Chapter 6 Quarterly Biochemical Data

6:1 Introduction

Where the Renal Standards document specifies that the local reference range should be used to define a standard, the percentage of patients achieving the standard was calculated without using the laboratory harmonisation factor produced for the Registry by UK NEQAS (see Chapter 5). Where the Renal Standards document specifies a range of values for a standard, harmonisation is achieved by using an adjustment for that laboratory from UK NEQAS, against the all laboratory mean for that method held by UK NEQAS. Where cumulative frequency distributions are shown, the data has been harmonised where possible, to allow a direct comparison on the figures. The UK NEQAS data was not available for centre B as this centre is in a separate quality assurance scheme. The laboratory at centre E is currently unwilling at this stage to contribute to the study in harmonisation and its UK NEQAS data was not made available to the Registry. Direct comparison of the cumulative frequency distribution data for centre B and E with other centres is therefore not possible**.**

For this analysis, all patients had been stable on their current modality for > 90 days. Patients who changed treatment modality within a quarter, or were transferred in from another centre, were excluded. Data are from the last quarter in 1997. If there was no result from this quarter a value from the previous quarter was used. Data completeness from centres is therefore shown for 6 months unless stated otherwise.

Although the Renal Association Standards document recommends several targets for the following biochemical variables, it makes no specific recommendations on the frequency of monitoring. As is demonstrated below, recent tests are often not available.

6:2 Serum Albumin

6:2.1 Methodological considerations

As discussed in Chapter 5, harmonisation of laboratory values is only currently possible between the same laboratory method. Centre G uses the BCP method for measuring albumin, while all the other centres use the BCG method. The BCP method is thought to be more accurate against the ‘gold standard’ of immuno-turbidimetry, because the BCG method partially measures globulin. Lowrie’s paper elucidating the relationship between mortality and albumin (reference 11) used the BCG method. The BCP method on average reads lower than the BCG by approximately 5 g/l.

6:2.2 Haemodialysis

The Renal Standards document recommends *a target serum albumin within the local laboratory reference range after six months on regular haemodialysis*.

Centre G uses the BCP method and has the smallest number of patients achieving the recommended standard, even using their lower local reference limit of a minimum serum albumin of 30 g/l, compared with the 35g/l quoted for most other centres (table 6.1). This is in contrast to peritoneal dialysis where the results for centre G appear to be more comparable to other centres. There has been some discussion by laboratories as to whether haemodialysis causes some interference with the BCP methodology, producing a false low albumin reading (see Chapter 5). In centre G there do not appear to be any unusual practices in haemodialysis treatment that would account for this discrepancy between modalities.

Centre	% below reference range	Median g/l	Lower quartile g/l	Upper quartile g/l	Local range g/l	% return of data
A	24	38	35	40	35-48	94
B*	0	41	39	43	35-53	95
C	8	39	38	42	35-50	98
D	19	39	35	41	35-55	93
E*	20	39	36	41	36-50	100
F	16	40	37	44	35-50	100
G*	34	31	29	33	30-52	95
H	21	41	38	45	37-49	88

* - not harmonised

Table 6.1 Serum albumin in haemodialysis patients

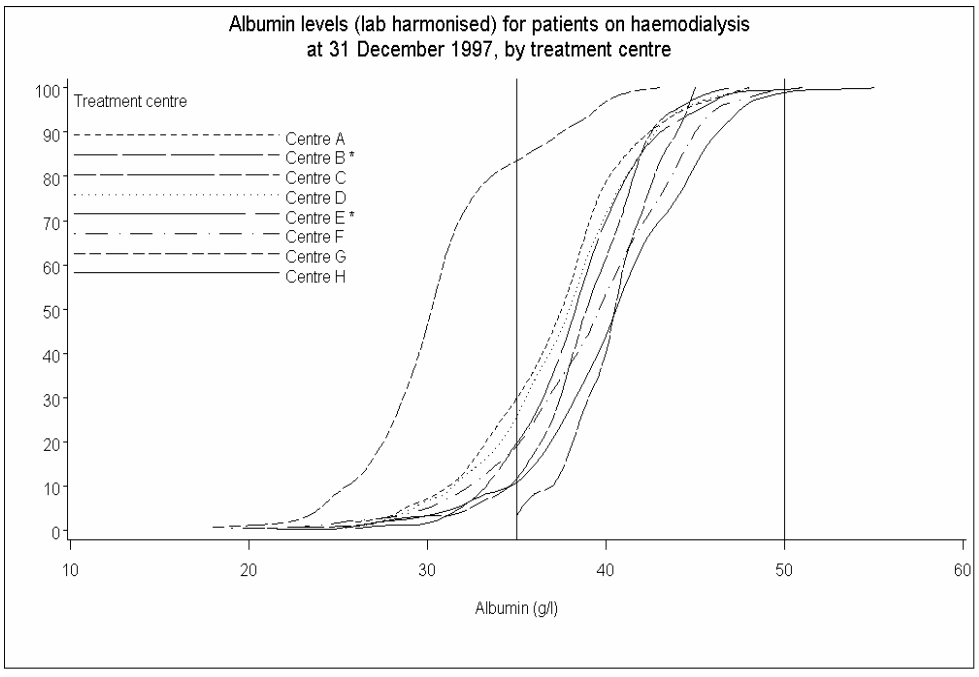

Figure 6.1 Cumulative frequency plots of serum albumin levels on haemodialysis

6:2.2 Peritoneal dialysis

The Renal Standards document recommends ***the serum albumin of at least 70% of patients on peritoneal dialysis should be within the local normal range.***

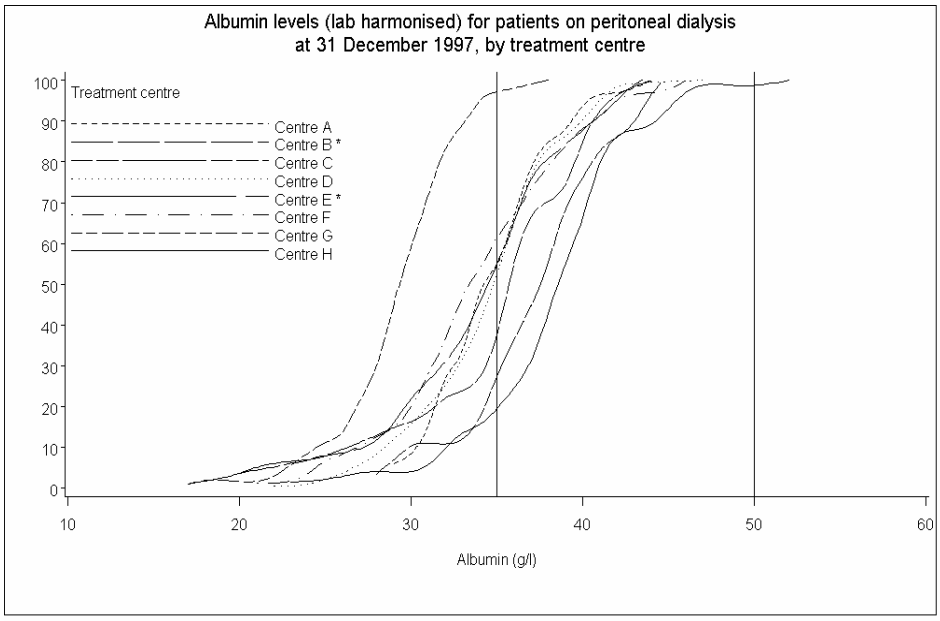

Figure 6.2 Cumulative frequency plots of serum albumin levels in peritoneal dialysis patients

