Chapter 10: Factors which may influence cardiovascular disease – blood pressure and serum cholesterol

Summary

- Blood pressure returns to the Renal Registry continue to be poor from some centres.
- In England & Wales, the combined blood pressure standard was achieved in 39% of patients pre-haemodialysis (inter unit range 14–64%), 48% of patients post-haemodialysis (range 32–67%), 32% of peritoneal dialysis patients (range 15–55%) and 27% of transplant patients (range 12–47%).
- Over the last 7 years there has been no significant change in systolic or diastolic blood pressure achievement.
- In England & Wales, the cholesterol standard was achieved in 77% of patients on haemodialysis (HD) (inter unit range 54–69%), 64% of peritoneal dialysis (PD) patients (range 41–84%) and 53% of transplant patients (Tx) (range 25–72%).
- Cholesterol levels are consistently lower in haemodialysis patients compared to peritoneal dialysis or transplant patients.
- Post-haemodialysis blood pressure, episodes of symptomatic hypotension during haemodialysis, C-reactive protein (CRP), beta blocker and statin use need to be recorded to help with the interpretation of Renal Registry data.

Introduction

Hypertension and hypercholesterolaemia are major risk factors for cardiac disease in the general population. Evidence from numerous randomised controlled trials indicate the lower the blood pressure or cholesterol level, the lower the cardiovascular risk, particularly for diabetics. There is no controlled trial data in this area for patients on renal replacement therapy (RRT). Until there is definitive evidence it is important to audit the effect of lowering blood pressure and cholesterol in the (HD), (PD) and (Tx) populations.

Hypertension plays a direct role in the development of heart disease and cardiac failure in renal impairment. The duration of hypertension before the start of dialysis correlates with mortality[1]. Studies with a follow-up period exceeding 5 years show a positive correlation between hypertension and mortality. The U-shaped relationship evident in short term studies[2] highlights the risk of death is greatest for patients with established cardiac failure and relative hypotension. The evidence suggests a more aggressive approach to blood pressure control is needed in the early stages of chronic kidney disease (CKD) if patients are to survive longer on RRT.

Widening pulse pressure (systolic minus diastolic blood pressure) is a manifestation of arterial stiffening and is a potent predictor of cardiac mortality in both the general and dialysis populations[3]. In a cross sectional study PD patients had significantly stiffer arteries with blunted vasodilator responses compared with patients on HD. Both dialysis groups had stiffer arteries than Tx patients and essential hypertensive controls[4]. The effect of different treatment modalities on arterial function is likely to be an important area for future research. Pulse pressure is not the only important factor; both high systolic blood pressure and low diastolic blood pressure are independently associated with cardiovascular death[5,6]. For HD, post-dialysis blood pressure correlates more closely with outcome[2,7].

The main cause of hypertension in the dialysis population is salt and water overload. Sodium also has an independent effect on left ventricular hypertrophy and dilatation[8]. A combination of dietary sodium restriction and increased sodium removal by long HD normalises blood pressure in 95% of patients and reduces mortality compared to conventional HD[9]. Also in PD, sodium restriction and enhanced sodium clearance achieves dry weight and blood pressure control in 90% of patients and is associated with improved survival[10,11]. For PD patients with residual renal function, increased ultrafiltration often leads to decreased

Kt/V, necessitating an increase in dialysis dose or transfer to HD. Currently no unit in the UK takes an aggressive approach to sodium balance and indeed this would be a difficult area to audit. The development of hypertension after renal transplantation is independently correlated with graft function and use of drugs, particularly cyclosporin[12]. The role of sodium balance has not been addressed in Tx patients.

Blood Pressure Control

Introduction

The Renal Association standards for control of hypertension were revised in August 2002. The current standards are:

Pre-haemodialysis systolic blood pressure <140 mmHg.
Pre-haemodialysis diastolic blood pressure <90 mmHg.
Post-haemodialysis, peritoneal dialysis and renal transplant recipient systolic blood pressure <130 mmHg.
Post-haemodialysis, peritoneal dialysis and renal transplant recipient diastolic blood pressure <80 mmHg.

The Renal Association does not specify separate standards for diabetics on RRT. Diabetic guidelines for non-RRT patients with proteinuria advise a lower target BP (<125/75 mmHg) to reduce cardiovascular risk.

There are several other UK guidelines set for blood pressure achievement in diabetic patients, which cause confusion. The National Institute of Clinical Excellence (NICE) guidelines[13,14] for non-RRT patients with Type 2 diabetes and proteinuria advise a BP <135/75 mmHg. The NICE guidelines for management of Type 1 diabetes in adults[15] recommends a BP of <130/80 mmHg in patients with diabetic nephropathy and <125/75 mmHg in those with proteinuria. The above standards should not be confused with the blood pressure target set within the GP contract, which is a payment related target and not a clinical standard.

KDOQI have set a guideline for patients with CKD stages 1 and 2, diabetic patients and all transplant recipients (irrespective of creatinine clearance) of:

Blood pressure <130/80 mmHg

Completeness of Data Returns

Table 10.1 shows the data completeness of blood pressure values for each unit according to

Table 10.1: Percentage of patients with complete returns of blood pressure values by modality

	% completed data			
	Pre HD	Post HD	PD	Transplants
Bangor	99	99	92	–
Bradford	5	3	98	89
Bristol	99	98	100	50
Cambridge	12	0	95	73
Carlisle	93	93	38	3
Carshalton	0	0	1	0
Clwyd	11	0	85	–
Coventry	99	99	75	66
Cardiff	8	0	6	93
Derby	83	84	26	–
Exeter	93	91	100	11
Gloucester	97	0	6	35
Guys	69	67	5	1
H&CX	0	0	0	0
Heartlands	92	91	7	2
Hull	88	88	47	4
Ipswich	95	96	2	1
Kings	0	0	0	0
Leeds	97	96	52	70
Leicester	97	93	92	80
Liverpool	34	0	64	66
ManWest	0	0	0	0
Middlesbrough	95	94	100	52
Newcastle	0	0	0	0
Nottingham	96	95	100	96
Oxford	95	82	80	7
Plymouth	0	0	0	2
Portsmouth	0	0	0	0
Preston	0	0	0	0
Reading	92	1	95	17
Sheffield	100	98	97	97
Stevenage	87	0	7	4
Southend	95	1	9	3
Sunderland	96	96	6	4
Swansea	0	0	0	2
Truro	96	96	60	47
Wirral	4	0	5	–
Wolverhampton	99	93	17	4
Wordsley	95	91	90	62
Wrexham	1	0	0	0
York	91	91	89	98
England	62	51	46	33
Wales	13	9	13	77
E&W	58	48	42	36

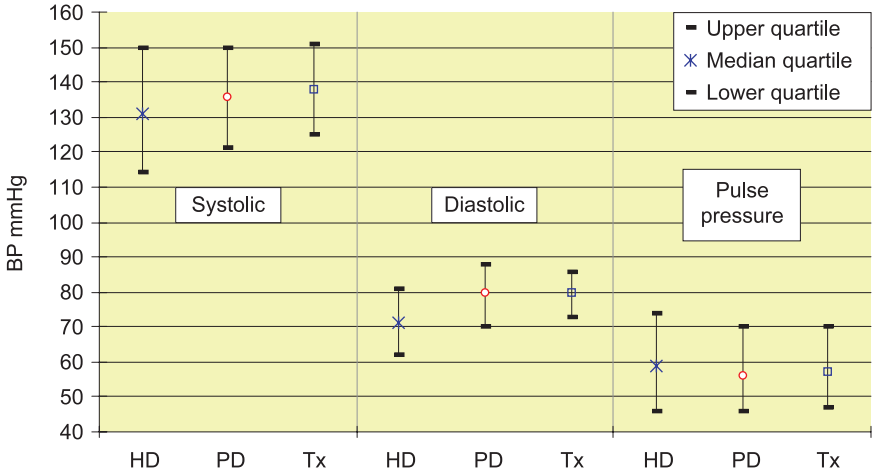

Figure 10.1: Summary of BP achievements

modalities. Patients need to have at least one blood pressure recording in the last 6 months of 2003 to be included in the analyses. Units with more than 50% missing data were excluded from the blood pressure analyses.

Sixteen centres had insufficient data for HD, 23 centres insufficient data for PD and 24 centres insufficient data for Tx. For the analyses, data were available for 4,052 Tx patients, 1,482 PD patients and 5,659 HD patients, but only 4,678 HD patients also had data on post-haemodialysis BP. Clearly a large proportion of units still have problems transferring data from all their clinical areas onto their renal IT systems. The renal NSF Information Strategy document highlights the need for an effective IT infrastructure.

Distribution of blood pressure by modality

Figure 10.1 indicates systolic, diastolic and pulse pressure distributions for each treatment modality (post-HD data is shown). The systolic/diastolic standard deviations for post HD, PD and Tx were 26/14, 24/13 and 20/11 respectively, with the widest spread for HD. The values have not changed substantially over the last few years and should be compared to 18/10 for a hypertensive population. A specified blood pressure target eg 130/80 typically becomes the mean blood pressure of the group. Diastolic blood pressure is significantly lower for HD and accounts for the wider pulse pressure in this group (Kruskall-Wallis test; $p < 0.0001$).

Achievement of combined systolic and diastolic standard

Figures 10.2–10.5 show a wide variation between units achieving the combined blood pressure standard for each modality. In England & Wales, the median percentage of HD patients achieving the standard pre-dialysis is 37% (range 9–54%) and post-dialysis 43% (range 30–54%). For PD patients, the median achieving the standard is 28% (range 4–47%) and 21% for Tx patients (range 16–26%). Chi squared testing indicates the variation between centres for each treatment modality is significant (HD and PD; $p < 0.0001$, Tx; $p = 0.0236$).

Systolic pressure alone

Figures 10.6–10.13 show a wide variation between units achieving the systolic blood pressure standard. In England & Wales, the percentage of HD patients achieving the standard pre-dialysis is 38% (range 9–56%) and post-dialysis is 48% (range 35–61%). 37% of PD patients achieve the standard (range 20–61%) and 31% of Tx patients (range 20–46%). Chi squared testing indicates the variation between centres for each treatment modality is significant (HD, PD and Tx; $p < 0.0001$). The median systolic blood pressure for pre-HD, post-HD, PD and Tx is 147, 131, 136 and 138 mmHg respectively.

Diastolic pressure alone

Figures 10.14–10.21 show wide variation between units achieving the diastolic blood pressure standard. In England & Wales, the

