Chapter 13: Performance Against Renal Association Standards

Summary

- Chi squared testing showed that the percentage of patients achieving the recommended Standard for all the following variables differed significantly between centres for both modalities of dialysis. The variables tested were: haemoglobin, dialysis adequacy, serum ferritin, calcium, phosphate, bicarbonate, and intact parathyroid hormone blood pressure.

Introduction

The Standards Committee of the Renal Association has identified a number of laboratory and clinical variables that may relate to quality of care or outcomes, and has recommended minimum Standards or target ranges that should be achieved in established dialysis patients. A revised document was published in Autumn 2002 and these are shown in Table 13.1.

Data included on dialysis patients are from the last quarter of 2002 for all items except cholesterol and iPTH which are from the last 6 months. Patients were excluded if they had not been on renal replacement therapy (RRT) for at least 3 months or if they had transferred unit or changed dialysis modality in the 3 month period prior to data sampling. This ensured that the results for a unit reflected stable treatment patterns and were not adversely affected by new patients whom the unit had not had the chance to treat effectively.

The problems of comparing biochemical variables such as albumin, calcium and bicarbonate identified in the previous reports still apply; comparative data must be interpreted with caution. The achievement of Standards defined around the local laboratory reference range is dependent on the source of derivation for the reference range. The urea reduction ratio (URR) may be influenced by post-dialysis sampling techniques.

Overview of presentation

Results have been ranked in order of performance purely for clarity of presentation, otherwise the figures would be difficult to read. The significance of the ranking order is discussed below.

Table 13.1. Renal Association 3rd Standards

Standard	Haemodialysis	Peritoneal dialysis	Transplant
Albumin	$\geq$35 g /L BCG $\geq$30 g/L BCP	$\geq$35 g /L BCG $\geq$30 g/L BCP	
Bicarbonate	20–26 mmol/L	25–29 mmol/L	
Blood pressure	Pre HD $\leq$140/90 mmHg Post HD $\leq$130/80 mmHg	$\leq$130/80 mmHg	$\leq$130/80 mmHg
Calcium adjusted for albumin	2.2.–2.6 mmol/L	2.2.–2.6 mmol/L	
Cholesterol - Total	<5mmol/L	<5mmol/L	
Dialysis adequacy	Urea reduction ratio $\geq$65%		
Ferritin	$\geq$100 mcg/L	$\geq$100 mcg/L	
Haemoglobin	$\geq$10g/dL	$\geq$10g/dL	
HbA1c	<7%	<7%	< 7%
Parathyroid hormone	<4 × upper local range	<4 × upper local range	<4 × upper local range
Phosphate	<1.8 mmol/L pre HD	<1.8 mmol/L	

In the following section, many figures use a common modified box-plot format, data being presented separately for haemodialysis (HD), and peritoneal dialysis (PD) and transplantation.

- The figures showing the percentage of patients reaching the Renal Association Standard include the 95% confidence interval calculated for this figure (using the Poisson approximation).

- Where medians are displayed, the 25th and 75th centiles for the unit are included.

- Data completeness is indicated by the 'percentage missing' figure before the renal unit abbreviated name (see Appendix H).

These methods are the best way the Registry has found to convey the underlying data for the larger number of centres.

Haemoglobin
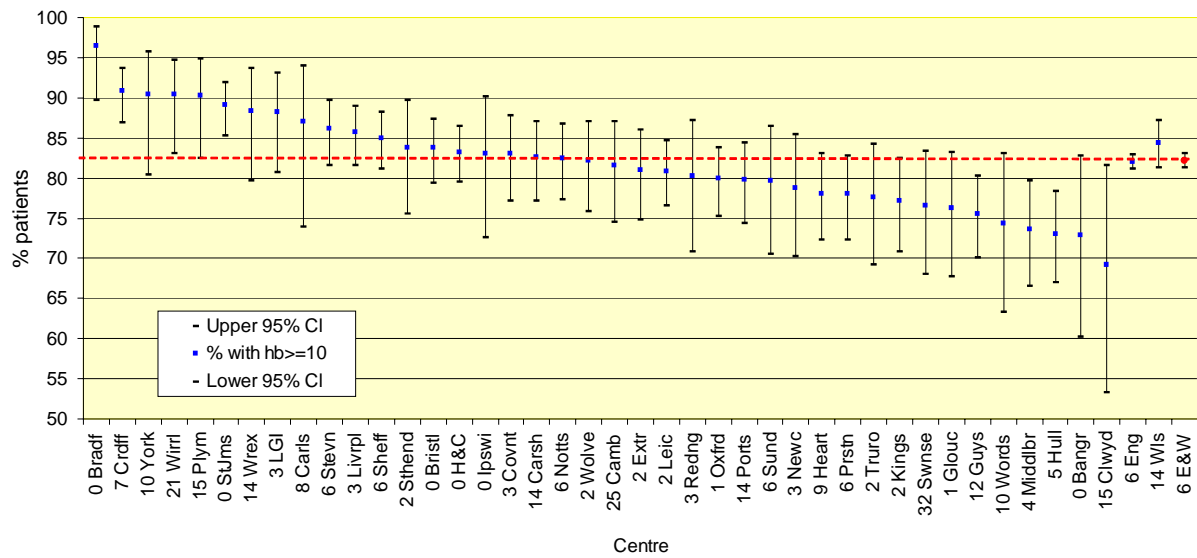
Figure 13.1. % of HD patients achieving the RA Hb Standard by centre
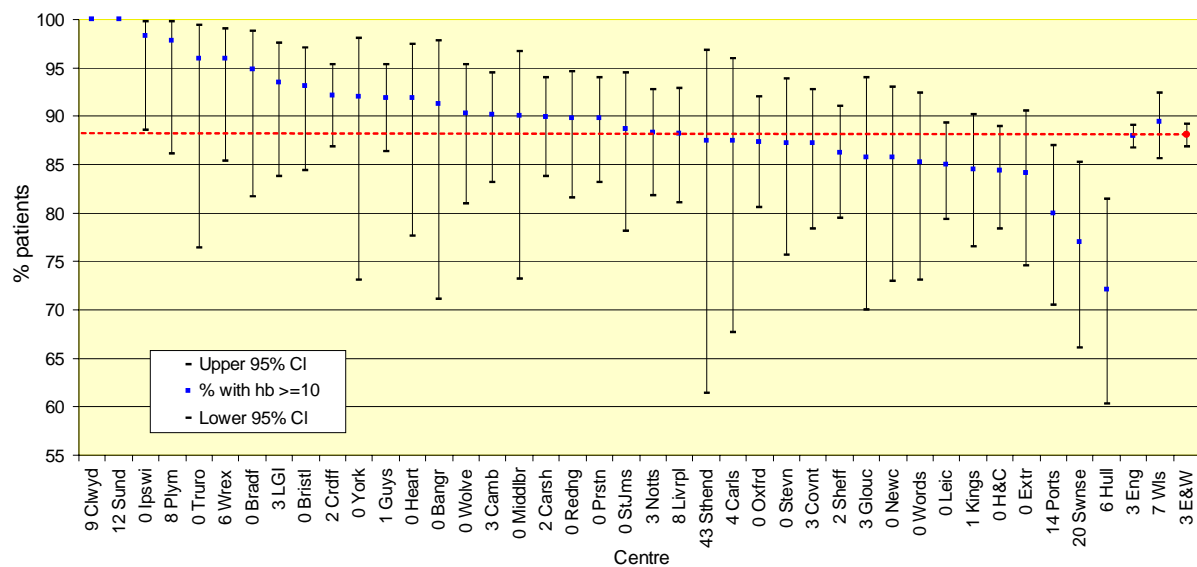
Figure 13.2. % of PD patients achieving the RA Hb Standard by centre
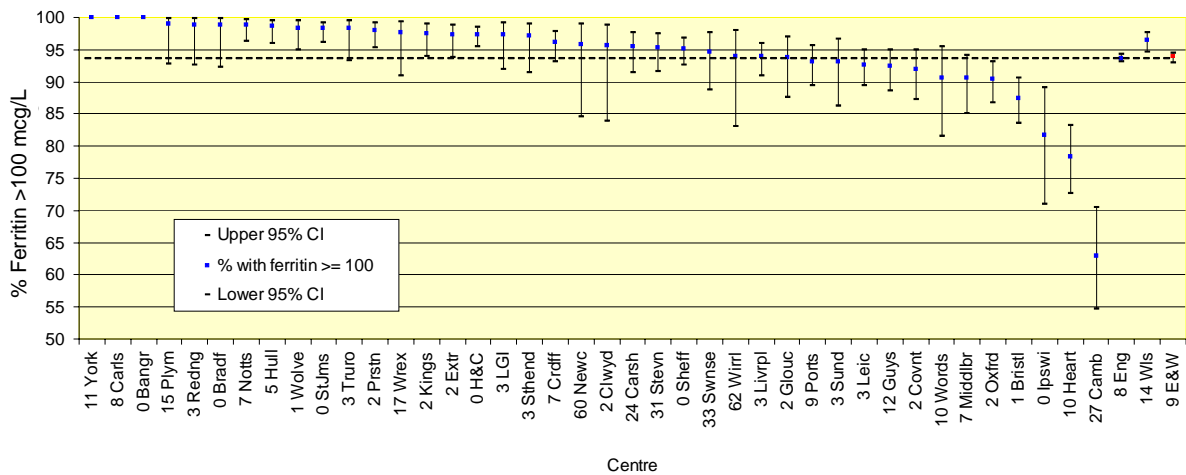
Serum Ferritin

