CHAPTER 3

DEATH AND SURVIVAL ON DIALYSIS

Wong Hin Seng
Ong Loke Meng
Wan Shaariah Md Yusuf

3.1: Death On Dialysis

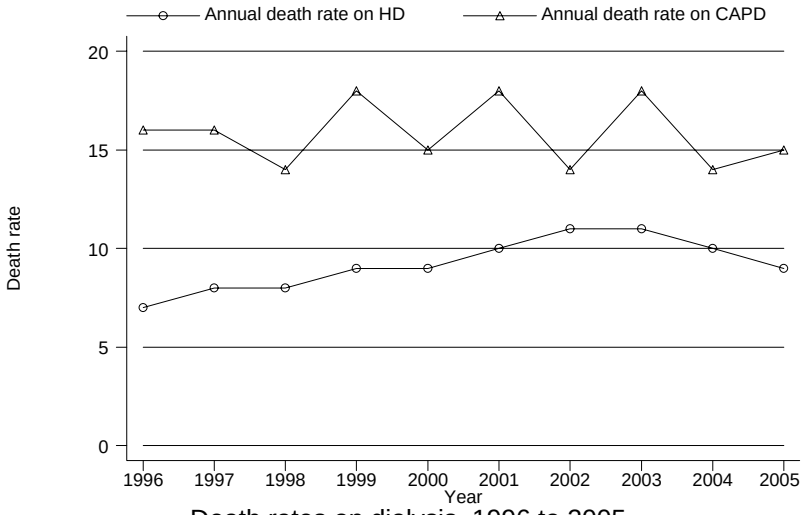
The number of deaths in dialysis patients for 2005 was 1203 (annual death rate of 9.7%). One thousand and thirty seven haemodialysis patients died in 2005 (annual rate of 9.2%) while 166 died on continuous ambulatory peritoneal dialysis (annual death rate of 14.7%).

Table 3.1.1: Deaths on Dialysis 1996 – 2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
No. of dialysis patients at risk	2579	3311	4120	5040	6117	7263	8463	9739	11076	12371
Dialysis deaths	222	315	373	487	586	810	920	1142	1188	1203
Dialysis death rate %	9	10	9	10	10	11	11	12	11	10
No. of HD patients at risk	2196	2840	3600	4473	5490	6551	7622	8754	9993	11243
HD deaths	160	241	299	387	495	680	805	964	1037	1037
HD death rate %	7	8	8	9	9	10	11	11	10	9
No. of CAPD patients at risk	383	471	520	567	627	712	841	985	1083	1128
CAPD deaths	62	74	74	100	91	130	115	178	151	166
CAPD death rate %	16	16	14	18	15	18	14	18	14	15

Figure 3.1.1 shows the annual death rate on dialysis from 1996 till 2005. The annual death rate for those on CAPD remained relatively unchanged over the last 10 years while there was an upward trend in the annual death rate for those on haemodialysis. The annual death rate for those on haemodialysis has increased by 26% over the last 10 years (from 7.3% in 1996 to 9.2% in 2005) and it peaked at 11% in 2003. This has narrowed the difference in the annual death rate between the two modalities of dialysis (from 13% in 1996 to 6% in 2005). The reasons for the marked change in the annual death rate for those treated with haemodialysis remains unclear. This may be partly contributed by the changes in demographics of patients starting dialysis in recent years with a higher proportion of diabetics (26% in 1995 to 54% in 2004) and elderly patients (in 1995, 34% were aged more than 55 years compared with 51% in 2004).

Figure 3.1.1: Death Rates on Dialysis 1996 – 2005



Death rates on dialysis, 1996 to 2005

The causes of death on dialysis are shown in Table 3.1.2. Cardiovascular disease remained the main cause of death in 2005; accounting for 25%. This has remained unchanged over the last 10 years. Death at home accounted for another 24% and a majority of these deaths were probably secondary to cardiovascular events. Death due to sepsis has decreased by 40% over the last 10 years and now accounts for only 12%.

