# Chapter 10
# Calcium, Phosphate, Parathyroid Hormone, Bicarbonate and Total Cholesterol Concentrations amongst patients receiving haemodialysis or peritoneal dialysis in England, Wales and Northern Ireland in 2009: national and centre-specific analyses

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**Key Words**
Bicarbonate · Biochemical variables · Calcium · Cholesterol · Dialysis · Haemodialysis · Parathyroid hormone · Peritoneal dialysis · Phosphate · Quality improvement

**Summary**

- 61% of HD patients and 70% of PD patients had a serum phosphate between 1.1–1.8 mmol/L.
- 24% of HD and 23% of PD patients had a serum phosphate >1.8 mmol/L.
- 74% of HD and 75% of PD patients had adjusted calcium between 2.2–2.5 mmol/L.
- 28% of HD and 32% of PD patients has a serum PTH between 16–32 pmol/L.
- 72% of HD and 83% of PD patients achieved the audit measure for bicarbonate.

## Introduction

The UK Renal Registry (UKRR) collects routine biochemical data from clinical information systems in renal centres in England, Wales and Northern Ireland. Annual cross sectional analyses are undertaken on some of these variables to determine centre level performance against national (Renal Association) clinical performance measures [1]. This enables UK renal centres to compare their own performance against each other and to the UK average performance [2]. The UK Renal Association Clinical Practice Guidelines were revised and the final version of the 4th edition of these guidelines was published in November 2007 [1]. Audit measures for kidney disease increasingly include tighter specification limits in conjunction with a growing evidence base. Out of range observations (e.g. hyperphosphataemia and hypophosphataemia) need to be interpreted cautiously as they may relate to different clinical problems or population characteristics. These will therefore require different strategies to improve centre performance of clinical audit measures. The format of data presentation has been revised compared to previous UKRR reports. To supplement these performance analyses, summary statistical data have been provided to enhance understanding of the population characteristics of each centre and longitudinal analyses demonstrate changes over time.

## Methods

These analyses relate to biochemical variables in the prevalent dialysis cohort in England, Wales and Northern Ireland in 2009. The cohort studied were patients prevalent on dialysis treatment on 31/12/2009, excluding patients receiving dialysis for less than 90 days and those who had changed modality or renal centre in the last 90 days. HD and PD cohorts were analysed separately. A full definition of this cohort including inclusion and exclusion criteria is included in appendix B www.renalreg.com/Report-Area/Report 2010/Appendix-B.pdf.

The biochemical variables analysed were phosphate, calcium, parathyroid hormone, bicarbonate and cholesterol. The method of data collection and validation by the UKRR has been described elsewhere [3]. For each quarter of 2009 the UKRR extracted biochemical data electronically from clinical information systems in UK dialysis centres. The UKRR does not collect data regarding different assay methods mainly because a single dialysis centre may process samples in several different laboratories. For centres providing adjusted calcium values, these data were analysed directly as it is these values on which clinical decisions within centres are based. For centres providing unadjusted calcium values, a formula in widespread use was used to calculate adjusted calcium [4]. The audit measure for adjusted calcium in the 4th edition of the Renal Association Clinical Practice Guidelines depends on a local reference range [1]. The UKRR has used adjusted calcium between 2.2–2.5 mmol/L as an audit measure. There are also a variety of methods and reference ranges in use to measure parathyroid hormone. To enable some form of comparative audit the UKRR has chosen 2–4 times the median upper laboratory value as the audit measure. This equates to 16–32 pmol/L and is comparable to KDOQI (15–31 pmol/L) [5]. The audit measure used for serum bicarbonate in the HD cohort was 20–26 mmol/L and in the PD cohort was 22–30 mmol/L. A summary of the current Renal Association audit measures and conversion factors to SI units are given in table 10.1.

Quarterly values were extracted from the database for the last two quarters for calcium and phosphate, the last three quarters for PTH and the entire year for cholesterol. Patients who do not have these data were excluded from the analyses. The completeness of data were analysed at centre and country level. All patients were included in analyses but centres with less than 50% completeness were excluded from plots showing centre performance. Data were also excluded from plots when there were less than 20 patients with data both at centre or country level. These data were analysed to calculate summary statistics (maximum, minimum, mean and median values in addition to standard deviation and quartile ranges). Where applicable, the percentage achieving the Renal Association or other surrogate clinical performance measure was also calculated.

Centres report several biochemical variables with different levels of accuracy, leading to problems in comparative evaluation. For example, in the case of serum bicarbonate, data can be submitted as integer values but some centres submit data to one

**Table 10.1.** Summary of clinical audit measures and conversion factor from SI units

| Biochemical variable | Clinical audit measure | Conversion factor from SI units |
|---|---|---|
| Phosphate | 1.1–1.8 mmol/L | mg/dl = mmol/L × 3.1 |
| Calcium | Normal range (ideally <2.5 mmol/L) | mg/dl = mmol/L × 4 |
| Parathyroid hormone | 2–4 times upper limit of normal | ng/L = pmol/L × 9.5 |
| Bicarbonate | HD patients: 20–26 mmol/L<br>PD patients: 22–30 mmol/L | mg/dl = mmol/L × 6.1 |
| Cholesterol | No audit measure | mg/dl = mmol/L × 38.6 |

decimal place. All data has this year been rounded up in an attempt to make all centres more comparable. This has resulted in significant changes in target attainment for some centres and an overall increase in the percentage of patients achieving the treatment target.

The number preceding the centre name in each figure indicates the percentage of missing data for that centre [6]. Funnel plot analysis was used to identify 'outlying centres'. The percentage achieving each standard was plotted against centre size along with the upper and lower 95% and 99.9% limits. Centres can be identified on these plots by looking up the number of patients treated in each centre provided in the relevant table and finding this value on the x-axis. Longitudinal analyses were performed for some data to calculate overall changes in achievement of a performance measure annually from 2000 to 2009 and were recalculated for each previous year using the rounding procedure. All data were unadjusted for case-mix.

## Results and Discussions

*Mineral and bone variables*

*Phosphate*

The 4th edition of the Renal Association Clinical Practice Guidelines states:

***'Serum phosphate in dialysis patients (measured before a "short gap" dialysis session in HD patients) should be maintained between 1.1 and 1.8 mmol/L.' (Module 2: Complications)*** [1]

The data for serum phosphate were 96% complete for HD patients and 98% complete for PD patients overall although there was considerable variation between centres (tables 10.2 and 10.4). The individual centre means and standard deviations are shown in tables 10.2 and 10.4. Sixty-one percent (CI 61–62%) of HD patients and 70% (CI 68–71%) of PD patients achieved a phosphate between 1.1–1.8 mmol/L (tables 10.3 and 10.5). The proportion of HD patients with hyperphosphataemia was 24% compared to 28% in 2008 and the proportion with hypophosphataemia was 15% compared to 2008 when it was 18% (table 10.3, figures 10.1 and 10.2). The proportion of PD patients with hyperphosphataemia was 23% compared to 24% in 2008 and the proportion with hypophosphataemia was 8% compared to 13% in 2008 (table 10.3, figures 10.3 and 10.4). The changes in the percentages above, below and within range for the period 2000 to 2009 for England, Northern Ireland and Wales combined, are shown in figure 10.5.

There was significant between centre variation in the proportion of patients below, within and above the range specified by the clinical performance measure (figures 10.1–10.4). The latest version of the Renal Association Clinical Practice Guidelines [7], finalised in 2010, suggests maintenance of serum phosphate between 1.1–1.7 mmol/L and this audit standard will be used in next year's report.

**Table 10.2.** Summary statistics for phosphate in haemodialysis patients in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 99.2 | 120 | 1.5 | 0.5 | 1.4 | 1.1 | 1.8 |
| B Heart | 95.3 | 387 | 1.7 | 0.5 | 1.6 | 1.3 | 1.9 |
| B QEH | 96.9 | 782 | 1.6 | 0.5 | 1.5 | 1.2 | 1.8 |
| Bangor | 100.0 | 74 | 1.6 | 0.5 | 1.5 | 1.2 | 1.8 |
| Basldn | 98.5 | 131 | 1.5 | 0.5 | 1.4 | 1.2 | 1.8 |
| Belfast | 98.7 | 226 | 1.5 | 0.5 | 1.4 | 1.1 | 1.8 |
| Bradfd | 94.3 | 166 | 1.4 | 0.5 | 1.4 | 1.1 | 1.8 |
| Brightn | 99.7 | 291 | 1.6 | 0.5 | 1.5 | 1.2 | 1.9 |
| Bristol | 100.0 | 403 | 1.7 | 0.5 | 1.7 | 1.4 | 2.0 |
| Camb | 70.1 | 230 | 1.5 | 0.5 | 1.5 | 1.2 | 1.8 |
| Cardff | 97.8 | 436 | 1.6 | 0.5 | 1.5 | 1.3 | 1.9 |
| Carlis | 100.0 | 57 | 1.5 | 0.5 | 1.4 | 1.2 | 1.8 |
| Carsh | 97.9 | 599 | 1.6 | 0.5 | 1.6 | 1.3 | 1.9 |
| Chelms | 100.0 | 109 | 1.4 | 0.4 | 1.3 | 1.1 | 1.6 |
| Clwyd | 100.0 | 74 | 1.7 | 0.5 | 1.6 | 1.3 | 2.1 |
| Colchr | 99.0 | 101 | 1.6 | 0.4 | 1.5 | 1.3 | 1.8 |

**Table 10.2.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Covnt | 98.1 | 308 | 1.5 | 0.5 | 1.5 | 1.2 | 1.9 |
| Derby | 100.0 | 236 | 1.5 | 0.5 | 1.5 | 1.2 | 1.8 |
| Derry | 100.0 | 60 | 1.6 | 0.4 | 1.5 | 1.3 | 1.9 |
| Donc | 100.0 | 109 | 1.5 | 0.5 | 1.5 | 1.2 | 1.8 |
| Dorset | 99.5 | 214 | 1.5 | 0.5 | 1.4 | 1.2 | 1.7 |
| Dudley | 84.6 | 121 | 1.6 | 0.6 | 1.6 | 1.2 | 2.0 |
| Exeter | 99.7 | 301 | 1.5 | 0.5 | 1.5 | 1.2 | 1.8 |
| Glouc | 100.0 | 173 | 1.6 | 0.5 | 1.6 | 1.3 | 1.9 |
| Hull | 99.7 | 300 | 1.6 | 0.6 | 1.5 | 1.2 | 1.8 |
| Ipswi | 99.0 | 96 | 1.5 | 0.5 | 1.5 | 1.2 | 1.7 |
| Kent | 98.4 | 309 | 1.7 | 0.5 | 1.6 | 1.3 | 2.0 |
| L Barts | 99.7 | 646 | 1.7 | 0.6 | 1.6 | 1.3 | 1.9 |
| L Guys | 96.7 | 519 | 1.4 | 0.5 | 1.4 | 1.1 | 1.7 |
| L Kings | 99.7 | 370 | 1.5 | 0.5 | 1.5 | 1.2 | 1.8 |
| L Rfree | 82.4 | 509 | 1.5 | 0.5 | 1.4 | 1.1 | 1.8 |
| L St.G | 98.4 | 243 | 1.5 | 0.5 | 1.4 | 1.1 | 1.7 |
| L West | 96.7 | 1,155 | 1.3 | 0.5 | 1.2 | 1.0 | 1.6 |
| Leeds | 98.9 | 463 | 1.6 | 0.5 | 1.5 | 1.2 | 1.8 |
| Leic | 99.6 | 703 | 1.6 | 0.5 | 1.5 | 1.3 | 1.8 |
| Liv Ain | 69.9 | 95 | 1.5 | 0.4 | 1.4 | 1.2 | 1.8 |
| Liv RI | 99.2 | 367 | 1.6 | 0.5 | 1.5 | 1.2 | 1.8 |
| M Hope | 87.8 | 288 | 1.6 | 0.6 | 1.5 | 1.2 | 2.0 |
| M RI | 60.2 | 245 | 1.6 | 0.6 | 1.5 | 1.2 | 2.0 |
| Middlbr | 98.5 | 264 | 1.6 | 0.5 | 1.5 | 1.2 | 1.9 |
| Newc | 100.0 | 252 | 1.6 | 0.6 | 1.5 | 1.2 | 1.9 |
| Newry | 98.9 | 93 | 1.5 | 0.5 | 1.5 | 1.1 | 1.9 |
| Norwch | 99.7 | 294 | 1.6 | 0.5 | 1.5 | 1.3 | 1.8 |
| Nottm | 100.0 | 379 | 1.5 | 0.5 | 1.4 | 1.2 | 1.8 |
| Oxford | 99.7 | 334 | 1.6 | 0.6 | 1.6 | 1.2 | 1.9 |
| Plymth | 99.1 | 112 | 1.5 | 0.5 | 1.4 | 1.2 | 1.8 |
| Ports | 99.8 | 440 | 1.6 | 0.5 | 1.6 | 1.3 | 2.0 |
| Prestn | 99.3 | 445 | 1.6 | 0.5 | 1.5 | 1.2 | 1.9 |
| Redng | 99.6 | 248 | 1.5 | 0.4 | 1.5 | 1.2 | 1.7 |
| Sheff | 99.8 | 570 | 1.6 | 0.5 | 1.6 | 1.3 | 1.9 |
| Shrew | 99.5 | 181 | 1.6 | 0.5 | 1.5 | 1.2 | 1.8 |
| Stevng | 99.2 | 349 | 1.6 | 0.5 | 1.6 | 1.3 | 2.0 |
| Sthend | 98.4 | 119 | 1.5 | 0.4 | 1.6 | 1.2 | 1.8 |
| Stoke | 99.6 | 276 | 1.5 | 0.5 | 1.5 | 1.2 | 1.8 |
| Sund | 96.4 | 159 | 1.7 | 0.6 | 1.6 | 1.3 | 2.0 |
| Swanse | 100.0 | 322 | 1.5 | 0.4 | 1.5 | 1.2 | 1.8 |
| Truro | 98.6 | 137 | 1.8 | 0.5 | 1.7 | 1.4 | 2.1 |
| Tyrone | 98.8 | 85 | 1.5 | 0.5 | 1.4 | 1.1 | 1.7 |
| Ulster | 100.0 | 86 | 1.4 | 0.4 | 1.4 | 1.1 | 1.7 |
| Wirral | 97.1 | 165 | 1.6 | 0.5 | 1.5 | 1.2 | 1.8 |
| Wolve | 99.7 | 286 | 1.6 | 0.5 | 1.5 | 1.2 | 1.9 |
| Wrexm | 100.0 | 71 | 1.4 | 0.5 | 1.4 | 1.1 | 1.7 |
| York | 98.8 | 167 | 1.4 | 0.5 | 1.3 | 1.1 | 1.6 |
| **England** | **96.0** | **16,203** | **1.6** | **0.5** | **1.5** | **1.2** | **1.8** |
| **N Ireland** | **99.1** | **670** | **1.5** | **0.5** | **1.4** | **1.1** | **1.8** |
| **Wales** | **99.0** | **977** | **1.6** | **0.5** | **1.5** | **1.2** | **1.8** |
| **E, W & NI** | **96.3** | **17,850** | **1.6** | **0.5** | **1.5** | **1.2** | **1.8** |

**Table 10.3.** Percentage of haemodialysis patients within, below and above the range specified in the RA audit measure for phosphate (1.1–1.8 mmol/L) in 2009

| | | | | | | | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Centre | N | % phos 1.1–1.8 mmol/L | Lower 95% CI | Upper 95% CI | % phos <1.1 mmol/L | % phos >1.8 mmol/L | % within range | 95% LCL | 95% UCL |
| Antrim | 120 | 53.3 | 44.4 | 62.1 | 22.5 | 24.2 | −1.3 | −17.9 | 15.3 |
| B Heart | 387 | 62.0 | 57.1 | 66.7 | 7.5 | 30.5 | 0.7 | −8.4 | 9.8 |
| B QEH | 782 | 66.5 | 63.1 | 69.7 | 11.4 | 22.1 | −1.0 | −7.2 | 5.3 |
| Bangor | 74 | 73.0 | 61.8 | 81.9 | 8.1 | 18.9 | 13.6 | −6.7 | 33.8 |
| Basldn | 131 | 63.4 | 54.8 | 71.2 | 16.0 | 20.6 | −0.4 | −15.9 | 15.2 |
| Belfast | 226 | 61.1 | 54.6 | 67.2 | 16.4 | 22.6 | 7.1 | −4.9 | 19.0 |
| Bradfd | 166 | 60.2 | 52.6 | 67.4 | 21.7 | 18.1 | 4.5 | −9.5 | 18.5 |
| Brightn | 291 | 57.7 | 52.0 | 63.3 | 13.4 | 28.9 | −2.7 | −13.5 | 8.1 |
| Bristol | 403 | 56.3 | 51.4 | 61.1 | 6.5 | 37.2 | 1.5 | −7.5 | 10.5 |
| Camb | 230 | 63.5 | 57.1 | 69.5 | 16.1 | 20.4 | 5.8 | −6.9 | 18.4 |
| Cardff | 436 | 60.3 | 55.7 | 64.8 | 12.2 | 27.5 | −4.9 | −13.4 | 3.6 |
| Carlis | 57 | 68.4 | 55.4 | 79.1 | 8.8 | 22.8 | −3.4 | −24.4 | 17.6 |
| Carsh | 599 | 64.9 | 61.0 | 68.7 | 9.4 | 25.7 | 7.0 | −0.4 | 14.4 |
| Chelms | 109 | 60.6 | 51.1 | 69.3 | 23.9 | 15.6 | −5.8 | −23.2 | 11.6 |
| Clwyd | 74 | 56.8 | 45.3 | 67.5 | 13.5 | 29.7 | 0.5 | −21.3 | 22.3 |
| Colchr | 101 | 74.3 | 64.9 | 81.8 | 5.9 | 19.8 | 6.9 | −9.8 | 23.6 |
| Covnt | 308 | 56.8 | 51.2 | 62.2 | 18.2 | 25.0 | 0.4 | −10.2 | 10.9 |
| Derby | 236 | 67.0 | 60.7 | 72.7 | 13.6 | 19.5 | 3.4 | −8.1 | 14.8 |
| Derry | 60 | 71.7 | 59.1 | 81.6 | 3.3 | 25.0 | 8.2 | −14.6 | 31.1 |
| Donc | 109 | 63.3 | 53.9 | 71.8 | 15.6 | 21.1 | −3.4 | −22.0 | 15.3 |
| Dorset | 214 | 70.6 | 64.1 | 76.3 | 11.7 | 17.8 | 4.6 | −7.4 | 16.7 |
| Dudley | 121 | 57.0 | 48.1 | 65.5 | 14.1 | 28.9 | −3.6 | −20.8 | 13.6 |
| Exeter | 301 | 62.8 | 57.2 | 68.1 | 13.0 | 24.3 | −3.3 | −13.6 | 7.1 |
| Glouc | 173 | 63.6 | 56.2 | 70.4 | 9.3 | 27.2 | −3.6 | −17.5 | 10.4 |
| Hull | 300 | 59.0 | 53.3 | 64.4 | 16.7 | 24.3 | 4.3 | −6.2 | 14.8 |
| Ipswi | 96 | 62.5 | 52.4 | 71.6 | 20.8 | 16.7 | 0.0 | −18.0 | 18.0 |
| Kent | 309 | 62.1 | 56.6 | 67.4 | 7.1 | 30.7 | 3.7 | −6.7 | 14.0 |
| L Barts | 646 | 57.3 | 53.4 | 61.0 | 11.8 | 31.0 | −2.0 | −9.3 | 5.3 |
| L Guys | 519 | 58.0 | 53.7 | 62.2 | 22.7 | 19.3 | −1.0 | −9.1 | 7.1 |
| L Kings | 370 | 64.9 | 59.9 | 69.6 | 14.9 | 20.3 | 1.9 | −7.2 | 10.9 |
| L Rfree | 509 | 56.8 | 52.4 | 61.0 | 20.2 | 23.0 | −2.3 | −10.2 | 5.7 |
| L St.G | 243 | 60.5 | 54.2 | 66.5 | 19.3 | 20.2 | −0.9 | −12.9 | 11.1 |
| L West | 1,155 | 56.3 | 53.4 | 59.1 | 31.7 | 12.0 | −0.4 | −6.1 | 5.3 |
| Leeds | 463 | 61.1 | 56.6 | 65.5 | 14.9 | 24.0 | 3.6 | −4.9 | 12.0 |
| Leic | 703 | 66.6 | 63.0 | 70.0 | 9.7 | 23.8 | 4.3 | −2.3 | 11.0 |
| Liv Ain | 95 | 66.3 | 56.3 | 75.1 | 14.7 | 19.0 | 7.1 | −10.4 | 24.5 |
| Liv RI | 367 | 64.3 | 59.3 | 69.0 | 14.2 | 21.5 | −0.3 | −9.6 | 8.9 |
| M Hope | 288 | 57.6 | 51.9 | 63.2 | 13.5 | 28.8 | 6.8 | −4.5 | 18.1 |
| M RI | 245 | 54.7 | 48.4 | 60.8 | 16.7 | 28.6 | 0.5 | −10.7 | 11.8 |
| Middlbr | 264 | 59.1 | 53.1 | 64.9 | 12.9 | 28.0 | −1.5 | −12.6 | 9.7 |
| Newc | 252 | 58.3 | 52.2 | 64.3 | 13.1 | 28.6 | −1.9 | −13.2 | 9.4 |
| Newry | 93 | 49.5 | 39.5 | 59.5 | 23.7 | 26.9 | −12.2 | −31.2 | 6.9 |
| Norwch | 294 | 64.6 | 59.0 | 69.9 | 12.2 | 23.1 | 9.3 | −1.2 | 19.8 |
| Nottm | 379 | 62.3 | 57.3 | 67.0 | 16.6 | 21.1 | 0.6 | −8.7 | 9.9 |
| Oxford | 334 | 59.0 | 53.6 | 64.1 | 12.9 | 28.1 | −0.9 | −10.8 | 9.0 |
| Plymth | 112 | 57.1 | 47.8 | 66.0 | 17.9 | 25.0 | 5.8 | −11.5 | 23.0 |
| Ports | 440 | 58.9 | 54.2 | 63.4 | 9.8 | 31.4 | 4.2 | −4.5 | 13.0 |
| Prestn | 445 | 60.5 | 55.8 | 64.9 | 11.7 | 27.9 | 3.1 | −5.6 | 11.8 |
| Redng | 248 | 66.9 | 60.8 | 72.5 | 16.5 | 16.5 | 2.8 | −8.3 | 14.0 |
| Sheff | 570 | 61.6 | 57.5 | 65.5 | 9.0 | 29.5 | 1.9 | −5.6 | 9.4 |
| Shrew | 181 | 64.1 | 56.9 | 70.7 | 13.3 | 22.7 | 1.0 | −12.3 | 14.3 |
| Stevng | 349 | 57.3 | 52.1 | 62.4 | 11.5 | 31.2 | −7.3 | −16.9 | 2.4 |

