UK Renal Registry 17th Annual Report: Chapter 3 Demographic and Biochemistry Profile of Kidney Transplant Recipients in the UK in 2013: National and Centre-specific Analyses

Rishi Pruthi[a], Anna Casula[a], Iain MacPhee[b]

[a]UK Renal Registry, Bristol, UK; [b]St George's, University of London, UK

Key Words

Blood pressure · Bone metabolism · Chronic kidney disease · Clinical Commissioning Group · Deceased donor · eGFR · Epidemiology · Ethnicity · Graft function · Haemoglobin · Live donor · Outcomes · Renal transplantation · Survival

Summary

- There was a 12% increase in overall renal transplant numbers in 2013, with a significant rise in kidney donation from donors after brainstem death (20%).
- In 2013, death-censored renal transplant failure rates in prevalent patients were similar to previous years at 2.4% per annum. Transplant patient death rates remained stable at 2.4 per 100 patient years.
- The median age of incident and prevalent renal transplant patients in the UK was 50.3 and 52.8 years respectively.
- The median eGFR of prevalent renal transplant recipients was 51.8 ml/min/1.73 m^2.
- The median eGFR of patients one year after transplantation was 56.9 ml/min/1.73 m^2 post live transplant, 53.0 ml/min/1.73 m^2 post brainstem death transplant and 49.7 ml/min/1.73 m^2 post circulatory death transplant.
- In 2013, 13.4% of prevalent transplant patients had eGFR $<$30 ml/min/1.73 m^2.
- The median decline in eGFR slope beyond the first year after transplantation was $-$0.58 ml/min/1.73 m^2/year.
- In 2013, infection (26%) and malignancy (24%) remained the commonest causes of death in patients with a functioning renal transplant.

Introduction

This chapter includes independent analyses regarding renal transplant activity and survival data from the UK Transplant Registry, held by the Organ Donation and Transplantation Directorate (ODT) of NHS Blood and Transplant (NHSBT). The UK Renal Registry (UKRR) has performed additional analyses of renal transplant recipient follow-up data examining demographics, clinical and biochemical variables. NHSBT records all the information regarding the episode of transplantation (donor and recipient details) and 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 six 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; (5) eGFR slope analysis; and (6) cause of death in transplant recipients. Methodology, results and conclusions of these analyses are discussed in detail for all six sections separately.

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. Throughout the chapter, the number preceding the centre name in each figure indicates the percentage of missing data for that centre for that variable.

Unless otherwise specified, prevalent transplant patients were defined as patients with a functioning renal transplant on the 31st December 2013.

A list of the recommended audit measures from the Renal Association which are relevant to the transplant population are given in appendix 1 of this chapter. Several of the audit measures are not currently reported by the UKRR in the annual report; the reasons behind this are varied, but predominantly relate to a high proportion of incomplete data or that the relevant variable is not currently within the specified UKRR dataset. Over time it is hoped to work with the renal community to improve reporting across the range of recommended standards.

Transplant activity, waiting list activity and survival data

Introduction

NHSBT prospectively collects donor and recipient data around the episode of transplantation. They also request that 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.

Methods

In 2013, there were 23 UK adult renal transplant centres, 19 in England, two in Scotland and one 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 kidney donors (donor after brainstem death and donor after circulatory death), living kidney donors, patient survival and graft survival is available on the NHSBT website (http://www.organdonation.nhs.uk/ukt/statistics/statistics.asp).

Results

During 2013, 3,257 kidney or kidney plus other organ transplants were performed. The absolute number of living kidney donors showed a 6% rise in 2013 representing 33.8% of all transplants performed whilst donor after circulatory death transplants continued to increase and comprised 24.4% of all kidney transplants performed. A 20% rise in the number of transplants from donors after brainstem death was also noted in 2013 (table 3.1).

There were small differences in one and five year risk-adjusted patient and graft survival rates amongst UK renal transplant centres (table 3.2). These graft survival rates include grafts with primary non-function (which are excluded from analysis by some countries).

Using data from the UKRR on prevalent renal transplant patients on 1st January 2013, the death rate during 2013 was 2.4/100 patient years (CI 2.2–2.6) when censored for return to dialysis and 2.5/100 patient years (CI 2.3–2.7) without censoring for dialysis. These death rates are similar to those observed over the last few years and have not shown any impact of the increasing age of the transplanted cohort.

During 2013, 2.4% of prevalent transplant patients experienced graft failure (excluding death as a cause of graft failure) maintaining the fall in graft failure rates

Table 3.1. UK kidney and kidney plus other organ transplant numbers in the UK (including paediatric), 1/1/2011–31/12/2013

Organ	2011	2012	2013	% change 2012–2013
Donor after brainstem death[a]	950	967	1,160	20
Donor after circulatory death[b]	594	708	794	12
Living donor kidney	1,026	1,034	1,100	6
Kidney and liver[c]	17	17	11	−35
Kidney and heart	0	3	1	
Kidney and pancreas[d]	163	172	190	10
Small bowel (inc kidney)	2	0	1	
Total kidney transplants	**2,752**	**2,901**	**3,257**	**12**

[a]Includes en bloc kidney transplants (7 in 2011, 4 in 2012, 4 in 2013) and double kidney transplants (5 in 2011, 7 in 2012, 18 in 2013)
[b]Includes en bloc kidney transplants (2 in 2011, 4 in 2012, 6 in 2013) and double kidney transplants (32 in 2011, 52 in 2012, 53 in 2013)
[c]Includes DCD transplants (2 in 2013)
[d]Includes DCD transplants (28 in 2011, 35 in 2012, 36 in 2013)

noted over the last couple of years. Whilst it might be premature to assume that graft failure rates are falling in the UK the 0.5% fall noted in the last five years is certainly encouraging.

Conclusions

In 2013, the increased number of kidney transplants performed was mostly due to an increase in organs from donors after brainstem death. The graft failure

Table 3.2. Risk-adjusted first adult kidney transplant only, graft and patient survival percentage rates for UK centres[a]

	Deceased donor 1 year survival		Deceased donor 5 year survival		Living kidney donor 1 year survival		Living kidney donor 5 year survival	
Centre	Graft	Patient	Graft	Patient	Graft	Patient	Graft	Patient
B QEH	89	97	83	90	97	100	89	95
Belfast	95	94	89	89	97	100	90	94
Bristol	93	95	85	86	98	99	95	97
Camb	92	97	85	92	98	99	93	98
Cardff	97	97	85	88	96	98	86	96
Covnt	87	92	89	89	94	99	86	94
Edin	91	95	83	86	96	98	89	95
Glasgw	95	96	86	90	96	97	93	97
L Barts	90	90	89	88	96	98	92	94
L Guys	93	96	83	88	97	98	92	95
L Rfree	94	96	90	93	98	99	96	96
L St.G	94	98	86	94	99	100	94	95
L West	95	98	88	91	96	99	82	95
Leeds	93	96	85	90	94	100	91	98
Leic	92	96	86	79	97	98	93	94
Liv Roy	92	94	81	91	95	100	91	94
M RI	95	96	87	89	99	98	95	96
Newc	93	95	83	87	100	99	91	98
Nottm	95	96	84	85	96	100	91	95
Oxford	93	96	89	87	97	97	96	94
Plymth	87	96	86	90	96	100	88	94
Ports	95	95	80	87	98	99	84	95
Sheff	92	96	83	93	97	100	92	98
All centres	**93**	**96**	**85**	**89**	**97**	**99**	**91**	**96**

Cohorts for survival rate estimation: 1 year survival: 1/1/2008–31/12/2012; 5 year survival: 1/1/2004–31/12/2008; 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
[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.asp)

rate of 2.4% per annum and patient death rate of 2.4 per 100 patient years were similar to those noted in 2012.

Transplant demographics

Introduction

Since 2008, all 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.

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 a patient is referred back to their local centre 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 usually attributed to the referring centre (see appendix B2 for allocation procedure). This process may result in some discrepancies in transplant numbers particularly in Oxford/Reading and Clywd/Liverpool Royal.

Methods

Two centres (Bangor and Colchester) 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.

For the analysis of primary renal diagnosis (PRD) in transplant recipients, a few centres were excluded from some of the take-on years because of concerns relating to the reliability of PRD coding (with these centres submitting a high percentage of uncertain or missing aetiology codes).

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 2013. The prevalence of transplant patients in areas covered by individual Clinical Commissioning Groups (CCG) or Health Board/Social Care Areas (HB) was estimated based on the postcode of the registered address for patients on renal replacement therapy (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 ethnicity regrouping into the above categories are provided in appendix H: Coding http://www.renalreg.org.

Results and Conclusions

Prevalent transplant numbers across the UK are described in table 3.3.

The prevalence of renal transplant recipients in each CCG/HB in England, Northern Ireland (Health and Social Care Trust Areas), Scotland (Health Boards) and Wales (Local Health Boards) and the proportion of prevalent patients according to modality in the renal centres across the UK is described in tables 3.4 and 3.5 respectively. After standardisation for age and gender, unexplained variability was evident in the prevalence of renal transplant recipients, with some areas having higher than the predicted number of prevalent transplant patients per million population and others lower. There are a number of potential explanations for these inconsistencies, including geographical differences in access to renal transplantation in the UK. This has previously been analysed in detail by the UKRR [2] and is currently the focus of a large national study (access to Transplant and Transplant Outcome Measures (ATTOM)).

The proportion of prevalent RRT patients with a transplant relative to the number on dialysis has been relatively stable over the last decade.

Age and gender

The gender ratio amongst incident and prevalent transplant patients has remained stable for at least the last ten years (table 3.6, figure 3.1). Note, absolute patient numbers differ from those published in previous reports as a result of additional data validation and reallocation of patients. The average age of incident transplant patients has steadily increased during the same time period. There has also been a gradual increase in the average age of prevalent transplant patients, which

Table 3.3. The prevalence per million population (pmp) of renal transplants in adults in the UK on 31/12/2013, by country

	England	N Ireland	Scotland	Wales	UK
Number of prevalent transplant patients	24,782	815	2,478	1,517	29,592
Total population, mid-2013 estimates from ONS* (millions)	53.9	1.8	5.3	3.1	64.1
Prevalence pmp transplant	460	445	465	492	462

*Office of National Statistics, UK

Table 3.4. The prevalence per million population (pmp) of patients with a renal transplant and standardised rate ratio in the UK, as on 31st December 2009–2013, by CCG/HB

[a]CCG/HB – Clinical Commissioning Group (England); Health and Social Care Trust Areas (Northern Ireland); Health Board (Scotland) and Local Health Board (Wales)
[b]Population numbers based on the 2012 mid-year estimates by age group and gender (data obtained from the Office of National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 Census)
[c]O/E – age and gender standardised prevelence rate ratio
CCG/HBs with significantly high average rate ratios are bold in greyed areas
CCG/HBs with significantly low average rate ratios are italicised in greyed areas
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
% non-White – percentage of the CCG/HB population that is non-White, from 2011 Census

UK Area	CCG/HB[a]	Total population[b]	Crude rate pmp					Age and gender standardised rate ratio 2013			% non-White
			2009	2010	2011	2012	2013	O/E[c]	95% LCL	95% UCL	
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	195,300	307	363	394	415	450	0.89	0.72	1.10	3.7
	NHS South Cheshire	176,800	345	396	396	413	452	0.93	0.75	1.15	2.9
	NHS Vale Royal	*102,100*	*274*	*274*	*284*	*303*	*352*	*0.72*	*0.52*	*1.00*	*2.1*
	NHS Warrington	203,700	403	368	393	417	476	0.99	0.82	1.21	4.1
	NHS West Cheshire	228,100	355	377	403	430	469	0.96	0.80	1.16	2.8
	NHS Wirral	*320,200*	*328*	*334*	*340*	*340*	*350*	*0.73*	*0.61*	*0.88*	*3.0*
Durham, Darlington and Tees	NHS Darlington	105,200	314	333	390	390	428	0.90	0.67	1.21	3.8
	NHS Durham Dales, Easington and Sedgefield	273,000	421	429	469	476	520	1.05	0.89	1.24	1.2
	NHS Hartlepool and Stockton-on-Tees	284,600	411	432	425	450	485	1.04	0.88	1.22	4.4
	NHS North Durham	241,300	369	394	390	410	431	0.89	0.74	1.08	2.5
	NHS South Tees	**273,700**	**511**	**515**	**548**	**559**	**563**	**1.21**	**1.04**	**1.42**	**6.7**
Greater Manchester	**NHS Bolton**	**279,000**	**423**	**452**	**498**	**527**	**548**	**1.20**	**1.03**	**1.41**	**18.1**
	NHS Bury	186,200	397	397	414	440	440	0.94	0.76	1.17	10.8
	NHS Central Manchester	182,400	285	329	351	367	422	1.19	0.95	1.49	48.0
	NHS Heywood, Middleton & Rochdale	212,000	382	396	429	453	486	1.07	0.89	1.30	18.3
	NHS North Manchester	167,100	245	293	317	359	389	0.98	0.77	1.25	30.8
	NHS Oldham	225,900	363	390	407	425	483	1.09	0.90	1.32	22.5
	NHS Salford	237,100	299	337	363	413	418	0.95	0.78	1.16	9.9
	NHS South Manchester	161,300	229	273	316	353	378	0.93	0.72	1.20	19.6
	NHS Stockport	283,900	373	398	409	423	451	0.94	0.79	1.12	7.9
	NHS Tameside and Glossop	253,400	403	430	470	478	497	1.05	0.88	1.25	8.2
	NHS Trafford	228,500	289	328	359	390	416	0.90	0.73	1.10	14.5
	NHS Wigan Borough	318,700	342	383	449	483	543	1.12	0.97	1.30	2.7
Lancashire	NHS Blackburn with Darwen	147,700	311	311	359	386	433	1.00	0.78	1.28	30.8
	NHS Blackpool	142,000	373	359	359	416	479	0.99	0.78	1.26	3.3
	NHS Chorley and South Ribble	167,900	298	345	393	393	435	0.89	0.71	1.12	2.9
	NHS East Lancashire	371,600	409	404	436	441	474	1.00	0.87	1.16	11.9
	NHS Fylde & Wyre	165,000	315	315	321	364	400	0.79	0.62	1.01	2.1
	NHS Greater Preston	202,000	317	327	337	376	396	0.87	0.70	1.08	14.7
	NHS Lancashire North	158,500	328	334	347	347	366	0.79	0.61	1.02	4.0
	NHS West Lancashire	110,900	316	370	388	415	406	0.83	0.62	1.12	1.9
Merseyside	NHS Halton	125,700	342	382	406	446	453	0.96	0.74	1.24	2.2
	NHS Knowsley	145,900	370	384	377	397	418	0.90	0.70	1.16	2.8
	NHS Liverpool	469,700	326	349	381	398	422	0.96	0.83	1.10	11.1
	NHS South Sefton	159,400	332	351	370	414	445	0.92	0.73	1.16	2.2
	NHS Southport and Formby	*114,300*	*254*	*306*	*315*	*289*	*350*	*0.71*	*0.52*	*0.97*	*3.1*
	NHS St Helens	176,100	307	335	346	352	397	0.82	0.65	1.03	2.0
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	505,200	368	394	402	426	455	0.90	0.79	1.02	1.5
	NHS Gateshead	200,200	385	385	415	445	440	0.92	0.75	1.14	3.7
	NHS Newcastle North and East	141,600	431	445	480	445	466	1.13	0.89	1.44	10.7
	NHS Newcastle West	140,900	348	326	341	362	383	0.89	0.68	1.16	18.3

