

CHAPTER 6

**MANAGEMENT OF ANAEMIA
IN DIAYSIS PATIENTS**

Philip Jeremiah
Bee Boon Cheak

6.1: TREATMENT FOR ANEMIA IN DIALYSIS

From 1997 to 2005 there was an increasing percentage of patients on erythropoietin (EPO); more haemodialysis patients were on EPO; 80% compared to 72% in CAPD patients. Despite the increasing usage of EPO, the blood transfusion rate has however remained at 10 -15%. (table 6.1.1 & 6.1.2)

There were a decreasing number of patients on oral iron supplements. Encouraging though was the steadily increasing use if intravenous Iron, but this was still far from optimum (at best 11 %)

Table 6.1.1: Treatment for Anemia, HD patients 1997-2005

Year	No. of subjects	% on Erythropoietin	% received blood transfusion	% on oral Iron	% received parenteral Iron
1997	1695	46	8	92	4
1998	2141	46	13	92	4
1999	2996	51	15	90	5
2000	4392	56	15	88	5
2001	5194	62	13	88	5
2002	6108	67	10	85	7
2003	7041	71	12	83	8
2004	8064	74	11	80	10
2005	9136	80	14	75	11

Table 6.1.2: Treatment for Anemia, CAPD patients 1997-2005

Year	No. of subjects	% on Erythropoietin	% received blood transfusion	% on oral Iron	% received parenteral Iron
1997	476	37	12	96	3
1998	541	44	16	96	3
1999	610	44	14	94	0
2000	662	46	11	92	4
2001	781	45	11	91	2
2002	891	49	11	93	2
2003	1236	53	14	87	4
2004	1313	63	15	85	7
2005	1389	72	12	87	8

In 2005 the percentage of patients on EPO among HD centres varied significantly, from as low as 4% to as high as 100%. The median usage of EPO was at 83%; compared to a median of 46% in 1997. (table and figure 6.1.3)

Table 6.1.3: Variation in Erythropoietin utilization (% patients) among HD centres, 2005

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	46	7	20	36	45.5	63	69	92
1998	51	0	5	33	48	57	78	86
1999	76	6	15	41.5	51	66.5	82	90
2000	110	0	20	45	57.5	69	90	100
2001	125	0	30	50	62	74	89	100
2002	153	7	25	55	68	78	92	100
2003	173	16	40	60	73	82	95	100
2004	198	0	38	64	77	86	97	100
2005	228	4	55	74	83	90.5	100	100

Figure 6.1.3: Variation in Erythropoietin utilization (% patients) among HD centres, 2005

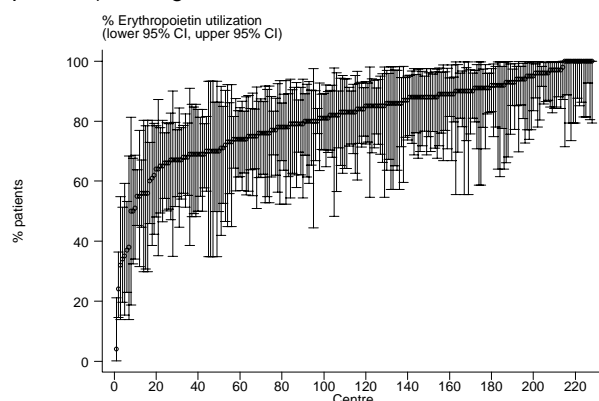
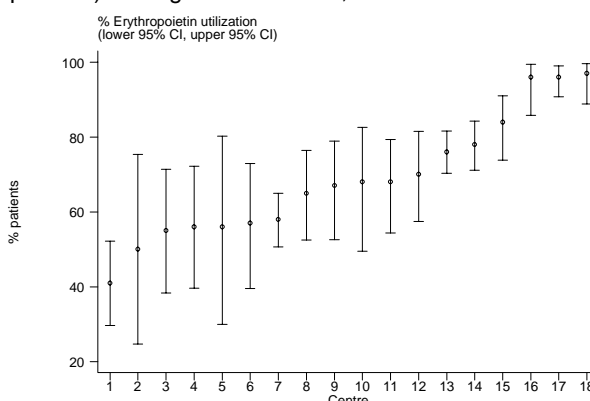


Figure 6.1.4: Variation in Erythropoietin utilization (% patients) among CAPD centres, 2005



In contrast to HD, the percentage of patients on EPO, among CAPD centres varied between 41 to 97%, with the median at 68%. (table & figure 6.1.4)

Table 6.1.4: Variation in Erythropoietin utilization (% patients) among CAPD centres, 2005

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	7	19	19	21	41	49	53	53
1998	9	15	15	30	47	56	64	64
1999	10	22	22	32	41	54	79	79
2000	11	26	26	33	47	53	68	68
2001	12	25	25	33.5	47.5	55	85	85
2002	14	26	26	41	50.5	56	68	68
2003	18	25	25	34	49.5	58	92	92
2004	18	5	5	54	63	74	97	97
2005	18	41	41	56	67.5	78	97	97

From 1997 to 2005, the median weekly EPO dose has remained at 4000 units in both HD and CAPD centres. In both HD and CAPD centres, at the 5th and 95th centile, 5% of centres have their weekly EPO dose at 2000 units and 8000 units respectively. (table & figure 6.1.5)

There appears to be an increasing use of higher EPO dosage in CAPD centres (table & figure 6.1.6)

Table 6.1.5: Variation in median weekly Erythropoietin dose (u/week) among HD centres 2005

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	30	2000	2000	4000	4000	4000	6000	8000
1998	34	2000	2000	4000	4000	4000	4000	4000
1999	51	2000	2000	2000	4000	4000	4000	4000
2000	78	2000	2000	2000	4000	4000	4000	6000
2001	93	2000	2000	2000	4000	4000	5000	8000
2002	117	2000	2000	4000	4000	4000	5000	6000
2003	140	2000	2000	4000	4000	4000	6000	8000
2004	169	2000	2000	4000	4000	4000	6000	8000
2005	193	2000	2000	4000	4000	8000	8000	18000

Figure 6.1.5: Variation in median weekly Erythropoietin dose among HD centres 2005

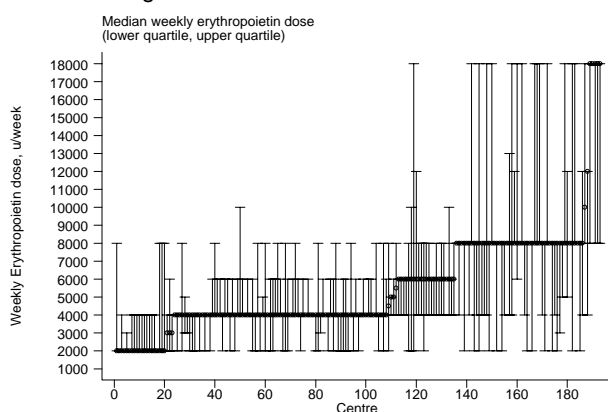


Figure 6.1.6: Variation in median weekly Erythropoietin dose among CAPD centres 2005