Centre	% below reference range	Median g/l	Lower quartile g/l	Upper quartile g/l	Local range g/l	% return of data
A	48	35	32	37	35-48	78
B*	22	36	35	40	35-53	94
C	17	38	35	40	35-50	94
D	40	35	33	37	35-55	98
E*	55	35	31	37	36-50	96
F	53	34	31	39	35-50	100
G*	46	30	28	32	30-52	92
H	31	39	37	41	37-49	89

* - not harmonised

Table 6.2 Serum albumin in peritoneal dialysis patients

In all units peritoneal dialysis patients have lower serum albumins than haemodialysis patients. The lower reference range for centre H is higher than for other centres and the range is in addition narrower. The Renal Association Standard is defined against 'locally specified laboratory ranges', which not only vary for the same method of measurement but may also not have been derived locally. The source for this range may have been obtained from the kit specification by the manufacturer (derived from a U.S. population).

6:3 Serum calcium

The Renal Standards document recommends that ***total calcium should fall within the normal range quoted by the local pathology laboratory, corrected for serum albumin concentration.***

6:3.1 Methodological considerations.

There are many different formulae to calculate total calcium, taking the measured value and correcting for serum albumin. The specific formula used varies from site to site. For comparison it is important that the same formula is used for all centres. Wherever possible the Renal Registry has collected the calcium data from centres uncorrected for albumin and then applied the same correction formula throughout. Some laboratories only supply corrected calcium values to the renal units. For three centres the uncorrected value was not available and the corrected calcium was taken and a derived uncorrected value was calculated using the local formula supplied by each centre, in conjunction with the albumin (non-laboratory harmonised) measured.

The Renal Registry has applied a standard formula to all the calcium data of :-

Corrected calcium = uncorrected calcium + ((40 – albumin) x 0.02)

The correction formula applies a laboratory harmonisation value to both the uncorrected calcium and the albumin.

The value for corrected calcium is therefore dependent on the local method for measuring albumin. Centre G uses the BCP method for measuring albumin, and this reads on average 5 g/l lower than the other sites using the BCG method. Corrected calcium values for this site will therefore be slightly high and make comparison with other centres invalid.

6:3:2 Haemodialysis

Calcium uncorrected for albumin, (lab harmonised)

Centres C, E and H only send corrected calcium values to the Registry. These values have been uncorrected using the local formula supplied by the laboratory (and verified with the local renal unit).

Centre	% in lab range	% below range	% above range	Median	Lower quartile	Upper quartile	% return 6 months
A	82	4	13	2.36	2.23	2.48	94
B*	74	5	22	2.47	2.34	2.60	95
C^	69	15	16	2.32	2.19	2.48	97
D	78	10	12	2.32	2.19	2.45	92
E^	14	76	10	2.39	2.26	2.50	99
F	79	7	14	2.35	2.20	2.47	99
G	57	26	16	2.33	2.20	2.51	93
H^	64	15	21	2.38	2.23	2.53	84

^ denotes centres which only supplied corrected calcium values.

* - not harmonised

Table 6.3 Serum calcium uncorrected for albumin in haemodialysis patients

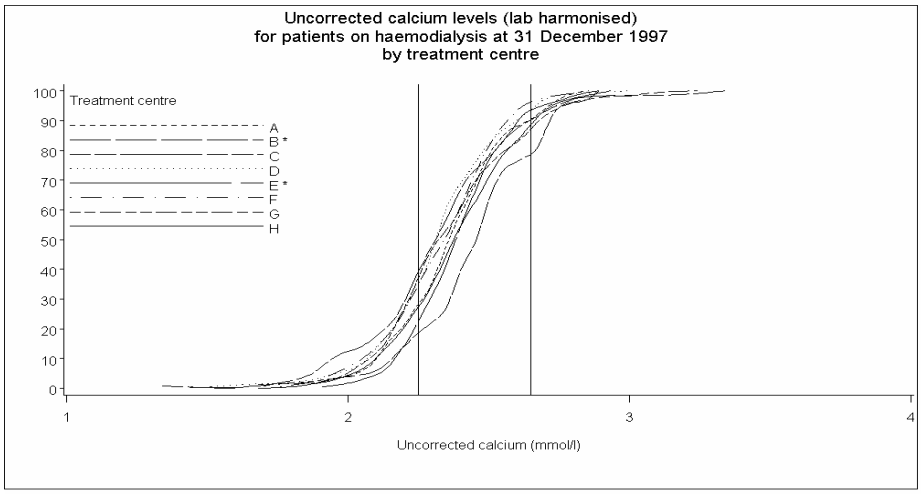

Figure 6.3 Cumulative frequency plots of uncorrected serum calcium in haemodialysis patients

Calcium corrected for albumin by Renal Registry (lab harmonised)

Centre	% between 2.25- 2.65	% < 2.25	% > 2.65	Median	Lower quartile	Upper quartile
A	70	20	10	2.42	2.28	2.56
B*	60	20	20	2.42	2.31	2.58
C^	55	36	9	2.32	2.20	2.46
D	64	28	8	2.36	2.22	2.51
E^	82	12	6	2.42	2.30	2.52
F	63	32	5	2.33	2.21	2.46
G	70	6	24	2.51	2.42	2.65
H^	63	30	7	2.36	2.20	2.51

^ denotes centres which only supplied corrected calcium values.
*- not harmonised