Table 3.4. Continued

UK Area	CCG/HB[a]	Total population[b]	Crude rate pmp					Age and gender standardised rate ratio 2013			% non-White
			2009	2010	2011	2012	2013	O/E[c]	95% LCL	95% UCL	
Cumbria, Northumberland, Tyne and Wear	**NHS North Tyneside**	**201,400**	**526**	**571**	**586**	**586**	**586**	**1.21**	**1.01**	**1.44**	**3.4**
	NHS Northumberland	316,100	414	389	437	446	481	0.94	0.81	1.11	1.6
	NHS South Tyneside	148,400	472	472	505	512	559	1.16	0.93	1.43	4.1
	NHS Sunderland	275,700	417	439	482	497	519	1.08	0.92	1.27	4.1
North Yorkshire and Humber	NHS East Riding of Yorkshire	314,500	385	394	410	426	493	0.96	0.82	1.13	1.9
	NHS Hambleton, Richmondshire and Whitby	*153,400*	*274*	*274*	*300*	*313*	*352*	*0.70*	*0.54*	*0.92*	*2.7*
	NHS Harrogate and Rural District	158,600	435	467	479	530	536	1.09	0.88	1.35	3.7
	NHS Hull	257,200	369	385	404	435	478	1.08	0.91	1.29	5.9
	NHS North East Lincolnshire	159,700	363	369	419	445	470	1.00	0.80	1.25	2.6
	NHS North Lincolnshire	*168,400*	*267*	*267*	*279*	*291*	*315*	*0.65*	*0.49*	*0.85*	*4.0*
	NHS Scarborough and Ryedale	110,500	407	425	453	434	425	0.85	0.64	1.13	2.5
	NHS Vale of York	346,100	387	407	433	488	526	1.11	0.96	1.28	4.0
South Yorkshire and Bassetlaw	NHS Barnsley	233,700	389	407	411	419	441	0.91	0.75	1.10	2.1
	NHS Bassetlaw	*113,200*	*292*	*318*	*318*	*336*	*345*	*0.69*	*0.50*	*0.94*	*2.6*
	NHS Doncaster	302,700	334	344	380	406	413	0.87	0.73	1.04	4.7
	NHS Rotherham	258,400	356	399	434	457	492	1.03	0.86	1.22	6.4
	NHS Sheffield	557,400	319	355	382	395	418	0.96	0.85	1.10	16.3
West Yorkshire	NHS Airedale, Wharfedale and Craven	158,200	417	455	436	449	474	0.98	0.78	1.23	11.1
	NHS Bradford City	**82,300**	**377**	**389**	**401**	**486**	**522**	**1.56**	**1.16**	**2.10**	**72.2**
	NHS Bradford Districts	**333,500**	**429**	**462**	**471**	**525**	**570**	**1.32**	**1.15**	**1.52**	**28.7**
	NHS Calderdale	205,300	434	472	507	536	531	1.11	0.92	1.34	10.3
	NHS Greater Huddersfield	238,800	373	398	431	461	473	1.01	0.84	1.22	17.4
	NHS Leeds North	199,600	351	366	406	416	421	0.90	0.73	1.12	17.4
	NHS Leeds South and East	238,300	348	378	394	407	466	1.09	0.90	1.31	18.3
	NHS Leeds West	319,800	294	328	350	403	441	1.05	0.89	1.24	10.8
	NHS North Kirklees	**186,700**	**477**	**487**	**509**	**514**	**595**	**1.34**	**1.11**	**1.61**	**25.3**
	NHS Wakefield	*327,600*	*314*	*339*	*354*	*375*	*397*	*0.82*	*0.69*	*0.97*	*4.6*
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	423,900	361	392	418	439	455	1.05	0.91	1.21	22.2
	NHS Herefordshire	*184,900*	*297*	*292*	*303*	*324*	*341*	*0.68*	*0.53*	*0.87*	*1.8*
	NHS Redditch and Bromsgrove	178,700	353	369	369	408	420	0.86	0.69	1.08	6.0
	NHS South Warwickshire	259,200	363	405	409	455	471	0.96	0.81	1.15	7.0
	NHS South Worcestershire	*292,300*	*291*	*325*	*339*	*346*	*373*	*0.76*	*0.63*	*0.91*	*3.7*
	NHS Warwickshire North	188,000	378	399	441	436	452	0.93	0.75	1.15	6.5
	NHS Wyre Forest	98,100	357	357	357	377	408	0.81	0.59	1.10	2.8
Birmingham and the Black Country	NHS Birmingham CrossCity	721,400	352	371	391	413	438	1.06	0.95	1.19	35.2
	NHS Birmingham South and Central	199,600	361	381	371	366	431	1.09	0.88	1.34	40.4
	NHS Dudley	*313,600*	*297*	*303*	*309*	*290*	*328*	*0.69*	*0.57*	*0.84*	*10.0*
	NHS Sandwell and West Birmingham	475,700	349	357	368	397	454	1.10	0.96	1.26	45.3
	NHS Solihull	*207,400*	*285*	*299*	*313*	*338*	*342*	*0.72*	*0.57*	*0.91*	*10.9*
	NHS Walsall	270,900	376	388	413	428	469	1.04	0.87	1.24	21.1
	NHS Wolverhampton	251,000	299	303	299	315	379	0.85	0.70	1.04	32.0
Derbyshire and Nottinghamshire	NHS Erewash	94,600	264	285	285	296	412	0.86	0.63	1.18	3.2
	NHS Hardwick	*108,900*	*257*	*266*	*257*	*257*	*257*	*0.52*	*0.36*	*0.75*	*1.8*
	NHS Mansfield & Ashfield	192,500	322	358	400	452	473	0.98	0.80	1.20	2.5
	NHS Newark & Sherwood	115,900	380	431	440	492	535	1.08	0.84	1.39	2.4
	NHS North Derbyshire	*272,100*	*320*	*334*	*364*	*404*	*401*	*0.79*	*0.66*	*0.96*	*2.5*
	NHS Nottingham City	308,700	233	314	330	353	395	1.00	0.84	1.19	28.5
	NHS Nottingham North & East	146,200	301	342	383	410	438	0.90	0.70	1.15	6.2
	NHS Nottingham West	110,700	379	443	461	470	533	1.09	0.85	1.41	7.3
	NHS Rushcliffe	111,600	332	341	385	403	457	0.93	0.71	1.23	6.9
	NHS Southern Derbyshire	515,300	311	357	390	411	444	0.95	0.84	1.08	11.0

Table 3.4. Continued

UK Area	CCG/HB[a]	Total population[b]	Crude rate pmp					Age and gender standardised rate ratio 2013			% non-White
			2009	2010	2011	2012	2013	O/E[c]	95% LCL	95% UCL	
East Anglia	NHS Cambridgeshire and Peterborough	849,000	346	375	399	410	435	0.94	0.85	1.04	9.5
	NHS Great Yarmouth & Waveney	213,200	305	300	314	338	436	0.90	0.73	1.10	2.7
	NHS Ipswich and East Suffolk	395,700	306	331	364	369	427	0.88	0.76	1.03	5.6
	NHS North Norfolk	167,900	369	369	393	375	500	0.96	0.78	1.19	1.5
	NHS Norwich	193,400	300	300	336	321	409	0.92	0.74	1.14	7.3
	NHS South Norfolk	235,200	332	361	336	357	455	0.92	0.77	1.12	2.6
	NHS West Norfolk	171,300	327	339	344	391	426	0.86	0.68	1.08	2.6
	NHS West Suffolk	221,000	348	371	380	416	430	0.90	0.74	1.11	4.6
Essex	NHS Basildon and Brentwood	250,500	307	347	363	375	467	1.00	0.84	1.20	7.1
	NHS Castle Point, Rayleigh and Rochford	172,100	378	372	378	389	436	0.87	0.69	1.09	3.0
	NHS Mid Essex	379,600	369	387	424	414	477	0.98	0.85	1.14	4.4
	NHS North East Essex	314,300	321	340	379	395	433	0.91	0.77	1.08	5.5
	NHS Southend	174,800	286	320	332	366	435	0.94	0.75	1.17	8.4
	NHS Thurrock	159,500	295	307	338	357	370	0.83	0.64	1.07	14.1
	NHS West Essex	290,000	334	372	379	407	417	0.88	0.74	1.06	8.2
Hertfordshire and the South Midlands	NHS Bedfordshire	419,200	375	396	403	465	480	1.01	0.88	1.16	11.2
	NHS Corby	63,100	285	317	349	333	317	0.70	0.45	1.08	4.5
	NHS East and North Hertfordshire	540,700	324	355	375	409	436	0.95	0.83	1.08	10.4
	NHS Herts Valleys	569,900	344	395	419	439	467	1.02	0.90	1.15	14.6
	NHS Luton	**205,800**	**335**	**374**	**432**	**471**	**525**	**1.29**	**1.07**	**1.55**	**45.3**
	NHS Milton Keynes	257,900	341	380	415	450	450	1.00	0.84	1.21	19.6
	NHS Nene	621,800	370	397	420	417	439	0.93	0.83	1.05	9.1
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	319,500	369	379	401	422	435	0.89	0.75	1.05	9.8
	NHS Leicester City	**331,600**	**516**	**516**	**549**	**570**	**630**	**1.56**	**1.36**	**1.78**	**49.5**
	NHS Lincolnshire East	228,100	342	364	373	386	425	0.83	0.68	1.01	2.0
	NHS Lincolnshire West	227,700	329	329	347	365	395	0.84	0.68	1.03	3.0
	NHS South Lincolnshire	*141,000*	*213*	*255*	*255*	*269*	*269*	*0.54*	*0.39*	*0.74*	*2.3*
	NHS South West Lincolnshire	122,000	287	287	344	361	377	0.76	0.57	1.01	2.3
	NHS West Leicestershire	374,200	393	430	454	470	497	1.03	0.90	1.19	6.9
Shropshire and Staffordshire	*NHS Cannock Chase*	*132,800*	*339*	*331*	*316*	*316*	*354*	*0.73*	*0.55*	*0.97*	*2.4*
	NHS East Staffordshire	*123,900*	*218*	*242*	*266*	*258*	*339*	*0.71*	*0.52*	*0.96*	*9.0*
	NHS North Staffordshire	213,200	347	356	385	413	446	0.90	0.74	1.10	3.5
	NHS Shropshire	*308,200*	*337*	*344*	*357*	*344*	*363*	*0.73*	*0.60*	*0.88*	*2.0*
	NHS South East Staffs and Seisdon and Peninsular	222,800	355	395	390	381	426	0.86	0.70	1.05	3.6
	NHS Stafford and Surrounds	151,100	324	324	351	377	423	0.85	0.66	1.08	4.7
	NHS Stoke on Trent	258,100	384	411	407	434	434	0.95	0.79	1.14	11.0
	NHS Telford & Wrekin	*167,700*	*274*	*280*	*292*	*286*	*352*	*0.76*	*0.59*	*0.98*	*7.3*
London	NHS Barking & Dagenham	190,600	320	346	404	409	462	1.20	0.97	1.47	41.7
	NHS Barnet	**364,000**	**462**	**497**	**555**	**618**	**643**	**1.50**	**1.32**	**1.71**	**35.9**
	NHS Camden	225,000	396	413	453	476	502	1.19	0.99	1.43	33.7
	NHS City and Hackney	259,700	316	339	339	362	408	1.03	0.85	1.25	44.6
	NHS Enfield	**317,300**	**435**	**463**	**526**	**580**	**611**	**1.45**	**1.26**	**1.66**	**39.0**
	NHS Haringey	**258,900**	**398**	**436**	**483**	**529**	**560**	**1.34**	**1.14**	**1.57**	**39.5**
	NHS Havering	239,700	300	313	325	334	388	0.84	0.69	1.03	12.3
	NHS Islington	**211,000**	**455**	**469**	**507**	**554**	**602**	**1.44**	**1.21**	**1.72**	**31.8**
	NHS Newham	314,100	274	309	325	366	423	1.12	0.95	1.33	71.0
	NHS Redbridge	**284,600**	**362**	**429**	**453**	**513**	**548**	**1.31**	**1.12**	**1.53**	**57.5**
	NHS Tower Hamlets	263,000	240	293	297	342	369	1.01	0.83	1.23	54.8
	NHS Waltham Forest	262,600	377	415	438	449	487	1.18	0.99	1.40	47.8
	NHS Brent	**314,700**	**566**	**597**	**610**	**658**	**734**	**1.73**	**1.52**	**1.97**	**63.7**

