CHAPTER 6

PERITONEAL DIALYSIS

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SECTION 6.1: MODALITIES AND PRESCRIPTION OF PD

In 2021, there was a total of 7,530 patients of whom 83.5% were on standard CAPD, 11.6% on Automated PD and 4.5% on DAPD (Table 6.1.1). The annual rate of increase in PD patients in the last 5 years has ranged between 6.2 – 10.1% per annum.

Over the last 5 years, there has been a gradual shift in distribution of patients on PD systems (Table 6.1.2). In CAPD, the distribution in 2021 was 53% on Baxter disconnect system, 43.8 % on Fresenius disconnect system and 3.1 % on Lucenxia. For APD, the distribution is 68.7%, 19.4% and 9.5% for Baxter, Fresenius and Lucenxia respectively.

Majority of PD patients (87.8%) were performing 4 exchanges a day while 10.3% were on incremental dialysis with fewer than 4 exchanges per day. Only 1.4% of patients performed 5 exchanges a day which is likely to reflect the fact that patients who require better clearances were converted to haemodialysis rather than increasing the number of exchanges (Table 6.1.3a). In those patients on CAPD, 96.2% are using dwell volumes of 8L/day or less (Table 6.1.3bi) while for APD, 80.1% use 10L/day or less (Table 6.1.3bii). The number of patients performing self-care CAPD in the last 10 years has slightly declined from 62.9% in 2011 to 58.3% in 2021, with an accompanying increasing trend towards more assisted PD (partial/fully assisted) from 34.6% to 41.7% (Table 6.1.4). The majority of APD is assisted as compared with self-care, 66% versus 34% respectively in 2021 (Figure 6.1.4).

Table 6.1.1: Peritoneal dialysis regimes, 2011-2021

PD regime	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
Standard CAPD	6291	83.5	5848	85.5	5364	86	4976	86.3	4674	86.9	4399	86.9
DAPD	340	4.5	268	3.9	279	4.5	212	3.7	141	2.6	132	2.6
Automated PD/ CCPD	875	11.6	691	10.1	550	8.8	503	8.7	458	8.5	459	9.1
Unknown/NA	24	0.3	30	0.4	45	0.7	75	1.3	103	1.9	74	1.5
Total	**7530**	**100**	**6837**	**100**	**6238**	**100**	**5766**	**100**	**5376**	**100**	**5064**	**100**

PD regime	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
Standard CAPD	4111	86.5	3516	85.1	3015	84.5	2645	84.5	2316	84
DAPD	113	2.4	141	3.4	127	3.6	92	2.9	70	2.5
Automated PD/ CCPD	463	9.7	407	9.9	387	10.8	355	11.3	343	12.4
Unknown/NA	67	1.4	66	1.6	40	1.1	40	1.3	29	1.1
Total	**4754**	**100**	**4130**	**100**	**3569**	**100**	**3132**	**100**	**2758**	**100**

Table 6.1.2: CAPD connectology, 2011-2021

CAPD connectology	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
CAPD	**6631**	**100**	**6116**	**100**	**5643**	**100**	**5188**	**100**	**4815**	**100**	**4531**	**100**
Baxter disconnect	3514	53	3358	54.9	3233	57.3	2993	57.7	2658	55.2	2678	59.1
Fresenius disconnect	2904	43.8	2605	42.6	2319	41.1	2127	41	2075	43.1	1808	39.9
Others	206	3.1	141	2.3	79	1.4	52	1	67	1.4	32	0.7
Unknown	7	0.1	12	0.2	11	0.2	16	0.3	14	0.3	14	0.3
APD	**875**	**100**	**691**	**100**	**550**	**100**	**503**	**100**	**458**	**100**	**459**	**100**
Baxter disconnect	601	68.7	504	72.9	418	76	369	73.3	317	69.3	301	65.5
Fresenius disconnect	170	19.4	140	20.2	108	19.6	113	22.4	105	22.9	97	21.1
Lucenxia	83	9.5	35	5	19	3.5	18	3.6	31	6.8	29	6.3
Others	8	0.9	3	0.5	3	0.5	1	0.1	1	0.2	0	0
Unknown	13	1.5	10	1.4	2	0.4	3	0.6	4	0.8	33	7.1

CAPD connectology	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
CAPD	**4224**	**100**	**3657**	**100**	**3142**	**100**	**2737**	**100**	**2386**	**100**
Baxter disconnect	2729	64.6	2545	69.6	2331	74.2	2097	76.6	1980	83
Fresenius disconnect	1432	33.9	1057	28.9	729	23.2	534	19.5	265	11.1
Others	38	0.9	40	1.1	57	1.8	88	3.2	122	5.1
Unknown	25	0.6	15	0.4	25	0.8	19	0.7	19	0.8
APD	**463**	**100**	**407**	**100**	**387**	**100**	**355**	**100**	**343**	**100**
Baxter disconnect	319	69	318	78.1	291	75.2	270	76.1	237	69.1
Fresenius disconnect	94	20.4	63	15.5	68	17.6	71	19.9	79	23
Lucenxia	17	3.6	1	0.2	0	0	0	0	0	0
Others	0	0	1	0.2	0	0	0	0	1	0.3
Unknown	32	7	24	6	28	7.2	14	4	26	7.6

Table 6.1.3(a): CAPD Number of Exchanges per day, 2011-2021

Number of exchanges/ day	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
1	4	0.1	6	0.1	10	0.2	6	0.1	5	0.1	6	0.1
2	23	0.3	19	0.3	17	0.3	19	0.4	14	0.3	9	0.2
3	656	9.9	497	8.1	437	7.7	365	7	246	5.1	173	3.8
4	5819	87.8	5483	89.7	5054	89.6	4660	89.8	4432	92	4197	92.6
5	96	1.4	83	1.4	99	1.8	101	1.9	69	1.4	59	1.3
Unknown	33	0.5	28	0.5	26	0.5	37	0.7	49	1	87	1.9
Total	**6631**	**100**	**6116**	**100**	**5643**	**100**	**5188**	**100**	**4815**	**100**	**4531**	**100**

Number of exchanges/ day	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
1	5	0.1	5	0.1	7	0.2	6	0.2	5	0.2
2	8	0.2	9	0.2	6	0.2	7	0.3	3	0.1
3	162	3.8	149	4.1	130	4.1	114	4.2	97	4.1
4	3947	93.4	3409	93.2	2921	93	2537	92.7	2223	93.2
5	44	1	37	1	36	1.1	41	1.5	24	1
Unknown	58	1.4	48	1.3	42	1.3	32	1.2	34	1.4
Total	**4224**	**100**	**3657**	**100**	**3142**	**100**	**2737**	**100**	**2386**	**100**

Table 6.1.3(b) (i): CAPD total dwell volumes per day, 2011-2021

Total dwell volumes /day	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
Less than 8	735	11.2	596	9.8	590	10.5	378	8.2	279	6.6	169	4.5
8	5596	85	5255	86.4	4808	85.8	3758	81.7	3579	84.8	3201	86.1
10	214	3.3	192	3.2	170	3	276	6	325	7.7	307	8.3
12	9	0.1	7	0.1	7	0.1	20	0.4	23	0.5	22	0.6
Unknown	27	0.4	30	0.5	26	0.5	170	3.7	17	0.4	17	0.5
Total	**6581**	**100**	**6080**	**100**	**5601**	**100**	**4602**	**100**	**4223**	**100**	**3716**	**100**

Total dwell volumes /day	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
Less than 8	155	4.5	187	6.5	147	5.9	127	5.8	92	4.8
8	2957	86.1	2410	83.2	2079	84	1811	83.4	1615	84.5
10	277	8.1	236	8.1	211	8.5	205	9.4	171	8.9
12	19	0.6	23	0.8	11	0.4	12	0.6	11	0.6
Unknown	27	0.8	41	1.4	27	1.1	16	0.7	22	1.2
Total	**3435**	**100**	**2897**	**100**	**2475**	**100**	**2171**	**100**	**1911**	**100**

