

CHAPTER 6

**MANAGEMENT OF ANAEMIA IN
PATIENTS ON DIALYSIS**

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SECTION 6.1: TREATMENT FOR ANAEMIA IN PATIENTS ON DIALYSIS

The percentage of patients treated with Erythropoiesis Stimulating Agents (ESAs) progressively increased since 2001 except in the last four years when it started slowing down reaching a plateau of 90% in 2010-2011. Higher percentage (90%) of patients on haemodialysis received ESAs compared to 78% of patients on peritoneal dialysis. However, the expected increase in the percentage of haemodialysis patients treated with ESAs was not visible even though a national scheme for ESAs subsidy for patients in NGO centres was introduced by the Ministry of Health in 2009. Despite the high percentage of the use of ESAs, the percentage of patients who received blood transfusions remained high at 14-15% in haemodialysis and higher (18%) in patients on peritoneal dialysis. (Tables 6.1.1 & 6.1.2)

The progressive decrease in the percentage of patients on haemodialysis receiving oral iron and the opposite increase in the percentage of patients receiving parenteral iron is an encouraging development which reflects better understanding of the optimal iron management and the more effective parenteral route to achieve adequate target and iron replete status. (Table 6.1.1) In patients on peritoneal dialysis, the use of oral iron decreased progressively but still remained the major source of the iron supply. However, a concomitant rise in the use of parenteral iron did not occur despite the reduction in the use of oral iron. (Table 6.1.2)

Table 6.1.1: Treatment for anaemia, HD patients 2002-2011

Year	Number of patients	% on ESAs	% received blood transfusion	% on oral iron	% received parenteral iron
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	17968	89	15	59	26
2010	19509	90	14	57	26
2011	22740	90	14	54	29

Table 6.1.2: Treatment for anaemia, PD patients 2002-2011

Year	Number of patients	% on ESAs	% received blood transfusion	% on oral iron	% received parenteral iron
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
2011	2612	78	18	71	10

In 2011, the percentage of patients on ESAs among various HD centres varied widely between as low as 2% to as high as 100%. However, the median usage of ESAs did increase progressively over the years and rose by 22%; from 71% in 2002 to 93% in 2011. Among PD centres, the median ESAs utilization increased by 34%; from 53% in 2002 to 87% in 2011. The degree of variation in the percentage of ESAs utilization was less marked among PD centres varying between a minimum of 43% to a maximum of 100% in 2011. (Table 6.1.3)

Table 6.1.3: Variation in Erythropoiesis-Stimulating Agents (ESAs) utilization (% patients) among HD centres, 2002-2011

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	153	14	28	57	71	79	91	100
2003	184	17	36	60	73	83	94	100
2004	218	11	39	67	77	86	97	100
2005	245	8	54	73	82	91	100	100
2006	288	3	54	79	87	93	100	100
2007	321	4	62	82	89	94	100	100
2008	377	9	64	85	91	96	100	100
2009	415	0	67	86	92	96	100	100
2010	452	11	73	86	92	97	100	100
2011	503	2	74	87	93	97	100	100

Figure 6.1.3: Variation in ESAs utilization (% patients) among HD centres, 2011

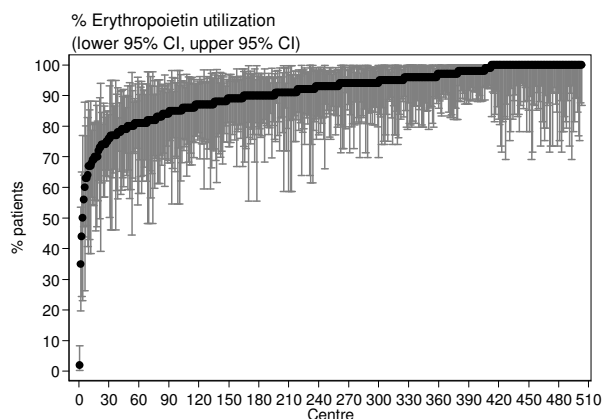
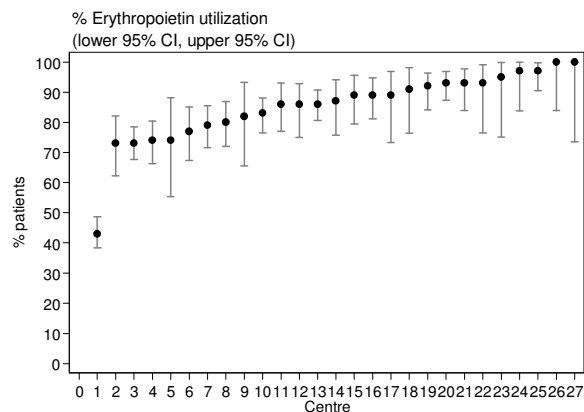


Figure 6.1.4: Variation in ESAs utilization (% patients) among PD centres, 2011



In PD centres, there was a lesser variation in the ESAs utilization – 43 to 100 %. The median usage of ESAs was 87% in 2011. (Table 6.1.4)

Table 6.1.4: Variation in ESAs utilization (% patients) among PD centres, 2002-2011

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	15	26	26	43	53	62	71	71
2003	18	25	25	38	50.5	67	92	92
2004	18	5	5	53	63	79	97	97
2005	19	41	41	62	69	81	97	97
2006	22	36	52	67	74	86	96	97
2007	23	0	44	64	76	90	97	100
2008	23	20	58	71	79	88	100	100
2009	24	30	56	73.5	81.5	87.5	100	100
2010	25	55	63	80	84	95	100	100
2011	27	43	73	79	87	93	100	100

The median weekly dose of ESAs has doubled over the last 10 years from about 2000 units in 2002 to 5000 units in 2011. Patients on peritoneal dialysis generally used less ESAs compared to patients on haemodialysis. In 2011, the median ESAs dosage in patients on PD was 4630 units per week compared to 5070 units in patients on HD. Similarly, the maximum ESAs dosage in patients on PD was less than 11,000 units weekly compared to 13,000 units in patients on HD. (Tables 6.15 & 6.16)

Table 6.1.5: Variation in mean weekly ESAs dose (u/week) among HD centres, 2002-2011

Year	Number of centres	Mean	SD	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	118	2467	706	1714	2000	2000	2240	2600	4000	5667
2003	148	2466	623	1790	2000	2009	2193	2667	3778	4769
2004	180	2464	648	1929	2000	2000	2182	2654	3869	4929
2005	218	3494	1857	1962	2000	2267	2926	4098	6267	16000
2006	272	5131	2098	2000	2885	3883	4680	5930	8300	20571
2007	306	5297	1889	2000	3125	4056	5050	6108	8261	16706
2008	366	4578	1131	1938	3000	3800	4465	5200	6730	8632
2009	396	4752	888	2160	3385	4114	4772	5260	6258	8154
2010	434	5083	1125	2000	3425	4353	5000	5762	7233	8240
2011	487	5189	1286	2000	3444	4381	5070	5776	7385	12994

Figure 6.1.5: Variation in mean weekly ESAs dose (u/week) among HD centres, 2011

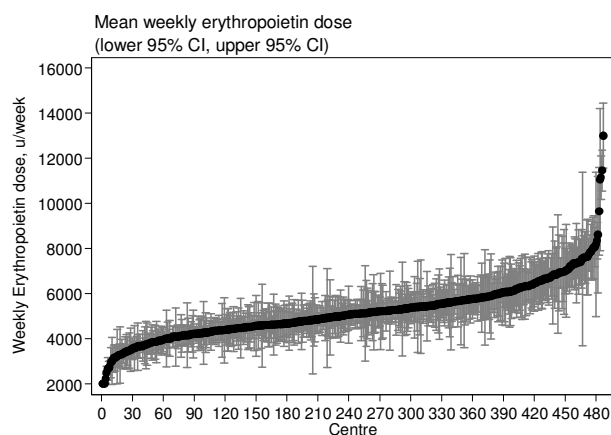


Table 6.1.6: Variation in mean weekly ESAs dose (u/week) among PD centres, 2002-2011