Table 3.4. Continued

UK Area	CCG/HB[a]	Total population[b]	Crude rate pmp					Age and gender standardised rate ratio 2013			% non-White
			2009	2010	2011	2012	2013	O/E[c]	95% LCL	95% UCL	
London	NHS Central London (Westminster)	161,000	391	435	428	466	503	1.11	0.89	1.38	36.2
	NHS Ealing	**340,700**	**543**	**578**	**596**	**628**	**643**	**1.50**	**1.31**	**1.71**	**51.0**
	NHS Hammersmith and Fulham	179,900	400	434	428	450	484	1.14	0.93	1.41	31.9
	NHS Harrow	**242,400**	**656**	**710**	**710**	**734**	**747**	**1.69**	**1.46**	**1.95**	**57.8**
	NHS Hillingdon	**281,800**	**472**	**518**	**568**	**596**	**600**	**1.40**	**1.21**	**1.63**	**39.4**
	NHS Hounslow	**259,100**	**471**	**510**	**525**	**548**	**618**	**1.45**	**1.24**	**1.69**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	218,800	421	494	494	498	507	1.11	0.93	1.34	33.4
	NHS Bexley	**234,300**	**465**	**516**	**529**	**538**	**581**	**1.29**	**1.09**	**1.53**	**18.1**
	NHS Bromley	**314,000**	**452**	**494**	**494**	**516**	**541**	**1.17**	**1.00**	**1.36**	**15.7**
	NHS Croydon	368,900	317	331	358	377	412	0.95	0.81	1.11	44.9
	NHS Greenwich	260,100	342	369	404	446	481	1.16	0.97	1.38	37.5
	NHS Kingston	163,900	390	397	409	451	470	1.07	0.86	1.34	25.5
	NHS Lambeth	310,200	326	335	374	416	464	1.13	0.96	1.33	42.9
	NHS Lewisham	**281,600**	**391**	**380**	**391**	**408**	**497**	**1.19**	**1.00**	**1.40**	**46.5**
	NHS Merton	**202,200**	**405**	**415**	**455**	**499**	**559**	**1.28**	**1.07**	**1.54**	**35.1**
	NHS Richmond	189,100	291	307	333	360	391	0.84	0.67	1.06	14.0
	NHS Southwark	**293,500**	**453**	**480**	**511**	**555**	**596**	**1.44**	**1.24**	**1.67**	**45.8**
	NHS Sutton	193,600	418	444	454	491	511	1.12	0.92	1.37	21.4
	NHS Wandsworth	308,300	318	334	373	405	441	1.07	0.90	1.26	28.6
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	177,600	304	293	287	293	360	0.79	0.62	1.01	5.4
	NHS Gloucestershire	*602,200*	*345*	*354*	*384*	*380*	*425*	*0.88*	*0.78*	*0.99*	*4.6*
	NHS Swindon	217,200	350	414	437	447	488	1.05	0.87	1.27	10.0
	NHS Wiltshire	*476,800*	*323*	*354*	*382*	*394*	*398*	*0.83*	*0.72*	*0.95*	*3.4*
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**432,500**	**451**	**476**	**486**	**511**	**550**	**1.31**	**1.15**	**1.49**	**16.0**
	NHS North Somerset	204,400	396	421	431	465	484	0.98	0.81	1.20	2.7
	NHS Somerset	535,000	363	383	413	415	436	0.89	0.78	1.01	2.0
	NHS South Gloucestershire	266,100	436	455	466	481	507	1.07	0.90	1.27	5.0
Devon, Cornwall and Isles of Scilly	NHS Kernow	540,200	441	452	476	515	546	1.09	0.97	1.22	1.8
	NHS North, East, West Devon	869,400	428	435	444	468	504	1.05	0.96	1.15	3.0
	NHS South Devon and Torbay	273,300	428	461	483	487	545	1.08	0.92	1.27	2.1
Kent and Medway	NHS Ashford	120,100	425	441	466	516	516	1.11	0.86	1.42	6.3
	NHS Canterbury and Coastal	200,300	374	399	419	479	494	1.09	0.89	1.32	5.9
	NHS Dartford, Gravesham and Swanley	249,200	465	474	457	478	510	1.11	0.93	1.32	13.0
	NHS Medway	268,200	380	406	414	447	492	1.08	0.91	1.29	10.4
	NHS South Kent Coast	203,000	310	345	374	394	419	0.86	0.69	1.06	4.5
	NHS Swale	**108,200**	**416**	**425**	**517**	**545**	**601**	**1.28**	**1.00**	**1.63**	**3.8**
	NHS Thanet	**135,700**	**361**	**405**	**450**	**538**	**597**	**1.27**	**1.02**	**1.58**	**4.5**
	NHS West Kent	463,700	354	358	377	403	421	0.89	0.77	1.02	4.9
Surrey and Sussex	NHS Brighton & Hove	275,800	305	348	363	370	388	0.88	0.73	1.06	10.9
	NHS Coastal West Sussex	476,700	386	399	424	424	462	0.94	0.83	1.08	3.8
	NHS Crawley	108,300	286	286	314	332	342	0.78	0.57	1.08	20.1
	NHS East Surrey	175,900	313	313	318	335	370	0.78	0.62	1.00	8.3
	NHS Eastbourne, Hailsham and Seaford	*182,000*	*302*	*319*	*330*	*346*	*368*	*0.77*	*0.60*	*0.98*	*4.4*
	NHS Guildford and Waverley	*205,900*	*306*	*301*	*291*	*345*	*354*	*0.77*	*0.61*	*0.97*	*7.2*
	NHS Hastings & Rother	*181,400*	*303*	*325*	*353*	*342*	*364*	*0.74*	*0.58*	*0.94*	*4.6*
	NHS High Weald Lewes Havens	167,800	328	334	352	411	417	0.83	0.66	1.05	3.1
	NHS Horsham and Mid Sussex	*223,300*	*313*	*331*	*336*	*336*	*367*	*0.76*	*0.61*	*0.95*	*4.9*
	NHS North West Surrey	338,200	411	417	423	444	467	0.99	0.85	1.16	12.5
	NHS Surrey Downs	282,700	368	389	393	407	432	0.89	0.75	1.07	9.1
	NHS Surrey Heath	94,100	446	468	489	521	499	1.03	0.78	1.38	9.3

Table 3.4. Continued

UK Area	CCG/HB[a]	Total population[b]	Crude rate pmp					Age and gender standardised rate ratio 2013			% non-White
			2009	2010	2011	2012	2013	O/E[c]	95% LCL	95% UCL	
Thames Valley	NHS Aylesbury Vale	196,400	484	494	525	545	555	1.16	0.96	1.40	9.7
	NHS Bracknell and Ascot	132,900	376	414	451	481	504	1.09	0.86	1.38	9.5
	NHS Chiltern	317,900	396	425	425	469	497	1.05	0.90	1.23	15.8
	NHS Newbury and District	**105,100**	**561**	**542**	**618**	**618**	**628**	**1.32**	**1.03**	**1.67**	**4.4**
	NHS North & West Reading	99,300	332	403	403	433	493	1.04	0.78	1.37	10.4
	NHS Oxfordshire	647,100	400	423	436	473	487	1.06	0.95	1.19	9.3
	NHS Slough	**141,800**	**585**	**642**	**649**	**684**	**818**	**2.02**	**1.69**	**2.43**	**54.3**
	NHS South Reading	**107,200**	**560**	**560**	**579**	**569**	**607**	**1.52**	**1.19**	**1.94**	**30.5**
	NHS Windsor, Ascot and Maidenhead	139,000	338	410	439	511	561	1.22	0.98	1.53	14.7
	NHS Wokingham	156,700	389	389	402	434	440	0.92	0.73	1.17	11.6
Wessex	*NHS Dorset*	*750,300*	*396*	*407*	*415*	*409*	*425*	*0.87*	*0.78*	*0.98*	*4.0*
	NHS Fareham and Gosport	196,100	403	403	418	423	479	0.99	0.81	1.21	3.4
	NHS Isle of Wight	*138,700*	*346*	*360*	*368*	*382*	*375*	*0.74*	*0.57*	*0.97*	*2.7*
	NHS North East Hampshire and Farnham	206,800	329	368	368	387	416	0.89	0.72	1.11	9.7
	NHS North Hampshire	*216,200*	*314*	*328*	*356*	*370*	*379*	*0.79*	*0.64*	*0.99*	*6.4*
	NHS Portsmouth	206,800	348	396	392	406	435	1.03	0.84	1.26	11.6
	NHS South Eastern Hampshire	209,100	387	416	411	445	459	0.94	0.77	1.15	3.1
	NHS Southampton	239,400	338	338	384	418	464	1.12	0.93	1.35	14.1
	NHS West Hampshire	544,400	373	393	406	417	435	0.89	0.78	1.01	3.9
Wales	*Betsi Cadwaladr University*	*690,400*	*343*	*359*	*359*	*352*	*336*	*0.69*	*0.61*	*0.79*	*2.5*
	Powys Teaching	*133,000*	*361*	*399*	*391*	*354*	*369*	*0.72*	*0.55*	*0.95*	*1.6*
	Hywel Dda	383,400	412	409	438	436	503	1.03	0.90	1.19	2.2
	Abertawe Bro Morgannwg University	**519,500**	**449**	**485**	**541**	**576**	**603**	**1.27**	**1.14**	**1.42**	**3.9**
	Cwm Taf	**294,500**	**567**	**628**	**662**	**686**	**740**	**1.58**	**1.38**	**1.80**	**2.6**
	Aneurin Bevan	**578,000**	**469**	**500**	**523**	**587**	**599**	**1.26**	**1.14**	**1.40**	**3.9**
	Cardiff and Vale University	**475,300**	**406**	**440**	**467**	**501**	**515**	**1.18**	**1.04**	**1.34**	**12.2**
Scotland	*Ayrshire and Arran*	*373,200*	*386*	*383*	*375*	*402*	*426*	*0.86*	*0.73*	*1.00*	*1.2*
	Borders	113,700	361	413	413	466	484	0.93	0.72	1.22	1.3
	Dumfries and Galloway	*150,800*	*351*	*345*	*371*	*365*	*378*	*0.74*	*0.57*	*0.95*	*1.2*
	Fife	*366,200*	*306*	*319*	*344*	*355*	*388*	*0.80*	*0.68*	*0.94*	*2.4*
	Forth Valley	*299,100*	*294*	*311*	*334*	*364*	*395*	*0.81*	*0.68*	*0.97*	*2.2*
	Grampian	573,400	351	359	373	398	427	0.89	0.78	1.01	4.0
	Greater Glasgow and Clyde	**1,217,000**	**412**	**423**	**440**	**487**	**522**	**1.11**	**1.03**	**1.20**	**7.3**
	Highland	319,800	450	472	463	466	485	0.95	0.81	1.11	1.3
	Lanarkshire	572,500	384	402	423	459	479	0.99	0.88	1.11	2.0
	Lothian	*843,700*	*316*	*333*	*351*	*361*	*370*	*0.80*	*0.71*	*0.89*	*5.6*
	Orkney	21,500	418	372	372	372	372	0.72	0.36	1.44	0.7
	Shetland	23,200	259	259	215	259	259	0.52	0.24	1.16	1.5
	Tayside	411,700	398	401	415	425	447	0.93	0.80	1.07	3.2
	Western Isles	27,600	254	254	290	290	327	0.63	0.33	1.21	0.9
Northern Ireland	Belfast	348,300	359	393	405	434	465	1.07	0.92	1.25	3.2
	Northern	465,500	335	352	367	378	410	0.90	0.78	1.04	1.2
	Southern	363,100	286	303	341	386	416	0.96	0.81	1.12	1.2
	South Eastern	350,100	363	360	388	394	426	0.92	0.78	1.08	1.3
	Western	296,600	324	344	351	354	438	0.99	0.83	1.17	1.0

could reflect the increasing age at which patients are transplanted and/or improved survival after renal transplantation over the last few years. The prevalent transplant patient workload across the UK increased to 29,592 patients at the end of 2013. The continued expansion of this patient group means there is a need for careful planning by renal centres for future service provision and resource allocation.

