nephron
Clinical
Practice

Nephron 2017;137(suppl1):189–234
DOI: 10.1159/000481370

Published online: September 29, 2017

UK Renal Registry 19th Annual Report: Chapter 8 Biochemical Variables amongst UK Adult Dialysis Patients in 2015: National and Centre-specific Analyses

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Keywords

Bicarbonate · Biochemical variables · Calcium · Dialysis · Haemodialysis · Parathyroid hormone · Peritoneal dialysis · Phosphate · Quality improvement

Summary

In 2015

- 64.1% of haemodialysis (HD) patients and 60.5% of peritoneal dialysis (PD) patients achieved the Renal Association (RA) audit measure for phosphate (<1.7 mmol/L).
- 35.9% of HD and 39.5% of PD patients had a serum phosphate above the RA audit standard (⩾1.7 mmol/L).
- Simultaneous control of all three parameters (calcium, phosphate and parathyroid hormone (PTH)) within current target ranges was achieved by 27.6% of HD and 33.1% of PD patients.
- 79.3% of HD and 77.8% of PD patients had adjusted calcium in the recommended target range of 2.2–2.5 mmol/L.
- 57.1% of HD and 61.3% of PD patients had phosphate between 1.1–1.7 mmol/L.
- 56.8% of HD and 63.6% of PD patients had a serum PTH between 16–72 pmol/L.
- 18.8% of HD and 13.9% of PD patients had a serum PTH >72 pmol/L.
- 64.3% of HD and 80.4% of PD patients achieved the audit measure for bicarbonate 18–24 mmol/L for HD patients and 22–30 mmol/L for PD patients).

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Introduction

The UK Renal Registry (UKRR) collects routine biochemical data from clinical information systems in renal centres in England, Wales and Northern Ireland and receives data from Scotland via the Scottish Renal Registry. Annual cross-sectional analyses are undertaken on some of these variables to determine centre level performance against national (Renal Association (RA)) clinical performance measures [1]. This enables UK renal centres to compare their own performance against each other and to the UK average performance. International chronic kidney disease – mineral bone disorder (CKD-MBD) guidelines were published in 2009 [2] and this prompted changes in CKD-MBD guidelines around the world. Therefore a review of the 5th edition of the RA guidelines was undertaken in order to outline the UK response. These updated RA guidelines were one of the first published by the RA in the 6th edition of their guidelines in March 2015 [3]. Data from 2015 are reported in this chapter, from quarters 2–4, immediately after these updated guidelines were published. The updated RA guidelines offer two audit measures, firstly the proportion of patients with serum phosphate <1.7 mmol/L and secondly the proportion of patients with all bone parameters within target range. The target range for phosphate recommended in the guideline is 1.1–1.7 mmol/L (not <1.7 mmol/L as for the phosphate audit measure). Therefore the authors have interpreted the latter audit measure to include this recommended target range for phosphate of 1.1–1.7 mmol/L which results in different measures of phosphate being used at different points in the chapter and readers should be aware of this when interpreting these results.

Audit measures for kidney disease increasingly include tighter specification limits in conjunction with a growing evidence base. Out of range observations (e.g. hyperphosphataemia or PTH below target range) 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. Summary statistical data have been provided to enhance understanding of the population characteristics of each centre and longitudinal analyses to demonstrate changes over time.

Data are also available on the UKRR data portal at www.renalreg.org.

Table 8.1 lists the recommended biochemical based audit measures from the RA which are relevant to the dialysis population. Several of the audit measures are not currently reported by the UKRR in its annual report; the reasons behind this are varied, but predominantly relate to a high proportion of incomplete data or the relevant variable not being within the specified UKRR dataset. The UKRR is actively working with renal centres to collect more granular and wide ranging data using new methods of data collection.

Methods

The analyses presented in this chapter relate to biochemical variables in the prevalent dialysis cohort in the UK. The cohort studied were patients prevalent on dialysis treatment on 31st December 2015. Patients receiving dialysis for less than 90 days and those who had changed modality or renal centre in the last 90 days were excluded. Haemodialysis (HD) and peritoneal dialysis (PD) cohorts were analysed separately. A full definition of the cohort including inclusion and exclusion criteria is available in appendix B (www.renalreg.org).

The biochemical variables analysed in this chapter were serum phosphate, calcium (adjusted for albumin), PTH and bicarbonate. The method of data collection and validation by the UKRR has been previously described [4]. In brief, for each quarter of 2015 the UKRR extracted biochemical data electronically from clinical information systems in renal centres in England, Wales and Northern Ireland (E,W&NI). Cambridge renal centre (Addenbrooke's) was not able to submit the 2015 data at patient level on time for the end of 2015 data collection period. Scottish centres have only been included in analyses relating to corrected calcium and phosphate control, with data for their prevalent dialysis cohort being supplied directly by the Scottish Renal Registry. The UKRR does not currently collect data regarding different assay methods mainly because a single dialysis centre may process samples in several different laboratories. The audit measure used for serum phosphate was <1.7 mmol/L in both the HD and PD cohorts [1, 3]. However, for the audit measure of composite control of bone parameters it is recommended that all parameters are within the target range and this includes phosphate within the range of 1.1–1.7 mmol/L, so two different phosphate measures are in use in this report. 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 [5]. The audit measure for adjusted calcium depends on the local reference range [3]. For the purposes of these analyses, the UKRR has used the RA guideline standard of adjusted calcium between 2.2–2.5 mmol/L as the audit measure [3]. There are also a variety of methods and reference ranges in use to measure PTH. To enable some form of comparative audit the UKRR has used two to nine times the median upper limit of the reference range (8 pmol/L) as the audit measure in line with the RA clinical practice guidelines and KDIGO 2009 guidance [2, 3]. This equates to a PTH range of 16–72 pmol/L. The audit measure used for serum bicarbonate in the HD cohort was 18–24 mmol/L as per the updated HD guidelines and in the PD cohort was 22–30 mmol/L. A summary

Table 8.1. Summary of Renal Association audit measures for biochemical variables [1]

RA audit measure or guideline	Included in UKRR annual report	Reason
CKD-MBD in CKD stage 5D audit measures		
Percentage of patients CKD5D with serum PO_4 <1.7 mmol/L	Yes	
Percentage of patients with all bone parameters within target range (Ca/P/PTH)	Yes	Target ranges used for this analysis: adjusted calcium 2.2–2.5 mmol/L, phosphate 1.1–1.7 mmol/L (please note this is different from audit measure of <1.7 mmol/L) and PTH 16–72 pmol/L (2–9 × upper end of reference range)
Peritoneal dialysis guidelines		
Cumulative frequency curves of plasma bicarbonate	No	Summary measures at centre and country level are presented in various formats but not as cumulative frequency curves
Haemodialysis guidelines		
Cumulative frequency curves of pre-dialysis potassium concentration	No	It is hoped for the next report that data completeness will enable analysis. There are also concerns that potential delays in blood sample processing may result in over estimates of potassium concentrations
Cumulative frequency curves of pre-dialysis serum calcium (adjusted for albumin) and phosphate concentrations	No	Summary measures at centre and country level are presented in various formats but not as cumulative frequency curves
Cardiovascular disease in CKD guidance		
Record of HbA1c concentrations in IFCC (mmol/mol) and/or DCCT (%) units	No	Poor data completeness
Cholesterol concentrations in patients prescribed HMG CoA reductase inhibitors	No	The UKRR has reported summary statistics for total cholesterol. These summary data were presented on 2013 data and will be presented again on 2016 data. Reliable information is not currently available within the UKRR data on statin prescription

IFCC International Federation of Clinical Chemistry
DCCT Diabetes Control and Complications Trial

of the current RA audit measures for these variables and conversion factors to SI units are given in table 8.2.

Quarterly values were extracted from the database for the last two quarters for calcium, phosphate and bicarbonate and the last three quarters for PTH. Patients who did not have these data were excluded from the analyses. Data completeness was analysed at centre and country level. All patients were included in analyses but centres with less than 50% completeness were excluded from plots and tables showing centre level performance. Data were also excluded from plots and tables when there were fewer than 10 patients with data, both at centre or country level. These data were analysed to calculate summary descriptive

Table 8.2. Summary of clinical guideline target ranges and conversion factors from SI units

Biochemical variable	Clinical guideline measure	Conversion factor from SI units
Phosphate*	HD patients: 1.1–1.7 mmol/L PD patients: 1.1–1.7 mmol/L	mg/dl = mmol/L × 3.1
Calcium (adjusted)	Normal range (ideally 2.2–2.5 mmol/L)	mg/dl = mmol/L × 4
Parathyroid hormone	2–9 times upper limit of normal	ng/L = pmol/L × 9.4
Bicarbonate	HD patients: 18–24 mmol/L PD patients: 22–30 mmol/L	mg/dl = mmol/L × 6.1

*There are two measures for phosphate in use: 1. phosphate clinical audit measure is <1.7 mmol/L while 2. the combined CKD-MBD audit measure assesses all parameters within the target ranges listed in the table which includes phosphate within 1.1–1.7 mmol/L

statistics (maximum, minimum, means with the corresponding standard deviation, medians and interquartile ranges). Where applicable, the percentage achieving the Renal Association standard or other surrogate clinical performance measure was also calculated.

The simultaneous control of all three components of bone and mineral disorder (BMD) parameters were analysed in combination. The proportion of patients with control of none, one, two or three parameters are presented. For the purpose of these analyses an adjusted calcium between 2.2–2.5 mmol/L, a phosphate level being maintained between 1.1–1.7 mmol/L and a PTH level between two and nine times the upper limit of normal (i.e. 16–72 pmol/L), were evaluated in combination.

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 decimal place. All data have been rounded in an attempt to make centres more comparable.

The number preceding the centre name in each figure indicates the percentage of missing data for that centre. Funnel plot analyses were used to identify outlying centres [6]. The percentage within range for 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 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 2005 to 2015 and were recalculated for each previous year using the rounding procedure.

All data are presented unadjusted for case-mix.

Results

Mineral and bone variables

Phosphate

In 2015 the following Renal Association clinical practice guideline regarding phosphate management was applicable:

Guideline 3.2 CKD-MBD: Serum phosphate in dialysis patients

Audit measure: Percentage of patients CKD5D with serum PO_4 <1.7 mmol/L [3]

Overall, data from 22,081 HD and 3,002 PD patients across the UK were included in the analyses of serum

Table 8.3. Summary statistics for serum phosphate in haemodialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	99.8	396	1.6	0.5	1.6	1.3	1.9
B QEH	97.0	905	1.5	0.5	1.4	1.2	1.7
Basldn	99.4	152	1.5	0.5	1.4	1.2	1.8
Bradfd	100.0	217	1.5	0.5	1.4	1.1	1.7
Brightn	99.8	401	1.6	0.5	1.5	1.3	1.9
Bristol	100.0	489	1.6	0.5	1.5	1.2	1.8
Camb*							
Carlis	100.0	74	1.5	0.5	1.4	1.2	1.8
Carsh	99.7	759	1.5	0.5	1.5	1.2	1.8
Chelms	99.3	138	1.6	0.4	1.6	1.2	1.9
Colchr	94.6	105	1.5	0.4	1.4	1.2	1.7
Covnt	100.0	332	1.6	0.5	1.6	1.3	1.9
Derby	99.6	221	1.5	0.5	1.5	1.2	1.7
Donc	100.0	163	1.5	0.4	1.5	1.2	1.8
Dorset	100.0	270	1.5	0.4	1.4	1.2	1.7
Dudley	100.0	155	1.5	0.5	1.4	1.2	1.8
Exeter	100.0	403	1.5	0.5	1.4	1.2	1.8
Glouc	100.0	216	1.6	0.5	1.5	1.3	1.8
Hull	99.7	326	1.6	0.5	1.5	1.2	1.8
Ipswi	100.0	129	1.4	0.6	1.3	1.1	1.7
Kent	99.5	395	1.7	0.5	1.6	1.3	2.0
L Barts	100.0	928	1.6	0.5	1.5	1.2	1.9
L Guys	100.0	629	1.5	0.5	1.5	1.1	1.8
L Kings	100.0	522	1.5	0.4	1.4	1.1	1.7
L Rfree	100.0	665	1.5	0.5	1.4	1.2	1.8
L St.G	97.4	303	1.4	0.5	1.4	1.1	1.7

Table 8.3. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
L West	91.8	1,259	1.5	0.5	1.4	1.1	1.7
Leeds	100.0	470	1.6	0.5	1.5	1.2	1.9
Leic	100.0	839	1.6	0.5	1.5	1.2	1.8
Liv Ain	98.1	155	1.3	0.5	1.3	1.0	1.6
Liv Roy	99.4	354	1.5	0.5	1.5	1.2	1.8
M RI	93.7	445	1.5	0.5	1.5	1.1	1.9
Middlbr	100.0	323	1.6	0.5	1.6	1.3	1.9
Newc	100.0	285	1.6	0.5	1.5	1.2	1.9
Norwch	99.7	311	1.5	0.5	1.4	1.2	1.7
Nottm	100.0	350	1.5	0.4	1.4	1.2	1.7
Oxford	99.5	396	1.6	0.6	1.6	1.2	1.9
Plymth	98.5	127	1.6	0.5	1.5	1.3	1.9
Ports	99.7	615	1.6	0.5	1.6	1.3	1.9
Prestn	100.0	531	1.6	0.5	1.5	1.3	1.9
Redng	100.0	283	1.5	0.5	1.5	1.2	1.8
Salford	99.7	366	1.5	0.5	1.5	1.2	1.8
Sheff	99.6	515	1.5	0.4	1.5	1.2	1.8
Shrew	100.0	193	1.6	0.5	1.5	1.2	1.9
Stevng	100.0	468	1.6	0.5	1.6	1.3	1.9
Sthend	100.0	108	1.6	0.5	1.6	1.3	1.9
Stoke	97.4	300	1.5	0.5	1.5	1.2	1.8
Sund	0.0	0					
Truro	100.0	145	1.5	0.5	1.4	1.2	1.8
Wirral	99.4	176	1.5	0.5	1.4	1.2	1.8
Wolve	99.3	284	1.5	0.6	1.4	1.1	1.8
York	100.0	145	1.4	0.4	1.3	1.0	1.6
N Ireland							
Antrim	100.0	114	1.4	0.4	1.3	1.1	1.6
Belfast	100.0	169	1.5	0.6	1.4	1.1	1.8
Newry	100.0	84	1.6	0.5	1.6	1.3	1.8
Ulster	100.0	97	1.5	0.5	1.5	1.2	1.8
West NI	100.0	113	1.6	0.4	1.6	1.3	1.8
Scotland							
Abrdn	100.0	205	1.4	0.4	1.4	1.1	1.7
Airdrie	100.0	174	1.4	0.5	1.4	1.1	1.7
D & Gall	94.2	49	1.6	0.4	1.5	1.2	1.9
Dundee	98.8	171	1.7	0.5	1.7	1.3	2.0
Edinb	98.0	247	1.7	0.5	1.7	1.4	2.0
Glasgw	98.2	535	1.7	0.5	1.6	1.3	1.9
Inverns	98.7	77	1.7	0.4	1.7	1.4	2.0
Klmarnk	100.0	124	1.4	0.5	1.4	1.1	1.7
Krkcldy	100.0	132	1.5	0.4	1.5	1.2	1.8
Wales							
Bangor	100.0	78	1.5	0.5	1.4	1.1	1.7
Cardff	99.8	459	1.6	0.5	1.5	1.2	1.8
Clwyd	100.0	76	1.7	0.5	1.6	1.3	2.0
Swanse	100.0	342	1.5	0.5	1.5	1.2	1.7
Wrexm	100.0	99	1.2	0.5	1.2	0.9	1.4
England	**97.8**	**18,736**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**
N Ireland	**100.0**	**577**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**
Scotland	**98.8**	**1,714**	**1.6**	**0.5**	**1.6**	**1.2**	**1.9**
Wales	**99.9**	**1,054**	**1.5**	**0.5**	**1.4**	**1.2**	**1.7**
UK	**98.0**	**22,081**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
*Cambridge renal centre was unable to submit serum phosphate data for 2015

Table 8.4. Percentage of haemodialysis patients with serum phosphate below and equal to or above 1.7 mmol/L, as specified in the RA audit measure, by centre in 2015

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
England								
B Heart	396	58.1	53.2	62.9	41.9	−2.0	−8.8	4.8
B QEH	905	71.5	68.5	74.3	28.5	0.7	−3.5	5.0
Basldn	152	66.5	58.6	73.5	33.6	−4.5	−14.9	5.8
Bradfd	217	68.7	62.2	74.5	31.3	−0.2	−9.2	8.7
Brightn	401	57.1	52.2	61.9	42.9	−4.4	−11.2	2.4
Bristol	489	62.8	58.4	67.0	37.2	4.1	−2.0	10.2
Carlis	74	67.6	56.2	77.2	32.4	2.0	−14.0	18.0
Carsh	759	67.1	63.6	70.3	32.9	0.9	−4.0	5.8
Chelms	138	60.1	51.8	68.0	39.9	−11.0	−22.3	0.4
Colchr	105	71.4	62.1	79.2	28.6	3.8	−8.6	16.3
Covnt	332	57.2	51.8	62.5	42.8	1.9	−5.7	9.5
Derby	221	68.3	61.9	74.1	31.7	10.7	1.7	19.7
Donc	163	63.8	56.2	70.8	36.2	0.5	−9.9	11.0
Dorset	270	74.4	68.9	79.3	25.6	2.2	−5.3	9.7
Dudley	155	68.4	60.7	75.2	31.6	11.5	0.9	22.1
Exeter	403	67.7	63.0	72.1	32.3	−0.3	−6.9	6.2
Glouc	216	61.1	54.5	67.4	38.9	−7.8	−16.9	1.2
Hull	326	62.3	56.9	67.4	37.7	−6.2	−13.6	1.3
Ipswi	129	74.4	66.2	81.2	25.6	3.1	−8.1	14.3
Kent	395	52.9	48.0	57.8	47.1	−4.2	−11.2	2.8
L Barts	928	60.3	57.2	63.5	39.7	2.6	−1.9	7.1
L Guys	629	65.2	61.4	68.8	34.8	−0.1	−5.8	5.7
L Kings	522	74.0	70.0	77.5	26.1	−0.3	−5.7	5.0
L Rfree	665	65.9	62.2	69.4	34.1	0.8	−4.3	6.0
L St.G	303	71.0	65.6	75.8	29.0	1.9	−5.5	9.4
L West	1,259	69.3	66.7	71.8	30.7	1.6	−2.1	5.2
Leeds	470	60.4	55.9	64.8	39.6	1.5	−4.7	7.8
Leic	839	60.3	57.0	63.6	39.7	4.0	−0.7	8.7
Liv Ain	155	78.1	70.9	83.9	21.9	5.0	−4.6	14.6
Liv Roy	354	63.6	58.4	68.4	36.4	−1.3	−8.5	5.8
M RI*	445	62.5	57.9	66.9	37.5	−1.3	−7.6	5.1
Middlbr	323	58.8	53.4	64.1	41.2	−2.4	−10.0	5.3
Newc	285	63.2	57.4	68.6	36.8	−1.9	−9.9	6.1
Norwch	311	69.5	64.1	74.3	30.6	3.5	−3.8	10.9
Nottm	350	73.1	68.3	77.5	26.9	8.3	1.5	15.2
Oxford	396	56.6	51.6	61.4	43.4	−1.7	−8.5	5.1
Plymth	127	59.8	51.1	68.0	40.2	−3.0	−14.9	9.0
Ports	615	56.3	52.3	60.1	43.7	0.0	−5.7	5.7
Prestn	531	57.6	53.4	61.8	42.4	0.4	−5.6	6.4
Redng	283	65.4	59.6	70.7	34.6	−5.2	−13.0	2.6
Salford*	366	63.9	58.9	68.7	36.1	−1.3	−8.2	5.5
Sheff	515	64.7	60.4	68.7	35.3	1.4	−4.3	7.2
Shrew	193	60.1	53.0	66.8	39.9	0.9	−9.2	11.0
Stevng	468	58.6	54.0	62.9	41.5	−3.8	−10.1	2.6
Sthend	108	56.5	47.0	65.5	43.5	0.1	−13.0	13.3
Stoke	300	65.0	59.4	70.2	35.0	−1.1	−8.7	6.5
Truro	145	71.0	63.1	77.8	29.0	0.7	−10.0	11.3
Wirral	176	67.6	60.4	74.1	32.4	1.8	−7.9	11.5
Wolve	284	62.7	56.9	68.1	37.3	−2.6	−10.5	5.3
York	145	80.0	72.7	85.7	20.0	−2.3	−11.6	7.1

Table 8.4. Continued

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
N Ireland								
Antrim	114	76.3	67.7	83.2	23.7	1.6	−9.7	12.8
Belfast	169	63.3	55.8	70.2	36.7	−2.3	−12.2	7.6
Newry	84	64.3	53.5	73.8	35.7	5.0	−9.6	19.6
Ulster	97	63.9	53.9	72.8	36.1	2.2	−11.5	15.9
West NI	113	58.4	49.1	67.1	41.6	−0.6	−13.8	12.7
Scotland								
Abrdn	205	74.2	67.7	79.7	25.9	12.4	3.2	21.5
Airdrie	174	70.1	62.9	76.5	29.9	−1.1	−10.6	8.4
D & Gall	49	63.3	49.1	75.5	36.7	7.7	−12.1	27.5
Dundee	171	48.0	40.6	55.4	52.1	−4.2	−14.9	6.5
Edinb	247	49.4	43.2	55.6	50.6	−1.4	−10.1	7.3
Glasgw	535	54.2	50.0	58.4	45.8	−2.6	−8.6	3.4
Inverns	77	49.4	38.4	60.4	50.7	0.1	−16.3	16.5
Klmarnk	124	67.7	59.0	75.4	32.3	6.4	−5.3	18.1
Krkcldy	132	64.4	55.9	72.1	35.6	−1.3	−12.7	10.0
Wales								
Bangor	78	74.4	63.6	82.8	25.6	4.7	−9.3	18.8
Cardff	459	65.8	61.3	70.0	34.2	1.3	−4.9	7.4
Clwyd	76	54.0	42.7	64.8	46.1	−1.5	−17.0	14.0
Swanse	342	68.4	63.3	73.1	31.6	−0.8	−7.9	6.2
Wrexm	99	88.9	81.0	93.7	11.1	17.3	6.6	28.0
England	**18,736**	**64.3**	**63.6**	**65.0**	**35.7**	**0.3**	**−0.7**	**1.3**
N Ireland	**577**	**65.2**	**61.2**	**68.9**	**34.8**	**0.5**	**−5.0**	**6.0**
Scotland	**1,714**	**58.7**	**56.3**	**61.0**	**41.3**	**0.4**	**−2.9**	**3.7**
Wales	**1,054**	**68.6**	**65.7**	**71.3**	**31.4**	**2.3**	**−1.8**	**6.3**
UK	**22,081**	**64.1**	**63.5**	**64.7**	**35.9**	**0.4**	**−0.5**	**1.3**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Salford and Manchester RI have been involved in the SPIRiT study; an RCT comparing low phosphate control (0.8 to 1.4 mmol/L) with high phosphate group control (1.8 to 2.4 mmol/L); HD patients only were recruited

phosphate in 2015. The overall data completeness for serum phosphate across the UK was 98.0% for HD and 98.8% for PD patients, with some variation between centres (tables 8.3, 8.5). HD centre returns were all >90%, except Cambridge and Sunderland at 0%. For PD patients, Cambridge also returned no data and only one other centre (London West) returned less than 90% data, compared with five centres last year. Data completeness for serum phosphate has improved over the last decade, especially for HD patients from 73.2% to 98.0% but also for PD patients from 90.0% to 98.8%.