Year	Number of centres	Mean	SD	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	12	2601	536	1857	1857	2240	2453	3050	3453	3453
2003	16	2595	396	2057	2057	2279	2563	2888	3575	3575
2004	17	2603	431	2074	2074	2400	2600	2696	3958	3958
2005	18	3437	1573	2000	2000	2286	2688	4124	7371	7371
2006	21	4643	1180	2308	2667	4091	5023	5441	5965	6373
2007	22	4981	1024	3250	3429	4182	5081	5702	6471	7090
2008	22	4537	989	2500	2970	3852	4448	5344	6051	6239
2009	23	4357	947	2320	2667	3968	4630	4836	5289	6595
2010	25	4400	973	2364	2667	4063	4342	4927	6066	6481
2011	27	4521	1323	1885	1947	3905	4630	5183	7000	7849

Figure 6.1.6: Variation in mean weekly ESAs dose (u/week) among PD centres, 2011

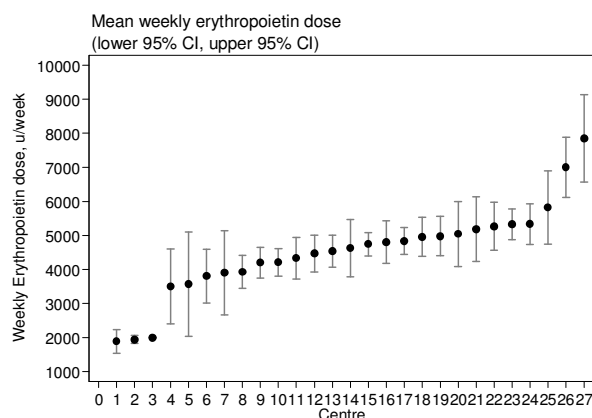
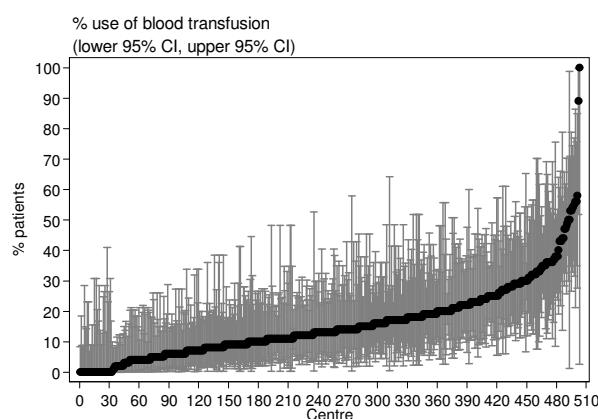


Figure 6.1.7: Variation in use of blood transfusion (% patients) among HD centres, 2011



In HD centres, the median requirement of blood transfusion is static at 13%. However, in PD patients, the median usage of blood transfusion appears to be slowly increasing. It is interesting to note that there are HD and PD centres where 100% of their patients receive blood transfusion. (Tables 6.1.7 & 6.1.8)

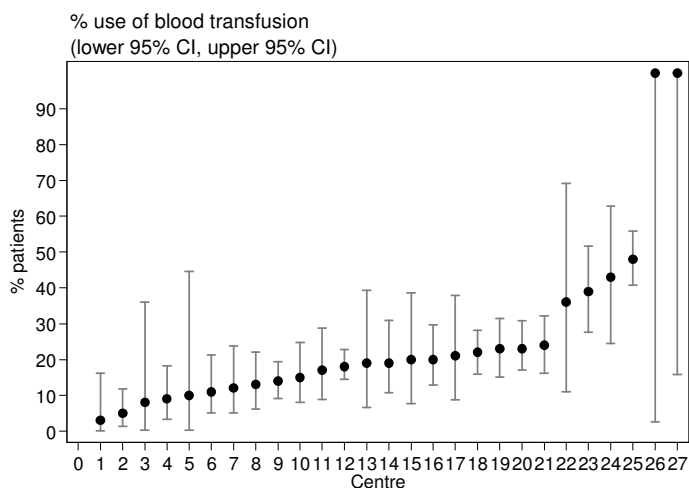
Table 6.1.7: Variation in use of blood transfusion (% patients) among HD centres, 2002-2011

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	153	0	0	2	7	14	26	67
2003	184	0	0	4	9	19	33	63
2004	218	0	0	2	7	16	39	48
2005	245	0	0	5	11	20	40	75
2006	288	0	3	10.5	17.5	29	47	89
2007	320	0	0	8	14.5	24	42	100
2008	377	0	0	8	16	27	47	100
2009	413	0	0	7	14	23	44	100
2010	451	0	0	7	13	23	44	100
2011	503	0	0	8	13	21	37	100

Table 6.1.8: Variation in use of blood transfusion (% patients) among PD centres, 2002-2011

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
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	48
2007	23	6	7	11	18	24	34	36
2008	23	2	4	7	15	28	35	40
2009	24	0	3	10	15.5	25.5	32	41
2010	25	0	1	9	16	25	35	50
2011	27	3	5	12	19	24	100	100

Figure 6.1.8: Variation in use of blood transfusion (% patients) among PD centres, 2011



SECTION 6.2: IRON STATUS ON DIALYSIS

In HD patients with or without ESAs, the median serum Ferritin is 300 to 500 ng/ml. In PD patients, however, the median serum Ferritin is higher at 500 to 700 ng/ml. In HD patients, up to 84% of patients have serum ferritin of greater 200 ng/ml, compared to 92% in PD patients. (Table 6.2.1 - Table 6.2.4)

Table 6.2.1: Distribution of serum ferritin without ESAs, HD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≥ 100 ng/ml	% Patients ≥ 200 ng/ml
2002	803	519.5	447.3	373	168.5	781	85	71
2003	916	551.5	434.2	456.7	190	827.7	87	74
2004	1042	590.7	463.6	473.5	218	910.5	89	77
2005	1010	618.5	498.7	485.5	225	902	90	77
2006	1169	562.4	485.6	408	193.8	817.5	87	74
2007	1182	586	501	431	196	860.9	86	75
2008	1186	578	489.9	431.9	197	838.1	87	75
2009	1283	546.6	461.7	419.7	171	798	87	71
2010	1387	510	454.2	372	159.7	755.6	84	69
2011	1582	497.5	439.9	373	163	700	84	70

Figure 6.2.1: Cumulative Distribution of serum ferritin without ESAs, HD patients, 2002-2011

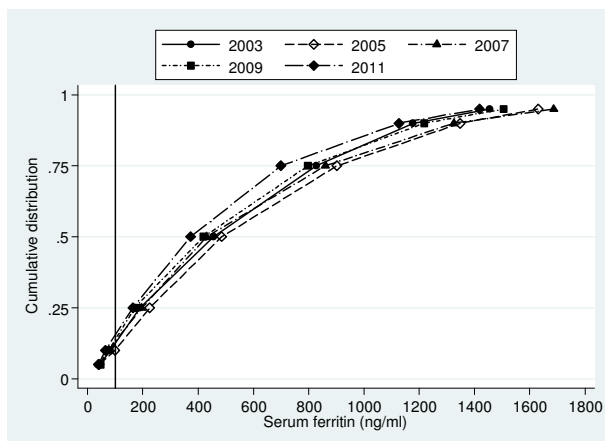


Figure 6.2.2: Distribution of serum ferritin without ESAs, PD patients, 2002-2011

