

Chapter 11: Renal Transplantation in Adults

(This chapter has been produced in collaboration with the British Transplant Society)

Summary

- This Chapter reports on data returned from 41 units of which 16 are renal transplant centres. Several large renal units remain outside the annual Registry data collection.
- The proportion of prevalent RRT patients of all ages made up by renal transplants was 46% in 2003, showing a continued decline.
- 26% of all transplant patients on the Registry database are managed by non-transplant centres.
- Treatment modality for prevalent RRT patients aged <65 years comprised of renal transplantation in 57%, HD in 30% and PD in 13%.
- 2.2% of all prevalent transplants failed in 2003.
- Annual death rate of patients with renal transplants was 2.4% excluding patients with failed grafts returning to dialysis and 2.6% if included.
- Renal transplant function (eGFR) varies significantly between centres.
- Haemoglobin and serum cholesterol achievement vary significantly between centres.
- Blood pressure reporting continues to be incomplete and point prevalent achieved blood pressure control falls well short of Renal Association Standards.
- Transplant function analysed by CKD stage 1–2 (eGFR <60), 3 (eGFR 30–59), 4 (eGFR 15–29), 5 (eGFR <15), shows that these categories account for 26%, 57%, 15% and 2.7% of patients respectively.
- Haemoglobin values fall with decreasing eGFR such that of the 2.7% of transplant patients with eGFR <15 ml/min, 30% had an Hb <10 g/dl and 51% <11 g/dl.
- Control of iPTH was poor in transplant recipients in CKD stages 4 and 5, with 27% and 48% of patients respectively having a PTH >32 pmol/L (=300 ng/L).
- An increase of systolic and diastolic BP was apparent with declining eGFR.
- 33% of transplant recipients in CKD stage 5 have a serum phosphate >1.8 mmol/L.
- With over 17% of prevalent transplant recipients being classified as CKD stage 4–5 this has implications in the planning of services for these patients.

Introduction

In England there are 14 centres outside of London performing renal transplantation in 2003 and one centre in Wales. In London, the eight transplant centres are gradually amalgamating to create five centres: St Helier (Carshalton) combining with St Georges, the Middlesex with the Royal Free Hospital, the Hammersmith & Charing Cross with St Mary's, Guy's Hospital and the London Hospital.

Notwithstanding these separate transplant centres, most centres have also amalgamated into alliances, of which there are six currently:

North Thames (Hammersmith & Charing Cross/St Mary's, The London, Royal Free Hospital/Middlesex),

South Thames (St Helier/St Georges and Guy's Hospital),

North of England (Leeds, Liverpool, Manchester and Newcastle),

Trent (Leicester, Nottingham, Sheffield),

South, South West & Wales (Bristol, Cardiff, Oxford, Plymouth, Portsmouth),

Scotland (Aberdeen, Edinburgh, Glasgow).

Belfast, Birmingham, Cambridge and Coventry were the only centres independent of an alliance. Over and above these transplant centres, much of the management follow-up of

transplant patients was performed in the original referring renal units. This Chapter reports data returned from 41 units, of which 16 perform renal transplantation.

National comprehensive data for incidence and survival of renal transplantation are available from UKTransplant (www.uktransplant.org.uk). The Renal Registry is undertaking combined analyses of data with UKTransplant and will report jointly on these analyses.

UKTransplant report that there were 1,386 cadaveric renal transplants and 450 live donor transplants in the period April 2003 to March 2004. In the same period in 2002–2003, there had been 1,399 cadaveric and 379 living related transplants, reflecting a rise in live donor transplants that compensates for a fall in cadaveric transplants undertaken. There continued to be a rise in the number of non-heart beating cadaveric donor organ retrievals, 70 in the year 2003–2004, up from 58 in 2002–2003. In total there were 1,836 renal transplants in 2003–2004, the largest number of renal transplants in a single year on record. The transplant waiting list at 31st March 2004 consisted of 5,074 patients compared to 5,020 at the same period in 2003, a rise of 1%. The number of patients waiting for a kidney transplant represents 86 patients per million population.

As in previous years, data on kidney disease leading to transplantation, demography of transplant recipients, ethnicity in transplantation, renal function, blood pressure, cholesterol, haemoglobin and the proportion of patients with diabetes receiving a transplant are all included in this Chapter.

