Chapter 5
Demographic and Biochemistry Profile of Kidney Transplant Recipients in the UK in 2008: national and centre-specific analyses

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Key Words
Anaemia · Bone metabolism · Chronic kidney disease · Deceased donor · eGFR · Epidemiology · Graft function · Live donor · Outcomes · Quality improvement · Renal transplantation · Survival

Abstract
Introduction: National renal transplant registries routinely report on centre-specific patient and graft survival following renal transplantation. However, other outcomes such as graft function (as measured by eGFR), haemoglobin and blood pressure are also important indicators of quality of care. ***Methods:*** Transplant activity and incident graft survival data were obtained from NHS Blood and Transplant, laboratory and clinical variables and prevalent survival data were obtained from the UK Renal Registry. Data were analysed separately for prevalent and one year post-transplant patients. ***Results:*** Increasing live and non-heartbeating donors were responsible for the increasing transplant activity. Graft failure occurred in 2.9% of prevalent transplant patients and death rates remained stable at 2.4/100 patient years. In transplant recipients with a specified cause of death, 21% died due to malignancy and 21% as a consequence of cardiac disease. There was centre variation in outcomes including eGFR and haemoglobin in prevalent and 1 year post-transplant recipients. Analysis of prevalent transplants by chronic kidney disease stage showed 14.7% with an eGFR <30 ml/min/1.73 m^2 and 2.1% <15 ml/min/1.73 m^2. Of those with CKD stage 5T, 40.4% had Hb concentrations <10.5 g/dl, 25.9% phosphate concentrations $\geqslant 1.8$ mmol/L, 9.0% adjusted calcium concentrations $\geqslant 2.6$ mmol/L and 40.8% PTH concentrations $\geqslant 32$ pmol/L. With the exception of PTH, transplant recipients with CKD stage 5T were less likely to achieve the UK standards compared to prevalent dialysis patients. ***Conclusion:*** Wide variations in clinical and biochemical outcomes amongst transplant recipients continue to exist and may reflect differences in healthcare delivery across the UK.

Introduction

This chapter includes independent analyses regarding renal transplant activity and survival data from the Directorate of Organ Donation and Transplantation (ODT, formally UK Transplant) within NHS Blood and Transplant (NHSBT). The UK Renal Registry (UKRR)

has performed additional analyses of renal transplant recipient data examining demographics, clinical and biochemical variables. Whilst NHSBT records all the information regarding the episode of transplantation (donor and recipient details), the UKRR holds additional information on key clinical and biochemical variables in renal transplant recipients. The co-operation between these two organisations results in a comprehensive database describing the clinical care delivered to renal transplant patients within the UK. This further allows for the comparison of key outcomes between centres and provides insight into the processes involved in the care of such patients in the UK.

This chapter is divided into 5 sections; (1) transplant activity, waiting list and survival data; (2) transplant demographics; (3) clinical and laboratory outcomes; (4) analysis of prevalent patients by chronic kidney disease (CKD) stage; and (5) causes of death in transplant recipients. Methodology, results and conclusions of these analyses are discussed in detail for all five sections separately.

Transplant activity, waiting list activity and survival data

Introduction

NHSBT prospectively collects donor and recipient data around the episode of transplantation. They also request transplant centres provide an annual paper based data return on the status of the recipient's graft function. This enables ODT to generate comprehensive analyses of renal transplant activity and graft survival statistics.

NHSBT attributes a patient to the centre that performed the transplant operation irrespective of where the patient was cared for before or after the procedure and hence only reports on transplant centre performance. Patients whose clinical management subsequently transfers back to a dialysis centre may be lost to NHSBT follow up, but, since all dialysis and transplant renal centres in the UK return data to the UKRR or Scottish Renal Registry, follow-up data are available for such patients.

The UK Renal Registry methodology is described elsewhere [1]. The UKRR collects quarterly clinical data via an electronic data extraction process from hospital-based renal IT systems, on all patients receiving renal replacement therapy.

The number preceding the centre name in each figure indicates the percentage of missing data for that centre.

Method

Following a recent period of consolidation and re-organisation, there are now 23 UK adult renal transplant centres with 19 in England, 2 in Scotland and 1 each in Northern Ireland and Wales.

Comprehensive information from 1999 onwards, concerning the number of patients on the transplant waiting list, the number of transplants performed, the number of deceased (heart-beating and non-heartbeating) and living donors, and patient and graft survival is available on the NHSBT website (www.uktransplant.org.uk/ukt/statistics/statistics.jsp).

Results

As of 31st December 2008, there were 9,586 patients (adult and paediatric) active or suspended on the renal, or renal plus other organ waiting list, an increase of 6.8% compared to 2007. During 2008, absolute numbers of live donor and non-heartbeating donor transplants continued to increase and comprised 37% and 18% of all kidney transplants performed respectively (table 5.1). The number of combined pancreas and kidney transplants performed in 2008 fell by 18%.

There are small differences in one year and five year risk-adjusted patient and graft survival rates amongst UK renal transplant centres (table 5.2). These graft survival rates included grafts with primary non-function (excluded in some other countries).

Using data from the UKRR on prevalent renal-only transplant patients on 1/1/2008, the death rate during 2008 was 2.4/100 patient years (CI 2.2–2.6) when censored for return to dialysis and 2.5/100 patient years (CI 2.3–2.8) without censoring for dialysis. These death rates are similar to 2007.

During 2008, 2.9% of prevalent transplant patients experienced graft failure (excluding death as a cause of graft failure). This figure has remained almost constant since 2003.

Conclusions

The increased number of kidney transplants performed in 2008 was mostly due to the growing use of non-heartbeating and living kidney donors. There was little difference in graft survival between UK centres. Graft failure rates remained stable at 2.9% per annum and transplant patient death rates remained similar at 2.4 per 100 patient years.

Transplant demographics

Introduction

Since mid-2008, all 72 UK renal centres have established electronic linkage to the UKRR or Scottish Renal Registry, giving the UKRR complete coverage of individual patient level data across the UK for the first time. The UKRR is now able to obtain, analyse, and report on a complete national cohort.

The following sections need to be interpreted in the context of variable repatriation policies; some transplant centres continue to follow up and report on all patients they transplant, whereas others refer patients back to non-transplant centres for most or all ongoing post-transplant care. Some transplant centres only refer back patients when their graft is failing. The time post-transplantation that such referral may happen also varies between transplant centres. The UKRR is able to detect duplicate patients (being reported from both transplant and referring centres) and in such situations care is attributed to the referring centre.

Methods

Four centres (Bangor, Colchester, Liverpool Aintree, Wirral) did not have any transplant patients and were excluded from some of the analyses. Their dialysis patients were included in the relevant dialysis population denominators. The nine centres in Scotland do not currently submit laboratory data to the UKRR and were not included in the analyses on post-transplant outcomes.

For the analysis of primary renal disease (PRD) in transplant recipients (table 5.7), five centres (Cambridge, Clwyd, Manchester Hope, Liverpool Aintree, Liverpool RI) were excluded because of concerns relating to the reliability of PRD coding (see chapter 3, figure 3.9).

Information on patient demographics (age, gender, ethnicity and PRD) for patients in a given renal centre was obtained from UKRR patient registration data fields. Individual patients were assigned to the centre that returned data for them during 2008. The prevalence of transplant patients in areas covered by individual primary care trusts (PCT) was estimated based on the post code of the registered address for patients on RRT. Data on ethnic origin, supplied as Patient Administration System (PAS) codes, were retrieved from fields within renal centre IT systems. For the purpose of this analysis patients were grouped into Whites, South Asians, Blacks, Others and Unknown. The details of regrouping of the PAS codes into the above ethnic categories are provided in appendix G. The UKRR requires a standard set of data items regarding comorbid conditions at the time of commencement of renal replacement therapy and first registration of the patient with the UKRR. The detailed methods of comorbidity data collection by the UKRR are described elsewhere [2].

Results and discussion

Prevalent transplant numbers across the 4 UK nations are described in table 5.3.

The prevalence of renal transplant recipients in each PCT in England, Northern Ireland (called District Council), Scotland (called Council Area) and Wales (called Local Authority area) and the proportion of prevalent patients according to modality in the renal centres across the UK are described in tables 5.4 and 5.5 respectively. After standardisation for age and gender, unexplained variability was evident in the prevalence of renal transplant recipients, with some areas having higher or lower than the predicted number of prevalent transplant patients per million population. The UKRR is undertaking further work to study whether this is secondary to differential access to transplantation.

The proportion of prevalent RRT patients with a transplant relative to the number on dialysis has been stable since at least 2000. Whilst the proportion of patients on HD has been increasing, the proportion (and absolute number) on PD has been falling. However, the increasing transplant activity has not been able to keep pace with the number of patients joining the national organ waiting list; the number of patients awaiting kidney-only transplantation increased by 7% between 2007 and 2008.

Age and gender

The gender ratio amongst incident and prevalent transplant patients has remained stable since 2003

Table 5.1. Kidney and kidney plus other organ transplant numbers in the UK, 1st January 2006–31st December 2008

Organ	2006	2007	2008	% change 2007–2008
Heartbeating donor kidney[a]	990	907	944	4
Non-heartbeating kidney[b]	250	300	439	46
Living donor kidney	671	804	924	15
Kidney and liver	17	9	17	89
Kidney and heart	1	1	0	
Kidney and pancreas[c]	138	197	162	−18
Total kidney transplants	**2,067**	**2,218**	**2,486**	**12**

[a] Includes en bloc kidney transplants (3 in 2006, 7 in 2007, 3 in 2008) and double kidney transplants (0 in 2006, 4 in 2007, 1 in 2008)
[b] Includes en bloc kidney transplants (1 in 2006, 1 in 2007, 2 in 2008) and double kidney transplants (11 in 2006, 4 in 2007, 3 in 2008)
[c] Includes non-heartbeating transplants (2 in 2006, 13 in 2007, 16 in 2008) and transplant including liver (1 in 2007)

Table 5.2. Risk-adjusted first adult kidney transplant only, graft and patient survival percentage rates for UK centres[a]

	Deceased donor 1 yr survival		Deceased donor 5 yr survival		Living kidney donor 1 yr survival		Living kidney donor 5 yr survival	
Centre	Graft	Patient	Graft	Patient	Graft	Patient	Graft	Patient
Belfast	95	98	79	88	97	100	94	100
Birmingham	90	96	81	90	93	98	89	97
Bristol	94	97	87	86	97	99	93	100
Cambridge	92	97	83	87	97	100	92	97
Cardiff	91	96	85	91	95	99	84	98
Coventry	98	98	90	89	96	100	90	96
Edinburgh	92	98	83	87	96	98	91	93
Glasgow	93	97	80	84	98	98	91	97
London Guy's	92	97	82	89	97	99	95	94
Leeds	95	97	79	86	98	99	90	93
Leicester	89	89	75	86	95	96	88	93
Liverpool	89	98	80	89	94	97	86	93
Manchester	93	94	81	88	97	100	83	94
Newcastle	93	95	82	84	96	99	92	90
Nottingham	87	96	80	84	93	96	88	97
Oxford	94	97	87	87	98	99	88	97
Plymouth	92	95	74	84	94	98	73	91
Portsmouth	91	94	83	86	93	95	89	90
London Royal Free	94	96	81	88	95	100	87	100
Royal London	96	96	83	85	98	97	80	96
Sheffield	89	99	83	90	98	100	86	96
London St George's	92	98	88	90	98	99	89	95
WLRTC [b]	96	97	87	88	94	99	90	95
All centres	**93**	**96**	**82**	**87**	**96**	**99**	**89**	**95**

[a] Information courtesy of NHSBT: number of transplants, patients and 95% CI for each estimate; statistical methodology for computing risk-adjusted estimates can be obtained from the NHSBT website (see http://www.organdonation.nhs.uk/ukt/statistics/statistics.jsp)
[b] WLRTC = West London Renal and Transplant Centre
Cohorts for survival rate estimation: 1 year survival: 1 Jan 2003–31 Dec 2007; 5 year survival: 1 Jan 1999–31 Dec 2003; first grafts only – re-grafts excluded for patient survival estimation. Since the cohorts to estimate 1- and 5-year survival are different, some centres may appear to have 5 year survival better than 1 year survival

(table 5.6 and figure 5.1). The average age of incident transplant patients has slowly increased since 2003. There has also been a small but steady increase in the average age of prevalent transplant patients, which could reflect the increasing age at which patients are transplanted and/or improved survival after renal transplantation over the last 6 years. The prevalent transplant patient workload across the UK has nearly doubled from 12,720 patients in 2003 to 22,300 patients at the end of 2008. The rapid expansion of this patient group suggests the need for careful planning by renal centres for future service provision and resource allocation.

Primary renal diagnosis

Recent years have seen an upward trend in the number of patients with diabetes receiving a kidney transplant, attributed to increasing rates of simultaneous pancreas

Table 5.3. Prevalence of transplants in adults in the UK on 31/12/2008

	England	Wales	Scotland	N Ireland	UK
All UK centres	18,563	1,148	1,979	610	22,300
Total population, mid-2008 (millions)[a]	51.4	3.0	5.2	1.8	61.4
Prevalence pmp transplant	361	384	383	344	363

[a] Estimates from the Office of National Statistics, UK

Table 5.4. The prevalence per million population (pmp) of patients with a renal transplant and standardised rate ratio in the UK, as on 31st December 2004–2008

[a] PCT = Primary Care Trust (England); District Council (N Ireland), Local Authority (Wales) and Council Area (Scotland)
[b] Population numbers based on 2006 mid-year estimates by age group and gender obtained from the ONS
[c] O/E = age and gender standardised acceptance rate ratio
PCTs with significantly high average rate ratios are bold in greyed areas; PCTs with significantly low average rate ratios are italicised in greyed areas
Blank cells = no data returned to the registry for that year

UK Area	Region	PCT/LA[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2008		
				2004	2005	2006	2007	2008	O/E[c]	L 95% CL	U 95% CL
North East	County Durham and Tees Valley	County Durham	500,400	344	364	366	396	410	1.08	0.94	1.24
		Darlington	99,100	293	313	313	333	363	0.97	0.70	1.35
		Redcar and Cleveland	139,200	438	438	453	481	503	**1.33**	**1.05**	**1.68**
		Hartlepool	91,100	395	373	395	406	373	1.02	0.73	1.43
		Middlesbrough	138,500	397	397	390	397	440	1.26	0.98	1.62
		North Tees	189,200	322	338	381	359	396	1.08	0.86	1.35
	Northumberland Tyne and Wear	Gateshead	190,500	388	430	399	394	399	1.06	0.85	1.33
		Newcastle	270,400	307	322	340	370	374	1.08	0.89	1.32
		North Tyneside	195,100	415	456	441	492	502	**1.33**	**1.09**	**1.62**
		Northumberland	309,900	368	371	368	381	390	0.99	0.83	1.18
		South Tyneside	151,000	344	371	391	424	417	1.12	0.88	1.44
		Sunderland Teaching	280,600	381	364	367	385	396	1.06	0.88	1.28
North West	Cheshire and Merseyside	Wirral	311,100	296	299	318	305	331	0.90	0.74	1.09
		Liverpool	436,200	291	309	307	309	332	0.95	0.81	1.12
		Central and Eastern Cheshire	451,200				299	290	*0.76*	*0.64*	*0.90*
		Western Cheshire	235,100	306	323	306	336	328	0.86	0.69	1.08
		Knowsley	151,500	304	297	304	323	337	0.95	0.72	1.25
		Sefton	277,500	267	274	292	306	303	0.81	0.65	1.00
		Halton and St Helens	297,000	239	259	266	300	330	0.89	0.73	1.08
		Warrington	194,300	273	273	314	386	381	1.01	0.80	1.27
	Cumbria and Lancashire	Blackburn with Darwen	141,200	156	170	177	312	326	0.97	0.73	1.29
		Blackpool	142,800	210	203	224	301	343	0.91	0.69	1.20
		North Lancashire	329,000	219	234	258	322	310	0.83	0.68	1.01
		Cumbria	496,000	260	262	282	317	333	*0.85*	*0.73*	*0.99*
		Central Lancashire	451,600	199	210	233	299	321	0.86	0.73	1.01
		East Lancashire	384,500	257	281	291	398	408	1.11	0.95	1.30
	Greater Manchester	Ashton, Leigh and Wigan	305,500	134	160	203	367	373	0.99	0.82	1.19
		Bolton	262,500	175	213	225	392	434	**1.20**	**1.00**	**1.44**
		Bury	182,900	60	82	98	344	334	0.91	0.71	1.17
		Manchester	451,900				270	288	0.90	0.76	1.07
		Heywood, Middleton and Rochdale	206,400				383	402	1.12	0.91	1.39
		Oldham	219,800	114	114	155	341	359	1.02	0.82	1.27
		Salford	217,800	156	152	156	266	294	0.83	0.65	1.06
		Stockport	280,800				338	356	0.95	0.78	1.15
		Tameside and Glossop	247,700				375	375	1.02	0.83	1.25
		Trafford	212,100				306	344	0.94	0.75	1.18
Yorkshire and the Humber	North and East Yorkshire and Northern Lincolnshire	East Riding of Yorkshire	331,100	227	254	260	299	326	0.83	0.69	1.00
		Hull	256,200	242	262	301	340	359	1.02	0.83	1.25
		North East Lincolnshire	159,900	244	231	263	281	306	0.84	0.63	1.11
		North Lincolnshire	155,200	232	277	296	316	322	0.84	0.64	1.11
		North Yorkshire and York	783,200	260	281	309	326	370	0.97	0.87	1.09
	South Yorkshire	Barnsley	223,700	335	331	358	358	384	1.02	0.82	1.26
		Doncaster	290,400	275	275	310	303	327	0.88	0.72	1.08
		Rotherham	253,000	285	265	296	320	356	0.95	0.77	1.17
		Sheffield	526,100	236	247	266	279	314	0.89	0.76	1.03

