UK Renal Registry 14th Annual Report: Chapter 3 Demoraphic and Biochemistry Profile of Kidney Transplant Recipients in the UK in 2010: national and centre-specific analyses

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Key Words

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

Summary

- There was an increase in renal transplantation from all sources of organs in 2010, with the biggest percentage increase seen in kidneys from donors after circulatory death (11%).
- In 2010, death-censored renal transplant failure rates in prevalent patients remained stable at 2.4% per annum. Transplant patient death rates remained stable at 2.5 per 100 patient years.
- The median age of incident and prevalent renal transplant patients in the UK was 49.7 and 51.2 years respectively.
- The median eGFR of prevalent renal transplant recipients was 51.3 ml/min/1.73 m^2.
- The median eGFR of patients one year post-live donor transplantation was 54.1 ml/min/1.73 m^2.
- The median eGFR of patients one year post-deceased donor transplant was 50.9 ml/min/1.73 m^2.
- 13.8% 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 -0.6 ml/min/1.73 m^2/year.
- In 2010, the commonest causes of death with a functioning renal transplant were malignancy (23%), infection (22%) and cardiac disease (17%).

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 6 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) causes 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 2010.

Transplant activity, waiting list activity and survival data

Introduction

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

NHSBT attributes a patient to the centre that performed the transplant operation irrespective of where the patient was cared for before or after the procedure and hence only reports on transplant centre performance.

Methods

There are 23 UK adult renal transplant centres, 19 in England, 2 in Scotland and 1 each in Northern Ireland and Wales.

Comprehensive information from 1999 onwards concerning the number of patients on the transplant waiting list, the number of transplants performed, the number of deceased 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 2010, 2,724 kidney or kidney plus other organ transplants were performed. The absolute numbers of living kidney donor and donor after circulatory death transplants continued to increase and comprised 37.7% and 20.2% of all kidney transplants performed respectively. There was also an increase in numbers of transplants from donors after brainstem death between 2009 and 2010 that was not seen between 2008 and 2009 (table 3.1).

There are 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

Table 3.1. Kidney and kidney plus other organ transplant numbers in the UK, 1/1/2008–31/12/2010

Organ	2008	2009	2010	% change 2009–2010
Donor after brainstem death[a]	944	945	989	5
Donor after circulatory death[b]	439	496	549	11
Living donor kidney	924	983	1,026	4
Kidney and liver	17	15	9	−40
Kidney and heart	0	1	0	
Kidney and pancreas[c]	162	160	151	−7
Total kidney transplants	**2,486**	**2,600**	**2,724**	**5**

[a] Includes en bloc kidney transplants (3 in 2008, 3 in 2009, 7 in 2010) and double kidney transplants (1 in 2008, 6 in 2009, 6 in 2010)
[b] Includes en bloc kidney transplants (2 in 2008, 1 in 2009, 2 in 2010) and double kidney transplants (3 in 2008, 4 in 2009, 16 in 2010)
[c] Includes donor after circulatory death transplants (16 in 2008, 19 in 2009, 29 in 2010)

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
Belfast	92	96	88	92	94	100	97	93
B QEH	88	96	82	89	95	98	85	97
Bristol	95	96	86	85	98	99	95	98
Camb	92	98	86	89	98	99	93	97
Cardff	94	98	86	88	94	98	86	97
Covnt	95	96	89	92	95	100	86	96
Edin	88	94	82	83	95	98	92	96
Glasgw	94	96	84	82	96	96	96	100
L Guy's	93	95	82	89	96	98	93	95
Leeds	94	96	85	89	96	100	91	97
Leic	91	89	84	83	95	97	92	93
Liv RI	91	97	80	94	95	100	88	92
M Hope	95	95	85	88	98	98	92	97
Newc	93	94	83	86	98	99	92	95
Nottm	91	94	78	85	95	97	92	96
Oxford	95	97	89	86	97	96	96	95
Plymth	90	96	86	90	95	99	90	93
Ports	95	94	80	88	94	98	84	91
L Rfree	95	96	87	93	98	100	93	93
L Barts	92	93	86	91	97	98	86	94
Sheff	90	99	81	92	100	100	88	100
L St.G	94	98	86	92	100	100	89	97
L West	95	98	89	92	96	99	88	96
All centres	**93**	**96**	**84**	**88**	**97**	**99**	**91**	**96**

[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
Cohorts for survival rate estimation: 1 year survival: 1/1/2006–31/12/2010; 5 year survival: 1/1/2002–31/12/2006; 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

rates include grafts with primary non-function (which are excluded from analyses by some countries).

Using data from the UKRR on prevalent renal-only transplant patients on 1st January 2010, the death rate during 2010 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.

During 2010, 2.4% of prevalent transplant patients experienced graft failure (excluding death as a cause of graft failure). This is lower than in recent years but it is premature to assume that graft failure rates are falling.

Conclusions

In 2010 there was an increase in renal transplantation from all sources of organs with the biggest percentage increase in kidneys from donors after circulatory death. The graft failure rate of 2.4% per annum and patient death rate of 2.5 per 100 patient years are similar to recent years.

Transplant demographics

Introduction

Since 2008, all 72 UK renal centres have established electronic linkage to the UKRR or Scottish Renal Registry, giving the UKRR complete coverage of individual patient level data across the UK.

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 attributed to the referring centre. This process may result in some discrepancies in transplant numbers particularly in Oxford/Reading and Clywd/Liverpool RI.

Methods

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

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 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 2010. The prevalence of transplant patients in areas covered by individual primary care trusts (PCT) or Health Boards/Social Care Areas (HB) was estimated based on the post code 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.com/report-area/report 2011/appendix-H.pdf. The UKRR requires a standard set of data items regarding comorbid conditions at the time of commencement of renal replacement therapy and first registration of the patient with the UKRR.

Results and discussion

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

The prevalence of renal transplant recipients in each PCT/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 fairly stable since at least 2000.

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 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 had increased to 24,739 patients at the end of 2010. 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 3.3. The prevalence per million population (pmp) of renal transplants in adults in the UK on 31/12/2010 (including children <18 years)

	England	N Ireland	Scotland	Wales	UK
Number of prevalent transplants	21,254	687	2,163	1,303	25,407
Total population, mid-2010 estimates from ONS[a] (millions)	52.2	1.8	5.2	3.0	62.3
Prevalence pmp transplant	407	382	414	433	408

[a]Estimates from the 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 2006–2010

[a]PCT/HB = Primary Care Trust (England); Health and Social Care Trust Areas (Northern Ireland); Health Board (Scotland) and Local Health Board (Wales)
[b]Population numbers based on the 2010 mid-year estimates by age group and gender (data obtained from the Office of National Statistics)
[c]O/E = age and gender standardised acceptance rate ratio
PCTs with significantly high average rate ratios are bold in greyed areas
PCTs with significantly low average rate ratios are italicised in greyed areas
Blank cells = no data returned to the UKRR for that year
LCL = lower 95% confidence limit
UCL = upper 95% confidence limit

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2010		
			2006	2007	2008	2009	2010	O/E[c]	LCL	UCL
North East	County Durham	510,800	343	370	382	394	409	1.00	0.87	1.14
	Darlington	100,600	318	348	368	338	368	0.91	0.66	1.25
	Gateshead	192,000	375	365	370	385	396	0.98	0.78	1.22
	Hartlepool	91,400	383	394	361	350	394	0.99	0.71	1.37
	Middlesbrough	142,100	387	394	422	457	457	1.22	0.96	1.56
	Newcastle	292,200	311	335	346	359	363	1.01	0.84	1.22
	North Tyneside	**198,400**	**439**	**494**	**494**	**514**	**559**	**1.36**	**1.13**	**1.64**
	Northumberland	312,100	349	368	378	388	372	0.86	0.72	1.03
	Redcar and Cleveland	**137,300**	**466**	**481**	**517**	**532**	**539**	**1.31**	**1.04**	**1.65**
	South Tyneside	154,100	370	409	415	422	415	1.03	0.80	1.31
	Stockton-on-Tees Teaching	192,600	363	343	384	400	400	1.00	0.80	1.25
	Sunderland Teaching	283,400	381	399	406	395	406	1.01	0.84	1.21
North West	Ashton, Leigh and Wigan	307,200	192	348	358	342	378	0.92	0.76	1.10
	Blackburn with Darwen Teaching	140,000	186	321	329	336	336	0.92	0.69	1.22
	Blackpool	140,200	200	292	342	357	357	0.88	0.67	1.16
	Bolton Teaching	266,500	221	386	428	432	447	1.14	0.95	1.37
	Bury	183,500	114	354	343	403	398	1.00	0.79	1.25
	Central and Eastern Cheshire	*457,200*		*311*	*311*	*313*	*332*	*0.79*	*0.68*	*0.93*
	Central Lancashire	459,200	226	287	307	320	353	0.87	0.75	1.02
	Cumbria Teaching	494,400	285	309	328	368	392	0.92	0.80	1.06
	East Lancashire Teaching	381,200	283	393	407	404	401	1.00	0.86	1.17
	Halton and St Helens	296,700	249	283	310	324	357	0.88	0.73	1.07
	Heywood, Middleton and Rochdale	205,000		390	405	420	444	1.15	0.93	1.41
	Knowsley	149,200	302	315	322	349	362	0.93	0.72	1.22
	Liverpool	445,300	292	296	319	341	366	0.98	0.84	1.14
	Manchester Teaching	498,800		243	257	261	307	0.92	0.78	1.08
	North Lancashire Teaching	*329,100*	*267*	*328*	*322*	*319*	*313*	*0.77*	*0.63*	*0.93*
	Oldham	219,600	159	346	364	383	414	1.08	0.88	1.33
	Salford	229,100	148	262	288	319	345	0.92	0.73	1.14
	Sefton	272,800	297	319	301	319	348	0.85	0.69	1.04
	Stockport	284,700		327	348	369	390	0.95	0.79	1.15
	Tameside and Glossop	250,700		411	411	415	451	1.12	0.93	1.35
	Trafford	217,100		276	299	286	322	0.81	0.64	1.02
	Warrington	199,100	316	392	392	422	392	0.95	0.76	1.19
	Western Cheshire	234,300	299	324	316	350	388	0.94	0.77	1.16
	Wirral	308,800	311	301	327	343	347	0.86	0.71	1.04
Yorkshire and the Humber	Barnsley	227,500	343	347	374	382	404	0.99	0.80	1.21
	Bradford and Airedale Teaching	**512,700**	**335**	**365**	**396**	**423**	**451**	**1.24**	**1.09**	**1.41**
	Calderdale	202,800	390	409	444	454	483	1.20	0.98	1.46
	Doncaster	290,900	316	309	330	354	364	0.90	0.75	1.09
	East Riding of Yorkshire	338,500	254	292	325	349	360	0.84	0.70	1.00
	Hull Teaching	263,800	292	322	341	360	371	0.98	0.81	1.20