Table 6.1.3(b) (ii): APD total dwell volumes per day, 2011-2021

Total dwell volumes /day	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
Less than 8	262	29.9	180	26	121	22	86	17.1	62	13.5	58	12.6
8	20	2.3	21	3	25	4.5	15	3	19	4.1	21	4.6
10	419	47.9	404	58.5	371	67.5	366	72.8	347	75.8	355	77.3
12	18	2.1	16	2.3	16	2.9	22	4.4	22	4.8	21	4.6
14	2	0.2	3	0.4	1	0.2	3	0.6	4	0.9	0	0
16	0	0	0	0	0	0	0	0	1	0.2	1	0.2
18	154	17.6	67	9.7	16	2.9	11	2.2	3	0.7	3	0.7
Total	**875**	**100**	**691**	**100**	**550**	**100**	**503**	**100**	**458**	**100**	**459**	**100**

Total dwell volumes /day	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
Less than 8	56	12.1	44	10.8	57	14.7	54	15.2	121	35.3
8	23	5	17	4.2	16	4.1	20	5.6	25	7.3
10	358	77.3	327	80.3	299	77.3	273	76.9	192	56
12	22	4.8	16	3.9	11	2.8	5	1.4	2	0.6
14	1	0.2	0	0	1	0.3	0	0	0	0
16	1	0.2	1	0.2	1	0.3	1	0.3	1	0.3
18	2	0.4	2	0.5	2	0.5	2	0.6	2	0.6
Total	**463**	**100**	**407**	**100**	**387**	**100**	**355**	**100**	**343**	**100**

Table 6.1.4: Assistance to Perform PD, 2011-2021

PD Regime / Assistant	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
CAPD	**6491**	**100**	**5973**	**100**	**5505**	**100**	**5081**	**100**	**4749**	**100**	**4170**	**100**
Self-care	3787	58.3	3441	57.6	3314	60.2	3081	60.6	2888	60.8	2526	60.6
Partial self-care	1081	16.7	955	16	820	14.9	772	15.2	702	14.8	681	16.3
Completely assisted	1623	25	1546	25.9	1357	24.7	1213	23.9	1157	24.4	910	21.8
Unknown	0	0	31	0.5	14	0.3	15	0.3	2	0	53	1.3
Automated PD	**855**	**100**	**677**	**100**	**538**	**100**	**488**	**100**	**451**	**100**	**420**	**100**
Self-care	289	33.8	211	31.2	179	33.3	163	33.4	140	31	130	31
Partial self-care	156	18.2	113	16.7	102	19	106	21.7	90	20	99	23.6
Completely assisted	410	48	331	48.9	249	46.3	219	44.9	221	49	178	42.4
Unknown	0	0	22	3.2	8	1.5	0	0	0	0	13	3.1

PD Regime / Assistant	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
CAPD	**3824**	**100**	**3295**	**100**	**2860**	**100**	**2488**	**100**	**2205**	**100**
Self-care	2384	62.3	2065	62.7	1786	62.4	1534	61.7	1388	62.9
Partial self-care	621	16.2	413	12.5	391	13.7	377	15.2	300	13.6
Completely assisted	754	19.7	765	23.2	607	21.2	530	21.3	462	21
Unknown	65	1.7	52	1.6	76	2.7	47	1.9	55	2.5
Automated PD	**429**	**100**	**364**	**100**	**354**	**100**	**327**	**100**	**308**	**100**
Self-care	131	30.5	107	29.4	111	31.4	91	27.8	79	25.6
Partial self-care	112	26.1	72	19.8	99	28	83	25.4	96	31.2
Completely assisted	180	42	179	49.2	135	38.1	142	43.4	120	39
Unknown	6	1.4	6	1.6	9	2.5	11	3.4	13	4.2

Figure 6.1.4(a): Assistance to Perform CAPD, 2011-2021

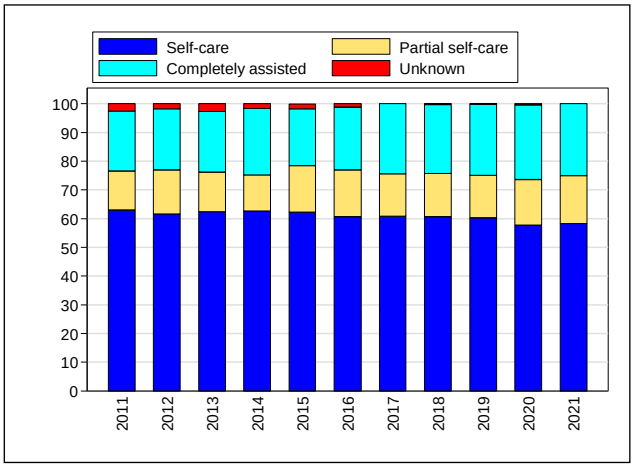
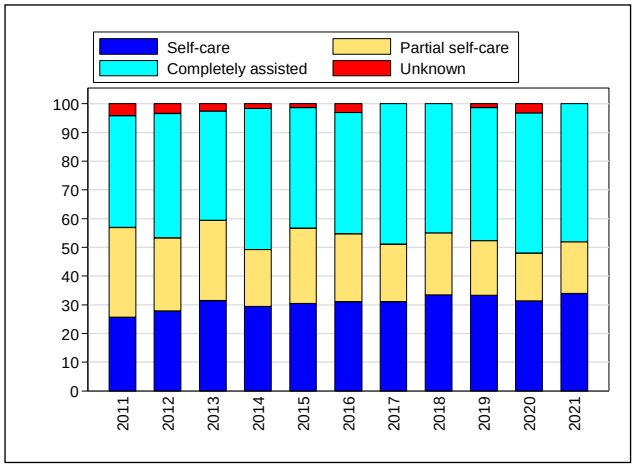


Figure 6.1.4(b): Assistance to Perform APD, 2011-2021



SECTION 6.2: ACHIEVEMENT OF SOLUTE CLEARANCE AND PERITONEAL TRANSPORT

The percentage of patients achieving target solute clearance of ≥1.7 per week was 65% in 2021 (Table 6.2.1). It has been observed from 2011-2021, the solute clearance rate is in declining trend. This is due to the paradigm shift in clinical practice of putting less emphasis on targeting Kt/V for high quality PD care.

There is a wide inter-centre variation in the proportion of patients achieving the delivered Kt/V in 2021. This wide inter-centre variation has been observed in previous years (Table and Figure 6.2.2).

Majority of incident PD patients are in the low average or high average membrane transport status (Table 6.2.3). This proportion of distribution was no different across the dialysis vintage even after 10 years on therapy (Table 6.2.4).