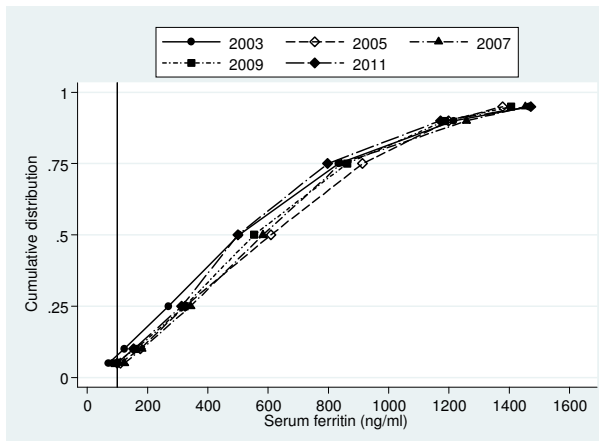


Table 6.2.2: Distribution of serum ferritin without ESAs, PD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≥ 100 ng/ml	% Patients ≥ 200 ng/ml
2002	236	634.8	491.2	514.9	226	924.6	93	79
2003	329	602.5	429.2	503.7	269	834	93	84
2004	303	608.4	385.7	522.7	330	882	94	85
2005	225	651.4	397.8	609	324	913.3	96	88
2006	263	589.9	411.3	484	280	815.8	95	85
2007	305	636.9	396.6	582.3	342.8	841.9	96	87
2008	338	634	410.1	592	327.4	841	93	86
2009	364	621.6	401.1	553	322.5	861.8	95	86
2010	382	624.9	446.6	523.5	287.4	875.8	93	83
2011	443	600	406.7	499.4	313.7	796.8	95	87

Table 6.2.3: Distribution of serum ferritin on ESAs, HD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≥100 ng/ml	% Patients ≥200 ng/ml
2002	2224	593.1	459.3	464.8	231.3	878.2	91	79
2003	3134	640.8	428.1	563.3	298	931	94	85
2004	3904	669.7	460.4	571	306	976.5	94	86
2005	5116	682.7	471	599.5	315.3	971.5	93	85
2006	6765	640.3	459	543	291.2	881	93	84
2007	8032	658.8	452.2	564.4	315.5	914	94	86
2008	9936	703.6	469.3	611	337.5	979.6	95	87
2009	12236	679.3	459.5	596.1	319.5	942	94	86
2010	13597	679.4	470	581.8	312	958	94	85
2011	16265	648.4	459.4	546	294.1	906	93	84

Figure 6.2.3: Cumulative distribution of serum ferritin on ESAs, HD patients 2002-2011

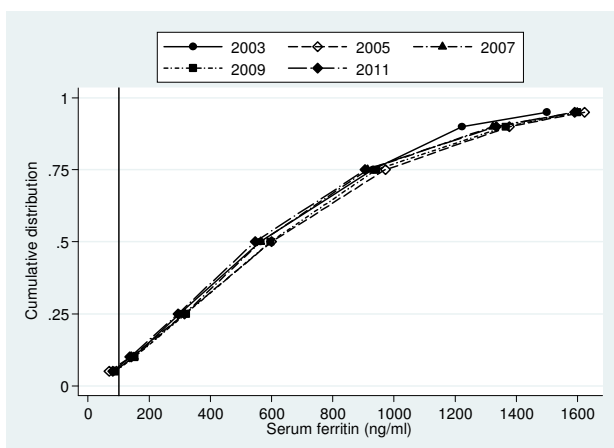


Figure 6.2.4: Cumulative distribution of serum ferritin on ESAs, PD patients 2002-2011

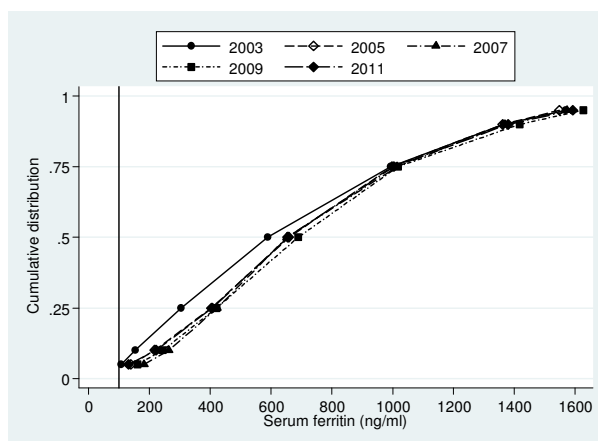


Table 6.2.4: Distribution of serum ferritin on ESAs, PD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≥100 ng/ml	% Patients ≥200 ng/ml
2002	345	666.8	462.4	538.5	284	999.5	94	85
2003	517	689.9	459.9	589	304	993.2	96	85
2004	540	728.8	427.2	655.6	406.3	986.7	98	92
2005	767	732.9	433.6	659	403.6	997.5	97	92
2006	888	729.9	435.6	638.4	399.5	986.2	98	94
2007	1091	741.3	426.1	652	423.8	1015	98	94
2008	1310	758.4	445.4	668.6	422.4	1030.3	98	93
2009	1390	759.5	438.7	689	421.1	1017.5	98	93
2010	1554	753.3	438	677.1	426.3	1005.5	97	93
2011	1681	732.8	439.1	655.1	407.5	1003.8	97	92

The transferrin saturation has remained essentially the same over the last decade, with the median always greater than 30%. In PD patients, the transferrin saturation has remained even higher than in HD patients. In 2011, up to 90% of all patients have transferrin saturation greater than 20%. (Table 6.2.5 - Table 6.2.8)

Table 6.2.5: Distribution of transferrin saturation without ESAs, HD patients, 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 20\%$
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	1442	33.5	15.6	30.4	22.7	40.5	83
2011	1568	32.4	14.7	29.7	22.9	38.3	85

Figure 6.2.5: Cumulative distribution of transferrin saturation without ESAs, HD patients 2002-2011

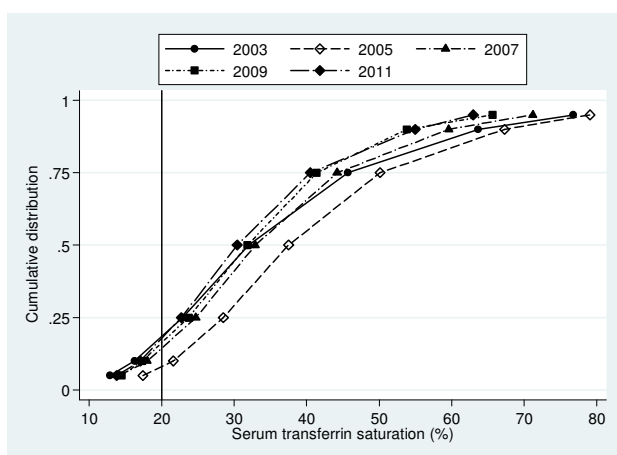


Figure 6.2.6: Cumulative distribution of transferrin saturation without ESAs, PD patients 2002-2011

