

## Chapter 7: Haemoglobin

### Summary

- Improvement in haemoglobin concentrations of patients receiving dialysis treatment continued in 2002. 82% of haemodialysis patients and 88% of peritoneal dialysis patients had a haemoglobin concentration above the Renal Association target of 10g/dl.
- Haemoglobin in the first quarter of dialysis treatment has also risen but 43% of individuals new to dialysis still had a haemoglobin <10g/dl in 2002 (45% in 2001).
- 63% of haemodialysis patients and 73% of peritoneal dialysis patients achieve a haemoglobin above the European guidelines of 11 g/dl.
- There is still wide variation between dialysis centres in proportion of new and prevalent patients who are anaemic. The variation in haemoglobin from year to year in small dialysis centres reflects the fluctuations in haemoglobin concentration of individuals receiving dialysis treatment. It is not possible to make judgements about quality of treatment in a centre on the basis of a single set of data.

### Introduction

This chapter describes data reported to the Renal Registry relating to management of renal anaemia at the end of 2002. Correction of anaemia in individuals with chronic renal failure has been shown to improve quality of life and is likely to increase length of life. The importance of this aspect of patient care is reflected in the fact that both national and international standards have been set for management of renal anaemia.

US and European guidelines set a target for an individual's haemoglobin of 11g/dl. The Renal Association have set a target haemoglobin of 10g/dl and this was confirmed in the latest addition of the Standards document published in August 2002. However, the third edition of the Renal Association Standards document has made changes to the standards relating to anaemia treatment. Whilst the target haemoglobin has not been altered the standard of 85% of patients on dialysis having a haemoglobin  $\geq 10$ g/dl has been removed.

The standard now states that :

***Individuals with CRF should achieve a haemoglobin of 10g/dl within 6 months of being seen by a nephrologist unless there is a specific reason why it could not be achieved.***

There is no longer a fixed benchmark against which renal centres can be compared. Instead, comparison with other centres through data submitted to the Renal Registry provides the guide to performance.

The Renal Registry records data on patients receiving renal replacement therapy (RRT) and the date of start of RRT is recorded. At present the Registry cannot provide information on haemoglobin levels 6 months after seeing a nephrologist. Therefore, whilst the Registry data give information on the performance of renal centres with regard to prevalent dialysis patients and patients close to the start of dialysis, there is no information on whether centres are reaching the target within 6 months of first seeing a patient.

### Inclusion criteria

Patients treated with dialysis during the last quarter of 2002 were included in the analy-

sis 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 2002 was used in the analysis.

### **Haemoglobin achievement by dialysis units**

The data describing the haemoglobin distribution in each centre are presented in Table 7.1 for haemodialysis (HD) and Table 7.2 for peritoneal dialysis (PD) and in Figures 7.1 and 7.2. The percentage with haemoglobin  $\geq 11\text{g/dl}$  is included as this is the European standard and may be used by some centres.

The percentage achieving the Renal Association target for haemodialysis patients was 82% in England and 84% in Wales, whilst for patients on PD this was 88% and 89% for England and Wales respectively. As described in previous reports there was considerable variation in performance. Two centres in 2002 had 27% of prevalent HD patients with a haemoglobin  $< 10\text{g/dl}$  whilst Bradford achieved a haemoglobin of  $\geq 10\text{g/dl}$  in 97% of haemodialysis patients and  $\geq 11\text{g/dl}$  in 86%. Two centres (Sunderland and Clwyd) reported haemoglobin  $\geq 10\text{g/dl}$  in 100% of PD patients whilst 2 centres appeared to be outliers with a low percentage of PD patients reaching the target (72% and 77%  $\geq 10\text{g/dl}$ )

Caution needs to be applied when interpreting data from smaller centres. High levels of achievement of the target were reported by a number of centres in last year's report that this year have considerably reduced. Southend reduced from 94%  $\geq 10\text{g/dl}$  for HD in 2001 to 84% in 2002, Truro reduced from 91% in 2001 to 78% in 2002 whilst Sunderland increased from 67% in 2001 to 80% in 2002. It is unlikely that all of these variations reflect real changes in practice and they are more likely to be due to the inherent variability of haemoglobin in individuals with chronic renal failure. Such variation is hidden in the data

from large centres but not when the number of data points is small. Individual centres will wish to investigate apparently significant changes in data year on year but it was not possible to make qualitative judgments about the standard of management on the basis of a single set of data.

Overall the spread of data does not appear to be different this year compared to previous years. The 90% ranges for England and Wales have not changed. There is no evidence that centres are in general becoming more successful at targeting haemoglobin, which is perhaps not surprising given the observed variability in individual haemoglobin concentration.

As in previous years a close relationship between median haemoglobin and percentage with haemoglobin greater than  $10\text{g/dl}$  or  $11\text{g/dl}$  is demonstrated for haemodialysis patients. Whilst less tight, the relationship has also held true for peritoneal dialysis patients in previous years, but in this years data the relationship is less clear. There is a suggestion that the percentage over target may reach a plateau around 90–95%  $\geq 10\text{g/dl}$ . This could be an indication of the proportion of individuals on dialysis whose anaemia cannot be corrected, even with best management, together with those who become anaemic because of illness regardless of their pre-illness haemoglobin level.

### **Haemoglobin concentrations of patients recently started RRT**

Haemoglobin concentrations in the first 3 months of starting dialysis have been analysed and the data are shown in Table 7.3 and Figures 7.11 to 7.15. The haemoglobin data were extracted locally as the latest value in that quarter. The large range of percentage  $\geq 10\text{g/dl}$  between centres shown in previous years has been maintained. In one centre as few as 33% of patients had haemoglobin  $\geq 10\text{g/dl}$  in the first quarter whilst in other centres this was as high as 80%.

**Table 7.1. 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 $\geq 10$	% with Hb $\geq 11$
Bangr	100	11.1	9–13.5	9.9–12.2	11.1	1.4	73	54
Bradf	100	12.4	10.5–14.9	11.4–13.6	12.5	1.5	97	86
Bristl	100	11.7	9–14.1	10.6–12.6	11.6	1.5	84	67
Camb	75	11.3	8.5–13.2	10.1–12.3	11.2	1.4	82	57
Carls	92	11.2	8.9–12.7	10.3–11.9	11.1	1.1	87	63
Carsh	86	11.8	8.9–14.2	10.7–12.9	11.7	1.7	83	68
Clwyd	85	10.5	8.8–13.5	9.8–11.9	10.9	1.4	69	44
Covnt	97	11.4	8.5–13.9	10.4–12.2	11.3	1.5	83	64
Crdff	93	12.1	9.5–14.7	11.1–13.1	12.1	1.6	91	77
Extr	98	11.2	8.8–13.2	10.3–12.1	11.1	1.4	81	58
Glouc	99	11.3	8.5–14.2	10.1–12.5	11.2	1.8	76	56
Guys	88	11.0	8.5–13.7	10–12.2	11.1	1.7	76	50
H&C	100	11.4	8.9–13.7	10.3–12.4	11.3	1.5	83	60
Heart	91	11.1	8.8–13.2	10.1–12	11.1	1.4	78	53
Hull	95	10.9	8.9–12.9	9.9–11.6	10.8	1.3	73	49
Ipswi	100	11.4	9.5–13.1	10.2–12.3	11.3	1.2	83	63
Kings	99	11.3	8–14.3	10–12.4	11.2	1.9	77	57
Leic	98	11.4	8.6–14.4	10.3–12.6	11.5	1.8	81	58
LGI	97	12.0	9.1–14.4	10.8–12.9	11.8	1.7	88	72
Livrpl	97	11.9	9.1–14.6	10.5–13	11.8	1.8	86	68
Middlbr	96	11.3	7.9–13.6	9.8–12.4	11.1	1.8	74	57
Newc	97	11.4	8.3–14.1	10.1–12.4	11.3	1.8	79	58
Notts	94	11.5	8.7–14.2	10.5–12.5	11.5	1.7	82	66
Oxfrd	99	11.4	8.6–14	10.3–12.3	11.3	1.7	80	59
Plym	85	11.8	9.4–14.2	11.1–12.7	11.9	1.4	90	75
Ports	86	11.3	8.1–14.1	10.2–12.5	11.3	1.8	80	59
Prstn	94	11.3	8.1–14.3	10.1–12.4	11.3	1.8	78	59
Redng	97	11.7	8.6–13.7	10.1–12.8	11.5	1.7	80	66
Sheff	94	11.4	9.1–13.7	10.5–12.2	11.4	1.4	85	61
Stevn	94	11.6	9.1–14	10.6–12.4	11.5	1.5	86	66
Sthend	98	11.8	8.5–13.7	10.8–12.8	11.6	1.6	84	70
StJms	100	12.1	9.1–14.8	10.9–13.1	12.0	1.7	89	73
Sund	94	11.2	8.7–13.8	10.3–12.5	11.2	1.6	80	55
Swnse	68	11.2	8.3–13.2	10.1–12.2	11.1	1.6	77	57
Truro	98	10.9	9.1–12.6	10.1–11.5	10.9	1.1	78	48
Wirrl	79	12.4	8.7–14.9	10.85–13.5	12.1	2.0	90	74
Wolve	98	11.5	9.1–14.6	10.3–12.7	11.6	1.7	82	65
Words	90	10.9	8.8–13.8	9.8–12.1	10.9	1.5	74	47
Wrex	86	11.9	9.2–14.2	10.5–12.7	11.7	1.6	88	64
York	90	11.7	9.2–14.1	10.7–12.5	11.6	1.5	90	68
Eng	94	11.5	8.7–14.1	10.3–12.5	11.4	1.6	82	62
Wls	86	11.7	8.8–14.2	10.5–12.8	11.6	1.6	84	66
E&W	94	11.5	8.8–14.1	10.4–12.5	11.4	1.6	82	62