Table 5.4. Continued

UK Area	Region	PCT/LA[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2008		
				2004	2005	2006	2007	2008	O/E[c]	L 95% CL	U 95% CL
Yorkshire and the Humber	West Yorkshire	Bradford and Airedale	493,000	323	341	345	375	387	**1.15**	**1.00**	**1.32**
		Calderdale	198,600	368	393	398	418	448	1.21	0.98	1.49
		Wakefield District	321,000	268	290	296	299	318	0.84	0.70	1.02
		Kirklees	398,400	364	402	424	427	429	**1.20**	**1.03**	**1.39**
		Leeds	750,300	264	272	305	320	337	0.98	0.86	1.11
East Midlands	Leicestershire, Northamptonshire, Rutland and Trent	Leicester City	289,700	418	431	473	501	525	**1.59**	**1.36**	**1.87**
		Leicestershire County and Rutland	673,600	321	343	355	379	410	1.08	0.96	1.22
		Northamptonshire	669,200	179	276	278	302	348	0.94	0.82	1.07
		Nottinghamshire County	657,500	283	295	310	322	330	*0.87*	*0.76*	*0.99*
		Bassetlaw	111,000	207	234	243	288	270	0.70	0.49	1.00
		Derby City	236,400	173	195	228	224	266	*0.76*	*0.59*	*0.97*
		Derbyshire County	720,800	214	223	236	275	298	*0.77*	*0.68*	*0.88*
		Lincolnshire	688,700	267	276	277	280	295	*0.76*	*0.67*	*0.88*
		Nottingham City	286,400	241	244	244	251	258	0.81	0.64	1.01
West Midlands	Birmingham and The Black Country	Dudley	305,200	256	246	252	272	269	*0.71*	*0.58*	*0.89*
		Birmingham East and North	395,900	293	298	328	338	359	1.08	0.91	1.27
		Heart of Birmingham Teaching	271,400	368	391	424	450	479	**1.62**	**1.37**	**1.93**
		South Birmingham	339,400	292	292	298	327	351	1.03	0.86	1.23
		Sandwell	287,700	302	323	330	351	368	1.05	0.86	1.26
		Solihull	203,000	207	236	271	276	286	*0.77*	*0.59*	*0.99*
		Walsall Teaching	254,700	287	298	310	346	365	1.02	0.83	1.24
		Wolverhampton City	236,900	249	245	245	287	308	0.87	0.69	1.09
	Coventry, Warwickshire, Herefordshire, Worcestershire, Shropshire and Staffordshire	Coventry Teaching	306,600	307	326	339	362	382	1.12	0.93	1.34
		Herefordshire	178,000	258	270	292	275	281	*0.72*	*0.54*	*0.94*
		Warwickshire	522,300	347	347	354	362	370	0.97	0.84	1.11
		Worcestershire	553,000	222	248	257	277	288	*0.75*	*0.64*	*0.87*
		North Staffordshire	211,400				293	307	0.80	0.63	1.02
		South Staffordshire	603,500				288	315	*0.82*	*0.71*	*0.94*
		Shropshire County	289,500	200	218	231	276	304	*0.78*	*0.63*	*0.96*
		Stoke on Trent	247,600				319	363	1.00	0.81	1.23
		Telford and Wrekin	161,800	130	124	173	216	241	*0.66*	*0.48*	*0.90*
East of England	Bedfordshire and Hertfordshire	Bedfordshire	403,600	223	253	273	305	337	0.90	0.76	1.07
		Luton	187,200	240	321	363	401	417	1.23	0.98	1.53
		West Hertfordshire	530,600	94	183	198	296	381	1.03	0.90	1.19
		East and North Hertfordshire	527,800	172	250	265	303	330	0.90	0.78	1.05
	Essex	Mid Essex	361,400	227	266	299	321	340	0.90	0.75	1.07
		North East Essex	315,400	193	235	247	263	276	*0.75*	*0.61*	*0.92*
		South East Essex	329,900	167	209	236	276	300	*0.80*	*0.66*	*0.98*
		South West Essex	388,300	203	237	242	304	314	0.87	0.73	1.04
		West Essex	274,700	237	258	273	273	269	*0.72*	*0.57*	*0.91*
	Norfolk, Suffolk and Cambridgeshire	Cambridgeshire	589,600	243	270	287	307	338	0.91	0.80	1.05
		Peterborough	163,400	196	202	239	263	269	0.76	0.57	1.02
		Norfolk	738,900	230	246	281	309	307	*0.80*	*0.70*	*0.91*
		Suffolk	585,300	227	236	265	284	301	*0.80*	*0.69*	*0.93*
		Great Yarmouth and Waveney	210,600	128	123	147	152	209	*0.55*	*0.41*	*0.74*
London	North Central London	Barnet	328,400		305	329	435	460	**1.31**	**1.12**	**1.54**
		Camden	227,200		229	264	295	361	1.05	0.85	1.31
		Enfield	285,400		364	396	431	491	**1.39**	**1.18**	**1.64**
		Haringey Teaching	225,600		288	328	359	408	1.19	0.97	1.45
		Islington	185,500		318	367	431	480	**1.40**	**1.13**	**1.72**

Table 5.4. Continued

UK Area	Region	PCT/LA[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2008		
				2004	2005	2006	2007	2008	O/E[c]	L 95% CL	U 95% CL
London	North East London	Barking and Dagenham	165,400	230	248	254	290	296	0.91	0.69	1.20
		City and Hackney Teaching	216,200			264	328	361	1.10	0.88	1.37
		Havering	227,500				273	286	*0.77*	*0.61*	*0.99*
		Newham	248,300	226	254	270	294	318	1.02	0.81	1.27
		Redbridge	251,800	258	286	322	353	421	**1.21**	**1.00**	**1.46**
		Tower Hamlets	212,500	174	212	245	254	268	0.86	0.67	1.12
		Waltham Forest	222,100			333	378	401	1.17	0.95	1.45
	North West London	Brent Teaching	271,400			155	497	645	**1.84**	**1.59**	**2.13**
		Ealing	306,400	258	287	307	483	568	**1.60**	**1.38**	**1.86**
		Hammersmith and Fulham	171,400	216	210	257	327	356	1.03	0.80	1.32
		Harrow	214,600				508	648	**1.81**	**1.53**	**2.13**
		Hillingdon	250,100	208	276	296	392	472	**1.35**	**1.13**	**1.62**
		Hounslow	218,600	247	279	320	439	572	**1.62**	**1.36**	**1.94**
		Kensington and Chelsea	178,000				258	298	0.81	0.62	1.06
		Westminster	231,700				272	354	0.99	0.80	1.23
	South East London	Bexley	221,600	370	393	402	451	478	**1.32**	**1.09**	**1.60**
		Bromley	299,400	311	341	364	407	424	1.16	0.97	1.38
		Greenwich Teaching	222,600	211	247	279	332	346	1.02	0.82	1.28
		Lambeth	272,200	198	209	213	287	327	0.95	0.77	1.17
		Lewisham	255,600	360	356	387	454	469	**1.35**	**1.13**	**1.62**
		Southwark	269,000	361	390	409	454	461	**1.35**	**1.13**	**1.61**
	South West London	Croydon	337,000	214	228	279	326	344	0.96	0.80	1.16
		Kingston	156,000				365	378	1.06	0.82	1.37
		Richmond and Twickenham	179,500				228	273	*0.74*	*0.56*	*0.97*
		Sutton and Merton	382,000				385	398	1.11	0.95	1.31
		Wandsworth	279,200				383	390	1.15	0.95	1.38
South East	Hampshire and Isle of Wight	Isle of Wight National Health Service	138,200	304	297	297	289	333	0.86	0.64	1.15
		Hampshire	1,265,900	283	285	312	331	361	0.96	0.87	1.05
		Portsmouth City Teaching	196,300	336	321	331	341	367	1.08	0.86	1.36
		Southampton City	229,100	288	301	323	345	358	1.07	0.86	1.33
	Kent and Medway	West Kent	662,600				367	397	1.06	0.94	1.20
		Medway	251,900				353	409	1.13	0.93	1.37
		Eastern and Coastal Kent	720,400				312	357	0.97	0.86	1.10
	Surrey and Sussex	Hastings and Rother	176,200	216	238	238	267	289	0.77	0.58	1.01
		Brighton and Hove City	251,500	203	211	243	282	306	0.86	0.69	1.07
		East Sussex Downs and Weald	330,200	233	224	218	270	297	*0.79*	*0.64*	*0.96*
		Surrey	1,073,400	229	243	282	346	367	0.98	0.89	1.08
		West Sussex	770,600	244	263	285	328	350	0.94	0.83	1.05
	Thames Valley	Milton Keynes	230,100	256	278	300	339	352	0.97	0.78	1.20
		Berkshire East	382,200	277	267	283	411	445	**1.25**	**1.07**	**1.45**
		Berkshire West	445,400	323	269	281	384	424	**1.17**	**1.01**	**1.34**
		Oxfordshire	607,400	352	367	400	410	430	**1.19**	**1.06**	**1.35**
		Buckinghamshire	500,700	314	340	387	417	415	1.11	0.97	1.27
South West	Avon, Gloucestershire and Wiltshire	Bath and North East Somerset	175,600	233	251	262	279	285	0.79	0.60	1.04
		Bristol	410,700	377	382	402	426	458	**1.34**	**1.16**	**1.55**
		Gloucestershire	578,500	304	323	327	334	342	0.91	0.79	1.04
		Swindon	192,600	317	332	337	343	369	1.01	0.80	1.27
		South Gloucestershire	254,200	366	382	393	433	441	1.18	0.98	1.41
		Wiltshire	448,600	245	256	279	303	319	0.85	0.72	1.00

Table 5.4. Continued

UK Area	Region	PCT/LA[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2008		
				2004	2005	2006	2007	2008	O/E[c]	L 95% CL	U 95% CL
South West	Dorset and Somerset	Bournemouth and Poole	297,900	282	309	329	369	349	0.96	0.79	1.16
		Dorset	403,100	283	308	337	380	397	1.02	0.88	1.20
		North Somerset	201,200	408	388	388	348	383	1.00	0.80	1.25
		Somerset	518,800	303	326	339	353	357	0.94	0.81	1.08
	South West Peninsula	Devon	740,600	270	274	301	336	356	0.93	0.83	1.05
		Plymouth Teaching	247,900	343	395	420	436	480	**1.34**	**1.12**	**1.61**
		Torbay	133,000	271	301	323	361	421	1.11	0.85	1.44
		Cornwall and Isles of Scilly	526,200	279	312	333	371	410	1.06	0.92	1.21
Wales	Bro Taf	Cardiff	317,500	359	381	406	435	450	**1.34**	**1.14**	**1.58**
		Merthyr Tydfil	55,800	484	520	520	591	609	**1.65**	**1.18**	**2.31**
		Rhondda, Cynon, Taff	234,100	393	436	483	500	521	**1.43**	**1.20**	**1.71**
		Vale of Glamorgan	123,200	317	300	308	308	325	0.88	0.64	1.20
	Dyfed Powys	Carmarthenshire	177,800	326	343	371	366	399	1.05	0.83	1.32
		Ceredigion	77,100	324	298	272	285	324	0.87	0.59	1.29
		Pembrokeshire	116,800	300	334	317	342	334	0.87	0.64	1.19
		Powys	130,900	229	229	267	290	321	0.82	0.60	1.10
	Gwent	Blaenau Gwent	69,500	403	388	403	446	432	1.16	0.81	1.66
		Caerphilly	171,300	362	379	397	426	467	**1.27**	**1.02**	**1.58**
		Monmouthshire	87,800	456	490	490	490	513	1.31	0.98	1.76
		Newport	140,500	363	335	313	363	370	1.03	0.79	1.36
		Torfaen	91,000	451	451	462	505	516	**1.40**	**1.05**	**1.86**
	Morgannwg	Bridgend	132,600	370	400	415	437	498	**1.33**	**1.04**	**1.69**
		Neath Port Talbot	137,100	306	328	401	387	408	1.08	0.83	1.40
		Swansea	227,000	352	366	370	388	392	1.07	0.87	1.32
	North Wales	Conwy	111,300	314	305	305	305	332	0.87	0.63	1.20
		Denbighshire	95,900	240	292	282	271	292	0.77	0.53	1.12
		Flintshire	150,000	260	280	293	360	393	1.03	0.80	1.33
		Gwynedd	118,200	271	305	288	355	321	0.87	0.63	1.19
		Isle of Anglesey	68,800	203	203	203	218	233	*0.60*	*0.37*	*0.98*
		Wrexham	131,000	328	313	359	336	405	1.08	0.83	1.41
Scotland	Scotland	Aberdeen City	207,000	319	324	338	343	357	0.96	0.76	1.20
		Aberdeenshire	236,300	309	334	343	355	360	0.92	0.74	1.13
		Angus	109,500	539	539	575	566	584	**1.50**	**1.17**	**1.91**
		Argyll & Bute	91,200	252	263	340	351	428	1.07	0.78	1.46
		Scottish Borders	110,300	227	254	245	272	308	0.78	0.56	1.09
		Clackmannanshire	48,800	246	266	266	266	266	0.69	0.40	1.20
		West Dunbartonshire	91,100	307	296	318	373	362	0.97	0.69	1.36
		Dumfries & Galloway	148,000	311	318	331	351	399	0.99	0.77	1.28
		Dundee City	142,100	366	366	408	415	443	1.23	0.96	1.57
		East Ayrshire	119,300	268	277	293	285	319	0.83	0.60	1.14
		East Dunbartonshire	105,700	426	435	435	464	445	1.15	0.87	1.54
		East Lothian	92,600	335	313	292	302	292	0.76	0.52	1.11
		East Renfrewshire	89,000	416	427	438	472	506	**1.34**	**1.00**	**1.80**
		Edinburgh, City of	463,300	283	311	291	309	328	0.91	0.78	1.07
		Falkirk	149,500	301	321	288	341	368	0.97	0.74	1.26
		Fife	359,200	259	281	292	290	323	0.86	0.71	1.03
		Glasgow City	580,600	370	382	394	417	437	**1.23**	**1.09**	**1.39**
		Highland	215,400	292	320	348	367	422	1.06	0.87	1.31
		Inverclyde	81,300	344	381	344	332	381	1.00	0.71	1.43
		Midlothian	79,000	291	304	316	367	468	1.23	0.89	1.70
		Moray	86,700	311	369	404	415	415	1.06	0.77	1.48

Table 5.4. Continued

UK Area	Region	PCT/LA[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2008		
				2004	2005	2006	2007	2008	O/E[c]	L 95% CL	U 95% CL
Scotland	Scotland	North Ayrshire	135,300	333	384	421	451	480	1.26	0.99	1.60
		North Lanarkshire	323,700	312	331	340	349	386	1.04	0.87	1.24
		Orkney Islands	20,000	500	550	550	400	500	1.26	0.68	2.34
		Perth & Kinross	140,200	321	328	335	342	350	0.90	0.68	1.19
		Renfrewshire	169,300	360	384	413	437	449	1.18	0.94	1.47
		Shetland Islands	22,000	318	273	273	273	227	0.58	0.24	1.40
		South Ayrshire	111,900	357	357	375	384	420	1.07	0.80	1.42
		South Lanarkshire	307,700	367	377	377	383	393	1.04	0.87	1.24
		Stirling	87,600	263	251	240	228	228	*0.61*	*0.40*	*0.95*
		West Lothian	165,700	344	368	332	350	368	0.98	0.76	1.26
		Eilean Siar	25,900	232	270	270	347	309	0.77	0.38	1.53
Northern Ireland	Northern Ireland	Antrim	51,500		350	427	447	485	1.39	0.94	2.06
		Ards	76,000		342	342	342	342	0.91	0.62	1.33
		Armagh	56,400		301	337	337	390	1.14	0.75	1.73
		Ballymena	61,400		228	261	277	309	0.86	0.55	1.35
		Ballymoney	29,300		171	239	205	171	0.49	0.20	1.17
		Banbridge	45,400		286	308	352	374	1.06	0.66	1.70
		Belfast	267,600		310	329	344	344	1.03	0.84	1.27
		Carrickfergus	39,800		503	503	503	528	1.45	0.95	2.23
		Castlereagh	65,600		366	427	442	457	1.24	0.87	1.78
		Coleraine	56,900		211	193	193	211	0.59	0.33	1.04
		Cookstown	34,600		58	87	87	116	*0.35*	*0.13*	*0.92*
		Craigavon	86,800		288	300	288	276	0.80	0.54	1.19
		Derry	107,800		297	334	343	343	1.04	0.75	1.43
		Down	68,400		234	249	263	263	0.76	0.48	1.20
		Dungannon	52,700		190	190	228	190	0.57	0.30	1.05
		Fermanagh	60,600		165	215	198	215	0.60	0.35	1.04
		Larne	31,400		573	510	510	510	1.36	0.83	2.22
		Limavady	33,900		354	324	324	354	1.03	0.59	1.82
		Lisburn	113,300		344	406	424	459	**1.32**	**1.01**	**1.74**
		Magherafelt	42,900		396	396	443	466	1.39	0.90	2.16
		Moyle	17,000		294	353	294	353	0.97	0.44	2.16
		Newry & Mourne	93,600		374	353	363	374	1.12	0.80	1.56
		Newtownabbey	81,400		319	393	393	381	1.06	0.74	1.50
		North Down	79,000		316	304	342	367	0.98	0.68	1.41
		Omagh	51,200		215	273	293	352	1.03	0.65	1.63
		Strabane	39,200		255	332	357	332	0.97	0.56	1.67

kidney transplantation (table 5.7). However in 2008, there was a reduction in the number of diabetic patients receiving a renal transplant. This coincided with a fall in the number of simultaneous pancreas kidney transplants performed in 2008. The proportion of patients transplanted with other primary renal diagnoses has remained stable from 2007.

Ethnicity

It was difficult to compare the proportion of patients within each ethnic group receiving a transplant to those commencing dialysis from the same group because data on ethnicity were missing in a considerable number of patients, who were classified as ethnicity 'unknown' (table 5.8). The percentages of patients with unknown ethnicity between 2003 and 2007 are different to those in last year's chapter [3]; this reflects retrospective input of ethnicity data, improving data completeness.