Table 3.1.2: Causes of Death on Dialysis 1996 - 2005

Year	1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	50	23	85	27	110	29	129	26	177	30
Died at home	40	18	52	17	72	19	107	22	135	23
Sepsis	45	20	53	17	66	18	84	17	85	15
CAPD peritonitis	1	0	5	2	2	1	11	2	21	4
GIT bleed	3	1	4	1	7	2	18	4	18	3
Cancer	2	1	9	3	8	2	6	1	8	1
Liver disease	2	1	3	1	5	1	7	1	14	2
Others	30	14	31	10	52	14	73	15	84	14
Unknown	49	22	73	23	51	14	52	11	44	8
TOTAL	222	100	315	100	373	100	487	100	586	100

Year	2001		2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	210	26	305	33	321	28	321	27	304	25
Died at home	228	28	212	23	289	25	302	25	286	24
Sepsis	128	16	141	15	182	16	149	13	140	12
CAPD peritonitis	29	4	16	2	11	1	13	1	17	1
GIT bleed	18	2	24	3	28	2	24	2	25	2
Cancer	18	2	18	2	26	2	19	2	23	2
Liver disease	11	1	16	2	23	2	27	2	21	2
Others	103	13	120	13	184	16	288	24	339	28
Unknown	65	8	68	7	78	7	45	4	48	4
TOTAL	810	100	920	100	1142	100	1188	100	1203	100

3.2: Patient Survival On Dialysis

3.2.1 Patient survival by type of dialysis modality

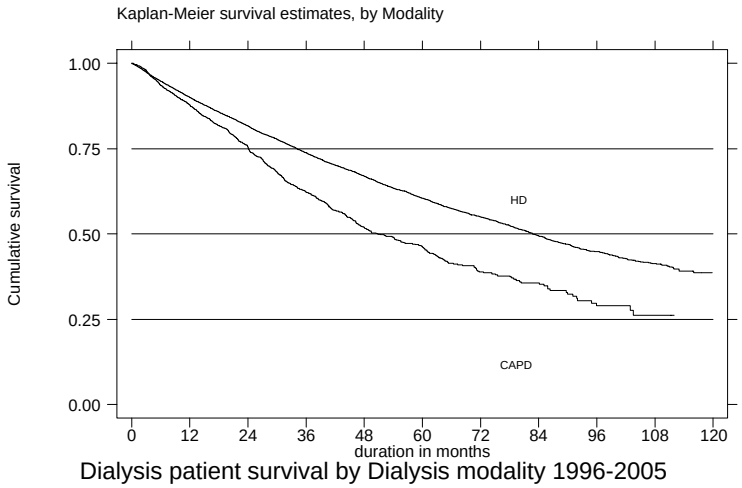
Patient survival by dialysis modality is shown in Table 3.2.1 and Figure 3.2.1. The overall unadjusted 5 year- and 10 year-patient survival on dialysis were 59% and 37% respectively. The unadjusted patient survival was superior in those on haemodialysis compared to those on CAPD and this survival difference progressively widened up to 5 years. At 5 years the unadjusted patient survival on haemodialysis was 60% compared to 46% in those on CAPD. These data contrast with those from the USRDS, Australasian and the UK registries where PD appeared to have a better survival compared to haemodialysis.

Table 3.2.1: Unadjusted patient survival by Dialysis modality, 1996-2005

Dialysis modality Interval (months)	CAPD			HD			All Dialysis		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	2374	94	0	15266	95	0	17640	95	0
12	1980	88	1	13066	90	0	15046	90	0
24	1300	76	1	9515	82	0	10813	81	0
36	769	62	1	6881	74	0	7650	72	0
48	439	52	1	4822	67	0	5261	65	0
60	267	46	1	3303	60	1	3569	59	0
72	147	39	2	2188	55	1	2335	53	1
84	89	36	2	1330	49	1	1417	48	1
96	39	29	2	716	45	1	754	43	1
108	13	26	3	278	41	1	290	40	1
120	-	-	-	17	39	1	17	37	1

* No. = Number at risk SE=standard error

Figure 3.2.1: Unadjusted patient survival by Dialysis modality, 1996-2005



Dialysis patient survival by Dialysis modality 1996-2005

3.2.2 Patient survival by year of starting dialysis

Table 3.2.2 and Fig 3.2.2 show the unadjusted patient survival by year of entry. The unadjusted 6 months survival of those starting dialysis in 2005 was 94%. Despite a progressive increase in the number of diabetic patients and older people starting dialysis in recent years, the unadjusted patient survival remained constant over the last 10 years with a 1-year and 5-year survival of 90-91% and 57-61% respectively.