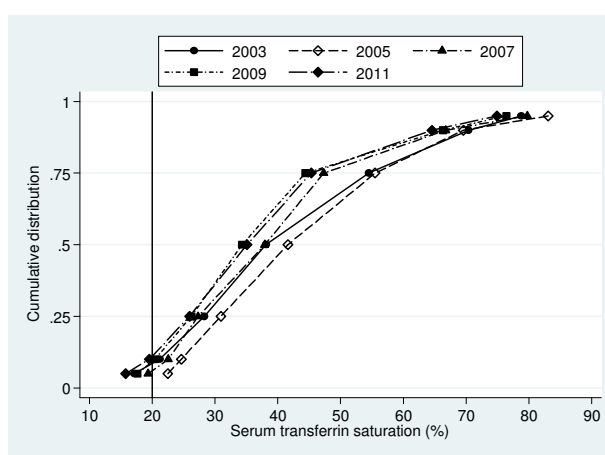


Table 6.2.6: Distribution of transferrin saturation without ESAs, PD patients, 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients $\geq 20\%$
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
2011	424	36.8	15.8	33.2	26.5	45.5	90

Table 6.2.7: Distribution of transferrin saturation on ESAs, HD patients, 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≥20 %
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	11850	34	15.4	30.9	23.8	40.5	86
2010	13761	34	15	30.9	24.1	40.2	87
2011	16295	32.6	14.3	29.7	23.1	38.8	85

Figure 6.2.7: Cumulative distribution of transferrin saturation on ESAs, HD patients 2002-2011

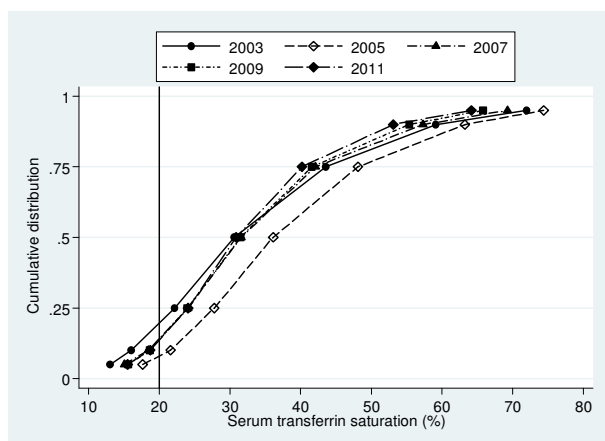


Figure 6.2.8: Cumulative distribution of transferrin saturation on ESAs, PD patients 2002-2011

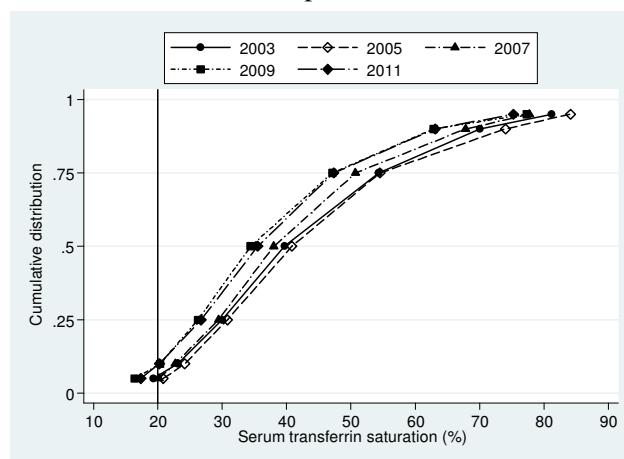


Table 6.2.8: Distribution of transferrin saturation on ESAs, PD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients ≥20 %
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
2011	1679	36.5	15.5	34.1	25.4	44.8	88

From 2002 to 2011, the median for serum ferritin concentration for all HD centres has remained at 400 to 600 ng/ml. There was a wide variation in ferritin levels ranging from 27 to 1191 ng/ml between HD centres in 2011. Up to 87% of HD patients have serum ferritin more than 200ng/ml. The median transferrin saturation has been around 30% over the last 10 years. 86% of patients on HD have transferrin saturation greater than 20%. (Table 6.2.9 c)

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, 2002-2011

Table 6.2.9 (a): Medium serum ferritin among patients on ESAs

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	69	117.6	185	363.3	459.5	607.5	828.5	1031
2003	102	152.5	302.8	463	562.5	703	950.1	1787.5
2004	125	99.5	328.5	451	563.5	735	981.5	2000
2005	164	1.6	302	464.8	629.5	734	950.8	2000
2006	207	1.5	235	411.4	547.5	691.3	907	2000
2007	242	92.7	254.3	431	561.8	689.8	880.5	1405
2008	282	92.2	320	478.5	592.3	719.2	934.7	1398.3
2009	336	101.7	298.8	456.6	589.8	721.6	908.8	1532.3
2010	370	35.5	260.3	431.9	568.1	728.1	981.8	1236.5
2011	433	27	245	404.7	536.8	683	934.5	1191

Figure 6.2.9(a): Variation in medium serum ferritin among patients on ESAs, HD centres 2011

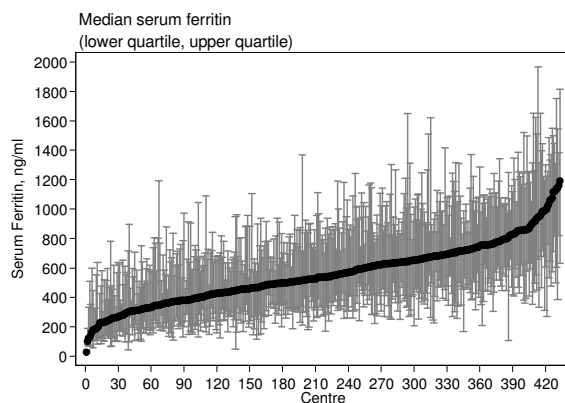


Figure 6.2.9(b): Variation in proportion of patients on ESAs with serum ferritin ≥ 100 ng/ml, HD centres 2011

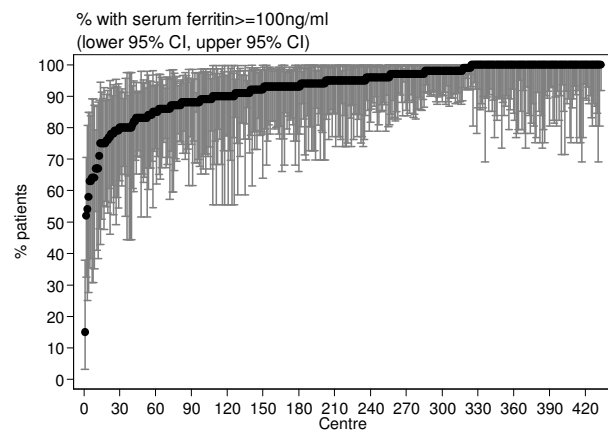


Table 6.2.9 (b): Proportion of patients on ESAs with serum ferritin ≥200 ng/ml, HD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	69	30	47	73	82	89	97	100
2003	102	43	64	78	87	92	100	100
2004	125	38	71	81	88	94	100	100
2005	164	0	64	80	88	94	100	100
2006	207	0	55	77	87	94	100	100
2007	242	15	58	79	89	95	100	100
2008	282	17	67	82	90	94	100	100
2009	336	25	65	79	87	93	100	100
2010	370	0	59	79	87	94	100	100
2011	433	15	56	76	87	93	100	100

Table 6.2.9 (c): Median transferrin saturation among patients on ESAs, HD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	62	13.5	21.2	26	29.4	35.4	50.8	60.2
2003	91	18.2	24.9	31.3	34.4	41.4	55.6	69.8
2004	114	22.7	27.2	33	36.1	41.4	52	66.8
2005	148	17.3	25.1	29.3	32.3	37.3	48.9	69.8
2006	183	13.7	23.2	28	31.7	36.2	45.4	81.3
2007	218	17.6	21.8	27.9	31.5	35.7	42.5	78.1
2008	257	16.5	23.6	28	31.8	34.3	45.5	75.8
2009	303	16.9	23.3	27.4	30.3	34.3	41.7	79.1
2010	354	16.6	22.5	27.5	30.9	33.8	41.1	77.2
2011	421	15.3	22.7	26.5	29.5	32.7	39.6	61.8

