

CHAPTER 6

**MANAGEMENT OF ANAEMIA  
IN PATIENTS ON DIALYSIS**

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## SECTION 6.1: TREATMENT FOR ANAEMIA IN DIALYSIS

From 2001 – 2010, there was an increasing percentage of patients receiving erythropoietin (EPO); more haemodialysis patients were on EPO; 90% compared 78% in PD. The percentage of patients requiring blood transfusion has remained at about 14 to 16% for both HD and PD patients over the last few years despite an increasing percentage of patients on EPO.

There were a decreasing number of patients receiving oral iron. Percentage of HD patients on parenteral iron is slowly increasing, however, in PD patients, this has essentially remained the same. (Table 6.1.1 – 6.1.2)

**Table 6.1.1:** Treatment for Anaemia, HD patients 2001-2010

Year	Number of patients	% on Erythropoietin	% received blood transfusion	% on oral iron	% received parenteral iron
2001	5194	62	13	88	5
2002	6108	67	10	85	7
2003	7017	72	12	83	8
2004	8064	74	11	80	10
2005	9344	81	14	74	11
2006	11679	83	18	76	16
2007	12907	85	15	74	17
2008	15399	88	16	63	23
2009	17969	89	15	59	26
2010	19245	90	14	57	27

**Table 6.1.2:** Treatment for Anaemia, PD patients 2001-2010

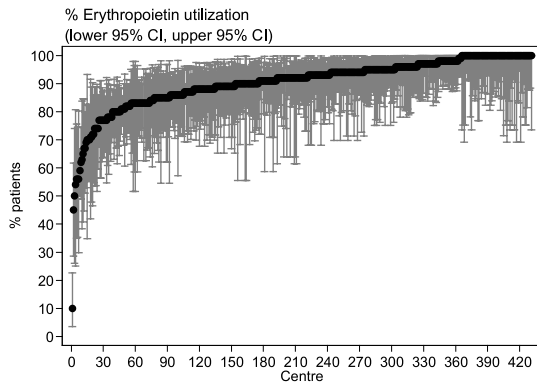
Year	Number of patients	% on Erythropoietin	% received blood transfusion	% on oral iron	% received parenteral iron
2001	781	45	11	91	2
2002	891	49	11	93	2
2003	1230	53	14	87	4
2004	1312	63	15	85	7
2005	1390	72	12	87	8
2006	1552	74	16	83	13
2007	1806	74	16	80	12
2008	2084	77	16	77	12
2009	2212	76	16	74	14
2010	2360	78	16	73	12

In 2010, the percentage of patients on EPO among the HD centres varied significantly from 10% to 100%. The median usage of EPO was 92% compared to 61% a decade ago. (Table 6.1.3)

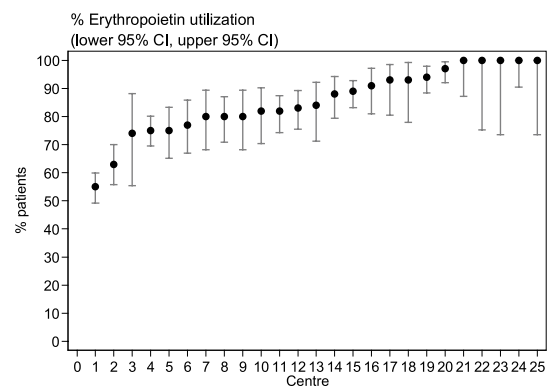
**Table 6.1.3:** Variation in Erythropoietin utilization (% patients) among HD centres, 2001-2010

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	127	0	19	49	61	75	88	100
2002	153	14	26	56	71	79	91	100
2003	185	17	38	60	73	83	95	100
2004	215	10	39	67	77	86	100	100
2005	243	8	56	73	83	91	100	100
2006	292	3	54	79	87	93	100	100
2007	318	4	61	82	89	94	100	100
2008	369	9	61	85	91	96	100	100
2009	410	0	71	86	92	96	100	100
2010	431	10	74	87	92	96	100	100

**Figure 6.1.3:** Variation in Erythropoietin utilization (% patients) among HD centres, 2010



**Figure 6.1.4:** Variation in Erythropoietin utilization (% patients) among PD centres, 2010



In PD centres, there was a lesser variation in the EPO utilization – 55 to 100 %. The median usage of EPO was 84% in 2010. (Table 6.1.4 )

**Table 6.1.4:** Variation in Erythropoietin utilization (% patients) among PD centres, 2001-2010

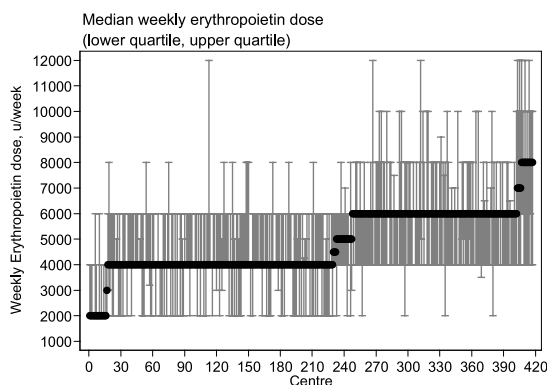
Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	12	25	25	33	47	57	87	87
2002	15	26	26	43	53	62	71	71
2003	18	25	25	38	50.5	67	92	92
2004	18	5	5	53	62.5	79	97	97
2005	19	41	41	62	69	81	97	97
2006	22	35	52	67	74	86	96	97
2007	23	0	44	64	76	90	97	100
2008	23	20	58	70	79	88	100	100
2009	23	30	56	73	83	88	100	100
2010	25	55	63	80	84	94	100	100

The median weekly EPO dose has remained at 4000 units over the last 4 years in both HD and PD centres. It is interesting to note that the maximum dose of EPO used in PD patients is only 6000 units / week and only 8000 units /week in HD patients. This varies significantly with what was reported in 2005 to 2007 in HD patients. (Table 6.1.5 and 6.1.6)

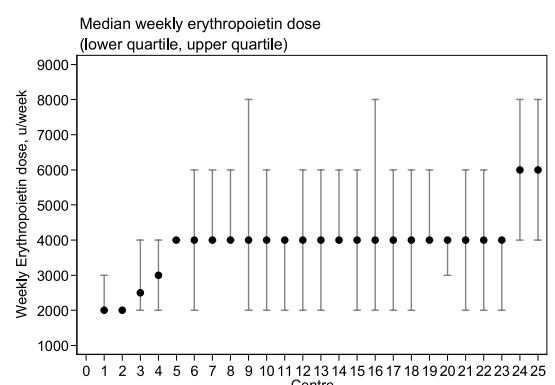
**Table 6.1.5:** Variation in median weekly Erythropoietin dose (u/week) among HD centres, 2001-2010