Table 3.2.2: Unadjusted patient survival by year of entry, 1996-2005

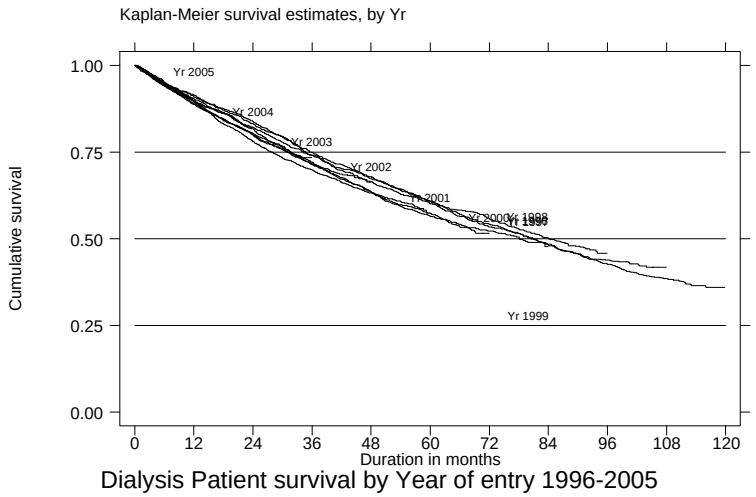
Year	1996			1997			1998			1999		
Interval (months)	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	934	95	1	1132	94	1	1241	95	1	1508	95	1
12	869	91	1	1061	90	1	1174	91	1	1411	90	1
24	768	84	1	951	82	1	1035	83	1	1216	82	1
36	656	74	1	836	74	1	910	75	1	1040	72	1
48	567	66	2	736	67	1	799	68	1	897	64	1
60	497	60	2	645	61	1	705	61	1	799	57	1
72	429	53	2	558	54	2	633	56	1	719	52	1
84	378	48	2	483	48	2	558	50	1	-	-	-
96	325	43	2	430	44	2	-	-	-	-	-	-
108	290	38	2	-	-	-	-	-	-	-	-	-
120	17	36	2	-	-	-	-	-	-	-	-	-

Year	2000			2001			2002			2003		
Interval (months)	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	1802	95	1	2059	94	1	2339	95	0	2499	94	0
12	1661	90	1	1873	89	1	2164	90	1	2306	89	1
24	1409	80	1	1592	78	1	1840	80	1	2001	80	1
36	1219	71	1	1378	70	1	1608	72	1	-	-	-
48	1056	63	1	1210	63	1	-	-	-	-	-	-
60	925	57	1	-	-	-	-	-	-	-	-	-

Year	2004			2005		
Interval (months)	No.	% Survival	SE	No.	% Survival	SE
6	2740	95	0	1395	94	1
12	2531	90	1	-	-	-

* No. = Number at risk SE=standard error

Figure 3.2.2: Unadjusted patient survival by year of entry, 1996-2005



Dialysis Patient survival by Year of entry 1996-2005

3.2.3 Patient survival by Age at starting dialysis

The unadjusted survival for age groups <14 years, 15-24 years and 25-34 years at the start of dialysis were similar, with a 5-year survival of more than 80% as shown in Table 3.2.3.. Beyond the age of 34 years old the unadjusted survival progressively worsened as the age on starting dialysis increases. The 9-year unadjusted survival for those who started dialysis at the age of less than 15 years was 77 % compared with 13% in those more than 64 years of age at the time of initiation of dialysis.

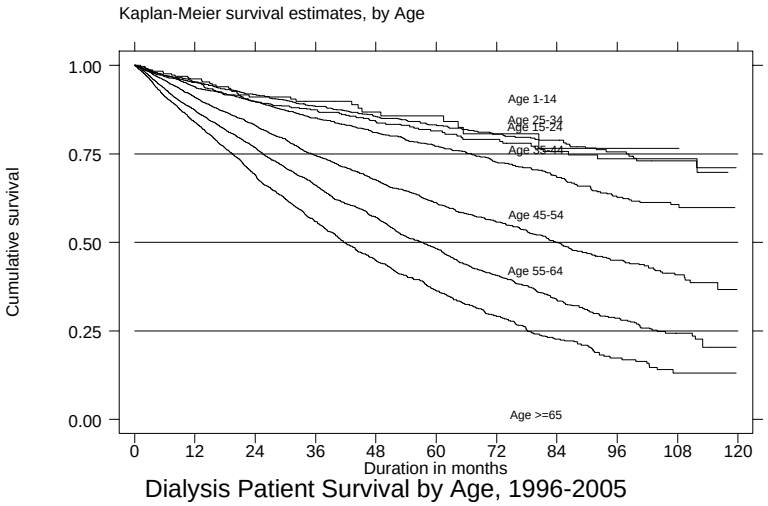
Table 3.2.3: Unadjusted patient survival by age, 1996-2005