Comorbidity

Although most renal centres' renal IT system contained fields for annual comorbidity data capture, these

Table 5.5. Distribution of prevalent patients on RRT by centre and modality on 31/12/2008

Centre	Total	% HD	% PD	% transplant
Transplant centres				
B QEH	1,714	47	9	44
Belfast	726	36	7	57
Bristol	1,247	36	7	57
Camb	927	39	5	56
Cardff	1,410	35	9	56
Covnt	745	43	10	47
Edinb	695	39	11	50
Glasgw	1,568	41	4	55
L Barts	1,526	41	15	43
L Guys	1,431	36	4	60
L Rfree	1,510	43	6	51
L St G	624	36	9	55
L West	2,570	48	2	50
Leeds	1,342	36	8	56
Leic	1,660	44	10	46
Liv RI	1,200	34	9	58
M RI	1,422	29	7	64
Newc	901	30	6	64
Nottm	944	42	13	45
Oxford	1,306	27	9	63
Plymth	443	29	12	59
Ports	1,268	35	7	57
Sheff	1,216	50	6	44
Dialysis centres				
Abrdn	456	45	8	46
Airdrie	245	65	5	30
Antrim	220	60	9	31
B Heart	594	69	6	25
Bangor	112	73	27	0
Basldn	217	64	16	20
Bradfd	414	47	8	45
Brightn	722	45	13	41
Carlis	203	40	10	50
Carsh	1,249	50	10	39
Chelms	202	51	21	28
Clwyd	146	51	7	42
Colchr	118	100	0	0
D & Gall	113	47	14	39
Derby	389	62	20	18
Derry	96	56	6	38
Donc	154	52	25	23
Dorset	513	41	11	48
Dudley	270	51	20	29
Dundee	370	44	7	49
Dunfn	220	50	11	38
Exeter	708	45	12	43
Glouc	324	49	11	40
Hull	696	46	11	43
Inverns	212	43	14	43
Ipswi	294	35	18	47
Kent	714	45	11	43
Klmarnk	263	54	16	30
L Kings	784	53	10	37
Liv Ain	130	98	2	0
M Hope	758	41	18	41

Table 5.5. Continued

Centre	Total	% HD	% PD	% transplant
Middlbr	682	43	4	54
Newry	158	62	8	30
Norwch	567	53	11	35
Prestn	873	51	7	42
Redng	578	45	14	41
Shrew	325	57	11	32
Stevng	580	63	7	30
Sthend	204	64	8	28
Stoke	603	45	13	42
Sund	343	47	7	46
Swanse	585	59	12	29
Truro	293	48	10	42
Tyrone	136	65	7	28
Ulster	95	88	5	6
Wirral	216	83	17	0
Wolve	489	62	13	26
Wrexm	223	34	11	55
York	274	44	8	48
England	**39,476**	**44**	**9**	**47**
N Ireland	**1,431**	**50**	**7**	**43**
Scotland	**4,142**	**44**	**8**	**48**
Wales	**2,476**	**43**	**10**	**46**
UK	**47,525**	**44**	**9**	**47**

Table 5.6. Median age and gender ratio of incident and prevalent transplant patients 2003–2008

	Incident transplants			Prevalent transplants[a]		
Year	N	Median age	M:F ratio	N	Median age	M:F ratio
2003	1,540	44.5	1.5	12,720	49.5	1.6
2004	1,710	45.3	1.7	14,904	49.7	1.6
2005	1,778	45.3	1.5	16,694	49.7	1.6
2006	2,004	45.2	1.6	17,729	49.9	1.6
2007	2,147	45.6	1.5	20,854	50.2	1.5
2008	2,351	46.3	1.5	22,300	50.4	1.5

[a] As on 31st December for given year

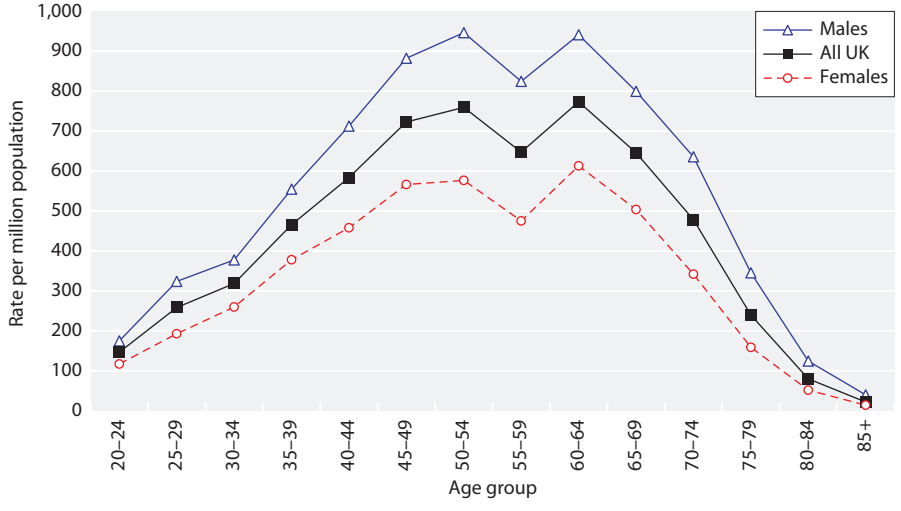

Fig. 5.1. Transplant prevalence rate per million population by age and gender on 31/12/2008

Table 5.7. Primary renal disease in renal transplant recipients 2004–2008

	New transplants by year						Established transplants on 1/1/2008	
Primary diagnosis	2004 %	2005 %	2006 %	2007 %	2008 %	N	%	N
Aetiology uncertain/GN[a] not biopsy proven	18.5	16.8	16.1	16.6	17.2	362	18.9	3,640
Diabetes	11.6	13.0	13.3	14.4	12.4	262	8.3	1,596
Glomerulonephritis	20.6	20.4	20.1	20.3	18.7	395	20.0	3,851
Polycystic kidney disease	13.1	11.6	12.4	13.4	13.0	273	12.2	2,361
Pyelonephritis	12.5	12.1	12.2	12.1	12.2	257	15.4	2,963
Reno-vascular disease	6.9	6.9	6.5	5.5	6.4	135	5.6	1,086
Other	13.1	14.3	15.3	14.7	15.2	321	15.4	2,974
Not available	3.6	5.0	4.3	3.2	4.8	102	4.3	829

[a] GN = glomerulonephritis

Table 5.8. Ethnicity of patients who received a transplant in the years 2003–2008

Year	% White	% South Asian	% African Caribbean	% Other	% Unknown
2003	73.5	5.9	4.6	2.0	14.0
2004	72.5	7.2	4.4	2.2	13.8
2005	73.8	7.2	5.3	1.3	12.3
2006	72.5	7.9	6.1	2.5	11.0
2007	71.5	7.5	5.4	2.5	13.0
2008	66.9	7.9	5.8	2.7	16.7

Northern Ireland centres included from 2005 onwards

fields were mostly incomplete. The UKRR therefore has not attempted to analyse the development of comorbidity after the start of RRT. Data completeness for comorbidities at the start of RRT was also poor at 46.1% for incident patients between 2003 and 2008. With this caveat in mind, it appears that transplanted patients have less comorbidity in comparison to dialysis patients not transplanted or those who died (table 5.9). This is however, a very simplistic comparison as the non-transplanted cohort included patients who were active on the waiting list and also patients deemed unfit for transplantation, who were likely to have more comorbidity than those on the waiting list.

If every renal centre consistently reported the comorbidity of their RRT population, it would be possible to determine whether there are between-centre differences

Table 5.9. Comorbidity amongst incident patients (2003–2008) who underwent transplantation (by the end of 2008) compared to those who remained on dialysis or died

	Not transplanted		Transplanted		
Comorbidity	N	%	N	%	p value[a]
Patients with comorbidity data	12,408		2,501		
No comorbidity present	5,003	40.3	1,891	75.6	
Ischaemic heart disease	3,212	26.2	132	5.3	<0.0001
Cerebrovascular disease	1,352	10.9	65	2.6	<0.0001
Diabetes (not listed as PRD)	1,111	9.1	67	2.7	<0.0001
COPD	961	7.8	40	1.6	<0.0001
Liver disease	354	2.9	28	1.1	<0.0001
Peripheral vascular disease	1,632	13.3	68	2.7	<0.0001
Smoking	1,796	15.0	308	12.5	0.0016
Malignancy	1,656	13.4	42	1.7	<0.0001

[a] Chi square p value comparing proportion with comorbidity between groups

in the degree of comorbidity amongst wait-listed and transplanted patients.

Clinical and laboratory outcomes

Introduction

There continues to be marked variation in the completeness of data (tables 5.10a and b) reported by each centre, particularly for blood pressure. Better data returns (or possibly better extraction of data held within renal IT systems) would facilitate more meaningful comparisons between centres and help to determine the causes of between-centre differences in outcomes. For this reason, along with differences in repatriation policies of prevalent transplant patients between centres as highlighted previously, caution needs to be exercised when comparing performance between centres.

The 72 renal centres in the UK comprise 52 centres in England, 5 in Wales, 6 in Northern Ireland and 9 in Scotland. Centres in Scotland only provide summary information and therefore laboratory outcome data for comparisons were not available for the Scottish renal centres. Four centres (Bangor, Colchester, Liverpool Aintree, Wirral) were reported as having no transplanted patients and were therefore excluded. After exclusion of these 13 centres, prevalent patient data from 59 renal centres across the UK were analysed.

Table 5.10a. Percentage completeness by centre for prevalent transplant patients[a] on 31/12/2008

Centre	Total number of patients	Ethnicity	eGFR[b]	Blood pressure	Centre	Total number of patients	Ethnicity	eGFR[b]	Blood pressure
Antrim	66	100.0	95.5	95.5	Leic	738	92.1	93.5	37.9
B Heart	148	100.0	87.2	0.0	Liv RI	674	93.8	90.5	78.0
B QEH	730	99.6	84.7	0.6	M Hope	308	99.0	94.8	0.0
Basldn	44	100.0	100.0	4.6	M RI	860	92.6	98.0	0.0
Belfast	404	100.0	97.3	92.1	Middlbr	361	91.7	92.5	50.7
Bradfd	179	69.3	89.9	97.8	Newc	561	99.6	95.7	0.7
Brightn	290	54.1	92.4	0.0	Newry	46	97.8	84.8	0.0
Bristol	685	98.3	99.3	91.1	Norwch	194	93.3	94.9	72.7
Camb	484	90.7	97.7	98.4	Nottm	414	96.4	98.6	96.6
Cardff	769	69.7	98.2	97.3	Oxford	792	47.0	98.1	15.3
Carlis	98	100.0	88.8	0.0	Plymth	249	83.9	95.6	1.2
Carsh	483	96.7	94.2	0.2	Ports	708	97.9	86.2	12.6
Chelms	53	90.6	92.5	94.3	Prestn	360	92.5	93.6	0.3
Clwyd	62	69.4	91.9	96.8	Redng	231	100.0	99.1	97.4
Covnt	337	95.9	90.5	86.4	Sheff	520	96.0	98.5	98.9
Derby	67	97.0	85.1	77.6	Shrew	102	100.0	100.0	29.4
Derry	24	100.0	91.7	100.0	Stevng	172	100.0	72.1	2.3
Donc	32	100.0	100.0	100.0	Sthend	53	84.9	96.2	1.9
Dorset	242	100.0	93.4	95.9	Stoke	245	43.7	98.8	0.4
Dudley	77	100.0	94.8	61.0	Sund	154	94.8	100.0	0.0
Exeter	297	88.6	94.6	90.2	Swanse	162	98.8	97.5	12.4
Glouc	124	97.6	96.8	2.4	Truro	116	81.0	97.4	80.2
Hull	289	73.7	86.2	0.4	Tyrone	37	100.0	97.3	94.6
Ipswi	131	100.0	94.7	97.0	Ulster	6	100.0	100.0	100.0
Kent	282	74.5	88.7	5.3	Wolve	123	100.0	98.4	96.8
L Barts	642	95.8	99.8	0.3	Wrexm	116	100.0	94.0	0.9
L Guys	830	85.9	97.7	0.1	York	131	78.6	98.5	97.0
L Kings	277	97.1	84.5	0.0	**England**	**17,936**	**88.5**	**93.7**	**32.8**
L RFree	748	98.7	82.8	0.0	**N Ireland**	**583**	**99.8**	**95.9**	**85.8**
L St G	332	72.0	93.1	0.0	**Wales**	**1,109**	**77.1**	**97.3**	**74.8**
L West	1,238	85.8	94.3	0.2	**E, W & NI**	**19,628**	**88.2**	**94.0**	**36.8**
Leeds	731	72.4	96.7	84.7					

[a] Total number of patients for outcomes analysis = 19,628 as patients transplanted in the last quarter of 2008 were excluded
[b] Patients with missing ethnicity were classed as White for eGFR calculation

Table 5.10b. Percentage completeness by centre for prevalent transplant patients on 31/12/2008

Centre	Total number of patients	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[a]	Serum phosphate	Serum PTH
Antrim	66	95	95	95	95	23
B Heart	148	90	57	78	78	16
B QEH	730	85	84	84	83	60
Basldn	44	100	95	100	82	70
Belfast	404	97	98	95	95	19
Bradfd	179	83	82	89	84	36
Brightn	290	92	40	85	84	32
Bristol	685	99	94	99	99	90
Camb	484	98	94	98	98	87
Cardff	769	98	90	98	98	20
Carlis	98	88	83	87	85	7
Carsh	483	81	71	93	93	4
Chelms	53	92	89	92	91	26
Clwyd	62	92	85	92	92	63
Covnt	337	91	0	91	52	20
Derby	67	82	61	82	70	55
Derry	24	88	100	83	83	42
Donc	32	100	59	97	97	28
Dorset	242	92	88	91	72	22
Dudley	77	94	82	94	94	56
Exeter	297	95	89	93	88	24
Glouc	124	97	77	97	97	35
Hull	289	85	53	85	85	29
Ipswi	131	93	82	95	94	49
Kent	282	96	75	90	88	0
L Barts	642	100	100	100	100	100
L Guys	830	97	87	90	90	23
L Kings	277	84	81	84	84	12
L RFree	748	65	79	81	81	54
L St G	332	93	89	92	92	67
L West	1,238	98	91	8	8	1
Leeds	731	95	94	95	95	28
Leic	738	94	92	93	93	60
Liv RI	674	90	7	90	90	36
M Hope	308	95	95	94	94	83
M RI	860	98	70	98	98	63
Middlbr	361	90	67	91	91	16
Newc	561	95	95	95	95	48
Newry	46	85	89	83	83	43
Norwch	194	95	95	94	94	19
Nottm	414	99	88	92	91	86
Oxford	792	98	78	98	98	38
Plymth	249	92	85	94	94	17
Ports	708	87	60	85	83	8
Prestn	360	92	83	91	89	56
Redng	231	99	98	98	97	71
Sheff	520	99	73	98	98	32
Shrew	102	100	95	96	96	61
Stevng	172	90	87	87	86	40
Sthend	53	96	83	96	96	15
Stoke	245	98	99	99	98	27
Sund	154	100	98	100	100	89
Swanse	162	98	95	98	98	36
Truro	116	98	74	97	97	40
Tyrone	37	89	97	92	92	46

Table 5.10b. Continued

Centre	Total number of patients	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[a]	Serum phosphate	Serum PTH
Ulster	6	100	83	100	100	67
Wolve	123	98	89	98	83	64
Wrexm	116	93	91	94	94	84
York	131	92	82	87	95	29
England	**17,936**	**93**	**79**	**87**	**85**	**42**
N Ireland	**583**	**95**	**97**	**93**	**93**	**25**
Wales	**1,109**	**97**	**91**	**97**	**97**	**32**
E, W & NI	**19,628**	**93**	**80**	**87**	**86**	**41**

[a] Serum calcium corrected for serum albumin

For the one year post-transplant outcomes, with patients assigned to the centres that performed their transplant, the two Scottish transplant centres were excluded as they do not submit biochemical data to the UKRR. London St George's and Manchester RI only commenced submitting data to the UKRR in 2007 and are therefore not shown in the figures. After excluding these 4 transplant centres, one year outcomes are described for 19 transplant centres across the UK.

Methods

Data for key laboratory variables are reported for all prevalent patients with valid data returns for a given renal centre (both transplanting and non-transplanting centres) and for one year post-transplant results for patients transplanted 2001–2007, with patients attributed to the transplant centre that performed the procedure.

Time since transplantation may have a significant effect on key biochemical and clinical variables and this is likely to be independent of a centre's clinical practices. Therefore inter-centre comparison of data on prevalent transplant patients is open to bias. To minimise such bias, one year post-transplantation outcomes are also reported in patients. It is presumed that patient selection policies and local clinical practices are more likely to be relevant in influencing outcomes 12 months post-transplant and therefore comparison of outcomes between centres are more robust. However, even the 12 months post-transplant comparisons could be biased by the fact that in some centres, repatriation of patients to their local renal centre only occurs if the graft is failing.

Prevalent patient data

Data from both transplanting and non-transplanting renal centres concerning biochemical and clinical variables for patients with a functioning transplant were included in the analyses. The cohort consisted of prevalent patients as on 31/12/2008. Patients were considered as having a functioning transplant if 'transplant' was listed as the last mode of RRT in the last quarter of 2008. Patients were assigned to the renal centre that sent the data to the UKRR but some patients will have received care in more than one centre. If data for the same transplant patient were received from both the transplant centre and non-transplant centre, care was allocated to the non-transplant centre. Patients with functioning transplants of less than 3 months duration were excluded from analyses. One centre, Ulster, with <20 patients is not shown in the figures. For haemoglobin, estimated glomerular filtration rate (eGFR), calcium and phosphate the latest value in quarter 3 or quarter 4 of 2008 was used. For blood pressure (BP) and cholesterol, the latest value from 2008 was used. For parathyroid hormone (PTH), the latest value in the last 3 quarters of 2008 was used.

Estimated glomerular filtration rate (eGFR)

For the purpose of eGFR calculation, the original 4-variable MDRD formula was used (with a constant of 186) to calculate eGFR from the serum creatinine concentration as reported by the centre. A wide variety of creatinine assays are in use in clinical biochemistry laboratories in the UK, and it is not possible to ensure that all measurements of creatinine concentration collected by the UKRR are harmonised. Although many laboratories are now reporting assay results that have been aligned to the isotope dilution-mass spectrometry standard (which would necessitate use of the modified MDRD formula), this was not the case at the end of 2008. Patients with valid serum creatinine results but no ethnicity data were classed as White for the purpose of the eGFR calculation.

One year post-transplant data

Patients who received a renal transplant between 01 January 2001 and 31 December 2007 were assigned according to the renal centre in which they were transplanted. In a small number of instances, the first documented evidence of transplantation in a patient's record is from a timeline entry in data returned from a non-transplant centre: in these instances, the patient was re-assigned to the nearest transplant centre (table 5.11).