The individual centre means and standard deviations are shown in tables 8.3 and 8.5 for HD and PD patients respectively.

For those receiving HD, 64.1% of patients achieved a phosphate level below 1.7 mmol/L, the audit measure specified by the RA, and for those on PD this was 60.5% (tables 8.4, 8.6).

There was inter-centre and inter-modality variation in the proportion of patients below and equal to or above the phosphate target specified by the clinical performance audit measure (figures 8.1–8.4, tables 8.4, 8.6).

Funnel plots for HD patients with controlled phosphataemia (<1.7 mmol/L), show a number of centres attaining this standard in a significantly high proportion of patients: London West, Birmingham QEH, London Kings, Nottingham, Dorset, Wrexham, York and Liverpool Aintree. All these centres achieved above the 99.9% upper confidence interval following correction for centre size. In addition, a number of centres had achieved the serum phosphate control standard in a lower than expected proportion of patients (being below the lower 99.9% confidence interval): Portsmouth, Glasgow, Kent, Edinburgh and Dundee (figure 8.2).

Funnel plots for PD patients indicated that the control of phosphate levels were similar in all centres. No significant outliers were identified (figure 8.4).

Table 8.5. Summary statistics for phosphate in peritoneal dialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	40	1.8	0.6	1.7	1.4	2.1
B QEH	100.0	121	1.7	0.5	1.6	1.3	2.0
Basldn	100.0	27	1.6	0.4	1.5	1.3	1.8
Bradfd	100.0	14	1.8	0.4	1.9	1.4	2.0
Brightn	100.0	60	1.7	0.4	1.5	1.3	2.0
Bristol	100.0	47	1.6	0.4	1.5	1.3	1.8
Camb[a]							
Carlis	100.0	30	1.5	0.4	1.5	1.2	1.7
Carsh	92.1	93	1.6	0.4	1.6	1.3	1.8
Chelms	95.7	22	1.7	0.6	1.6	1.3	2.0
Colchr[b]	n/a						
Covnt	97.4	74	1.4	0.4	1.4	1.2	1.6
Derby	100.0	73	1.5	0.4	1.5	1.2	1.7
Donc	100.0	18	1.5	0.2	1.5	1.3	1.7
Dorset	100.0	35	1.5	0.3	1.5	1.3	1.6
Dudley	100.0	52	1.6	0.4	1.6	1.4	1.8
Exeter	98.6	70	1.5	0.4	1.4	1.3	1.7
Glouc	100.0	28	1.6	0.4	1.5	1.3	1.9
Hull	98.5	65	1.6	0.4	1.6	1.4	1.8
Ipswi	100.0	27	1.5	0.5	1.4	1.2	1.7
Kent	100.0	54	1.6	0.4	1.5	1.4	1.8
L Barts	98.4	179	1.6	0.4	1.5	1.3	1.8
L Guys	100.0	29	1.6	0.4	1.5	1.3	1.9
L Kings	100.0	80	1.6	0.4	1.6	1.3	1.9
L Rfree	99.3	133	1.6	0.4	1.6	1.3	1.8
L St.G	97.8	44	1.5	0.4	1.5	1.2	1.7
L West	86.7	52	1.5	0.4	1.4	1.2	1.8
Leeds	100.0	50	1.7	0.4	1.7	1.4	2.0
Leic	100.0	95	1.6	0.4	1.6	1.3	1.9
Liv Ain	96.4	27	1.6	0.4	1.5	1.4	1.9
Liv Roy	100.0	61	1.5	0.4	1.6	1.2	1.8
M RI	100.0	58	1.7	0.5	1.6	1.3	1.9
Middlbr	93.3	14	1.5	0.3	1.5	1.3	1.7
Newc	100.0	38	1.6	0.4	1.6	1.4	1.9
Norwch	100.0	28	1.6	0.4	1.6	1.3	1.9
Nottm	100.0	64	1.5	0.4	1.5	1.2	1.7
Oxford	100.0	78	1.7	0.5	1.5	1.3	1.9
Plymth	100.0	28	1.4	0.3	1.4	1.2	1.7
Ports	98.3	59	1.7	0.5	1.7	1.4	1.9
Prestn	100.0	49	1.5	0.3	1.5	1.2	1.7
Redng	100.0	59	1.5	0.3	1.4	1.3	1.6
Salford	98.8	81	1.7	0.5	1.7	1.4	2.0
Sheff	100.0	53	1.6	0.4	1.5	1.3	1.8
Shrew	100.0	27	1.6	0.3	1.6	1.4	1.8
Stevng	100.0	13	1.7	0.2	1.8	1.5	1.9
Sthend	100.0	15	1.5	0.4	1.5	1.2	1.7
Stoke	98.6	69	1.6	0.4	1.5	1.3	1.8
Sund	92.9	13	1.7	0.7	1.6	1.1	1.9
Truro	100.0	19	1.5	0.4	1.5	1.2	1.7
Wirral	100.0	17	1.9	0.5	1.8	1.6	2.1
Wolve	98.5	67	1.5	0.4	1.5	1.2	1.7
York	95.5	21	1.6	0.4	1.6	1.4	1.8

Table 8.5. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	17	1.5	0.4	1.5	1.3	1.8
Belfast	100.0	19	1.6	0.5	1.6	1.3	1.8
Newry	100.0	18	1.4	0.2	1.4	1.2	1.5
Ulster	100.0	6					
West NI	100.0	9					
Scotland							
Abrdn	100.0	21	1.7	0.4	1.8	1.4	2.0
Airdrie	100.0	8					
D & Gall	100.0	10	1.5	0.4	1.6	1.1	1.8
Dundee	100.0	16	1.6	0.3	1.6	1.4	1.9
Edinb	94.7	18	1.7	0.6	1.6	1.2	1.9
Glasgw	100.0	44	1.7	0.6	1.6	1.3	2.0
Inverns	100.0	13	1.7	0.5	1.7	1.3	2.0
Klmarnk	100.0	33	1.8	0.5	1.8	1.5	2.1
Krkcldy	100.0	16	1.7	0.5	1.6	1.4	1.9
Wales							
Bangor	100.0	13	1.6	0.4	1.7	1.4	1.8
Cardff	97.2	70	1.6	0.4	1.5	1.3	1.8
Clwyd	100.0	13	1.6	0.5	1.5	1.4	1.8
Swanse	100.0	55	1.6	0.4	1.5	1.3	1.9
Wrexm	100.0	33	1.6	0.4	1.6	1.3	1.9
England	**98.7**	**2,570**	**1.6**	**0.4**	**1.5**	**1.3**	**1.8**
N Ireland	**100.0**	**69**	**1.5**	**0.4**	**1.5**	**1.3**	**1.6**
Scotland	**99.4**	**179**	**1.7**	**0.5**	**1.7**	**1.3**	**2.0**
Wales	**98.9**	**184**	**1.6**	**0.4**	**1.5**	**1.3**	**1.9**
UK	**98.8**	**3,002**	**1.6**	**0.4**	**1.5**	**1.3**	**1.8**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
[a]Cambridge renal centre was unable to submit serum phosphate data for 2015
[b]n/a – no PD patients

Table 8.6. Percentage of peritoneal dialysis patients with serum phosphate below and equal to or above 1.7 mmol/L as specified in the RA audit measure in 2015

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% with phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
England								
B Heart	40	50.0	35.0	65.0	50.0	−6.3	−29.4	16.9
B QEH	121	58.7	49.7	67.1	41.3	−5.1	−17.5	7.3
Basldn	27	51.9	33.6	69.6	48.2	−0.1	−27.3	27.0
Bradfd	14	35.7	15.7	62.4	64.3	−8.0	−43.0	26.9
Brightn	60	65.0	52.2	75.9	35.0	−1.7	−19.1	15.8
Bristol	47	61.7	47.2	74.4	38.3	19.9	0.8	38.9
Carlis	30	56.7	38.8	72.9	43.3	2.1	−25.2	29.5
Carsh	93	59.1	48.9	68.6	40.9	−3.9	−17.4	9.5
Chelms	22	54.6	34.1	73.5	45.5	10.1	−20.9	41.1
Covnt	74	77.0	66.1	85.2	23.0	4.9	−8.9	18.6
Derby	73	69.9	58.4	79.3	30.1	5.6	−9.8	21.0
Donc	18	66.7	42.9	84.2	33.3	4.2	−25.0	33.3
Dorset	35	77.1	60.5	88.1	22.9	7.6	−11.7	26.8
Dudley	52	61.5	47.8	73.7	38.5	25.5	6.8	44.3
Exeter	70	70.0	58.3	79.6	30.0	3.7	−11.1	18.5
Glouc	28	57.1	38.7	73.8	42.9	8.5	−15.9	32.9
Hull	65	55.4	43.2	66.9	44.6	−8.3	−25.0	8.5

Table 8.6. Continued

Centre	*N*	% phos <1.7 mmol/L	Lower 95% CI	Upper 95% CI	% with phos ⩾1.7 mmol/L	Change in % <1.7 mmol/L from 2014	95% LCL change	95% UCL change
Ipswi	27	66.7	47.3	81.7	33.3	−6.7	−30.5	17.1
Kent	54	68.5	55.1	79.5	31.5	1.3	−16.0	18.6
L Barts	179	62.6	55.3	69.4	37.4	−2.7	−12.5	7.1
L Guys	29	62.1	43.6	77.6	37.9	−7.9	−34.7	18.8
L Kings	80	57.5	46.5	67.8	42.5	−10.9	−25.8	4.1
L Rfree	133	57.1	48.6	65.3	42.9	−0.6	−12.7	11.5
L St.G	44	65.9	50.9	78.3	34.1	6.8	−13.4	27.0
L West	52	71.2	57.5	81.8	28.9	6.6	−11.7	24.9
Leeds	50	46.0	32.8	59.8	54.0	−3.0	−22.6	16.7
Leic	95	62.1	52.0	71.3	37.9	8.9	−4.6	22.4
Liv Ain	27	63.0	43.8	78.8	37.0	16.1	−9.0	41.2
Liv Roy	61	55.7	43.2	67.6	44.3	−19.8	−37.1	−2.4
M RI	58	58.6	45.7	70.5	41.4	−3.5	−21.2	14.3
Middlbr*	14	71.4	44.0	88.9	28.6			
Newc	38	57.9	41.9	72.4	42.1	5.5	−16.3	27.3
Norwch	28	60.7	42.0	76.7	39.3	−9.3	−33.7	15.1
Nottm	64	68.8	56.5	78.9	31.3	−2.5	−17.9	12.9
Oxford	78	56.4	45.3	66.9	43.6	−4.1	−19.7	11.4
Plymth	28	71.4	52.4	85.0	28.6	−1.9	−24.9	21.1
Ports	59	47.5	35.1	60.1	52.5	−10.6	−28.3	7.1
Prestn	49	69.4	55.3	80.6	30.6	−0.2	−18.7	18.3
Redng	59	76.3	63.8	85.4	23.7	9.1	−7.0	25.1
Salford	81	48.2	37.5	59.0	51.9	−4.8	−20.9	11.3
Sheff	53	56.6	43.1	69.2	43.4	−12.6	−30.9	5.7
Shrew	27	51.9	33.6	69.6	48.2	3.9	−23.3	31.0
Stevng	13	30.8	12.0	59.1	69.2	−53.9	−82.5	−25.2
Sthend	15	73.3	46.7	89.6	26.7	29.6	−3.5	62.6
Stoke	69	65.2	53.3	75.5	34.8	−3.8	−19.3	11.8
Sund	13	53.9	28.2	77.6	46.2	−3.3	−40.8	34.2
Truro	19	63.2	40.3	81.3	36.8	2.1	−29.2	33.3
Wirral	17	35.3	16.8	59.6	64.7	−18.0	−52.0	15.9
Wolve	67	71.6	59.8	81.1	28.4	15.3	−0.5	31.1
York	21	61.9	40.3	79.7	38.1	4.8	−24.9	34.4
N Ireland								
Antrim	17	70.6	45.8	87.2	29.4	9.1	−25.1	43.2
Belfast	19	63.2	40.3	81.3	36.8	23.2	−9.8	56.1
Newry	18	88.9	64.8	97.2	11.1	17.5	−10.3	45.2
Scotland								
Abrdn	21	42.9	24.0	64.0	57.1	0.5	−27.9	29.0
D & Gall	10	60.0	29.7	84.2	40.0	10.0	−31.5	51.5
Dundee	16	56.3	32.4	77.5	43.8	−10.4	−42.0	21.2
Edinb	18	55.6	33.0	76.0	44.4	2.6	−30.4	35.6
Glasgw	44	52.3	37.7	66.4	47.7	−10.6	−32.4	11.2
Inverns	13	46.2	22.4	71.8	53.9	−17.5	−56.8	21.8
Klmarnk	33	33.3	19.5	50.8	66.7	−18.1	−41.2	5.0
Krkcldy	16	50.0	27.3	72.7	50.0	−11.5	−47.6	24.5
Wales								
Bangor	13	46.2	22.4	71.8	53.9	−13.9	−50.6	22.9
Cardff	70	55.7	44.0	66.9	44.3	−8.1	−24.3	8.2
Clwyd	13	53.9	28.2	77.6	46.2	−6.2	−46.8	34.5
Swanse	55	58.2	44.9	70.4	41.8	−7.1	−25.8	11.5
Wrexm	33	57.6	40.5	73.0	42.4	1.1	−25.3	27.4
England	**2,570**	**61.3**	**59.4**	**63.2**	**38.7**	**−0.4**	**−3.0**	**2.2**
N Ireland	**54**	**74.1**	**60.9**	**84.0**	**25.9**	**13.7**	**−3.9**	**31.3**
Scotland	**171**	**48.0**	**40.6**	**55.4**	**52.1**	**−7.9**	**−18.5**	**2.6**
Wales	**184**	**56.0**	**48.7**	**63.0**	**44.0**	**−6.7**	**−16.9**	**3.6**
UK	**3,002**	**60.5**	**58.8**	**62.3**	**39.5**	**−0.8**	**−3.3**	**1.6**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

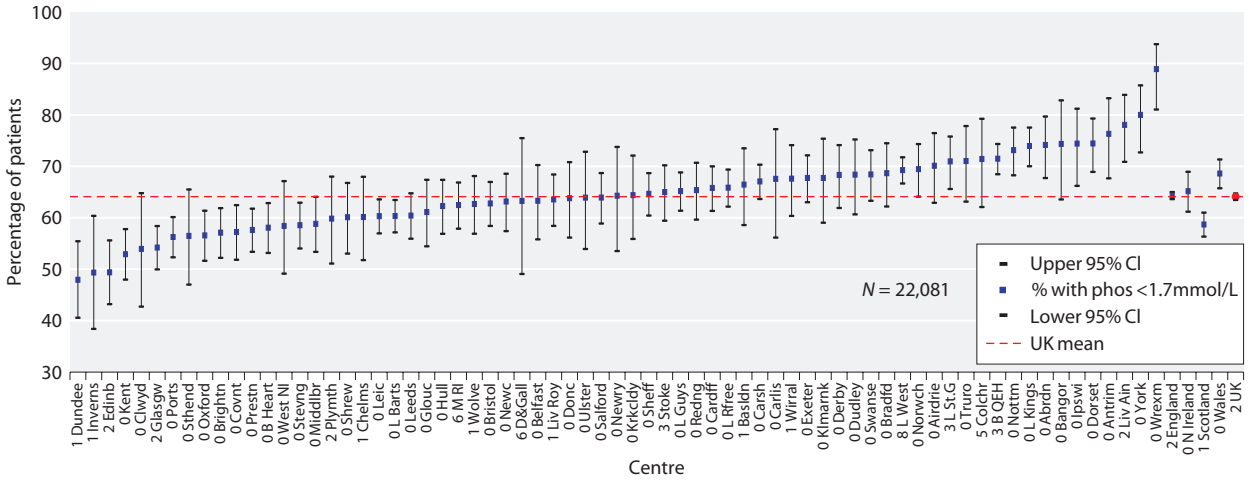

Fig. 8.1. Percentage of haemodialysis patients with serum phosphate below 1.7 mmol/L as specified by the RA audit measure, by centre in 2015

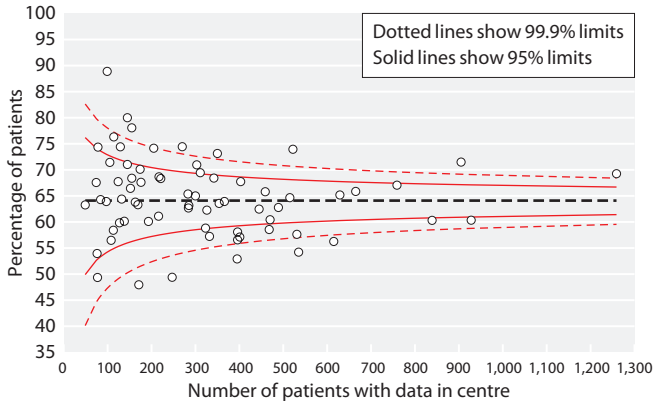

Fig. 8.2. Funnel plot of percentage of haemodialysis patients with serum phosphate below 1.7 mmol/L as specified by the RA clinical audit measure, by centre in 2015

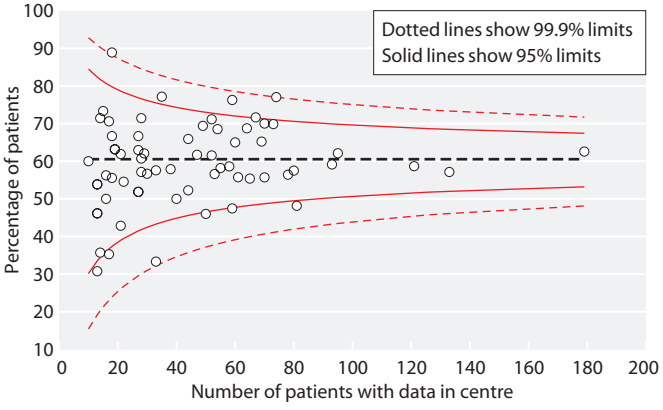

Fig. 8.4. Funnel plot of percentage of peritoneal dialysis patients with phosphate below 1.7 mmol/L as specified by the RA clinical audit measure, by centre in 2015

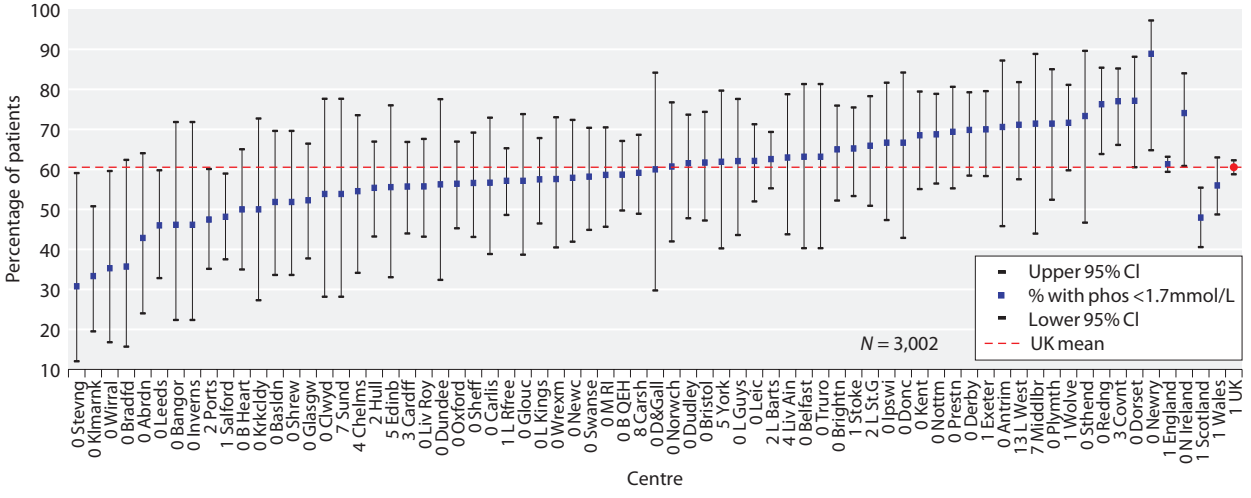

Fig. 8.3. Percentage of peritoneal dialysis patients with serum phosphate below 1.7 mmol/L as specified by the RA audit measure, by centre in 2015

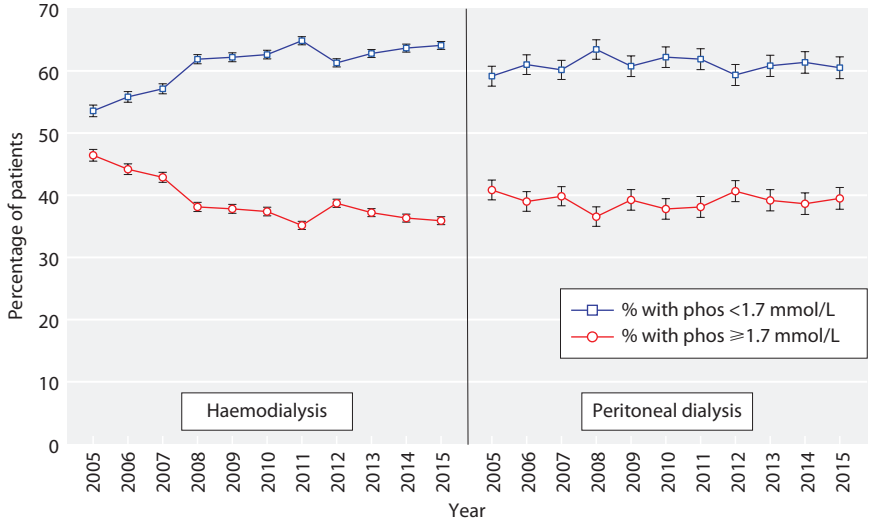

Fig. 8.5. Longitudinal change in percentage of patients with phosphate below and equal to or above 1.7 mmol/L, as specified by the RA clinical audit measure, by dialysis modality 2005–2015

The audit measure of phosphate <1.7 mmol/L is new in the updated 2015 clinical practice guideline [3] and comparable data for previous years have been calculated for comparison purposes. Longitudinal analysis demonstrated a small but continued improvement against the clinical performance measure for those receiving HD whilst the proportion of PD patients with hyperphosphataemia has remained stable (figure 8.5). Data showing the performance of centres in attaining phosphate control within the guideline target range (1.1–1.7 mmol/L) can be found in appendix 1 of this chapter (rather than the audit measure of <1.7 mmol/L presented here).

Simultaneous control of adjusted calcium, phosphate and PTH in preventing severe hyperparathyroidism

At the beginning of 2015 the following RA audit measure for combined biochemical control applied:

'Percentage of patients with all bone parameters within target range (Calcium/Phosphate/PTH)'

The RA guideline does not explicitly outline the target ranges to be used in the audit measure itself therefore the authors have interpreted this to include the target ranges suggested for each biochemical measure in the guideline. Therefore the combined audit measure comprised the following: phosphate 1.1–1.7 mmol/L, adjusted calcium 2.2–2.5 mmol/L and PTH 16–72 pmol/L. Please note this phosphate measure is discrepant with the preceding audit measure for phosphate alone (of <1.7 mmol/L). This section presents only the audit measure of composite control, however data regarding attainment of each of the three components individually can be found in appendix 1.