Age group (years)	<=14			15-24			25-34			35-44		
Interval (months)	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	274	98	1	831	97	1	1540	97	0	2592	97	0
12	240	96	1	707	95	1	1353	95	1	2284	94	0
24	176	91	2	500	90	1	1048	92	1	1781	90	1
36	128	90	2	371	87	1	825	88	1	1383	85	1
48	81	87	3	263	84	2	612	85	1	1044	81	1
60	56	86	3	192	81	2	478	83	1	769	77	1
72	32	81	4	136	79	2	340	80	1	531	73	1
84	15	77	5	89	76	2	232	79	1	350	68	1
96	7	77	5	55	74	3	134	76	2	196	63	2
108	2	77	5	23	74	3	59	73	2	83	61	2
120	-	-	-	-	-	-	3	71	3	4	60	2

Age group (years)	45-54			55-64			>=65		
Interval (months)	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	4500	96	0	4684	93	0	3221	91	0
12	3849	91	0	3961	87	0	2656	84	1
24	2814	83	1	2806	77	1	1693	69	1
36	2015	75	1	1902	66	1	1030	56	1
48	1407	68	1	1247	57	1	608	45	1
60	970	61	1	773	48	1	336	36	1
72	635	56	1	479	41	1	188	29	1
84	375	50	1	263	34	1	99	23	1
96	195	45	1	133	29	1	40	17	2
108	75	41	2	42	24	2	13	13	2
120	7	37	3	3	20	2	2	13	2

* No. = Number at risk SE=standard error

Figure 3.2.3: Unadjusted patient survival by age, 1996-2005



Dialysis Patient Survival by Age, 1996-2005

3.2.4 Patient survival by Diabetic status

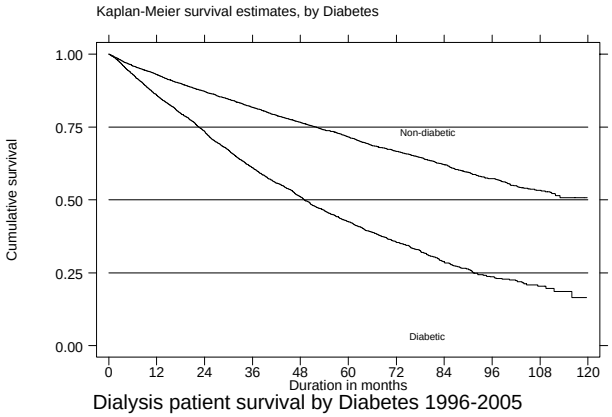
The unadjusted patient survival among diabetic and non diabetic patients is shown in Table 3.2.4 and Figure 3.2.4. The presence of diabetes mellitus has major impact on patient survival. The difference in the unadjusted patient survival appeared as early as 6 months after initiation of dialysis and increased with the time on dialysis. The 10 year unadjusted patient survival among diabetics and non diabetics were 51% and 17% respectively, a three fold difference.

Table 3.2.4: Unadjusted patient survival by Diabetes status, 1996-2005

Diabetes status	Non-Diabetic			Diabetic		
Interval (months)	No.	% Survival	SE	No.	% Survival	SE
6	9517	96	0	8123	93	0
12	8320	93	0	6726	86	0
24	6363	87	0	4450	73	1
36	4838	82	0	2812	61	1
48	3536	77	1	1725	51	1
60	2533	72	1	1037	43	1
72	1741	67	1	594	36	1
84	1104	62	1	314	29	1
96	630	57	1	125	24	1
108	254	53	1	37	20	1
120	14	51	1	4	17	2

* No. = Number at risk SE=standard error

Figure 3.2.4: Unadjusted patient survival by Diabetes status, 1996-2005



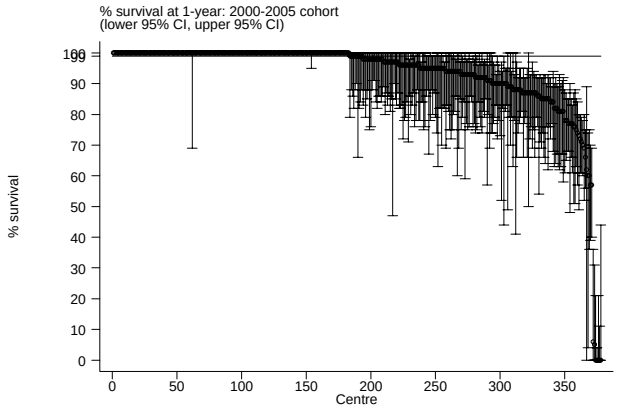
Dialysis patient survival by Diabetes 1996-2005