Table 6.4 Haemodialysis patients: serum calcium corrected for albumin

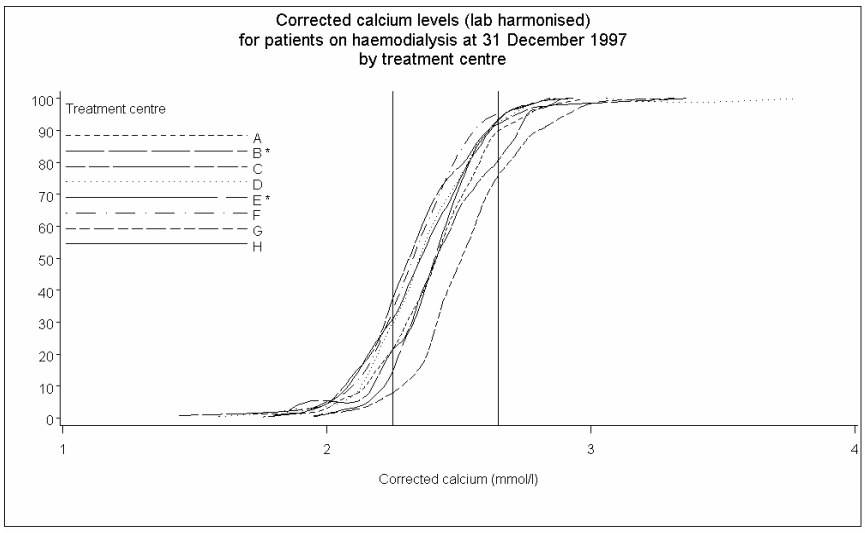

Figure 6.4 Cumulative frequency plots of corrected serum calcium in haemodialysis patients

After applying the harmonisation factors, a range of 2.25 – 2.65 mmol/l was used to enable comparison between centres as the locally defined range is no longer applicable.

The harmonised uncorrected calcium data appear to show a narrower inter-centre distribution than the corrected values. This is attributable to the problems of comparing albumin between different laboratories.

6:3.3 Peritoneal dialysis

Calcium uncorrected for albumin, (lab harmonised)

The peritoneal dialysis data demonstrates a much wider variation of the data between centres, both corrected and uncorrected (figures 6.5, 6.6; tables 6.5,6.6). This wider distribution cannot be accounted for by different laboratory methodologies as this spread is not seen for patients on haemodialysis.

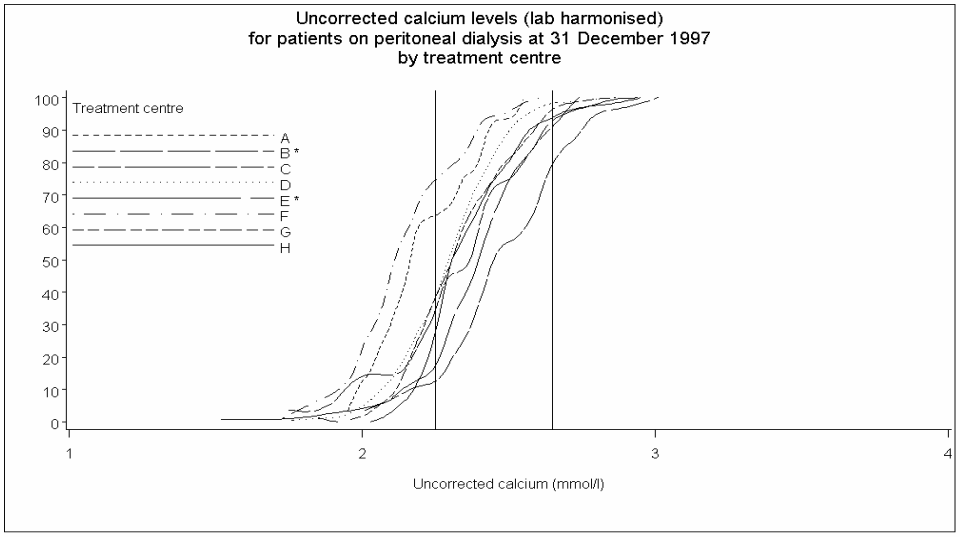

Figure 6.5 Cumulative frequency plots of uncorrected serum calcium in peritoneal dialysis patients

Centre	% in lab range	% below range	% above range	Median	Lower quartile	Upper quartile	% return 6 months
A	90	10		2.17	2.09	2.34	70
B*	67	7	26	2.45	2.35	2.64	90
C^	67	15	18	2.38	2.20	2.53	88
D	84	11	5	2.30	2.18	2.41	97
E^*	74	13	13	2.40	2.29	2.51	90
F	78	18	4	2.12	2.01	2.26	99
G	65	27	8	2.32	2.19	2.46	87
H^	83	6	11	2.31	2.25	2.46	87

^ denotes centres which only supplied corrected calcium values.
* - not harmonised

Table 6.5 Serum calcium uncorrected for albumin in peritoneal dialysis patients

Calcium corrected for albumin by Renal Registry (lab harmonised)

Centre	% between 2.2 – 2.65	% < 2.25	% > 2.65	Median	Lower quartile	Upper quartile
A	59	41	0	2.29	2.18	2.46
B*	60	7	33	2.61	2.40	2.76
C^	63	22	15	2.41	2.25	2.52
D	81	15	4	2.39	2.30	2.51
E^*	75	4	21	2.50	2.40	2.63
F	46	52	2	2.23	2.12	2.37
G	72	4	24	2.52	2.41	2.65
H^	76	17	7	2.37	2.27	2.49

^ denotes centres which only supplied corrected calcium values.
* - not harmonised

Table 6.6 Serum calcium corrected for albumin in peritoneal dialysis patients

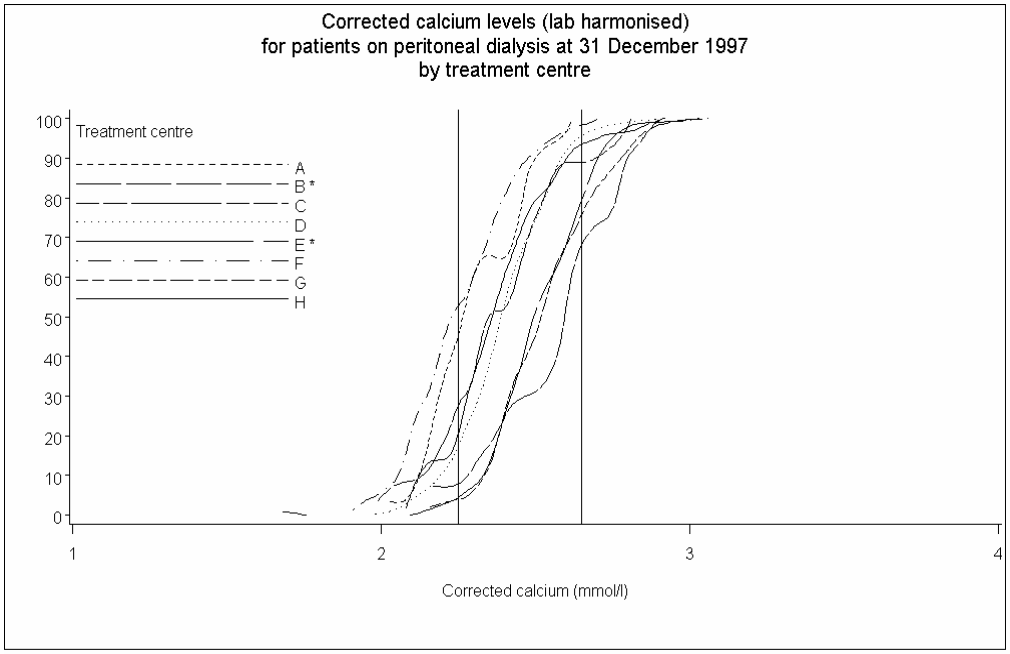

Figure 6.6 Cumulative frequency plots of corrected serum calcium in peritoneal dialysis patients