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	93	2000	2000	2000	2000	2000	4000	5000
2002	117	2000	2000	2000	2000	2000	4000	6000
2003	147	2000	2000	2000	2000	2000	4000	5000
2004	180	2000	2000	2000	2000	2000	4000	5000
2005	218	2000	2000	2000	2000	4000	6000	16000
2006	277	2000	2000	4000	4000	6000	8000	24000
2007	305	2000	4000	4000	4000	6000	8000	16000
2008	359	2000	2000	4000	4000	4000	6000	9000
2009	403	2000	3000	4000	4000	6000	6000	8000
2010	417	2000	4000	4000	4000	6000	6000	8000

**Figure 6.1.5:** Variation in median weekly Erythropoietin dose (u/week) among HD centres, 2010



**Figure 6.1.6:** Variation in median weekly Erythropoietin dose (u/week) among PD centres, 2010



**Table 6.1.6:** Variation in median weekly Erythropoietin dose (u/week) among PD centres, 2001-2010

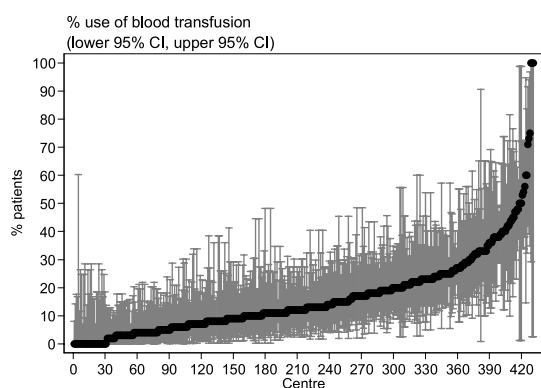
Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	11	2000	2000	2000	2000	3000	4000	4000
2002	12	2000	2000	2000	2000	2000	4000	4000
2003	16	2000	2000	2000	2000	2000	4000	4000
2004	17	2000	2000	2000	2000	2000	4000	4000
2005	18	2000	2000	2000	2000	4000	6000	6000
2006	21	2000	2000	2000	4000	4000	4500	5000
2007	22	2000	2000	4000	4000	4000	6000	8000
2008	22	2000	2000	4000	4000	4000	6000	6000
2009	22	2000	2000	4000	4000	4000	4000	4000
2010	25	2000	2000	4000	4000	4000	6000	6000

In HD centres, the median requirement of blood transfusion is slowly reducing, however, this has remained at around 16% in PD centres. (Table 6.1.7 – 6.1.8)

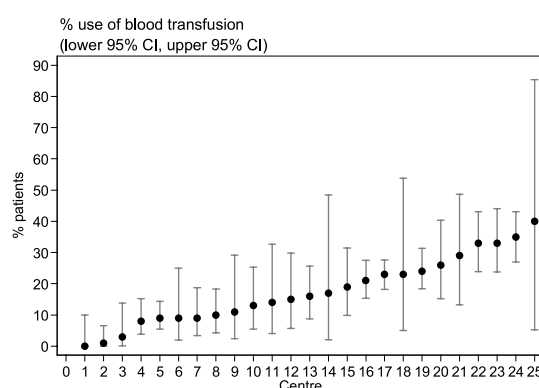
**Table 6.1.7:** Variation in use of blood transfusion (% patients) among HD centres, 2001-2010

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	127	0	0	5	12	20	36	50
2002	153	0	0	2	8	15	28	67
2003	185	0	0	4	9	19	36	63
2004	215	0	0	2	7	17	38	48
2005	243	0	0	5	11	20	42	75
2006	292	0	2	10.5	18	29	47	89
2007	317	0	0	8	15	24	42	100
2008	368	0	0	8	17	26.5	44	100
2009	409	0	0	7	14	23	44	100
2010	431	0	0	7	12	22	44	100

**Figure 6.1.7:** Variation in use of blood transfusion (% patients) among HD centres, 2010



**Figure 6.1.8:** Variation in use of blood transfusion (% patients) among PD centres, 2010



**Table 6.1.8:** Variation in use of blood transfusion (% patients) among PD centres, 2001-2010

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	12	0	0	0	3.5	15.5	37	37
2002	15	0	0	5	8	21	42	42
2003	18	0	0	3	10.5	21	59	59
2004	18	0	0	7	15	20	37	37
2005	19	0	0	4	11	17	44	44
2006	22	0	3	9	16.5	27	36	47
2007	23	6	7	11	18	24	33	36
2008	23	2	4	7	15	28	35	40
2009	23	0	3	9	16	26	32	36
2010	25	0	1	9	16	24	35	40

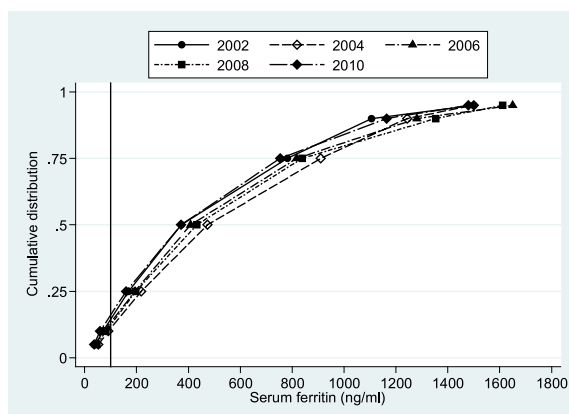
## SECTION 6.2: IRON STATUS ON DIALYSIS

In HD and PD patients with or without EPO, the mean and median serum Ferritin has remained stable over the years – 400 to 700 ng/ml. Up to 97% of patients have serum ferritin of greater 100 ng/ml. It appears that PD patients, with or without EPO have consistently shown higher Ferritin level than HD patients. (Table 6.2.1 – 6.2.4)

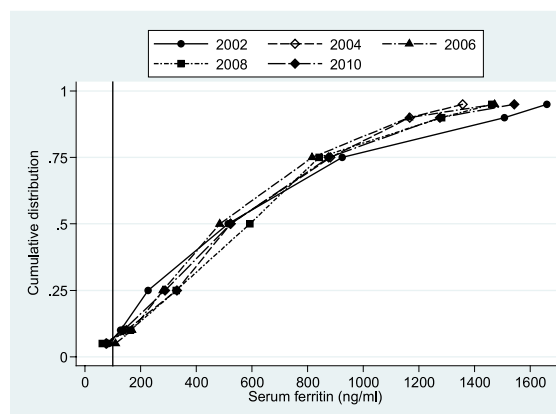
**Table 6.2.1:** Distribution of Serum Ferritin without Erythropoietin, HD patients 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 100$ ng/ml
2001	758	537.6	453.9	383.5	172	828	87
2002	803	519.5	447.3	373	168.5	781	85
2003	916	551.5	434.2	456.7	190	827.7	87
2004	1042	590.7	463.6	473.5	218	910.5	89
2005	1010	618.5	498.7	485.5	225	902	90
2006	1169	562.4	485.6	408	193.8	817.5	87
2007	1182	586.0	501.0	431	196	860.9	86
2008	1186	578.0	489.9	431.9	197	838.1	87
2009	1283	546.6	461.7	419.7	171	798	87
2010	1360	508.6	453.1	371.4	159.6	753.3	83

