Chapter 8: Factors Influencing Haemoglobin

Summary

- The percentage of patients achieving a serum ferritin above 100 μg/L was greater than in 2002 for both haemodialysis (HD) (95% vs 94%) and peritoneal dialysis (PD) (87% vs 85%).
- For patients on HD, more than 90% of patients had a serum ferritin above 100 μg/L at 36 of 40 renal units in contrast to only 15 of 39 units for patients on PD.
- Median ferritin was higher for HD (440 μg/L; quartile range 279–637 μg/L) than for PD (267 μg/L; quartile range 158–436 μg/L).
- There remained large differences in achieved ferritin between different centres, and year-on-year changes in individual units' median ferritin did not always parallel national trends.
- The percentage of patients with serum ferritin >100 μg/L increased linearly with age for both HD and PD modality (linear trend $p < 0.001$).
- After change of modality from PD to HD, serum ferritin rises from 200 μg/L to 330 μg/L at the end of 12 months post switch and continues rising.
- More patients were treated with Erythropoietin Stimulating Agents (ESAs) than in 2001 for both HD (91% vs 83%) and PD (77% vs 65%).
- As in previous reports, the percentage of patients with haemoglobin (Hb) above 10 g/dl without ESA therapy was greater for PD (23%) than HD (7%).
- ESA doses were higher in patients on HD (mean 9,197 units/wk; median 8,000 units/wk) than in PD (mean 5,831 units/wk; median 5,000 units/wk).
- The percentage of patients treated with ESAs varied little with time on HD, but progressively increased from the second year of PD treatment onwards.
- Age had little impact on the percentage of HD patients treated with ESAs, but in PD patients treatment rates were higher in 18–44 year olds than in older patients.
- A higher percentage of females than males received ESAs in both HD and PD modalities. For both modalities more males than females achieved a Hb above 10 g/dl without ESA treatment.

Introduction

National and international recommendations for target iron status in chronic kidney disease remain unchanged from previous reports. The 2002 Renal Association Standards Document (SDIII), revised European Best Practice Guidelines (EBPGII) and Dialysis Outcomes Quality Initiatives (DOQI) guidelines all recommend:

> ***a target serum ferritin greater than 100 μg/L and percentage transferrin saturation (TSAT) more than 20% in patients with chronic kidney disease***

SDIII and EBPGII also recommend:

> ***less than 10% hypochromic red cells (HRC) (evidence level B)***

in addition, EBPGII adds:

> ***a target reticulocyte Hb content (CHr) greater than 29 pg/cell (evidence level B)***

To achieve adequate iron status across a patient population, SDIII and EBPGII advocate population target medians for ferritin of 200–500 μg/L, for TSAT of 30–40%, for hypochromic red cells of <2.5% and CHr of =35 pg/cell. EBPGII comments that: a serum ferritin target for the treatment population of 200–250 μg/L ensures that 85–90% of patients attain a serum ferritin of 100 μg/L.

All guidelines advise that:

> ***serum ferritin levels should not exceed 800 µg/L*** since the risk of iron toxicity increases without conferring additional benefit.

Serum ferritin has several disadvantages as an index of iron status. It measures storage iron rather than available iron; behaves as an acute phase reactant, and is therefore increased in inflammatory states, malignancy and liver disease; and may not accurately reflect iron stores if measured within a week of the administration of intravenous iron. Of the alternative measures of iron status available, HRC and CHr are generally considered superior to TSAT. Both however require specialised analysers to which few UK renal units have easy access. Since TSAT is measured infrequently in many centres, and most UK units continue to use serum ferritin for routine iron management, ferritin remains the chosen index of iron status for this report. The Registry will start collecting TSAT, HRC and CHr from those units measuring it.

Information on the use of ESAs was excluded from the 2003 report due to data collection problems. These problems have now been addressed, allowing ESA data from 23 units to be presented in this report. These data remain incomplete and work continues to establish more comprehensive ESA returns. Data are presented as total weekly erythropoietin dose. Doses of darbepoietin were harmonised with erythropoietin data by multiplying by 200 and correcting for any frequency of administration less than weekly.

Completeness of data returns

The completeness of serum ferritin returns to the Registry over 6 months is shown in table 8.1. Not all sites use serum ferritin as the sole indicator of iron status. The Wirral renal unit does not have an automated biochemistry link into the IT renal system which accounts for their very low rate of return. Some haemodialysis patients may be having serum ferritin measured at their satellite haemodialysis centre and this data may not always be transferred to the main renal unit IT system. In other cases of missing data, renal units may need to address structural processes to ensure that serum ferritin is checked at the 3 monthly clinic visit.

Table 8.1: Completeness of serum ferritin returns

	Ferritin HD %	Ferritin PD %
Bangor	100	92
Bradford	100	100
Bristol	100	100
Cambridge	71	96
Carlisle	93	94
Carshalton	78	92
Clwyd	94	100
Coventry	99	93
Cardiff	96	96
Derby	87	91
Exeter	97	100
Gloucester	97	97
Guys	99	99
H&CX	98	97
Heartlands	93	100
Hull	96	96
Ipswich	99	70
Kings	99	94
Leeds	99	98
Leicester	97	99
Liverpool	85	95
ManWest	71	98
Middlesbrough	93	100
Newcastle	97	98
Nottingham	97	100
Oxford	91	99
Plymouth	84	98
Portsmouth	94	87
Preston	98	100
Reading	98	100
Sheffield	100	100
Stevenage	89	100
Southend	96	94
Sunderland	96	100
Swansea	70	99
Truro	98	91
Wolverhampton	17	19
Wordsley	99	100
Wrexham	97	96
York	85	90
England	92	96

Serum ferritin

Serum ferritin concentrations and interquartile ranges are presented in table 8.2 and figure 8.1 for haemodialysis and table 8.3 and figure 8.2 for peritoneal dialysis. The percentages of patients achieving a serum ferritin over 100 µg/L for each modality are shown in figures 8.3 and 8.4.