Table 3.4. Continued

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2009		
			2005	2006	2007	2008	2009	O/E[c]	LCL	UCL
Yorkshire and the Humber	Kirklees	409,900	400	405	407	420	439	1.13	0.98	1.31
	Leeds	798,700	274	285	299	317	342	0.93	0.83	1.05
	North East Lincolnshire	158,800	258	277	302	334	365	0.92	0.71	1.19
	North Lincolnshire	*157,500*	*279*	*286*	*292*	*267*	*279*	*0.67*	*0.50*	*0.90*
	North Yorkshire and York	802,100	295	313	355	375	384	0.93	0.83	1.04
	Rotherham	254,300	299	330	366	385	433	1.07	0.88	1.28
	Sheffield	555,700	252	261	295	315	351	0.94	0.81	1.08
	Wakefield District	325,500	301	301	320	329	363	0.88	0.74	1.06
East Midlands	Bassetlaw	112,100	241	294	294	285	312	0.74	0.53	1.03
	Derby City	247,100	214	235	251	299	364	0.97	0.79	1.19
	Derbyshire County	*729,900*	*234*	*278*	*295*	*297*	*314*	*0.74*	*0.65*	*0.85*
	Leicester City	**306,800**	**443**	**466**	**495**	**567**	**570**	**1.62**	**1.39**	**1.88**
	Leicestershire County and Rutland	687,200	335	358	387	393	422	1.03	0.92	1.15
	Lincolnshire Teaching	*705,000*	*272*	*275*	*291*	*298*	*315*	*0.75*	*0.66*	*0.86*
	Northamptonshire Teaching	687,600	279	301	348	362	384	0.95	0.84	1.07
	Nottingham City	306,300	225	232	235	248	323	0.95	0.78	1.16
	Nottinghamshire County Teaching	668,000	305	314	325	338	380	0.92	0.81	1.04
West Midlands	Birmingham East and North	409,300	310	320	342	357	374	1.05	0.90	1.23
	Coventry Teaching	315,700	304	326	345	367	386	1.06	0.89	1.27
	Dudley	307,500	250	276	280	293	302	0.74	0.61	0.91
	Heart of Birmingham Teaching	**285,100**	**361**	**379**	**403**	**403**	**417**	**1.33**	**1.11**	**1.59**
	Herefordshire	*179,400*	*284*	*284*	*273*	*295*	*295*	*0.69*	*0.53*	*0.90*
	North Staffordshire	211,900		316	335	363	373	0.89	0.71	1.11
	Sandwell	292,900	324	338	358	376	376	0.99	0.82	1.20
	Shropshire County	*293,400*	*228*	*283*	*300*	*341*	*334*	*0.79*	*0.65*	*0.96*
	Solihull	*206,300*	*286*	*291*	*296*	*305*	*301*	*0.74*	*0.58*	*0.95*
	South Birmingham	342,200	289	316	348	351	380	1.04	0.87	1.23
	South Staffordshire	*611,300*		*291*	*317*	*327*	*340*	*0.81*	*0.71*	*0.93*
	Stoke on Trent	248,000		310	355	379	407	1.04	0.86	1.26
	Telford and Wrekin	*162,400*	*172*	*216*	*246*	*289*	*296*	*0.74*	*0.56*	*0.98*
	Walsall Teaching	256,800	304	339	358	386	401	1.04	0.86	1.26
	Warwickshire	536,200	351	360	362	380	423	1.02	0.90	1.16
	Wolverhampton City	*239,300*	*217*	*259*	*280*	*297*	*288*	*0.76*	*0.60*	*0.96*
	Worcestershire	*557,300*	*264*	*282*	*294*	*319*	*343*	*0.81*	*0.71*	*0.94*
East of England	Bedfordshire	416,300	281	310	336	358	372	0.92	0.78	1.07
	Cambridgeshire	616,400	271	290	321	360	399	1.00	0.88	1.13
	Hertfordshire	1,107,500	210	265	326	344	382	0.96	0.88	1.06
	Great Yarmouth and Waveney	*214,700*	*144*	*154*	*214*	*279*	*279*	*0.68*	*0.52*	*0.87*
	Luton	198,900	312	347	362	372	397	1.11	0.89	1.38
	Mid Essex	374,500	270	294	315	358	374	0.91	0.77	1.07
	Norfolk	*764,800*	*272*	*305*	*307*	*326*	*332*	*0.80*	*0.71*	*0.91*
	North East Essex	*329,500*			*276*	*294*	*303*	*0.76*	*0.63*	*0.93*
	Peterborough	173,600	230	265	265	305	323	0.84	0.65	1.10
	South East Essex	*338,200*	*225*	*260*	*293*	*325*	*313*	*0.77*	*0.64*	*0.94*
	South West Essex	410,000	234	283	293	329	359	0.91	0.78	1.07
	Suffolk	*601,900*	*271*	*287*	*299*	*332*	*356*	*0.87*	*0.76*	*0.99*
	West Essex	286,400	269	269	272	318	342	0.85	0.70	1.03
London	Barking and Dagenham	179,700	228	262	267	328	351	1.02	0.80	1.31
	Barnet	**348,000**	**316**	**417**	**428**	**497**	**532**	**1.39**	**1.21**	**1.61**
	Bexley	**228,300**	**381**	**434**	**460**	**477**	**526**	**1.35**	**1.13**	**1.61**
	Brent Teaching	**256,300**	**148**	**456**	**636**	**694**	**734**	**1.95**	**1.69**	**2.25**

Table 3.4. Continued

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2009		
			2005	2006	2007	2008	2009	O/E[c]	LCL	UCL
London	Bromley	312,400	352	400	423	439	467	1.17	1.00	1.38
	Camden	235,500	246	272	335	378	395	1.07	0.87	1.31
	City and Hackney Teaching	231,000	225	281	312	338	355	1.00	0.80	1.24
	Croydon	345,400	261	307	318	356	373	0.96	0.81	1.15
	Ealing	**318,300**	**298**	**377**	**566**	**594**	**635**	**1.65**	**1.44**	**1.90**
	Enfield	**295,000**	**369**	**417**	**468**	**471**	**508**	**1.34**	**1.14**	**1.57**
	Greenwich Teaching	228,100	281	320	329	386	438	1.20	0.99	1.46
	Hammersmith and Fulham	**169,800**	**212**	**212**	**330**	**424**	**465**	**1.25**	**1.00**	**1.56**
	Haringey Teaching	**225,100**	**338**	**378**	**431**	**493**	**538**	**1.42**	**1.19**	**1.70**
	Harrow	**230,300**		**447**	**599**	**673**	**734**	**1.89**	**1.62**	**2.19**
	Havering	*236,100*		*250*	*271*	*292*	*301*	*0.76*	*0.60*	*0.96*
	Hillingdon	**266,200**	**252**	**282**	**428**	**473**	**518**	**1.39**	**1.17**	**1.64**
	Hounslow	**236,700**	**249**	**262**	**444**	**511**	**562**	**1.48**	**1.24**	**1.75**
	Islington	**193,900**	**325**	**382**	**428**	**469**	**495**	**1.35**	**1.10**	**1.65**
	Kensington and Chelsea	169,500		254	319	348	413	1.03	0.82	1.31
	Kingston	169,000		355	373	391	396	1.04	0.82	1.32
	Lambeth	284,400	229	302	341	387	376	1.01	0.83	1.22
	Lewisham	**266,400**	**368**	**417**	**424**	**450**	**462**	**1.22**	**1.02**	**1.45**
	Newham	**240,200**	**258**	**283**	**316**	**387**	**454**	**1.34**	**1.11**	**1.62**
	Redbridge	**270,300**	**296**	**322**	**374**	**407**	**477**	**1.28**	**1.08**	**1.52**
	Richmond and Twickenham	190,800		189	262	299	314	0.78	0.60	1.00
	Southwark	**287,100**	**376**	**421**	**439**	**495**	**529**	**1.42**	**1.21**	**1.67**
	Sutton and Merton	403,000		357	367	402	422	1.08	0.93	1.26
	Tower Hamlets	238,100	231	244	235	273	328	0.98	0.78	1.22
	Waltham Forest	**227,400**	**325**	**365**	**391**	**418**	**466**	**1.27**	**1.05**	**1.54**
	Wandsworth	289,200		335	349	353	370	1.01	0.84	1.22
	Westminster	253,400		229	320	387	422	1.09	0.90	1.32
South East Coast	Brighton and Hove City	258,400	228	271	298	321	360	0.95	0.77	1.16
	East Sussex Downs and Weald	*336,100*	*211*	*259*	*292*	*309*	*318*	*0.77*	*0.64*	*0.93*
	Eastern and Coastal Kent	742,200		290	340	372	402	1.01	0.90	1.13
	Hastings and Rother	179,700	250	289	312	312	328	0.79	0.61	1.02
	Medway	256,600		308	359	398	417	1.06	0.87	1.28
	Surrey	1,114,400	272	323	349	368	380	0.94	0.86	1.04
	West Kent	685,100		350	377	394	401	0.99	0.88	1.12
	West Sussex	*800,000*	*271*	*316*	*336*	*345*	*363*	*0.89*	*0.79*	*1.00*
South Central	**Berkshire East**	**406,500**	**273**	**369**	**433**	**475**	**497**	**1.29**	**1.12**	**1.48**
	Berkshire West	471,500	282	384	426	456	443	1.13	0.99	1.30
	Buckinghamshire	512,100	379	404	410	416	441	1.09	0.96	1.24
	Hampshire	1,297,200	308	328	359	374	391	0.95	0.87	1.04
	Isle of Wight National Health Service	140,200	278	257	307	314	328	0.77	0.58	1.03
	Milton Keynes	247,000	279	312	328	348	385	0.97	0.79	1.19
	Oxfordshire	624,200	388	399	415	420	437	1.12	1.00	1.26
	Portsmouth City Teaching	207,200	314	328	357	357	401	1.11	0.90	1.38
	Southampton City	239,800	309	325	334	346	342	0.96	0.78	1.20
South West	Bath and North East Somerset	179,800	267	284	289	323	311	0.81	0.62	1.06
	Bournemouth and Poole Teaching	310,800	322	364	354	351	364	0.94	0.78	1.13
	Bristol	**441,100**	**372**	**388**	**422**	**433**	**462**	**1.27**	**1.11**	**1.46**
	Cornwall and Isles of Scilly	537,900	329	361	398	429	433	1.03	0.91	1.17
	Devon	749,700	292	329	352	385	399	0.95	0.85	1.07
	Dorset	404,900	348	400	420	432	449	1.06	0.92	1.23
	Gloucestershire	*593,600*	*315*	*320*	*332*	*330*	*323*	*0.79*	*0.68*	*0.91*