Figure 6.2.9(c): Variation in median transferring saturation among patients on ESAs, HD centres 2011

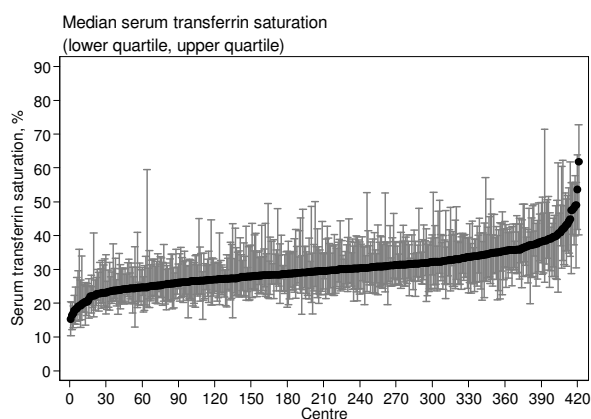


Figure 6.2.9(d): Variation in proportion of patients on ESAs with transferrin saturation \geq 20%, HD centres 2011

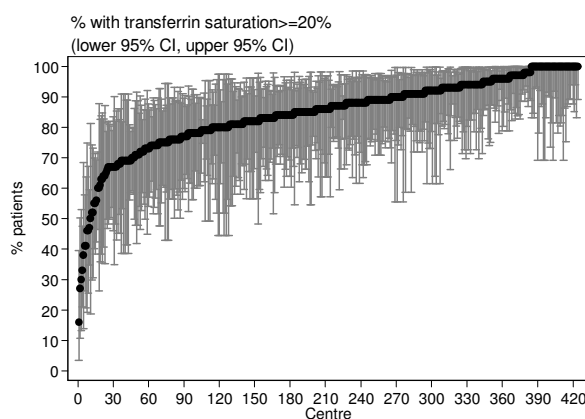


Table 6.2.9 (d): Proportion of patients on ESAs with transferrin saturation \geq 20%, HD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	62	27	55	69	83	92	100	100
2003	91	45	67	86	92	100	100	100
2004	114	67	73	90	94	100	100	100
2005	149	42	70	84	91	95	100	100
2006	183	20	63	80	90	95	100	100
2007	220	27	62.5	83	90	96	100	100
2008	261	13	68	81	89	95	100	100
2009	308	35	64	80	88	94	100	100
2010	355	24	63	80	89	95	100	100
2011	424	16	64	79	86	93	100	100

Table 6.2.10: Variation in iron status outcomes among patients on ESAs, PD centres 2002-2011

Table 6.2.10 (a): Medium serum ferritin among patients on ESAs

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
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	859.5	859.5
2005	17	338.5	338.5	557.2	710	800.9	843	843
2006	19	391.2	391.2	531	608.2	791.6	968.4	968.4
2007	21	290.3	313.4	592	633	716.3	961.7	1048.6
2008	21	309.5	385	495	656.3	801.8	970.1	991.5
2009	21	329.4	341.3	566	670.7	776.8	947	1167.5
2010	24	266.5	306	516.5	658.2	756.4	827.5	973.3
2011	26	209.4	362.2	574.5	638.4	783.8	958.7	1021.9

Figure 6.2.10(a): Variation in medium serum ferritin among patients on ESAs, PD centres 2011

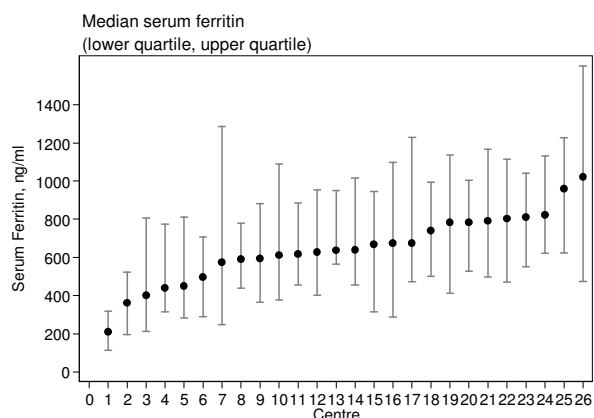


Figure 6.2.10(b): Variation in proportion of patients on ESAs with serum ferritin ≥ 100ng/ml, PD centres 2011

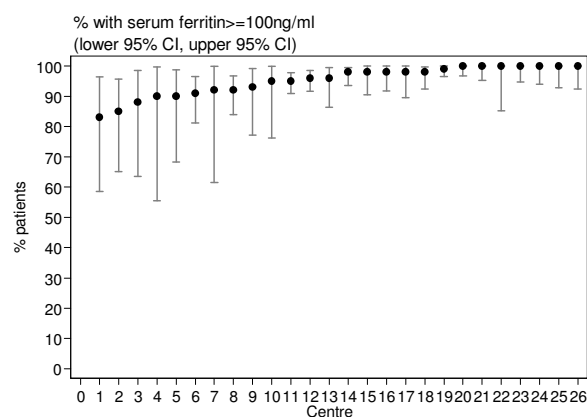


Table 6.2.10 (b): Proportion of patients on ESAs with serum ferritin ≥100 ng/ml, PD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
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	86	95	98	100	100	100
2010	24	86	87	93.5	98	99.5	100	100
2011	26	83	85	92	97	100	100	100

Table 6.2.10 (c): Median transferrin saturation among patients on ESAs, PD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
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	36.1	40.6	42.7	82.3	82.3
2005	17	30.3	30.3	35.9	38.5	43.4	74.9	74.9
2006	19	31.9	31.9	34.8	37.6	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	22	25	27.5	32.5	37.1	44	55.4	83.4
2010	22	23.5	25	32.5	35.7	42.2	54.2	78.5
2011	23	22.7	23.8	30.8	33.6	37.6	48.6	60.3

Figure 6.2.10 (c): Variation in median transferrin saturation among patients on ESAs, PD centres 2011

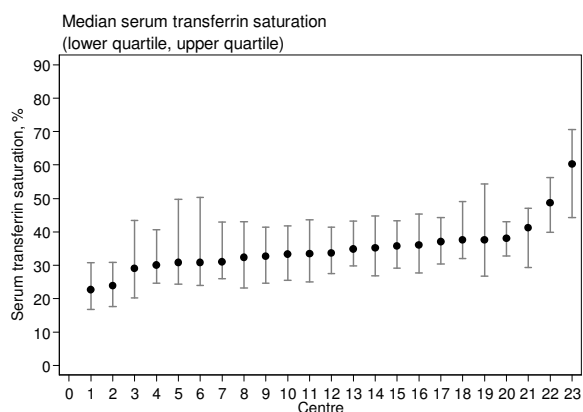


Figure 6.2.10 (d): Variation in proportion of patients on ESAs with transferrin saturation $\geq 20\%$, PD centres 2011