**Table 7.2. Haemoglobin data for patients on peritoneal dialysis**

<b>Centre</b>	<b>% data return</b>	<b>Median Hb g/dl</b>	<b>90% range</b>	<b>Quartile Range</b>	<b>Mean Hb g/dl</b>	<b>Standard deviation</b>	<b>% with Hb <math>\geq 10</math></b>	<b>% with Hb <math>\geq 11</math></b>
Bangr	100	12.2	9.6–14	11–13.2	12.0	1.4	91	78
Bradf	100	12.8	9.4–15.8	11.6–14.3	12.9	2.0	95	85
Bristl	100	12.3	9.6–14.3	11–13.25	12.1	1.6	93	76
Camb	97	11.8	9.4–14.8	10.7–13.05	11.9	1.6	90	72
Carls	96	12.3	8.6–14.6	10.5–13.5	12.0	1.8	88	67
Carsh	98	12.3	8.7–14.8	11.1–13	12.1	1.7	90	78
Clwyd	91	11.9	10.5–14	10.9–12.8	12.0	1.3	100	60
Covnt	97	11.7	9–14	10.6–12.8	11.7	1.6	87	67
Crdff	98	12.0	9.5–15	11–13.3	12.1	1.7	92	75
Extr	100	11.3	9.4–14.1	10.2–12.2	11.4	1.5	84	55
Glouc	97	11.9	9–13.8	10.9–12.7	11.8	1.5	86	74
Guys	99	11.8	9.5–14	10.9–12.7	11.9	1.4	92	72
H&C	100	11.9	8.8–15	10.7–12.8	11.8	1.9	84	71
Heart	100	11.6	8.5–14.5	10.5–12.3	11.6	1.5	92	68
Hull	94	10.8	7.9–13.3	9.85–11.85	10.8	1.6	72	46
Ipswi	100	12.0	10.3–15	11.4–12.9	12.2	1.4	98	84
Kings	99	12.0	8.1–14.5	10.7–13.1	11.8	1.8	85	71
Leic	100	11.7	9.15–14.5	10.5–12.75	11.7	1.7	85	68
LGI	97	12.6	9.7–15	11.4–13.7	12.6	1.6	93	85
Livrpl	92	12.0	8.6–14.8	11.1–13.1	12.0	1.8	88	78
Middlbr	100	12.8	8.7–14.6	12.1–13.2	12.5	1.6	90	87
Newc	100	11.7	7.6–15.2	10.8–13.3	11.8	2.2	86	71
Notts	97	11.6	9.3–14.3	10.6–12.4	11.6	1.5	88	64
Oxfrd	100	11.8	8.9–15.2	10.8–12.7	11.8	1.9	87	70
Plym	92	12.0	10.2–14	11.1–12.8	12.0	1.3	98	76
Ports	86	11.4	8.2–14.9	10.2–12.8	11.5	1.9	80	58
Prstn	100	11.7	9.5–14.9	10.7–13.1	11.9	1.6	90	69
Redng	100	11.7	9.2–13.8	11.15–12.5	11.8	1.3	90	82
Sheff	98	11.6	9–14.3	10.5–12.8	11.7	1.7	86	63
Stevn	100	12.1	8.5–14.7	10.8–13.3	11.9	1.8	87	73
Sthend	57	12.1	8.8–15.7	10.8–13.65	12.2	1.9	88	69
StJms	100	12.2	9.2–14.6	11.2–13	12.1	1.6	89	81
Sund	88	11.7	10.1–12.9	11.1–12.1	11.7	0.8	100	86
Swnse	80	11.3	8.9–13.5	10–12.3	11.2	1.6	77	59
Truro	100	11.7	10.6–13.1	11–12.4	11.7	1.3	96	76
Wirrl								
Wolve	100	12.3	8.7–14.4	11.05–13.15	12.0	1.6	90	79
Words	100	11.7	9.1–14.2	10.7–12.9	11.7	1.6	85	69
Wrex	94	12.4	10.4–14.7	11.6–12.8	12.3	1.4	96	88
York	100	12.4	9.5–14.6	11–13.1	12.2	1.7	92	76
Eng	97	11.8	9.1–14.6	10.8–12.9	11.8	1.7	88	71
Wls	93	12.0	9.2–14.7	10.9–12.8	11.9	1.7	89	73
E&W	97	11.8	9.1–14.6	10.8–12.9	11.8	1.7	88	71