Figure 13.3. % of HD patients achieving the RA Ferritin Standard by centre
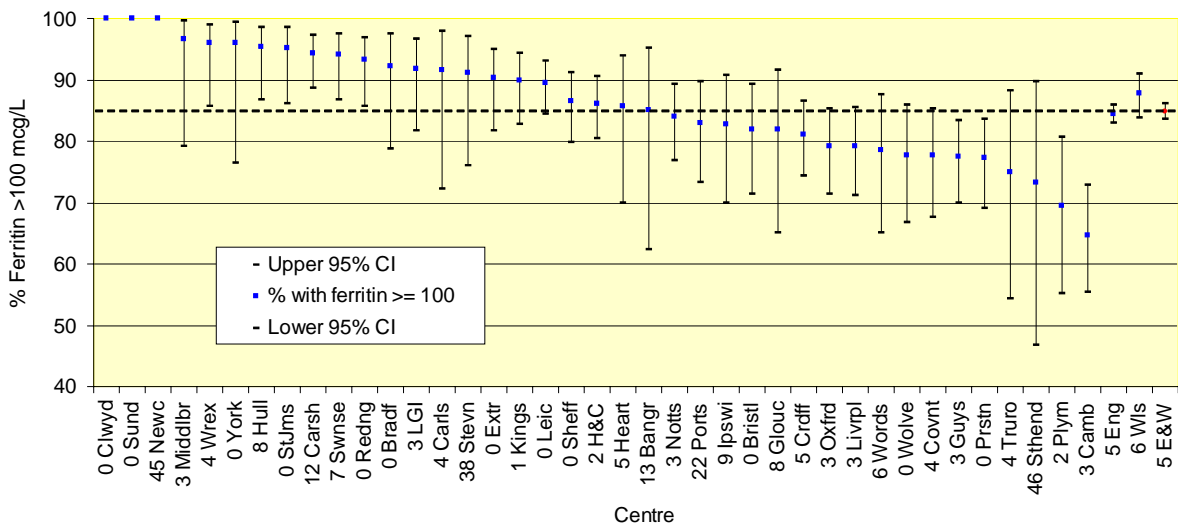

Figure 13.4. % of PD patients achieving the RA Ferritin Standard by centre
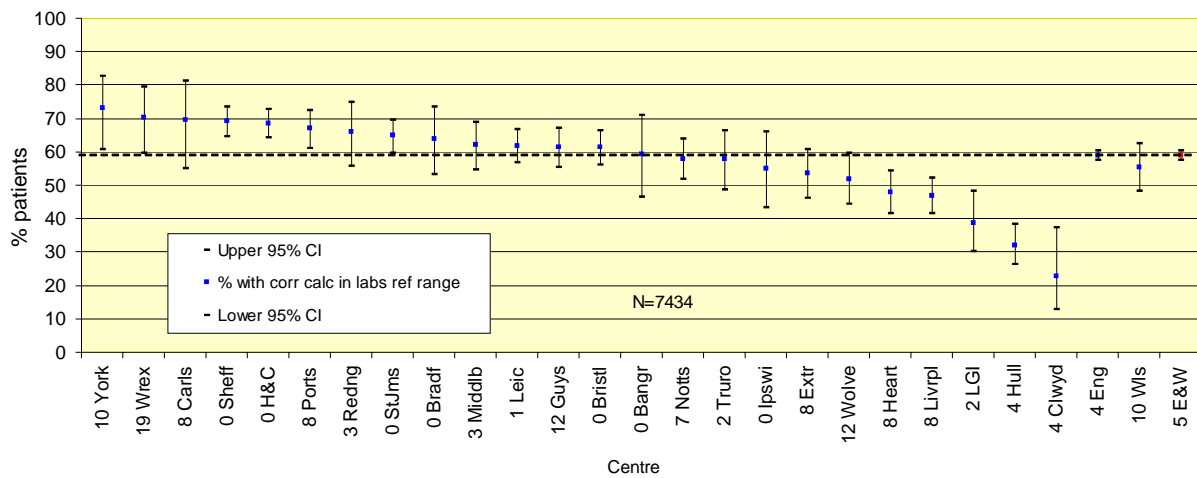
Serum calcium

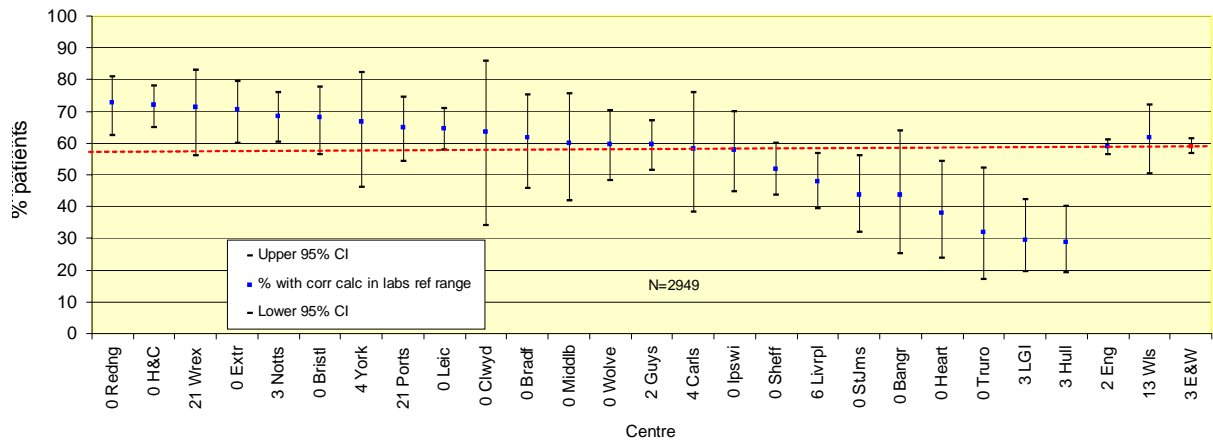**Figure 13.5. % of HD patients achieving the RA calcium Standard by centre**