Table 8.2: Serum ferritin concentration in HD patients

Centre	% data return	Median ferritin	90% range	Quartile range	% ferritin >100 µg/L
Bangor	100	499	148–960	357–641	97
Bradford	100	351	145–949	260–493	99
Bristol	100	418	70–1304	210–683	91
Cambridge	71	160	11–658	75–306	66
Carlisle	93	379	190–956	262–507	98
Carshalton	78	379	131–998	251–519	97
Clwyd	94	264	107–687	222–408	96
Coventry	99	352	75–1467	196–501	92
Cardiff	96	602	155–1207	411–824	99
Derby	87	344	75–973	212–508	92
Exeter	97	335	133–678	256–432	97
Gloucester	97	310	44–848	190–414	88
Guys	99	444	94–1012	283–645	95
H&CX	98	586	191–1449	381–814	97
Heartlands	93	170	31–535	97–287	73
Hull	96	455	156–893	330–617	97
Ipswich	99	482	57–911	227–633	91
Kings	99	511	169–1107	360–680	98
Leeds	99	534	256–1044	446–650	99
Leicester	97	389	116–875	232–569	96
Liverpool	85	675	86–1714	407–1000	95
ManWest	71	481	81–1351	256–786	94
Middlesbrough	93	337	56–1301	187–674	87
Newcastle	97	464	206–933	355–600	98
Nottingham	97	553	226–1066	433–661	99
Oxford	91	313	91–799	213–438	94
Plymouth	84	554	148–1404	408–686	96
Portsmouth	94	358	121–820	264–492	97
Preston	98	530	136–1211	359–790	97
Reading	98	558	277–1174	429–803	100
Sheffield	100	523	113–1055	362–696	96
Stevenage	89	425	107.5–1169	288–629	96
Southend	96	360	190–671	285–437	99
Sunderland	96	472	154–1178	320–624	99
Swansea	70	360	93–952	225–532	94
Truro	98	513	254–935	387–640	99
Wolverhampton	99	463	186–798	347–568	98
Wordsley	97	451	126–1118	320–710	98
Wrexham	85	553	194–1084	418–864	96
York	92	556	238–908	432–656	100
England	92	436	97–1104	278–629	95
Wales	88	508	126–1095	305–732	97
Eng & Wales	92	440	98–1103	279–637	95

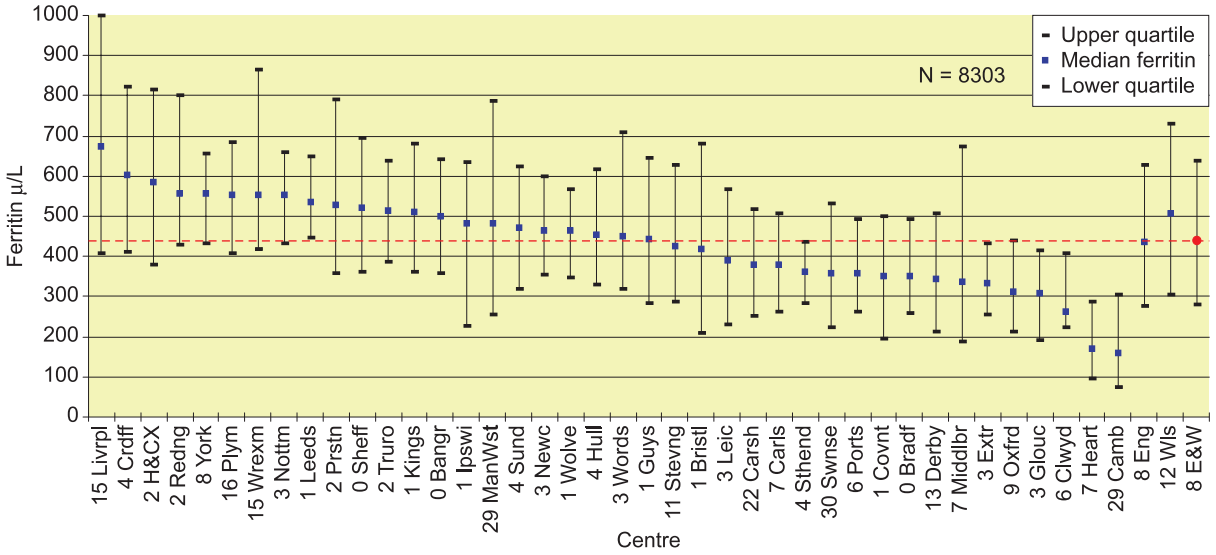


Figure 8.1: Median serum ferritin: haemodialysis

All centres achieved a median ferritin over 100 µg/L for both HD and PD, though as in previous reports the overall median was higher for HD (440 µg/L) than for PD (267 µg/L). Despite good overall achievement of targets for ferritin, there remained large variations in achieved ferritin between units. For HD patients, median ferritin ranged from 160 to 675 µg/L, and for PD from 140 to 712 µg/L, and whilst only four centres had fewer than 90% of HD patients with ferritin less than 100 µg/L, this applied to 24 units in respect of PD. This may reflect both variations in facilities and staff for the administration of intravenous iron (particularly for home dialysis patients) and differences in the ability of units to finance a large intravenous iron replacement programme.

Many centres showed marked differences in iron status between their HD and PD populations suggesting that iron replacement practices are different for the two modalities, either by design or because of logistical problems in providing intravenous iron to PD patients. The three centres with the highest median ferritin in HD (Liverpool, Cardiff and Hammersmith & Charing Cross) all had ferritin values near the national median in PD, suggesting either that they aspired to higher targets for HD than PD, or that PD patients had poorer access to intravenous iron. In contrast, Middlesbrough and Sunderland, who in last year's report had the highest median ferritin for PD, returned ferritin values near the national median for HD, implying intentional targeting of iron therapy to their PD population.