Table 3.4. Continued

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2009		
			2005	2006	2007	2008	2009	O/E[c]	LCL	UCL
South West	North Somerset	212,100	387	349	372	391	415	1.00	0.81	1.23
	Plymouth Teaching	**258,900**	**402**	**413**	**463**	**502**	**506**	**1.35**	**1.14**	**1.60**
	Somerset	525,500	337	352	354	375	386	0.93	0.81	1.07
	South Gloucestershire	264,900	385	423	430	434	461	1.14	0.96	1.37
	Swindon	206,900	304	314	338	353	416	1.05	0.85	1.29
	Torbay	134,400	298	327	387	439	461	1.12	0.87	1.43
	Wiltshire	*459,800*	*274*	*300*	*313*	*318*	*350*	*0.85*	*0.73*	*1.00*
Wales	*Betsi Cadwaladr University*	*678,500*	*292*	*305*	*327*	*338*	*342*	*0.83*	*0.73*	*0.95*
	Powys Teaching	131,100	313	351	374	389	420	0.97	0.74	1.26
	Hywel Dda	374,800	342	358	382	398	392	0.95	0.81	1.12
	Abertawe Bro Morgannwg University	**504,800**	**406**	**424**	**442**	**468**	**505**	**1.26**	**1.11**	**1.42**
	Cwm Taf	**290,600**	**485**	**513**	**540**	**575**	**643**	**1.63**	**1.41**	**1.88**
	Aneurin Bevan	**561,300**	**392**	**429**	**447**	**470**	**513**	**1.28**	**1.14**	**1.43**
	Cardiff and Vale University	**466,100**	**365**	**386**	**403**	**412**	**440**	**1.19**	**1.04**	**1.37**
Scotland	Ayrshire & Arran	366,900	362	376	406	398	398	0.95	0.81	1.12
	Borders	113,000	283	319	363	372	434	1.00	0.76	1.32
	Dumfries and Galloway	148,100	324	344	378	405	405	0.93	0.72	1.20
	Fife	364,800	291	299	321	332	348	0.85	0.72	1.01
	Forth Valley	*293,100*	*263*	*290*	*300*	*300*	*321*	*0.79*	*0.64*	*0.96*
	Grampian	550,500	331	343	352	381	396	0.96	0.84	1.09
	Greater Glasgow & Clyde	**1,204,100**	**389**	**410**	**424**	**432**	**444**	**1.12**	**1.03**	**1.22**
	Highland	**310,700**	**354**	**373**	**425**	**476**	**509**	**1.18**	**1.01**	**1.37**
	Lanarkshire	562,700	350	359	384	387	421	1.03	0.91	1.17
	Lothian	837,000	281	305	324	335	355	0.90	0.80	1.01
	Orkney	19,800	556	455	556	455	404	0.92	0.46	1.84
	Shetland	22,500	267	267	222	267	267	0.63	0.28	1.41
	Tayside	402,400	413	420	437	435	435	1.07	0.92	1.24
	Western Isles	26,500	226	302	264	264	264	0.61	0.29	1.27
Northern Ireland	Belfast	335,700	354	366	369	390	432	1.18	1.00	1.38
	Northern	458,600	329	331	353	366	375	0.97	0.83	1.12
	Southern	357,700	282	296	294	296	308	0.83	0.69	1.00
	South Eastern	347,100	326	343	354	363	369	0.94	0.79	1.12
	Western	299,900	293	300	307	323	333	0.88	0.73	1.07

Primary renal diagnosis

The primary renal diagnosis of patients receiving kidney transplants in the UK has remained stable over the last 5 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 2005 and 2009 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 continues 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

Table 3.5. Distribution of prevalent patients on RRT by centre and modality on 31/12/2010

Centre	N	% HD	% PD	% transplant
Transplant centres				
B QEH	1,844	47	8	45
Belfast	682	34	4	61
Bristol	1,250	37	5	58
Camb	988	35	4	61
Cardff	1,517	33	7	61
Covnt	844	42	10	48
Edinb	713	38	7	54
Glasgw	1,490	42	4	54
L Barts	1,778	44	11	45
L Guys	1,618	35	3	62
L Rfree	1,639	41	4	54
L St. G	678	42	8	50
L West	2,862	46	1	52
Leeds	1,383	36	7	57
Leic	1,808	44	9	47
Liv RI	1,238	31	7	62
Man RI	1,552	31	6	63
Newc	888	30	6	64
Nottm	972	43	9	48
Oxford	1,363	28	8	64
Plymth	459	29	10	61
Ports	1,333	36	8	56
Sheff	1,254	49	5	46
Dialysis centres				
Abrdn	462	44	6	50
Airdrie	326	56	3	40
Antrim	217	59	5	35
B Heart	632	67	7	26
Bangor	113	77	23	0
Basldn	214	64	12	24
Bradfd	455	41	8	51
Brightn	770	45	11	44
Carlis	203	30	6	64
Carsh	1,377	53	7	40
Chelms	238	52	15	34
Clwyd	142	49	11	40
Colchester	120	100	0	0
D & Gall	118	45	7	48
Derby	459	48	22	30
Derry	111	55	2	43
Donc	222	66	11	23
Dorset	585	42	9	49
Dudley	303	52	20	27
Dundee	385	45	7	48
Dunfn	263	51	10	39
Exeter	785	46	10	44
Glouc	377	51	11	38
Hull	725	45	9	46
Inverns	230	38	10	52
Ipswi	316	37	11	52
Kent	793	45	9	46
Klmarnk	284	54	15	32
L Kings	837	51	11	38
Liv Ain	159	96	4	0
M Hope	837	43	15	42

Table 3.5. Continued

Centre	N	% HD	% PD	% transplant
Middlbr	711	40	3	57
Newry	177	62	5	33
Norwch	615	52	9	39
Prestn	968	52	7	41
Redng	636	41	14	46
Shrew	337	60	7	34
Stevng	606	64	6	31
Sthend	212	59	8	32
Stoke	635	46	12	42
Sund	369	48	9	43
Swanse	595	61	9	31
Truro	335	46	9	46
Tyrone	145	66	6	28
Ulster	112	83	2	15
Wirral	223	83	17	0
Wolve	518	61	14	25
Wrexm	223	35	10	56
York	337	45	7	48
England	**42,660**	**44**	**8**	**48**
N Ireland	**1,444**	**50**	**4**	**46**
Scotland	**4,271**	**44**	**6**	**50**
Wales	**2,590**	**42**	**8**	**50**
UK	**50,965**	**44**	**8**	**49**

Table 3.6. Median age and gender ratio of incident and prevalent transplant patients 2005–2010

	Incident transplants			Prevalent transplants[a]		
Year	N	Median age	M:F ratio	N	Median age	M:F ratio
2005	1,754	45.4	1.4	16,646	49.7	1.6
2006	1,969	45.3	1.6	17,637	49.9	1.5
2007	2,128	45.6	1.6	20,603	50.1	1.5
2008	2,357	46.4	1.5	22,182	50.4	1.5
2009	2,499	48.4	1.6	23,433	50.7	1.5
2010	2,568	49.7	1.7	24,739	51.2	1.5

[a]As on 31st December for given year

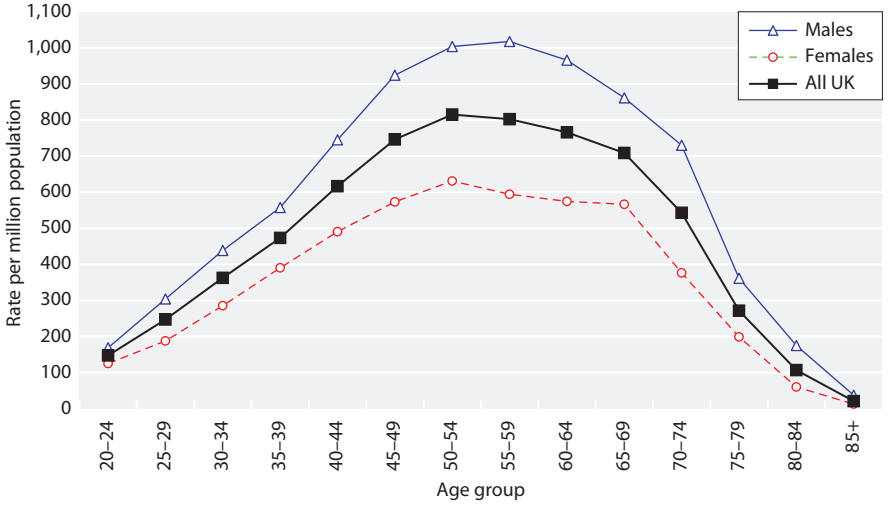

Fig. 3.1. Transplant prevalence rate per million population by age and gender on 31/12/2010

Table 3.7. Primary renal diagnosis in renal transplant recipients 2006–2010

	New transplants by year						Established transplants on 01/01/2010	
	2006	2007	2008	2009	2010			
Primary renal diagnosis	%	%	%	%	%	N	%	N
Aetiology uncertain/GN[a] not biopsy proven	16.6	16.1	15.3	15.3	15.4	360	19.6	4,584
Diabetes	13.4	14.5	12.9	12.5	11.6	272	8.9	2,086
Glomerulonephritis	19.6	20.5	19.4	20.8	17.3	406	19.4	4,549
Polycystic kidney disease	12.6	13.3	13.1	12.8	13.4	314	12.2	2,857
Pyelonephritis	12.4	11.9	12.1	11.5	9.6	225	14.5	3,400
Renovascular disease	6.0	5.5	6.8	6.1	6.8	159	5.7	1,333
Other	16.8	16.1	17.3	15.6	15.8	371	16.7	3,903
Not available	2.6	2.0	3.2	5.2	10.1	237	3.1	721

[a]GN = glomerulonephritis

Table 3.8. Ethnicity of patients who received a transplant in the years 2005–2010

Year	% White	% South Asian	% Black	% Other	% Unknown
2005	77.0	7.8	5.1	1.0	9.1
2006	74.9	8.1	6.6	2.0	8.4
2007	75.0	7.8	6.1	2.0	9.3
2008	71.9	8.4	6.4	1.9	11.5
2009	70.1	10.2	6.8	2.2	10.6
2010	71.2	9.9	6.4	2.2	10.2

the causes of between-centre differences in outcomes. For this reason, along with differences in repatriation policies of prevalent transplant patients between centres as highlighted previously, caution needs to be exercised when comparing performance between centres.

