

Chapter 7: Haemoglobin

Summary

- Improvement in haemoglobin concentrations of patients receiving dialysis treatment continued in 2003. 84% of haemodialysis patients and 88% of peritoneal dialysis patients had a haemoglobin concentration above the Renal Association target of 10 g/dl. In total, 85% of all dialysis achieved an Hb \geq 10 g/dl.
- Only 6% of prevalent HD patients and 4% of PD patients had an Hb $<$ 9 g/dl.
- Haemoglobin in the first quarter of dialysis treatment has also continued to rise although 41% of individuals new to dialysis still had an Hb $<$ 10 g/dl in 2003 (cf 43% and 45% in 2002 and 2001 respectively). 19% had an Hb $<$ 9 g/dl in 2003.
- 65% of haemodialysis patients and 72% of peritoneal dialysis patients achieve a haemoglobin above the European guidelines of 11 g/dl. 67% of the 11,456 dialysis patients with haemoglobin returns had an Hb \geq 11 g/dl.
- Several centres appear to achieve a narrower control of haemoglobin concentration within their patient populations as evidenced by a smaller standard deviation of 1.0. This smaller sd is not related to centre size and either indicates a systematic approach, a difference within the patient cohort (eg comorbidity) or a random statistical variation.

Introduction

This chapter describes data reported to the Renal Registry at the end of 2003, relating to the management of anaemia. The third edition of the Renal Association Standards document has stated that:

individuals with chronic renal failure should achieve a haemoglobin of 10 g/dl within 6 months of being seen by a nephrologist

unless there is a specific reason why it could not be achieved.

To date the proportion of patients with chronic renal failure who cannot achieve a haemoglobin of 10 g/dl for clinical reasons is not known and so there is no longer a proportion stated as a standard. Renal centres will judge their performance by comparison with other centres through data submitted to the Renal Registry. United States and European clinical guidelines set the target for haemoglobin at 11 g/dl and some UK nephrologists may use protocols designed to achieve this higher target.

The UK Renal Registry collects data on patients receiving RRT and records the date that RRT starts. The Registry does not as yet have sufficient information on data pre-dialysis to allow analysis of the requirement to achieve the target haemoglobin within 6 months. Several renal units are achieving similar haemoglobin levels pre-dialysis to those post dialysis indicating a systematic approach to treating anaemia in patients with chronic kidney disease.

As in previous years the number preceding the centre name in all the figures indicates the percentage of missing data for that centre.

Inclusion criteria

Patients on dialysis during the last quarter of 2003 were included in the analysis if they had been on the same modality of dialysis in the same centre for 3 months. The latest available haemoglobin reading from each patient in the last quarter of 2003 was used in the analysis.

Completeness of data

The completeness of haemoglobin returns to the Registry are shown below in table 7.1. The Wirral renal unit does not have an automated lab link into the Liverpool renal system and this accounts for their low level of data return.

Table 7.1: Completeness of haemoglobin data

Centre	HD	PD
Bangr	100	100
Bradf	100	98
Bristl	100	100
Camb	71	100
Carls	93	94
Carsh	85	99
Clwyd	96	92
Covnt	99	96
Crdff	95	97
Derby	88	94
Extr	97	100
Glouc	98	100
Guys	96	100
H&CX	99	99
Heart	90	100
Hull	96	98
Ipswi	100	98
Kings	97	94
Leeds	99	98
Leic	98	99
Livrpl	87	94
ManWst	69	98
Middlbr	97	100
Newc	93	98
Nottm	97	100
Oxfrd	99	100
Plym	81	89
Ports	94	88
Prstn	95	99
Redng	98	100
Sheff	100	100
Stevng	93	100
Sthend	98	100
Sund	98	100
Swmse	74	99
Truro	98	94
Wirrl	11	13
Wolve	99	100
Words	100	100
Wrexm	85	94
York	93	100

Haemoglobin achievement by dialysis centres for all prevalent patients

The data describing the haemoglobin distribution in each centre is tabulated in table 7.2 for haemodialysis and table 7.3 for peritoneal dialysis and also shown in figures 7.1 and 7.2. The percentage of patients with haemoglobin ≥ 11 g/dl for each centre is also shown in the tables for the information of those centres that regard this as the most appropriate target. Once again, in 2003 there was an increase in the percentage of haemodialysis patients with haemoglobin ≥ 10 g/dl (84% in England and 85% in Wales compared to 82% and 84% respectively in 2002). For peritoneal dialysis patients the percentage with haemoglobin ≥ 10 g/dl stayed constant at 88% in England and 89% in Wales.

The percentage of patients with haemoglobin ≥ 11 g/dl has increased for both haemodialysis and peritoneal dialysis patients in both England and Wales (62% in 2002 increasing to 65% in 2003 for haemodialysis and 71% in 2002 increasing to 72% in 2003 for peritoneal dialysis). This increase could indicate that some centres are aiming to achieve the European target of haemoglobin 11 g/dl or that there is increased recognition that to achieve the Renal Association target of 10 g/dl in a high proportion of patients a median haemoglobin over 11 g/dl is required.

Figures 7.3, 7.4, 7.5, 7.6, 7.7 and 7.8 compare haemoglobins in dialysis centres by median haemoglobin, percentage with Hb ≥ 10 g/dl and percentage Hb ≥ 11 g/dl for patients on haemodialysis and peritoneal dialysis. As in previous years reports there is a broad spread of data across different dialysis centres for median haemoglobin and for percentage attainment of the Renal Association target. For haemodialysis the 90% range is unchanged compared to 2002. The quartile range for haemodialysis was 10.4–12.5 in 2002 and 10.5–12.6 in 2003. There is very little change between the ranges in 2002 compared with 2003 for peritoneal dialysis.

There is no obvious relationship between centre size and haemoglobin management. The 5 centres with the highest percentage of patients

Table 7.2: Haemoglobin data for patients on haemodialysis

Centre	% data return	Median Hb g/dl	90% range	Quartile range	Mean Hb g/dl	Standard deviation	% with Hb ≥ 10	% with Hb ≥ 11
Bangr	100	11.8	9.4–14.9	10.7–12.9	11.8	1.5	86	64
Bradf	100	12.1	10.1–15.0	11.3–13.1	12.3	1.5	97	83
Bristl	99	11.8	8.8–14.3	10.7–12.5	11.7	1.5	88	71
Camb	71	11.1	7.7–14.1	10.1–12.4	11.2	1.9	76	54
Carls	93	11.2	9.2–12.6	10.5–11.7	11.1	1.0	84	62
Carsh	85	11.5	8.8–14.6	10.5–12.6	11.6	1.8	83	66
Clwyd	96	11.2	7.9–14.1	10.0–12.9	11.4	2.0	77	60
Covnt	99	11.4	8.7–13.9	10.4–12.4	11.4	1.6	83	60
Crdff	95	12.1	8.9–14.5	10.8–13.2	11.9	1.7	85	72
Derby	88	10.9	8.1–13.9	10.0–12.3	11.1	1.7	75	48
Extr	97	11.3	9.1–13.5	10.5–12.2	11.3	1.3	85	59
Glouc	98	11.7	8.8–13.8	10.7–12.5	11.6	1.5	86	73
Guys	96	11.3	9.2–13.7	10.4–12.4	11.4	1.5	84	59
H&CX	99	11.9	9.1–14.2	10.8–12.9	11.8	1.5	89	71
Heart	90	11.2	8.6–13.5	10.0–12.2	11.1	1.5	75	58
Hull	96	11.4	8.6–13.4	10.5–12.2	11.3	1.4	84	65
Ipswi	100	11.4	9.4–13.2	10.7–12.2	11.5	1.3	89	64
Kings	97	11.4	8.7–13.4	10.3–12.3	11.2	1.5	79	58
Leeds	99	11.8	9.2–14.0	10.9–12.6	11.7	1.5	89	74
Leic	98	10.9	8.8–13.6	10.0–12.0	11.1	1.5	76	49
Livrpl	87	12.0	9.2–15.1	10.7–13.4	12.0	1.9	87	71
ManWst	69	11.1	8.8–14.3	9.8–12.8	11.3	1.8	73	57
Middlbr	97	11.5	8.2–14.3	10.3–12.5	11.4	1.8	81	64
Newc	93	11.4	8.2–13.5	10.4–12.2	11.2	1.6	80	62
Nottm	97	11.6	9.1–14.3	10.4–12.6	11.6	1.6	86	66
Oxfrd	99	11.4	8.7–13.8	10.4–12.5	11.4	1.5	83	62
Plym	81	11.7	9.8–13.8	10.9–12.4	11.7	1.1	93	73
Ports	94	11.6	8.8–14.4	10.4–13.0	11.6	1.7	82	68
Prstn	95	11.8	8.7–14.2	10.5–12.9	11.7	1.7	85	66
Redng	98	11.7	8.9–14.5	10.6–12.8	11.7	1.6	86	68
Sheff	100	11.3	8.7–13.8	10.2–12.2	11.2	1.5	79	59
Stevng	93	11.7	9.4–14.0	10.6–12.6	11.7	1.5	89	67
Sthend	98	11.7	8.6–13.2	11.1–12.4	11.6	1.4	91	78
Sund	98	11.0	8.8–14.0	10.3–12.6	11.3	1.6	82	50
Swmse	74	11.6	8.9–14.4	10.3–13.0	11.6	1.8	82	65
Truro	98	11.1	9.4–12.7	10.4–11.5	11.0	1.0	82	57
Wolve	99	12.1	8.4–14.5	10.8–13.1	11.8	1.9	83	73
Words	100	11.1	8.9–14.1	10.2–12.2	11.2	1.5	80	54
Wrexm	85	12.7	9.6–14.5	11.6–13.5	12.4	1.5	94	82
York	93	11.9	9.1–14.2	10.9–12.8	11.8	1.6	88	72
Eng	93	11.5	8.8–14.1	10.4–12.5	11.5	1.6	84	64
Wls	89	12.0	8.9–14.5	10.7–13.1	11.9	1.7	85	70
E&W	93	11.5	8.8–14.1	10.5–12.6	11.5	1.6	84	65

with an Hb ≥ 10 g/dl for haemodialysis are relatively small, each having fewer than 150 patients with data returned. However Hammer-smith & Charing Cross (H&CX) and Leeds are large centres (>400 patients) with good performance against the target. A number of smaller

units have a low percentage of patients with Hb ≥ 10 g/dl.