Figure 13.6. % of PD patients achieving the RA calcium Standard by centre
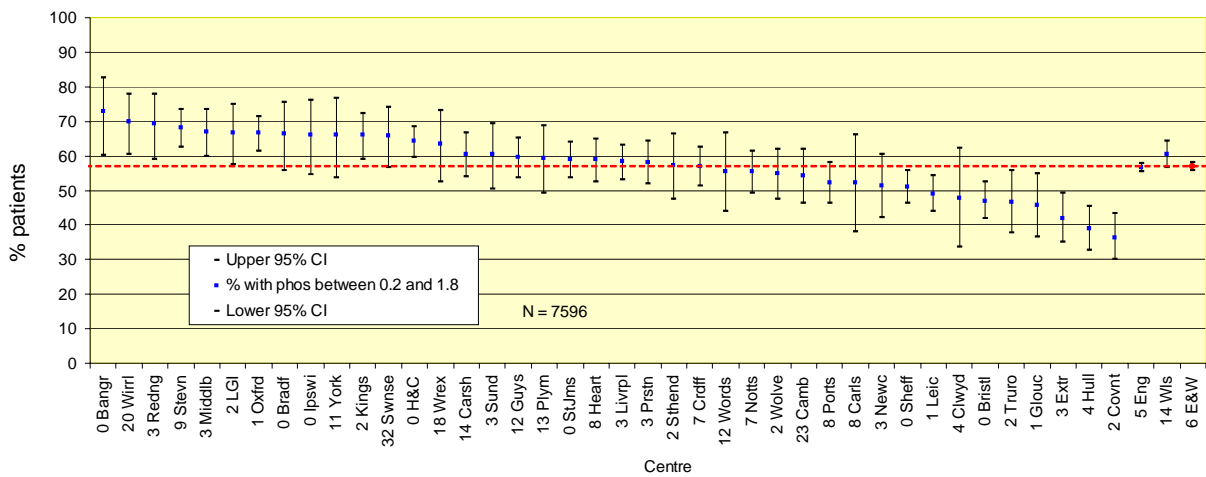
Serum phosphate

Figure 13.7. % of HD patients achieving the RA phosphate Standard by centre
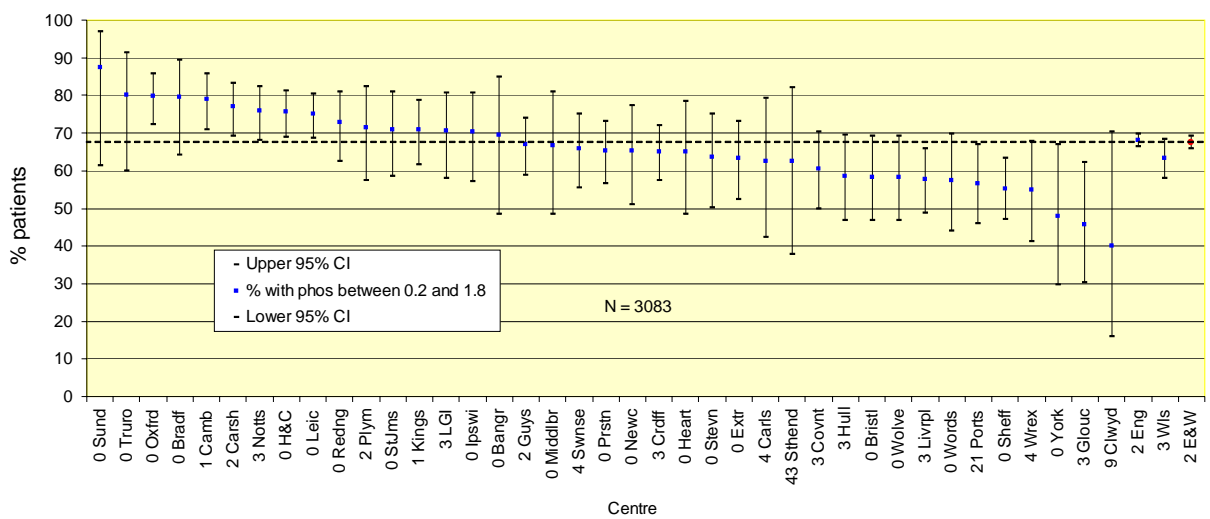

Figure 13.8. % of PD patients achieving the RA phosphate Standard by centre

Intact parathyroid hormone

As the local laboratory reference range for PTH has not been derived from a local or UK population reference range, the Registry in line with previous years has used the average upper laboratory reference limit. In the new Standards this is $<\times 4$ rather than $<\times 3$.
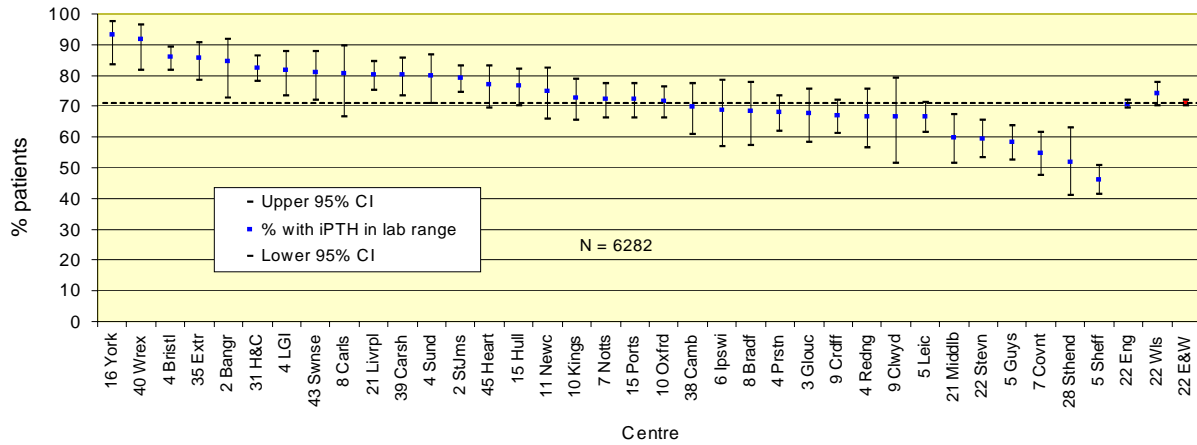