Table 3.5. Distribution of prevalent patients on RRT by centre and modality on 31/12/2013

Centre	*N*	% HD	% PD	% Transplant
Transplant centres				
B QEH	2,051	45	7	48
Belfast	729	29	4	67
Bristol	1,427	36	5	59
Camb	1,198	32	2	66
Cardff	1,584	31	5	65
Covnt	940	41	9	50
Edinb	739	37	4	59
Glasgw	1,598	37	3	60
L Barts	2,103	45	9	45
L Guys	1,841	34	2	64
L Rfree	1,955	37	7	56
L St.G	759	37	6	57
L West	3,142	44	2	54
Leeds	1,466	35	5	61
Leic	2,072	44	7	49
Liv Roy	1,269	28	5	67
M RI	1,864	28	4	68
Newc	964	28	4	67
Nottm	1,075	35	8	58
Oxford	1,565	28	6	66
Plymth	503	27	7	66
Ports	1,555	39	5	56
Sheff	1,329	44	5	50
Dialysis centres				
Abrdn	519	43	5	52
Airdrie	393	49	4	48
Antrim	224	57	7	37
B Heart	658	66	6	28
Bangor	99	87	13	
Basldn	270	59	11	30
Bradfd	520	39	6	55
Brightn	875	45	9	45
Carlis	227	30	12	58
Carsh	1,488	51	8	41
Chelms	239	51	9	40
Clwyd	153	50	9	41
Colchr	115	100		
D & Gall	117	38	13	49
Derby	472	46	18	36
Donc	259	63	14	24
Dorset	628	43	8	50
Dudley	312	56	18	26
Dundee	403	43	5	52
Exeter	896	46	8	46
Glouc	412	51	8	41
Hull	815	40	10	50
Inverns	216	32	7	61
Ipswi	354	34	8	57
Kent	965	41	7	52
Klmarnk	296	46	15	39
Krkcldy	283	52	7	41
L Kings	965	52	11	38
Liv Ain	190	82	16	3
Middlbr	836	42	2	56
Newry	199	46	9	45

Table 3.5. Continued

Centre	*N*	% HD	% PD	% Transplant
Norwch	692	48	6	47
Prestn	1,090	50	5	45
Redng	731	39	10	51
Salford	895	45	9	46
Shrew	342	55	9	36
Stevng	758	61	5	34
Sthend	221	54	8	38
Stoke	726	43	12	45
Sund	423	47	3	51
Swanse	691	48	8	44
Truro	377	40	6	54
Ulster	156	68	4	28
West NI	238	47	6	46
Wirral	252	85	14	2
Wolve	563	53	15	32
Wrexm	250	40	9	51
York	409	34	7	59
England	**48,053**	**42**	**7**	**52**
N Ireland	**1,546**	**42**	**5**	**53**
Scotland	**4,564**	**41**	**5**	**54**
Wales	**2,777**	**39**	**7**	**55**
UK	**56,940**	**42**	**6**	**52**

Blank cells: no patients on that modality

Table 3.6. Median age and gender ratio of incident and prevalent transplant patients 2008–2013

	Incident transplants			Prevalent transplants*		
Year	*N*	Median age	M : F ratio	*N*	Median age	M : F ratio
2008	2,345	46.4	1.5	22,287	50.4	1.5
2009	2,496	48.3	1.6	23,508	50.8	1.5
2010	2,585	49.6	1.7	24,903	51.2	1.6
2011	2,633	49.1	1.7	26,197	51.7	1.6
2012	2,790	50.5	1.6	27,605	52.2	1.6
2013	3,117	50.3	1.6	29,592	52.8	1.6

*As on 31st December for given year

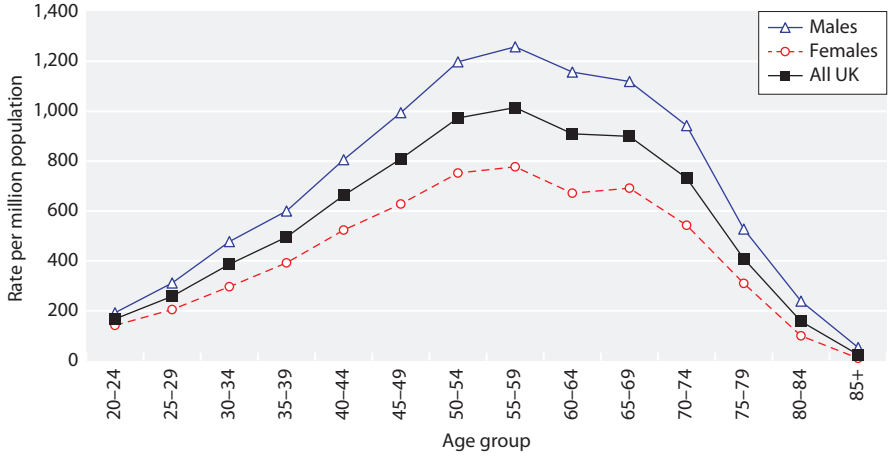

Fig. 3.1. Transplant prevalence rate per million population by age and gender on 31/12/2013

Table 3.7. Primary renal diagnosis in renal transplant recipients 2008–2013

	New transplants by year							Established transplants on 01/01/2013	
	2008	2009	2010	2011	2012	2013			
Primary diagnosis	%	%	%	%	%	%	*N*	%	*N*
Aetiology uncertain	14.6	14.1	14.2	14.7	11.9	12.3	374	15.4	4,243
Diabetes	13.1	13.3	12.5	13.0	15.2	13.3	407	9.9	2,737
Glomerulonephritis	21.9	23.5	20.4	23.1	22.6	22.3	680	23.4	6,460
Polycystic kidney disease	13.4	13.4	14.0	12.5	13.3	13.7	419	12.9	3,555
Pyelonephritis	12.1	11.4	10.2	10.1	10.0	9.9	302	13.5	3,733
Reno-vascular disease	6.7	6.2	7.3	6.5	7.0	8.1	247	5.7	1,582
Other	16.8	15.7	16.4	17.2	17.5	16.0	488	17.3	4,769
Not available	1.4	2.4	5.0	3.0	2.5	4.3	132	1.9	526

Primary renal diagnosis

The primary renal diagnosis of patients receiving kidney transplants in the UK has remained relatively stable over the last five years (table 3.7).

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 3.8). The percentages of patients with unknown ethnicity between 2008 and 2013 provided in this year's chapter are different from those in last year's chapter [3]; this reflects retrospective input of ethnicity data, improving data completeness.

Clinical and laboratory outcomes

Introduction

There continued to be marked variation in the completeness of data (tables 3.9a, 3.9b) reported by each renal centre, particularly for blood pressure. Better data records (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 inter-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 centre performance.

The 71 renal centres in the UK comprise 52 centres in England, five in Wales, five in Northern Ireland and nine in Scotland. Two centres (Bangor and Colchester) were reported as having no transplanted patients and were therefore excluded. After exclusion of these two centres, prevalent patient data from 69 renal centres across the UK were analysed.

For the one year post-transplant analyses, in which patients were assigned to the centre that performed their transplant, all 23 transplant centres across the UK were included in the analysis.

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 2006–2012, with patients attributed to the transplant centre that performed the procedure.

Table 3.8. Ethnicity of patients who received a transplant in the years 2008–2013

Year	% White	% S Asian	% Black	% Other	% Unknown
2008	76.2	9.0	6.2	1.9	6.6
2009	74.6	10.5	6.8	2.2	6.0
2010	75.2	10.5	5.8	2.3	6.1
2011	74.8	9.7	6.2	2.6	6.7
2012	72.3	9.9	7.2	3.0	7.6
2013	70.0	12.3	7.5	2.0	8.1

Table 3.9a. Percentage completeness of ethnicity, eGFR and blood pressure by centre for prevalent transplant patients on 31/12/2013

Centre	*N*	Ethnicity[a]	eGFR	Blood pressure[b]
B Heart	177	100	92	0
B QEH	950	100	93	93
Basldn	79	100	99	3
Bradfd	278	100	89	75
Brightn	387	98	89	0
Bristol	812	100	100	73
Camb	744	99	99	97
Carlis	129	100	96	0
Carsh	587	96	86	0
Chelms	92	100	98	92
Covnt	455	100	96	80
Derby	158	100	97	96
Donc	61	100	98	97
Dorset	297	100	88	78
Dudley	79	100	97	15
Exeter	403	100	98	89
Glouc	160	100	97	86
Hull	396	98	89	1
Ipswi	190	100	96	0
Kent	492	99	64	88
L Barts	910	100	99	0
L Guys	1,147	99	96	0
L Kings	349	100	97	99
L RFree	1,064	98	96	77
L St.G	403	95	96	0
L West	1,640	100	98	0
Leeds	860	100	98	98
Leic	976	97	97	49
Liv Ain	4	100	75	0
Liv Roy	832	99	93	0
M RI	1,188	99	98	0
Middlbr	449	100	88	42
Newc	621	100	99	0
Norwch	316	100	98	31
Nottm	592	100	99	86
Oxford	990	97	98	15
Plymth	310	100	93	82
Ports	825	100	95	20
Prestn	468	100	98	0
Redng	361	99	99	0
Salford	401	100	98	0
Sheff	660	100	99	91
Shrew	122	100	65	0
Stevng	248	100	71	23
Sthend	78	100	99	59
Stoke	318	100	99	0
Sund	212	100	99	0
Truro	199	100	98	2
Wirral	4	100	75	0
Wolve	177	100	98	88
York	240	100	94	42
N Ireland				
Antrim	82	100	100	74
Belfast	470	100	100	59
Newry	86	100	100	88
Ulster	41	100	100	95
West NI	107	100	99	92
Scotland				
Abrdn	259	58	97	n/a
Airdrie	184	47	67	n/a
D & Gall	56	23	89	n/a
Dundee	204	71	99	n/a
Edinb	415	13	96	n/a
Glasgw	921	13	79	n/a
Inverns	131	92	82	n/a
Klmarnk	115	74	69	n/a
Krkcldy	114	31	96	n/a
Wales				
Cardff	1,000	100	98	97
Clwyd	63	97	0	0
Swanse	287	100	99	100
Wrexm	127	100	74	0
England	**23,890**	**99**	**95**	**38**
N Ireland	**786**	**100**	**100**	**70**
Scotland	**2,399**	**34**	**85**	**n/a**
Wales	**1,477**	**100**	**92**	**85**
UK	**28,552**	**94**	**94**	**42[c]**

[a]Patients with missing ethnicity were classed as White for eGFR calculation
[b]Scottish centres excluded from blood pressure analysis as data not provided by the Scottish Renal Registry
[c]Excluding Scotland

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 bias relating to fluctuations in biochemical and clinical parameters occurring in the initial post-transplant period, one year post-transplantation outcomes are also reported. 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 is more robust. However, even the 12 months post-transplant comparisons could be biased by the fact that in some centres, repatriation of patients only occurs if the graft is failing whereas in others it only occurs if the graft function is stable.

Centres with <20 patients or <50% data completeness have been excluded from the figures. Scottish centres were also excluded from blood pressure analyses as data were not provided.

Prevalent patient data

Biochemical and clinical data for patients with a functioning transplant followed in either a transplanting or non-transplanting centre were included in the analyses. The cohort consisted of

Table 3.9b. Percentage completeness of haemoglobin, serum cholesterol, serum calcium, serum phosphate and serum PTH by centre for prevalent transplant patients on 31/12/2013

Centre	*N*	Haemoglobin	Total serum cholesterol[a]	Adjusted serum calcium[a,b]	Serum phosphate	Serum PTH[a]
England						
B Heart	177	92	65	89	88	23
B QEH	950	92	90	93	92	72
Basldn	79	99	49	99	94	44
Bradfd	278	87	73	78	62	46
Brightn	387	88	29	82	81	31
Bristol	812	100	94	100	99	99
Camb	744	98	97	99	99	97
Carlis	129	95	61	95	91	9
Carsh	587	80	60	86	86	19
Chelms	92	96	89	98	93	26
Covnt	455	96	0	95	70	40
Derby	158	96	94	96	96	92
Donc	61	97	44	93	93	64
Dorset	297	87	77	83	65	28
Dudley	79	97	92	97	96	70
Exeter	403	98	86	97	97	25
Glouc	160	96	66	96	96	24
Hull	396	89	27	89	88	7
Ipswi	190	95	57	96	96	67
Kent	492	97	77	95	95	17
L Barts	910	98	99	99	99	92
L Guys	1,147	0	55	90	90	40
L Kings	349	97	79	97	97	32
L RFree	1,064	95	81	95	95	77
L St.G	403	96	81	95	95	84
L West	1,640	98	45	98	98	36
Leeds	860	98	99	98	98	49
Leic	976	97	97	96	96	52
Liv Ain	4	75	25	75	75	50
Liv Roy	832	92	77	90	90	74
M RI	1,188	98	65	98	98	64
Middlbr	449	88	50	86	85	10
Newc	621	99	87	99	99	62
Norwch	316	98	97	95	98	30
Nottm	592	98	84	96	93	88
Oxford	990	98	74	98	98	34
Plymth	310	92	56	88	87	39
Ports	825	95	57	93	88	24
Prestn	468	97	71	95	94	58
Redng	361	99	92	98	85	48
Salford	401	98	87	97	97	80
Sheff	660	99	65	98	98	26
Shrew	122	81	79	72	72	14
Stevng	248	96	81	92	80	57
Sthend	78	99	35	99	96	8
Stoke	318	99	100	99	98	69
Sund	212	98	96	98	97	95
Truro	199	97	61	97	97	34
Wirral	4	75	75	75	75	75
Wolve	177	96	86	93	83	64
York	240	94	64	89	86	20

Table 3.9b. Continued

Centre	*N*	Haemoglobin	Total serum cholesterol[a]	Adjusted serum calcium[a,b]	Serum phosphate	Serum PTH[a]
N Ireland						
Antrim	82	100	100	95	100	98
Belfast	470	99	100	98	98	26
Newry	86	100	100	98	99	99
Ulster	41	100	100	98	98	39
West NI	107	97	99	96	96	92
Scotland						
Abrdn	259	96	n/a	n/a	95	n/a
Airdrie	184	98	n/a	n/a	97	n/a
D & Gall	56	95	n/a	n/a	88	n/a
Dundee	204	99	n/a	n/a	98	n/a
Edinb	415	95	n/a	n/a	93	n/a
Glasgw	921	97	n/a	n/a	97	n/a
Inverns	131	79	n/a	n/a	63	n/a
Klmarnk	115	97	n/a	n/a	96	n/a
Krkcldy	114	96	n/a	n/a	96	n/a
Wales						
Cardff	1,000	99	97	99	98	23
Clwyd	63	95	98	95	95	78
Swanse	287	96	88	96	96	70
Wrexm	127	95	98	95	95	98
England	**23,890**	**91**	**73**	**95**	**93**	**52**
N Ireland	**786**	**99**	**100**	**97**	**98**	**51**
Scotland[a]	**2,399**	**96**	**n/a**	**n/a**	**94**	**n/a**
Wales	**1,477**	**98**	**95**	**98**	**97**	**41**
UK	**28,552**	**92**	**75[c]**	**95[c]**	**93**	**52[c]**

[a]Dataset provided by the Scottish Renal Registry for Scottish centres shown did not include data on serum cholesterol, serum calcium or serum PTH
[b]Serum calcium corrected for serum albumin
[c]Excluding Scotland

prevalent patients as on 31st December 2013. Patients were considered as having a functioning transplant if 'transplant' was listed as the last mode of RRT in the last quarter of 2013. 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 usually allocated to the non-transplant centre (see appendix B2). Patients with a functioning transplant of less than three months duration were excluded from analyses. For haemoglobin, estimated glomerular filtration rate (eGFR), corrected calcium, phosphate and blood pressure (BP), the latest value in quarter 3 or quarter 4 of 2013 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 (unless otherwise stated). 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 2013. 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 1st January 2006 and 31st December 2012 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 3.10).