**Figure 6.2.1:** Cumulative Distribution of Serum Ferritin without Erythropoietin, HD patients 2001-2010



**Figure 6.2.2:** Distribution of Serum Ferritin without Erythropoietin, PD patients 2001-2010



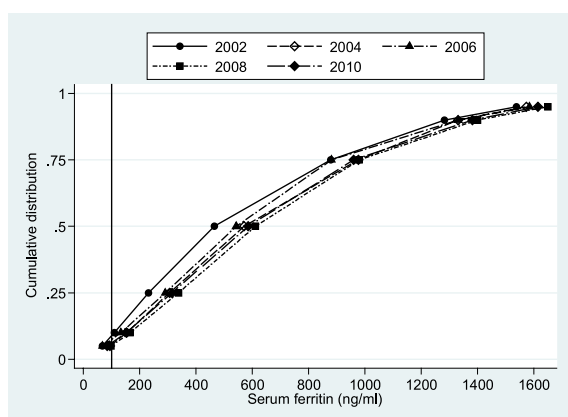
**Table 6.2.2:** Distribution of Serum Ferritin without Erythropoietin, PD patients 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 100$ ng/ml
2001	223	543.8	417.5	440	216.9	754	91
2002	236	634.8	491.2	514.9	226	924.6	93
2003	329	602.5	429.2	503.7	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
2006	263	589.9	411.3	484	280	815.8	95
2007	305	636.9	396.6	582.3	342.8	841.9	96
2008	338	634	410.1	592	327.4	841	93
2009	364	621.6	401.1	553	322.5	861.8	95
2010	382	624.9	446.6	523.5	287.4	875.8	93

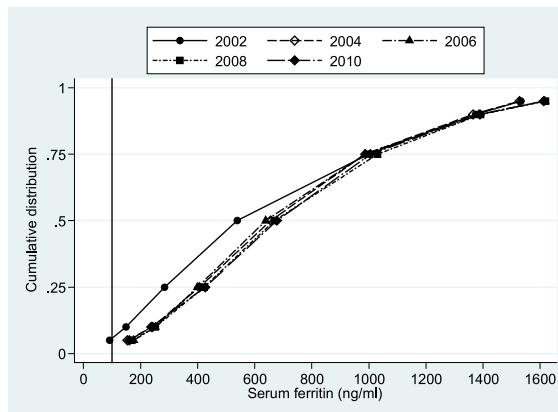
**Table 6.2.3:** Distribution of Serum Ferritin on Erythropoietin, HD patients 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 100$ ng/ml
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	3134	640.8	428.1	563.3	298	931	94
2004	3904	669.7	460.4	571	306	976.5	94
2005	5116	682.7	471	599.5	315.3	971.5	93
2006	6765	640.3	459	543	291.2	881	93
2007	8032	658.8	452.2	564.4	315.5	914	94
2008	9936	703.6	469.3	611	337.5	979.6	95
2009	12237	679.3	459.5	596	319.5	941.9	94
2010	13444	681.9	470	585.5	314.5	960	94

**Figure 6.2.3:** Cumulative distribution of Serum Ferritin on Erythropoietin, HD patients 2001-2010



**Figure 6.2.4:** Cumulative distribution of Serum Ferritin on Erythropoietin, PD patients 2001-2010



**Table 6.2.4:** Distribution of Serum Ferritin on Erythropoietin, PD patients 2001-2010

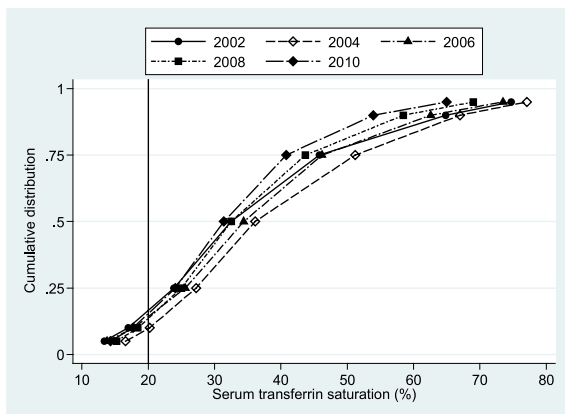
Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 100$ ng/ml
2001	261	645.9	449.2	557.5	275.7	885.4	93
2002	345	666.8	462.4	538.5	284	999.5	94
2003	517	689.9	459.9	589	304	993.2	96
2004	540	728.8	427.2	655.6	406.3	986.7	98
2005	767	732.9	433.6	659	403.6	997.5	97
2006	888	729.9	435.6	638.4	399.5	986.2	98
2007	1091	741.3	426.1	652	423.8	1015	98
2008	1310	758.4	445.4	668.6	422.4	1030.3	98
2009	1390	759.5	438.7	689	421.1	1017.5	98
2010	1554	753.3	438	677.1	426.3	1005.5	97

The median transferrin saturation has remained the same over the last decade, with the mean and median always greater than 30%. In 2010, up to 91% of all patients have transferrin saturation greater than 20% (Table 6.2.5 – 6.2.8)

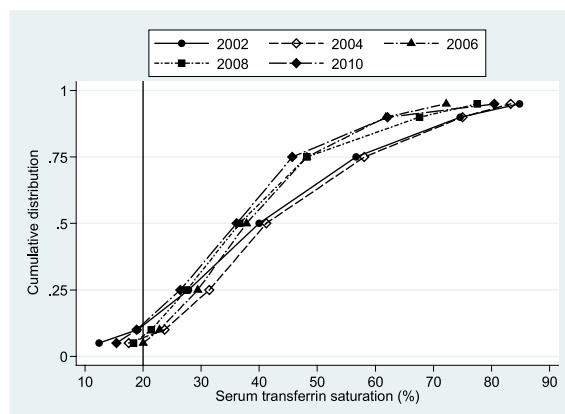
**Table 6.2.5:** Distribution of transferrin saturation without Erythropoietin, HD patients, 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 20$ %
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	922	40.3	18.6	36.1	27.2	51.2	91
2004	1031	41.2	18.1	37.5	28.5	50.1	92
2005	1106	37.7	17.8	34.4	25.6	46.2	87
2006	1149	36.2	16.9	32.9	24.7	44.2	87
2007	1206	36.1	16.5	32.5	25	43.7	87
2008	1211	34.3	15.5	31.8	23.7	41.4	85
2009	1282	34.3	15.9	31.4	24.1	40.8	85
2010	1412	33.5	15.5	30.5	22.8	40.3	83

