

# Chapter 11: Measures of Care in Adult Renal Transplant Recipients in the UK

Rommel Ramanan, Udaya Udayaraj, Retha Steenkamp, David Ansell and Charlie Tomson

## Summary

- The total number of adult and paediatric patients active on the renal transplant waiting list on 31/12/2006 was 6,220, an 8% increase from the previous year.
- During 2006, heart beating deceased donor numbers decreased by 1% compared to 2005. In comparison, non-heart beating deceased donors and living kidney donors increased by 25% and 24% respectively. The proportion of renal transplants performed from deceased heart beating donors fell from 60% in 2005 to 55% in 2006.
- The number of combined kidney and pancreas transplants has doubled since 2004.
- On 31/12/2006, 46% of prevalent adult patients on renal replacement therapy (RRT) in the UK, had a functioning renal transplant which equated to 20,262 patients. During 2006, the death rate in prevalent transplant patients was 2.4 per 100 patient years. An additional 3.2% of all prevalent transplants failed with patients returning to dialysis.
- There was wide variation in prevalence per million population (pmp) of transplanted patients resident in each Local Authority area across the UK.
- There were wide and unexplained variations between centres in the percentage of prevalent dialysis patients on the renal transplant waiting list and also the time taken to listing incident patients.
- Results from the joint Renal Association/British Transplantation Society survey highlight centre differences in resource allocation and clinical practices governing access to renal transplantation in both transplant and non-transplanting renal centres.
- In 2006, 12.5% of incident transplants were performed in patients with diabetes, similar to 2005.
- The median eGFR in patients with a functioning kidney transplant was 46 ml/min/1.73 m<sup>2</sup>, with 17% of prevalent transplant recipients having an eGFR <30. The median eGFR 12 months after transplantation for patients transplanted in 2001–2005 inclusive was 49 ml/min/1.73 m<sup>2</sup>.
- The median Hb in prevalent transplant recipients was 12.8 g/dl, with 4% of patients having a Hb <10 g/dl. The median Hb, 12 months after transplantation for incident patients (2000–2005) was 13.0 g/dl.
- The median systolic and diastolic BP in prevalent transplant patients was 136 mmHg and 80 mmHg respectively; only 25% had a systolic BP <130 mmHg and a diastolic BP <80 mmHg.
- Transplant function analysed by CKD stage 1–2T (eGFR ≥60), 3T (eGFR 30–59), 4T (eGFR 15–29) and 5T (eGFR <15), showed that these categories account for 24%, 59%, 15% and 2% of prevalent transplant patients respectively. Clinical and biochemical variables deteriorate with declining eGFR and patients with CKD stages 4T or 5T were less likely to achieve RA standards compared to prevalent patients on dialysis.

## Introduction

This chapter is a result of independent work performed by NHS Blood & Transplant (NHS BT, formerly UK Transplant), the UK Renal Registry (UKRR) and joint analyses between the two organisations. The UKRR holds information on key clinical and biochemical variables for renal transplant recipients and NHS

**Table 11.1: Kidney and kidney plus other organ transplants in the UK, 1 Jan 2004–31 Dec 2006**

Organ	2004	2005	2006	% change 2005–2006
Heart beating donor kidney <sup>a</sup>	1,211	997	990	–1
Non-heart beating kidney	147	200	250	25
Living donor kidney	463	543	671	24
Kidney and liver	15	11	17	55
Kidney and heart	0	2	1	
Kidney and pancreas <sup>b</sup>	69	102	138	35
<b>Total kidney transplants</b>	<b>1,905</b>	<b>1,855</b>	<b>2,067</b>	<b>11</b>

<sup>a</sup> Includes en bloc kidney transplants (three in 2004, five in 2005, five in 2006) and double kidney transplants (five in 2004, six in 2005, eleven in 2006).

<sup>b</sup> Includes combined non-heart beating k/p/single lung transplant (one in 2006).

BT holds information on details of the episode of transplantation. This continues to be a fruitful and mutually beneficial relationship, as it results in a comprehensive database of renal transplant recipients in the UK. This has allowed comparison of key outcome variables between centres and provided insight into the processes involved in the care of renal transplant patients.

## Overview

In December 2006, there were 19 adult renal transplant centres in England, 1 in Northern Ireland, 2 in Scotland and 1 in Wales.

Comprehensive information from the year 1995 to present date, concerning the number of patients on the transplant waiting list, the number of transplants performed, the number of heart beating, non-heart beating and living donors, patient and graft survival are available on the NHS BT website ([www.uktransplant.org/ukt/statistics](http://www.uktransplant.org/ukt/statistics)).

As of 31 December 2006, 6,220 patients (including adult and paediatric) were active on the renal or renal plus other solid organ waiting list, an increase of 10.5% when compared with 2005. Absolute numbers of live donor and

non-heart beating donor transplants continued to increase and in 2006 formed 32% and 12% of all kidney transplants respectively (Table 11.1) which compared with 29% and 10% in 2005. There has been a further fall in heart beating donor numbers. Compared to 2004, there was a 100% increase in the number of combined kidney and pancreas transplants performed in 2006.

There was no statistically significant difference in one year and five year risk adjusted patient and graft survival rates amongst UK renal transplant centres (Table 11.2). These graft survival rates included grafts with primary non-function (which is excluded in some countries).

Data from the UKRR showed that 3.2% of patients with a functioning transplant on 1/1/2006 returned to dialysis after their transplants failed in 2006. This has remained almost unchanged since 2000.

Using data from the UKRR, the death rate in the prevalent transplant cohort was 2.3 per 100 patient years (95% CI 2.1–2.6) when censoring at return to dialysis and 2.5 per 100 patient years (95% CI 2.3–2.8) including those who restarted dialysis.

**Table 11.2: Risk adjusted first adult kidney transplant only, graft and patient survival percentage rates for UK centres<sup>a</sup>**

Centre	Deceased donor 1 yr survival		Deceased donor 5 yr survival		Living kidney donor 1 yr survival		Living kidney donor 5 yr survival	
	Graft	Patient	Graft	Patient	Graft	Patient	Graft	Patient
Belfast	91	98	75	84	95	100		
Birmingham	93	95	84	88	93	100	91	95
Bristol	94	94	89	89	97	99	93	100
Cambridge	92	95	79	85	96	99	92	99
Cardiff	90	96	84	90	92	99	85	94
Coventry	95	96	88	89	97	100	89	90
Edinburgh	91	98	81	89	97	98	85	92
Glasgow	91	95	79	88	97	98	86	96
Guy's	92	96	83	88	97	100	95	96
Leeds	92	96	77	82	97	98	92	93
Leicester	90	93	78	86	97	96	85	93
Liverpool	90	98	79	88	90	95	87	97
Manchester	93	96	78	87	96	100	79	93
Newcastle	91	95	82	79	96	99	92	92
Nottingham	86	93	81	87	94	100	90	99
Oxford	94	95	85	84	96	99	90	96
Plymouth	90	94	71	85	75	93		
Portsmouth	89	96	80	85	94	95	89	94
Royal Free	89	95	78	89	90	100	81	100
Royal London	93	95	84	83	93	98	85	93
Sheffield	90	98	81	88	90	100	87	94
St George's	94	97	87	87	91	99	87	93
WLRTC*	95	96	85	86	94	98	91	98
<b>All centres</b>	<b>92</b>	<b>96</b>	<b>81</b>	<b>86</b>	<b>95</b>	<b>99</b>	<b>88</b>	<b>95</b>

\* WLRTC – West London Renal Transplant Centre.

Cohorts for survival rate estimation: 1 year survival 1 Jan 2001–31 Dec 2005; 5 year survival 1 Jan 1997–31 Dec 2001. First grafts only (re-grafts excluded for patient survival estimation). Estimates not provided where number of transplants <15.

<sup>a</sup> Information courtesy of NHS BT. Number of transplants/patients and 95% CI for each estimate; statistical methodology for computing risk adjusted estimates can be obtained from the NHS BT website.

## Post transplant follow up

Sixty seven centres sent data electronically to the UKRR and provided data on demographic, laboratory and blood pressure data for renal transplant patients during 2006. The remaining 5 UK centres (Kent & Canterbury, Manchester RI, Stoke, Colchester and London St George's) are not yet linked electronically but have supplied summary statistics. Due to differences in the timing of repatriation of patients after transplantation from the transplanting centre to the host/non-transplanting renal centre, caution

needs to be exercised when comparing results between centres. The number of prevalent patients on renal replacement therapy (RRT) in each renal centre and the proportion of transplant patients are shown in Table 11.3.

On 31/12/2006, 46% of UK RRT patients had a functioning renal transplant, compared to 46% in 2005 and 45% in 2004. This compares to 49% in 1997 and reflects growth in number of patients on dialysis rather than in decreasing transplant numbers or poorer patient survival post transplantation.

**Table 11.3: Distribution of prevalent patients on RRT by centre and modality on 31/12/2006<sup>a</sup>**

Centre	Total	% HD	% PD	% Transplant
B Heart	578	64	7	29
B QEH	1,557	48	9	44
Basldn	186	70	15	15
Bradfd	365	43	12	44
Brightn	659	48	15	37
Bristol	1,203	38	7	55
Camb	906	36	7	57
Carlis	188	46	6	47
Carsh	1,102	46	11	43
Chelms	155	66	21	13
Cestr	43	100	0	0
Colchester	84	100	0	0
Covnt	675	43	10	47
Derby	301	68	26	5
Dorset	396	37	14	49
Dudley	263	49	20	31
Exeter	630	45	13	42
Glouc	319	53	12	35
Hull	610	50	10	39
Ipswi	283	36	20	44
Kent & Canterbury	546	47	18	34
L Barts	1,416	38	17	46
L Guys	1,315	35	5	60
L Kings	669	48	12	41
L RFree	1,383	42	10	49
L St George's	595	33	7	59
L West	2,156	50	4	46
Leeds	1,380	37	8	55
Leic	1,500	41	13	45
Liv Ain	99	100	0	0
Liv RI	1,338	31	7	62
Man RI	1,504	24	10	66
ManWst	718	42	19	39
Middlbr	640	41	5	53
Newc	905	27	7	66
Norwch	437	55	12	32
Nottm	923	37	15	47
Oxford	1,250	30	10	60
Plymth	412	35	10	54
Ports	1,143	33	9	58
Prestn	832	43	11	46
Redng	530	41	16	43
Sheff	1,232	47	12	41
Shrew	259	53	19	28
Stevng	606	57	8	35
Sthend	184	67	9	24
Stoke	588	42	17	40
Sund	271	56	6	38
Truro	291	54	13	33
Wirral	163	79	21	0
Wolve	451	65	14	21
York	223	50	12	38
<b>England</b>	<b>36,462</b>	<b>43</b>	<b>11</b>	<b>47</b>

Table 11.3: (continued)

Centre	Total	% HD	% PD	% Transplant
Bangor	103	66	34	0
Cardff	1,333	34	11	55
Clwyd	80	81	10	9
Swanse	503	54	17	29
Wrexm	132	70	28	2
<b>Wales</b>	<b>2,151</b>	<b>44</b>	<b>15</b>	<b>41</b>
Abrdn	434	47	7	46
Airdrie	233	66	11	23
D&Gall	77	73	16	12
Dundee	365	41	13	46
Dunfn	156	63	17	19
Edinb	701	37	12	52
Glasgw	1,553	38	7	56
Inverns	200	39	21	40
Klmarnk	215	63	21	16
<b>Scotland</b>	<b>3,934</b>	<b>44</b>	<b>11</b>	<b>46</b>
Antrim	200	65	13	23
Belfast	751	36	8	55
Derry	34	91	0	9
Newry	148	56	11	32
Tyrone	160	58	4	38
Ulster	61	92	3	5
<b>N Ireland</b>	<b>1,354</b>	<b>49</b>	<b>8</b>	<b>43</b>
<b>England</b>	<b>36,462</b>	<b>43</b>	<b>11</b>	<b>47</b>
<b>Wales</b>	<b>2,151</b>	<b>44</b>	<b>15</b>	<b>41</b>
<b>Scotland</b>	<b>3,934</b>	<b>44</b>	<b>11</b>	<b>46</b>
<b>N Ireland</b>	<b>1,354</b>	<b>49</b>	<b>8</b>	<b>43</b>
<b>UK</b>	<b>43,901</b>	<b>43</b>	<b>11</b>	<b>46</b>

<sup>a</sup> Includes five centres which were not electronically linked but provided summary statistics. L West includes Hammersmith & Charing Cross and additional summary data for St Mary's transplant patients.

## Demographic variables

### Age and gender

There has been no significant change in the gender ratio of incident and prevalent transplant patients between 2001 and 2006 (Table 11.4, Figure 11.1). This ratio was similar to that found in patients starting RRT and indicated there was no gender bias in patient selection for transplantation. The median age of patients receiving a transplant and those surviving with a transplant has been slowly rising.

### Centre and Local Authority prevalence of renal transplant patients

In 2006, the number of prevalent transplant patients in the UK increased to more than

20,000 compared to approximately 19,000 patients in 2005. Table 11.5 describes the prevalence of renal transplant recipients amongst the countries that make up the UK. The number of prevalent transplant recipients under follow up in each UK renal centre are shown in Table 11.6. Table 11.7 describes the prevalence per million population (pmp) in each Local Authority (LA) in the country.