Table 6.2.1: Distribution of delivered Kt/V, PD patients 2011-2021

Year	Number of Patients	Mean	SD	Median	LQ	UQ	% patients ≥ 1.7 per week
2021	5573	1.9	0.5	1.8	1.6	2.1	65
2020	5234	1.9	0.5	1.8	1.6	2.1	67
2019	4960	1.9	0.5	1.9	1.6	2.2	69
2018	4399	1.9	0.5	1.9	1.6	2.2	69
2017	4075	2.0	0.5	1.9	1.7	2.2	72
2016	3809	2.0	0.5	1.9	1.7	2.3	74
2015	3477	2.0	0.5	2.0	1.7	2.3	74
2014	3022	2.0	0.5	1.9	1.7	2.3	74
2013	2724	2.1	0.5	2.0	1.7	2.3	78
2012	2278	2.1	0.5	2.0	1.8	2.4	79
2011	1727	2.1	0.5	2.0	1.8	2.3	79

Table 6.2.2: Variation in proportion of patients with Kt/V ≥1.7 per week among PD centres, 2011-2021

Year	Number of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
2021	44	23	45	52.5	64.0	72.0	82	90
2020	42	22	50	55.0	65.0	75.0	82	92
2019	38	14	32	59.0	67.0	77.0	90	96
2018	35	20	31	59.0	68.0	78.0	90	95
2017	33	37	38	63.0	68.0	79.0	88	89
2016	32	50	54	63.5	74.5	82.5	89	92
2015	30	47	55	66.0	74.5	80.0	89	91
2014	28	44	47	66.5	73.5	80.0	89	89
2013	25	48	52	70.0	80.0	84.0	88	91
2012	24	53	59	70.0	79.5	87.5	95	100
2011	23	61	63	71.0	79.0	83.0	90	91

Figure 6.2.2: Variation in proportion of patients with Kt/V ≥1.7 per week among PD centres 2011-2021

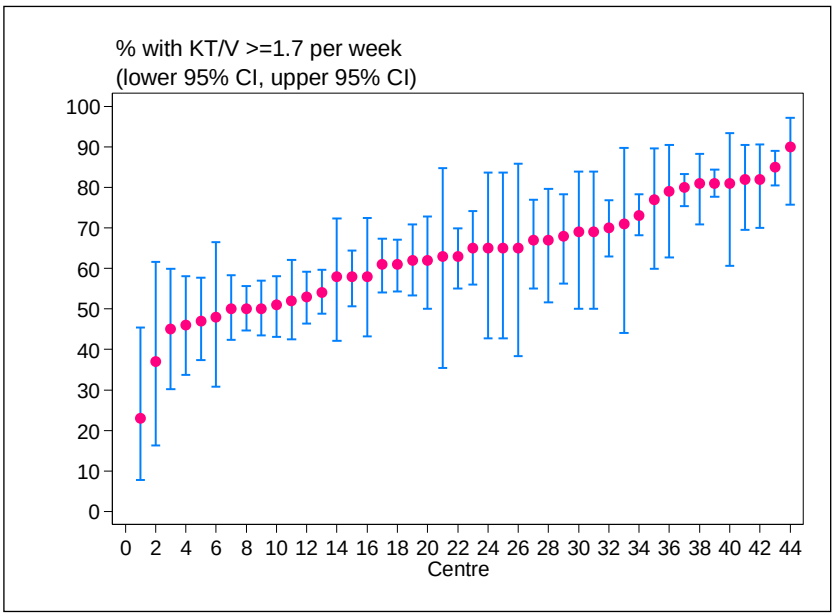


Table 6.2.3: Peritoneal transport status by PET D/P creatinine at 4 hours, new PD patients 2011-2021

Year	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
Low	519	11.5	486	11.3	474	10.7	434	11.5	424	11.8	339	11.3
Low average	1739	38.6	1645	38.3	1783	40.3	1542	40.8	1567	43.4	1312	43.9
High average	1729	38.3	1648	38.4	1684	38.1	1399	37	1282	35.5	1017	34
High	524	11.6	514	12	481	10.9	402	10.6	334	9.3	319	10.7
Total	**4511**	**100**	**4293**	**100**	**4422**	**100**	**3777**	**100**	**3607**	**100**	**2987**	**100**

Year	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
Low	341	12.3	307	13.1	265	12.5	194	10.5	163	10.3
Low average	1169	42.3	921	39.2	861	40.6	743	40.4	622	39.3
High average	936	33.9	791	33.6	752	35.4	705	38.3	604	38.2
High	317	11.5	333	14.2	245	11.5	198	10.8	194	12.3
Total	**2763**	**100**	**2352**	**100**	**2123**	**100**	**1840**	**100**	**1583**	**100**

Table 6.2.4: Peritoneal Transport Status (PET) with dialysis vintage

Duration (Years)	<1		1-<2		2-<3		3-<4		4-<5	
	n	%	n	%	n	%	n	%	n	%
Low	113	12.2	127	11.7	92	11.1	55	10.2	44	12.3
Low average	371	39.9	420	38.6	319	38.3	203	37.8	146	40.9
High average	352	37.8	414	38	306	36.8	213	39.7	129	36.1
High	94	10.1	128	11.8	115	13.8	66	12.3	38	10.6
Total	**930**	**100**	**1089**	**100**	**832**	**100**	**537**	**100**	**357**	**100**

Duration (Years)	5-<6		6-<7		7-<8		8-<9		9-<10		10 or more	
	n	%	n	%	n	%	n	%	n	%	n	%
Low	36	16.3	20	10.1	13	12.4	9	12.5	4	6.8	6	5.0
Low average	84	38.0	71	35.7	32	30.5	29	40.3	18	30.5	48	40.3
High average	82	37.1	83	41.7	49	46.7	27	37.5	30	50.8	49	41.2
High	19	8.6	25	12.6	11	10.5	7	9.7	7	11.9	16	13.4
Total	**221**	**100**	**199**	**100**	**105**	**100**	**72**	**100**	**59**	**100**	**119**	**100**

SECTION 6.3: TECHNIQUE SURVIVAL ON PD

Table and Figure 6.3.1(a) & (b) illustrate patient technique survival by era. The latter era in 2017-2021 showed better PD technique survival (uncensored for death and transplant) as compared to former eras. This is observed till 48 months of PD therapy. However, after censored for death and transplant, there were no difference in technique survival between the different eras.

Younger age consistently has better technique survival compared to older age (Table & Figure 6.3.2 (a)). However, this observation is reversed after censored for death and transplant with increasing age having better technique survival (Table & Figure 6.3.2 (b)).

Tables and Figures 6.3.3 (a) & (b) illustrates female gender consistently had better technique survival than male. Diabetes has been associated with worse technique survival as early at 1 year (Table & Figure 6.3.4(a) and (b)) both uncensored and censored for death and transplant.

Table 6.3.1(a): Unadjusted technique survival by era, 2002-2021 (uncensored for death and transplant)

Era Interval (month)	2002-2006			2007-2011			2012-2016			2017-2021		
	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE
0	1960	100		3334	100		6052	100		8537	100	
6	1773	93	1	2971	93	0	5405	93	0	6992	94	0
12	1551	86	1	2584	85	1	4813	86	0	5343	86	0
24	1202	74	1	1949	71	1	3605	71	1	2897	72	1
36	892	61	1	1464	59	1	2687	58	1	1372	59	1
48	678	51	1	1081	48	1	1956	46	1	511	47	1
60	519	44	1	788	39	1	1429	37	1	37	36	2
72	404	38	1	570	31	1	815	29	1	1		
84	284	30	1	423	26	1	414	24	1	1		
96	211	25	1	289	21	1	199	20	1	1		
108	170	22	1	226	18	1	88	18	1	1		
120	136	19	1	172	15	1	6	16	1	1		

Table 6.3.1(b): Unadjusted technique survival by era, 2002-2021 (censored for death and transplant)

Era Interval (month)	2002-2006			2007-2011			2012-2016			2017-2021		
	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE
0	1960	100		3334	100		6052	100		8537	100	
6	1773	98	0	2971	97	0	5405	97	0	6992	97	0
12	1551	93	1	2584	92	0	4813	93	0	5343	93	0
24	1202	86	1	1949	84	1	3605	85	0	2897	85	0
36	892	78	1	1464	76	1	2687	78	1	1372	78	1
48	678	72	1	1081	70	1	1956	72	1	511	72	1
60	519	65	1	788	63	1	1429	66	1	37	68	1
72	404	60	2	570	58	1	815	60	1	1		
84	284	53	2	423	52	1	414	55	1	1		
96	211	48	2	289	44	1	199	49	1	1		
108	170	44	2	226	40	2	88	46	2	1		
120	136	41	2	172	37	2	6	42	2	1		

Figure 6.3.1(a): Unadjusted technique survival by era, 2002-2021 (uncensored for death and transplant)