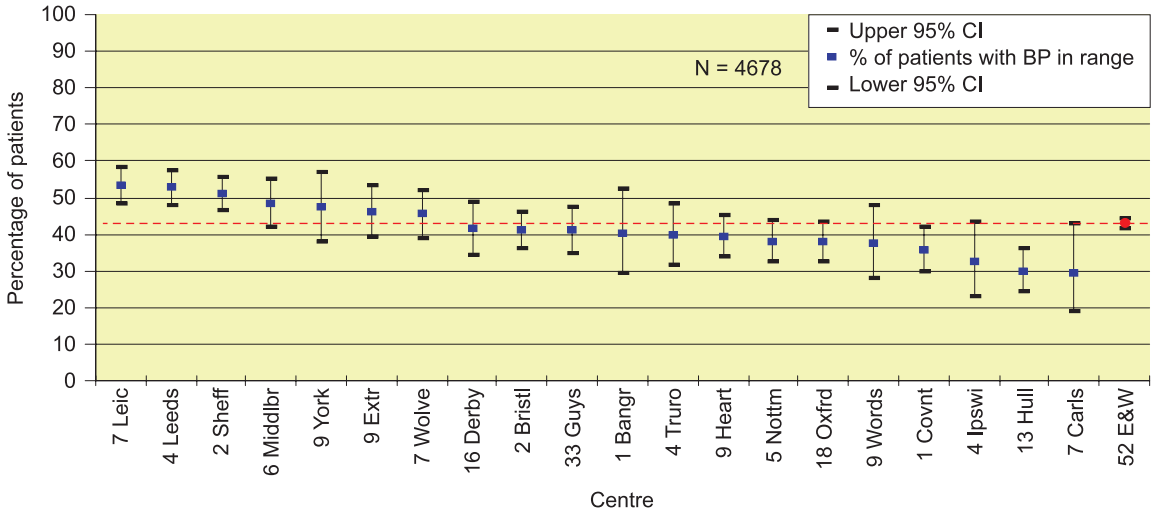

Figure 10.2: Percentage of patients with BP <130/80 mmHg: post-HD

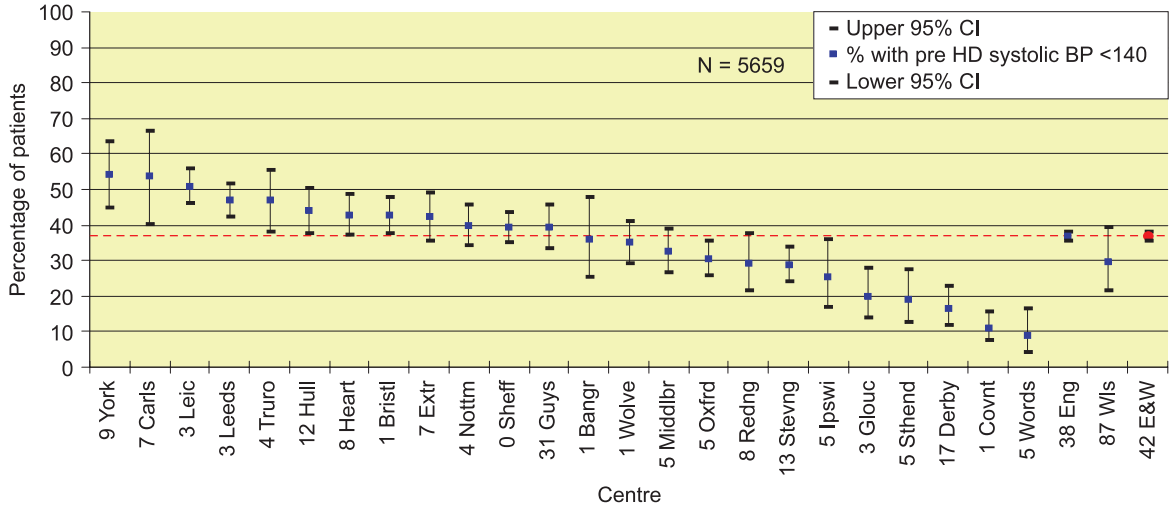

Figure 10.3: Percentage of patients with BP <140/90 mmHg: pre-HD

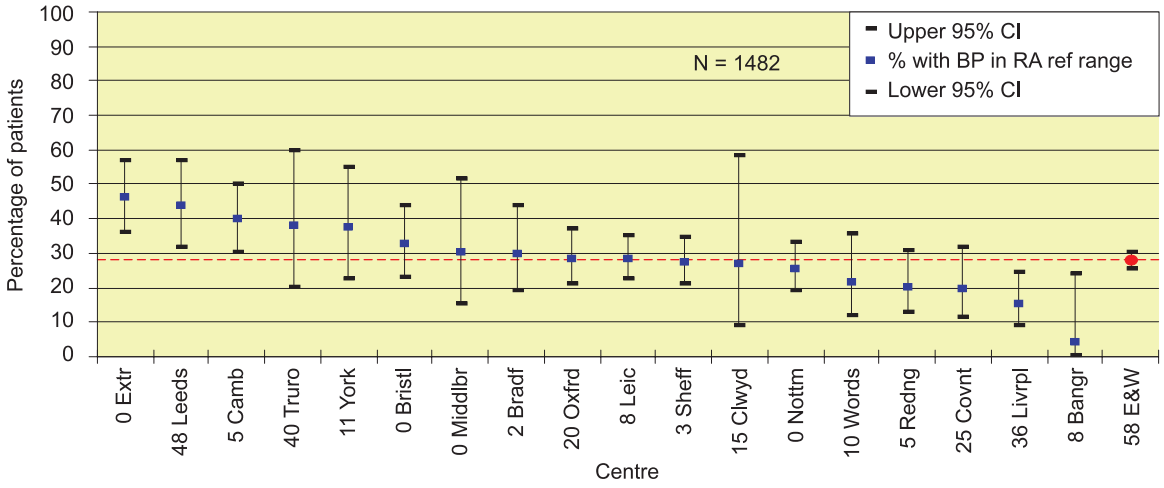

Figure 10.4: Percentage of patients with BP <130/80 mmHg: PD

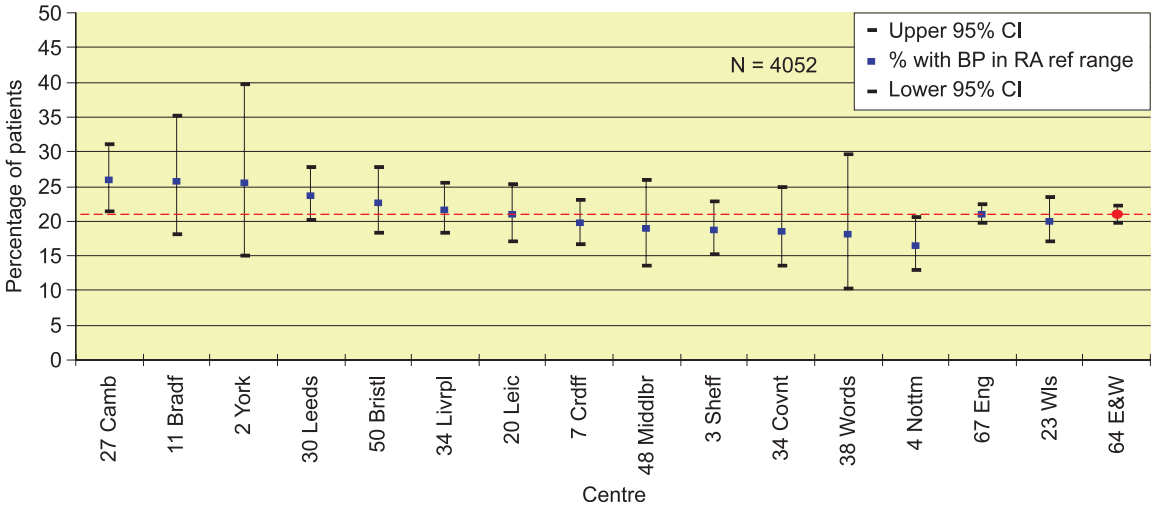

Figure 10.5: Percentage of patients with BP <130/80 mmHg: transplant

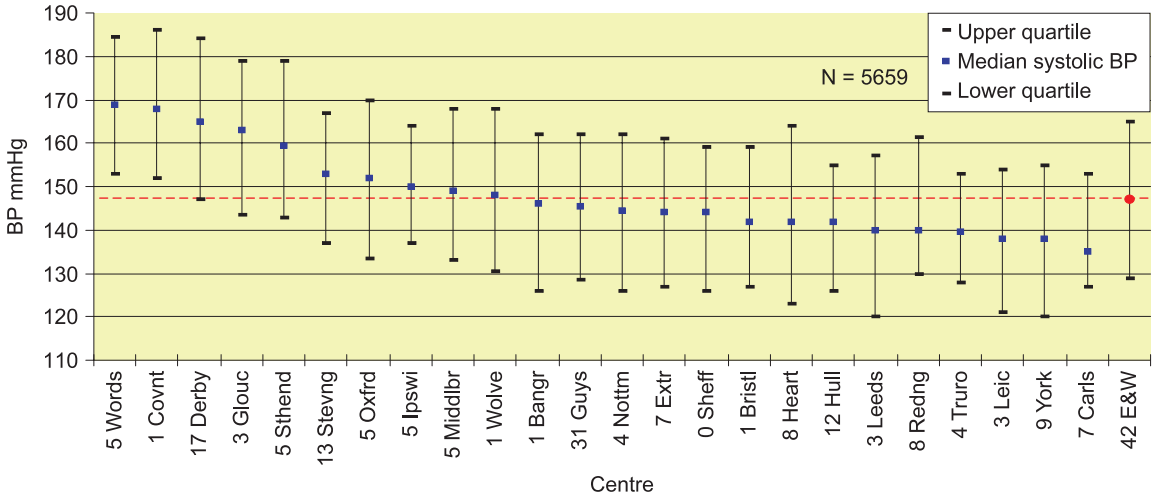

Figure 10.6: Median systolic BP: pre-HD

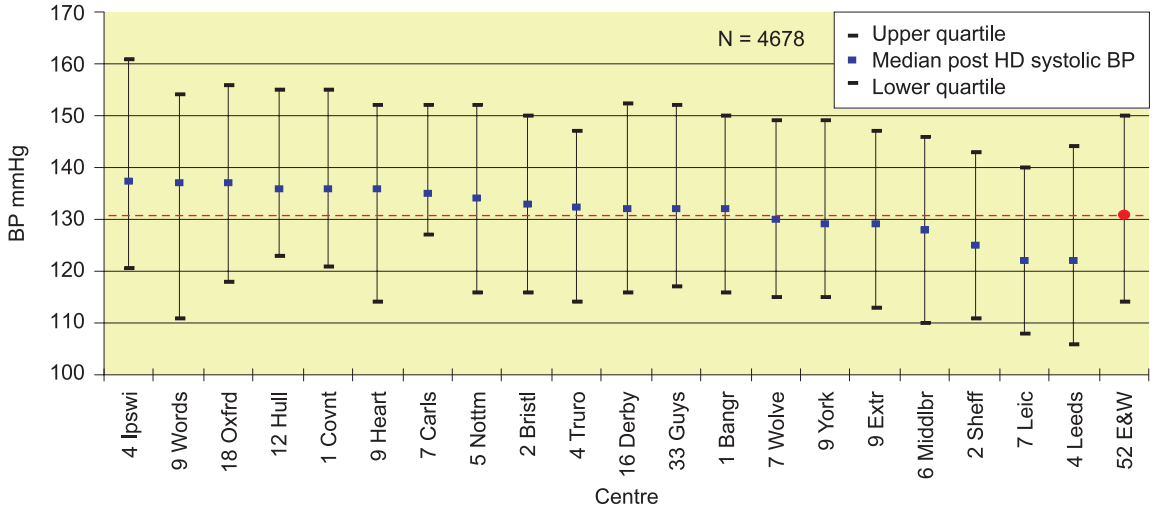

Figure 10.7: Median systolic BP: post-HD

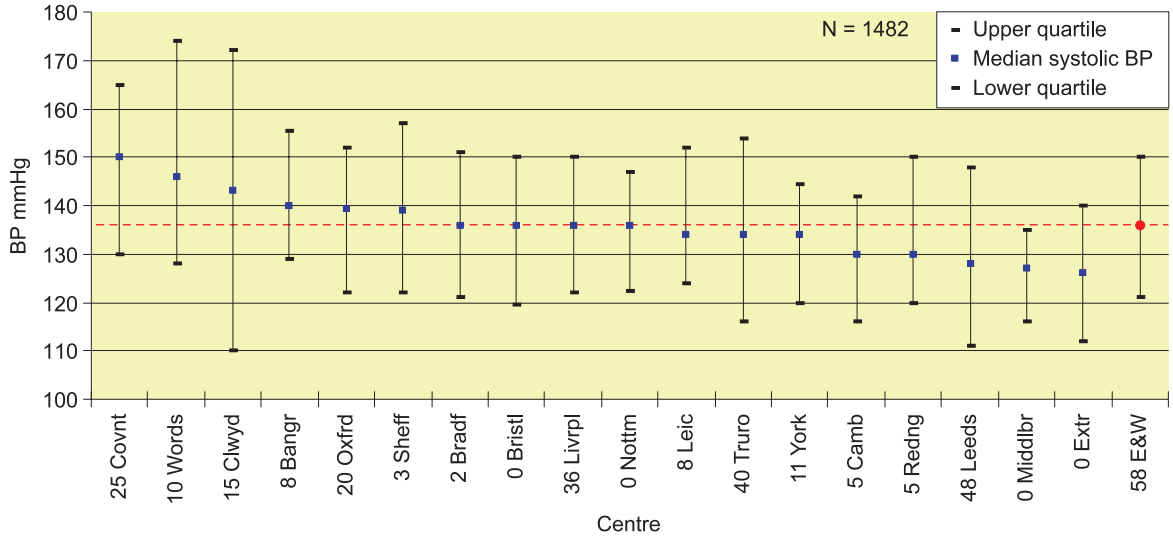

Figure 10.8: Median systolic BP: PD

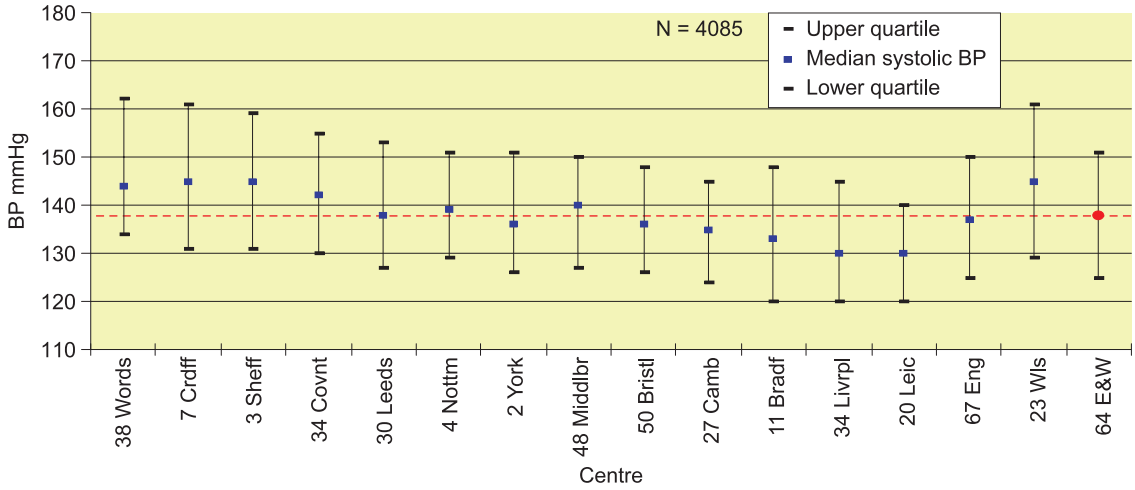

Figure 10.9: Median systolic BP: transplant

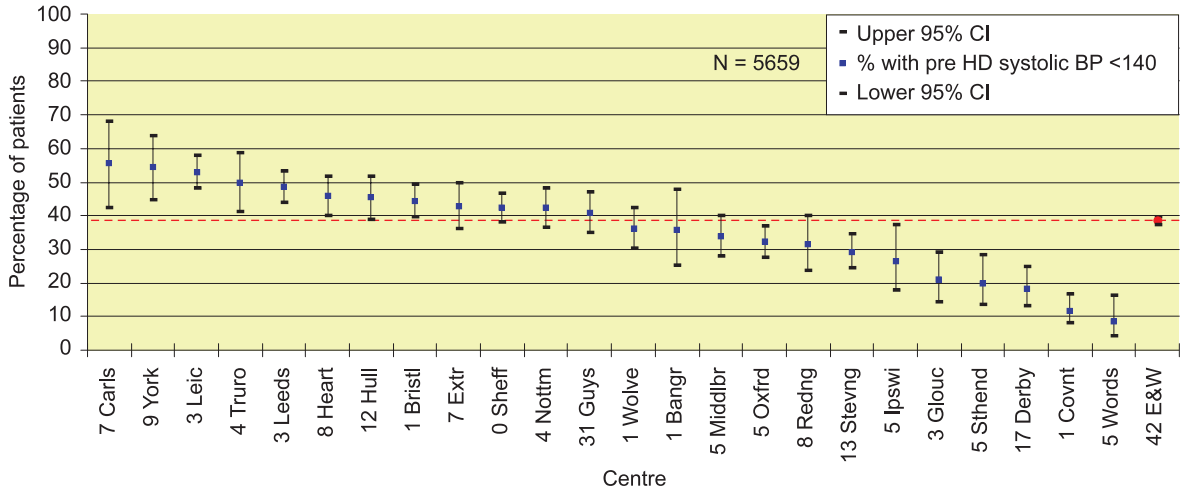

Figure 10.10: Percentage of patients with systolic BP <140 mmHg: pre-HD

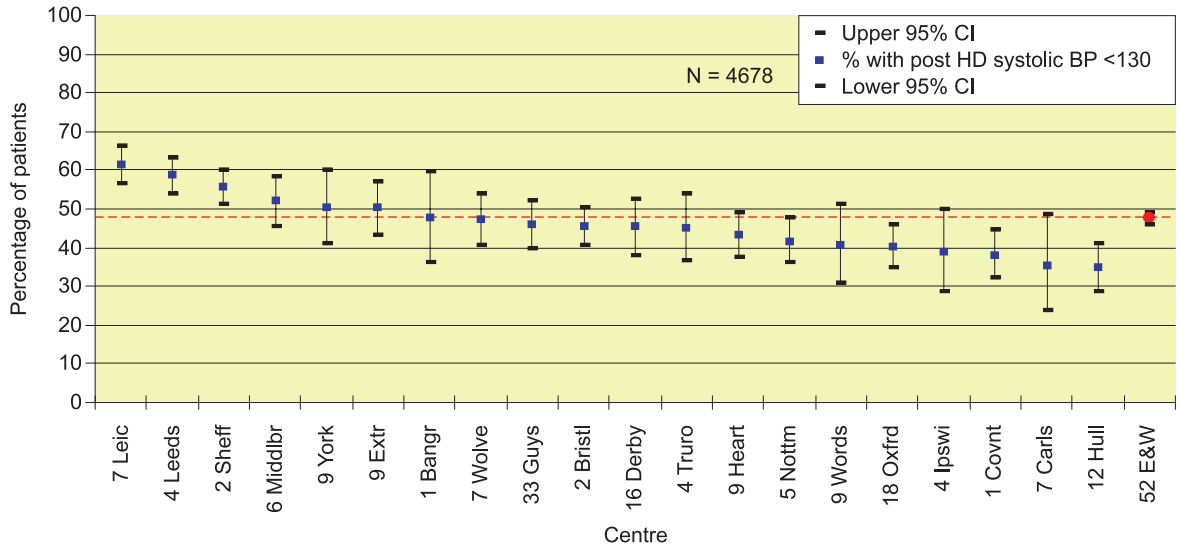

Figure 10.11: Percentage of patients with systolic BP <130 mmHg: post-HD

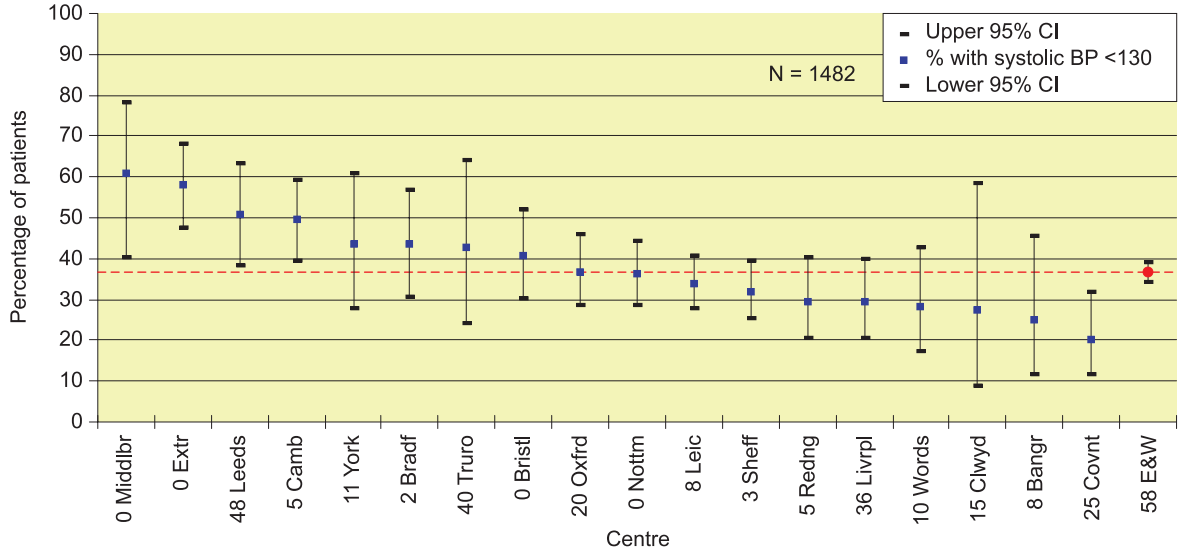

Figure 10.12: Percentage of patients with systolic BP <130 mmHg: PD

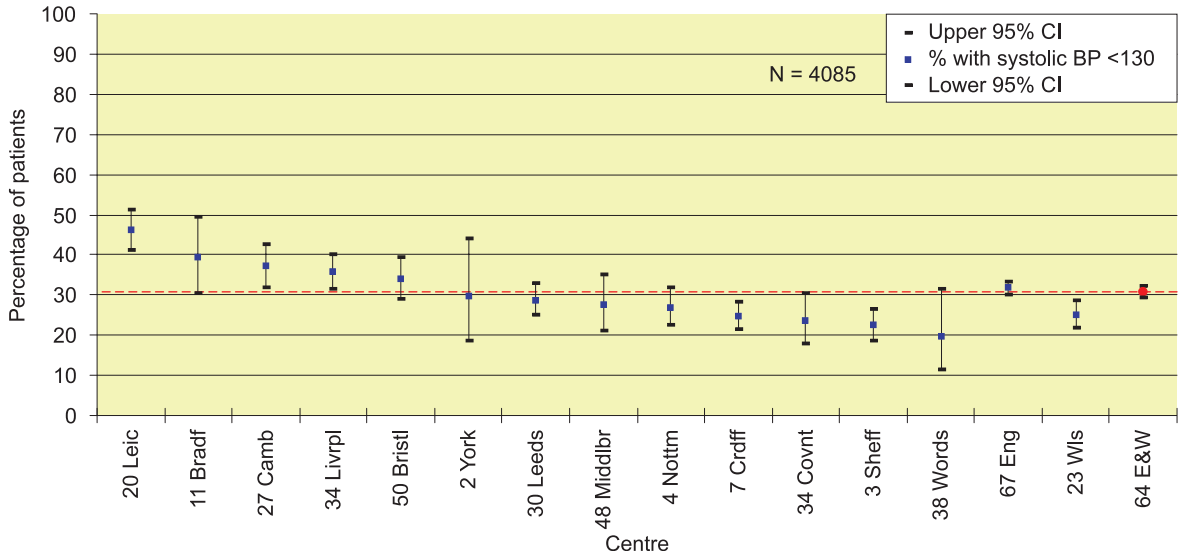

Figure 10.13: Percentage of patients with systolic BP <130 mmHg: transplant

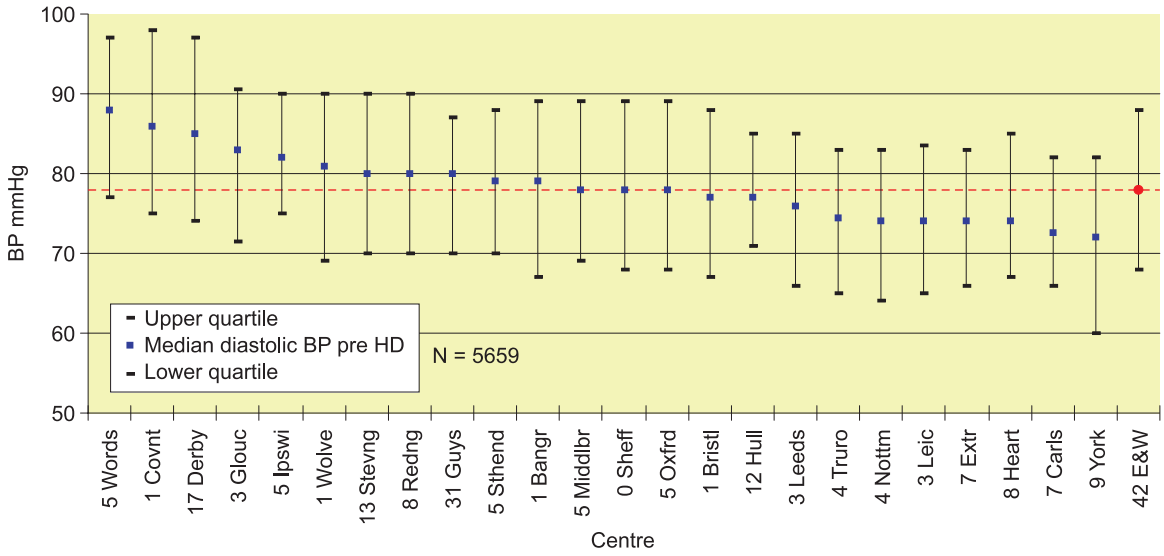

Figure 10.14: Median diastolic BP: pre-HD

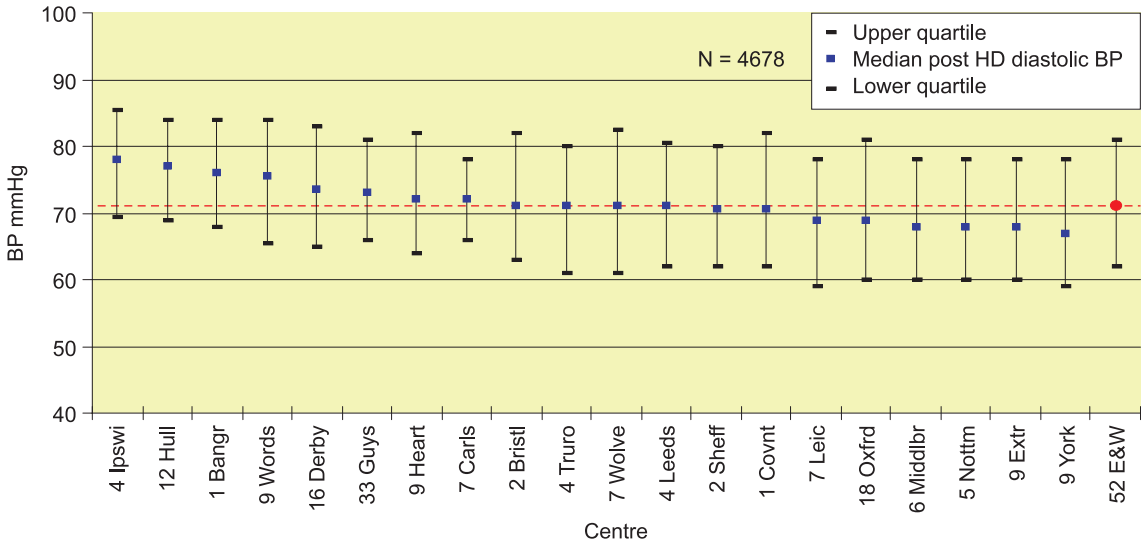

Figure 10.15: Median diastolic BP: post-HD

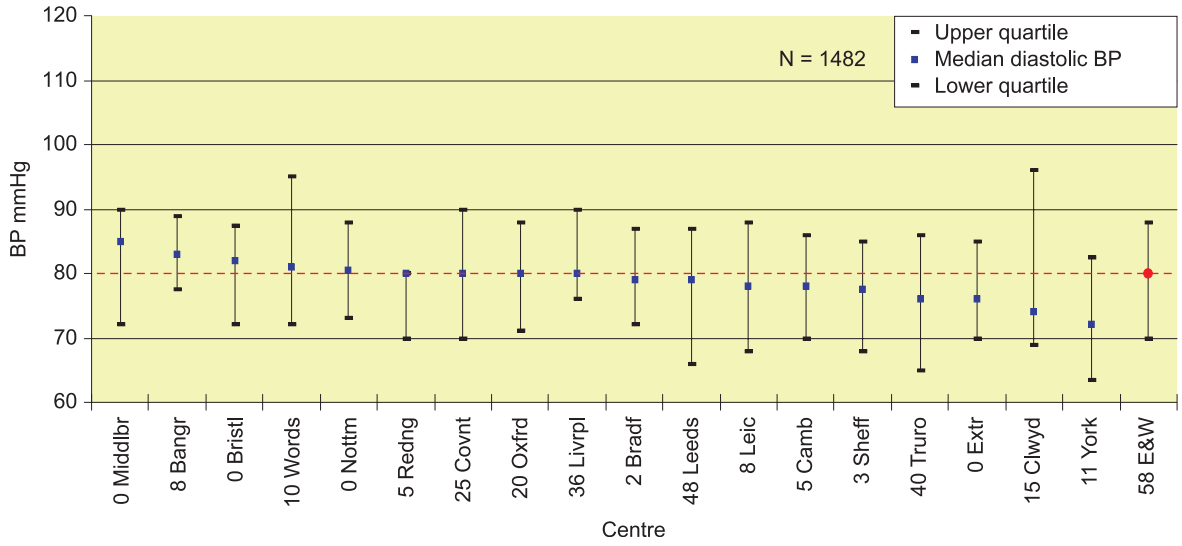

Figure 10.16: Median diastolic BP: PD

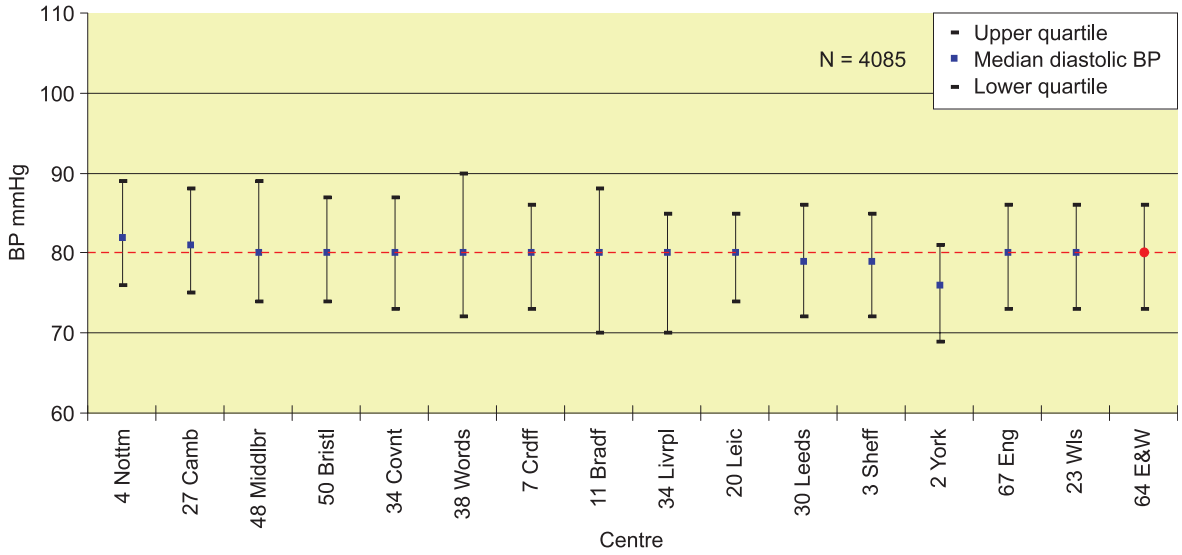

Figure 10.17: Median diastolic BP: transplant

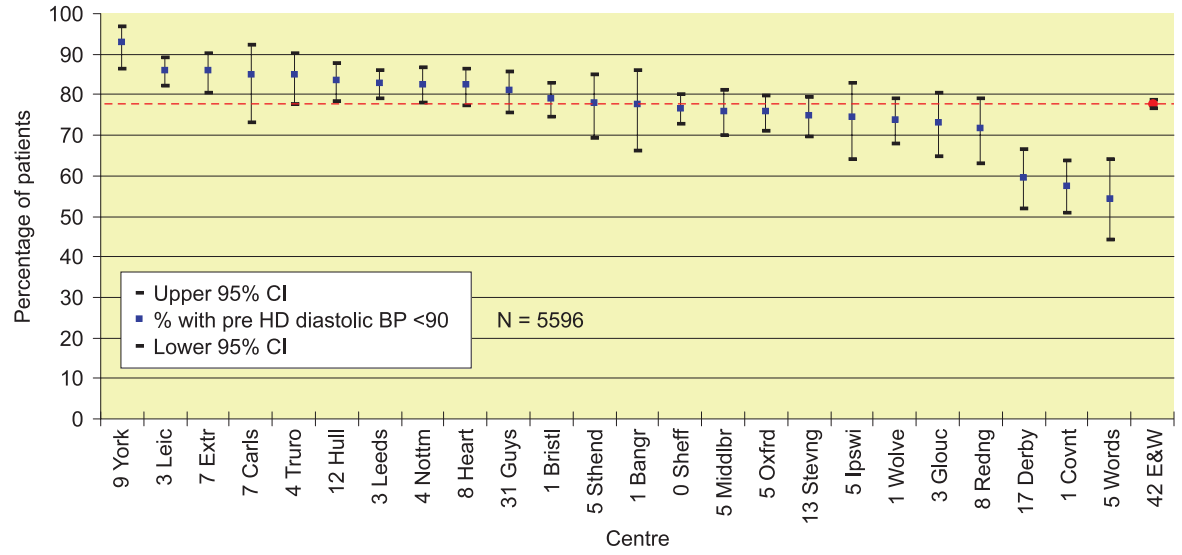