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

For the one year post-transplant analyses, in which patients were assigned to the centres that performed their transplant, the two Scottish transplant centres were excluded as they only submit limited biochemical data to the UKRR. After excluding these 2 transplant centres, one year outcomes are described for 21 transplant centres across the UK.

Methods

Data for key laboratory variables are reported for all prevalent patients with valid data returns for a given renal centre (both transplanting and non-transplanting centres) and for one year post-transplant results for patients transplanted 2003–2009, with patients attributed to the transplant centre that performed the procedure.

Time since transplantation may have a significant effect on key biochemical and clinical variables and this is likely to be independent of a centre's clinical practices. Therefore, inter-centre comparison of data on prevalent transplant patients is open to bias. To minimise 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 are 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.

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 prevalent patients as on 31st December 2010. Patients were considered as having a functioning transplant if 'transplant' was listed as the last mode of RRT in the last quarter of 2010. Patients were assigned to the renal centre that sent the data to

Table 3.9a. Percentage completeness by centre for prevalent transplant patients on 31/12/2010[a]

Centre	N	Ethnicity	eGFR[b]	Blood pressure	Centre	N	Ethnicity	eGFR[b]	Blood pressure
Antrim	77	100	94	87	Leic	811	94	96	41
B Heart	157	100	93	0	Liv RI	745	92	91	61
B QEH	810	100	93	2	M Hope	344	99	88	0
Basldn	50	100	94	48	M RI	940	97	99	0
Belfast	412	98	98	64	Middlbr	394	99	96	52
Bradfd	226	99	84	77	Newc	551	100	99	1
Brightn	327	63	87	0	Newry	56	100	100	93
Bristol	710	99	98	71	Norwch	238	95	95	55
Camb	574	97	98	97	Nottm	446	100	98	92
Cardff	896	75	97	97	Oxford	846	91	99	12
Carlis	123	98	98	0	Plymth	275	99	95	0
Carsh	538	96	93	0	Ports	733	99	94	12
Chelms	80	99	93	81	Prestn	391	100	95	0
Clwyd	55	75	98	80	Redng	272	100	99	95
Covnt	386	98	86	77	Sheff	561	100	98	97
Derby	129	98	77	98	Shrew	114	100	64	0
Derry	46	100	93	89	Stevng	183	100	73	0
Donc	47	100	100	98	Sthend	67	93	96	55
Dorset	279	100	90	75	Stoke	262	54	99	0
Dudley	83	100	98	16	Sund	154	99	98	94
Exeter	341	96	96	81	Swanse	172	99	98	99
Glouc	133	100	98	100	Truro	148	89	99	98
Hull	329	63	93	0	Tyrone	40	100	95	88
Ipswi	158	99	99	87	Ulster	17	100	94	94
Kent	357	91	46	0	Wolve	130	100	96	95
L Barts	766	100	96	0	Wrexm	123	99	80	0
L Guys	973	81	95	0	York	159	81	99	48
L Kings	306	98	95	0	**England**	**20,058**	**95**	**94**	**32**
L RFree	873	99	98	0	**N Ireland**	**648**	**99**	**97**	**73**
L St.G	333	88	94	0	**Wales**	**1,246**	**81**	**96**	**87**
L West	1,445	100	98	0	**E, W & NI**	**21,952**	**94**	**95**	**36**
Leeds	761	90	97	94					

[a]Scottish centres are not shown as they do not provide biochemical data to the UKRR
[b]Patients with missing ethnicity were classed as White for eGFR calculation

the UKRR but some patients will have received care in more than one centre. If data for the same transplant patient were received from both the transplant centre and non-transplant centre, care was allocated to the non-transplant centre. Patients with a functioning transplant of less than 3 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 2010 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 2010. 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 2003 and 31st December 2009 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. For patients with more than one transplant during 2003–2009, they were included as separate episodes provided each of the transplants functioned for a year.

Table 3.9b. Percentage completeness by centre for prevalent transplant patients on 31/12/2010[a]

Centre	N	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[b]	Serum phosphate	Serum PTH
Antrim	77	92	92	86	94	81
B Heart	157	93	38	90	89	12
B QEH	810	93	73	93	91	67
Basldn	50	94	56	94	86	24
Belfast	412	98	97	97	97	23
Bradfd	226	80	56	81	81	19
Brightn	327	88	26	83	82	27
Bristol	710	98	67	98	98	97
Camb	574	98	73	98	98	91
Cardff	896	98	52	98	98	9
Carlis	123	96	72	94	92	7
Carsh	538	74	55	92	92	3
Chelms	80	91	48	93	93	18
Clwyd	55	98	80	100	100	64
Covnt	386	85	0	84	44	28
Derby	129	73	55	66	65	51
Derry	46	93	91	91	91	85
Donc	47	100	85	100	100	28
Dorset	279	88	60	52	58	19
Dudley	83	95	67	55	96	53
Exeter	341	96	72	95	90	23
Glouc	133	97	47	98	95	35
Hull	329	93	18	91	91	14
Ipswi	158	99	49	99	98	75
Kent	357	95	55	93	93	13
L Barts	766	96	95	96	96	63
L Guys	973	95	46	90	90	33
L Kings	306	95	41	95	95	13
L RFree	873	96	96	98	98	82
L St.G	333	94	42	94	94	46
L West	1,445	98	82	98	98	7
Leeds	761	94	89	96	96	46
Leic	811	96	84	95	95	61
Liv RI	745	90	5	86	90	71
M Hope	344	88	82	88	88	74
M RI	940	99	47	99	99	61
Middlbr	394	95	45	95	94	17
Newc	551	98	70	98	98	15
Newry	56	96	96	98	96	57
Norwch	238	93	90	92	92	18
Nottm	446	98	54	95	94	87
Oxford	846	99	50	98	98	28
Plymth	275	89	45	92	92	20
Ports	733	94	35	91	88	11
Prestn	391	93	79	93	93	63
Redng	272	98	93	98	93	85
Sheff	561	98	42	98	98	19
Shrew	114	88	78	80	80	4
Stevng	183	94	69	93	90	39
Sthend	67	94	28	93	93	4
Stoke	262	99	98	99	98	31
Sund	154	97	81	98	98	91
Swanse	172	98	71	98	98	38
Truro	148	99	66	98	98	72
Tyrone	40	90	90	93	93	63

Table 3.9b. Continued

Centre	N	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[b]	Serum phosphate	Serum PTH
Ulster	17	94	88	94	94	71
Wolve	130	96	58	96	89	49
Wrexm	123	96	94	98	98	95
York	159	86	62	87	92	15
England	**20,058**	**94**	**61**	**93**	**92**	**43**
N Ireland	**648**	**96**	**96**	**95**	**96**	**41**
Wales	**1,246**	**98**	**60**	**98**	**98**	**24**
E, W & NI	**21,952**	**95**	**62**	**94**	**93**	**42**

[a]Scottish centres are not shown as they do not provide biochemical data to the UKRR
[b]Serum calcium corrected for serum albumin

Table 3.10. Number of patients reallocated to transplanting centre

Transplant centre	Total number of patients per transplant centre	Non-transplant centre	Number of patients reallocated to a transplant centre
B QEH	718	Dudley	1
		Shrew	2
		Stoke	4
Belfast	209	Antrim	2
		Derry	4
		Newry	14
		Tyrone	1
Bristol	685	Dorset	3
		Glouc	3
Camb	866	Norwch	1
		Stevng	3
Cardff	624		n/a
Covnt	286		n/a
L Barts	531		n/a
L Guys	1,021	Kent	13
		L Kings	5
L Rfree	388		n/a
L St.G	270	Brightn	11
		Carsh	7
L West	1,015		n/a
Leeds	901	Hull	16
Leic	427		n/a
Liv RI	530	Prestn	2
		Wrexm	1
M RI	457	M Hope	2
Newc	673	Carlis	6
		Middlbr	19
		Sund	6
Nottm	258		n/a
Oxford	857		n/a
Plymth	379		n/a
Ports	399		n/a
Sheff	341		n/a
Total	**11,835**		**126**

Only transplant centres in England, N Ireland and Wales included

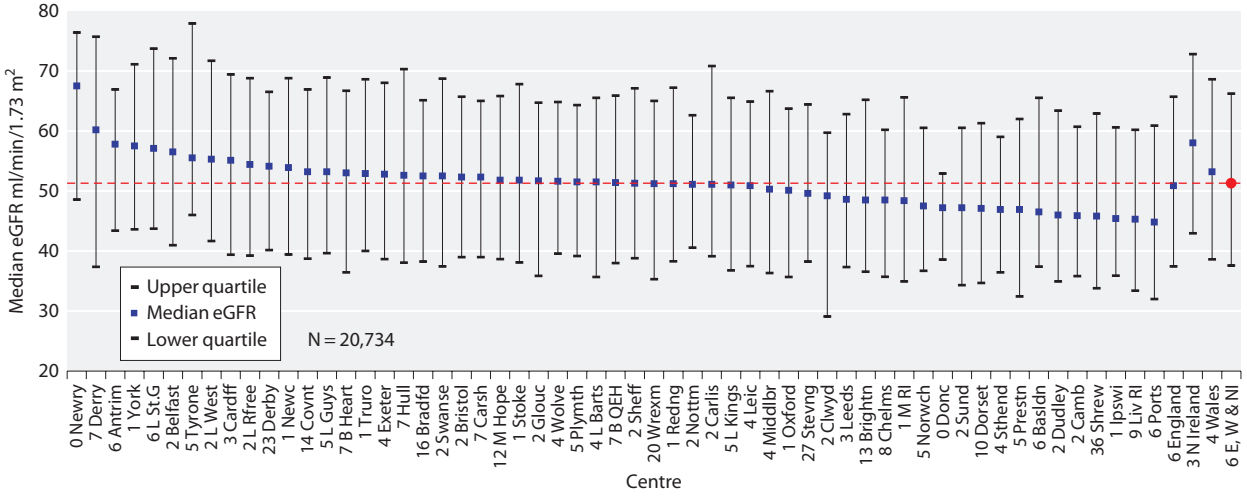

Fig. 3.2. Median eGFR in prevalent transplant patients by centre on 31/12/2010

For each patient, the most recent laboratory or blood pressure for the relevant 4th/5th quarter (10–15 months) 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.