**Table 10.3.** Continued

| Centre | N | % phos 1.1–1.8 mmol/L | Lower 95% CI | Upper 95% CI | % phos <1.1 mmol/L | % phos >1.8 mmol/L | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % within range | 95% LCL | 95% UCL |
| Sthend | 119 | 64.7 | 55.7 | 72.8 | 13.5 | 21.9 | −3.4 | −19.1 | 12.4 |
| Stoke | 276 | 65.2 | 59.4 | 70.6 | 13.8 | 21.0 | 3.0 | −8.0 | 14.0 |
| Sund | 159 | 58.5 | 50.7 | 65.9 | 10.1 | 31.5 | 7.8 | −6.9 | 22.5 |
| Swanse | 322 | 69.3 | 64.0 | 74.1 | 11.2 | 19.6 | 8.6 | −1.2 | 18.3 |
| Truro | 137 | 56.9 | 48.5 | 65.0 | 2.2 | 40.9 | −7.0 | −22.3 | 8.2 |
| Tyrone | 85 | 65.9 | 55.2 | 75.2 | 17.7 | 16.5 | −4.7 | −23.1 | 13.7 |
| Ulster | 86 | 66.3 | 55.7 | 75.5 | 19.8 | 14.0 | 5.5 | −13.8 | 24.9 |
| Wirral | 165 | 66.1 | 58.5 | 72.9 | 10.3 | 23.6 | 11.8 | −2.3 | 25.9 |
| Wolve | 286 | 62.9 | 57.2 | 68.3 | 11.9 | 25.2 | 3.8 | −6.9 | 14.4 |
| Wrexm | 71 | 60.6 | 48.8 | 71.2 | 23.9 | 15.5 | 12.7 | −8.7 | 34.1 |
| York | 167 | 65.3 | 57.8 | 72.1 | 22.8 | 12.0 | 3.1 | −12.4 | 18.7 |
| **England** | **16,203** | **61.3** | **60.5** | **62.0** | **14.5** | **24.2** | **1.3** | **−0.1** | **2.7** |
| **N Ireland** | **670** | **60.3** | **56.5** | **63.9** | **17.9** | **21.8** | **1.4** | **−5.6** | **8.4** |
| **Wales** | **977** | **64.0** | **60.9** | **66.9** | **12.5** | **23.5** | **2.6** | **−3.1** | **8.3** |
| **E, W & NI** | **17,850** | **61.4** | **60.7** | **62.1** | **14.5** | **24.1** | **1.4** | **0.0** | **2.7** |

**Table 10.4.** Summary statistics for phosphate in peritoneal dialysis patients in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 100.0 | 14 | | | | | |
| B Heart | 96.3 | 26 | 1.4 | 0.4 | 1.4 | 1.1 | 1.6 |
| B QEH | 84.6 | 121 | 1.5 | 0.4 | 1.5 | 1.2 | 1.8 |
| Bangor | 100.0 | 29 | 1.5 | 0.3 | 1.5 | 1.4 | 1.5 |
| Basldn | 100.0 | 25 | 1.4 | 0.4 | 1.4 | 1.1 | 1.5 |
| Belfast | 100.0 | 34 | 1.8 | 0.6 | 1.8 | 1.4 | 2.1 |
| Bradfd | 100.0 | 31 | 1.7 | 0.4 | 1.7 | 1.4 | 2.0 |
| Brightn | 100.0 | 76 | 1.4 | 0.4 | 1.4 | 1.2 | 1.7 |
| Bristol | 100.0 | 68 | 1.7 | 0.5 | 1.6 | 1.4 | 2.0 |
| Camb | 100.0 | 31 | 1.4 | 0.3 | 1.4 | 1.2 | 1.6 |
| Cardff | 100.0 | 95 | 1.5 | 0.4 | 1.5 | 1.3 | 1.7 |
| Carlis | 100.0 | 13 | | | | | |
| Carsh | 99.1 | 110 | 1.6 | 0.4 | 1.6 | 1.3 | 1.8 |
| Chelms | 100.0 | 31 | 1.4 | 0.3 | 1.4 | 1.2 | 1.6 |
| Clwyd | 85.7 | 6 | | | | | |
| Covnt | 94.5 | 69 | 1.4 | 0.3 | 1.4 | 1.2 | 1.7 |
| Derby | 100.0 | 82 | 1.4 | 0.3 | 1.4 | 1.2 | 1.6 |
| Derry | 100.0 | 3 | | | | | |
| Donc | 96.7 | 29 | 1.5 | 0.4 | 1.5 | 1.2 | 1.8 |
| Dorset | 96.3 | 52 | 1.5 | 0.4 | 1.5 | 1.2 | 1.8 |
| Dudley | 98.0 | 49 | 1.7 | 0.5 | 1.7 | 1.4 | 1.9 |
| Exeter | 100.0 | 64 | 1.5 | 0.4 | 1.5 | 1.3 | 1.8 |
| Glouc | 100.0 | 39 | 1.7 | 0.4 | 1.7 | 1.5 | 1.9 |
| Hull | 98.4 | 62 | 1.6 | 0.4 | 1.6 | 1.3 | 1.8 |
| Ipswi | 100.0 | 42 | 1.8 | 0.5 | 1.7 | 1.4 | 2.0 |
| Kent | 100.0 | 64 | 1.5 | 0.3 | 1.5 | 1.3 | 1.7 |
| L Barts | 98.8 | 164 | 1.6 | 0.4 | 1.6 | 1.2 | 1.9 |
| L Guys | 100.0 | 44 | 1.6 | 0.4 | 1.6 | 1.3 | 1.9 |
| L Kings | 100.0 | 68 | 1.6 | 0.4 | 1.5 | 1.3 | 1.9 |
| L Rfree | 98.4 | 63 | 1.6 | 0.3 | 1.6 | 1.3 | 1.8 |
| L St.G | 96.6 | 56 | 1.5 | 0.4 | 1.3 | 1.2 | 1.6 |
| L West | 100.0 | 31 | 1.6 | 0.5 | 1.5 | 1.4 | 1.8 |
| Leeds | 100.0 | 86 | 1.6 | 0.5 | 1.6 | 1.3 | 1.9 |

**Table 10.4.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Leic | 98.0 | 145 | 1.6 | 0.4 | 1.6 | 1.3 | 1.8 |
| Liv Ain | 28.6 | 2 | | | | | |
| Liv RI | 98.8 | 79 | 1.5 | 0.4 | 1.4 | 1.3 | 1.7 |
| M Hope | 96.4 | 108 | 1.7 | 0.5 | 1.7 | 1.3 | 2.0 |
| M RI | 97.8 | 87 | 1.7 | 0.5 | 1.6 | 1.3 | 2.0 |
| Middlbr | 93.8 | 15 | | | | | |
| Newc | 100.0 | 48 | 1.7 | 0.5 | 1.7 | 1.5 | 1.9 |
| Newry | 100 | 12 | | | | | |
| Norwch | 87.3 | 48 | 1.5 | 0.5 | 1.5 | 1.3 | 1.8 |
| Nottm | 100.0 | 101 | 1.6 | 0.4 | 1.5 | 1.3 | 1.9 |
| Oxford | 100.0 | 93 | 1.7 | 0.4 | 1.6 | 1.4 | 1.9 |
| Plymth | 100.0 | 38 | 1.6 | 0.4 | 1.5 | 1.3 | 1.7 |
| Ports | 95.1 | 77 | 1.7 | 0.5 | 1.6 | 1.3 | 1.9 |
| Prestn | 100.0 | 65 | 1.7 | 0.4 | 1.6 | 1.3 | 1.9 |
| Redng | 100.0 | 73 | 1.4 | 0.3 | 1.4 | 1.3 | 1.7 |
| Sheff | 100.0 | 68 | 1.5 | 0.4 | 1.6 | 1.2 | 1.7 |
| Shrew | 96.3 | 26 | 1.6 | 0.4 | 1.7 | 1.4 | 2.0 |
| Stevng | 96.4 | 27 | 1.5 | 0.4 | 1.4 | 1.2 | 1.7 |
| Sthend | 94.1 | 16 | | | | | |
| Stoke | 98.6 | 68 | 1.5 | 0.4 | 1.4 | 1.3 | 1.7 |
| Sund | 100.0 | 24 | 1.6 | 0.4 | 1.7 | 1.5 | 1.9 |
| Swanse | 100.0 | 52 | 1.5 | 0.4 | 1.4 | 1.3 | 1.8 |
| Truro | 100.0 | 21 | 1.7 | 0.5 | 1.7 | 1.3 | 1.9 |
| Tyrone | 90.9 | 10 | | | | | |
| Ulster | 100.0 | 2 | | | | | |
| Wirral | 69.2 | 18 | | | | | |
| Wolve | 100.0 | 40 | 1.6 | 0.5 | 1.4 | 1.2 | 1.8 |
| Wrexm | 95.5 | 21 | 1.7 | 0.4 | 1.6 | 1.3 | 2.0 |
| York | 100.0 | 15 | | | | | |
| **England** | **97.4** | **2,898** | **1.6** | **0.4** | **1.5** | **1.3** | **1.8** |
| **N Ireland** | **98.7** | **75** | **1.7** | **0.5** | **1.6** | **1.4** | **1.9** |
| **Wales** | **99.0** | **203** | **1.5** | **0.4** | **1.5** | **1.3** | **1.7** |
| **E, W & NI** | **97.5** | **3,176** | **1.6** | **0.4** | **1.5** | **1.3** | **1.8** |

Blank cells denote centres excluded from analyses due to low patient numbers or poor data completeness

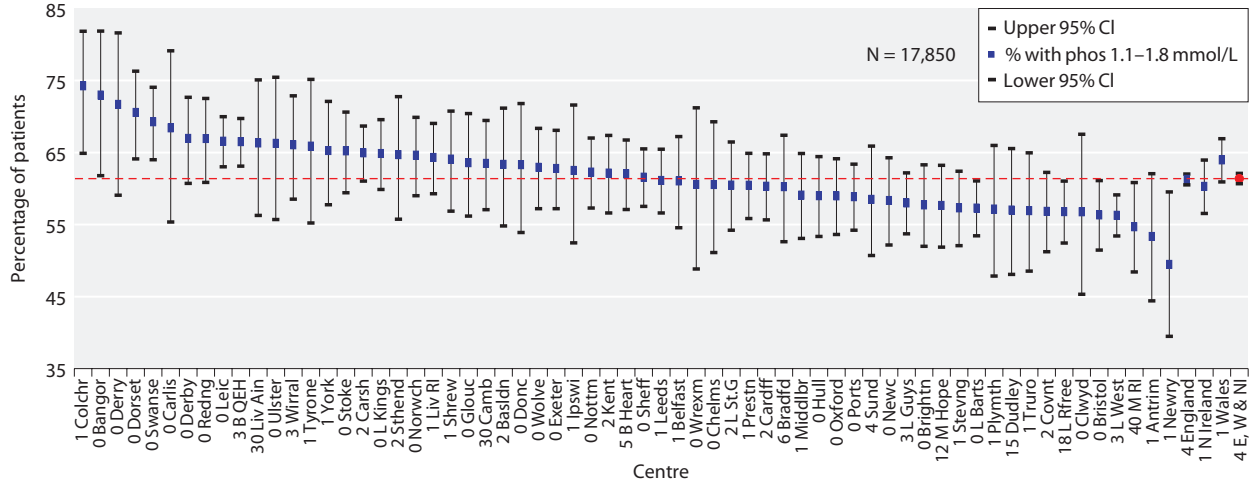


**Fig. 10.1.** Percentage of haemodialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.8 mmol/L) by centre in 2009

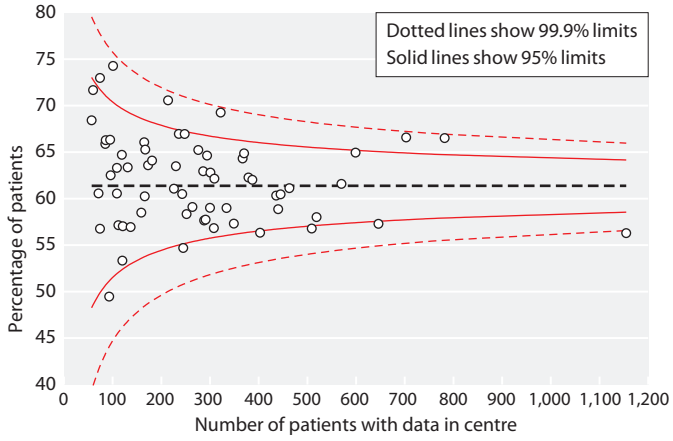


**Fig. 10.2.** Funnel plot of percentage of haemodialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.8 mmol/L) by centre in 2009

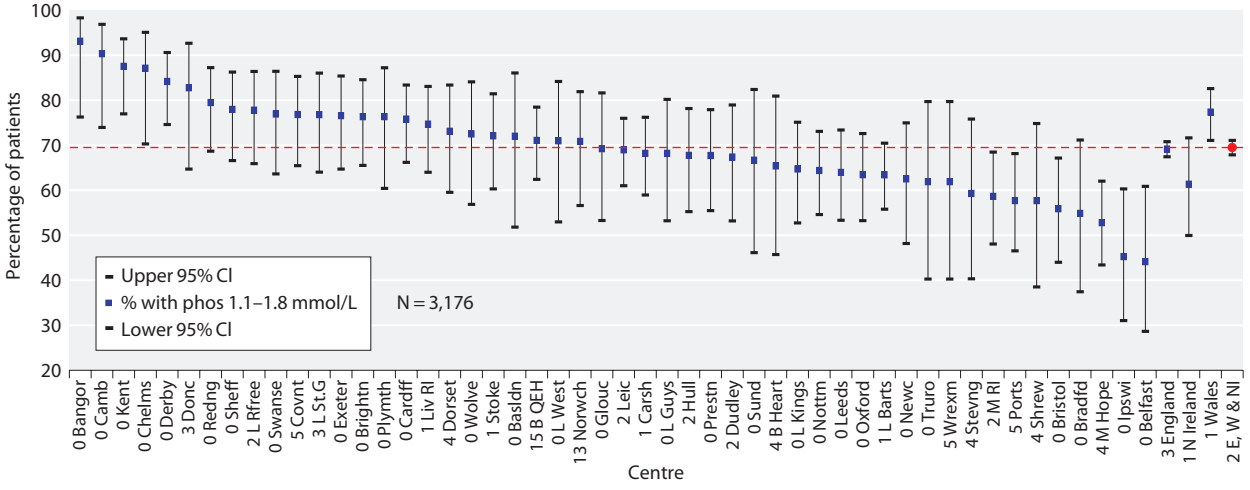


**Fig. 10.3.** Percentage of peritoneal dialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.8 mmol/L) by centre in 2009

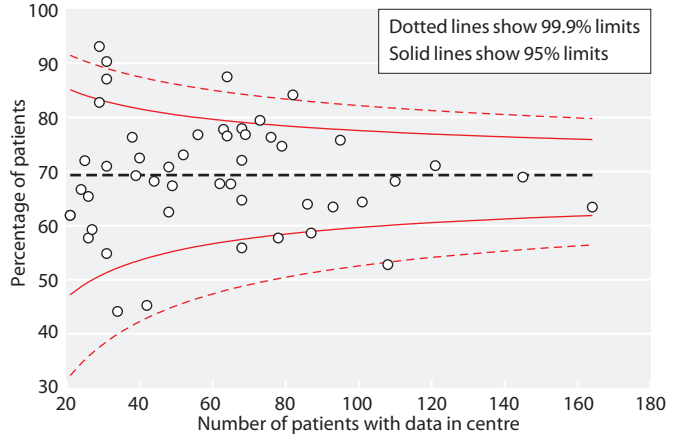


**Fig. 10.4.** Funnel plot of percentage of peritoneal dialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.8 mmol/L) by centre in 2009

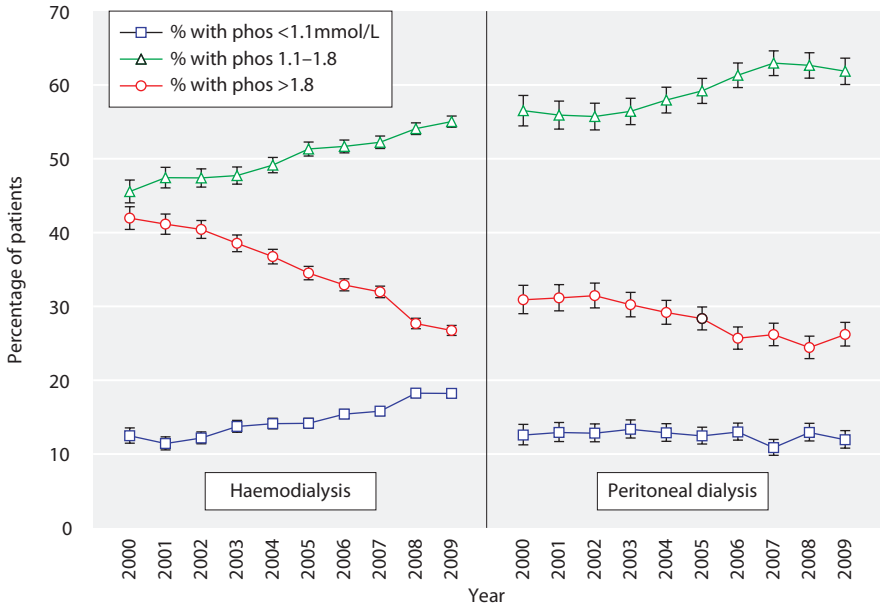


**Fig. 10.5.** Longitudinal change in percentage of patients with phosphate <1.1 mmol/L, 1.1–1.8 mmol/L and >1.8 mmol/L by dialysis modality 2000–2009

**Table 10.5.** Percentage of peritoneal dialysis patients within, below and above the range specified in the RA audit measure for phosphate (1.1–1.8 mmol/L) in 2009

| | | | | | | | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Centre | N | % phos 1.1–1.8 mmol/L | Lower 95% CI | Upper 95% CI | % phos <1.1 mmol/L | % phos >1.8 mmol/L | % within range | 95% LCL | 95% UCL |
| B Heart | 26 | 65.4 | 45.7 | 80.9 | 19.2 | 15.4 | −16.8 | −47.2 | 13.7 |
| B QEH | 121 | 71.1 | 62.4 | 78.5 | 9.1 | 19.8 | 4.1 | −11.8 | 20.0 |
| Bangor | 29 | 93.1 | 76.3 | 98.3 | 0.0 | 6.9 | 17.2 | −6.6 | 41.1 |
| Basldn | 25 | 72.0 | 51.8 | 86.0 | 16.0 | 12.0 | −4.7 | −35.2 | 25.9 |
| Belfast | 34 | 44.1 | 28.6 | 60.8 | 11.8 | 44.1 | −10.2 | −39.2 | 18.8 |
| Bradfd | 31 | 54.8 | 37.4 | 71.1 | 12.9 | 32.3 | −19.4 | −50.1 | 11.4 |
| Brightn | 76 | 76.3 | 65.5 | 84.5 | 9.2 | 14.5 | 8.8 | −9.6 | 27.3 |
| Bristol | 68 | 55.9 | 44.0 | 67.2 | 8.8 | 35.3 | −9.4 | −30.6 | 11.8 |
| Camb | 31 | 90.3 | 73.9 | 96.9 | 9.7 | 0.0 | 14.0 | −8.5 | 36.5 |
| Cardff | 95 | 75.8 | 66.2 | 83.4 | 6.3 | 17.9 | 0.6 | −15.2 | 16.3 |
| Carsh | 110 | 68.2 | 58.9 | 76.2 | 8.2 | 23.6 | −2.0 | −17.9 | 13.9 |
| Chelms | 31 | 87.1 | 70.3 | 95.1 | 9.7 | 3.2 | 10.2 | −13.1 | 33.5 |
| Covnt | 69 | 76.8 | 65.4 | 85.3 | 8.7 | 14.5 | 4.7 | −15.1 | 24.5 |
| Derby | 82 | 84.2 | 74.6 | 90.6 | 7.3 | 8.5 | 9.2 | −7.4 | 25.7 |
| Donc | 29 | 82.8 | 64.7 | 92.6 | 3.5 | 13.8 | 15.2 | −11.7 | 42.1 |
| Dorset | 52 | 73.1 | 59.5 | 83.4 | 3.9 | 23.1 | −16.7 | −36.1 | 2.7 |
| Dudley | 49 | 67.4 | 53.2 | 78.9 | 4.1 | 28.6 | −10.4 | −34.0 | 13.1 |
| Exeter | 64 | 76.6 | 64.7 | 85.4 | 3.1 | 20.3 | 8.8 | −12.0 | 29.6 |
| Glouc | 39 | 69.2 | 53.3 | 81.6 | 2.6 | 28.2 | −6.5 | −33.6 | 20.6 |
| Hull | 62 | 67.7 | 55.2 | 78.2 | 8.1 | 24.2 | −5.1 | −25.7 | 15.4 |
| Ipswi | 42 | 45.2 | 31.0 | 60.3 | 7.1 | 47.6 | −15.2 | −42.1 | 11.7 |
| Kent | 64 | 87.5 | 76.9 | 93.6 | 3.1 | 9.4 | 11.0 | −6.0 | 28.1 |
| L Barts | 164 | 63.4 | 55.8 | 70.4 | 7.3 | 29.3 | 0.9 | −12.1 | 13.9 |
| L Guys | 44 | 68.2 | 53.2 | 80.2 | 6.8 | 25.0 | −9.4 | −33.1 | 14.4 |
| L Kings | 68 | 64.7 | 52.7 | 75.1 | 10.3 | 25.0 | −7.1 | −27.4 | 13.2 |
| L Rfree | 63 | 77.8 | 65.9 | 86.4 | 3.2 | 19.1 | 7.1 | −12.0 | 26.3 |
| L St.G | 56 | 76.8 | 64.0 | 86.0 | 8.9 | 14.3 | 14.8 | −8.1 | 37.7 |
| L West | 31 | 71.0 | 53.0 | 84.2 | 6.5 | 22.6 | 1.9 | −26.0 | 29.9 |
| Leeds | 86 | 64.0 | 53.3 | 73.4 | 7.0 | 29.1 | −0.7 | −19.8 | 18.4 |

