

CHAPTER 7

Management of Anaemia in Patients on Dialysis

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SECTION 7.1: TREATMENT FOR ANAEMIA IN DIALYSIS

From 1999 – 2008, there was an increasing percentage of patients receiving erythropoietin (EPO); more haemodialysis patients were on EPO; 87% compared 77% in PD. The percentage of patients requiring blood transfusion has remained at 16% for both HD and PD patients over the last few years.

There were a decreasing number of patients receiving oral iron, with a significant increase of HD patients on parenteral iron. (Table 7.1.1 – 7.1.2)

Table 7.1.1: Treatment for Anaemia, HD patients 1999 to 2008

Year	No of subject	% on Erythropoietin	% receive blood transfusion	% on oral iron	% received parenteral iron
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	7017	71	12	83	8
2004	8064	74	11	80	10
2005	9344	80	14	74	11
2006	11679	83	18	76	16
2007	12907	85	15	74	17
2008	15280	87	16	63	23

Table 7.1.2: Treatment for Anaemia, PD patients 1999 to 2008

Year	No of subject	% on Erythropoietin	% receive blood transfusion	% on oral iron	% received parenteral iron
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	1230	53	14	87	4
2004	1312	63	15	85	7
2005	1390	71	12	87	8
2006	1552	73	16	83	13
2007	1806	73	16	80	12
2008	2084	77	16	77	12

In 2008, the percentage of patients on EPO among the HD centres varied significantly from 0% to 100%. The median usage of EPO was 91% compared to 50.5% a decade ago. (Table 7.1.3)

Table 7.1.3: Variation in Erythropoietin utilization (% patients) among HD centres, 2008

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	76	6	13	41.5	50.5	67.5	82	90
2000	108	0	20	43.5	56	69.5	90	100
2001	127	0	19	49	61	75	88	100
2002	152	14	26	56	70.5	79	91	100
2003	180	17	37	60	72.5	83	93.5	100
2004	210	9	40	65	76	85	97	100
2005	239	8	54	74	83	90	100	100
2006	293	3	55	79	86	93	100	100
2007	313	3	61	81	89	93	100	100
2008	358	0	62	85	91	96	100	100

Figure 7.1.3: Variation in Erythropoietin utilization (% patients) among HD centres, 2008

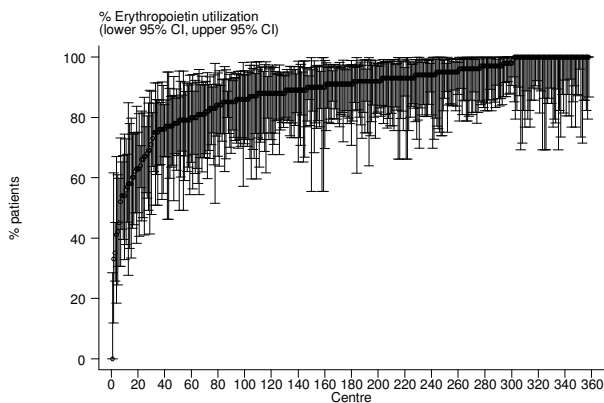
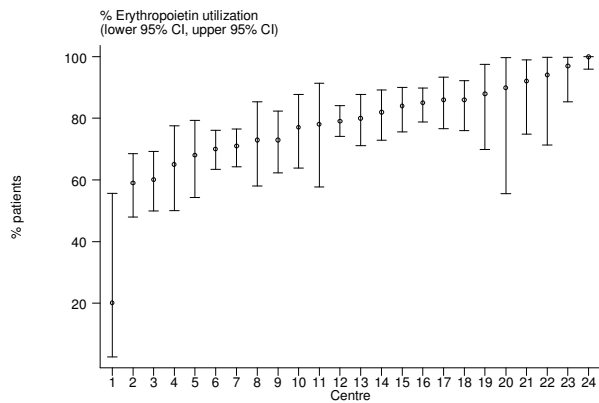


Figure 7.1.4: Variation in Erythropoietin utilization (% patients) among PD centres, 2008



In PD centres, there was a lesser variation in the EPO utilization – 20 to 100 %. The median usage of EPO was 79.5% in 2008. (Table 7.1.4)

Table 7.1.4: Variation in Erythropoietin utilization (% patients) among PD centres, 2008

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	10	22	22	32	40.5	54	78	78
2000	11	26	26	33	47	56	70	70
2001	12	25	25	33	47	57	87	87
2002	15	26	26	43	53	59	71	71
2003	19	25	25	38	51	75	92	92
2004	19	5	5	53	64	79	97	97
2005	20	42	48.5	62.5	68.5	83.5	97	97
2006	22	39	51	66	72	86	97	97
2007	24	0	44	65.5	77	88.5	97	97
2008	24	20	59	70.5	79.5	87	97	100

The median weekly EPO dose has remained at 4000 units over the last 3 years in both HD and PD centres. (Table 7.1.5 and 7.1.6)

Table 7.1.5: Variation in median weekly Erythropoietin dose (u/week) among HD centres, 2008

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	54	2000	2000	2000	2000	2000	4000	4000
2000	79	2000	2000	2000	2000	2000	4000	6000
2001	95	2000	2000	2000	2000	2000	4000	5000
2002	118	2000	2000	2000	2000	2000	4000	6000
2003	146	2000	2000	2000	2000	2000	4000	5000
2004	177	2000	2000	2000	2000	2000	4000	5000
2005	211	2000	2000	2000	2000	4000	6000	16000
2006	276	2000	2000	4000	4000	6000	8000	24000
2007	300	2000	2000	4000	4000	6000	8000	16000
2008	348	2000	2000	4000	4000	5000	6000	8000

Figure 7.1.5: Variation in median weekly Erythropoietin dose (u/week) among HD centres, 2008

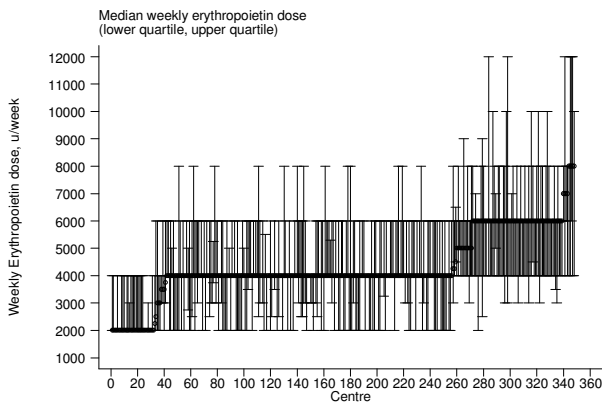


Figure 7.1.6: Variation in median weekly Erythropoietin dose (u/week) among PD centres, 2008