Carshalton/St Helier's was a transplanting centre until 2003, with subsequent transplants performed at London St George's. Therefore, data from this centre refer to patients transplanted locally until 2003. Patients who had died or experienced graft failure within 12 months of transplantation were excluded from

Table 5.11. Number of patients reallocated to transplanting centre

Transplant centre	Number of patients per transplant centre	Number of patients reallocated to transplant centre	Non-transplant centre
B QEH	658	2	Shrew
		4	Stoke
Belfast	273	1	Antrim
		2	Newry
		1	Tyrone
		1	Ulster
Bristol	631	1	Glouc
Camb	649	15	Stevng
Cardff	578	1	Swanse
Covnt	256	n/a	
L Barts	495	n/a	
L Guys	1,023	34	Kent
		248	L Kings
L Rfree	508	2	Sthend
L St G	391	1	Brightn
		155	Carsh
L West	806	n/a	
Leeds	825	17	Hull
Leic	354	n/a	
Liv RI	689	166	Prestn
		2	Wrexm
M RI	709	33	M Hope
Newc	645	11	Carlis
		18	Middlbr
		13	Sund
Nottm	257	1	Derby
Oxford	668	n/a	
Plymth	304	3	Truro
Ports	364	n/a	
Sheff	321	n/a	
Total	**11,404**	**732**	

the analyses. For patients with more than one transplant during 2001–2007, they were included as separate episodes provided each of the transplants functioned for a year.

For each patient, the most recent laboratory or blood pressure for the relative 4th/5th quarter (9–15 months) after renal transplantation was taken to be representative of the one year post-transplant outcome. For the purpose of the eGFR calculation, patients with valid serum creatinine results but missing ethnicity data were classed as White.

Results and discussion

Post-transplant eGFR in prevalent transplant patients

When interpreting eGFR post-transplantation it is important to remember that estimated GFR formulae only have a modest predictive performance in the transplant population [4]. Median eGFR in each centre and percentage of patients with eGFR <30 ml/min/1.73 m^2 are shown in figures 5.2 and 5.3. The median eGFR was 49.2 ml/min/1.73 m^2, with 14.7% of prevalent transplant recipients having an eGFR <30 ml/min/1.73 m^2. Table 5.12 summarises the proportion of transplant patients with an eGFR <30 ml/min/1.73 m^2 by centre. Whilst local repatriation policies on timing of transfer of care of patients with failing transplants from transplant centres to referring centres might explain some of the differences, it is notable that both transplanting and non-transplant centres feature at both ends of the scale. The accuracy of the 4v MDRD equation in estimating GFR $\geqslant 60$ ml/min/1.73 m^2 is questionable [5], therefore a figure describing this is not included in this chapter. It is likely centres with a high prevalence of patients with eGFR <30 ml/min/1.73 m^2 expend

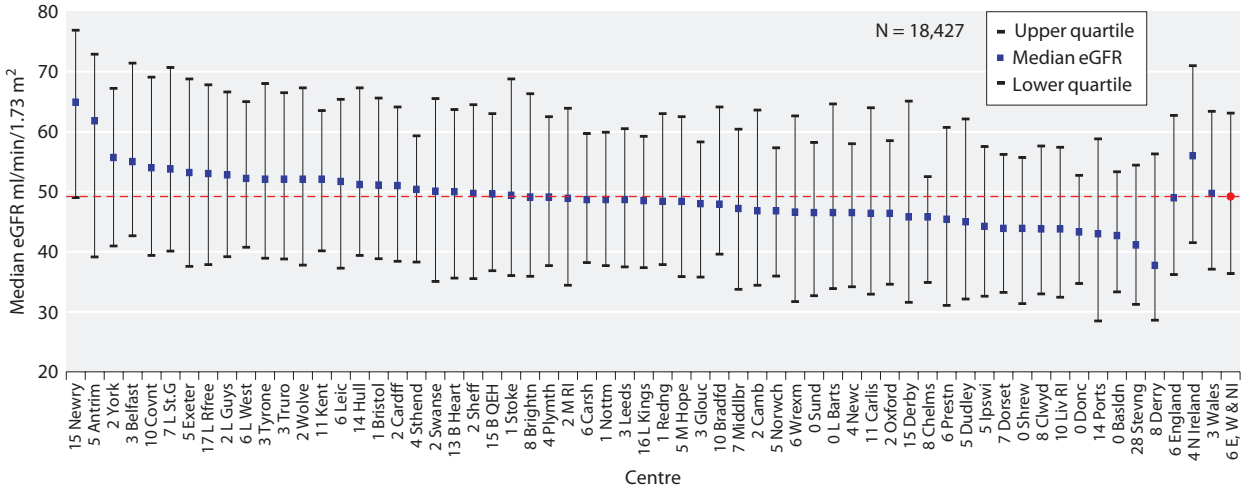

Fig. 5.2. Median eGFR in prevalent transplant patients by centre on 31/12/08

significant resources in the management of complications related to declining renal function as well as ensuring safe transition to dialysis and/or re-transplantation.

Figure 5.4 represents the percentage of prevalent patients by centre with eGFR <30 mls/min/1.73 m^2 as a funnel plot, enabling more reliable comparison of outcomes between centres across the UK. The solid lines show the 2 standard deviation limits (95%) and the dotted lines the limits for 3 standard deviations (99.9%). With 58 centres included and a normal distribution, 2–3 centres would be expected to fall between the 95%–99.9% CI (1 in 20) and no centres should fall outside the 99.9% limits.

However, these data show over-dispersion with 19 centres falling outside the 95% CI of which 7 centres were outside the 99.9% CI. Four centres (Belfast, London West, London St George's, Antrim) fall outside the lower 99.9% CI suggesting a lower than expected proportion of patients with eGFR <30 ml/min/1.73 m^2. Liverpool, Portsmouth and Preston fall outside the upper 99.9% CI suggesting a higher than expected proportion of patients with eGFR <30 ml/min.1.73 m^2. The presence of mainly transplanting renal centres at either end of this spectrum suggests that differences in repatriation policies alone are not sufficient to explain this variation.

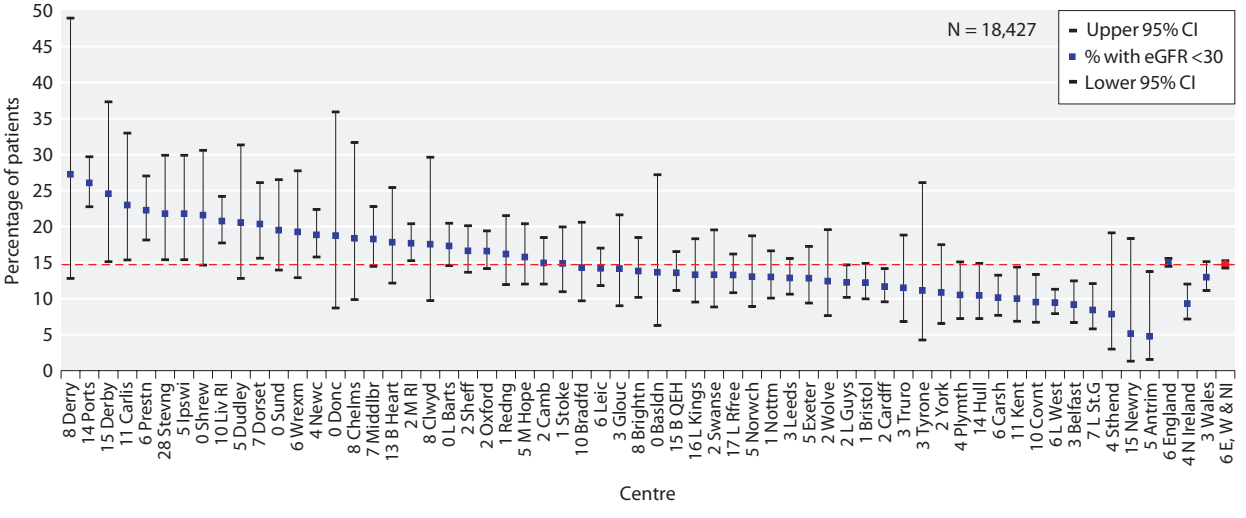

Fig. 5.3. Percentage of prevalent transplant patients by centre on 31/12/08 with eGFR <30 ml/min/1.73 m^2

Table 5.12. Proportion of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 on 31/12/08

Centre	Number of patients with eGFR data	Patients with eGFR <30 (%)	Centre	Number of patients with eGFR data	Patients with eGFR <30 (%)
Ulster	6	16.7	Stoke	242	14.9
Derry	22	27.3	Hull	249	10.4
Donc	32	18.8	Kent	250	10.0
Tyrone	36	11.1	Brightn	268	13.8
Newry	39	5.1	Exeter	281	12.8
Basldn	44	13.6	M Hope	292	15.8
Chelms	49	18.4	Covnt	305	9.5
Sthend	51	7.8	L St G	309	8.4
Derby	57	24.6	Middlbr	334	18.3
Clwyd	57	17.5	Prestn	337	22.3
Antrim	63	4.8	Belfast	393	9.2
Dudley	73	20.5	Nottm	408	13.0
Carlis	87	23.0	Carsh	455	10.1
Shrew	102	21.6	Camb	468	15.0
Wrexm	109	19.3	Sheff	511	16.6
Truro	113	11.5	Newc	536	18.8
Glouc	120	14.2	Liv RI	607	20.8
Wolve	121	12.4	Ports	610	26.1
Stevng	124	21.8	L Rfree	618	13.3
Ipswi	124	21.8	B QEH	618	13.6
York	129	10.9	L Barts	641	17.3
B Heart	129	17.8	Bristol	680	12.2
Sund	154	19.5	Leic	690	14.2
Swanse	158	13.3	Leeds	707	12.9
Bradfd	161	14.3	Cardff	755	11.7
Norwch	184	13.0	Oxford	777	16.6
Dorset	226	20.4	L Guys	809	12.2
Redng	229	16.2	M RI	843	17.7
L Kings	233	13.3	L West	1,164	9.5
Plymth	238	10.5			

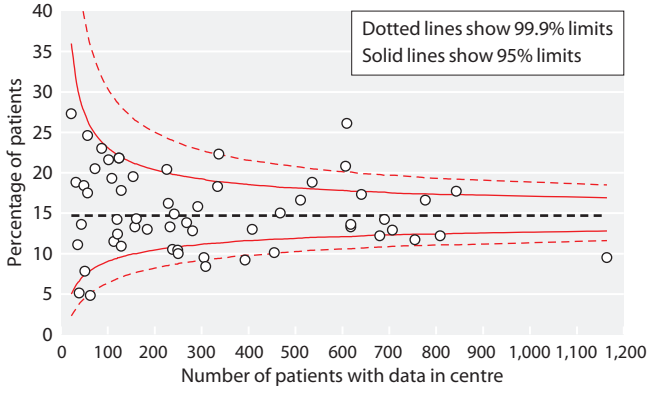

Fig. 5.4. Funnel plot of percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre size on 31/12/08

eGFR in patients one year after transplantation

Graft function at one year post-transplantation may predict subsequent long-term graft outcome [6]. Figure 5.5 shows that the median one year post-transplant eGFR for patients transplanted 2001–2007 was 50.6 ml/min/1.73 m^2. Figures 5.6a and 5.6b provide the same information divided according to source of organ as live donor and deceased donor respectively. It is interesting to note the same centres are in similar positions at either end of the spectrum for one year post-transplant eGFR for both deceased donor transplants and live donor kidney transplants, raising the possibility that centre variation in clinical management may contribute to this variation.

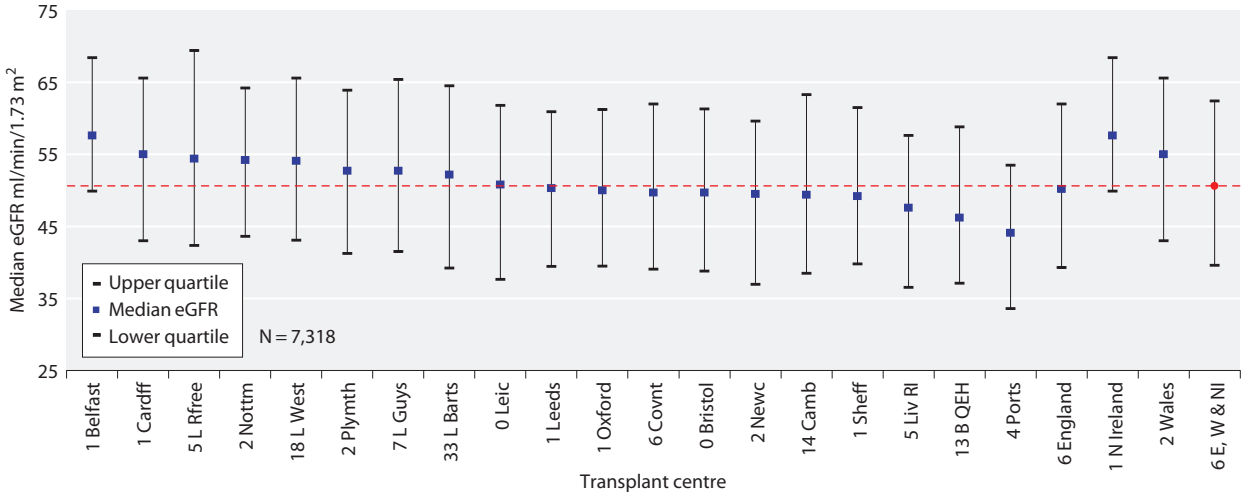

Fig. 5.5. Median eGFR one year post-transplant by transplant centre for patients transplanted between 2001–2007

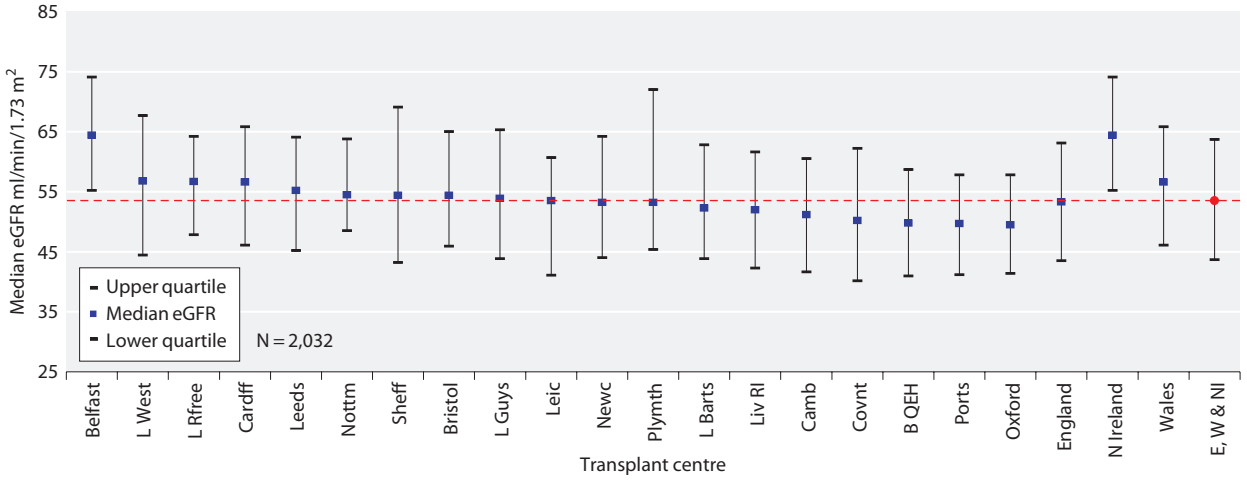

Fig. 5.6a. Median eGFR one year post-living donor transplant by transplant centre 2001–2007

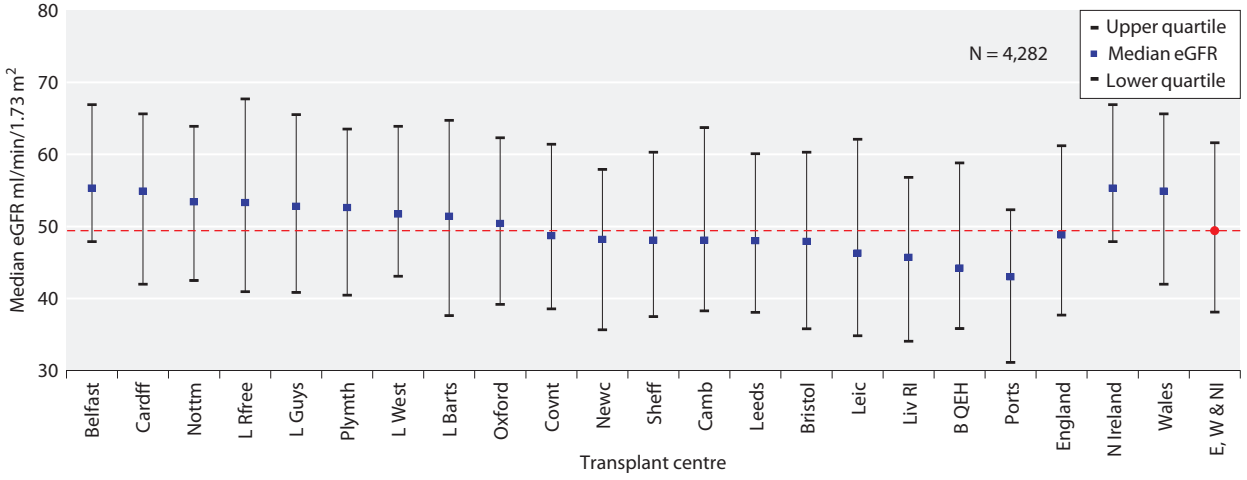

Fig. 5.6b. Median eGFR one year post-deceased donor transplant by transplant centre 2001–2007

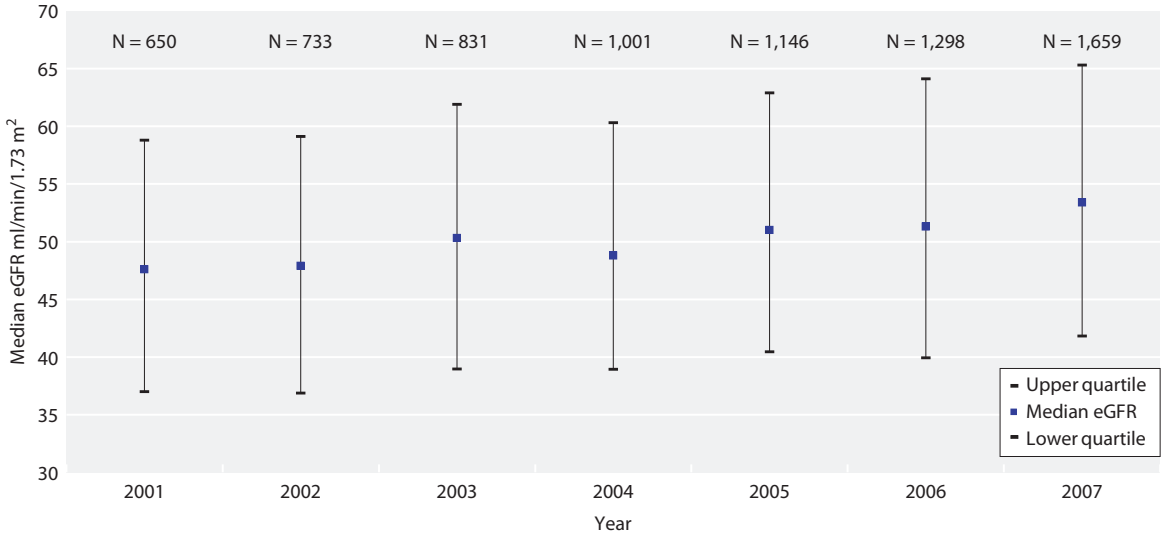

Fig. 5.7. Median eGFR one year post-transplant by year of transplantation 2001–2007