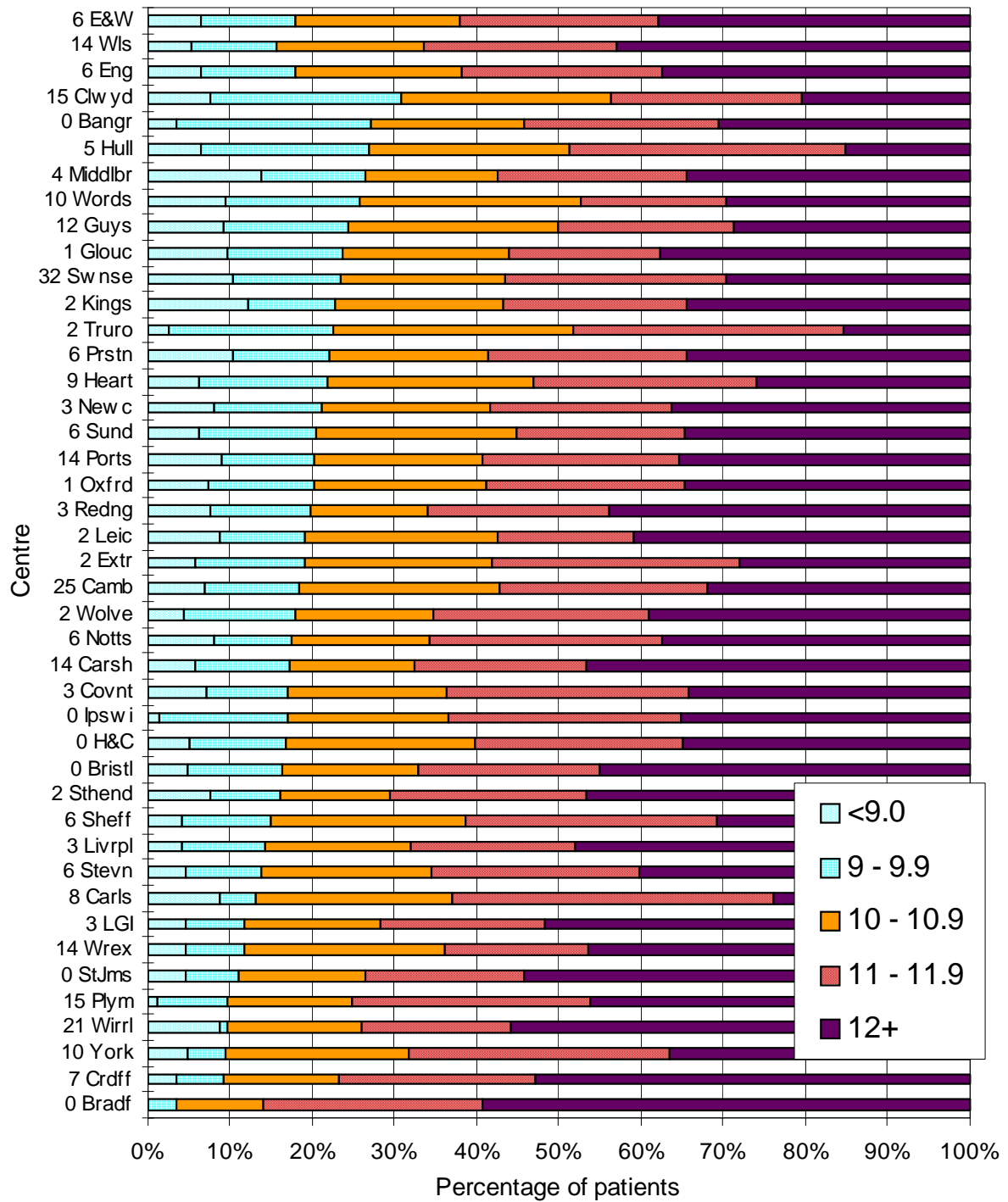


Figure 7.1. Distribution of haemoglobin in patients on HD

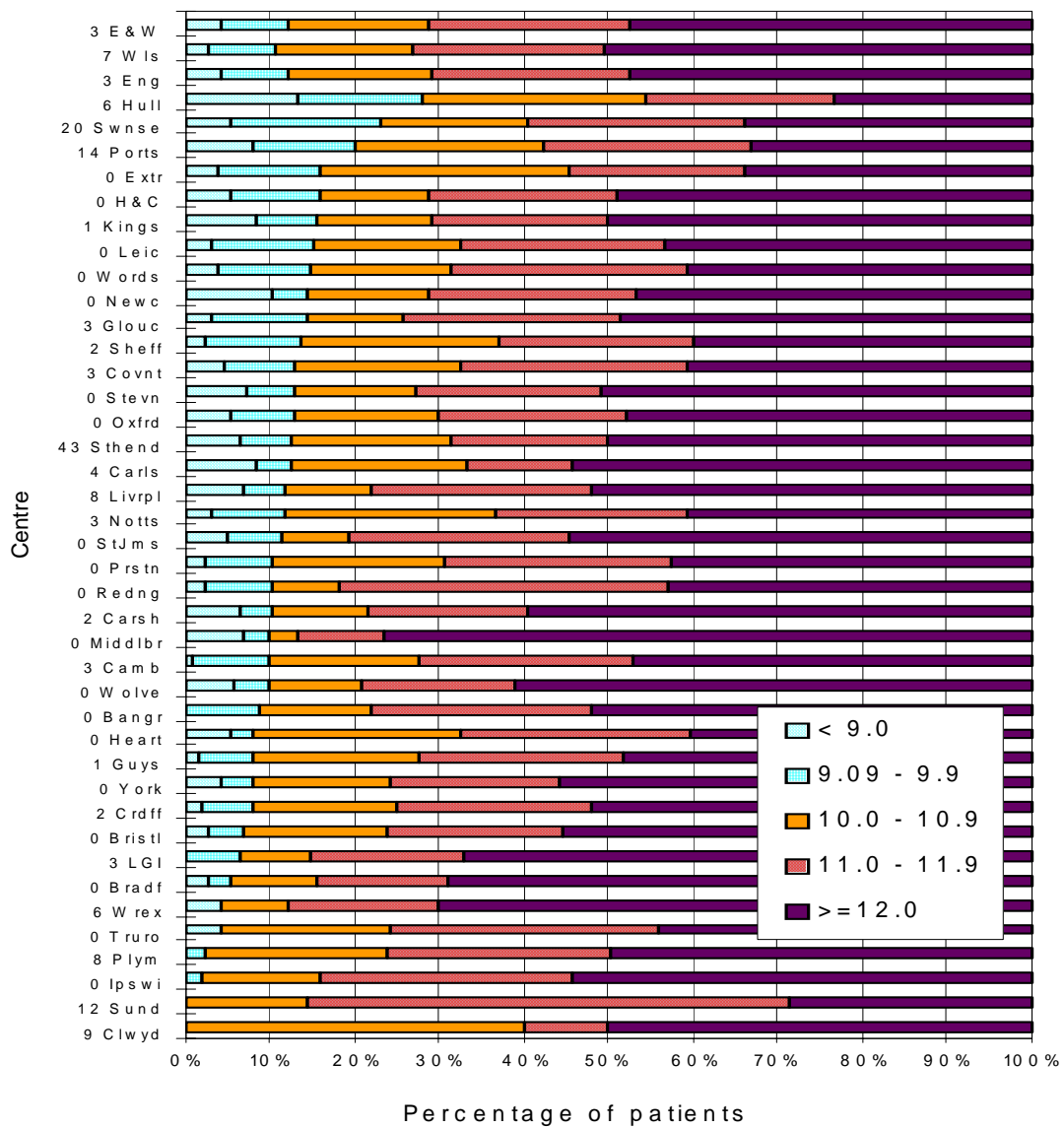


Figure 7.2. Distribution of haemoglobin in patients on PD

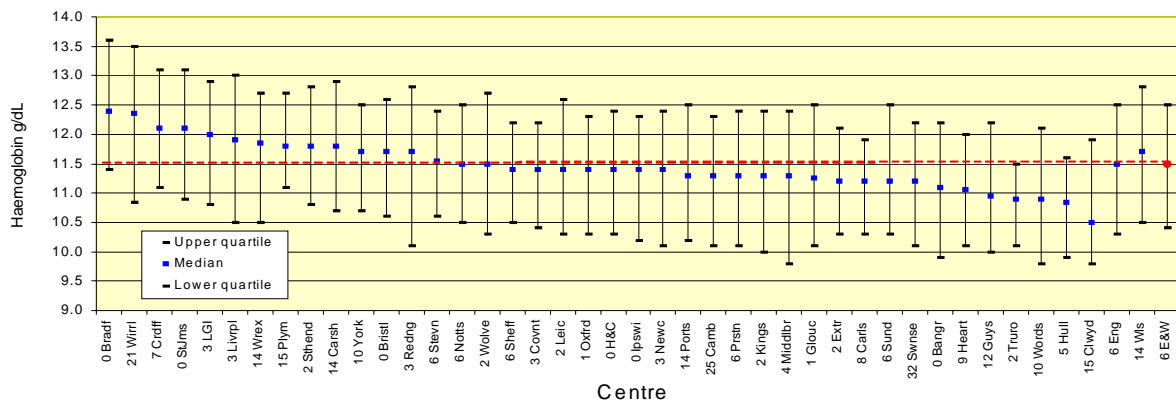


Figure 7.3. Haemoglobin and quartile ranges for HD patients

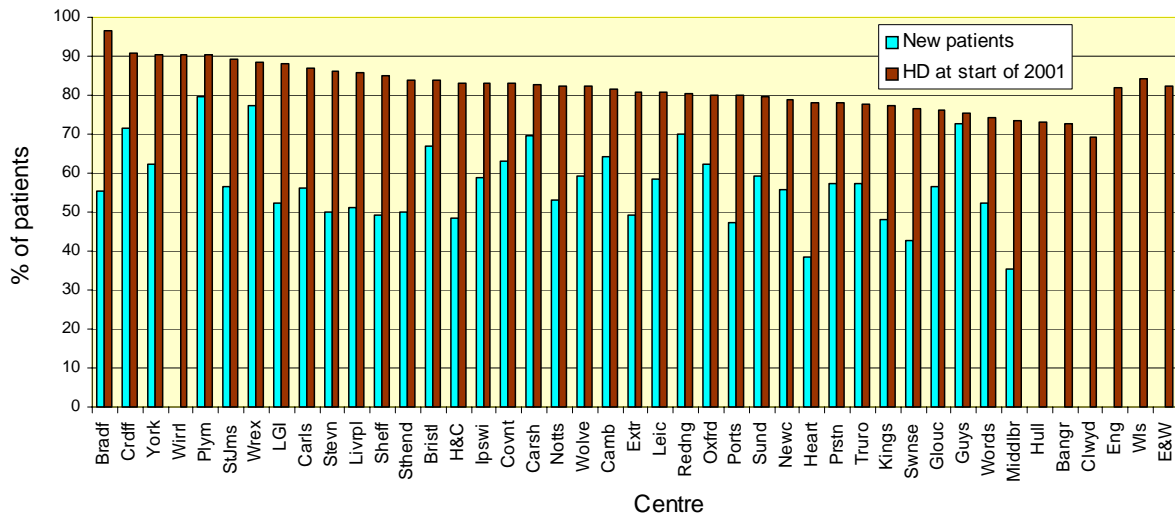


Figure 7.4. Percentage of HD patients, by centre, achieving the Renal Association target Hb