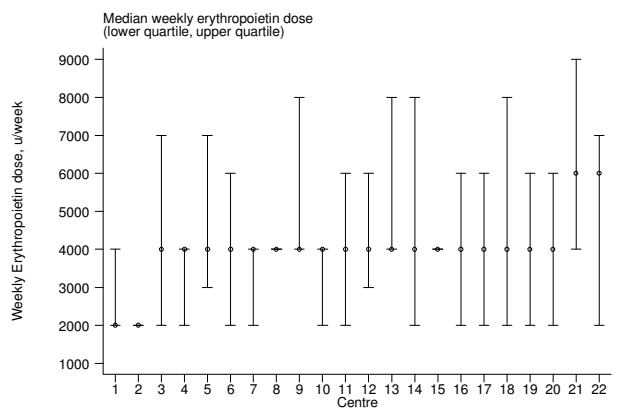


Table 7.1.6: Variation in median weekly Erythropoietin dose (u/week) among PD centres, 2008

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	7	2000	2000	2000	2000	2000	4000	4000
2000	8	2000	2000	2000	2000	3000	4000	4000
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	22	2000	2000	3000	4000	4000	5000	5500
2007	22	2000	2000	4000	4000	4000	6000	8000
2008	22	2000	2000	4000	4000	4000	6000	6000

In HD and PD centres, the median requirement of blood transfusion has remained at around 16% over the last 3 years. (Table 7.1.7 – 7.1.8)

Table 7.1.7: Variation in use of blood transfusion (% patients) among HD centres, 2008

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	76	0	0	4	10.5	21	41	55
2000	108	0	0	4.5	11	21.5	48	77
2001	127	0	0	5	12	19	36	50
2002	152	0	0	2	7	14.5	26	67
2003	180	0	0	3	9	19	36	63
2004	210	0	0	2	8	16	36	50
2005	239	0	0	5	11	20	41	75
2006	293	0	2	10	18	29	50	88
2007	312	0	0	8	15	23.5	43	100
2008	357	0	0	8	16	26	47	100

Figure 7.1.7: Variation in use of blood transfusion (% patients) among HD centres, 2008

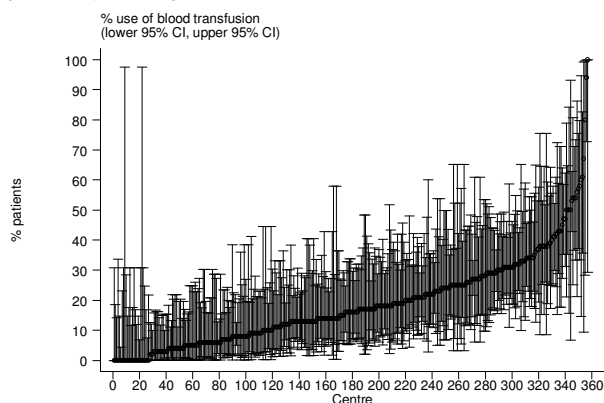


Figure 7.1.8: Variation in use of blood transfusion (% patients) among PD centres, 2008

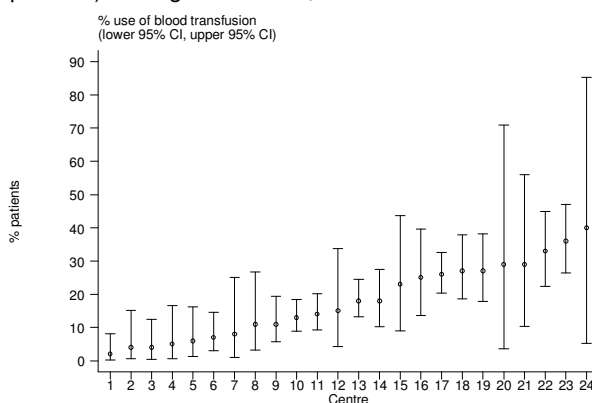


Table 7.1.8: Variation in use of blood transfusion (% patients) among PD centres, 2008

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	10	0	0	0	6.5	23	47	47
2000	11	0	0	0	8	17	42	42
2001	12	0	0	0	3.5	15.5	37	37
2002	15	0	0	5	8	21	42	42
2003	19	0	0	3	12	21	59	59
2004	19	0	0	5	15	20	37	37
2005	20	0	0	3.5	10.5	17	43	45
2006	22	0	4	9	16	27	36	50
2007	24	6	6	11	18	23	36	38
2008	24	2	4	7.5	16.5	27	36	40

SECTION 7.2: 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 86 % of patients have serum ferritin of >200 ng/ml and 56% that is >500 ng/ml. About 27% of patients have ferritin >800ng/ml. Generally PD patients have higher ferritin levels compared to HD patients. (Table 7.2.1 – 7.2.4)

Table 7.2.1: Distribution of Serum Ferritin without Erythropoietin, HD patients 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients ≥100 ng/ml
1999	337	517.9	424.3	402.8	162.8	809.5	86
2000	572	486.7	416.8	362.3	151.3	741	83
2001	761	537.2	453.6	382	172	828	87
2002	804	519.6	447	373.5	168.8	780.5	85
2003	922	552.6	433.8	458	192	828.9	87
2004	1048	591.6	463.9	473.8	218.6	911.8	89
2005	1029	618	496.6	487	225.5	902	90
2006	1224	570.1	484.3	425.7	201.3	823.5	87
2007	1253	591.4	501	443.4	200	867	87
2008	1209	578.5	487.1	434	198.5	838	88

Figure 7.2.1: Cumulative Distribution of Serum Ferritin without Erythropoietin, HD patients 1999-2008

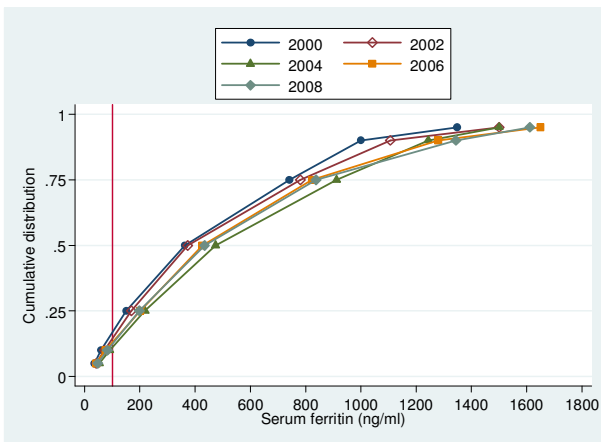


Figure 7.2.2: Distribution of Serum Ferritin without Erythropoietin, PD patients 1999-2008