3.3 Survival of incident patients 2000 – 2005 by centre

3.3.1. Survival of incident haemodialysis patients 2000 – 2005 by centre

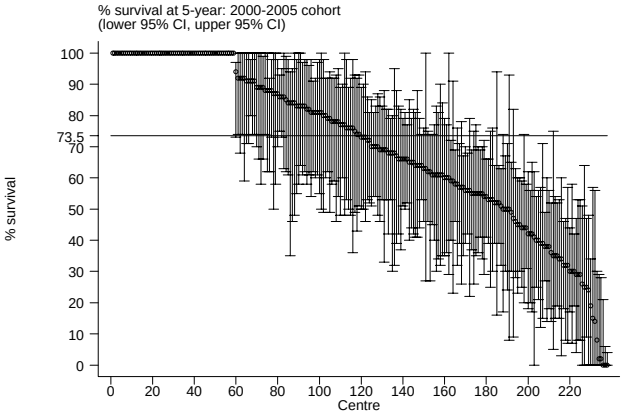
Figure 3.3.1(a) and Figure 3.3.1(b) show the patient survival (adjusted to age and diabetes) by haemodialysis centres at 1year and at 5 years respectively. The median adjusted patient survival among haemodialysis centres at 1 year and 5 years for the 2000-2005 cohort were 99% and 73.5% respectively. There was wide centre variation with regards to patient survival at one year and this became more apparent at 5 years (more than 10 fold different).

Figure 3.3.1(a): Variation in percentage survival at 1-year adjusted to age and diabetes, 2000-2005



* Horizontal line represents the median % survival among HD centres

Figure 3.3.1(b): Variation in percentage survival at 5-year adjusted to age and diabetes, 2000-2005

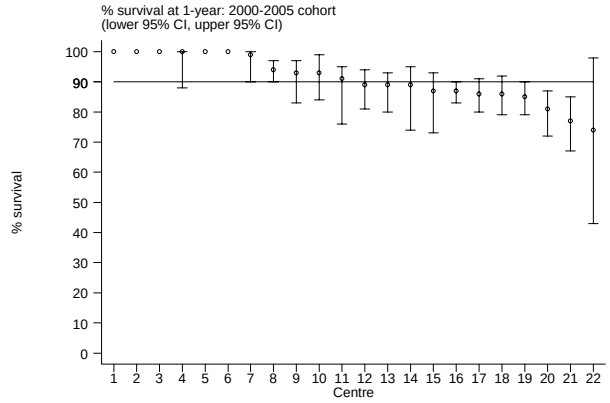


* Horizontal line represents the median % survival among HD centres

3.3.2. Survival of incident CAPD patients 2000 – 2005 by centre

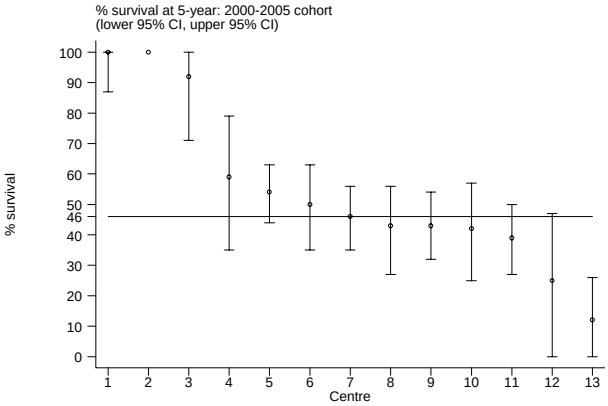
The adjusted patient survival at 1 year and at 5 years according to CAPD centres are shown in Figure 3.3.2(a) and Figure 3.3.2(b). The median adjusted patient survival among CAPD centres at one year and 5 years for the 2000-2005 cohort were 90% and 46% respectively. There was no centre variation with regards to patient survival at one year. However the adjusted CAPD patient survival at 5 years demonstrated marked centre variation.

Figure 3.3.2(a): Variation in percentage survival at 1-year adjusted to age and diabetes, 2000-2005



* Horizontal line represents the median % survival among CAPD centres

Figure 3.3.2(b): Variation in percentage survival at 5-year adjusted to age and diabetes, 2000-2005



* Horizontal line represents the median % survival among CAPD centres