Figures 7.9 and 7.10 indicate the relationship between median Hb in a centre and the percentage of patients with Hb ≥ 10 g/dl or Hb

Table 7.3: Haemoglobin data for patients on peritoneal dialysis

Centre	% data return	Median Hb g/dl	90% range	Quartile range	Mean Hb g/dl	Standard deviation	% with Hb ≥ 10	% with Hb ≥ 11
Bangr	100	13.5	10.8–15.3	12.2–13.8	13.2	1.4	96	92
Bradf	98	12.8	9.8–15.0	11.7–13.8	12.7	1.7	94	85
Bristl	100	12.1	9.3–15.0	10.8–13.0	12.0	1.8	92	73
Camb	100	11.9	9.4–14.0	10.9–12.7	11.8	1.4	89	73
Carls	94	11.4	8.6–14.5	10.2–12.7	11.5	1.7	86	59
Carsh	99	12.2	9.4–14.8	11.2–13.1	12.1	1.6	93	78
Clwyd	92	12.2	8.8–14.3	9.9–12.5	11.7	1.8	75	67
Covnt	96	11.6	8.9–15.3	10.2–12.6	11.6	1.8	80	63
Crdff	97	12.3	9.3–14.8	11.0–13.1	12.1	1.7	90	75
Derby	94	11.7	8.6–14.5	10.7–12.8	11.8	1.7	84	70
Extr	100	11.7	9.7–13.8	11.0–12.5	11.7	1.3	91	75
Glouc	100	11.6	8.0–12.9	10.3–12.2	11.2	1.4	81	59
Guys	100	11.7	8.9–14.4	10.6–12.8	11.7	1.6	85	66
H&CX	99	11.9	9.2–14.6	11.0–13.1	12.0	1.7	91	77
Heart	100	11.8	8.9–14.0	10.7–12.5	11.6	1.5	86	71
Hull	98	11.5	9.3–14.3	10.7–12.8	11.6	1.5	82	69
Ipswi	98	12.3	9.7–14.4	11.2–13.0	12.2	1.5	95	78
Kings	94	12.3	8.7–14.9	11.0–13.1	12.0	1.8	86	75
Leeds	98	12.4	9.2–15.0	11.3–13.3	12.3	1.7	88	80
Leic	99	11.8	8.7–14.2	10.5–12.9	11.6	1.7	85	66
Livrpl	94	12.2	9.0–14.4	11.0–13.3	12.1	1.7	87	76
ManWst	98	11.2	8.9–14.0	10.1–12.4	11.3	1.6	81	54
Middlbr	100	12.5	9.0–14.3	11.5–13.3	12.1	1.9	86	76
Newc	98	12.0	8.8–14.1	10.5–12.9	11.8	1.7	82	72
Nottm	100	11.9	9.8–15.1	11.0–13.1	12.1	1.6	93	78
Oxfrd	100	12.2	8.9–14.6	11.1–13.1	12.1	1.6	89	79
Plym	89	12.0	10.2–14.7	11.2–12.6	12.1	1.3	95	83
Ports	88	12.0	9.2–15.7	10.7–13.2	12.1	2.0	85	70
Prstn	99	11.8	9.2–14.4	10.7–12.8	11.8	1.7	90	67
Redng	100	11.6	9.1–13.9	10.7–12.4	11.5	1.5	85	70
Sheff	100	11.4	8.4–13.9	10.3–12.6	11.4	1.7	81	60
Stevng	100	12.0	9.6–14.2	10.9–13.2	12.0	1.6	92	75
Sthend	62	12.0	10.0–16.3	10.9–12.8	12.2	1.8	96	65
Sund	100	11.3	9.6–14.2	10.5–12.5	11.5	1.4	88	63
Swmse	99	11.9	8.2–14.9	10.6–13.4	11.8	2.0	84	67
Truro	94	11.3	9.4–14.7	10.7–12.5	11.6	1.4	94	65
Wolve	100	12.5	9.6–15.5	11.2–13.4	12.4	1.7	93	80
Words	100	11.7	9.9–14.4	11.2–12.9	11.9	1.7	92	80
Wrexm	94	12.8	11.0–14.6	12.0–13.6	12.8	1.1	100	96
York	100	12.7	10.0–14.7	11.4–13.6	12.5	1.5	96	85
Eng	97	11.9	9.1–14.6	10.8–12.9	11.9	1.7	88	72
Wls	97	12.3	9.3–14.9	11.1–13.4	12.2	1.8	89	77
E&W	97	11.9	9.2–14.6	10.8–13.0	11.9	1.7	88	72

≥ 11 g/dl. For the first time this year there is a suggestion that a plateau may develop at higher median haemoglobins with little difference in percentage Hb ≥ 10 g/dl between centres with median haemoglobins ranging from 11.6 g/dl to

12.1 g/dl. The percentage Hb ≥ 10 g/dl in these centres is 85–90%. This may suggest that with current strategies it is not possible to achieve a higher proportion of haemodialysis patients with the target haemoglobin.