Results and discussion

Post-transplant eGFR in prevalent transplant patients

When interpreting eGFR post-transplantation it is important to remember that estimated GFR formulae only have a modest predictive performance in the transplant population [4]. Median eGFR in each centre and percentage of patients with eGFR <30 ml/min/1.73 m^2 are shown in figures 3.2 and 3.3. The median eGFR was 51.3 ml/min/1.73 m^2, with 13.8% 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 of patients with failing transplants from transplant centres to referring centres might explain some of the differences, it is notable that both transplanting and non-transplant centres feature at both ends of the scale. The accuracy of the 4-variable MDRD equation in estimating GFR ⩾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

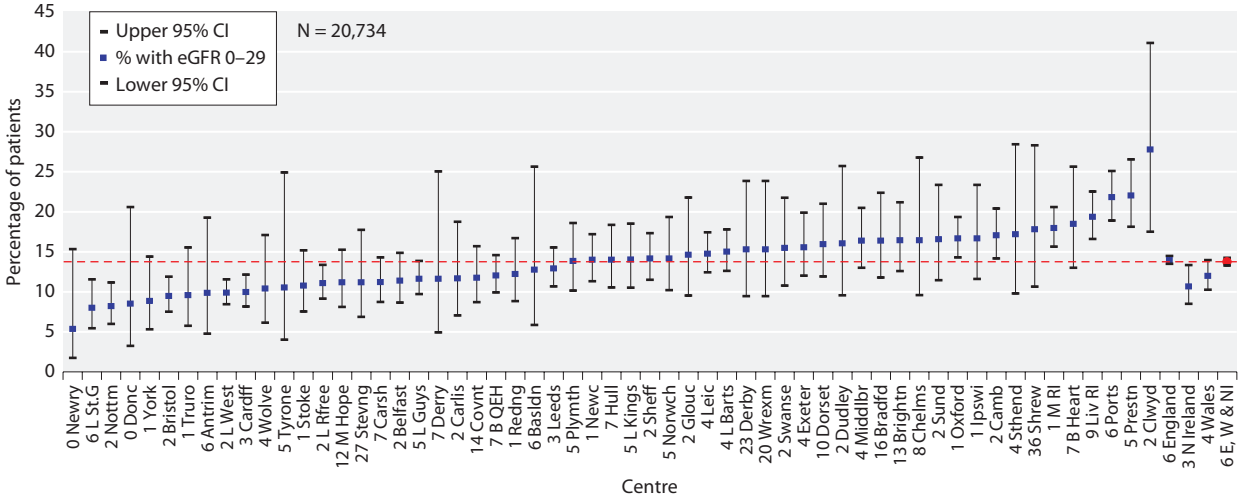

Fig. 3.3. Percentage of prevalent transplant patients by centre on 31/12/2010 with eGFR <30 ml/min/1.73 m^2

Table 3.11. Proportion of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 on 31/12/2010

Centre	Patients with eGFR data N	eGFR <30 %	Centre	Patients with eGFR data N	eGFR <30 %
Tyrone	38	10.5	Redng	270	12.2
Derry	43	11.6	Brightn	286	16.4
Basldn	47	12.8	L Kings	292	14.0
Donc	47	8.5	M Hope	304	11.2
Clwyd	54	27.8	Hull	307	14.0
Newry	56	5.4	L St.G	313	8.0
Sthend	64	17.2	Exeter	328	15.5
Antrim	71	9.9	Covnt	332	11.7
Shrew	73	17.8	Prestn	372	22.0
Chelms	73	16.4	Middlbr	378	16.4
Dudley	81	16	Belfast	404	11.4
Derby	98	15.3	Nottm	439	8.2
Wrexm	98	15.3	Carsh	500	11.2
Carlis	120	11.7	Newc	543	14.0
Wolve	125	10.4	Sheff	551	14.2
Glouc	130	14.6	Camb	563	17.1
Stevng	134	11.2	Liv RI	681	19.4
Truro	146	9.6	Ports	687	21.8
B Heart	146	18.5	Bristol	696	9.5
Sund	151	16.6	L Barts	732	15.0
Ipswi	156	16.7	Leeds	736	12.9
York	158	8.9	B QEH	755	12.1
Kent	163	15.3	Leic	779	14.8
Swanse	168	15.5	Oxford	840	16.7
Bradfd	189	16.4	L Rfree	858	11.1
Norwch	226	14.2	Cardff	873	10.0
Dorset	251	15.9	L Guys	929	11.6
Stoke	260	10.8	M RI	929	18.0
Plymth	260	13.8	L West	1415	9.9

lines the limits for 3 standard deviations (99.9%). With 57 centres included and a normal distribution, 2–3 centres would be expected to fall between the 95%–99% 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 15 centres falling outside the 95% CI of which 8 centres were outside the 99.9% CI. Five centres (Bristol, Cardiff, London St George's, London West, Nottingham) fall outside the lower 99.9% CI suggesting a lower than expected proportion of patients with eGFR <30 ml/min/1.73 m^2. Liverpool RI, Portsmouth and Preston fall outside the upper 99.9% CI suggesting a higher than expected proportion of patients with eGFR <30 ml/min/1.73 m^2.

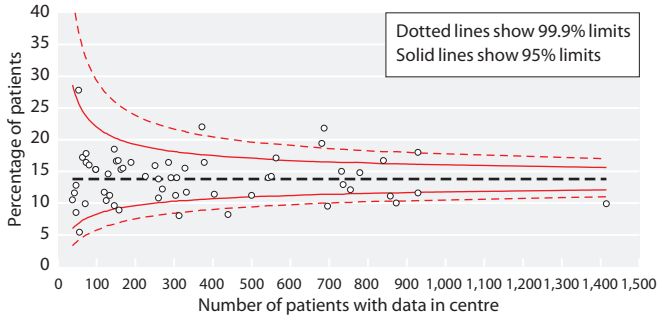

Fig. 3.4. Funnel plot of percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre size on 31/12/2010

eGFR in patients one year after transplantation

Graft function at one year post-transplantation may predict subsequent long-term graft outcome [6]. The median eGFR of patients one year post-live donor transplantation was 54.1 ml/min/1.73 m^2. The median eGRF of patients one year post-deceased donor transplant was 50.9 ml/min/1.73 m^2. Figures 3.5a and 3.5b show the median one year post-transplant eGFR for patients transplanted 2003–2009, by transplant type.

Figures 3.6a and 3.6b show one year post-transplant eGFR by donor type and year of transplantation. An

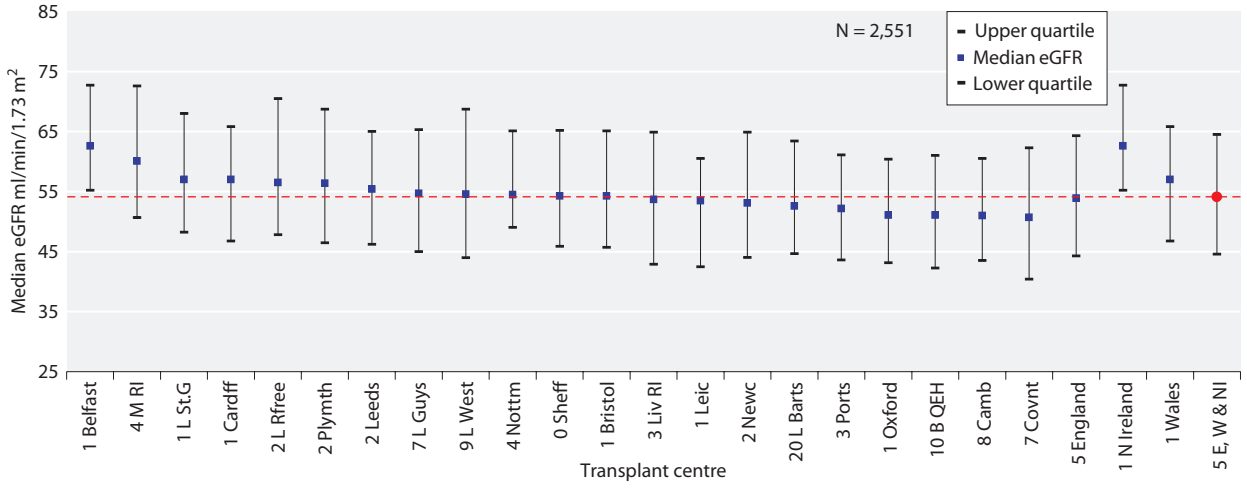

Fig. 3.5a. Median eGFR one year post-live donor transplant by transplant centre 2003–2009

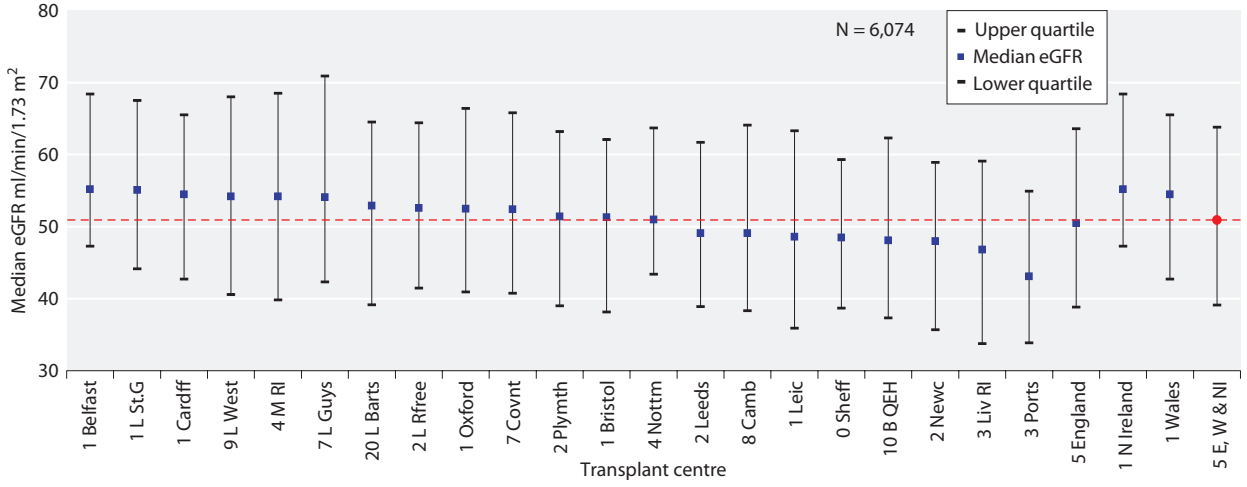

Fig. 3.5b. Median eGFR one year post-deceased donor transplant by transplant centre 2003–2009

upward trend in eGFR ($p < 0.001$) over the time period is noticed with both live and deceased donor transplants. Therefore changing donor demographics, with a higher proportion of live donor transplants more recently, does not explain the upward trend in one year post-transplant eGFR.