6:4 Serum phosphate

6:4.1 Haemodialysis

The Renal Standards document recommends ***a target range for predialysis serum phosphate of 1.2 – 1.7 mmol/l.***

Centre	% in ref range	% >1.2	% > 1.7	Median	Lower quartile	Upper quartile	% return
A	28	12	60	2.0	1.6	2.5	94
B*	40	10	50	1.8	1.5	2.1	95
C	40	9	51	1.8	1.5	2.4	98
D	29	11	60	1.9	1.4	2.3	92
E*	27	4	67	2.1	1.7	2.5	99
F	43	9	48	1.7	1.3	2.1	99
G	39	6	55	1.8	1.4	2.4	93
H	39	9	52	1.8	1.4	2.0	84

* - not harmonised

Table 6.7 Predialysis serum phosphate of patients on haemodialysis

The data for centre B has not been harmonised This centre in conjunction with centre H has the smallest interquartile range of 0.6 mmol/l.

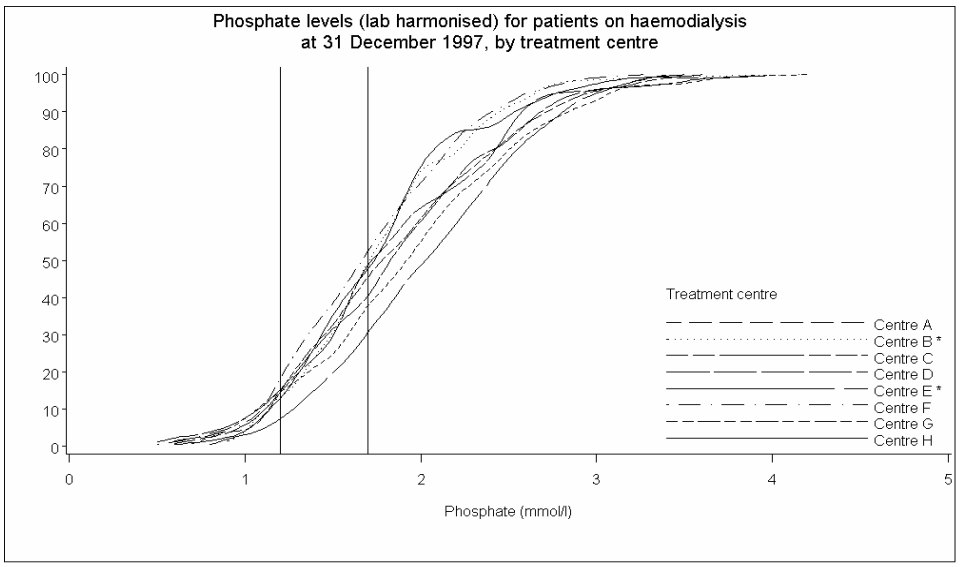

Figure 6.7 Cumulative frequency plot of serum phosphate for patients on haemodialysis

6:4.2 Peritoneal dialysis

The Renal Standards document recommends ***a target range for serum phosphate of 1.1 –1.6 mmol/l.***

Some centres have small numbers of patients on peritoneal dialysis. The smoothing algorithm used in these circumstances produces the irregular dips shown in figure 6.7.

Centre B and centre H have the highest percentage of patients falling within the Standards recommendation. However the data for centre B is not directly comparable with other centres as it could not be harmonised.

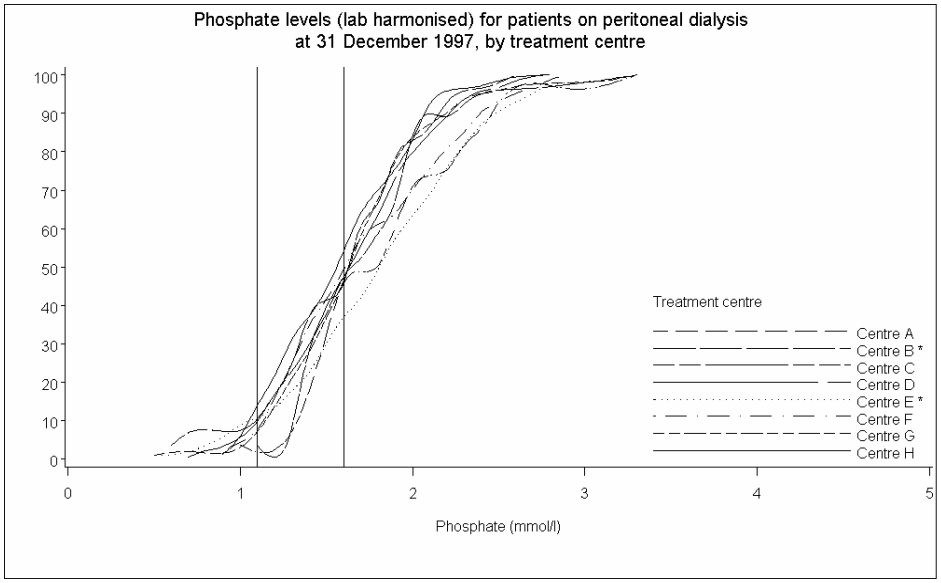

Figure 6.8 Cumulative frequency plot of serum phosphate for patients on peritoneal dialysis

The interquartile ranges for peritoneal dialysis patients were much narrower at 0.5 – 0.7 mmol/l than the ranges for haemodialysis patients of 0.6 – 1.0 mmol/l.

Centre	% in ref range	% < 1.1	% > 1.6	Median	Lower quartile	Upper quartile	% return
A	43	4	53	1.9	1.5	2.3	65
B*	48		52	1.7	1.4	2.0	94
C	38	7	55	1.7	1.4	1.9	94
D	42	6	52	1.7	1.4	2.0	99
E*	28	9	63	1.9	1.5	2.2	91
F	45	5	50	1.7	1.4	2.1	99
G	43	3	54	1.7	1.4	1.9	87
H	49	6	45	1.6	1.3	1.9	87

* - not harmonised

Table 6.8 Serum phosphate of patients on peritoneal dialysis

6:5 Serum bicarbonate

6:5.1 Methodological considerations

For bicarbonate there is no UK NEQAS data available to harmonise these results. There are 3 different methods used by the contributing centres to measure bicarbonate (PECP, enzymatic, actual). The variation in the local reference range supplied by the laboratories does not reflect any specific method. The percentage of patients outside the Renal Association standard seems dependent upon the locally specified laboratory range. The mechanism used by each laboratory to determine the quoted range is not known by the Renal Registry, but it is known that very few have a locally derived

normal range. A reference range of 22 – 30 mmol/l has been shown in the figures as 22 mmol/l is the most widely quoted lower limit of normal.