Figure 13.9. % of HD patients achieving iPTH < 32 pmol/L by centre
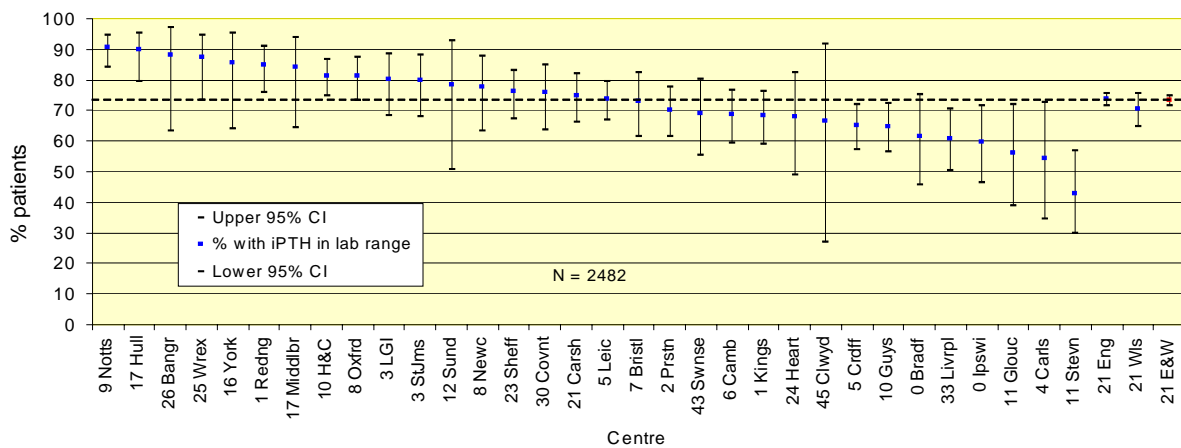
Figure 13.10. % of PD patients achieving iPTH < 32 pmol/L by centre

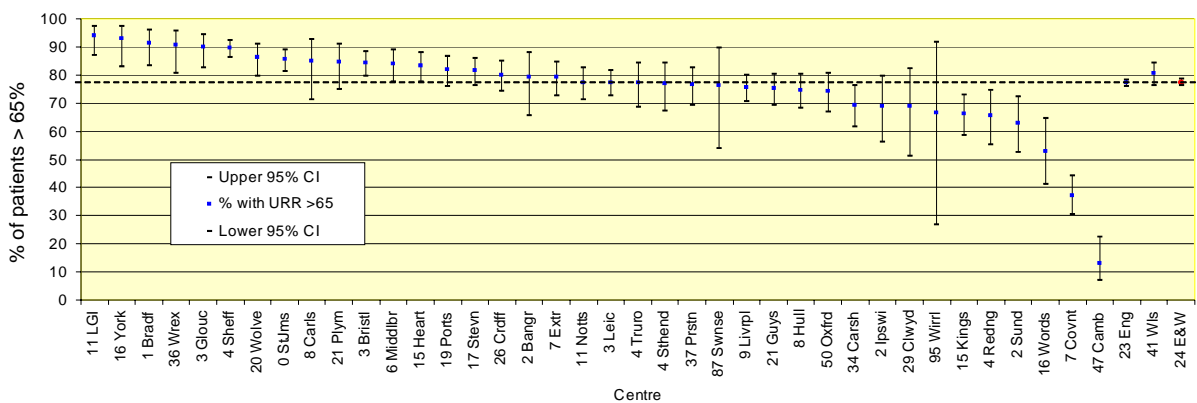## Dialysis adequacy

Figure 13.11. % of HD patients with URR $\geq$ 65% by centre
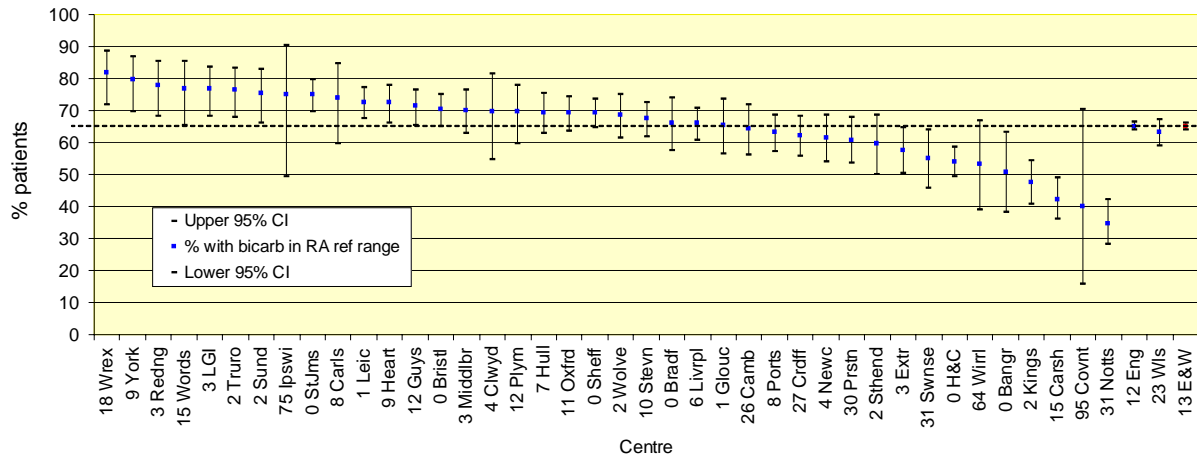
Serum bicarbonate

Figure 13.12. % of HD patients achieving the RA bicarbonate Standard by centre
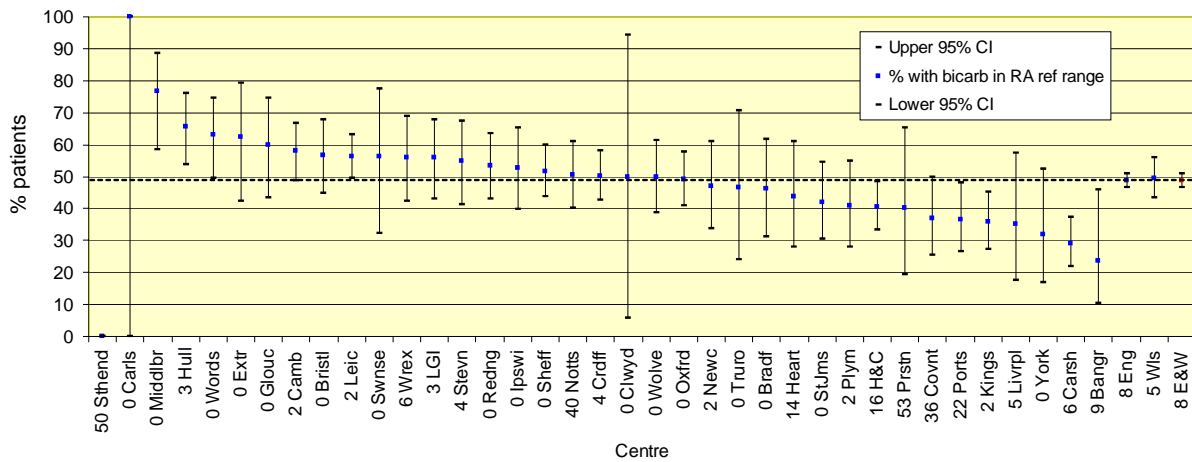