**Figure 6.2.5:** Cumulative distribution of transferrin saturation without Erythropoietin, HD patients 2001-2010



**Figure 6.2.6:** Cumulative distribution of transferrin saturation without Erythropoietin, PD patients 2001-2010



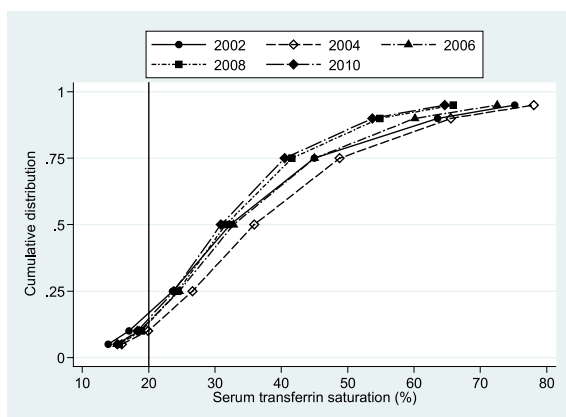
**Table 6.2.6:** Distribution of transferrin saturation without Erythropoietin, PD patients, 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 20\%$
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	397	45.2	19.7	41.2	31.4	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
2006	299	40.5	17.4	37.9	27.3	47.3	95
2007	348	40.3	17.9	36.6	27.5	48.2	92
2008	349	38.2	17.8	34.3	26.2	44.4	91
2009	439	38.4	18.2	36.1	26.4	45.7	87
2010	441	38.3	17.8	35.1	25.9	45.3	89

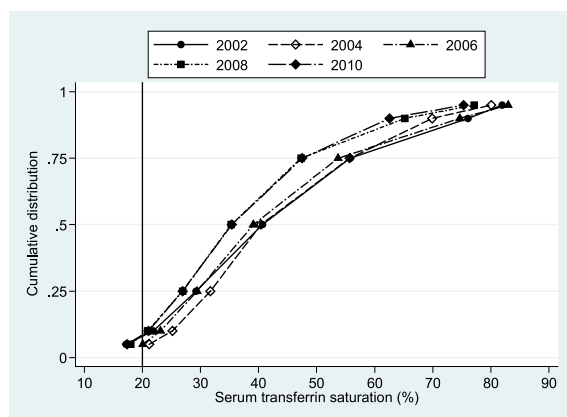
**Table 6.2.7:** Distribution of Transferrin saturation on Erythropoietin, HD patients, 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 20\%$
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	2641	39.6	18.4	35.9	26.6	48.8	90
2004	3269	39.6	17	36.1	27.8	48.1	93
2005	4808	36.6	17.2	32.8	24.6	45	87
2006	6384	35.1	16.4	31.6	24.1	42.1	87
2007	7604	34.7	15.4	31.6	24.4	41.6	88
2008	9535	34.7	15.4	31.5	24	41.6	87
2009	11851	34	15.4	30.9	23.8	40.5	86
2010	13615	34	15.1	30.9	24.2	40.3	87

**Figure 6.2.7:** Cumulative distribution of transferrin saturation on Erythropoietin, HD patients 2001-2010



**Figure 6.2.8:** Cumulative distribution of transferrin saturation on Erythropoietin, PD patients 2001-2010



**Table 6.2.8:** Distribution of Transferrin saturation on Erythropoietin, PD patients, 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≥20 %
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	460	44.6	17.8	40.4	31.7	55.7	96
2004	697	44.7	18.7	40.8	30.8	54.5	96
2005	820	43.5	19.3	39.1	29.4	53.7	95
2006	916	41.6	17.5	38	29.4	50.7	95
2007	1080	39.3	17.6	35.3	26.9	47.3	92
2008	1265	38.6	17.9	34.4	26.2	47.1	91
2009	1550	39.1	17.3	35.4	26.9	47.5	92
2010	1628	38.9	17.5	35.5	26.7	47.3	91

From 2001 to 2010, the median for ferritin for all HD centres has remained at 500 to 600 ng/ml. There was a wide variation in ferritin levels ranging from 37 to 1236 ng/ml between HD centres in 2010. At the median, 96% of patients on EPO have a serum ferritin greater 100 ng/ml. The median transferrin saturation has been > 30% over the last 10 years. 89% of patients on HD have transferrin saturation greater than 20%. (Table 6.2.9)

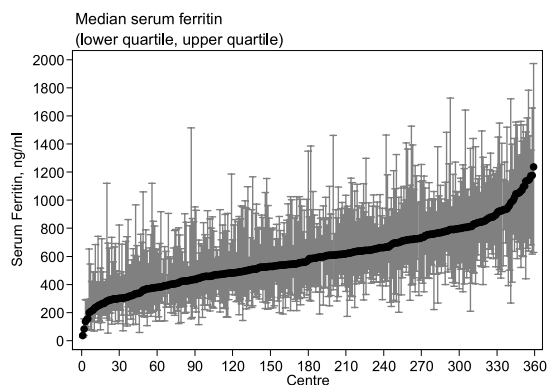
A similar trend, but with higher level of ferritin and transferrin saturation was seen in the PD centres. (Table 6.2.10)

**Table 6.2.9:** Variation in iron status outcomes among HD centres, 2001-2010

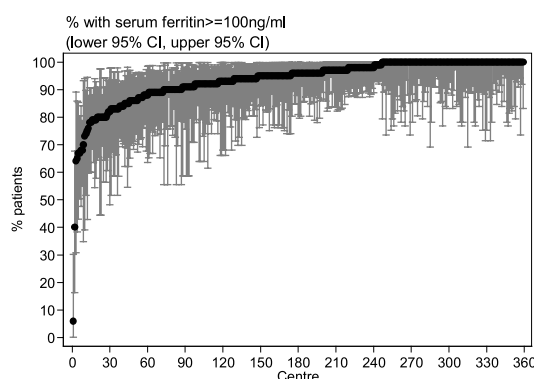
a) Medium serum ferritin among patients on erythropoietin

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	51	213.8	239.3	360.5	508	670	886.5	1225
2002	68	106.6	193.9	369.5	478.7	610	836.5	1031
2003	101	152.5	317.8	463	554	692	950.1	1742.8
2004	124	99.5	328.5	450.3	569.3	736.4	991.8	2000
2005	161	1.6	307	463	625.3	734	950.8	2000
2006	209	1.5	237	413.4	554.8	691.3	867	2000
2007	241	92.7	259	439	561.7	689.8	874.5	1408
2008	281	9;2.2	316	487	601	709	922.6	2000
2009	337	101.7	298.8	452.3	594	719.5	898.7	1473
2010	359	37.3	265	435.8	575	733.8	991.8	1236.5