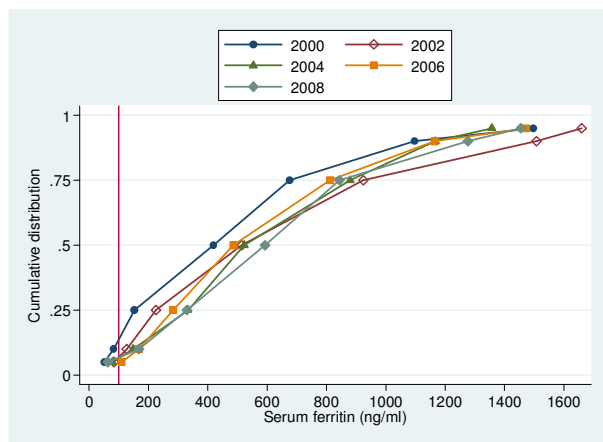


Table 7.2.2: Distribution of Serum Ferritin without Erythropoietin, PD patients 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients ≥100 ng/ml
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	329	602.5	429.2	503.7	269	834	93
2004	304	608.4	385	522.9	333.5	879.7	94
2005	227	647.3	398.5	597.3	320.5	913.3	96
2006	269	589.5	408	486.1	283	812.5	96
2007	318	637.6	394.4	586.8	343	841.8	97
2008	342	636.2	409.3	592.4	329.4	844.3	94

Table 7.2.3: Distribution of Serum Ferritin on Erythropoietin, HD patients 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients ≥ 100 ng/ml
1999	586	560.4	418.6	453	225	829	93
2000	1173	588.7	456.5	476	219	860	91
2001	1634	597.8	444.2	491.1	236	894.2	91
2002	2223	593.1	459.5	464.5	231	879	91
2003	3128	640.6	428.3	562.8	298	930.5	94
2004	3898	669.6	460.4	571	306	976	94
2005	5097	683.1	471.3	599.5	316	971.5	93
2006	6710	639.5	459.2	542.5	290	880.4	93
2007	7961	658.6	451.8	564	315.7	914	94
2008	9875	703.6	469.5	611	337.5	979.2	95

Figure 7.2.3: Cumulative distribution of Serum Ferritin on Erythropoietin, HD patients 1999-2008

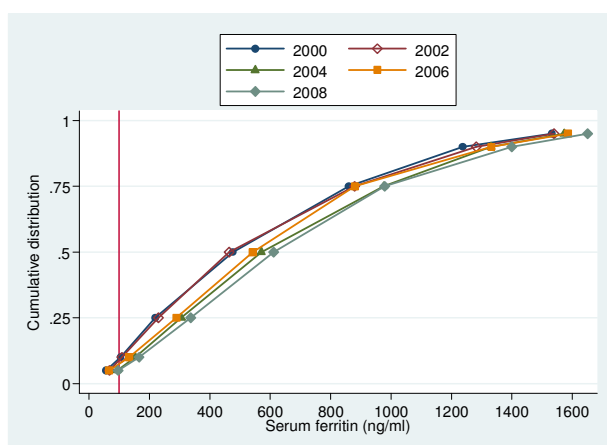


Figure 7.2.4: Cumulative distribution of Serum Ferritin on Erythropoietin, PD patients 1999-2008

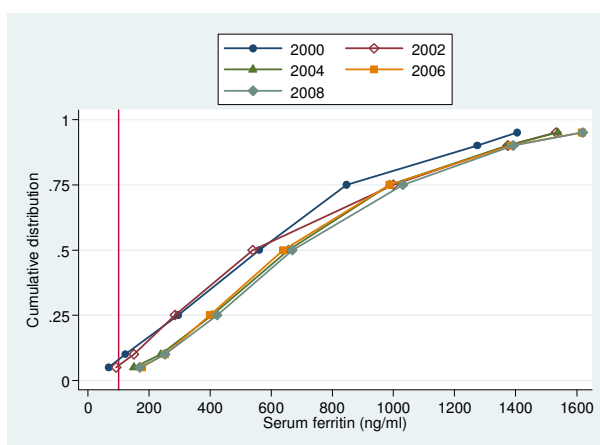


Table 7.2.4: Distribution of Serum Ferritin on Erythropoietin, PD patients 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients ≥ 100 ng/ml
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	517	689.9	459.9	589	304	993.2	96
2004	539	729	427.5	656.2	405.5	987.4	98
2005	765	734.3	433.2	660.5	406.5	997.5	97
2006	882	730.9	436.6	639	398.2	986.9	98
2007	1078	742.4	426.9	651.8	425.8	1017.7	98
2008	1306	758.2	445.8	668.6	422.1	1030.3	98

The median transferrin saturation has remained the same over the last decade, with the mean and median always greater than 30%. Up to 91% of all patients have transferrin saturation greater than 20% (Table 7.2.5 – 7.2.8)

Table 7.2.5: Distribution of transferrin saturation without Erythropoietin, HD patients, 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients $\geq 20\%$
1999	654	32.9	16.3	29.9	20.9	42.4	78
2000	801	32.7	16.9	28.6	20.9	41.3	78
2001	839	36.8	18.5	32.3	23.8	45.7	84
2002	811	36.5	18.9	32	22.9	45.7	83
2003	925	40.3	18.6	36	27.2	51.1	91
2004	1035	41.2	18.1	37.5	28.5	50.1	92
2005	1125	37.8	17.7	34.5	25.7	46.4	87
2006	1209	36.2	16.9	32.9	24.7	44.1	87
2007	1285	36.1	16.5	32.5	24.8	43.7	87
2008	1233	34.2	15.4	31.8	23.7	41.3	85

Figure 7.2.5: Cumulative distribution of transferrin saturation without Erythropoietin, HD patients 1999-2008

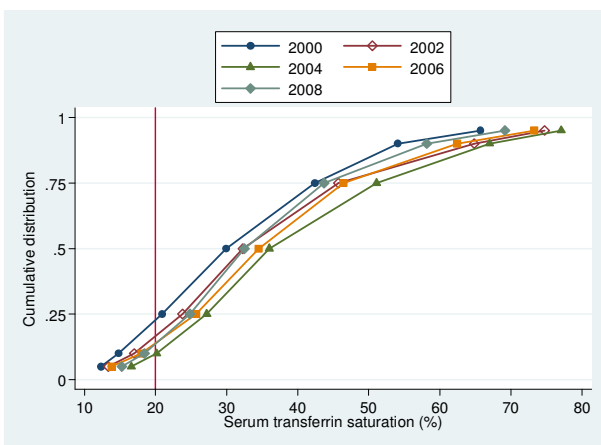


Figure 7.2.6: Cumulative distribution of transferrin saturation without Erythropoietin, PD patients 1999-2008