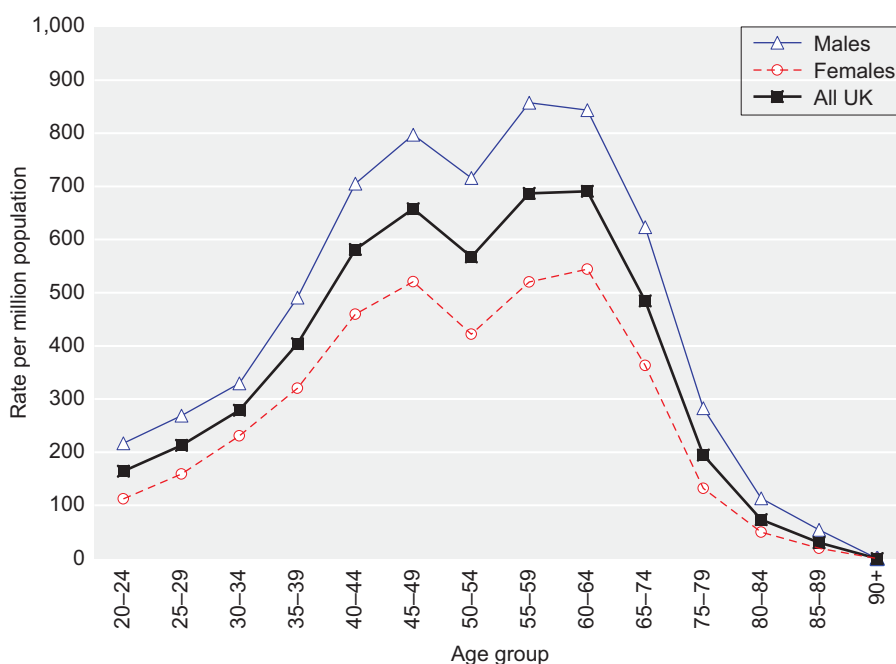
The LA prevalence data was derived from the patient postcode which was validated against the full address using QAS software ([www.qas.co.uk](http://www.qas.co.uk)). LA boundaries and population numbers were obtained from the UK 2001 census and the methodology is described elsewhere<sup>1</sup>.

The above data demonstrated that like all other modalities, the prevalent transplant population was increasing in most centres and LAs.

**Table 11.4: Median age and gender ratio of incident and prevalent transplant patients for centres returning data electronically to the Registry**

Year	Incident transplants			Prevalent transplants <sup>a</sup>		
	Number	Median age	M:F ratio	Number	Median age	M:F ratio
2001	972	44.5	1.7	10,179	48.7	1.6
2002	1,042	46.9	1.5	11,798	49.4	1.6
2003	1,171	45.3	1.5	12,848	49.5	1.6
2004	1,363	45.5	1.7	15,048	49.6	1.6
2005	1,471	45.4	1.4	16,894	49.7	1.6
2006	1,698	45.4	1.6	17,985	49.9	1.6

<sup>a</sup> As on 31st December for given year.



**Figure 11.1: Transplant prevalence rate (pmp) by age and gender on 31/12/06**

Whilst local policies that affect the relative number of patients followed up in transplant and non-transplanting centres might explain the differences in numbers between centres, it is uncertain as to why such wide differences existed between LAs. Further work is necessary to demonstrate if differences between LAs in

incidence of patients on RRT, number of live kidney donor (LKD) transplants performed in the local transplanting centre, access to cadaveric transplantation waiting list were factors that influenced the number of prevalent transplant patients in each LA. The LAs with some of the highest acceptance rates of RRT in the UK

**Table 11.5: Prevalence of transplants in adults in the UK on 31/12/2006**

	England	Wales	Scotland	N Ireland	UK
Centres contributing to UKRR (67)	14,718	891	1,799	577	17,985
All UK centres (67 + 5 <sup>a</sup> = 72)	16,995	891	1,799	577	20,262
Total population, mid-2006 estimates from ONS <sup>b</sup> (millions)	50.8	3.0	5.1	1.7	60.6
Prevalence pmp transplant <sup>a</sup>	335	300	352	331	334

<sup>a</sup> Includes data from five centres which are not electronically linked but provide summary statistics.

<sup>b</sup> ONS – Office of National Statistics, UK.

**Table 11.6: Number of prevalent transplant patients by renal centre on 31/12/2006\***

Dialysis centres	Number of patients	Transplant centres	Number of patients
Abrdn	200	B QEH	681
Airdrie	54	Belfast	416
Antrim	46	Bristol	665
B Heart	167	Camb	513
Bangor	0	Cardff	735
Basldn	28	Covnt	314
Bradfd	162	Edinb	361
Brightn	243	Glasgw	862
Carlisle	89	L Barts	651
Carsh	469	L Guys	789
Chelms	20	L RFree	677
Chestr	0	L St George's	352
Clwyd	7	L West	1,002
Colchester	0	Leeds	765
D&Gall	9	Leic	679
Derby	16	Liv RI	830
Derry	3	Man RI	1,000
Dorset	194	Newc	595
Dudley	82	Nottm	437
Dundee	169	Oxford	755
Dunfn	30	Plymth	224
Exeter	264	Ports	662
Glouc	113	Sheff	504
Hull	239		
Inverns	80		
Ipswi	125		
Kent & Canterbury	186		
Klmarnk	34		
Liv Ain	0		
L Kings	274		
Man Wst	280		
Middlbr	340		
Newry	48		
Norwch	142		
Prestn	381		
Redng	230		
Shrew	73		
Stevng	213		
Stoke	238		
Sthend	44		
Sund	102		
Swanse	146		
Truro	96		
Tyrone	61		
Ulster	3	<b>England</b>	<b>17,084</b>
Wirral	0	<b>N Ireland</b>	<b>577</b>
Wolve	94	<b>Scotland</b>	<b>1,799</b>
Wrexm	3	<b>Wales</b>	<b>891</b>
York	85	<b>UK</b>	<b>20,351</b>

\* Includes data from five centres which were not electronically linked but provided summary statistics.

**Table 11.7: The prevalence per million population of patients with a renal transplant by UK Local Authorities on 31 December 2004–2006**

UK Area	Region	Local Authority	Population covered*	Rate pmp 2004	Rate pmp 2005	Rate pmp 2006		
North East	County Durham & Tees Valley	Darlington	97,838	307	317	317		
		Durham	493,469	357	377	381		
		Hartlepool	88,610	406	395	429		
		Middlesbrough	134,855	400	408	408		
		Redcar & Cleveland	139,132	446	446	460		
	Northumberland, Tyne & Wear	Stockton-on-Tees	178,408	319	336	381		
		Gateshead	191,151	387	429	398		
		Newcastle upon Tyne	259,536	331	362	385		
		North Tyneside	191,658	412	449	438		
		Northumberland	307,190	378	384	378		
		South Tyneside	152,785	340	360	380		
		Sunderland	280,807	388	370	377		
		North West	Cheshire & Merseyside	Cheshire				
				Halton	118,209	271	288	296
Knowsley	150,459			312	299	299		
Liverpool	439,471			289	309	309		
Sefton	282,958			254	262	276		
St. Helens	176,843			221	237	243		
Warrington	191,080			272	267	309		
Wirral	312,293			295	301	320		
Cumbria & Lancashire	Blackburn with Darwen		137,470	189	182	204		
	Blackpool		142,283	239	232	246		
	Cumbria		487,607	277	277	304		
	Lancashire		1,134,975	266	255	283		
	Greater Manchester							
Yorkshire & Humber	N&E Yorkshire & N Lincolnshire		Bolton	261,037	180	222	238	
			Bury	180,607	61	100	100	
			Manchester					
			Oldham	217,276	110	110	143	
			Rochdale	205,357	83	112	131	
			Salford	216,105	148	171	176	
	South Yorkshire		Stockport					
			Tameside					
			Trafford					
			Wigan	301,415	149	173	216	
		East Riding of Yorkshire	314,113	242	264	271		
		Kingston upon Hull, City of	243,588	267	283	320		
		North East Lincolnshire	157,981	247	241	272		
		North Lincolnshire	152,848	249	262	288		
		North Yorkshire	569,660	276	290	314		
West Yorkshire	York	181,096	271	298	353			
	Barnsley	218,063	349	339	367			
	Doncaster	286,865	272	279	317			
	Rotherham	248,175	282	262	290			
	Sheffield	513,234	247	261	283			
	Bradford	467,664	342	370	374			
	Calderdale	192,405	395	421	426			
	Kirklees	388,567	381	419	448			
Leeds	715,403	292	301	333				
Wakefield	315,172	282	308	314				



Table 11.7: (continued)

UK Area	Region	Local Authority	Population covered*	Rate pmp 2004	Rate pmp 2005	Rate pmp 2006
East Midlands	Leicestershire, Northamptonshire & Rutland	Leicester	279,920	432	454	489
		Leicestershire	609,578	325	349	359
	Trent	Northamptonshire	629,676	195	302	310
		Rutland	34,563	434	463	434
		Derby	221,709	198	226	257
		Derbyshire	734,585	212	225	241
		Lincolnshire	646,644	289	297	298
		Nottingham	266,988	266	273	270
		Nottinghamshire	748,508	277	285	297
		Birmingham	977,085	320	331	351
West Midlands	Birmingham & the Black Country	Dudley	305,153	246	239	246
		Sandwell	282,904	318	343	346
		Solihull	199,515	216	241	276
		Walsall	253,498	280	292	304
	Coventry, Warwickshire, Herefordshire & Worcestershire	Wolverhampton	236,582	254	258	254
		Coventry	300,849	316	339	352
		Herefordshire, County of	174,871	263	274	286
	Shropshire & Staffordshire	Warwickshire	505,858	356	352	366
		Worcestershire	542,105	225	251	258
		Shropshire	283,173	208	237	240
Staffordshire						
Stoke-on-Trent						
East of England	Bedfordshire & Hertfordshire	Telford & Wrekin	158,325	126	139	177
		Bedfordshire	381,572	246	286	309
		Hertfordshire	1,033,978	145	231	248
	Essex	Luton	184,373	233	325	380
		Essex	1,310,837	222	256	278
		Southend-on-Sea	160,259	156	218	231
	Norfolk, Suffolk & Cambridgeshire	Thurrock	143,128	196	252	245
		Cambridgeshire	552,659	248	282	300
		Norfolk	796,728	223	235	267
		Peterborough	156,061	218	224	269
London	North Central London	Suffolk	668,555	226	233	265
		Barnet	314,561		324	347
		Camden	198,020		278	323
		Enfield	273,559		380	413
		Haringey	216,505		319	365
	North East London	Islington	175,797		336	370
		Barking & Dagenham	163,942	244	274	281
		City of London	7,183			0
		Hackney	202,824	227	296	286
		Havering				
		Newham	243,889	221	250	271
		Redbridge	238,634	281	314	356
		Tower Hamlets	196,105	194	240	280
North West London	Waltham Forest	218,341			339	
	Brent	263,463			175	
	Ealing	300,948	272	292	352	
	Hammersmith & Fulham	165,244	236	242	266	

Table 11.7: (continued)

UK Area	Region	Local Authority	Population covered*	Rate pmp 2004	Rate pmp 2005	Rate pmp 2006		
London	North West London	Harrow						
		Hillingdon	243,006	193	263	300		
		Hounslow	212,342	226	264	344		
		Kensington & Chelsea Westminster						
	South East London	Bexley	218,307	376	399	403		
		Bromley	295,532	308	342	369		
		Greenwich	214,404	219	261	294		
		Lambeth	266,169	222	233	240		
		Lewisham	248,923	374	382	414		
		Southwark	244,866	433	461	478		
	South West London	Croydon	330,588	221	242	290		
		Kingston upon Thames Merton Richmond upon Thames Sutton Wandsworth						
		South East	Hampshire & I of Wight	Hampshire	1,240,102	297	298	326
				Isle of Wight	132,731	301	294	286
Portsmouth				186,700	370	354	370	
Southampton		217,444		317	340	363		
Kent & Medway		Kent						
	Medway							
Surrey & Sussex	Brighton & Hove	Brighton & Hove	247,817	218	230	270		
		East Sussex	492,326	240	244	238		
	Surrey	1,059,017	239	253	303			
	West Sussex	753,612	245	261	281			
Thames Valley	Bracknell Forest	Bracknell Forest	109,616	292	265	265		
		Buckinghamshire	479,026	330	347	403		
	Milton Keynes	207,057	280	304	338			
	Oxfordshire	605,489	370	385	419			
	Reading	143,096	349	217	231			
	Slough	119,064	336	353	386			
	West Berkshire	144,485	353	318	318			
	Windsor & Maidenhead							
	Wokingham	150,231	260	266	293			
	South West	Avon, Gloucestershire & Wiltshire	Bath & NE East Somerset	169,040	248	272	284	
Bristol, City of			380,616	410	415	431		
Gloucestershire			564,559	315	342	351		
North Somerset			188,564	430	414	414		
South Gloucestershire			245,641	387	403	411		
Swindon			180,051	300	317	317		
Wiltshire			432,972	254	273	293		
Dorset & Somerset			Bournemouth	163,444	269	263	269	
		Dorset	390,980	309	330	343		
		Poole	138,288	289	340	369		
		Somerset	498,095	305	333	341		
		South West Peninsula	Cornwall & I of Scilly	Cornwall & I of Scilly	501,267	289	327	347
Devon				704,491	277	285	309	
Plymouth			240,722	361	415	440		
Torbay			129,706	285	316	347		

Table 11.7: (continued)