Figure 10.18: Percentage of patients with diastolic BP <90 mmHg: pre-HD

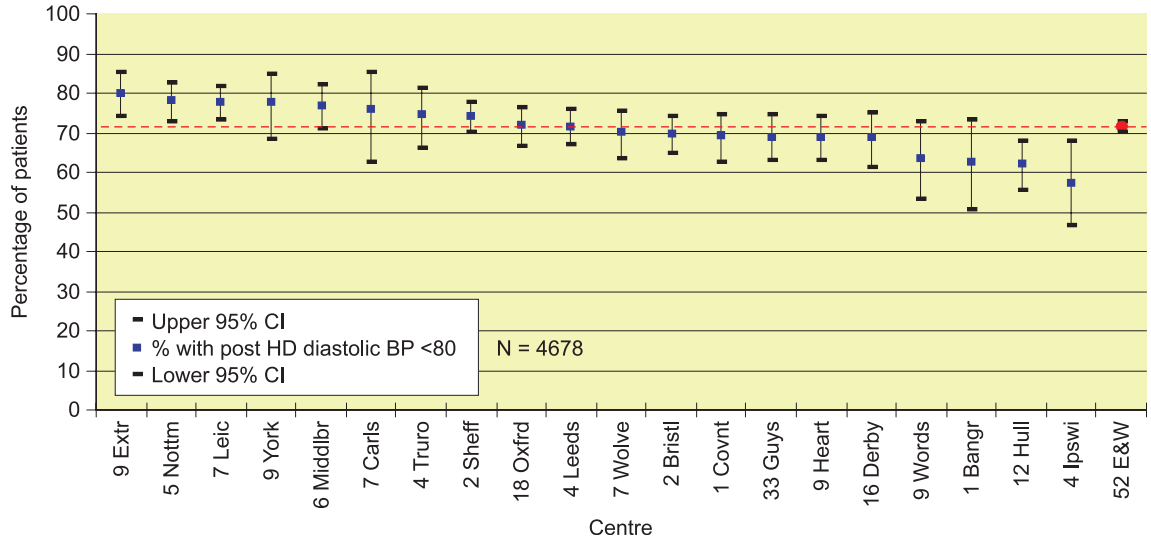

Figure 10.19: Percentage of patients with diastolic BP <80 mmHg: post-HD

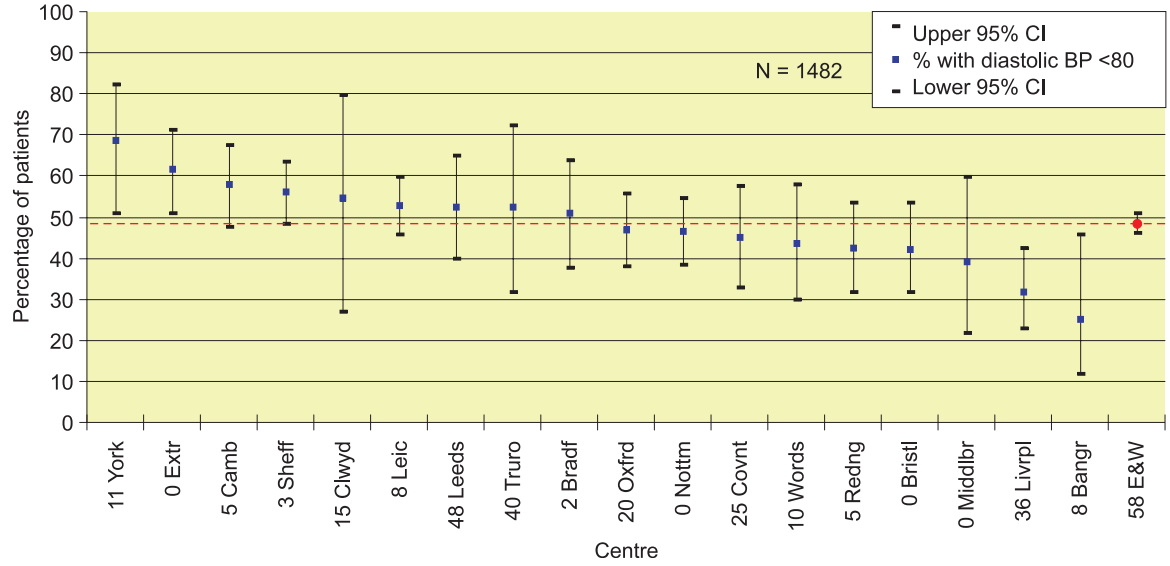

Figure 10.20: Percentage of patients with diastolic BP <80 mmHg: PD

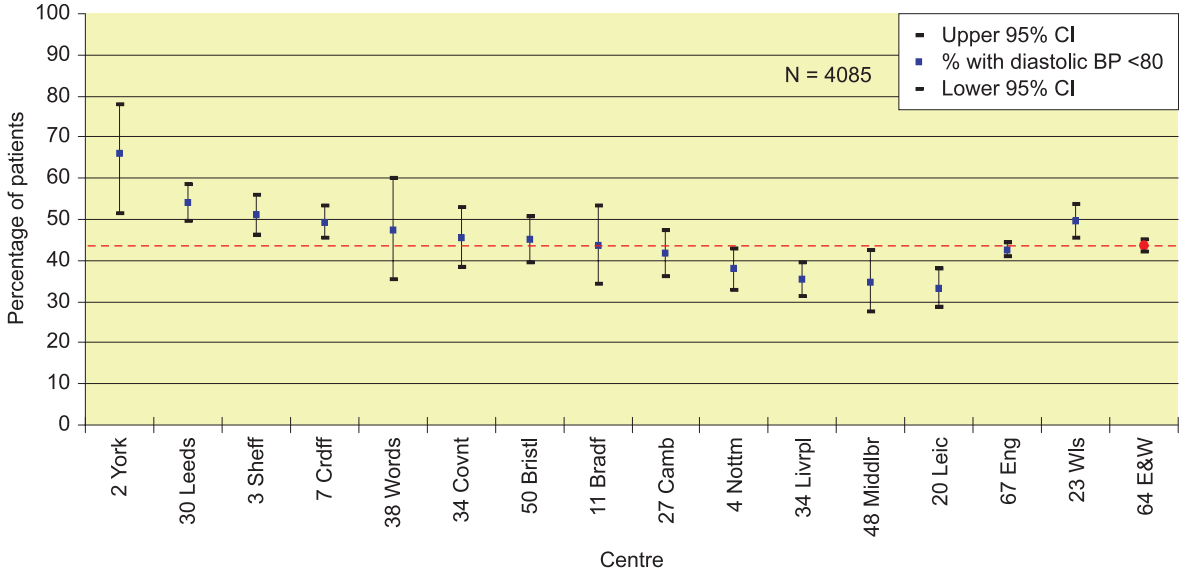

Figure 10.21: Percentage of patients with diastolic BP <80 mmHg: transplant

percentage of HD patients achieving the standard pre-dialysis is 78% (range 54–93%) and post-dialysis 71% (range 58–80%). 49% of PD patients achieve the standard (range 25–69%) and 44% of Tx patients (range 33–66%). Chi squared testing indicates the variation between centres for each treatment modality is significant (HD and Tx; $p < 0.0001$, PD; $p = 0.0093$). The median diastolic blood pressure for pre-HD, post-HD, PD and Tx is 78, 71, 80 and 80 mmHg respectively.

Mean arterial pressure (MAP)

Figures 10.22–10.29 show wide variation between units achieving the desired mean arterial pressure. MAP is calculated as diastolic blood pressure plus one third of the pulse pressure. In England & Wales, the percentage of HD patients achieving the standard pre-dialysis average 64% (range 34–80%) and post-dialysis average 63% (range 47–73%). An average of 48% of PD patients achieve the standard (range 25–63%) and 43% of Tx patients (range 33–65%). Chi squared testing indicates the variation between centres for each treatment modality is significant (HD and Tx; $p < 0.0001$, PD; $p = 0.0245$). The median MAP for pre-HD, post-HD, PD and Tx is 101, 92, 98 and 99 mmHg respectively.