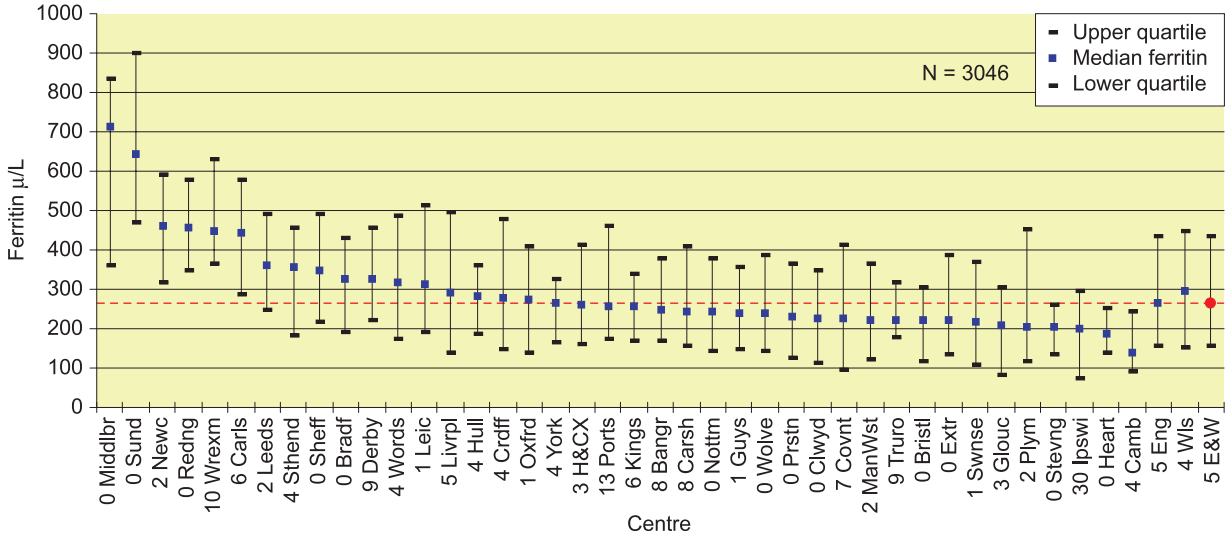


Figure 8.2: Median serum ferritin: peritoneal dialysis

Table 8.3: Serum ferritin concentration in PD patients

Centre	% data return	Median ferritin	90% range	Quartile range	% ferritin >100 µg/L
Bangor	92	250	120–474	168–380	96
Bradford	100	327	84–829	190–430	90
Bristol	100	221	35–521	117–305	77
Cambridge	96	140	29–564	91–243	70
Carlisle	94	445	230–1032	285–579	100
Carshalton	92	245	42–781	155–410	85
Clwyd	100	228	48–529	111–348	77
Coventry	93	226	33–1076	94–413	72
Cardiff	96	278	60–908	149–478	87
Derby	91	326	82–760	223–457	90
Exeter	100	221	56–722	136–389	81
Gloucester	97	207	10–693	82–306	71
Guys	99	241	57–838	150–355	86
H&CX	97	263	57–1150	159–412	89
Heartlands	100	186	24–478	138–253	86
Hull	96	282	107–664	185–361	96
Ipswich	70	199	22–496	75–296	72
Kings	94	255	85–746	171–337	93
Leeds	98	361	144–935	249–492	99
Leicester	99	315	49–879	192–511	89
Liverpool	95	290	49–966	138–497	87
ManWest	98	223	37–1111	120–367	81
Middlesbrough	100	712	187–1141	359–834	100
Newcastle	98	461	49–1029	317–593	95
Nottingham	100	243	72–746	143–378	90
Oxford	99	272	44–848	140–407	84
Plymouth	98	207	57–683	118–452	83
Portsmouth	87	258	62–1200	176–462	89
Preston	100	232	54–829	128–366	84
Reading	100	456	142–958	350–580	96
Sheffield	100	346	72–891	219–490	93
Southend	96	358	67–700	182–456	90
Stevenage	100	204	47–497	135–263	81
Sunderland	100	644	96–1141	469–900	94
Swansea	99	220	19–677	110–370	79
Truro	91	222	64–594	178–318	90
Wolverhampton	100	239	76–543	145–389	87
Wordsley	96	316	63–838	176–488	87
Wrexham	90	450	292–903	364–630	100
York	96	265	72–1025	166–325	84
England	95	266	53–872	158–434	87
Wales	96	296	51–874	152–450	87
Eng & Wales	95	267	53–872	158–436	87

Given that only two centres for HD and three centres for PD had a median serum ferritin less than 200 µg/L, it is unsurprising that no relationship exists for either modality between the percentage of patients with serum ferritin above 200 µg/L and a haemoglobin level >10 g/dl (figures 8.5 and 8.6).

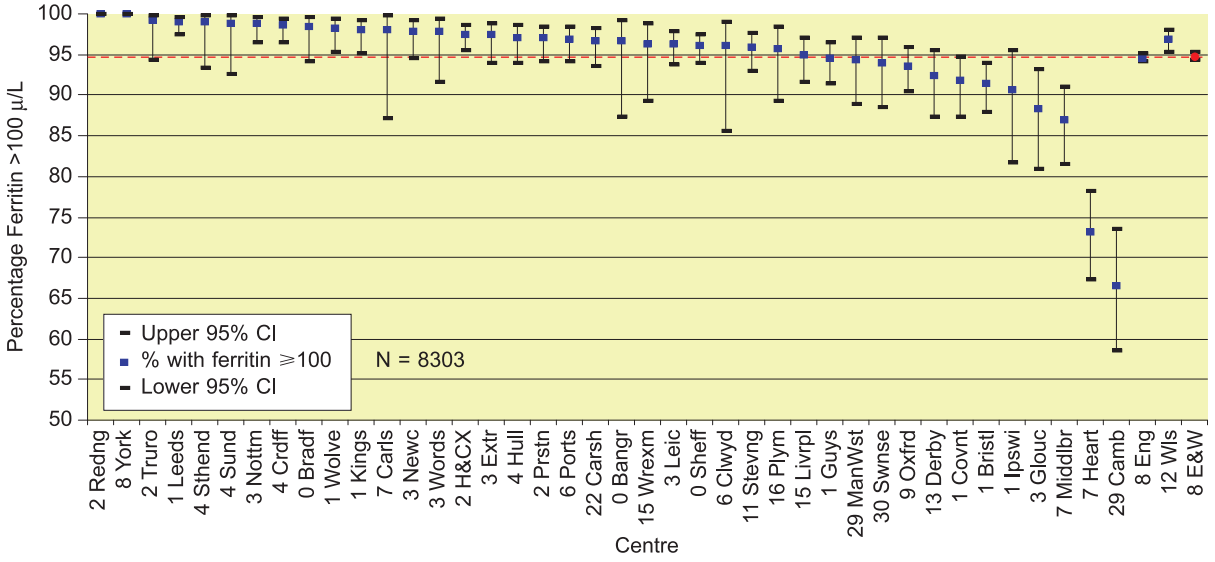


Figure 8.3: Percentage of HD patients with serum ferritin >100 µg/L

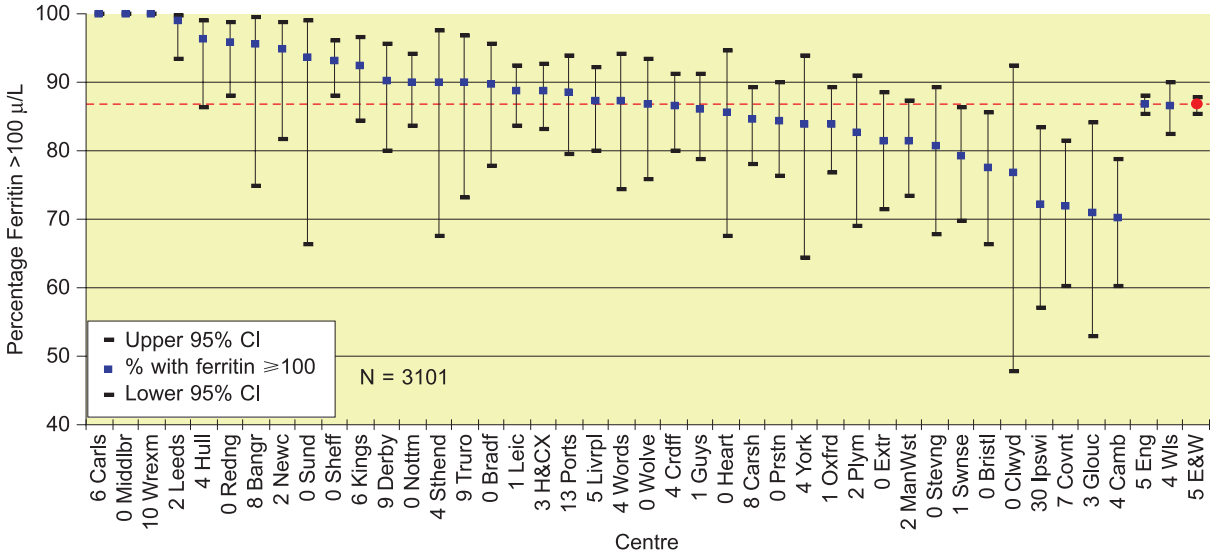


Figure 8.4: Percentage of PD patients with serum ferritin >100 µg/L

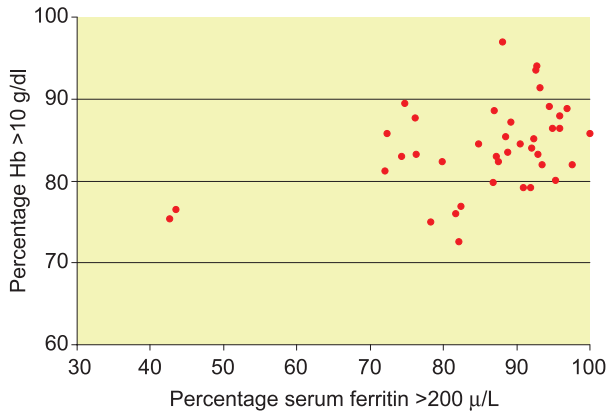


Figure 8.5: Percentage of patients with serum ferritin >200 µg/L and Hb >10 g/dl on HD