Transplants performed in 2003

There were 1,021 renal transplants performed by centres contributing data to the Renal Registry,

Table 11.1: Median age of new transplant recipients in Registry units in E&W since 1998

Year	Median age	Number
1998	42.9	496
1999	41.6	517
2000	45.4	646
2001	43.7	830
2002	46.8	935
2003	44.9	1,021

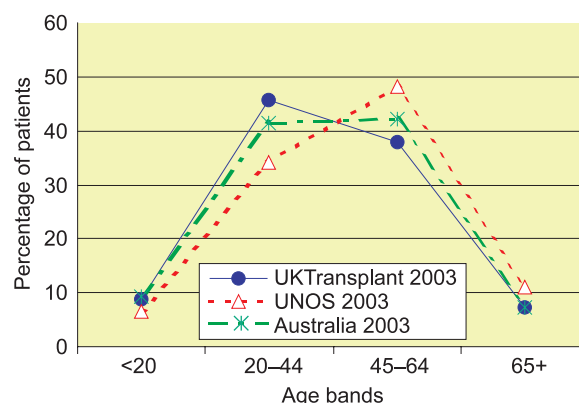


Figure 11.1: Age distribution of patients transplanted in 2003, UK, USA, and Australia

which represents 60% of renal transplants performed in the UK in 2003. The median age of the new transplant recipients in 2003 was 44.9 years, of which 60% were men and 40% women, reflecting the predominance of males in the dialysis population.

The median age of all transplant recipients in 2003 (including those from live donors) is shown in Figure 11.1. These data from the USA have been supplied by the UNOS database and the Australian data from the ANZDATA Registry. The median age of transplant recipients is slightly higher in the US and 11% of recipients are aged over 65 compared with 7.5% in the UK and 7.2% in Australia.

Table 11.2 shows the number of new and prevalent transplant patients in the UK and in

Table 11.2: Number of new and prevalent transplant recipients in centres reporting to the Renal Registry

	New transplants UK (inc children)	Prevalent transplants UK	New transplants Renal Registry E&W	Prevalent transplants Renal Registry E&W
1999	1,581	Not available	517	5,433
2000	1,671	Not available	646	6,689
2001	1,691	Not available	830	8,688
2002	1,658	17,135	935	10,372
2003	1,697	Not available	1,021	11,194

Table 11.3: Primary diagnosis transplant patients in the UK

	New transplants in 2003		Established transplants 1/1/03	
	%	No	%	No
Aetiology unc. /Glomer. NP*	17	170	16	1,627
Glomerulonephritis	22	221	25	2,581
Pyelonephritis	12	121	16	1,684
Diabetes	10	100	7	730
Renal vascular disease/ Hypert.	7	67	7	700
Polycystic kidney disease	14	138	11	1,184
Not sent	5	56	3	291
Other	14	148	15	1,506

*glomerulonephritis not biopsy proven.

Table 11.4: Incidence of co-morbidity in transplanted and not transplanted patients

Co-morbidity	Not transplanted 3707	Transplanted 425
Cardiovascular disease	26.5%	6.8%
Peripheral vascular disease	15.5%	2.1%
Cerebrovascular disease	12.3%	3.5%
Diabetes (not cause of ERF)	8.1%	2.6%
Diabetes (as primary diagnosis)	20.6%	10.7%
COPD	8.5%	1.4%
Liver disease	2.3%	0.7%
Malignancy	12.7%	1.9%
Smoking	17.9%	16.8%

the centres involved in Registry's activity from 1999–2003. UK data on new transplant recipients was supplied by UKTransplant and UK prevalent transplant data were derived from the National Renal Survey.

The primary renal disease in newly transplanted patients as well as in the established population are detailed in Table 11.3.

Renal transplantation and co-morbidity

Patients benefit significantly from renal transplantation and the characteristics of patients on the waiting list and receiving a transplant are of interest. Using information from centres with a high return of co-morbid information collected at the start of RRT (>75%), an analysis of patients who had been transplanted and those that remained on dialysis by the end of 2003 was performed. Of an incident cohort of 4,132 patients, just over 10% of patients (425) had been transplanted.