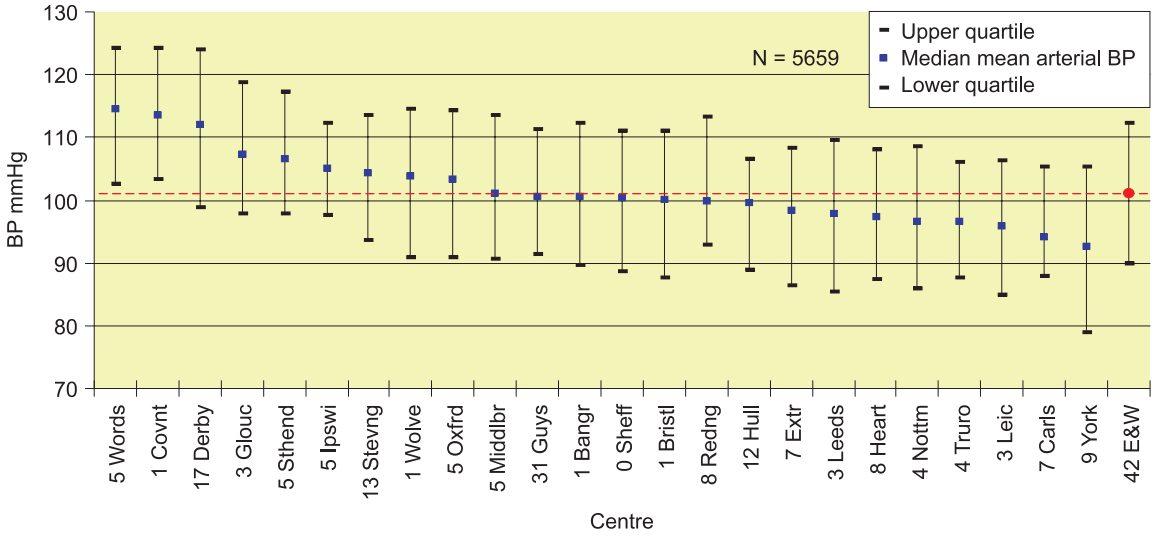

Figure 10.22: Median MAP: pre-HD

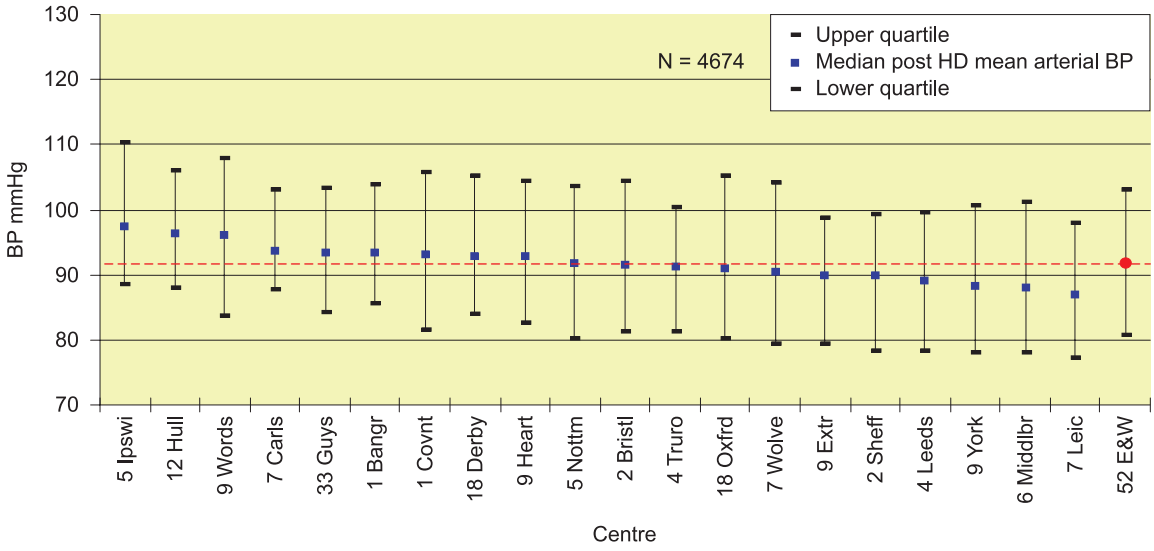

Figure 10.23: Median MAP: post-HD

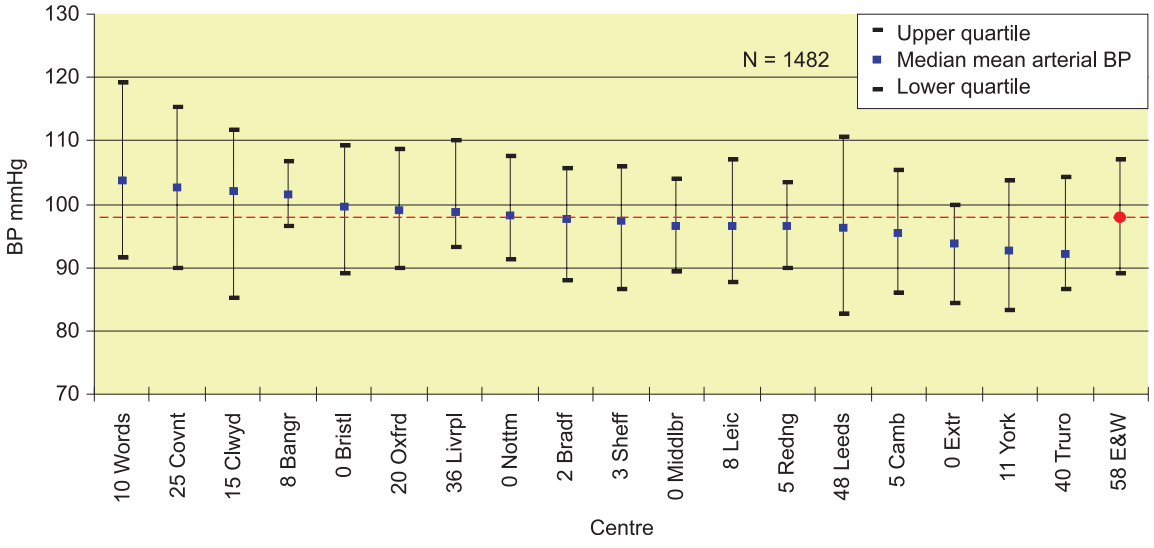

Figure 10.24: Median MAP: PD

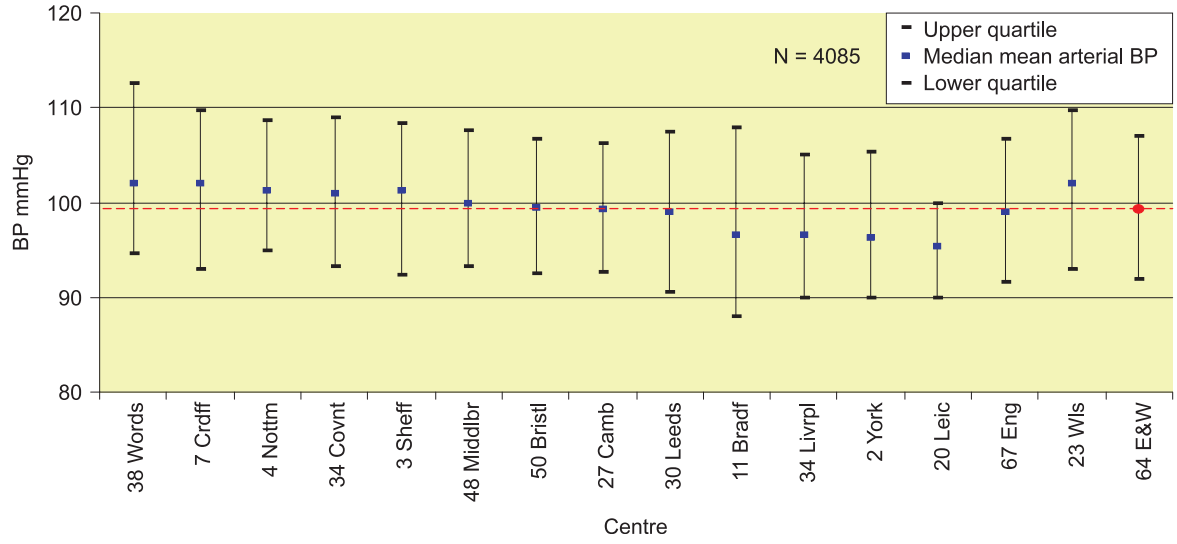

Figure 10.25: Median MAP: transplant

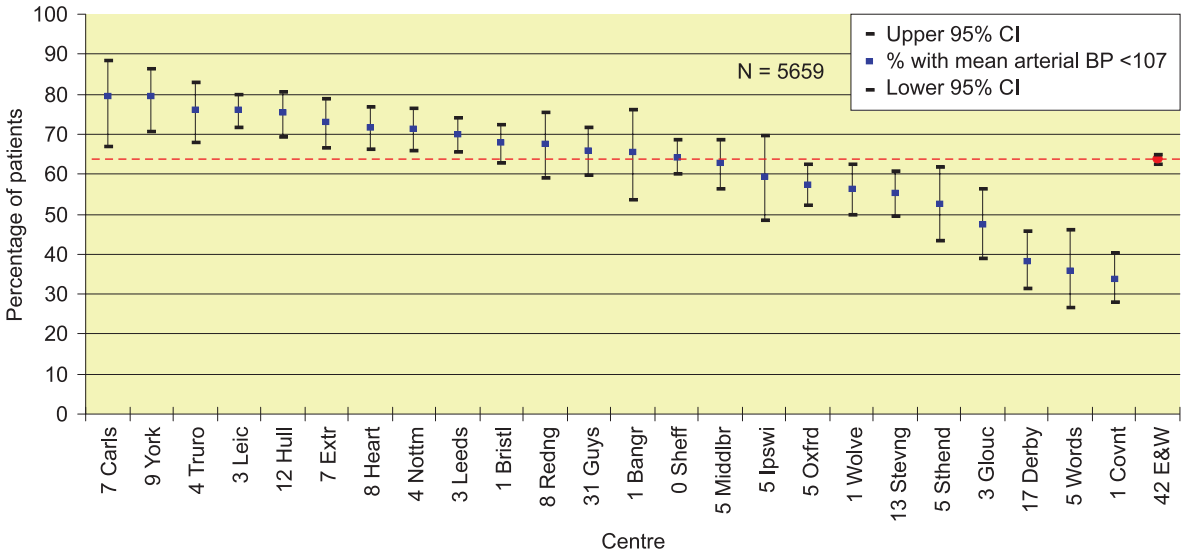

Figure 10.26: Percentage of patients with MAP <107 mmHg: pre-HD

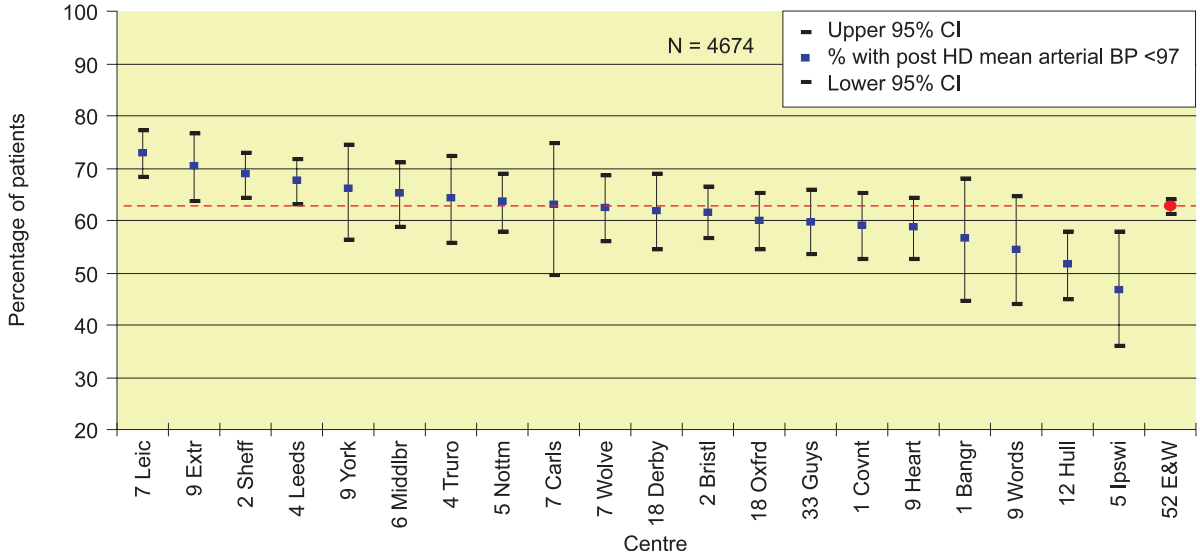

Figure 10.27: Percentage of patients with MAP <97 mmHg: post-HD

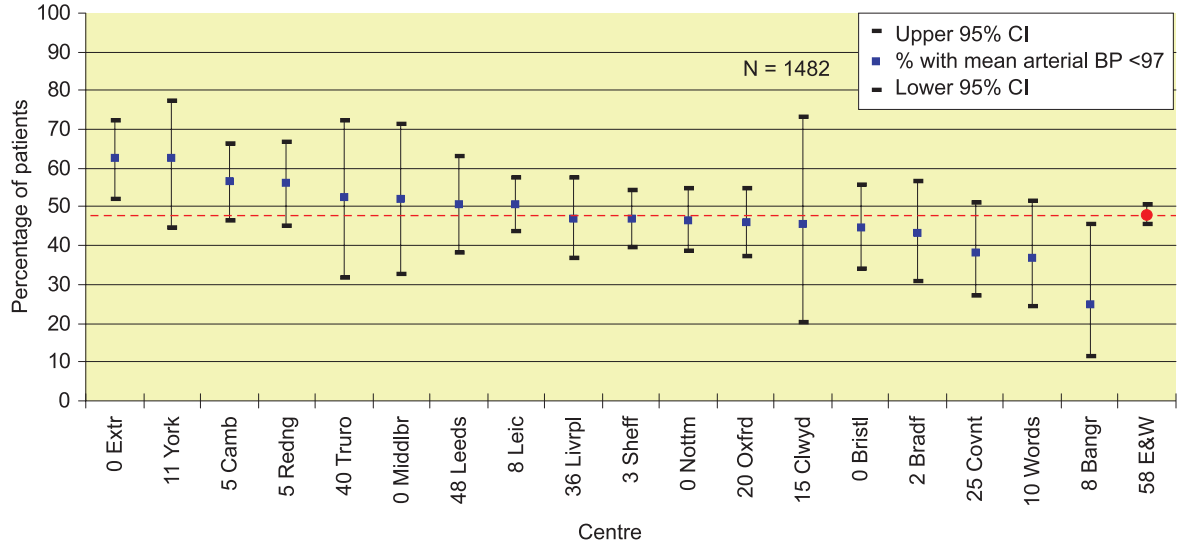

Figure 10.28: Percentage of patients with MAP <97 mmHg: PD

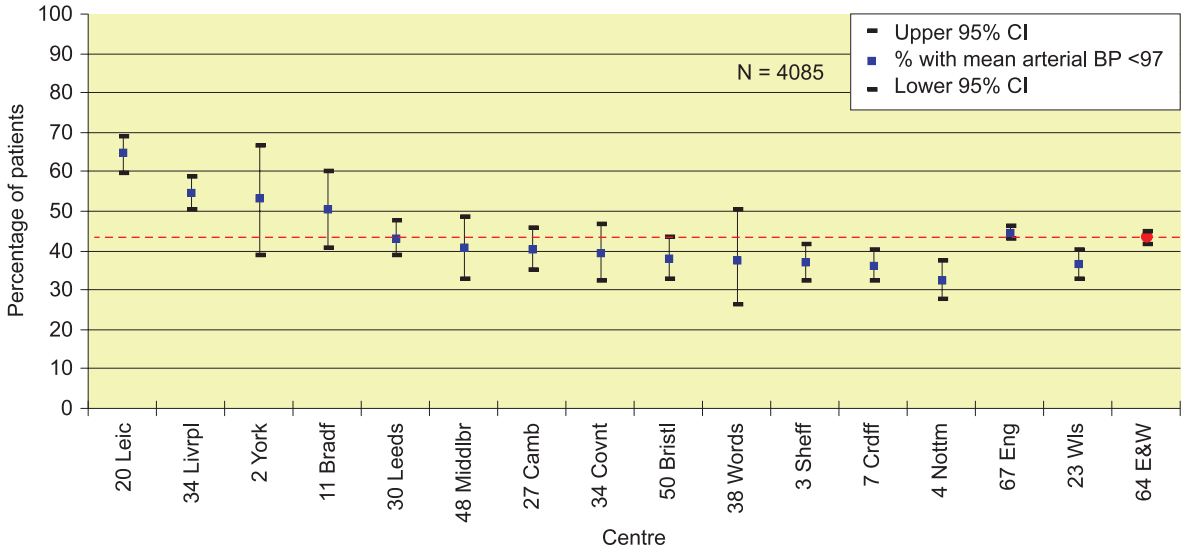

Figure 10.29: Percentage of patients with MAP <97 mmHg: transplant

Pulse pressure

Figures 10.30–10.33 show the variation between units for pulse pressure. The median pulse pressure for pre-HD, post-HD, PD and Tx is 68, 59, 56 and 57 mmHg respectively.

Blood pressure by primary diagnosis

Figures 10.34–10.41 show the variation in blood pressure control by primary diagnosis for each treatment modality (the HD data are post-haemodialysis data). The data show higher blood pressure levels for diabetics and reno-vascular disease; the median systolic pressure being higher than for other groups by 10 mmHg and 6 mmHg respectively. Except for diabetics, blood pressure control is significantly better on HD for each of the diagnostic groups. Compared