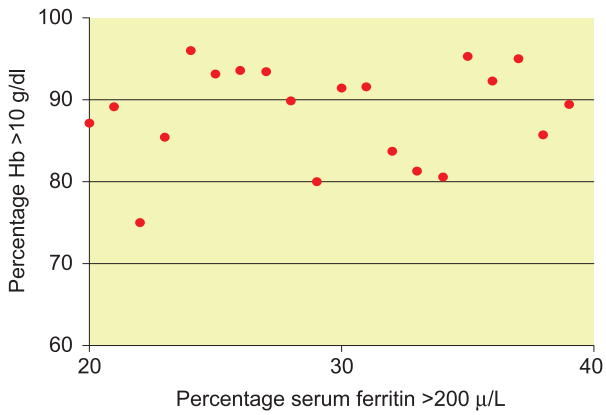


Figure 8.6: Percentage of patients with serum ferritin >200 µg/L and Hb >10 g/dl on PD

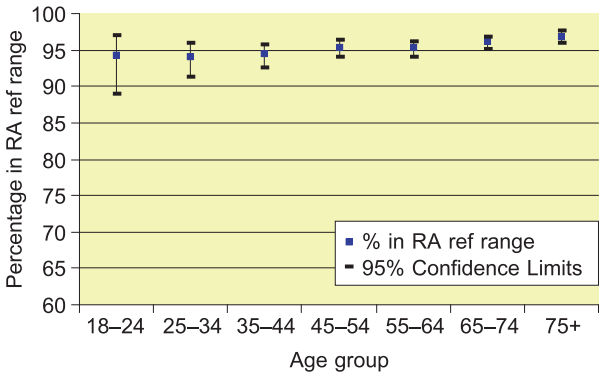


Figure 8.7: Percentage of HD patients with a serum ferritin >100 µg/L by age band

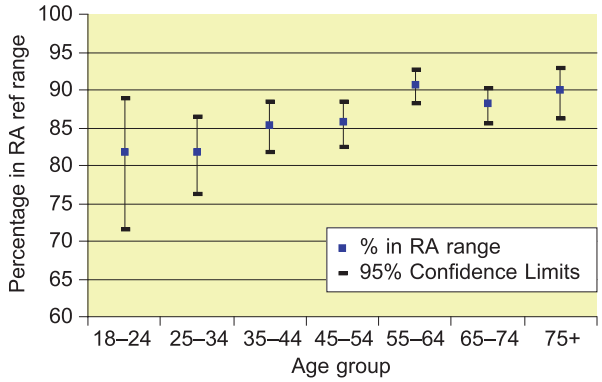


Figure 8.8: Percentage of PD patients with a serum ferritin >100 µg/L by age band

Achievement of serum ferritin and patient age

The achievement of serum ferritin >100 µg/L by age band has not been previously analysed by the Registry and is shown in figures 8.7 and 8.8.

The percentage of HD patients with a serum ferritin >100 µg/L was found to differ significantly between the age groups (χ^2 test, $p = 0.027$). The χ^2 test for linear trend was also significant ($p < 0.001$) and the test for deviation from non linearity was not significant.

The percentage of PD patients with a serum ferritin >100 µg/L was found to differ significantly between the age groups (χ^2 test, $p = 0.003$). The χ^2 test for linear trend was also significant ($p < 0.001$) and the test for deviation from non linearity was not significant.

Changes in serum ferritin 1999–2003 in England and Wales

Figure 8.9 shows that the percentage of HD and PD patients achieving a ferritin over 100 µg/L continued its year-on-year rise during 2003. For the first time, there was a fall in the percentage of HD patients with serum ferritin in the range 300–499 µg/L, and as expected given the overall rise in median ferritin, the percentage with ferritin over 500 µg/L correspondingly increased (figure 8.10). For PD, the percentage with ferritin 300–499 µg/L and above continued to increase (figure 8.11), showing a lag behind the trend for HD.

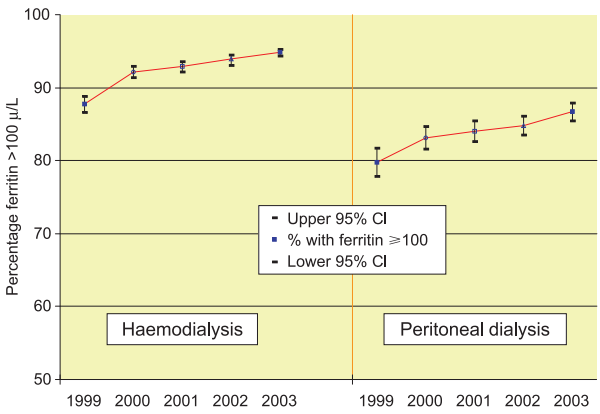


Figure 8.9: Percentage change in achievement of serum ferritin >100 µg/L, 1999–2003

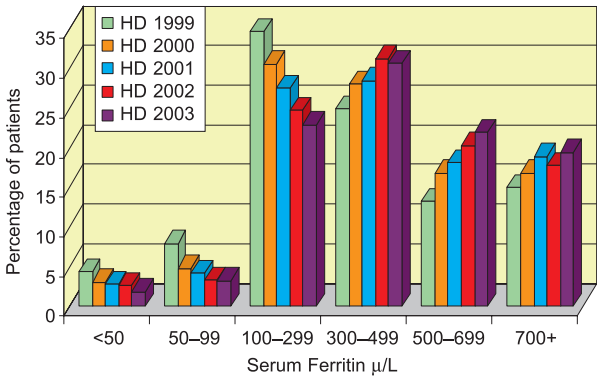


Figure 8.10: Serum ferritin distribution 1999–2003 haemodialysis

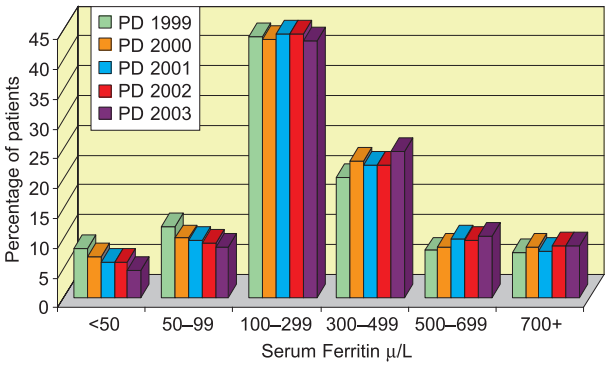


Figure 8.11: Serum ferritin distribution 1999–2003 peritoneal dialysis

Serum ferritin and length of time on renal replacement therapy

As in last year's report, the median and lower quartile values for serum ferritin were above 100 µg/L for both HD and PD by the sixth month on dialysis. As before however, median ferritin continued to increase beyond this time, reaching the respective modality median by two years after the start of dialysis (figures 8.12 and 8.13). For HD this paralleled a rise in Hb over the same period, though in PD haemoglobin fell from one year onwards in contrast to the continuing rise in ferritin. This observation implies that many units continue to drive up the serum ferritin in patients who on the basis of published guidelines would already be considered iron replete, again suggesting that local targets for serum ferritin may exceed published recommendations.