**Table 10.5.** Continued

| Centre | N | % phos 1.1–1.8 mmol/L | Lower 95% CI | Upper 95% CI | % phos <1.1 mmol/L | % phos >1.8 mmol/L | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % within range | 95% LCL | 95% UCL |
| Leic | 145 | 69.0 | 61.0 | 76.0 | 7.6 | 23.5 | 7.4 | −6.7 | 21.5 |
| Liv RI | 79 | 74.7 | 64.0 | 83.1 | 7.6 | 17.7 | 8.8 | −9.5 | 27.1 |
| M Hope | 108 | 52.8 | 43.4 | 62.0 | 10.2 | 37.0 | −8.8 | −26.0 | 8.3 |
| M RI | 87 | 58.6 | 48.0 | 68.5 | 6.9 | 34.5 | 0.4 | −18.7 | 19.4 |
| Newc | 48 | 62.5 | 48.2 | 74.9 | 6.3 | 31.3 | 4.4 | −22.1 | 30.9 |
| Norwch | 48 | 70.8 | 56.6 | 81.9 | 12.5 | 16.7 | −5.5 | −28.0 | 16.9 |
| Nottm | 101 | 64.4 | 54.6 | 73.1 | 8.9 | 26.7 | −7.5 | −24.0 | 9.1 |
| Oxford | 93 | 63.4 | 53.2 | 72.6 | 5.4 | 31.2 | −9.4 | −26.5 | 7.8 |
| Plymth | 38 | 76.3 | 60.4 | 87.2 | 7.9 | 15.8 | 5.2 | −19.7 | 30.1 |
| Ports | 78 | 57.7 | 46.5 | 68.1 | 10.3 | 32.1 | 2.0 | −19.1 | 23.0 |
| Prestn | 65 | 67.7 | 55.5 | 77.9 | 4.6 | 27.7 | 1.0 | −21.0 | 23.0 |
| Redng | 73 | 79.5 | 68.7 | 87.2 | 12.3 | 8.2 | 3.5 | −14.2 | 21.1 |
| Sheff | 68 | 77.9 | 66.6 | 86.2 | 7.4 | 14.7 | 16.0 | −3.8 | 35.7 |
| Shrew | 26 | 57.7 | 38.5 | 74.8 | 7.7 | 34.6 | −9.0 | −42.4 | 24.5 |
| Stevng | 27 | 59.3 | 40.3 | 75.8 | 18.5 | 22.2 | −15.0 | −46.0 | 15.9 |
| Stoke | 68 | 72.1 | 60.3 | 81.4 | 10.3 | 17.7 | −4.3 | −23.4 | 14.7 |
| Sund | 24 | 66.7 | 46.1 | 82.4 | 8.3 | 25.0 | 2.4 | −38.9 | 43.7 |
| Swanse | 52 | 76.9 | 63.6 | 86.4 | 7.7 | 15.4 | 0.7 | −20.1 | 21.4 |
| Truro | 21 | 61.9 | 40.3 | 79.7 | 0.0 | 38.1 | 0.4 | −36.4 | 37.1 |
| Wolve | 40 | 72.5 | 56.8 | 84.1 | 7.5 | 20.0 | 2.9 | −21.3 | 27.0 |
| Wrexm | 21 | 61.9 | 40.3 | 79.7 | 0.0 | 38.1 | 0.0 | −38.7 | 38.7 |
| **England** | **2,898** | **69.1** | **67.4** | **70.8** | **8.0** | **22.9** | **0.5** | **−2.6** | **3.6** |
| **N Ireland** | **75** | **61.3** | **49.9** | **71.6** | **9.3** | **29.3** | **−6.1** | **−25.6** | **13.4** |
| **Wales** | **203** | **77.3** | **71.1** | **82.6** | **4.9** | **17.7** | **3.5** | **−7.3** | **14.2** |
| **E, W & NI** | **3,176** | **69.5** | **67.8** | **71.1** | **7.8** | **22.7** | **0.5** | **−2.5** | **3.4** |

*Adjusted Calcium*

The 4th edition of the Renal Association Clinical Practice Guidelines states:

***'Serum calcium, adjusted for albumin concentration should be maintained within the normal reference range for the laboratory used (measured before a "short gap" dialysis session in HD patients) and ideally kept below 2.5 mmol/L.' (Module 2: Complications)*** [1]

The current guideline is based upon adjusted serum calcium. A variety of formulae have been proposed to permit calculation of the 'adjusted' total calcium (i.e. an estimation of the expected total calcium were the serum albumin normal) from the total calcium and albumin concentration, but there are no data to support the use of mathematical corrections of serum calcium among patients with ERF. There are significant problems with comparison of adjusted serum calcium as the calculated result is heavily dependent upon the methods of albumin and calcium measurement and the formula used for adjustment. Laboratories should derive the correct formula for the two methods they use but it is apparent that this is not always done and a variety of formulae are in use, the most common being adjusted calcium = total calcium + 0.02(40-albumin) according to a recent review by the Welsh External Quality Assessment Scheme (WEQAS, 2011, personal communication to A. Dawnay). This formula was used by approximately 50% of laboratories, while at least 22 other equations were used by the remainder. WEQAS proposes the establishment of master equations for the three calcium methods and two albumin methods in use across the eight analytical platforms in current use in the UK. This will facilitate achievement of measurement uniformity between laboratories and national harmonisation to an adjusted calcium reference range of 2.2–2.6 mmol/L (http://www.pathologyharmony.co.uk/graphics/Pathology%20Harmony%20II%20%20for%20web.pdf ).

The two most common assays for measuring albumin yield discordant results, the bromocresol purple (BCP) method generally providing lower albumin values than bromocresol green (BCG). The deviation of albumin assayed by BCP and BCG dye-binding methods also appears to differ between dialysis patients and those with

normal renal function due to differing interferences with the dye-binding, bringing into question the applicability of adjustment formulae that were derived for the general population. This impacts on the adjusted calcium result and is important in multicentre and comparative studies but such studies have often compounded the problem by incorrectly applying a single formula to both BCG and BCP measurements [8]. There are data which suggest that in this situation it may be better to use uncorrected serum calcium rather than adjusted serum calcium [9, 10].

The impact of laboratory method biases and changes in formulae was highlighted in last year's report and centres with excessive proportions of patients outside the limits were advised to consult their local laboratories. The problem is illustrated by the following. For the last two years Bristol was one of the lowest achieving centres for the adjusted calcium standard and as a result an investigation took place. Local data from Bristol, Exeter, Gloucester and Truro showed that when uncorrected rather than corrected calciums were compared, Bristol changed from being lowest to the highest achiever. As many centres use BCG to measure albumin and some others routinely correct their BCP albumin to BCG before correcting calcium, an analysis was undertaken to explore the effect of converting the Bristol BCP albumins to BCG equivalents: 5.5 g/L was added to the BCP albumin to convert it to an equivalent BCG albumin before adjusting the calcium [11]. With this adjustment, Bristol's ranking on the caterpillar plots for the percentage of patients with corrected calcium >2.5 mmol/L improved from 37/52 to 22/52 for PD patients and from 63/64 to 29/64 for HD patients. This investigation highlights the importance in the calculation and interpretation of adjusted serum calcium, of the method of albumin measurement and the adjustment formula used. While such adjustment of data cannot be condoned it does serve to highlight potential problems. The solution for centres is to work with their laboratories to ensure that the calcium results are adjusted correctly for the method in use. The current guideline for control of serum calcium does not discuss these problems or take them into account. These problems must be borne in mind when trying to interpret the following figures which compare serum adjusted calcium achieved in different renal units. These issues raise the question as to whether these comparisons between centres of achievement of the calcium guidelines are of value, and also raises questions about the guidelines themselves.

The audit measure for calcium in the 4th edition of the Renal Association Clinical Practice Guidelines does not specify a lower limit for calcium and advises that adjusted calcium should ideally be within the normal range. The guideline does however recommend that adjusted calcium should be <2.5 mmol/L. The UKRR used 2.2–2.5 mmol/L as the audit measure for adjusted calcium in 2009. The data for adjusted calcium were 94% complete for HD patients and 97% complete for PD patients overall, although there was between centre variation (tables 10.6 and 10.8). Seventy-four percent (CI 74–75%) of HD patients and 75% (CI 74–77%) of PD patients achieved adjusted calcium between 2.2–2.5 mmol/L (tables 10.7 and 10.9). The proportion of

**Table 10.6** Summary statistics for adjusted calcium in haemodialysis patients in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 99 | 120 | 2.3 | 0.17 | 2.3 | 2.2 | 2.4 |
| B Heart | 95 | 387 | 2.3 | 0.18 | 2.3 | 2.2 | 2.4 |
| B QEH | 68 | 550 | 2.3 | 0.20 | 2.3 | 2.2 | 2.4 |
| Bangor | 100 | 74 | 2.3 | 0.17 | 2.35 | 2.3 | 2.4 |
| Basldn | 99 | 131 | 2.5 | 0.15 | 2.5 | 2.4 | 2.6 |
| Belfast | 99 | 226 | 2.3 | 0.17 | 2.3 | 2.2 | 2.4 |
| Bradfd | 95 | 167 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Brightn* | 73 | 214 | 2.3 | 0.17 | 2.3 | 2.2 | 2.4 |
| Bristol | 100 | 403 | 2.5 | 0.18 | 2.5 | 2.4 | 2.6 |
| Camb | 70 | 230 | 2.3 | 0.19 | 2.3 | 2.2 | 2.4 |
| Cardff* | 98 | 436 | 2.4 | 0.18 | 2.4 | 2.3 | 2.5 |
| Carlis | 100 | 57 | 2.3 | 0.20 | 2.3 | 2.2 | 2.4 |
| Carsh | 98 | 599 | 2.3 | 0.20 | 2.3 | 2.2 | 2.4 |
| Chelms | 100 | 109 | 2.4 | 0.14 | 2.4 | 2.3 | 2.5 |
| Clwyd | 100 | 74 | 2.3 | 0.19 | 2.3 | 2.2 | 2.4 |

**Table 10.6** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Colchr* | 94 | 96 | 2.5 | 0.23 | 2.5 | 2.4 | 2.6 |
| Covnt* | 98 | 309 | 2.3 | 0.19 | 2.2 | 2.1 | 2.4 |
| Derby | 100 | 236 | 2.4 | 0.14 | 2.4 | 2.3 | 2.5 |
| Derry | 100 | 60 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Donc | 100 | 109 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Dorset | 100 | 215 | 2.4 | 0.18 | 2.4 | 2.3 | 2.5 |
| Dudley | 85 | 121 | 2.4 | 0.22 | 2.4 | 2.3 | 2.6 |
| Exeter | 100 | 301 | 2.4 | 0.19 | 2.4 | 2.2 | 2.5 |
| Glouc | 100 | 173 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Hull | 100 | 300 | 2.4 | 0.16 | 2.4 | 2.3 | 2.5 |
| Ipswi | 100 | 97 | 2.4 | 0.16 | 2.4 | 2.3 | 2.5 |
| Kent | 98 | 309 | 2.5 | 0.18 | 2.5 | 2.4 | 2.6 |
| L Barts | 100 | 646 | 2.2 | 0.19 | 2.2 | 2.1 | 2.3 |
| L Guys | 97 | 519 | 2.3 | 0.18 | 2.2 | 2.1 | 2.4 |
| L Kings | 100 | 370 | 2.3 | 0.22 | 2.3 | 2.2 | 2.4 |
| L Rfree | 83 | 511 | 2.2 | 0.19 | 2.2 | 2.1 | 2.4 |
| L St.G | 100 | 247 | 2.4 | 0.16 | 2.4 | 2.3 | 2.5 |
| L West | 97 | 1,155 | 2.4 | 0.16 | 2.4 | 2.3 | 2.5 |
| Leeds | 99 | 463 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Leic | 100 | 703 | 2.4 | 0.17 | 2.3 | 2.3 | 2.5 |
| Liv Ain | 70 | 95 | 2.5 | 0.15 | 2.5 | 2.4 | 2.6 |
| Liv RI | 99 | 367 | 2.4 | 0.20 | 2.4 | 2.3 | 2.5 |
| M Hope | 88 | 288 | 2.3 | 0.19 | 2.3 | 2.15 | 2.4 |
| M RI | 60 | 245 | 2.2 | 0.20 | 2.2 | 2.1 | 2.4 |
| Middlbr | 99 | 264 | 2.3 | 0.20 | 2.3 | 2.2 | 2.5 |
| Newc* | 100 | 252 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Newry | 99 | 93 | 2.2 | 0.18 | 2.2 | 2.1 | 2.3 |
| Norwch | 100 | 294 | 2.4 | 0.15 | 2.4 | 2.4 | 2.5 |
| Nottm | 100 | 379 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Oxford | 100 | 334 | 2.4 | 0.16 | 2.4 | 2.3 | 2.5 |
| Plymth | 99 | 112 | 2.3 | 0.19 | 2.35 | 2.25 | 2.5 |
| Ports | 100 | 440 | 2.3 | 0.17 | 2.3 | 2.3 | 2.5 |
| Prestn* | 93 | 415 | 2.3 | 0.19 | 2.3 | 2.2 | 2.4 |
| Redng | 100 | 248 | 2.3 | 0.17 | 2.35 | 2.2 | 2.4 |
| Sheff | 100 | 570 | 2.3 | 0.16 | 2.3 | 2.2 | 2.4 |
| Shrew | 100 | 182 | 2.4 | 0.17 | 2.4 | 2.3 | 2.4 |
| Stevng | 99 | 348 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Sthend | 98 | 119 | 2.4 | 0.18 | 2.4 | 2.3 | 2.5 |
| Stoke | 100 | 277 | 2.3 | 0.17 | 2.4 | 2.2 | 2.5 |
| Sund* | 96 | 159 | 2.4 | 0.18 | 2.4 | 2.3 | 2.5 |
| Swanse | 100 | 322 | 2.3 | 0.17 | 2.3 | 2.2 | 2.4 |
| Truro | 99 | 138 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Tyrone | 99 | 85 | 2.4 | 0.17 | 2.5 | 2.3 | 2.6 |
| Ulster | 100 | 86 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Wirral | 97 | 165 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Wolve | 100 | 287 | 2.3 | 0.19 | 2.3 | 2.2 | 2.4 |
| Wrexm | 100 | 71 | 2.4 | 0.18 | 2.4 | 2.3 | 2.6 |
| York | 88 | 149 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| **England** | **94** | **15,854** | **2.3** | **0.19** | **2.3** | **2.2** | **2.5** |
| **N Ireland** | **99** | **670** | **2.3** | **0.19** | **2.3** | **2.2** | **2.5** |
| **Wales** | **99** | **977** | **2.3** | **0.18** | **2.3** | **2.2** | **2.4** |
| **E, W & NI** | **94** | **17,501** | **2.3** | **0.19** | **2.3** | **2.2** | **2.5** |

*These centres supplied uncorrected calcium and were corrected using the formula: adjusted calcium = unadjusted calcium + [(40-albumin) × 0.02]

**Table 10.7.** Percentage of haemodialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2009

| | | | | | | | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Centre | N | % adjusted Ca 2.2–2.5 mmol/L | Lower 95% CI | Upper 95% CI | % adjusted Ca <2.2 mmol/L | adjusted Ca >2.5 mmol/L | % within range | 95% LCL | 95% UCL |
| Antrim | 120 | 77.5 | 69.2 | 84.1 | 15.8 | 6.7 | 0.2 | −13.8 | 14.1 |
| B Heart | 387 | 71.8 | 67.2 | 76.1 | 21.7 | 6.5 | 3.3 | −5.3 | 11.8 |
| B QEH | 550 | 69.1 | 65.1 | 72.8 | 23.3 | 7.6 | −3.2 | −9.9 | 3.4 |
| Bangor | 74 | 82.4 | 72.1 | 89.5 | 9.5 | 8.1 | 2.7 | −14.2 | 19.6 |
| Basldn | 131 | 70.2 | 61.9 | 77.4 | 3.8 | 26.0 | −16.9 | −29.8 | −4.0 |
| Belfast | 226 | 77.4 | 71.5 | 82.4 | 17.7 | 4.9 | −2.7 | −12.6 | 7.3 |
| Bradfd | 167 | 88.0 | 82.2 | 92.1 | 5.4 | 6.6 | 9.7 | −0.8 | 20.2 |
| Brightn | 214 | 78.5 | 72.5 | 83.5 | 13.6 | 7.9 | 9.5 | −1.5 | 20.4 |
| Bristol | 403 | 62.0 | 57.2 | 66.7 | 3.0 | 35.0 | 2.1 | −6.7 | 10.9 |
| Camb | 230 | 72.6 | 66.5 | 78.0 | 13.0 | 14.4 | −2.3 | −13.6 | 9.1 |
| Cardff | 436 | 74.8 | 70.5 | 78.6 | 11.9 | 13.3 | −2.8 | −10.3 | 4.7 |
| Carlis | 57 | 68.4 | 55.4 | 79.1 | 19.3 | 12.3 | 7.9 | −14.0 | 29.7 |
| Carsh | 599 | 73.3 | 69.6 | 76.7 | 17.5 | 9.2 | 1.8 | −5.0 | 8.6 |
| Chelms | 109 | 84.4 | 76.3 | 90.1 | 8.3 | 7.3 | 16.0 | 0.8 | 31.2 |
| Clwyd | 74 | 74.3 | 63.2 | 83.0 | 18.9 | 6.8 | −2.2 | −21.2 | 16.7 |
| Colchr | 96 | 58.3 | 48.3 | 67.8 | 0.0 | 41.7 | −16.4 | −33.8 | 0.9 |
| Covnt | 309 | 64.7 | 59.2 | 69.9 | 27.2 | 8.1 | −11.0 | −20.6 | −1.4 |
| Derby | 236 | 80.9 | 75.4 | 85.5 | 4.7 | 14.4 | 5.1 | −4.8 | 14.9 |
| Derry | 60 | 83.3 | 71.7 | 90.8 | 1.7 | 15.0 | −3.2 | −20.6 | 14.2 |
| Donc | 109 | 77.1 | 68.3 | 84.0 | 4.6 | 18.4 | −7.7 | −22.7 | 7.4 |
| Dorset | 215 | 75.4 | 69.2 | 80.7 | 6.1 | 18.6 | 6.4 | −5.2 | 17.9 |
| Dudley | 121 | 60.3 | 51.4 | 68.6 | 9.1 | 30.6 | −11.4 | −27.8 | 5.0 |
| Exeter | 301 | 72.1 | 66.8 | 76.9 | 10.3 | 17.6 | 2.0 | −7.8 | 11.8 |
| Glouc | 173 | 82.1 | 75.6 | 87.1 | 4.1 | 13.9 | 4.9 | −6.9 | 16.8 |
| Hull | 300 | 77.3 | 72.3 | 81.7 | 4.7 | 18.0 | 6.3 | −3.1 | 15.6 |
| Ipswi | 97 | 77.3 | 67.9 | 84.6 | 5.2 | 17.5 | −6.0 | −20.7 | 8.7 |
| Kent | 309 | 69.6 | 64.2 | 74.5 | 4.2 | 26.2 | 0.7 | −9.0 | 10.5 |
| L Barts | 646 | 64.6 | 60.8 | 68.2 | 30.7 | 4.8 | −2.5 | −9.5 | 4.6 |
| L Guys | 519 | 68.8 | 64.7 | 72.6 | 27.0 | 4.2 | −7.6 | −14.9 | −0.4 |
| L Kings | 370 | 81.4 | 77.1 | 85.0 | 13.5 | 5.1 | −1.5 | −8.7 | 5.8 |
| L Rfree | 511 | 66.9 | 62.7 | 70.9 | 28.4 | 4.7 | −1.7 | −9.2 | 5.9 |
| L St.G | 247 | 77.3 | 71.7 | 82.1 | 5.3 | 17.4 | 3.6 | −7.0 | 14.1 |
| L West | 1,155 | 79.7 | 77.2 | 81.9 | 8.8 | 11.5 | −1.7 | −6.2 | 2.8 |
| Leeds | 463 | 74.1 | 69.9 | 77.9 | 5.4 | 20.5 | −0.4 | −7.9 | 7.2 |
| Leic | 703 | 79.2 | 76.1 | 82.1 | 9.8 | 11.0 | 2.9 | −2.9 | 8.7 |
| Liv Ain | 95 | 72.6 | 62.8 | 80.6 | 2.1 | 25.3 | −4.2 | −20.0 | 11.6 |
| Liv RI | 367 | 73.0 | 68.3 | 77.3 | 9.3 | 17.7 | 4.3 | −4.5 | 13.1 |
| M Hope | 288 | 68.1 | 62.5 | 73.2 | 25.0 | 6.9 | −4.0 | −14.3 | 6.4 |
| M RI | 245 | 60.4 | 54.2 | 66.3 | 35.5 | 4.1 | −11.3 | −21.9 | −0.6 |
| Middlbr | 264 | 71.2 | 65.5 | 76.4 | 16.7 | 12.1 | −3.7 | −13.8 | 6.4 |
| Newc | 252 | 80.6 | 75.2 | 85.0 | 7.9 | 11.5 | 4.3 | −5.2 | 13.7 |
| Newry | 93 | 61.3 | 51.1 | 70.6 | 36.6 | 2.2 | −13.1 | −30.9 | 4.7 |
| Norwch | 294 | 73.5 | 68.1 | 78.2 | 2.7 | 23.8 | −2.1 | −11.4 | 7.3 |
| Nottm | 379 | 75.5 | 70.9 | 79.5 | 5.8 | 18.7 | 6.7 | −1.8 | 15.3 |
| Oxford | 334 | 79.0 | 74.3 | 83.1 | 6.6 | 14.4 | 7.4 | −1.2 | 16.1 |
| Plymth | 112 | 75.9 | 67.1 | 82.9 | 11.6 | 12.5 | −3.9 | −18.3 | 10.5 |
| Ports | 440 | 81.1 | 77.2 | 84.5 | 10.2 | 8.6 | 2.8 | −4.3 | 10.0 |
| Prestn | 415 | 71.3 | 66.8 | 75.5 | 18.6 | 10.1 | 3.5 | −4.7 | 11.8 |
| Redng | 248 | 82.7 | 77.4 | 86.9 | 11.7 | 5.7 | −0.7 | −9.5 | 8.2 |
| Sheff | 570 | 79.8 | 76.3 | 82.9 | 14.2 | 6.0 | 1.8 | −4.5 | 8.0 |
| Shrew | 182 | 84.1 | 78.0 | 88.7 | 4.4 | 11.5 | 10.1 | −1.1 | 21.3 |
| Stevng | 348 | 75.3 | 70.5 | 79.5 | 7.2 | 17.5 | −0.7 | −9.2 | 7.8 |
| Sthend | 119 | 76.5 | 68.0 | 83.2 | 5.0 | 18.5 | 0.0 | −14.2 | 14.2 |
| Stoke | 277 | 77.3 | 72.0 | 81.8 | 15.2 | 7.6 | −3.1 | −12.4 | 6.2 |