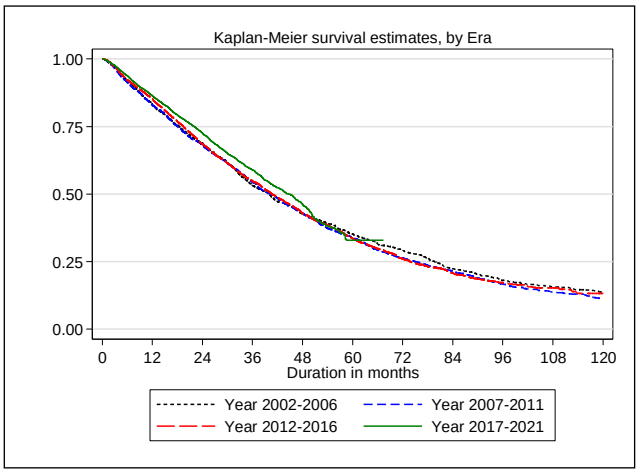


Figure 6.3.1(b): Unadjusted technique survival by era, 2002-2021 (censored for death and transplant)

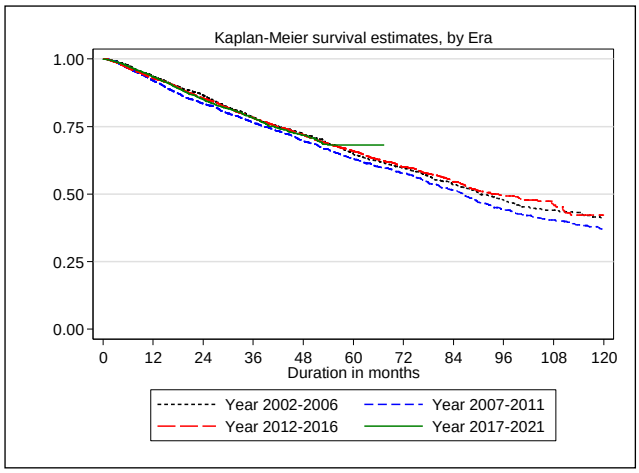


Table 6.3.2(a): Unadjusted technique survival by age (uncensored for death and transplant)

Age group (years)	20-24			25-34			35-44		
Interval (month)	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE
0	380	100		1,391	100		1,881	100	
6	330	97	1	1199	97	0	1626	96	0
12	279	94	1	1027	94	1	1338	91	1
24	201	92	2	702	88	1	901	80	1
36	147	89	2	488	82	1	604	72	1
48	102	83	3	346	76	2	372	63	2
60	63	78	3	223	67	2	234	55	2
72	47	75	4	135	62	2	137	45	2
84	30	72	4	81	55	3	88	40	2
96	16	70	5	49	49	3	54	37	2
108	6	55	9	29	48	3	31	32	3
120	3	55	9	11	46	4	10	29	3

Age group (years)	45-54			55-64			>=65		
Interval (month)	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE
0	3,109	100		4,349	100		3,369	100	
6	2690	95	0	3720	93	0	2734	88	1
12	2254	88	1	3027	85	1	2160	77	1
24	1498	74	1	1910	68	1	1265	56	1
36	968	61	1	1100	51	1	749	40	1
48	617	50	1	651	38	1	393	26	1
60	394	40	1	351	27	1	202	16	1
72	222	31	1	183	19	1	97	11	1
84	117	24	1	86	14	1	39	7	1
96	63	21	1	39	10	1	14	4	1
108	32	19	2	20	8	1	7	3	1
120	12	16	2	11	7	1	3	2	1

Table 6.3.2(b): Unadjusted technique survival by age (censored for death and transplant)

Age group (years) Interval (month)	20-24			25-34			35-44		
	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE
0	380	100		1,391	100		1,881	100	
6	330	95	1	1199	97	1	1626	98	0
12	279	92	2	1027	92	1	1338	93	1
24	201	81	2	702	83	1	901	84	1
36	147	73	3	488	73	1	604	76	1
48	102	63	3	346	67	2	372	67	2
60	63	54	4	223	58	2	234	61	2
72	47	50	4	135	53	2	137	55	2
84	30	43	4	81	49	2	88	49	2
96	16	35	5	49	45	3	54	45	3
108	6	35	5	29	42	3	31	42	3
120	3	35	5	11	38	4	10	40	3

Age group (years) Interval (month)	45-54			55-64			>=65		
	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE
0	3,109	100		4,349	100		3,369	100	
6	2690	97	0	3720	97	0	2734	97	0
12	2254	93	1	3027	94	0	2160	94	0
24	1498	85	1	1910	86	1	1265	88	1
36	968	78	1	1100	79	1	749	84	1
48	617	73	1	651	74	1	393	79	1
60	394	66	1	351	69	1	202	76	1
72	222	61	2	183	62	2	97	73	2
84	117	56	2	86	58	2	39	68	3
96	63	52	2	39	50	3	14	66	4
108	32	48	3	20	48	4	7	45	10
120	12	44	4	11	44	5	3	36	12

Figure 6.3.2(a): Unadjusted technique survival by age (uncensored for death and transplant)

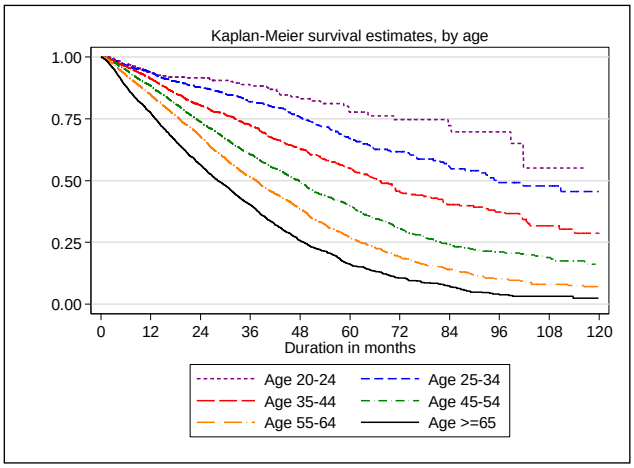


Figure 6.3.2(b): Unadjusted technique survival by age (censored for death and transplant)

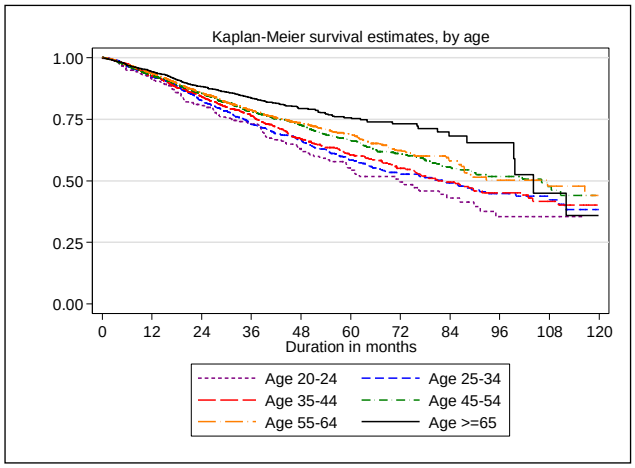


Table 6.3.3(a): Unadjusted technique survival by gender (uncensored for death and transplant)

Gender	Male			Female		
Interval (months)	n	% Survival	SE	n	% Survival	SE
0	8,085	100		7,280	100	
6	6916	94	0	6171	93	0
12	5634	86	0	5139	86	0
24	3583	71	1	3399	72	1
36	2216	57	1	2202	61	1
48	1278	44	1	1456	50	1
60	782	34	1	873	40	1
72	451	27	1	505	33	1
84	234	22	1	283	28	1
96	124	18	1	150	23	1
108	70	16	1	80	21	1
120	27	14	1	31	19	1

Table 6.3.3(b): Unadjusted technique survival by gender (censored for death and transplant)