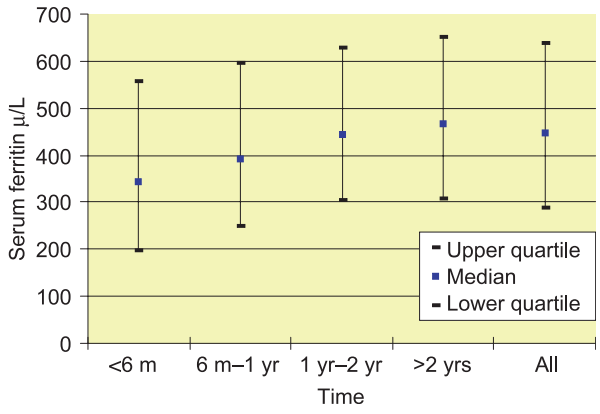


Figure 8.12: Median ferritin by length of time on RRT: HD

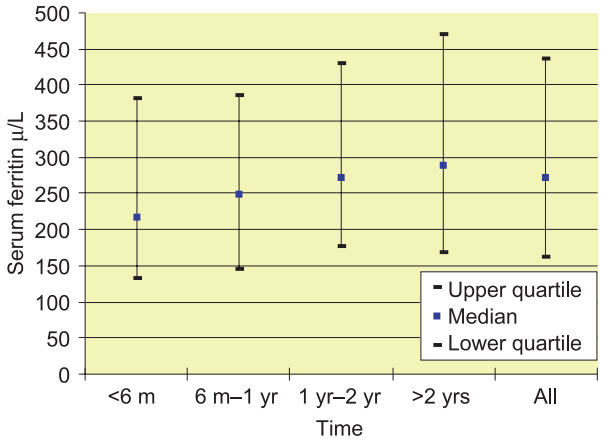


Figure 8.13: Median ferritin by length of time on RRT: PD

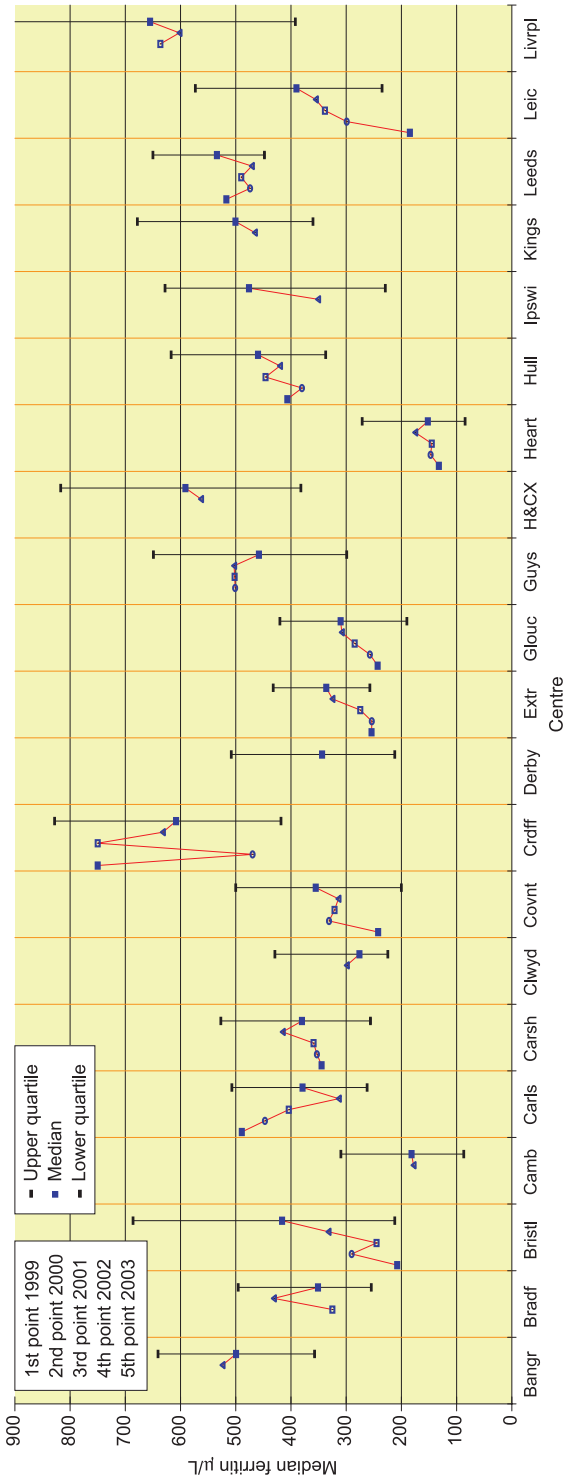
Changes in serum ferritin by centre 1999–2003

The continuing rise in median ferritin across England and Wales between 1999 and 2003 was not universally paralleled in individual renal units. In respect of HD, serial ferritin values from individual units broadly followed one of four patterns during this period (figure 8.14). Bristol, Leicester, Portsmouth, Stourbridge and Wrexham matched the national picture, showing a progressive and continuing rise in serum ferritin throughout the four year period. In all these centres except Wrexham (where the national median was exceeded in every year except 2000) this increased from a relatively low baseline in 1999 to values near to (or in Stourbridge exceeding) the national median by 2003. In Exeter, Gloucester, Preston, Nottingham and Southend, rising medians in earlier years were followed by a plateau, suggesting successful achievement of a local target. Guys, Leeds, Liverpool, Sheffield and Sunderland maintained a stable median ferritin between 1999 and 2003, and in every year this exceeded the respective national median. Finally, Carlisle and Swansea showed a falling trend, although both centres still returned a median ferritin within the recommended population target in 2003.

Year-on-year changes of median ferritin in PD patients were less pronounced than in the HD population, with more units maintaining stable levels than showing progressive change (figure 8.15). Several units did however, show serial increases, including Coventry, Guys, Liverpool, Reading and Wrexham. Of particular note are Middlesbrough and Sunderland, whose pronounced rise in ferritin in the PD population contrasted with stable levels in HD patients over the same period. This again suggests preferential targeting of iron replacement to PD patients in these units.

Change in serum ferritin after modality change

The change in serum ferritin before and after modality change has not been previously analysed. Patients who died within 12 months after change of modality were excluded from the analysis as they may have just changed from PD to HD due to inter-current illness prior to death.