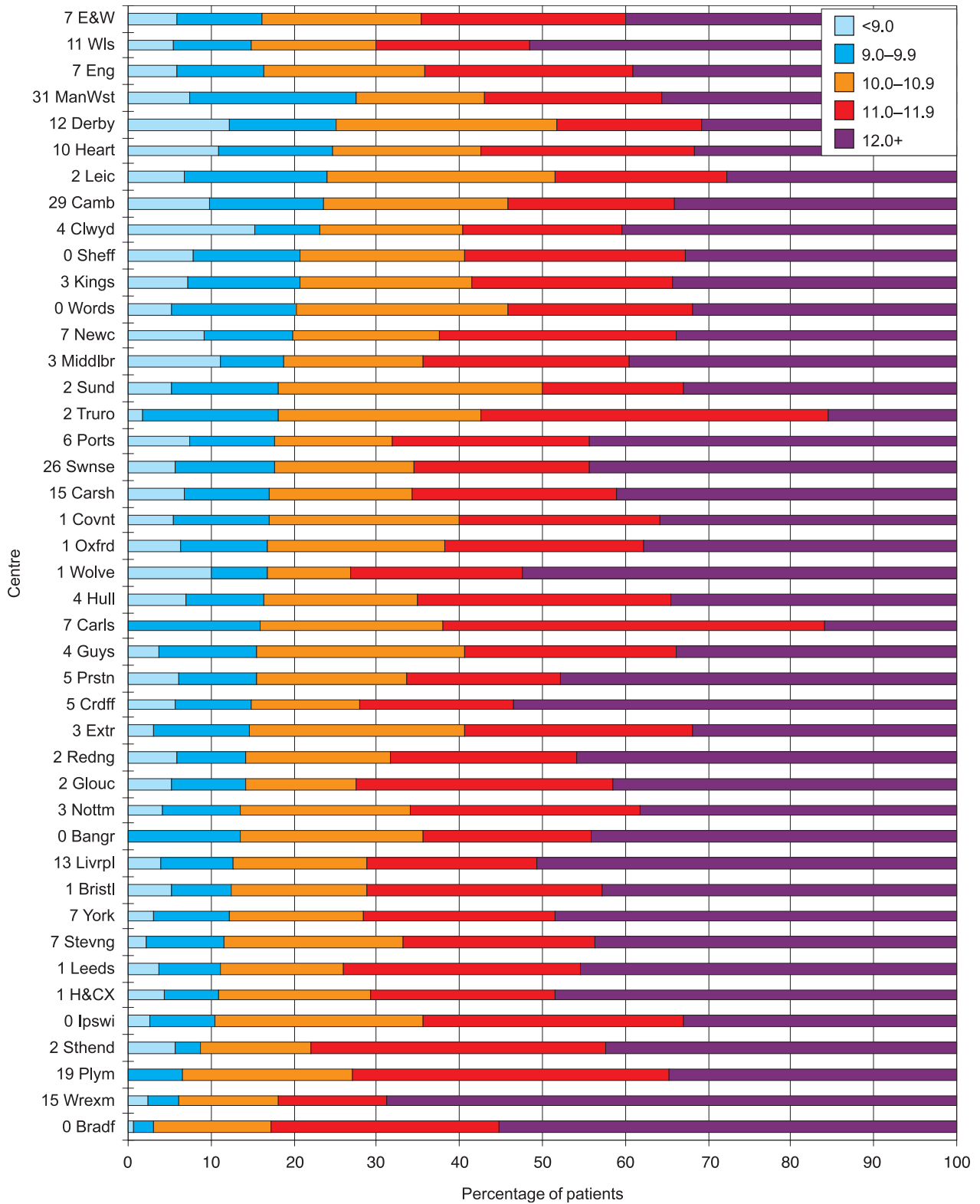


Figure 7.1: Distribution of haemoglobin in patients on HD

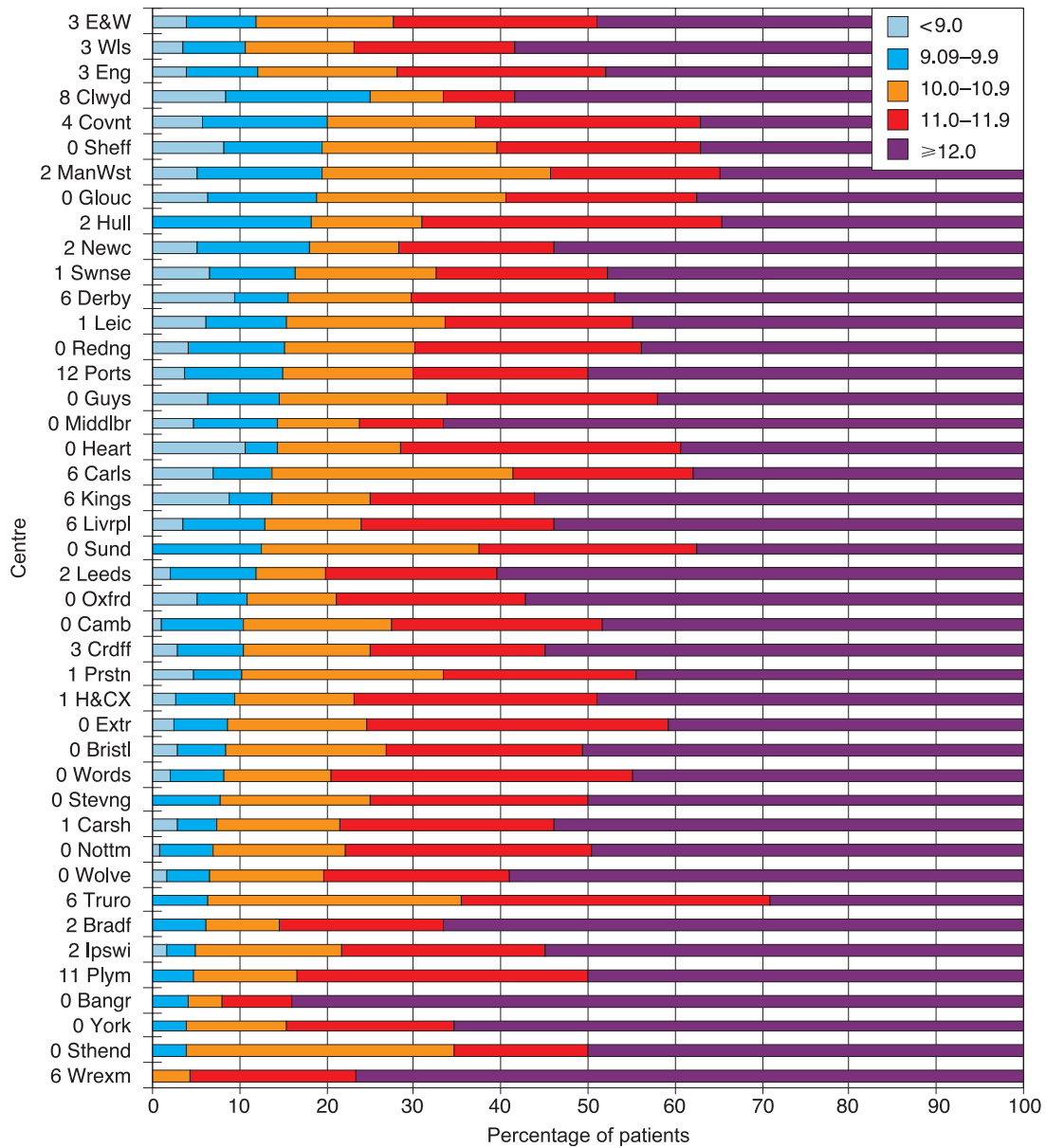


Figure 7.2: Distribution of haemoglobin in patients on PD

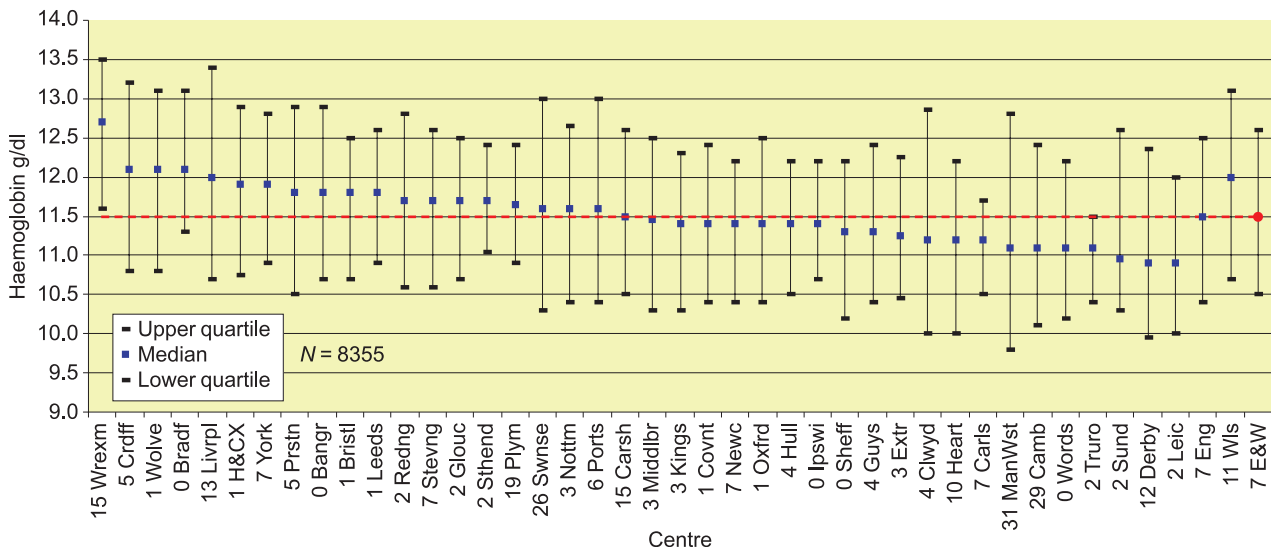


Figure 7.3: Haemoglobin and quartile ranges for HD patients

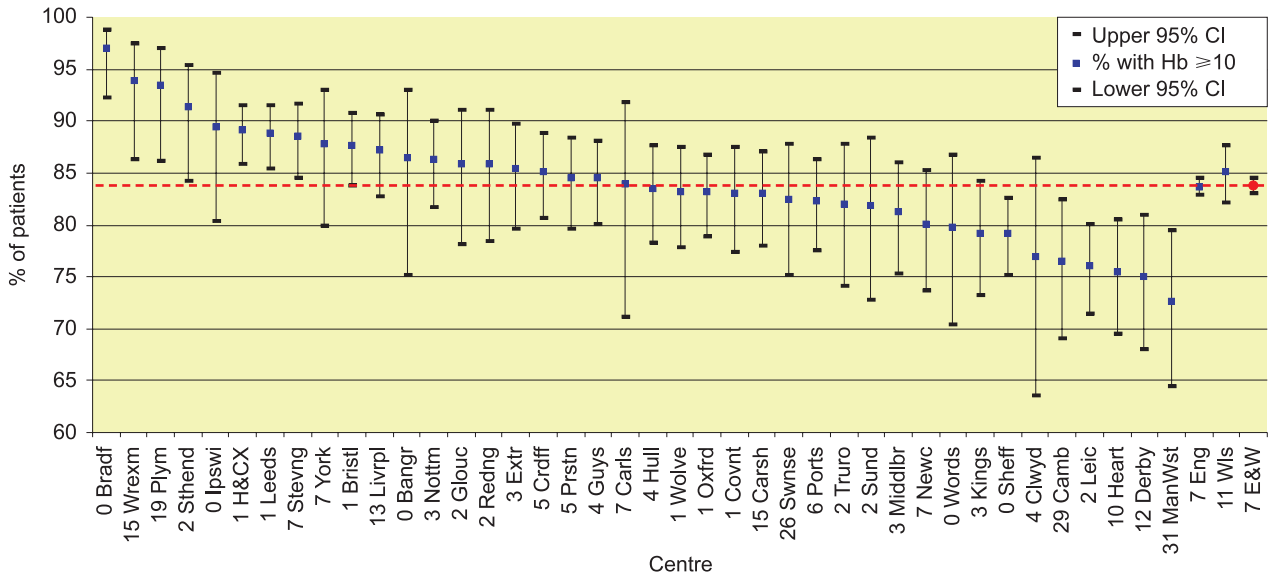


Figure 7.4: Percentage of HD patients, by centre, achieving RA target Hb

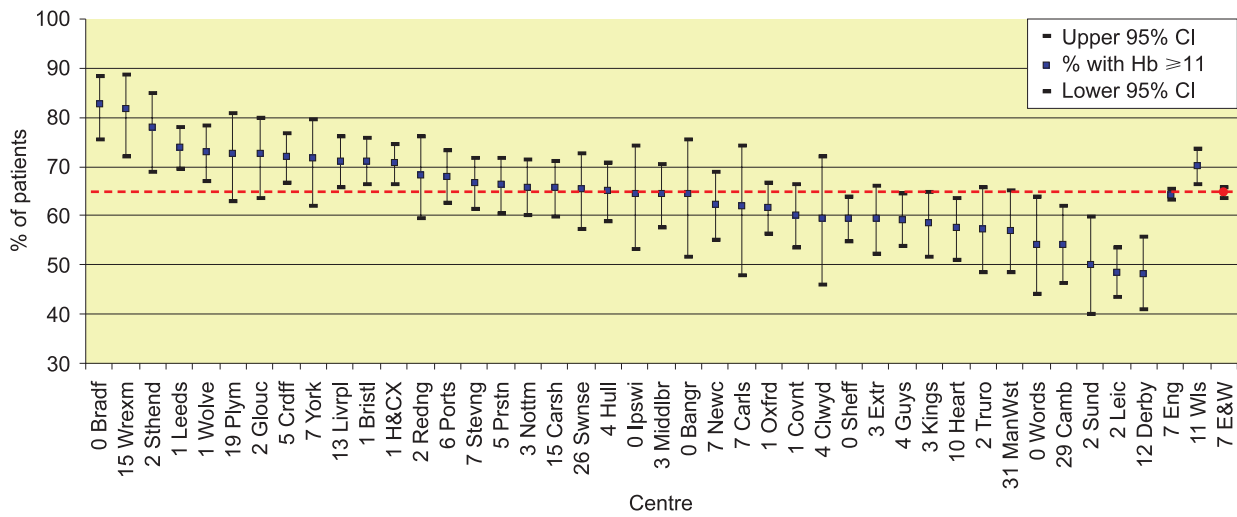


Figure 7.5: Percentage of HD patients with Hb > 11 g/dl

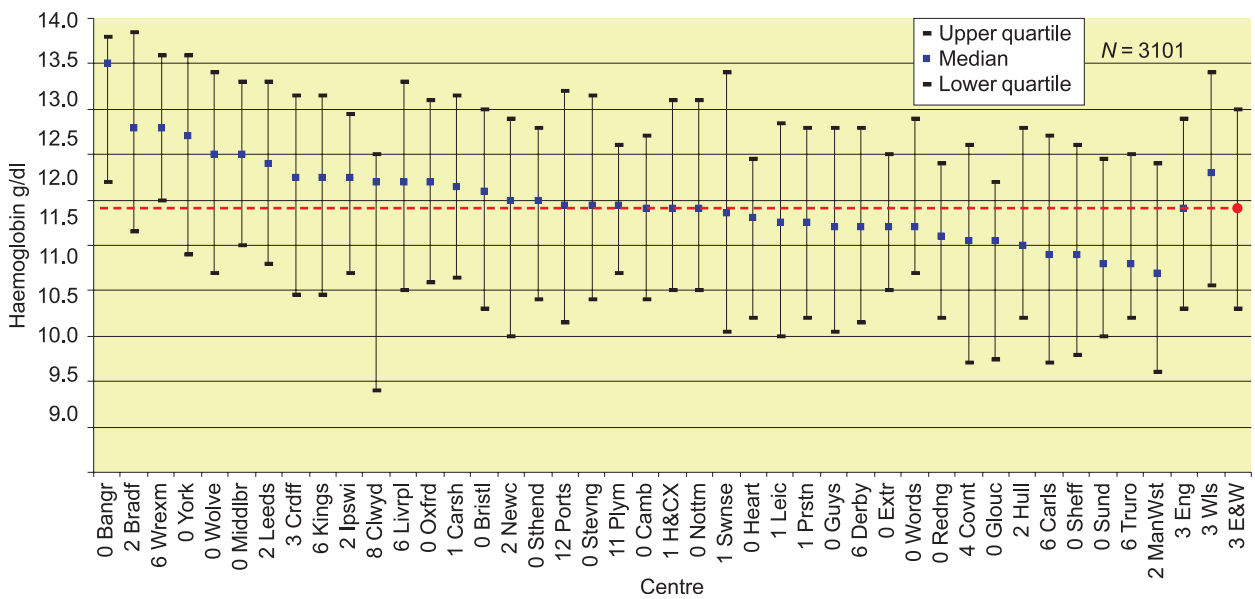


Figure 7.6: Haemoglobin and quartile ranges for PD patients

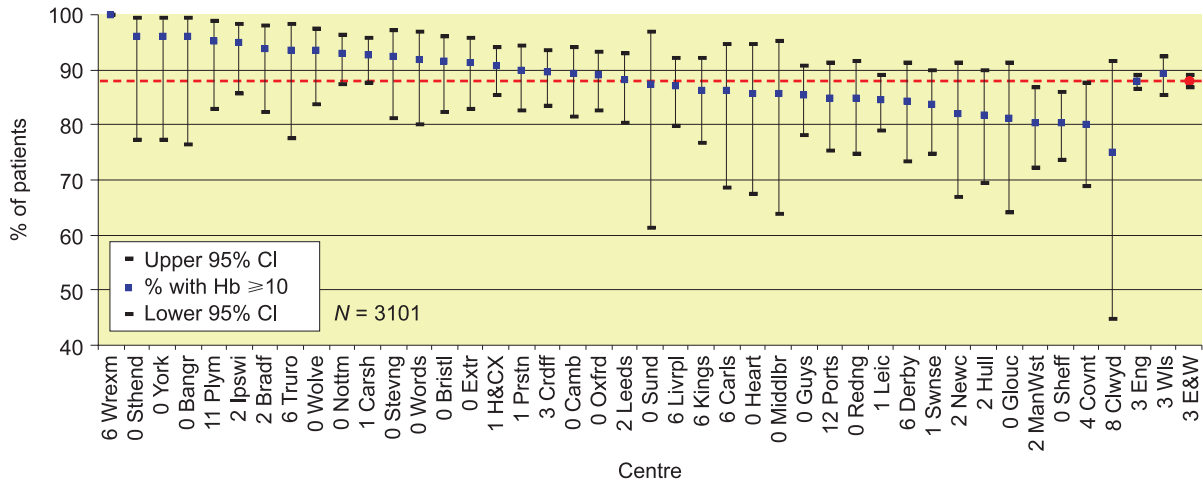


Figure 7.7: Percentage of PD patients, by centre, achieving RA target Hb

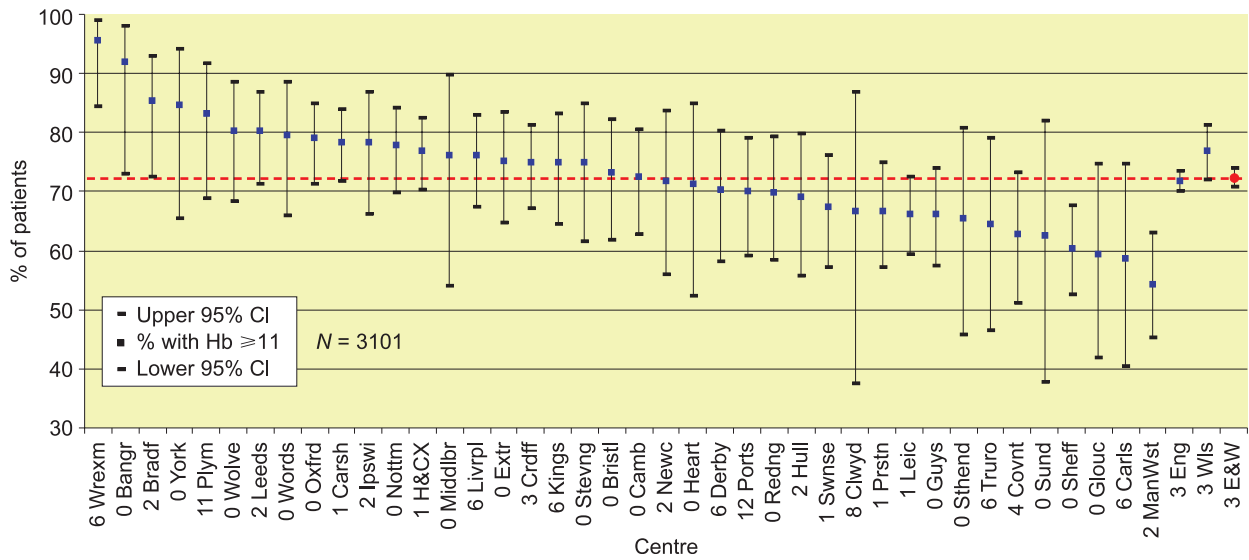
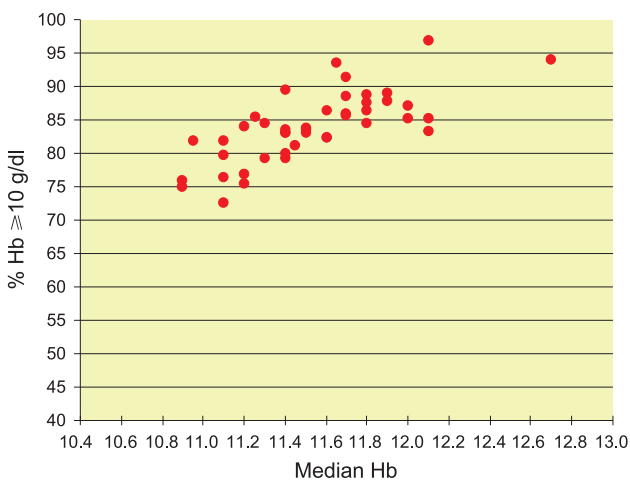
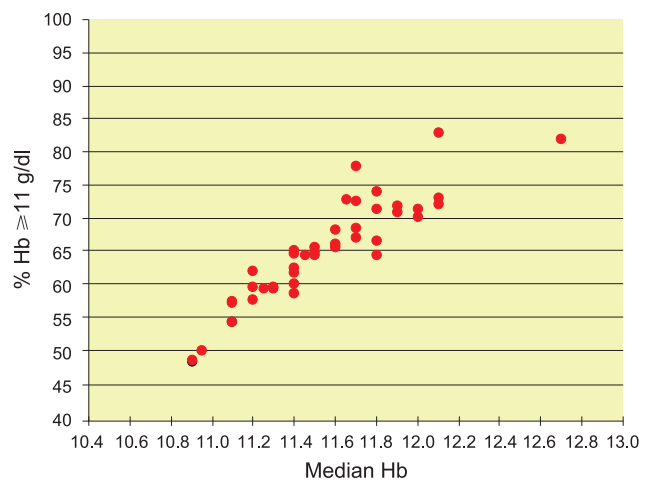


Figure 7.8: Percentage of PD patients with Hb > 11 g/dl



Percentage of patients with Hb ≥ 10 g/dl plotted against median Hb: HD



Percentage of patients with Hb ≥ 11 g/dl plotted against median Hb: HD

Figure 7.9

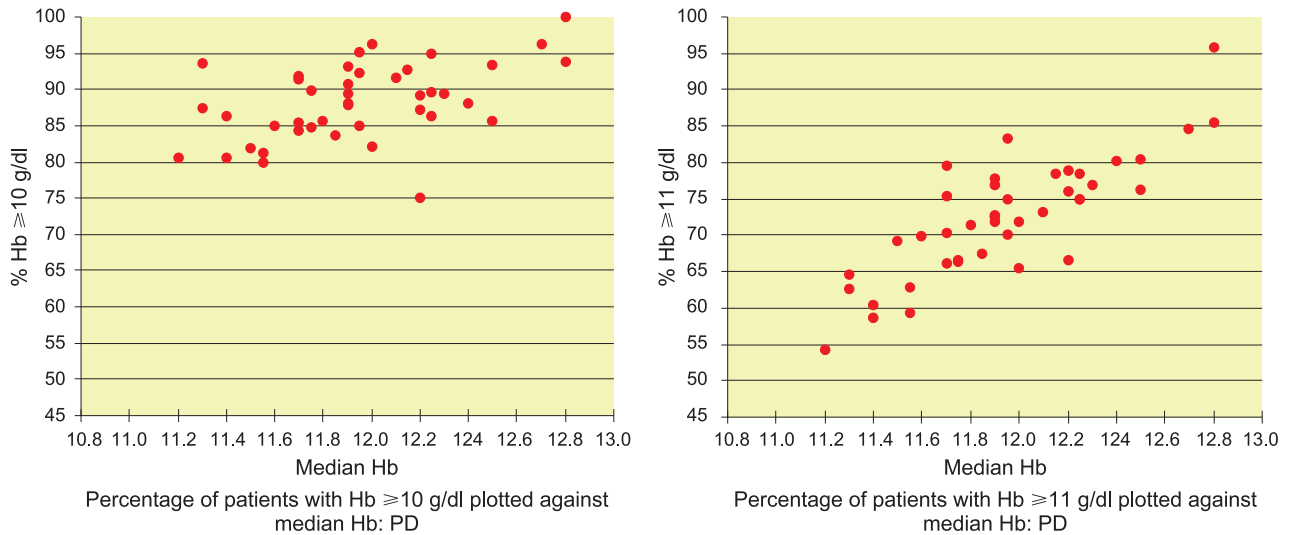


Figure 7.10

Haemoglobin concentrations in patients who have recently started RRT