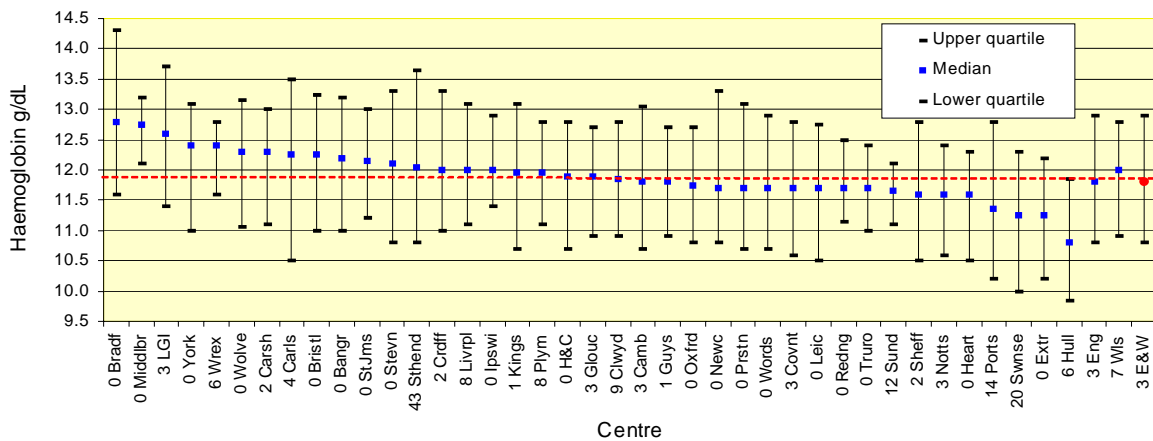


Figure 7.5. Haemoglobin and quartile ranges for PD patients

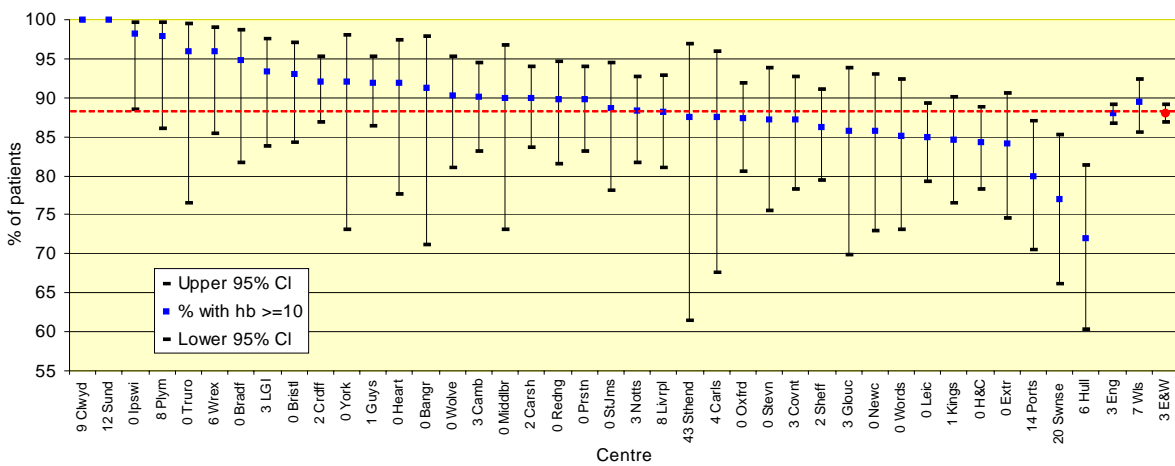
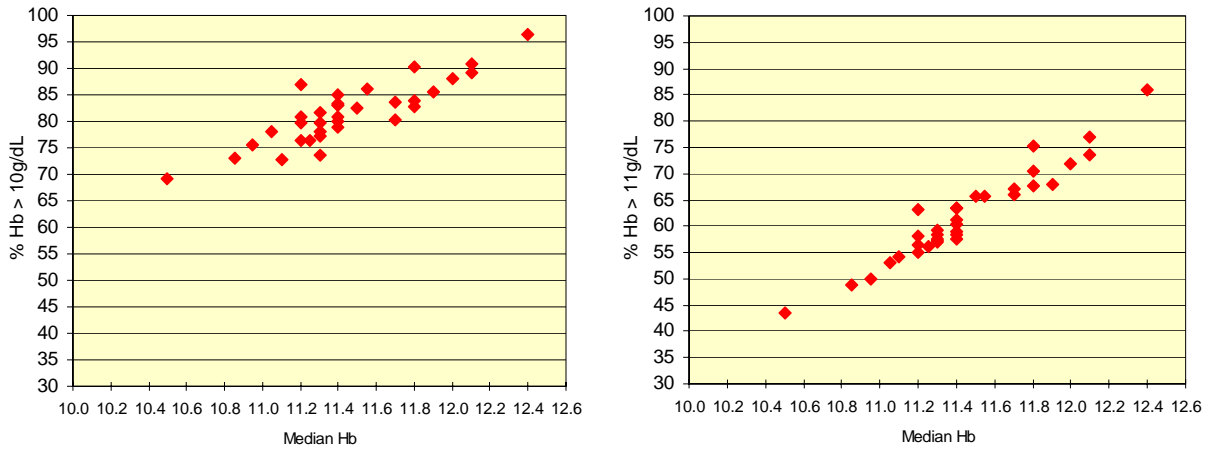
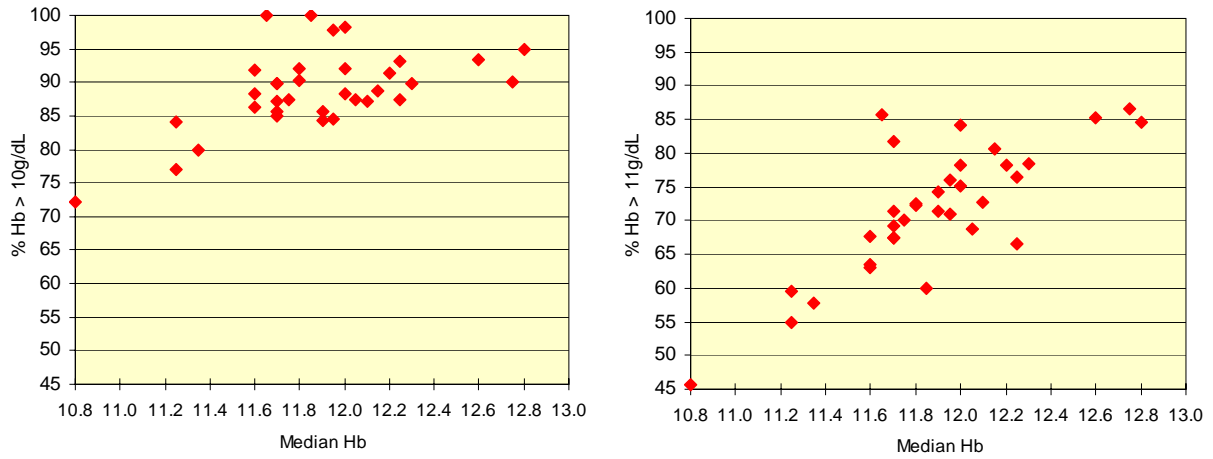


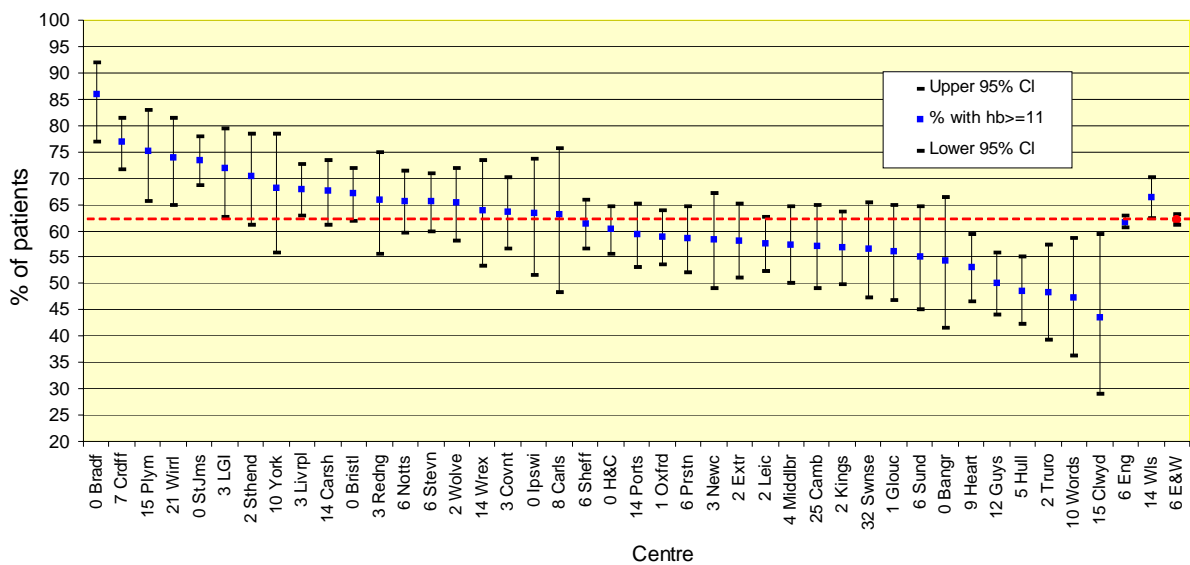
Figure 7.6. Percentage of HD patients, by centre, achieving the Renal Association target Hb