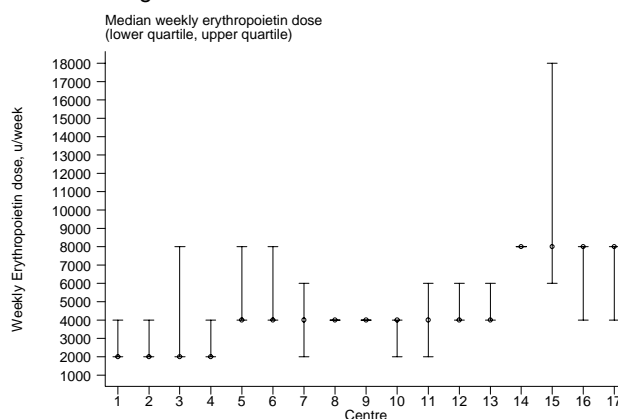


Table 6.1.6: Variation in median weekly Erythropoietin dose (u/week) among CAPD centres 2005

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	6	4000	4000	4000	4000	4000	4000	4000
1998	6	4000	4000	4000	4000	4000	4000	4000
1999	7	2000	2000	2000	4000	4000	4000	4000
2000	9	2000	2000	4000	4000	4000	4000	4000
2001	11	2000	2000	4000	4000	4000	4000	4000
2002	12	2000	2000	4000	4000	4000	4000	4000
2003	14	2000	2000	4000	4000	4000	5000	5000
2004	13	2000	2000	4000	4000	4000	4000	4000
2005	17	2000	2000	4000	4000	4000	8000	8000

In HD patients, the median usage of blood transfusion has increased from 7.5% in 2004 to 11% in 2005. This however has remained at 12.5% for CAPD patients. The blood transfusion rate among both HD and CAPD centres varied significantly between 0 to 45% (table and figures 6.1.7, 6.1.8)

Table 6.1.7: Variation in use of blood transfusion (% patients) among HD centres, 2005

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	46	0	0	0	7	14	37	71
1998	51	0	0	4	10	17	36	48
1999	76	0	0	4	10	21.5	42	56
2000	110	0	0	4	11.5	22	48	75
2001	125	0	0	5	12	20	36	46
2002	153	0	0	3	7	17	40	67
2003	173	0	0	3	8	19	35	65
2004	198	0	0	2	7.5	16	38	54
2005	228	0	0	5	11	21	45	90

Figure 6.1.7: Variation in use of blood transfusion (% patients) among HD centres, 2005

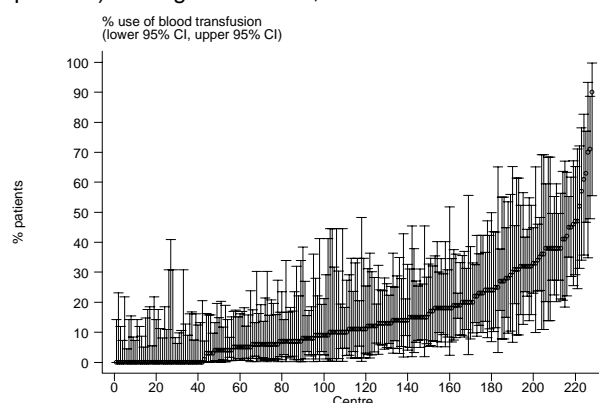


Figure 6.1.8: Variation in use of blood transfusion (% patients) among CAPD centres, 2005

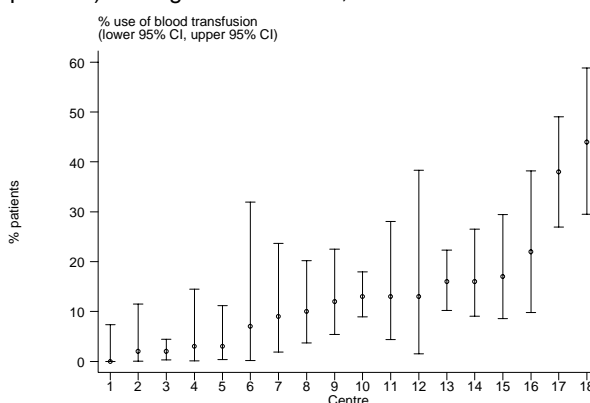


Table 6.1.8: Variation in use of blood transfusion (% patients) among CAPD centres, 2005

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	7	1	1	4	6	29	47	47
1998	9	0	0	7	11	17	47	47
1999	10	0	0	0	6.5	23	47	47
2000	11	0	0	0	9	16	42	42
2001	12	0	0	0	4	15.5	37	37
2002	14	0	0	5	8	21	41	41
2003	18	0	0	4	13	24	57	57
2004	18	0	0	7	12.5	19	34	34
2005	18	0	0	3	12.5	16	44	44

6.2: IRON STATUS ON DIALYSIS

In HD and CAPD patients with or without EPO, the mean and median serum ferritin and transferrin saturation have slowly increased over the years except in 2005 when the transferrin saturation showed a decrease.

Up to 98% of patients have serum ferritin of at least 100 ng/ml and transferrin saturation greater than 20%. This is more so in CAPD compared to HD. (table and figures 6.2.1 to 6.2.8)

Table 6.2.1: Distribution of Serum Ferritin without Erythropoietin, HD patients 1997 –2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients ≥ 100 ng/ml
1997	280	493.1	349.3	435.5	162.5	850.5	86
1998	224	430.8	383.2	297.5	128.4	636.5	80
1999	337	517.9	424.3	402.8	162.8	809.5	86
2000	571	487.5	416.8	363.2	152.5	741	83
2001	758	537.6	453.9	383.5	172	828	87
2002	803	519.5	447.3	373	168.5	781	85
2003	916	551.6	434.2	456.7	190	827.7	87
2004	1044	590.1	463.4	473	218	908.5	89
2005	1008	616.8	499.2	482.5	223.5	901.5	90

Figure 6.2.1: Cumulative distribution of Serum Ferritin without Erythropoietin, HD patients 1997-2005

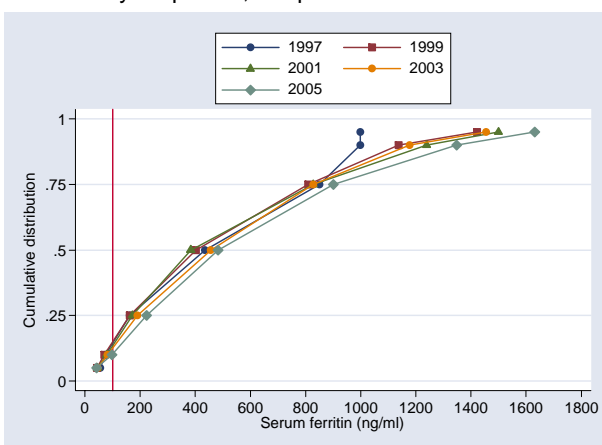


Figure 6.2.2: Cumulative distribution of Serum Ferritin without Erythropoietin, CAPD patients 1997-2005