Gender	Male			Female		
Interval (months)	n	% Survival	SE	n	% Survival	SE
0	8,085	100		7,280	100	
6	6916	97	0	6171	97	0
12	5634	93	0	5139	93	0
24	3583	85	0	3399	86	0
36	2216	77	1	2202	79	1
48	1278	69	1	1456	75	1
60	782	64	1	873	67	1
72	451	60	1	505	61	1
84	234	54	1	283	55	1
96	124	47	2	150	50	2
108	70	44	2	80	45	2
120	27	42	2	31	42	2

Figure 6.3.3(a): Unadjusted technique survival by gender (uncensored for death and transplant)

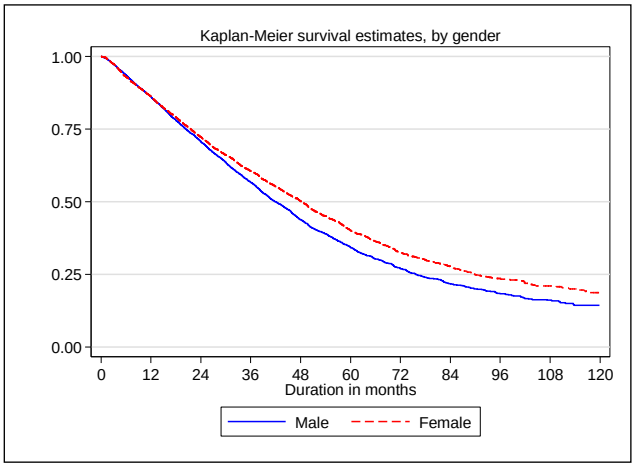


Figure 6.3.3(b): Unadjusted technique survival by gender (censored for death and transplant)

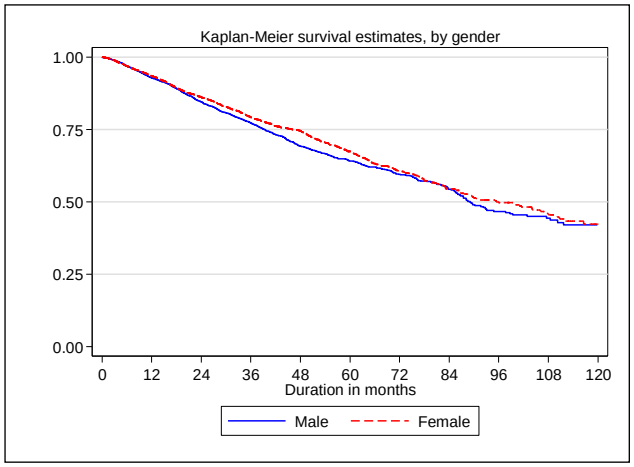


Table 6.3.4(a): Unadjusted technique survival by diabetes status (uncensored for death and transplant)

Diabetes status	Non-diabetic			Diabetic		
Interval (month)	n	% Survival	SE	n	% Survival	SE
0	18,694	100		6,482	100	
6	10071	93	0	2957	93	0
12	8261	86	0	2469	85	1
24	5430	72	0	1523	69	1
36	3532	60	1	864	54	1
48	2211	49	1	511	40	1
60	1373	39	1	275	29	1
72	810	32	1	141	22	1
84	451	27	1	65	16	1
96	241	23	1	34	14	1
108	134	20	1	16	13	1
120	50	17	1	9	13	1

Table 6.3.4(b): Unadjusted technique survival by diabetes status (censored for death and transplant)

Diabetes status	Non-diabetic			Diabetic		
Interval (month)	n	% Survival	SE	n	% Survival	SE
0	18,694	100		6,482	100	
6	10038	97	0	2989	96	0
12	8225	94	0	2506	91	1
24	5435	86	0	1523	83	1
36	3559	79	0	844	75	1
48	2247	73	1	479	69	1
60	1392	67	1	259	62	2
72	812	61	1	142	58	2
84	440	55	1	78	54	2
96	234	49	1	40	49	3
108	131	46	2	19	42	4
120	49	42	2	10	42	4

Figure 6.3.4(a): Unadjusted technique survival by diabetes status (uncensored for death and transplant)

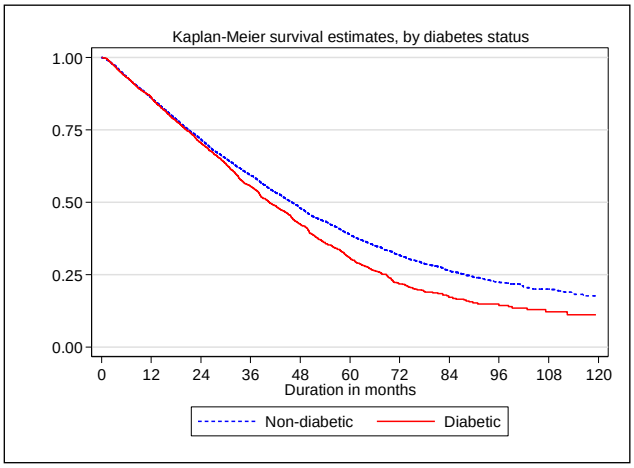


Figure 6.3.4(b): Unadjusted technique survival by diabetes status (censored for death and transplant)

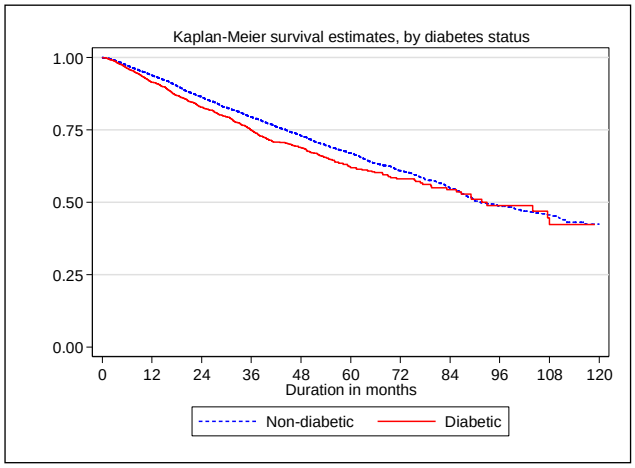
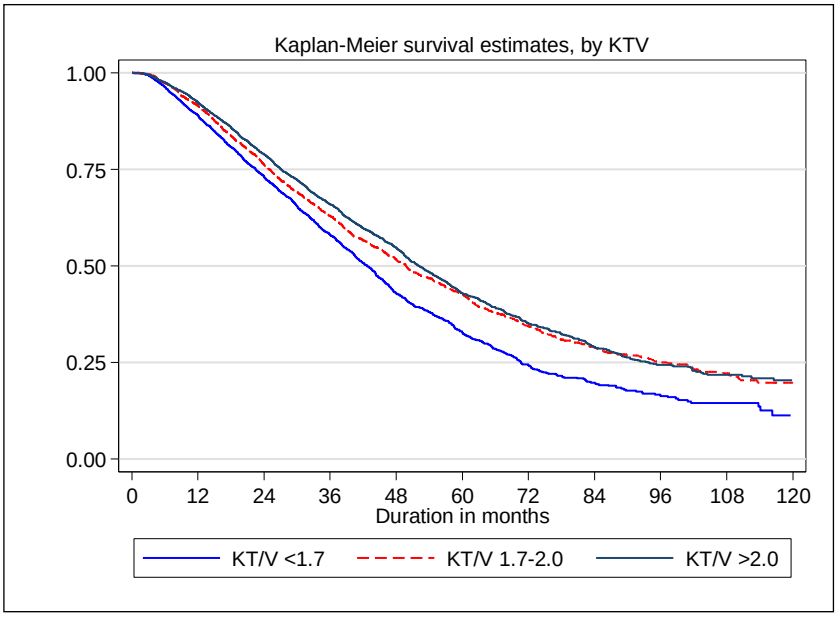


Table 6.3.5: Unadjusted technique survival by Kt/V

Kt/V	<1.7			1.7-2.0			>2.0		
Interval (months)	n	% Survival	SE	n	% Survival	SE	n	% Survival	SE
0	4,078	100		3,648	100		4,903	100	
6	3844	96	0	3375	97	0	4599	98	0
12	3235	89	1	2892	91	0	3992	92	0
24	2091	74	1	1924	76	1	2768	79	1
36	1295	58	1	1231	62	1	1794	66	1
48	745	45	1	779	50	1	1149	54	1
60	431	35	1	512	42	1	678	42	1
72	225	25	1	304	34	1	406	34	1
84	111	21	1	160	28	1	232	29	1
96	56	17	1	82	24	1	134	25	1
108	30	15	1	46	22	2	73	22	1
120	9	13	2	20	20	2	31	19	2

Figure 6.3.5: Unadjusted technique survival by Kt/V



In 2021, 81.6% drop out were due to death (Table 6.3.6). This is followed by PD infections (9.2%) and social reasons (2.6%). The PD drop-out < 12 months on therapy in 2021 were 25.1%. This trend is observed similarly in previous years (Table 6.3.8).