with PD and Tx, the median systolic blood pressure was lower on HD by 3–9 mmHg and 7–13 mmHg respectively. The reduction in median diastolic blood pressure was 5–8 mmHg and 6–9 mmHg respectively. In hypertension trials, a 10 mmHg lowering of systolic or 5 mmHg lowering of diastolic blood pressure for just a few years reduces death from stroke by 40% and ischaemic heart disease by 30%[16]. Excluding diabetics, the percentages of patients achieving the combined blood pressure standard were 40–48% for HD, 23–34% for PD and 18–23% for Tx. This probably reflects

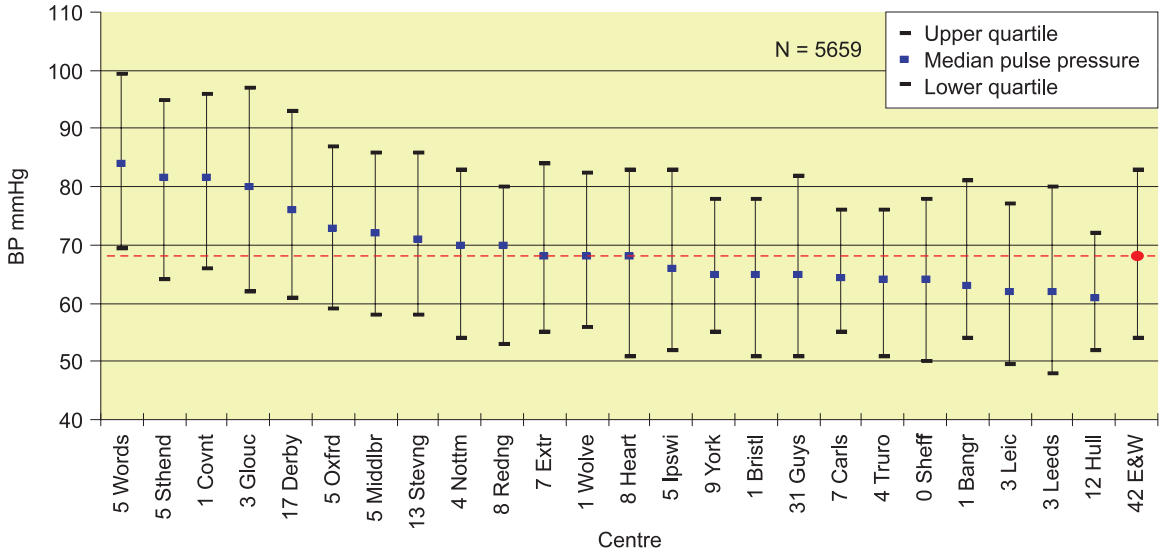

Figure 10.30: Median PP: pre-HD

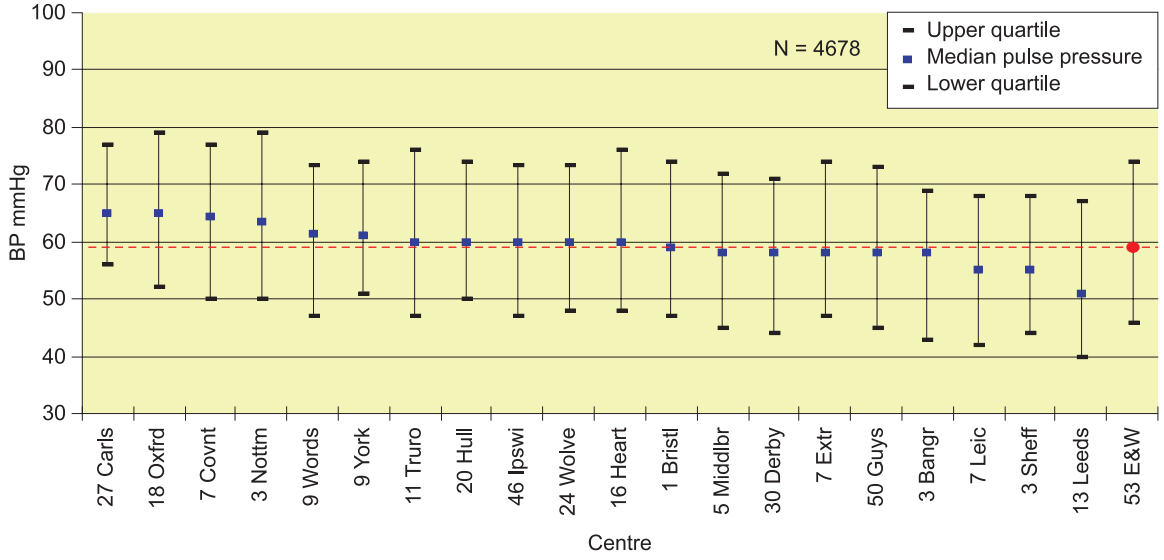

Figure 10.31: Median PP: post-HD

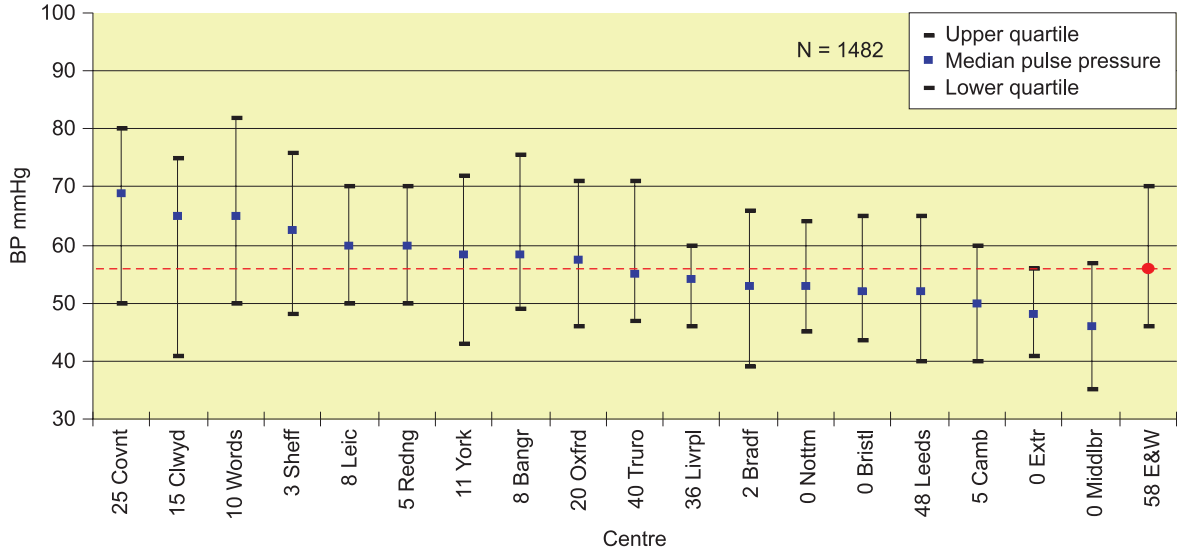

Figure 10.32: Median PP: PD

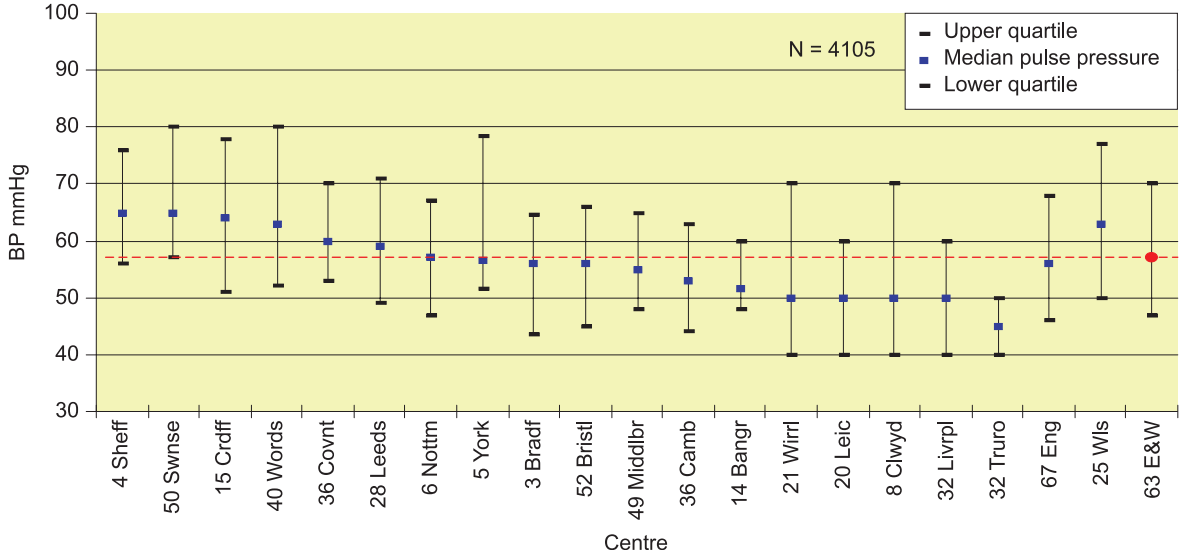

Figure 10.33: Median PP: transplant

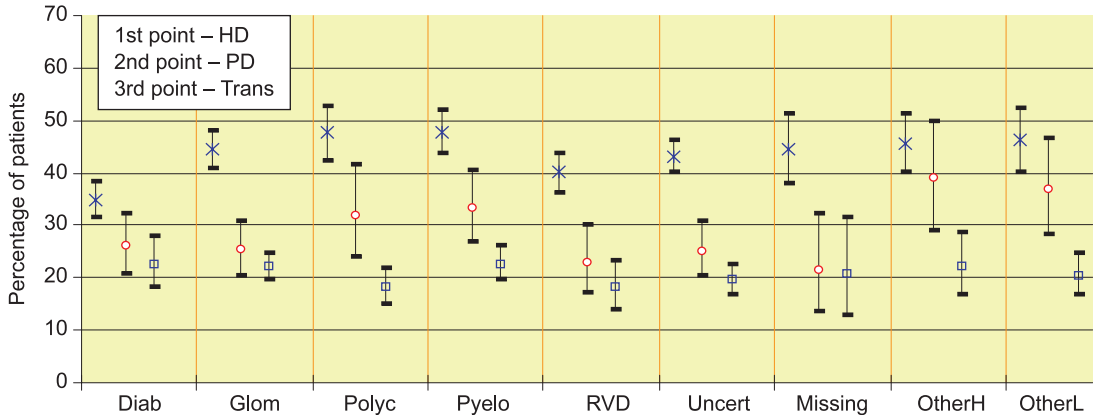

Figure 10.34: Percentage of patients with BP in standards by diagnosis

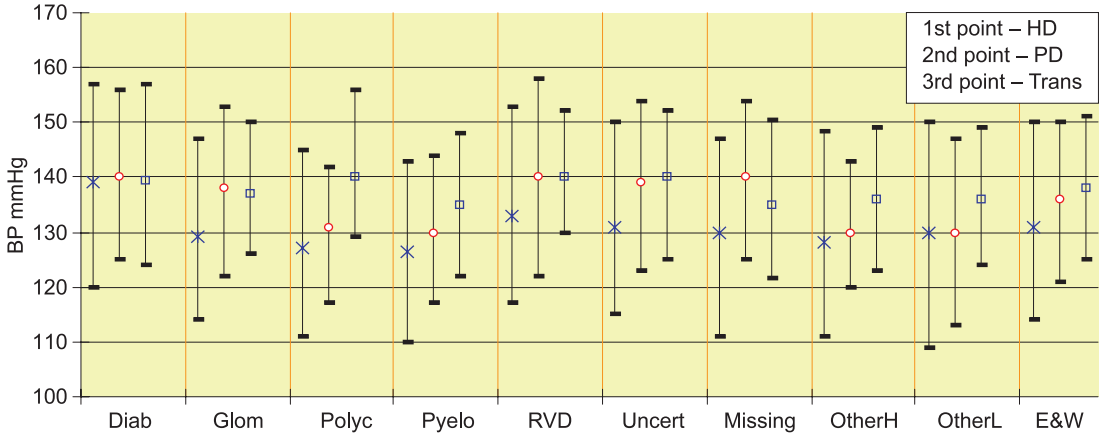

Figure 10.35: Median SBP by diagnosis

closer monitoring and supervision of fluid balance by HD nursing staff and suggests a more effective approach to blood pressure control is needed in the outpatient clinic setting. Poor blood pressure control for diabetics remains a major concern with only 35%, 26% and 23% of them achieving the combined standard on HD, PD and Tx respectively.