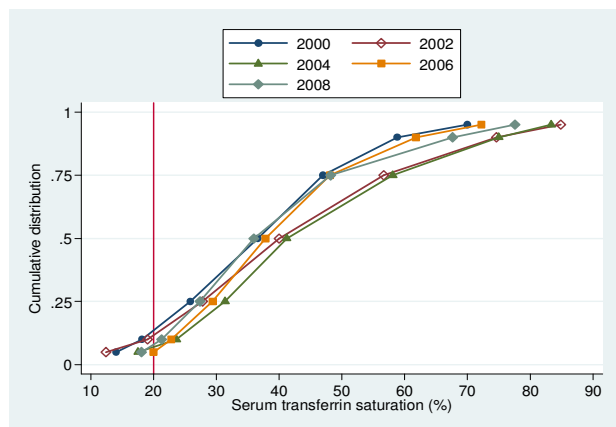


Table 7.2.6: Distribution of transferrin saturation without Erythropoietin, PD patients, 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients $\geq 20\%$
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	397	45.2	19.7	41.2	31.4	58.1	93
2004	380	44.5	18.1	41.6	30.9	55.3	98
2005	288	40.6	16.2	37.8	29.4	48.1	95
2006	310	40.4	17.3	37.9	27.1	46.8	95
2007	359	40.1	18	36	27.4	48.2	92
2008	353	38.2	17.7	34.3	26.2	44.4	91

Table 7.2.7: Distribution of Transferrin saturation on Erythropoietin, HD patients, 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients ≥ 20 %
1999	703	34.5	16	31.6	23.2	42	85
2000	1246	34.9	16.7	30.4	23	44	84
2001	1631	36.2	17.9	32.4	23.6	45.1	84
2002	1995	34.6	17.6	30.6	22.2	43.6	81
2003	2638	39.6	18.4	36	26.6	48.9	90
2004	3265	39.6	17	36.1	27.7	48.1	93
2005	4789	36.6	17.3	32.8	24.6	45	87
2006	6324	35.1	16.4	31.6	24.1	42.1	87
2007	7525	34.7	15.4	31.6	24.4	41.5	88
2008	9504	34.7	15.4	31.5	24	41.6	87

Figure 7.2.7: Cumulative distribution of transferrin saturation on Erythropoietin, HD patients 1999-2008

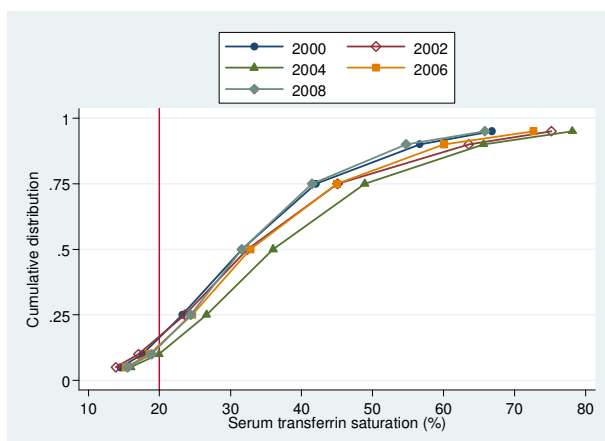


Figure 7.2.8: Cumulative distribution of transferrin saturation on Erythropoietin, PD patients 1999-2008

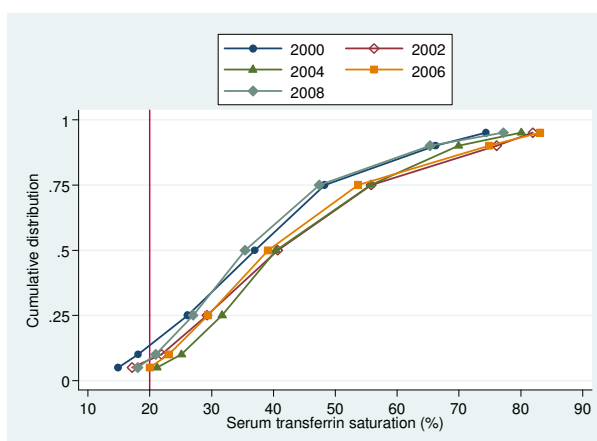


Table 7.2.8: Distribution of Transferrin saturation on Erythropoietin, PD patients, 1999-2008

Year	No of subjects	Mean	Std_Dev	Median	LQ	UQ	% Patients ≥ 20 %
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	460	44.6	17.8	40.4	31.7	55.7	96
2004	696	44.7	18.7	40.8	30.8	54.5	96
2005	819	43.5	19.3	39.1	29.4	53.7	95
2006	905	41.7	17.5	38	29.4	50.7	95
2007	1069	39.3	17.6	35.4	27	47.4	92
2008	1261	38.6	17.9	34.4	26.2	47.1	90

From 1999 to 2008, the median for serum ferritin for all HD centres had increased from 400 to 600 ng/ml. There was a wide variation in median serum ferritin levels ranging from 295 to 941 ng/ml between HD centres in 2008. At the median, 96% of patients on EPO have a serum ferritin greater 100 ng/ml.

The median transferrin saturation of HD centres has been > 30% over the last 10 years. 89% of HD centres have patients with transferrin saturation greater than 20%. (Table 7.2.9)

A similar trend, but with higher level of ferritin and transferrin saturation was seen in the PD centres. (Table 7.2.10)

Table 7.2.9: Variation in iron status outcomes among HD centres, 2008

a) medium serum ferritin among patients on erythropoietin

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	22	169	189.5	354.5	406.9	524.5	890.1	945.3
2000	42	165	235.5	373	559	682	813.5	1087.5
2001	51	213.8	239.3	385	508	696.5	886.5	1191.3
2002	69	106.6	192	367	470	608.5	828	1070.8
2003	100	152.5	294.3	460.4	549.5	697.3	973.6	1742.8
2004	125	99.5	329.8	463.1	570	716.3	1000	2000
2005	163	1.6	258.5	459.3	616.3	725.4	920	2000
2006	210	1.5	234.5	414	555.8	682.5	875.5	2000
2007	237	85.5	250.5	427	563	689.8	880.5	1389.5
2008	275	82.4	294.7	475	599	719.3	941	2000

Figure 7.2.9(a): Variation in medium serum ferritin among patients on erythropoietin, HD centres 2008

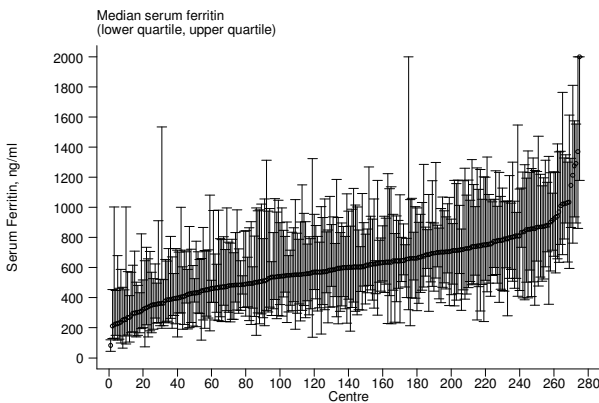
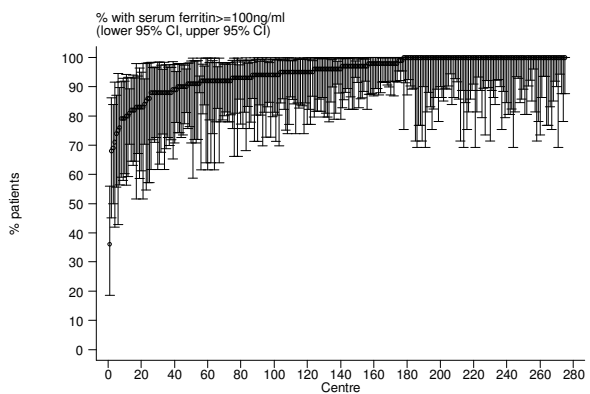