The haemoglobin concentrations for the first quarter that individuals received dialysis in each centre are presented in table 7.4 and in figures 7.11, 7.12 and 7.13. These new patient data are compared to the data from prevalent dialysis patients in figure 7.14. The Renal Association haemoglobin target no longer distinguishes between patients with chronic renal failure who do or do not receive dialysis treatment.

There is a continuing increase in the percentage of new patients with Hb ≥ 10 g/dl (figure 7.15). The rate of increase has reduced in the past 2 years compared to previously, perhaps because of the proportion of patients who present as uraemic emergencies and have not had an opportunity for management of anaemia

prior to dialysis starting. Some units also experienced difficulties with prescription of erythropoietin to pre-dialysis patients. These factors no doubt also influence the variation in the difference in anaemia management between new and prevalent patients in centres.

Exeter for example, has the lowest percentage (41%) of new patients with Hb ≥ 10 g/dl but achieves 87% Hb ≥ 10 g/dl for prevalent patients. Guys, on the other hand, has 85% of prevalent patients with an Hb ≥ 10 g/dl and 73% of new patients. Figures 7.16 and 7.17 indicate the rate of increase of haemoglobin concentration of new patients over their first year of dialysis treatment. Median haemoglobin rises to 6 months and percentage Hb ≥ 10 g/dl may go on increasing up to 12 months. This data therefore supports the Renal Association standard that allows 6 months to achieve the target haemoglobin concentration.