UK Area	Region	Local Authority	Population covered*	Rate pmp 2004	Rate pmp 2005	Rate pmp 2006	
Wales	Bro Taf	Cardiff	305,353	383	413	442	
		Merthyr Tydfil	55,979	482	518	536	
		Rhondda, Cynon, Taff	231,947	401	444	491	
	Dyfed Powys	Vale of Glamorgan		119,292	360	344	352
			Carmarthenshire	172,842	336	364	388
		Ceredigion	74,941	360	320	320	
		Pembrokeshire	114,131	289	333	307	
		Powys		126,353	230	222	269
	Gwent	Blaenau Gwent		70,064	400	385	400
			Caerphilly	169,519	354	366	383
		Monmouthshire	84,885	495	530	530	
		Newport	137,012	387	358	336	
	Morgannwg	Torfaen	90,949	451	451	462	
		Bridgend	128,645	381	412	420	
		Neath Port Talbot	134,468	320	364	439	
	North Wales	Swansea		223,300	381	416	425
			Conwy	109,596	319	319	319
		Denbighshire	93,065	269	322	312	
		Flintshire	148,594	289	316	330	
		Gwynedd	116,843	265	308	291	
		Isle of Anglesey	66,829	209	209	224	
		Wrexham	128,476	311	319	366	
	Scotland	Aberdeen City	212,125	311	311	325	
		Aberdeenshire	226,871	304	322	335	
		Angus	108,400	517	526	535	
		Argyll & Bute	91,306	252	252	340	
		Scottish Borders	106,764	244	272	262	
Clackmannanshire		48,077	250	270	291		
West Dunbartonshire		93,378	257	257	268		
Dumfries & Galloway		147,765	305	311	318		
Dundee City		145,663	384	391	433		
East Ayrshire		120,235	250	241	258		
East Dunbartonshire		108,243	406	416	425		
East Lothian		90,088	344	322	300		
East Renfrewshire		89,311	381	392	414		
Edinburgh, City of		448,624	294	323	308		
Falkirk		145,191	317	331	303		
Fife		349,429	266	289	306		
Glasgow City		577,869	386	408	417		
Highland		208,914	278	306	330		
Inverclyde		84,203	321	368	344		
Midlothian		80,941	297	309	321		
Moray		86,940	322	403	426		
North Ayrshire		135,817	346	398	427		
North Lanarkshire		321,067	327	349	352		
Orkney Islands	19,245	520	572	572			
Perth & Kinross	134,949	319	333	333			
Renfrewshire	172,867	347	370	399			
Shetland Islands	21,988	318	273	273			

Table 11.7: (continued)

UK Area	Region	Local Authority	Population covered*	Rate pmp 2004	Rate pmp 2005	Rate pmp 2006
Scotland		South Ayrshire	112,097	339	339	357
		South Lanarkshire	302,216	377	384	390
		Stirling	86,212	255	255	244
		West Lothian	158,714	347	372	334
		Eilean Siar	26,502	189	226	226
Northern Ireland		Antrim	48,366		331	414
		Ards	73,244		341	341
		Armagh	54,262		350	387
		Ballymena	58,610		239	273
		Ballymoney	26,895		223	297
		Banbridge	41,389		314	362
		Belfast	277,391		314	332
		Carrickfergus	37,658		505	505
		Castlereagh	66,488		391	466
		Coleraine	56,314		213	195
		Cookstown	32,581		92	123
		Craigavon	80,671		310	310
		Derry	105,066		314	352
		Down	63,828		235	266
		Dungannon	47,735		230	209
		Fermanagh	57,527		174	226
		Larne	30,833		616	551
		Limavady	32,422		339	308
		Lisburn	108,694		386	432
		Magherafelt	39,778		402	402
		Moyle	15,932		314	377
	Newry & Mourne	87,058		414	391	
	Newtownabbey	79,996		288	363	
	North Down	76,323		341	328	
	Omagh	47,953		250	313	
	Strabane	38,246		261	340	

\* Population numbers obtained from UK census 2001.

Estimates are not provided for a given year for LA centres that were not electronically linked to UKRR.

(Chapter 3, Table 3.3) did not have similarly high rates of transplant prevalence and this is likely to reflect the ethnic minority mix of these areas (with higher acceptance rates in Asians and African Caribbeans, lower donor rates and difficult matching of tissue types).

Commissioners of renal services need to take such data into consideration when planning for allocation of resources to deliver an equitable and comprehensive renal transplant service across the UK. Local surgical, medical, transplant coordinators and specialist nursing requirements will vary in order to reflect these

complex variations in underlying service requirements to match the local need.

## Access to renal transplantation

A number of patient and centre specific factors are likely to influence access to renal transplantation. This makes it difficult to consider prescribing a 'standard' for proportion of patients that should ideally be waitlisted for transplantation in a given centre. However, as discussed in the previous section there were unexplained differences in transplant patient prevalence across

the UK. As a consequence, the UKRR, in conjunction with data supplied by NHS BT, undertook an analysis to analyse differences in the proportion of patients waitlisted for transplantation between UK renal centres.

## Methods

Centre specific data were analysed in two formats.

1. **Prevalent patients:** The number of prevalent patients on dialysis on 31/12/06 at a given centre were used as the denominator. The number of patients active on the transplant waiting list for kidney or kidney plus another organ on 31/12/06 for that centre was taken as the numerator, to calculate percentage active on the waiting list. Using a point prevalence analysis, has some potential disadvantages. Firstly, short-term fluctuations in both numerator and denominator within a centre might lead to inaccuracy in estimation of the overall proportion listed. Secondly, selective enrichment over time of the prevalent dialysis population with patients who are unsuitable for transplantation and hence unlisted patients, could lead to a lower proportion listed. Thirdly, centres with active LKD transplant programs may have smaller proportions contributing to the numerator, particularly if the centre operates a policy of not entering potential LKD recipients onto the NHS BT waiting list.
2. **Incident patients:** To counter some of the potential criticism of using a prevalent patient analysis, the listing practices amongst the incident RRT patients in each centre were analysed. The number of incident RRT patients between 01/01/2003 and 31/12/2004 from each centre contributing data to the UKRR were used as the denominator. The number of patients from each centre who were active on the transplant list for kidney or kidney plus other organ within two years of commencement of RRT were used as the numerator. Patients with diabetic nephropathy as the cause of established renal failure (ERF) may require more intensive investigations to establish fitness prior to wait listing and consequently result in delayed listing. Therefore, for each centre, the proportion of patients with a primary renal diagnosis of diabetic nephropathy was also ascertained to

see if this influenced the numerator value for the centre.

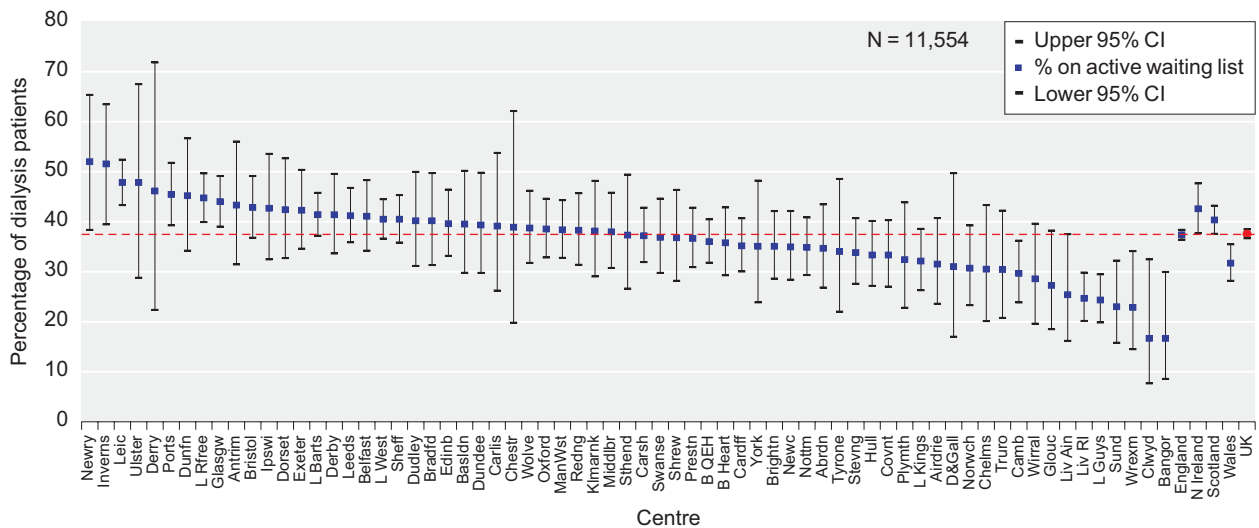
For both prevalent and incident patient analyses, patients were designated according to the referring renal centre and not by the local renal transplant centre. Information on start date of dialysis was obtained from the UKRR and date of first activation on the kidney transplant waiting list was supplied by NHS BT. Since the number of patients aged >65 years contributed to only a minority of those waitlisted but accounted for over 50% of those starting RRT, the results presented are only for patients aged <65 years. Accurate attribution of patients undergoing pre-emptive LKD transplantation to their parent dialysis centre was not always possible. It requires the centre to include a 'transfer out pre-emptive transplant' in their RRT timeline.

Therefore, it was not possible to analyse whether such patients, who may not have been waitlisted prior to transplantation, impacted on the final analyses. Instead, the LKD transplants pmp in each transplant centre were used as a surrogate marker for living kidney donor transplant activity.

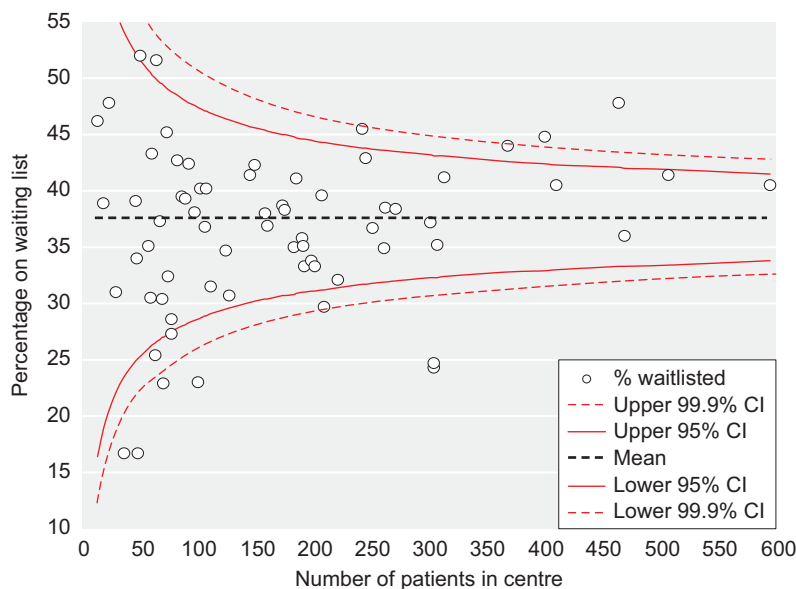
## Results

Figure 11.2 shows the percentage of prevalent patients aged <65 on the active waiting list and Figure 11.3 shows the same data in a funnel plot. The solid lines in the funnel plot show 2 s.ds (95% CI) where 3/60 centres may fall outside these limits (above or below) and the dotted lines show 3 s.ds (99.9% CI) where no centre would be expected by chance to fall outside these limits. Figure 11.3 indicates 2 transplanting centres (Liverpool and London Guy's) and 4 referring renal centres (Wrexham, Clwyd, Bangor and Sunderland) as 'outliers' with a percentage of patients outside the lower 99.9% CI compared to the rest of the UK. Interestingly 3 of the outlying referring centres (Wrexham, Clwyd and Bangor) all refer partly or completely to one transplanting centre (Liverpool). Liverpool Aintree was also outside the lower 2 s.d. limit.

Liverpool have indicated that this may partly be a consequence of using point prevalence analysis as indicated by the numbers of patients on the active waiting list at this centre are continuing to increase by 70 per year from 2005–2007.



**Figure 11.2: Percentage of prevalent dialysis patients aged <65 years active on transplant waiting list on 31/12/06**



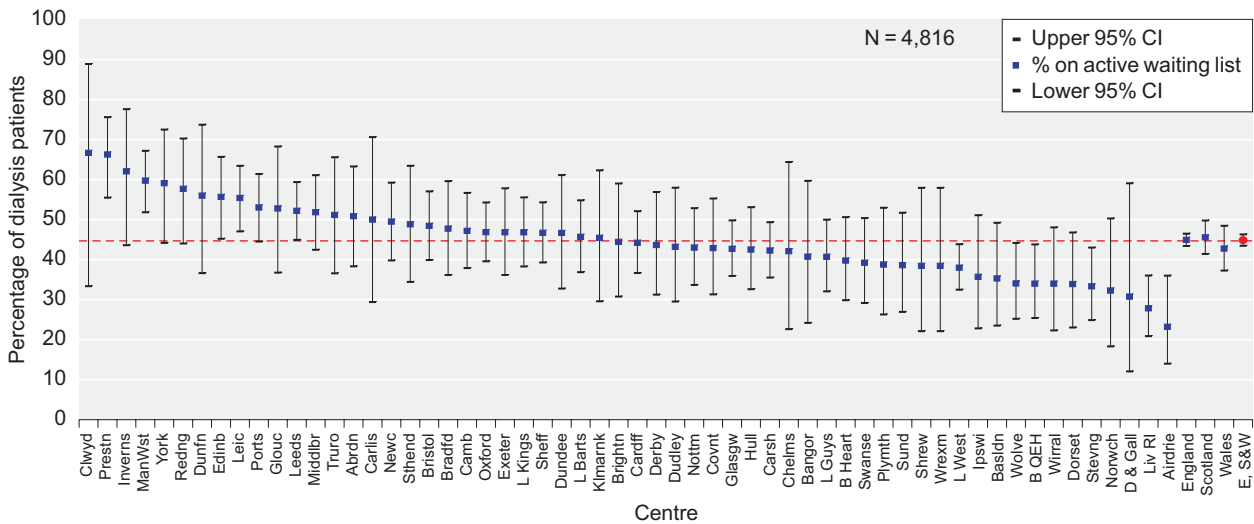
**Figure 11.3: Funnel plot of the percentage of prevalent dialysis patients aged under 65 on the active transplant waiting list on 31/12/2006**

London Guy’s have indicated that their low listing rate may be due to their very active LKD transplant program. Analysis in conjunction with NHS BT, has shown that Guys waitlist a lower proportion of their LKD patients at 27%, compared with a UK average of 65%. If the data were adjusted to reflect 65% of LKDs being listed, the data for Guys would still remain outside 3 s.ds.