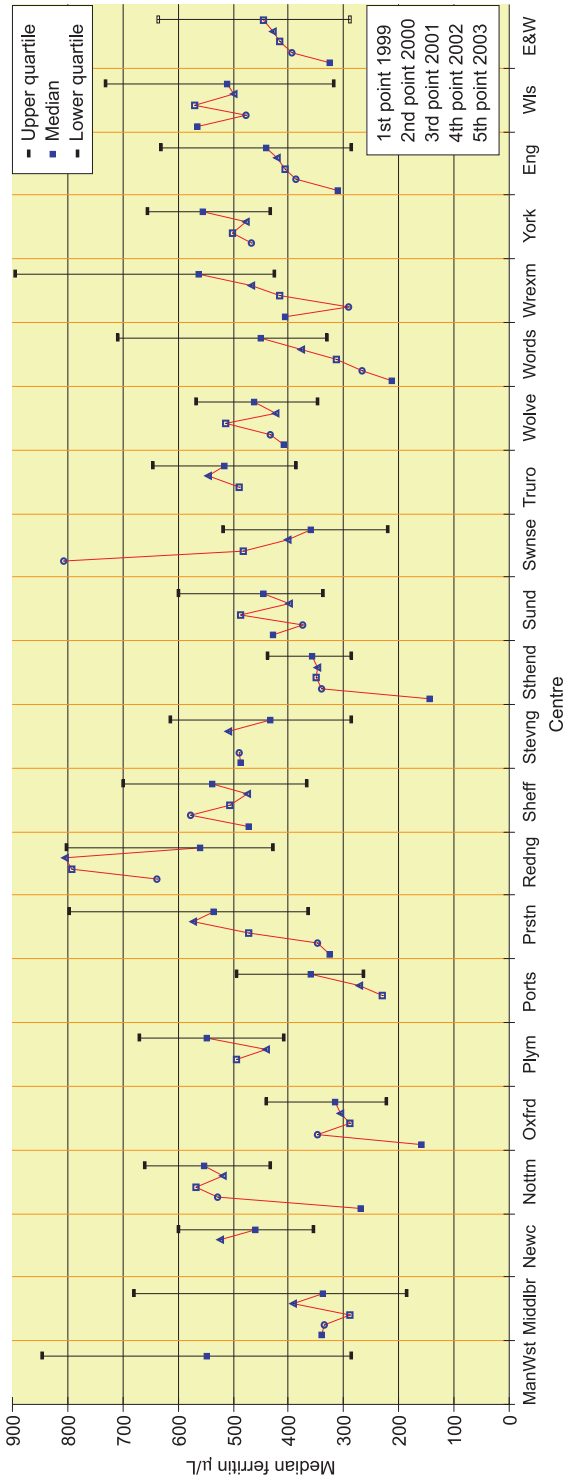


Figure 8.14: Serial ferritin concentration in haemodialysis patients

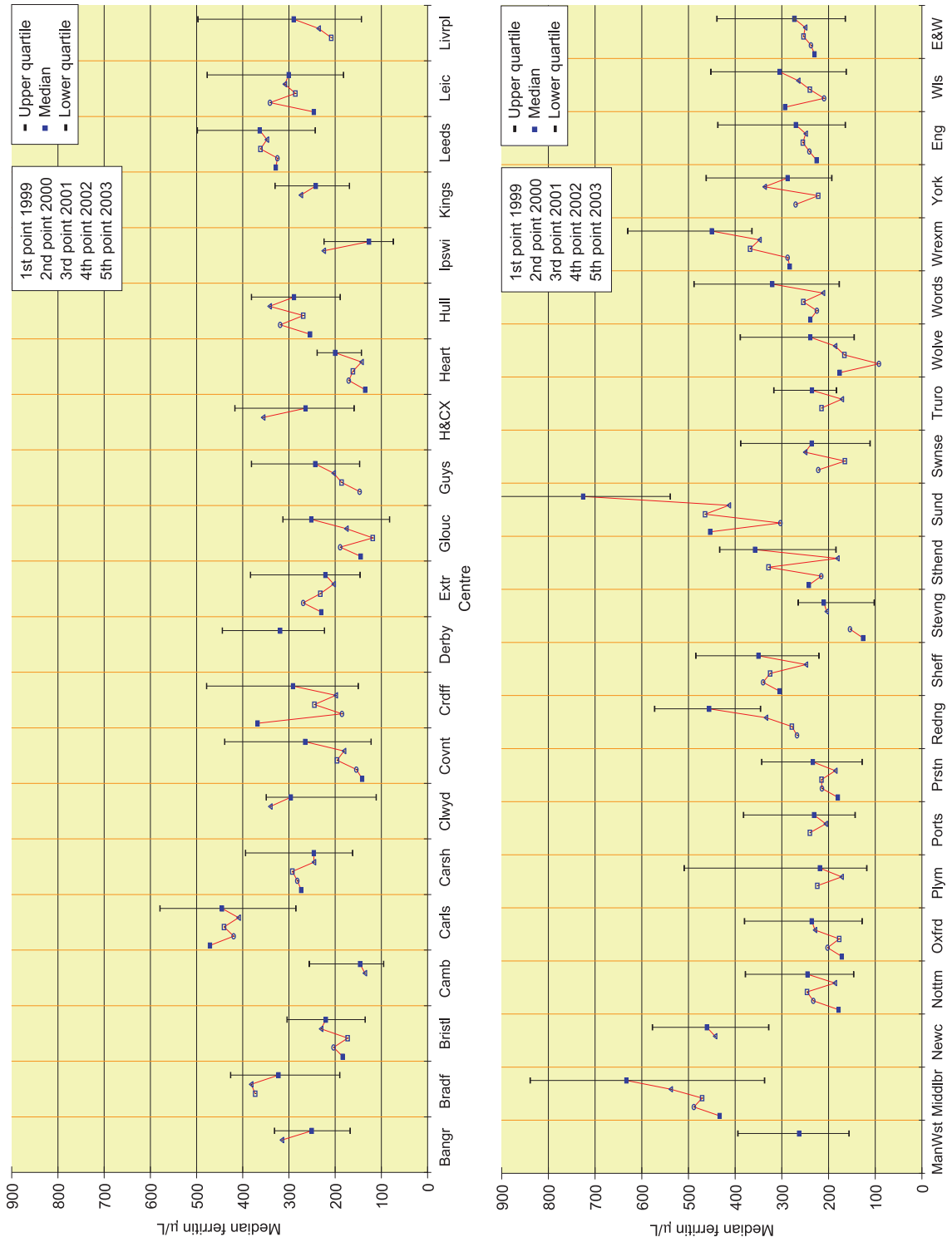


Figure 8.15: Serial ferritin concentration in peritoneal dialysis patients

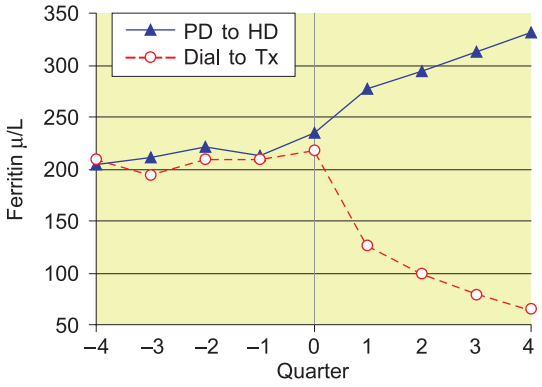


Figure 8.16: Change in serum ferritin before and after modality change

Figure 8.16 shows that after changing from PD to HD, serum ferritin increased from a median of 200 µg/L to 330 µg/L by the end of 12 months, although this was still below the average ferritin of 440 µg/L for HD patients in E&W. In contrast, dialysis patients receiving a transplant showed a marked fall in serum ferritin (associated with a rise in Hb to 13.5 g/dl). It is of note that median serum ferritin in the dialysis patients who were transplanted was lower than the median ferritin of all those on dialysis.