There were combined biochemical results to assess mineral bone disease available from 57 HD and 52 PD centres, including 17,811 HD and 2,336 PD patients, from England, Wales and Northern Ireland in 2015. Table 8.7 demonstrates the percentage of patients achieving results within the target range for none, one, two or all three bone mineral parameters, by centre for patients

Table 8.7. Percentage of haemodialysis patients achieving simultaneous control of the three key bone and mineral disorder parameters (adjusted calcium, phosphate and parathyroid hormone) by centre, in 2015

		Number of parameters			
Centre	*N*	None	One	Two	Three
England					
B Heart	393	7.4	21.1	40.5	31.0
Basldn	150	2.7	26.0	45.3	26.0
Bradfd	213	2.3	24.4	44.6	28.6
Brightn	394	3.6	22.1	50.5	23.9
Bristol	485	2.1	22.1	43.3	32.6
Carlis	72	4.2	31.9	43.1	20.8
Carsh	731	5.3	27.1	40.6	26.9
Chelms	138	2.9	27.5	42.8	26.8

Table 8.7. Continued

Centre	*N*	Number of parameters			
		None	One	Two	Three
Colchr	105	1.9	19.0	41.0	38.1
Covnt	330	7.3	23.9	42.1	26.7
Derby	221	3.6	21.7	43.0	31.7
Donc	162	3.1	16.7	45.1	35.2
Dorset	269	2.6	19.7	48.3	29.4
Dudley	151	4.0	22.5	44.4	29.1
Exeter	398	0.8	27.4	48.0	23.9
Glouc	206	2.9	21.4	42.7	33.0
Hull	324	4.9	28.1	41.7	25.3
Ipswi	128	8.6	19.5	40.6	31.3
Kent	390	6.2	26.9	39.2	27.7
L Barts	917	5.9	25.7	44.8	23.6
L Guys	623	5.1	27.9	40.6	26.3
L Kings	509	3.9	24.4	47.5	24.2
L Rfree	661	4.4	19.1	44.0	32.5
L St.G	288	4.2	31.3	36.1	28.5
L West	947	6.1	29.1	45.4	19.3
Leeds	466	4.7	23.8	44.6	26.8
Leic	823	6.0	26.7	43.0	24.3
Liv Ain	143	5.6	32.9	39.2	22.4
Liv Roy	283	4.9	27.6	41.3	26.1
M RI	426	3.1	26.8	44.6	25.6
Middlbr	315	6.0	25.7	42.9	25.4
Newc	284	4.2	24.6	39.8	31.3
Norwch	303	4.6	24.1	34.7	36.6
Nottm	341	2.9	22.6	37.0	37.5
Oxford	390	7.2	25.6	41.3	25.9
Plymth	121	7.4	19.0	43.0	30.6
Ports	603	3.6	29.0	41.6	25.7
Prestn	495	4.6	26.9	38.0	30.5
Redng	283	3.5	22.6	38.2	35.7
Shrew	189	6.9	24.9	36.5	31.7
Stevng	458	3.7	22.9	45.4	27.9
Sthend	96	10.4	26.0	40.6	22.9
Stoke	260	2.7	23.5	40.8	33.1
Truro	143	4.9	21.7	47.6	25.9
Wirral	169	2.4	24.3	45.0	28.4
Wolve	270	7.4	28.1	44.1	20.4
York	141	4.3	24.8	48.9	22.0
N Ireland					
Antrim	114	1.8	24.6	42.1	31.6
Belfast	165	1.2	31.5	47.9	19.4
Newry	84	1.2	19.0	36.9	42.9
Ulster	94	9.6	24.5	44.7	21.3
West NI	112	5.4	21.4	44.6	28.6
Wales					
Bangor	78	6.4	17.9	42.3	33.3
Cardff	446	3.1	23.8	42.2	30.9
Clwyd	74	0.0	35.1	40.5	24.3
Swanse	340	3.2	19.4	43.5	33.8
Wrexm	97	9.3	32.0	35.1	23.7
England	**16,207**	**4.7**	**25.1**	**42.8**	**27.4**
N Ireland	**569**	**3.5**	**25.1**	**43.9**	**27.4**
Wales	**1,035**	**3.8**	**23.5**	**41.8**	**30.9**
E, W & NI	**17,811**	**4.6**	**25.0**	**42.8**	**27.6**

Centres excluded if they did not have at least 50% completeness for all of the three variables

Table 8.8. Percentage of peritoneal dialysis patients achieving simultaneous control of the three key bone and mineral disorder parameters (adjusted calcium, phosphate and parathyroid hormone) by centre, in 2015

		Number of parameters			
Centre	*N*	None	One	Two	Three
England					
B Heart	37	10.8	18.9	45.9	24.3
Basldn	27	3.7	18.5	37.0	40.7
Bradfd	13	7.7	23.1	38.5	30.8
Brightn	59	5.1	22.0	40.7	32.2
Bristol	44	4.5	20.5	38.6	36.4
Carlis	27	0.0	11.1	48.1	40.7
Carsh	83	7.2	19.3	49.4	24.1
Chelms	20	15.0	35.0	20.0	30.0
Covnt	69	4.3	21.7	47.8	26.1
Derby	68	1.5	17.6	44.1	36.8
Donc	18	0.0	11.1	44.4	44.4
Dorset	29	0.0	24.1	34.5	41.4
Dudley	48	6.3	27.1	39.6	27.1
Exeter	69	2.9	14.5	55.1	27.5
Glouc	24	0.0	16.7	54.2	29.2
Hull	54	7.4	27.8	35.2	29.6
Ipswi	27	14.8	11.1	51.9	22.2
Kent	54	9.3	20.4	33.3	37.0
L Barts	172	3.5	17.4	39.0	40.1
L Guys	24	4.2	20.8	33.3	41.7
L Kings	72	2.8	29.2	40.3	27.8
L Rfree	123	4.1	21.1	38.2	36.6
L St.G	44	6.8	29.5	40.9	22.7
L West	45	11.1	20.0	37.8	31.1
Leeds	50	0.0	18.0	48.0	34.0
Leic	90	4.4	28.9	45.6	21.1
Liv Ain	20	5.0	15.0	45.0	35.0
Liv Roy	56	3.6	12.5	46.4	37.5
M RI	57	1.8	26.3	40.4	31.6
Newc	34	5.9	20.6	44.1	29.4
Norwch	18	16.7	5.6	38.9	38.9
Nottm	63	1.6	19.0	20.6	58.7
Oxford	77	1.3	11.7	49.4	37.7
Plymth	26	3.8	26.9	38.5	30.8
Ports	50	0.0	34.0	46.0	20.0
Prestn	49	2.0	20.4	42.9	34.7
Redng	55	0.0	12.7	36.4	50.9
Shrew	26	3.8	15.4	34.6	46.2
Stevng	11	9.1	18.2	54.5	18.2
Stoke	57	5.3	17.5	47.4	29.8
Sund	13	0.0	7.7	69.2	23.1
Truro	18	0.0	16.7	50.0	33.3
Wirral	16	6.3	6.3	68.8	18.8
Wolve	65	4.6	24.6	33.8	36.9
York	21	4.8	38.1	28.6	28.6
N Ireland					
Antrim	17	0.0	23.5	52.9	23.5
Belfast	19	5.3	21.1	31.6	42.1
Newry	18	0.0	22.2	44.4	33.3

Table 8.8. Continued

Centre	*N*	Number of parameters			
		None	One	Two	Three
Wales					
Bangor	13	0.0	38.5	30.8	30.8
Cardff	61	3.3	29.5	41.0	26.2
Swanse	53	3.8	17.0	50.9	28.3
Wrexm	33	3.0	18.2	45.5	33.3
England	**2,122**	**4.3**	**20.5**	**41.8**	**33.4**
N Ireland	**54**	**1.9**	**22.2**	**42.6**	**33.3**
Wales	**160**	**3.1**	**23.8**	**44.4**	**28.8**
E, W & NI	**2,336**	**4.2**	**20.7**	**42.0**	**33.1**

Centres excluded if they did not have at least 50% completeness for all of the three variables

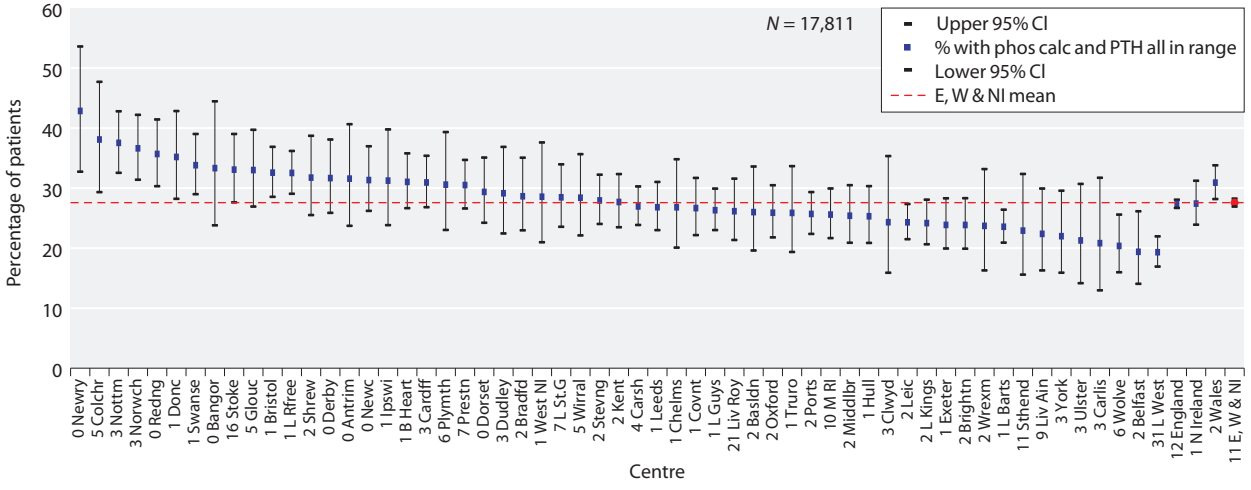

Fig. 8.6. Percentage of HD patients achieving simultaneous control of the three key mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

receiving HD and figure 8.6 shows the variation between centres in the proportion achieving control of all three parameters. Table 8.8 and figure 8.7 show the same data for patients receiving PD.

Overall, 4.6% of HD and 4.2% of PD patients across England, Wales and Northern Ireland had none of the three bone mineral parameters controlled within the target ranges described above. Control of one parameter was reported in 25.0% of HD and 20.7% of PD patients; of two parameters in 42.8% of HD and 42.0% of PD patients; of all three parameters in 27.6% of HD and 33.1% of PD patients (tables 8.7, 8.8).

Figures 8.8 and 8.9 are funnel plots showing the percentage with control of the three bone mineral parameters by centre (who contributed data to these analyses). There was little variation in the percentage achieving simultaneous control of the three bone mineral parameters for HD patients, with only one centre being above the 99.9% confidence interval and one below. There was even less variation for PD centres with one centre above and none below the 99.9% confidence interval.

Bicarbonate

In 2015 the following Renal Association clinical practice guidelines regarding bicarbonate management were applicable:

Haemodialysis Guideline 6.3: Pre-dialysis serum bicarbonate concentrations

'We suggest that pre-dialysis serum bicarbonate concentrations, measured with minimum delay after venepuncture, should be between 18 and 24 mmol/L' [7].

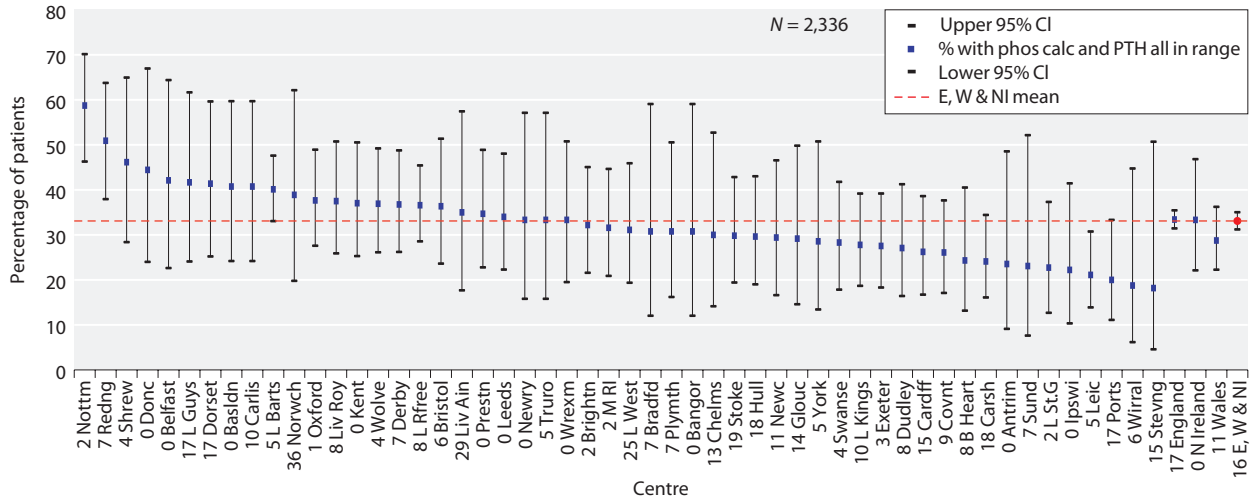

Fig. 8.7. Percentage of PD patients achieving simultaneous control of all three mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

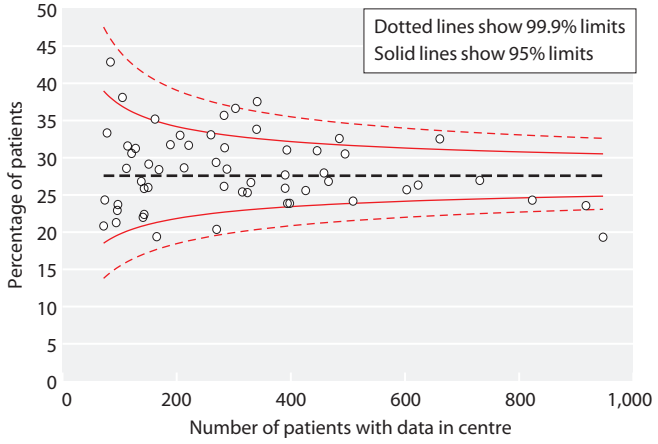

Fig. 8.8. Funnel plot of percentage of HD patients achieving simultaneous control of all three mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

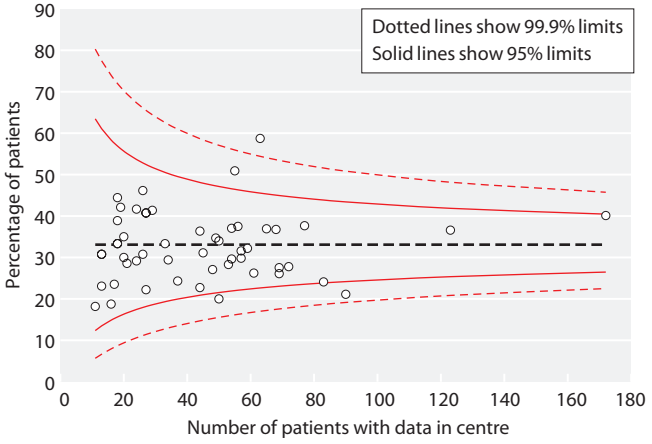

Fig. 8.9. Funnel plot of percentage of PD patients achieving simultaneous control of all three mineral bone disorders (adjusted calcium, phosphate and parathyroid hormone) in preventing severe hyperparathyroidism, by centre in 2015

Peritoneal Dialysis Guideline 6.2 – PD: Metabolic factors

'We recommend that plasma bicarbonate should be maintained within the normal range' [8].

A total of 19,253 HD and 2,560 PD patients' data were available for serum bicarbonate analysis from England, Wales and Northern Ireland in 2015. Data were 92.6% complete for HD patients and 89.5% complete for PD patients (tables 8.9, 8.11). Data completeness for serum bicarbonate levels in HD and PD patients has not changed significantly over a decade. The proportion of HD patients with serum bicarbonate within the audit measure range was 64.3% in 2015 (95% CI 63.7–65.0%) (table 8.10); the mean bicarbonate in HD patients was 23.2 mmol/L (table 8.9). The proportion with a serum bicarbonate within the audit standard in PD patients was 80.4% (CI 78.8–81.9%) (table 8.12). The mean bicarbonate level in PD patients was 24.8 mmol/L (table 8.11).

As in previous reports, inter-centre variation was observed in attainment of the audit standard (tables 8.10, 8.12, figures 8.10–8.13). The funnel plot of serum bicarbonate values in 2015 for HD patients (figure 8.11) showed a large dispersal of attainment, 22 centres being above the 99.9% limit and 13 below the 99.9% limit. In contrast, the funnel plot for PD patients (figure 8.13) showed few outliers. Sample processing, case-mix,

Table 8.9. Summary statistics for serum bicarbonate in haemodialysis patients by centre in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	98.2	390	22.0	3.1	22	20	24
B QEH	98.0	914	23.1	2.4	23	22	25
Basldn	99.4	152	21.9	2.3	22	20	23
Bradfd	100.0	217	24.3	2.9	24	23	26
Brightn	98.8	397	22.1	2.7	22	20	24
Bristol	100.0	489	22.1	2.4	22	21	24
Camb*							
Carlis	100.0	74	20.8	2.1	21	20	22
Carsh	72.7	553	24.9	2.4	25	23	26
Chelms	99.3	138	22.9	2.4	23	21	25
Colchr	94.6	105	22.6	1.6	23	21	23
Covnt	89.8	298	23.2	3.4	23	21	26
Derby	99.6	221	22.5	2.4	22	21	24
Donc	100.0	163	22.2	3.0	22	20	24
Dorset	100.0	270	22.1	2.6	22	21	24
Dudley	100.0	155	23.7	2.6	24	22	25
Exeter	100.0	403	22.7	2.7	23	21	24
Glouc	100.0	216	22.4	2.5	22	21	24
Hull	99.7	326	22.8	3.2	23	21	25
Ipswi	100.0	129	23.8	3.2	24	22	26
Kent	99.5	395	22.3	2.9	22	20	24
L Barts	100.0	928	21.9	3.0	22	20	24
L Guys	91.6	576	23.9	3.0	24	22	26
L Kings	100.0	522	23.7	2.1	24	22	25
L Rfree	100.0	665	22.4	2.5	22	21	24
L St.G	92.0	286	24.7	2.9	25	23	26
L West	55.8	765	20.4	2.7	20	19	22
Leeds	100.0	470	23.1	3.0	23	21	25
Leic	99.4	834	24.8	3.7	25	22	27
Liv Ain	98.1	155	24.2	3.1	24	23	26
Liv Roy	88.8	316	25.4	3.3	26	23	28
M RI	93.3	443	22.2	2.8	22	20	24
Middlbr	100.0	323	26.6	3.0	26	25	29
Newc	100.0	285	23.2	3.3	23	21	25
Norwch	98.7	308	22.7	2.6	23	21	24
Nottm	96.0	336	25.1	2.9	25	23	27
Oxford	99.5	396	22.8	3.3	23	21	25
Plymth	99.2	128	25.7	2.8	26	24	27
Ports	93.8	579	23.7	2.9	24	22	26
Prestn	99.1	526	23.6	2.6	24	22	25
Redng	100.0	283	23.8	2.9	24	22	25
Salford	10.6	39					
Sheff	99.6	515	23.1	2.6	23	21	25
Shrew	100.0	193	23.5	3.1	24	22	26
Stevng	99.8	467	22.4	2.9	22	21	24
Sthend	100.0	108	24.3	2.7	24	23	26
Stoke	83.4	257	25.6	3.1	26	24	27
Sund	100.0	206	27.9	2.6	28	27	29
Truro	100.0	145	22.4	2.8	23	21	24
Wirral	92.7	164	24.2	2.8	24	22	26
Wolve	99.3	284	19.2	2.6	19	17	21
York	100.0	145	23.5	2.4	24	22	25

Table 8.9. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	114	26.2	2.7	26	25	28
Belfast	100.0	169	21.9	2.9	22	20	24
Newry	100.0	84	23.1	2.2	23	22	25
Ulster	100.0	97	22.4	2.5	23	21	24
West NI	100.0	113	21.8	2.2	22	21	23
Wales							
Bangor	100.0	78	24.0	2.8	24	22	26
Cardff	93.3	429	23.5	2.8	24	22	25
Clwyd	100.0	76	23.4	2.8	23	21	25
Swanse	100.0	342	23.5	2.6	23	22	25
Wrexm	100.0	99	26.0	2.1	26	25	27
England	**92.1**	**17,652**	**23.2**	**3.2**	**23**	**21**	**25**
N Ireland	**100.0**	**577**	**23.0**	**3.0**	**23**	**21**	**25**
Wales	**97.1**	**1,024**	**23.8**	**2.8**	**24**	**22**	**26**
E, W & NI	**92.6**	**19,253**	**23.2**	**3.2**	**23**	**21**	**25**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
*Cambridge renal centre was unable to submit bicarbonate data for 2015

Table 8.10. Percentage of haemodialysis patients within, below and above the range for bicarbonate (18–24 mmol/L) by centre in 2015

Centre	*N*	% bicarb 18–24 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <18 mmol/L	% bicarb >24 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	390	78.5	74.1	82.3	5.4	16.2	3.1	−2.8	9.0
B QEH	914	70.6	67.5	73.4	1.4	28.0	8.0	3.7	12.4
Basldn	152	86.2	79.7	90.8	2.6	11.2	8.6	0.1	17.2
Bradfd	217	50.7	44.1	57.3	1.4	47.9	−3.4	−13.0	6.2
Brightn	397	78.3	74.0	82.1	4.3	17.4	1.5	−4.3	7.3
Bristol	489	85.1	81.6	88.0	2.5	12.5	6.3	1.5	11.1
Carlis	74	90.5	81.5	95.4	6.8	2.7	−2.9	−12.0	6.2
Carsh	553	43.0	39.0	47.2	0.2	56.8	5.1	−1.2	11.3
Chelms	138	72.5	64.4	79.3	1.5	26.1	−15.8	−25.1	−6.5
Colchr	105	85.7	77.7	91.2	0.0	14.3	15.2	4.2	26.2
Covnt	298	61.7	56.1	67.1	3.4	34.9	7.1	−0.9	15.0
Derby	221	79.6	73.8	84.4	2.7	17.7	5.5	−2.4	13.3
Donc	163	75.5	68.3	81.5	2.5	22.1	3.2	−6.3	12.7
Dorset	270	82.6	77.6	86.7	3.0	14.4	1.4	−5.2	7.9
Dudley	155	60.7	52.8	68.0	0.7	38.7	3.1	−7.8	13.9
Exeter	403	74.9	70.5	78.9	2.5	22.6	15.8	9.3	22.3
Glouc	216	77.3	71.3	82.4	3.7	19.0	24.4	15.6	33.2
Hull	326	65.0	59.7	70.0	6.4	28.5	4.2	−3.3	11.8
Ipswi	129	54.3	45.6	62.7	2.3	43.4	−3.5	−15.9	8.9