There were not sufficient data from centre G to reliably calculate the distributions.

	Haemodialysis		Peritoneal dialysis	
Centre	3 months	6 months	3 month	6 months
A	70	83	28	54
B	95	95	90	94
C	97	98	88	94
D	84	92	80	95
E	96	99	75	89
F	100	100	90	99
G				
H	91	94	87	93

Figures are the % of patients with a result available in the given time period.

Table 6.9 Completeness of serum bicarbonate data

6:5.2 Haemodialysis

The Renal Standards document recommends ***that a target predialysis serum bicarbonate within the normal range quoted by the local pathology laboratory should be the aim in all patients after 3 months on haemodialysis.***

All patients on home haemodialysis have been excluded from this analysis. This is because bloods may have been sent in by post, which will produce an inaccurate serum bicarbonate result.

The percentage of patients achieving the Renal Association standard shows a wide variation from 10% - 83% (table 6.10, figure 6.9) The median and interquartile values are included. The centre with lowest compliance with the standard has the highest locally defined lower reference range.

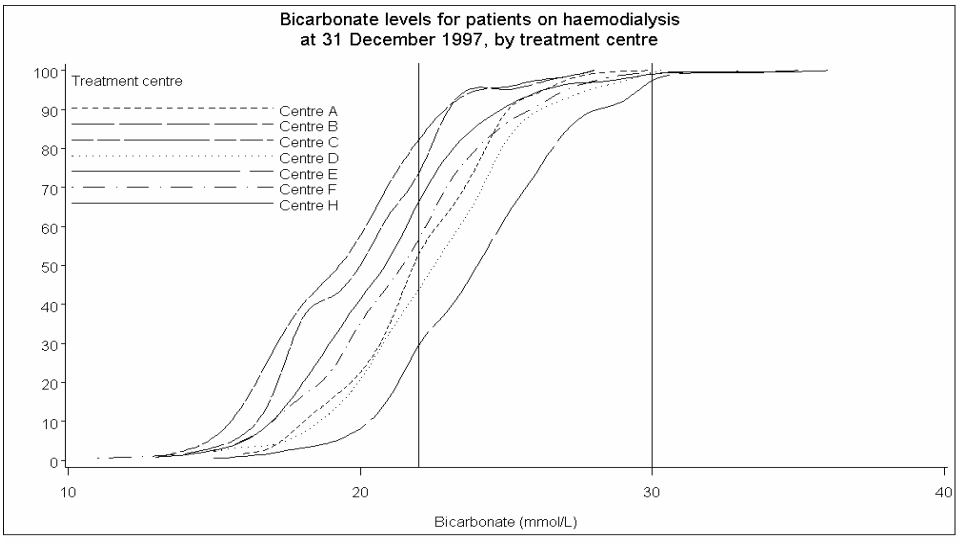

Figure 6.9 Cumulative frequency plots of serum bicarbonate for patients on haemodialysis

Centre	Median	Lower quartile	Upper quartile	% in lab range	% below range	% above range	% in 22-30 mmol/l	Local range mmol/l
A	22	21	24	**65**	35	0	**65**	22 - 30
B	21	18	23	**10**	90	0	**37**	24 - 32
C	20	17	22	**29**	71	0	**29**	22 - 29
D	23	21	25	**66**	33	1	**66**	22 - 30
E	25	22	27	**83**	16	1	**82**	22 - 31
F	22	20	24	**77**	22	1	**54**	20 - 29
G								19 - 28
H	21	19	23	**66**	31	3	**48**	20 - 28

Table 6.10 Serum bicarbonate range for patients on haemodialysis

For comparison the percentage within a standard range of 22 – 30 mmol/l is shown. Using this range the compliance of unit B is improved and that of F and H reduced.

6:5.3 Peritoneal dialysis

The Renal Standards document recommends in peritoneal dialysis patients that ***serum bicarbonate level should not fall below the local normal range, or rise more than 3 mmol/l above it.***

The percentage within local range varied between centres from 82% to 98%. Centre B with the highest locally defined lower reference value has 93% of patients within range.

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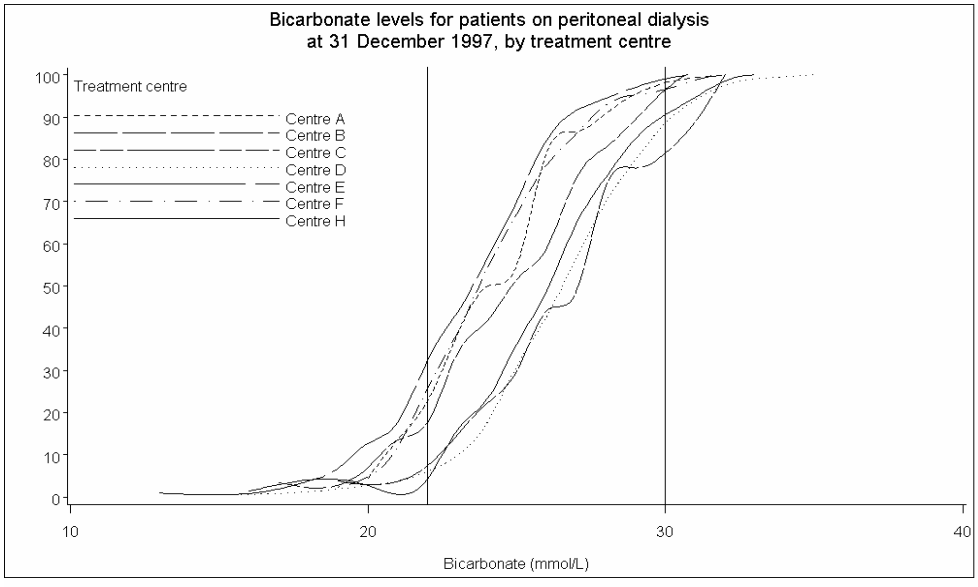


Figure 6.10 Cumulative frequency plots of serum bicarbonate for patients on peritoneal dialysis

Centre	% in lab range	% below range	% above range	Median	Lower quartile	Upper quartile	Local range
A*	86	14	0	25	24	26	22 - 30
B	93	7	0	28	25	29	24 - 32
C	83	14	3	25	23	27	22 - 29
D	95	4	1	27	25	29	22 - 30
E	82	17	1	24	22	26	22 - 31
F	98	2	0	24	22	26	20 - 29
G							19 - 28
H	93	1	6	27	25	28	20 - 28

* Note 46% of bicarbonate data was missing for centre A even after including data from the previous quarter (i.e. no data was available from the last 6 months).