As expected there was a higher level of co-morbid conditions in those patients who remained on dialysis (Table 11.4). Although the prevalence of smoking was similar between the 2 groups this masks the fact that there is a higher prevalence of smoking (22%) in the younger patients starting RRT.

Prevalence of established renal transplants

At the end of 2003, there were 11,194 prevalent transplant patients in participating centres. The transplant prevalence rate by age group is shown in Figure 11.2. The prevalence rate is lower in women as the incidence of renal replacement therapy is higher in men by a ratio of approximately 3:2. The transplant prevalence rate peaks in both men and women in the 55–59 years age group, at 724 pmp and 429 pmp respectively.

Table 11.5 shows the number of prevalent transplant patients at each centre organised by

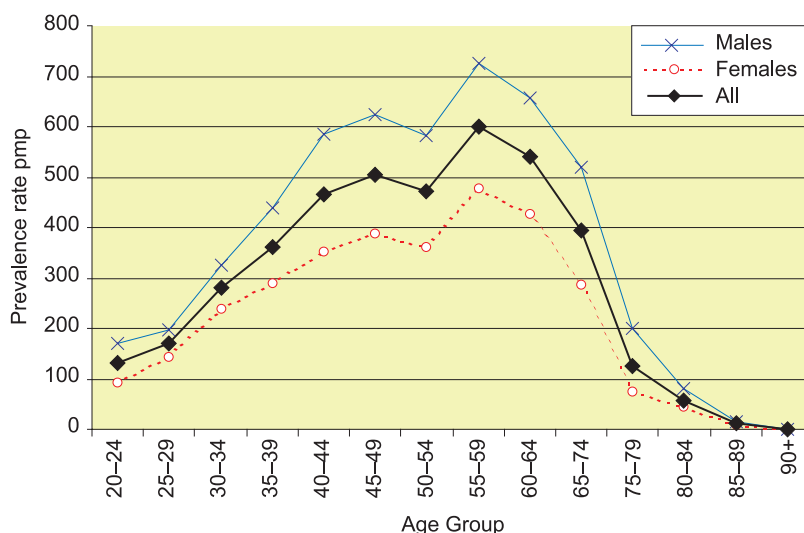


Figure 11.2: Transplant prevalence rate pmp by age and gender

whether the renal unit is a dialysis only centre or also a transplanting centre. Transplant centres transfer patients back to the referring dialysis centres at a variable time after transplantation,

ranging from several weeks to not at all. This means that a prevalence rate cannot be produced by centre. The numbers in Table 11.5 provide an indication of workload. The totals for Wales in Table 11.5 are lower than the transplant prevalence totals shown in Chapter 4 as the data for Table 11.5 are calculated from patients under the care of Welsh renal units. About 100 transplant patients in North Wales are under the direct care of the Liverpool renal unit.

Table 11.5: Number of prevalent transplant patients by renal unit

Dialysis centre	No of Tx	Transplanting centre	No of Tx
Bangr	N/A	Bristol	600
Bradf	114	Camb	421
Carls	86	Carsh	344
Clwyd	N/A	Covnt	269
Derby	N/A	Crdff	645
Extr	228	Guys	707
Glouc	88	H&CX	381
Heart	192	Leeds	664
Hull	203	Leic	484
Ipswi	92	Livrpl	730
Kings	246	Newc	525
ManWst	254	Nottm	375
Middlbr	293	Oxfrd	860
Prstn	321	Plym	203
Redng	12	Ports	625
Stevng	155	Sheff	429
Sthend	31		
Sund	137		
Swnse	119		
Truro	70		
Wirrl	N/A		
Wolve	93		
Words	99		
Wrexm	51	Eng Total	10,379
York	48	Wales Total	815

The transplant prevalence rate per million population by Shire and County of the recipient postcode is shown in Table 11.6. Several large transplant centres were not contributing data to the Registry in 2003 (Birmingham, Manchester and 4 London centres). This may account for some of the low prevalence rates in the Birmingham and Manchester area. In contrast, the Cumbria and Lancashire patients are all transferred back to the parent renal unit (Preston and Carlisle) post transplant. The low prevalence rate seen in Blackburn & Darwen may be due partly to the difficulty of matching HLA tissue types from cadaveric donors with those of patients from ethnic minority backgrounds. Cadaveric donation rates are lower in the ethnic minority groups and this compounds the problems for RRT, given the 4–6 times higher incidence of chronic renal failure within these groups.