**Table 10.7.** Continued

| Centre | N | % adjusted Ca 2.2–2.5 mmol/L | Lower 95% CI | Upper 95% CI | % adjusted Ca <2.2 mmol/L | adjusted Ca >2.5 mmol/L | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % within range | 95% LCL | 95% UCL |
| Sund | 159 | 74.8 | 67.5 | 81.0 | 5.7 | 19.5 | 6.1 | −7.3 | 19.4 |
| Swanse | 322 | 70.5 | 65.3 | 75.2 | 23.6 | 5.9 | −7.1 | −16.1 | 1.8 |
| Truro | 138 | 83.3 | 76.2 | 88.7 | 5.1 | 11.6 | 8.3 | −4.3 | 20.9 |
| Tyrone | 85 | 69.4 | 58.9 | 78.3 | 4.7 | 25.9 | −2.4 | −20.4 | 15.7 |
| Ulster | 86 | 76.7 | 66.7 | 84.5 | 2.3 | 20.9 | −11.9 | −26.8 | 3.1 |
| Wirral | 165 | 80.0 | 73.2 | 85.4 | 6.1 | 13.9 | 2.2 | −9.6 | 14.0 |
| Wolve | 287 | 70.4 | 64.8 | 75.4 | 23.3 | 6.3 | −4.0 | −13.7 | 5.8 |
| Wrexm | 71 | 66.2 | 54.5 | 76.2 | 7.0 | 26.8 | 1.4 | −19.2 | 22.0 |
| York | 149 | 82.6 | 75.6 | 87.8 | 4.0 | 13.4 | −3.3 | −15.7 | 9.0 |
| **England** | **15,854** | **74.3** | **73.6** | **74.9** | **13.2** | **12.5** | **0.4** | **−0.9** | **1.7** |
| **N Ireland** | **670** | **74.6** | **71.2** | **77.8** | **14.9** | **10.5** | **−4.7** | **−10.6** | **1.3** |
| **Wales** | **977** | **73.3** | **70.4** | **76.0** | **15.8** | **11.0** | **−3.4** | **−8.5** | **1.7** |
| **E, W & NI** | **17,501** | **74.2** | **73.6** | **74.9** | **13.4** | **12.4** | **0.0** | **−1.2** | **1.2** |

**Table 10.8.** Summary statistics for adjusted calcium in peritoneal dialysis patients in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 100 | 14 | | | | | |
| B Heart | 96 | 26 | 2.3 | 0.17 | 2.3 | 2.2 | 2.4 |
| B QEH | 85 | 121 | 2.3 | 0.15 | 2.3 | 2.2 | 2.4 |
| Bangor | 100 | 29 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Basldn | 100 | 25 | 2.5 | 0.13 | 2.5 | 2.4 | 2.6 |
| Belfast | 100 | 34 | 2.3 | 0.10 | 2.3 | 2.2 | 2.4 |
| Bradfd | 100 | 31 | 2.4 | 0.13 | 2.4 | 2.3 | 2.5 |
| Brightn* | 100 | 76 | 2.4 | 0.14 | 2.4 | 2.3 | 2.5 |
| Bristol | 100 | 68 | 2.5 | 0.16 | 2.5 | 2.4 | 2.6 |
| Camb | 100 | 31 | 2.3 | 0.19 | 2.3 | 2.2 | 2.4 |
| Cardff* | 100 | 95 | 2.4 | 0.19 | 2.4 | 2.3 | 2.5 |
| Carlis | 100 | 13 | | | | | |
| Carsh | 99 | 110 | 2.4 | 0.15 | 2.4 | 2.2 | 2.4 |
| Chelms | 100 | 31 | 2.5 | 0.17 | 2.5 | 2.3 | 2.6 |
| Clwyd | 86 | 6 | | | | | |
| Covnt* | 99 | 72 | 2.3 | 0.14 | 2.25 | 2.2 | 2.4 |
| Derby | 100 | 82 | 2.4 | 0.11 | 2.4 | 2.4 | 2.5 |
| Derry | 100 | 3 | | | | | |
| Donc | 97 | 29 | 2.5 | 0.16 | 2.5 | 2.4 | 2.6 |
| Dorset | 98 | 53 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Dudley | 98 | 49 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Exeter | 100 | 64 | 2.3 | 0.18 | 2.3 | 2.2 | 2.4 |
| Glouc | 100 | 39 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Hull | 98 | 62 | 2.5 | 0.12 | 2.5 | 2.4 | 2.5 |
| Ipswi | 100 | 42 | 2.4 | 0.14 | 2.4 | 2.3 | 2.5 |
| Kent | 100 | 64 | 2.5 | 0.14 | 2.5 | 2.4 | 2.6 |
| L Barts | 99 | 164 | 2.4 | 0.20 | 2.3 | 2.2 | 2.45 |
| L Guys | 100 | 44 | 2.4 | 0.16 | 2.3 | 2.2 | 2.5 |
| L Kings | 100 | 68 | 2.3 | 0.15 | 2.3 | 2.2 | 2.4 |
| L Rfree | 98 | 63 | 2.3 | 0.20 | 2.3 | 2.2 | 2.4 |
| L St.G | 97 | 56 | 2.5 | 0.12 | 2.5 | 2.4 | 2.6 |
| L West | 100 | 31 | 2.4 | 0.14 | 2.4 | 2.3 | 2.5 |
| Leeds | 100 | 86 | 2.4 | 0.15 | 2.4 | 2.4 | 2.5 |

**Table 10.8.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Leic | 97 | 144 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Liv Ain | 29 | 2 | | | | | |
| Liv RI | 99 | 79 | 2.4 | 0.18 | 2.4 | 2.3 | 2.5 |
| M Hope | 96 | 108 | 2.3 | 0.19 | 2.3 | 2.2 | 2.4 |
| M RI | 98 | 87 | 2.3 | 0.15 | 2.3 | 2.2 | 2.4 |
| Newc* | 100 | 48 | 2.5 | 0.17 | 2.45 | 2.4 | 2.6 |
| Newry | 100 | 12 | | | | | |
| Norwch | 89 | 49 | 2.5 | 0.10 | 2.5 | 2.4 | 2.5 |
| Norwch | 89 | 49 | | | | | |
| Nottm | 100 | 101 | 2.5 | 0.15 | 2.5 | 2.5 | 2.6 |
| Oxford | 100 | 93 | 2.5 | 0.17 | 2.5 | 2.4 | 2.6 |
| Plymth | 100 | 38 | 2.4 | 0.17 | 2.4 | 2.3 | 2.5 |
| Ports | 95 | 77 | 2.4 | 0.18 | 2.4 | 2.3 | 2.5 |
| Prestn* | 89 | 58 | 2.3 | 0.14 | 2.3 | 2.2 | 2.4 |
| Redng | 100 | 73 | 2.4 | 0.15 | 2.4 | 2.3 | 2.5 |
| Sheff | 100 | 68 | 2.3 | 0.15 | 2.3 | 2.2 | 2.4 |
| Shrew | 100 | 27 | 2.3 | 0.16 | 2.3 | 2.3 | 2.4 |
| Stevng | 96 | 27 | 2.4 | 0.16 | 2.4 | 2.3 | 2.5 |
| Sthend | 94 | 16 | | | | | |
| Stoke | 99 | 68 | 2.4 | 0.16 | 2.4 | 2.3 | 2.5 |
| Sund* | 100 | 24 | 2.6 | 0.31 | 2.4 | 2.4 | 2.7 |
| Swanse | 100 | 52 | 2.2 | 0.13 | 2.2 | 2.1 | 2.3 |
| Truro | 100 | 21 | 2.4 | 0.20 | 2.4 | 2.3 | 2.6 |
| Tyrone | 91 | 10 | | | | | |
| Ulster | 100 | 2 | | | | | |
| Wirral | 69 | 18 | | | | | |
| Wolve | 100 | 40 | 2.3 | 0.21 | 2.3 | 2.2 | 2.4 |
| Wrexm | 95 | 21 | 2.5 | 0.15 | 2.5 | 2.4 | 2.6 |
| York | 100 | 15 | | | | | |
| **England** | **97** | **2,896** | **2.4** | **0.18** | **2.4** | **2.3** | **2.5** |
| **N Ireland** | **99** | **75** | **2.3** | **0.14** | **2.4** | **2.2** | **2.4** |
| **Wales** | **99** | **203** | **2.4** | **0.18** | **2.4** | **2.2** | **2.5** |
| **E, W & NI** | **97** | **3,174** | **2.4** | **0.18** | **2.4** | **2.3** | **2.5** |

Blank cells denote centres excluded from the analysis due to low patient numbers or poor data completeness
*These centres supplied uncorrected calcium and were corrected using the formula: adjusted calcium = unadjusted calcium + [(40-albumin) × 0.02]

**Table 10.9.** Percentage of peritoneal dialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2009

| | | | | | | | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Centre | N | % adjusted Ca 2.2–2.5 mmol/L | Lower 95% CI | Upper 95% CI | % adjusted Ca <2.2 mmol/L | adjusted Ca >2.5 mmol/L | % within range | 95% LCL | 95% UCL |
| B Heart | 26 | 69.2 | 49.5 | 83.8 | 19.2 | 11.5 | −5.8 | −37.3 | 25.7 |
| B QEH | 121 | 77.7 | 69.4 | 84.2 | 14.1 | 8.3 | 2.0 | −12.5 | 16.5 |
| Bangor | 29 | 65.5 | 46.9 | 80.3 | 10.3 | 24.1 | −24.1 | −51.2 | 2.9 |
| Basldn | 25 | 68.0 | 47.8 | 83.1 | 0.0 | 32.0 | −12.0 | −42.6 | 18.6 |
| Belfast | 34 | 91.2 | 76.0 | 97.1 | 5.9 | 2.9 | 17.3 | −3.6 | 38.2 |
| Bradfd | 31 | 90.3 | 73.9 | 96.9 | 6.5 | 3.2 | 9.7 | −13.2 | 32.5 |
| Brightn | 76 | 79.0 | 68.4 | 86.7 | 2.6 | 18.4 | −9.8 | −24.9 | 5.3 |

**Table 10.9.** Continued

| Centre | N | % adjusted Ca 2.2–2.5 mmol/L | Lower 95% CI | Upper 95% CI | % adjusted Ca <2.2 mmol/L | adjusted Ca >2.5 mmol/L | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % within range | 95% LCL | 95% UCL |
| Bristol | 68 | 67.7 | 55.7 | 77.7 | 1.5 | 30.9 | 6.5 | −14.3 | 27.4 |
| Camb | 31 | 74.2 | 56.3 | 86.5 | 19.4 | 6.5 | −10.0 | −35.4 | 15.4 |
| Cardff | 95 | 74.7 | 65.1 | 82.5 | 8.4 | 16.8 | −7.2 | −22.2 | 7.9 |
| Carsh | 110 | 81.8 | 73.5 | 88.0 | 7.3 | 10.9 | 7.3 | −6.9 | 21.4 |
| Chelms | 31 | 67.7 | 49.7 | 81.7 | 3.2 | 29.0 | −1.5 | −30.3 | 27.4 |
| Covnt | 72 | 75.0 | 63.8 | 83.6 | 23.6 | 1.4 | −10.3 | −27.5 | 6.9 |
| Derby | 82 | 87.8 | 78.8 | 93.3 | 0.0 | 12.2 | 6.5 | −8.4 | 21.4 |
| Donc | 29 | 65.5 | 46.9 | 80.3 | 3.5 | 31.0 | −4.8 | −34.7 | 25.2 |
| Dorset | 53 | 77.4 | 64.2 | 86.7 | 5.7 | 17.0 | −8.3 | −28.0 | 11.3 |
| Dudley | 49 | 81.6 | 68.3 | 90.2 | 2.0 | 16.3 | 6.1 | −15.8 | 27.9 |
| Exeter | 64 | 75.0 | 63.0 | 84.1 | 17.2 | 7.8 | 3.8 | −16.8 | 24.5 |
| Glouc | 39 | 76.9 | 61.3 | 87.5 | 7.7 | 15.4 | 1.2 | −24.8 | 27.1 |
| Hull | 62 | 77.4 | 65.4 | 86.2 | 1.6 | 21.0 | 1.7 | −17.3 | 20.8 |
| Ipswi | 42 | 81.0 | 66.3 | 90.2 | 4.8 | 14.3 | −2.4 | −23.3 | 18.5 |
| Kent | 64 | 60.9 | 48.6 | 72.1 | 1.6 | 37.5 | 3.0 | −19.0 | 24.9 |
| L Barts | 164 | 75.6 | 68.5 | 81.6 | 10.4 | 14.0 | −0.3 | −11.9 | 11.2 |
| L Guys | 44 | 88.6 | 75.5 | 95.2 | 4.6 | 6.8 | 13.1 | −7.0 | 33.2 |
| L Kings | 68 | 77.9 | 66.6 | 86.2 | 14.7 | 7.4 | −9.4 | −25.9 | 7.1 |
| L Rfree | 63 | 65.1 | 52.6 | 75.8 | 22.2 | 12.7 | −9.6 | −29.8 | 10.6 |
| L St.G | 56 | 73.2 | 60.2 | 83.2 | 0.0 | 26.8 | 5.2 | −17.7 | 28.1 |
| L West | 31 | 80.7 | 63.1 | 91.0 | 6.5 | 12.9 | 6.8 | −18.5 | 32.2 |
| Leeds | 86 | 76.7 | 66.7 | 84.5 | 4.7 | 18.6 | −5.0 | −21.1 | 11.1 |
| Leic | 144 | 77.1 | 69.5 | 83.2 | 4.2 | 18.8 | 0.2 | −12.4 | 12.7 |
| Liv RI | 79 | 77.2 | 66.7 | 85.2 | 3.8 | 19.0 | 1.9 | −15.2 | 19.1 |
| M Hope | 108 | 73.2 | 64.0 | 80.7 | 19.4 | 7.4 | 1.7 | −13.8 | 17.3 |
| M RI | 87 | 79.3 | 69.5 | 86.6 | 19.5 | 1.2 | 2.4 | −13.6 | 18.4 |
| Newc | 48 | 64.6 | 50.2 | 76.7 | 4.2 | 31.3 | −23.8 | −45.6 | −2.0 |
| Norwch | 49 | 77.6 | 63.8 | 87.1 | 0.0 | 22.5 | 8.5 | −13.8 | 30.7 |
| Nottm | 101 | 56.4 | 46.6 | 65.8 | 2.0 | 41.6 | 4.6 | −13.1 | 22.3 |
| Oxford | 93 | 63.4 | 53.2 | 72.6 | 3.2 | 33.3 | −5.5 | −22.9 | 12.0 |
| Plymth | 38 | 68.4 | 52.2 | 81.1 | 7.9 | 23.7 | −13.8 | −38.2 | 10.6 |
| Ports | 77 | 71.4 | 60.4 | 80.4 | 6.5 | 22.1 | −7.4 | −25.7 | 10.8 |
| Prestn | 58 | 84.5 | 72.8 | 91.7 | 5.2 | 10.3 | −1.5 | −18.6 | 15.6 |
| Redng | 73 | 89.0 | 79.6 | 94.4 | 4.1 | 6.9 | 7.7 | −7.2 | 22.7 |
| Sheff | 68 | 79.4 | 68.2 | 87.4 | 14.7 | 5.9 | 0.5 | −17.2 | 18.3 |
| Shrew | 27 | 81.5 | 62.5 | 92.1 | 7.4 | 11.1 | 4.8 | −22.9 | 32.5 |
| Stevng | 27 | 70.4 | 51.0 | 84.4 | 7.4 | 22.2 | −1.1 | −31.1 | 29.0 |
| Stoke | 68 | 72.1 | 60.3 | 81.4 | 7.4 | 20.6 | −5.7 | −24.6 | 13.2 |
| Sund | 24 | 58.3 | 38.3 | 75.9 | 4.2 | 37.5 | | | |
| Swanse | 52 | 69.2 | 55.5 | 80.2 | 28.9 | 1.9 | −8.7 | −30.3 | 12.9 |
| Truro | 21 | 47.6 | 27.9 | 68.2 | 14.3 | 38.1 | −25.5 | −61.4 | 10.5 |
| Wolve | 40 | 77.5 | 62.1 | 87.9 | 17.5 | 5.0 | 6.1 | −17.0 | 29.2 |
| Wrexm | 21 | 71.4 | 49.2 | 86.6 | 0.0 | 28.6 | 14.3 | −23.4 | 52.0 |
| **England** | **2,896** | **75.0** | **73.4** | **76.5** | **8.2** | **16.9** | **−0.6** | **−3.5** | **2.3** |
| **N Ireland** | **75** | **86.7** | **77.0** | **92.7** | **6.7** | **6.7** | **11.1** | **−4.6** | **26.8** |
| **Wales** | **203** | **71.9** | **65.4** | **77.7** | **12.8** | **15.3** | **−7.8** | **−18.5** | **2.9** |
| **E, W & NI** | **3,174** | **75.1** | **73.5** | **76.6** | **8.4** | **16.5** | **−0.8** | **−3.6** | **1.9** |

HD patients with hypercalcaemia was 12% compared to 13% in 2008 and the proportion with hypocalcaemia was 13% compared to 12% in 2008. The proportion of PD patients with hypercalcaemia was 17% similar to 2008 (16%) and the proportion with hypocalcaemia was 8% the same as in 2008 (tables 10.7 and 10.9, figures 10.6 to 10.9). The changes in the percentages above, below and within range for the period 2000 to 2009 for England, Northern Ireland and Wales combined are shown in figure 10.10. The percentage of patients achieving the audit standard for calcium seems to have reached a plateau for both HD and PD patients.

As for phosphate, there was significant between centre variation in unadjusted analyses for the proportion of patients below, within and above the range specified by the clinical performance measure (figures 10.6–10.10). There was greater variation in the proportion of patients within range for adjusted calcium than phosphate, most notably for HD patients. The funnel plot shows a greater number of centres outlying the 3SD limit indicating over dispersion in the data possibly due to differences in calcium analysis between centres. The latest guidance from the Renal Association [7], finalised in December 2010, continues to suggest maintenance of serum calcium within the normal range and ideally between 2.2 and 2.5 mmol/L, avoiding hypercalcaemic episodes and calcium concentrations below 2.2 mmol/L; hence the audit measure will remain unchanged for next year's report.

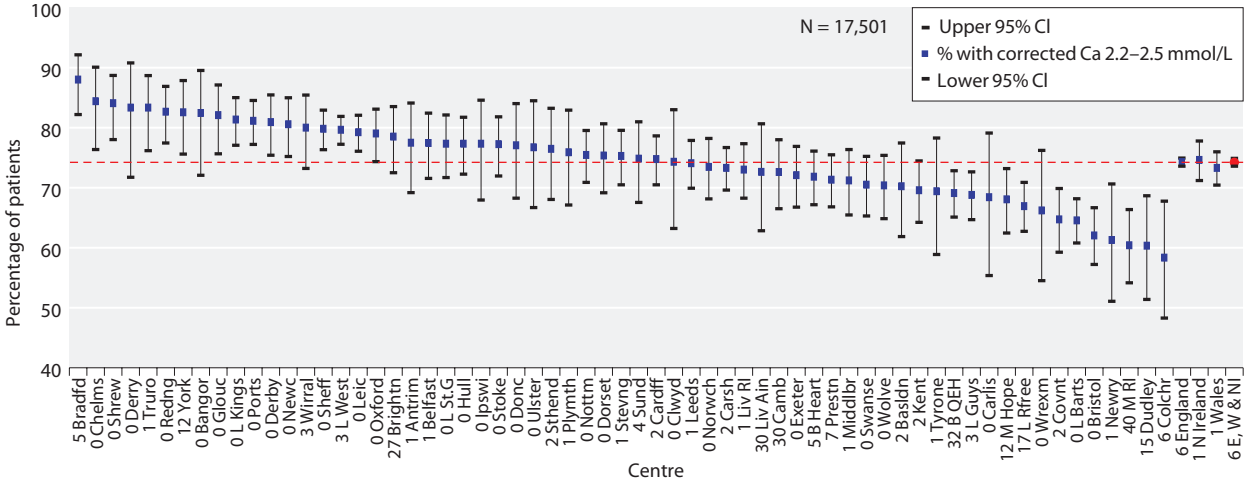


**Fig. 10.6.** Percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2009

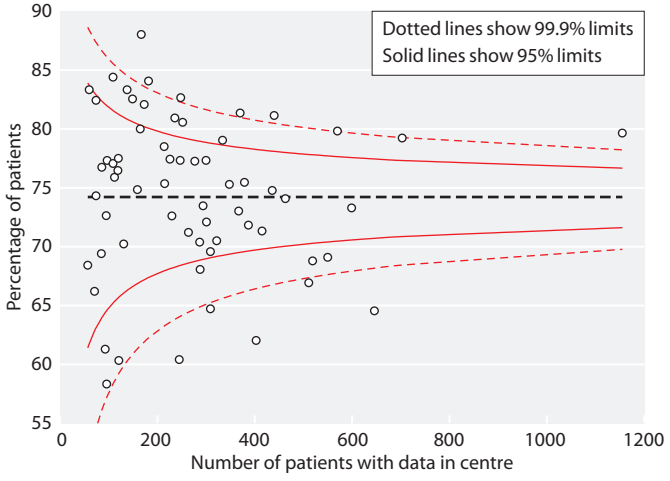


**Fig. 10.7.** Funnel plot of percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2009

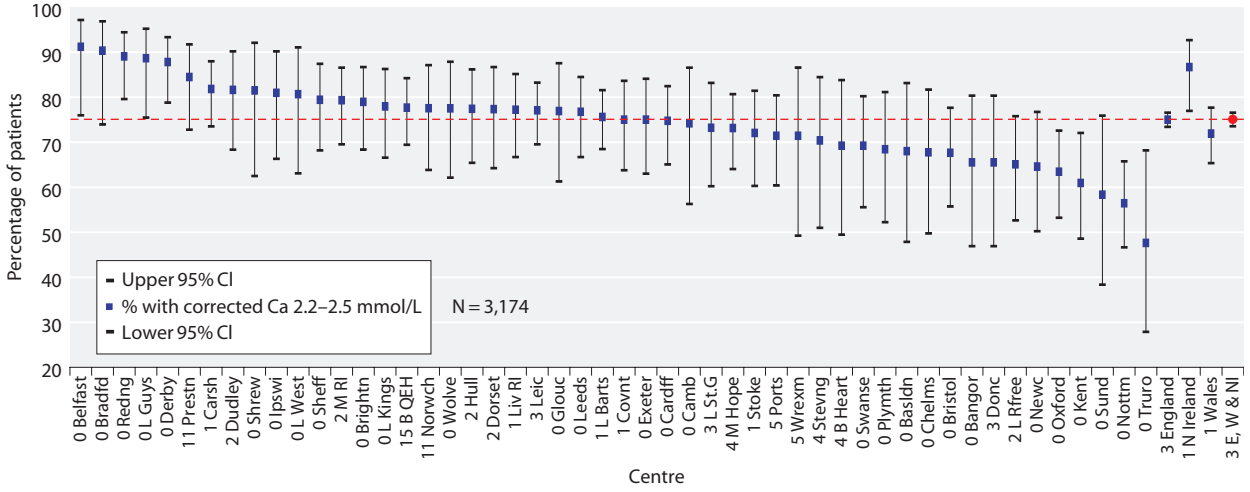


**Fig. 10.8.** Percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2009

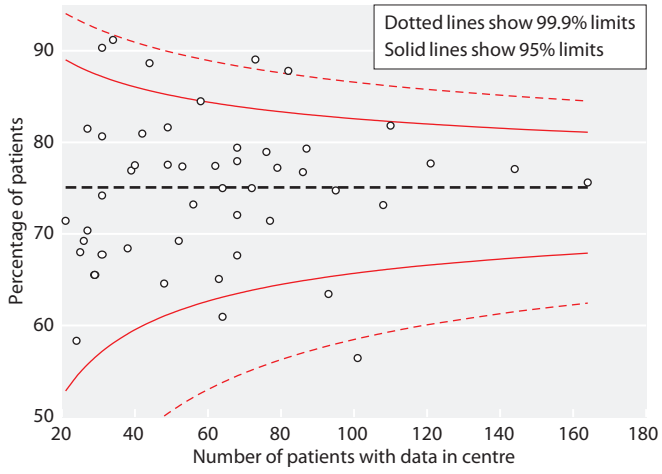


**Fig. 10.9.** Funnel plot of percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2009

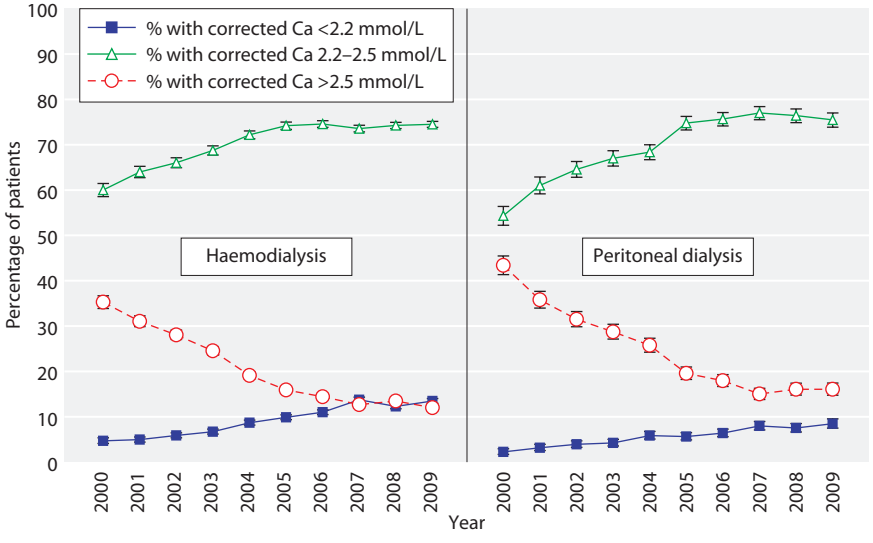


**Fig. 10.10.** Longitudinal change in percentage of patients with adjusted calcium <2.2 mmol/L, 2.2–2.5 mmol/L and >2.5 mmol/L by dialysis modality 2000–2009