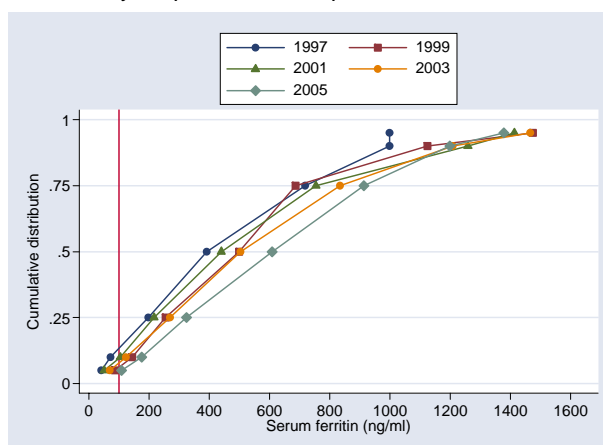


Table 6.2.2: Distribution of Serum Ferritin without Erythropoietin, CAPD patients 1997–2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients ≥ 100 ng/ml
1997	133	469	333.5	392	198	718	88
1998	92	492.4	368.3	405	208.2	687.5	87
1999	124	553.7	400.1	499.3	255.3	686.8	94
2000	144	505.9	433.8	420	152.3	675.5	88
2001	223	543.8	417.5	440	216.9	754	91
2002	236	634.8	491.2	514.9	226	924.6	93
2003	330	602.8	428.5	503.9	269	834	93
2004	303	608.4	385.7	522.7	330	882	94
2005	225	651.4	397.8	609	324	913.3	96

Table 6.2.3: Distribution of Serum Ferritin on Erythropoietin, HD patients 1997 – 2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients ≥ 100 ng/ml
1997	471	543.3	347	495.5	219	973	90
1998	328	549.9	382.4	476.5	248	809.8	91
1999	586	560.4	418.6	453	225	829	93
2000	1174	588.3	456.6	475.5	219	860	91
2001	1637	597.5	444.2	491	236	894.2	91
2002	2224	593.1	459.3	464.8	231.3	878.2	91
2003	3138	640.9	428	562.8	298.5	932	94
2004	3902	669.9	460.5	571	306	977	94
2005	5026	683.2	470.7	599.5	317	972.8	93

Figure 6.2.3: Cumulative distribution of Serum Ferritin on Erythropoietin, HD patients 1997-2005

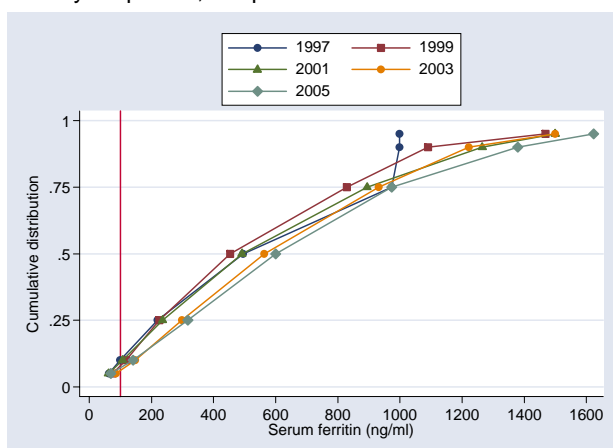


Figure 6.2.4: Cumulative distribution of Serum Ferritin on Erythropoietin, CAPD patients 1997-2005

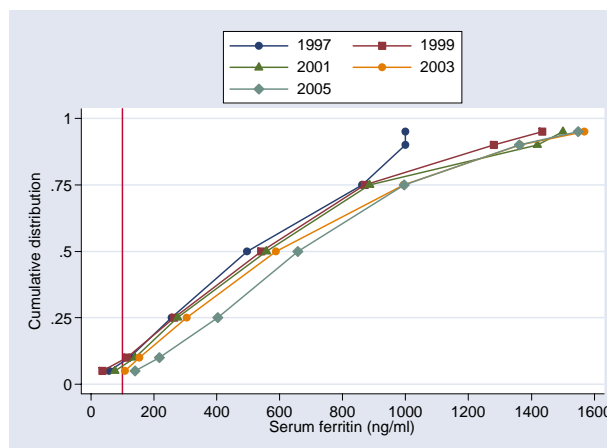


Table 6.2.4: Distribution of Serum Ferritin on Erythropoietin, CAPD patients 1997 – 2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients ≥ 100 ng/ml
1997	129	550.8	323.7	496	256	862	93
1998	135	611.2	438.3	524.7	257	839.5	93
1999	136	604.8	436.3	540.6	264.6	870.1	93
2000	180	608.2	416.7	560	295.2	846.3	92
2001	261	645.9	449.2	557.5	275.7	885.4	93
2002	345	666.8	462.4	538.5	284	999.5	94
2003	518	689.6	459.5	588.4	304	993.2	96
2004	541	728.1	427.1	655	405.5	986	98
2005	766	732.2	433.5	657.3	403.6	996.6	97

Table 6.2.5: Distribution of transferrin saturation without Erythropoietin, HD patients 1997 –2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients $\geq 20\%$
1997	723	34.1	16.6	29.8	22.7	40.4	84
1998	599	33.3	16.2	29.5	22.1	41.7	82
1999	654	32.9	16.3	29.9	20.9	42.4	78
2000	800	32.7	16.9	28.6	20.9	41.4	78
2001	836	36.9	18.5	32.5	23.9	45.8	84
2002	811	36.5	18.9	32	22.9	45.7	83
2003	921	40.3	18.6	36	27.2	51.1	91
2004	1031	41.2	18.1	37.5	28.5	50.1	92
2005	1106	37.7	17.8	34.5	25.6	46.2	87

Figure 6.2.5: Cumulative distribution of transferrin saturation without Erythropoietin, HD patients 1997-2005

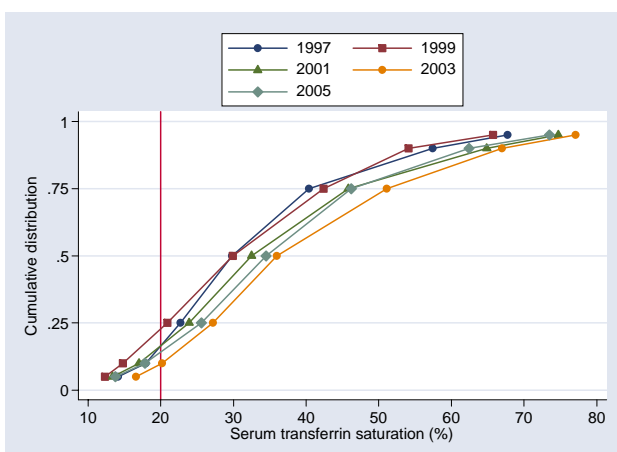


Figure 6.2.6: Cumulative distribution of transferrin saturation without Erythropoietin, CAPD patients 1997-2005