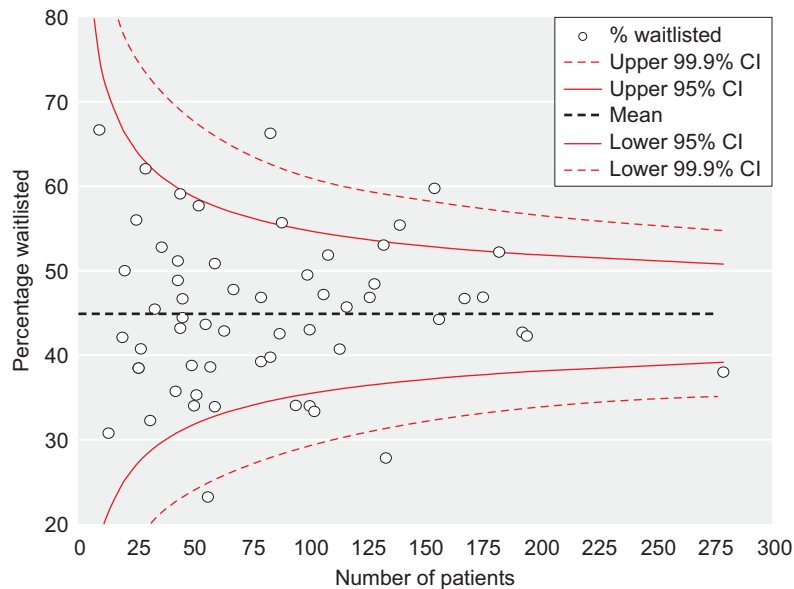
Leicester and London Royal Free fell outside the upper 99% CI. Patients from the ethnic minorities (who are more difficult to match and have lower donor rates) contributed to a greater

proportion of the prevalent pool in these two centres and consequently had a longer wait time on dialysis. This selectively increased the numerator. However, other centres with similar demographics did not have similar percentages of waitlisted patients suggesting factors other than just ethnicity may also be important.

The percentage of incident dialysis patients waitlisted for individual centres has not previously been analysed. This has been analysed as the percentage of incident patients waitlisted within 2 years of starting RRT (Figure 11.4). Figure 11.5 shows the same data in a funnel plot.



**Figure 11.4: Percentage of incident patients 2003–2004, aged <65 years active on the transplant waiting list within 2 years of commencement of dialysis**



**Figure 11.5: Funnel plot of the percentage of incident patients 2003–2004, aged <65 years active on the transplant waiting list within 2 years of commencement of dialysis**

This indicates one transplanting centre (Liverpool) and one non transplanting renal centre (Airdrie) fell below the lower 99.9% CI. Several other centres fell below the lower 95% CI limits. It is not possible to state whether these data are due primarily to greater delay between start of RRT and wait listing, or to a genuine difference in selection policy for transplantation. In the absence of robust co-morbidity data from all the centres it is difficult to know whether a differential distribution of co-morbidity may explain some of these variances. Interestingly both centres (Manchester West, Preston) that fell

outside the upper 95% CI with speedier listing are served by a single transplant centre.

Table 11.8 includes the prevalent and incident data reported in funnel plots (Figures 11.3 and 11.5) for individual transplanting centres and the referring centres. The table indicates wide variations between transplant centres as well as between some referring centres and their transplant centre. Despite the differences in the proportion of incident patients with a primary renal diagnosis of diabetic nephropathy between centres, there appeared to be no correlation

**Table 11.8: Prevalent and incident patients wait listing data according to transplant centre (in bold) and its referring centres**

Centre name*	Prevalent dialysis population on 31/12/06 aged <65		Incident dialysis patients between 01/01/03–31/12/04 aged <65			LKD transplants pmp 01/04/03– 31/03/04**
	Number	% active on waiting list	Number	% with diabetes as primary renal diagnosis	% waitlisted within 2 years of starting RRT	
<b>Birmingham QE</b>	469	36	100	26.5	34	3.1
Birmingham H	190	35.8	83	43.2	39.8	
Wolverhampton	173	38.7	94	28	34	
Dudley	102	40.2	44	27.3	43.2	
Shrewsbury	106	36.8	26	11.5	38.5	
<b>Bristol</b>	245	42.9	128	27.4	48.4	17.8
Exeter	149	42.3	79	21.2	46.8	
Gloucester <sup>a</sup>	77	27.3	36	14.7	52.8	
Dorset <sup>b</sup>	92	42.4	59	27.3	33.9	
<b>Cambridge</b>	209	29.7	106	22.9	47.2	4.4
Stevenage	198	33.8	102	18.2	33.3	
Norwich	127	30.7	31	19.4	32.3	
Ipswich	82	42.7	42	17.1	35.7	
<b>Cardiff</b>	307	35.2	156	26.2	44.2	6.3
Swansea	160	36.9	79	23	39.2	
<b>Coventry</b>	192	33.3	63	22.2	42.9	22.2
<b>Edinburgh</b>	207	39.6	88	12.5	55.7	
Aberdeen	124	34.7	59	35.6	50.8	
Dundee	89	39.3	45	31.1	46.7	
Inverness	64	51.6	29	25.9	62.1	
Dunfermline	73	45.2	25	28	56	
<b>Glasgow</b>	368	44	192	22.8	42.7	7.9
Dumfries	29	31	13	23.1	30.8	
Airdrie	111	31.5	56	27.3	23.2	
Kilmarnock	97	38.1	33	17.1	45.5	
<b>Leeds</b>	313	41.2	182	19.9	52.2	8.4
Bradford	107	40.2	67	27.7	47.8	
York	57	35.1	44	25.6	59.1	
Hull	201	33.3	87	24.1	42.5	
<b>Leicester</b>	464	47.8	139	27.3	55.4	12.7
<b>Liverpool</b>	304	24.7	133	14.3	27.8	
Bangor	48	15.7	27	7.4	40.7	4.6
Glan Clwyd	36	16.7	9	37.5	66.7	
Wrexham	70	22.9	26	52	38.5	
Aintree	63	25.4	1	0	0	
Wirral	77	28.6	50	0	34	
Chester	18	38.8	3	0	0	
<b>Manchester RI</b>						
Manchester W	271	38.4	154	10.4	59.7	
Preston	251	36.7	83	15.7	66.3	
Stoke						



Table 11.8: (continued)

Centre name*	Prevalent dialysis population on 31/12/06 aged <65		Incident dialysis patients between 01/01/03–31/12/04 aged <65			LKD transplants pmp 01/04/03–31/03/04**
	Number	% active on waiting list	Number	% with diabetes as primary renal diagnosis	% waitlisted within 2 years of starting RRT	
<b>Newcastle</b>	183	35	99	16.3	49.5	6.7
Sunderland	100	23	57	17.5	38.6	
Middlesbrough	158	38	108	17.9	51.9	
Carlisle	46	39.1	20	25	50	
<b>Nottingham</b>	261	34.9	100	27	43	9.4
Derby	145	41.4	55	33.3	43.6	
<b>Oxford</b>	262	38.5	175	28.7	46.9	5.3
Reading	175	38.3	52	19.2	57.7	
<b>Plymouth</b>	74	32.4	49	24.5	38.8	2.2
Truro	69	30.4	43	22.2	51.2	
<b>Portsmouth</b>	242	45.5	132	21.7	53	5.0
<b>Sheffield</b>	410	40.5	167	26.5	46.7	
<b>London Kings</b>	221	32.1	126	27.3	46.8	4.9
<b>London Guys</b>	304	24.3	113	24.8	40.7	
<i>Kent &amp; Canterbury</i>						
<b>London RFree</b>	400	44.8				
<b>London Barts</b>	507	41.4	116	28.6	45.7	4.1
Southend	67	37.3	43	41.9	48.8	
Basildon	86	39.5	51	31.4	35.3	
Chelmsford	59	30.5	19	47.1	42.1	
<i>Colchester</i>						
<b>London West</b>	595	40.5	279	32.9	38	
<b>L St George's</b>						
Carshalton	301	37.2	194	30.6	42.3	44.4
Brighton	191	35.1	45	22.9	44.4	
<b>Belfast</b>	185	41.1				4.1
Derry	13	46.2				
Ulster	23	47.8				
Tyrone	47	34				
Newry	50	52				
Antrim	60	43				
<b>Total</b>	<b>11,554</b>	<b>37.6</b>	<b>2,129</b>	<b>24.3</b>	<b>43.8</b>	

\* Referring centres assigned to the transplant centre that performs most of their transplants especially LKD transplantation. This allocation may not be accurate.

\*\* Data from NHS BT website (annual activity data for 2003–2004).

<sup>a</sup> Gloucester patients are equally split for wait listing at Oxford and Bristol.

<sup>b</sup> Dorset contract for transplantation moved from Plymouth to Bristol in 04/05.

<sup>c</sup> Aberdeen used to undertake renal transplantation until 2004.

Centres in italics do not submit data to UKRR. Blank spaces indicate data un-available at UKRR or not accessible from NHS BT website.

between this factor and the percentage of patients activated onto the waiting list (Pearson correlation coefficient of  $-0.005$ ,  $p=0.96$ ). Table 11.8 does not seem to suggest the

number of LKD transplants performed by a transplant centre correlates with the number of prevalent (Pearson correlation coefficient of  $0.16$ ,  $p=0.56$ ) or incident patients (Pearson

correlation coefficient of 0.14,  $p=0.44$ ) accessing the waiting list. This suggests factors other than rate or volume of LKD transplantation influenced access to the waiting list in individual centres.

Entry onto the waiting list was dependent on referral for individual patients to be received by 'gate-keeping' clinicians/physicians/surgeons and the time taken to process such referrals followed by a decision to waitlist. Consequently inequity or delay in any step of this patient pathway may result in variations between centres. The above data might be useful for transplant centres and referring renal centres to design local patient pathways to ensure equitable and early access to the waiting list for the entire catchment population.

Currently NHS BT defines time on the waiting list as commencing from the date the patient was first listed for an organ on its database. Since current organ allocation rules favour 'longer waiters', time accrued on the waiting list increases the chances of an organ being allocated. Hence, the time taken to list a patient for renal transplantation may be used as a quality of care indicator for patients with ERF on dialysis, with better performing centres achieving earlier activation. Whilst a 'standard' for optimum or maximum time a patient may expect to elapse after commencing dialysis before being waitlisted is difficult to prescribe at an individual level, such analyses may open the debate for what the centre or national average should be. It is hoped to include median time to waitlist for individual centres in next year's report.

### ***Results of the joint Renal Association – British Transplantation Society survey on access to transplantation***

In 2007, the RA and BTS undertook a joint survey of transplant centres and referring renal centres across the UK to better understand resource allocation and clinical practices both pre and post-transplant, in individual centres. The questionnaire was designed by a joint working group on behalf of the RA and BTS and administered by Dr Kesh Baboolal (Consultant Nephrologist, Cardiff). The questionnaire was sent to

both the lead nephrologist and lead transplant surgeon in each transplant centre and to the lead nephrologist in each non-transplanting renal centre. Responses were collated by Dr Baboolal and were analysed jointly with the UKRR.

Clinical practice data for individual centres was self reported by the lead clinician. Catchment population and transplant numbers pmp, including sub-types of transplants, number of waitlisted patients as of 31 March 2007 for each centre was obtained by accessing the NHS BT database: ([http://www.NHSBTransplant.org.uk/NHSBT/statistics/transplant\\_activity\\_report/current\\_activity\\_reports/NHS\\_BT/tx\\_activity\\_report\\_2007\\_uk\\_pp12-20.pdf](http://www.NHSBTransplant.org.uk/NHSBT/statistics/transplant_activity_report/current_activity_reports/NHS_BT/tx_activity_report_2007_uk_pp12-20.pdf)).

The transplant activity quoted below includes kidney alone and kidney plus other organ transplants performed at any of the centres.

Despite the endorsement of both the RA and BTS disappointingly only 9 of the 23 adult renal transplant centres (39%) and 15 of the 47 (31%) referring renal centres responded to the survey. For purposes of this year's annual report, the results of the analyses from the survey have been restricted to variables surrounding access to transplantation. A more detailed publication of all aspects covered by the survey is expected later.

Table 11.9 suggests wide variability in dedicated sessional commitment to transplantation by both consultant nephrologists and transplant surgeons amongst transplant centres across the UK. There was also a very wide variation in number of transplants pmp and number of waitlisted patients pmp amongst transplant centres. Even after excluding Cambridge (which included liver transplant sessions) there was no relationship between the number of consultant surgical or nephrologist sessions dedicated to transplantation and total (cadaveric and LKD) transplant numbers. Whilst a number of factors including allocation rules and the proportion of patients from the ethnic minority on the waiting list may have influenced the number of cadaveric transplants performed by a centre, the numbers of LKD and non-heart beating donor transplants were likely to be more influenced by availability of local resources. Centre transplant activity seemed to be clustered into 3 groups (<30 pmp, 30–40 pmp, >40 pmp).

**Table 11.9: Consultant and transplant co-ordinator resources compared with transplant activity at renal transplant centres**

Centre	Catchment population (millions <sup>a</sup> )	Consultant surgical PA <sup>b</sup> pmp	Consultant nephrologist PA pmp	LKD co-ordinators pmp	Number of transplants pmp <sup>d</sup>			No of dialysis patients active on tx waiting list pmp <sup>e</sup>	
					Cadaveric	Live kidney donor	Non-heart beating		
Cambridge	2.6	9.6 <sup>c</sup>	n/a	0.6	23.0	10.2	21.1	54.3	94
Cardiff	2.2	9.0	3.1	0.4	21.4	10.0	7.0	38.4	102
Edinburgh	2.4	7.0	4.1	0.4	18.3	5.8	1.2	25.3	129
Leicester	2.1	11.4	5.7	0.4	9.2	14.7	0.0	23.9	157
Newcastle	2.8	3.5	3.5	0.3	12.8	9.0	16.0	37.8	83
Nottingham	1.6	11.2	1.5	0.6	14.2	8.7	0.0	22.9	134
Sheffield	1.8	5.0	3.8	0.5	16.0	8.0	0.0	24.0	116
St George's	3.5	n/a	n/a	1.4	14.2	10.0	2.2	26.4	76
Bristol	2.2	4.5	3.1	0.9	18.9	16.9	13.1	48.9	139

<sup>a</sup> Catchment population obtained from NHS BT website except for St George's which was reported by the clinical lead. This figure was used as the denominator to calculate the number of patients on waiting list data for the centre.

<sup>b</sup> Programmed activity/week dedicated to transplantation (a PA is equivalent to 4 hours of consultant time).

<sup>c</sup> Cambridge surgical data includes both liver and kidney transplants.