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 guidelines regarding the management of anaemia in CKD were published by the association in November 2010 [7]. However, most of the data presented in this chapter pre-dates this and therefore the previous standards are referred to. These state that ***'Patients with CKD should achieve a haemoglobin between 10.5–12.5 g/dl'*** [8]. However, many transplant patients with good transplant function will have haemoglobin concentrations >12.5 g/dl without the use of 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 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

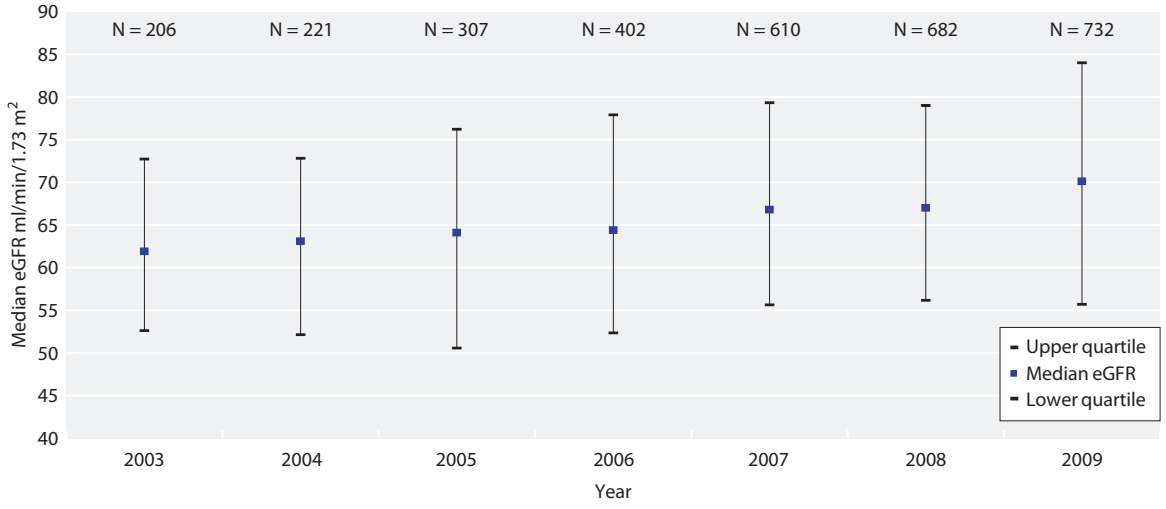

Fig. 3.6a. Median eGFR one year post-live donor transplant by year of transplantation 2003–2009

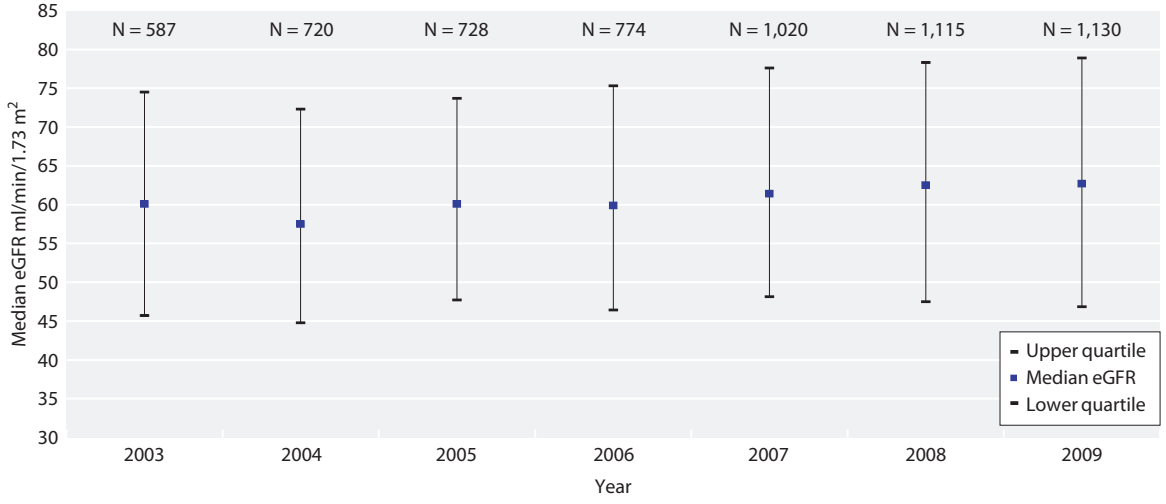

Fig. 3.6b. Median eGFR one year post-deceased donor transplant by year of transplantation 2003–2009

prevalent transplant patients achieving Hb >10.5g/dl in each centre, stratified by eGFR, is displayed in figures 3.8a and 3.8b. In previous reports a cut-off of 45ml/min/1.73 m^2 was used to stratify analysis for patients with poor graft function. For this report a cut-off of 30 ml/min/1.73 m^2 was used as a more appropriate category for transplants with poor function.

Figure 3.9 describes the percentage of prevalent patients by centre with haemoglobin <10.5g/dl as a funnel plot enabling more reliable comparison of outcomes between centres across the UK. With 58 centres included and a normal distribution, 2–3 centres would be expected to fall between the 95%–99.9% CI (1 in 20) and no centres should fall outside the 99.9% CI purely as a chance event.

Two centres (London Barts, London Royal Free) fall outside the upper 99.9% CI and four further centres (Leicester, Liverpool RI, London Kings, London West) fall outside the upper 95% CI indicating a higher than predicted proportion of transplant patients not achieving the haemoglobin target. Eleven centres fall outside the lower 99.9% CI, indicating they perform better than expected with fewer than predicted patients having a haemoglobin <10.5g/dl.

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 the kidney transplant recipient is that ***'Blood pressure***

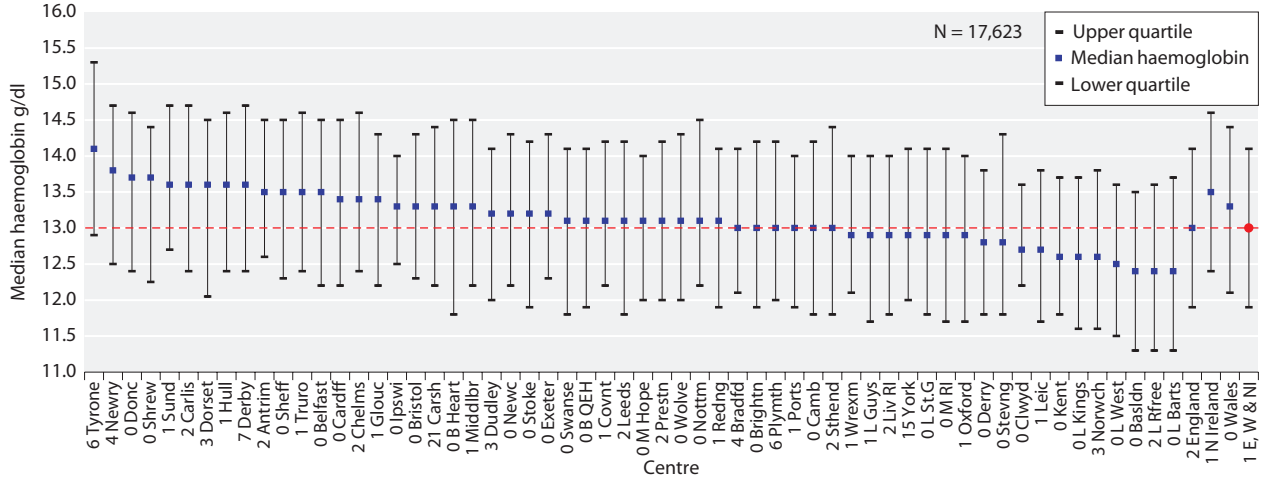

Fig. 3.7a. Median haemoglobin for prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 by centre on 31/12/2010

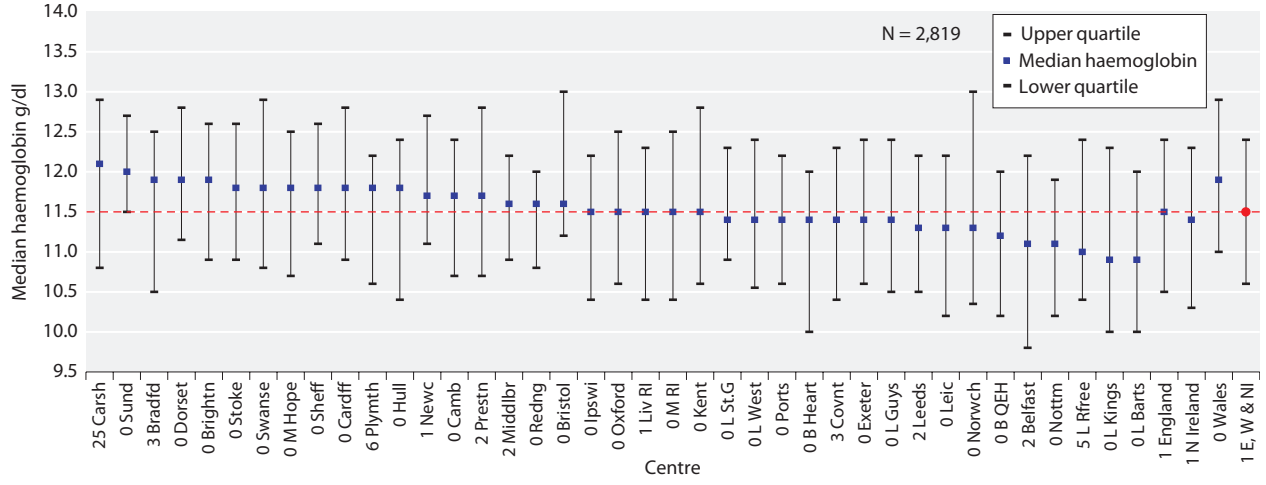

Fig. 3.7b. Median haemoglobin for prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre on 31/12/2010

should be <130/80mmHg (or <125/75mmHg 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 <130/80mmHg, by eGFR. The percentage of patients with BP <130/80 (systolic BP <130 **and** diastolic BP <80 mmHg) was higher (28.6% vs. 23.3%) in those with better renal function (eGFR ⩾30 ml/min/1.73 m^2). To avoid repetition, further analyses of the attainment of the RA standards for blood pressure are reported in chapter 10.