Patients who had died or experienced graft failure within 12 months of transplantation were excluded from the analyses. Patients with more than one transplant during 2006–2012 were included as separate episodes provided each of the transplants functioned for a year.

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

Table 3.10. Number of patients per transplant centre after allocation of patients at non-transplant centres (transplanted between 2006–2012)

Transplant centre	Total number of patients per transplant centre	Non-transplant centre	Number of patients rellocated to a transplant centre
B QEH	899	Stoke	2
Belfast	381	Antrim	2
		Newry	4
		Ulster	3
		West NI	4
Bristol	678	Dorset	3
Camb	1,115		
Cardff	790	Swansea	2
Covnt	369		
Edinb	644	Abrdn	1
		Dundee	6
		Inverns	2
Glasgw	635	Airdrie	2
L Barts	731		
L Guys	1,276	L Kings	3
L Rfree	647		
L St.G	581	Brightn	1
		Carsh	1
L West	1,129		
Leeds	949		
Leic	540		
Liv Roy	594	Prestn	1
M RI	1,087		
Newc	809	Middlbr	1
Nottm	414		
Oxford	1,151		
Plymth	421		
Ports	438		
Sheff	410		
Total	**16,688**		**38**

Results and conclusions

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 3.2 and 3.3. The median eGFR was 51.8 ml/min/1.73 m^2, with 13.4% of prevalent transplant recipients having an eGFR <30 ml/min/1.73 m^2. Table 3.11 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 for patients with failing transplants from transplant centres to referring centres might explain some of the differences, it is notable that both transplanting and non-transplanting centres feature at both ends of the scale. The accuracy of the 4-variable 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.

Figure 3.4 shows the percentage of prevalent patients by centre with eGFR <30 ml/min/1.73 m^2 as a funnel plot, enabling a 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 66 centres included and a normal distribution, 3–4 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.

There continued to be variation between centres; these data show over-dispersion with 16 centres falling outside the 95% CI of which six centres were outside the 99.9% CI. Three centres (Newry, London St Georges, London

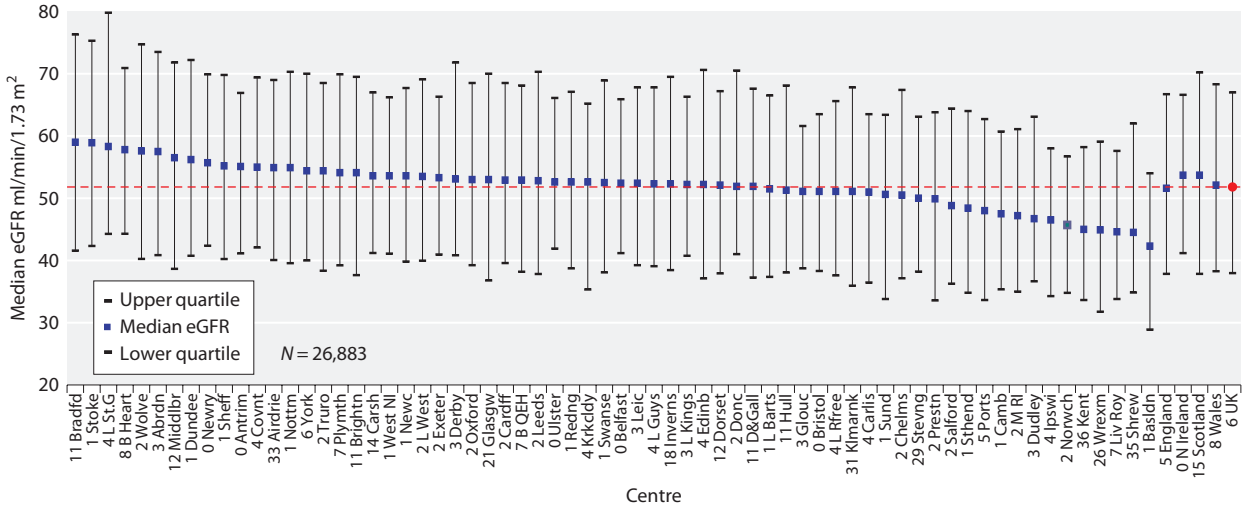

Fig. 3.2. Median eGFR in prevalent transplant patients by centre on 31/12/2013

West) fell outside the lower 99.9% CI suggesting a lower than expected proportion of patients with eGFR <30 ml/min/1.73 m^2. Liverpool Royal, Portsmouth and Preston fell outside the upper 99.9% CI suggesting a higher than expected proportion of patients with eGFR <30 ml/min/1.73 m^2.

eGFR in patients one year after transplantation

Graft function at one year post-transplantation may predict subsequent long term graft outcome [6]. Figures 3.5a, 3.5b, and 3.5c show the median one year post-transplant eGFR for patients transplanted between 2006–2012, by transplant type. Living kidney donation had the highest median eGFR at one year (56.9 ml/min/1.73 m^2), followed by donation after brainstem death (53 ml/min/1.73 m^2) and donation after circulatory death (49.7 ml/min/1.73 m^2).

Figures 3.6a, 3.6b and 3.6c show one year post-transplant eGFR by donor type and year of transplantation. An upward trend in eGFR ($p = 0.001$) over the time period was noticed with both live and donation after brainstem death transplant, but not with donation after circulatory death ($p = 0.4$).

Haemoglobin in prevalent transplant patients

Transplant patients have previously fallen under the remit of the UK Renal Association Complications of Chronic Kidney Disease (CKD) guidelines. Updated

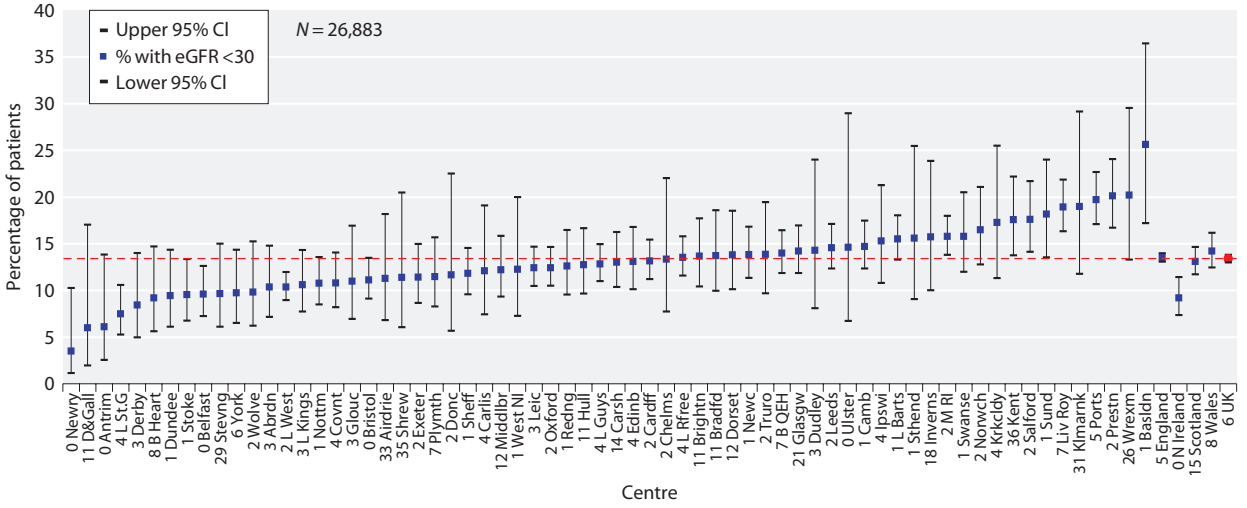

Fig. 3.3. Percentage of prevalent transplant patients by centre on 31/12/2013 with eGFR <30 ml/min/1.73 m^2

Table 3.11. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 on 31/12/2013

Centre	Patients with eGFR data *N*	Percentage with eGFR <30	Centre	Patients with eGFR data *N*	Percentage with eGFR <30
Ulster	41	14.6	Kent	313	17.6
D & Gall	50	6	Stoke	314	9.6
Donc	60	11.7	L Kings	340	10.6
Sthend	77	15.6	Brightn	344	13.7
Dudley	77	14.3	Hull	353	12.7
Basldn	78	25.6	Redng	357	12.6
Shrew	79	11.4	L St.G	387	7.5
Klmarnk	79	19.0	Salford	392	17.6
Antrim	82	6.1	Middlbr	393	12.2
Newry	86	3.5	Exeter	394	11.4
Chelms	90	13.3	Edinb	397	13.1
Wrexm	94	20.2	Covnt	436	10.8
West NI	106	12.3	Prestn	457	20.1
Inverns	108	15.7	Belfast	469	9.6
Krkcldy	110	17.3	Carsh	507	13.0
Carlis	124	12.1	Nottm	585	10.8
Airdrie	124	11.3	Newc	614	13.8
Derby	154	8.4	Sheff	651	11.8
Glouc	155	11.0	Glasgw	725	14.2
B Heart	163	9.2	Camb	734	14.7
Wolve	173	9.8	Liv Roy	771	18.9
Stevng	176	9.7	Ports	781	19.7
Ipswi	183	15.3	Bristol	810	11.1
Truro	195	13.8	Leeds	844	14.6
Dundee	201	9.5	B QEH	886	14.0
Sund	209	18.2	L Barts	896	15.5
York	226	9.7	Leic	951	12.4
Bradfd	248	13.7	Oxford	974	12.4
Abrdn	251	10.4	Cardff	980	13.2
Dorset	261	13.8	L Rfree	1,019	13.5
Swanse	285	15.8	L Guys	1,099	12.8
Plymth	288	11.5	M RI	1,160	15.8
Norwch	309	16.5	L West	1,602	10.4

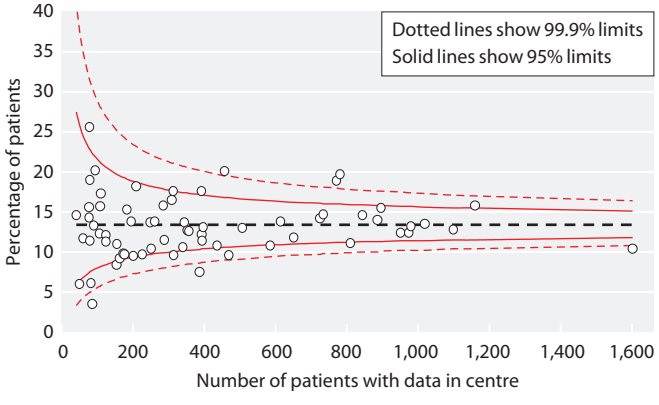

Fig. 3.4. Funnel plot of percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre size on 31/12/2013

guidelines regarding the management of anaemia in CKD were published by the association in November 2010 [7] which have now been adopted for this report. These guidelines recommend '***achieving a population distribution centred on a mean of 11 g/dl with a range of 10–12 g/dl***' [8] (equivalent to 110 g/L, range 100–120 g/L). However, many transplant patients with good transplant function will have haemoglobin concentrations >120 g/L without the use of erythopoiesis 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. Most of these data are not collected

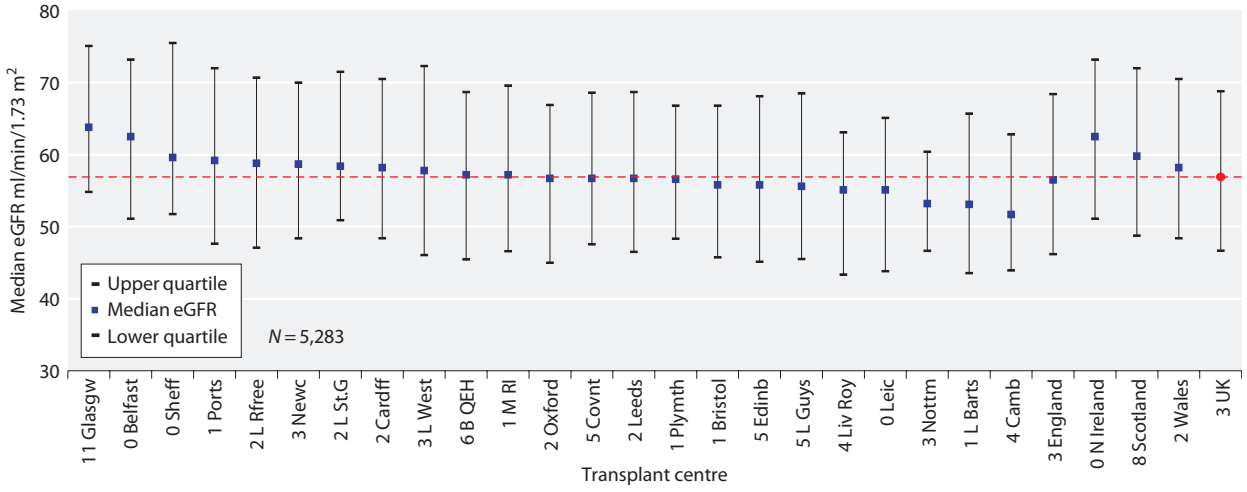

Fig. 3.5a. Median eGFR one year post-live donor transplant by transplant centre 2006–2012