Table 8.10. Continued

Centre	*N*	% bicarb 18–24 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <18 mmol/L	% bicarb >24 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Kent	395	77.0	72.6	80.9	4.1	19.0	0.9	−5.1	6.9
L Barts	928	78.0	75.2	80.6	6.1	15.8	4.0	0.1	7.9
L Guys	576	54.2	50.1	58.2	1.9	43.9	6.7	0.2	13.1
L Kings	522	65.7	61.5	69.7	0.6	33.7	−19.8	−24.9	−14.6
L Rfree	665	77.6	74.3	80.6	3.0	19.4	−2.3	−6.7	2.0
L St.G	286	46.5	40.8	52.3	1.4	52.1	30.6	23.4	37.8
L West*	765	80.4	77.4	83.1	13.6	6.0			
Leeds	470	67.2	62.9	71.3	3.0	29.8	−3.7	−9.6	2.2
Leic	834	43.9	40.6	47.3	2.0	54.1	−2.9	−7.6	1.9
Liv Ain	155	53.6	45.7	61.3	0.7	45.8	16.1	5.1	27.0
Liv Roy	316	37.3	32.2	42.8	1.0	61.7	−3.3	−10.8	4.2
M RI	443	77.7	73.5	81.3	2.9	19.4	2.0	−3.5	7.6
Middlbr	323	23.8	19.5	28.8	0.0	76.2	−1.5	−8.2	5.3
Newc	285	64.9	59.2	70.2	3.2	31.9	−1.4	−9.3	6.6
Norwch	308	73.7	68.5	78.3	2.9	23.4	−8.1	−14.6	−1.5
Nottm	336	39.0	33.9	44.3	1.5	59.5	1.7	−5.8	9.1
Oxford	396	64.1	59.3	68.7	6.1	29.8	14.5	7.8	21.2
Plymth	128	25.8	19.0	34.0	0.8	73.4	−15.5	−26.9	−4.0
Ports	579	58.2	54.1	62.2	2.3	39.6	−0.7	−6.6	5.1
Prestn	526	61.4	57.2	65.5	2.1	36.5	14.8	8.8	20.8
Redng	283	58.7	52.8	64.3	2.8	38.5	11.5	3.2	19.8
Sheff	515	71.1	67.0	74.8	1.9	27.0	14.9	9.2	20.5
Shrew	193	60.6	53.6	67.3	2.6	36.8	4.6	−5.6	14.7
Stevng	467	75.0	70.8	78.7	4.1	21.0	20.8	14.7	26.9
Sthend	108	51.9	42.5	61.1	0.0	48.2	8.2	−5.0	21.4
Stoke	257	33.9	28.3	39.9	0.4	65.8	−2.3	−10.7	6.0
Sund	206	6.3	3.7	10.6	0.5	93.2	−11.9	−18.2	−5.6
Truro	145	75.9	68.2	82.1	4.1	20.0	23.3	12.3	34.2
Wirral	164	54.3	46.6	61.7	0.6	45.1	5.9	−4.6	16.5
Wolve	284	72.5	67.1	77.4	25.0	2.5	−8.2	−15.1	−1.3
York	145	63.5	55.3	70.9	0.7	35.9	22.3	10.6	34.0
N Ireland									
Antrim	114	24.6	17.5	33.3	0.0	75.4	−2.5	−13.9	9.0
Belfast	169	82.3	75.7	87.3	5.9	11.8	1.8	−6.2	9.9
Newry	84	69.1	58.4	78.0	2.4	28.6	−1.9	−15.7	11.9
Ulster	97	84.5	75.9	90.5	1.0	14.4	25.0	12.7	37.2
West NI	113	88.5	81.2	93.2	2.7	8.9	11.5	1.4	21.6
Wales									
Bangor	78	62.8	51.6	72.8	0.0	37.2	26.1	11.0	41.2
Cardff	429	60.6	55.9	65.1	2.1	37.3	0.5	−6.0	6.9
Clwyd	76	67.1	55.8	76.7	1.3	31.6	22.5	7.5	37.6
Swanse	342	64.0	58.8	69.0	1.8	34.2	13.4	6.0	20.9
Wrexm	99	24.2	16.8	33.6	0.0	75.8	−43.9	−57.7	−30.0
England	**17,652**	**64.5**	**63.7**	**65.2**	**3.5**	**32.1**	**3.9**	**2.8**	**4.9**
N Ireland	**577**	**70.5**	**66.7**	**74.1**	**2.8**	**26.7**	**5.7**	**0.3**	**11.1**
Wales	**1,024**	**58.9**	**55.8**	**61.9**	**1.6**	**39.6**	**4.4**	**0.1**	**8.7**
E, W & NI	**19,253**	**64.3**	**63.7**	**65.0**	**3.3**	**32.3**	**3.9**	**3.0**	**4.9**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

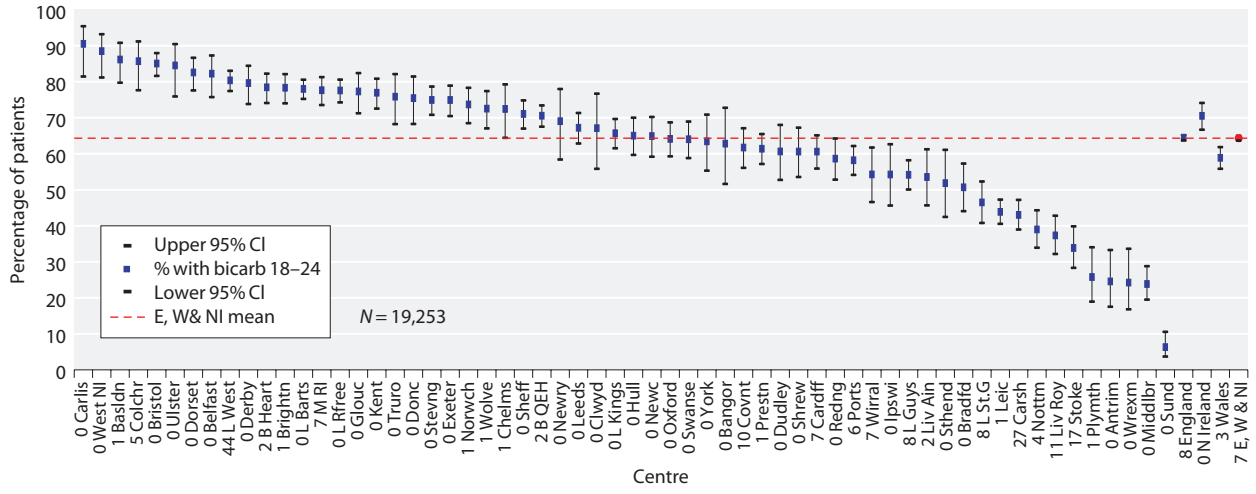

Fig. 8.10. Percentage of haemodialysis patients with serum bicarbonate within range (18–24 mmol/L) by centre in 2015

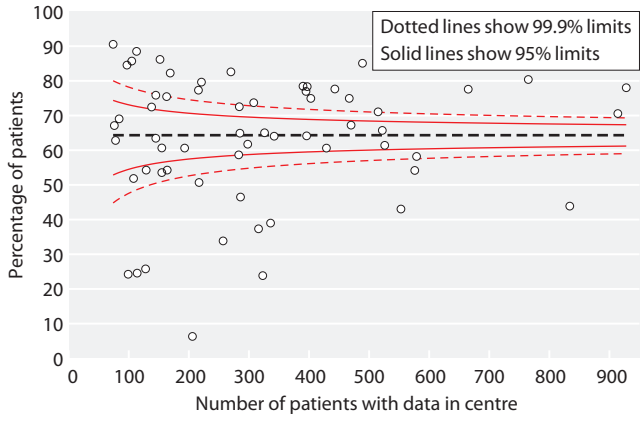

Fig. 8.11. Funnel plot for percentage of haemodialysis patients within range for bicarbonate (18–24 mmol/L) by centre in 2015

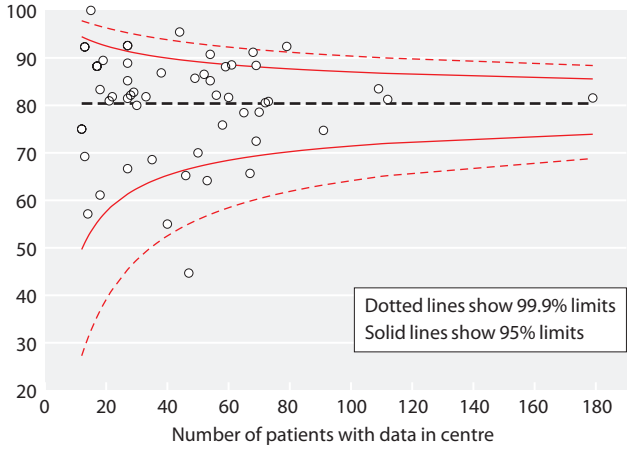

Fig. 8.13. Funnel plot for percentage of peritoneal dialysis patients within range for bicarbonate (22–30 mmol/L) by centre in 2015

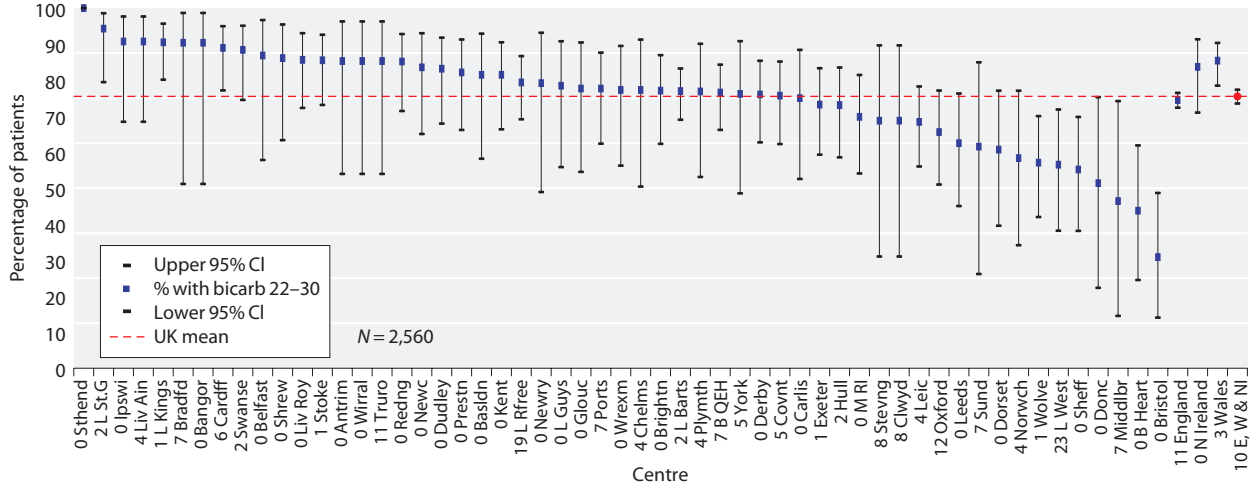

Fig. 8.12. Percentage of peritoneal dialysis patients with serum bicarbonate within range (22–30 mmol/L) by centre in 2015

Table 8.11. Summary statistics for serum bicarbonate in peritoneal dialysis patients by centre in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	40	22.0	2.8	22	20	24
B QEH	92.6	112	23.6	2.7	24	22	25
Basldn	100.0	27	25.2	3.1	25	23	27
Bradfd	92.9	13	26.9	1.8	27	26	28
Brightn	100.0	60	24.4	3.2	25	22	26
Bristol	100.0	47	21.7	2.1	21	20	23
Camb[a]							
Carlis	100.0	30	24.3	2.7	24	22	27
Carsh	0.0	0					
Chelms	95.7	22	24.7	2.8	24	23	26
Colchr[b]	n/a						
Covnt	94.7	72	24.6	3.0	25	23	26
Derby	100.0	73	24.1	3.4	24	22	26
Donc	100.0	18	22.4	2.2	22	21	24
Dorset	100.0	35	23.5	3.3	23	21	26
Dudley	100.0	52	25.7	3.3	26	23	28
Exeter	98.6	70	24.2	2.9	24	22	26
Glouc	100.0	28	24.4	3.3	25	23	27
Hull	98.5	65	24.9	3.5	25	22	27
Ipswi	100.0	27	25.5	3.0	25	24	28
Kent	100.0	54	24.5	2.8	25	23	26
L Barts	98.4	179	24.1	3.2	25	22	26
L Guys	100.0	29	23.6	2.4	24	22	25
L Kings	98.8	79	26.6	2.5	26	25	28
L Rfree	81.3	109	24.5	3.0	25	22	27
L St.G	97.8	44	24.4	2.2	24	23	26
L West	76.7	46	23.5	3.2	24	21	26
Leeds	100.0	50	26.9	3.6	28	25	29
Leic	95.8	91	25.6	3.9	25	23	28
Liv Ain	96.4	27	26.3	2.5	27	25	28
Liv Roy	100.0	61	25.3	2.7	26	24	27
M RI	100.0	58	23.3	2.7	23	22	25
Middlbr	93.3	14	29.6	2.8	30	28	32
Newc	100.0	38	24.9	3.3	25	23	27
Norwch	96.4	27	22.4	2.7	23	20	25
Nottm	48.4	31					
Oxford	88.5	69	23.5	3.9	24	21	26
Plymth	96.4	27	24.2	3.3	24	22	27
Ports	93.3	56	25.6	3.1	26	23	28
Prestn	100.0	49	26.6	3.1	27	24	29
Redng	100.0	59	27.0	2.6	27	25	29
Salford	14.6	12					
Sheff	100.0	53	22.8	3.1	23	21	25
Shrew	100.0	27	26.0	3.3	26	24	29
Stevng	92.3	12	24.3	3.6	23	22	27
Sthend	100.0	15	26.2	1.7	26	25	28
Stoke	98.6	69	27.5	2.7	28	26	29
Sund	92.9	13	23.4	3.2	23	21	26
Truro	89.5	17	26.8	2.7	27	26	28
Wirral	100.0	17	26.8	2.7	27	25	28
Wolve	98.5	67	23.0	2.8	23	21	25
York	95.5	21	25.8	3.5	26	25	28

Table 8.11. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	17	25.4	2.6	25	24	27
Belfast	100.0	19	25.1	3.6	25	24	28
Newry	100.0	18	26.3	3.7	27	23	29
Ulster	100.0	6					
West NI	100.0	9					
Wales							
Bangor	100.0	13	26.0	3.0	27	23	28
Cardff	94.4	68	25.7	2.8	26	25	27
Clwyd	92.3	12	23.5	2.5	24	22	25
Swanse	98.2	54	27.0	2.7	27	25	30
Wrexm	100.0	33	26.1	3.0	26	25	28
England	**88.8**	**2,311**	**24.7**	**3.3**	**25**	**22**	**27**
N Ireland	**100.0**	**69**	**25.2**	**3.3**	**25**	**23**	**27**
Wales	**96.8**	**180**	**26.0**	**2.9**	**26**	**25**	**28**
E, W & NI	**89.5**	**2,560**	**24.8**	**3.3**	**25**	**23**	**27**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
[a]Cambridge renal centre was unable to submit bicarbonate data for 2015
[b]n/a – no PD patients

Table 8.12. Percentage of peritoneal dialysis patients within, below and above the range for bicarbonate (22–30 mmol/L) by centre in 2015

Centre	*N*	% bicarb 22–30 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <22 mmol/L	% bicarb >30 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	40	55.0	39.6	69.5	45.0	0.0	−22.4	−43.7	−1.1
B QEH	112	81.3	73.0	87.4	18.8	0.0	−6.3	−15.9	3.4
Basldn	27	85.2	66.5	94.3	11.1	3.7	3.4	−17.6	24.3
Bradfd	13	92.3	60.9	98.9	0.0	7.7	−1.4	−20.2	17.3
Brightn	60	81.7	69.9	89.6	15.0	3.3	−1.7	−15.6	12.3
Bristol	47	44.7	31.3	58.9	55.3	0.0	−20.8	−39.7	−1.8
Carlis	30	80.0	62.1	90.7	20.0	0.0	−10.9	−29.6	7.8
Chelms	22	81.8	60.4	93.0	13.6	4.6	−7.1	−28.8	14.6
Covnt	72	80.6	69.8	88.1	15.3	4.2	−10.4	−21.5	0.8
Derby	73	80.8	70.2	88.3	17.8	1.4	−2.0	−14.7	10.6
Donc	18	61.1	37.9	80.2	38.9	0.0	−22.2	−49.2	4.8
Dorset	35	68.6	51.7	81.7	31.4	0.0	5.5	−15.2	26.3
Dudley	52	86.5	74.4	93.4	7.7	5.8	7.4	−7.4	22.1
Exeter	70	78.6	67.4	86.7	20.0	1.4	−9.4	−21.3	2.5
Glouc	28	82.1	63.6	92.4	17.9	0.0	−12.5	−28.4	3.5

Table 8.12. Continued

Centre	*N*	% bicarb 22–30 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <22 mmol/L	% bicarb >30 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Hull	65	78.5	66.9	86.8	18.5	3.1	−7.7	−20.7	5.4
Ipswi	27	92.6	74.8	98.1	7.4	0.0	15.9	−2.2	34.0
Kent	54	85.2	73.1	92.4	14.8	0.0	0.7	−12.6	14.0
L Barts	179	81.6	75.2	86.6	18.4	0.0	4.2	−4.0	12.4
L Guys	29	82.8	64.7	92.6	17.2	0.0	17.8	−7.3	42.8
L Kings	79	92.4	84.1	96.6	2.5	5.1	−5.1	−11.8	1.7
L Rfree	109	83.5	75.3	89.3	13.8	2.8	−0.4	−10.4	9.7
L St.G	44	95.5	83.6	98.9	4.6	0.0	9.1	−2.8	21.0
L West	46	65.2	50.6	77.5	32.6	2.2	−7.5	−26.6	11.5
Leeds	50	70.0	56.0	81.0	14.0	16.0	−11.6	−28.3	5.1
Leic	91	74.7	64.8	82.6	13.2	12.1	−9.3	−20.7	2.2
Liv Ain	27	92.6	74.8	98.1	3.7	3.7	2.0	−12.2	16.1
Liv Roy	61	88.5	77.8	94.4	9.8	1.6	−3.3	−14.4	7.8
M RI	58	75.9	63.3	85.2	24.1	0.0	−8.6	−23.0	5.8
Middlbr*	14	57.1	31.6	79.4	0.0	42.9			
Newc	38	86.8	72.0	94.4	10.5	2.6	5.9	−10.1	21.9
Norwch	27	66.7	47.3	81.7	33.3	0.0	26.7	1.7	51.6
Oxford	69	72.5	60.8	81.7	26.1	1.5	−5.2	−19.7	9.4
Plymth	27	81.5	62.5	92.1	18.5	0.0	−4.2	−23.8	15.3
Ports	56	82.1	69.9	90.1	12.5	5.4	−0.9	−14.8	13.0
Prestn	49	85.7	72.9	93.0	2.0	12.2	9.6	−6.1	25.4
Redng	59	88.1	77.1	94.2	0.0	11.9	6.2	−6.5	18.9
Sheff	53	64.2	50.5	75.8	35.9	0.0	−12.8	−30.0	4.5
Shrew	27	88.9	70.7	96.4	7.4	3.7	−3.1	−19.0	12.8
Stevng	12	75.0	44.8	91.7	25.0	0.0	−16.7	−43.5	10.2
Sthend	15	100.0	0.0	100.0	0.0	0.0	6.3	−5.6	18.1
Stoke	69	88.4	78.5	94.1	1.5	10.1	5.1	−6.4	16.5
Sund	13	69.2	40.9	88.0	30.8	0.0	−16.5	−47.6	14.6
Truro	17	88.2	63.2	97.0	5.9	5.9	0.7	−21.6	23.0
Wirral	17	88.2	63.2	97.0	0.0	11.8	9.7	−16.7	36.1
Wolve	67	65.7	53.6	76.0	32.8	1.5	−10.4	−25.5	4.7
York	21	81.0	58.9	92.7	9.5	9.5	−9.5	−30.5	11.4
N Ireland									
Antrim*	17	88.2	63.2	97.0	5.9	5.9			
Belfast	19	89.5	66.3	97.4	10.5	0.0	2.8	−19.3	24.9
Newry	18	83.3	59.1	94.5	11.1	5.6	−2.4	−27.5	22.8
Wales									
Bangor	13	92.3	60.9	98.9	7.7	0.0	12.3	−12.6	37.2
Cardff	68	91.2	81.7	96.0	5.9	2.9	10.0	−1.4	21.4
Clwyd*	12	75.0	44.8	91.7	25.0	0.0			
Swanse	54	90.7	79.6	96.1	1.9	7.4	11.2	−2.5	24.8
Wrexm	33	81.8	65.0	91.6	12.1	6.1	−0.8	−21.1	19.5
England	**2,311**	**79.6**	**77.9**	**81.2**	**16.8**	**3.6**	**−2.3**	**−4.6**	**−0.1**
N Ireland	**69**	**87.0**	**76.8**	**93.1**	**10.1**	**2.9**	**1.3**	**−11.4**	**13.9**
Wales	**180**	**88.3**	**82.8**	**92.3**	**7.2**	**4.4**	**7.1**	**−0.5**	**14.7**
E, W & NI	**2,560**	**80.4**	**78.8**	**81.9**	**15.9**	**3.7**	**−1.6**	**−3.7**	**0.6**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

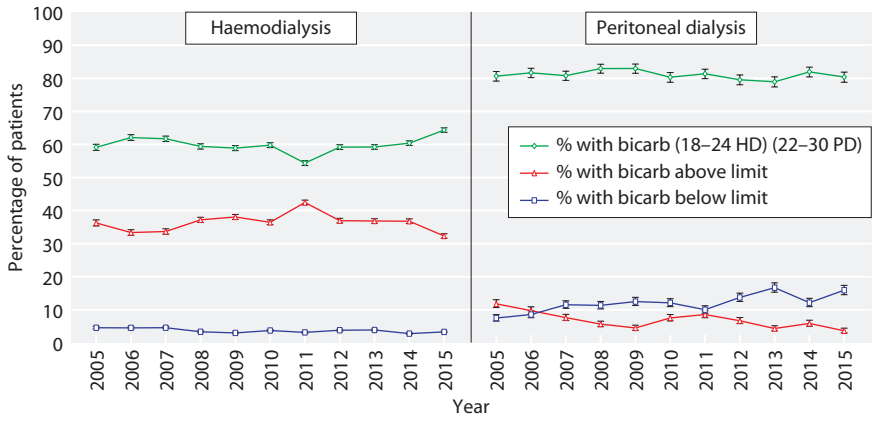

Fig. 8.14. Longitudinal change in percentage of patients within the range for bicarbonate by dialysis modality 2005–2015

differences in dialysis, residual renal function and oral bicarbonate prescriptions may all contribute to the variation observed.

Serial trends in serum bicarbonate measures between 2005 and 2015 by dialysis modality are presented in figure 8.14. Achievement of bicarbonate audit measures has not changed over the past decade for either modality. There has been a consistent difference between the modalities in the percentage with raised bicarbonate measures.

Discussion

A number of studies have demonstrated reduced dialysis patient survival with disordered calcium and phosphate levels [9, 10] as well as with inadequate simultaneous control of three MBD parameters [11–13]. This chapter presents the results of MBD management for established renal failure patients in the UK and demonstrates the overall ongoing improvement in achieving measures. However, the inter- and intra-centre variation in the control of MBD parameters remains a challenge. Some of these apparent differences may be as a result of confounding factors, rather than true differences in the quality of care. Analyses including adjustment for patient level factors will be undertaken in future years when the enhanced UKRR dataset is available from renal centres, such as comorbidity, phosphate binder, calcium mimetic and vitamin D analogue use and the dialysis dose and dialysate concentrations prescribed. In addition to adjusting for patient level factors (to account for case-mix) there are also centre level factors. The UKRR 7th Annual Report chapter 8 [14] discussed the problems related to variations in calcium and PTH measurements. It is an aspiration for future work also to integrate these into the analyses, such as assays used for the biochemical parameters and the local reference ranges. Overall data completeness was good for the biochemical variables presented in this chapter with some exceptions and data completeness has improved over the years. However, the UKRR will need to attain good data completeness for a host of other patient and centre level variables in order to undertake the adjusted analyses described.