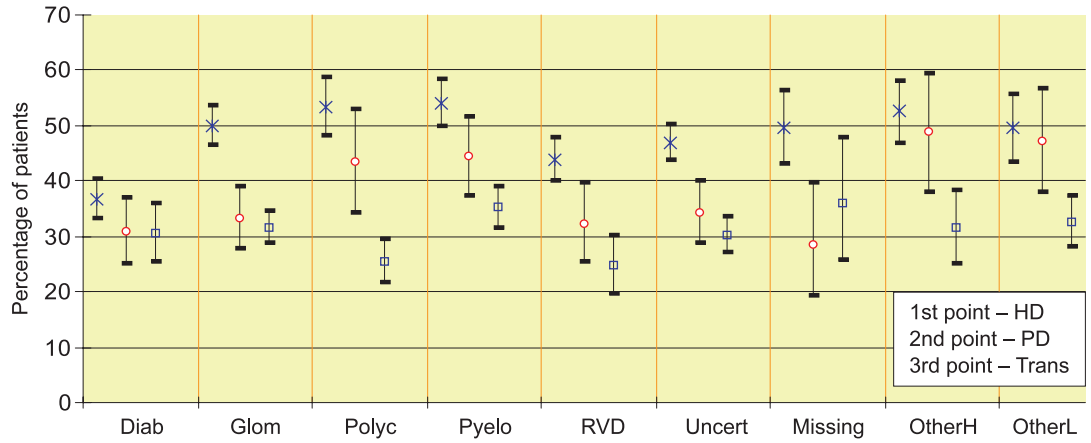

Figure 10.36: Percentage of patients with SBP in standards by diagnosis

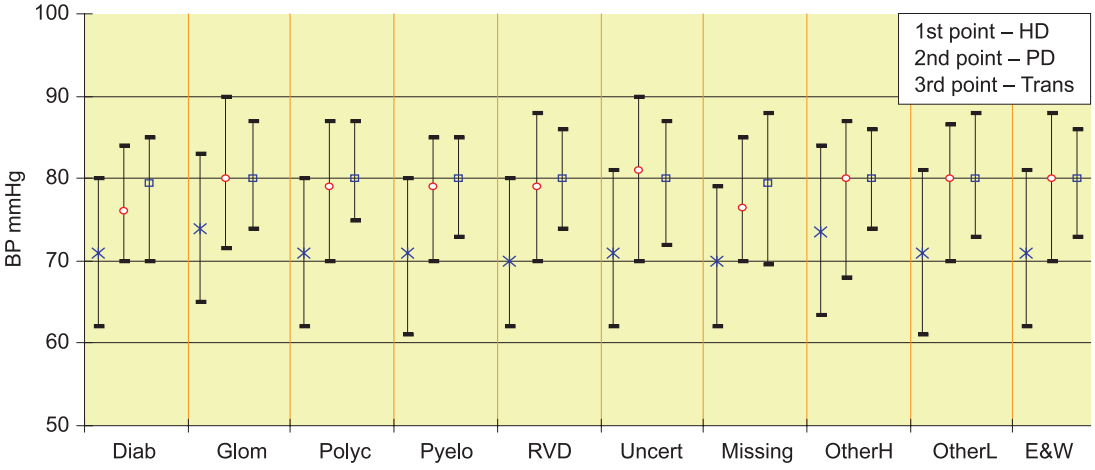

Figure 10.37: Median DBP by diagnosis

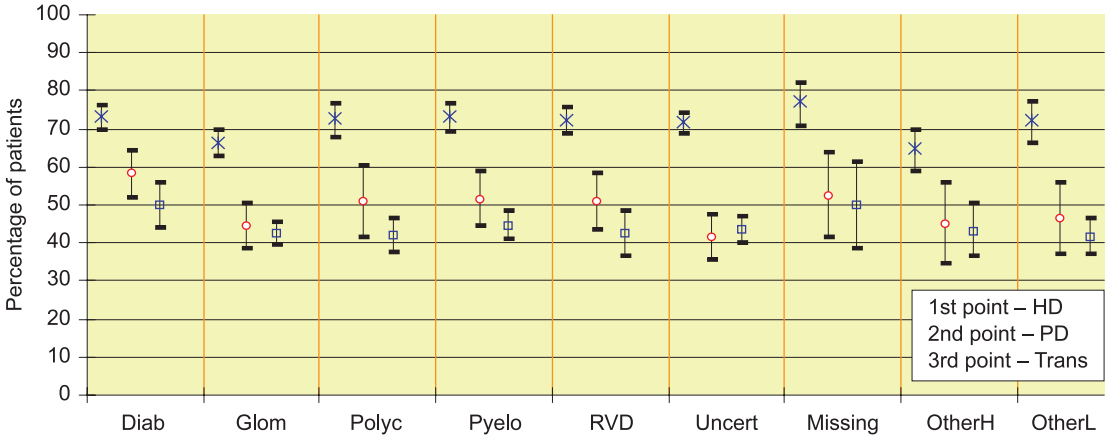

Figure 10.38: Percentage of patients with DBP in standards by diagnosis

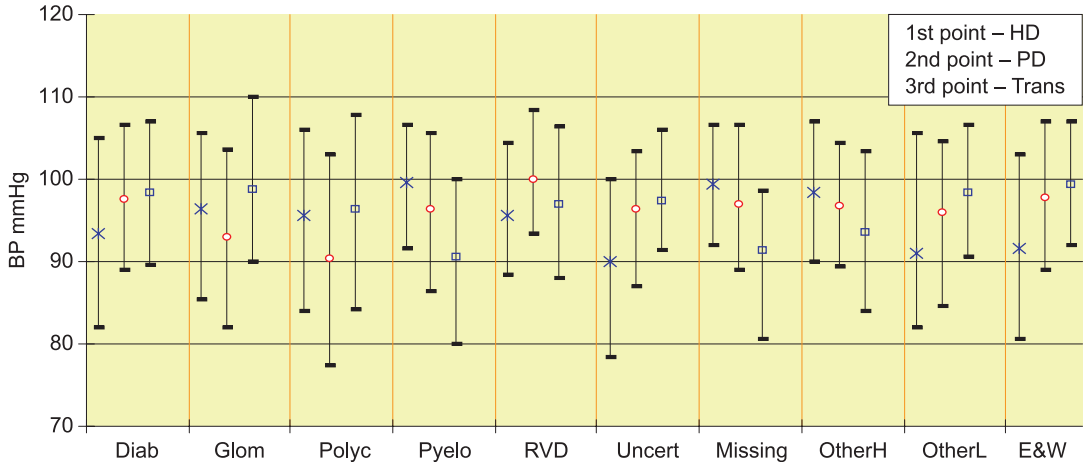

Figure 10.39: Median MAP by diagnosis

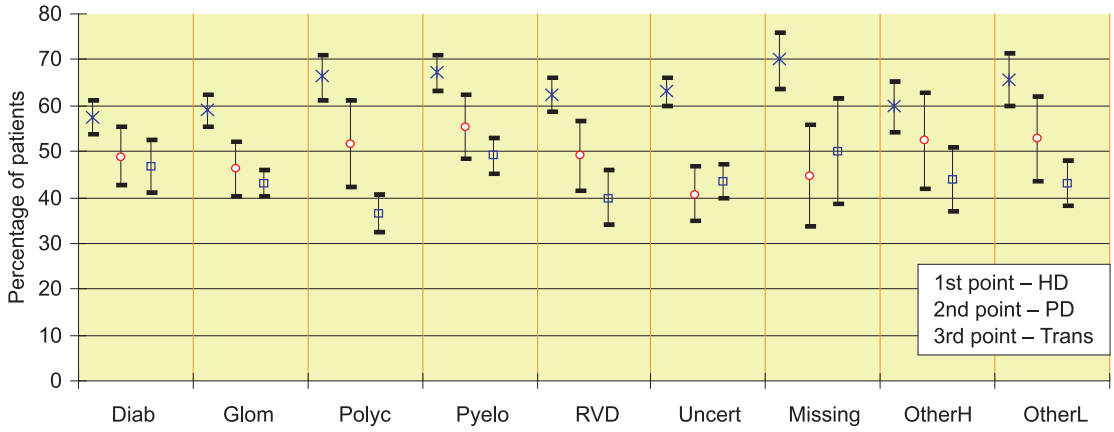

Figure 10.40: Percentage of patients with MAP in standards by diagnosis

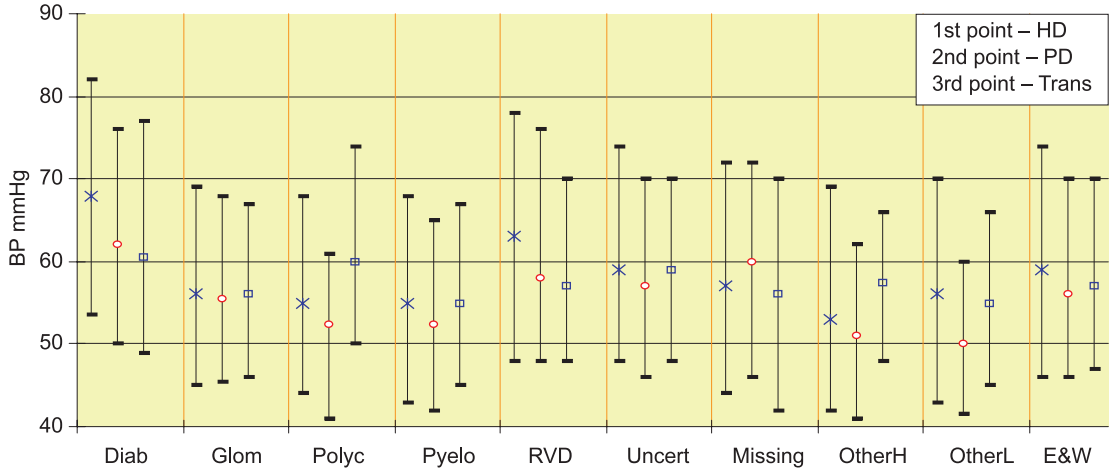

Figure 10.41: Median PP by diagnosis

Cholesterol and Achievement of the Standard

Introduction

Hyperlipidaemia is common in the dialysis population. The typical changes are raised triglycerides, low high-density lipoprotein (HDL) and variable changes in low-density lipoprotein (LDL) and total cholesterol. Large randomised controlled trials in patients with existing coronary artery disease have demonstrated that lowering LDL-cholesterol by 1mmol/L for 4–5 years reduces the risk of myocardial infarction or stroke by 25%[17].

There are still major uncertainties regarding the benefit of cholesterol lowering in CKD patients as less than a quarter of cardiac mortality is attributed to acute myocardial infarction. More common causes of cardiac death such as cardiac failure, cardiac arrest and arrhythmia may not be directly related to serum cholesterol concentration. The relationship between duration of hyperlipidaemia and mortality is unclear but the CRIB study is due to publish baseline cholesterol and 4 year mortality data for a cohort of 369 patients with CKD. A retrospective, single centre study showed patient survival was significantly increased if total cholesterol was less than 5.5 mmol/L at the time of renal transplantation[18]. The J-shaped relationship between cholesterol and mortality in short term studies[19,20] highlights the fact that the risk of death is greatest for patients with malnutrition, chronic disease and chronic inflammation. These conditions are all associated with low cholesterol levels and are major independent risk factors for death.

To date there is no convincing evidence that primary prevention with statins benefits patients with renal failure. The 4D study has just reported no benefit of atorvastatin 20 mg vs placebo in 1255 HD patients with Type 2 diabetes for cardiac death, non-fatal myocardial infarction and stroke (abstract ASN). The ALERT study compared fluvastatin 40 mg vs placebo in 2102 renal transplant patients. Although LDL fell on average by 1 mmol/L the reduction in cardiac death and myocardial infarction was not significant over a 6 year period[21].

There is more convincing evidence that statins offer effective secondary prevention. The CARE study showed pravastatin 40 mg reduced further cardiac events in 1711 patients after myocardial infarction in patients with mild CKD[22]. The Renal Registry needs to collect data on statin use to audit the benefit of lowering cholesterol in patients on renal replacement therapy.

Atherosclerosis is an inflammatory process and in the general healthy population, C-reactive protein (CRP) is a stronger predictor of future cardiovascular events than LDL-cholesterol[23]. Neither the Framingham risk score nor the European SCORE system use CRP to calculate cardiovascular risk. A single CRP level using a high-sensitivity assay has been shown to have prognostic value for both haemodialysis and peritoneal dialysis populations[24,25]. The Finnish Registry has shown no difference in CRP concentrations between these two dialysis modalities in recent years. CRP will now be collected as part of the data returns from centres that download this item in their laboratory link.

The Renal Association set standards for lipids for the first time in August 2002. The current standards are:

Primary prevention:

Statins should be initiated in dialysis patients with a 10 year risk of coronary disease >30% to achieve:

Total cholesterol <5 mmol/L or a 30% reduction from baseline

Fasting LDL-cholesterol of <3 mmol/L

Secondary prevention:

Patients should be treated with aspirin, an ACE inhibitor, a beta-blocker and a statin unless contraindicated.

The Renal Association does not set separate standards for patients with established cardiovascular disease, diabetes or renal transplant patients. Neither does it recommend how frequently lipids should be measured.

European best practice guidelines suggest the dialysis standards should be applied to transplant patients[26]. Lower targets are recommended for patients with established cardiovascular disease or diabetes (total cholesterol

<4.5 mmol/L and LDL-cholesterol 2.5 mmol/L)[27]. Lipid profiles are advised annually for transplant patients and every 6 months for dialysis patients. Blood samples should be taken immediately before dialysis or at least 12 hours after, preferably with the patient in a fasting state.

The KDOQI guidelines are based round the ATPIII Guidelines[28] and recommend that:

Haemodialysis patients should have lipid profiles measured either before dialysis, or on days not receiving dialysis. (B)
Patients with LDL cholesterol >2.6 mmol/L should be treated to lower LDL cholesterol below this level.

The standard also includes treating triglycerides and is defined around monitoring LDL cholesterol and not total cholesterol as in the UK. KDOQI have also defined transplant recipients with normal function to be the same as for those patients with CKD, considering these patients as high risk:

For adult kidney transplant recipients with LDL ⩾2.6 mmol/L, treatment should be considered to reduce LDL to <2.6 mmol/L (evidence B).
For adult kidney transplant recipients with LDL <2.6 mmol/L, fasting triglycerides ⩾2.26 mmol/L, and non-HDL cholesterol (total cholesterol minus HDL) ⩾3.36 mmol/L, treatment should be considered to reduce non-HDL cholesterol to <3.36 mmol/L (evidence C).

The Renal Registry will present fasting lipid profiles if enough units start to collect this data. The current audit is based on random, non-fasting total cholesterol measurements only.

Completeness of data return

Table 10.2 shows the data completeness of cholesterol data for each centre by modality. There is a large variation of data completeness and the data is especially poorly captured for patients on peritoneal dialysis.