<sup>d</sup> Transplant numbers pmp for the financial year 2006–2007 for each centre obtained from NHS BT website.

<sup>e</sup> Number of patients active on 31 March 2007 for the centre used as the numerator.

n/a = data not available.

### ***Clinics, referral and team organisation***

All the transplant centres included transplantation as part of their pre-ERF education programme. All centres except Cardiff and Newcastle, had weekly dedicated transplant assessment clinics. At Cambridge, St George's and Sheffield these clinics were staffed by both consultant nephrologists and transplant surgeons, in Edinburgh and Leicester they were staffed only by nephrologists whilst in Nottingham and Bristol only by surgeons.

Referrals for transplant assessment were usually accepted from all members of the renal multi-disciplinary team. Bristol, Edinburgh, Nottingham and St George's had a written protocol for acceptance of patients onto the waiting list. All centres except Cambridge and Sheffield, had written protocols for cardiac investigations prior to wait listing.

All centres held at least monthly multi-disciplinary meetings to discuss patients before wait listing which was attended by the extended renal multi-disciplinary team including transplant co-ordinators and specialist nurses. No centre reported involvement by anaesthetists in these multi-disciplinary meetings.

Only Edinburgh and St George's undertook 'out-reach' transplant assessment clinics in the referring renal centres, while all other centres undertook pre-transplant assessment only at the transplant centre.

All transplant centres had dedicated LKD co-ordinators with St George's and Newcastle also having dedicated LKD co-ordinators at one or more of their referring renal centres.

With the exception of Edinburgh and Nottingham, donor work up was performed by nephrologists. All the transplant centres reported a belief that more LKD transplants could be performed in their centre, with major barriers to increasing transplant numbers identified as: availability of theatre time, support from Trust and commissioning groups, ABO blood group/HLA incompatibility and access to specialist services such as cardiology and radiology.

The turn around time from referral to surgery for potential LKD transplants varied from 2 months (St George's) to 12 months (Sheffield) with most centres taking between 4–6 months. Delay in medical investigations to confirm donor fitness and theatre availability were regarded as the primary reasons for time taken to complete LKD transplants.

In Cambridge, St George's and Edinburgh, live transplant operations were performed simultaneously whilst in the other centres a sequential operation took place. Laparoscopic nephrectomy was the predominant donor operation in all centres.

### **Analysis from non-transplanting centres**

Table 11.10 indicated wide variability in consultant nephrologist time dedicated to transplantation in non-transplanting renal centres as well as the number of prevalent transplant patients cared for at the centre, with several centres not following transplant patients.

Only Salford and Carshalton reported having dedicated educational programmes for transplantation; other centres included this as part of their general pre-ERF counselling. Bangor, Carshalton and Chelmsford had a dedicated pre-transplant assessment clinic, usually manned by surgical and/or medical staff from the local transplant centre. In the remaining centres, patients travelled to the transplant centre to be assessed before being activated on the waiting list.

Approximately 50% of the centres who responded to the survey had a written protocol for referral and assessment prior to wait listing

and/or for cardiac investigations. All centres except Birmingham Heartlands, Basildon, Derby, Chelmsford, Colchester and Manchester West held at least monthly multi-disciplinary meetings to discuss patients prior to wait listing usually in conjunction with clinical staff from the transplant centre. With the exceptions of Carshalton and London Kings, final assessments were performed at the transplant centre.

All centres except Liverpool Aintree and Dunfermline, had a named contact/link person between their centre and the transplant centre. Only Carshalton, Swansea, Liverpool-Aintree and Chelmsford undertook regular audits of patient referrals and acceptance onto the waiting list.

About half these centres had a dedicated LKD co-ordinator on-site and in most centres some of the donor medical work up was undertaken locally.

Dunfermline, Brighton, Colchester, Chelmsford and Derby estimated they were achieving maximum potential in LKD referrals. Amongst the other centres, the number of LKD co-ordinators, delays at the transplant centre, awareness amongst patients and families and support from Trusts and commissioners were identified as the major barriers to increasing LKD transplant activity. Average turn around time from referral

**Table 11.10: Consultant resources in non-transplanting centres**

Centre	Catchment population (millions)	Nephrologist PAs dedicated to Tx	Prevalent transplant patients in centre <sup>a</sup>
Bangor	0.18	1	0
B Heart	0.60	3	167
Basildn	0.50	1	28
Brightn	0.98	5	243
Carsh	1.80	4	469
Chelms	0.50	1	20
Colchester	n/a	0	0
Derby	0.48	0	16
Dunfn	n/a	1	30
Livrpl Ain	0.64	0	0
L Kings	1.01	1	274
Man Wst	0.94	2	280
Swansea	0.70	4	146
Tyrone	n/a	1	61
Wrexm	0.32	0	3

<sup>a</sup> Prevalent patient numbers as of 31/12/06.

n/a = data not available.

for donor assessment to surgery was 6 months in most centres and varied from 3 months at Carshalton to 18 months at Bangor.

### Survey conclusions

The joint RA/BTS survey highlights wide variability in availability of resources as well as local clinical practices at both transplanting and non-transplanting renal centres. Some of the specific findings need to be interpreted with caution as less than 50% of transplanting centres and less than a third of the non-transplanting renal centres responded to the survey. It was also difficult to accurately quantify consultant time dedicated to transplantation at the individual centre level.

There was unexplained variability in access to renal transplantation across the UK. These results suggest there should be guidance on minimum workforce requirements to support an adequate and timely service, clinical practice structures/care bundles to enable equitable access to transplantation for the whole population.

There is a necessity for regular local and national audit in order to assess access to renal transplantation and this should form part of

the core audit of administered clinical care to patients with ERF.

### Primary renal diagnosis, ethnicity, co-morbidity and transplantation

There has been no change (Table 11.11) in the relative proportions of patients with the most common primary renal diagnoses except for patients with diabetes undergoing transplantation in 2006. As expected with the large increase (see Table 11.1) in simultaneous pancreas kidney transplantation, there has been an increase in the proportion of diabetics receiving a transplant, from 9.7% in 2003 to 12.5% in 2006.

Data on ethnic origin was retrieved from renal IT systems. For the purpose of this analysis, patients were grouped into Whites, South Asians, Blacks, Chinese and Others. The details of regrouping of the PAS codes into the above ethnic categories are provided in Appendix J at [www.renalreg.org](http://www.renalreg.org). There has been an improvement in the reduction of patients with missing ethnicity information in the incident RRT population (Table 11.12). In the last 2 years,

**Table 11.11: Primary renal diagnosis of renal transplant recipients**

Primary diagnosis	New transplants by year					Established transplants on 01/01/06	
	2003	2004	2005	2006		%	Number
	%	%	%	%	Number		
Aetiology uncertain/GN <sup>a</sup> not biopsy proven	19.5	19.9	19.4	17.3	293	20.4	3,452
Diabetes	9.7	10.9	11.8	12.5	212	7.3	1,227
Glomerulonephritis	21.1	20.5	19.2	18.0	305	19.4	3,280
Polycystic kidney disease	14.1	13.0	11.8	12.3	209	11.7	1,979
Pyelonephritis	13.1	12.4	11.6	10.7	181	15.7	2,659
Reno-vascular disease	5.5	6.9	6.3	5.3	90	5.7	971
Other	15.0	14.5	13.2	13.8	235	15.0	2,539
Not available	2.0	1.9	6.7	10.2	173	4.7	787

<sup>a</sup> GN – glomerulonephritis.

**Table 11.12: Ethnicity of patients who received a transplant in the years 2001–2006**

Year	% White	% South Asian	% African Caribbean	% Others	% Unknown
2001	69.4	4.6	2.0	0.7	23.3
2002	72.5	6.7	4.4	1.4	15.0
2003	72.2	4.1	3.1	1.5	19.0
2004	70.1	6.6	4.0	2.0	17.2
2005	71.2	7.2	5.5	1.1	15.0
2006	68.0	7.6	6.1	2.5	15.8

**Table 11.13: Comparison of co-morbidity in patients starting RRT during 2001–2006 who underwent transplantation with those who remained on dialysis or died**

Co-morbidity	Not transplanted		Transplanted		p value <sup>a</sup>
	Number	%	Number	%	
Patients with co-morbidity data	9,259		1,552		
Without co-morbidity	3,751	40.5	1,162	74.9	<0.0001
Ischaemic heart disease	2,470	27.1	85	5.5	<0.0001
Peripheral vascular disease	1,306	14.2	35	2.3	<0.0001
Cerebrovascular disease	1,072	11.6	44	2.8	<0.0001
Diabetes (not cause of ERF)	800	8.9	36	2.3	<0.0001
COPD	726	8.0	27	1.8	<0.0001
Liver disease	240	2.6	10	0.6	<0.0001
Malignancy	1,229	13.3	35	2.3	<0.0001
Smoking	1,438	16.7	214	14.7	0.0603

<sup>a</sup> Chi square p value comparing proportion with co-morbidity between groups.

there may have been a slight rise in the proportion of patients from South Asian and African origins receiving a transplant and this may have been due to the new matching scheme for rare antigens. In the incident RRT cohort, 9.5% were from a South Asian background and 5.8% having an African Caribbean origin.

As expected, patients who received a renal transplant had no co-morbidity or fewer co-morbidities (co-morbidity listed at time of commencement of RRT) compared to incident dialysis patients who did not receive a transplant or who died during the same period remaining on dialysis (Table 11.13). The patients and centres included in this analysis are described in Chapter 5.

The prevalence of smoking was similar to that of the dialysis population. Multiple co-morbidities were likely to restrict access to transplant waiting list or to living kidney donor transplantation and this would explain the above differences. The prevalence of various co-morbidities amongst patients waitlisted for a deceased donor transplant within the first year of RRT compared to those not waitlisted in the first year have been reported in Chapter 5. If more centres consistently reported co-morbidity data to the UKRR it would be possible to establish if there are any inter-centre differences between patients with one or more co-morbidities achieving renal transplantation.

## Post-transplant outcome

Sixty seven centres (47 England, 9 Scotland, 5 Wales and 6 Northern Ireland) submitted demographic and clinical data to the UKRR in 2006, the highest number since the inception of the Registry. However, there continued to be a huge variation in the extent of completeness of data (Table 11.14) reported by each centre. Better data returns are likely to facilitate more meaningful comparisons between centres as well as to identify why some centres may be significantly different in any outcome variable compared to the rest of the country. Until the data returns improve caution needs to be exercised when comparing performances between centres as unrecorded or unreported variables may be influencing outcome.

## Methods

### *Prevalent patient data*

The cohort comprised of patients transplanted before 30th September 2006. Biochemical and clinical variables derived from both transplanting and non-transplanting centres for patients with a functioning transplant were included in the analyses.

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.

**Table 11.14: Percentage completeness by centre for prevalent patients on 31/12/2006<sup>a</sup>**

Centre	Ethnicity		eGFR <sup>b</sup>		Hb		BP	
	%	Total with data	%	Total with data	%	Total with data	%	Total with data
Antrim	100.0	46	82.6	38	69.6	32	34.8	16
B Heart	100.0	165	83.6	138	82.4	136	1.2	2
B QEH	99.9	655	87.4	573	87.4	573	0.6	4
Basldn	96.4	27	100.0	28	100.0	28	7.1	2
Belfast	99.5	403	96.1	389	93.3	378	31.4	127
Bradfd	67.5	106	89.8	141	77.7	122	95.5	150
Brightn	42.0	100	97.1	231	97.1	231	95.8	228
Bristol	98.0	626	97.2	621	96.9	619	89.4	571
Camb	81.8	401	91.4	448	91.4	448	2.0	10
Cardff	40.4	288	97.2	693	97.2	693	96.5	688
Carlisle	98.9	86	94.3	82	93.1	81	0.0	0
Carsh	92.1	417	89.9	407	88.7	402	0.4	2
Chelms	93.3	14	86.7	13	80.0	12	80.0	12
Clwyd	0.0	0	85.7	6	85.7	6	85.7	6
Covnt	87.9	268	85.3	260	84.9	259	78.7	240
Derby	100.0	15	6.7	1	26.7	4	6.7	1
Derry	100.0	3	66.7	2	0.0	0	0.0	0
Dorset	100.0	190	92.6	176	90.5	172	8.4	16
Dudley	100.0	82	98.8	81	97.6	80	84.2	69
Exeter	94.6	244	95.0	245	94.6	244	59.3	153
Glouc	100.0	107	98.1	105	98.1	105	5.6	6
Hull	86.9	206	91.1	216	91.1	216	0.8	2
Ipswi	100.0	124	95.2	118	95.2	118	97.6	121
L Barts	94.0	592	82.5	520	82.4	519	0.2	1
L Guys	87.6	666	96.1	730	96.3	732	0.4	3
L Kings	94.0	250	94.7	252	95.1	253	0.4	1
L RFree	92.4	599	82.9	537	82.7	536	0.2	1
L West	100.0	456	95.8	437	95.8	437	0.0	0
Leeds	72.4	535	95.0	702	92.0	680	73.1	540
Leic	89.8	598	91.0	606	90.1	600	57.7	384
Liv RI	93.6	761	92.1	749	91.9	747	88.4	719
ManWst	94.0	251	89.5	239	89.9	240	0.0	0
Middlbr	92.5	309	94.3	315	92.2	308	58.4	195
Newc	99.1	570	96.4	554	96.0	552	0.4	2
Newry	100.0	46	84.8	39	82.6	38	4.4	2
Norwch	85.0	119	95.0	133	95.0	133	1.4	2
Nottm	94.8	404	96.0	409	95.3	406	96.0	409
Oxford	38.2	287	96.6	725	96.0	724	13.9	106
Plymth	93.6	203	96.8	210	95.9	208	0.5	1
Ports	99.1	637	86.0	553	86.5	556	0.3	2
Prestn	91.9	331	85.3	307	80.0	288	0.0	0
Redng	100.0	230	98.1	225	98.1	225	98.1	225
Sheff	98.2	481	97.6	478	97.6	478	97.8	479
Shrew	100.0	70	100.0	70	100.0	70	15.7	11
Stevng	100.0	205	53.7	110	70.2	144	0.0	0
Sthend	81.4	35	90.7	39	90.7	39	0.0	0
Sund	96.1	98	98.0	100	98.0	100	1.0	1
Swanse	100.0	141	96.5	136	96.5	136	11.4	16
Truro	80.7	75	95.7	89	96.8	90	83.9	78

**Table 11.14: (continued)**

Centre	Ethnicity		eGFR <sup>b</sup>		Hb		BP	
	%	Total with data	%	Total with data	%	Total with data	%	Total with data
Tyrone	100.0	60	91.7	55	40.0	24	5.0	3
Ulster	100.0	3	100.0	3	100.0	3	33.3	1
Wolve	100.0	94	96.8	91	96.8	91	95.7	90
Wrexm	66.7	2	33.3	1	33.3	1	0.0	0
York	79.0	64	98.8	80	91.4	74	97.5	79
<b>England</b>	<b>88.7</b>	<b>12,753</b>	<b>91.6</b>	<b>13,144</b>	<b>91.1</b>	<b>13,076</b>	<b>33.7</b>	<b>4,918</b>
<b>N Ireland</b>	<b>99.6</b>	<b>561</b>	<b>93.4</b>	<b>526</b>	<b>84.4</b>	<b>475</b>	<b>26.5</b>	<b>149</b>
<b>Wales</b>	<b>49.9</b>	<b>431</b>	<b>96.8</b>	<b>836</b>	<b>96.8</b>	<b>836</b>	<b>82.2</b>	<b>710</b>
<b>UK</b>	<b>87.0</b>	<b>13,745</b>	<b>91.9</b>	<b>14,506</b>	<b>91.2</b>	<b>14,391</b>	<b>36.1</b>	<b>5,777</b>

<sup>a</sup> Scottish centres are not shown as they do not report biochemical data to the UKRR.