Table 7.4: Haemoglobin levels for new patients starting dialysis

Centre	% data return	Median Hb g/dl	90% range	Quartile range	% Hb >10 g/dl
Bangr	97	10.2	8.0–15.1	9.4–11.4	61
Bradf	94	10.6	8.1–13.3	9.7–11.5	66
Bristl	100	10.4	8.0–13.3	9.3–11.3	60
Camb	89	10.5	7.7–14.0	9.3–11.7	64
Carls	97	10.6	7.2–13.8	9.4–11.6	61
Carsh	93	10.8	8.1–13.0	9.7–11.8	71
Clwyd	100	9.6	8.1–11.4	9.2–10.3	44
Covnt	93	10.4	8.3–13.4	9.6–11.4	67
Crdff	99	10.8	8.6–13.6	9.9–11.9	74
Derby	73	9.6	7.4–12.0	8.3–10.6	45
Extr	99	9.7	8.1–12.5	9.2–10.5	41
Glouc	100	10.2	7.9–12.9	9.1–10.9	59
Guys	85	10.8	8.6–13.1	9.9–11.7	73
H&CX	99	10.3	8.1–13.4	9.3–11.4	60
Heart	97	9.9	7.5–12.4	9.3–10.7	47
Hull	96	9.9	7.8–12.2	8.9–11.2	49
Ipswi	94	10.6	8.2–12.3	9.4–11.1	60
Kings	74	9.7	8.0–13.2	9.0–11.1	48
Leeds	94	10.3	7.7–13.6	9.3–11.2	64
Leic	99	10.1	7.8–12.9	9.1–11.2	54
Livrpl	99	10.4	8.2–13.4	9.2–11.4	61
ManWst	69	10.1	7.7–12.9	9.1–11.3	54
Middlbr	90	9.8	7.3–12.6	8.5–11.0	44
Newc	89	9.7	7.5–12.7	9.0–11.1	46
Nottm	100	10.1	8.1–13.5	9.1–11.4	51
Oxfrd	100	10.5	8.8–13.3	9.5–11.4	65
Plym	84	10.7	7.8–13.5	9.3–11.6	61
Ports	100	10.0	7.9–13.3	9.0–11.4	51
Prstn	98	9.9	7.8–13.0	9.0–11.4	48
Redng	100	10.5	8.3–13.4	9.5–11.6	65
Sheff	98	10.1	7.9–13.4	9.0–11.1	53
Stevng	99	10.4	8.2–13.6	9.2–11.3	63
Sthend	95	10.9	7.2–12.9	9.1–11.9	63
Sund	98	10.5	7.7–13.7	9.5–11.7	67
Swkse	95	9.9	7.6–12.7	8.8–11.1	45
Truro	100	10.6	7.9–12.8	9.5–11.5	67
Wolve	98	10.3	8.1–13.2	9.1–11.7	60
Words	100	10.0	8.4–14.0	8.8–11.2	50
Wrexm	81	10.4	8.6–12.5	9.8–11.1	68
York	96	10.8	7.7–13.6	10.1–11.7	77
Eng	93	10.3	8.0–13.2	9.2–11.4	58
Wls	96	10.3	8.1–13.3	9.3–11.5	61
E&W	93	10.3	8.0–13.3	9.2–11.4	59