**Figure 6.2.9(a):** Variation in medium serum ferritin among patients on erythropoietin, HD centres 2010



**Figure 6.2.9(b):** Variation in proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, HD centres 2010





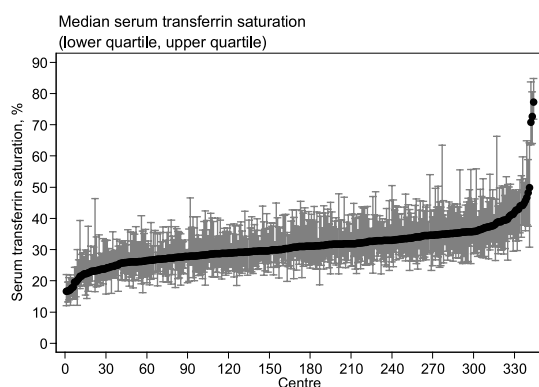
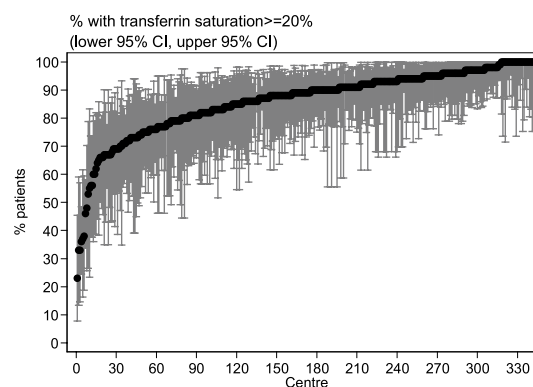
b) Proportion of patients on erythropoietin with serum ferritin  $\geq 100$  ng/ml, HD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	51	71	71	88	93	96	100	100
2002	68	55	73	88.5	93	96.5	100	100
2003	101	57	76	91	96	100	100	100
2004	124	50	85	92	96	100	100	100
2005	161	5	79	91	95	100	100	100
2006	209	0	74	91	95	100	100	100
2007	241	44	78	92	96	100	100	100
2008	281	47	81	92	96	100	100	100
2009	337	50	81	91	95	100	100	100
2010	359	6	79	91	96	100	100	100

## c) Median transferrin saturation among patients on erythropoietin, HD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	54	21	22.6	26.8	31.3	36.8	48.1	76.1
2002	61	14.1	21.2	26	29.5	35.6	50.8	60.2
2003	91	18.2	24.2	30.8	34.4	41.1	55.6	70.7
2004	115	22.7	26.8	33	35.9	41.5	52	66.8
2005	147	15.2	25.1	29.2	32.5	37.1	47.1	69.8
2006	186	13.7	22.4	27.8	31.4	35.8	45.4	81.3
2007	217	17.4	22	27.7	31.4	35.1	42.5	78.1
2008	259	16.5	23.4	28	31.9	34.5	46.5	76
2009	309	16.9	21.7	27.4	30.3	34	42.6	79.8
2010	344	16.6	22.6	27.7	31	34	40.9	77.2

Figure 6.2.9(c): Variation in median transferrin saturation among patients on erythropoietin HD centres, 2010

Figure 6.2.9(d): Variation in proportion of patients on erythropoietin with transferrin saturation  $\geq 20\%$ , HD centres, 2010d) Proportion of patients on erythropoietin with transferrin saturation  $\geq 20\%$ , HD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	54	57	60	76	88.5	96	100	100
2002	61	32	58	69	82	92	100	100
2003	91	45	68	86	93	100	100	100
2004	115	55	73	90	94	100	100	100
2005	150	30	70	83	91	95	100	100
2006	187	20	60	80	90	95	100	100
2007	219	27	62	83	91	96	100	100
2008	262	13	68	81	90	95	100	100
2009	314	35	62	80	88	94	100	100
2010	344	23	66	81	89	94	100	100

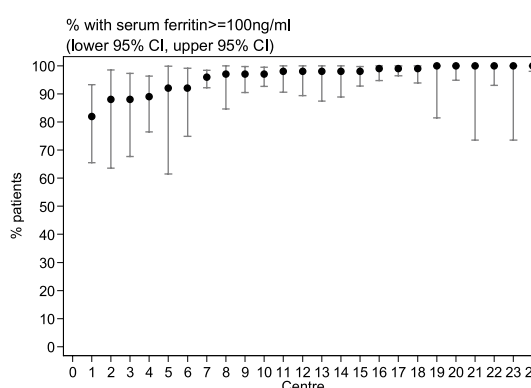
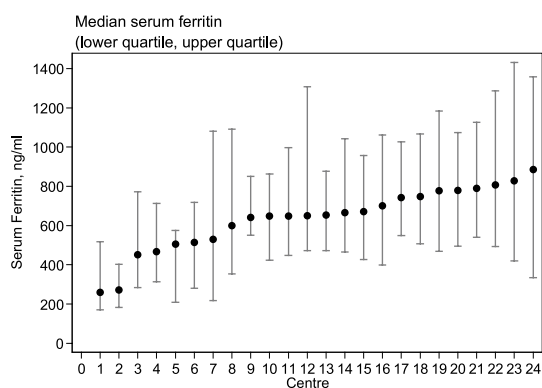
**Table 6.2.10:** Variation in iron status outcomes among PD centres, 2001-2010

a) Medium serum ferritin among patients on erythropoietin

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	9	285.8	285.8	532.8	550.7	617.5	908	908
2002	10	372.2	372.2	437.4	477	606.5	826.5	826.5
2003	12	304	304	454.5	508.5	716.1	954.9	954.9
2004	13	317	317	529.5	610	701.3	860.3	860.3
2005	17	338.5	338.5	557.2	709.9	800.9	843	843
2006	19	391.2	391.2	531	619.3	788.5	968.4	968.4
2007	21	290.3	313.4	592	636.2	716.3	961.7	1048.6
2008	21	309.5	381.3	494.3	656.3	801.8	970.1	991.5
2009	21	291.3	341.3	555.5	679.1	795.3	947	1233.3
2010	24	260.4	272.3	521.5	651.3	762.2	827.5	886.2

**Figure 6.2.10(a):** Variation in medium serum ferritin among patients on erythropoietin, PD centres 2010

**Figure 6.2.10(b):** Variation in proportion of patients on erythropoietin with serum ferritin ≥ 100ng/ml, PD centres 2010