<sup>b</sup> Patients with missing ethnicity were classed as White for eGFR calculation.

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 for whom exact date of transplant was not known were excluded from analyses. Eleven centres with <20 patients are not shown in the figures and tables and Scottish centres were excluded as they do not report biochemical data to the UKRR. Patients were considered as having a functioning transplant if 'transplant' was listed as the last mode of RRT in the last quarter of 2006. For laboratory results, the last value in quarter 3 or quarter 4 (last 6 months) of 2006 was used. For blood pressure recordings the latest value from 2006 was used.

### *Estimated glomerular filtration rate (eGFR)*

For the purpose of eGFR calculation, the 4-variable MDRD formula<sup>2</sup> was used. Serum creatinine has not been standardised to that of the assay used at the MDRD laboratory, also the different creatinine assay methods in use in the UK have not specifically been taken into account. By May 2006, over 60% of UK laboratories had aligned their creatinine assays with that of the creatinine concentration obtained using the Beckman analyzer running a compensated kinetic Jaffe assay as used in the MDRD study. In the UK, there is now a further move towards standardising against an isotope dilution mass spectrometry (ID-MS) traceable creatinine result, which will then require use of an adjusted 4v MDRD equation.

The UK Association of Clinical Biochemists have stated that most UK laboratories were using the kinetic Jaffe assay and the standard 4v MDRD equation is most appropriate (personal communication E Lamb). Patients with valid serum creatinine results but no ethnicity data were classed as White for the purpose of eGFR calculation (few UK patients are of African Caribbean origin).

### *One year post transplant data*

Time post transplantation may have a significant effect on key biochemical and clinical variables. This is likely to be independent of a centre's clinical practices. Therefore inter-centre comparisons of data on prevalent transplant patients is open to bias. To minimise such bias outcomes are additionally reported in patients one year post transplantation. It was presumed that patient selection policies and local clinical practices were more likely to be relevant in influencing outcomes 12 months post transplant and therefore comparison of outcomes between centres is more robust.

Patients who received a renal transplant between 01 January 2000 and 31 December 2005 were assigned according to the renal centre in which they were transplanted. Thus, Carlisle, Sunderland and Middlesbrough patients were transferred to Newcastle, Hull to Leeds, London Kings to London Guy's, Shrewsbury and Birmingham Heartlands to Birmingham QEH, Stevenage to Cambridge, Swansea to Cardiff, Truro to Plymouth and Bangor, Clwyd and Wrexham to Liverpool. Carshalton and Brighton were



transplanting centres until 2003 with all subsequent transplantation performed at London St George's. Therefore data from these two centres refer to patients transplanted in these centres until 2003. London Barts, Scottish and Northern Ireland centres were excluded as they did not submit biochemical data for the entire 5 year period. Patients who had died or experienced graft failure within 12 months post transplantation were excluded from analysis. Patients with more than one transplant between 2000–2005 were included as separate episodes provided each of the transplants functioned for at least a year.

For each patient, the most recent laboratory or blood pressure for 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 eGFR calculation, if there was a valid serum creatinine but no ethnicity data available, patients were classed as White.

### Post transplant eGFR in prevalent transplant recipients

Median eGFR in each centre and percentage of patients with eGFR  $\geq 60$  or  $< 30$  ml/min/1.73 m<sup>2</sup> are shown in Figures 11.6 to 11.8. The median eGFR was 46.5, with 17% of prevalent transplant recipients having an eGFR  $< 30$  ml/min/1.73 m<sup>2</sup>. Local repatriation policies on the

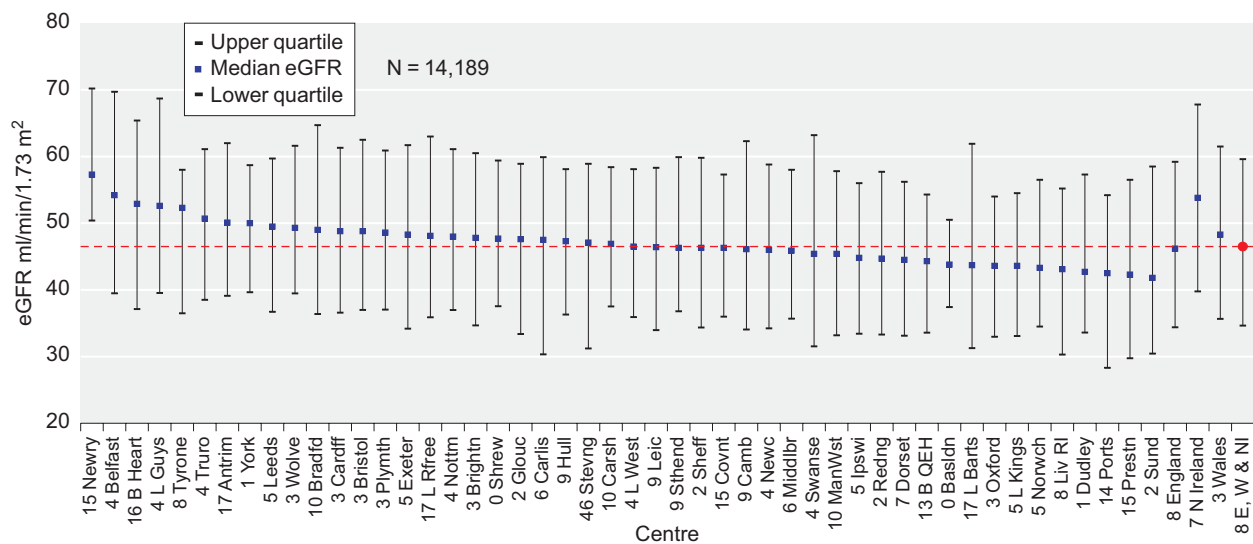


Figure 11.6: Median eGFR of prevalent transplant patients by centre on 31/12/2006

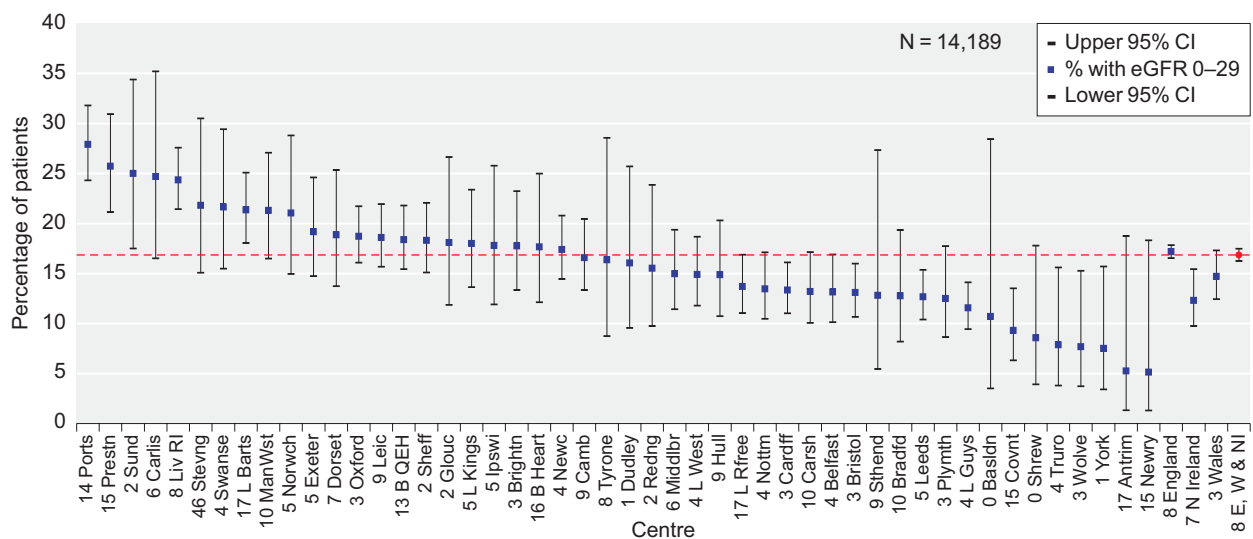
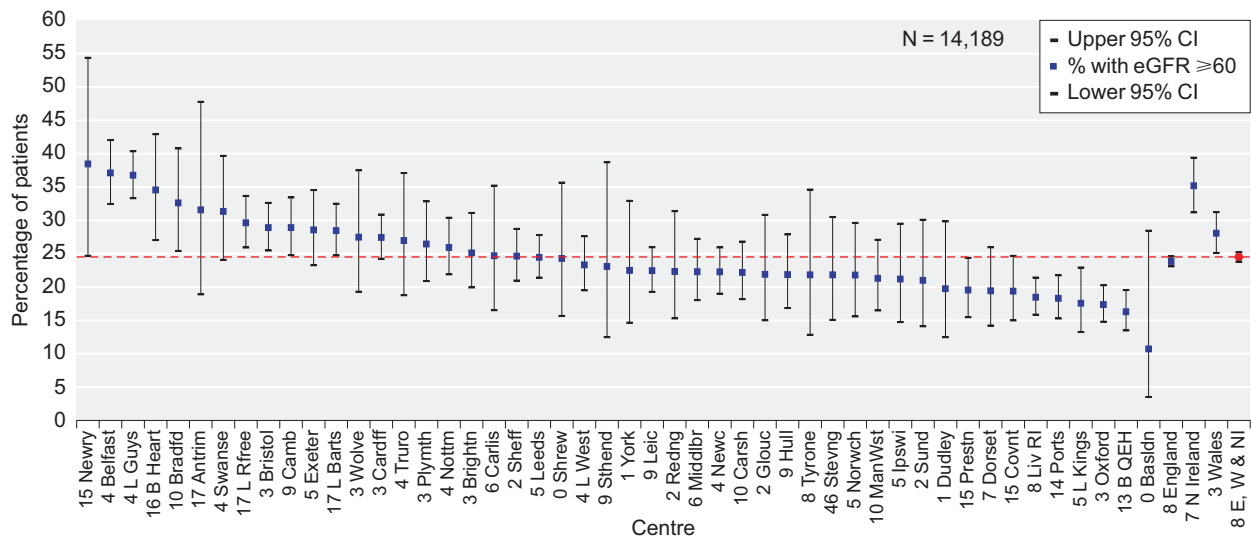


Figure 11.7: Percentage of prevalent transplant patients by centre with eGFR  $< 30$  ml/min/1.73 m<sup>2</sup> on 31/12/2006



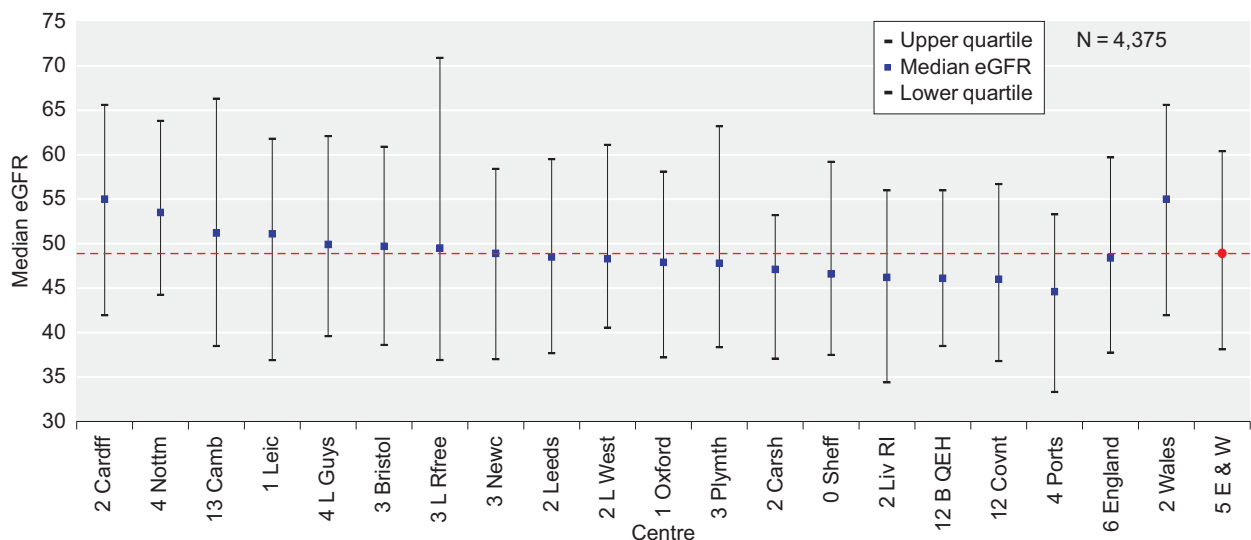
**Figure 11.8: Percentage of prevalent transplant patients by centre with eGFR ≥ 60 ml/min/1.73 m<sup>2</sup> on 31/12/2006**

timing of transfer of patient care from transplant centres to the referring centres for those with a failing graft, might explain some of the differences but Figure 11.6, shows that both transplanting and non-transplant centres feature at both ends of the graph. The 4v MDRD equation is inaccurate in the estimation of GFR ≥ 60 ml/min/1.73 m<sup>2</sup> and caution needs to be exercised whilst interpreting Figure 11.8. Centres with a high prevalence of patients with eGFR < 30 ml/min/1.73 m<sup>2</sup> were likely to require significant resources in the management of complications related to declining renal function as