With the current commissioning arrangements in the UK, groups such as primary care trusts which represent relatively small populations of 30,000 to 250,000 often wish to

Table 11.6: Prevalent transplant patients by local authority

UK Area	Shire, County	Name	Total pop	Rate pmp 2001	Rate pmp 2002	Rate pmp 2003	
North East	County Durham and Tees Valley	Darlington	97,838	235	245	235	
		Durham	493,469		271	281	
		Hartlepool	88,610	293	338	361	
		Middlesbrough	134,855	170	170	170	
		Redcar and Cleveland	139,132	237	237	215	
		Stockton-on-Tees	178,408	128	134	145	
	Northumberland, Tyne & Wear	Gateshead	191,151		392	423	
		Newcastle upon Tyne	259,536		327	339	
		North Tyneside	191,658		370	417	
		Northumberland	307,190		319	364	
		South Tyneside	152,785		301	359	
		Sunderland	280,807	245	348	366	
		North West	Cheshire & Merseyside	Halton	118,209	186	236
Knowsley	150,459			299	312	332	
Liverpool	439,471			266	263	307	
Sefton	282,958			190	208	236	
St. Helens	176,843			192	214	203	
Warrington	191,080			193	198	261	
Wirral	312,293			259	281	307	
Cumbria & Lancashire	Blackburn with Darwen		137,470	87	94	138	
	Blackpool		142,283	133	105	231	
	Cumbria		487,607	198	211	252	
	Lancashire		1,134,975	140	150	247	
	Greater Manchester		Bolton	261,037			203
Bury			180,607			71	
Oldham			217,276			110	
Rochdale			205,357			116	
Salford			216,105			185	
Wigan			301,415			162	
Yorkshire and the Humber			North & East Yorkshire, Northern Lincolnshire	East Riding of Yorkshire	314,113	194	213
	Kingston upon Hull, City of			243,588	209	234	242
	North East Lincolnshire	157,981		208	240	240	
	North Lincolnshire	152,848		176	209	228	
	North Yorkshire	569,660		180	196	217	
	York	181,096		248	248	254	
	South Yorkshire	Barnsley	218,063	298	321	330	
		Doncaster	286,865	195	219	247	
		Rotherham	248,175	241	245	261	
		Sheffield	513,234	198	220	235	
	West Yorkshire	Bradford	467,664	273	290	322	
		Calderdale	192,405	301	343	353	
		Kirklees	388,567	301	324	355	
		Leeds	715,403	255	265	266	
		Wakefield	315,172	250	250	266	

Table 11.6: (continued)