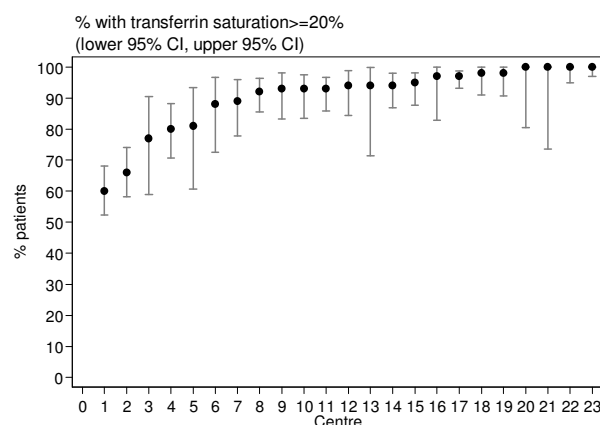


Table 6.2.10 (d): Proportion of patients on ESAs with transferrin saturation $\geq 20\%$, PD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
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	91	95	97	100	100
2009	22	71	81	90	94.5	98	100	100
2010	22	70	70	92	95	100	100	100
2011	23	60	66	88	94	98	100	100

SECTION 6.3: HAEMOGLOBIN OUTCOMES ON DIALYSIS

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

In 2011 the median haemoglobin ranged from 10.2 to 11.4g/dl for all dialysis patients. Up to 70 to 75% of both HD and PD patients without ESAs have haemoglobin > 10 gm/dl, and this has remained the same over the last 5 years. (Tables 6.3.1 & 6.3.2)

Table 6.3.1: Distribution of haemoglobin concentration without ESAs, HD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients <10g/dL	% Patients 10-<12g/dL	% Patients ≥12g/dL
2002	1795	9.6	2.1	9.4	8.1	10.9	62	25	13
2003	1801	9.7	2.1	9.5	8.3	11	60	25	15
2004	1925	10.1	2.2	9.9	8.6	11.5	53	28	19
2005	1667	10.5	2.3	10.3	8.9	12.1	46	29	25
2006	1760	10.6	2.2	10.5	9	12.1	42	32	26
2007	1756	10.8	2.2	10.7	9.1	12.4	40	29	31
2008	1751	10.8	2.3	10.8	9.1	12.6	39	29	32
2009	1847	11.2	2.3	11.3	9.4	12.9	33	29	38
2010	1875	11.2	2.2	11.4	9.6	12.9	30	30	40
2011	2092	11.2	2.2	11.4	9.7	12.8	30	30	40

Figure 6.3.1: Cumulative distribution of haemoglobin concentration without ESAs, HD patients 2002-2011

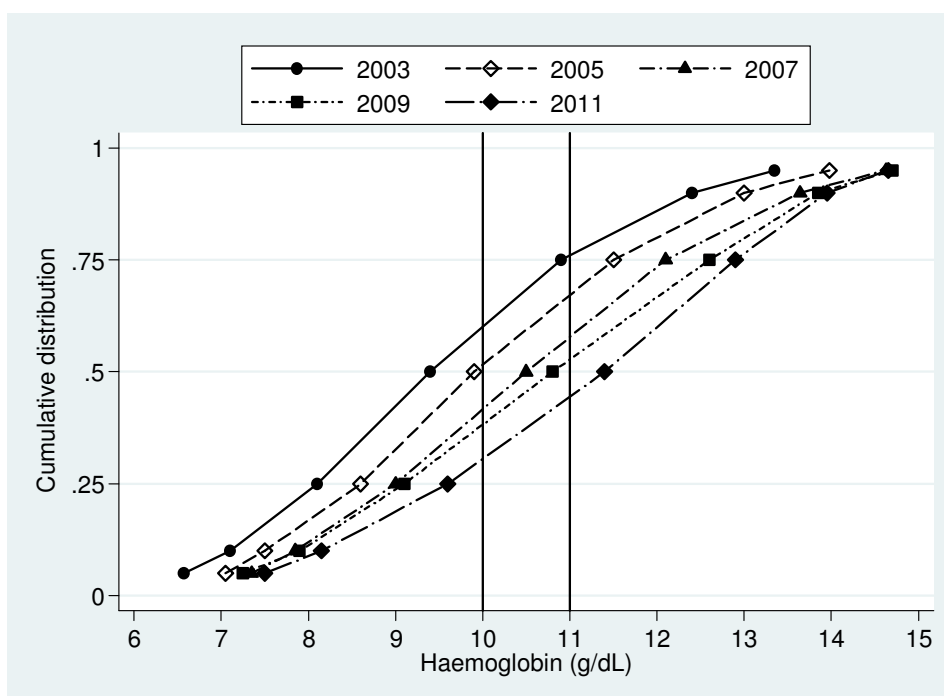


Table 6.3.2: Distribution of haemoglobin concentration without ESAs, PD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients <10g/dL	% Patients 10-<12g/dL	% Patients ≥12g/dL
2002	434	10	1.8	9.9	8.8	11	54	35	11
2003	542	10	1.7	9.9	8.9	11	52	38	10
2004	481	10.4	1.6	10.3	9.4	11.4	42	43	15
2005	375	10.8	1.6	10.8	9.9	11.8	28	52	20
2006	387	10.9	1.6	10.9	10	11.8	25	55	20
2007	436	11.1	1.6	11	10.2	12.1	22	51	27
2008	450	11.1	1.7	11.1	10.2	12.1	21	51	28
2009	488	11.1	1.8	11.1	10.1	12.2	25	47	28
2010	495	11.1	1.7	11.1	9.9	12.2	27	46	27
2011	555	11.1	1.6	11.1	10	12.2	25	48	27

Figure 6.3.2: Cumulative distribution of haemoglobin concentration without ESAs, PD patients 2002-2011

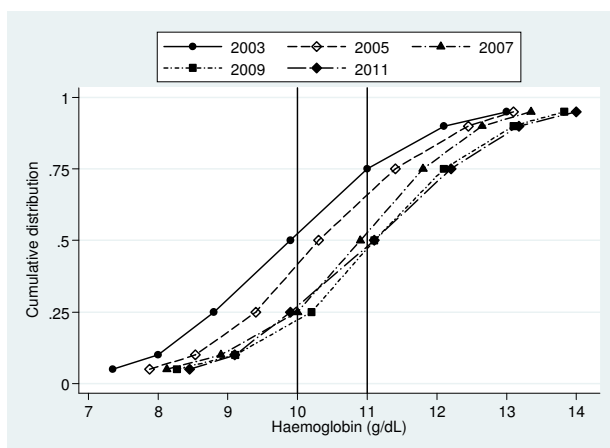


Figure 6.3.3(a): Cumulative distribution of haemoglobin concentration on ESAs, diabetes HD patients 2002-2011

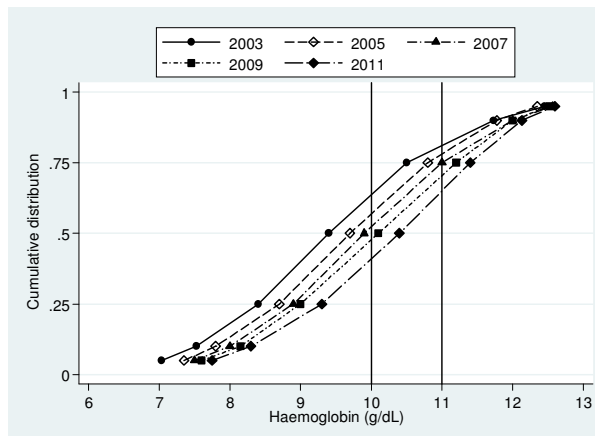


Table 6.3.3(a): Distribution of haemoglobin concentration on ESAs, diabetes HD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients <10g/dL	% Patients 10-<12g/dL	% Patients ≥12g/dL
2002	1261	9.5	1.7	9.4	8.4	10.5	65	28	7
2003	1667	9.6	1.5	9.6	8.6	10.6	62	32	6
2004	2189	9.8	1.5	9.7	8.7	10.8	57	35	8
2005	2890	10	1.6	9.9	8.9	11	52	38	10
2006	4084	10	1.6	9.9	8.9	11	53	38	9
2007	4654	10.1	1.5	10.1	9	11.1	48	42	10
2008	5881	10.1	1.5	10.1	9	11.2	47	43	10
2009	7337	10.2	1.5	10.3	9.2	11.3	44	45	11
2010	8123	10.3	1.5	10.4	9.3	11.4	42	46	12
2011	9300	10.3	1.5	10.4	9.3	11.4	41	47	12