Figure 7.2.9(b): Variation in proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, HD centres 2008



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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	22	70	76	92	96	100	100	100
2000	42	68	73	88	93	97	100	100
2001	51	67	73	86	93	97	100	100
2002	69	55	73	89	93	96	100	100
2003	100	57	76	90.5	96	100	100	100
2004	125	50	85	92	96	100	100	100
2005	163	5	79	90	95	100	100	100
2006	210	0	73	91	95	100	100	100
2007	237	43	77	91	96	100	100	100
2008	275	36	82	92	96	100	100	100

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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	26	16.4	20.7	26.9	31.5	34.3	44.8	44.8
2000	43	16	23.2	27.9	31.3	37.1	44.1	57.5
2001	55	21	22.5	27.1	31	37	48.4	76.1
2002	61	14.7	21	26	29.7	36.5	51.1	60.2
2003	90	18.2	24.2	31.3	34.2	41.2	57.3	70.7
2004	112	22.7	26.4	32.6	36.1	41.5	52	67.6
2005	149	15.2	24.1	29.2	32.4	38.3	47.7	69.8
2006	186	13.7	22.9	27.5	31.5	35.4	45	78.7
2007	213	17.6	21.8	28	31.4	35.2	44	77.8
2008	261	14.8	23.5	28	31.5	34.4	46.5	76.8

Figure 7.2.9(c): Variation in median transferrin saturation among patients on erythropoietin HD centres, 2008

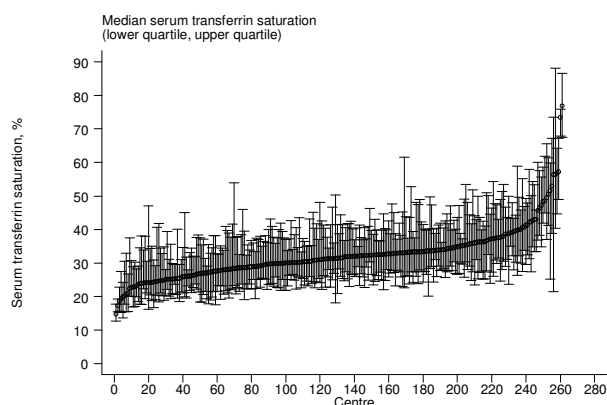
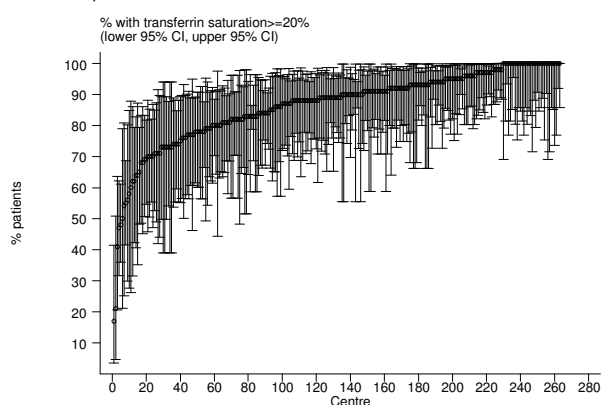


Figure 7.2.9(d): Variation in proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, HD centres, 2008



d) Proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, HD centres

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	26	30	57	83	86.5	94	100	100
2000	43	20	60	77	86	94	100	100
2001	55	53	59	75	88	95	100	100
2002	61	33	56	72	82	91	100	100
2003	90	45	70	86	92.5	100	100	100
2004	112	55	70	90	94	100	100	100
2005	150	30	71	83	91	95	100	100
2006	186	20	59	81	90	95	100	100
2007	214	27	60	83	91	96	100	100
2008	263	17	64	81	89	95	100	100

Table 7.2.10: Variation in iron status outcomes among PD centres, 2008

a) Medium serum ferritin among patients on erythropoietin

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	5	302.8	302.8	343.4	470	491.5	719.5	719.5
2000	6	335	335	437.3	632.6	770	773	773
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	706.5	860.3	860.3
2005	17	338.5	338.5	555.5	710	800.9	843	843
2006	19	399.9	399.9	535.3	634.6	787.4	968.4	968.4
2007	20	283.3	340.7	592.8	665	730.7	1005.1	1048.6
2008	21	211.3	385	495	658.9	697	970.1	979

Figure 7.2.10(a): Variation in medium serum ferritin among patients on erythropoietin, PD centres 2008

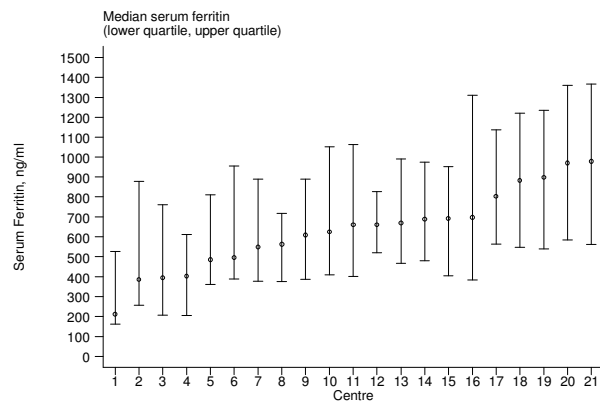
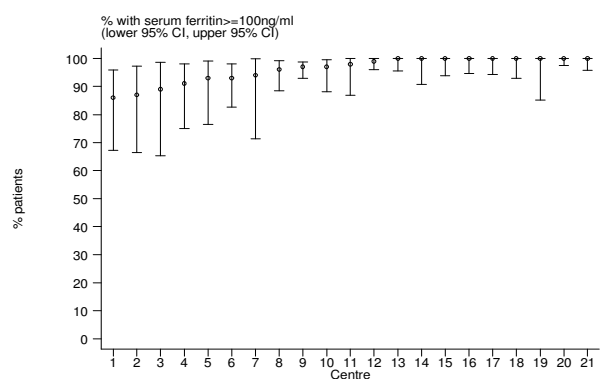


Figure 7.2.10(b): Variation in proportion of patients on erythropoietin with serum ferritin ≥ 100 ng/ml, PD centres 2008



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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	5	85	85	92	95	100	100	100
2000	6	87	87	88	93	100	100	100
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	20	86	88.5	96	98	100	100	100
2008	21	86	87	93	98	100	100	100