Analysis of prevalent patients by CKD stage

Introduction

Approximately 2.4% of prevalent transplant patients returned to dialysis in 2010, a similar percentage to that seen over the last 8 years. Amongst patients with native chronic kidney disease, late presentation is associated with poor outcomes, largely attributable to lack of specialist management of anaemia, acidosis, hyperphosphataemia and to inadequate advance preparation for dialysis. Transplant recipients on the other hand, are almost always followed up regularly in specialist

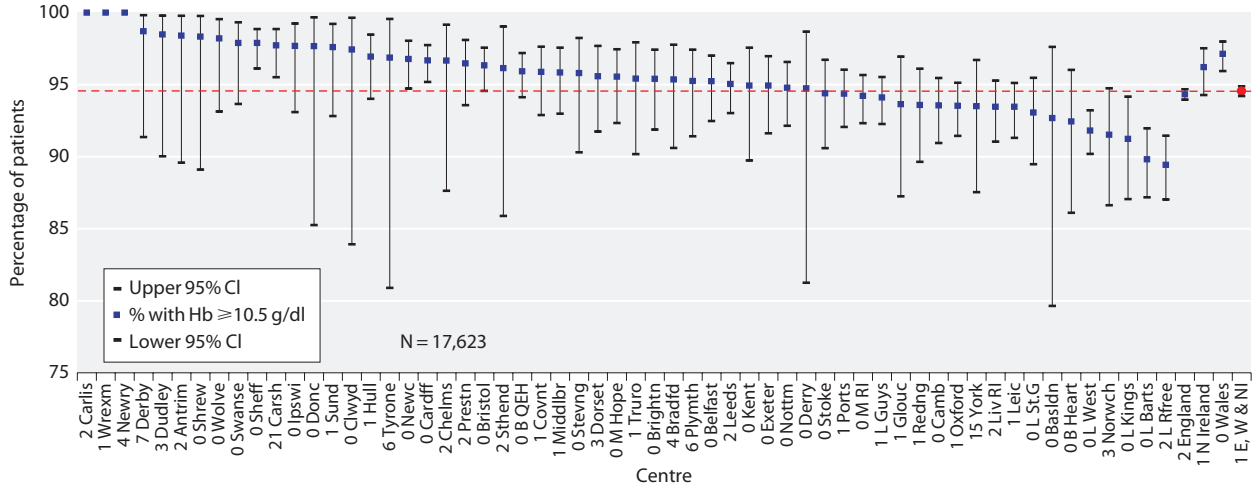

Fig. 3.8a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving haemoglobin ⩾10.5g/dl by centre on 31/12/2010

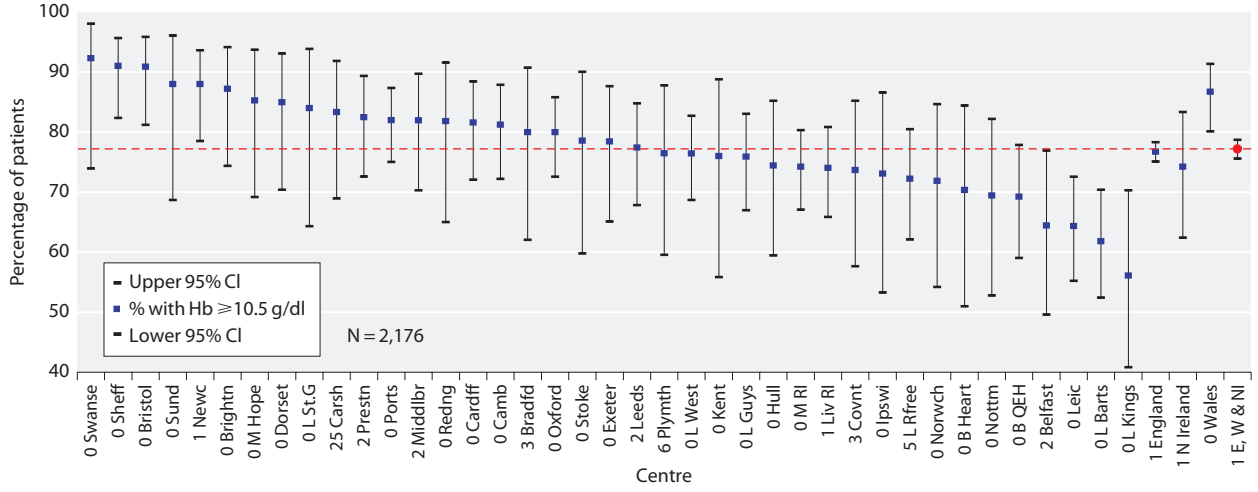

Fig. 3.8b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving haemoglobin ⩾10.5g/dl by centre on 31/12/2010

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 2010 (N = 20,744) and were classified according to the KDIGO staging criteria with the suffix of 'T' to represent their transplant status. Patients with missing ethnicity information were classified as White for the purpose of calculating eGFR. Prevalent dialysis patients, except those who commenced dialysis in 2010, comprised the comparison dialysis cohort (N = 18,751) including 2,411 peritoneal dialysis patients. Only

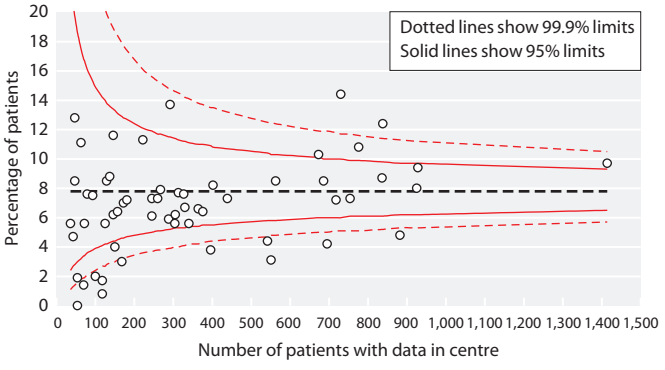

Fig. 3.9. Funnel plot of percentage of prevalent transplant patients with haemoglobin <10.5g/dl by centre size on 31/12/2010

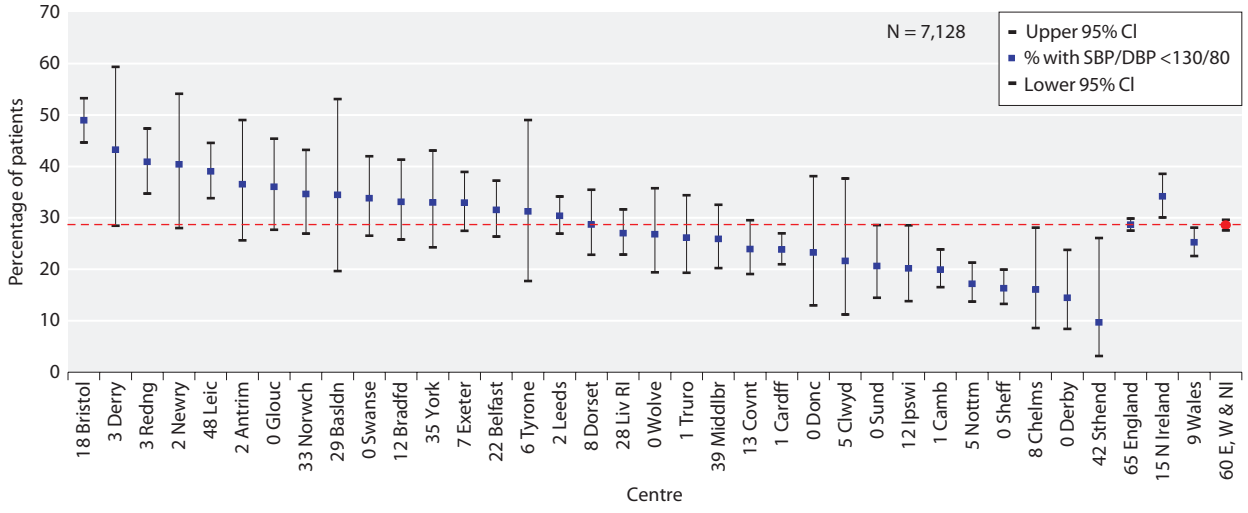

Fig. 3.10a. Percentage of prevalent transplant patients with eGFR $\geqslant$30 ml/min/1.73 m^2 achieving blood pressure of <130/80mmHg by centre on 31/12/2010

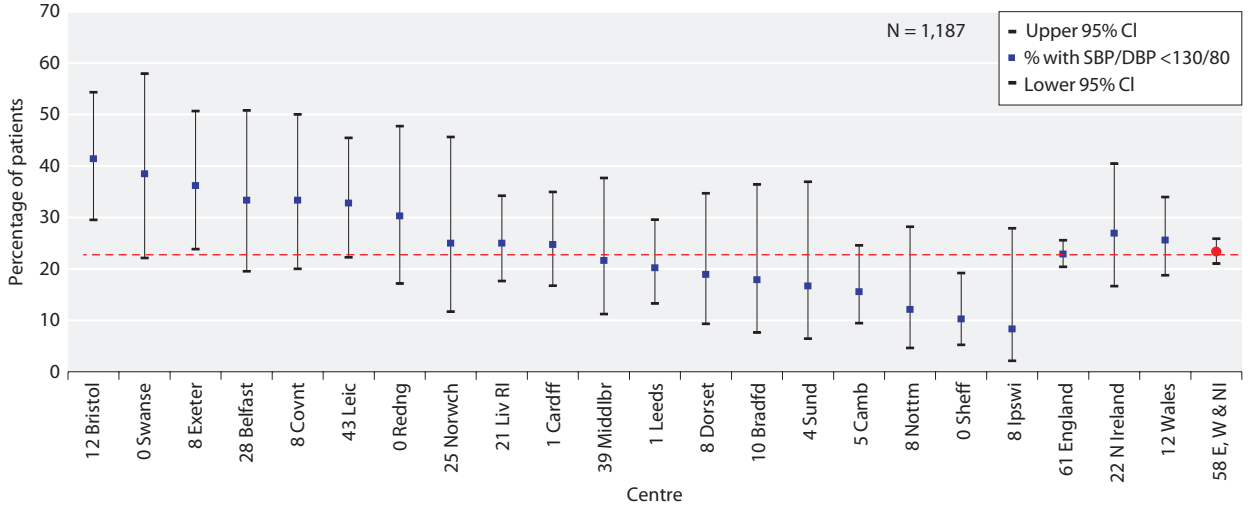

Fig. 3.10b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving blood pressure of <130/80mmHg by centre on 31/12/2010

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 2010 laboratory data.