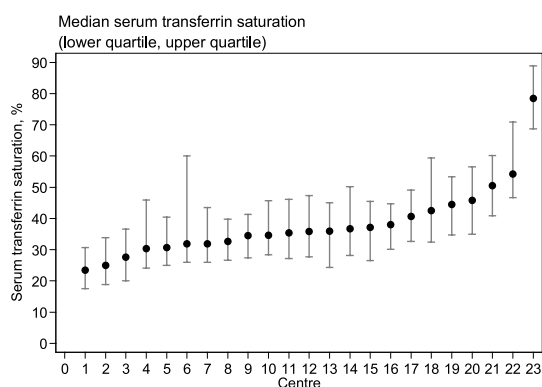
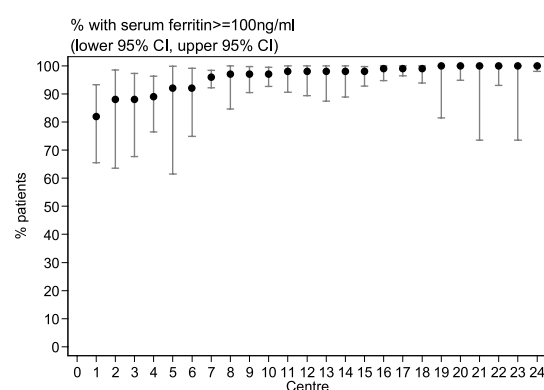


b) Proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, PD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	9	80	80	85	94	100	100	100
2002	10	91	91	92	94.5	100	100	100
2003	12	85	85	95	96	98	100	100
2004	13	93	93	95	100	100	100	100
2005	17	86	86	96	97	100	100	100
2006	19	95	95	97	100	100	100	100
2007	21	90	90	96	98	100	100	100
2008	21	87	88	93	98	100	100	100
2009	21	83	85	95	98	100	100	100
2010	24	82	88	94	98	99.5	100	100

c) Median transferrin saturation among patients on erythropoietin, PD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	8	28.4	28.4	31.9	36.9	47.5	79.8	79.8
2002	9	30.5	30.5	36.5	38.6	40.3	60.4	60.4
2003	13	31.9	31.9	35.8	41.5	47.5	64	64
2004	17	29.1	29.1	36	40.9	42.7	82.3	82.3
2005	17	30.3	30.3	35.9	38.5	43	76.4	76.4
2006	19	30.1	30.1	34.6	37.7	40.2	75.8	75.8
2007	19	25.9	25.9	29.6	37.7	46.3	83	83
2008	19	25.2	25.2	31.6	34.2	42.9	81.1	81.1
2009	21	25	27.5	32.8	37.9	40	55.4	83.4
2010	23	23.5	25	31.9	35.9	42.5	54.2	78.5

**Figure 6.2.10 (c):** Variation in median transferrin saturation among patients on erythropoietin, PD centres 2010**Figure 6.2.10 (d):** Variation in proportion of patients on erythropoietin with transferrin saturation  $\geq 20\%$ , PD centres 2010**d) Proportion of patients on erythropoietin with transferrin saturation  $\geq 20\%$ , PD centres**

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	8	85	85	92	93.5	95.5	97	97
2002	9	78	78	92	93	98	100	100
2003	13	90	90	95	96	100	100	100
2004	17	88	88	96	97	100	100	100
2005	17	88	88	93	97	100	100	100
2006	19	83	83	94	95	98	100	100
2007	19	75	75	88	94	98	100	100
2008	19	65	65	92	95	96	100	100
2009	21	70	81	91	95	98	100	100
2010	23	70	70	90	95	100	100	100

### SECTION 6.3: HAEMOGLOBIN OUTCOMES ON DIALYSIS

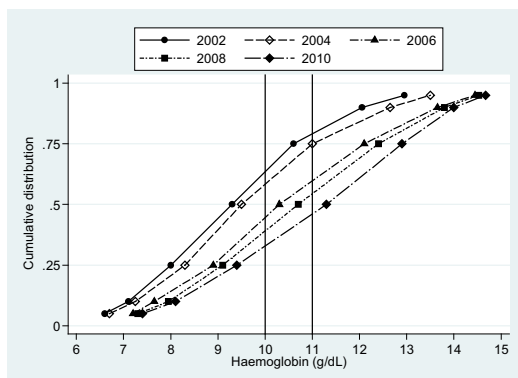
The mean and median haemoglobin concentrations in all dialysis patients with or without EPO remained the same.

In 2010 the mean and median haemoglobin ranged from 10.3 to 11.4g/dl for all dialysis patients. The percentage of patients with haemoglobin > 10 or > 11 gm/dl steadily increased for HD patients not on EPO; the Hb is otherwise static for all other patients. In 2010, the median hemoglobin achieved in HD and PD patients is the same at 10.4g/dl. This is despite of higher use of EPO and parenteral iron in HD patients. (Table 6.3.1 – 6.3.4)

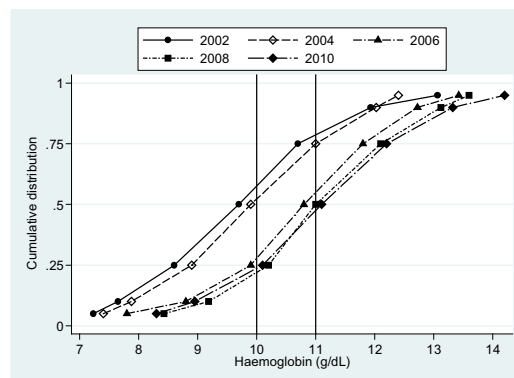
**Table 6.3.1:** Distribution of Haemoglobin Concentration without Erythropoietin, HD patients 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≤10g/dL	% Patients >10g/dL	% Patients ≤11g/dL	% Patients >11g/dL
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	1801	9.7	2.1	9.5	8.3	11	60	40	75	25
2004	1925	10.1	2.2	9.9	8.6	11.5	53	47	68	32
2005	1667	10.5	2.3	10.3	8.9	12.1	46	54	62	38
2006	1760	10.6	2.2	10.5	9	12.1	42	58	59	41
2007	1756	10.8	2.2	10.7	9.1	12.4	40	60	54	46
2008	1751	10.8	2.3	10.8	9.1	12.6	39	61	54	46
2009	1847	11.2	2.3	11.3	9.4	12.9	33	67	46	54
2010	1835	11.2	2.2	11.4	9.6	12.9	29	71	43	57