Table 6.3.3(b): Distribution of haemoglobin concentration on ESAs, non-diabetes HD patients 2002-2011

Year	Number of patients	Mean	SD	Median	LQ	UQ	% Patients <10g/dL	% Patients 10-<12g/dL	% Patients ≥12g/dL
2002	2598	9.5	1.7	9.6	8.4	10.7	61	32	7
2003	3116	9.6	1.7	9.6	8.5	10.7	60	32	8
2004	3617	9.9	1.6	9.9	8.8	11	53	38	9
2005	4328	10.1	1.6	10.1	8.9	11.2	48	40	12
2006	5331	10.1	1.6	10.1	9.1	11.2	47	41	12
2007	6042	10.3	1.6	10.4	9.3	11.4	41	46	13
2008	7153	10.3	1.5	10.4	9.2	11.4	41	47	12
2009	8190	10.3	1.5	10.5	9.3	11.4	40	48	12
2010	8970	10.4	1.5	10.5	9.4	11.5	38	49	13
2011	10280	10.3	1.5	10.5	9.4	11.4	39	49	12

Figure 6.3.3(b): Cumulative distribution of haemoglobin concentration on ESAs, non-diabetes HD patients 2002-2011

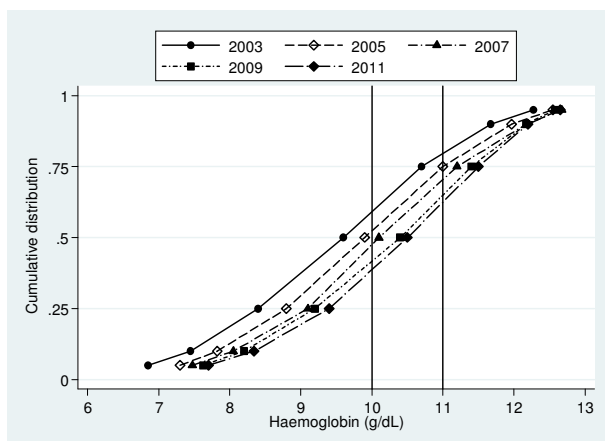


Figure 6.3.4(a): Cumulative distribution of haemoglobin concentration on ESAs, diabetes PD patients 2002-2011

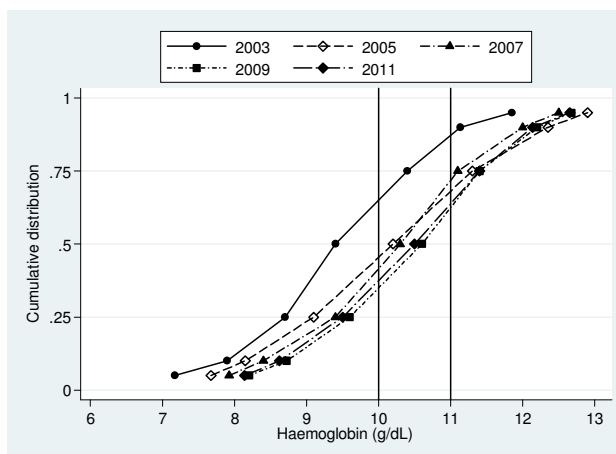


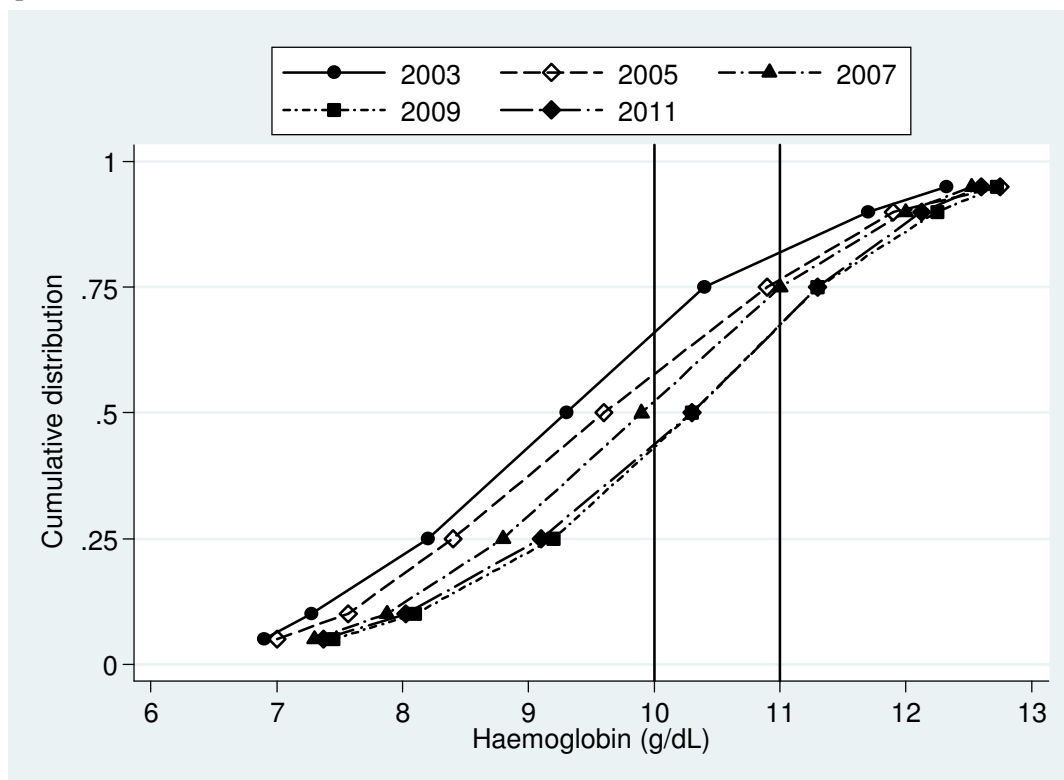
Table 6.3.4 (a): Distribution of haemoglobin concentration on ESAs, diabetes PD patients 2002-2011

Year	Number of subject	Mean	SD	Median	LQ	UQ	% Patients <10g/dL	% Patients 10-<12g/dL	% Patients ≥12g/dL
2002	89	9.5	1.3	9.4	8.7	10.4	65	33	2
2003	153	10.1	1.7	10.1	9.1	11.2	48	41	11
2004	224	10.2	1.6	10.2	9.1	11.3	46	40	14
2005	267	10.3	1.6	10.3	9.3	11.5	43	43	14
2006	334	10.2	1.4	10.3	9.4	11.1	43	47	10
2007	459	10.5	1.3	10.4	9.6	11.4	37	51	12
2008	629	10.5	1.3	10.6	9.6	11.4	33	55	12
2009	652	10.5	1.4	10.6	9.6	11.4	35	53	12
2010	620	10.5	1.4	10.5	9.5	11.4	37	50	13
2011	591	10.4	1.4	10.5	9.5	11.4	36	53	11

Table 6.3.4 (b): Distribution of haemoglobin concentration on ESAs, non-diabetes PD patients 2002-2011