**Figure 7.7. Percentage patients with Hb >10g/dl and HB >11g/dl plotted against median Hb for HD patients**



**Figure 7.8. Percentage patients with Hb >10g/dl and HB >11g/dl plotted against median Hb for PD patients**



**Figure 7.9. Percentage of HD patients with haemoglobin >11g/dl**



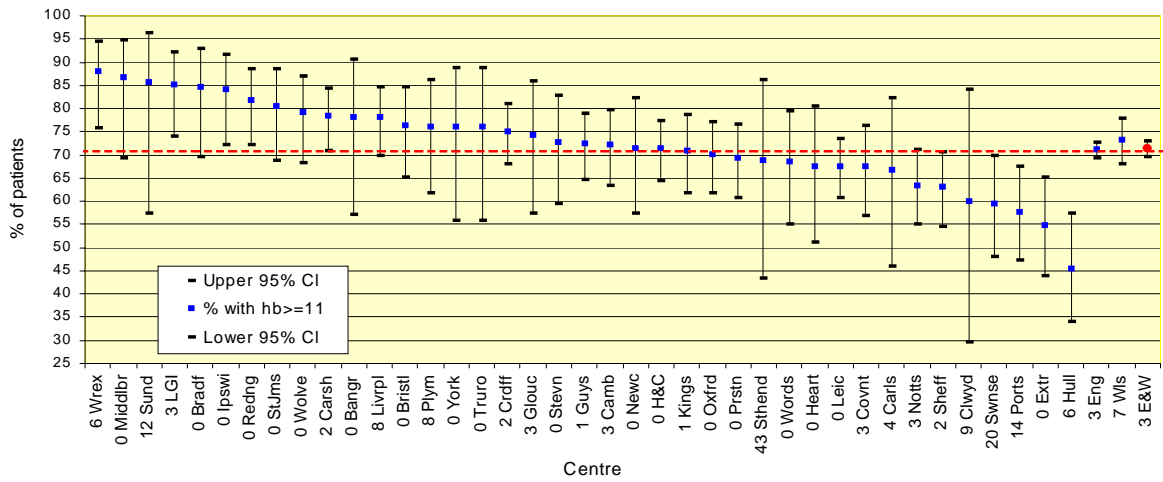


Figure 7.10. Percentage of PD patients with haemoglobin >11g/dl

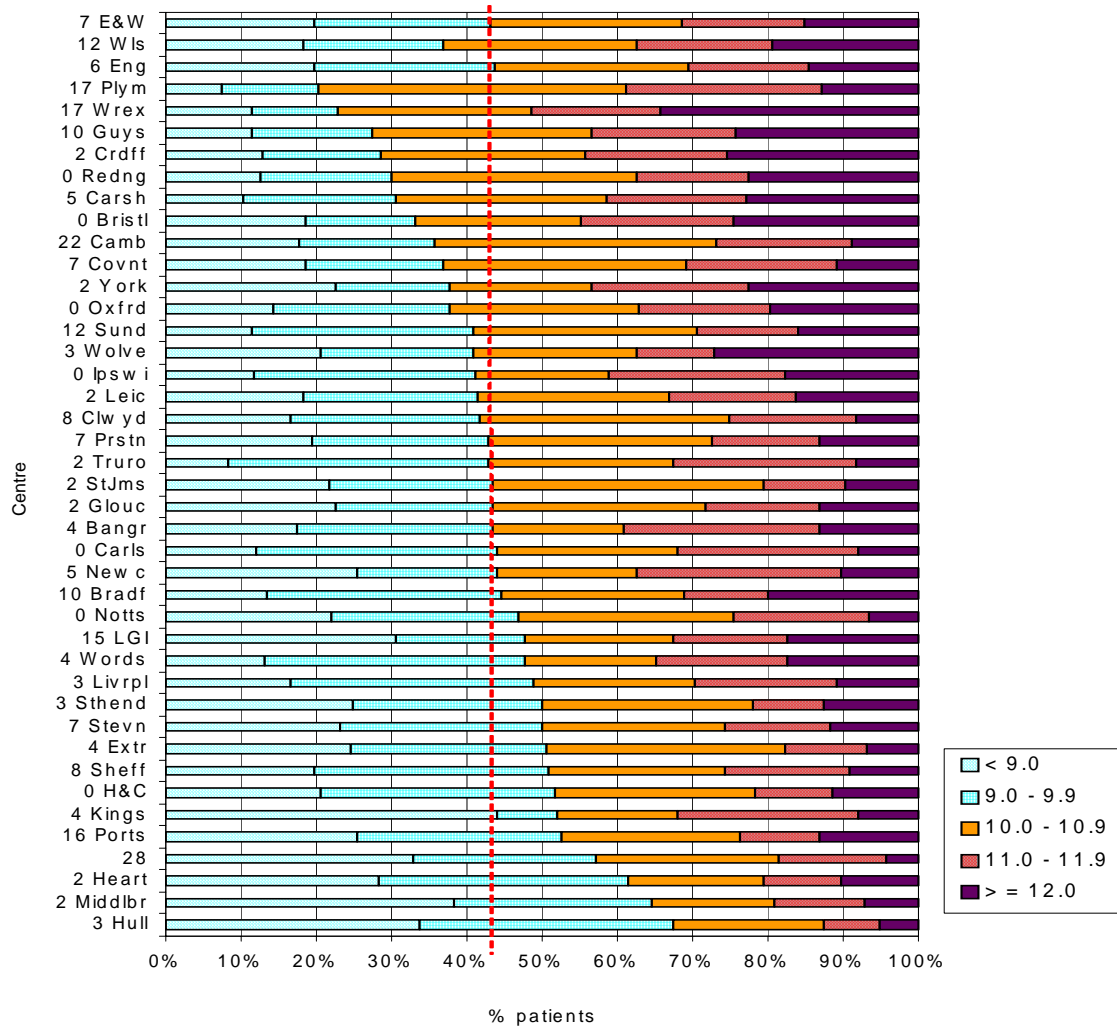


Figure 7.11. Distribution of haemoglobin for new patients

**Table 7.3. Haemoglobin levels for new patients starting dialysis**

Centre	% data return	Median HB g/dl	90% range	Quartile range	% HB >10g/dl
Bangr	95.8	10.3	8.6–12.7	9.2–11.6	56.5
Bradf	90.0	10.5	8.7–13.3	9.3–11.6	55.6
Bristl	100.0	10.7	8.1–13.8	9.7–11.9	66.9
Camb	77.8	10.3	7.8–12.5	9.45–11.15	64.3
Carls	100.0	10.3	8.6–12.4	9.3–11.3	56.0
Carsh	94.6	10.8	8.3–13.3	9.8–11.8	69.4
Clwyd	92.3	10.3	7.9–13	9.5–10.85	58.3
Covnt	92.9	10.3	8.2–12.4	9.4–11.2	63.1
Crdff	97.8	10.9	8.5–13.6	9.7–12	71.4
Extr	96.1	9.9	7.9–12.2	9–10.6	49.3
Glouc	98.1	10.2	8–13.2	9.2–11.1	56.6
Guys	89.9	10.8	8.6–13.5	9.6–11.9	72.6
H&C	100.0	10.0	7.7–12.9	9.1–10.9	48.3
Heart	97.5	9.8	7.4–12.8	8.9–10.4	38.5
Hull	96.9	9.5	7.2–12.1	8.5–10.3	32.6
Ipswi	100.0	10.4	6.6–13.6	9.4–11.2	58.8
Kings	96.2	9.7	7.5–12.2	8.5–11.1	48.0
Leic	97.9	10.4	8–13.2	9.3–11.3	58.5
LGI	85.2	10.1	7.5–13.4	8.5–11.3	52.2
Livrpl	96.8	10.2	8.1–12.5	9.3–11.1	51.2
Middlbr	98.0	9.4	6.6–12.2	8.2–10.6	35.4
Newc	95.2	10.1	6.9–12.5	8.9–11.3	55.9
Notts	100.0	10.0	7.9–12.2	9.1–10.9	53.2
Oxfrd	100.0	10.6	8–14.4	9.5–11.8	62.2
Plym	83.1	10.8	8.4–13.2	10–11.6	79.6
Ports	83.8	9.9	7.2–12.7	8.9–10.9	47.4
Prstn	93.3	10.1	7.1–12.7	9.2–11.1	57.1
Redng	100.0	10.7	8.6–13.5	9.7–11.8	70.0
Sheff	91.7	10.1	7.9–12.4	9.2–11	49.2
Stevn	93.5	10.1	7.4–13.3	9–11	50.0
Sthend	97.0	10.0	6.6–13.9	8.85–10.7	50.0
StJms	97.6	10.0	7.9–12.5	9–10.7	56.6
Sund	88.0	10.3	8.5–13	9.3–11.4	59.1
Swkse	72.2	9.7	7.7–11.9	8.7–10.7	42.9
Truro	98.0	10.3	8.6–12.4	9.7–11.1	57.1
Wolve	96.7	10.7	8–14.6	9.3–12	59.1
Words	95.8	10.4	8.2–12.7	9.3–11.6	52.2
Wrex	83.3	11.3	7.9–14.9	10–12.4	77.1
York	98.1	10.6	7.7–13.7	9.1–11.7	62.3
Eng	93.6	10.3	7.8–13.1	9.2–11.3	56.3
Wls	87.5	10.6	7.9–13.6	9.3–11.6	63.0
E&W	93.0	10.3	7.8–13.1	9.2–11.3	56.9