*Parathyroid hormone*

The 4th edition of the Renal Association Clinical Practice Guidelines states:

***'The target range for parathyroid hormone measured using an intact PTH assay should be between 2 and 4 times the upper limit of normal for the intact PTH assay used. The same target range should apply when using the whole molecule PTH assay.' (Module 2: Complications)*** [1]

The data for parathyroid hormone were 85% complete for HD patients and 87% complete for PD patients overall, although there was between centre variation (tables 10.10 and 10.12). Twenty-eight percent (CI 27–29%) of HD patients and 32% (30–33%) of PD patients achieved a parathyroid hormone between 16–32 pmol/L (tables 10.11 and 10.13). The proportion of HD patients with a parathyroid hormone above the upper limit of the range was 41% and the proportion with parathyroid hormone below the lower limit of the range was 31%. The proportion of PD patients with parathyroid hormone above the upper limit of the range was 38% and the proportion with parathyroid hormone below the lower limit of the range was 31% (tables 10.11 and 10.13, figures 10.11 to 10.14). Again there was significant between centre variation in unadjusted analyses for the proportion of patients below, within and above the range specified by the clinical performance measure.

**Table 10.10.** Summary statistics for PTH in haemodialysis patients in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 99 | 120 | 26 | 23 | 19 | 11 | 32 |
| B Heart | 89 | 362 | 37 | 36 | 27 | 13 | 47 |
| B QEH | 65 | 523 | 21 | 14 | 21 | 9 | 33 |
| Bangor | 100 | 74 | 31 | 48 | 19 | 10 | 28 |
| Basldn | 99 | 131 | 30 | 27 | 21 | 11 | 43 |
| Belfast | 95 | 217 | 40 | 43 | 28 | 12 | 49 |
| Bradfd | 91 | 160 | 34 | 38 | 21 | 11 | 44 |
| Brightn | 83 | 241 | 37 | 38 | 26 | 10 | 51 |
| Bristol | 97 | 391 | 32 | 35 | 21 | 11 | 41 |
| Camb | 47 | 155 | | | | | |
| Cardff | 96 | 428 | 36 | 35 | 26 | 13 | 48 |
| Carlis | 100 | 57 | 34 | 28 | 27 | 15 | 47 |
| Carsh | 5 | 29 | | | | | |
| Chelms | 100 | 109 | 49 | 40 | 34 | 22 | 64 |
| Clwyd | 93 | 69 | 30 | 28 | 21 | 10 | 41 |
| Colchr | 99 | 101 | 35 | 31 | 25 | 13 | 46 |
| Covnt | 97 | 306 | 37 | 44 | 24 | 13 | 46 |
| Derby | 99 | 234 | 30 | 33 | 22 | 13 | 37 |
| Derry | 97 | 58 | 50 | 36 | 40 | 23 | 66 |
| Donc | 98 | 107 | 38 | 37 | 24 | 14 | 54 |
| Dorset | 98 | 210 | 30 | 36 | 19 | 7 | 41 |
| Dudley | 73 | 104 | 37 | 48 | 19 | 10 | 40 |
| Exeter | 98 | 297 | 21 | 23 | 14 | 5 | 26 |
| Glouc | 99 | 172 | 24 | 22 | 19 | 9 | 33 |
| Hull | 97 | 293 | 49 | 71 | 30 | 12 | 60 |
| Ipswi | 98 | 95 | 39 | 36 | 29 | 17 | 48 |
| Kent | 0 | 1 | | | | | |
| L Barts | 99 | 639 | 47 | 48 | 32 | 16 | 60 |
| L Guys | 93 | 500 | 46 | 52 | 28 | 11 | 62 |
| L Kings | 98 | 362 | 43 | 37 | 34 | 15 | 62 |
| L Rfree | 80 | 496 | 37 | 40 | 27 | 15 | 47 |
| L St.G | 94 | 231 | 47 | 42 | 34 | 17 | 64 |
| L West | 89 | 1,059 | 56 | 61 | 35 | 17 | 75 |
| Leeds | 97 | 456 | 29 | 30 | 20 | 10 | 38 |
| Leic | 97 | 685 | 43 | 44 | 31 | 13 | 58 |
| Liv Ain | 57 | 77 | 40 | 44 | 24 | 10 | 50 |
| Liv RI | 97 | 358 | 39 | 37 | 28 | 14 | 50 |

**Table 10.10.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| M Hope | 75 | 247 | | | | | |
| M RI | 50 | 205 | 43 | 37 | 34 | 16 | 57 |
| Middlbr | 93 | 250 | 44 | 48 | 31 | 15 | 51 |
| Newc | 98 | 246 | 33 | 30 | 25 | 13 | 44 |
| Newry | 98 | 92 | 37 | 33 | 28 | 17 | 46 |
| Norwch | 96 | 283 | 31 | 29 | 25 | 14 | 39 |
| Nottm | 100 | 379 | 36 | 43 | 25 | 13 | 43 |
| Oxford | 96 | 323 | 47 | 40 | 37 | 15 | 67 |
| Plymth | 98 | 111 | 19 | 20 | 14 | 5 | 26 |
| Ports | 90 | 398 | 42 | 50 | 23 | 10 | 53 |
| Prestn | 87 | 391 | 33 | 33 | 23 | 12 | 42 |
| Redng | 100 | 248 | 29 | 28 | 23 | 13 | 37 |
| Sheff | 98 | 558 | 40 | 34 | 31 | 16 | 56 |
| Shrew | 96 | 175 | 36 | 46 | 20 | 11 | 42 |
| Stevng | 97 | 340 | 60 | 52 | 48 | 29 | 76 |
| Sthend | 90 | 109 | 53 | 46 | 40 | 20 | 70 |
| Stoke | 95 | 263 | 46 | 47 | 31 | 18 | 61 |
| Sund | 95 | 157 | 46 | 37 | 35 | 19 | 65 |
| Swanse | 72 | 232 | 43 | 42 | 30 | 17 | 59 |
| Truro | 98 | 136 | 26 | 29 | 18 | 8 | 35 |
| Tyrone | 99 | 85 | 36 | 26 | 30 | 21 | 41 |
| Ulster | 100 | 86 | 26 | 24 | 19 | 10 | 31 |
| Wirral | 63 | 107 | 32 | 31 | 23 | 13 | 41 |
| Wolve | 97 | 278 | 19 | 25 | 12 | 6 | 23 |
| Wrexm | 99 | 70 | 22 | 19 | 19 | 8 | 32 |
| York | 76 | 129 | 37 | 33 | 26 | 14 | 53 |
| **England** | **85** | **14,274** | **39.0** | **39.3** | **27.4** | **13.8** | **51.0** |
| **N Ireland** | **97** | **658** | **35.0** | **34.0** | **26.0** | **13.0** | **45.0** |
| **Wales** | **88** | **873** | **36.0** | **38.0** | **26.0** | **13.0** | **46.0** |
| **E, W & NI** | **85** | **15,805** | **38.1** | **38.0** | **27.0** | **13.8** | **49.5** |

Blank cells denote centres excluded from analyses due to low patient numbers or poor data completeness
M Hope excluded due to technical difficulties with data extraction

**Table 10.11.** Percentage of haemodialysis patients within, below and above the range for PTH (16–32 pmol/L) in 2009

| | | | | | | | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Centre | N | % PTH 16–32 pmol/L | Lower 95% CI | Upper 95% CI | % PTH <16 pmol/L | % PTH >32 pmol/L | % within range | 95% LCL | 95% UCL |
| Antrim | 120 | 33.3 | 25.5 | 42.2 | 42.5 | 24.2 | −0.3 | −16.0 | 15.5 |
| B Heart | 362 | 26.2 | 22.0 | 31.0 | 30.1 | 43.7 | 3.3 | −5.0 | 11.7 |
| B QEH | 523 | 33.8 | 29.9 | 38.0 | 39.6 | 26.6 | −3.9 | −12.0 | 4.2 |
| Bangor | 74 | 37.8 | 27.6 | 49.3 | 41.9 | 20.3 | 11.8 | −8.2 | 31.7 |
| Basldn | 131 | 31.3 | 24.0 | 39.7 | 36.6 | 32.1 | −0.4 | −15.5 | 14.8 |
| Belfast | 217 | 25.8 | 20.4 | 32.0 | 31.3 | 42.9 | 0.4 | −10.4 | 11.1 |
| Bradfd | 160 | 22.5 | 16.7 | 29.6 | 41.3 | 36.3 | −7.0 | −19.7 | 5.7 |
| Brightn | 241 | 27.0 | 21.8 | 32.9 | 31.5 | 41.5 | 3.1 | −6.7 | 13.0 |
| Bristol | 391 | 30.7 | 26.3 | 35.4 | 36.6 | 32.7 | −2.3 | −10.9 | 6.3 |
| Cardff | 428 | 29.0 | 24.9 | 33.5 | 30.6 | 40.4 | 1.2 | −6.9 | 9.3 |
| Carlis | 57 | 28.1 | 18.0 | 41.0 | 28.1 | 43.9 | −5.7 | −26.8 | 15.4 |
| Chelms | 109 | 29.4 | 21.6 | 38.6 | 16.5 | 54.1 | −2.6 | −19.3 | 14.2 |
| Clwyd | 69 | 21.7 | 13.6 | 33.0 | 40.6 | 37.7 | −2.5 | −21.5 | 16.6 |

**Table 10.11.** Continued

| Centre | N | % PTH 16–32 pmol/L | Lower 95% CI | Upper 95% CI | % PTH <16 pmol/L | % PTH >32 pmol/L | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % within range | 95% LCL | 95% UCL |
| Colchr | 101 | 31.7 | 23.4 | 41.4 | 32.7 | 35.6 | 1.6 | −15.6 | 18.7 |
| Covnt | 306 | 27.5 | 22.7 | 32.7 | 31.7 | 40.9 | 3.8 | −5.5 | 13.2 |
| Derby | 234 | 37.6 | 31.6 | 44.0 | 32.1 | 30.3 | 1.9 | −9.6 | 13.5 |
| Derry | 58 | 22.4 | 13.5 | 34.9 | 15.5 | 62.1 | −16.8 | −39.4 | 5.8 |
| Donc | 107 | 31.8 | 23.7 | 41.2 | 30.8 | 37.4 | −0.2 | −18.5 | 18.2 |
| Dorset | 210 | 26.7 | 21.1 | 33.1 | 42.4 | 31.0 | 2.4 | −9.2 | 14.0 |
| Dudley | 104 | 23.1 | 16.0 | 32.1 | 43.3 | 33.7 | −7.6 | −24.2 | 9.0 |
| Exeter | 297 | 28.3 | 23.5 | 33.7 | 53.2 | 18.5 | 1.6 | −8.1 | 11.3 |
| Glouc | 172 | 27.9 | 21.7 | 35.1 | 44.8 | 27.3 | −17.1 | −31.1 | −3.1 |
| Hull | 293 | 20.1 | 15.9 | 25.1 | 31.4 | 48.5 | −6.3 | −15.5 | 3.0 |
| Ipswi | 95 | 34.7 | 25.9 | 44.8 | 23.2 | 42.1 | −1.1 | −18.9 | 16.8 |
| L Barts | 639 | 25.7 | 22.4 | 29.2 | 24.6 | 49.8 | 2.1 | −4.3 | 8.5 |
| L Guys | 500 | 22.6 | 19.2 | 26.5 | 31.4 | 46.0 | −3.3 | −10.5 | 3.8 |
| L Kings | 362 | 21.6 | 17.6 | 26.1 | 27.1 | 51.4 | −6.9 | −15.1 | 1.4 |
| L Rfree | 496 | 33.1 | 29.1 | 37.3 | 26.8 | 40.1 | 2.6 | −5.0 | 10.2 |
| L St.G | 231 | 28.1 | 22.7 | 34.3 | 20.4 | 51.5 | −3.1 | −14.6 | 8.3 |
| L West | 1,059 | 24.1 | 21.6 | 26.8 | 23.3 | 52.6 | 1.6 | −3.4 | 6.6 |
| Leeds | 456 | 29.4 | 25.4 | 33.7 | 39.5 | 31.1 | 0.1 | −7.8 | 8.0 |
| Leic | 685 | 22.8 | 19.8 | 26.1 | 28.9 | 48.3 | 0.1 | −5.9 | 6.0 |
| Liv Ain | 77 | 28.6 | 19.6 | 39.6 | 32.5 | 39.0 | −4.4 | −23.1 | 14.3 |
| Liv RI | 358 | 27.9 | 23.5 | 32.8 | 26.8 | 45.3 | 1.4 | −7.3 | 10.1 |
| M Hope | 247 | | | | | | | | |
| M RI | 205 | 22.4 | 17.2 | 28.7 | 23.9 | 53.7 | 0.1 | −10.5 | 10.7 |
| Middlbr | 250 | 27.2 | 22.0 | 33.1 | 26.0 | 46.8 | 0.4 | −10.0 | 10.9 |
| Newc | 246 | 28.9 | 23.5 | 34.8 | 34.2 | 37.0 | −2.7 | −13.4 | 8.0 |
| Newry | 92 | 37.0 | 27.7 | 47.2 | 21.7 | 41.3 | 0.5 | −18.2 | 19.2 |
| Norwch | 283 | 39.9 | 34.4 | 45.8 | 26.9 | 33.2 | 2.7 | −8.0 | 13.3 |
| Nottm | 379 | 31.1 | 26.7 | 36.0 | 29.6 | 39.3 | 0.4 | −8.5 | 9.2 |
| Oxford | 323 | 20.4 | 16.4 | 25.2 | 25.1 | 54.5 | −1.8 | −10.2 | 6.6 |
| Plymth | 111 | 27.9 | 20.4 | 37.0 | 52.3 | 19.8 | 0.4 | −15.2 | 16.0 |
| Ports | 398 | 21.6 | 17.8 | 25.9 | 36.4 | 42.0 | 1.2 | −6.3 | 8.6 |
| Prestn | 391 | 34.8 | 30.2 | 39.6 | 31.7 | 33.5 | 5.9 | −2.6 | 14.4 |
| Redng | 248 | 36.3 | 30.5 | 42.5 | 31.5 | 32.3 | −2.6 | −14.0 | 8.8 |
| Sheff | 558 | 27.6 | 24.1 | 31.5 | 24.2 | 48.2 | −0.5 | −7.5 | 6.4 |
| Shrew | 175 | 28.6 | 22.4 | 35.7 | 38.9 | 32.6 | 1.1 | −11.5 | 13.7 |
| Stevng | 340 | 22.4 | 18.2 | 27.1 | 10.3 | 67.4 | −10.5 | −19.3 | −1.6 |
| Sthend | 109 | 30.3 | 22.4 | 39.5 | 13.8 | 56.0 | 7.1 | −8.3 | 22.6 |
| Stoke | 263 | 30.8 | 25.5 | 36.6 | 20.5 | 48.7 | 6.4 | −3.9 | 16.8 |
| Sund | 157 | 26.1 | 19.8 | 33.5 | 19.8 | 54.1 | −2.9 | −16.1 | 10.4 |
| Swanse | 232 | 29.7 | 24.2 | 35.9 | 23.7 | 46.6 | 3.9 | −6.1 | 14.0 |
| Truro | 136 | 28.7 | 21.7 | 36.8 | 44.9 | 26.5 | −0.9 | −15.2 | 13.3 |
| Tyrone | 85 | 38.8 | 29.1 | 49.5 | 16.5 | 44.7 | −0.5 | −19.8 | 18.9 |
| Ulster | 86 | 37.2 | 27.7 | 47.9 | 40.7 | 22.1 | −11.5 | −31.4 | 8.3 |
| Wirral | 107 | 35.5 | 27.0 | 45.0 | 33.6 | 30.8 | −0.8 | −17.9 | 16.4 |
| Wolve | 278 | 24.8 | 20.1 | 30.2 | 60.1 | 15.1 | 2.0 | −7.4 | 11.4 |
| Wrexm | 70 | 32.9 | 22.9 | 44.6 | 45.7 | 21.4 | 9.0 | −10.8 | 28.7 |
| York | 129 | 30.2 | 22.9 | 38.7 | 27.9 | 41.9 | 1.8 | −13.7 | 17.3 |
| **England** | **14,027** | **27.6** | **26.9** | **28.3** | **30.9** | **41.5** | **−0.4** | **−1.8** | **1.0** |
| **N Ireland** | **658** | **31.6** | **28.2** | **35.3** | **29.9** | **38.5** | **−2.6** | **−9.3** | **4.1** |
| **Wales** | **873** | **29.7** | **26.7** | **32.8** | **31.7** | **38.6** | **3.2** | **−2.3** | **8.7** |
| **E, W & NI** | **15,558** | **27.9** | **27.2** | **28.6** | **30.9** | **41.2** | **−0.3** | **−1.6** | **1.0** |

M Hope excluded due to technical difficulties with data extraction

**Table 10.12.** Summary statistics for PTH in peritoneal dialysis patients in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 100 | 14 | | | | | |
| B Heart | 81 | 22 | 41 | 36 | 29 | 19 | 56 |
| B QEH | 73 | 104 | 19 | 14 | 16 | 6 | 27 |
| Bangor | 100 | 29 | 22 | 22 | 18 | 9 | 32 |
| Basldn | 100 | 25 | 32 | 30 | 21 | 13 | 49 |
| Belfast | 97 | 33 | 53 | 40 | 36 | 23 | 77 |
| Bradfd | 87 | 27 | 51 | 61 | 28 | 9 | 78 |
| Brightn | 97 | 74 | 35 | 36 | 25 | 15 | 39 |
| Bristol | 91 | 62 | 32 | 35 | 26 | 8 | 40 |
| Camb | 100 | 31 | 33 | 21 | 26 | 17 | 44 |
| Cardff | 99 | 94 | 44 | 37 | 32 | 17 | 67 |
| Carlis | 85 | 11 | | | | | |
| Carsh | 4 | 4 | | | | | |
| Chelms | 100 | 31 | 40 | 27 | 36 | 21 | 50 |
| Clwyd | 86 | 6 | | | | | |
| Covnt | 90 | 66 | 33 | 35 | 23 | 10 | 48 |
| Derby | 100 | 82 | 20 | 14 | 17 | 11 | 25 |
| Derry | 100 | 3 | | | | | |
| Donc | 100 | 30 | 42 | 29 | 43 | 20 | 57 |
| Dorset | 81 | 44 | 19 | 20 | 9 | 6 | 26 |
| Dudley | 86 | 43 | 31 | 43 | 14 | 6 | 42 |
| Exeter | 100 | 64 | 25 | 21 | 21 | 10 | 31 |
| Glouc | 87 | 34 | 29 | 33 | 18 | 9 | 35 |
| Hull | 84 | 53 | 29 | 25 | 22 | 12 | 37 |
| Ipswi | 100 | 42 | 42 | 29 | 34 | 23 | 51 |
| Kent | 0 | 0 | | | | | |
| L Barts | 98 | 163 | 33 | 31 | 24 | 12 | 43 |
| L Guys | 95 | 42 | 41 | 36 | 29 | 16 | 58 |
| L Kings | 100 | 68 | 53 | 40 | 44 | 21 | 80 |
| L Rfree | 98 | 63 | 28 | 20 | 23 | 11 | 41 |
| L St.G | 93 | 54 | 37 | 35 | 27 | 14 | 41 |
| L West | 100 | 31 | 50 | 33 | 45 | 20 | 71 |
| Leeds | 99 | 85 | 32 | 25 | 26 | 15 | 40 |
| Leic | 92 | 136 | 33 | 31 | 25 | 11 | 46 |
| Liv Ain | 0 | 0 | | | | | |
| Liv RI | 95 | 76 | 26 | 26 | 23 | 10 | 35 |
| M Hope | 79 | 89 | | | | | |
| M RI | 98 | 87 | 43 | 36 | 33 | 18 | 60 |
| Middlbr | 63 | 10 | | | | | |
| Newc | 98 | 47 | 24 | 27 | 15 | 7 | 34 |
| Newry | 100 | 12 | | | | | |
| Norwch | 76 | 42 | 31 | 34 | 18 | 11 | 38 |
| Nottm | 100 | 101 | 36 | 35 | 24 | 10 | 49 |
| Oxford | 94 | 87 | 44 | 40 | 35 | 16 | 59 |
| Plymth | 97 | 37 | 32 | 30 | 23 | 13 | 37 |
| Ports | 78 | 63 | 49 | 53 | 36 | 17 | 62 |
| Prestn | 98 | 64 | 28 | 25 | 21 | 15 | 30 |
| Redng | 99 | 72 | 28 | 37 | 16 | 9 | 38 |
| Sheff | 87 | 59 | 39 | 30 | 31 | 21 | 55 |
| Shrew | 100 | 27 | 44 | 41 | 32 | 10 | 66 |
| Stevng | 86 | 24 | 53 | 31 | 48 | 29 | 76 |
| Sthend | 76 | 13 | | | | | |
| Stoke | 86 | 59 | 48 | 37 | 39 | 22 | 61 |
| Sund | 88 | 21 | 25 | 26 | 22 | 9 | 30 |
| Swanse | 94 | 49 | 37 | 19 | 35 | 23 | 46 |