Serum cholesterol by modality

Figures 10.42–10.48 show wide variation between units achieving the cholesterol standard. In England & Wales, the number of patients achieving the standard for HD average

Table 10.2: Table of completion of cholesterol data by centre and modality

	% completed data		
	HD	PD	Transplants
Bangor	93	96	–
Bradford	47	98	90
Bristol	95	100	97
Cambridge	66	95	35
Carlisle	83	38	66
Carshalton	3	1	16
Clwyd	76	85	–
Coventry	0	75	0
Cardiff	89	6	86
Derby	79	26	–
Exeter	73	100	81
Gloucester	92	6	76
Guys	78	5	43
H&CX	98	0	97
Heartlands	69	7	27
Hull	73	47	38
Ipswich	93	2	88
Kings	47	0	88
Leeds	85	52	92
Leicester	92	92	96
Liverpool	5	64	19
ManWest	75	0	76
Middlesbrough	97	100	84
Newcastle	89	0	84
Nottingham	74	100	77
Oxford	89	80	71
Plymouth	82	0	84
Portsmouth	34	0	56
Preston	97	0	61
Reading	90	95	80
Sheffield	92	97	96
Stevenage	29	7	67
Southend	48	100	57
Sunderland	96	6	96
Swansea	69	0	86
Truro	88	60	84
Wirral	1	5	–
Wolverhampton	84	17	65
Wordsley	68	90	55
Wrexham	73	0	73
York	79	89	50
England	69	46	66
Wales	81	13	85
E&W	70	42	68

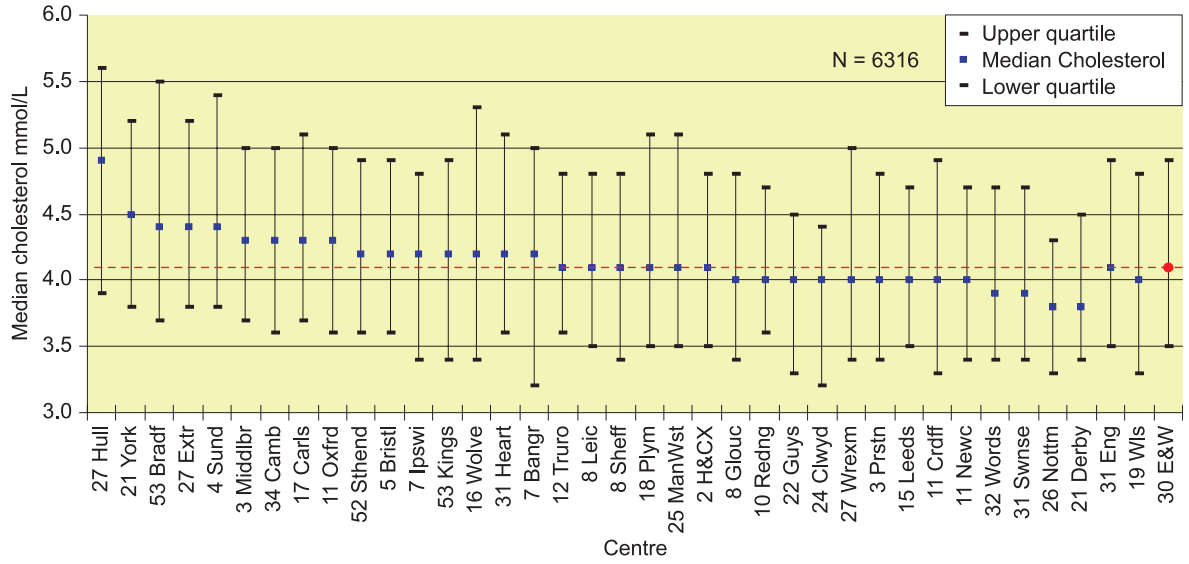

Figure 10.42: Median cholesterol: HD

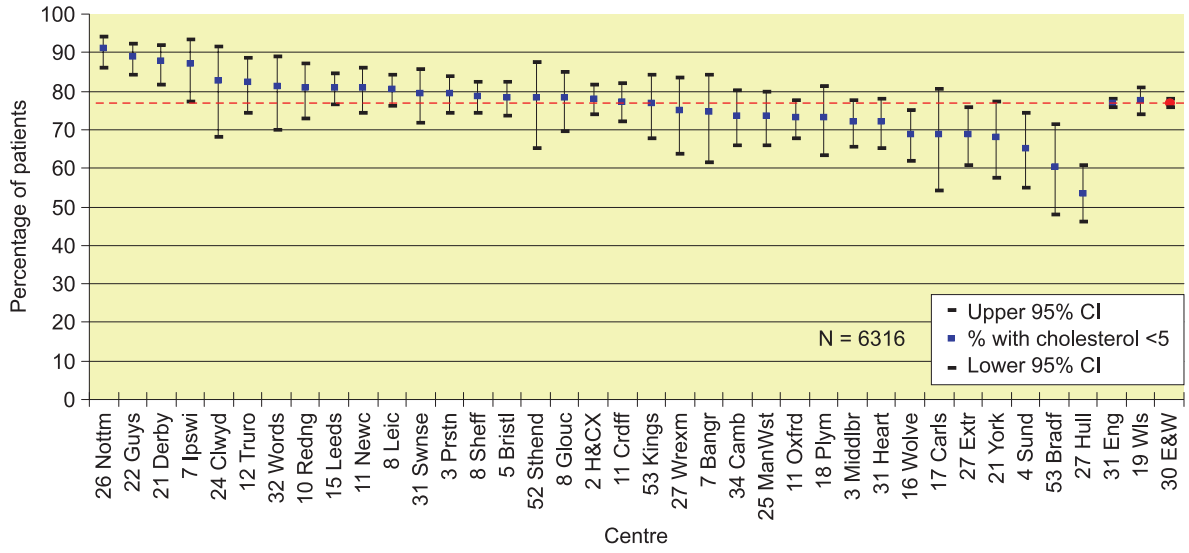

Figure 10.43: Percentage of patients with cholesterol <5 mmol/L: HD

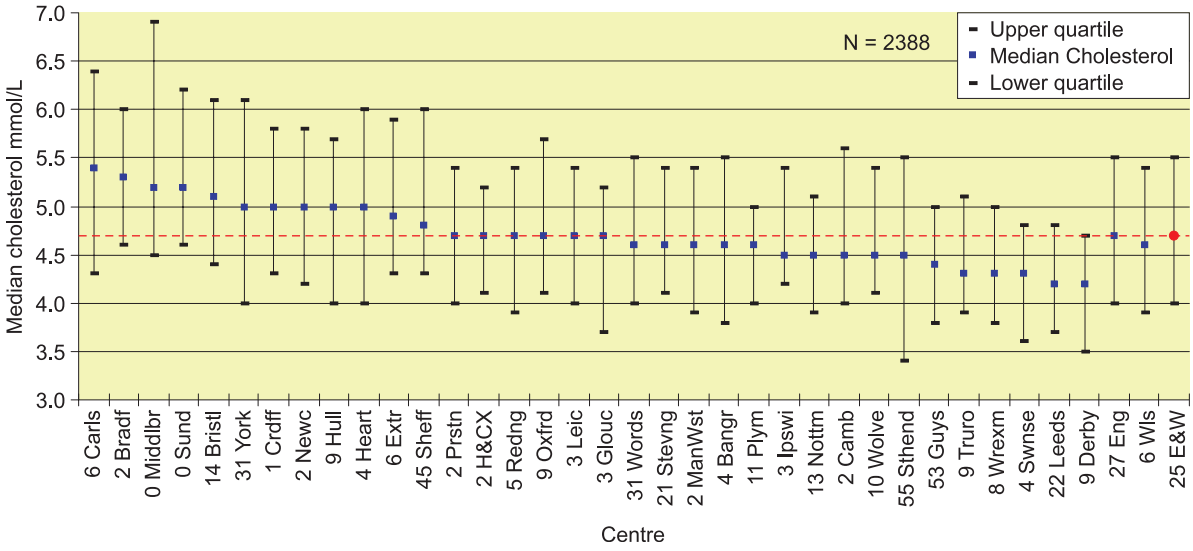

Figure 10.44: Median cholesterol: PD

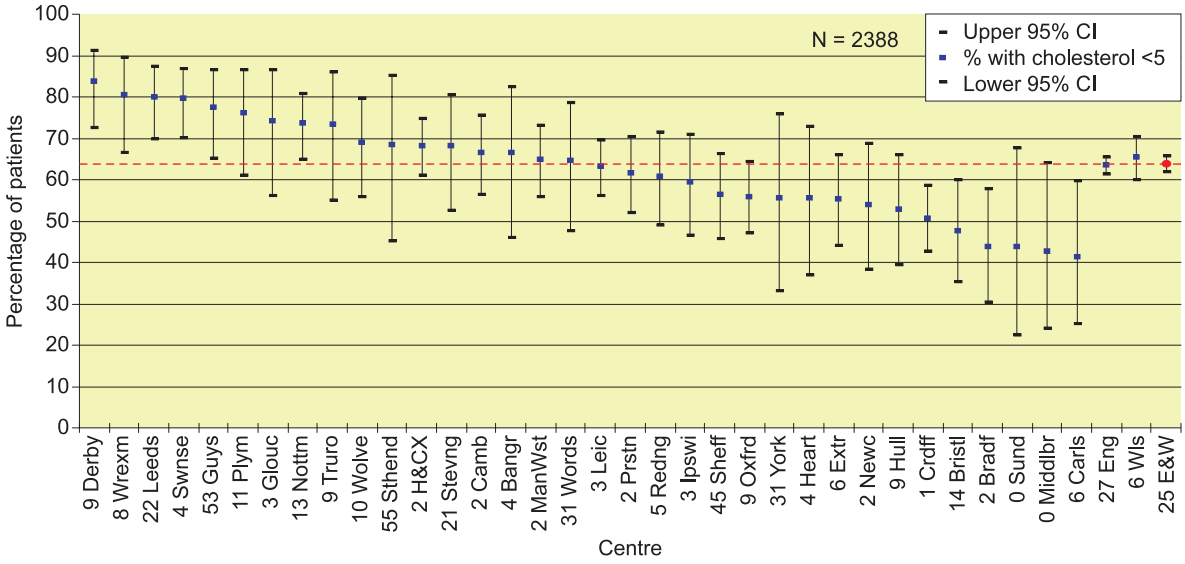

Figure 10.45: Percentage of patients with cholesterol <5 mmol/L: PD

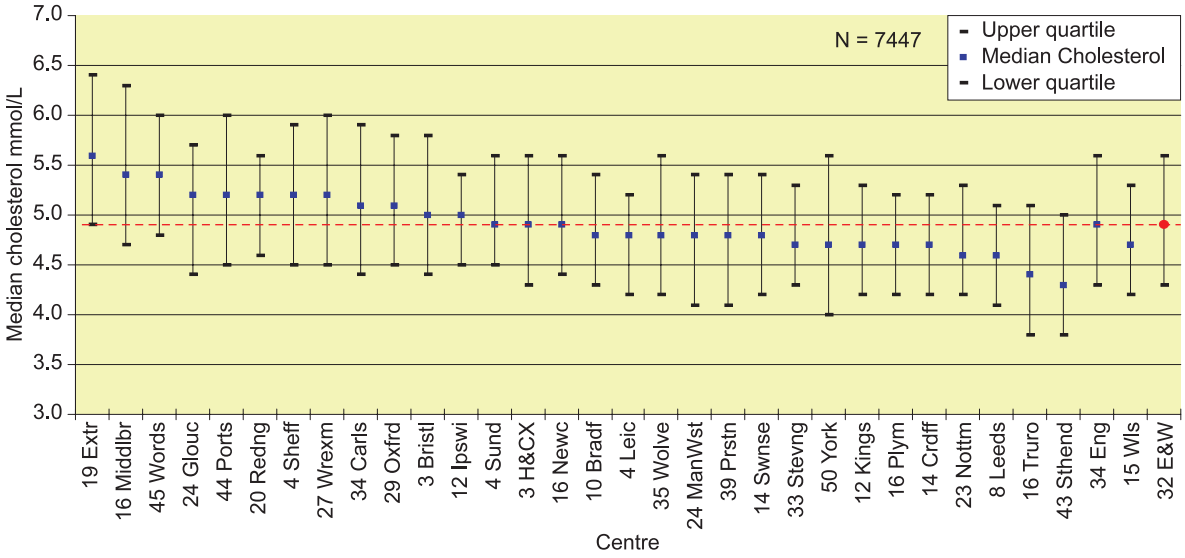

Figure 10.46: Median cholesterol: transplant

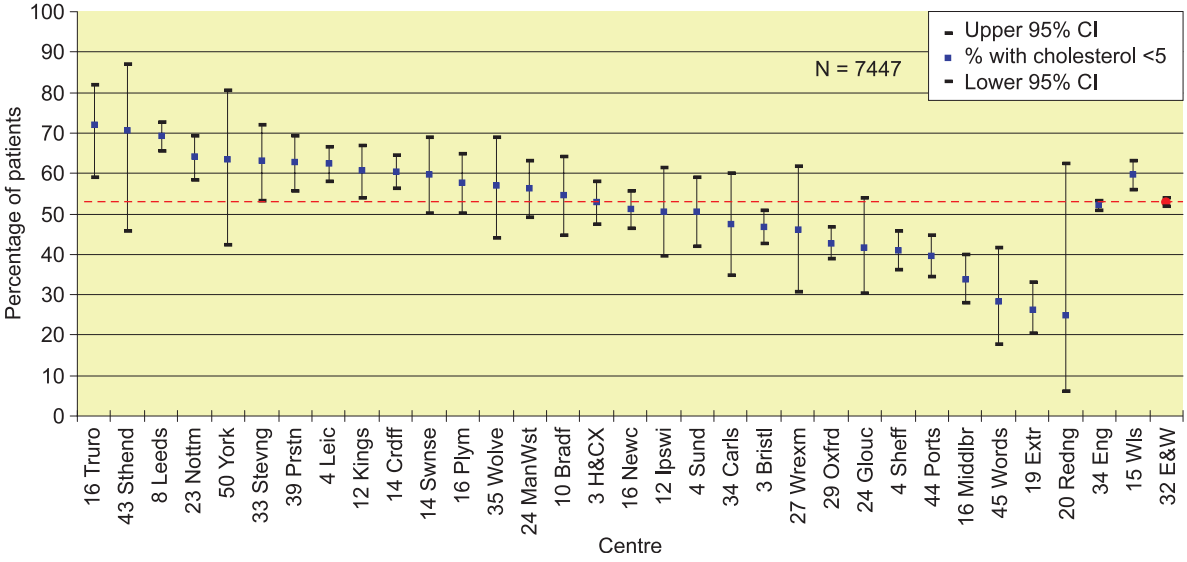

Figure 10.47: Percentage of patients with cholesterol <5 mmol/L: transplant

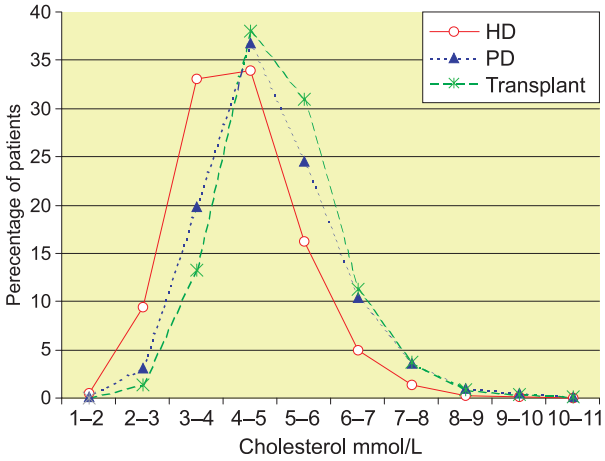

Figure 10.48: Serum cholesterol distribution by modality 31/12/2003

76.9% (range 54–91%), 63.8% for PD (range 41–84%) and 52.9% for transplant (range 25–72%). Chi squared testing indicates the variation between centres for each treatment modality is significant (HD, PD and TX; $p < 0.0001$).

Cholesterol levels are significantly lower in HD patients; the median cholesterol concentration for HD, PD and transplant is 4.1, 4.7 and 4.9 mmol/L respectively (Kruskall-Wallis test; $p < 0.0001$). It is not possible to correlate cholesterol levels with statin use as this drug data is not currently collected by the Renal Registry. Other factors to explain the differences include inflammation, protein losses and nutritional status.

Change in Cholesterol achievement 1997–2002

Figure 10.49 shows the cholesterol data for all treatment modalities between 1997 and 2003. Figures 10.50–10.52 show these data by centre. Over 6 years cholesterol levels have fallen in all treatment groups. The percentage of patients currently achieving the standard for HD, PD and Tx is 77%, 64% and 53% respectively. The majority of units show an improvement in cholesterol control over this period. The units with the worst control initially show a fall in median cholesterol in excess of 1 mmol/L (data not shown). Finnish Registry data has shown the reduction in total cholesterol is mainly due to a fall in LDL-cholesterol in each treatment modality. In addition, triglycerides were highest in PD patients and HDL-cholesterol highest in Tx patients. Data from the SHARP trial should indicate whether lipid profiles of UK patients show similar trends.