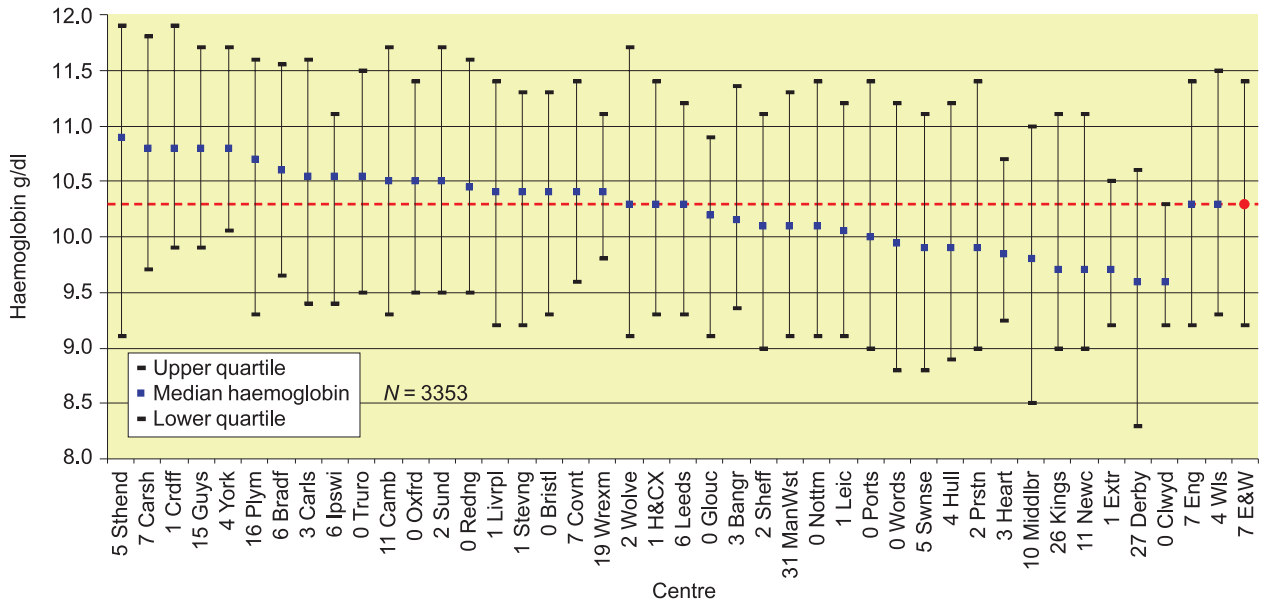


Figure 7.11: Haemoglobin median and quartile range for new patients

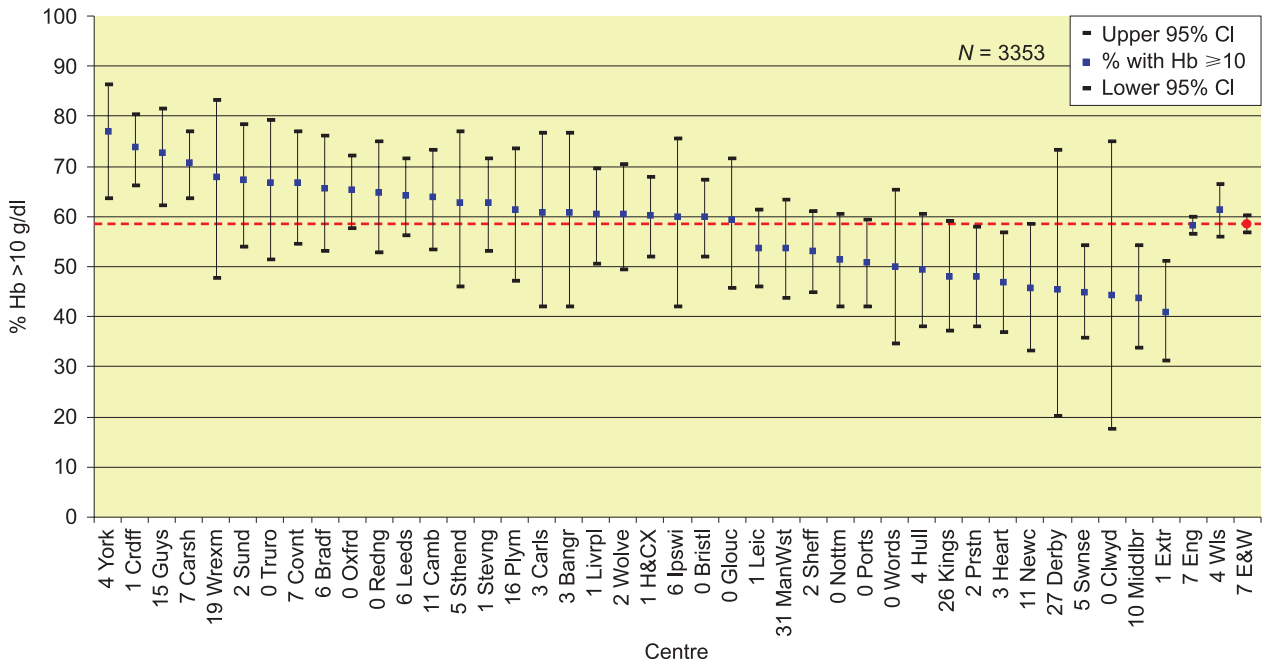


Figure 7.12: Percentage of new patients, by centre, achieving the RA target

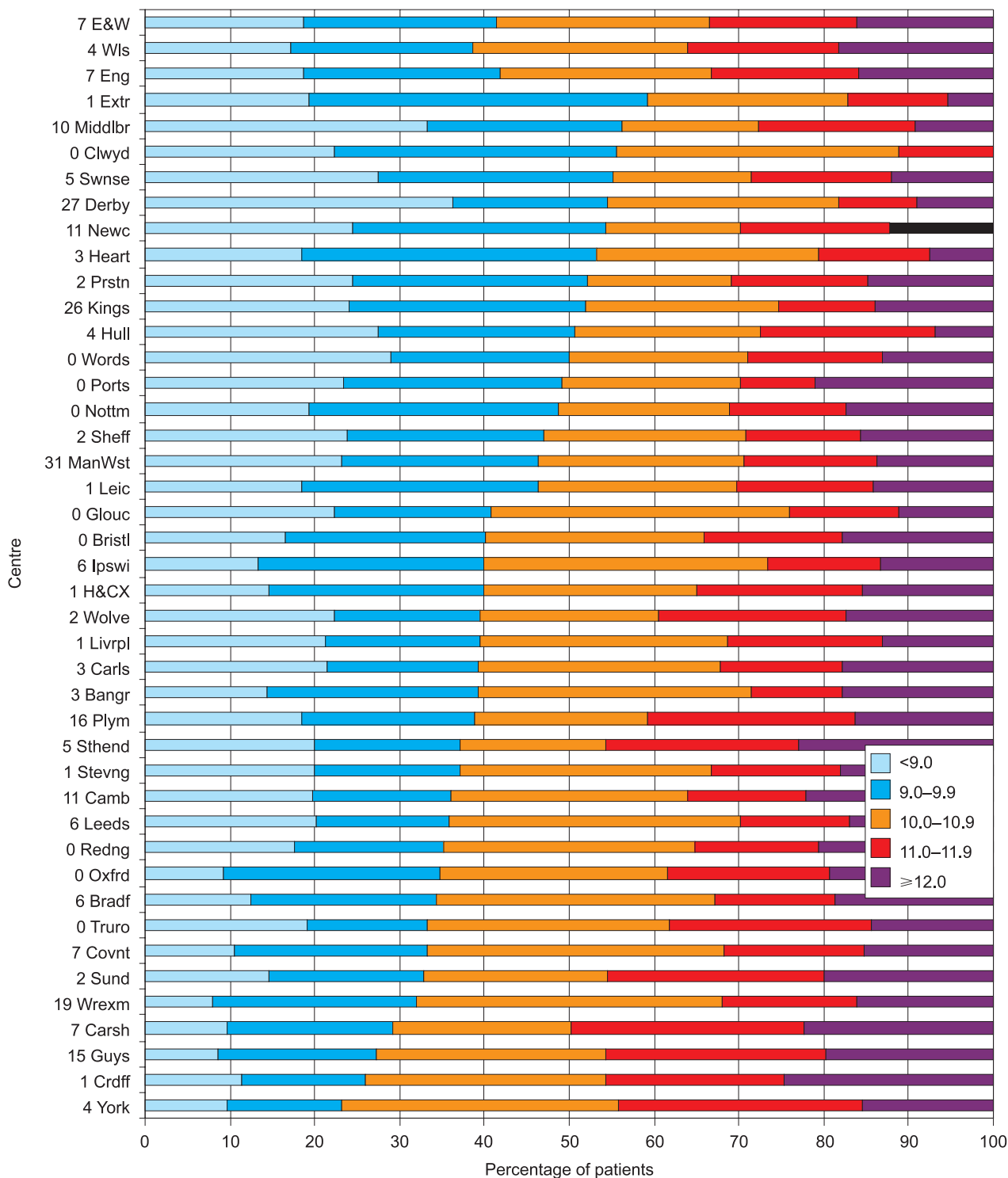


Figure 7.13: Distribution of haemoglobin for new patients

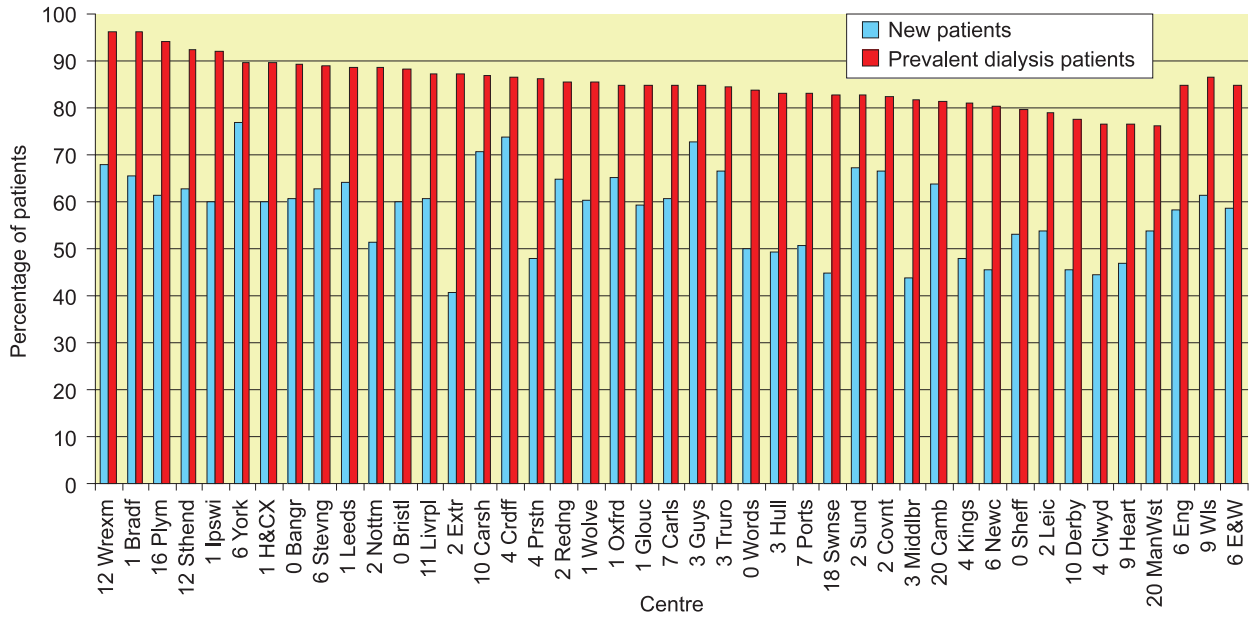


Figure 7.14: Percentage of new and prevalent patients with Hb ≥ 10 g/dl

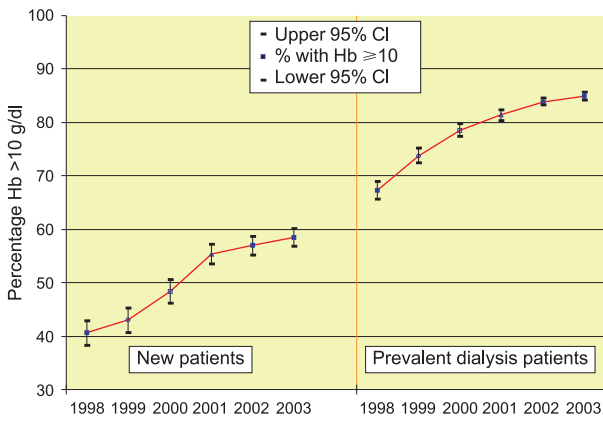


Figure 7.15: Change in percentage of patients starting RRT with Hb ≥ 10 g/dl in E&W 1998–2003

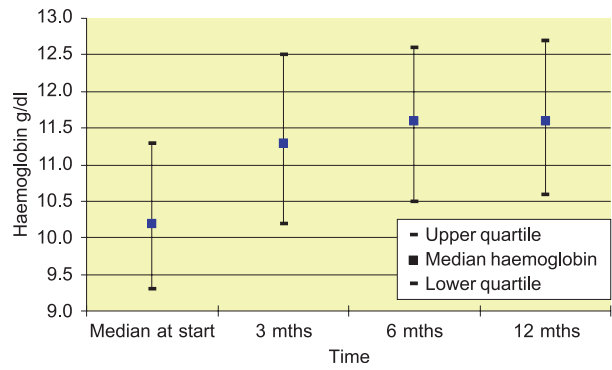


Figure 7.16: Serial median Hb for new patients in 2003

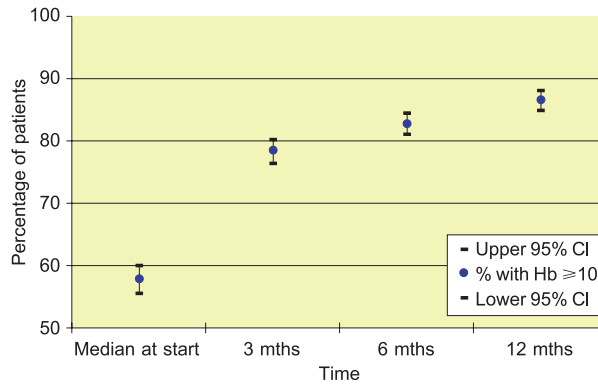


Figure 7.17: Serial percentage of new patients in 2003 with Hb ≥ 10 g/dl

Haemoglobin concentration and change of treatment modality

Figure 7.18 shows the effect on mean haemoglobin concentration of changing from peritoneal dialysis to haemodialysis. There is a sharp fall in haemoglobin concentration in the quarter following the change of dialysis modality. This will reflect the increased risk of anaemia on haemodialysis, failure of any remaining residual renal function after starting HD and also the effect of any illness that precipitated the change of treatment. It is of note that recovery of haemoglobin concentration may take as long as 9 months. Centres utilising algorithms for EPO prescribing may need to take modality data into account and EPO dose should be increased when changing modality.

Although patients on PD generally have a higher haemoglobin than those on HD (tables 7.3 and 7.2, 11.9 v 11.5 g/dl), it is of interest that those patients that change modality from PD have a below average haemoglobin of 11.5 g/dl. By one year post change this has risen back to 11.5 g/dl which is average for HD patients. This indicates that those patients remaining on PD are a separate medical group from those that change.

Dialysis patients who receive kidney transplants may experience a small fall in haemoglobin around the time of transplantation. There is a rapid rise post transplant such that the mean haemoglobin in the first quarter post transplant is substantially higher than the haemoglobin on dialysis. It may still take 6 to 9

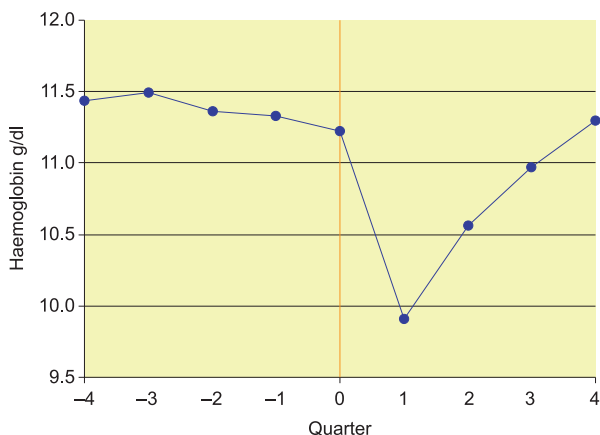


Figure 7.18: Haemoglobin by quarter before and after modality change PD to HD

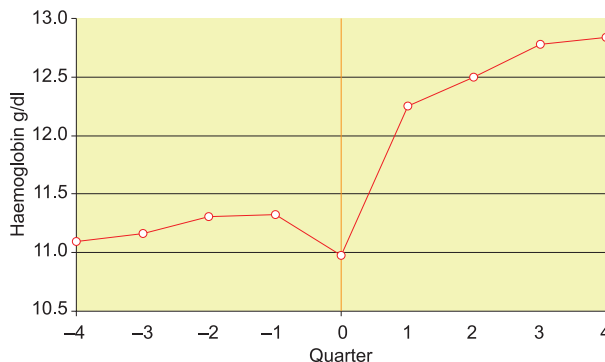


Figure 7.19: Haemoglobin by quarter before and after modality change dialysis to transplant

months post transplantation for haemoglobin to reach its long term level (figure 7.19).

Changes in anaemia management over time

Year on year the Registry data demonstrate an increase in the percentage of haemodialysis patients in England and Wales with haemoglobin ≥ 10 g/dl, this year reaching 82% (figure 7.20). The percentage of peritoneal dialysis patients reaching the target haemoglobin in 2003 was the same as in 2002 at 88%. This steady improvement of anaemia management nationally disguises considerable variability that occurs within single dialysis centres particularly those with relatively small numbers of patients (figures 7.21, 7.22, 7.23, 7.24). Many centres have small numbers of patients on peritoneal dialysis contributing to variability in these results. A single set of data for a particular centre must therefore be interpreted with caution.