**Table 10.12.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Truro | 90 | 19 | | | | | |
| Tyrone | 100 | 11 | | | | | |
| Ulster | 100 | 2 | | | | | |
| Wirral | 58 | 15 | | | | | |
| Wolve | 100 | 40 | 20 | 18 | 15 | 8 | 26 |
| Wrexm | 95 | 21 | 26 | 16 | 24 | 15 | 29 |
| York | 93 | 14 | | | | | |
| **England** | **86** | **2,557** | **35.3** | **31.6** | **26.6** | **13.9** | **47.3** |
| **N Ireland** | **99** | **75** | **42.0** | **38.0** | **28.0** | **19.0** | **46.0** |
| **Wales** | **97** | **199** | **36.0** | **30.0** | **30.0** | **16.0** | **48.0** |
| **E, W & NI** | **87** | **2,831** | **34.3** | **30.2** | **26.1** | **13.8** | **46.0** |

Blank cells denote centres excluded from analyses due to small numbers or poor data completeness
M Hope excluded due to technical difficulties with data extraction

**Table 10.13.** Percentage of peritoneal dialysis patients within, below and above the range for PTH (16–32 pmol/L) in 2009

| | | | | | | | Change from 2008 | |
|---|---|---|---|---|---|---|---|---|
| Centre | N | % PTH 16–32 pmol/L | Lower 95% CI | Upper 95% CI | % PTH <16 pmol/L | % PTH >32 pmol/L | % within range | 95% LCL | 95% UCL |
| B Heart | 22 | 45.5 | 26.5 | 65.9 | 18.2 | 36.4 | 5.5 | −31.8 | 42.7 |
| B QEH | 104 | 35.6 | 27.0 | 45.2 | 47.1 | 17.3 | 7.5 | −9.8 | 24.7 |
| Bangor | 29 | 27.6 | 14.4 | 46.2 | 48.3 | 24.1 | −6.9 | −38.1 | 24.4 |
| Basldn | 25 | 32.0 | 16.9 | 52.2 | 36.0 | 32.0 | −8.0 | −41.3 | 25.3 |
| Belfast | 33 | 36.4 | 21.9 | 53.7 | 12.1 | 51.5 | 9.1 | −18.6 | 36.8 |
| Bradfd | 27 | 18.5 | 7.9 | 37.5 | 37.0 | 44.4 | 1.3 | −25.2 | 27.7 |
| Brightn | 74 | 43.2 | 32.5 | 54.7 | 25.7 | 31.1 | 4.6 | −16.2 | 25.3 |
| Bristol | 62 | 27.4 | 17.8 | 39.8 | 38.7 | 33.9 | 7.4 | −12.0 | 26.8 |
| Camb | 31 | 32.3 | 18.3 | 50.3 | 19.4 | 48.4 | 0.7 | −28.4 | 29.8 |
| Cardff | 94 | 28.7 | 20.5 | 38.7 | 22.3 | 48.9 | 10.5 | −5.1 | 26.0 |
| Chelms | 31 | 29.0 | 15.9 | 47.1 | 12.9 | 58.1 | −0.7 | −29.3 | 27.9 |
| Covnt | 66 | 27.3 | 17.9 | 39.2 | 37.9 | 34.9 | −8.3 | −29.7 | 13.1 |
| Derby | 82 | 52.4 | 41.7 | 63.0 | 36.6 | 11.0 | 10.3 | −10.1 | 30.7 |
| Donc | 30 | 23.3 | 11.6 | 41.5 | 16.7 | 60.0 | −17.3 | −47.3 | 12.7 |
| Dorset | 44 | 25.0 | 14.4 | 39.7 | 59.1 | 15.9 | 3.6 | −19.9 | 27.0 |
| Dudley | 43 | 14.0 | 6.4 | 27.8 | 51.2 | 34.9 | −5.6 | −26.6 | 15.4 |
| Exeter | 64 | 37.5 | 26.6 | 49.9 | 39.1 | 23.4 | 4.2 | −18.3 | 26.6 |
| Glouc | 34 | 23.5 | 12.2 | 40.5 | 41.2 | 35.3 | −3.7 | −31.2 | 23.7 |
| Hull | 53 | 28.3 | 17.8 | 41.8 | 37.7 | 34.0 | 2.4 | −19.4 | 24.2 |
| Ipswi | 42 | 40.5 | 26.9 | 55.7 | 2.4 | 57.1 | 5.1 | −21.4 | 31.5 |
| L Barts | 163 | 30.7 | 24.1 | 38.2 | 33.1 | 36.2 | −1.1 | −13.6 | 11.4 |
| L Guys | 42 | 35.7 | 22.8 | 51.1 | 23.8 | 40.5 | 11.2 | −13.6 | 36.0 |
| L Kings | 68 | 20.6 | 12.6 | 31.8 | 16.2 | 63.2 | −9.0 | −27.8 | 9.9 |
| L Rfree | 63 | 27.0 | 17.5 | 39.2 | 34.9 | 38.1 | −15.3 | −36.2 | 5.6 |
| L St.G | 54 | 31.5 | 20.6 | 44.9 | 29.6 | 38.9 | 12.7 | −9.1 | 34.6 |
| L West | 31 | 19.4 | 9.0 | 36.9 | 12.9 | 67.7 | −18.8 | −45.4 | 7.9 |
| Leeds | 85 | 38.8 | 29.1 | 49.5 | 25.9 | 35.3 | −3.4 | −22.9 | 16.2 |
| Leic | 136 | 29.4 | 22.4 | 37.6 | 33.1 | 37.5 | 8.0 | −5.5 | 21.5 |
| Liv RI | 76 | 34.2 | 24.5 | 45.5 | 38.2 | 27.6 | 6.7 | −12.3 | 25.8 |
| M Hope | 89 | | | | | | | | |
| M RI | 87 | 31.0 | 22.2 | 41.5 | 18.4 | 50.6 | 7.7 | −9.5 | 24.9 |
| Newc | 47 | 23.4 | 13.5 | 37.5 | 51.1 | 25.5 | −13.2 | −38.3 | 11.9 |
| Norwch | 42 | 33.3 | 20.8 | 48.7 | 40.5 | 26.2 | 7.8 | −17.7 | 33.2 |
| Nottm | 101 | 23.8 | 16.5 | 33.0 | 38.6 | 37.6 | 0.9 | −14.3 | 16.1 |

**Table 10.13.** Continued

| Centre | N | % PTH 16–32 pmol/L | Lower 95% CI | Upper 95% CI | % PTH <16 pmol/L | % PTH >32 pmol/L | Change from 2008 % within range | Change from 2008 95% LCL | Change from 2008 95% UCL |
|---|---|---|---|---|---|---|---|---|---|
| Oxford | 87 | 24.1 | 16.3 | 34.2 | 24.1 | 51.7 | −1.6 | −18.1 | 14.8 |
| Plymth | 37 | 40.5 | 26.1 | 56.8 | 29.7 | 29.7 | 16.9 | −10.5 | 44.3 |
| Ports | 63 | 25.4 | 16.2 | 37.5 | 19.1 | 55.6 | 9.0 | −9.7 | 27.7 |
| Prestn | 64 | 50.0 | 38.0 | 62.0 | 28.1 | 21.9 | 7.1 | −16.3 | 30.6 |
| Redng | 72 | 23.6 | 15.2 | 34.8 | 47.2 | 29.2 | −19.6 | −39.3 | 0.1 |
| Sheff | 59 | 42.4 | 30.5 | 55.2 | 15.3 | 42.4 | 26.7 | 6.4 | 47.1 |
| Shrew | 27 | 25.9 | 12.9 | 45.3 | 29.6 | 44.4 | −3.1 | −33.4 | 27.2 |
| Stevng | 24 | 29.2 | 14.6 | 49.8 | 8.3 | 62.5 | 3.4 | −28.0 | 34.7 |
| Stoke | 59 | 30.5 | 20.1 | 43.3 | 8.5 | 61.0 | −1.7 | −23.7 | 20.3 |
| Sund | 21 | 33.3 | 16.8 | 55.3 | 47.6 | 19.1 | | | |
| Swanse | 49 | 32.7 | 21.1 | 46.8 | 10.2 | 57.1 | −3.1 | −27.0 | 20.8 |
| Wolve | 40 | 32.5 | 19.9 | 48.3 | 52.5 | 15.0 | −14.7 | −40.7 | 11.4 |
| Wrexm | 21 | 47.6 | 27.9 | 68.2 | 28.6 | 23.8 | 32.6 | −2.2 | 67.5 |
| **England** | **2,468** | **31.2** | **29.4** | **33.1** | **31.7** | **37.1** | **1.5** | **−1.8** | **4.9** |
| **N Ireland** | **75** | **40.0** | **29.6** | **51.4** | **18.7** | **41.3** | **4.3** | **−15.6** | **24.2** |
| **Wales** | **199** | **32.2** | **26.0** | **39.0** | **24.6** | **43.2** | **7.3** | **−4.1** | **18.7** |
| **E, W & NI** | **2,742** | **31.6** | **29.8** | **33.3** | **30.8** | **37.7** | **2.0** | **−1.1** | **5.2** |

Blank cells denote a centre with low patient numbers last year precluding calculation of the change in target attainment
M Hope excluded due to technical difficulties with data extraction

*Mineral and bone variables – discussion*

There are convincing observational data that hyperphosphataemia is associated with increased mortality in dialysis patients but the data linking calcium and parathyroid hormone to patient survival are less clear [12–16]. A recent cohort study has demonstrated that simultaneous achievement of all three audit measures does appear to be associated with better outcomes [17].

The UKRR has consistently demonstrated between centre variation in achievement of audit measures for bone and mineral parameters but little is understood about the causes of this 'centre effect'. The complexity of the clinical processes required to manage mineral and bone disorders is probably further confounded by case-mix. Finally it is important to consider data quality and the potential for measurement bias particularly in light of the variability in assay methods for parathyroid hormone where substantial differences exist in both calibration and in the detection of the various fragments that accumulate in renal failure. However, detecting these centre level differences is an important step in understanding the factors associated with exceptional

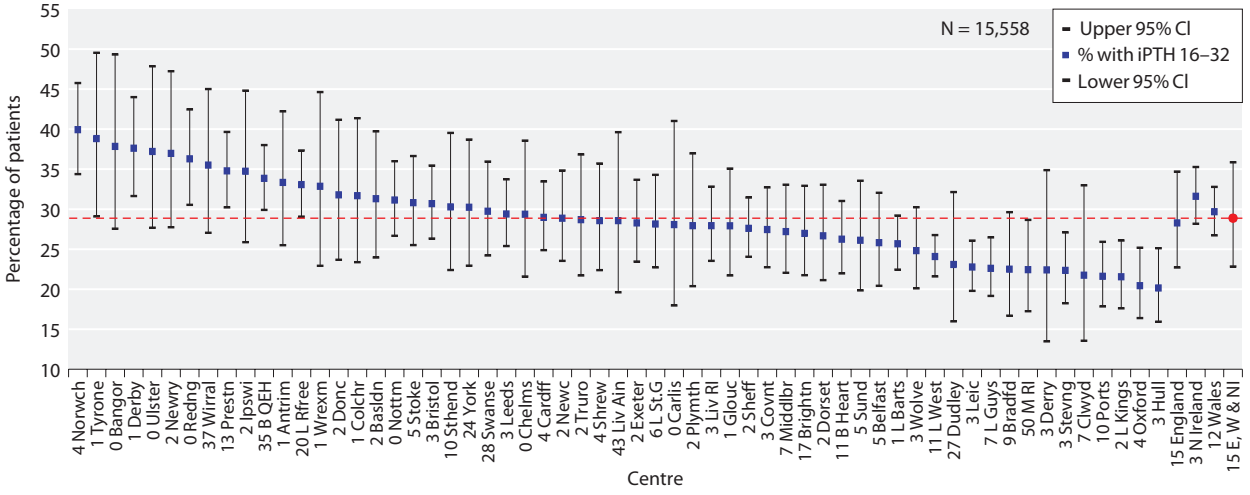


**Fig. 10.11.** Percentage of haemodialysis patients with PTH within range (16–32 pmol/L) by centre in 2009

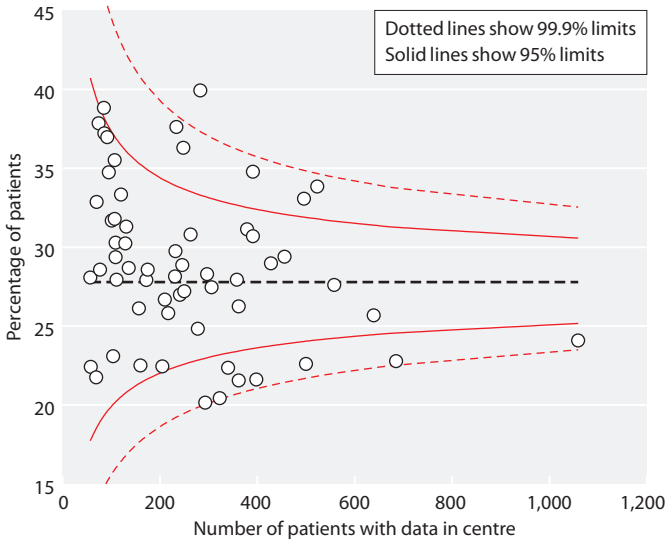


**Fig. 10.12.** Funnel plot of percentage of haemodialysis patients with PTH within range (16–32 pmol/L) by centre in 2009

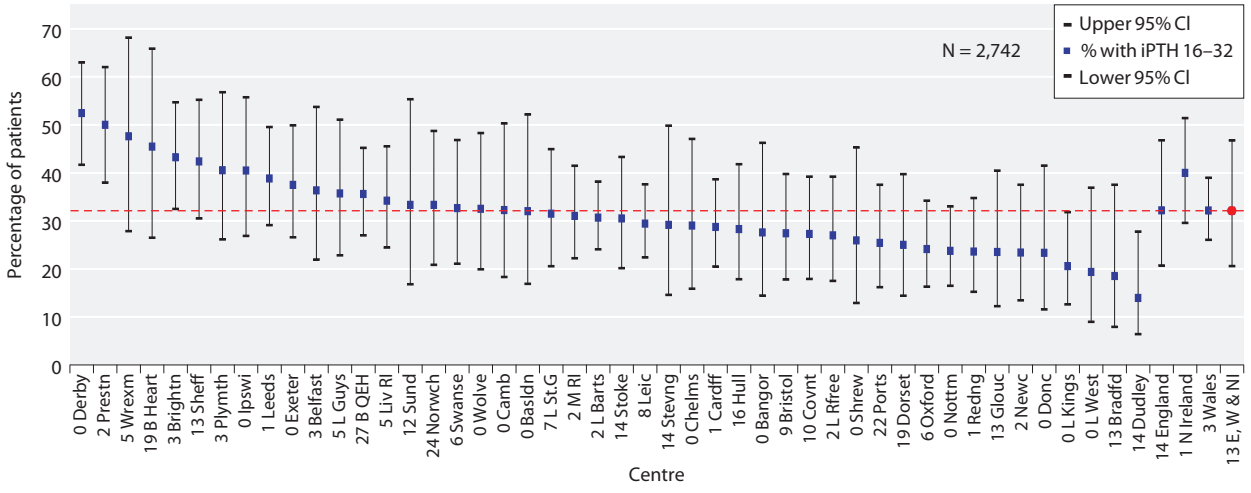


**Fig. 10.13.** Percentage of peritoneal dialysis patients with PTH within range (16–32 pmol/L) by centre in 2009

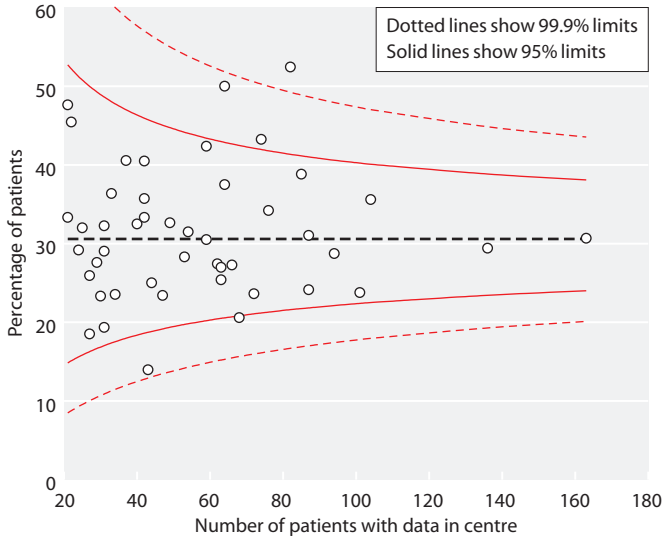


**Fig. 10.14.** Funnel plot of percentage of peritoneal dialysis patients with PTH within range (16–32 pmol/L) by centre in 2009

performance. The latest version of the Renal Association Clinical Practice Guidelines, finalised in December 2010, suggests the maintenance of serum PTH between 2 and 9 times the upper limit of the normal range. There is some evidence of changing practice in this regard already with a rise in the percentage of HD patients with a PTH >32 pmol/L over the last 4 years.

*Bicarbonate*

The 4th edition of the Renal Association Clinical Practice Guidelines state:

***'For HD patients pre-dialysis serum bicarbonate concentrations measured with minimum delay after venepuncture and before a "short gap" dialysis session should be between 20 and 26 mmol/L. (Module 3a: Haemodialysis)***

***For PD patients, Plasma bicarbonate should be maintained within the normal range.' (Module 3b: Peritoneal dialysis)*** [1]

Bicarbonate data were 85% complete for HD patients and 87% complete for PD patients (tables 10.14 and 10.16). Seventy-two percent (CI 71–72%) of HD patients and 83% (CI 82–84%) of PD patients achieved the audit measure for bicarbonate and there was significant inter-centre variation for both HD and PD (tables 10.15 and 10.17, figures 10.15 and 10.16). There was even greater between centre variation in the proportion of patients with bicarbonate values above and below the specified range for the audit measure (tables 10.15 and 10.17). The UKRR has previously conducted a limited survey into the possible underlying causes of this variation. The study predominantly looked at measures of sample

**Table 10.14.** Summary statistics for serum bicarbonate in haemodialysis patients by centre in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 99 | 120 | 24 | 3 | 25 | 23 | 26 |
| B Heart | 82 | 334 | 24 | 3 | 24 | 23 | 26 |
| B QEH | 97 | 780 | 24 | 3 | 24 | 23 | 26 |
| Bangor | 100 | 74 | 24 | 3 | 24 | 22 | 26 |
| Basldn | 99 | 131 | 23 | 3 | 23 | 21 | 25 |
| Belfast | 99 | 226 | 23 | 2 | 23 | 21 | 24 |
| Bradfd | 95 | 167 | 24 | 4 | 23 | 22 | 26 |
| Brightn | 97 | 283 | 22 | 3 | 22 | 20 | 23 |
| Bristol | 100 | 403 | 23 | 3 | 23 | 22 | 25 |
| Camb | 67 | 220 | 24 | 3 | 24 | 22 | 26 |
| Cardff | 85 | 380 | 22 | 3 | 22 | 20 | 24 |
| Carlis | 100 | 57 | 23 | 3 | 23 | 21 | 25 |
| Carsh | 97 | 595 | 24 | 3 | 24 | 22 | 26 |
| Chelms | 100 | 109 | 26 | 2 | 26 | 24 | 27 |
| Clwyd | 100 | 74 | 21 | 3 | 21 | 19 | 23 |
| Colchr | 99 | 101 | 26 | 2 | 26 | 25 | 28 |
| Covnt | 94 | 296 | 24 | 4 | 25 | 22 | 27 |
| Derby | 100 | 236 | 21 | 3 | 21 | 19 | 23 |
| Derry | 100 | 60 | 21 | 2 | 22 | 20 | 23 |
| Donc | 100 | 109 | 22 | 2 | 22 | 21 | 24 |
| Dorset | 100 | 215 | 23 | 3 | 23 | 21 | 24 |
| Dudley | 77 | 110 | 25 | 3 | 25 | 22 | 26 |
| Exeter | 99 | 300 | 23 | 2 | 23 | 21 | 24 |
| Glouc | 100 | 173 | 26 | 3 | 26 | 24 | 27 |
| Hull | 99 | 298 | 22 | 2 | 22 | 20 | 23 |
| Ipswi | 99 | 96 | 22 | 3 | 21 | 19 | 24 |
| Kent | 100 | 313 | 21 | 2 | 21 | 19 | 22 |
| L Barts | 100 | 645 | 24 | 3 | 24 | 22 | 26 |
| L Guys | 83 | 446 | 23 | 3 | 23 | 21 | 25 |
| L Kings | 100 | 370 | 25 | 3 | 25 | 23 | 27 |
| L Rfree | 82 | 506 | 24 | 3 | 23 | 22 | 26 |
| L St.G | 100 | 247 | 28 | 3 | 28 | 26 | 30 |
| L West | 0 | 1 | | | | | |
| Leeds | 99 | 463 | 22 | 3 | 22 | 20 | 24 |

**Table 10.14.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Leic | 99 | 702 | 24 | 3 | 24 | 22 | 26 |
| Liv Ain | 70 | 95 | 24 | 3 | 23 | 22 | 25 |
| Liv RI | 99 | 367 | 24 | 4 | 24 | 21 | 26 |
| M Hope | 4 | 14 | | | | | |
| M RI | 59 | 241 | 24 | 4 | 24 | 21 | 26 |
| Middlbr | 98 | 262 | 26 | 3 | 26 | 24 | 28 |
| Newc | 100 | 252 | 25 | 3 | 25 | 22 | 27 |
| Newry | 99 | 93 | 22 | 2 | 22 | 21 | 24 |
| Norwch | 99 | 293 | 22 | 3 | 22 | 20 | 24 |
| Nottm | 81 | 308 | 24 | 3 | 24 | 22 | 26 |
| Oxford | 99 | 333 | 25 | 4 | 25 | 22 | 27 |
| Plymth | 100 | 113 | 22 | 3 | 22 | 20 | 23 |
| Ports | 100 | 440 | 23 | 3 | 23 | 22 | 25 |
| Prestn | 82 | 366 | 23 | 3 | 24 | 21 | 25 |
| Redng | 100 | 248 | 26 | 3 | 26 | 24 | 27 |
| Sheff | 100 | 570 | 25 | 3 | 25 | 23 | 27 |
| Shrew | 100 | 182 | 23 | 3 | 23 | 21 | 25 |
| Stevng | 99 | 348 | 23 | 3 | 23 | 22 | 25 |
| Sthend | 98 | 119 | 24 | 3 | 24 | 22 | 26 |
| Stoke | 0 | 0 | | | | | |
| Sund | 99 | 163 | 23 | 3 | 23 | 21 | 24 |
| Swanse | 100 | 322 | 25 | 3 | 25 | 23 | 27 |
| Truro | 98 | 136 | 22 | 2 | 22 | 21 | 23 |
| Tyrone | 99 | 85 | 25 | 3 | 24 | 23 | 26 |
| Ulster | 100 | 86 | 20 | 2 | 20 | 18 | 21 |
| Wirral | 98 | 167 | 24 | 3 | 24 | 22 | 26 |
| Wolve | 100 | 286 | 20 | 3 | 20 | 18 | 22 |
| Wrexm | 100 | 71 | 22 | 3 | 22 | 20 | 24 |
| York | 95 | 160 | 23 | 3 | 23 | 21 | 25 |
| **England** | **84** | **14,169** | **24** | **3** | **24** | **21** | **26** |
| **N Ireland** | **99** | **670** | **23** | **3** | **23** | **21** | **25** |
| **Wales** | **93** | **921** | **23** | **4** | **23** | **21** | **26** |
| **E, W & NI** | **85** | **15,760** | **24** | **3** | **24** | **21** | **26** |