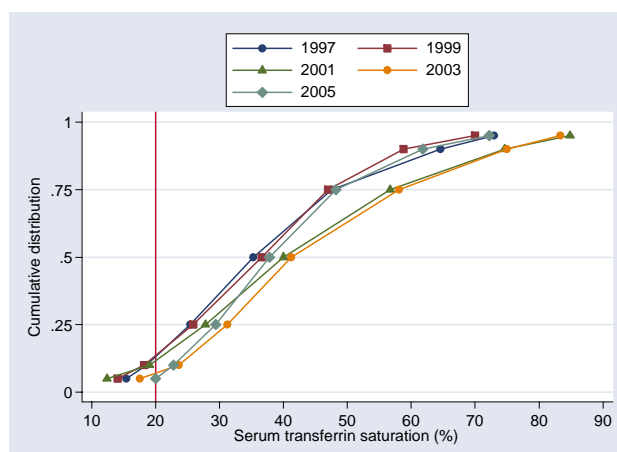


Table 6.2.6: Distribution of transferrin saturation without Erythropoietin, CAPD patients 1997–2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients $\geq 20\%$
1997	246	38.7	17.9	35.3	25.4	47.6	88
1998	184	37.7	15.7	37.3	25.6	47	85
1999	194	37.7	16.2	36.6	25.9	47	88
2000	237	37.9	18.5	34.2	25	48	86
2001	279	43.2	20.8	40	27.8	56.7	89
2002	332	42.7	19.1	38.1	28.3	54.5	92
2003	398	45.1	19.7	41.2	31.2	58.1	93
2004	379	44.5	18.2	41.6	30.9	55.5	98
2005	287	40.6	16.2	37.8	29.4	48.2	95

Table 6.2.7: Distribution of transferrin saturation on Erythropoietin, HD patients 1997 – 2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients $\geq 20\%$
1997	636	35.9	17.3	31.4	24.2	43.3	87
1998	549	34.9	15.5	32	24.4	42.5	86
1999	703	34.5	16	31.6	23.2	42	85
2000	1247	34.9	16.7	30.4	23	44	84
2001	1634	36.2	17.9	32.3	23.6	45	84
2002	1995	34.6	17.6	30.6	22.2	43.6	81
2003	2646	39.6	18.4	36	26.6	49	90
2004	3269	39.6	17	36.1	27.8	48.1	93
2005	4735	36.7	17.3	32.8	24.6	45	87

Figure 6.2.7: Cumulative distribution of transferrin saturation on Erythropoietin, HD patients 1997-2005

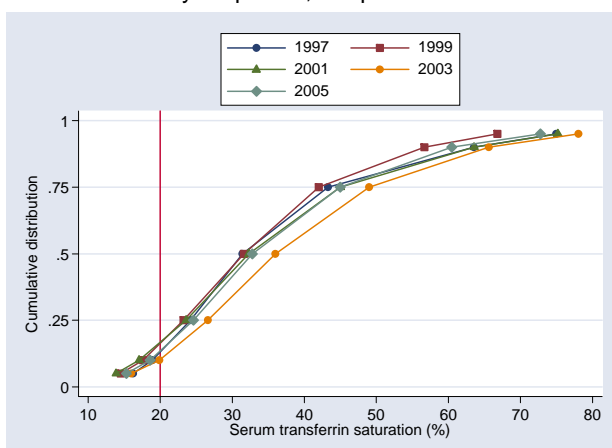


Figure 6.2.8: Cumulative distribution of transferrin saturation on Erythropoietin, CAPD patients 1997-2005

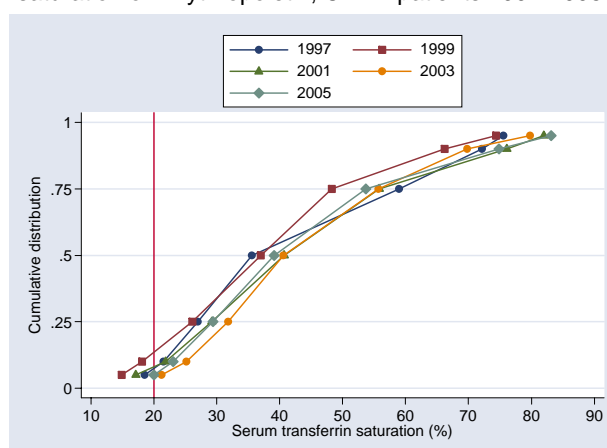


Table 6.2.8: Distribution of transferrin saturation on Erythropoietin, CAPD patients 1997 – 2005

Year	No of subjects	Mean	Std Dev	Median	LQ	UQ	% Patients $\geq 20\%$
1997	147	42.2	19.7	35.6	27	59	91
1998	111	39.4	13.8	38.5	28.8	47.4	94
1999	137	38.9	17	37	26.1	48.3	86
2000	238	38.9	18.7	36	24.5	51.1	86
2001	292	44.1	19.6	40.7	29.2	55.8	94
2002	363	43.6	18.6	39.7	30	54.3	94
2003	461	44.7	17.8	40.6	31.8	55.7	96
2004	698	44.7	18.7	40.8	30.8	54.5	96
2005	819	43.5	19.3	39.1	29.4	53.7	95

From 1997 to 2005, the median for both serum ferritin levels and transferrin saturation of all HD centres have increased. (table 6.2.9). There was a wide variation in median ferritin levels between HD centres in 2005 ranging from 257 to >1000 ng/ml. More than 90% of patients on EPO have serum ferritin greater than 100 ng/ml and more than 80% have transferrin saturation greater than 20%. (table and figures 6.2.9)

A similar trend but with higher levels of ferritin and transferrin saturation was seen in the CAPD centers (table and figures 6.2.10)

Table 6.2.9: Variation in iron status outcomes among HD centres 2005

(a) Median serum ferritin among patients on erythropoietin

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	21	220.5	291.5	390	495.5	623	792	809.3
1998	13	205	205	423	472.2	560.3	722.8	722.8
1999	22	189.5	202	351.8	419	569	940.5	949.5
2000	43	154	205.3	369	534.8	683.8	813.5	1232
2001	52	217	238.3	393	514.3	676.2	883.3	1191.3
2002	71	106.6	192	366	456	611.6	890.5	1070.8
2003	99	138	299.5	442	549.3	711.6	997	1742.8
2004	123	99.5	327	448.4	566	735	1001.5	2000
2005	157	1.6	257	451.5	621.5	725.5	1024	2000

Figure 6.2.9(a): Variation in median serum ferritin among patients on erythropoietin, HD centres 2005

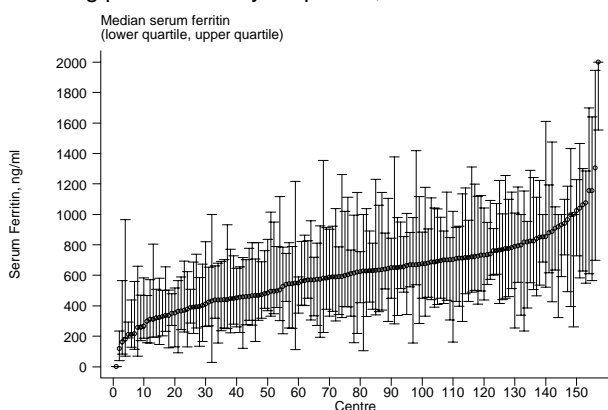
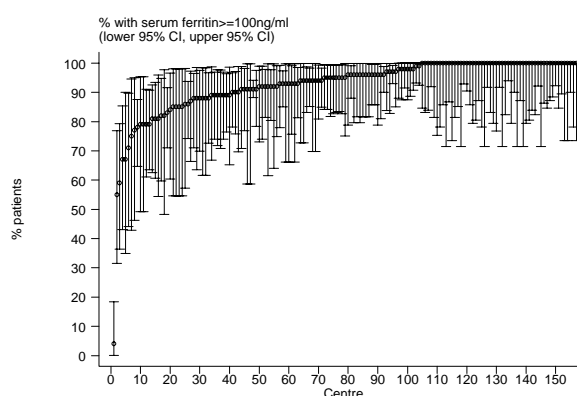