Regression analysis (least squares) indicated a small but significant upward trend (+0.9 ml/min change in eGFR/year) ($p < 0.001$) in the one year post-transplant median eGFR between 2001 and 2007 (figure 5.7). This suggests better graft function for patients transplanted more recently. Live donor transplantation as a proportion of the total number of transplants has been increasing year-on-year since 2000. Such recipients are known to have a higher one year post-transplant eGFR compared to deceased donor transplant recipients [7], so the upward trend seen in figure 5.7 could be due to the increased proportion of live donor transplants over time. However, previous years' analyses have been limited by missing donor information in the years 2005 and 2006. For the first time analysis of one year post-transplant eGFR has been performed based on donor type, with recipients of live kidney donor (figure 5.8a) and deceased donor (figure 5.8b) transplants being analysed separately. An upward trend in eGFR over the time period is noticed with both live and deceased donor transplants and the rate of change in slope of eGFR per year between the donor types (+0.86 ml/min/year for live donor transplants and +0.90 ml/min/year for deceased donor transplants) are also similar. Therefore

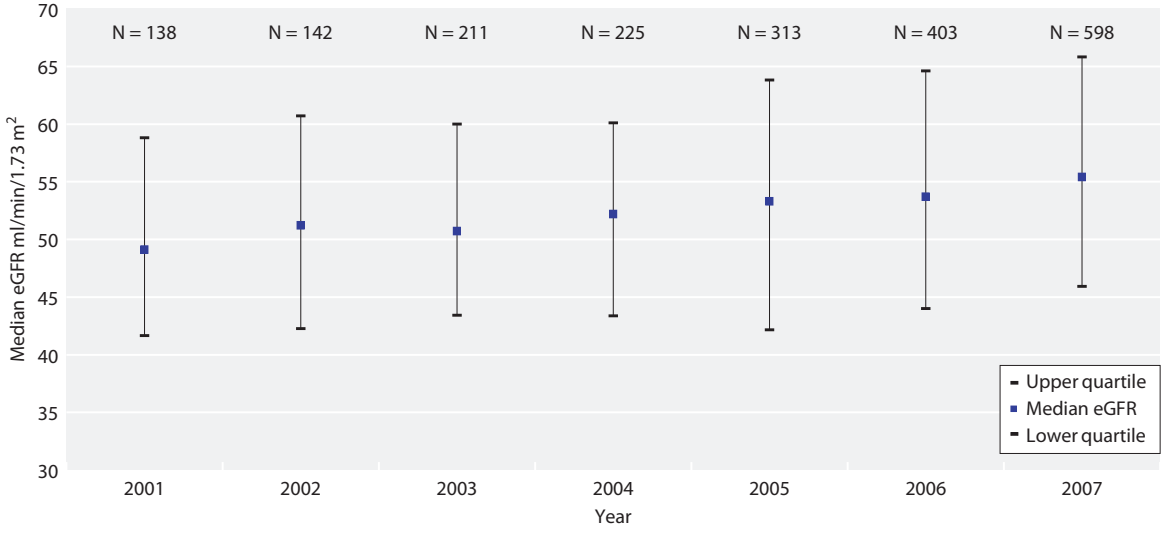

Fig. 5.8a. Median eGFR one year post-live donor transplant by year of transplantation 2001–2007

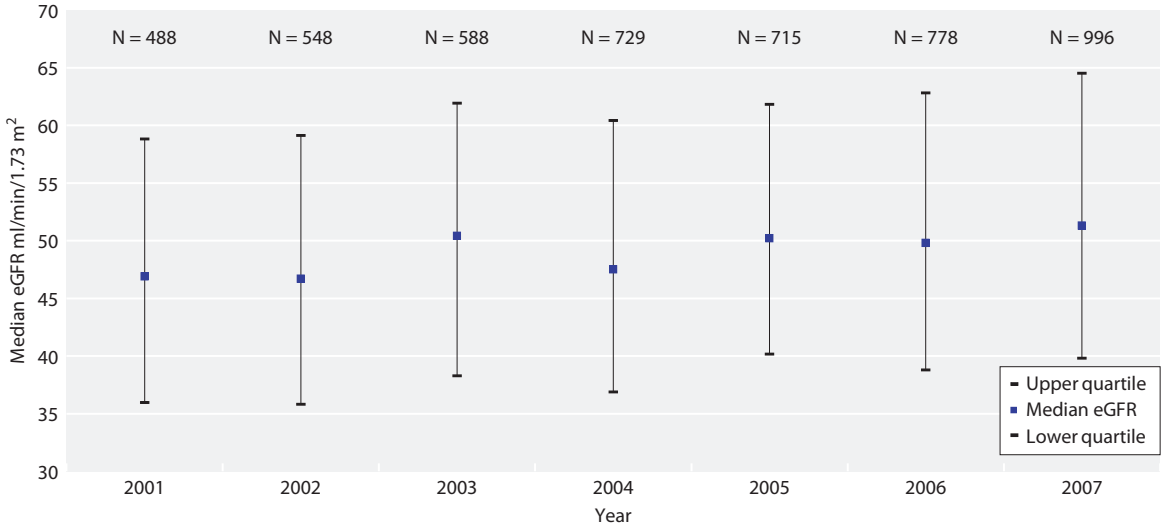

Fig. 5.8b. Median eGFR one year post-deceased donor transplant by year of transplantation 2001–2007

changing donor demographics, with a higher proportion of live donor transplants more recently, do not explain the upward trend in one year post-transplant eGFR.

When analysing eGFR post-transplant by centre, 11 of the 19 centres did not have a significant annual change in the eGFR at one year following transplantation (data not shown). Eight centres demonstrated a significant increase in eGFR one year post-transplant between 2001 and 2007 (median 1.5 ml/min/1.73 m^2 increase per year (range 0.9–2.6 ml/min/1.73 m^2)).

Haemoglobin in prevalent transplant patients

Transplant patients fall under the remit of the UK Renal Association complications of chronic kidney disease (CKD) guidelines, which state '***Patients with CKD should achieve a haemoglobin between 10.5–12.5 g/dl***' [8]. However, many transplant patients with good transplant function will have haemoglobin concentrations >12.5 g/dl without the use of erythropoiesis stimulating agents, and so it is inappropriate to audit performance using the higher limit.

A number of factors including comorbidity, immunosuppressive medication, graft function, ACE inhibitor use, erythropoietin (EPO) use, intravenous or oral iron use, as well as centre practices and protocols for management of anaemia, affect haemoglobin concentrations in transplant patients. Whilst it is impossible to control for all the potential variables, this report includes for the first time, centre results stratified according to graft function as estimated by eGFR (figures 5.9, 5.10a and

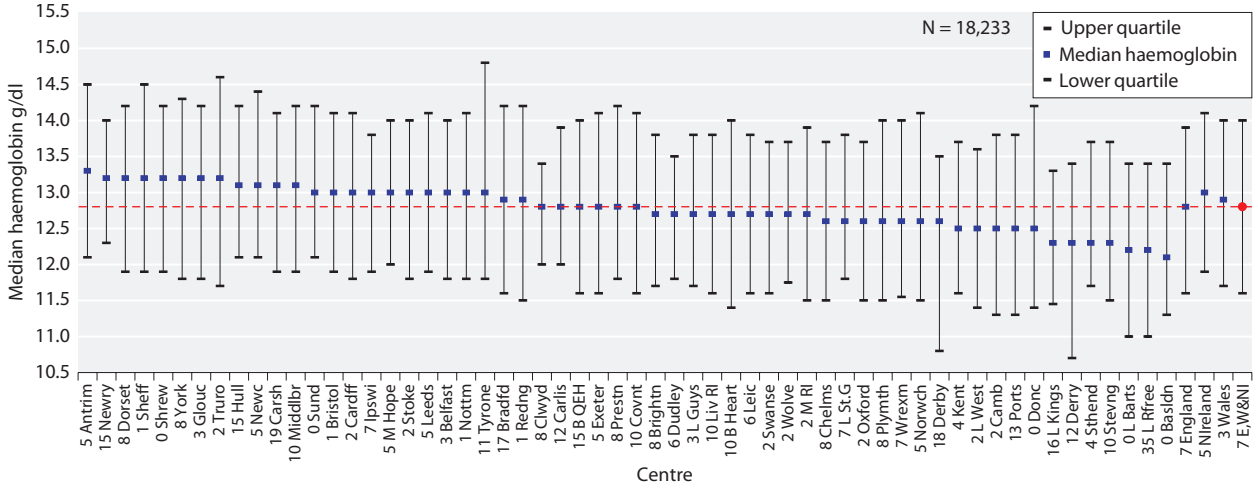

Fig. 5.9. Median haemoglobin for prevalent transplant patients by centre on 31/12/2008

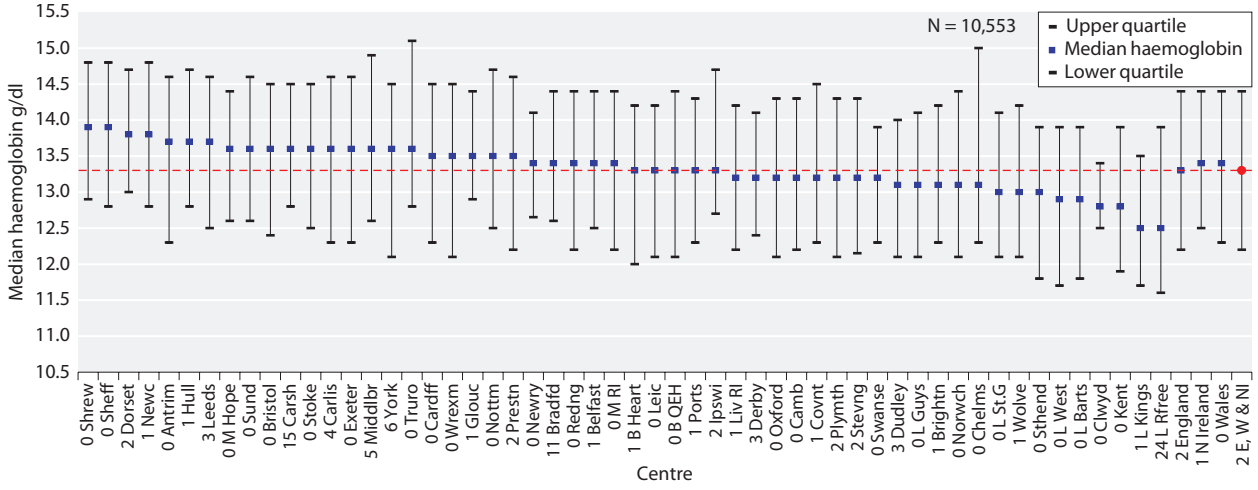

Fig. 5.10a. Median haemoglobin for prevalent transplant patients with eGFR $\geqslant$45 ml/min/1.73 m^2 by centre on 31/12/2008

5.10b). The percentage of prevalent transplant patients achieving Hb >10.5 g/dl in each centre, stratified by eGFR, is displayed in figures 5.11a and 5.11b.

Figure 5.12 describes the percentage of prevalent patients by centre with haemoglobin <10.5 g/dl as a funnel plot enabling more reliable comparison of outcomes between centres across the UK. The solid lines show the 2 standard deviation limits (95% limits) and the dotted lines the limits for 3 standard deviations (99.9% limits). With 58 centres included and a normal distribution, 2–3 centres would be expected to fall between the 95%–99.9% CI (1 in 20) and no centres should fall outside the 99.9% CI purely as a chance event.

Two centres (London Royal Free, London Barts) fall outside the upper 99% CI with one further centre, Portsmouth falling outside the upper 95% CI indicating a higher than predicted proportion of transplant patients not achieving the haemoglobin target. Four centres (Cardiff, Sunderland, Sheffield, Antrim) perform better than expected with fewer than predicted patients having a haemoglobin <10.5 g/dl.

Haemoglobin in patients one year post-transplantation

The one year post-transplant haemoglobin for patients transplanted between 2001–2007 continued to be stable at 13.0 g/dl (figure 5.13).

Blood pressure in prevalent transplant patients

In the absence of controlled trial data, opinion based recommendation from the UK Renal Association (RA)

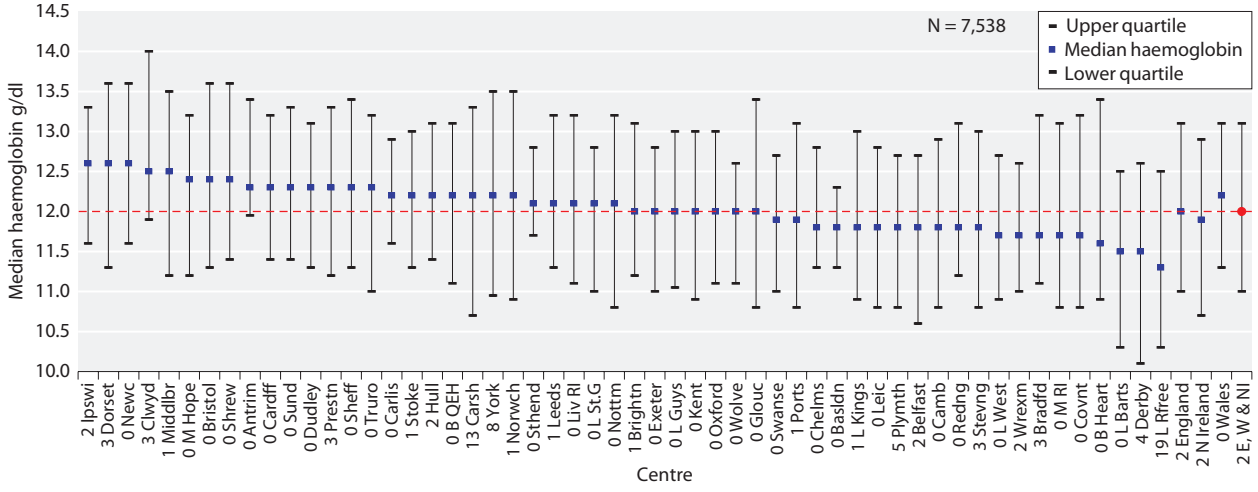

Fig. 5.10b. Median haemoglobin for prevalent transplant patients with eGFR <45 ml/min/1.73 m^2 by centre on 31/12/2008

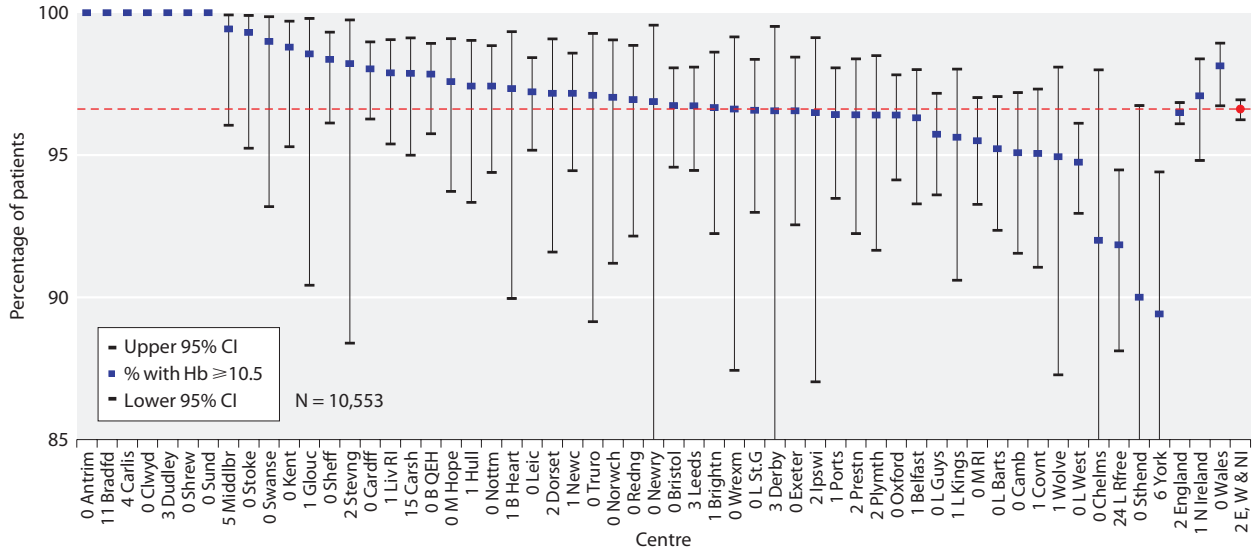

Fig. 5.11a. Percentage of prevalent transplant patients with eGFR ⩾45 ml/min/1.73 m^2 achieving haemoglobin ⩾10.5 g/dl by centre on 31/12/2008

states '***Amongst patients with CKD blood pressure should be lowered to <130/80 mmHg***' [9].

As indicated in table 5.10a, completeness for blood pressure data returns was variable and only centres with >50% data returns were included for consideration. Despite this restriction, caution needs to be exercised in interpretation of these results because of the volume of missing data and potential bias (e.g. a centre may be more likely to record and report blood pressure data electronically in patients with poor BP control).

Median systolic BP (figure 5.14), diastolic BP (figure 5.15) and percentage of patients achieving RA targets (figure 5.16) are shown. Higher blood pressure may have a cause or effect association with degree of graft function. Figures 5.17a and 5.17b are new analyses this year and demonstrate the association of transplant eGFR (stratified as ⩾ or <45 ml/min/1.73 m^2) with blood pressure. The percentage of patients with BP <130/80 (systolic BP <130 **and** diastolic BP <80 mmHg) was higher (29.6% vs. 24.8%) in those with better renal function (eGFR ⩾45 ml/min/1.73 m^2).