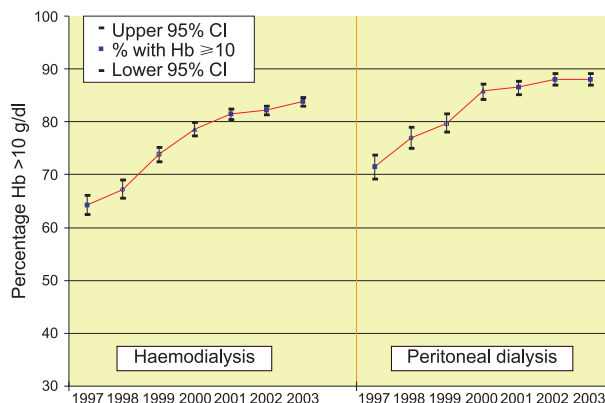


Figure 7.20: Percentage of dialysis patients with Hb ≥ 10 g/dl 1997–2003

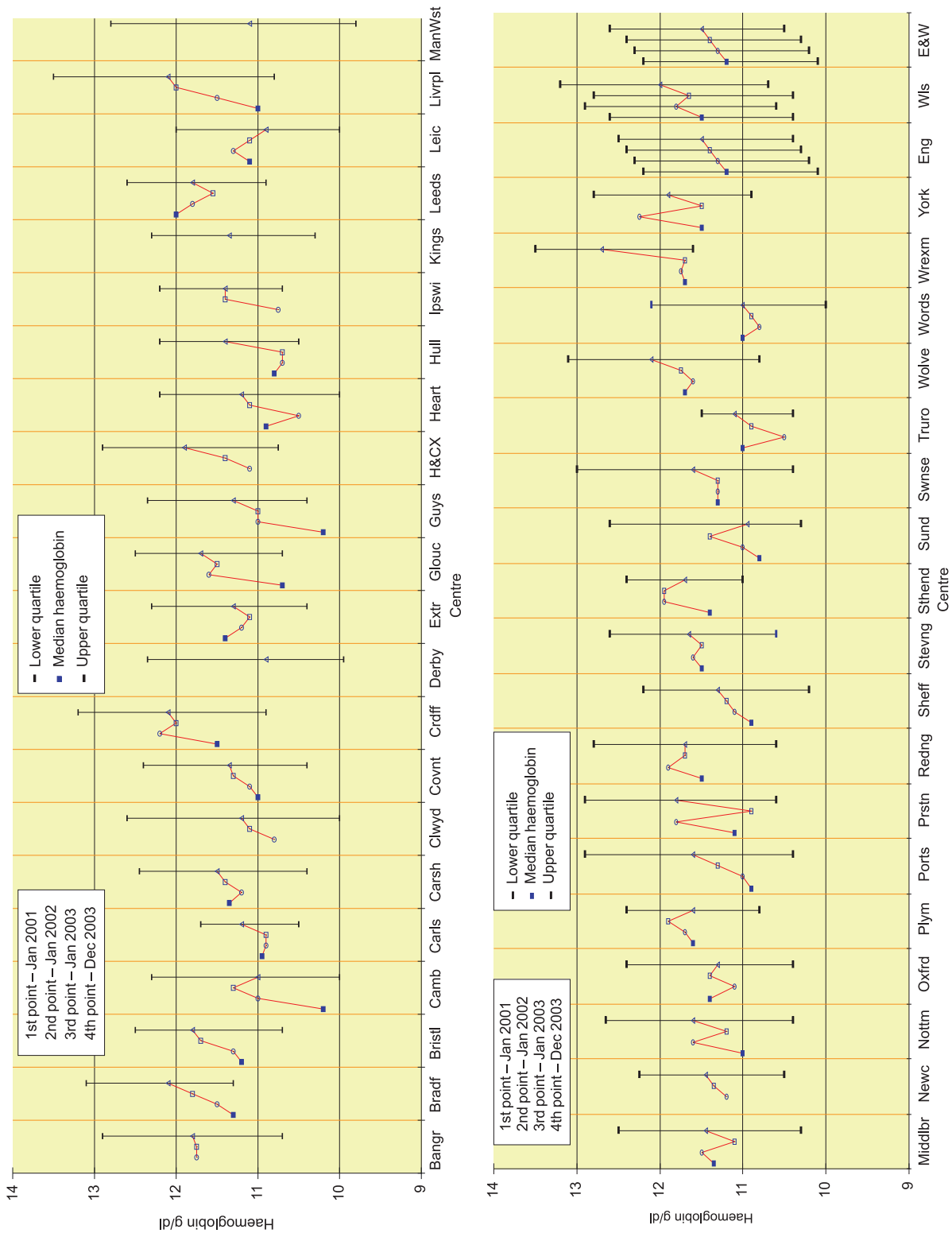


Figure 7.21: Median Hb from start 2001 to end of 2003 by centre: haemodialysis

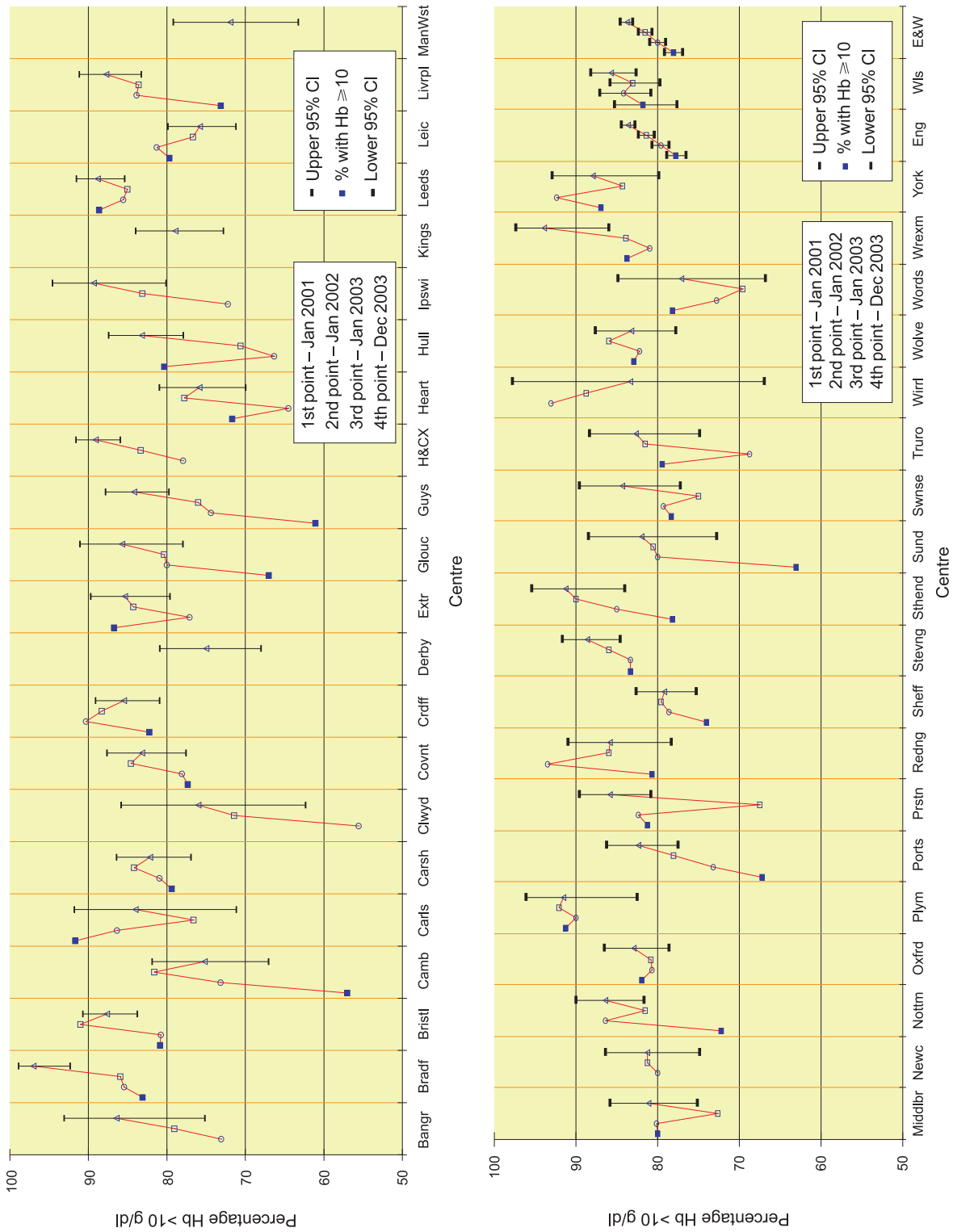


Figure 7.22: Hb \geq 10 g/dl at start 2001 to end of 2003 by centre: haemodialysis