Serum bicarbonate levels have not changed significantly compared with recent years, but a persistent fraction of HD patients still have raised bicarbonate levels. The UKRR has previously conducted a limited survey [15] into the possible underlying causes of serum bicarbonate variation. The study examined measures of sample processing and of dialysis treatment. It did not adjust for case-mix and was unable to detect any significant differences between centres. Studies have identified an increased risk of death stratified by a reduced predialysis serum bicarbonate level (<17 mmol/L) or with raised levels (>27 mmol/L) [16–17], as well as with raised dialysate bicarbonate concentrates [11]. Future analysis of management of acidosis will have to re-explore the factors associated with an increased trend in developing alkalosis in HD patients.

Conflicts of interest: the authors declare no conflict of interest

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Appendix 1 Attainment of individual standard for adjusted calcium, phosphate and PTH

This appendix includes analysis of the individual mineral bone measures that are included in the composite audit measure, namely adjusted calcium, phosphate and PTH within the recommended target ranges.

Adjusted calcium

In 2015, the following Renal Association clinical practice guideline regarding calcium management was applicable:

Guideline 2.2 CKD-MBD: Serum calcium in dialysis patients (stage 5D)

'We suggest that 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 haemodialysis patients. Ideally, adjusted serum calcium should be maintained between 2.2 and 2.5 mmol/L, with avoidance of hypercalcaemic episodes (2D)' [3].

In 2015, data from 22,175 HD and 2,998 PD patients across the UK were available for serum adjusted calcium analysis. The data were 98.4% complete for HD patients and 98.7% complete for PD patients overall, although there was between centre variation (tables 8.13, 8.15). From 2004 to 2015 across UK centres, data completeness for serum adjusted calcium increased from 57.2% to 98.0% in HD patients and from 56.8% to 98.7% in PD patients.

London West and Belfast did not return locally adjusted calcium results for any patients, whilst Sunderland and Wirral returned adjusted calcium results for only a proportion of their patients. Hence these data are shown after adjustment using a generic formula that may not be applicable to the calcium and albumin methods used locally and may have over- or underestimated the adjusted calcium. These centres are served

Table 8.13. Summary statistics for adjusted calcium in haemodialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	99.8	396	2.4	0.2	2.4	2.3	2.5
B QEH	98.3	917	2.3	0.2	2.3	2.2	2.4
Basldn	99.4	152	2.4	0.2	2.4	2.3	2.5
Bradfd	100.0	217	2.4	0.1	2.3	2.3	2.4
Brightn	100.0	402	2.3	0.2	2.3	2.2	2.4
Bristol	100.0	489	2.4	0.1	2.4	2.3	2.5
Camb*							
Carlis	100.0	74	2.3	0.2	2.3	2.2	2.4
Carsh	99.7	759	2.3	0.2	2.3	2.2	2.4
Chelms	99.3	138	2.3	0.2	2.3	2.2	2.4
Colchr	94.6	105	2.4	0.1	2.4	2.3	2.4
Covnt	100.0	332	2.3	0.2	2.3	2.2	2.4
Derby	99.6	221	2.5	0.2	2.5	2.4	2.6
Donc	100.0	163	2.4	0.1	2.4	2.3	2.5
Dorset	100.0	270	2.3	0.1	2.3	2.2	2.4
Dudley	100.0	155	2.3	0.2	2.3	2.2	2.4
Exeter	100.0	403	2.4	0.1	2.3	2.3	2.4
Glouc	100.0	216	2.4	0.1	2.4	2.3	2.4
Hull	99.7	326	2.4	0.2	2.4	2.3	2.5
Ipswi	100.0	129	2.4	0.2	2.4	2.3	2.5
Kent	99.5	395	2.4	0.2	2.4	2.3	2.5
L Barts	100.0	928	2.3	0.2	2.3	2.2	2.4
L Guys	100.0	629	2.3	0.2	2.4	2.2	2.4
L Kings	100.0	522	2.3	0.2	2.3	2.2	2.4
L Rfree	100.0	665	2.3	0.2	2.3	2.2	2.4

Table 8.13. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
L St.G	97.4	303	2.4	0.2	2.4	2.3	2.5
L West	84.8	1,164	2.3	0.2	2.4	2.2	2.5
Leeds	100.0	470	2.4	0.2	2.3	2.3	2.4
Leic	100.0	839	2.4	0.2	2.4	2.3	2.5
Liv Ain	98.1	155	2.3	0.2	2.3	2.2	2.4
Liv Roy	99.4	354	2.4	0.2	2.4	2.3	2.4
M RI	93.7	445	2.4	0.2	2.4	2.3	2.5
Middlbr	100.0	323	2.3	0.2	2.3	2.1	2.4
Newc	100.0	285	2.3	0.2	2.4	2.2	2.4
Norwch	99.7	311	2.4	0.2	2.4	2.3	2.5
Nottm	100.0	350	2.4	0.2	2.4	2.3	2.4
Oxford	99.5	396	2.4	0.2	2.4	2.3	2.5
Plymth	98.5	127	2.3	0.2	2.3	2.2	2.4
Ports	99.8	616	2.4	0.2	2.3	2.2	2.4
Prestn	93.4	496	2.3	0.2	2.3	2.2	2.4
Redng	100.0	283	2.3	0.2	2.3	2.3	2.4
Salford	99.7	366	2.4	0.2	2.4	2.2	2.5
Sheff	99.6	515	2.3	0.2	2.3	2.2	2.4
Shrew	100.0	193	2.3	0.2	2.3	2.2	2.4
Stevng	100.0	468	2.3	0.2	2.3	2.2	2.4
Sthend	100.0	108	2.4	0.2	2.4	2.3	2.5
Stoke	95.5	294	2.3	0.2	2.3	2.3	2.4
Sund	100.0	206	2.3	0.2	2.2	2.2	2.3
Truro	100.0	145	2.4	0.2	2.4	2.3	2.5
Wirral	99.4	176	2.4	0.2	2.4	2.2	2.5
Wolve	99.3	284	2.4	0.2	2.4	2.3	2.5
York	100.0	145	2.4	0.1	2.4	2.3	2.5
N Ireland							
Antrim	100.0	114	2.3	0.2	2.4	2.3	2.4
Belfast	100.0	169	2.4	0.2	2.3	2.3	2.4
Newry	100.0	84	2.4	0.1	2.4	2.3	2.4
Ulster	99.0	96	2.5	0.2	2.5	2.4	2.6
West NI	100.0	113	2.3	0.1	2.3	2.2	2.4
Scotland							
Abrdn	100.0	205	2.4	0.2	2.4	2.2	2.5
Airdrie	100.0	174	2.4	0.2	2.4	2.3	2.5
D & Gall	96.2	50	2.3	0.2	2.3	2.2	2.4
Dundee	98.8	171	2.4	0.2	2.4	2.3	2.5
Edinb	98.8	249	2.5	0.2	2.5	2.3	2.6
Glasgw	99.6	543	2.4	0.2	2.4	2.3	2.5
Inverns	98.7	77	2.3	0.2	2.3	2.2	2.4
Klmarnk	100.0	124	2.4	0.2	2.4	2.3	2.5
Krkcldy	100.0	132	2.3	0.2	2.3	2.2	2.4
Wales							
Bangor	100.0	78	2.3	0.2	2.2	2.2	2.4
Cardff	99.8	459	2.4	0.2	2.3	2.2	2.5
Clwyd	100.0	76	2.4	0.2	2.4	2.3	2.5
Swanse	100.0	342	2.4	0.2	2.3	2.3	2.4
Wrexm	100.0	99	2.3	0.2	2.3	2.2	2.4
England	**98.2**	**18,820**	**2.3**	**0.2**	**2.3**	**2.2**	**2.4**
N Ireland	**99.8**	**576**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Scotland	**99.4**	**1,725**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Wales	**99.9**	**1,054**	**2.3**	**0.2**	**2.3**	**2.2**	**2.4**
UK	**98.4**	**22,175**	**2.3**	**0.2**	**2.3**	**2.2**	**2.4**

*Cambridge renal centre was unable to submit adjusted calcium data for 2015

Table 8.14. Percentage of haemodialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2015

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 in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	396	80.8	76.6	84.4	8.6	10.6	12.5	6.5	18.5
B QEH	917	76.4	73.6	79.1	18.0	5.6	2.2	−1.7	6.2
Basldn	152	82.2	75.3	87.5	4.0	13.8	1.5	−7.2	10.1
Bradfd	217	88.9	84.0	92.5	4.6	6.5	7.8	0.9	14.7
Brightn	402	82.1	78.0	85.5	9.2	8.7	−1.2	−6.5	4.1
Bristol	489	89.8	86.8	92.2	1.6	8.6	5.4	1.2	9.5
Carlis	74	71.6	60.4	80.7	17.6	10.8	−8.7	−23.0	5.6
Carsh	759	76.7	73.5	79.6	15.2	8.2	−0.3	−4.7	4.0
Chelms	138	78.3	70.6	84.4	16.7	5.1	−6.9	−16.1	2.3
Colchr	105	89.5	82.1	94.1	0.0	10.5	−3.8	−11.4	3.7
Covnt	332	78.9	74.2	83.0	11.1	9.9	0.2	−6.0	6.4
Derby	221	71.0	64.7	76.6	1.4	27.6	−1.3	−9.7	7.1
Donc	163	85.9	79.7	90.4	6.8	7.4	−0.9	−8.3	6.6
Dorset	270	85.9	81.3	89.6	8.9	5.2	4.2	−2.1	10.4
Dudley	155	80.0	73.0	85.6	11.0	9.0	1.1	−7.8	10.0
Exeter	403	90.8	87.6	93.3	1.7	7.4	2.1	−2.2	6.3
Glouc	216	86.6	81.4	90.5	5.1	8.3	2.6	−4.2	9.4
Hull	326	76.1	71.1	80.4	7.1	16.9	−8.7	−14.8	−2.5
Ipswi	129	75.2	67.0	81.9	4.7	20.2	−7.4	−17.6	2.8
Kent	395	73.7	69.1	77.8	7.3	19.0	−3.3	−9.4	2.8
L Barts	928	72.4	69.5	75.2	18.5	9.1	−0.6	−4.7	3.5
L Guys	629	80.9	77.7	83.8	10.7	8.4	−0.7	−5.4	4.0
L Kings	522	81.0	77.4	84.2	15.5	3.5	−1.4	−6.2	3.3
L Rfree	665	80.9	77.7	83.7	10.8	8.3	1.9	−2.4	6.2
L St.G	303	78.2	73.2	82.5	9.6	12.2	−4.2	−10.6	2.3
L West	1,164	73.5	70.9	76.0	13.9	12.5	2.0	−1.8	5.8
Leeds	470	84.5	80.9	87.5	6.2	9.4	5.1	0.2	10.0
Leic	839	80.7	77.9	83.2	7.6	11.7	1.0	−2.8	4.8
Liv Ain	155	85.2	78.7	89.9	8.4	6.5	4.9	−3.5	13.3
Liv Roy	354	80.5	76.1	84.3	10.5	9.0	−0.2	−6.1	5.7
M RI	445	81.6	77.7	84.9	5.6	12.8	5.0	−0.3	10.3
Middlbr	323	65.9	60.6	70.9	30.3	3.7	−1.5	−8.9	5.9
Newc	285	80.7	75.7	84.9	10.2	9.1	1.0	−5.7	7.7
Norwch	311	75.6	70.5	80.0	5.8	18.7	−3.7	−10.2	2.9
Nottm	350	83.1	78.9	86.7	6.9	10.0	−2.2	−7.6	3.2
Oxford	396	78.3	74.0	82.1	10.4	11.4	−1.5	−7.1	4.1
Plymth	127	74.8	66.5	81.6	21.3	3.9	−5.5	−15.7	4.7
Ports	616	78.7	75.3	81.8	10.1	11.2	−1.6	−6.2	3.0
Prestn	496	81.7	78.0	84.8	14.5	3.8	2.3	−2.6	7.2
Redng	283	79.9	74.8	84.1	12.4	7.8	−8.4	−14.5	−2.4
Salford	366	75.4	70.7	79.6	10.7	13.9	−5.1	−11.1	0.8
Sheff	515	80.8	77.1	84.0	11.7	7.6	0.2	−4.5	5.0
Shrew	193	79.8	73.5	84.9	10.9	9.3	−1.2	−9.4	6.9
Stevng	468	78.6	74.7	82.1	14.5	6.8	−7.0	−12.0	−2.1
Sthend	108	74.1	65.0	81.5	4.6	21.3	−3.2	−14.6	8.2
Stoke	294	85.0	80.5	88.7	7.5	7.5	4.0	−2.0	10.1
Sund	206	72.3	65.8	78.0	19.9	7.8	−1.9	−10.5	6.7
Truro	145	86.2	79.6	90.9	5.5	8.3	7.7	−1.2	16.6
Wirral	176	81.3	74.8	86.4	10.2	8.5	2.8	−5.5	11.0
Wolve	284	78.5	73.4	82.9	6.0	15.5	4.5	−2.5	11.5
York	145	87.6	81.2	92.0	2.8	9.7	5.3	−3.3	13.9

Table 8.14. 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 in % within range from 2014	95% LCL change	95% UCL change
N Ireland									
Antrim	114	78.1	69.6	84.7	14.9	7.0	−0.3	−11.1	10.5
Belfast	169	87.0	81.0	91.3	8.3	4.7	6.6	−1.0	14.2
Newry	84	95.2	88.0	98.2	2.4	2.4	19.7	9.5	29.8
Ulster	96	59.4	49.3	68.7	2.1	38.5	−14.5	−27.8	−1.2
West NI	113	74.3	65.5	81.5	20.4	5.3	−4.7	−16.0	6.7
Scotland									
Abrdn	205	72.2	65.7	77.9	14.2	13.7	−9.5	−17.7	−1.3
Airdrie	174	81.6	75.2	86.7	3.5	14.9	−4.3	−12.0	3.4
D & Gall	50	76.0	62.3	85.8	12.0	12.0	−6.2	−22.5	10.1
Dundee	171	83.6	77.3	88.5	6.4	9.9	0.7	−7.3	8.7
Edinb	249	63.5	57.3	69.2	7.6	28.9	−5.1	−13.4	3.1
Glasgw	543	83.4	80.1	86.3	6.1	10.5	−5.3	−9.4	−1.1
Inverns	77	81.8	71.6	88.9	11.7	6.5	7.2	−6.3	20.7
Klmarnk	124	79.8	71.9	86.0	3.2	16.9	2.6	−7.5	12.6
Krkcldy	132	79.6	71.8	85.6	12.1	8.3	−2.0	−11.4	7.4
Wales									
Bangor	78	80.8	70.5	88.1	15.4	3.9	−5.3	−16.9	6.3
Cardff	459	76.3	72.1	79.9	12.0	11.8	−1.9	−7.3	3.6
Clwyd	76	81.6	71.3	88.8	7.9	10.5	8.1	−4.8	21.0
Swanse	342	83.3	79.0	86.9	7.3	9.4	6.3	0.3	12.4
Wrexm	99	78.8	69.6	85.7	15.2	6.1	1.3	−10.1	12.8
England	**18,820**	**79.4**	**78.8**	**80.0**	**10.8**	**9.8**	**0.4**	**−0.4**	**1.2**
N Ireland	**576**	**79.3**	**75.8**	**82.5**	**10.1**	**10.6**	**1.3**	**−3.4**	**6.0**
Scotland	**1,725**	**78.2**	**76.2**	**80.1**	**7.7**	**14.1**	**−3.7**	**−6.3**	**−1.0**
Wales	**1,054**	**79.5**	**77.0**	**81.8**	**10.7**	**9.8**	**1.6**	**−1.9**	**5.1**
UK	**22,175**	**79.3**	**78.8**	**79.8**	**10.6**	**10.1**	**0.2**	**−0.6**	**0.9**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

by laboratories that report adjusted calcium results and therefore it should be possible to report the adjusted values to the UKRR.

Of HD patients, 79.3% (95% CI 78.8–79.8%) and of PD patients 77.8% (95% CI 76.3–79.2%) had an adjusted calcium between 2.2–2.5 mmol/L (tables 8.14, 8.16, figures 8.15, 8.17).

The proportion of hypocalcaemic patients in the UK was 10.6% for HD and 7.4% for PD (tables 8.14, 8.16). The proportion of hypercalcaemic patients in the UK was 10.1% for HD and 14.8% for PD (tables 8.14, 8.16).

Figure 8.16 presents the funnel plot of HD patients attaining adjusted calcium levels between 2.2 and 2.5 mmol/L in 2015. Five centre's results fell below the lower 99.9% confidence interval: Ulster, Edinburgh, Middlesbrough, London St Bartholomew's and London West. However, the London West data may be misleading since the centre failed to return locally adjusted calcium results. The percentage of HD patients with serum calcium within the reference range was significantly higher than the average (above the 99.9% confidence limit) in Newry, Colchester, Bradford, Exeter and Bristol.

Figure 8.18 presents the funnel plot of PD patients attaining the adjusted calcium levels between 2.2 and 2.5 mmol/L in 2015. Once corrected for centre size, no centre was significantly lower than the national average. There were three centres achieving a significantly higher percentage compared with the UK average: Truro, Leeds and Oxford.

Longitudinal changes in the control measures of serum adjusted calcium show improvements in the attained national standards. Hypocalcaemia in HD patients has declined since 2010, with no significant changes being observed in PD patients. In the same time period there has been a modest fall in hypercalcaemia in both modalities (figure 8.19).

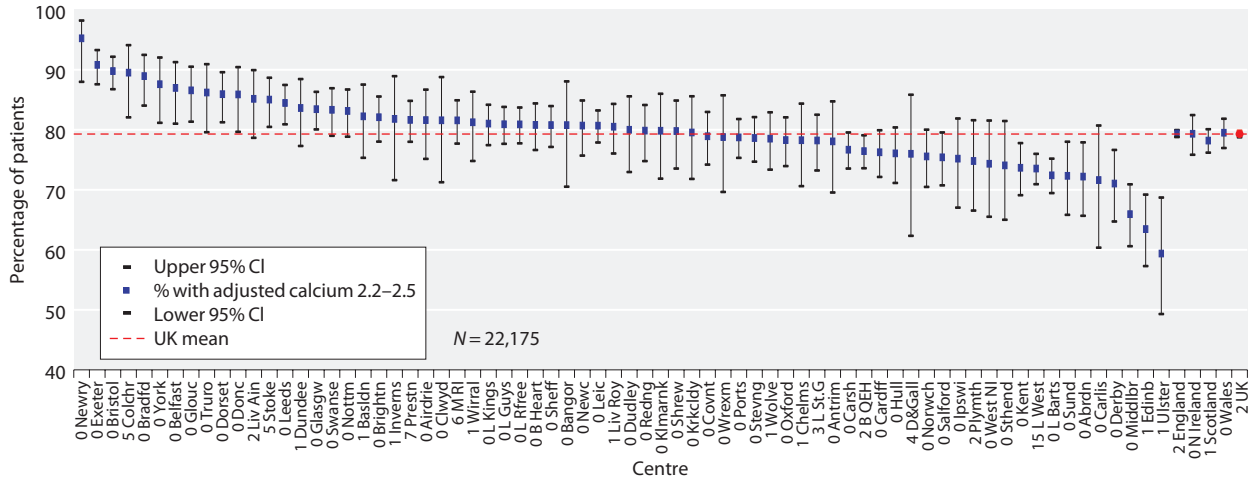

Fig. 8.15. Percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

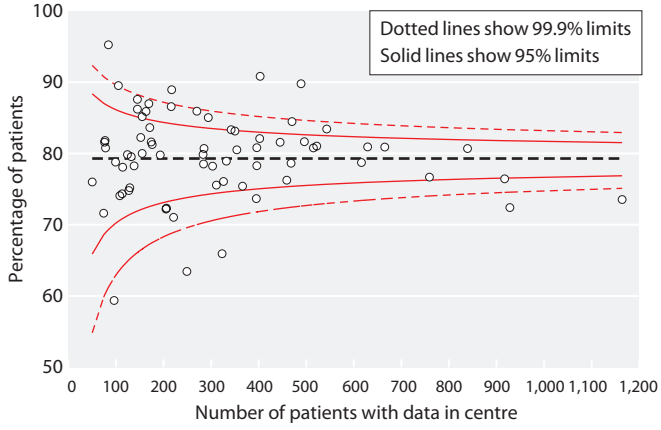

Fig. 8.16. Funnel plot of percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

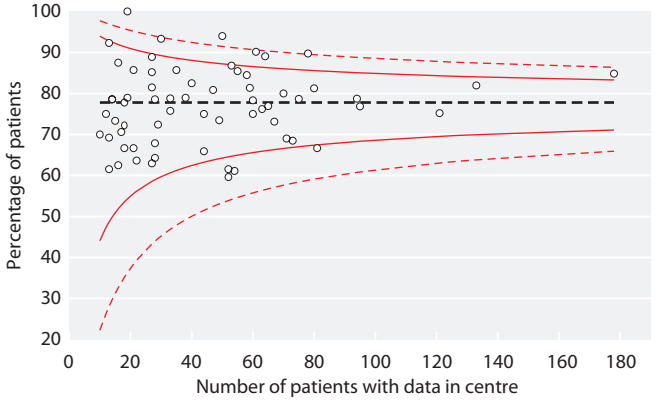

Fig. 8.18. Funnel plot of percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