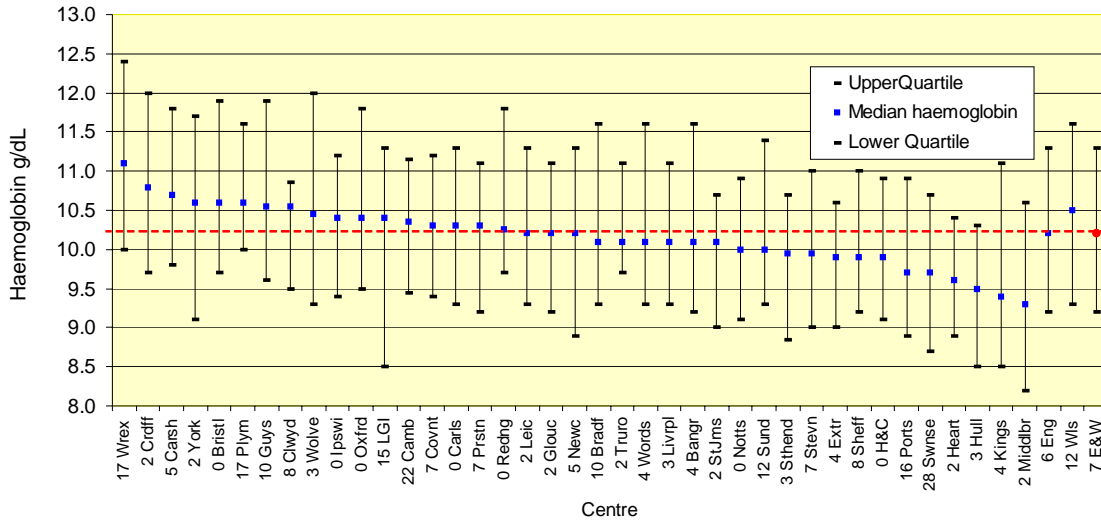


Figure 7.12. Haemoglobin median and quartile range for new patients

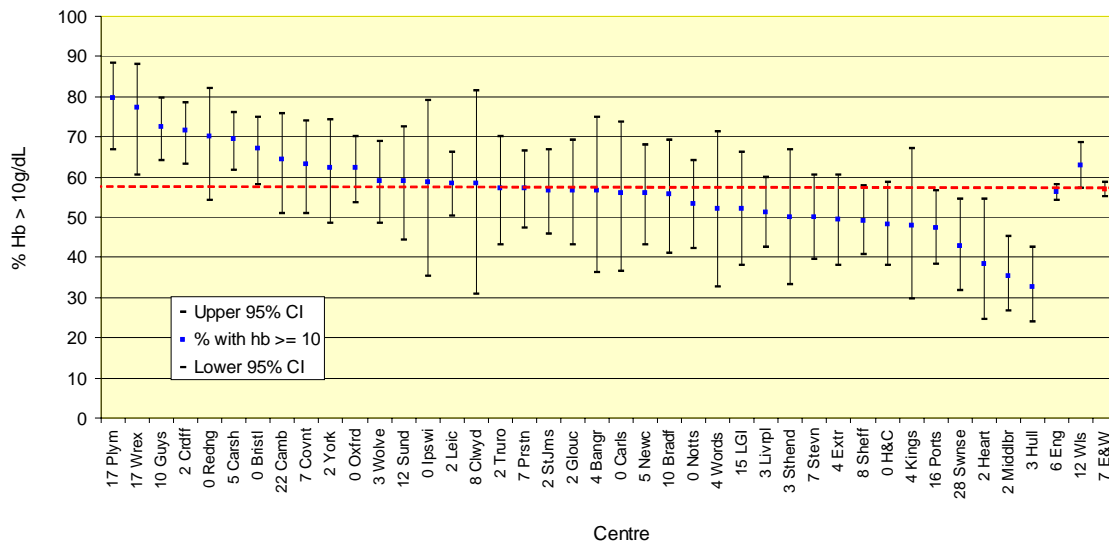


Figure 7.13. Percentage of new patients, by centre, achieving the Renal Association target

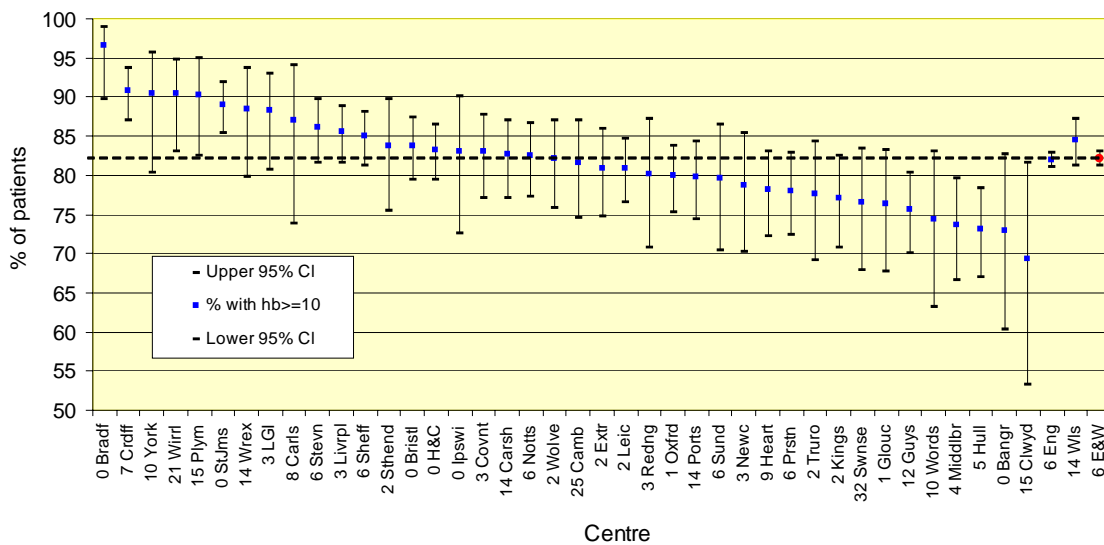


Figure 7.14. Percentage of patients with haemoglobin  $> 10$ g/dl: new and prevalent patients

Figure 7.14 compares the first quarter haemoglobin value of new patients with the haemoglobin of prevalent patients. In some centres the percentage with target haemoglobin in the first quarter of dialysis is very close to that percentage in prevalent patients. In other centres there is a large gap. This variation is likely to reflect differences in pre-dialysis anaemia management but will also be influenced by proportions of patients referred late for treatment. The change in the Renal Association standard to require a haemoglobin  $\geq 10$ g/dl in all patients whether on dialysis or pre-dialysis, within 6 months of being seen by a nephrologist may impact upon these variations in the future.

### Changes in anaemia management over time

Every year that the Registry has reported, there has been an increase in median haemoglobin and an increase in percentage reaching the target haemoglobin, although the percentage increase has slowed (Figure 7.15). In haemodialysis patients 82.2% have a haemoglobin  $>10$  g/dl compared with 81.4% at the end of 2001. For peritoneal dialysis patients this has increased from 86.5%  $>10$  g/dl at the end of 2001, to 88.1%  $>10$  g/dl at the end of 2002.