Table 6.3.6: Reasons for drop-out from PD program, 2011-2021

Year	2021		2020		2019		2018		2017		2016	
Reasons	n	%	n	%	n	%	n	%	n	%	n	%
Death	1163	81.6	882	79.6	893	80.1	819	81.3	775	76.9	731	67.4
Transplant	8	0.6	27	2.4	27	2.4	25	2.5	8	0.8	6	0.6
PD infections	131	9.2	94	8.5	89	8	77	7.6	97	9.6	127	11.7
Inadequate dialysis	16	1.1	13	1.2	23	2.1	20	2	25	2.5	55	5.1
Catheter related issues	58	4.1	39	3.5	41	3.7	34	3.4	23	2.3	51	4.7
Social reasons	37	2.6	37	3.3	26	2.3	21	2.1	25	2.5	52	4.8
Others	12	0.8	15	1.4	10	0.9	10	1	15	1.5	18	1.7
Unknown	1	0.1	1	0.1	6	0.5	1	0.1	40	4	45	4.1
Total	**1426**	**100**	**1108**	**100**	**1115**	**100**	**1007**	**100**	**1008**	**100**	**1085**	**100**

Year	2015		2014		2013		2012		2011	
Reasons	n	%	n	%	n	%	n	%	n	%
Death	631	65.5	576	70.4	471	67.1	395	68	374	64.3
Transplant	10	1	14	1.7	17	2.4	14	2.4	16	2.7
PD infections	121	12.6	66	8.1	74	10.5	51	8.8	60	10.3
Inadequate dialysis	38	3.9	34	4.2	38	5.4	25	4.3	26	4.5
Catheter related issues	35	3.6	34	4.2	26	3.7	30	5.2	32	5.5
Social reasons	55	5.7	45	5.5	37	5.3	28	4.8	35	6
Others	11	1.1	7	0.9	12	1.7	8	1.4	4	0.7
Unknown	63	6.5	42	5.1	27	3.8	30	5.2	35	6
Total	**964**	**100**	**818**	**100**	**702**	**100**	**581**	**100**	**582**	**100**

Figure 6.3.6: Reasons for drop-out from PD program, 2011-2021

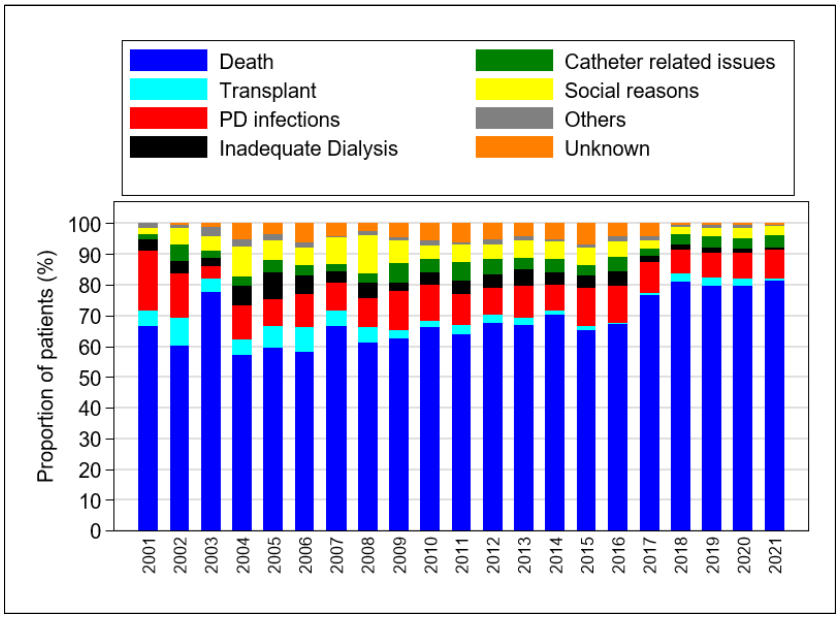


Table 6.3.7: Drop-out rate from PD program with time on treatment, 2011-2021

Year	2021		2020		2019		2018		2017		2016	
Time	n	%	n	%	n	%	n	%	n	%	n	%
< 3 months	69	4.8	63	5.7	45	4	33	3.3	45	4.5	41	3.8
3-<6 months	102	7.2	81	7.3	72	6.5	78	7.7	71	7	87	8
6- <12 months	187	13.1	169	15.3	147	13.2	128	12.7	116	11.5	146	13.5
>=12 months	1068	74.9	795	71.8	851	76.3	768	76.3	776	77	811	74.7
Total	**1426**	**100**	**1108**	**100**	**1115**	**100**	**1007**	**100**	**1008**	**100**	**1085**	**100**

Year	2015		2014		2013		2012		2011	
Time	n	%	n	%	n	%	n	%	n	%
< 3 months	63	6.5	45	5.5	42	6	34	5.9	29	5
3-<6 months	90	9.3	79	9.7	56	8	58	10	53	9.1
6- <12 months	138	14.3	97	11.9	85	12.1	77	13.3	79	13.6
>=12 months	673	69.8	597	73	519	73.9	412	70.9	421	72.3
Total	**964**	**100**	**818**	**100**	**702**	**100**	**581**	**100**	**582**	**100**

SECTION 6.4: PERITONITIS

The median peritonitis rate in 2021 is 1 in 47.1 patient-months. There is still significant inter-centre variation as illustrated in Table and Figure 6.4.1. The contribution of gram positive and gram-negative organisms to peritonitis is 28.1 % and 24.2% respectively, while fungal and mycobacterial infections account for 2.8% and 1.3% respectively (Table 6.4.2). Culture-negative peritonitis rates remain high at 26.1% of all episodes in 2021.

In terms of overall outcomes, 75.7% of peritonitis episodes resolved, this included 2% of relapsing peritonitis that recovered. 21.8% resulted in catheter loss (Table 6.4.3). The mortality rate in 2021 was 2.5% and the pattern of the causative organisms remained the same; highest mortality seen in infections due to mycobacterial, fungal and gram-negative infections (Table 6.4.4). Comparing the eras of 2011-2015 and 2016-2021, the death rates from mycobacterium and fungal peritonitis have increased (Figure 6.4.4).

Multivariate analysis indicates that age above 65 years, lower education and requirement for assistance with PD are risk factors associated with peritonitis (Table 6.4.5).