Year	Number of subject	Mean	SD	Median	LQ	UQ	% Patients <10g/dL	% Patients 10-<12g/dL	% Patients ≥12g/dL
2002	343	9.4	1.7	9.3	8.2	10.4	70	24	6
2003	486	9.6	1.6	9.6	8.4	10.6	63	28	9
2004	574	9.7	1.7	9.6	8.4	10.9	57	34	9
2005	703	9.8	1.7	9.7	8.6	11	56	33	11
2006	784	9.9	1.6	9.9	8.8	11	52	38	10
2007	860	10.2	1.7	10.3	9	11.4	44	41	15
2008	948	10.2	1.6	10.3	9.2	11.3	44	44	12
2009	1012	10.2	1.6	10.3	9.2	11.4	44	44	12
2010	1185	10.2	1.6	10.3	9.1	11.3	44	45	11
2011	1351	10.1	1.5	10.2	9.1	11.2	46	45	9

Figure 6.3.4(b): Cumulative distribution of haemoglobin concentration on ESAs, non-diabetes PD patients 2002-2011



In 2011, for HD patients on ESAs, the Hb ranged 8.2 to 12.7 gm/dl with the median at 10.4 gm/dl. A similar trend is noted in PD centres with a significantly lesser variation.

In 2011 for HD patients on ESAs, the proportion of patients with Hb > 10 gm /dl varied between 0 to 100%, with median at 61%. As expected, a lesser variation was seen in the PD patients.

Table 6.3.5 (a): Proportion in median haemoglobin level among patients on ESAs, HD centres 2002-2011

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	112	7.9	8.4	9	9.5	9.9	10.8	11.6
2003	143	7.9	8.5	9.1	9.6	10	10.7	11.5
2004	179	7.7	8.6	9.3	9.8	10.2	10.9	11.3
2005	215	8.3	8.8	9.5	9.9	10.4	11.1	11.8
2006	269	7.7	8.8	9.5	9.9	10.4	11.3	12.6
2007	305	8.6	9.1	9.8	10.2	10.6	11.2	11.9
2008	360	8.1	9	9.8	10.2	10.7	11.4	12.1
2009	395	8.5	9.1	9.9	10.3	10.8	11.4	12.2
2010	431	8.1	9.3	9.9	10.4	10.9	11.5	12.1
2011	490	8.2	9.1	9.9	10.4	10.9	11.4	12.7

Figure 6.3.5(a): Variation in median haemoglobin level among patients on ESAs, HD centres 2011

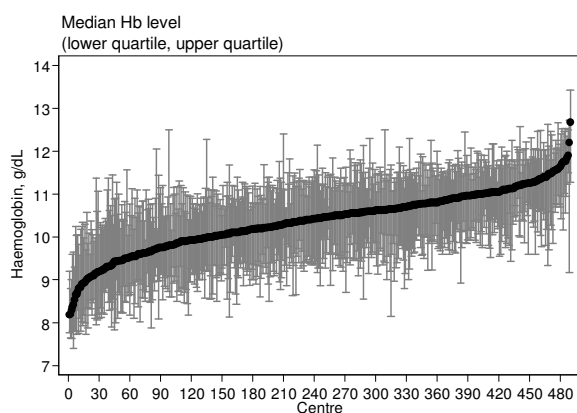


Figure 6.3.5(b): Variation in proportion of patients on ESAs with haemoglobin level > 10g/dL, HD centres 2011

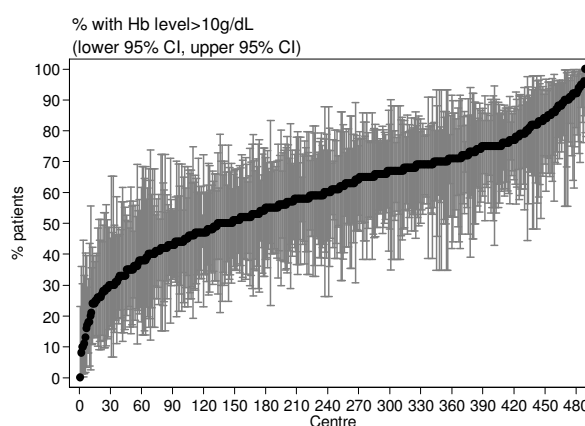


Table 6.3.5 (b): Proportion of patients on ESAs with haemoglobin level > 10g/dL, HD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
2002	112	0	13	27	36	47	64	87
2003	143	7	14	27	36	50	69	90
2004	179	7	17	30	42	57	73	85
2005	215	0	18	33	49	61	79	100
2006	269	0	20	35	47	62	81	94
2007	305	13	28	43	56	67	84	100
2008	360	0	26.5	44	56	69	82	100
2009	395	7	27	45	58	70	86	100
2010	431	13	27	46	60	73	88	100
2011	490	0	28	47	61	71	88	100

Table 6.3.6 (a): Proportion in median haemoglobin level among patients on ESAs, PD centres 2002-2011

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
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	11.2
2008	22	9.2	9.6	10.2	10.4	10.8	11.1	11.2
2009	23	9.4	9.5	9.9	10.6	10.7	11.1	11.2
2010	25	9.3	9.5	10.1	10.5	10.9	11.2	11.3
2011	27	9	9	10	10.4	10.7	11	11

Figure 6.3.6(a): Variation in median haemoglobin level among patients on ESAs, PD centres 2011

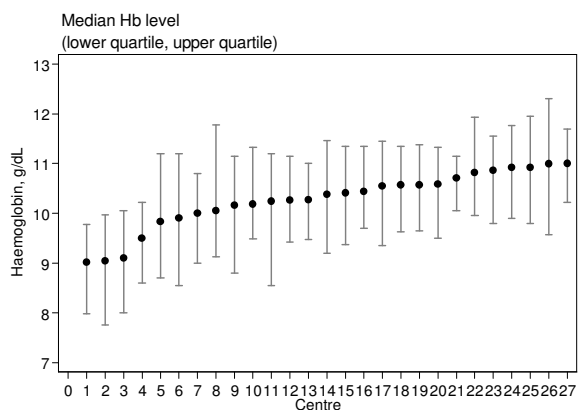


Figure 6.3.6(b): Variation in proportion of patients on ESAs with haemoglobin level > 10g/dL, PD centres 2011

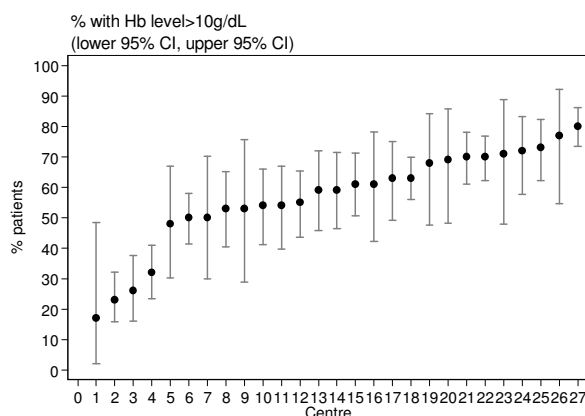


Table 6.3.6 (b): Proportion of patients on ESAs with haemoglobin level > 10g/dL, PD centres

Year	Number of centres	Min	5 th centile	LQ	Median	UQ	95 th centile	Max
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	42	55	72	72
2005	18	21	21	35	46	56	76	76
2006	22	16	19	43	48	58	70	76
2007	22	36	36	52	59.5	63	72	73
2008	22	31	35	55	60.5	65	75	89
2009	23	33	37	46	60	67	74	75
2010	25	36	36	52	59	65	75	75
2011	27	17	23	50	59	70	77	80