Blank cells denote centres excluded from analyses due to low patient numbers or poor data completeness

**Table 10.15.** Percentage of haemodialysis patients within, below and above the range for bicarbonate (20–26 mmol/L) by centre in 2009

| | | | | | | | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Centre | N | % bicarb 20–26 mmol/L | Lower 95% CI | Upper 95% CI | % bicarb <20 mmol/L | % bicarb >26 mmol/L | % within range | 95% LCL | 95% UCL |
| Antrim | 120 | 80.0 | 71.9 | 86.2 | 1.7 | 18.3 | −4.0 | −16.8 | 8.8 |
| B Heart | 334 | 74.6 | 69.6 | 78.9 | 4.2 | 21.3 | 7.2 | −1.7 | 16.1 |
| B QEH | 780 | 76.0 | 72.9 | 78.9 | 4.9 | 19.1 | 2.1 | −3.8 | 8.1 |
| Bangor | 74 | 70.3 | 59.0 | 79.6 | 6.8 | 23.0 | −0.7 | −20.4 | 18.9 |
| Basldn | 131 | 77.9 | 70.0 | 84.2 | 9.9 | 12.2 | −1.2 | −14.5 | 12.1 |
| Belfast | 226 | 85.0 | 79.7 | 89.1 | 8.9 | 6.2 | 4.9 | −4.3 | 14.1 |
| Bradfd | 167 | 70.1 | 62.7 | 76.5 | 10.8 | 19.2 | −0.2 | −13.2 | 12.7 |
| Brightn | 283 | 76.3 | 71.0 | 80.9 | 20.5 | 3.2 | −3.0 | −12.2 | 6.2 |
| Bristol | 403 | 81.4 | 77.3 | 84.9 | 10.4 | 8.2 | −0.7 | −7.6 | 6.3 |
| Camb | 220 | 72.3 | 66.0 | 77.8 | 5.0 | 22.7 | −2.6 | −14.3 | 9.1 |
| Cardff | 380 | 69.7 | 64.9 | 74.2 | 22.1 | 8.2 | −4.1 | −12.6 | 4.4 |
| Carlis | 57 | 84.2 | 72.4 | 91.6 | 3.5 | 12.3 | 6.8 | −11.1 | 24.6 |

**Table 10.15.** Continued

| Centre | N | % bicarb 20–26 mmol/L | Lower 95% CI | Upper 95% CI | % bicarb <20 mmol/L | % bicarb >26 mmol/L | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % within range | 95% LCL | 95% UCL |
| Carsh | 595 | 72.4 | 68.7 | 75.9 | 5.9 | 21.7 | 6.6 | −0.4 | 13.6 |
| Chelms | 109 | 59.6 | 50.2 | 68.4 | 0.9 | 39.5 | −7.7 | −25.1 | 9.6 |
| Clwyd | 74 | 66.2 | 54.8 | 76.0 | 31.1 | 2.7 | −16.6 | −35.3 | 2.1 |
| Colchr | 101 | 59.4 | 49.6 | 68.5 | 0.0 | 40.6 | 1.5 | −16.6 | 19.7 |
| Covnt | 296 | 64.5 | 58.9 | 69.8 | 7.1 | 28.4 | n/a | n/a | n/a |
| Derby | 236 | 71.6 | 65.5 | 77.0 | 26.7 | 1.7 | −10.3 | −20.4 | −0.3 |
| Derry | 60 | 75.0 | 62.6 | 84.3 | 21.7 | 3.3 | 1.9 | −19.5 | 23.4 |
| Donc | 109 | 83.5 | 75.3 | 89.3 | 11.9 | 4.6 | 4.9 | −10.7 | 20.5 |
| Dorset | 215 | 84.7 | 79.2 | 88.9 | 9.3 | 6.1 | 6.8 | −3.3 | 16.9 |
| Dudley | 110 | 69.1 | 59.9 | 77.0 | 6.4 | 24.6 | −1.9 | −18.5 | 14.8 |
| Exeter | 300 | 84.7 | 80.1 | 88.3 | 9.0 | 6.3 | 4.6 | −3.6 | 12.8 |
| Glouc | 173 | 62.4 | 55.0 | 69.3 | 0.6 | 37.0 | −11.1 | −24.7 | 2.4 |
| Hull | 298 | 82.6 | 77.8 | 86.5 | 16.4 | 1.0 | 3.6 | −4.8 | 12.0 |
| Ipswi | 96 | 64.6 | 54.6 | 73.5 | 27.1 | 8.3 | −10.4 | −27.4 | 6.6 |
| Kent | 313 | 68.7 | 63.3 | 73.6 | 29.1 | 2.2 | −6.0 | −15.4 | 3.5 |
| L Barts | 645 | 75.2 | 71.7 | 78.4 | 6.2 | 18.6 | −2.5 | −8.8 | 3.8 |
| L Guys | 446 | 78.3 | 74.2 | 81.8 | 8.5 | 13.2 | −4.4 | −11.3 | 2.6 |
| L Kings | 370 | 61.6 | 56.6 | 66.4 | 3.5 | 34.9 | −20.4 | −28.7 | −12.1 |
| L Rfree | 506 | 71.2 | 67.0 | 74.9 | 9.1 | 19.8 | −1.9 | −9.2 | 5.3 |
| L St.G | 247 | 31.6 | 26.1 | 37.6 | 0.8 | 67.6 | −11.5 | −23.3 | 0.3 |
| Leeds | 463 | 71.3 | 67.0 | 75.2 | 21.2 | 7.6 | −4.8 | −12.3 | 2.7 |
| Leic | 702 | 70.9 | 67.5 | 74.2 | 7.1 | 21.9 | 5.8 | −0.7 | 12.3 |
| Liv Ain | 95 | 82.1 | 73.1 | 88.6 | 7.4 | 10.5 | 3.4 | −11.0 | 17.8 |
| Liv RI | 367 | 67.0 | 62.1 | 71.7 | 9.3 | 23.7 | −3.6 | −12.7 | 5.4 |
| M RI | 241 | 68.9 | 62.8 | 74.4 | 8.3 | 22.8 | 1.2 | −9.4 | 11.8 |
| Middlbr | 262 | 52.3 | 46.2 | 58.3 | 1.9 | 45.8 | −0.5 | −11.9 | 10.9 |
| Newc | 252 | 55.2 | 49.0 | 61.2 | 9.9 | 34.9 | −16.6 | −27.6 | −5.7 |
| Newry | 93 | 85.0 | 76.2 | 90.9 | 12.9 | 2.2 | 15.2 | −0.8 | 31.1 |
| Norwch | 293 | 77.5 | 72.3 | 81.9 | 16.7 | 5.8 | 6.6 | −2.8 | 16.0 |
| Nottm | 308 | 75.0 | 69.9 | 79.5 | 4.6 | 20.5 | 9.5 | −0.4 | 19.3 |
| Oxford | 333 | 59.2 | 53.8 | 64.3 | 8.7 | 32.1 | −8.0 | −17.7 | 1.7 |
| Plymth | 113 | 75.2 | 66.5 | 82.3 | 20.4 | 4.4 | 4.6 | −10.8 | 20.0 |
| Ports | 440 | 80.7 | 76.7 | 84.1 | 8.0 | 11.4 | 1.7 | −5.4 | 8.8 |
| Prestn | 366 | 74.6 | 69.9 | 78.8 | 10.1 | 15.3 | −2.7 | −11.1 | 5.7 |
| Redng | 248 | 63.3 | 57.1 | 69.1 | 1.2 | 35.5 | −8.5 | −19.4 | 2.5 |
| Sheff | 570 | 66.0 | 62.0 | 69.7 | 3.9 | 30.2 | −6.1 | −13.1 | 1.0 |
| Shrew | 182 | 79.1 | 72.6 | 84.4 | 11.0 | 9.9 | 8.5 | −3.4 | 20.4 |
| Stevng | 348 | 83.9 | 79.7 | 87.4 | 6.0 | 10.1 | 7.7 | −0.1 | 15.6 |
| Sthend | 119 | 72.3 | 63.6 | 79.6 | 10.9 | 16.8 | 0.0 | −15.0 | 15.0 |
| Sund | 163 | 81.6 | 74.9 | 86.8 | 11.7 | 6.8 | 7.8 | −4.4 | 19.9 |
| Swanse | 322 | 61.8 | 56.4 | 67.0 | 1.9 | 36.3 | −7.9 | −17.5 | 1.8 |
| Truro | 136 | 86.0 | 79.1 | 90.9 | 13.2 | 0.7 | 26.8 | 13.4 | 40.1 |
| Tyrone | 85 | 74.1 | 63.8 | 82.3 | 3.5 | 22.4 | 14.1 | −4.3 | 32.5 |
| Ulster | 86 | 50.0 | 39.6 | 60.4 | 50.0 | 0.0 | 12.0 | −7.8 | 31.8 |
| Wirral | 167 | 75.5 | 68.4 | 81.4 | 5.4 | 19.2 | 13.8 | 0.5 | 27.0 |
| Wolve | 286 | 58.0 | 52.2 | 63.6 | 40.6 | 1.4 | −7.8 | −18.3 | 2.8 |
| Wrexm | 71 | 74.7 | 63.3 | 83.4 | 19.7 | 5.6 | −1.4 | −20.1 | 17.2 |
| York | 160 | 74.4 | 67.1 | 80.5 | 10.0 | 15.6 | 2.3 | −12.2 | 16.7 |
| **England** | **14,169** | **71.6** | **70.9** | **72.4** | **9.7** | **18.7** | **−0.6** | **−2.0** | **0.8** |
| **N Ireland** | **670** | **77.3** | **74.0** | **80.3** | **13.9** | **8.8** | **6.2** | **0.0** | **12.4** |
| **Wales** | **921** | **67.1** | **64.0** | **70.1** | **14.3** | **18.6** | **−5.9** | **−11.4** | **−0.3** |
| **E, W & NI** | **15,760** | **71.6** | **70.9** | **72.3** | **10.2** | **18.2** | **−0.6** | **−2.0** | **0.7** |

n/a data unavailable for last year due to low patient numbers

**Table 10.16.** Summary statistics for serum bicarbonate in peritoneal dialysis patients by centre in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 93 | 13 | | | | | |
| B Heart | 93 | 25 | 26 | 2 | 26 | 24 | 27 |
| B QEH | 76 | 108 | 25 | 3 | 25 | 23 | 27 |
| Bangor | 100 | 29 | 26 | 3 | 26 | 24 | 28 |
| Basldn | 100 | 25 | 26 | 2 | 26 | 25 | 27 |
| Belfast | 100 | 34 | 24 | 3 | 24 | 23 | 27 |
| Bradfd | 100 | 31 | 27 | 2 | 27 | 24 | 29 |
| Brightn | 93 | 71 | 24 | 3 | 24 | 21 | 26 |
| Bristol | 99 | 67 | 24 | 3 | 24 | 22 | 26 |
| Camb | 100 | 31 | 27 | 3 | 27 | 26 | 29 |
| Cardff | 99 | 94 | 23 | 3 | 22 | 20 | 25 |
| Carlis | 100 | 13 | | | | | |
| Carsh | 92 | 102 | 27 | 3 | 27 | 26 | 29 |
| Chelms | 100 | 31 | 26 | 3 | 27 | 25 | 28 |
| Clwyd | 86 | 6 | | | | | |
| Covnt | 93 | 68 | 25 | 3 | 26 | 24 | 28 |
| Derby | 100 | 82 | 25 | 3 | 25 | 23 | 27 |
| Derry | 100 | 3 | | | | | |
| Donc | 87 | 26 | 25 | 3 | 25 | 23 | 28 |
| Dorset | 96 | 52 | 24 | 3 | 24 | 22 | 27 |
| Dudley | 96 | 48 | 25 | 3 | 25 | 23 | 27 |
| Exeter | 100 | 64 | 26 | 4 | 26 | 24 | 28 |
| Glouc | 100 | 39 | 26 | 3 | 26 | 25 | 28 |
| Hull | 98 | 62 | 25 | 3 | 26 | 24 | 28 |
| Ipswi | 100 | 42 | 24 | 3 | 24 | 23 | 26 |
| Kent | 100 | 64 | 23 | 3 | 23 | 21 | 25 |
| L Barts | 98 | 162 | 26 | 3 | 26 | 25 | 28 |
| L Guys | 100 | 44 | 24 | 3 | 24 | 22 | 26 |
| L Kings | 100 | 68 | 26 | 3 | 26 | 24 | 28 |
| L Rfree | 98 | 63 | 25 | 3 | 25 | 23 | 28 |
| L St.G | 97 | 56 | 28 | 3 | 29 | 27 | 30 |
| L West | 0 | 0 | | | | | |
| Leeds | 100 | 86 | 25 | 3 | 25 | 23 | 27 |
| Leic | 97 | 144 | 27 | 3 | 27 | 25 | 29 |
| Liv Ain | 29 | 2 | | | | | |
| Liv RI | 99 | 79 | 24 | 3 | 24 | 22 | 26 |
| M Hope | 7 | 8 | | | | | |
| M RI | 99 | 88 | 26 | 3 | 26 | 24 | 27 |
| Middlbr | 94 | 15 | | | | | |
| Newc | 98 | 47 | 25 | 3 | 25 | 24 | 28 |
| Newry | 92 | 11 | | | | | |
| Norwch | 89 | 49 | 23 | 3 | 23 | 21 | 25 |
| Nottm | 44 | 44 | | | | | |
| Oxford | 68 | 63 | 25 | 4 | 25 | 22 | 28 |
| Plymth | 100 | 38 | 24 | 2 | 24 | 22 | 25 |
| Ports | 85 | 69 | 26 | 3 | 26 | 24 | 27 |
| Prestn | 89 | 58 | 25 | 3 | 25 | 22 | 27 |
| Redng | 100 | 73 | 26 | 3 | 26 | 25 | 29 |
| Sheff | 100 | 68 | 26 | 3 | 26 | 24 | 28 |
| Shrew | 100 | 27 | 27 | 3 | 27 | 26 | 30 |
| Stevng | 89 | 25 | 25 | 3 | 26 | 23 | 27 |
| Sthend | 94 | 16 | | | | | |
| Stoke | 7 | 5 | | | | | |
| Sund | 100 | 24 | 24 | 3 | 24 | 23 | 25 |
| Swanse | 100 | 52 | 27 | 3 | 27 | 25 | 29 |
| Truro | 95 | 20 | 26 | 4 | 26 | 23 | 30 |

**Table 10.16.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Tyrone | 91 | 10 | | | | | |
| Ulster | 100 | 2 | | | | | |
| Wirral | 65 | 17 | | | | | |
| Wolve | 100 | 40 | 24 | 3 | 24 | 23 | 26 |
| Wrexm | 95 | 21 | 25 | 2 | 25 | 24 | 27 |
| York | 100 | 15 | | | | | |
| **England** | **86** | **2,564** | **25** | **3** | **26** | **23** | **28** |
| **N Ireland** | **96** | **73** | **24** | **3** | **25** | **23** | **27** |
| **Wales** | **99** | **202** | **24** | **3** | **25** | **22** | **27** |
| **E, W & NI** | **87** | **2,839** | **25** | **3** | **25** | **23** | **28** |

Blank cells denote low patient numbers or poor data completeness

**Table 10.17.** Percentage of peritoneal dialysis patients within, below and above the range for bicarbonate (22–30 mmol/L) by centre in 2009

| | | | | | | | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| Centre | N | % bicarb 22–30 mmol/L | Lower 95% CI | Upper 95% CI | % bicarb <22 mmol/L | % bicarb >30 mmol/L | % within range | 95% LCL | 95% UCL |
| B Heart | 25 | 96.0 | 76.5 | 99.4 | 4.0 | 0.0 | 6.7 | −11.4 | 24.9 |
| B QEH | 108 | 80.6 | 72.0 | 87.0 | 15.7 | 3.7 | −7.5 | −20.6 | 5.7 |
| Bangor | 29 | 79.3 | 61.0 | 90.4 | 10.3 | 10.3 | −2.8 | −29.8 | 24.1 |
| Basldn | 25 | 100.0 | 0.0 | 100.0 | 0.0 | 0.0 | 16.7 | −0.9 | 34.2 |
| Belfast | 34 | 88.2 | 72.5 | 95.5 | 11.8 | 0.0 | 5.6 | −14.6 | 25.9 |
| Bradfd | 31 | 100.0 | 0.0 | 100.0 | 0.0 | 0.0 | 22.6 | 3.2 | 42.0 |
| Brightn | 71 | 66.2 | 54.5 | 76.2 | 32.4 | 1.4 | −5.6 | −25.2 | 14.0 |
| Bristol | 67 | 79.1 | 67.8 | 87.2 | 20.9 | 0.0 | −6.8 | −23.5 | 9.8 |
| Camb | 31 | 87.1 | 70.3 | 95.1 | 0.0 | 12.9 | −5.0 | −24.2 | 14.2 |
| Cardff | 94 | 63.8 | 53.7 | 72.9 | 36.2 | 0.0 | −6.7 | −23.8 | 10.5 |
| Carsh | 102 | 82.4 | 73.7 | 88.6 | 3.9 | 13.7 | 1.4 | −12.3 | 15.2 |
| Chelms | 31 | 90.3 | 73.9 | 96.9 | 6.5 | 3.2 | 13.4 | −8.8 | 35.6 |
| Covnt | 68 | 86.8 | 76.5 | 93.0 | 10.3 | 2.9 | 3.4 | −14.0 | 20.9 |
| Derby | 82 | 85.4 | 76.0 | 91.5 | 13.4 | 1.2 | 5.4 | −10.2 | 21.0 |
| Donc | 26 | 88.5 | 69.7 | 96.2 | 11.5 | 0.0 | | | |
| Dorset | 52 | 75.0 | 61.6 | 84.9 | 25.0 | 0.0 | −20.9 | −38.0 | −3.8 |
| Dudley | 48 | 81.3 | 67.7 | 90.0 | 14.6 | 4.2 | −11.9 | −29.5 | 5.6 |
| Exeter | 64 | 84.4 | 73.3 | 91.4 | 10.9 | 4.7 | 11.5 | −7.5 | 30.5 |
| Glouc | 39 | 92.3 | 78.7 | 97.5 | 5.1 | 2.6 | 7.5 | −12.0 | 27.0 |
| Hull | 62 | 90.3 | 80.1 | 95.6 | 9.7 | 0.0 | 10.6 | −5.2 | 26.4 |
| Ipswi | 42 | 83.3 | 69.0 | 91.8 | 16.7 | 0.0 | −2.1 | −21.9 | 17.7 |
| Kent | 64 | 60.9 | 48.6 | 72.1 | 39.1 | 0.0 | −8.2 | −29.5 | 13.2 |
| L Barts | 162 | 85.2 | 78.9 | 89.9 | 4.9 | 9.9 | 1.1 | −8.7 | 10.8 |
| L Guys | 44 | 75.0 | 60.3 | 85.6 | 20.5 | 4.6 | −6.6 | −28.7 | 15.4 |
| L Kings | 68 | 89.7 | 79.9 | 95.0 | 5.9 | 4.4 | −0.4 | −13.6 | 12.7 |
| L Rfree | 63 | 81.0 | 69.4 | 88.9 | 15.9 | 3.2 | −1.7 | −18.8 | 15.3 |
| L St.G | 56 | 76.8 | 64.0 | 86.0 | 1.8 | 21.4 | −5.2 | −25.4 | 15.0 |
| Leeds | 86 | 90.7 | 82.5 | 95.3 | 7.0 | 2.3 | 5.3 | −7.6 | 18.2 |
| Leic | 144 | 83.3 | 76.3 | 88.6 | 5.6 | 11.1 | −1.2 | −12.3 | 9.8 |
| Liv RI | 79 | 82.3 | 72.3 | 89.2 | 15.2 | 2.5 | 3.0 | −12.8 | 18.7 |
| M RI | 88 | 87.5 | 78.8 | 92.9 | 8.0 | 4.6 | −0.4 | −13.1 | 12.3 |
| Newc | 47 | 91.5 | 79.4 | 96.8 | 6.4 | 2.1 | 7.8 | −10.2 | 25.7 |
| Norwch | 49 | 69.4 | 55.3 | 80.6 | 30.6 | 0.0 | 20.3 | −4.0 | 44.6 |
| Oxford | 63 | 79.4 | 67.6 | 87.6 | 14.3 | 6.4 | −2.3 | −20.0 | 15.4 |
| Plymth | 38 | 84.2 | 69.0 | 92.7 | 15.8 | 0.0 | −0.2 | −20.9 | 20.4 |
| Ports | 69 | 89.9 | 80.2 | 95.1 | 8.7 | 1.5 | −1.5 | −14.9 | 11.8 |

**Table 10.17.** Continued

| Centre | N | % bicarb 22–30 mmol/L | Lower 95% CI | Upper 95% CI | % bicarb <22 mmol/L | % bicarb >30 mmol/L | Change from 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % within range | 95% LCL | 95% UCL |
| Prestn | 58 | 82.8 | 70.8 | 90.5 | 12.1 | 5.2 | −0.2 | −19.3 | 18.9 |
| Redng | 73 | 84.9 | 74.8 | 91.5 | 8.2 | 6.9 | −7.1 | −20.6 | 6.4 |
| Sheff | 68 | 86.8 | 76.5 | 93.0 | 5.9 | 7.4 | −2.0 | −16.3 | 12.4 |
| Shrew | 27 | 88.9 | 70.7 | 96.4 | 0.0 | 11.1 | 1.4 | −20.3 | 23.1 |
| Stevng | 25 | 84.0 | 64.3 | 93.9 | 12.0 | 4.0 | −7.2 | −29.9 | 15.5 |
| Sund | 24 | 83.3 | 63.1 | 93.6 | 16.7 | 0.0 | | | |
| Swanse | 52 | 88.5 | 76.6 | 94.7 | 5.8 | 5.8 | 3.7 | −12.9 | 20.3 |
| Truro | 20 | 85.0 | 62.4 | 95.1 | 10.0 | 5.0 | 0.4 | −27.1 | 27.9 |
| Wolve | 40 | 87.5 | 73.3 | 94.7 | 12.5 | 0.0 | −3.4 | −20.2 | 13.4 |
| Wrexm | 21 | 95.2 | 72.9 | 99.3 | 4.8 | 0.0 | −4.8 | −16.7 | 7.2 |
| **England** | **2,564** | **83.5** | **82.0** | **84.9** | **11.7** | **4.8** | **0.1** | **−2.6** | **2.8** |
| **N Ireland** | **73** | **84.9** | **74.8** | **91.5** | **15.1** | **0.0** | **3.4** | **−12.4** | **19.1** |
| **Wales** | **202** | **75.7** | **69.4** | **81.2** | **21.3** | **3.0** | **−3.5** | **−13.9** | **7.0** |
| **E, W & NI** | **2,839** | **83.0** | **81.6** | **84.3** | **12.5** | **4.5** | **−0.1** | **−2.6** | **2.5** |

Blank cells denote low patient numbers last year precluding calculation of change in target attainment

processing and of dialysis treatment. It did not adjust for case-mix and was unable to detect any significant differences between centres. However, it is possible that there may be unmeasured processes including dialysis and oral bicarbonate prescription that might account for the variation observed [18].