In 1998 only 40% of patients starting RRT had a haemoglobin  $>10$  g/dl (Figure 7.16)

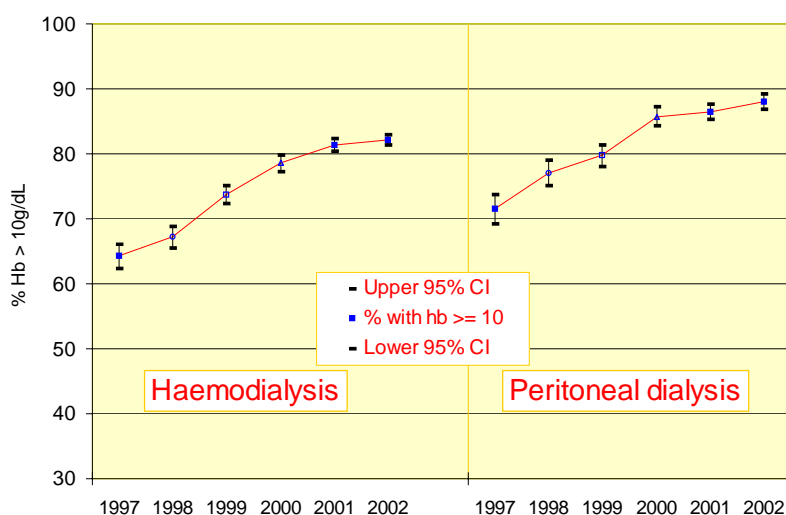


Figure 7.15. Change in percentage of prevalent patients with Hb  $>10$ g/dl in E&W 1997–2002

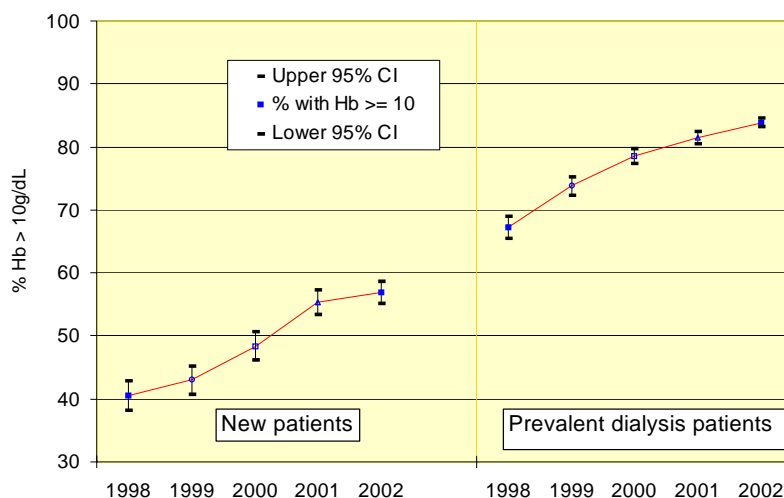


Figure 7.16. Change in percentage of patients starting RRT with Hb  $>10$ g/dl in E&W 1998–2002

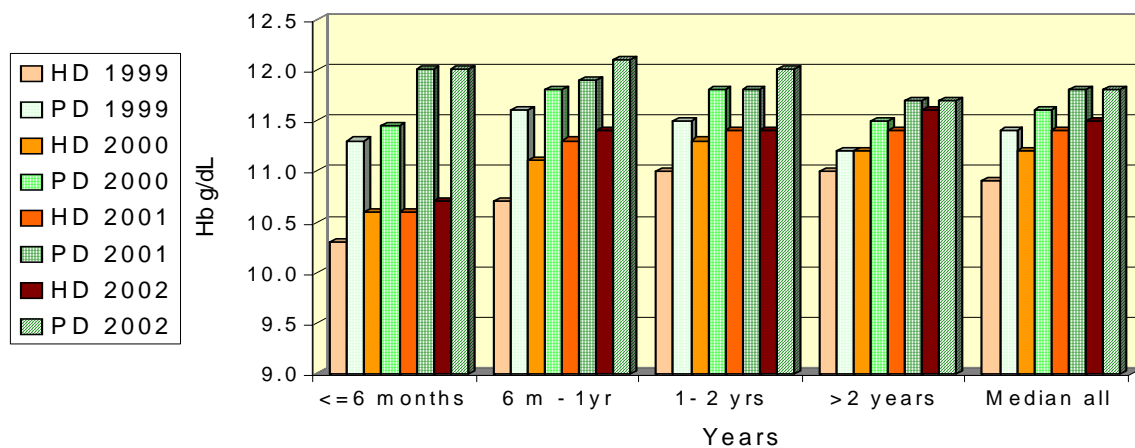
compared with 57% in 2002. The years 1999–2001 showed a dramatic increase, although the rate of this increase is now slowing. In this year's report, Chapter 16 analyses data on the late referral (seen by a nephrologist <3 months before starting renal replacement therapy) of patients. Late referral occurs in 30% of patients starting renal replacement therapy and analysis indicates this rate has remained unchanged over 1998–2002. Further large improvements in haemoglobin of patients starting renal replacement therapy may rely on targeting late referral.

Analysing these data by a cross-sectional basis on the 31st December each year (Figure 7.17), the time taken to increase haemoglobin can be seen. It is still taking 6–12 months for patients on haemodialysis to

achieve maximum haemoglobin level. The Renal Standards document recommends these targets should be achieved within 6 months of seeing a nephrologist.

### ***Temporal changes in haemoglobin in different renal units***

Serial data are shown for those centres that have submitted data to the Registry since the first quarter 2001. As has previously been noted there is great variation in haemoglobin levels and proportion of patients achieving the target in small centres from one quarter to the next. This variation is much less obvious in larger centres.



**Figure 7.17. Change in median Hb by length of time on RRT**



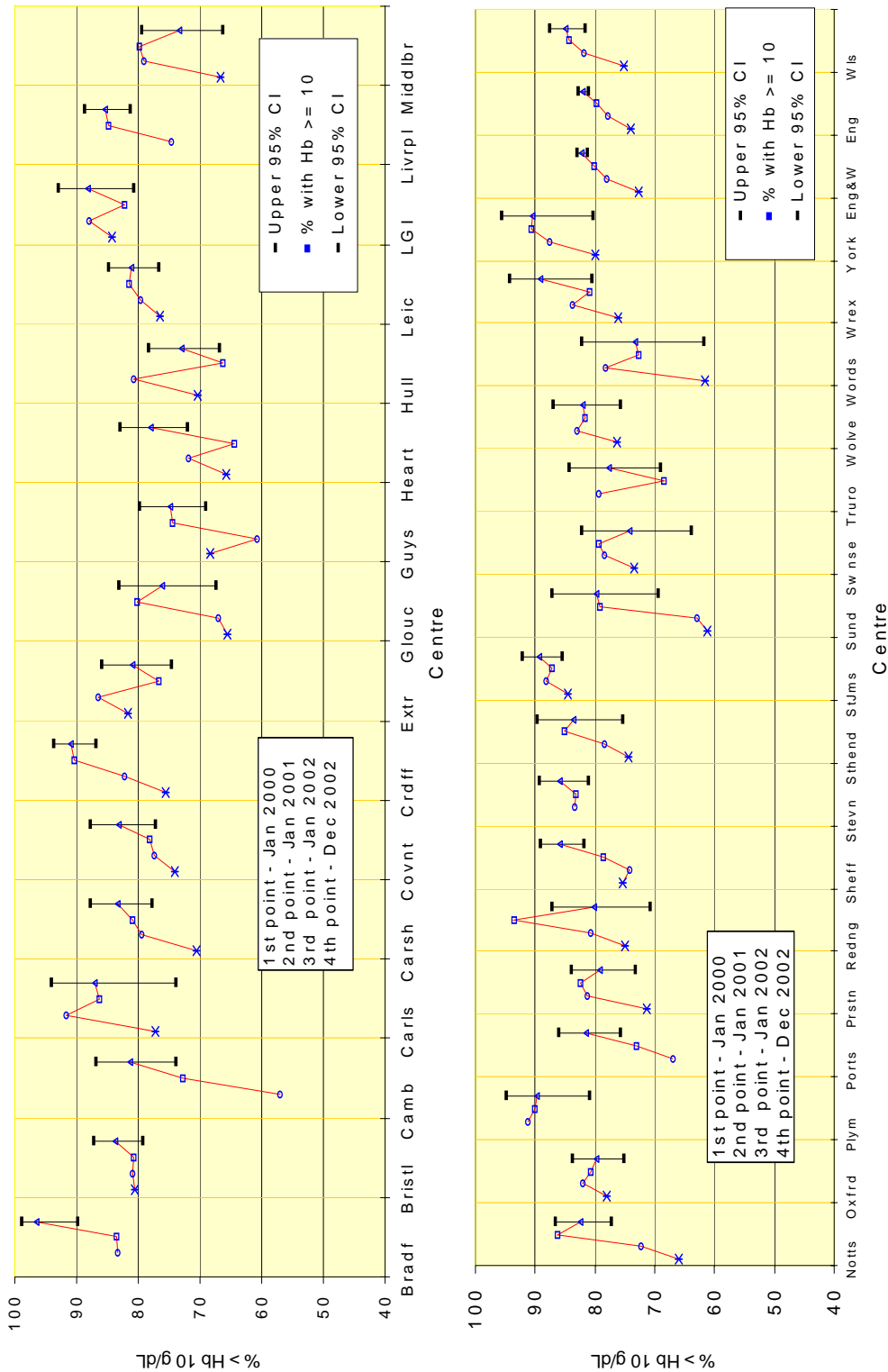


Figure 7.19. Percentage haemoglobin  $> 10$ g/dl January 2000–December 2002 for patients receiving haemodialysis