Table 6.11 Serum bicarbonate of patients on peritoneal dialysis

6:6 Parathyroid Hormone

The Renal Standards document recommends ***that iPTH (intact hormone assay) should be maintained at between 2 and 3 times the local normal range.***

6:6.1 Methodological considerations

The Registry has converted all iPTH values to pmol/l. The conversion factor for ng/l to pmol/l is pmol/l = ng/l / 9.5

This analysis includes iPTH data collected over the 9 months from March to December 1997. The latest value from the centres was used. If patients had changed dialysis modality during this period, they were classified according to their latest modality.

All laboratories appear to be using assays that measure only the intact PTH. Only one laboratory (centre F) calculates its own population based reference range. This results in a much lower upper limit of the reference range and accounts for the discrepancy between centres E and F using the same manufacture's kit. The other laboratories either use a range taken from a standard reference textbook, or the assay kit manufacturer's specified range. This discrepancy in defining the reference range markedly affects how the centre 'achieves' the Standards. Centre F appears non-compliant, but when compared against the widely used upper limit of 7.6 pmol/l has one of the highest compliances. Because of these anomalies in local ranges, the Registry has shown compliance against a reference limit of 23 pmol/l (7.6 x 3) on the figures.

6:6.2 Completeness of data

Table 6.12 shows that recent tests of serum iPTH are frequently not available.

	Haemodialysis			Peritoneal dialysis		
Centre	**3 months**	**6 months**	**9 months**	**3 month**	**6 months**	**9 months**
A	2	4	5	2	9	12
B	0	2	2	7	10	21
C	1	3	4	9	15	29
D	23	33	48	18	29	43
E	16	25	33	11	24	37
F	34	60	77	46	71	78
G	83	85	95	18	42	60
H	2	4	47	0	0	22

Figures are the percentage of patients with results within the specified time period

Table 6.12 Completeness of serum iPTH data

Centres F and G have a high percentage of data completeness and this must reflect the differing attitudes of centres to the importance of measuring PTH. Direct comparison with centres with a much lower percentage of data completeness may be invalid. It is not known whether missing data reflects a policy that in patients with a low PTH repeat measurement is not indicated within 9 months, or whether the measurement has simply not been checked.

6:6.3 Haemodialysis

The serum iPTH data for haemodialysis patients are shown in figure 6.11 and table 6.13

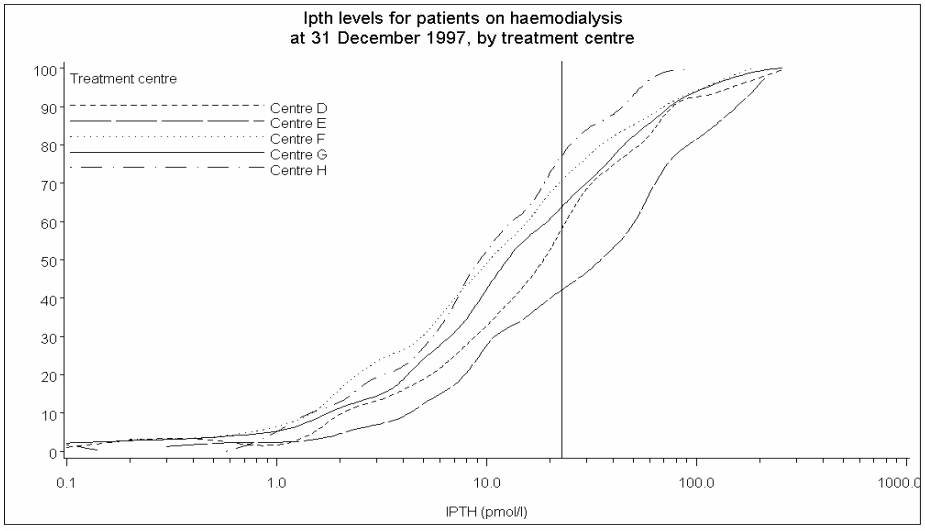


Figure 6.11 Cumulative frequency plots of intact parathyroid hormone for patients on haemodialysis

Centre	% in x3 local range	% < 23 pmol/l	Median	Lower quartile	Upper quartile	Local range	Method
A*							
B*						0.9 - 5.4 pmol/l	
C*						1.3 - 7.6 pmol/l	DPC
D	55	55	19	7	43	1.3 - 7.6 pmol/l	DPC
E	39	42	37	9	74	1.1 - 6.8 pmol/l	Chiron
F	54	71	10	3	28	< 4.0 pmol/l	Chiron
G	63	63	12	5	37	1.3 - 7.6 pmol/l	DPC
H	73	76	10	5	21	1.1 - 6.8 pmol/l	Nichols

* data completeness too low for assessment

Table 6.13 Serum iPTH range for patients on haemodialysis

Compliance with the standard is low. Using the Registry upper limit of 23 pmol/l, centre F moves from 55% to 71% achieving this standard.

6:6.4 Peritoneal dialysis

Centre	% in x3 local range	% < 23 pmol/l	Median	Lower quartile	Upper quartile	Local range	Method
A*							
B*						0.9 - 5.4 pmol/L	
C*						1.3 - 7.6 pmol/L	DPC
D	46	46	25	10	43	1.3 - 7.6 pmol/L	DPC
E	56	64	16	6	36	1.1 - 6.8 pmol/L	Chiron
F	40	62	15	7	33	< 4.0 pmol/L	Chiron
G	66	66	10	3	30	1.3 - 7.6 pmol/L	DPC
H*						1.1 - 6.8 pmol/L	Nichols

* data completeness too low for assessment

Table 6.14 Serum iPTH range for patients on peritoneal dialysis

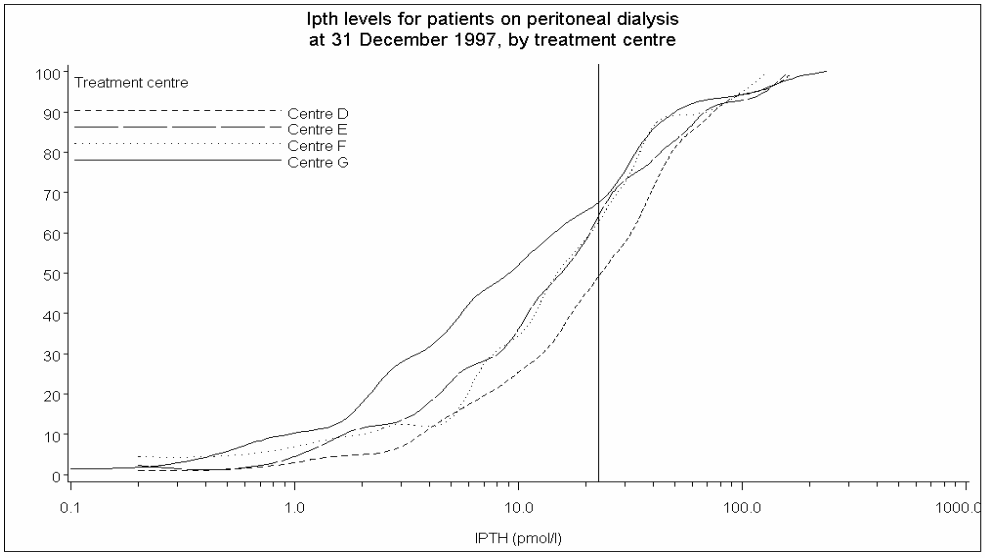


Figure 6.12 Cumulative frequency plots of serum intact parathyroid hormone for patients on peritoneal dialysis