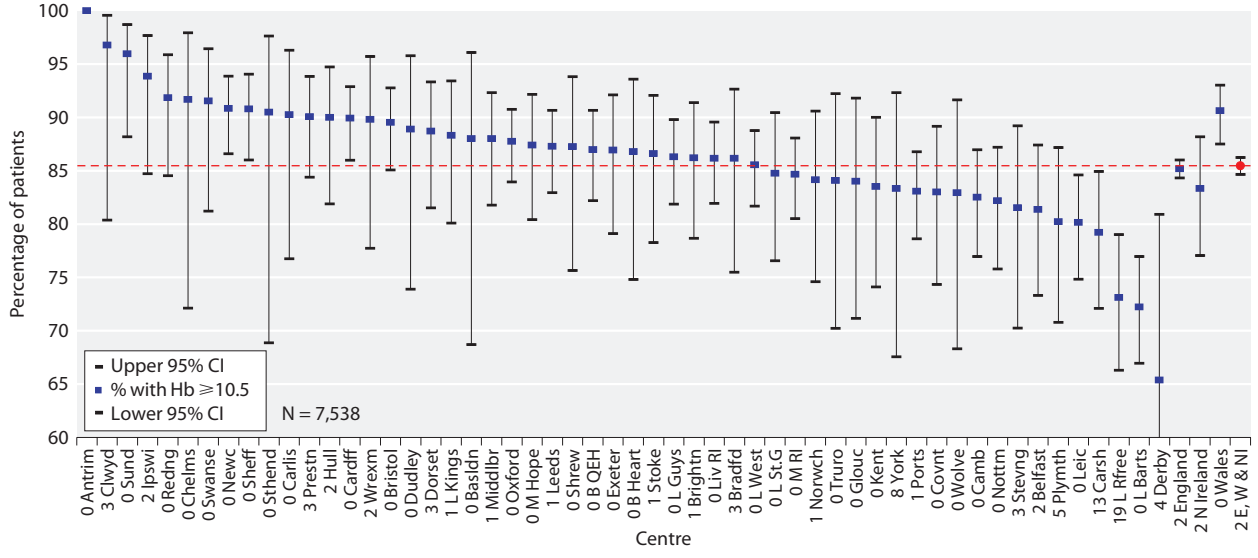

Fig. 5.11b. Percentage of prevalent transplant patients with eGFR <45 ml/min/1.73 m^2 achieving haemoglobin ⩾10.5 g/dl by centre on 31/12/2008

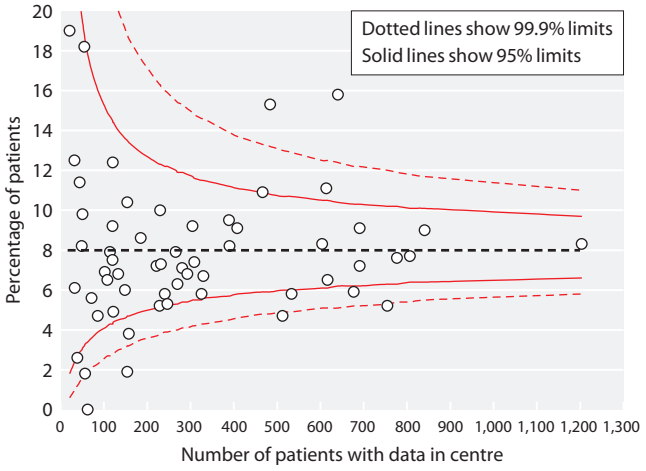

Fig. 5.12. Funnel plot of percentage of the prevalent transplant patients with haemoglobin <10.5 g/dl by centre size on 31/12/2008

Blood pressure in patients one year after transplantation

Figures 5.18 and 5.19 show median systolic and diastolic blood pressures in patients one year after transplantation, respectively.

At present, renal transplant recipients are considered as a sub-group of the native kidney disease population. There is no current evidence that suggests the knowledge gained from native kidney disease literature is not applicable to transplant recipients. Less than 27.7% of prevalent transplant patients across the UK achieved a BP of <130/80 mmHg, and it is necessary to evaluate new ways to achieve this goal or assess whether this is realistically achievable in the majority of patients. Northern Ireland managed to attain a BP <130/80 mmHg in 40.2% of patients; exploring the reasons for this may help to inform UK policy.

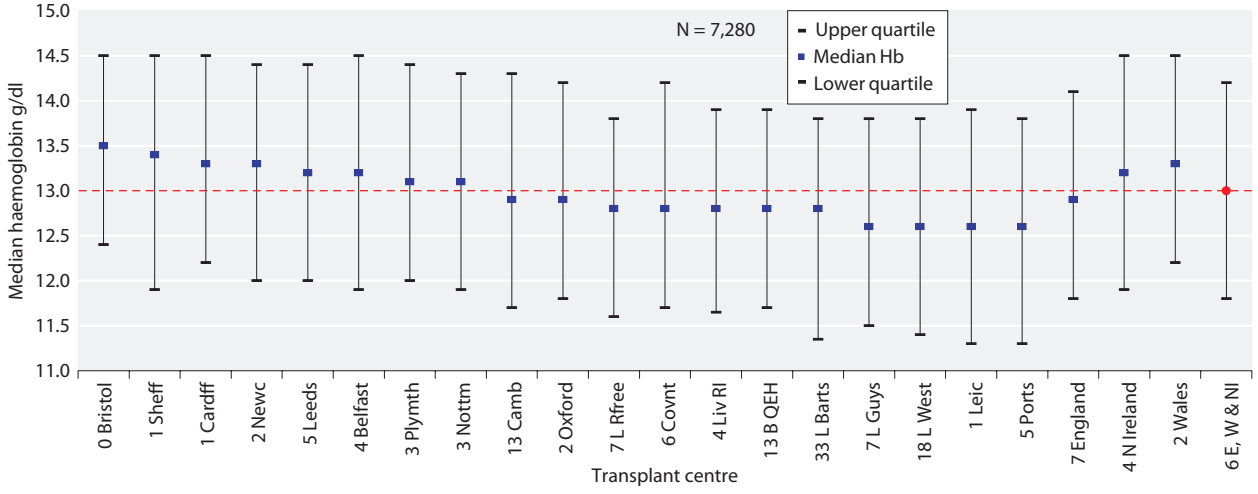

Fig. 5.13. Median haemoglobin one year post-transplant by transplant centre for patients transplanted between 2001–2007

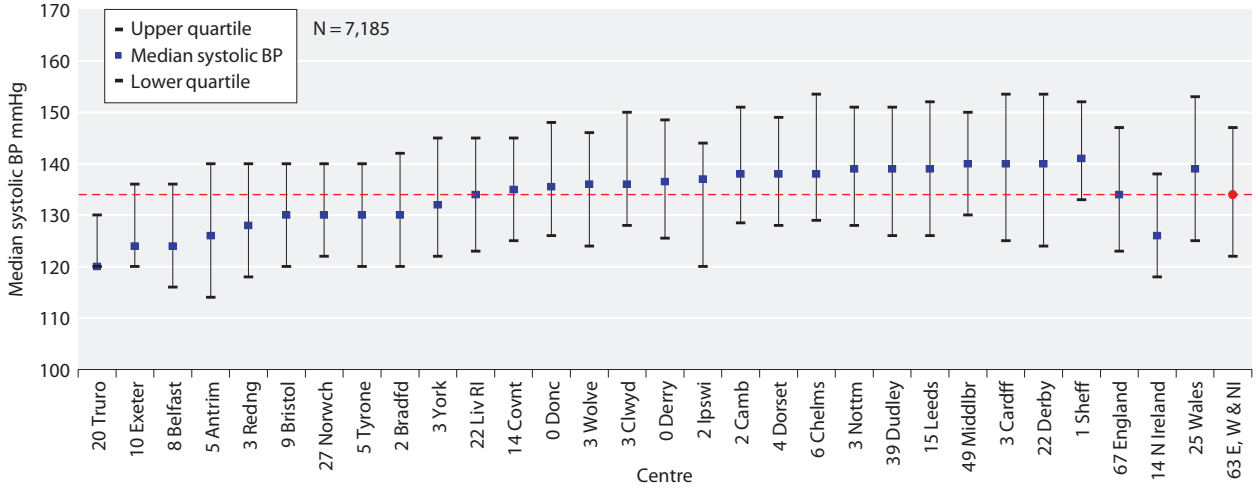

Fig. 5.14. Median systolic blood pressure for prevalent transplant patients by centre on 31/12/2008

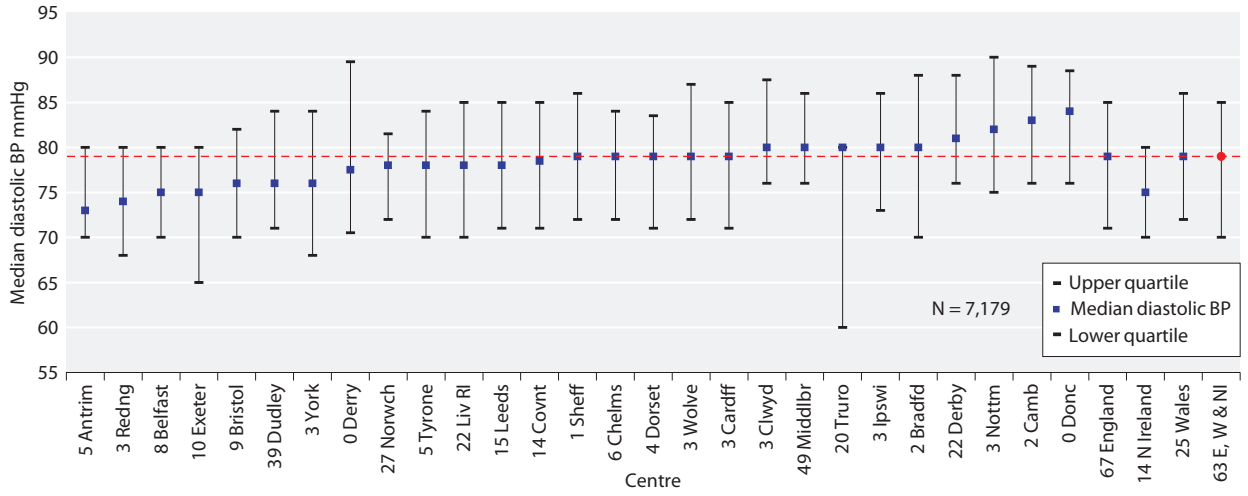

Fig. 5.15. Median diastolic blood pressure for prevalent transplant patients by centre on 31/12/2008

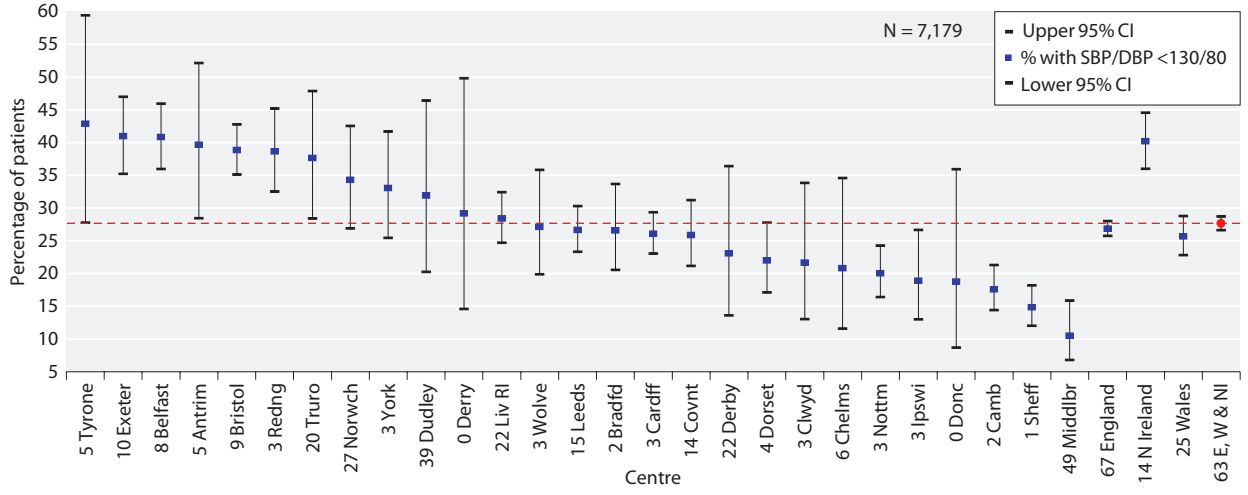

Fig. 5.16. Percentage of prevalent transplant patients achieving blood pressure target of <130/80 mmHg by centre on 31/12/2008

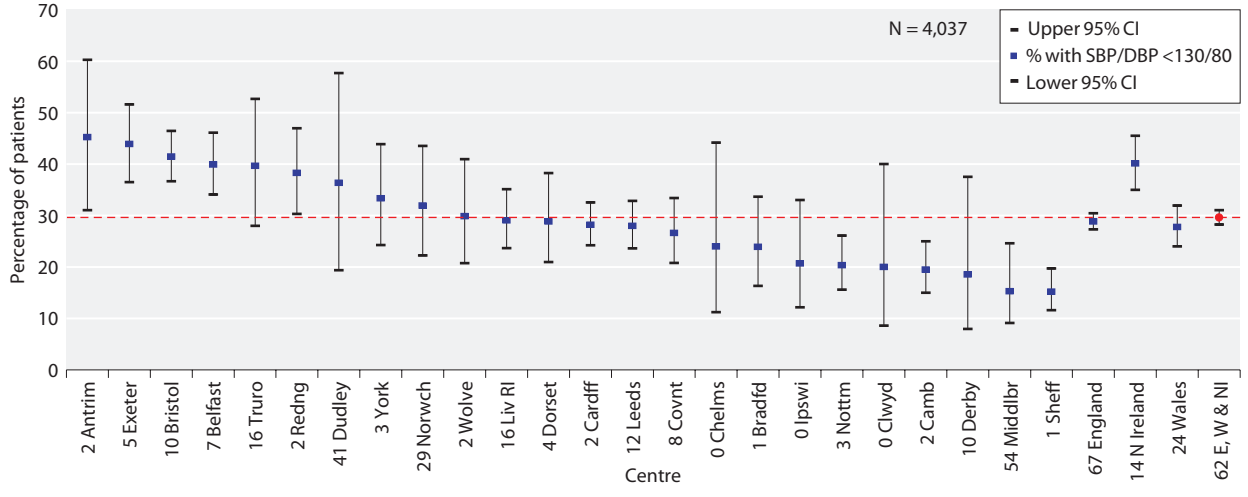

Fig. 5.17a. Percentage of prevalent transplant patients with eGFR $\geqslant$45 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/08

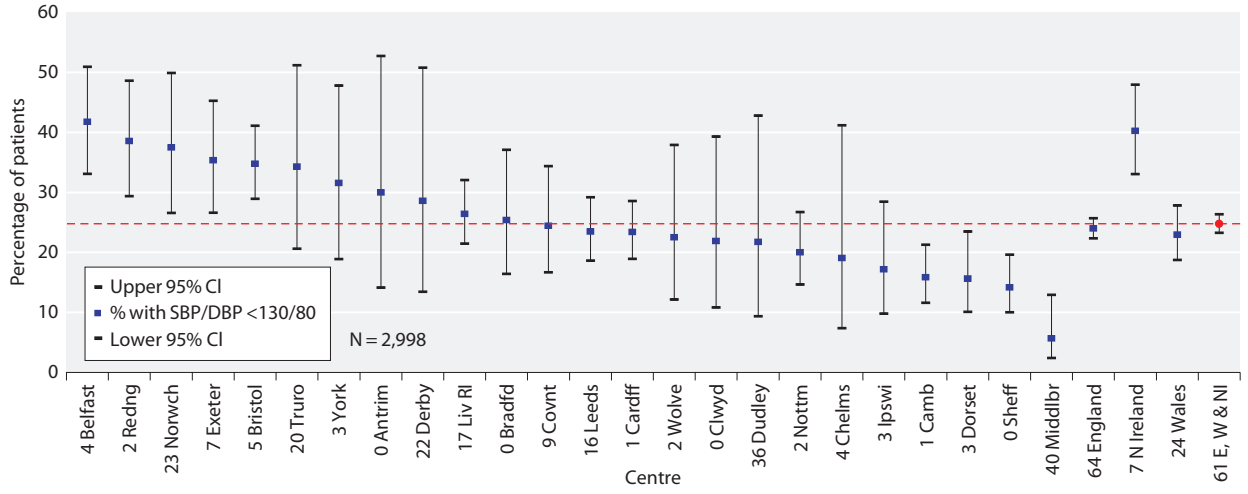

Fig. 5.17b. Percentage of prevalent transplant patients with eGFR <45 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/08

Cholesterol in transplant patients

The Renal Association guidelines [9] state '***Three hydroxy-3 methylglutaryl-Co-enzyme A reductase inhibitors (statins) should be considered for primary prevention in all CKD including dialysis patients with a 10-year risk of cardiovascular disease, calculated as >20% according to the Joint British Societies' Guidelines (JBS 2), despite the fact that these calculations have not been validated in patients with renal disease. A total cholesterol of <4 mmol/l or a 25% reduction from baseline, or a fasting low density lipoprotein (LDL)-cholesterol of <2 mmol/l or a 30% reduction from baseline, should be achieved, whichever is the greatest reduction in all patients***'. Audit against this standard is not currently possible using data returned to the Registry, because such an audit would require categorisation of 10-year risk in each patient to allow analysis of serum cholesterol concentrations amongst patients. There is at present no consensus amongst UK clinicians that all transplant patients should be treated as though they have a 10-year risk of cardiovascular disease of >20%, although further guidelines on the medical management of transplant patients and on the management of cardiovascular disease in CKD are in preparation. However, previous Registry reports have contained analyses of total cholesterol, and these are repeated here for comparison.