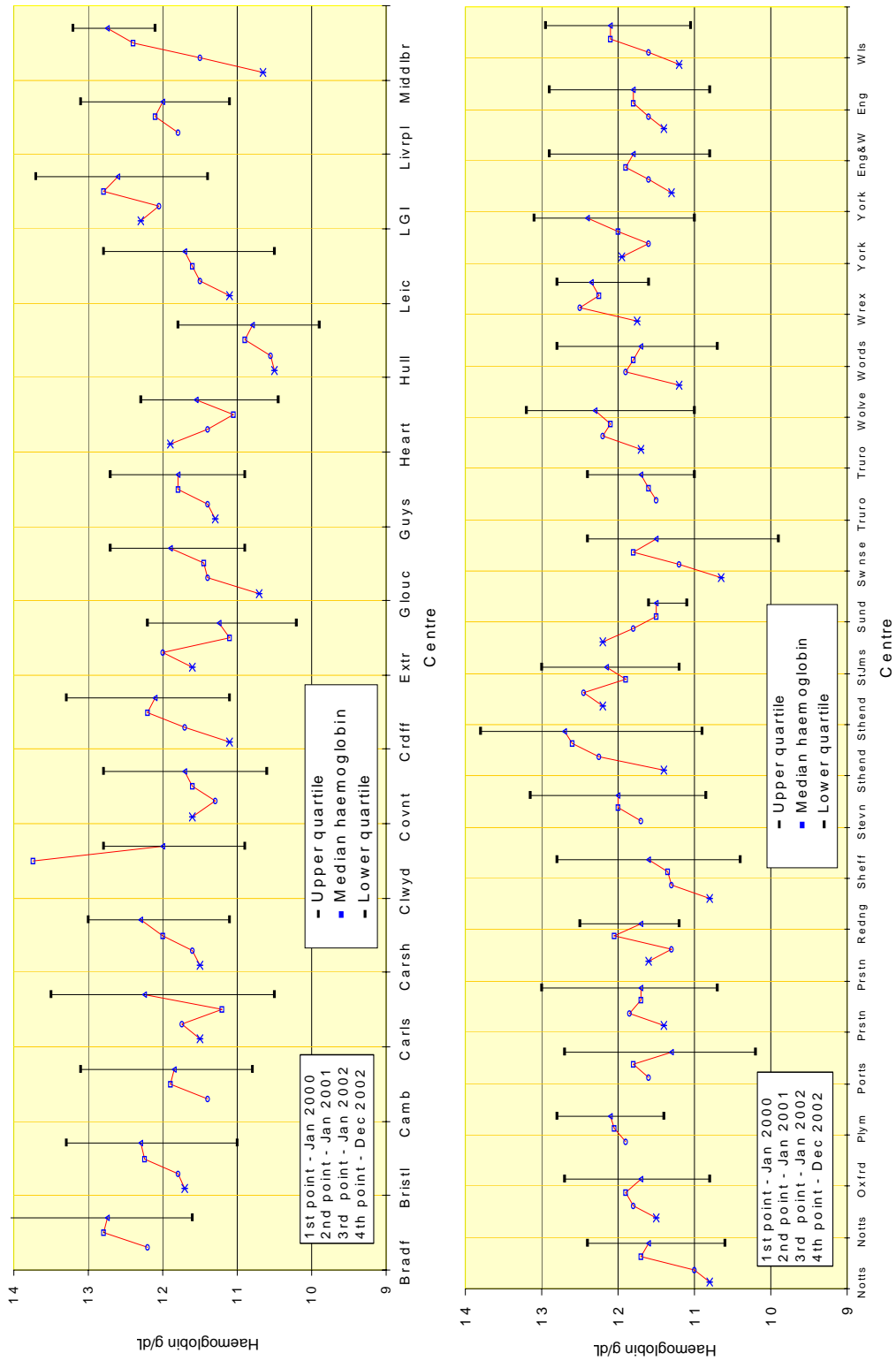


Figure 7.20. Median haemoglobin and quartile range January 2000–December 2002 for patients receiving peritoneal dialysis



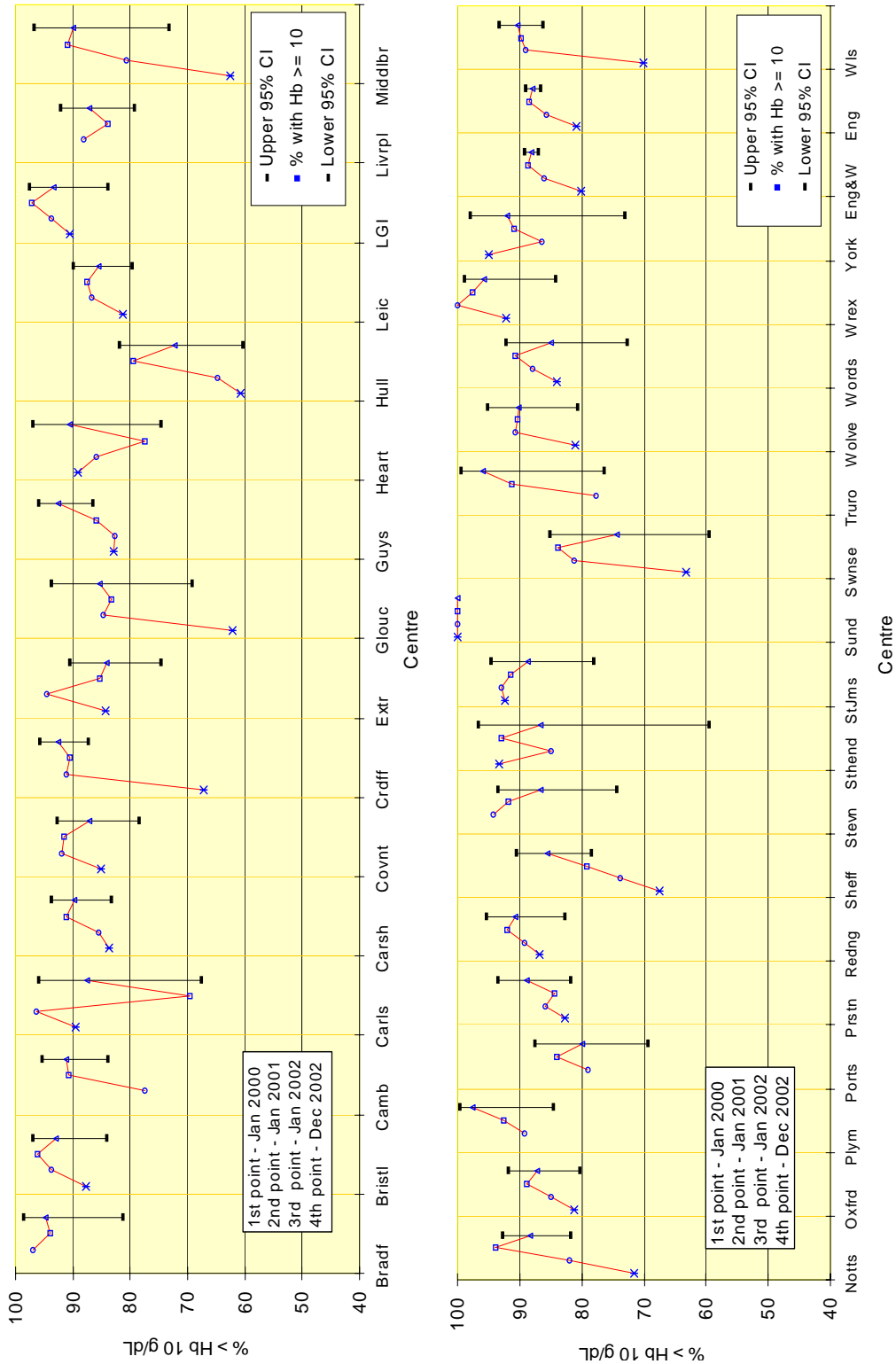


Figure 7.21. Percentage haemoglobin >10g/dl January 2000–December 2002 for patients receiving peritoneal dialysis

## **Conclusion**

There has been a continued rise in the haemoglobin concentrations of dialysis patients and the proportion reaching the Renal Association target. There is some evidence that this rise may be reaching a plateau in peritoneal dialysis patients.

There continues to be marked difference in haemoglobin concentrations between recently started patients and prevalent dialysis patients. Anaemia is unavoidable when patients present as uraemic emergencies but is also the result of both late referral to neph-

rologists and variations in predialysis anaemia management that could be improved.

There is evidence of variation of haemoglobin levels in centres over time. This reflects the effect of fluctuating haemoglobin concentrations in individuals receiving dialysis treatment, which has also been identified in previous Registry reports. It is therefore not possible to make judgements about quality of treatment within a centre on the basis of a single set of data especially if it has relatively few dialysis patients.