Figure 13.13. % of PD patients achieving the RA bicarbonate Standard by centre
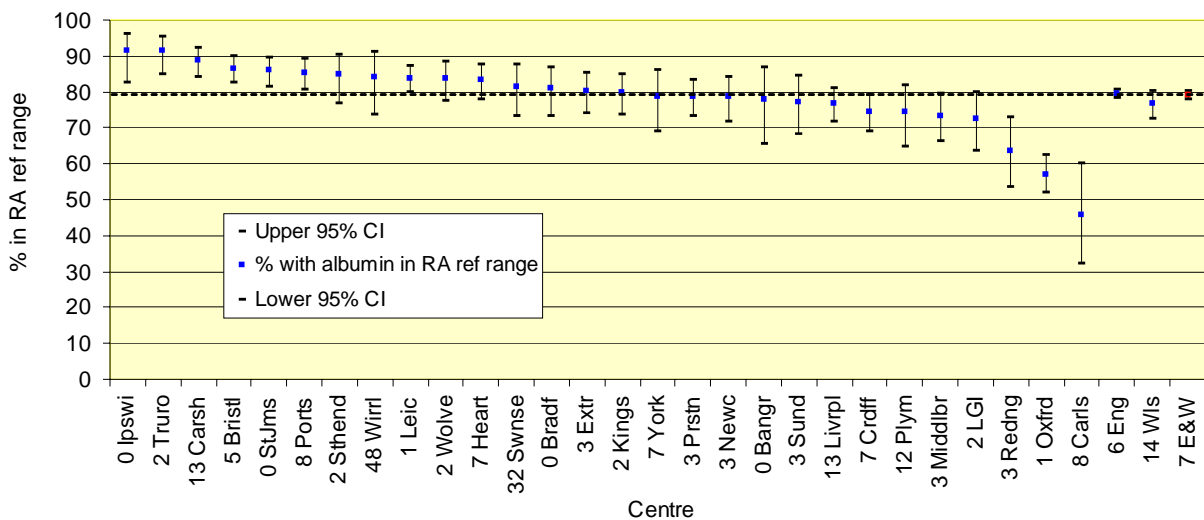
Serum albumin

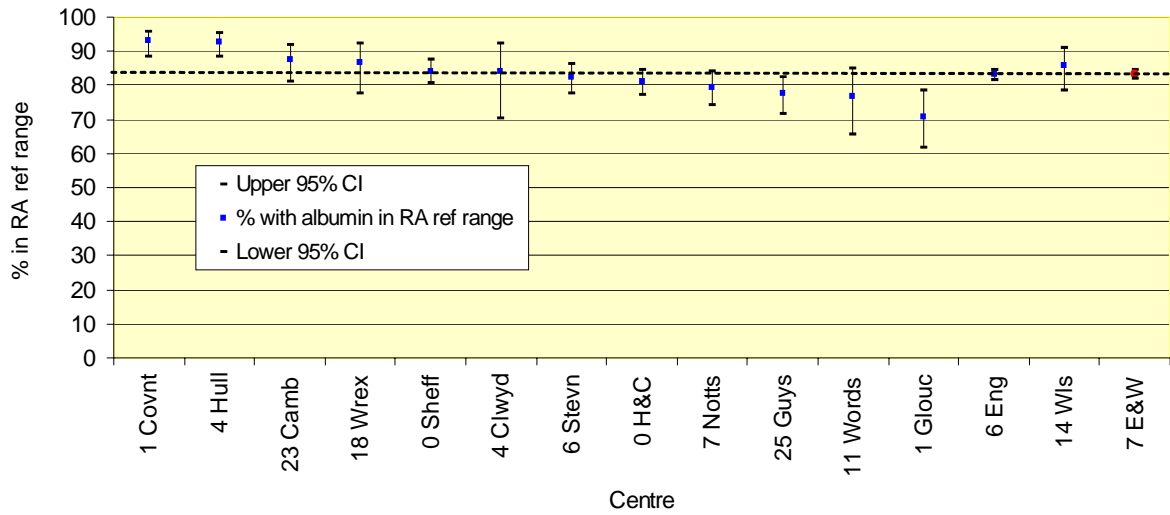**Figure 13.14. % of HD patients achieving the RA albumin BCG Standard by centre**

Figure 13.15. % of HD patients achieving the RA albumin BCP Standard by centre

Figure 13.16. % of PD patients achieving the RA albumin BCG Standard by centre
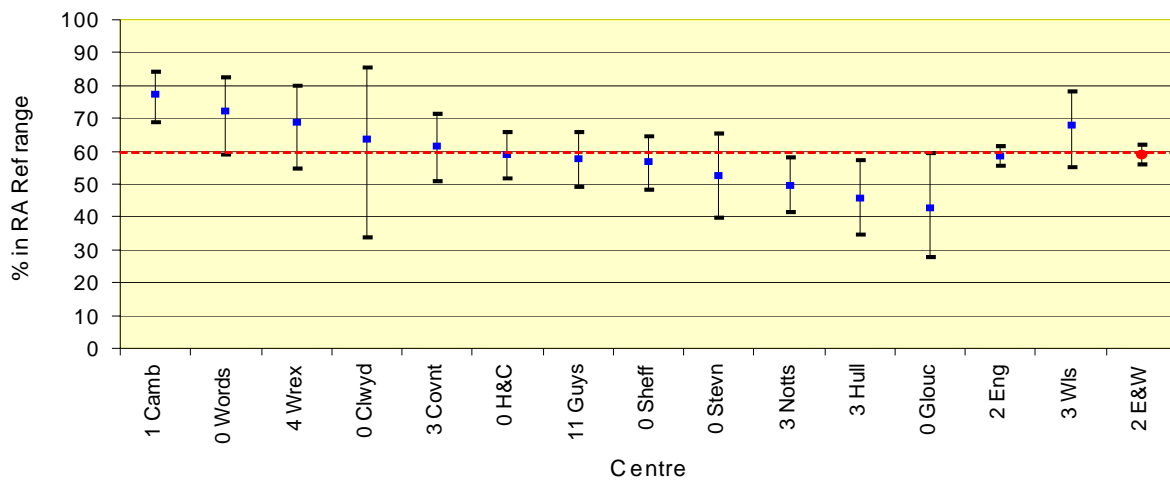
Figure 13.17. % of PD patients achieving the RA albumin BCP Standard by centre