Table 6.4.1: Variation of peritonitis rate (pt-month/epi) among PD centres, 2011-2021

Year	Number of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
2021	48	15.6	23.1	37.7	47.1	59	96.5	236.4
2020	42	18.7	21.4	35.1	45.7	52.4	91.3	210.6
2019	42	13.6	21.9	37.6	47.5	66.8	104	316.4
2018	41	7.5	11.9	31.2	43.5	54.2	134.4	185.8
2017	40	10.4	17.1	36.2	44	52.5	78.2	185.6
2016	36	10.5	18.5	31.5	42.3	59.5	148.3	189.5
2015	36	3.5	17.1	25.6	38.6	53.8	107.3	113.9
2014	33	18.3	23.4	32.4	44.7	65.4	201.3	321.4
2013	32	14.5	22.1	33.2	43.2	50.8	106.2	153.3
2012	29	25.5	29.5	43	57.2	78.6	177.6	237.2
2011	28	7.1	12	33.3	43.9	61.1	101	263.5

Figure 6.4.1: Variation in peritonitis rate among PD centres, 2021

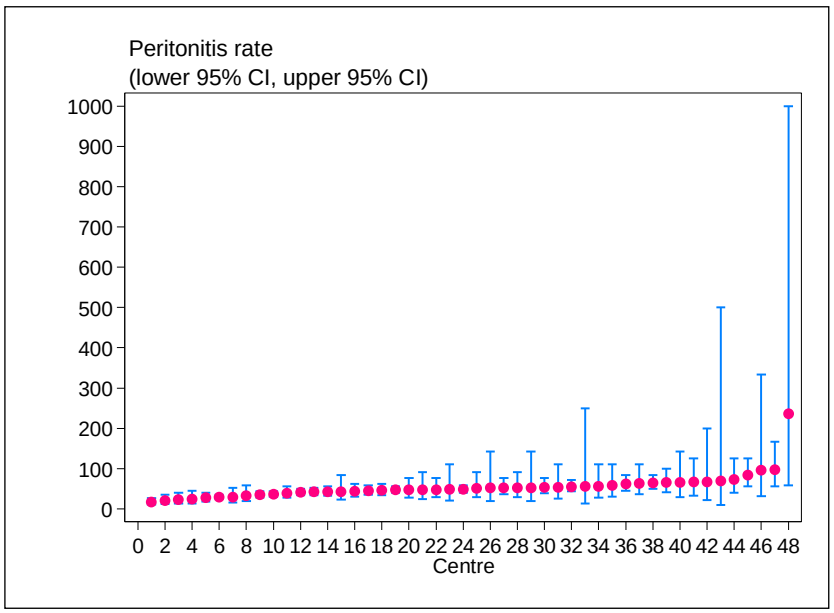


Table 6.4.2: Causative organism in PD peritonitis, 2011-2021

	2021		2020		2019		2018		2017		2016	
	n	%	n	%	n	%	n	%	n	%	n	%
(A) Gram Positives												
Staph. aureus	279	11.7	284	12.5	306	17.1	283	15.5	285	17.2	226	14.4
Staph Coagulase Neg.	269	11.3	206	9.1	117	6.5	133	7.3	142	8.6	153	9.7
Strep	94	4	94	4.1	73	4.1	69	3.8	87	5.3	70	4.4
Others	27	1.1	25	1.1	20	1.1	32	1.8	39	2.4	41	2.6
(B) Gram Negatives												
Pseudomonas	240	10.1	208	9.2	196	11	167	9.2	160	9.7	154	9.8
Acinetobacter	38	1.6	36	1.6	29	1.6	35	1.9	35	2.1	41	2.6
Klebsiella	99	4.2	90	4	58	3.2	85	4.7	57	3.4	68	4.3
Enterobacter	20	0.8	24	1.1	19	1.1	28	1.5	28	1.7	29	1.8
E.Coli	84	3.5	95	4.2	81	4.5	86	4.7	93	5.6	110	7
Others	96	4	101	4.5	49	2.7	50	2.7	45	2.7	50	3.2
(C) Polymicrobial	0	0	0	0	0	0	0	0	22	1.3	51	3.2
(D) Others												
Fungal	66	2.8	55	2.4	54	3	53	2.9	51	3.1	45	2.9
Mycobacterium	32	1.3	27	1.2	16	0.9	22	1.2	11	0.7	17	1.1
Others	357	15	341	15	191	10.7	191	10.5	160	9.7	72	4.6
(E) No growth	621	26.1	618	27.2	528	29.5	548	30.1	403	24.4	367	23.3
(F) Unknown	55	2.3	64	2.8	51	2.9	38	2.1	35	2.1	80	5.1
Total	**2377**	**100**	**2268**	**100**	**1788**	**100**	**1820**	**100**	**1653**	**100**	**1574**	**100**

	2015		2014		2013		2012		2011	
	n	%	n	%	n	%	n	%	n	%
(A) Gram Positives										
Staph. aureus	226	14.4	177	14.3	192	18	149	17.5	133	16
Staph Coagulase Neg.	156	9.9	91	7.4	75	7	63	7.4	62	7.5
Strep	84	5.3	60	4.8	58	5.4	40	4.7	34	4.1
Others	53	3.4	36	2.9	44	4.1	24	2.8	19	2.3
(B) Gram Negatives										
Pseudomonas	126	8	116	9.4	113	10.6	86	10.1	106	12.8
Acinetobacter	32	2	34	2.7	31	2.9	32	3.8	29	3.5
Klebsiella	61	3.9	56	4.5	45	4.2	33	3.9	37	4.5
Enterobacter	18	1.1	20	1.6	16	1.5	17	2	14	1.7
E.Coli	79	5	61	4.9	52	4.9	49	5.8	53	6.4
Others	24	1.5	27	2.2	14	1.3	14	1.6	12	1.4
(C) Polymicrobial	53	3.4	49	4	24	2.2	1	0.1	1	0.1
(D) Others										
Fungal	49	3.1	26	2.1	34	3.2	28	3.3	21	2.5
Mycobacterium	2	0.1	6	0.5	5	0.5	2	0.2	6	0.7
Others	108	6.9	72	5.8	55	5.2	52	6.1	46	5.5
(E) No growth	447	28.5	330	26.7	233	21.8	185	21.8	196	23.6
(F) Unknown	53	3.4	77	6.2	76	7.1	75	8.8	61	7.3
Total	**1571**	**100**	**1238**	**100**	**1067**	**100**	**850**	**100**	**830**	**100**