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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	6	24	24	27.2	33.6	39.4	42.4	42.4
2000	6	23.1	23.1	26.5	36.3	37.6	52.5	52.5
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	43.6	82.3	82.3
2005	17	30.3	30.3	35.6	38.5	43	74.9	74.9
2006	19	31.9	31.9	33.9	37.7	40.5	75.8	75.8
2007	19	25.9	25.9	29.6	37.7	45.7	83.2	83.2
2008	19	25.4	25.4	31.6	34.6	41	81.2	81.2

Figure 7.2.10 (c): Variation in median transferrin saturation among patients on erythropoietin, PD centres 2008

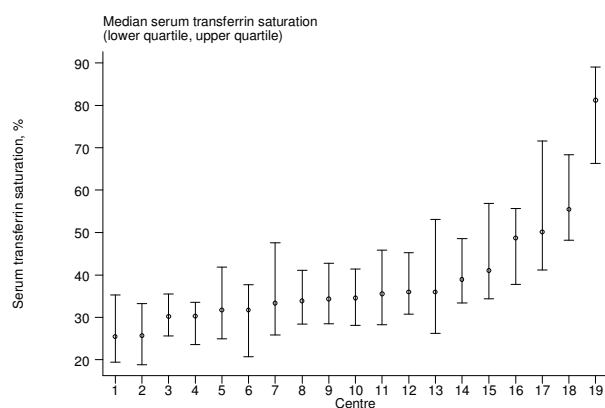
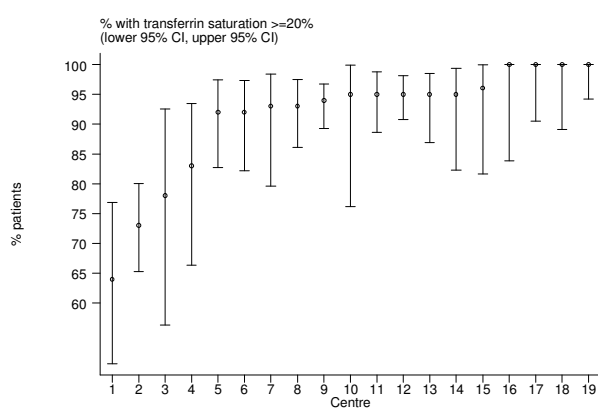


Figure 7.2.10 (d): Variation in proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, PD centres 2008



d) Proportion of patients on erythropoietin with transferrin saturation $\geq 20\%$, PD centres

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	6	53	53	84	87.5	94	100	100
2000	6	68	68	74	90	100	100	100
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	95	97	100	100	100
2005	17	88	88	94	97	100	100	100
2006	19	83	83	93	95	98	100	100
2007	19	73	73	88	94	98	100	100
2008	19	64	64	92	95	96	100	100

SECTION 7.3: HAEMOGLOBIN OUTCOMES ON DIALYSIS

The mean and median haemoglobin concentrations in all dialysis patients with or without EPO were steadily increasing; in 2008 the mean and median haemoglobin ranged from 10.2 to 11.1g/dl. The percentage of patients with haemoglobin > 10 or > 11 gm/dl steadily increased for patients with or without EPO. (Table 7.3.1 – 7.3.4)

Table 7.3.1: Distribution of Haemoglobin Concentration without Erythropoietin, HD patients 1999-2008

Year	No of subject	Mean	Std Dev	Median	LQ	UQ	% Patients ≤10g/dL	% Patients >10g/dL	% Patients ≤11g/dL	% Patients >11g/dL
1999	1400	9.1	1.9	8.9	7.8	10.3	70	30	85	15
2000	1755	9.4	2.1	9.1	7.9	10.6	67	33	80	20
2001	1812	9.4	1.9	9.3	8	10.6	64	36	81	19
2002	1796	9.6	2.1	9.4	8.1	10.9	62	38	76	24
2003	1810	9.7	2.1	9.5	8.3	11	60	40	76	24
2004	1932	10.1	2.1	9.9	8.6	11.5	53	47	68	32
2005	1695	10.5	2.3	10.3	8.9	12	46	54	62	38
2006	1839	10.6	2.2	10.4	9	12.1	42	58	60	40
2007	1854	10.8	2.2	10.7	9.1	12.4	40	60	55	45
2008	1770	10.8	2.3	10.8	9.1	12.5	39	61	54	46

Figure 7.3.1: Cumulative distribution of haemoglobin concentration without Erythropoietin, HD patients 1999-2008

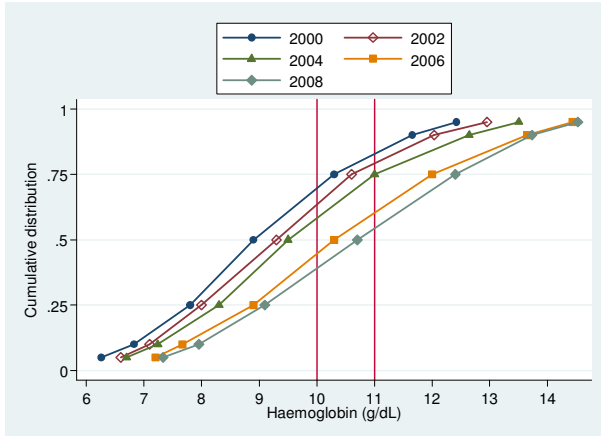


Figure 7.3.2: Cumulative distribution of haemoglobin concentration without Erythropoietin, PD patients 1999-2008

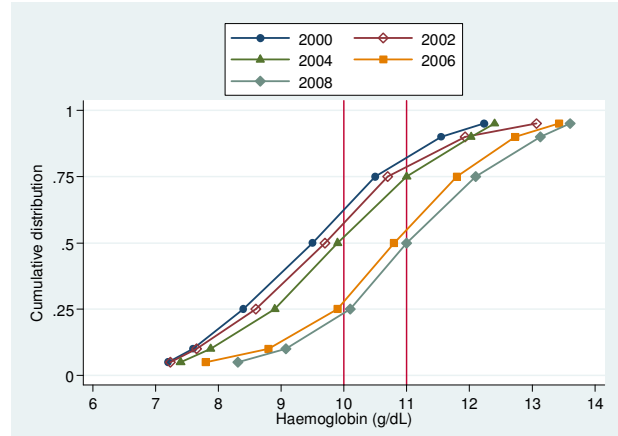


Table 7.3.2: Distribution of Haemoglobin Concentration without Erythropoietin, PD patients 1999-2008

Year	No of subject	Mean	Std Dev	Median	LQ	UQ	% Patients ≤10g/dL	% Patients >10g/dL	% Patients ≤11g/dL	% Patients >11g/dL
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	542	10	1.7	9.9	8.9	11	52	48	76	24
2004	482	10.4	1.6	10.3	9.3	11.4	43	57	67	33
2005	378	10.8	1.6	10.8	9.9	11.8	28	72	60	40
2006	399	10.8	1.6	10.9	9.9	11.8	26	74	54	46
2007	452	11	1.6	11	10.1	12.1	24	76	51	49
2008	456	11.1	1.7	11.1	10.2	12.1	22	78	46	54