Blood pressure
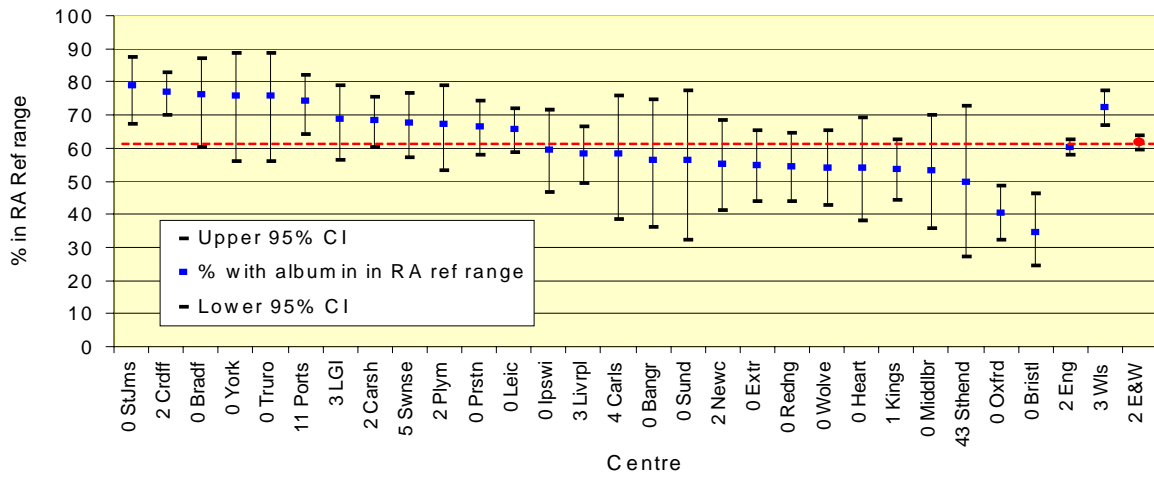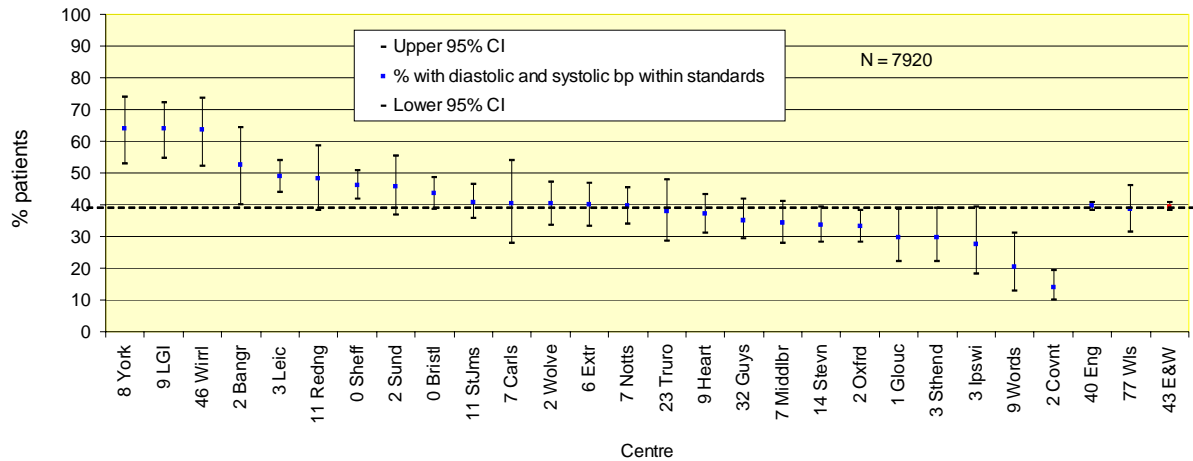

Figure 13.18. % of HD patients achieving the RA BP Standard by centre
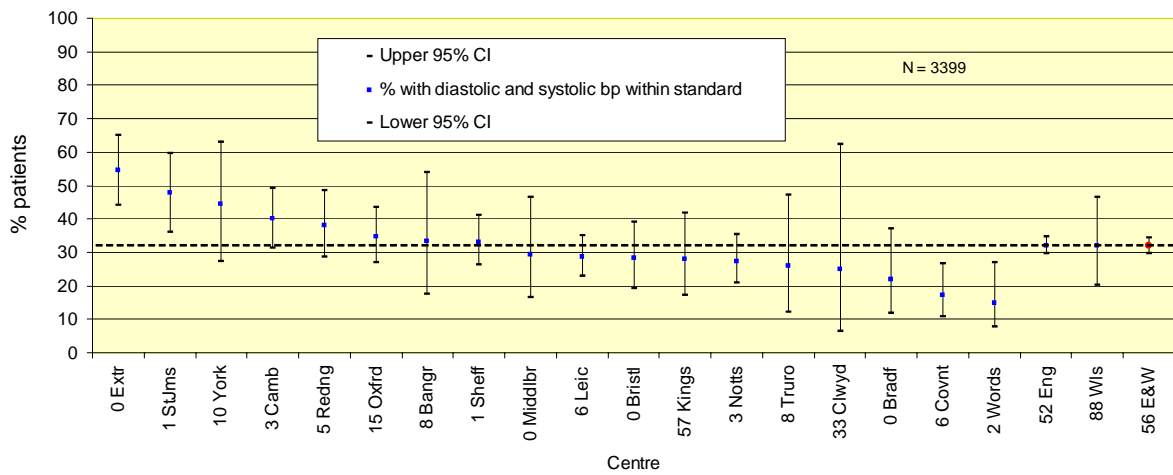
Figure 13.19. % of PD patients achieving the RA BP Standard by centre

Figure 13.20. % of transplant patients achieving the RA BP Standard by centre

Serum Cholesterol

Figure 13.21. % of HD patients achieving the RA cholesterol Standard by centre

Figure 13.22. % of PD patients achieving the RA cholesterol Standard by centre

Glycated Haemoglobin
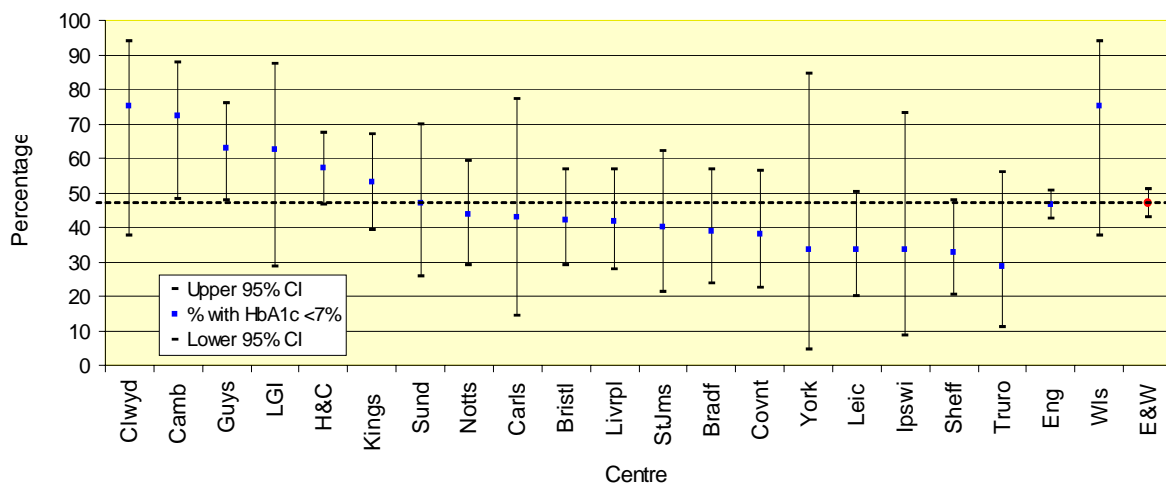
Figure 13.23. % of diabetic HD patients achieving the RA HbA1c Standard by centre