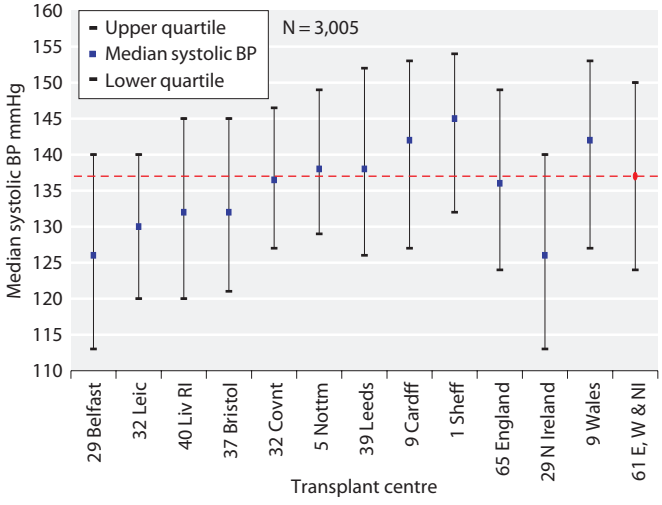

Fig. 5.18. Median systolic blood pressure one year post-transplant by transplant centre for patients transplanted between 2001–2007

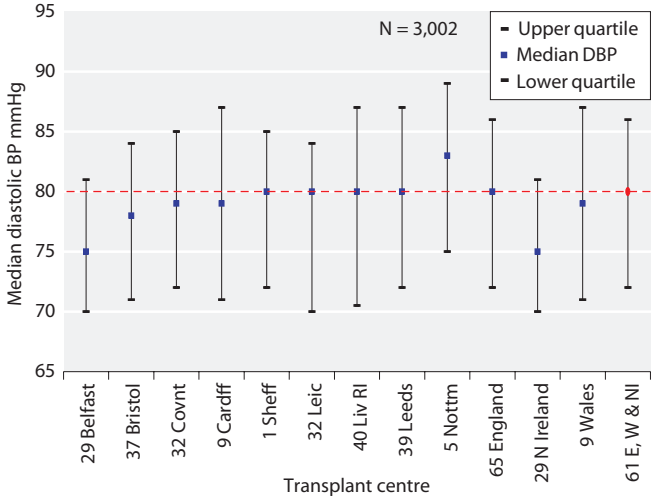

Fig. 5.19. Median diastolic blood pressure one year post-transplant by transplant centre for patients transplanted between 2001–2007

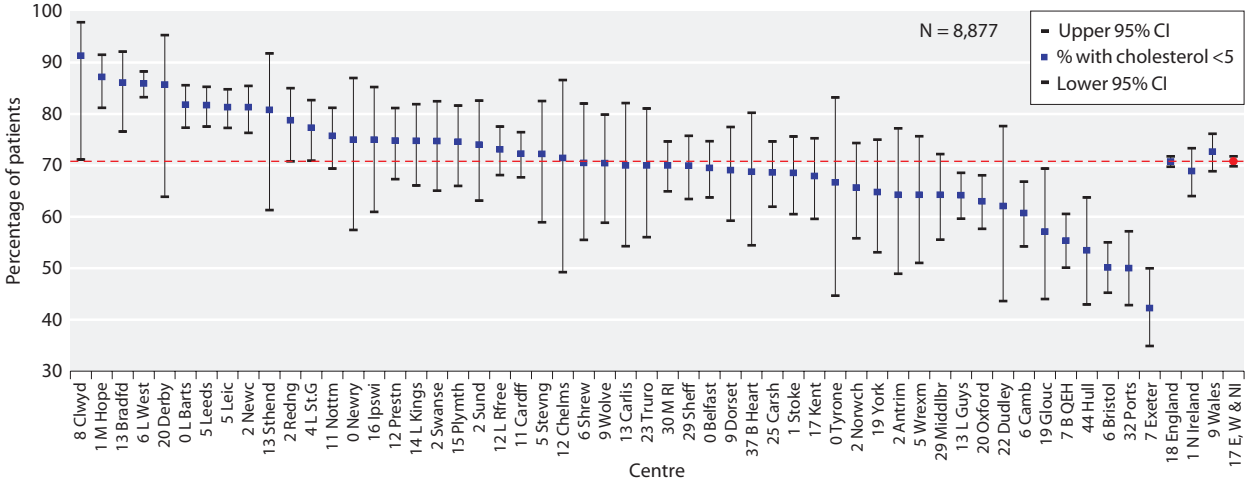

Fig. 5.20a. Percentage of prevalent transplant patients with eGFR $\geqslant$45 ml/min/1.73 m^2 achieving total cholesterol <5 mmol/L by centre on 31/12/2008

The percentage of prevalent transplant recipients achieving a cholesterol concentration <5 mmol/L by centre and stratified according to eGFR ($\geqslant$ or <45 ml/min/1.73 m^2) and median cholesterol concentration one year after transplantation are described in figures 5.20a, 5.20b and 5.21 respectively. The median cholesterol concentration in the UK was 4.6 mmol/L. At the end of 2008, 68.8% of prevalent transplant patients had a total cholesterol concentration <5 mmol/L. The major between-centre differences in total cholesterol concentrations are likely to reflect the effects of significant differences in the clinical approach to the management of hypercholesterolaemia.

Bone mineral metabolism in transplant patients

In the absence of definitive literature concerning evaluation and management of bone mineral disorder in transplant recipients, guidelines derived from chronic native kidney disease are commonly used as a surrogate. It is beyond the scope of this commentary to discuss the appropriateness or otherwise of this strategy. Since there are no other accepted guidelines on target biochemical values concerning bone disease in transplant patients the CKD audit measures have been adopted. It is anticipated the publication of guidelines on the medical management of the kidney transplant recipient by the Renal Association and by the Kidney Disease: Improving

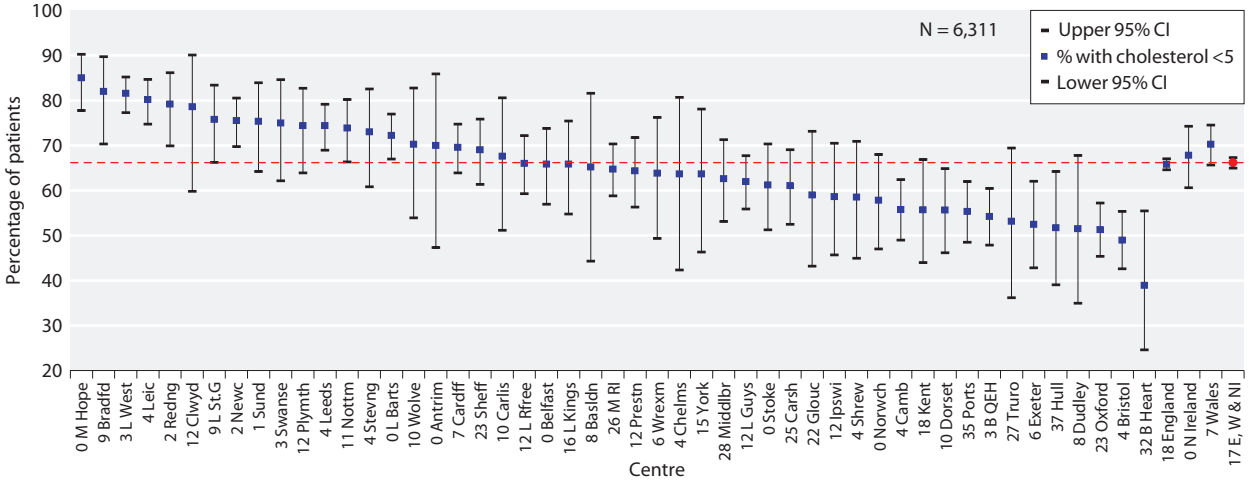

Fig. 5.20b. Percentage of prevalent transplant patients with eGFR <45 ml/min/1.73 m^2 achieving total cholesterol <5 mmol/L by centre on 31/12/2008

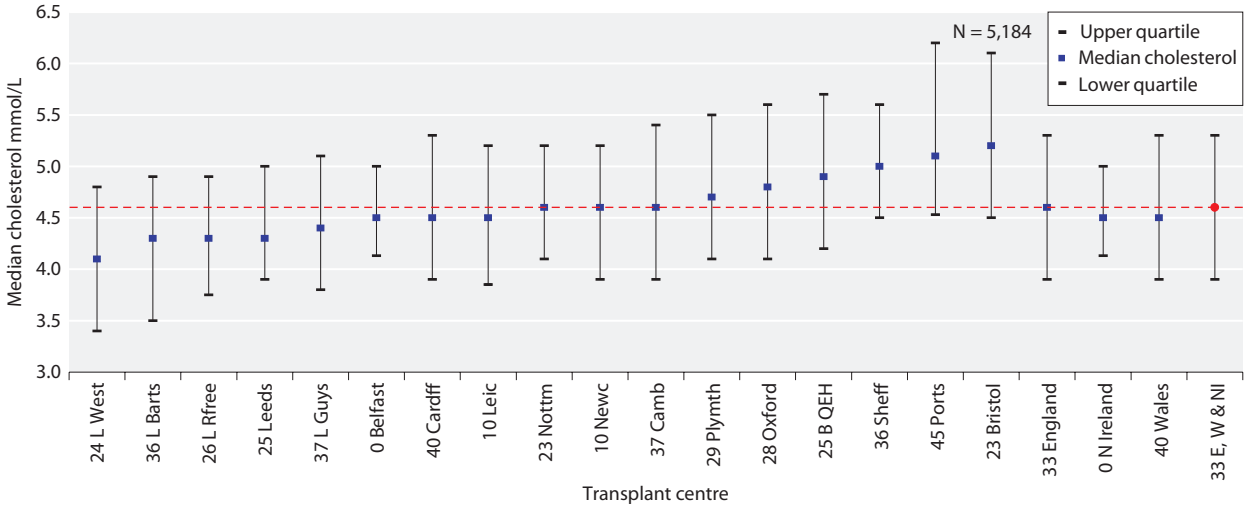

Fig. 5.21. Median total cholesterol one year post-transplant by transplant centre for patients transplanted between 2001–2007

Global Outcomes (KDIGO) initiative will have occurred by the time of publication of the next UKRR report.

Serum phosphate

The percentage of prevalent patients achieving a phosphate concentration <1.8 mmol/L are described in figure 5.22 with further stratification based on eGFR (⩾ or <45 ml/min/1.73 m^2) in figures 5.23a and 5.23b. With 99% of prevalent patients achieving a phosphate concentration <1.8 mmol/L with achievement ranging from 95%–100%, this is probably not a useful clinical performance indicator.

Figure 5.24 describes median phosphate concentrations one year after transplantation. One year post-transplant, 35.2% of kidney recipients have phosphate concentrations in the range of 1.1–1.8 mmol/L. This low percentage mainly reflects patients having serum phosphate concentrations <1.1 mmol/L because of post-transplant phosphate losses.

Serum calcium

The percentage of prevalent transplant patients with a serum calcium concentration within the target range of 2.2–2.6 mmol/L are shown in figure 5.25 with further stratification based on eGFR (⩾ or <45 ml/min/1.73 m^2) in figures 5.26a and 5.26b.

In contrast to the phosphate results, there is wide inter-centre variation in achievement of in-range serum calcium concentrations (61.3% to 93.5%), with both transplanting and non-transplanting renal centres at

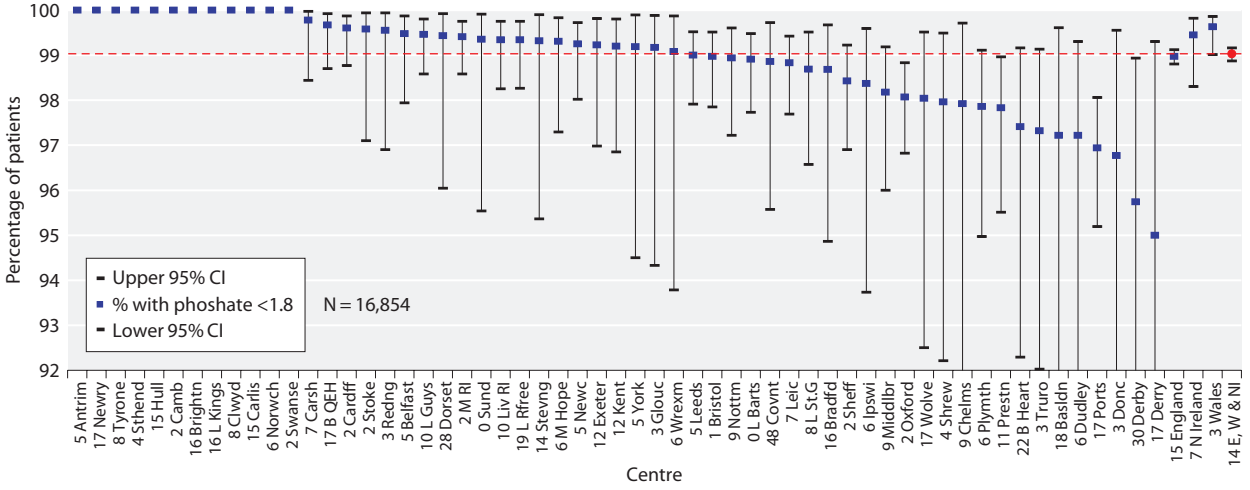

Fig. 5.22. Percentage of prevalent transplant patients with serum phosphate <1.8 mmol/L by centre on 31/12/2008

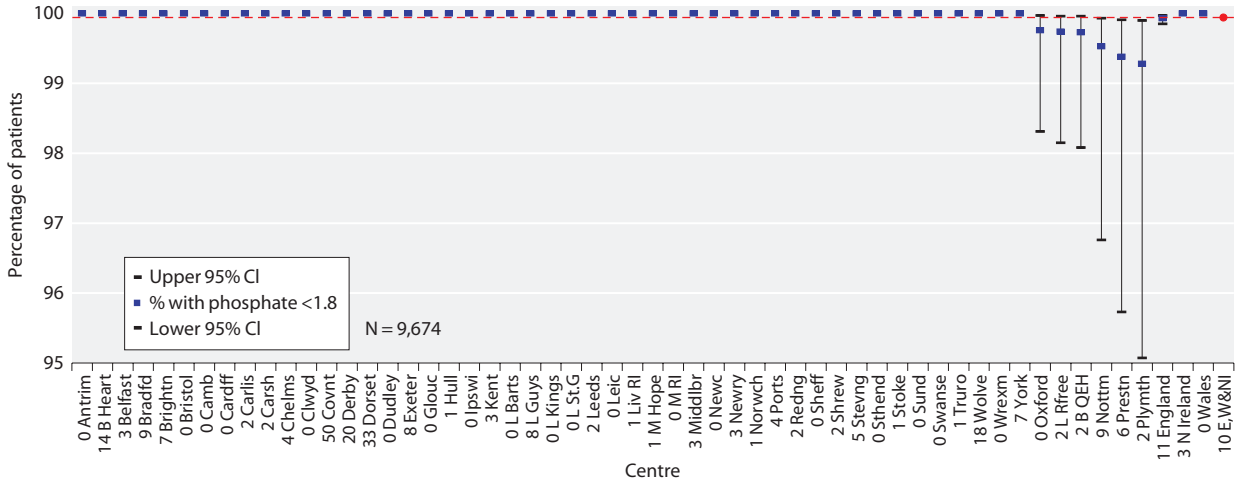

Fig. 5.23a. Percentage of prevalent transplant patients with eGFR $\geqslant$45 ml/min/1.73 m^2 achieving serum phosphate <1.8 mmol/L by centre on the 31/12/2008

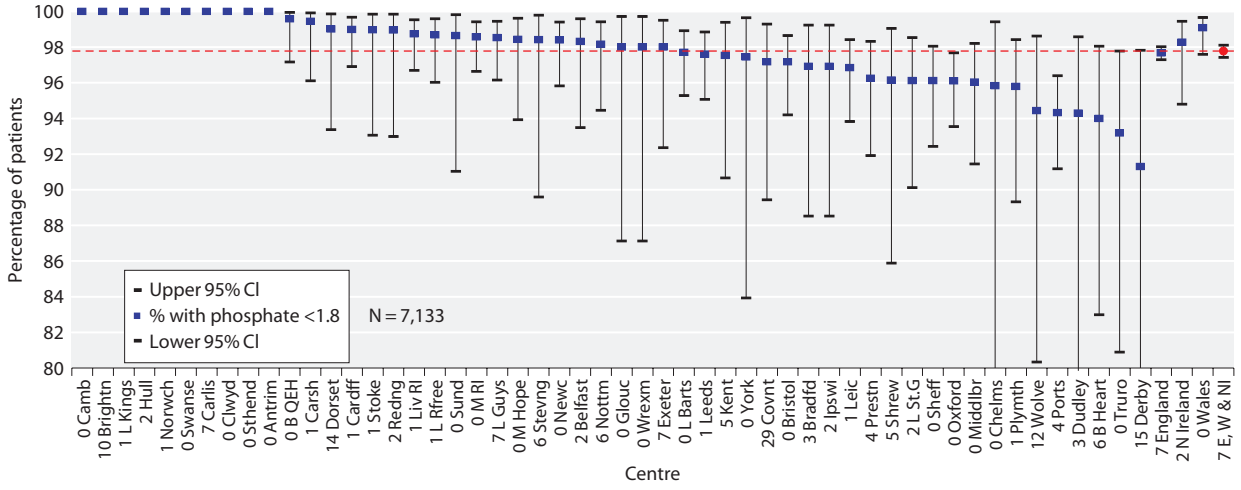

Fig. 5.23b. Percentage of prevalent transplant patients with eGFR <45 ml/min/1.73 m^2 achieving serum phosphate <1.8 mmol/L by centre on the 31/12/2008

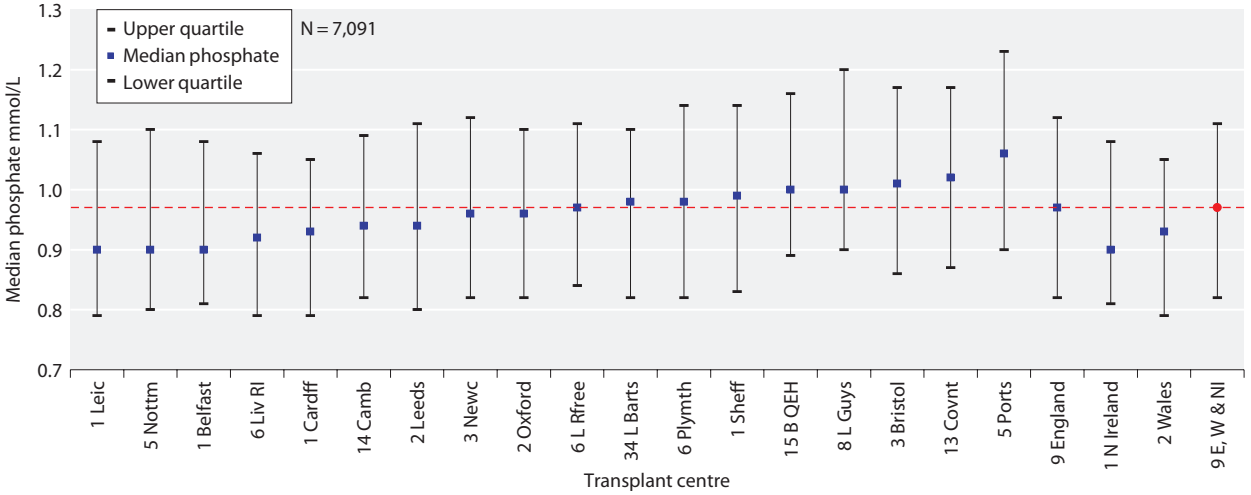

Fig. 5.24. Median serum phosphate one year post-transplant by transplant centre for patients transplanted 2001–2007