Figure 6.2.9(b): Variation in proportion of patients on erythropoietin with serum ferritin \geq 100 ng/ml, HD centres 2005



(b) Proportion of patients on erythropoietin with serum ferritin \geq 100 ng/ml

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	21	71	73	86	91	93	100	100
1998	13	73	73	90	92	95	100	100
1999	22	73	76	92	96	100	100	100
2000	43	70	72	85	93	97	100	100
2001	52	71	73	87	93	97	100	100
2002	71	55	73	88	93	97	100	100
2003	99	60	75	91	95	100	100	100
2004	123	50	84	92	96	100	100	100
2005	157	4	77	89	95	100	100	100

(c) Median transferrin saturation among patients on erythropoietin

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	26	22.6	25.7	28.8	32	37.1	68.5	69.2
1998	22	22.8	24.1	27.2	32.3	35.6	44.4	51.9
1999	26	16.4	20.7	26.3	31.5	34	43.8	44.8
2000	42	16	23.6	27.8	31.1	36.2	44.1	57.5
2001	53	21.9	22.5	27.2	30.3	36.6	48	76.6
2002	62	15.3	20.5	25.1	30.2	36	51.1	59.7
2003	91	19.2	24.2	30.5	33.9	41.6	57.3	71.6
2004	111	23	26.7	32.5	37	41.4	54.3	67.6
2005	146	15.2	24.1	29	32.6	37.3	49.5	71.9

Figure 6.2.9(c): Variation in median transferrin saturation among patients on erythropoietin, HD centres 2005

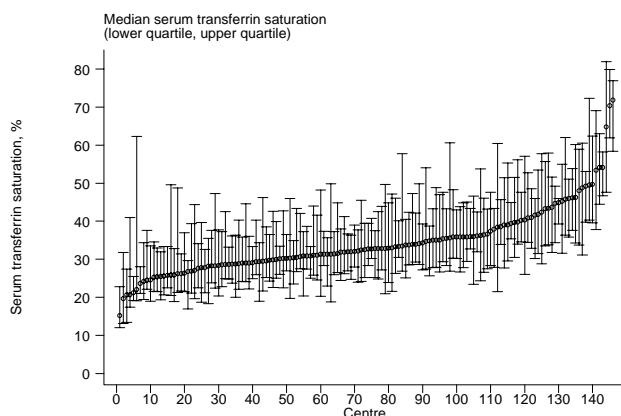
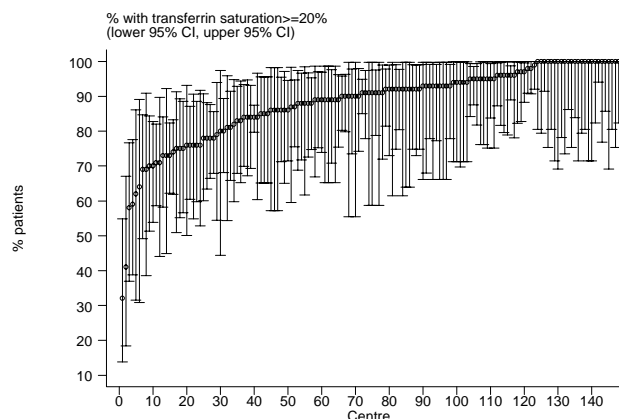


Figure 6.2.9(d): Variation in proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, HD centres 2005



(d) Proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	26	69	75	82	90	94	100	100
1998	22	57	64	78	88	95	100	100
1999	26	30	57	83	87	94	100	100
2000	42	20	62	77	85.5	94	100	100
2001	53	53	60	76	89	95	100	100
2002	62	33	53	69	81.5	92	100	100
2003	91	47	69	85	92	100	100	100
2004	111	55	71	91	94	100	100	100
2005	148	32	69	84	91	95.5	100	100

Table 6.2.10: Variation in iron status outcomes among CAPD centres 2005

(a) Median serum ferritin among patients on erythropoietin

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	4	377.5	377.5	404.8	457.3	530	577.5	577.5
1998	4	418.4	418.4	468.7	534.3	606.3	663	663
1999	5	320.4	320.4	330	459.5	495.6	719.5	719.5
2000	6	315.5	315.5	437.3	668.8	773	793.1	793.1
2001	9	243	243	508	597.3	639.4	908	908
2002	10	360.4	360.4	450.8	477.4	588	826.5	826.5
2003	12	307.6	307.6	442.5	534.3	726.2	963.6	963.6
2004	13	312.4	312.4	527.8	625	760.9	1011	1011
2005	16	225	225	564.4	677.8	794.7	823.9	823.9

Figure 6.2.10(a): Variation in median serum ferritin among patients on erythropoietin, CAPD centres 2005

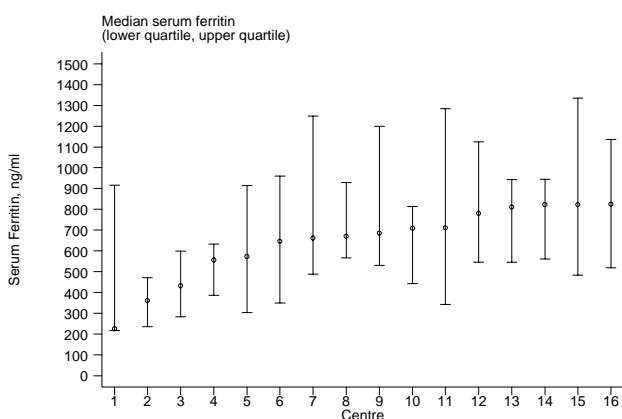
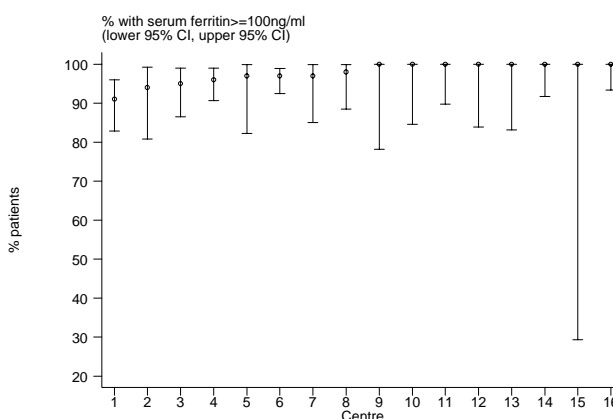


Figure 6.2.10(b): Variation in proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, CAPD centres 2005



(b) Proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	4	84	84	88.5	93.5	97	100	100
1998	4	83	83	89	97.5	100	100	100
1999	5	84	84	93	95	100	100	100
2000	6	88	88	88	94.5	100	100	100
2001	9	80	80	85	91	100	100	100
2002	10	87	87	92	95	100	100	100
2003	12	86	86	95	97	98	100	100
2004	13	90	90	95	100	100	100	100
2005	16	91	91	96.5	99	100	100	100