Table 7.3.3: Distribution of Haemoglobin Concentration on Erythropoietin, HD patients 1999-2008

Year	No of subject	Mean	Std Dev	Median	LQ	UQ	% Patients $\leq 10\text{g/dL}$	% Patients $>10\text{g/dL}$	% Patients $\leq 11\text{g/dL}$	% Patients $>11\text{g/dL}$
1999	1503	9.2	1.5	9.1	8.1	10.2	71	29	89	11
2000	2331	9.4	1.7	9.4	8.3	10.5	65	35	85	15
2001	3046	9.4	1.6	9.4	8.3	10.5	65	35	85	15
2002	3858	9.5	1.7	9.5	8.4	10.7	62	38	81	19
2003	4774	9.6	1.6	9.6	8.5	10.7	61	39	81	19
2004	5799	9.8	1.6	9.9	8.8	10.9	54	46	77	23
2005	7190	10	1.6	10	8.9	11.1	50	50	73	27
2006	9336	10.1	1.6	10	9	11.1	50	50	72	28
2007	10598	10.2	1.5	10.3	9.2	11.3	44	56	69	31
2008	12897	10.2	1.5	10.3	9.1	11.3	44	56	69	31

Figure 7.3.3: Cumulative distribution of Haemoglobin Concentration on Erythropoietin, HD patients 1999-2008

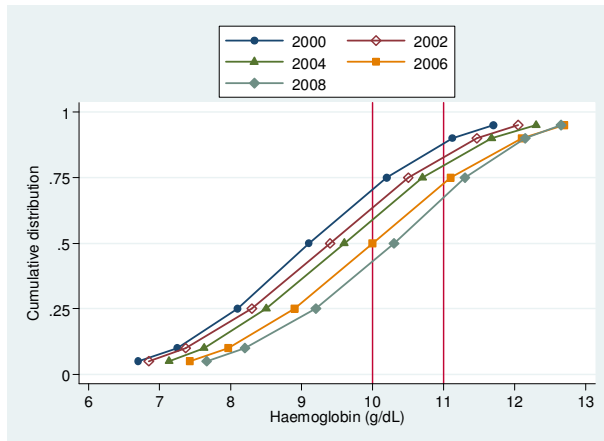


Figure 7.3.4: Cumulative distribution of Haemoglobin Concentration on Erythropoietin, PD patients 1999-2008

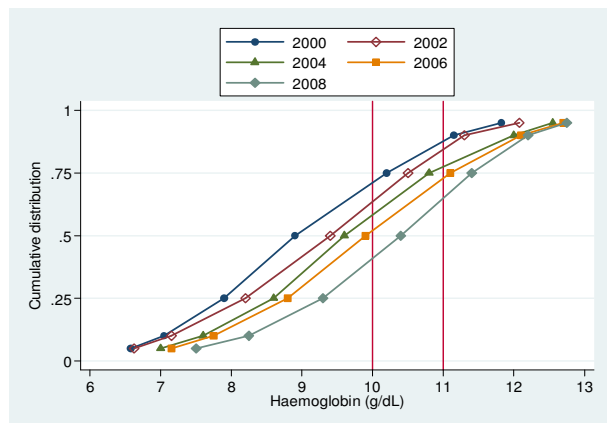


Table 7.3.4: Distribution of Haemoglobin Concentration on Erythropoietin, PD patients 1999-2008

Year	No of subject	Mean	Std Dev	Median	LQ	UQ	% Patients $\leq 10\text{g/dL}$	% Patients $>10\text{g/dL}$	% Patients $\leq 11\text{g/dL}$	% Patients $>11\text{g/dL}$
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	639	9.7	1.7	9.6	8.6	10.8	59	41	78	22
2004	797	9.8	1.7	9.8	8.6	11	54	46	76	24
2005	967	9.9	1.7	9.9	8.8	11.1	53	47	73	27
2006	1106	10	1.6	10.1	9	11	49	51	75	25
2007	1303	10.3	1.6	10.4	9.3	11.4	41	59	66	34
2008	1571	10.4	1.5	10.4	9.4	11.3	39	61	66	34

In 2008, for HD patients on EPO, the median Hb in HD centres ranged 8.0 to 12.6 gm/dl with the median at 10.2 gm/dl. Similar trend was noted in the PD centres with lesser variation.

In 2008 for HD patients on EPO, the proportion of patients with Hb > 10 gm /dl varied between 0 to 100%, with median at 57%. Similarly for patients with Hb > 11gm/dl, the range was from 0 to 100% with the median at 31%. Lesser variation was seen in the PD patients.

Table 7.3.5: Variation in Haemoglobin outcomes among HD centres 2008

a) Median haemoglobin level among patients on Erythropoietin

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	52	7.7	8	8.7	9.1	9.6	10.2	10.4
2000	75	8.1	8.2	8.8	9.3	9.7	10.5	14.6
2001	93	8	8.3	8.9	9.5	9.9	10.6	12.2
2002	112	8.3	8.5	9	9.5	10	10.8	11.3
2003	143	7.8	8.5	9.1	9.6	10	10.7	11.5
2004	175	7.8	8.6	9.2	9.7	10.2	10.9	11.3
2005	209	8.4	8.8	9.5	10	10.5	11.1	11.7
2006	272	7.7	8.9	9.5	10	10.5	11.3	12.8
2007	298	8.6	9	9.8	10.2	10.6	11.3	12.8
2008	347	8	8.9	9.8	10.2	10.7	11.4	12.6

Figure 7.3.5(a): Variation in median haemoglobin level among patients on Erythropoietin, HD centres 2008

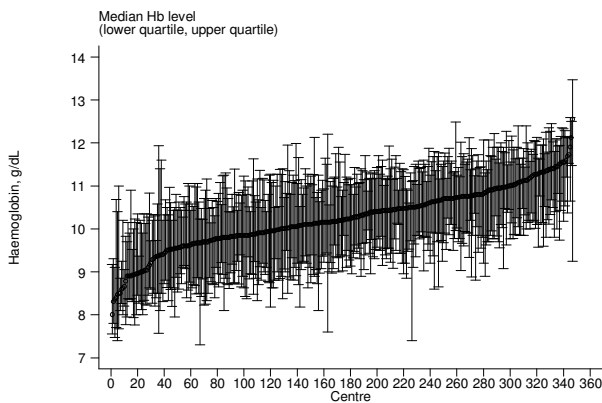
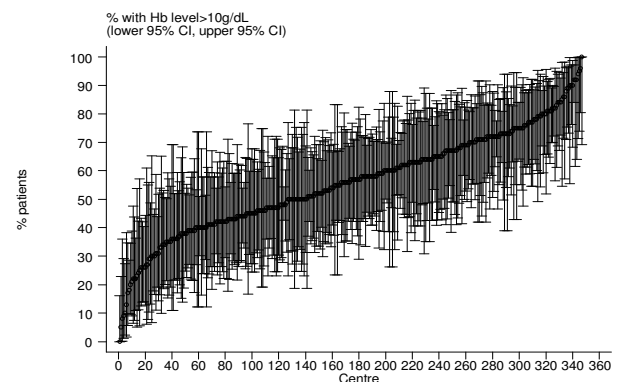