Erythropoietin stimulating agents

In the previous chapter there continues an annual increase in the haemoglobin achieved by renal units. For E&W, only 15% and 11% of HD and PD patients had an Hb <10 g/dl. This would leave a medium size renal unit (700,000 population), with approximately 200 patients on HD and 100 on PD, **with 30 and 11 patients respectively with a haemoglobin <10 g/dl**. These numbers are very small and interpretation of the variation in percentage of patients with an Hb <10 g/dl and not on ESAs MUST be viewed with caution.

In a similar way to the rest of the Registry data the ESA data is collected from renal IT systems, although in contrast to the automated laboratory links this relies on manual data entry. The reliability of these data depends on who is entering the data (doctor, EPO nurse, or data clerk), whether the renal unit is prescribing the ESA directly (within the renal unit budget) or whether ESAs are prescribed by the GP (from the PCT budget). In the latter case, the data in the renal IT system may not always be updated with that of the GP letter or the GP may decline to prescribe ESAs at the higher dose advised by the nephrologist.

Patients treated and dose variation

ESA data were returned by 22 centres for HD (table 8.4) and 21 centres for PD (table 8.5), though for several centres data were available only for one modality. For both HD and PD, more patients were treated with ESAs than in the 2002 report (91% vs 83% for HD; 77% vs 65% for PD), though achieved haemoglobins were also higher. The percentage of patients receiving ESAs ranged from 82 to 97% (mean 91%) for HD and from 58–90% (mean 77%), for PD. Only one unit (Middlesbrough) prescribed ESAs to a higher percentage of PD than HD patients. In several other centres (notably Coventry, Guys and Leeds) strikingly fewer PD than HD patients received ESAs. It is of note, that the median haemoglobin of PD patients from these 3 centres was the same as or higher than that in the HD population. In addition, the percentage of PD patients with Hb <10 g/dl who were receiving ESAs was higher than the overall percentage of patients treated with ESAs. This suggests that the difference between modalities reflects lower ESA requirements in the PD population in these centres, rather than being due to problems in providing ESAs for this group.

As in previous reports, the percentage of patients achieving a haemoglobin over 10 g/dl without ESAs, was markedly higher for PD than HD, despite a higher median ferritin in the HD population of 440 µg/L compared with that of 267 µg/L in the PD population. This reflects the greater susceptibility of HD patients to anaemia and a probable offsetting effect of greater residual renal function in PD patients. In respect of patients with an Hb <10 g/dl, three centres (Gloucester, Plymouth and Sunderland) succeeded in prescribing ESAs for all patients in both modalities. Only Ipswich and Middlesbrough, who prescribed ESAs for all PD patients with an Hb <10 g/dl, treated a greater proportion of PD than HD patients in this category.

HD patients continued to receive larger doses of ESAs than their PD peers (median 8000 vs 5000 units/wk; mean 9197 vs 5831 units/week

Table 8.4: ESA prescribing in HD patients

Treatment Centre	% on ESA	Mean weekly dose for pts on ESA	Median dose for Hb pts on ESA	Hb <10 g/dl % on ESA	Hb ⩾10 g/dl % not on ESA
Bangor	95	10021	8500	100	6
Bradford	93	7509	6000	75	6
Bristol	93	8209	6000	95	7
Coventry	85	10827	10000	76	12
Cardiff	96	9000	9000	95	2
Exeter	95	8288	7500	93	2
Gloucester	97	10568	9000	100	4
Guys	90	–	–	94	10
Ipswich	84	7595	8000	88	16
Kings	95	–	–	95	4
Leeds	94	10194	9000	98	6
Leicester	94	9627	8000	98	6
Liverpool	91	9780	9000	94	6
ManWest	82	9213	8000	97	6
Middlesbrough	88	6413	6000	90	9
Plymouth*	n/a	8488	7000	100	12
Sheffield	92	9713	8000	95	9
Stevenage	85	11370	10000	94	12
Southend	89	6065	4000	78	8
Sunderland	89	7424	6000	100	13
Truro	90	4786	4000	95	11
York	89	11537	10000	100	5
England	90	9186	8000	94	8
Wales	96	10000	9000	96	2
Eng & Wales	91	9197	8000	94	7

*data from Plymouth incomplete

respectively). For HD, two of the three units prescribing the highest median dose of 10000 units/wk (Stevenage and York) delivered haemoglobins above the national median, though the third (Coventry) which treated the same percentage of patients with ESAs as Stevenage, reported a median Hb slightly below the national median. In respect of PD, three of the five units prescribing a median dose of 6000 units/week or more (Coventry, Carlisle and Sheffield) reported a median haemoglobin near the bottom of the national range, though all three centres also treated a smaller percentage of PD patients than the national average. As in previous reports, centres prescribing higher doses of ESAs were not necessarily more successful in meeting haemoglobin targets, reflecting the importance of other influences on renal anaemia including iron status, residual renal function, case mix and dialysis adequacy.

ESAs and time on renal replacement therapy

From table 8.6, the percentage of HD patients receiving ESAs during their first year of dialysis corresponded exactly to the overall national median percentage for the HD population. This demonstrates that HD patients in need of ESAs commenced treatment before or soon after starting haemodialysis. For PD, the percentage treated with ESAs during the first year of dialysis was slightly below that of the overall national median, but subsequently exceeded this from 2–3 years onwards. This may reflect delay in the commencement of ESAs in PD patients, or more probably the effect of a progressive loss of residual renal function from the second year of RRT onwards, resulting in increasing anaemia and therefore ESA requirements.