(c) Median transferrin saturation among patients on erythropoietin

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	6	26.7	26.7	27.6	33.6	42.5	70.5	70.5
1998	4	34.2	34.2	35.5	37	41.6	46.2	46.2
1999	6	24	24	27.2	35.2	39.4	42.4	42.4
2000	6	22.3	22.3	26.5	35.6	37.6	52.5	52.5
2001	8	28.4	28.4	31.3	35.7	44.9	79.1	79.1
2002	9	29.7	29.7	36.5	37.7	40.7	59.6	59.6
2003	12	33.7	33.7	35.6	40.6	48.3	63.3	63.3
2004	16	29.1	29.1	36.4	40.6	44.9	82.5	82.5
2005	16	31.1	31.1	36.3	37.9	42.6	73.4	73.4

Figure 6.2.10(c): Variation in median transferrin saturation among patients on erythropoietin, CAPD centres 2005

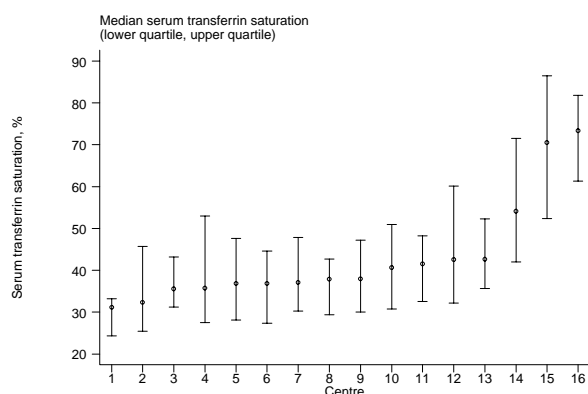
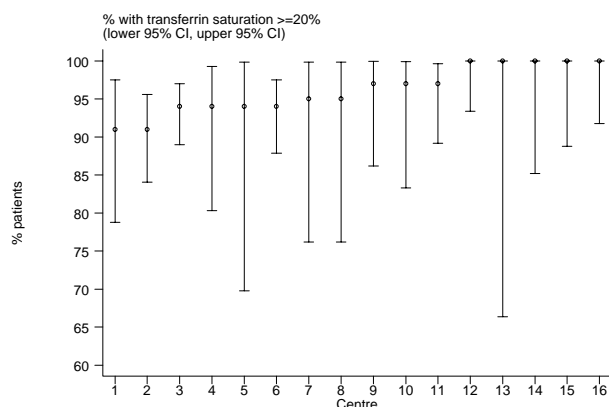


Figure 6.2.10(d): Variation in proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, CAPD centres 2005



(d) Proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	6	70	70	88	90.5	100	100	100
1998	4	81	81	88	95.5	96.5	97	97
1999	6	53	53	85	87	94	100	100
2000	6	68	68	74	89.5	100	100	100
2001	8	85	85	90.5	94	96	97	97
2002	9	78	78	91	92	98	100	100
2003	12	92	92	95	96	99	100	100
2004	16	90	90	95.5	97.5	100	100	100
2005	16	91	91	94	96	100	100	100

6.3: HAEMOGLOBIN OUTCOMES ON DIALYSIS

The mean and median haemoglobin concentration in all dialysis patients with or without EPO is steadily increasing; in 2005 the mean and median haemoglobin ranged from 9.9 to 10.8 g/dl. The percentage of patients with the haemoglobin of > 10 or > 11 g/dl is also steadily increasing. In 2005, the percentage of patients with the haemoglobin > 10 gm/dl varied between 54% in HD to 72 % in CAPD patients. Similarly, the percentage of patient with the haemoglobin > 11 gm/dl was 38% and 40% respectively. (tables and figures 6.3.1-6.3.4)

Table 6.3.1: Distribution of Haemoglobin Concentration without Erythropoietin, HD patients 1997 – 2005

Year	No. of subjects	Mean	Std Dev	Median	LQ	UQ	% Patient ≤10 g/dL	% Patient >10 g/dL	% Patient ≤11 g/dL	% Patient >11 g/dL
1997	896	9.3	1.9	9	8	10.5	69	31	82	18
1998	1119	9.1	1.9	8.9	7.8	10.3	71	29	83	17
1999	1400	9.1	1.9	8.9	7.8	10.3	70	30	85	15
2000	1754	9.4	2.1	9.1	7.9	10.6	67	33	80	20
2001	1809	9.4	1.9	9.3	8	10.6	64	36	81	19
2002	1795	9.6	2.1	9.4	8.1	10.9	62	38	76	24
2003	1803	9.7	2.1	9.5	8.3	11	60	40	75	25
2004	1927	10.1	2.2	9.9	8.6	11.5	53	47	68	32
2005	1658	10.5	2.3	10.3	8.8	12	46	54	62	38

Figure 6.3.1: Cumulative distribution of haemoglobin Concentration without Erythropoietin, HD patients 1997-2005

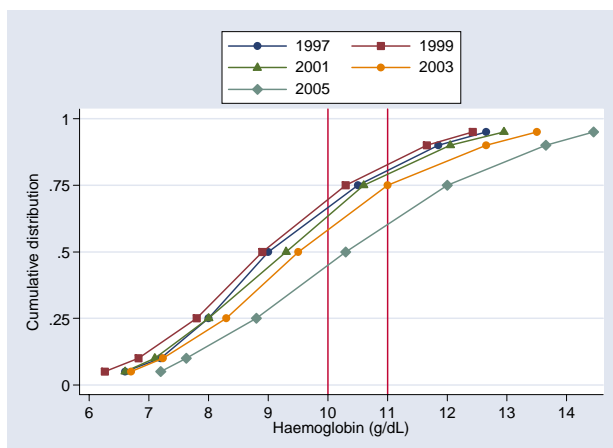


Figure 6.3.2: Cumulative distribution of haemoglobin concentration without Erythropoietin, CAPD patients 1997-2005

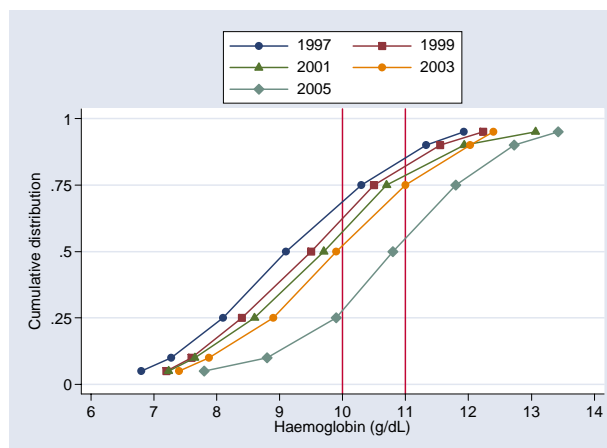


Table 6.3.2: Distribution of Haemoglobin Concentration without Erythropoietin, CAPD patients 1997– 2005

Year	No. of subjects	Mean	Std Dev	Median	LQ	UQ	% Patient ≤10 g/dL	% Patient >10 g/dL	% Patient ≤11 g/dL	% Patient >11 g/dL
1997	297	9.2	1.6	9.1	8.1	10.3	72	28	86	14
1998	301	9.3	1.8	9.2	8.1	10.3	68	32	84	16
1999	336	9.5	1.6	9.5	8.4	10.5	66	34	84	16
2000	342	9.8	1.7	9.7	8.7	10.9	58	42	79	21
2001	405	9.8	1.8	9.7	8.6	10.7	59	41	78	22
2002	434	10	1.8	9.9	8.8	11	54	46	76	24
2003	543	10	1.7	9.9	8.9	11	52	48	76	24
2004	481	10.4	1.6	10.3	9.4	11.4	42	58	67	33
2005	375	10.8	1.6	10.8	9.9	11.8	28	72	60	40