*Total cholesterol*

There is no audit standard for total cholesterol in the 4th edition of the Renal Association Clinical Practice Guidelines. Current guidance on lipid management states:

***'Three hydroxy-3 methylglutaryl-Co-enzyme A reductase inhibitors (statins) should be considered for primary prevention in all CKD including dialysis patients with a 10-year risk of cardiovascular disease, calculated as >20% according to the Joint British Societies' Guidelines (JBS 2), despite the fact that these calculations have not been validated in patients with renal disease. The***

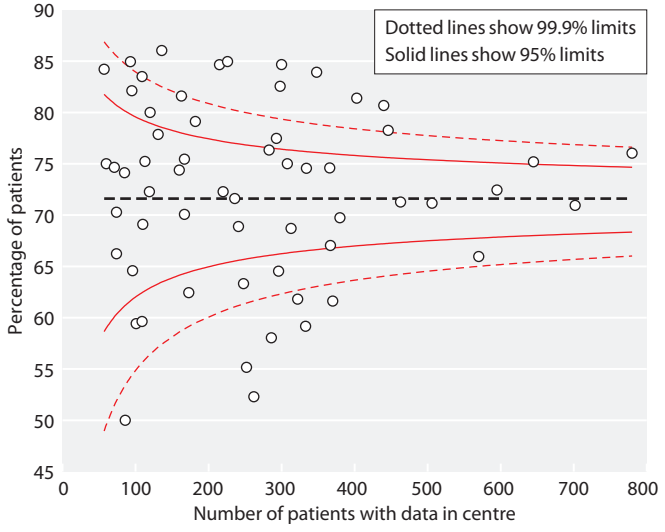


**Fig. 10.15.** Funnel plot for percentage of haemodialysis patients within the range for bicarbonate (20–26 mmol/L) by centre in 2009

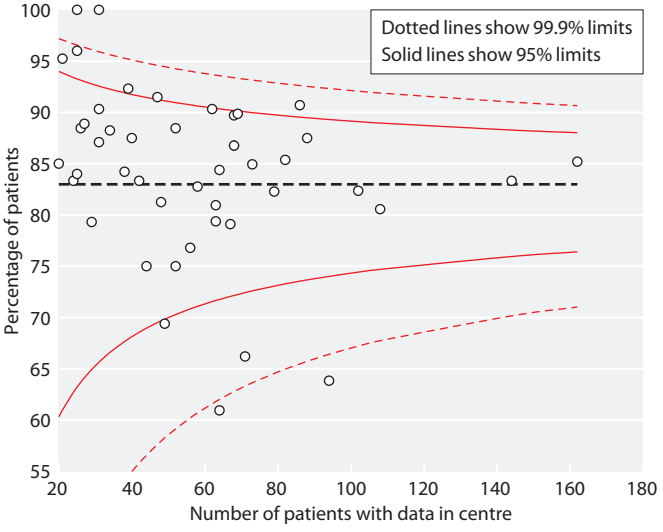


**Fig. 10.16.** Funnel plot for percentage of peritoneal dialysis patients within the range for bicarbonate (22–30 mmol/L) by centre in 2009

***target total cholesterol should be <4 mmol/L or a 25% reduction from baseline, and a fasting low density lipoprotein (LDL)-cholesterol of <2 mmol/L or a 30% reduction from baseline, should be achieved, whichever is the greatest reduction in all patients (Evidence in CKD 1–3, Good Practice in CKD 4–5 and dialysis patients). Statins should not be withdrawn from patients in whom they were previously indicated and should continue to be prescribed when such patients start renal replacement therapy (RRT) or change modality. (Good Practice).' (Module 2: Complications)*** [1]

Total cholesterol data were 84% complete for HD patients and 82% complete for PD patients. As there are no specific audit measures for total cholesterol, summary data are presented for each dialysis centre (tables 10.18 and 10.19, figures 10.17 and 10.18). There are a number of case-mix factors (comorbidity, inflammation,

**Table 10.18.** Summary statistics for total cholesterol in haemodialysis patients by centre in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 100 | 121 | 3.6 | 1.1 | 3.4 | 3.0 | 4.1 |
| B Heart | 93 | 377 | 4.2 | 1.1 | 4.1 | 3.5 | 4.8 |
| B QEH | 78 | 633 | 3.9 | 1.0 | 3.7 | 3.2 | 4.5 |
| Bangor | 95 | 70 | 4.2 | 1.1 | 4.2 | 3.4 | 5.0 |
| Basldn | 99 | 131 | 3.8 | 1.2 | 3.6 | 3.0 | 4.5 |
| Belfast | 82 | 187 | 3.9 | 1.0 | 3.8 | 3.2 | 4.3 |
| Bradfd | 88 | 154 | 4.1 | 1.0 | 4.0 | 3.5 | 4.6 |
| Brightn | 14 | 41 | | | | | |
| Bristol | 93 | 376 | 4.0 | 1.2 | 3.9 | 3.2 | 4.7 |
| Camb | 68 | 223 | 3.8 | 1.1 | 3.6 | 2.9 | 4.5 |
| Cardff | 92 | 411 | 3.9 | 1.1 | 3.8 | 3.1 | 4.6 |
| Carlis | 100 | 57 | 4.3 | 1.0 | 4.3 | 3.7 | 4.8 |
| Carsh | 80 | 489 | 4.2 | 1.1 | 4.1 | 3.4 | 4.8 |
| Chelms | 90 | 98 | 3.7 | 1.0 | 3.6 | 2.9 | 4.3 |
| Clwyd | 100 | 74 | 3.9 | 0.8 | 3.8 | 3.3 | 4.4 |
| Colchr | 88 | 90 | 3.9 | 1.2 | 3.7 | 3.1 | 4.5 |
| Covnt | 0 | 0 | | | | | |
| Derby | 89 | 209 | 3.9 | 1.1 | 3.7 | 3.2 | 4.4 |
| Derry | 100 | 60 | 3.6 | 0.8 | 3.7 | 3.1 | 4.0 |
| Donc | 98 | 107 | 3.9 | 1.1 | 3.7 | 3.1 | 4.4 |
| Dorset | 94 | 202 | 4.0 | 1.0 | 3.9 | 3.3 | 4.5 |
| Dudley | 67 | 96 | 3.6 | 0.9 | 3.6 | 3.1 | 4.2 |
| Exeter | 93 | 280 | 4.0 | 1.2 | 3.9 | 3.2 | 4.6 |
| Glouc | 91 | 157 | 3.9 | 1.0 | 3.8 | 3.1 | 4.6 |
| Hull | 90 | 271 | 4.1 | 1.1 | 3.9 | 3.2 | 4.8 |
| Ipswi | 87 | 84 | 4.0 | 1.1 | 3.8 | 3.3 | 4.5 |
| Kent | 97 | 306 | 3.9 | 1.0 | 3.8 | 3.2 | 4.6 |
| L Barts | 100 | 646 | 4.1 | 1.1 | 3.9 | 3.3 | 4.7 |
| L Guys | 92 | 494 | 4.0 | 1.1 | 3.9 | 3.3 | 4.6 |
| L Kings | 97 | 360 | 4.1 | 1.0 | 4.0 | 3.4 | 4.6 |
| L Rfree | 83 | 511 | 4.0 | 1.1 | 3.8 | 3.2 | 4.6 |
| L St.G | 98 | 243 | 4.0 | 1.0 | 3.9 | 3.3 | 4.7 |
| L West | 97 | 1,159 | 3.6 | 0.9 | 3.5 | 3.0 | 4.1 |
| Leeds | 98 | 458 | 3.9 | 1.0 | 3.8 | 3.2 | 4.5 |
| Leic | 90 | 634 | 3.9 | 1.1 | 3.8 | 3.2 | 4.4 |
| Liv Ain | 40 | 55 | | | | | |
| Liv RI | 7 | 27 | | | | | |
| M Hope | 82 | 270 | 3.7 | 1.0 | 3.6 | 3.1 | 4.3 |
| M RI | 51 | 206 | 3.9 | 1.0 | 3.8 | 3.2 | 4.6 |
| Middlbr | 98 | 262 | 4.2 | 1.2 | 4.0 | 3.4 | 5.0 |
| Newc | 100 | 252 | 3.8 | 1.0 | 3.6 | 3.1 | 4.4 |
| Newry | 99 | 93 | 3.5 | 1.3 | 3.3 | 2.7 | 3.9 |

**Table 10.18.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Norwch | 99 | 293 | 4.0 | 1.0 | 3.8 | 3.3 | 4.6 |
| Nottm | 99 | 377 | 4.0 | 1.0 | 3.9 | 3.3 | 4.6 |
| Oxford | 87 | 290 | 3.8 | 1.0 | 3.8 | 3.0 | 4.4 |
| Plymth | 89 | 100 | 4.1 | 1.1 | 3.9 | 3.5 | 4.6 |
| Ports | 65 | 288 | 4.1 | 1.3 | 3.9 | 3.1 | 4.8 |
| Prestn | 98 | 440 | 4.0 | 1.0 | 3.9 | 3.3 | 4.5 |
| Redng | 96 | 238 | 3.8 | 0.9 | 3.8 | 3.2 | 4.4 |
| Sheff | 92 | 524 | 3.9 | 1.1 | 3.7 | 3.1 | 4.5 |
| Shrew | 99 | 181 | 4.0 | 1.0 | 3.9 | 3.3 | 4.5 |
| Stevng | 18 | 63 | | | | | |
| Sthend | 96 | 116 | 4.0 | 1.1 | 3.9 | 3.3 | 4.7 |
| Stoke | 99 | 274 | 3.8 | 0.9 | 3.8 | 3.1 | 4.4 |
| Sund | 97 | 160 | 3.8 | 1.0 | 3.7 | 3.1 | 4.5 |
| Swanse | 93 | 300 | 4.1 | 1.1 | 4.0 | 3.3 | 4.8 |
| Truro | 99 | 138 | 3.9 | 1.1 | 3.8 | 3.2 | 4.4 |
| Tyrone | 100 | 86 | 3.8 | 0.9 | 3.8 | 3.1 | 4.5 |
| Ulster | 100 | 86 | 3.6 | 0.8 | 3.7 | 3.0 | 4.1 |
| Wirral | 86 | 147 | 3.9 | 1.0 | 3.8 | 3.1 | 4.5 |
| Wolve | 96 | 276 | 4.1 | 1.1 | 4.0 | 3.4 | 4.7 |
| Wrexm | 85 | 60 | 4.0 | 0.9 | 4.0 | 3.5 | 4.6 |
| York | 88 | 149 | 4.5 | 1.0 | 4.4 | 3.8 | 5.2 |
| **England** | **83** | **14,012** | **3.9** | **1.1** | **3.8** | **3.2** | **4.5** |
| **N Ireland** | **94** | **633** | **3.7** | **1.0** | **3.6** | **3.0** | **4.2** |
| **Wales** | **93** | **915** | **4.0** | **1.1** | **3.9** | **3.2** | **4.7** |
| **E, W & NI** | **84** | **15,560** | **3.9** | **1.1** | **3.8** | **3.2** | **4.5** |

Blank cells denote low patient numbers or poor data completeness

**Table 10.19.** Summary statistics for total cholesterol in peritoneal dialysis patients by centre in 2009

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Antrim | 100 | 14 | | | | | |
| B Heart | 96 | 26 | 4.8 | 1.21 | 4.55 | 3.9 | 5.4 |
| B QEH | 85 | 121 | 4.57 | 1.2 | 4.4 | 3.6 | 5.4 |
| Bangor | 100 | 29 | 4.87 | 1.22 | 4.6 | 3.8 | 5.8 |
| Basldn | 100 | 25 | 4.34 | 0.9 | 4.3 | 3.8 | 4.7 |
| Belfast | 100 | 34 | 4.46 | 1.14 | 4.19 | 3.9 | 4.9 |
| Bradfd | 94 | 29 | 4.3 | 1.25 | 3.9 | 3.7 | 5 |
| Brightn | 33 | 25 | | | | | |
| Bristol | 88 | 60 | 4.74 | 1.94 | 4.5 | 3.8 | 5.05 |
| Camb | 97 | 30 | 4.11 | 0.99 | 3.9 | 3.4 | 4.8 |
| Cardff | 96 | 93 | 4.46 | 1.22 | 4.2 | 3.6 | 5.3 |
| Carlis | 100 | 13 | | | | | |
| Carsh | 28 | 31 | | | | | |
| Chelms | 90 | 28 | 4.18 | 1.03 | 3.94 | 3.38 | 4.86 |
| Clwyd | 71 | 5 | | | | | |
| Covnt | 0 | 0 | | | | | |
| Derby | 84 | 69 | 4.49 | 1.18 | 4.5 | 3.6 | 5.3 |
| Derry | 100 | 3 | | | | | |
| Donc | 37 | 11 | | | | | |
| Dorset | 89 | 48 | 4.33 | 1.14 | 4.15 | 3.55 | 5 |
| Dudley | 68 | 34 | 3.97 | 1.24 | 3.65 | 3.1 | 4.7 |
| Exeter | 95 | 61 | 4.53 | 1.37 | 4.3 | 3.8 | 5 |
| Glouc | 79 | 31 | 4.4 | 1.15 | 4.2 | 3.5 | 4.9 |

**Table 10.19.** Continued

| Centre | % completeness | Patients with data N | Mean | SD | Median | Lower quartile | Upper quartile |
|---|---|---|---|---|---|---|---|
| Hull | 81 | 51 | 5.01 | 1.83 | 4.8 | 4.2 | 6 |
| Ipswi | 100 | 42 | 3.98 | 0.98 | 3.85 | 3.25 | 4.78 |
| Kent | 100 | 64 | 4.68 | 1.18 | 4.75 | 3.8 | 5.35 |
| L Barts | 99 | 164 | 4.62 | 1.16 | 4.4 | 3.9 | 5.3 |
| L Guys | 93 | 41 | 4.72 | 1.05 | 4.6 | 4 | 5.2 |
| L Kings | 100 | 68 | 4.42 | 0.75 | 4.4 | 3.9 | 4.9 |
| L Rfree | 98 | 63 | 4.37 | 0.97 | 4.3 | 3.6 | 4.9 |
| L St.G | 91 | 53 | 4.91 | 1.67 | 4.5 | 3.8 | 5.6 |
| L West | 100 | 31 | 4.68 | 0.96 | 4.7 | 4 | 5.3 |
| Leeds | 97 | 83 | 4.41 | 1.27 | 4.2 | 3.6 | 5 |
| Leic | 94 | 139 | 4.37 | 1.19 | 4.2 | 3.6 | 5 |
| Liv Ain | 0 | 0 | | | | | |
| Liv RI | 0 | 0 | | | | | |
| M Hope | 78 | 87 | 4.46 | 1.25 | 4.3 | 3.5 | 5.3 |
| M RI | 94 | 84 | 4.53 | 1.23 | 4.5 | 3.75 | 5 |
| Middlbr | 44 | 7 | | | | | |
| Newc | 100 | 48 | 4.42 | 1.24 | 4.2 | 3.45 | 5.3 |
| Newry | 100 | 12 | | | | | |
| Norwch | 91 | 50 | 4.85 | 1.26 | 4.8 | 4 | 5.9 |
| Nottm | 97 | 98 | 4.52 | 1.17 | 4.4 | 3.7 | 5.1 |
| Oxford | 87 | 81 | 4.59 | 1.17 | 4.6 | 3.7 | 5.3 |
| Plymth | 97 | 37 | 4.9 | 1.4 | 4.5 | 3.9 | 5.5 |
| Ports | 77 | 62 | 4.39 | 1.39 | 4.07 | 3.47 | 5.23 |
| Prestn | 97 | 63 | 4.31 | 0.97 | 4.35 | 3.78 | 4.86 |
| Redng | 99 | 72 | 4.67 | 1.38 | 4.4 | 3.75 | 5.4 |
| Sheff | 65 | 44 | 4.23 | 1.11 | 4.1 | 3.4 | 5 |
| Shrew | 93 | 25 | 5.02 | 1.31 | 4.9 | 4.3 | 5.7 |
| Stevng | 64 | 18 | | | | | |
| Sthend | 76 | 13 | | | | | |
| Stoke[a] | 100 | 69 | | | | | |
| Sund | 75 | 18 | | | | | |
| Swanse | 86 | 43 | 4.38 | 1.09 | 4.3 | 3.6 | 4.9 |
| Truro | 86 | 18 | | | | | |
| Tyrone | 64 | 7 | | | | | |
| Ulster | 100 | 2 | | | | | |
| Wirral | 62 | 16 | | | | | |
| Wolve | 95 | 38 | 4.4 | 1.1 | 4.1 | 3.5 | 5.3 |
| Wrexm | 95 | 21 | 4.4 | 1.1 | 4.2 | 3.6 | 5.3 |
| York | 93 | 14 | | | | | |
| **England** | **81** | **2,150** | **4.5** | **1.2** | **4.3** | **3.7** | **5.2** |
| **N Ireland** | **95** | **72** | **4.4** | **1.3** | **4.2** | **3.6** | **4.9** |
| **Wales** | **93** | **191** | **4.5** | **1.2** | **4.3** | **3.6** | **5.2** |
| **E, W & NI** | **82** | **2,370** | **5.1** | **1.4** | **4.9** | **4.2** | **5.9** |

Blank cells denote low patient numbers or poor data completeness
[a]Stoke excluded due to technical difficulties extracting data

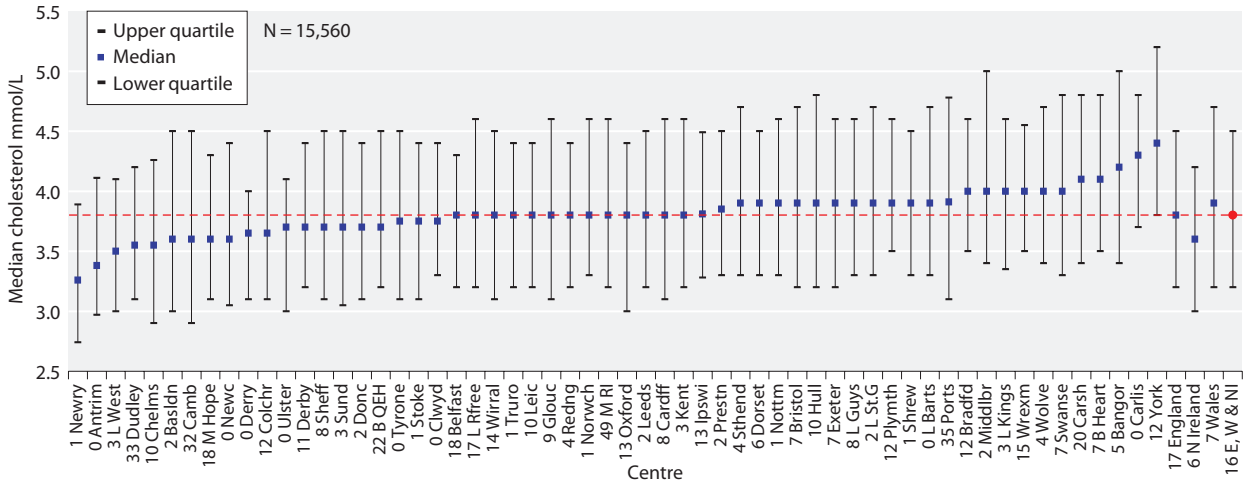


**Fig. 10.17.** Median total cholesterol in haemodialysis patients by centre in 2009

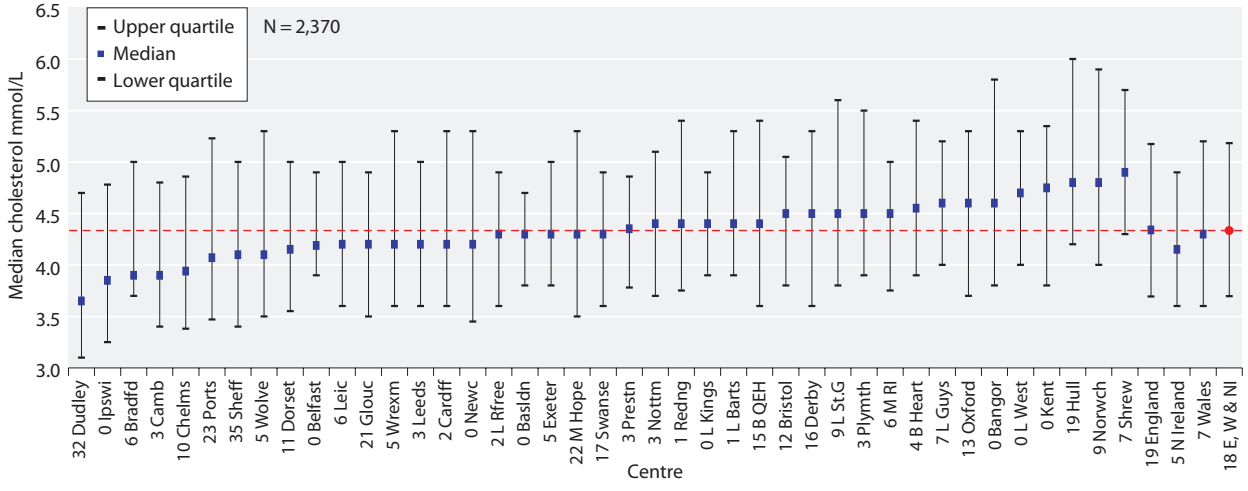


**Fig. 10.18.** Median total cholesterol in peritoneal dialysis patients by centre in 2009

malnutrition) which may account for any inter-centre variation in addition to differences in prescription of lipid lowering medication and other therapies known to influence serum lipid concentration e.g. steroids, sevelamer etc.

Conflicts of interest: none

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