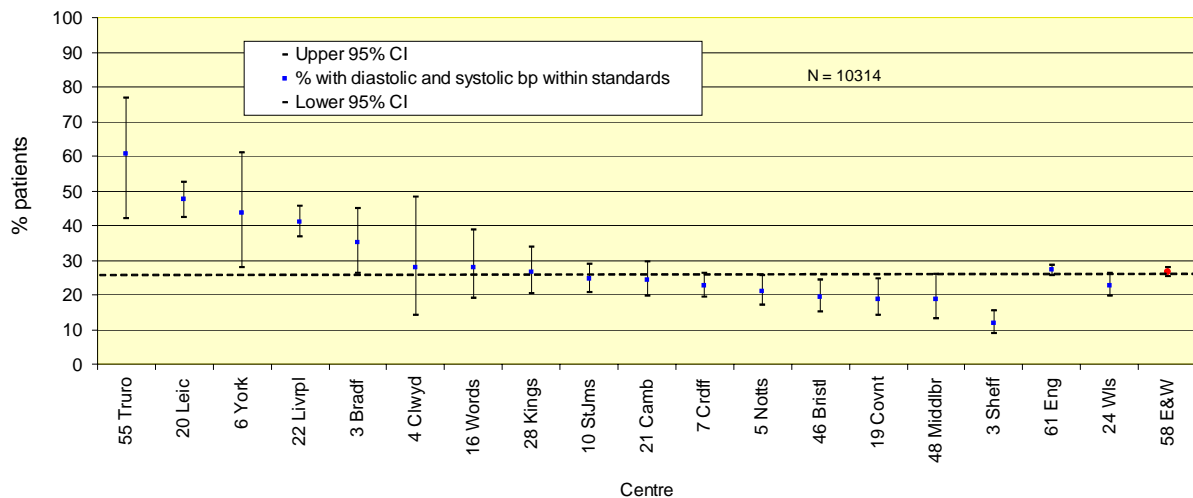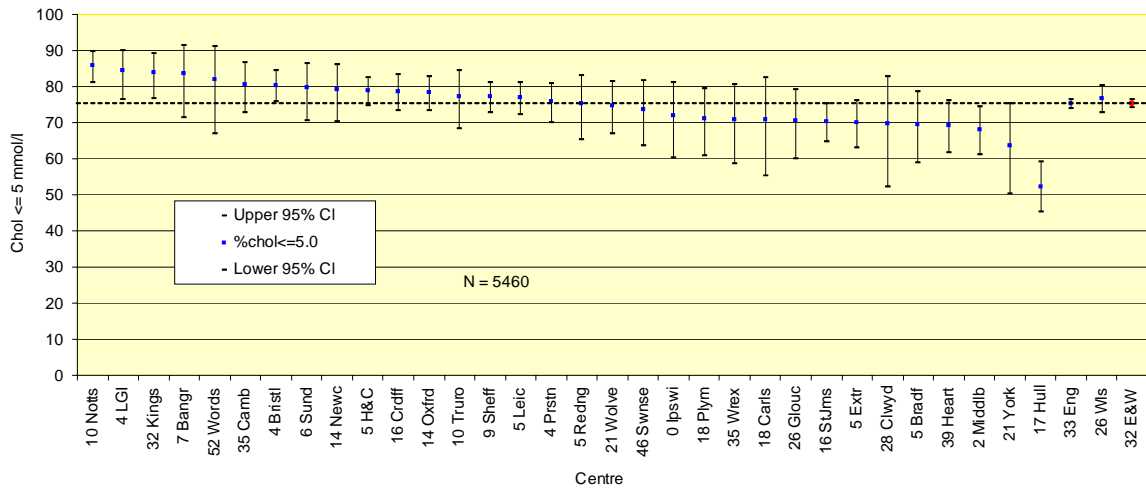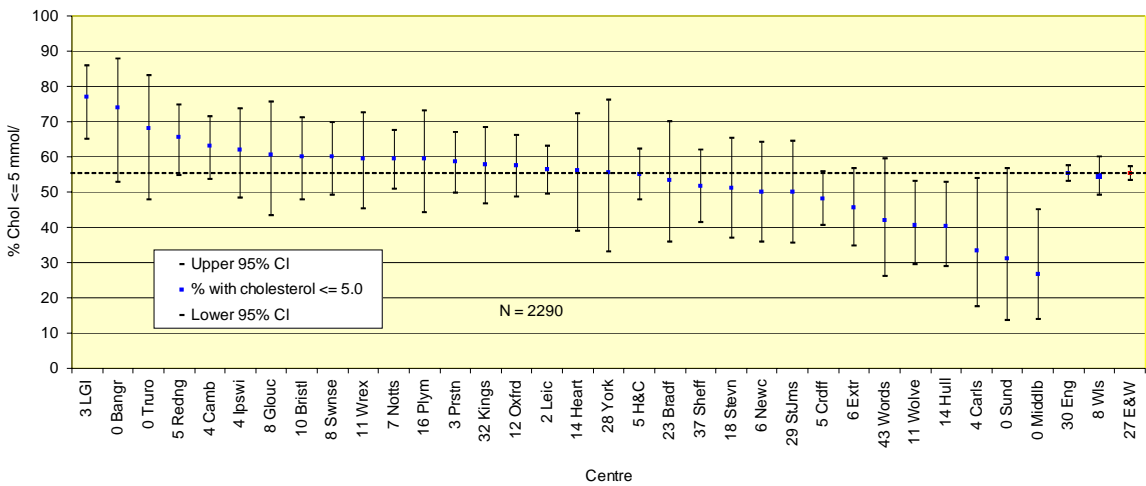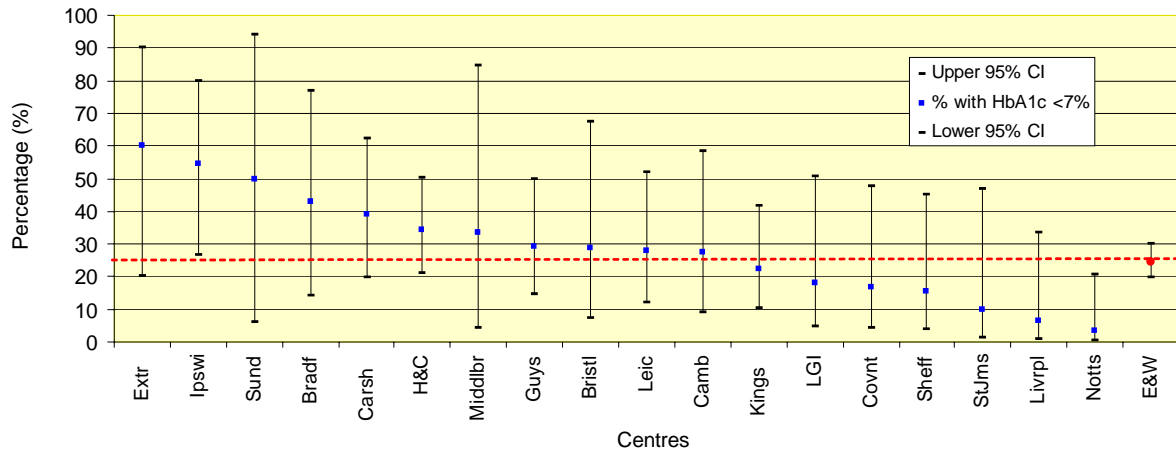**Figure 13.24. % of diabetic PD patients achieving the RA HbA1c Standard by centre**
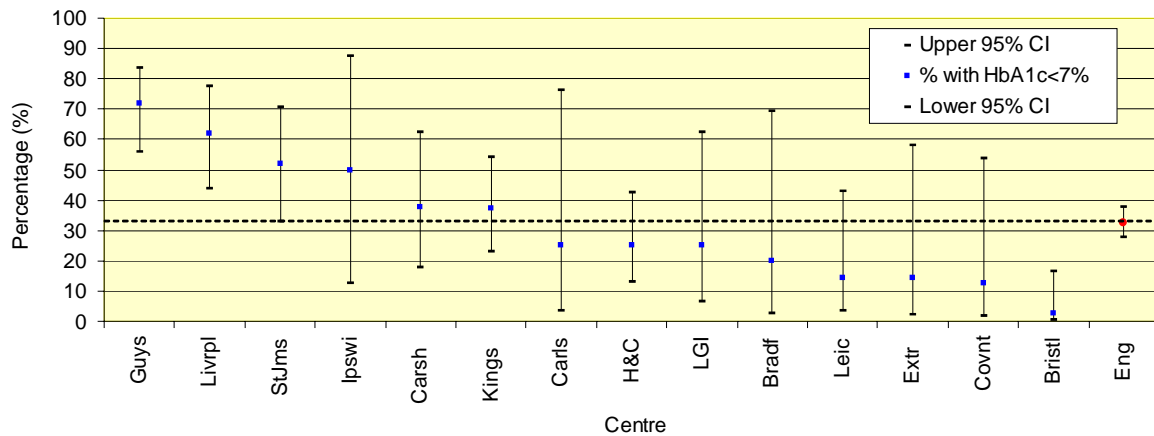
Figure 13.25. % of diabetic transplant patients achieving the RA HbA1c Standard by centre