Table 6.3.3: Distribution of Haemoglobin Concentration on Erythropoietin, HD patients 1997 – 2005

Year	No. of subjects	Mean	Std Dev	Median	LQ	UQ	% Patient ≤ 10 g/dL	% Patient > 10 g/dL	% Patient ≤ 11 g/dL	% Patient > 11 g/dL
1997	773	8.9	1.6	8.9	7.8	9.9	76	24	90	10
1998	971	9.1	1.6	9.1	7.9	10.2	71	29	88	12
1999	1503	9.2	1.5	9.1	8.1	10.2	71	29	89	11
2000	2332	9.4	1.7	9.4	8.3	10.5	65	35	85	15
2001	3049	9.4	1.6	9.4	8.3	10.5	65	35	85	15
2002	3859	9.5	1.7	9.5	8.4	10.7	62	38	81	19
2003	4786	9.6	1.6	9.6	8.5	10.7	61	39	81	19
2004	5804	9.8	1.6	9.9	8.8	10.9	54	46	77	23
2005	7025	10	1.6	10	8.9	11.1	50	50	74	26

Figure 6.3.3: Cumulative distribution of Haemoglobin Concentration on Erythropoietin, HD patients 1997-2005

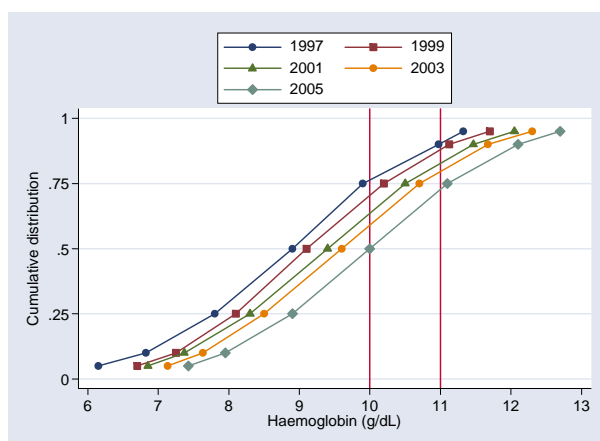


Figure 6.3.4: Cumulative distribution of Haemoglobin Concentration on Erythropoietin, CAPD patients 1997-2005

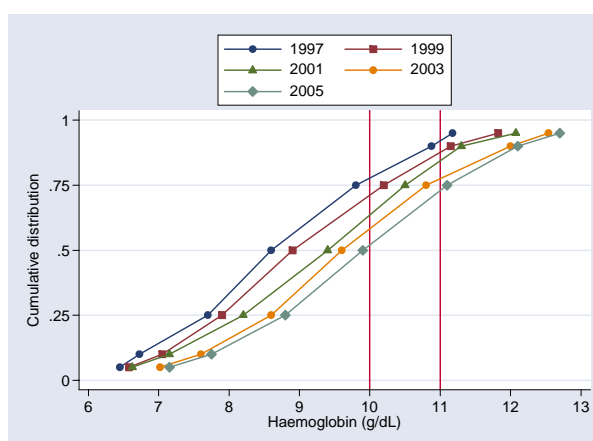


Table 6.3.4: Distribution of Haemoglobin Concentration on Erythropoietin, CAPD patients 1997 – 2005

Year	No. of subjects	Mean	Std Dev	Median	LQ	UQ	% Patient ≤ 10 g/dL	% Patient > 10 g/dL	% Patient ≤ 11 g/dL	% Patient > 11 g/dL
1997	175	8.8	1.5	8.6	7.7	9.8	79	21	94	6
1998	238	9	1.6	8.8	8	10.1	74	26	88	12
1999	262	9	1.6	8.9	7.9	10.2	73	27	89	11
2000	299	9.4	1.7	9.2	8.1	10.6	65	35	82	18
2001	345	9.3	1.6	9.4	8.2	10.5	65	35	86	14
2002	432	9.4	1.6	9.3	8.4	10.4	69	31	83	17
2003	640	9.7	1.7	9.6	8.6	10.8	60	40	78	22
2004	799	9.8	1.7	9.8	8.6	11	54	46	76	24
2005	969	9.9	1.7	9.9	8.8	11.1	53	47	73	27

Table 6.3.5: Variation in Haemoglobin outcomes among HD centres 2005

(a) Median haemoglobin level among patients on erythropoietin

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	30	7.8	7.9	8.5	9	9.3	10.4	10.6
1998	34	7.6	7.6	8.5	9.1	9.4	10.4	10.5
1999	51	7.8	8.1	8.6	9.1	9.6	10.2	10.3
2000	77	7.8	8.1	8.8	9.3	9.8	10.5	14.6
2001	93	7.9	8.3	8.9	9.4	9.9	10.4	11.1
2002	115	8.2	8.5	8.9	9.5	10.1	10.9	11.5
2003	144	7.8	8.5	9.1	9.5	10	10.7	11.5
2004	175	7.8	8.6	9.2	9.7	10.3	11	11.2
2005	204	8.4	8.8	9.4	10	10.4	11.2	12

In 2005 for HD patients on EPO, the median haemoglobin in HD centres ranged between 8.4 to 12 g/dl with the median at 10 g/dl. A similar trend was noted in CAPD centres.

In 2005, for HD patients on EPO, the proportion of patients with Hb >10g/dl varied between 0 -100% with median at 49%. Similarly for patients >11g/dl the range was from 0 -73% with the median at 23.5%. This wide variation was not seen in the CAPD patients. (see table & figures 6.3.5 – 6.3.6)

Figure 6.3.5(a): Variation in median haemoglobin level among patients on Erythropoietin, HD centres 2005

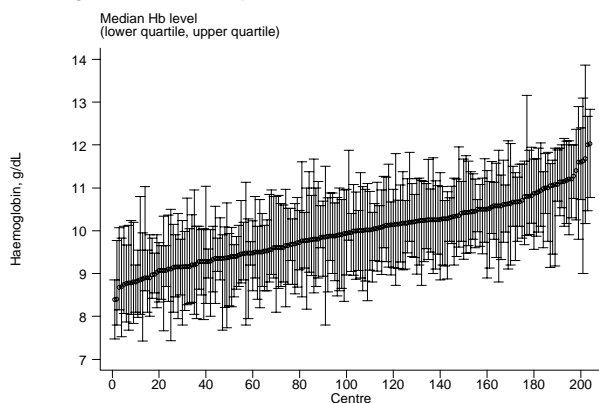
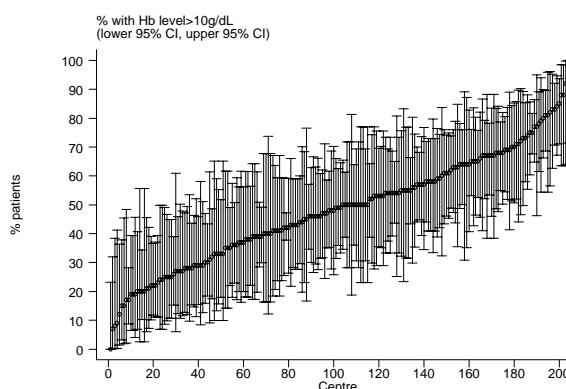