Table 8.5: ESA prescribing in PD patients

Treatment Centre	% on ESA	Mean weekly dose for pts on ESA	Median dose for Hb pts on ESA	Hb <10 g/dl % on ESA	Hb ⩾10 g/dl % not on ESA
Bangor	76	4000	4000	100	21
Bristol	75	5072	4000	83	26
Carlisle	71	7682	6000	100	28
Coventry	58	7048	7000	71	43
Cardiff	82	–	–	93	18
Exeter	85	6001	4500	86	15
Gloucester	78	4940	4000	100	27
Guys	69	3600	3600	83	33
Ipswich	74	5674	4000	100	26
Kings	86	–	–	82	7
Leeds	71	6337	4500	92	30
Leicester	76	4664	4000	80	24
Liverpool	85	6426	6000	93	15
ManWest	77	5326	5000	74	22
Middlesbrough	90	4842	4000	100	11
Plymouth	83	6000	6000	100	18
Sheffield	74	7802	6000	87	30
Stevenage	79	5317	4000	100	23
Sunderland	88	5071	4000	100	14
Truro	82	4038	4000	100	17
Wordsley	90	5477	4000	100	11
England	77	5863	5000	85	23
Wales	81	4000	4000	88	18
Eng & Wales	77	5831	5000	85	23

Table 8.6: ESA use and length of time on RRT

	Time on treatment (years)					
	<1 (%, no)	1–2 (%, no)	2–3 (%, no)	3–5 (%, no)	5–10 (%, no)	10+ (%, no)
Haemodialysis	91 (768)	92 (858)	94 (675)	92 (806)	89 (749)	86 (488)
Peritoneal dialysis	75 (275)	75 (246)	82 (216)	78 (235)	79 (169)	80 (99)

Age and ESA provision

Only minor variations were seen with age in the percentage of HD patients treated with ESAs, with slightly lower treatment rates in the 35–64 year age group (table 8.7). In comparison with 2002 data, fewer HD patients achieved an Hb ⩾10 g/dl without ESAs, though this may simply reflect higher overall treatment rates in the current report. Treatment rates in PD patients showed more significant variations with age, falling from 87% in the 18–34 age group to 74% in 45–64 age group (table 8.8). Consistent with this, was the higher percentage of PD patients aged 45–64 who achieved an Hb ⩾10 g/dl without ESAs (figure 8.17).

ESA prescription and gender

As in previous reports, a greater percentage of females than males were treated with ESAs in

Table 8.7: Percentage use of ESAs, by Hb achievement and age, on HD

Age Group (years)	18–34	35–44	45–54	55–64	65–74	75+
% on EPO	92	88	89	91	92	91
% Hb <10 on ESA	97	93	93	95	94	94
% Hb >10 no ESA	7	12	9	8	7	5

Table 8.8: Percentage use of ESAs, by Hb achievement and age, on PD

Age Group (years)	18–34	35–44	45–54	55–64	65–74	75+
% on EPO	87	80	74	75	76	77
% HB <10 on ESA	90	90	90	87	70	92
% HB >10 no ESA	15	20	28	26	22	22

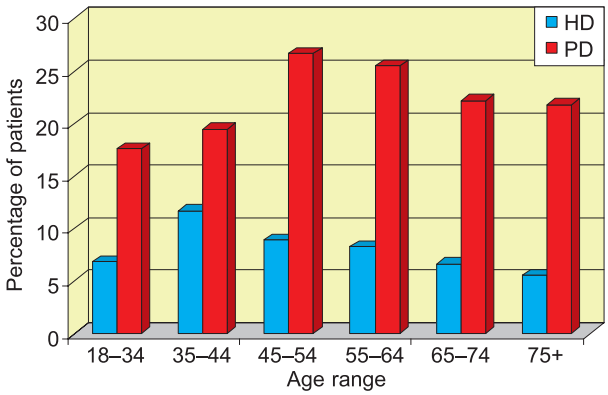


Figure 8.17: Percentage of patients with Hb ⩾10 g/dl, by age group and modality

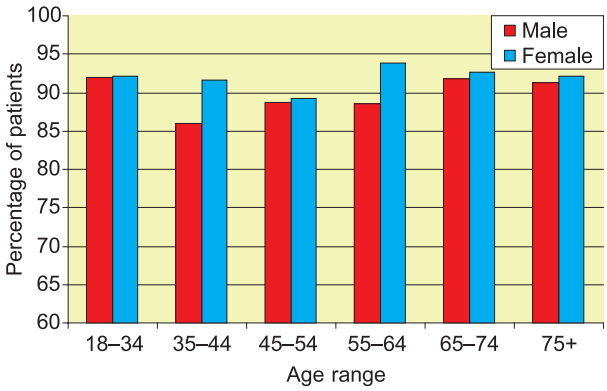


Figure 8.18: Percentage provision of ESAs by age and gender, for patients on HD

both dialysis modalities, despite a lower achieved haemoglobin in females (tables 8.9 and 8.10). For PD, this effect was particularly pronounced in the 35–64 age group, perhaps because the increased susceptibility to anaemia of women within this group is relatively more important than in HD where dialysis blood losses over-ride gender differences (figures 8.18 and 8.19). For both modalities, more males than females achieved a haemoglobin over 10 g/dl without ESAs, though this effect was more pronounced in PD (tables 8.9 and 8.10).

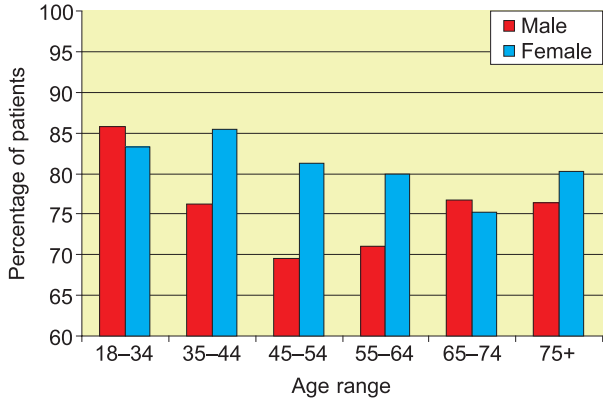


Figure 8.19: Percentage provision of ESAs by age and gender, for patients on PD

Table 8.9: ESA treatment, by gender, on HD

Gender	Mean Hb g/dl	Standard deviation	% on ESA	Hb <10 g/dl % on ESA	Hb ⩾10 g/dl % without ESA
Male	11.6	1.6	90	93	8
Female	11.3	1.6	92	95	6

Table 8.10: ESA treatment, by gender, on PD

Gender	Mean Hb g/dl	Standard deviation	% on ESA	Hb <10 g/dl % on ESA	Hb ⩾10 g/dl % without ESA
Male	12.1	1.7	74	82	26
Female	11.6	1.6	81	88	19

Conclusion

The continuing rise in median serum ferritin and the percentage of patients with serum ferritin greater than 100 μmol/L seen in this year's report show that the provision of intravenous iron for UK dialysis patients continues to improve. Whilst there remain marked differences in achieved ferritin between centres, examination of serial data and comparison of the iron status of HD and PD patients in individual units suggest that this may be due to policy decisions about iron replacement therapy rather than simply to the superiority of some intravenous iron programmes over others. Although the returns on ESA treatment remain incomplete, they show a continuing increase in the number of patients treated compared with 2001 data. The percentage of patients requiring ESAs and the doses they received, remained markedly higher in HD than PD, though in contrast to HD, the number of PD patients receiving ESAs increased with time on dialysis.

Overall, the data demonstrate that UK renal units continue to accord a high priority to the management of factors influencing haemoglobin, and suggest that iron and ESA therapy are increasingly monitored and modified to address local priorities in the treatment of renal anaemia.