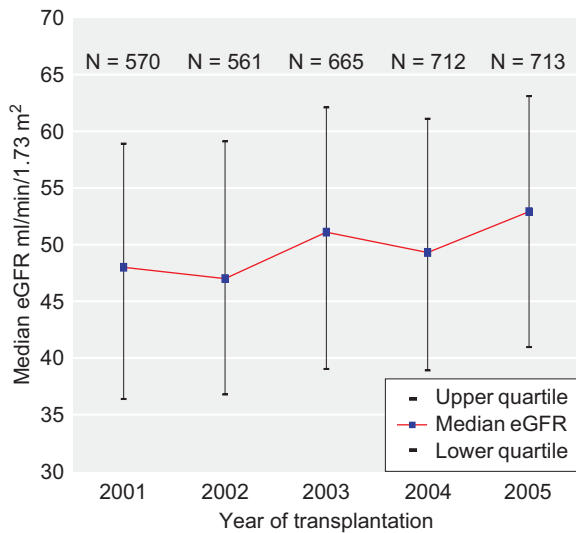
well as ensuring safe transition to dialysis and/or re-transplantation.

### eGFR in patients one year after transplantation

Renal function one year after transplantation may predict future graft performance. Figure 11.9 shows that median eGFR one-year post transplant for patients transplanted between 2000–2005, was 49 ml/min/1.73 m<sup>2</sup>. All transplants (deceased and LKD) from each centre were included in this analysis.



**Figure 11.9: Median eGFR one year post transplant by transplant centre for patients transplanted between 2000–2005**



**Figure 11.10: Median eGFR one year post transplant by year of transplantation 2000–2005**

There was a significant difference in one year post transplant median eGFR between the years 2000 to 2005 (Kruskal–Wallis  $p < 0.001$ ) (Figures 11.9 and 11.10). Linear regression analysis indicates a small upward trend in the one year post transplant median eGFR between 2001 and 2005 (Figure 11.9). This increase was approximately 1.1 ml/min/year ( $p < 0.0001$ ), suggesting better graft function for patients transplanted more recently. Factors like newer immunosuppressive agents, increasing proportion of living kidney donor transplants etc may explain the improvement in eGFR over time. In subsequent Reports it is hoped to present this analysis separately for live and deceased donor

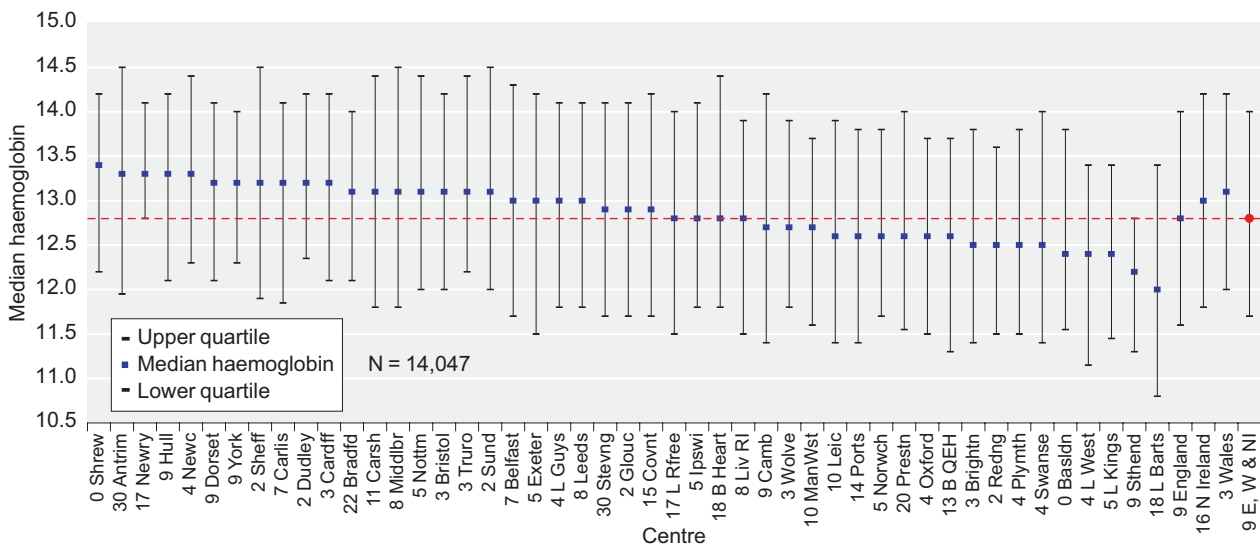
kidney recipients, to study whether the changing donor demographics influence outcome over time.

### Haemoglobin in prevalent transplant patients

The RA chronic kidney disease (CKD) guidelines recommend that all patients should have a haemoglobin above 10 g/dl.

A number of factors including; immunosuppressive medication, graft function, EPO use, IV/oral iron use in addition to centre practices/protocols for management of anaemia, will affect haemoglobin levels in transplant patients. Figure 11.11 shows the median Hb values from UK centres, whilst Figure 11.12 shows the percentage of transplant patients with Hb  $< 10$  g/dl by centre. In previous years, centres with  $< 20$  patients or  $< 50\%$  completeness of Hb data returns were excluded from these figures but are shown this year, however these data should be interpreted with caution.

The median Hb was 12.8 g/dl, with 4.2% of patients having a Hb  $< 10$  g/dl, both similar to last years results. Once again it is interesting to note that the five centres with the highest percentage of prevalent transplant patients with eGFR  $< 30$  ml/min/1.73 m<sup>2</sup> (Figure 11.7) were not the same as the five centres with the highest percentage of patients with Hb  $< 10$  g/dl, suggesting centre practices outweigh any influence of low GFR contributing to anaemia.



**Figure 11.11: Median Hb (g/dl) for prevalent transplant patients by centre on 31/12/2006**

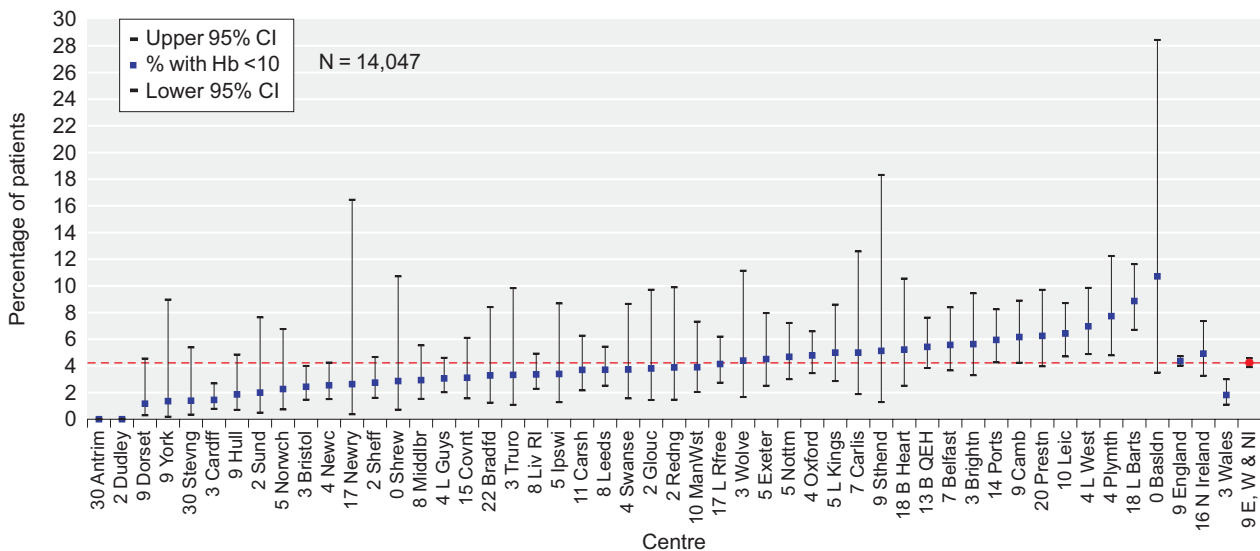


Figure 11.12: Percentage of prevalent transplant patients with Hb <10 g/dl by centre on 31/12/2006

### Haemoglobin in patients one year after transplantation

There was no change in the median Hb of 13 g/dl at one year post transplantation compared to last year (Figure 11.13).

### Blood pressure in prevalent transplant patients

In the absence of controlled trial data, opinion based recommendation from the RA states that BP targets for transplant patients should be similar to the targets for patients with CKD i.e. systolic BP <130 mmHg and diastolic BP <80 mmHg.

Blood pressure data returns continued to be patchy with some centres providing information on the majority of patients, whilst others provided little if any. The data returns were reliant on nephrologists and surgeons entering these data into renal IT systems. It is hoped that the increasing availability of patients viewing their transplant clinic data using 'renalpatientview' will stimulate clinicians to enter this data.

Median systolic BP (Figure 11.14), median diastolic BP (Figure 11.15) and the percentage of patients who achieved RA standards (Figure 11.16) are shown. Only centres with >50% data returns are shown in these figures.

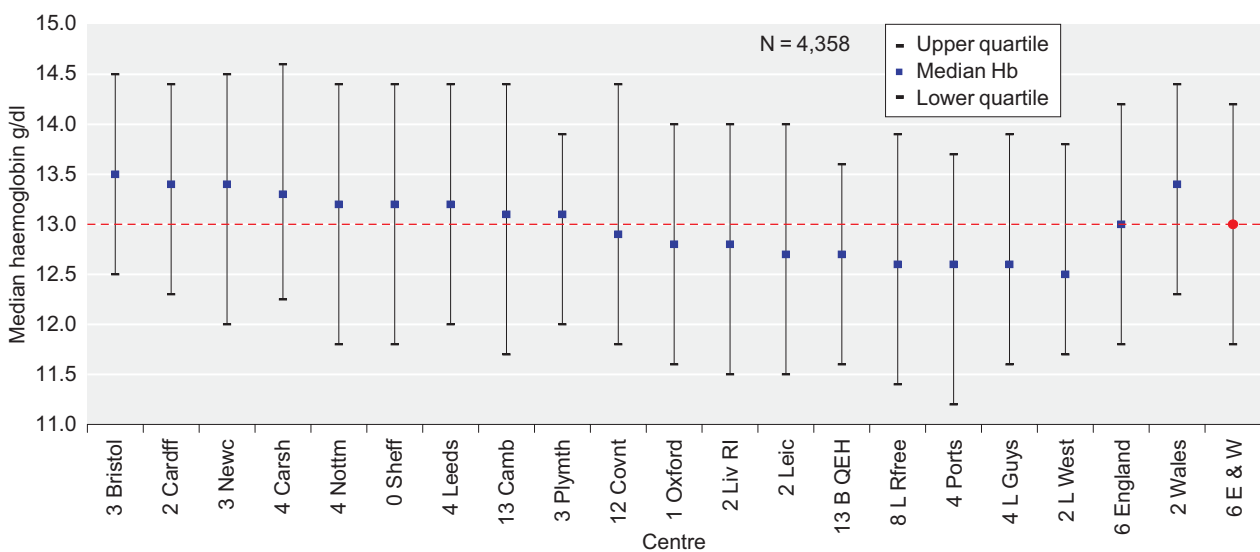


Figure 11.13: Median Hb one year post transplant by transplant centre for patients transplanted between 2000-2005

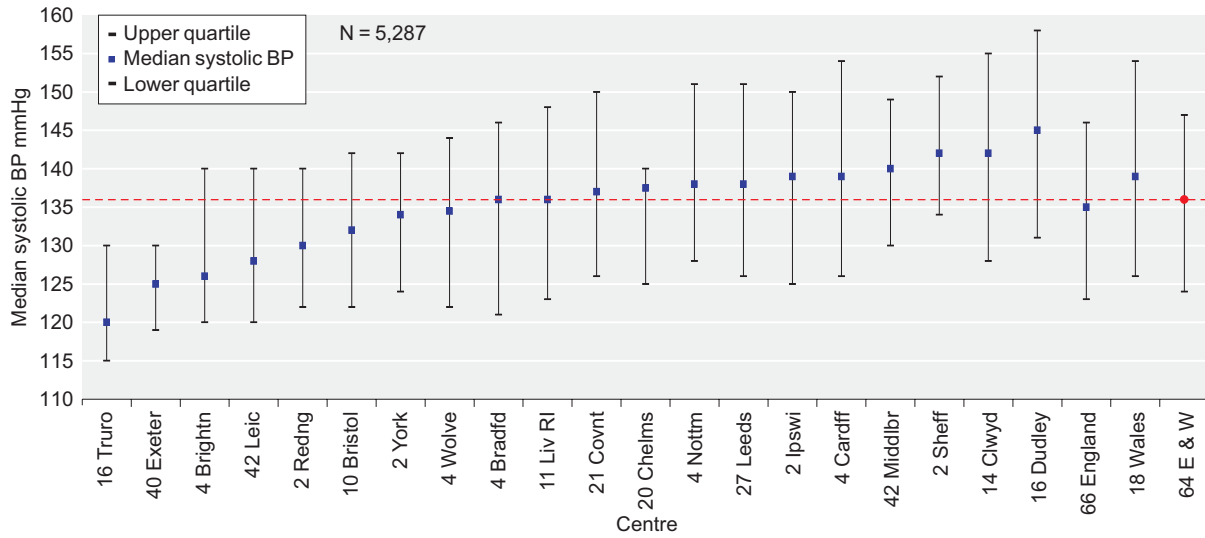


Figure 11.14: Median systolic BP mmHg in prevalent transplant patients by centre on 31/12/2006