**Figure 6.3.1:** Cumulative distribution of haemoglobin concentration without Erythropoietin, HD patients 2001-2010



**Figure 6.3.2:** Cumulative distribution of haemoglobin concentration without Erythropoietin, PD patients 2001-2010

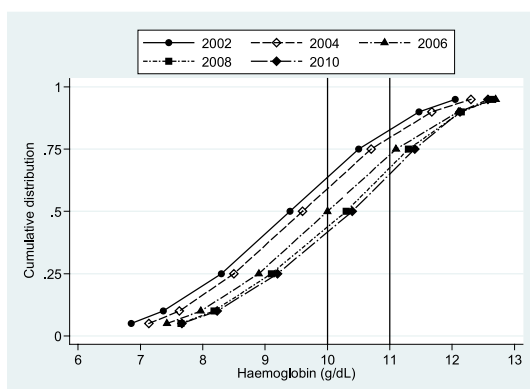
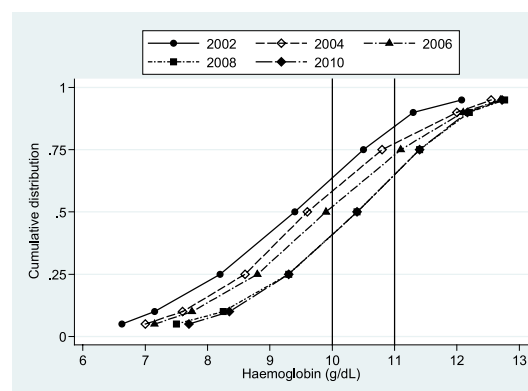


**Table 6.3.2:** Distribution of Haemoglobin Concentration without Erythropoietin, PD patients 2001-2010

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≤10g/dL	% Patients >10g/dL	% Patients ≤11g/dL	% Patients >11g/dL
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	542	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
2006	387	10.9	1.6	10.9	10	11.8	25	75	54	46
2007	436	11.1	1.6	11	10.2	12.1	22	78	50	50
2008	450	11.1	1.7	11.1	10.2	12.1	21	79	46	54
2009	488	11.1	1.8	11.1	10.1	12.2	25	75	48	52
2010	495	11.1	1.7	11.1	9.9	12.2	27	73	48	52

**Table 6.3.3:** Distribution of Haemoglobin Concentration on Erythropoietin, HD patients 2001-2010

Year	Number of subject	Mean	SD	Median	LQ	UQ	% Patients $\leq 10\text{g/dL}$	% Patients $>10\text{g/dL}$	% Patients $\leq 11\text{g/dL}$	% Patients $>11\text{g/dL}$
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	4783	9.6	1.6	9.6	8.5	10.7	61	39	81	19
2004	5806	9.8	1.6	9.9	8.8	10.9	54	46	77	23
2005	7218	10	1.6	10	8.9	11.1	50	50	73	27
2006	9415	10.1	1.6	10	9	11.1	50	50	72	28
2007	10696	10.2	1.5	10.3	9.1	11.3	44	56	69	31
2008	13034	10.2	1.5	10.3	9.1	11.3	44	56	69	31
2009	15528	10.3	1.5	10.4	9.2	11.4	42	58	67	33
2010	16875	10.3	1.5	10.4	9.3	11.4	40	60	65	35

**Figure 6.3.3:** Cumulative distribution of Haemoglobin Concentration on Erythropoietin, HD patients 2001-2010**Figure 6.3.4:** Cumulative distribution of Haemoglobin Concentration on Erythropoietin, PD patients 2001-2010**Table 6.3.4:** Distribution of Haemoglobin Concentration on Erythropoietin, PD patients 2001-2010

Year	Number of subject	Mean	SD	Median	LQ	UQ	% Patients $\leq 10\text{g/dL}$	% Patients $>10\text{g/dL}$	% Patients $\leq 11\text{g/dL}$	% Patients $>11\text{g/dL}$
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	639	9.7	1.7	9.6	8.6	10.8	59	41	78	22
2004	798	9.8	1.7	9.8	8.6	11	54	46	76	24
2005	970	9.9	1.7	9.9	8.8	11.1	53	47	73	27
2006	1118	10	1.6	10.1	9	11.1	50	50	74	26
2007	1319	10.3	1.6	10.4	9.3	11.4	42	58	66	34
2008	1577	10.3	1.5	10.4	9.4	11.3	39	61	66	34
2009	1664	10.3	1.5	10.4	9.3	11.4	40	60	65	35
2010	1805	10.3	1.5	10.4	9.3	11.4	42	58	67	33

In 2010, for HD patients on EPO, the median Hb in HD centres ranged 7.9 to 12.1 gm/dl with the median at 10.4 gm/dl. A similar trend is noted in PD centres with a significantly lesser variation.

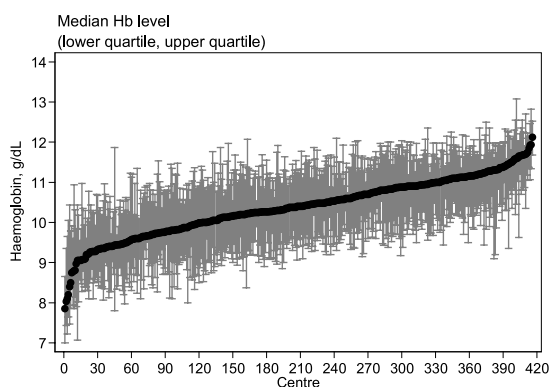
In 2010 for HD patients on EPO, the proportion of patients with Hb  $> 11$  gm /dl varied between 0 to 97%, with median at 33%. As expected, a lesser variation was seen in the PD patients.

**Table 6.3.5:** Variation in Haemoglobin outcomes among HD centres 2001-2010

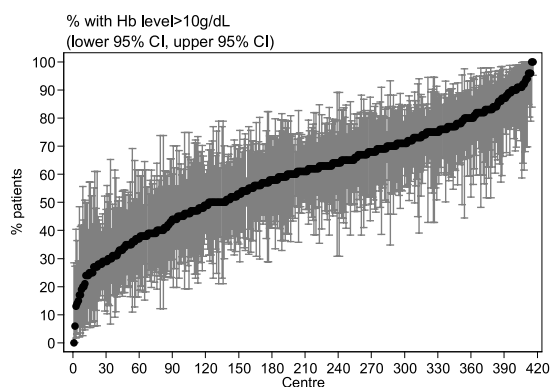
a) Median haemoglobin level among patients on Erythropoietin

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	91	7.9	8.3	8.9	9.5	9.9	10.6	11
2002	111	7.9	8.5	9	9.4	10	10.8	11.6
2003	142	7.9	8.6	9.1	9.6	10	10.6	11.5
2004	179	7.7	8.6	9.2	9.7	10.3	10.9	11.3
2005	213	8.3	8.8	9.5	10	10.4	11.1	11.8
2006	273	7.7	8.8	9.5	9.9	10.4	11.3	12.8
2007	304	8.6	9.1	9.8	10.2	10.6	11.3	12.4
2008	356	8.2	9	9.8	10.2	10.7	11.4	12.2
2009	398	8.5	9.1	9.9	10.3	10.8	11.4	12.2
2010	416	7.9	9.2	9.9	10.4	10.9	11.5	12.1

**Figure 6.3.5(a):** Variation in median haemoglobin level among patients on Erythropoietin, HD centres 2010



**Figure 6.3.5(b):** Variation in proportion of patients on erythropoietin with haemoglobin level > 10g/dL, HD centres 2010