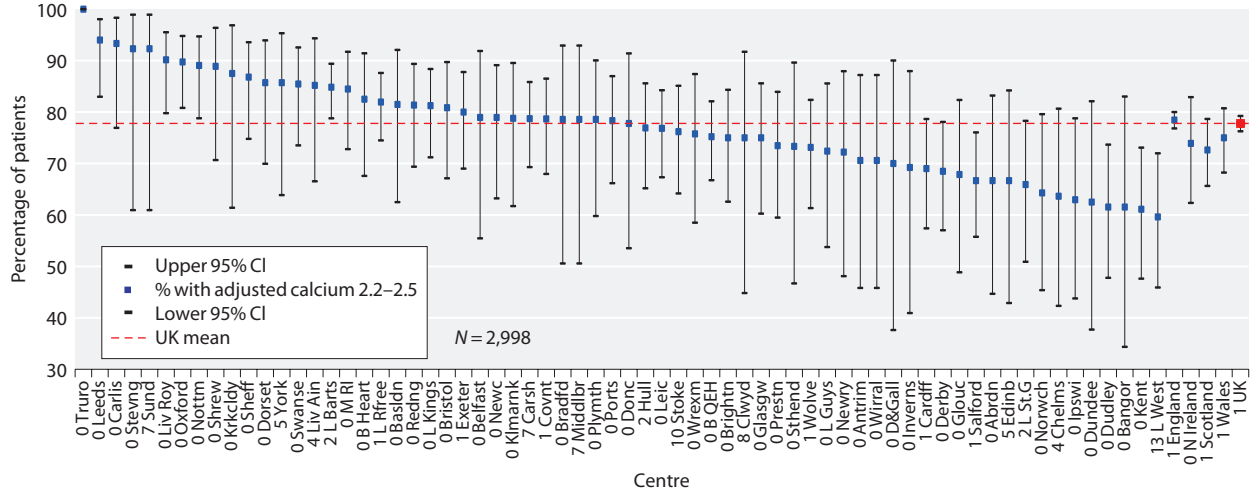

Fig. 8.17. Percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2015

Table 8.15. Summary statistics for adjusted calcium in peritoneal dialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	40	2.4	0.2	2.4	2.3	2.5
B QEH	100.0	121	2.3	0.2	2.3	2.2	2.5
Basldn	100.0	27	2.4	0.2	2.4	2.3	2.5
Bradfd	100.0	14	2.4	0.2	2.4	2.3	2.5
Brightn	100.0	60	2.4	0.2	2.4	2.3	2.5
Bristol	100.0	47	2.4	0.1	2.4	2.3	2.5
Camb[a]							
Carlis	100.0	30	2.3	0.1	2.3	2.2	2.3
Carsh	93.1	94	2.3	0.2	2.3	2.2	2.4
Chelms	95.7	22	2.3	0.2	2.3	2.2	2.4
Colchr[b]							
Covnt	98.7	75	2.4	0.2	2.3	2.2	2.4
Derby	100.0	73	2.5	0.1	2.5	2.4	2.6
Donc	100.0	18	2.4	0.2	2.4	2.3	2.5
Dorset	100.0	35	2.3	0.2	2.3	2.3	2.4
Dudley	100.0	52	2.5	0.2	2.5	2.4	2.6
Exeter	98.6	70	2.4	0.2	2.4	2.3	2.5
Glouc	100.0	28	2.4	0.2	2.4	2.3	2.5
Hull	98.5	65	2.4	0.1	2.4	2.3	2.5
Ipswi	100.0	27	2.3	0.2	2.3	2.2	2.4
Kent	100.0	54	2.5	0.1	2.5	2.4	2.6
L Barts	97.8	178	2.3	0.2	2.3	2.2	2.4
L Guys	100.0	29	2.4	0.1	2.4	2.3	2.5
L Kings	100.0	80	2.3	0.2	2.3	2.2	2.4
L Rfree	99.3	133	2.4	0.2	2.4	2.3	2.5
L St.G	97.8	44	2.5	0.2	2.5	2.4	2.6
L West	86.7	52	2.5	0.2	2.5	2.3	2.6
Leeds	100.0	50	2.4	0.1	2.4	2.3	2.4
Leic	100.0	95	2.4	0.2	2.4	2.3	2.5
Liv Ain	96.4	27	2.4	0.1	2.4	2.3	2.5
Liv Roy	100.0	61	2.4	0.1	2.3	2.3	2.4
M RI	100.0	58	2.4	0.2	2.4	2.3	2.5
Middlbr	93.3	14	2.2	0.2	2.2	2.2	2.3
Newc	100.0	38	2.4	0.2	2.4	2.3	2.5
Norwch	100.0	28	2.5	0.1	2.5	2.4	2.6
Nottm	100.0	64	2.4	0.2	2.4	2.3	2.5
Oxford	100.0	78	2.4	0.1	2.4	2.3	2.5
Plymth	100.0	28	2.3	0.2	2.3	2.2	2.4
Ports	100.0	60	2.4	0.2	2.4	2.3	2.5
Prestn	100.0	49	2.3	0.2	2.3	2.2	2.4
Redng	100.0	59	2.4	0.2	2.4	2.3	2.5
Salford	98.8	81	2.4	0.2	2.4	2.3	2.6
Sheff	100.0	53	2.3	0.1	2.3	2.2	2.4
Shrew	100.0	27	2.4	0.1	2.3	2.2	2.4
Stevng	100.0	13	2.3	0.1	2.3	2.2	2.4
Sthend	100.0	15	2.5	0.1	2.4	2.4	2.6
Stoke	90.0	63	2.4	0.2	2.4	2.3	2.5
Sund	92.9	13	2.4	0.1	2.4	2.3	2.4
Truro	100.0	19	2.4	0.1	2.4	2.3	2.4
Wirral	100.0	17	2.3	0.2	2.3	2.2	2.4
Wolve	98.5	67	2.4	0.2	2.4	2.3	2.4
York	95.5	21	2.4	0.1	2.5	2.3	2.5

Table 8.15. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	17	2.4	0.2	2.4	2.4	2.5
Belfast	100.0	19	2.4	0.2	2.4	2.2	2.4
Newry	100.0	18	2.4	0.1	2.4	2.4	2.5
Ulster	100.0	6					
West NI	100.0	9					
Scotland							
Abrdn	100.0	21	2.3	0.2	2.3	2.1	2.4
Airdrie	100.0	8					
D & Gall	100.0	10	2.4	0.2	2.4	2.2	2.5
Dundee	100.0	16	2.5	0.2	2.5	2.4	2.6
Edinb	94.7	18	2.5	0.1	2.5	2.4	2.6
Glasgw	100.0	44	2.4	0.2	2.4	2.3	2.5
Inverns	100.0	13	2.4	0.3	2.4	2.3	2.5
Klmarnk	100.0	33	2.4	0.2	2.4	2.3	2.5
Krkcldy	100.0	16	2.3	0.2	2.3	2.2	2.4
Wales							
Bangor	100.0	13	2.3	0.2	2.3	2.1	2.5
Cardff	98.6	71	2.4	0.2	2.5	2.3	2.5
Clwyd	92.3	12	2.5	0.2	2.5	2.5	2.5
Swanse	100.0	55	2.4	0.2	2.4	2.3	2.5
Wrexm	100.0	33	2.3	0.2	2.3	2.2	2.3
England	**98.5**	**2,566**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
N Ireland	**100.0**	**69**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Scotland	**99.4**	**179**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Wales	**98.9**	**184**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
UK	**98.7**	**2,998**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
[a]Cambridge renal centre was unable to submit adjusted calcium data for 2015
[b]n/a – no PD patients

Table 8.16. Percentage of peritoneal dialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2015

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 in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	40	82.5	67.6	91.4	7.5	10.0	−1.9	−19.1	15.4
B QEH	121	75.2	66.8	82.1	14.9	9.9	−7.7	−18.0	2.6
Basldn	27	81.5	62.5	92.1	3.7	14.8	1.5	−20.0	22.9
Bradfd	14	78.6	50.6	92.9	7.1	14.3	−8.1	−35.6	19.4
Brightn	60	75.0	62.6	84.3	10.0	15.0	−8.3	−23.1	6.5
Bristol	47	80.9	67.1	89.7	0.0	19.2	6.3	−9.8	22.4
Carlis	30	93.3	76.9	98.3	6.7	0.0	20.6	0.0	41.2
Carsh	94	78.7	69.3	85.8	10.6	10.6	−1.5	−12.6	9.7
Chelms	22	63.6	42.3	80.7	22.7	13.6	−25.8	−50.2	−1.4
Covnt	75	78.7	68.0	86.5	8.0	13.3	0.4	−12.5	13.2
Derby	73	68.5	57.0	78.1	0.0	31.5	−0.1	−15.3	15.1
Donc	18	77.8	53.5	91.4	5.6	16.7	−5.6	−29.9	18.8
Dorset	35	85.7	70.0	93.9	5.7	8.6	−7.8	−21.4	5.8
Dudley	52	61.5	47.8	73.7	1.9	36.5	−14.5	−32.2	3.3
Exeter	70	80.0	69.0	87.8	7.1	12.9	−10.4	−21.7	1.0
Glouc	28	67.9	48.9	82.4	14.3	17.9	−15.9	−36.9	5.1

Table 8.16. 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 in % within range from 2014	95% LCL change	95% UCL change
Hull	65	76.9	65.2	85.6	3.1	20.0	−0.3	−14.7	14.0
Ipswi	27	63.0	43.8	78.8	22.2	14.8	−10.4	−34.5	13.8
Kent	54	61.1	47.6	73.1	1.9	37.0	−6.1	−23.9	11.6
L Barts	178	84.8	78.8	89.4	11.2	3.9	9.0	1.0	17.1
L Guys	29	72.4	53.8	85.6	3.5	24.1	−27.6	−43.9	−11.3
L Kings	80	81.3	71.2	88.4	16.3	2.5	4.0	−8.6	16.6
L Rfree	133	82.0	74.5	87.6	9.0	9.0	0.7	−8.8	10.1
L St.G	44	65.9	50.9	78.3	0.0	34.1	−20.5	−37.7	−3.2
L West	52	59.6	45.9	72.0	0.0	40.4	3.4	−16.0	22.7
Leeds	50	94.0	83.0	98.1	2.0	4.0	2.2	−7.9	12.3
Leic	95	76.8	67.3	84.2	7.4	15.8	−5.7	−16.8	5.3
Liv Ain	27	85.2	66.5	94.3	0.0	14.8	13.3	−7.2	33.9
Liv Roy	61	90.2	79.8	95.5	3.3	6.6	8.5	−4.6	21.7
M RI	58	84.5	72.8	91.7	1.7	13.8	6.9	−7.3	21.1
Middlbr*	14	78.6	50.6	92.9	21.4	0.0			
Newc	38	79.0	63.2	89.1	5.3	15.8	0.4	−17.6	18.3
Norwch	28	64.3	45.4	79.6	0.0	35.7	4.3	−20.7	29.2
Nottm	64	89.1	78.8	94.7	4.7	6.3	15.5	2.7	28.2
Oxford	78	89.7	80.8	94.8	3.9	6.4	5.5	−5.1	16.1
Plymth	28	78.6	59.8	90.0	17.9	3.6	−11.4	−30.0	7.2
Ports	60	78.3	66.2	87.0	8.3	13.3	−7.2	−20.8	6.5
Prestn	49	73.5	59.5	83.9	14.3	12.2	−2.6	−20.1	14.8
Redng	59	81.4	69.4	89.4	5.1	13.6	−5.5	−18.6	7.5
Salford	81	66.7	55.8	76.0	1.2	32.1	−14.2	−28.1	−0.3
Sheff	53	86.8	74.8	93.6	5.7	7.6	−1.7	−14.3	10.9
Shrew	27	88.9	70.7	96.4	0.0	11.1	−3.1	−19.0	12.8
Stevng	13	92.3	60.9	98.9	7.7	0.0	3.9	−15.1	22.8
Sthend	15	73.3	46.7	89.6	0.0	26.7	−1.7	−32.5	29.2
Stoke	63	76.2	64.2	85.1	6.4	17.5	−1.3	−15.6	13.1
Sund	13	92.3	60.9	98.9	0.0	7.7	28.0	−1.0	57.0
Truro	19	100.0	0.0	100.0	0.0	0.0	22.2	3.0	41.4
Wirral	17	70.6	45.8	87.2	23.5	5.9	−16.1	−43.7	11.6
Wolve	67	73.1	61.3	82.4	13.4	13.4	−1.5	−16.2	13.1
York	21	85.7	63.9	95.3	0.0	14.3	−4.8	−24.3	14.8
N Ireland									
Antrim	17	70.6	45.8	87.2	11.8	17.7	−6.3	−37.9	25.2
Belfast	19	79.0	55.5	91.9	5.3	15.8	5.6	−23.3	34.5
Newry	18	72.2	48.1	87.9	5.6	22.2	0.8	−30.6	32.2
Scotland									
Abrdn	21	66.7	44.7	83.2	28.6	4.8	−2.6	−29.4	24.3
D & Gall	10	70.0	37.6	90.0	10.0	20.0	−8.6	−44.2	27.0
Dundee	16	62.5	37.7	82.1	0.0	37.5	−13.7	−43.6	16.2
Edinb	18	66.7	42.9	84.2	0.0	33.3	−7.0	−36.4	22.4
Glasgw	44	75.0	60.3	85.6	2.3	22.7	−8.3	−26.0	9.3
Inverns	13	69.2	40.9	88.0	7.7	23.1	−21.7	−52.0	8.6
Klmarnk	33	78.8	61.7	89.5	0.0	21.2	10.2	−10.5	31.0
Krkcldy	16	87.5	61.4	96.9	6.3	6.3	−4.8	−26.5	16.9
Wales									
Bangor	13	61.5	34.4	83.0	30.8	7.7	−11.8	−46.4	22.9
Cardff	71	69.0	57.4	78.7	7.0	23.9	−9.3	−23.8	5.3
Clwyd	12	75.0	44.8	91.7	8.3	16.7	−5.0	−39.9	29.9
Swanse	55	85.5	73.5	92.6	5.5	9.1	−0.3	−13.8	13.3
Wrexm	33	75.8	58.5	87.4	21.2	3.0	−15.5	−34.2	3.1
England	**2,566**	**78.5**	**76.8**	**80.0**	**7.2**	**14.4**	**−1.4**	**−3.6**	**0.8**
N Ireland	**69**	**73.9**	**62.3**	**82.9**	**8.7**	**17.4**	**−1.5**	**−16.8**	**13.7**
Scotland	**179**	**72.6**	**65.6**	**78.7**	**6.2**	**21.2**	**−4.3**	**−13.2**	**4.7**
Wales	**184**	**75.0**	**68.2**	**80.7**	**10.9**	**14.1**	**−6.9**	**−15.5**	**1.6**
UK	**2,998**	**77.8**	**76.3**	**79.2**	**7.4**	**14.8**	**−1.9**	**−4.0**	**0.1**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

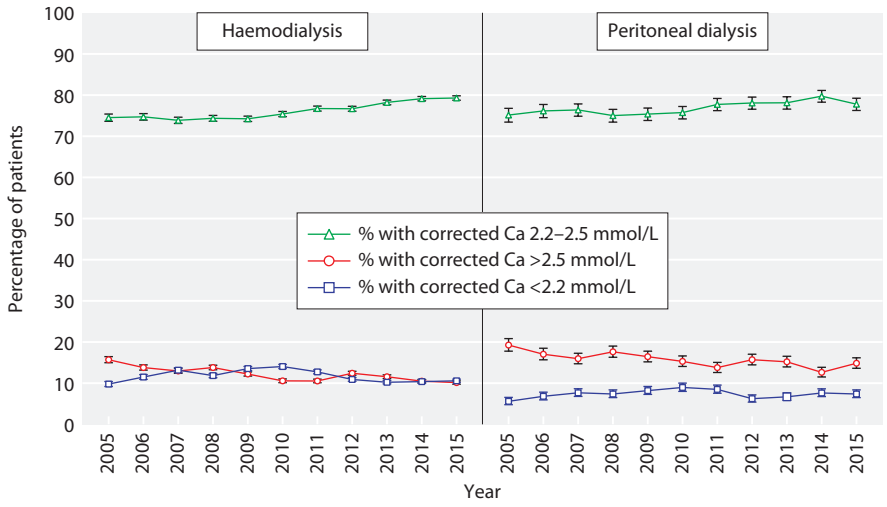

Fig. 8.19. Longitudinal change in percentage of patients with adjusted calcium <2.2 mmol/L, 2.2–2.5 mmol/L and >2.5 mmol/L by dialysis modality 2005–2015

Phosphate

In 2015 the following Renal Association clinical practice guideline regarding phosphate management was applicable:

Guideline 3.2 CKD-MBD: Serum phosphate in dialysis patients

'We suggest that serum phosphate in dialysis patients, measured before a "short-gap" dialysis session in haemodialysis patients, should be maintained between 1.1 and 1.7 mmol/L (2C)' [3]

For those receiving HD, 57.1% of patients achieved a phosphate level between 1.1–1.7 mmol/L, the guideline

Table 8.17. Percentage of haemodialysis patients with serum phosphate within, below or above the target range of 1.1–1.7 mmol/L, as specified in the RA guidelines, by centre in 2015

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	396	54.8	49.9	59.6	10.6	34.6	−0.3	−14.4	13.8
B QEH	905	62.7	59.5	65.8	14.6	22.8	−1.1	−13.6	11.5
Basldn	152	54.0	46.0	61.7	17.1	29.0	−2.2	−17.6	13.2
Bradfd	217	57.6	50.9	64.0	17.5	24.9	2.5	−12.2	17.2
Brightn	401	56.4	51.5	61.1	10.2	33.4	−2.1	−16.0	11.8
Bristol	489	60.5	56.1	64.8	10.8	28.6	4.3	−9.0	17.5
Carlis	74	52.7	41.4	63.8	16.2	31.1	−3.0	−21.3	15.2
Carsh	759	60.0	56.4	63.4	14.5	25.6	−2.4	−15.5	10.7
Chelms	138	52.2	43.9	60.4	12.3	35.5	−11.9	−27.7	3.9
Colchr	105	67.6	58.1	75.9	9.5	22.9	9.5	−5.6	24.6
Covnt	332	57.5	52.2	62.7	9.0	33.4	−2.4	−16.3	11.6
Derby	221	58.4	51.8	64.7	16.7	24.9	0.3	−14.1	14.7
Donc	163	63.8	56.2	70.8	8.0	28.2	−1.3	−15.4	12.9
Dorset	270	65.9	60.1	71.3	13.7	20.4	1.3	−11.9	14.4
Dudley	155	62.6	54.7	69.8	11.0	26.5	0.1	−14.4	14.5
Exeter	403	60.6	55.7	65.2	14.4	25.1	−0.2	−13.6	13.3
Glouc	216	59.7	53.1	66.1	10.2	30.1	−5.3	−19.6	8.9
Hull	326	57.4	51.9	62.6	12.0	30.7	−6.1	−20.1	7.9
Ipswi	129	58.1	49.5	66.3	22.5	19.4	3.4	−12.4	19.1
Kent	395	54.9	50.0	59.8	7.3	37.7	−2.7	−16.8	11.4
L Barts	928	51.5	48.3	54.7	16.7	31.8	3.3	−10.7	17.4

Table 8.17. Continued

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
L Guys	629	54.9	50.9	58.7	17.7	27.5	0.4	−13.6	14.4
L Kings	522	61.7	57.4	65.8	17.1	21.3	−5.2	−18.2	7.8
L Rfree	665	58.7	54.9	62.3	15.0	26.3	2.1	−11.2	15.4
L St.G	303	54.5	48.8	60.0	23.4	22.1	−5.4	−19.8	9.0
L West	1,259	57.9	55.2	60.6	18.5	23.6	2.9	−10.3	16.0
Leeds	470	54.7	50.2	59.1	13.2	32.1	2.4	−11.6	16.3
Leic	839	55.1	51.7	58.4	13.0	31.9	−1.2	−14.8	12.5
Liv Ain	155	58.1	50.2	65.6	27.1	14.8	6.1	−9.0	21.2
Liv Roy	354	58.5	53.3	63.5	13.3	28.3	3.8	−10.0	17.6
M RI*	445	51.9	47.3	56.5	16.6	31.5	−2.4	−16.7	12.0
Middlbr	323	57.9	52.4	63.2	8.4	33.8	1.0	−13.0	15.0
Newc	285	57.9	52.1	63.5	11.2	30.9	−1.1	−15.3	13.0
Norwch	311	65.0	59.5	70.1	12.5	22.5	2.3	−10.8	15.4
Nottm	350	64.6	59.4	69.4	14.6	20.9	8.0	−5.1	21.1
Oxford	396	49.2	44.3	54.2	14.4	36.4	−0.6	−15.3	14.0
Plymth	127	60.6	51.9	68.7	9.5	29.9	1.7	−13.5	16.9
Ports	615	50.4	46.5	54.4	12.7	36.9	−0.3	−14.7	14.1
Prestn	531	57.1	52.8	61.2	8.9	34.1	3.7	−10.0	17.3
Redng	283	59.4	53.5	64.9	12.0	28.6	−7.8	−21.7	6.1
Salford*	366	52.5	47.3	57.5	17.8	29.8	2.2	−12.2	16.6
Sheff	515	60.6	56.3	64.7	11.8	27.6	0.4	−12.7	13.5
Shrew	193	58.6	51.5	65.3	9.3	32.1	−1.8	−16.5	12.9
Stevng	468	56.0	51.5	60.4	9.8	34.2	−4.8	−18.6	9.1
Sthend	108	52.8	43.4	62.0	12.0	35.2	−5.4	−21.6	10.8
Stoke	300	55.0	49.3	60.5	16.0	29.0	−6.8	−21.1	7.5
Truro	145	63.5	55.3	70.9	11.0	25.5	−4.0	−18.5	10.6
Wirral	176	51.1	43.8	58.4	21.0	27.8	−0.7	−16.1	14.6
Wolve	284	48.6	42.8	54.4	23.2	28.2	−4.4	−19.5	10.7
York	145	60.0	51.8	67.7	25.5	14.5	−2.9	−18.1	12.3
N Ireland									
Antrim	114	61.4	52.2	69.9	20.2	18.4	1.9	−13.5	17.4
Belfast	169	46.2	38.8	53.7	23.7	30.2	−2.0	−17.8	13.8
Newry	84	59.5	48.8	69.5	9.5	31.0	2.5	−13.9	19.0
Ulster	97	60.8	50.8	70.0	13.4	25.8	2.3	−13.7	18.3
West NI	113	61.1	51.8	69.6	3.5	35.4	5.1	−10.8	20.9
Scotland									
Abrdn	205	59.0	52.2	65.6	18.5	22.4	0.4	−14.2	14.9
Airdrie	174	56.3	48.9	63.5	20.7	23.0	−3.0	−17.9	11.9
D & Gall	49	63.3	49.1	75.5	6.1	30.6	9.9	−9.1	29.0
Dundee	171	50.3	42.9	57.7	7.6	42.1	−2.5	−18.1	13.2
Edinb	247	53.9	47.6	60.0	7.3	38.9	0.8	−13.9	15.4
Glasgw	535	53.1	48.8	57.3	8.8	38.1	−1.8	−15.9	12.4
Inverns	77	49.4	38.4	60.4	9.1	41.6	−7.4	−25.4	10.7
Klmarnk	124	58.1	49.2	66.4	20.2	21.8	2.0	−13.4	17.4
Krkcldy	132	60.6	52.0	68.6	10.6	28.8	−3.7	−18.6	11.2
Wales									
Bangor	78	65.4	54.2	75.1	12.8	21.8	−0.4	−16.4	15.5
Cardff	459	59.7	55.1	64.1	13.1	27.2	1.7	−11.7	15.1
Clwyd	76	52.6	41.5	63.5	9.2	38.2	0.8	−16.3	17.9
Swanse	342	62.3	57.0	67.3	14.3	23.4	−3.3	−16.6	10.1
Wrexm	99	53.5	43.7	63.1	36.4	10.1	−2.3	−18.8	14.1
England	**18,736**	**57.2**	**56.5**	**57.9**	**14.3**	**28.6**	**−0.4**	**−13.2**	**12.5**
N Ireland	**577**	**56.5**	**52.4**	**60.5**	**15.3**	**28.3**	**1.8**	**−11.8**	**15.5**
Scotland	**1,714**	**55.0**	**52.7**	**57.4**	**11.7**	**33.3**	**−1.2**	**−14.6**	**12.2**
Wales	**1,054**	**59.9**	**56.9**	**62.8**	**15.4**	**24.8**	**−0.3**	**−13.2**	**12.6**
UK	**22,081**	**57.1**	**56.5**	**57.8**	**14.1**	**28.7**	**−0.4**	**−13.2**	**12.5**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

*Salford and Manchester RI have been involved in the SPIRiT study – an RCT comparing low phosphate control (0.8 to 1.4 mmol/L) with high phosphate group control (1.8 to 2.4 mmol/L); HD patients only were recruited

Table 8.18. Percentage of peritoneal dialysis patients within, below and above the range specified in the RA guideline for phosphate (1.1–1.7 mmol/L) in 2015