Statistical analysis

Methodology

Chi squared tests were used to see whether the percentage of patients with data in a given range varied significantly between centres. Degrees of freedom are equal to the number of centres with over 50% completeness minus 1.

Results

Haemoglobin

A chi squared test was used to determine whether the percentage of patients with a haemoglobin level of 10 g/dL or more dif-

fered between centres.

For patients on HD, the percentage of patients with a haemoglobin of 10 g/dL or more was found to differ significantly between centres (χ^2 = 126.3, d.f. = 39, p < 0.001).

For patients on PD, the percentage of patients with a haemoglobin of 10 g/dL or more was found to differ significantly between centres (χ^2 = 69.6, d.f. = 38, p < 0.0013).

Ferritin

A chi squared test was used to determine whether the percentage of patients with a ferritin level of 100 mcg/L or more differed

between centres.

For patients on HD, the percentage of patients with a ferritin of 100 mcg/L or over was found to differ significantly between centres ($\chi^2 = 512.5$, d.f. = 39, p < 0.001).

For patients on PD, the percentage of patients with a ferritin of 100 mcg/L or over was found to differ significantly between centres ($\chi^2 = 142$, d.f .= 38, p < 0.001).

Calcium

A chi squared test was used to determine whether the percentage of patients with a calcium level of 2.2 to 2.6mmol/L differed between centres.

For patients on HD, the percentage of patients with a serum calcium of 2.2. to 2.6 mmol/L differed significantly between centres ($\chi^2 = 420$, d.f. = 26, p < 0.001).

For patients on PD, the percentage of patients with a serum calcium of 2.2. to 2.6 mmol/L differed significantly between centres ($\chi^2 = 248$, d.f. = 26, p < 0.001).

Phosphate

A chi squared test was used to determine whether the percentage of patients with a phosphate level of 1.8mmol/L or less differed between centres.

For patients on HD, the percentage of patients with a serum phosphate of 1.8 mmol/L or less differed significantly between centres ($\chi^2 = 221$, d.f. = 39, p < 0.001).

For patients on PD, the percentage of patients with a serum phosphate of 1.8 mmol/L or less differed significantly between centres ($\chi^2 = 102$, d.f. = 38, p < 0.001).

PTH

A chi squared test was used to determine whether the percentage of patients with a PTH of 32 pmol/L or below differed between centres. Note this is slightly different from the RA standard.

For patients on HD, the percentage of patients with a PTH value of 32 pmol/L or less differed significantly between centres ($\chi^2 = 377$, d.f. = 38, p < 0.001).

For patients on PD, the percentage of patients with a PTH of 32 pmol/L or less differed significantly between centres ($\chi^2 = 138$, d.f. = 35, p < 0.001).

URR

A chi squared test was used to determine whether the percentage of patients with a URR of 65% or more differed between centres.

The percentage of patients with a URR of 65% or above was found to vary significantly between centres ($\chi^2 = 542.9$, d.f. = 37, p < 0.001).

Bicarbonate

A chi squared test was used to determine whether the percentage of patients with bicarbonate values within 20–26 mmol/L or 25–29 mmol/L respectively for HD and PD varied between centres.

For patients on HD, the percentage of patients with a bicarbonate within 20–26 mmol/L differed significantly between centres ($\chi^2 = 899.9$, d.f. = 39, p < 0.001).

For patients on PD, the percentage of patients with a bicarbonate within 20–26 mmol/L differed significantly between centres ($\chi^2 = 168.8$, d.f. = 36, p < 0.001).

Albumin

A chi squared test was used to determine whether the percentage of patients with a serum albumin 35 g/L or more measured using a BCG assay or 30 g/L or more measured using a BCP assay varied between centres.

For patients on HD, the percentage of patients with a serum albumin ≥35 g/L measured by BCG differed significantly between centres ($\chi^2 = 331.5$, d.f. = 28, p < 0.001) and > 30 g/L measured by BCP differed significantly between centres ($\chi^2 = 142.8$, d.f. = 10, p < 0.001).

For patients on PD, the percentage of patients with a serum albumin ≥ 35 g/L measured by BCG differed significantly between centres ($\chi^2 = 114.8$, d.f. $= 27$, p < 0.001) and >30 g/L measured by BCP differed significantly between centres ($\chi^2 = 39.9$, d.f. $= 10$, p < 0.001).

Blood pressure

A chi-squared test was used to determine whether the percentage of patients with both systolic and diastolic blood pressure within range differed between centres.

For patients on HD, the percentage of patients with a pre-dialysis blood pressure of $\leq 140/90$ mmHg differed significantly between centres ($\chi^2 = 208.3$, d.f. $= 31$, p < 0.001).

For patients on PD, the percentage of patients with a blood pressure of $\leq 130/80$ mmHg differed significantly between centres ($\chi^2 = 68.5$, d.f. $= 29$, p < 0.001).

For patients with a transplant, the percentage of patients with a blood pressure of $\leq 130/80$ mmHg differed significantly between centres ($\chi^2 = 200.1$, d.f. $= 20$, p < 0.001).

Cholesterol

A chi squared test was used to determine whether the percentage of patients with a serum cholesterol level of 5 mmol/L or less differed between centres.

For patients on HD, the percentage of patients with a serum cholesterol of 5 mmol/L or less differed significantly between centres ($\chi^2 = 124.4$, d.f. $= 36$, p < 0.001).

For patients on PD, the percentage of patients with a serum cholesterol of 5 mmol/L or less differed significantly between centres ($\chi^2 = 132.1$, d.f. $= 38$, p < 0.001).

HbA1c

A chi squared test was used to determine whether the percentage of patients with a glycated haemoglobin level of less than 7% differed between centres.

For patients on HD, the percentage of patients with an HbA1c of $<$ 7% differed significantly between centres ($\chi^2 = 52.9$, d.f. $= 23$, p < 0.001).

For patients on PD, the percentage of patients with an HbA1c of $<7\%$ *did not* differ significantly between centres ($\chi^2 = 29.9$, d.f. $= 22$, p $= 0.122$).

For patients with a transplant, the percentage of patients with an HbA1c of $<7\%$ differed significantly between centres ($\chi^2 = 89.7$, d.f. $= 20$, p < 0.001).