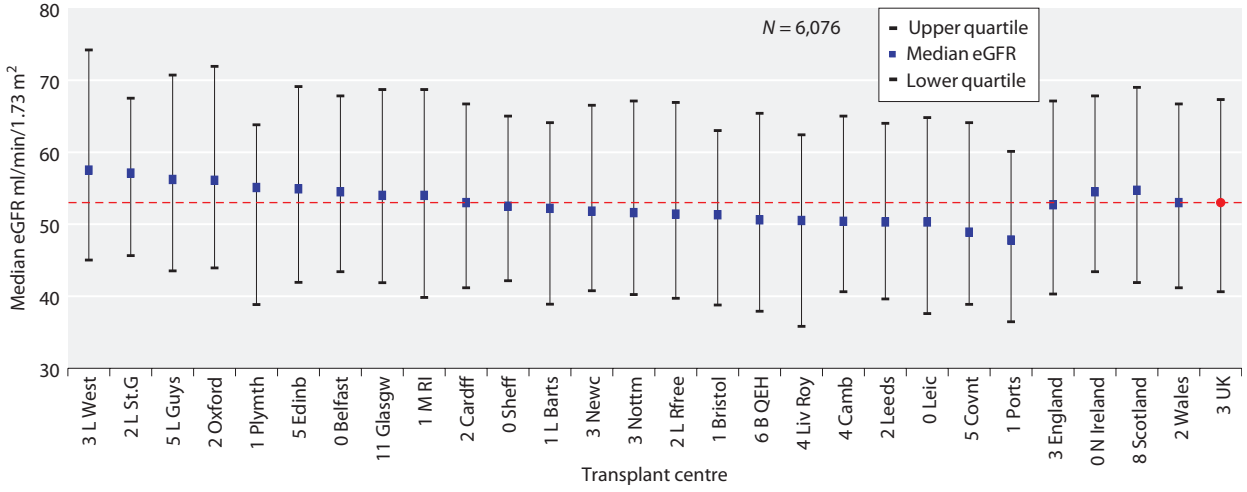

Fig. 3.5b. Median eGFR one year post-brainstem death donor transplant by transplant centre 2006–2012

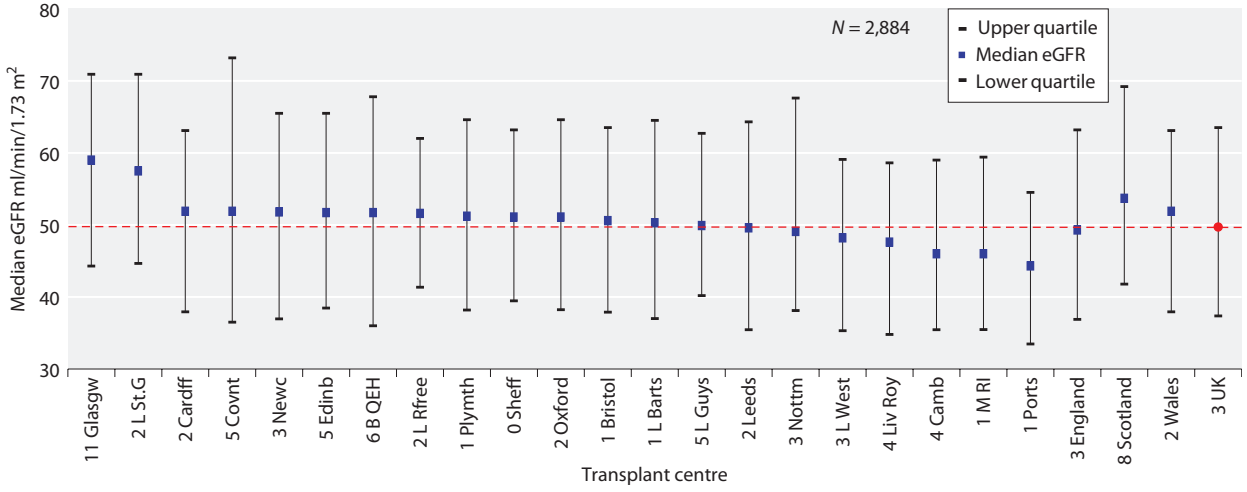

Fig. 3.5c. Median eGFR one year post-circulatory death donor transplant by transplant centre 2006–2012

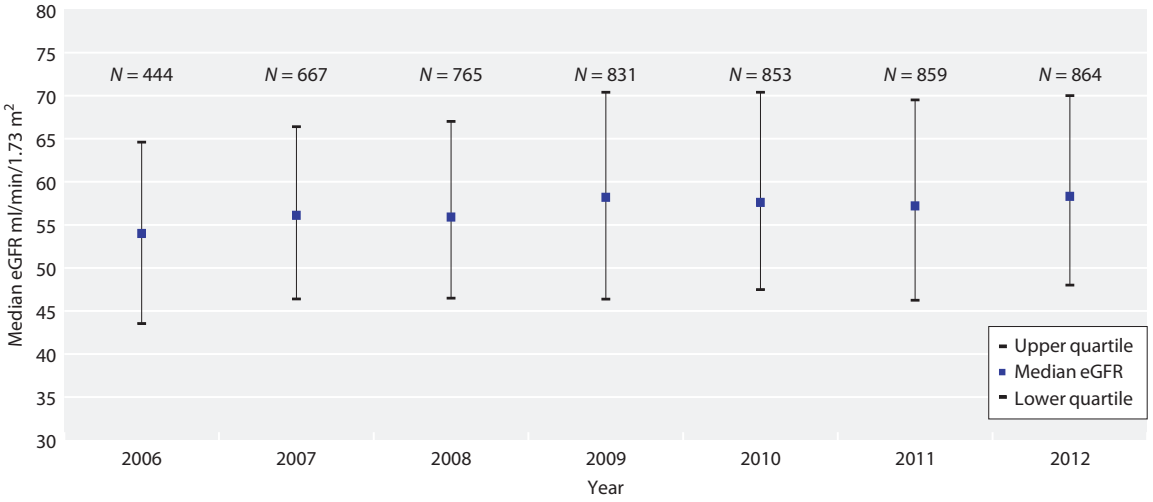

Fig. 3.6a. Median eGFR one year post-live donor transplant by year of transplantation 2006–2012

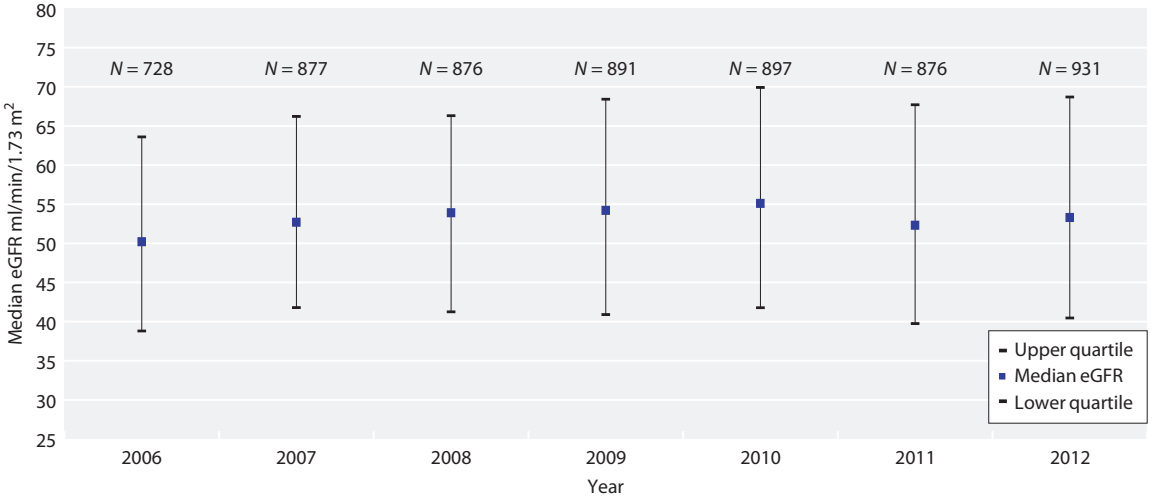

Fig. 3.6b. Median eGFR one year post-brainstem death donor transplant by year of transplantation 2006–2012

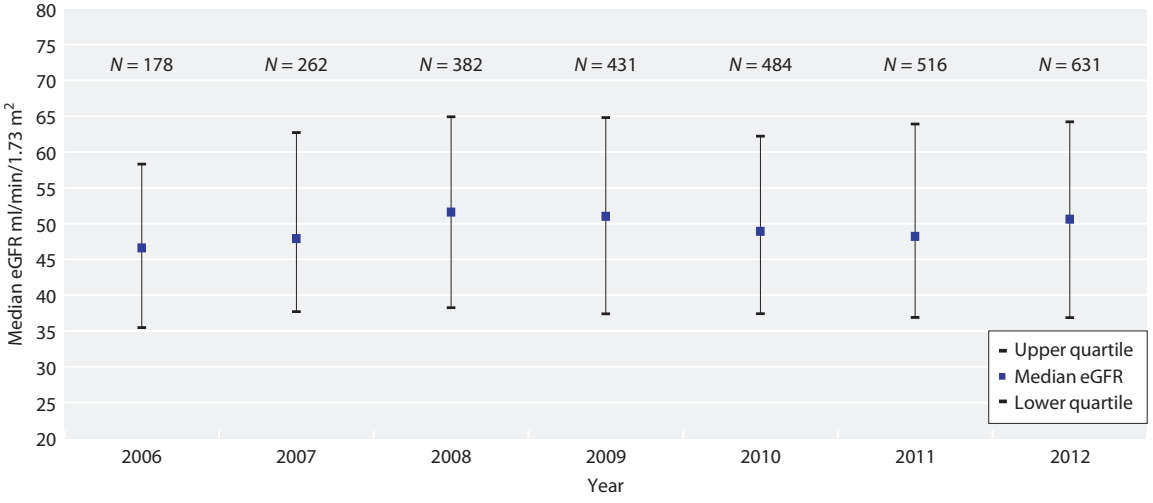

Fig. 3.6c. Median eGFR one year post-circulatory death donor transplant by year of transplantation 2006–2012

by the UKRR and therefore caution must be used when interpreting analyses of haemoglobin attainment. Figures 3.7a and 3.7b report centre results stratified according to graft function as estimated by eGFR. The percentage of prevalent transplant patients achieving Hb $\geqslant$100 g/L in each centre, stratified by eGFR, is displayed in figures 3.8a and 3.8b.

Figure 3.9 describes the percentage of prevalent patients by centre with haemoglobin <100 g/L as a funnel plot enabling more reliable comparison of outcomes between centres across the UK. With 66 centres included and a normal distribution, 3–4 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 St Bartholemews and London Royal Free) fell outside the upper 99.9% CI and two further centres (Leeds and Oxford) fell outside the upper 95% CI indicating a higher than predicted proportion of transplant patients not achieving the haemoglobin target. Six centres fell outside the lower 99.9% CI, indicating they performed better than expected with fewer than predicted patients having a haemoglobin <100 g/L.

Blood pressure in prevalent transplant patients

In the absence of controlled trial data, the opinion based recommendation of the UK Renal Association (RA) published in the 2010 guideline for the care of kidney transplant recipients is that '***Blood pressure should be***

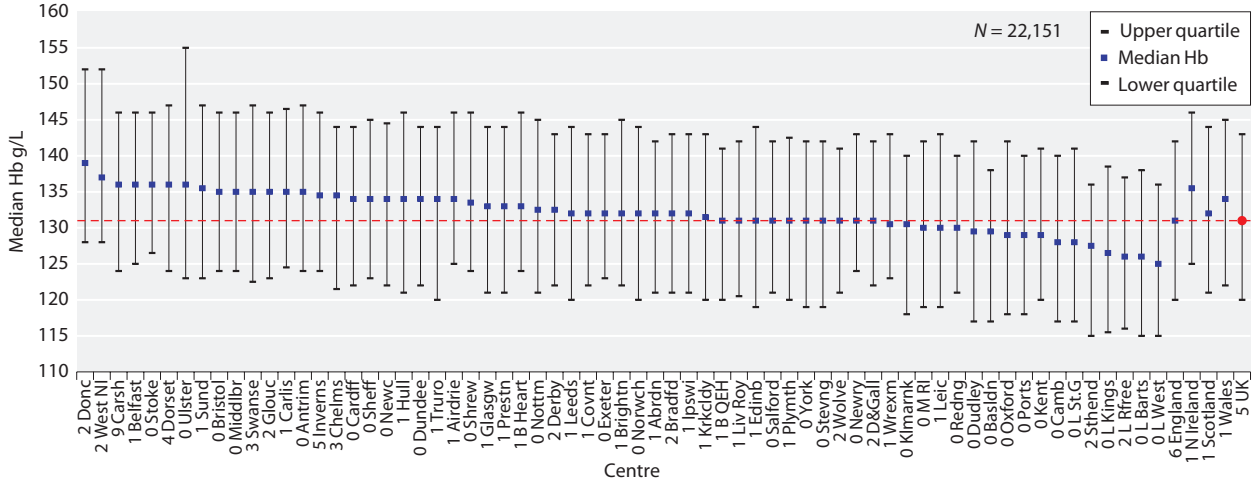

Fig. 3.7a. Median haemoglobin for prevalent transplant patients with eGFR $\geqslant$30 ml/min/1.73 m^2 by centre on 31/12/2013