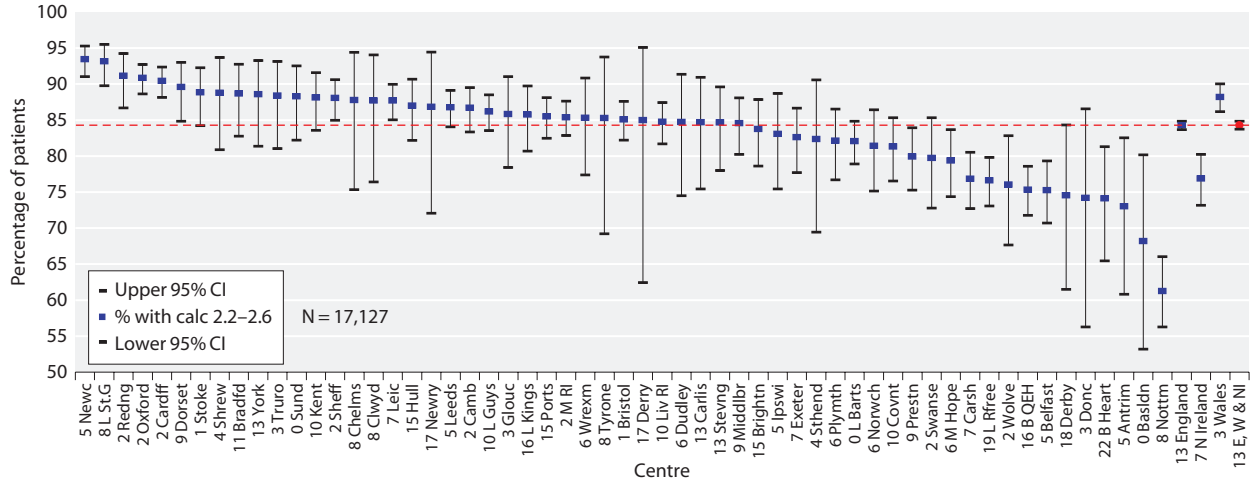

Fig. 5.25. Percentage of prevalent transplant patients with adjusted serum calcium between 2.2–2.6 mmol/L by centre on 31/12/2008

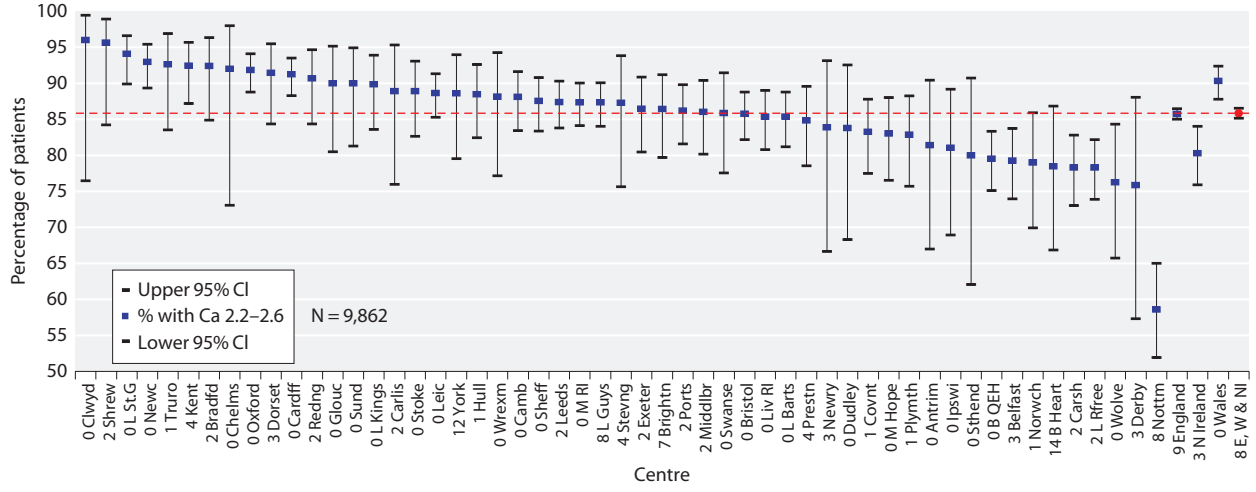

Fig. 5.26a. Percentage of prevalent transplant patients with eGFR $\geqslant$45 ml/min/1.73 m^2 with adjusted serum calcium between 2.2–2.6 mmol/L by centre on 31/12/2008

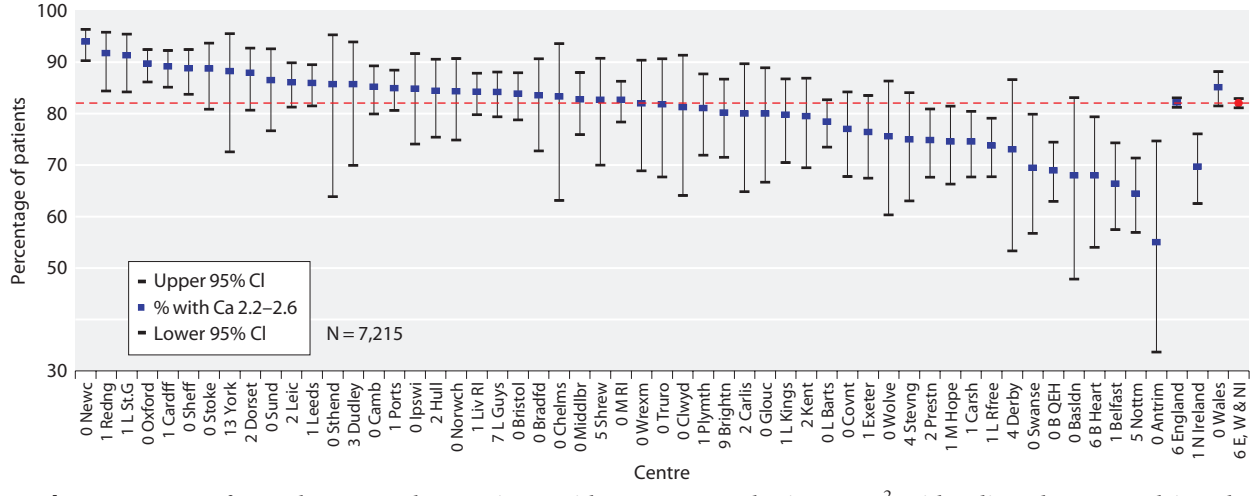

Fig. 5.26b. Percentage of prevalent transplant patients with eGFR <45 ml/min/1.73 m^2 with adjusted serum calcium between 2.2–2.6 mmol/L by centre on 31/12/2008

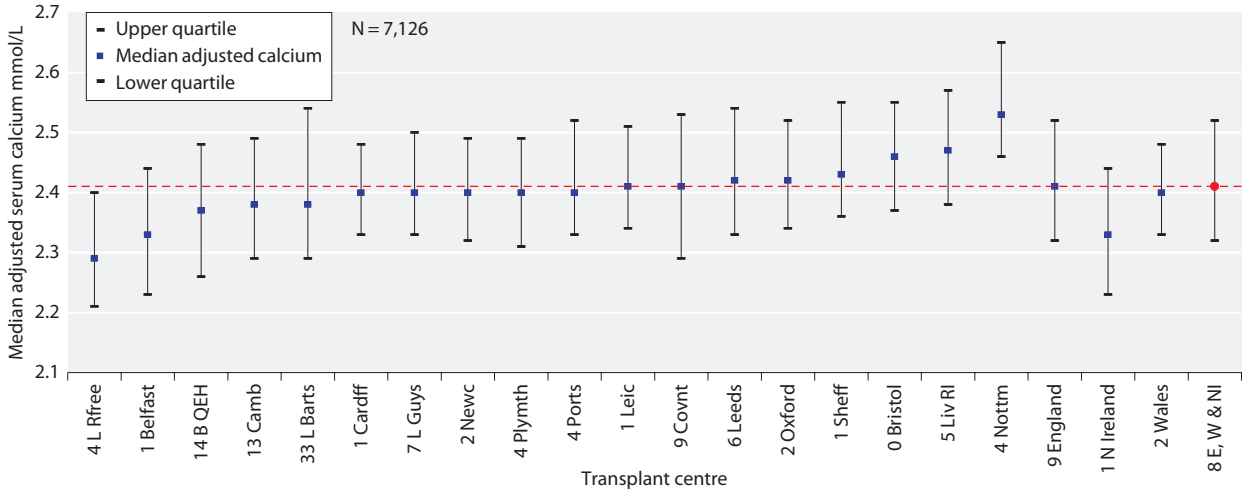

Fig. 5.27. Median adjusted serum calcium in patients one year post-transplant for patients transplanted 2001–2007

either end of the performance spectrum. This spread is not explained by efficiency of graft function as estimated by eGFR. Further work to understand the differences in centre policy and laboratory measurement practices behind these variations is necessary.

Figure 5.27 demonstrates median serum calcium one year post-transplant.

Serum parathyroid hormone concentration

There are no definitive guidelines on the frequency with which serum PTH should be measured in stable transplant recipients. Consequently, there was very wide variability in data completeness across the UK and therefore centre specific outcomes for this biochemical variable have not been analysed.

Analysis of prevalent patients by CKD stage

Introduction

About 3% of prevalent transplant patients returned to dialysis in 2008, a similar percentage to that seen over the last 8 years. Amongst patients with native chronic kidney disease, late presentation is associated with poor outcomes, largely attributable to lack of specialist management of anaemia, acidosis, hyperphosphataemia and to inadequate advance preparation for dialysis. Transplant recipients, on the other hand, are almost always followed up regularly in specialist transplant or renal clinics and it would be reasonable to expect patients with failing grafts to receive appropriate care and therefore have many of their modifiable risk factors addressed before complete graft failure and return to dialysis.

Methods

The transplant cohort consisted of prevalent transplant recipients as on 31/12/2008 (n = 18,444) and were classified according to the KDIGO staging criteria with the suffix of 'T' to represent their transplant status. Patients with missing ethnicity information were classified as White for the purpose of calculating eGFR. Prevalent dialysis patients, except those who commenced dialysis in 2008, comprised the comparison dialysis cohort (n = 17,638) including 2,672 peritoneal dialysis patients. For both cohorts, the analysis used the most recent available value from the last two quarters of the 2008 laboratory data.

Results and Discussion

Table 5.13 shows that 14.7% of the prevalent transplant population, or about 2,700 patients, had moderate to advanced renal impairment of eGFR <30 ml/min/1.73 m^2. The table also demonstrates that patients with failing grafts achieve UK RA standards for key biochemical and clinical outcome variables less often than dialysis patients. This substantial group of patients represents a considerable challenge, as resources need to be channelled to improve key outcome variables and achieve a safe and timely modality switch to another form of renal replacement therapy.

Table 5.13. Analysis by CKD stage for prevalent transplant patients compared with prevalent dialysis patients on 21/12/2008

	Stage 1–2T (⩾60)	Stage 3T (30–59)	Stage 4T (15–29)	Stage 5T (<15)	Stage 5D
Number of patients	5,520	10,208	2,327	389	17,638
% of patients	29.9	55.4	12.6	2.1	
eGFR ml/min/1.73 m^2					
mean ± SD	75.2 ± 14.1	45.3 ± 8.4	23.8 ± 4.1	11.9 ± 2.4	
median	71.4	45.4	24.4	12.3	
Systolic BP mmHg					
mean ± SD	133.5 ± 17.1	136.5 ± 18.1	139.2 ± 19.1	143.0 ± 19.7	131.5 ± 24.7
% ⩾130	58.7	64.1	68.8	78.8	50.2
Diastolic BP mmHg					
mean ± SD	77.6 ± 10.3	78.2 ± 10.7	78.8 ± 11.2	79.3 ± 12.1	70.1 ± 14.4
% ⩾80	45.8	48.4	51.0	51.7	24.8
Cholesterol mmol/L					
mean ± SD	4.5 ± 1.0	4.6 ± 1.1	4.7 ± 1.2	4.6 ± 1.1	4.0 ± 1.1
% ⩾5	29.4	32.6	35.2	35.1	16.8
Haemoglobin g/dl					
mean ± SD	13.5 ± 1.6	12.7 ± 1.6	11.6 ± 1.6	10.9 ± 1.7	11.5 ± 1.5
% <10.5	2.9	6.7	20.6	40.4	21.5
Phosphate mmol/L[a]					
mean ± SD	1.0 ± 0.2	1.0 ± 0.2	1.2 ± 0.3	1.6 ± 0.4	1.6 ± 0.4
% ⩾1.8	0.0	0.2	2.2	25.9	25.3
Corrected calcium mmol/L					
mean ± SD	2.4 ± 0.1	2.4 ± 0.2	2.4 ± 0.2	2.3 ± 0.2	2.4 ± 0.2
% >2.6	6.8	8.9	5.7	9.0	8.6
% <2.2	6.8	7.3	11.9	24.8	17.3
PTH pmol/L					
median	8.0	9.9	16.5	24.6	27.0
% ⩾32	2.4	5.7	20.7	40.8	42.8

[a] Only PD patients included in stage 5D, n = 2,672

Causes of death in transplant recipients

Introduction

Differences in causes of death between dialysis and transplant patients may be expected and may reflect the different priorities required in management of these two groups of patients. Chapter 7 includes a more detailed discussion on causes of death in dialysis patients.

Methods

The cause of death is sent by renal centres as an EDTA-ERA Registry code. These have been grouped into the following categories; cardiac disease, cerebrovascular disease, infection, malignancy, treatment withdrawal, other and uncertain.

Some centres have high data returns to the UKRR regarding cause of death, whilst others return no information. Provision of this information is not mandatory.

Adult patients aged 18 years and over, from England or Wales, were included in the analyses on cause of death. Previous analysis was limited to data from centres with a high rate of return for cause of death. When this was compared with an analysis of all the cause of death data on the database, the percentages in corresponding EDTA categories remained unchanged so the latter data were therefore included. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 1/1/2008.

Results and discussion

Causes of death in prevalent RRT patients in 2008 by modality and age

Tables 5.14, 5.15 and figure 5.28 show the differences in the causes of death between prevalent dialysis and transplant patients. These data are not adjusted for age or differences in comorbidity between the two groups.

Table 5.14. Cause of death by modality in prevalent RRT patients on 1/1/2008

	All modalities		Dialysis		Transplant	
Cause of death	Number of deaths	%	Number of deaths	%	Number of deaths	%
Cardiac disease	381	24	341	25	40	21
Cerebrovascular disease	68	4	55	4	13	7
Infection	266	17	235	17	31	16
Malignancy	135	9	96	7	39	21
Treatment withdrawal	220	14	211	15	9	5
Other	110	7	89	6	21	11
Uncertain	388	25	352	26	36	19
Total	**1,568**		**1,379**		**189**	
No cause of death data	2,412		2,047		365	

Table 5.15. Cause of death in prevalent transplant patients on 1/1/2008 by age

	All age groups		<55 years		⩾55 years	
Cause of death	Number of deaths	%	Number of deaths	%	Number of deaths	%
Cardiac disease	40	21	12	24	28	20
Cerebrovascular disease	13	7	3	6	10	7
Infection	31	16	5	10	26	19
Malignancy	39	21	11	22	28	20
Treatment withdrawal	9	5	4	8	5	4
Other	21	11	6	12	15	11
Uncertain	36	19	10	20	26	19
Total	**189**		**51**		**138**	
No cause of death data	365		92		273	

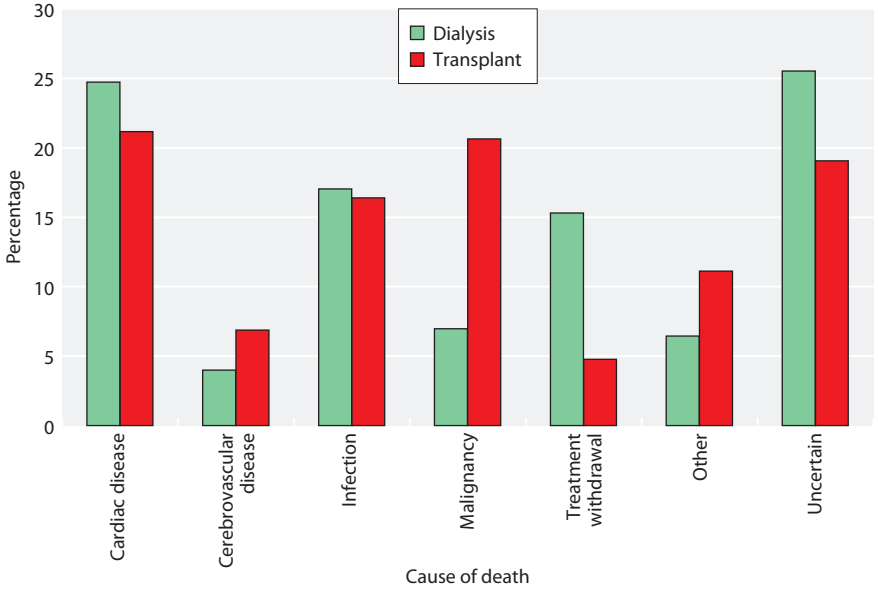

Fig. 5.28. Cause of death by modality for prevalent patients on 1/1/2008

Death due to cardiovascular disease is less common in transplanted patients than in dialysis patients, reflecting the cardiovascular screening undertaken as transplant work-up; transplant recipients are a pre-selected low risk group of patients. In keeping with current literature [10] regarding post-transplantation malignancy, cancer is a frequent cause of death within the transplant population (21% of all deaths) and reflects long-term immunosuppressive therapy. Five percent of transplant patients die due to treatment withdrawal, with some individuals deciding not to commence dialysis following transplant failure.

In table 5.15 there are differences in the percentage of patients dying due to cardiac disease, infection and treatment withdrawal between patients aged <55 or $\geqslant 55$ years and this most likely reflects the small number of patients dying in the <55 age group.

Conflict of interest: none

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