Figure 6.3.5(b): Variation in proportion of patients on erythropoietin with haemoglobin level > 10 g/dL, HD centres 2005



(b) Proportion of patients on erythropoietin with haemoglobin level > 10 g/dL

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	30	0	0	13	23.5	29	60	82
1998	34	0	0	13	27	38	57	71
1999	51	0	5	15	28	38	58	61
2000	77	0	4	20	31	43	64	97
2001	93	4	12	24	33	45	67	69
2002	115	8	15	27	35	51	71	86
2003	144	0	10	27	36	50	67	100
2004	175	8	17	31	41	58	73	85
2005	204	0	19	34	49	63	81	100

(c) Proportion of patients on erythropoietin with haemoglobin level > 11 g/dL

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	30	0	0	0	6.5	13	21	33
1998	34	0	0	0	7	17	25	38
1999	51	0	0	3	8	16	29	37
2000	77	0	0	7	12	20	33	92
2001	93	0	0	8	13	22	38	50
2002	115	0	5	11	18	27	47	71
2003	144	0	0	7	14	26.5	43	61
2004	175	0	0	11	19	29	49	55
2005	204	0	4	13	23.5	33	55	73

Figure 6.3.5(c): Variation in proportion of patients on erythropoietin with haemoglobin level > 11 g/dL, HD centres 2005

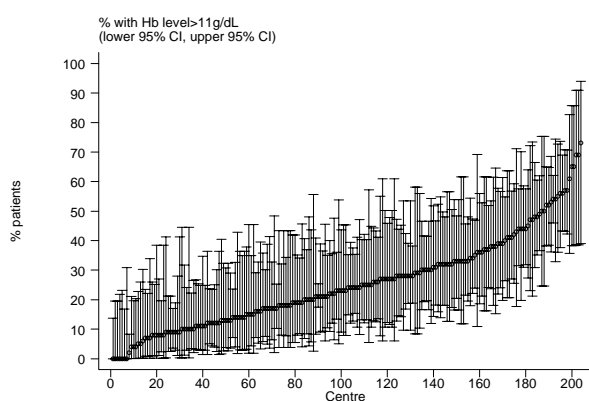


Figure 6.3.6(a): Variation in median haemoglobin level among patients on Erythropoietin, CAPD centres 2005

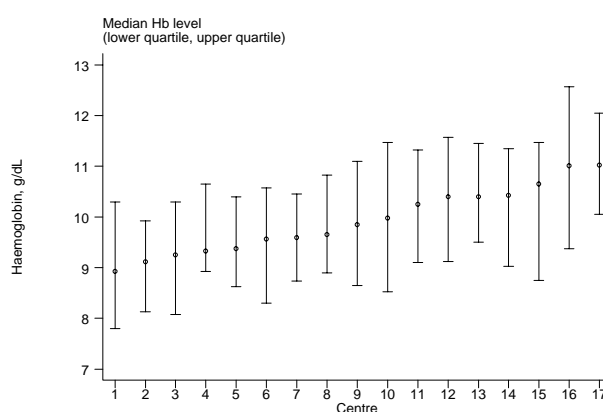


Table 6.3.6: Variation in Haemoglobin outcomes among CAPD centres 2005
(a) Median haemoglobin level among patients on erythropoietin

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	6	7.8	7.8	7.8	8.7	9	9.5	9.5
1998	6	7.9	7.9	8.3	8.9	9.3	9.5	9.5
1999	7	8.1	8.1	8.4	8.7	9.3	9.5	9.5
2000	9	8.2	8.2	8.9	9.1	9.3	10.3	10.3
2001	11	9	9	9.2	9.4	9.6	9.7	9.7
2002	12	8.8	8.8	9	9.3	9.5	9.9	9.9
2003	15	8.9	8.9	9.3	9.6	10	11.3	11.3
2004	16	8.5	8.5	9.2	9.7	10.2	11.2	11.2
2005	17	8.9	8.9	9.4	9.9	10.4	11	11

(b) Proportion of patients on erythropoietin with haemoglobin level > 10 g/dL

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	6	0	0	10	19	31	38	38
1998	6	16	16	19	26.5	29	40	40
1999	7	13	13	20	25	35	40	40
2000	9	18	18	30	36	38	55	55
2001	11	20	20	31	36	42	47	47
2002	12	15	15	24.5	32	39	48	48
2003	15	8	8	29	38	50	76	76
2004	16	13	13	31.5	42.5	57.5	72	72
2005	17	24	24	35	46	57	76	76

Figure 6.3.6(b): Variation in proportion of patients on erythropoietin with haemoglobin level > 10 g/dL, CAPD centres 2005

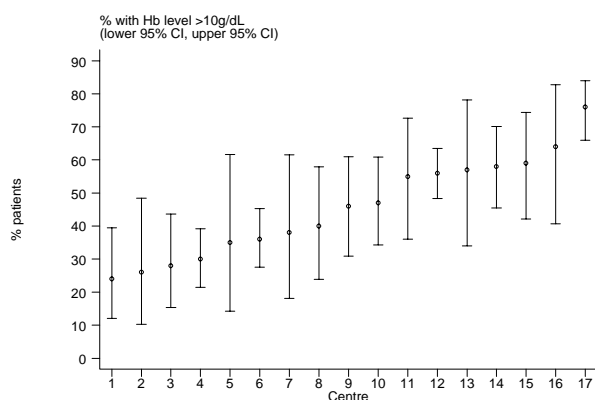
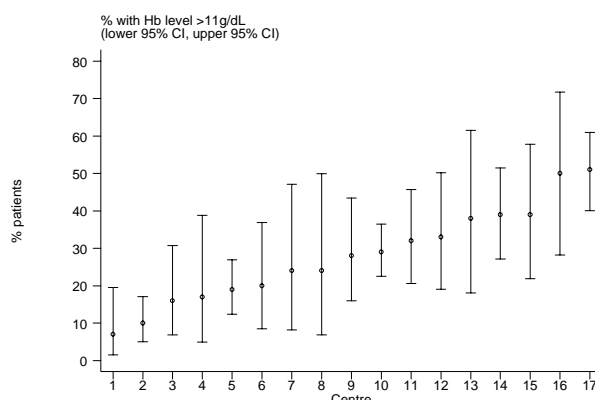


Figure 6.3.6(c): Variation in proportion of patients on erythropoietin with haemoglobin level > 11 g/dL, CAPD centres 2005



(c) Proportion of patients on erythropoietin with haemoglobin level > 11 g/dL

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
1997	6	0	0	0	5.5	8	10	10
1998	6	4	4	8	11	15	16	16
1999	7	0	0	8	9	13	16	16
2000	9	12	12	16	18	21	24	24
2001	11	7	7	10	15	20	23	23
2002	12	10	10	13	18	21.5	27	27
2003	15	5	5	12	17	24	52	52
2004	16	0	0	11	19	31	54	54
2005	17	7	7	19	28	38	51	51