Centres E, F and G have a similar distribution of data for patients on peritoneal dialysis with a variation of 57% - 66% achieving a value lower than the Registry upper limit. Centre D results have a different distribution from these three centres.

The interquartile range for all centres except E, is much larger for patients on peritoneal dialysis. This may partially reflect the lower data completeness in this group. Centres D and F have higher median PTH level in peritoneal dialysis patients compared with haemodialysis patients, while centres E, G, H have a lower PTH level in these patients. This implies a variation in local policy and attitudes to both measurement PTH and its management in peritoneal dialysis and haemodialysis patients.

6:7 Serum cholesterol

The Renal Standards document has no recommended range for serum cholesterol

6:7.1 Introduction

The Renal Registry is able to harmonise cholesterol data to facilitate direct comparisons of measurements between centres.

Most nephrologists are probably looking towards serum cholesterol levels of ≤ 5.5 for men and women, especially in patients with vascular disease or diabetes, in order to follow the Chief Medical Officer's guidelines. The current recommendation by the Chief Medical Officer is to collect LDL cholesterol and the Renal Registry will be adding this item to its database for future analysis.

The Renal Registry has analysed the cholesterol data over 1 year as many centres only measure this annually. It may even be the case, where this has been measured previously and the result was normal without use of a lipid lowering agent, that the centre may not measure it again.

The analysis is split between dialysis and transplant patients, and by gender. The treatment modality was defined on 31/12/97. Some patients may have changed modality over the course of the preceding year, but they were analysed as their category of modality on 31/12/97.

6:7.2 Completeness of data

There was a high percentage of missing data (table 6.15). There are clearly strong local policy factors influencing the measurement of cholesterol which account for the variation in completeness of these data. The Renal Registry has not collected data on the use of 'statins' as many centres do not hold this information in their renal computer system.

Centres with less than 20 results have been removed from the analysis, although the data was retained when calculating the overall median result. As there is a large amount

of missing data for most centres, the total percentage of patients for any centre above or below a value may not correctly reflect the whole population in that centre.

Centre	Dialysis % returned	Transplant % returned
A	27	80
B	44	48
C		
D	44	7
E	10	6
F	54	64
G	5	63
H	15	25

Figures are the percentage of patients with a result within the last year

Table 6.15 Completeness of serum cholesterol data

6:7.3 All Dialysis patients

The figures for patients on dialysis appear to show a fairly close distribution of cholesterol results between centres (table 6.16, figure 6.13).

	Male dialysis		Female dialysis	
Centre	% ≤ 5.5 mmol/	% ≤ 6.5 mmol/	% ≤ 5.5 mmol/	% ≤ 6.5 mmol/l
A	61	95	28*	72*
B	56	84	44*	75*
C				
D	67	86	41	80
E	68*	93*	17*	50*
F	73	92	48	77
G	42*	75*	**	**
H	59	78	60	70

* indicates > 10 and ≤ 20 results recorded for that modality by the centre

** indicate < 10 results recorded for that modality

Table 6.16 Serum cholesterol by gender and modality

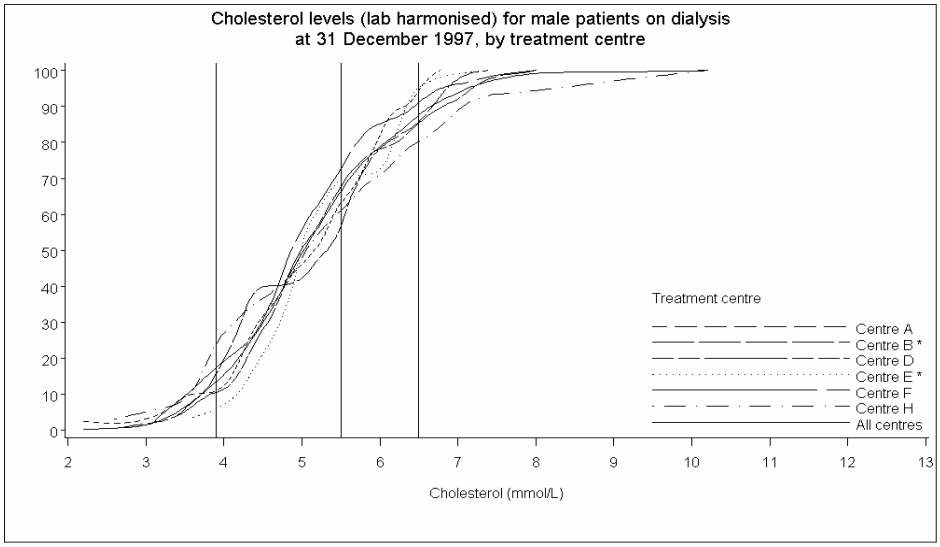


Figure 6.13 Cumulative frequency plots of serum cholesterol for male patients on dialysis

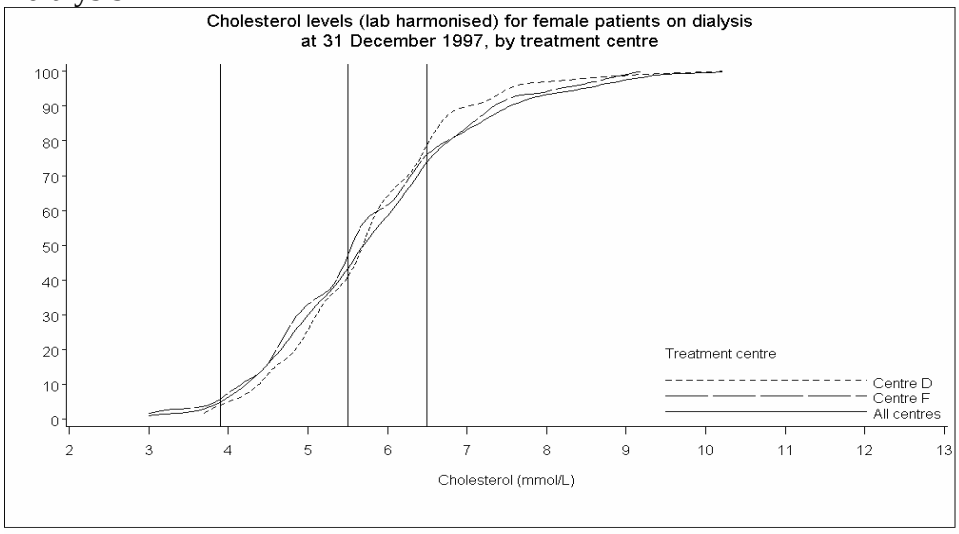


Figure 6.14 Cumulative frequency plots of serum cholesterol for female patients on dialysis