Figure 6.4.2: Causative organism in PD peritonitis, 2011-2021

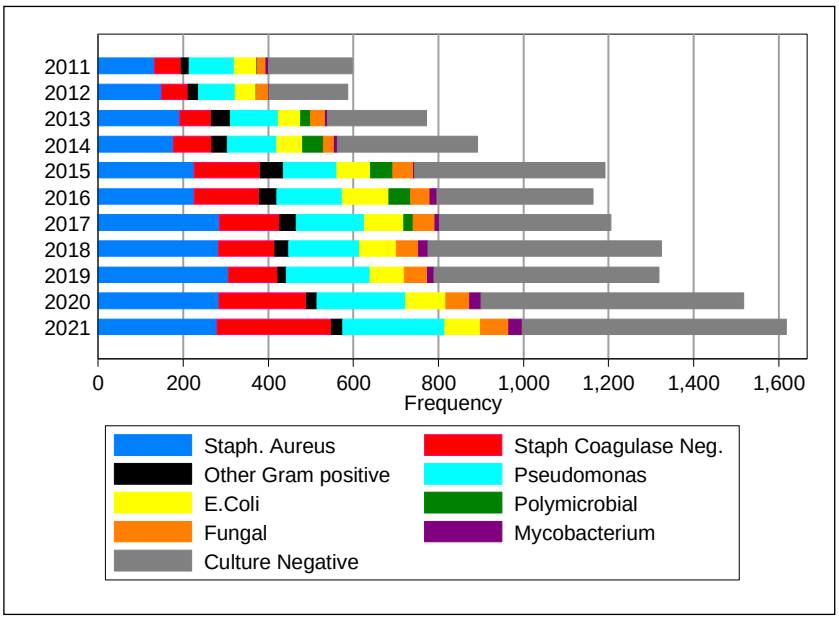


Table 6.4.3: Overall outcomes of PD peritonitis, 2011-2021

Year	Resolved		Relapsed Then Resolved		Relapsed Catheter Removed		Not Resolved Catheter Removed		Death		Unknown		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2021	1753	73.7	47	2	48	2	470	19.8	59	2.5	0	0	2377
2020	1653	72.9	66	2.9	43	1.9	438	19.3	68	3	0	0	2268
2019	1267	70.9	47	2.6	31	1.7	368	20.6	50	2.8	25	1.4	1788
2018	1310	72	70	3.8	40	2.2	342	18.8	43	2.4	15	0.8	1820
2017	1256	76	44	2.7	11	0.7	280	16.9	41	2.5	21	1.3	1653
2016	1124	71.4	57	3.6	14	0.9	291	18.5	38	2.4	50	3.2	1574
2015	1120	71.3	53	3.4	16	1	326	20.8	27	1.7	29	1.8	1571
2014	842	68	55	4.4	10	0.8	235	19	45	3.6	51	4.1	1238
2013	731	68.5	37	3.5	13	1.2	196	18.4	25	2.3	65	6.1	1067
2012	529	62.2	37	4.4	30	3.5	152	17.9	23	2.7	79	9.3	850
2011	514	61.9	41	4.9	25	3	141	17	28	3.4	81	9.8	830

Table 6.4.4(a): Outcome of peritonitis by causative organism, 2011-2016

	Outcome									
	Resolved		Catheter removed		Death		Unknown		Total	
	n	%	n	%	n	%	n	%	n	%
(A) Gram Positives										
Staph. Aureus	842	76.3	107	9.7	98	8.9	56	5.1	1103	100
Staph Coagulase Neg.	498	83	28	4.7	47	7.8	27	4.5	600	100
Strep	288	83.2	17	4.9	28	8.1	13	3.8	346	100
Others	162	74.7	24	11.1	23	10.6	8	3.7	217	100
(B) Gram Negatives										
Pseudomonas	468	66.8	104	14.8	83	11.8	46	6.6	701	100
Acinetobacter	122	61.3	25	12.6	39	19.6	13	6.5	199	100
Klebsiella	200	66.7	39	13	51	17	10	3.3	300	100
Enterobacter	80	70.2	16	14	11	9.6	7	6.1	114	100
E.Coli	269	66.6	44	10.9	80	19.8	11	2.7	404	100
Others	86	61	24	17	24	17	7	5	141	100
(C) Polymicrobial	119	66.5	26	14.5	26	14.5	8	4.5	179	100
(D) Others										
Fungal	52	25.6	79	38.9	63	31	9	4.4	203	100
Mycobacterium	7	18.4	15	39.5	15	39.5	1	2.6	38	100
Others	269	66.4	51	12.6	60	14.8	25	6.2	405	100
(E) No growth	1321	75.1	205	11.7	183	10.4	49	2.8	1758	100
(F) Unknown	241	57.1	67	15.9	78	18.5	36	8.5	422	100

Table 6.4.4(b): Outcome of peritonitis by causative organism, 2017-2021

	Outcome									
	Resolved		Catheter removed		Death		Unknown		Total	
	n	%	n	%	n	%	n	%	n	%
(A) Gram Positives										
Staph. Aureus	1211	84.3	103	7.2	114	7.9	9	0.6	1437	100
Staph Coagulase Neg.	709	81.8	63	7.3	92	10.6	3	0.3	867	100
Strep	368	88.2	20	4.8	27	6.5	2	0.5	417	100
Others	106	74.1	20	14	17	11.9	0	0	143	100
(B) Gram Negatives										
Pseudomonas	683	70.3	134	13.8	152	15.7	2	0.2	971	100
Acinetobacter	113	65.3	31	17.9	29	16.8	0	0	173	100
Klebsiella	277	71.2	41	10.5	71	18.3	0	0	389	100
Enterobacter	89	74.8	15	12.6	14	11.8	1	0.8	119	100
E.Coli	304	69.2	53	12.1	79	18	3	0.7	439	100
Others	262	76.8	29	8.5	48	14.1	2	0.6	341	100
(C) Polymicrobial	20	90.9	1	4.5	1	4.5	0	0	22	100
(D) Others										
Fungal	44	15.8	104	37.3	130	46.6	1	0.4	279	100
Mycobacterium	15	13.9	41	38	51	47.2	1	0.9	108	100
Others	871	70.2	183	14.8	184	14.8	2	0.2	1240	100
(E) No growth	2060	75.8	335	12.3	315	11.6	8	0.3	2718	100
(F) Unknown	157	64.6	28	11.5	40	16.5	18	7.4	243	100

Figure 6.4.4: Outcome of peritonitis by causative organism by era, 2011-2016 & 2017-2021

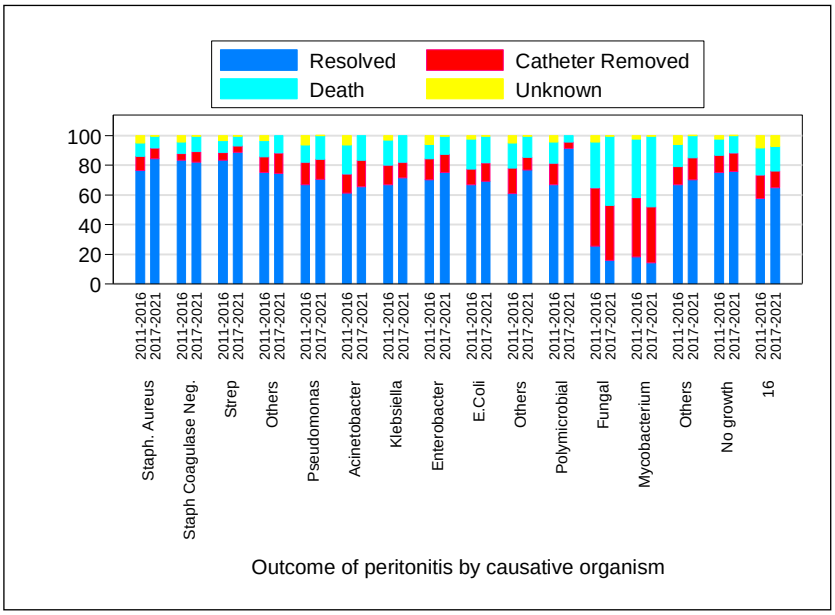


Table 6.4.5: Risk factors influencing peritonitis rate, 2011-2021

Factors	n	Risk Ratio	95% CI	P value
Age (years)				
20-24	154	1.112	(0.92, 1.32)	0.202
25-34 (ref*)	448	1.000		
35-44	632	1.077	(1.02, 1.22)	0.2
45-54	1006	1.045	(0.92, 1.22)	0.415
55-64	1294	1.176	(1.12, 1.32)	0.003
>=65	951	1.228	(1.12, 1.42)	<0.001
Gender				
Male (ref*)	2402	1.000		
Female	2300	0.997	(0.92, 1.12)	0.927
Diabetes				
No (ref*)	3579	1.000		
Yes	1123	1.056	(1.02, 1.12)	0.088
Income				
<RM 1000 (ref*)	1499	1		
RM 1000-3000	2230	0.996	(0.92, 1.12)	0.893
RM 3001-5000	680	0.908	(0.82, 1.02)	0.035
RM 5001-10000	240	0.903	(0.82, 1.02)	0.165
>=RM 10000	53	1.130	(0.92, 1.52)	0.349
Education				
Nil	219	1.163	(1.02, 1.32)	0.017
Primary	1245	1.107	(1.02, 1.22)	0.002
Secondary (ref*)	2455	1		
Tertiary	783	0.945	(0.92, 1.02)	0.188
Assistance to perform CAPD				
Self care (ref*)	2444	1		
Partially assisted	829	1.166	(1.12, 1.32)	<0.001
Completely assisted	1429	1.202	(1.12, 1.32)	<0.001