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	40	50.0	35.0	65.0	10.0	40.0	−3.1	−26.3	20.1
B QEH	121	56.2	47.3	64.8	6.6	37.2	−6.7	−19.2	5.7
Basldn	27	59.3	40.3	75.8	7.4	33.3	3.3	−23.6	30.1
Bradfd	14	35.7	15.7	62.4	7.1	57.1	−1.8	−36.3	32.7
Brightn	60	68.3	55.6	78.8	0.0	31.7	−3.9	−20.7	12.9
Bristol	47	63.8	49.3	76.2	4.3	31.9	9.3	−9.7	28.3
Carlis	30	63.3	45.1	78.4	13.3	23.3	−9.4	−34.8	16.0
Carsh	93	58.1	47.8	67.6	9.7	32.3	−3.2	−16.7	10.3
Chelms	22	40.9	22.8	61.8	13.6	45.5	−9.1	−40.0	21.8
Covnt	74	67.6	56.2	77.2	13.5	18.9	−5.9	−20.3	8.6
Derby	73	67.1	55.6	76.9	11.0	21.9	2.8	−12.7	18.4
Donc	18	83.3	59.1	94.5	0.0	16.7	20.8	−5.1	46.7
Dorset	35	77.1	60.5	88.1	5.7	17.1	9.8	−9.7	29.2
Dudley	52	69.2	55.5	80.2	1.9	28.9	31.2	12.8	49.6
Exeter	70	72.9	61.3	82.0	7.1	20.0	3.0	−11.4	17.3
Glouc	28	60.7	42.0	76.7	7.1	32.1	−1.5	−25.4	22.5
Hull	65	58.5	46.2	69.7	6.2	35.4	−8.2	−24.7	8.3
Ipswi	27	63.0	43.8	78.8	14.8	22.2	−3.7	−28.5	21.1
Kent	54	66.7	53.2	77.9	7.4	25.9	9.8	−8.1	27.7
L Barts	179	60.3	53.0	67.2	10.1	29.6	−1.8	−11.7	8.2
L Guys	29	65.5	46.9	80.3	3.5	31.0	0.5	−26.6	27.7
L Kings	80	58.8	47.7	69.0	8.8	32.5	−12.1	−26.9	2.6
L Rfree	133	60.9	52.4	68.8	6.0	33.1	4.0	−8.1	16.0
L St.G	44	65.9	50.9	78.3	11.4	22.7	6.8	−13.4	27.0
L West	52	63.5	49.7	75.3	7.7	28.9	1.0	−18.0	19.9
Leeds	50	48.0	34.6	61.7	8.0	44.0	−13.2	−32.7	6.2
Leic	95	59.0	48.8	68.4	7.4	33.7	4.8	−8.8	18.4
Liv Ain	27	59.3	40.3	75.8	7.4	33.3	6.1	−19.2	31.5
Liv Roy	61	54.1	41.6	66.1	11.5	34.4	−13.3	−31.4	4.9
M RI	58	51.7	39.0	64.2	8.6	39.7	−13.8	−31.5	3.9
Middlbr*	14	71.4	44.0	88.9	7.1	21.4			
Newc	38	60.5	44.5	74.6	5.3	34.2	10.5	−11.2	32.2
Norwch	28	60.7	42.0	76.7	3.6	35.7	4.0	−21.3	29.4
Nottm	64	71.9	59.7	81.5	6.3	21.9	4.8	−10.6	20.2
Oxford	78	61.5	50.4	71.6	3.9	34.6	−5.6	−20.7	9.5
Plymth	28	64.3	45.4	79.6	17.9	17.9	−19.0	−41.2	3.2
Ports	59	54.2	41.5	66.4	3.4	42.4	−0.6	−18.3	17.1
Prestn	49	65.3	51.1	77.2	12.2	22.5	−8.6	−27.0	9.8
Redng	59	78.0	65.7	86.8	5.1	17.0	7.5	−8.1	23.1
Salford	81	56.8	45.9	67.1	3.7	39.5	2.4	−13.6	18.4
Sheff	53	66.0	52.4	77.4	5.7	28.3	−14.7	−31.4	1.9
Shrew	27	66.7	47.3	81.7	3.7	29.6	10.7	−15.7	37.0
Stevng	13	46.2	22.4	71.8	0.0	53.9	−38.5	−68.9	−8.0
Sthend	15	66.7	40.6	85.4	13.3	20.0	16.7	−17.5	50.9
Stoke	69	66.7	54.8	76.7	2.9	30.4	−0.9	−16.5	14.6
Sund	13	46.2	22.4	71.8	7.7	46.2	−3.9	−41.5	33.8
Truro	19	63.2	40.3	81.3	15.8	21.1	−14.6	−43.6	14.4
Wirral	17	47.1	25.5	69.7	0.0	52.9	20.4	−12.2	53.0
Wolve	67	67.2	55.1	77.3	11.9	20.9	9.4	−6.7	25.5
York	21	57.1	36.0	76.0	14.3	28.6	0.0	−29.9	29.9

Table 8.18. Continued

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
N Ireland									
Antrim	17	58.8	35.2	79.0	11.8	29.4	−2.7	−38.0	32.6
Belfast	19	63.2	40.3	81.3	10.5	26.3	9.8	−23.5	43.1
Newry	18	83.3	59.1	94.5	11.1	5.6	4.8	−22.8	32.3
Scotland									
Abrdn	21	42.9	24.0	64.0	4.8	52.4	−14.8	−43.3	13.6
D & Gall	10	40.0	15.8	70.3	20.0	40.0	−10.0	−51.5	31.5
Dundee	16	56.3	32.4	77.5	12.5	31.3	−19.9	−50.3	10.4
Edinb	18	61.1	37.9	80.2	11.1	27.8	−15.4	−45.6	14.9
Glasgw	44	61.4	46.4	74.5	6.8	31.8	−1.5	−23.0	20.0
Inverns	13	46.2	22.4	71.8	7.7	46.2	−17.5	−56.8	21.8
Klmarnk	33	39.4	24.4	56.7	3.0	57.6	−14.9	−38.4	8.6
Krkcldy	16	68.8	43.3	86.4	0.0	31.3	30.3	−4.6	65.2
Wales									
Bangor	13	46.2	22.4	71.8	7.7	46.2	−0.5	−37.6	36.5
Cardff	70	62.9	51.0	73.3	1.4	35.7	−6.7	−22.4	9.0
Clwyd	13	53.9	28.2	77.6	15.4	30.8	−6.2	−46.8	34.5
Swanse	55	58.2	44.9	70.4	10.9	30.9	−1.0	−20.0	18.0
Wrexm	33	57.6	40.5	73.0	3.0	39.4	1.1	−25.3	27.4
England	**2,570**	**61.9**	**60.0**	**63.7**	**7.6**	**30.6**	**−0.7**	**−3.3**	**2.0**
N Ireland	**69**	**71.0**	**59.3**	**80.5**	**10.1**	**18.8**	**2.6**	**−13.5**	**18.7**
Scotland	**179**	**52.5**	**45.2**	**59.7**	**7.3**	**40.2**	**−9.1**	**−19.3**	**1.2**
Wales	**184**	**58.7**	**51.5**	**65.6**	**6.0**	**35.3**	**−3.3**	**−13.6**	**6.9**
UK	**3,002**	**61.3**	**59.6**	**63.1**	**7.5**	**31.2**	**−1.2**	**−3.7**	**1.2**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness
*Blank cells indicate no data for 2014

specified by the RA (as opposed to the audit measure), and for those on PD this was 61.3% (tables 8.17, 8.18).

There was inter-centre and inter-modality variation in the proportion of patients within the phosphate target range specified by the clinical guideline (figures 8.20–8.23, tables 8.17, 8.18).

Funnel plots for HD patients with phosphate within the target range (1.1–1.7 mmol/L), show one centre (Birmingham Queen Elizabeth) attaining this standard in a significantly high proportion of patients (being above the 99.9% upper confidence interval following correction for centre size). In addition, two centres had achieved the serum phosphate control standard in a lower than expected proportion of patients (being below the lower 99.9% confidence interval): Portsmouth and London St Bartholomew's (figure 8.21). Differences in outlier status can be seen when this guideline target measure is applied compared to the audit measure of phosphate <1.7 mmol/L, namely fewer centres are found to be outliers.

The funnel plot for PD patients indicated that the control of phosphate levels was similar in all centres. No significant outliers were identified (figure 8.23).

Longitudinal analysis demonstrated a stable performance against the clinical guideline recommendation for those receiving HD and PD (figure 8.24).

Parathyroid hormone

At the beginning of 2015 the following RA guideline for PTH applied:

Guideline 4.2.1 CKD-MBD: Target range of serum PTH in patients on dialysis

'We suggest that the target range for parathyroid hormone measured using an intact PTH assay should be between 2 and 9 times the upper limit of normal for the assay used (2C)' [3].

PTH results from 18,880 HD patients and 2,412 PD patients from England, Northern Ireland and Wales

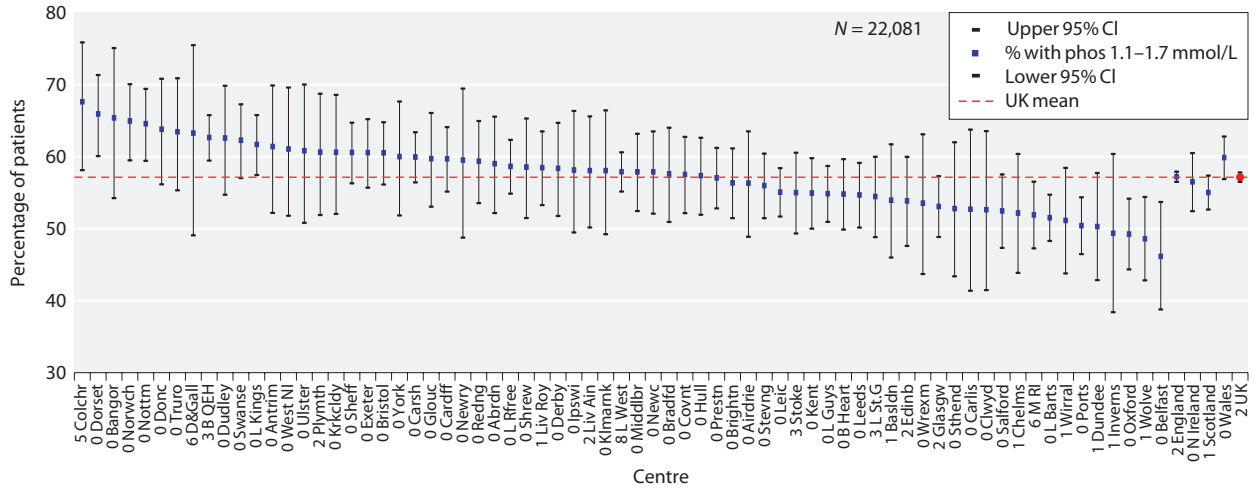

Fig. 8.20. Percentage of haemodialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

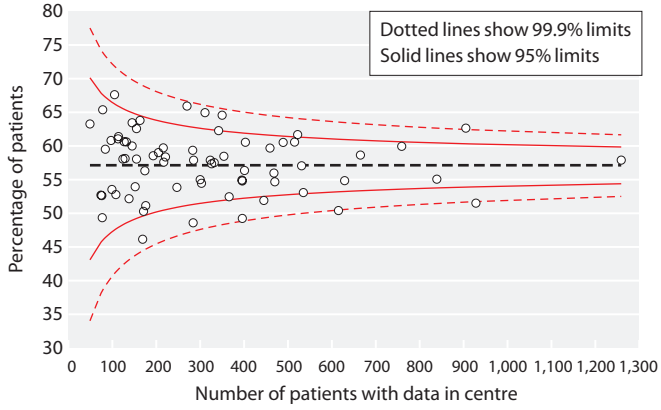

Fig. 8.21. Funnel plot of percentage of haemodialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

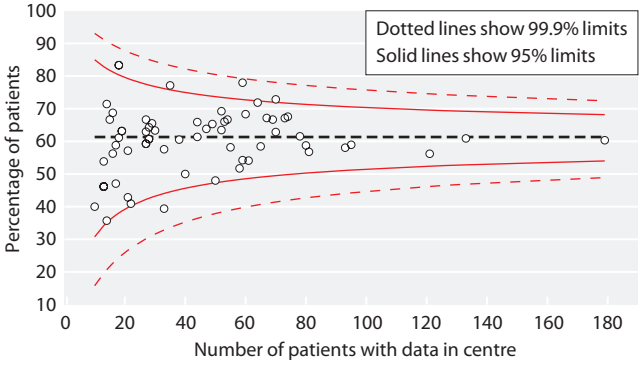

Fig. 8.23. Funnel plot of percentage of peritoneal dialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

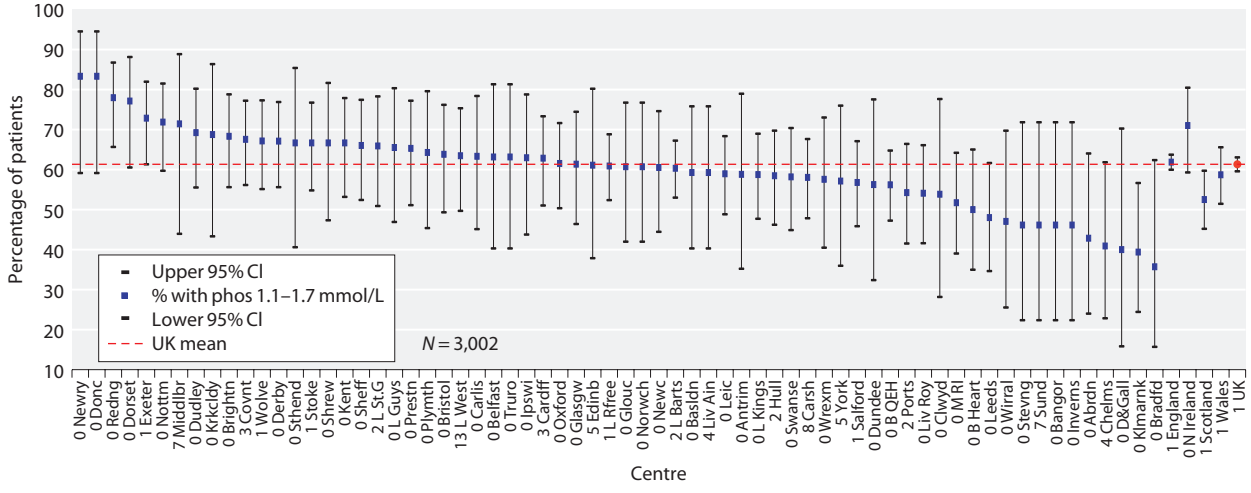

Fig. 8.22. Percentage of peritoneal dialysis patients with phosphate within the range specified by the RA guideline (1.1–1.7 mmol/L) by centre in 2015

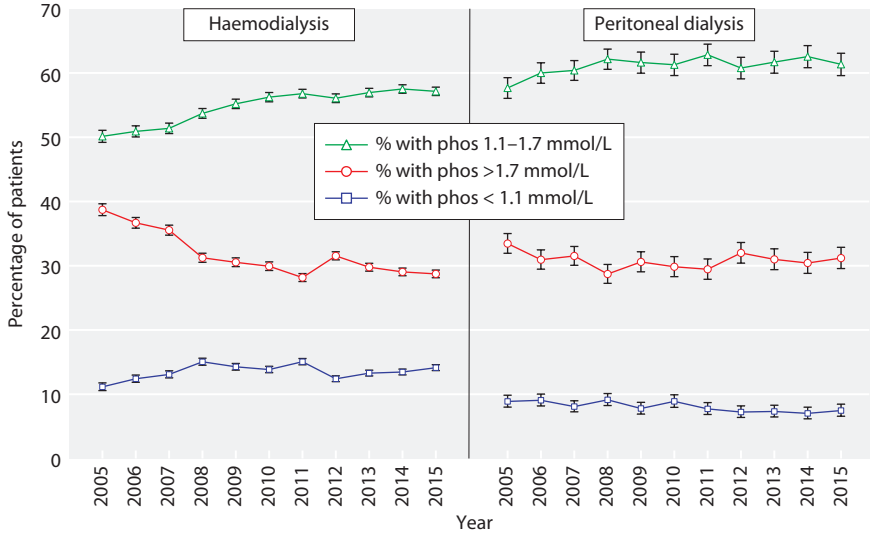

Fig. 8.24. Longitudinal change in percentage of patients with phosphate below, within and above the RA guideline by dialysis modality 2005–2015

were available for analysis from 2015. The data were 90.8% complete for HD patients and 84.4% for PD patients overall, although there was between centre variation (tables 8.19, 8.21). For the analyses, Birmingham Queen Elizabeth, Salford, Sheffield and Cambridge were excluded due to poor data completeness (including 0% returns from Cambridge for HD and PD patients and 0% returns from Salford for PD patients).

From 2004 to 2015 across the three countries, data completeness for PTH increased from 76.6% to 90.8% in HD patients, although this latest figure represents a 3% fall compared to 2014. For PD patients, the improvement in data completeness has been less marked: from 80.1% to 84.4% during 2004–2015 and this latest figure represents a fall from 91.7% in 2014.

Median PTH amongst HD patients was 32 pmol/L (IQR 16–60 pmol/L) and amongst PD patients was 30 pmol/L (IQR 17–53 pmol/L) for the three countries.

Of HD patients, 56.8% (95% CI 56.1–57.5%) and of PD patients, 63.6% (95% CI 61.6–65.5%) achieved a PTH between 16–72 pmol/L (tables 8.20, 8.22, figures 8.25, 8.27).

Table 8.19. Summary statistics for PTH in haemodialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	99.0	393	51.8	47.5	40	21	68
B QEH	40.7	380					
Basldn	98.0	150	43.7	35.9	33	18	59
Bradfd	98.2	213	39.1	40.2	26	13	47
Brightn	98.3	395	43.2	43.9	30	15	55
Bristol	99.2	485	39.2	40.0	28	14	51
Camb*							
Carlis	97.3	72	28.5	26.3	24	10	37
Carsh	96.2	732	66.8	63.0	47	25	89
Chelms	99.3	138	46.9	41.4	33	19	62
Colchr	94.6	105	31.0	33.0	21	12	37
Covnt	99.4	330	34.6	38.8	23	12	43
Derby	99.6	221	38.8	36.6	31	18	48
Donc	99.4	162	59.6	48.1	46	27	74
Dorset	99.6	269	30.0	33.5	20	11	37
Dudley	97.4	151	37.2	35.6	27	11	54
Exeter	98.8	398	20.4	20.3	15	7	26
Glouc	95.4	206	35.9	38.9	25	13	49
Hull	99.1	324	46.4	51.5	31	14	60

Table 8.19. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
Ipswi	99.2	128	26.7	25.0	20	13	33
Kent	98.5	391	62.9	49.3	48	29	76
L Barts	98.8	917	52.2	50.3	38	21	67
L Guys	99.1	623	57.8	55.8	44	21	77
L Kings	97.5	509	42.1	45.0	27	12	57
L Rfree	99.4	661	40.9	37.9	31	18	53
L St.G	92.6	288	53.5	51.4	40	19	69
L West	76.3	1,047	69.5	65.6	50	23	91
Leeds	99.2	466	38.6	43.2	24	12	48
Leic	98.1	823	45.5	49.0	29	12	63
Liv Ain	90.5	143	18.5	23.5	11	5	24
Liv Roy	79.5	283	38.4	36.6	28	12	54
M RI	89.7	426	49.9	52.5	34	18	64
Middlbr	97.5	315	51.7	50.2	36	20	64
Newc	99.7	284	48.1	42.6	37	18	66
Norwch	97.1	303	37.8	36.7	30	14	52
Nottm	97.4	341	40.7	38.9	30	16	53
Oxford	98.2	391	54.1	49.7	40	21	73
Plymth	93.8	121	47.2	48.2	32	18	61
Ports	98.1	605	54.5	56.4	38	21	67
Prestn	99.8	530	44.7	43.1	33	16	59
Redng	100.0	283	44.0	36.7	33	21	58
Salford	30.5	112					
Sheff	44.1	228					
Shrew	97.9	189	43.1	37.7	29	15	65
Stevng	97.9	458	53.8	39.0	48	29	76
Sthend	88.9	96	65.3	58.2	45	20	97
Stoke	85.7	264	48.4	44.2	38	21	62
Sund	97.6	201	49.4	53.5	32	15	60
Truro	98.6	143	22.8	22.4	15	7	33
Wirral	96.1	170	36.3	25.9	29	18	46
Wolve	94.4	270	41.7	51.1	26	11	52
York	97.2	141	26.0	30.7	14	6	37
N Ireland							
Antrim	100.0	114	34.5	35.6	27	14	39
Belfast	97.6	165	34.3	42.1	21	10	47
Newry	100.0	84	29.6	22.7	24	15	35
Ulster	97.9	95	30.0	30.7	21	10	37
West NI	99.1	112	31.6	26.0	24	13	46
Wales							
Bangor	100.0	78	30.9	32.4	22	13	38
Cardff	97.2	447	44.8	44.1	35	19	55
Clwyd	97.4	74	33.6	34.9	23	10	47
Swanse	99.4	340	38.0	38.1	27	15	49
Wrexm	98.0	97	30.0	41.1	16	5	35
England	**90.1**	**17,274**	**47.1**	**48.1**	**33**	**16**	**62**
N Ireland	**98.8**	**570**	**32.4**	**33.6**	**23**	**12**	**40**
Wales	**98.2**	**1,036**	**39.3**	**40.8**	**29**	**15**	**50**
E, W & NI	**90.8**	**18,880**	**46.3**	**47.4**	**32**	**16**	**60**

Blank cells: centres excluded from analysis due to low patient numbers or poor data completeness
*Cambridge renal centre was unable to submit PTH data for 2015

Table 8.20. Percentage of haemodialysis patients within, below and above the range for PTH (16–72 pmol/L) in 2015