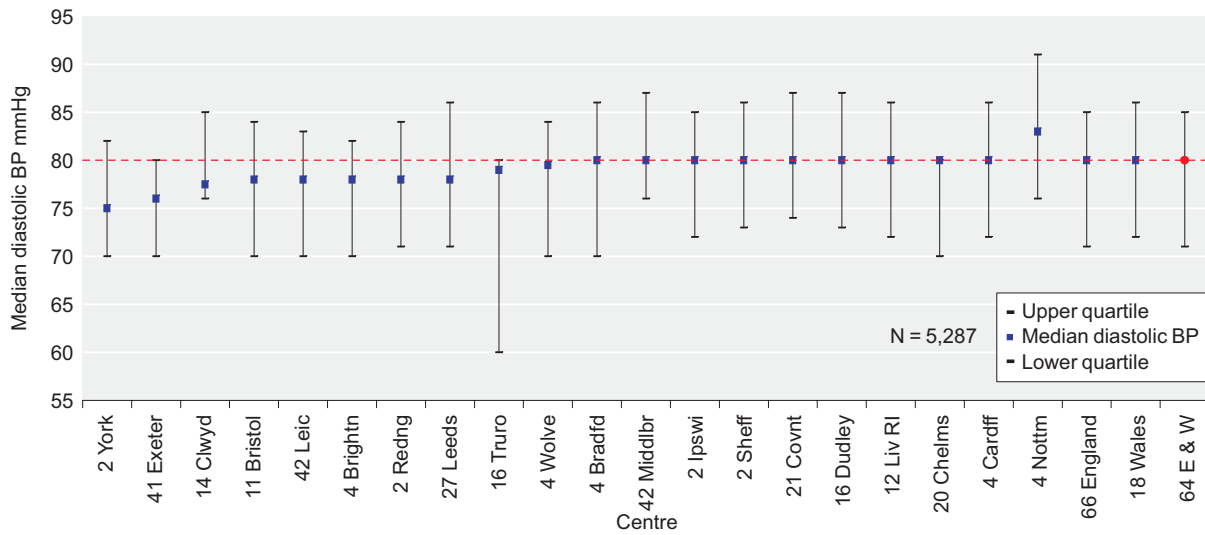


Figure 11.15: Median diastolic BP mmHg in prevalent transplant patients by centre on 31/12/2006

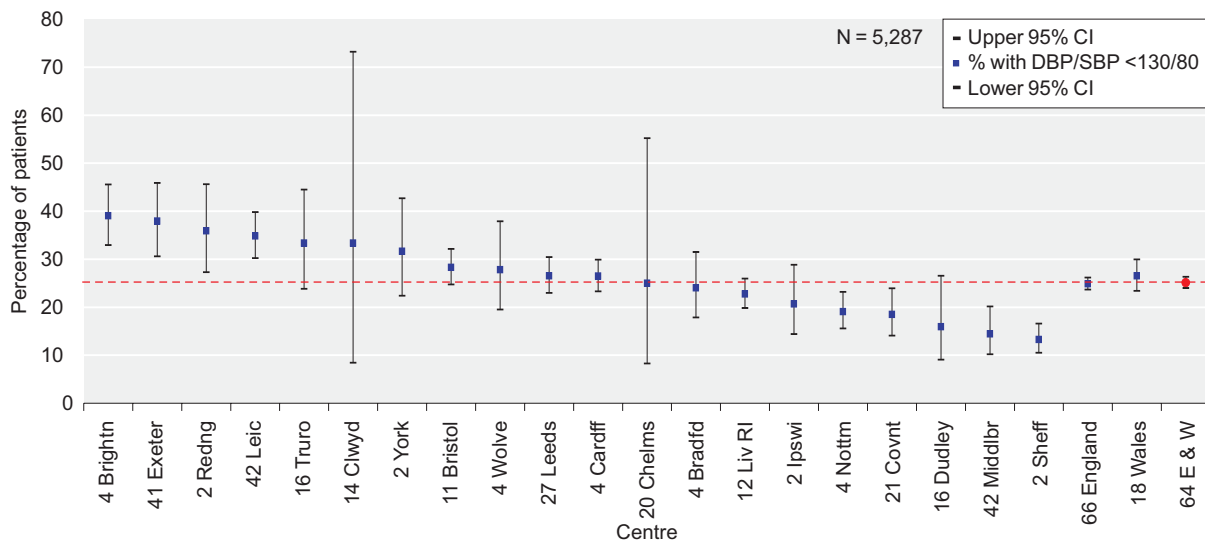
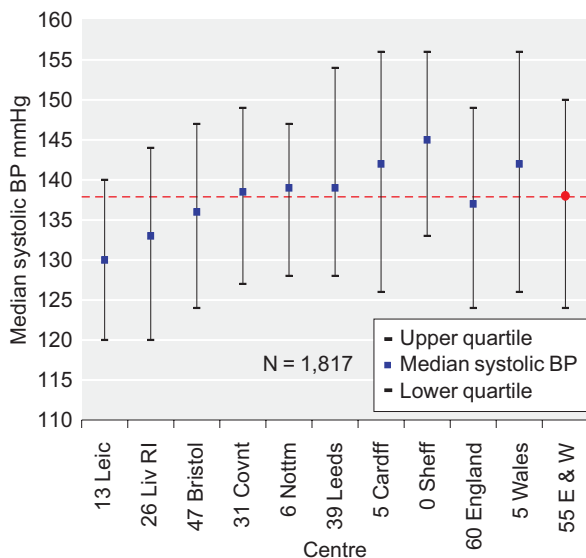


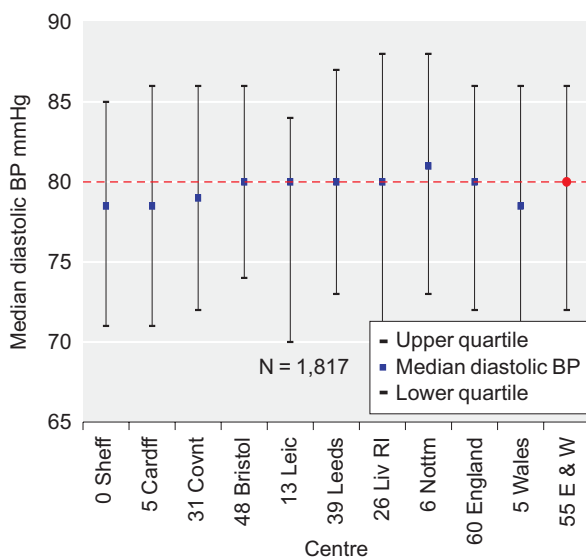
Figure 11.16: Percentage of prevalent transplant patients with SBP <130 mmHg and DBP <80 mmHg by centre on 31/12/2006

### Blood pressure in patients one year after transplantation

Systolic and diastolic blood pressure at one year post transplantation is given in Figure 11.17 and Figure 11.18 respectively. Since only a few centres had substantially >50% data returns for this variable caution needs to be exercised when comparing centres.



**Figure 11.17: Median systolic BP mmHg one year post transplant by transplant centre for patients transplanted between 2000–2005**



**Figure 11.18: Median diastolic BP mmHg one year post transplant by transplant centre for patients transplanted between 2000–2005**

### Analysis of prevalent transplant patients by CKD stage

Patients were classified into different stages according to the CKD classification: Stage 1T – eGFR  $\geq 90$  ml/min/1.73 m<sup>2</sup>; Stage 2T – eGFR 60–89 ml/min/1.73 m<sup>2</sup>; Stage 3T – eGFR 30–59 ml/min/1.73 m<sup>2</sup>; Stage 4T – eGFR 15–29 ml/min/1.73 m<sup>2</sup>; Stage 5T – eGFR <15 ml/min/1.73 m<sup>2</sup>. Using the KDIGO guidelines, RTR with eGFR  $\geq 60$  ml/min/1.73 m<sup>2</sup> were classified as CKD stage 1T–2T according to the level of GFR alone, which is in contrast to the KDOQI guidelines for native CKD, where markers of kidney damage (i.e. proteinuria, scarring) are also required. The UKRR does not collect data on proteinuria, allograft imaging or histology.

About 3% of prevalent transplant patients returned to dialysis in 2006 and this was similar to all previous years since 2000. Table 11.15 shows nearly 17% of the prevalent transplant population, or nearly 2,500 patients, had moderate to advanced renal impairment of eGFR <30 ml/min/1.73 m<sup>2</sup>.

The table this year also includes the percentage in each group achieving the Standard in 2005 for comparison with the 2006 data. Similar to last year’s analysis, the table demonstrates that patients with failing grafts do not achieve RA standards for key biochemical and clinical outcome variables with the same frequency as patients already on dialysis. In 2006, there might be a slight improvement in the percentage of patients in Stage 5T with PTH < 32 (54% v 50%) but this has been achieved with an increase in serum phosphate above 1.8 mmol/L (29% v 26%).

This substantial group of patients represents a not inconsiderable challenge as resources need to be channelled not only to improve key outcome variables but also to achieve a safe and timely modality switch to another form of RRT.

**Table 11.15: Analysis by CKD stage for prevalent transplant patients compared with prevalent dialysis patients**

	Stage 1–2T (≥60)	Stage 3T (30–59)	Stage 4T (15–29)	Stage 5T (<15)	Stage 5D
No of patients	3,536	8,440	2,103	326	14,950
% of patients	24.6	58.6	14.6	2.3	
<b>eGFR ml/min/1.73 m<sup>2</sup> <sup>a</sup></b>					
mean ± SD	73.8 ± 12.7	44.9 ± 8.3	23.9 ± 4.2	11.7 ± 2.6	
median	70.4	44.8	24.4	12.2	
<b>Systolic BP mmHg</b>					
mean ± SD	134.7 ± 17.6	137.2 ± 18.3	140.9 ± 20.8	140.9 ± 20.3	130.8 ± 24.8
% ≥ 130	60.4	65.4	72.6	70.3	49.6
<b>Diastolic BP mmHg</b>					
mean ± SD	78.3 ± 10.5	78.7 ± 10.8	79.0 ± 11.8	78.0 ± 11.6	70.6 ± 14.2
% ≥ 80	49.4	50.7	51.0	56.0	25.9
<b>Cholesterol mmol/L</b>					
mean ± SD in 2006	4.6 ± 1.0	4.6 ± 1.0	4.7 ± 1.1	4.7 ± 1.3	4.0 ± 1.4
% ≥ 5 in 2006	31.3	32.4	36.9	34.7	16.4
% ≥ 5 in 2005	35.8	38.4	40.5	35.3	18.4
<b>Haemoglobin g/dl</b>					
mean ± SD in 2006	13.7 ± 1.6	12.9 ± 1.6	11.7 ± 1.6	11.0 ± 1.7	11.8 ± 1.6
% <10 in 2006	1.3	2.9	11.2	25.1	12.4
% <10 in 2005	1.1	3.1	11.4	27.4	13.3
<b>Ferritin µg/L</b>					
Median in 2006	87.0	119.0	170.0	178.0	404.0
% ≤ 100 in 2006	54.4	43.8	28.8	25.9	6.0
% ≤ 100 in 2005	49.5	41.9	30.9	22.2	6.2
<b>Phosphate mmol/L<sup>b</sup></b>					
mean ± SD in 2006	1.0 ± 0.2	1.0 ± 0.2	1.2 ± 0.3	1.6 ± 0.4	1.6 ± 0.4
% ≥ 1.8 in 2006	0.1	0.2	3.1	29.0	27.9
% ≥ 1.8 in 2005	0.1	0.3	3.0	26.0	30.0
<b>Corrected calcium mmol/L</b>					
mean ± SD in 2006	2.4 ± 0.1	2.4 ± 0.2	2.4 ± 0.2	2.3 ± 0.2	2.4 ± 0.2
% >2.6 in 2006	7.0	7.9	5.7	7.3	9.1
% <2.1 in 2006	6.6	7.2	12.2	27.7	15.9
% >2.6 in 2005	9.5	9.8	5.9	7.2	10.5
% <2.1 in 2005	3.9	5.6	11.5	24.7	13.8
<b>iPTH pmol/L</b>					
Median in 2006	8.6	9.7	17.2	29.0	25.1
% ≥ 32 in 2006	4.0	6.8	23.4	46.4	40.9
% ≥ 32 in 2005	7.1	6.5	21.9	49.7	39.2
<b>Albumin g/L<sup>c</sup></b>					
mean ± SD	42.5 ± 4.0	41.8 ± 3.9	40.1 ± 4.6	38.3 ± 5.1	37.8 ± 5.1
<b>Bicarbonate mmol/L</b>					
mean ± SD	25.7 ± 3.1	24.9 ± 3.4	22.9 ± 3.8	21.0 ± 4.4	23.7 ± 3.7

Data from last 2 quarters in 2006 and also where relevant data from 2005 used for this analysis.

For stage 5D, incident dialysis patients in 2006 were excluded.

<sup>a</sup> Prevalent transplant patients with no ethnicity data were classed as White.

<sup>b</sup> Only PD patients included in stage 5D, n = 2,645.

<sup>c</sup> Only patients with BCG assay included: transplant patients n = 12,610, only HD patients included in stage 5D n = 9,489.

## References

1. Appendix. *Nephrol Dial Transplant* 2007;22(Suppl 7): vii 194–vii 244.
2. Levey AS, Greene T, Kusek JW, Beck GJ. A simplified equation to predict glomerular filtration rate from serum creatinine (abstract). *J Am Soc Nephrol* 2000;11: A0828.