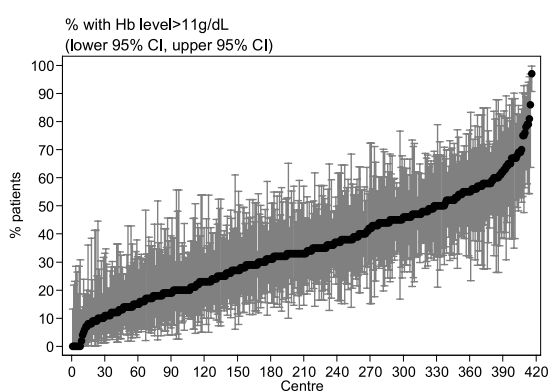
b) Proportion of patients on erythropoietin with haemoglobin level > 10g/dL, HD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	91	4	10	23	33	47	67	71
2002	111	0	14	27	35	48	64	87
2003	142	7	14	27	37	50	66	90
2004	179	9	17	30	42	57	76	89
2005	213	0	20	33	49	61	78	100
2006	273	0	18	36	47	62	81	95
2007	304	13	26	42	55	68	83	100
2008	356	0	27	43	57	69.5	82	100
2009	398	7	27	46	58	70	86	100
2010	416	0	27	46	61	73	89	100

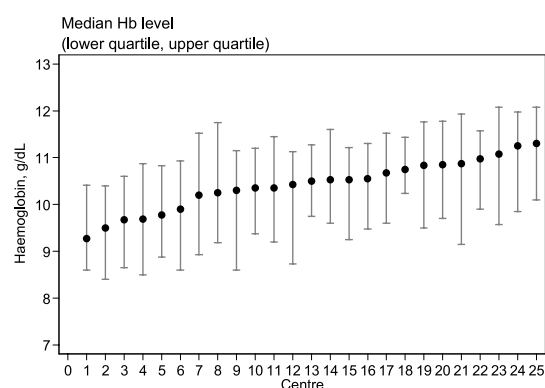
## c) Proportion of patients on erythropoietin with haemoglobin level &gt; 11g/dL, HD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	91	0	0	8	13	24	33	50
2002	111	0	4	12	17	27	43	67
2003	142	0	0	8	15	27	41	56
2004	179	0	0	10	19	30	47	58
2005	213	0	4	13	25	35	53	83
2006	273	0	6	17	25	37	58	73
2007	304	0	8	19	27	40	61	92
2008	356	0	8	20.5	30	41	60	100
2009	398	0	9	21	31	44	62	81
2010	416	0	9	20	33	47	65	97

**Figure 6.3.5(c):** Variation in proportion of patients on erythropoietin with haemoglobin level > 11g/dL, HD centres 2010



**Figure 6.3.6(a):** Variation in median haemoglobin level among patients on Erythropoietin, PD centres 2010



**Table 6.3.6:** Variation in Haemoglobin outcomes among PD centres 2001-2010

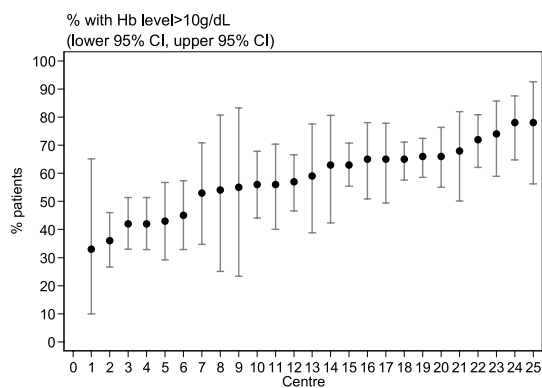
## a) Median haemoglobin level among patients on Erythropoietin

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	11	9	9	9.2	9.4	9.6	9.7	9.7
2002	12	8.6	8.6	9.1	9.3	9.5	9.9	9.9
2003	16	8.4	8.4	9.3	9.5	10	11.2	11.2
2004	17	8.4	8.4	9.2	9.7	10.2	11.2	11.2
2005	18	8.9	8.9	9.6	9.9	10.3	11	11
2006	22	8.8	8.8	9.5	9.9	10.4	10.6	10.9
2007	22	9.5	9.5	10.1	10.3	10.8	11.1	11.1
2008	22	9.2	9.6	10.2	10.4	10.8	11.1	11.2
2009	22	9.2	9.4	9.9	10.5	10.7	11.1	11.2
2010	25	9.3	9.5	10.2	10.5	10.8	11.3	11.3

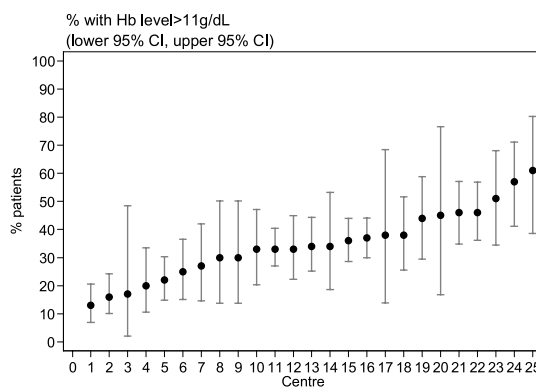
b) Proportion of patients on erythropoietin with haemoglobin level > 10g/dL, PD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	11	25	25	31	38	42	47	47
2002	12	11	11	25	32	37.5	48	48
2003	16	0	0	28.5	35.5	50	75	75
2004	17	10	10	38	43	55	72	72
2005	18	21	21	35	46	56	76	76
2006	22	16	19	43	48	58	70	80
2007	22	35	36	52	59.5	63	72	72
2008	22	31	36	53	60	65	75	89
2009	22	31	37	49	59.5	65	75	76
2010	25	33	36	53	59	66	78	78

**Figure 6.3.6(b):** Variation in proportion of patients on erythropoietin with haemoglobin level > 10g/dL, PD centres, 2010



**Figure 6.3.6(c):** Variation in proportion of patients on erythropoietin with haemoglobin level > 11g/dL, PD centres 2010



c) Proportion of patients on erythropoietin with haemoglobin level > 11g/dL, PD centres

Year	Number of centres	Min	5 <sup>th</sup> centile	LQ	Median	UQ	95 <sup>th</sup> centile	Max
2001	11	8	8	10	16	20	23	23
2002	12	7	7	13	17.5	22	27	27
2003	16	0	0	12	15.5	22.5	52	52
2004	17	0	0	13	20	29	54	54
2005	18	7	7	21	29.5	34	51	51
2006	22	0	5	16	25.5	33	38	48
2007	22	13	14	22	34.5	44	52	53
2008	22	11	15	23	34	44	54	60
2009	22	13	18	31	36	43	51	51
2010	25	13	16	27	34	44	57	61