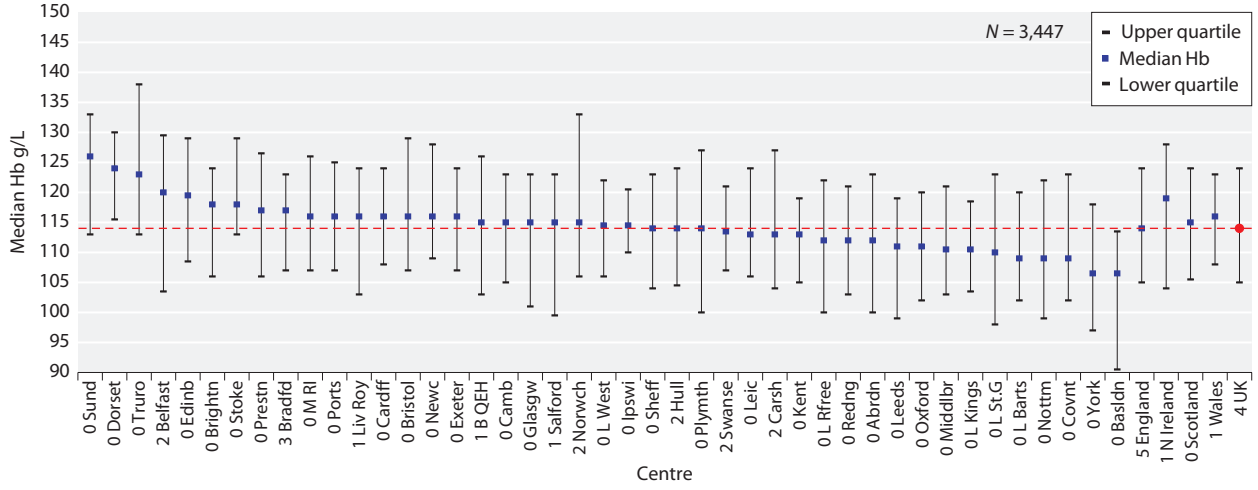

Fig. 3.7b. Median haemoglobin for prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre on 31/12/2013

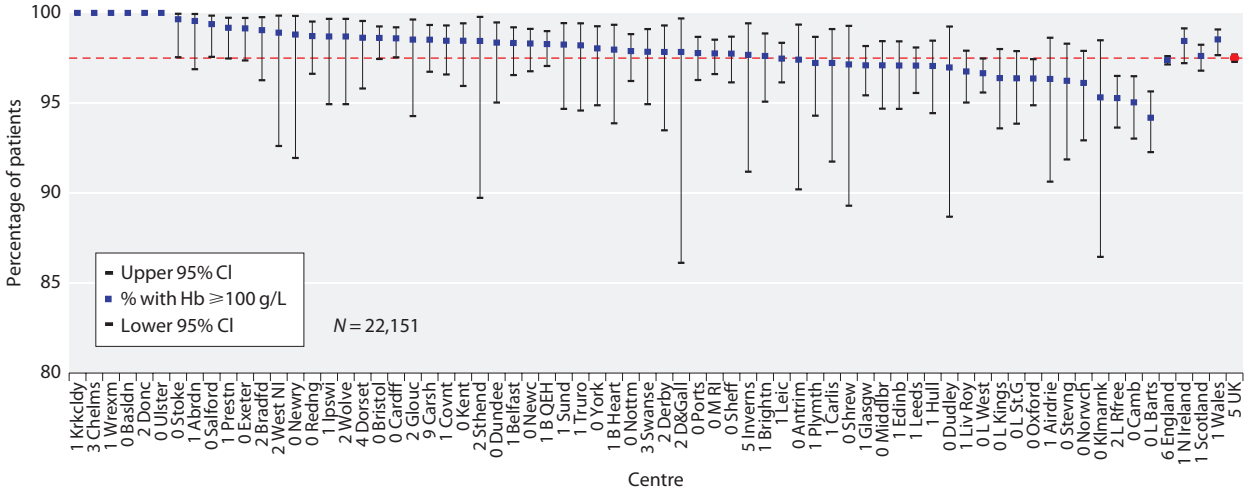

Fig. 3.8a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving haemoglobin ⩾100 g/L by centre on 31/12/2013

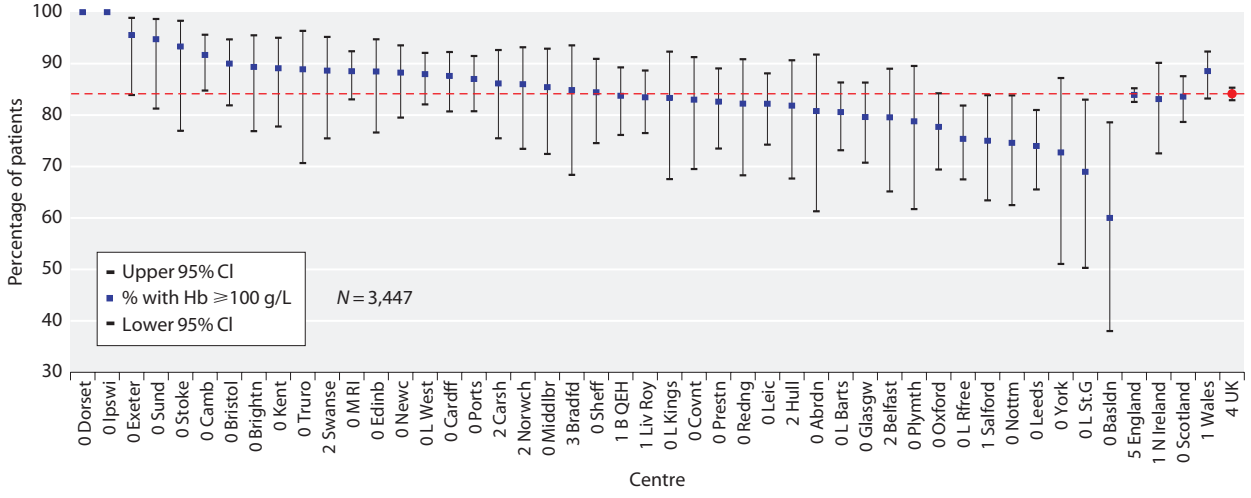

Fig. 3.8b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving haemoglobin ⩾100 g/L by centre on 31/12/2013

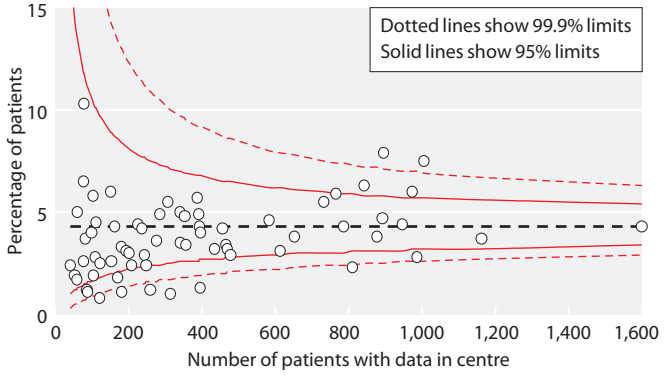

Fig. 3.9. Funnel plot of percentage of prevalent transplant patients with haemoglobin <100 g/L by centre size on 31/12/2013

<130/80 mmHg (or <125/75 mmHg if proteinuria)' [9]. This blood pressure target is the same as that used in previous annual reports [10].

As indicated in table 3.9a, 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). Figures 3.10a and 3.10b show the percentage of patients with a blood pressure of <130/80 mmHg, by eGFR. The percentage of patients with BP <130/80 (systolic

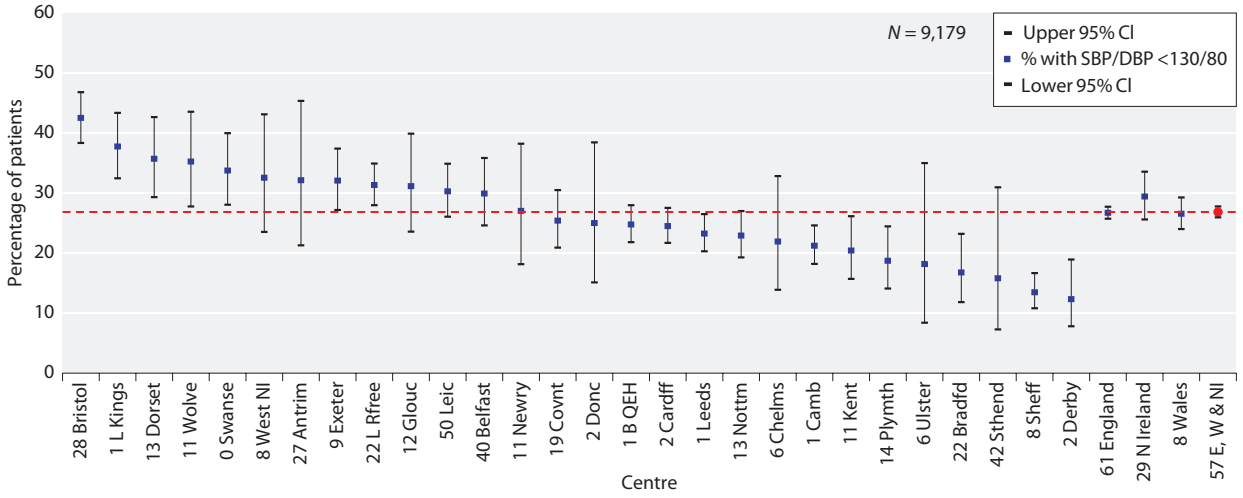

Fig. 3.10a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2013

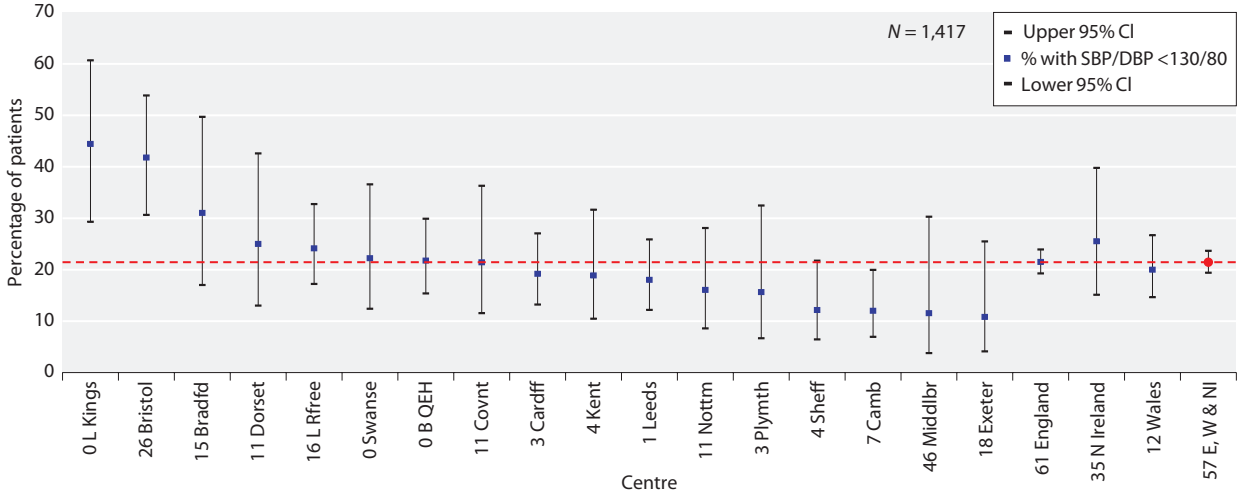

Fig. 3.10b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2013

BP <130 **and** diastolic BP <80 mmHg) was higher (26.8% vs. 21.5%) in those with better renal function (eGFR ⩾30 ml/min/1.73 m^2).

Analysis of prevalent patients by CKD stage

Introduction

Approximately 2.4% of prevalent transplant patients returned to dialysis in 2013, a similar percentage to that seen over the last few 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 31st December 2013 ($N = 26,896$) and were classified

Table 3.12. Analysis by CKD stage for prevalent transplant patients compared with prevalent dialysis patients on 31/12/2013

	Stage 1–2T (⩾60)	Stage 3T (30–59)	Stage 4T (15–29)	Stage 5T (<15)	Stage 5D
Number of patients	9,536	13,757	3,154	449	21,278
% of patients	35.5	51.2	11.7	1.7	
eGFR ml/min/1.73 m^2 [a]					
mean ± SD	76.9 ± 15.0	45.7 ± 8.3	23.9 ± 4.1	11.9 ± 2.5	
median	72.9	45.9	24.4	12.4	
Systolic BP mmHg					
mean ± SD	134.2 ± 16.8	135.7 ± 17.4	139.9 ± 18.9	145.2 ± 21.5	132.1 ± 25.1
% ⩾130	59.6	63.4	70.3	77.0	51.4
Diastolic BP mmHg					
mean ± SD	78.4 ± 10.0	78.3 ± 10.4	78.8 ± 11.5	82.1 ± 13.1	68.4 ± 14.9
% ⩾80	48.6	47.7	48.4	60.3	21.6
Cholesterol mmol/L					
mean ± SD	4.4 ± 1.0	4.5 ± 1.1	4.6 ± 1.2	4.6 ± 1.2	4.0 ± 1.1
% ⩾4	67.7	70.4	71.2	68.5	45.1
Haemoglobin g/L					
mean ± SD	136.4 ± 16.1	127.8 ± 16.3	115.7 ± 15.2	106.0 ± 15.1	111.8 ± 13.6
% <100.0	1.5	3.2	13.6	32.4	16.6
Phosphate mmol/L[b]					
mean ± SD	0.9 ± 0.2	1.0 ± 0.2	1.1 ± 0.3	1.5 ± 0.4	1.6 ± 0.4
% >1.7	0.1	0.3	2.6	28.4	34.3
Corrected calcium mmol/L					
mean ± SD	2.4 ± 0.1	2.4 ± 0.2	2.4 ± 0.2	2.4 ± 0.2	2.4 ± 0.2
% >2.5	28.5	28.7	22.2	16.8	17.7
% <2.2	4.2	5.2	9.1	17.8	15.7
PTH pmol/L					
median	8.5	9.5	15.9	28.4	31.1
% >72	0.3	0.7	4.0	13.7	17.5

[a]Prevalent transplant patients with no ethnicity data were classed as White
[b]Only PD patients included in stage 5D, $n = 2{,}330$

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 2013, comprised the comparison dialysis cohort ($N = 21{,}278$) including 2,330 peritoneal dialysis patients. Only patients on peritoneal dialysis were considered when examining differences in serum phosphate between transplant recipients and dialysis patients. For both the transplant and dialysis cohorts, the analysis used the most recent available value from the last two quarters of the 2013 laboratory data. Scottish centres were excluded from blood pressure, calcium, cholesterol and PTH analyses as corresponding data were not provided.