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	393	59.0	54.1	63.8	18.6	22.4	3.8	−3.1	10.7
Basldn	150	58.0	50.0	65.6	22.7	19.3	−1.0	−12.0	10.1
Bradfd	213	54.0	47.3	60.6	31.0	15.0	−2.0	−11.7	7.7
Brightn	395	56.5	51.5	61.3	25.6	18.0	0.8	−6.2	7.7
Bristol	485	56.1	51.6	60.4	28.0	15.9	−3.1	−9.3	3.2
Carlis	72	55.6	44.0	66.6	36.1	8.3	3.9	−13.2	21.0
Carsh	732	52.6	49.0	56.2	14.6	32.8	−4.8	−10.0	0.4
Chelms	138	63.0	54.7	70.7	17.4	19.6	−6.8	−18.2	4.6
Colchr	105	58.1	48.5	67.1	33.3	8.6	−0.7	−14.1	12.7
Covnt	330	51.8	46.4	57.2	36.1	12.1	0.6	−7.1	8.3
Derby	221	73.3	67.1	78.7	17.2	9.5	−3.2	−11.3	4.9
Donc	162	62.4	54.7	69.5	11.7	25.9	−12.4	−22.3	−2.4
Dorset	269	52.4	46.4	58.3	39.0	8.6	2.2	−6.3	10.8
Dudley	151	55.0	47.0	62.7	31.8	13.3	1.4	−9.7	12.6
Exeter	398	43.7	38.9	48.6	53.0	3.3	1.4	−5.6	8.3
Glouc	206	59.2	52.4	65.7	30.6	10.2	−0.5	−10.0	9.0
Hull	324	53.7	48.3	59.1	28.1	18.2	0.1	−7.8	8.0
Ipswi	128	60.2	51.5	68.3	35.2	4.7	1.9	−10.5	14.3
Kent	391	60.1	55.2	64.8	9.0	31.0	−6.1	−13.0	0.7
L Barts	917	62.2	59.0	65.2	16.6	21.3	−3.4	−7.8	1.0
L Guys	623	52.3	48.4	56.2	18.8	28.9	−0.6	−6.9	5.7
L Kings	509	49.3	45.0	53.7	33.4	17.3	−2.3	−8.5	3.9
L Rfree	661	65.5	61.8	69.0	21.5	13.0	3.7	−1.5	8.9
L St.G	288	55.6	49.8	61.2	21.2	23.3	4.8	−3.5	13.1
L West	1,047	49.0	46.0	52.0	16.1	34.9	−0.7	−5.1	3.6
Leeds	466	54.1	49.5	58.6	30.9	15.0	−0.7	−7.1	5.7
Leic	823	49.9	46.5	53.4	30.4	19.7	−1.2	−6.1	3.6
Liv Ain	143	37.1	29.6	45.3	60.8	2.1	−1.0	−12.2	10.1
Liv Roy	283	51.2	45.4	57.0	33.2	15.6	−4.4	−12.3	3.5
M RI	426	59.4	54.7	64.0	20.2	20.4	2.1	−4.6	8.8
Middlbr	315	62.5	57.1	67.7	17.8	19.7	5.0	−2.8	12.8
Newc	284	59.2	53.3	64.7	20.4	20.4	−1.4	−9.6	6.8
Norwch	303	62.7	57.1	68.0	27.1	10.2	−0.9	−8.6	6.8
Nottm	341	61.3	56.0	66.3	24.1	14.7	2.5	−4.9	9.8
Oxford	391	58.6	53.6	63.4	15.6	25.8	0.0	−6.9	6.8
Plymth	121	60.3	51.4	68.6	21.5	18.2	4.3	−8.0	16.6
Ports	605	60.7	56.7	64.5	17.4	22.0	2.1	−3.7	7.8
Prestn	530	57.9	53.7	62.1	24.0	18.1	−0.3	−6.2	5.7
Redng	283	66.8	61.1	72.0	18.7	14.5	1.1	−6.8	9.0
Shrew	189	54.0	46.8	61.0	25.9	20.1	−3.0	−13.3	7.2
Stevng	458	63.3	58.8	67.6	10.9	25.8	−3.4	−9.7	2.8
Sthend	96	49.0	39.1	58.9	17.7	33.3	−8.6	−22.3	5.1
Stoke	264	65.2	59.2	70.7	17.4	17.4	5.2	−3.2	13.7
Sund	201	53.7	46.8	60.5	25.9	20.4	3.7	−6.2	13.6
Truro	143	45.5	37.5	53.7	50.4	4.2	−2.3	−14.1	9.4
Wirral	170	67.7	60.3	74.3	21.2	11.2	5.3	−4.6	15.2
Wolve	270	50.4	44.4	56.3	34.1	15.6	0.0	−8.3	8.4
York	141	41.1	33.3	49.4	50.4	8.5	−5.0	−17.2	7.1
N Ireland									
Antrim	114	64.0	54.8	72.3	28.1	7.9	−9.8	−21.8	2.2
Belfast	165	52.7	45.1	60.2	37.6	9.7	6.8	−3.7	17.2
Newry	84	66.7	56.0	75.9	26.2	7.1	9.0	−5.5	23.6
Ulster	95	56.8	46.7	66.4	36.8	6.3	4.7	−9.5	18.9
West NI	112	60.7	51.4	69.3	32.1	7.1	1.7	−11.5	14.9

Table 8.20. Continued

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Wales									
Bangor	78	56.4	45.3	66.9	35.9	7.7	–4.4	–19.7	11.0
Cardff	447	64.9	60.3	69.2	19.2	15.9	5.0	–1.4	11.3
Clwyd	74	54.1	42.7	65.0	35.1	10.8	1.6	–14.2	17.3
Swanse	340	62.7	57.4	67.6	25.6	11.8	–3.6	–11.6	4.4
Wrexm	97	42.3	32.9	52.3	48.5	9.3	–12.9	–26.9	1.0
England	**17,274**	**56.5**	**55.7**	**57.2**	**24.0**	**19.5**	–0.9	–1.9	0.2
N Ireland	**570**	**59.3**	**55.2**	**63.3**	**32.8**	**7.9**	3.0	–2.8	8.7
Wales	**1,036**	**60.6**	**57.6**	**63.6**	**26.5**	**12.9**	0.2	–4.1	4.5
E, W & NI	**18,880**	**56.8**	**56.1**	**57.5**	**24.4**	**18.8**	–0.7	–1.7	0.3

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

Table 8.21. Summary statistics for PTH in peritoneal dialysis patients in 2015

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	92.5	37	62.7	37.0	57.0	37.0	89.0
B QEH	0.0	0					
Basldn	100.0	27	34.7	24.6	27.0	19.0	48.0
Bradfd	92.9	13	59.6	29.4	56.0	41.0	66.0
Brightn	98.3	59	34.9	32.0	30.0	10.0	42.0
Bristol	93.6	44	36.9	33.7	25.5	15.0	50.0
Camb*							
Carlis	90.0	27	28.7	21.6	22.0	12.0	43.0
Carsh	85.2	86	72.6	54.1	60.0	35.0	108.0
Chelms	91.3	21	69.2	62.7	53.0	23.0	79.0
Colchr	n/a						
Covnt	90.8	69	29.9	28.6	21.0	10.0	41.0
Derby	93.2	68	29.3	16.2	26.5	18.0	37.0
Donc	100.0	18	36.3	25.4	30.5	20.0	46.0
Dorset	82.9	29	26.3	20.1	19.0	12.0	31.0
Dudley	92.3	48	30.0	23.1	26.5	10.5	42.5
Exeter	98.6	70	28.3	24.8	21.0	12.0	33.0
Glouc	85.7	24	31.0	16.0	27.5	22.0	35.0
Hull	81.8	54	27.2	27.0	21.0	12.0	32.0
Ipswi	100.0	27	39.4	36.2	24.0	14.0	46.0
Kent	100.0	54	53.2	42.2	38.0	19.0	67.0
L Barts	96.2	175	41.6	27.8	35.0	21.0	56.0
L Guys	82.8	24	34.3	23.0	26.5	18.0	52.0
L Kings	90.0	72	65.8	54.8	45.5	23.0	108.5
L Rfree	91.8	123	40.3	33.1	30.0	17.0	53.0
L St.G	97.8	44	29.1	28.0	19.0	11.0	35.5
L West	81.7	49	45.0	29.1	44.0	21.0	61.0
Leeds	100.0	50	35.9	26.7	31.0	19.0	43.0
Leic	94.7	90	41.2	44.8	26.5	12.0	47.0
Liv Ain	71.4	20	19.9	19.7	18.5	8.5	24.0
Liv Roy	91.8	56	24.9	15.0	22.0	14.5	29.5
M RI	98.3	57	52.6	41.1	40.0	24.0	68.0

Table 8.21. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
Middlbr	60.0	9					
Newc	89.5	34	41.5	66.0	28.0	12.0	51.0
Norwch	64.3	18	34.7	24.2	30.5	22.0	43.0
Nottm	98.4	63	45.6	43.7	36.0	20.0	55.0
Oxford	98.7	77	40.5	26.4	35.0	20.0	59.0
Plymth	92.9	26	23.2	17.6	17.0	10.0	35.0
Ports	83.3	50	43.1	47.5	30.0	15.0	51.0
Prestn	100.0	49	30.9	20.9	27.0	16.0	41.0
Redng	93.2	55	36.2	20.7	33.0	22.0	49.0
Salford	0.0	0					
Sheff	32.1	17					
Shrew	96.3	26	40.4	30.2	31.0	16.0	62.0
Stevng	84.6	11	48.0	36.7	38.0	10.0	86.0
Sthend	60.0	9					
Stoke	90.0	63	48.8	34.5	38.0	20.0	73.0
Sund	92.9	13	32.9	18.8	32.0	23.0	43.0
Truro	94.7	18	31.1	28.3	19.5	12.0	39.0
Wirral	94.1	16	30.6	18.6	26.0	21.0	40.0
Wolve	95.6	65	37.7	32.9	31.0	14.0	50.0
York	100.0	22	37.8	36.9	18.0	10.0	72.0
N Ireland							
Antrim	100.0	17	33.8	34.4	20.0	17.0	48.0
Belfast	100.0	19	32.3	27.3	28.0	16.0	38.0
Newry	100.0	18	22.2	13.0	21.0	12.0	29.0
Ulster	100.0	6					
West NI	100.0	9					
Wales							
Bangor	100.0	13	39.1	25.5	35.0	22.0	58.0
Cardff	86.1	62	59.1	45.0	45.0	26.0	83.0
Clwyd	46.2	6					
Swanse	96.4	53	28.8	26.1	20.0	14.0	36.0
Wrexm	100.0	33	39.9	25.8	33.0	23.0	50.0
England	**83.6**	**2,176**	**40.5**	**36.0**	**30.0**	**17.0**	**53.0**
N Ireland	**100.0**	**69**	**29.4**	**26.9**	**23.0**	**13.0**	**36.0**
Wales	**89.8**	**167**	**44.4**	**36.7**	**31.0**	**19.0**	**58.0**
E, W & NI	**84.4**	**2,412**	**40.4**	**35.9**	**30.0**	**17.0**	**53.0**

Blank cells: centres excluded from analysis due to small numbers or poor data completeness
*Cambridge renal centre was unable to submit PTH data for 2015
n/a – no PD patients

In 2015, the proportion of HD patients with a PTH above the upper limit of the range (>72 pmol/L) was 18.8% and the proportion below the lower limit of the range (<16 pmol/L) was 24.4%.

The proportion of PD patients with PTH above the upper limit (>72 pmol/L) of the range was 13.9% and the proportion below the lower limit of the range (<16 pmol/L) was 22.6% (tables 8.20, 8.22).

There was significant variation by centre following unadjusted analyses for the proportion of patients below, within and above the range specified by the clinical performance measures. The funnel plot (figure 8.26) for HD patients showed above average achievement of the target range in Cardiff, Derby, Reading, London St Bartholomew's and London Royal Free and below average achievement for Liverpool Aintree, Exeter, Leicester, London Kings, London West and York. For PD patients (figure 8.28) Derby and Reading were above average achievement of the target range and there were no outliers below the 99.9% confidence interval for the target.

Longitudinal analysis of PTH control measures at the level of the three countries noted sustained reduction in the proportion of patients with low PTH levels

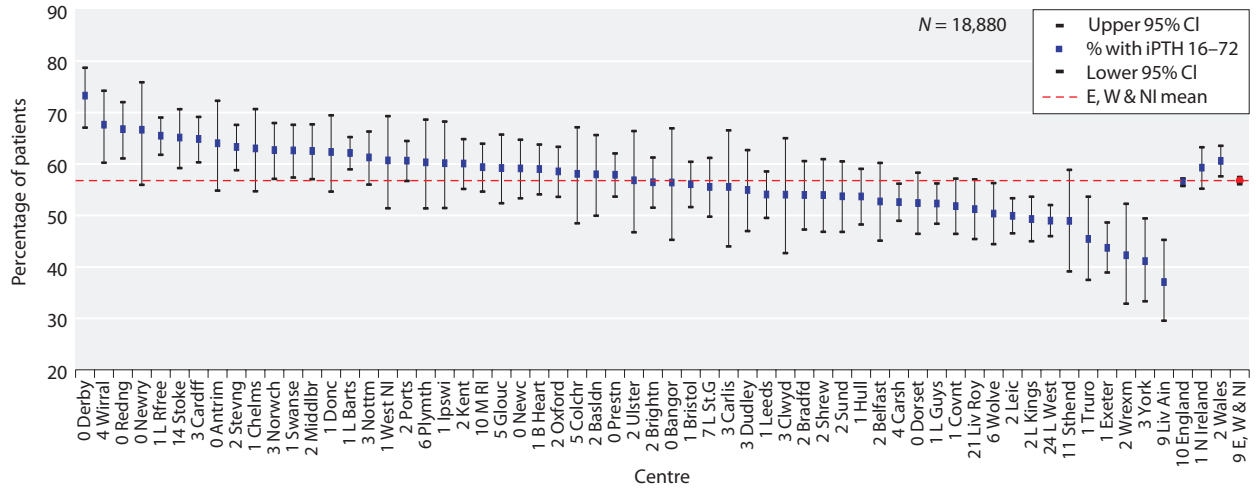

Fig. 8.25. Percentage of haemodialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

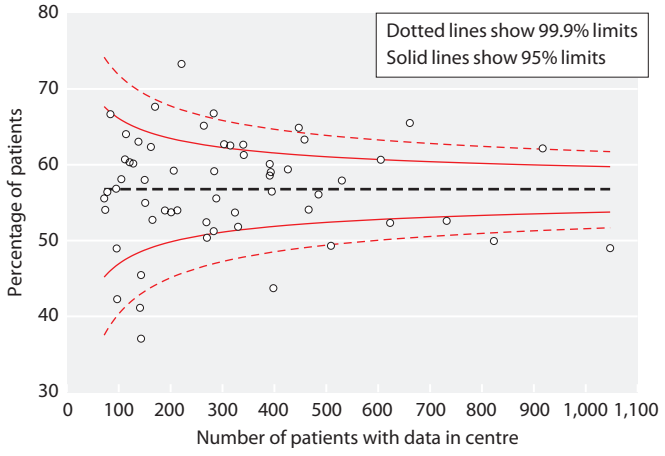

Fig. 8.26. Funnel plot of percentage of haemodialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

Fig. 8.28. Funnel plot of percentage of peritoneal dialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

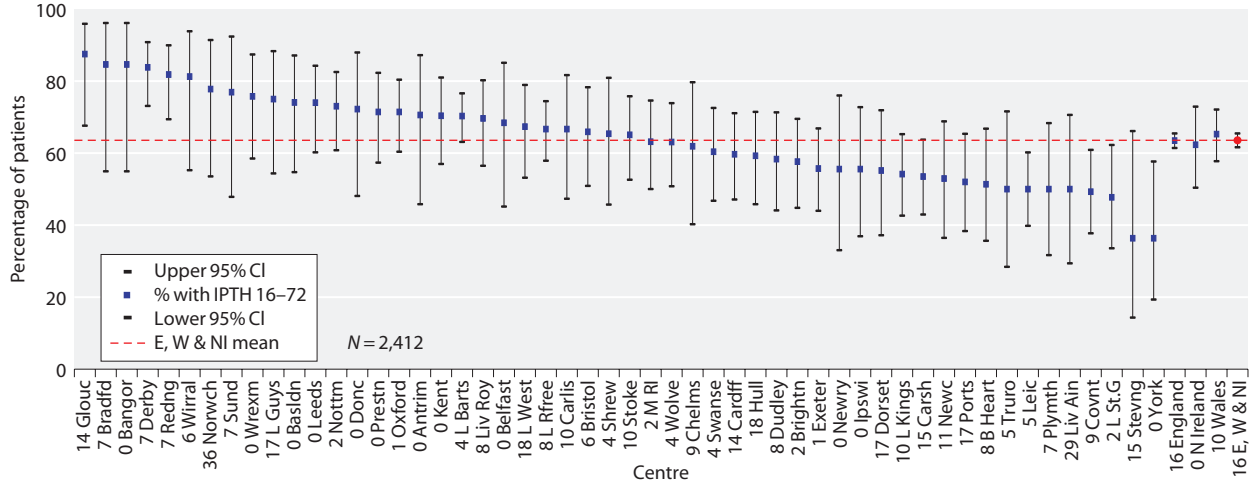

Fig. 8.27. Percentage of peritoneal dialysis patients with PTH within range (16–72 pmol/L) by centre in 2015

Table 8.22. Percentage of peritoneal dialysis patients within, below and above the range for PTH (16–72 pmol/L) in 2015

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
England									
B Heart	37	51.4	35.7	66.8	10.8	37.8	–18.7	–41.6	4.3
Basldn	27	74.1	54.7	87.1	18.5	7.4	10.1	–15.0	35.1
Bradfd	13	84.6	54.9	96.1	0.0	15.4	11.3	–18.5	41.0
Brightn	59	57.6	44.8	69.5	32.2	10.2	7.6	–11.1	26.4
Bristol	44	65.9	50.9	78.3	25.0	9.1	–0.1	–19.1	18.8
Carlis	27	66.7	47.3	81.7	29.6	3.7	6.7	–21.2	34.5
Carsh	86	53.5	43.0	63.7	9.3	37.2	–10.9	–25.0	3.2
Chelms	21	61.9	40.3	79.7	4.8	33.3	3.1	–28.2	34.4
Covnt	69	49.3	37.7	60.9	42.0	8.7	–5.7	–21.8	10.3
Derby	68	83.8	73.1	90.8	14.7	1.5	11.0	–2.6	24.6
Donc	18	72.2	48.1	87.9	16.7	11.1	–10.4	–36.2	15.5
Dorset	29	55.2	37.2	71.9	37.9	6.9	6.6	–17.9	31.1
Dudley	48	58.3	44.1	71.3	35.4	6.3	–9.8	–29.1	9.5
Exeter	70	55.7	44.0	66.9	37.1	7.1	0.1	–15.7	16.0
Glouc	24	87.5	67.6	95.9	8.3	4.2	26.6	2.7	50.6
Hull	54	59.3	45.8	71.5	37.0	3.7	–8.0	–25.8	9.8
Ipswi	27	55.6	36.9	72.8	25.9	18.5	–16.9	–41.7	8.0
Kent	54	70.4	57.0	81.0	9.3	20.4	5.5	–11.9	22.8
L Barts	175	70.3	63.1	76.6	16.0	13.7	6.7	–3.0	16.4
L Guys	24	75.0	54.4	88.3	20.8	4.2	–7.3	–32.4	17.7
L Kings	72	54.2	42.6	65.3	12.5	33.3	–2.4	–18.4	13.6
L Rfree	123	66.7	57.9	74.4	19.5	13.8	5.2	–7.2	17.6
L St.G	44	47.7	33.6	62.3	43.2	9.1	–18.2	–38.5	2.2
L West	49	67.4	53.2	78.9	14.3	18.4	4.1	–14.8	22.9
Leeds	50	74.0	60.2	84.3	18.0	8.0	0.5	–16.8	17.9
Leic	90	50.0	39.8	60.2	34.4	15.6	–12.8	–26.7	1.2
Liv Ain	20	50.0	29.4	70.6	45.0	5.0	–8.1	–36.0	19.9
Liv Roy	56	69.6	56.5	80.2	28.6	1.8	–0.6	–18.3	17.2
M RI	57	63.2	50.0	74.6	12.3	24.6	–4.8	–22.8	13.2
Newc	34	52.9	36.5	68.8	35.3	11.8	–9.6	–32.1	12.9
Norwch	18	77.8	53.5	91.4	16.7	5.6	8.2	–18.7	35.1
Nottm	63	73.0	60.8	82.5	15.9	11.1	3.6	–11.7	18.9
Oxford	77	71.4	60.4	80.4	15.6	13.0	3.9	–10.8	18.5
Plymth	26	50.0	31.7	68.3	46.2	3.9	0.0	–26.7	26.7
Ports	50	52.0	38.4	65.4	28.0	20.0	–7.3	–26.3	11.8
Prestn	49	71.4	57.4	82.3	24.5	4.1	–4.7	–22.3	13.0
Redng	55	81.8	69.4	89.9	12.7	5.5	2.2	–12.3	16.6
Shrew	26	65.4	45.7	80.9	19.2	15.4	–7.4	–33.4	18.7
Stevng	11	36.4	14.3	66.1	27.3	36.4	–27.6	–61.7	6.5
Stoke	63	65.1	52.6	75.8	9.5	25.4	4.0	–12.3	20.3
Sund	13	76.9	47.9	92.4	23.1	0.0	19.8	–14.8	54.4
Truro	18	50.0	28.4	71.6	38.9	11.1	–27.8	–57.8	2.3
Wirral	16	81.3	55.3	93.8	18.8	0.0	27.9	–3.8	59.6
Wolve	65	63.1	50.8	73.9	26.2	10.8	–5.6	–21.7	10.6
York	22	36.4	19.3	57.7	40.9	22.7	–11.3	–40.6	18.1
N Ireland									
Antrim	17	70.6	45.8	87.2	23.5	5.9	24.4	–10.3	59.1
Belfast	19	68.4	45.2	85.1	21.1	10.5	1.8	–30.0	33.5
Newry	18	55.6	33.0	76.0	44.4	0.0	–15.9	–48.8	17.1

Table 8.22. Continued

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2014	95% LCL change	95% UCL change
Wales									
Bangor	13	84.6	54.9	96.1	7.7	7.7	13.2	–17.5	43.9
Cardff	62	59.7	47.1	71.1	11.3	29.0	–14.4	–31.3	2.5
Swanse	53	60.4	46.8	72.5	32.1	7.6	–11.1	–29.3	7.2
Wrexm	33	75.8	58.5	87.4	15.2	9.1	–11.2	–31.3	8.9
England	**2,176**	**63.5**	**61.4**	**65.5**	**22.7**	**13.9**	**–1.2**	**–4.0**	**1.5**
N Ireland	**69**	**62.3**	**50.4**	**72.9**	**31.9**	**5.8**	**0.9**	**–16.1**	**18.0**
Wales	**167**	**65.3**	**57.8**	**72.1**	**18.0**	**16.8**	**–9.1**	**–19.1**	**1.0**
E, W & NI	**2,412**	**63.6**	**61.6**	**65.5**	**22.6**	**13.9**	**–1.6**	**–4.2**	**1.0**

Centres missing from the table were excluded from analysis due to low patient numbers or poor data completeness

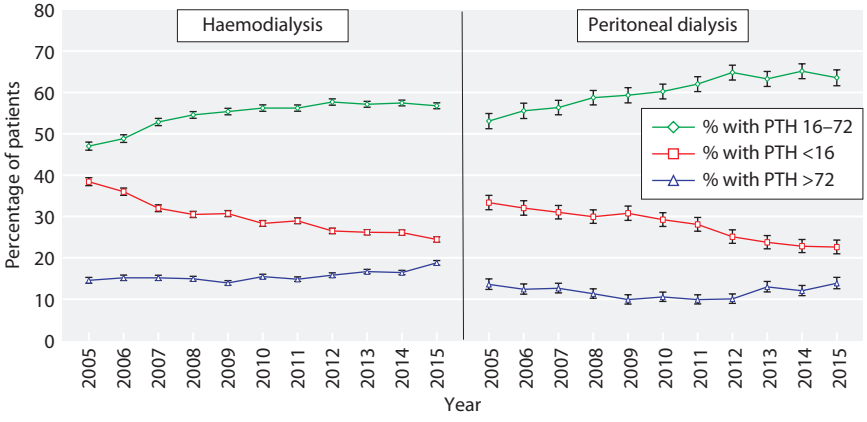

Fig. 8.29. Longitudinal change in percentage of patients with PTH within range (16–72 pmol/L) by dialysis modality 2005–2015

(<16 pmol/L) in HD and PD patients. Similarly, there has been a corresponding increase in the fraction of HD and PD patients with PTH levels being maintained within the 16–72 pmol/L range. The fraction of patients with PTH above range (>72 pmol/L) increased from 14.6% in 2005 to 18.8% in 2015 in those receiving HD but was unchanged in those receiving PD during the same period (figure 8.29).