Figure 7.3.5(b): Variation in proportion of patients on erythropoietin with haemoglobin level > 10g/dL, HD centres 2008



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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	52	0	4	15	28.5	38	59	61
2000	75	0	5	20	31	43	61	97
2001	93	4	10	24	33	48	69	100
2002	112	8	16	27.5	36	50	68	86
2003	143	0	14	28	36	50	69	100
2004	175	8	18	30	41	58	74	85
2005	209	0	20	33	49	63	78	100
2006	272	0	20	35.5	48	64	80	93
2007	298	13	24	42	55	68	86	100
2008	347	0	26	43	57	69	84	100

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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	52	0	0	3	8	15.5	29	39
2000	75	0	0	6	13	20	32	92
2001	93	0	0	8	14	24	38	60
2002	112	0	6	12	17.5	27	47	71
2003	143	0	0	8	15	28	41	59
2004	175	0	0	11	19	29	47	58
2005	209	0	4	13	24	35	54	75
2006	272	0	6	17	25	37	58	75
2007	298	0	7	19	28	40	62	92
2008	347	0	8	20	31	41	60	100

Figure 7.3.5(c): Variation in proportion of patients on erythropoietin with haemoglobin level >11g/dL, HD centres 2008

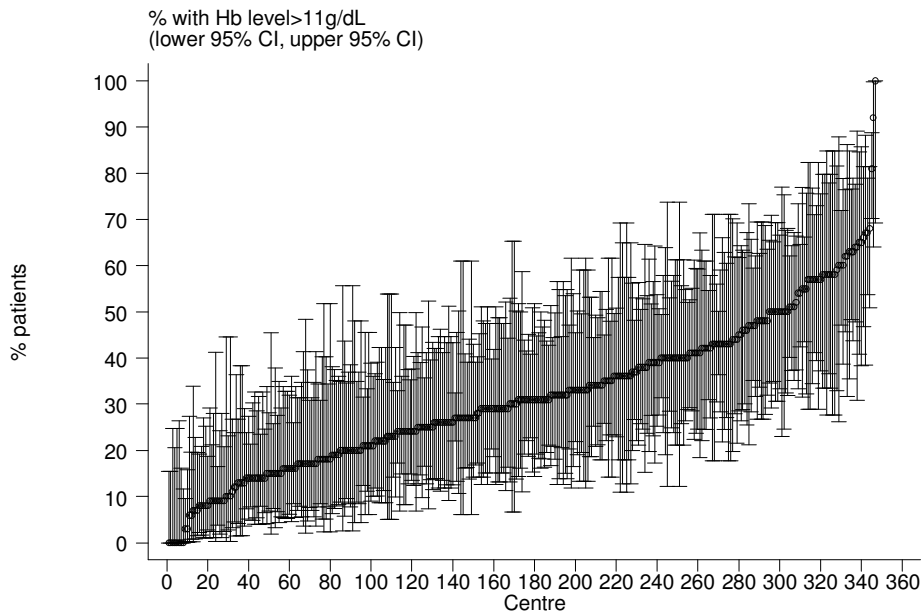


Table 7.3.6: Variation in Haemoglobin outcomes among PD centres 2008

a) Median haemoglobin level among patients on Erythropoietin

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
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	9.3	10.1	10.1
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	9.5	9.9	10.3	11	11
2006	22	8.8	8.9	9.5	10	10.4	10.6	10.9
2007	22	9.5	9.5	10.1	10.4	10.8	11.1	11.3
2008	22	9.2	9.6	10.1	10.4	10.8	11.1	11.2

Figure 7.3.6(a): Variation in median haemoglobin level among patients on Erythropoietin, PD centres 2008

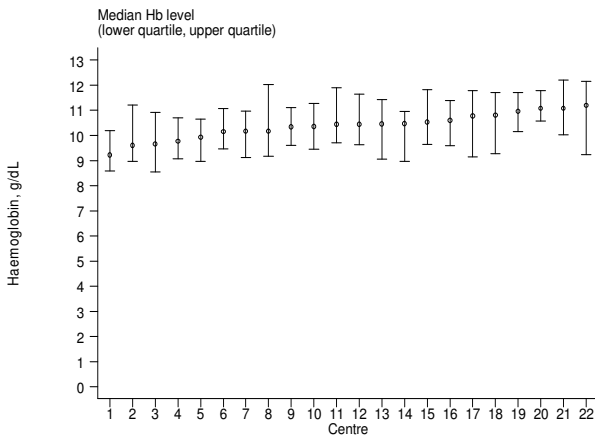
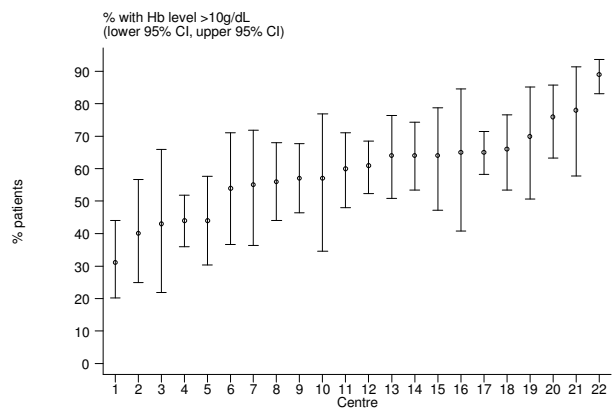


Figure 7.3.6(b): Variation in proportion of patients on erythropoietin with haemoglobin level > 10g/dL, PD centres, 2008



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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	7	7	7	20	25	36	40	40
2000	9	19	19	30	36	38	50	50
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	36	43	55	72	72
2005	18	21	21	34	48	56	76	76
2006	22	17	18	44	48	58	70	79
2007	22	36	38	53	60	63	72	73
2008	22	31	40	54	60.5	65	78	89

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

Year	No of centres	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	7	0	0	8	9	13	16	16
2000	9	10	10	16	18	21	24	24
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	19	29	54	54
2005	18	7	7	20	28.5	34	52	52
2006	22	5	7	16	24.5	32	43	48
2007	22	13	14	22	35	44	53	54
2008	22	11	14	25	34	44	54	60

Figure 7.3.6(c): Variation in proportion of patients on erythropoietin with haemoglobin level >11g/dL, PD centres 2008