Results and conclusions

Table 3.12 shows that 13.4% of the prevalent transplant population (3,603 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 achieved UK Renal Association standards for some 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.

eGFR slope analysis

Introduction

The gradient of deterioration in eGFR (slope) may predict patients likely to have early graft failure. The

Table 3.13. Differences in median eGFR slope between subgroups of prevalent transplant patients

Patient characteristic		*N*	Median slope	Lower quartile	Upper quartile	*p*-value
Age at transplant	<40	4,438	−1.08	−4.15	11.1	<0.0001
	40–55	5,556	−0.36	−2.74	16.0	
	>55	4,499	−0.39	−2.74	15.8	
Ethnicity	Asian	1,313	−0.93	−3.88	16.6	<0.0001
	Black	856	−1.29	−4.27	13.2	
	Other	295	−1.03	−4.57	13.3	
	White	11,204	−0.52	−2.95	13.8	
Gender	Male	8,860	−0.36	−2.78	15.7	<0.0001
	Female	5,633	−0.91	−3.80	12.5	
Diabetes	Non-diabetic	12,210	−0.47	−2.95	15.1	<0.0001
	Diabetic	2,008	−1.23	−4.01	10.6	
Donor	Cadaveric	9,464	−0.58	−3.14	14.3	0.8
	Live	5,029	−0.57	−3.17	14.8	
Year of transplant	2002	787	−0.61	−2.32	05.8	<0.001
	2003	972	−0.55	−2.34	08.6	
	2004	1,138	−0.32	−2.11	10.6	
	2005	1,134	−0.17	−2.07	13.0	
	2006	1,434	−0.59	−2.66	11.2	
	2007	1,572	−0.66	−2.71	11.3	
	2008	1,804	−0.58	−2.96	14.3	
	2009	1,876	−0.93	−3.78	13.6	
	2010	1,943	−0.80	−4.53	24.9	
	2011	1,833	−0.40	−5.93	44.2	
Status of transplant at end of follow-up	Died	1,006	−0.88	−3.98	19.4	<0.001
	Failed	1,029	−6.23	−11.96	−2.90	
	Re-transplanted	54	−3.83	−6.80	−1.47	
	Functioning	12,404	−0.29	−2.51	16.0	
All		**14,493**	**−0.58**	**−3.15**	**1.45**	

eGFR slope and its relationship to specific patient characteristics are presented here.

Methods

All UK patients aged ⩾18 years receiving a renal transplant between 1st January 2002 and 31st December 2011, were considered for inclusion. A minimum duration of 18 months graft function was required and three or more creatinine measurements from the second year of graft function onwards were used to plot eGFR slope. If a transplant failed but there were at least three creatinine measurements between one year post-transplant and graft failure, the patient was included but no creatinine measurements after the quarter preceding the recorded date of transplant failure were analysed.

Slopes were calculated using linear regression, assuming linearity, and the effect of age, ethnicity, gender, diabetes, donor type, year of transplant and current transplant status were analysed. *P* values were calculated using the Kruskal-Wallis test. eGFR was calculated using the CKD-EPI equation and results expressed as ml/min/1.73 m^2/year. The CKD-EPI equation was used in preference to the MDRD formula as it is thought to have a greater degree of accuracy at higher levels of eGFR [11].

Results and conclusions

The study cohort consisted of 14,493 patients. The median GFR slope was −0.58 ml/min/1.73 m^2/year (table 3.13). The gradient was steeper for Black recipients (−1.3 ml/min/1.73 m^2/year), in keeping with previously published data suggesting poorer outcomes for this group [12,13]. There was no statistically significant difference in eGFR slope in recipients of deceased donor kidneys (−0.58 ml/min/1.73 m^2/year) compared to patients who received organs from live donors (−0.57 ml/min/1.73 m^2/year). Female patients had a steeper slope (−0.91 ml/min/

1.73 m^2/year) than males (−0.36 ml/min/1.73 m^2/year), as did diabetic patients (−1.23 ml/min/1.73 m^2/year) compared to non-diabetic patients (−0.47 ml/min/1.73 m^2/year). The slope was steeper in younger recipients, possibly reflecting increased risk of immunological damage. As might be expected, the steepest slope was in patients where the transplant subsequently failed. This analysis has assumed linearity of progression of fall in GFR and further work is underway to characterise the patterns of progression more precisely.

The findings in this study differ slightly from previous UKRR work exploring eGFR changes in transplant recipients [14]. This identified that male donor to female recipient transplantation, younger recipients, diabetes, white ethnicity, and human leukocyte antigen (HLA) mismatch were associated with faster decline in eGFR. These differences may be explained by patients with eGFR >60 ml/min/1.73 m^2 at one year post-transplantation being excluded and the more complex multivariable model used in the previous work. Udayaraj and colleagues [14] also adjusted for factors such as HLA mismatch and donor age, which were not available for the patients studied in this chapter.

Cause of death in transplant recipients

Introduction

Differences in causes of death between dialysis and transplant patients may be expected due to selection for transplantation and use of immunosuppression. Chapter 5 includes a more detailed discussion on cause of death in dialysis patients.

Methods

The cause of death is sent by renal centres as an ERA-EDTA 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. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 1st January 2013.

Results and conclusions

Table 3.14 and figure 3.11 show the differences in the cause of death between prevalent dialysis and transplant patients. Table 3.15 shows the cause of death for prevalent

Table 3.14. Cause of death by modality in prevalent RRT patients on 1/1/2013, who died in 2013

	All modalities		Dialysis		Transplant	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	734	23	647	24	87	17
Cerebrovascular disease	136	4	111	4	25	5
Infection	664	21	531	20	133	26
Malignancy	311	10	186	7	125	24
Treatment withdrawal	525	16	517	19	8	2
Other	660	21	543	20	117	23
Uncertain	186	6	161	6	25	5
Total	**3,216**		**2,696**		**520**	
No cause of death data	1,353	30	1,130	30	223	30

Table 3.15. Cause of death in prevalent transplant patients on 1/1/2013 by age, who died in 2013

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	87	17	47	18	40	16
Cerebrovascular disease	25	5	11	4	14	5
Infection	133	26	65	25	68	27
Malignancy	125	24	73	28	52	20
Treatment withdrawal	8	2	5	2	3	1
Other	117	23	54	20	63	25
Uncertain	25	5	9	3	16	6
Total	**520**		**264**		**256**	
No cause of death data	223	30	110	29	113	31

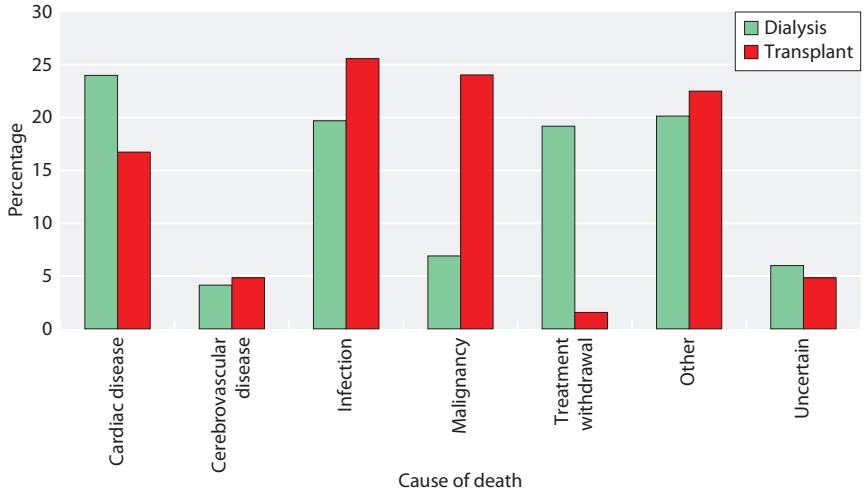

Fig. 3.11. Cause of death by modality for prevalent patients on 1/1/2013, who died in 2013

transplant patients by age. Death due to cardiovascular disease was less common in transplanted patients than in dialysis patients, perhaps reflecting the cardiovascular screening undertaken during transplant work-up; transplant recipients are a pre-selected lower risk group of patients. The leading causes of death amongst transplant patients were infection (26%), malignancy (24%) and other (23%). There has been a reduction over time in the proportion of deaths in transplant patients attributed to cardiovascular or stroke disease (43% in 2003 compared to 22% in 2013) with an increase in the proportion ascribed to infection or malignancy (30% in 2003 compared to 50% in 2013). This change has also been reported in other registries, e.g. ANZDATA (http://www.anzdata.org.au) and may reflect better management of cardiovascular risk (although table 3.12 shows blood pressure management remained suboptimal). Explanations for the rising death rate secondary to malignancy may include the increasing age of transplant recipients and the increased intensity of immunosuppressive regimens leading to complications of over-immunosuppression.

Conflicts of interest: Dr I MacPhee has received research funding and speaker honoraria from Astellas.

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Appendix 1: Reporting status of audit measures

Table 3.16. Showing the reporting status of the recommended Renal Association Audit Measures for the Post-operative Care of Kidney Transplant Recipients in the 17th Annual Report

RA audit measure	Included in UKRR annual report?	Reason for non-inclusion
1. Proportion of blood results available for review, and reviewed, within 24 hours	No	UKRR does not currently collect these data
2. Proportion of units with a written follow-up schedule available to all staff and patients	No	UKRR does not currently collect these data
3. Percentage of patients accessing their results through Renal Patient View	No	Requires linkage with RPV
4. Percentage of total patients assessed in an annual review clinic	No	UKRR does not currently collect these data
5. Percentage of total patients receiving induction with ILRAs and TDAs	No	Poor data completeness
6. Percentage of de novo KTRs receiving tacrolimus	No	Poor data completeness
7. Percentage of de novo KTRs receiving MPA based immunosuppression	No	Poor data completeness
8. Percentage of de novo KTRs receiving corticosteroid maintenance therapy	No	Poor data completeness
9. Use of generic agents	No	UKRR does not currently collect these data
10. Severity of biopsy proven acute rejection (BPAR) recorded by BANFF criteria	No	UKRR does not currently collect these data
11. Percentage of KTRs with BPAR in first 3 months and first 12 months	No	UKRR does not currently collect these data
12. Percentage of KTRs requiring TDAs to treat rejection in first year	No	UKRR does not currently collect these data
13. Complication rates after renal transplant biopsy	No	UKRR does not currently collect these data
14. Proportion of patients receiving a target blood pressure of 130/80 mmHg or 125/75 mmHg in the presence of proteinuria (PCR >100 or ACR >70)	No	Poor data completeness
15. Proportion of patients receiving an ACE inhibitor or angiotensin receptor blocker	No	Poor data completeness
16. Proportion of patients with proteinuria assessed by dipstick and, if present, quantified at each clinic visit	No	UKRR does not currently collect these data
17. Proportion of renal transplant recipients with an annual fasting lipid profile	No	UKRR does not currently collect these data
18. Proportion of KTR taking statins (including the type of statin) for primary and secondary prevention of premature cardiovascular disease	No	UKRR does not currently collect these data
19. Proportion of patients on other lipid lowering agents	No	Poor data completeness
20. Proportion of patients achieving dyslipidaemia targets	Yes	
21. Incidence of new onset diabetes after transplantation (NODAT) at three months and at annual intervals thereafter	No	UKRR does not currently collect these data
22. Proportion of patients who require insulin, and in whom remedial action is undertaken – minimisation of steroids and switching of CNIs	No	UKRR does not currently collect these data
23. Proportion of patients with ischaemic heart disease	No	Poor data completeness
24. Proportion of patients suffering myocardial infarction	No	Poor data completeness
25. Proportion of patients undergoing primary revascularisation	No	Poor data completeness

Table 3.16. Continued

RA audit measure	Included in UKRR annual report?	Reason for non-inclusion
26. Proportion of patients receiving secondary prevention with a statin, anti-platelet agents and RAS blockers	No	UKRR does not currently collect these data
27. Proportion of patients who are obese	No	Poor data completeness
28. Proportion of patients having screening procedures for neoplasia at the annual review clinic	No	UKRR does not currently collect these data
29. Incidence of CMV disease	No	Poor data completeness
30. Rate of EBV infection and PTLD	No	UKRR does not currently collect these data
31. Completeness of records for EBV donor and recipient serology	No	UKRR does not currently collect these data
32. Rates of primary VZV and shingles infection	No	UKRR does not currently collect these data
33. Completeness of records for VZV recipient serology	No	UKRR does not currently collect these data
34. Rates and outcomes of HSV infection	No	UKRR does not currently collect these data
35. Rates of BK viral infection in screening tests	No	UKRR does not currently collect these data
36. Rates and outcomes of BK nephropathy	No	UKRR does not currently collect these data
37. Frequency of bisphosponate use	No	UKRR does not currently collect these data
38. Incidence of fractures	No	UKRR does not currently collect these data
39. Incidence of hyperparathyroidism	No	Poor data completeness
40. Incidence of parathyroidectomy	No	UKRR does not currently collect these data
41. Use of cinacalcet	No	Poor data completeness
42. Frequency of hyperuricaemia and gout	No	UKRR does not currently collect these data
43. Prevalence of anaemia	Yes	
44. Prevalence of polycythaemia	No	Poor data completeness
45. Pregnancy rates and outcomes	No	UKRR does not currently collect these data
46. Prevalence of sexual dysfunction	No	UKRR does not currently collect these data