Results and discussion

Table 3.12 shows that 13.7% of the prevalent transplant population (2,855 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. For the first time the UKRR have analysed eGFR slope and its relationship to specific patient characteristics, and the results are presented here.

Table 3.12. Analysis by CKD stage for prevalent transplant patients compared with prevalent dialysis patients on 31/12/2010

	Stage 1–2T (⩾60)	Stage 3T (30–59)	Stage 4T (15–29)	Stage 5T (<15)	Stage 5D
Number of patients	7,135	10,754	2,538	317	18,751
% of patients	34.4	51.8	12.2	1.5	
eGFR ml/min/1.73 m^2[a]					
mean ± SD	76.5 ± 14.9	45.6 ± 8.3	23.8 ± 4.1	11.7 ± 2.5	
median	72.4	45.7	24.4	12.0	
Systolic BP mmHg					
mean ± SD	133.0 ± 16.3	135.9 ± 17.7	139.2 ± 19.7	142.6 ± 22.2	130.3 ± 24.7
% ⩾130	57.4	63.1	68.9	73.3	48.5
Diastolic BP mmHg					
mean ± SD	78.1 ± 10.4	78.5 ± 10.7	79.4 ± 12.2	81.2 ± 12.8	69.1 ± 14.5
% ⩾80	47.6	49.2	52.0	57.8	22.9
Cholesterol mmol/L					
mean ± SD	4.5 ± 1.0	4.6 ± 1.1	4.6 ± 1.2	4.6 ± 1.2	4.0 ± 1.1
% ⩾5	27.4	31.7	35.7	31.3	17.5
Haemoglobin g/dl					
mean ± SD	13.5 ± 1.6	12.7 ± 1.6	11.6 ± 1.5	10.9 ± 1.6	11.4 ± 1.4
% <10.5	3.2	6.9	21.1	36.1	22.6
Phosphate mmol/L[b]					
mean ± SD	0.9 ± 0.2	1.0 ± 0.2	1.2 ± 0.3	1.6 ± 0.4	1.6 ± 0.4
% ⩾1.8	0.1	0.2	2.0	22.9	27.0
Corrected calcium mmol/L					
mean ± SD	2.4 ± 0.2	2.4 ± 0.2	2.3 ± 0.2	2.3 ± 0.2	2.3 ± 0.2
% >2.6	7.3	7.6	5.0	6.2	6.5
% <2.2	11.1	10.0	16.7	23.3	19.9
Phosphate mmol/L[b]					
median	8.3	9.7	16.0	27.6	28.5
% ⩾32	4.0	5.2	20.2	43.5	45.0

[a]Prevalent transplant patients with no ethnicity data were classed as White
[b]Only PD patients included in stage 5D, N = 2,411

Methods

Patients from England, Wales or Northern Ireland aged ⩾18 years receiving a renal transplant between 1st January 2000 and 31st December 2008, were considered for inclusion. A minimum duration of 18 months graft function was required and 3 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 18 months 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 discussion

The study cohort consisted of 9,734 patients. The median GFR slope was −0.6 ml/min/1.73 m^2/year (table 3.13). The gradient was steeper for Asian (−1.15 ml/min/1.73 m^2/year) and Black (−1.18 ml/min/1.73 m^2/year) recipients, in keeping with previously published data suggesting poorer outcomes for Black patients [12, 13]. eGFR slope was steeper in recipients of deceased donor kidneys (−0.68 ml/min/1.73 m^2/year) compared to patients who received organs from live donors (−0.24 ml/min/1.73 m^2/year). Female patients had a steeper slope

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

Patient characteristic		N	Median slope	Lower quartile	Upper quartile	p-value
Age at transplant	<40	3,352	−1.22	−5.67	2.84	<0.0001
	40–55	3,786	−0.46	−4.05	3.08	
	>55	2,596	−0.08	−3.49	3.03	
Ethnicity	Asian	745	−1.15	−5.50	3.47	0.02
	Black	516	−1.18	−5.55	2.85	
	Other	152	−0.34	−4.14	3.70	
	White	7,803	−0.56	−4.24	2.89	
Gender	Male	5,961	−0.37	−3.92	3.09	<0.0001
	Female	3,773	−1.02	−5.08	2.79	
Diabetes	Non-diabetic	8,356	−0.49	−4.18	3.03	<0.0001
	Diabetic	1,182	−1.37	−5.84	2.69	
Donor type	Deceased	6,496	−0.68	−4.25	2.80	0.02
	Live	2,006	−0.24	−4.26	3.56	
Year of transplant	2000	600	−0.76	−3.94	2.40	0.01
	2001	725	−0.69	−4.37	2.74	
	2002	693	−0.87	−4.66	2.34	
	2003	837	−1.10	−4.54	2.18	
	2004	1,015	−1.13	−4.22	2.55	
	2005	1,076	−0.38	−3.74	2.88	
	2006	1,450	−0.36	−4.01	3.27	
	2007	1,594	−0.56	−4.49	3.03	
	2008	1,744	−0.23	−5.21	4.29	
Current status of transplant	Died	556	−1.11	−4.60	2.68	<0.0001
	Re-transplanted	58	−3.16	−6.48	0.01	
	Functioning	8,452	−0.31	−3.91	3.26	
	Failed	668	−4.50	−11.62	−0.52	
All		**9,734**	**−0.60**	**−4.37**	**2.99**	

−1.02 ml/min/1.73 m^2/year) than males −0.37 ml/min/1.73 m^2/year), as did diabetic patients −1.37 ml/min/1.73 m^2/year) compared to non-diabetic patients −0.49 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.

Table 3.14. Cause of death by modality in prevalent RRT patients on 1/1/2010

	All modalities		Dialysis		Transplant	
Cause of death	N	%	N	%	N	%
Cardiac disease	572	22	510	23	62	17
Cerebrovascular disease	122	5	101	5	21	6
Infection	498	19	419	19	79	22
Malignancy	279	11	196	9	83	23
Treatment withdrawal	351	14	337	15	14	4
Other	233	9	196	9	37	10
Uncertain	535	21	466	21	69	19
Total	**2,590**		**2,225**		**365**	
No cause of death data	1,666	39	1,393	39	273	43

Table 3.15. Cause of death in prevalent transplant patients on 1/1/2010 by age

	All age groups		<65 years		⩾65 years	
Cause of death	N	%	N	%	N	%
Cardiac disease	62	17	37	18	25	16
Cerebrovascular disease	21	6	12	6	9	6
Infection	79	22	38	18	41	26
Malignancy	83	23	54	26	29	19
Treatment withdrawal	14	4	6	3	8	5
Other	37	10	24	11	13	8
Uncertain	69	19	38	18	31	20
Total	**365**		**209**		**156**	
No cause of death data	273	43	157	57	116	43

The findings in this study differ slightly from previous UKRR work exploring eGFR changes in transplant recipients [14]. This identified 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.

Causes 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 6 includes a more detailed discussion on causes 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.

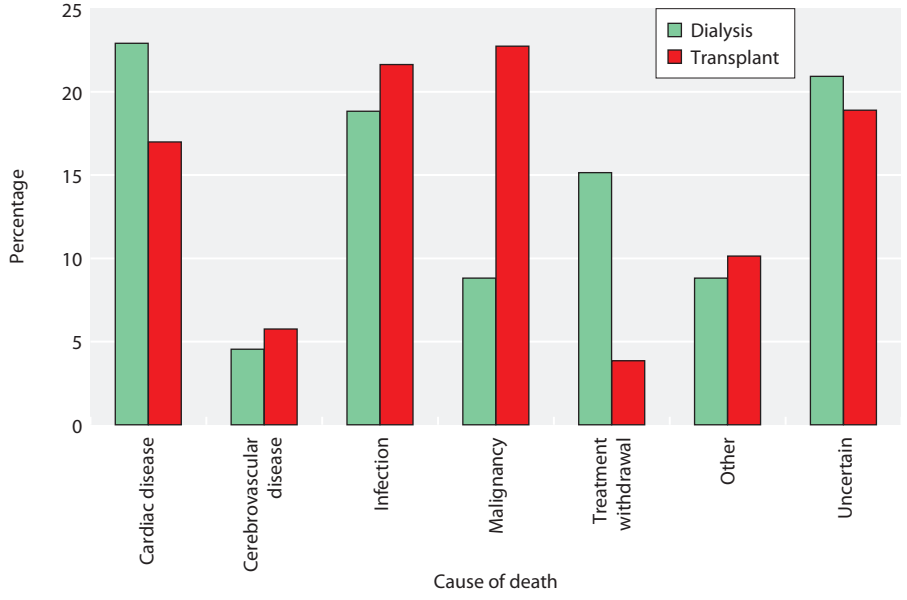

Fig. 3.11. Cause of death by modality for prevalent patients on 1/1/2010

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

Adult patients aged 18 years and over, from England or Wales, were included in the analyses on cause of death. Previous analyses were limited to data from centres with a high rate of return for cause of death. When this was compared with an analysis of all the cause of death data on the database, the percentages in corresponding ERA-EDTA categories remained unchanged so the latter data were therefore included. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 31st December 2010.

Results and discussion

Tables 3.14, 3.15 and figure 3.11 show the differences in the causes of death between prevalent dialysis and transplant patients. Death due to cardiovascular disease is 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. Malignancy is the commonest reported cause of death in transplant recipients (23%), in keeping with current literature regarding post-transplantation malignancy [15]. 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 23% in 2010) with an increase in the proportion ascribed to infection or malignancy (30% in 2003 compared to 45% in 2010). This change has also been reported in other registries, eg ANZDATA (http://www.anzdata.org.au) and may reflect better management of cardiovascular risk (although table 3.12 shows BP and phosphate 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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