Cholesterol levels following modality change

Figures 10.53 and 10.54 show the change in serum cholesterol when patients switch from

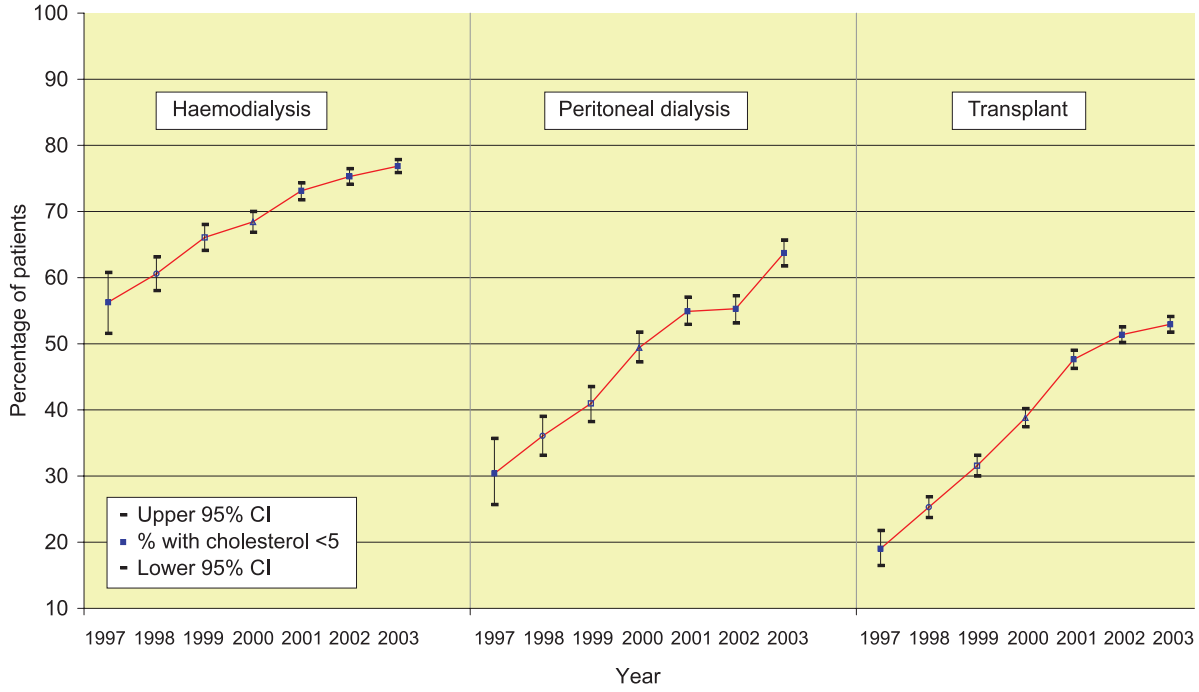

Figure 10.49: Percentage of patients with cholesterol <5 mmol/L HD vs PD vs Tx 1997–2003

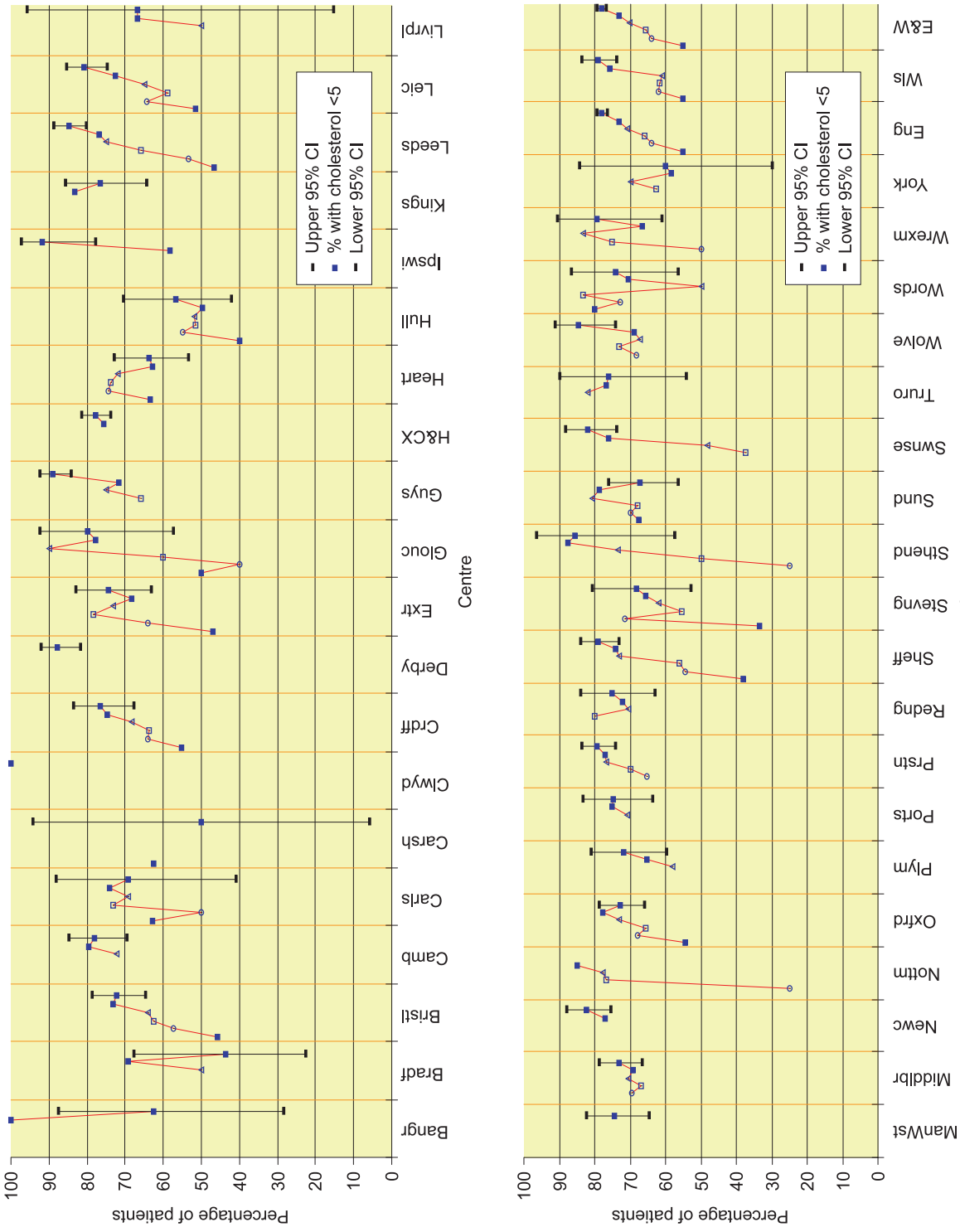

Figure 10.50: Change in % HD patients with cholesterol <5 mmol/L by centre 1998–2003

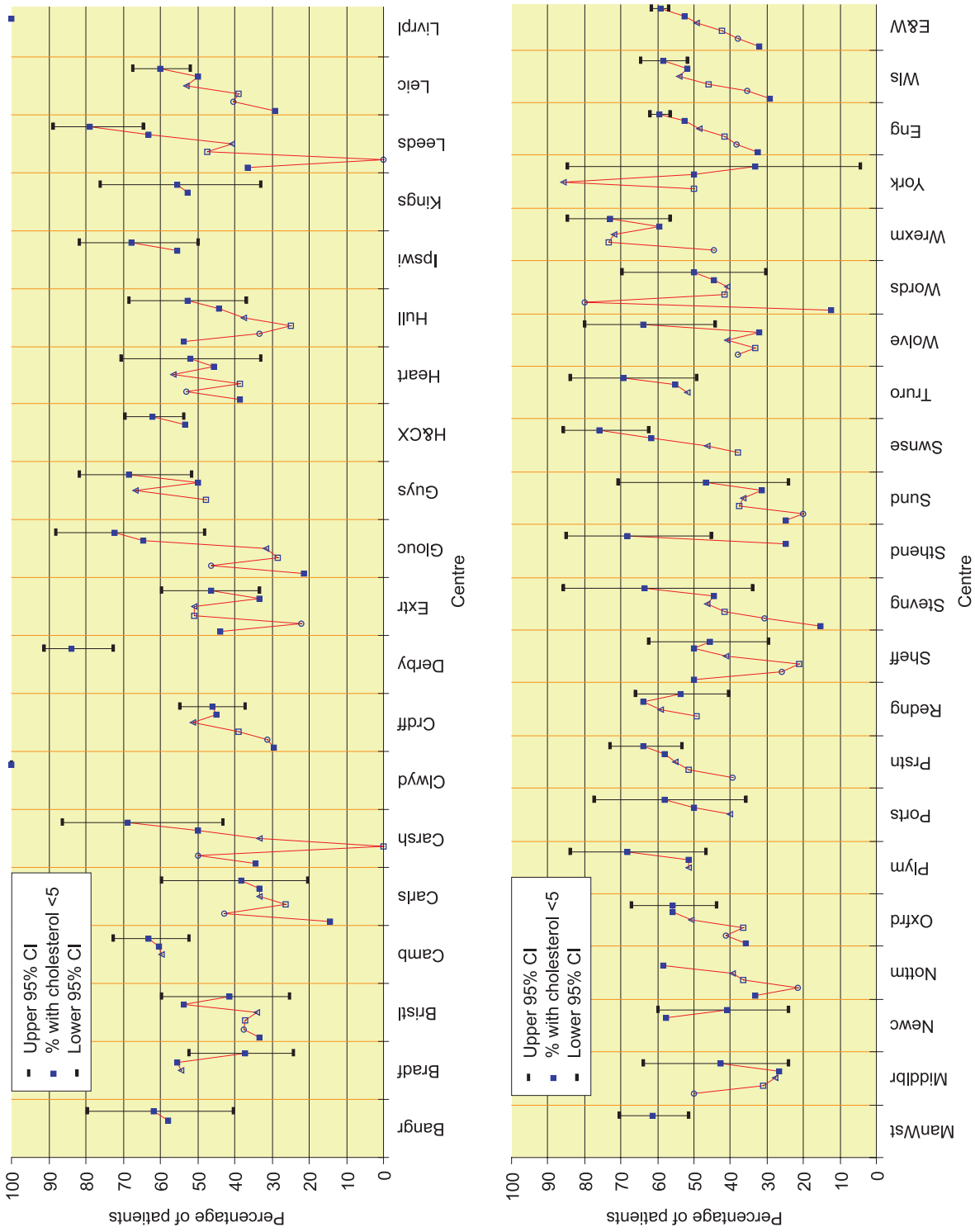

Figure 10.51: Change in % PD patients with cholesterol <5 mmol/L by centre 1998–2003

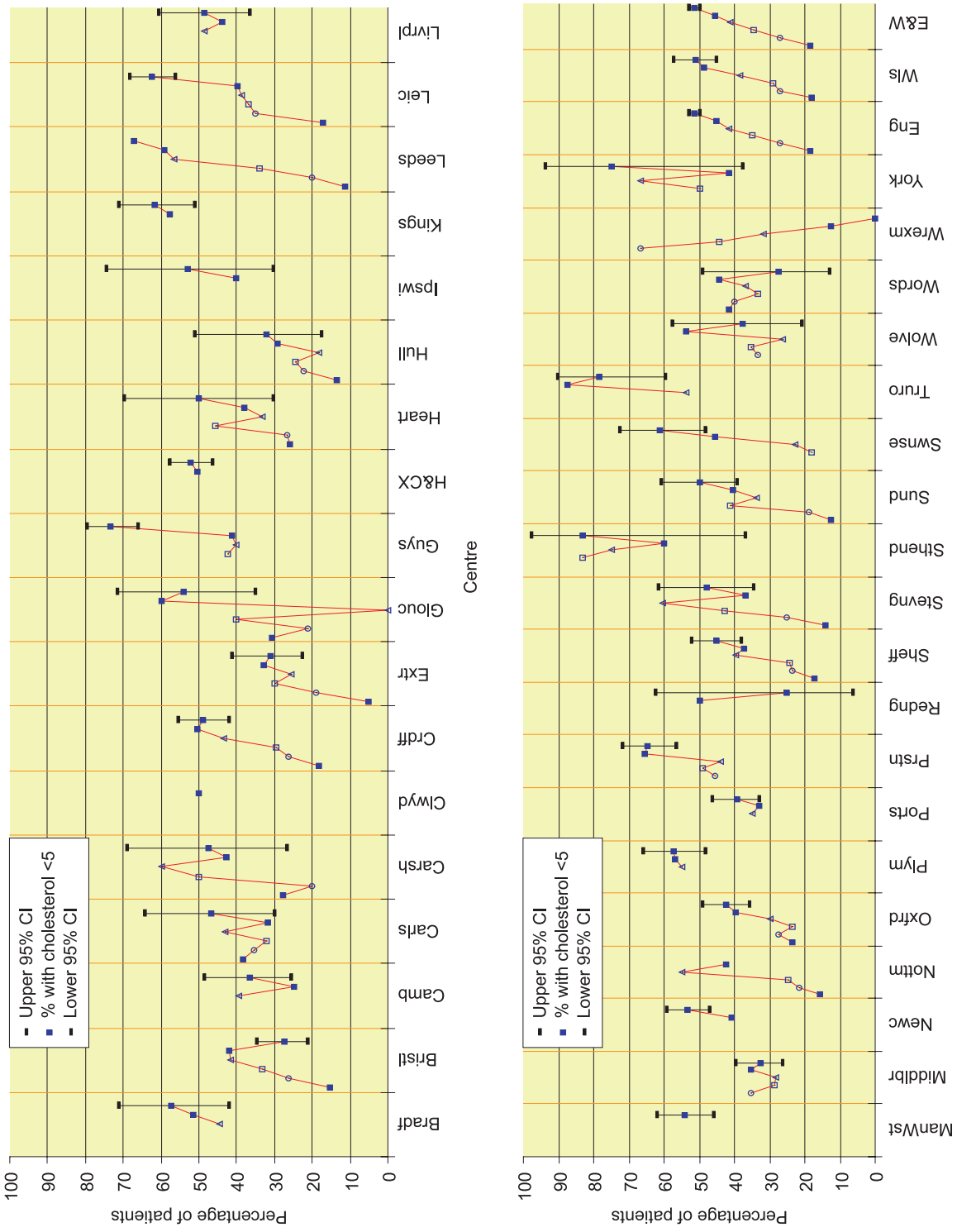

Figure 10.52: Change in % Tx patients with cholesterol <5 mmol/L by centre 1998–2003

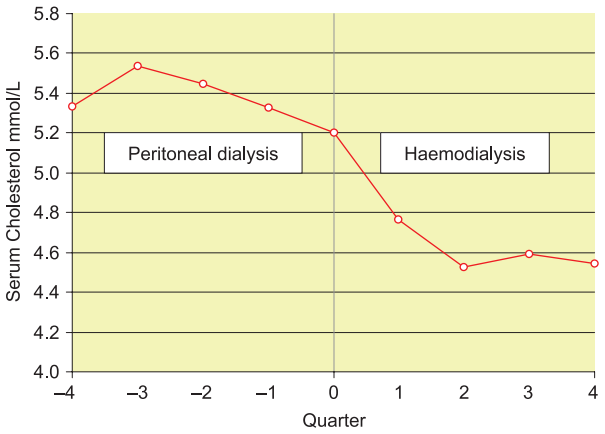

Figure 10.53: Serum cholesterol before and after modality change (PD to HD)

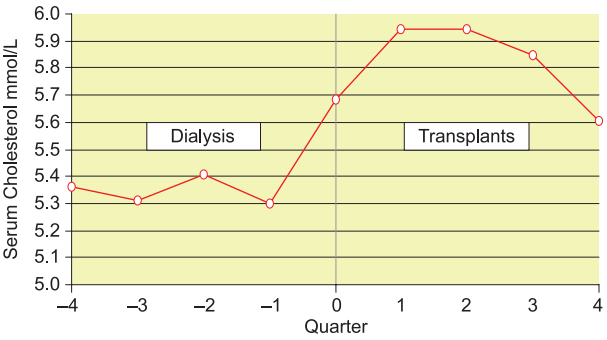

Figure 10.54: Serum cholesterol before and after modality change (dialysis to transplant)

one treatment modality to another. The means have been adjusted for the fall in cholesterol for each modality each year. The value at 'quarter zero' covers a period of three months around modality change. This represents a mix of cholesterol levels pre and post switch so can be ignored. When patients transfer from PD to HD the mean serum cholesterol falls by 0.8 mmol/L. The cholesterol falls during the first two quarters on HD and then the level plateaus for the rest of the year. It is not clear whether systemic inflammation induced by HD or withdrawal of PD solutions is responsible. Data regarding statin use is not available. By contrast when dialysis patients are transplanted the mean serum cholesterol rises within the first quarter by 0.64 mmol/L. These levels are sustained until the end of the first year when the mean cholesterol falls by 0.34 mmol/L. This may reflect hyperlipidaemia induced by immunosuppression as higher doses are used initially to prevent acute rejection. Alternatively the fall in cholesterol level towards the end of the year may be a direct result of therapeutic intervention with a statin.

The degree of change in serum cholesterol when patients switch treatment modalities is comparable to last year. The clinical significance, if any, will hopefully be established by long term follow up.

Ongoing Trials

The AURORA study is investigating rosuvastatin 10 mg vs. placebo in 2700 HD patients and results are expected in 2008. The SHARP trial is investigating ezetimibe 10 mg/simvastatin 20 mg vs. placebo in 9000 CKD patients (3000 on dialysis). Results are expected in 2009.

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