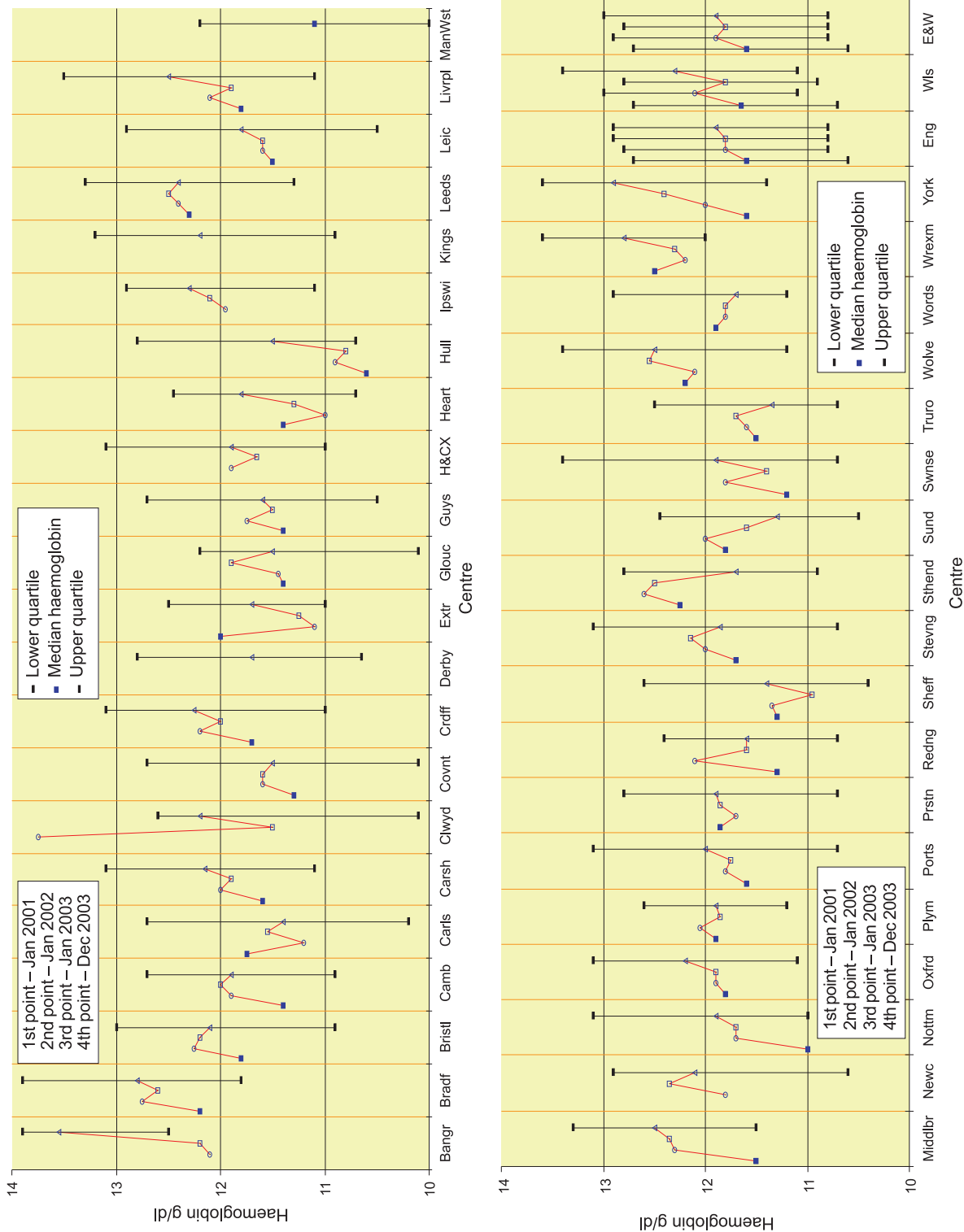


Figure 7.23: Median Hb from start 2001 to end of 2003 by centre: peritoneal dialysis

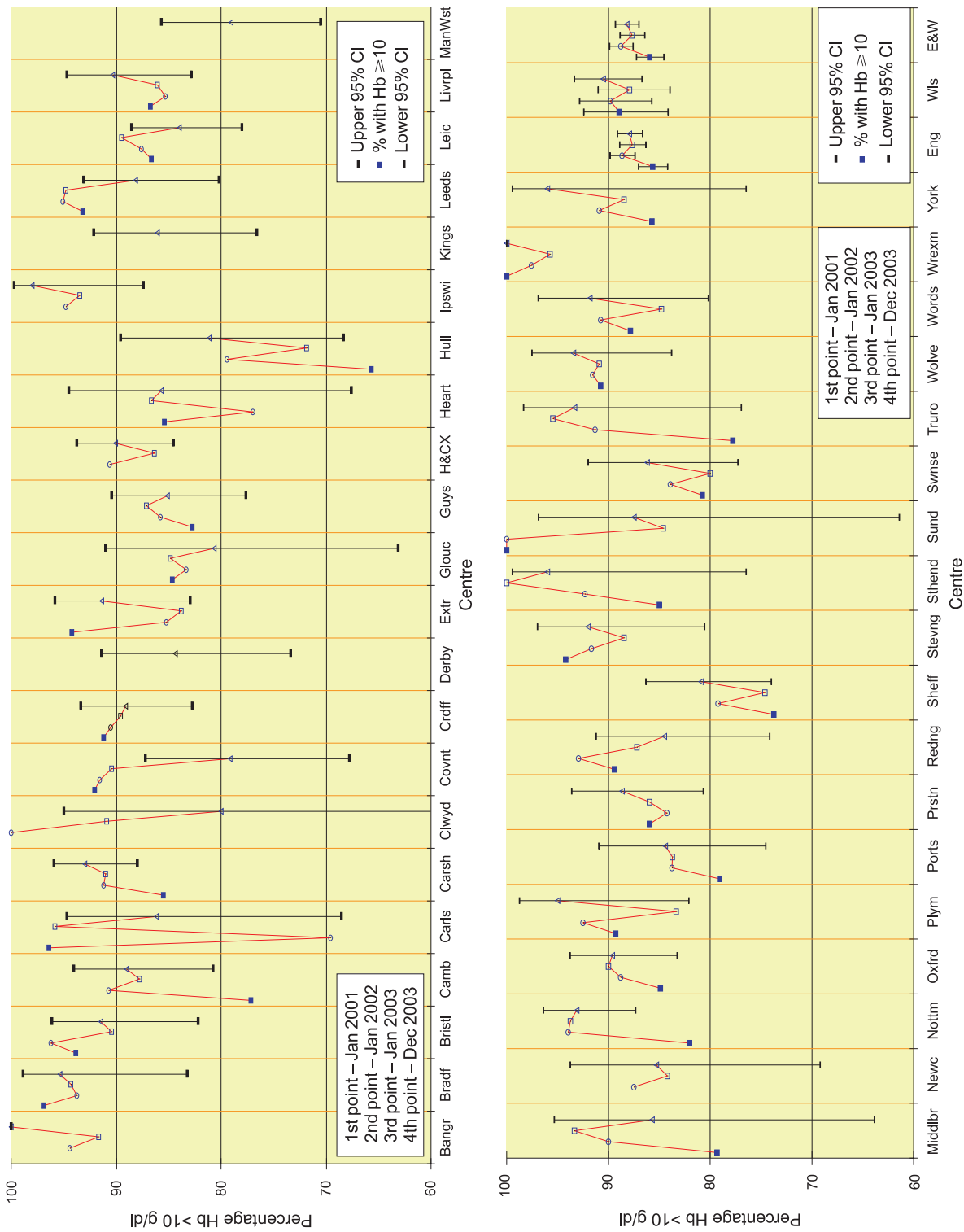


Figure 7.24: Hb ≥ 10 g/dl at start 2003 to end of 2003 by centre: peritoneal dialysis

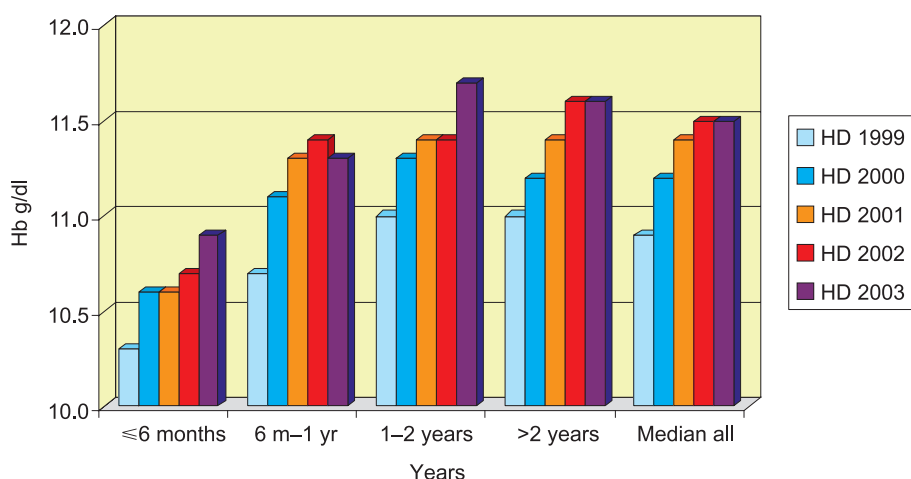


Figure 7.25: Change in median Hb by length of time on RRT HD

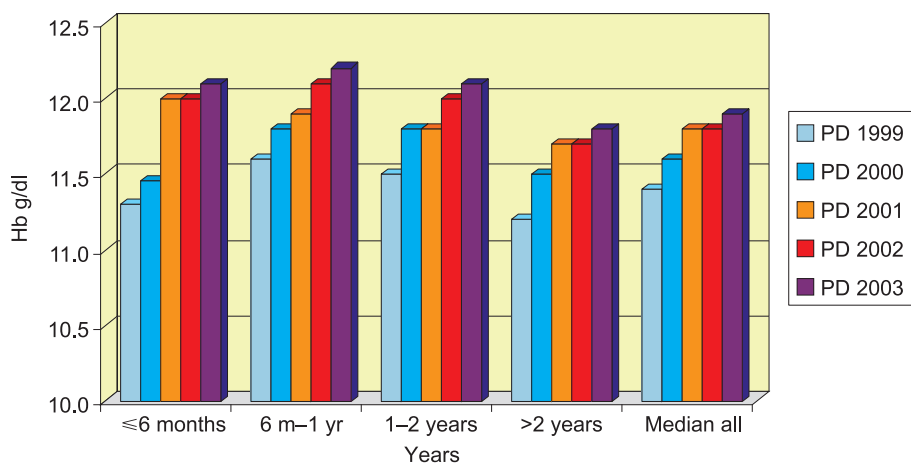


Figure 7.26: Change in median Hb by length of time on RRT PD

Several units that started from a low base in 2001 have made very major advances in anaemia management in subsequent years. Cambridge, Guys, Clwyd and Sunderland stand out as centres that have made significant improvements. A few centres have had declines in the percentage of patients achieving the target Hb and those units will no doubt wish to investigate the causes. Plymouth is interesting for sustaining a stable and very high percentage of patients meeting the target over the 3 years of study despite having a relatively small number of dialysis patients. There is insufficient information to show whether this is because Plymouth has an unusually stable patient group or particularly effective anaemia management.

Figure 7.25 shows that median haemoglobin for new patients within 6 months of starting

haemodialysis has risen from 10.3 g/dl in 1999 to 10.9 g/dl in 2003. Part of this is due to the increased use of EPO pre-dialysis, but there may also be a more rapid rise in haemoglobin.

Figure 7.26 shows that this change is even more striking in patients on PD, where the median haemoglobin has risen from 11.3 g/dl within the first 6 months in 1999 to 12.1 g/dl in 2003.

Conclusion

Anaemia management continues to improve in dialysis units across England and Wales. Pre-dialysis anaemia management remains an area where there is great variability between dialysis centres. Now that the Renal Association standard does not distinguish between dialysis and

pre-dialysis patients this variability should reduce in the future. There is some evidence of a plateau developing in the relationship between percentage of patients achieving the Renal Association target and median haemoglobin

concentration. This suggests that there may be a limit to the extent to which currently used anaemia management protocols can cope with the intrinsic variability in dialysis patients haemoglobin.