6.7.3 Significance of a low serum cholesterol in dialysis patients

Lowrie et al. showed that for patients on haemodialysis, a low cholesterol was associated with an increased relative risk of death. Compared with a cholesterol value of 5.2 – 6.5 mmol/l, a cholesterol of 2.6 - 3.9 mmol/l was associated with a 2.4 increase in the relative risk of death. Below 2.6 mmol/l the relative risk was increased to 4.3. Lowrie et al. did not analyse this data by stratification into male and female groups. A high cholesterol above 9.1 mmol/l was only associated with an increased relative risk of death of 1.3. These results from 1987-88 pre-dated the widespread use of 'statins' and it can be assumed that these patients were not on lipid lowering agents and that these results reflected the nutritional status of the patients. With the widespread use of lipid

lowering agents it may not be correct to apply the above risk factors to current haemodialysis patients.

Lowrie did not analyse cholesterol data for peritoneal dialysis patients, and the relative risk for this group of patients is unknown. Table 6.17 shows the data on low cholesterol from the Renal Registry.

Centre	Males % < 3.9 on dialysis	Females % < 3.9 on dialysis	Males % < 3.9 Transplanted	Females % < 3.9 Transplanted
A	10*		6	3
B	12			
C				
D	10	3	0	
E	4*			
F	15	3	3	1
G			1	1
H	22*	5*	3	0

* indicates > 10 and ≤ 20 results recorded for that modality by the centre

Table 6.17 Patients with low serum cholesterol

6:7.4 Transplant patients

In transplanted patients, centre G has a high proportion of patients with a serum cholesterol above the desired range, (table 6.18, figures 6.15, 6.16), although there is insufficient data to compare this with its dialysis patients. It also has a higher median cholesterol than other centres.

	Male transplanted		Female transplanted	
Centre	% ≤ 5.5 mmol/	% ≤ 6.5 mmol/	% ≤ 5.5 mmol/	% ≤ 6.5 mmol/l
A	59	88	43	61
B	56*	81*		
C				
D	25*	50*		
E	60*	80*	18*	45*
F	39	73	33	71
G	19	51	12	35
H	43	70	31	64

* indicates > 10 and ≤ 20 results recorded for that modality by the centre

Table 6.18 Serum cholesterol range of transplant patients, by gender

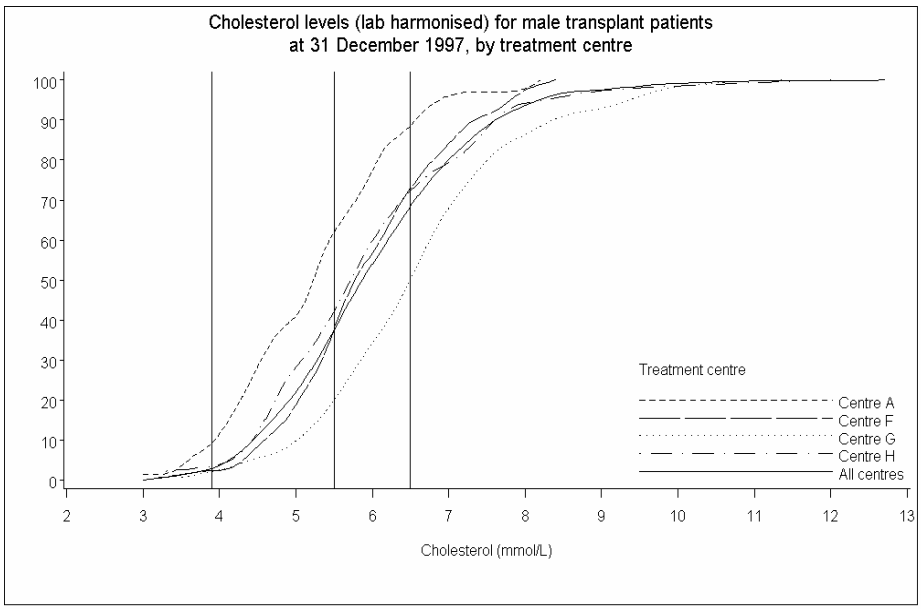
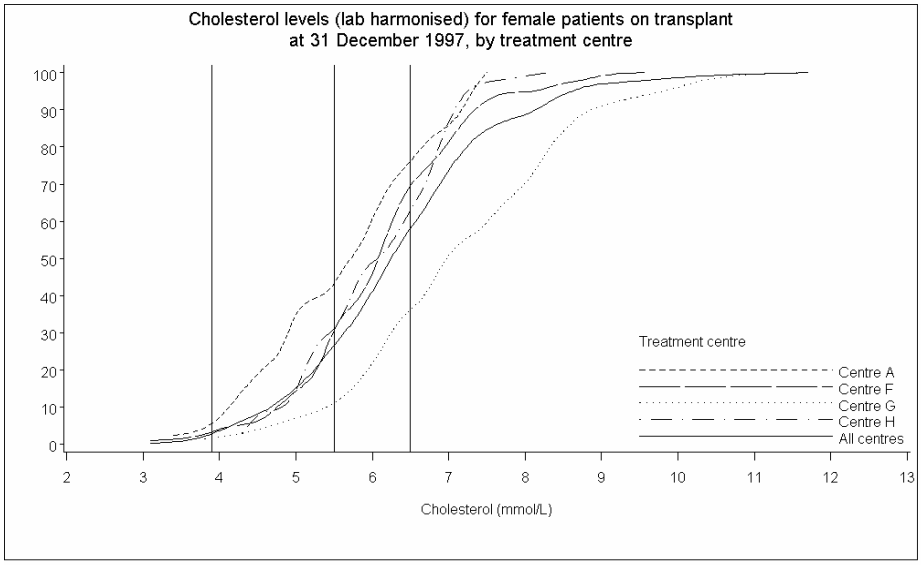


Figure 6.15 Cumulative frequency plots of serum cholesterol for male transplant patients



Vertical lines indicate 3.9, 5.5 and 6.5 mmol/l.

Figure 6.16 Cumulative frequency plots of serum cholesterol for female transplant patients