UK Area	Shire, County	Name	Total pop	Rate pmp	Rate pmp	Rate pmp
				2001	2002	2003
East Midlands	Leicestershire, Northamptonshire, Rutland	Leicester	279,920	371	382	385
		Leicestershire	609,578	246	267	277
	Trent	Northamptonshire	629,676	252	255	266
		Rutland	34,563	318	405	491
		Derby	221,709			184
		Derbyshire	734,585	197	206	205
		Lincolnshire	646,644	219	228	236
		Nottingham	266,988	250	273	262
West Midlands	Birmingham & the Black Country	Nottinghamshire	748,508	232	247	249
		Dudley	305,153	190	190	196
		Solihull	199,515	145	160	170
		Walsall	253,498	67	86	102
	Coventry, Warwickshire, Herefordshire & Worcestershire	Wolverhampton	236,582	139	143	169
		Coventry	300,849	262	289	295
		Warwickshire	505,858	314	326	330
		Bedfordshire & Hertfordshire	381,572	193	222	233
East of England	Bedfordshire & Hertfordshire	Hertfordshire	1,033,978		95	113
		Luton	184,373	195	233	244
		Essex	160,259	49	62	62
	Norfolk, Suffolk & Cambridgeshire	Cambridgeshire	552,659	220	222	235
		Peterborough	156,061	160	173	192
London	North West London	Ealing	300,948		255	245
		Hammersmith and Fulham	165,244		217	217
	South East London	Bexley	218,307	242	334	366
		Bromley	295,532	233	280	287
		Greenwich	214,404		205	223
		Lambeth	266,169	131	187	187
		Lewisham	248,923	245	341	333
		Southwark	244,866		371	400
	South West London	Croydon	330,588	187	220	211
	South East	Hampshire & Isle of Wight	Hampshire	1,240,102	256	265
Isle of Wight			132,731	271	293	286
Portsmouth			186,700	348	358	380
Thames Valley		Southampton	217,444	280	280	308
		Buckinghamshire	479,026	281	319	336
		Milton Keynes	207,057	236	236	275
		Oxfordshire	605,489	346	345	351
		Reading	143,096	321	335	363
		Slough	119,064		302	352
		West Berkshire	144,485	339	352	366
Wokingham	150,231	252	252	272		
South West	Avon, Gloucestershire and Wiltshire	Bath and North East Somerset	169,040	242	236	224
		Bristol, City of	380,616	359	375	399
		Gloucestershire	564,559	212	249	281
		North Somerset	188,564	355	381	403
		South Gloucestershire	245,641	309	350	370
		Swindon	180,051	277	283	288
		Wiltshire	432,972	237	247	254

Table 11.6: (continued)

UK Area	Shire, County	Name	Total pop	Rate pmp 2001	Rate pmp 2002	Rate pmp 2003	
South West	Dorset and Somerset	Somerset	498,095	228	254	287	
		South West Peninsula	Cornwall and Isles of Scilly	501,267	249	263	277
	South West Peninsula	Devon	704,491	227	241	255	
		Plymouth	240,722	324	332	328	
		Torbay	129,706	323	323	300	
Wales	Bro Taf	Cardiff	305,353	320	330	343	
		Merthyr Tydfil	55,979	428	464	428	
		Rhondda, Cynon, Taff	231,947	375	375	362	
		The Vale of Glamorgan	119,292	301	318	360	
		Dyfed Powys	Carmarthenshire	172,842	347	283	329
	Dyfed Powys	Ceredigion	74,941	240	280	333	
		Pembrokeshire	114,131	227	210	254	
		Powys	126,353	102	71	63	
		Gwent	Blaenau Gwent	70,064	413	385	442
			Caerphilly	169,519	312	312	342
	Monmouthshire		84,885	424	424	412	
	Morgannwg	Newport	137,012	350	357	343	
		Torfaen	90,949	472	461	439	
		Bridgend	128,645	334	334	342	
		Neath Port Talbot	134,468	327	275	334	
		Swansea	223,300	353	367	398	
	North Wales	Conwy	109,596		255	319	
		Denbighshire	93,065	107	204	268	
		Flintshire	148,594		275	296	
		Gwynedd	116,843		222	282	
Isle of Anglesey		66,829		164	179		
Wrexham		128,476	373	358	350		
ENGLAND			31,024,376			263	
WALES			2,903,083			329	
		Total	33,927,459			269	

assess their performance. When assessing a relatively infrequent occurrence, such as prevalence of renal transplantation in such small populations, there are wide confidence intervals for any observed frequency. To enable assessment of whether an observed acceptance rate is likely to be significantly different from the national average, Figure 11.3 has been included in the report. From this, for any size of population (X axis) the upper and lower 95% confidence intervals around the national average prevalence rate (dotted lines) can be read from the Y axis. Any observed acceptance rate for renal failure must be outside these limits for the given population to be statistically significantly different from the national average. Thus for a

population of 100,000 the observed transplant prevalence would have to be outside the limits of 170 per million population per year to 370 per million population per year. However for a population of 500,000 these limits are from 224 per million population per year to 315 per million population per year.

Figures 11.4 and 11.5 show the percentage of dialysis patients in 2003 under and above the age of 65 years at each centre who ever had a transplant in the past. Overall 21.5% (range 5.7–2.9%) of dialysis patients aged less than 65 years have ever had a transplant and considerably fewer, only 3.1% (range 0–9.1%) of dialysis patients above the age of 65 years have ever had a transplant in the past.

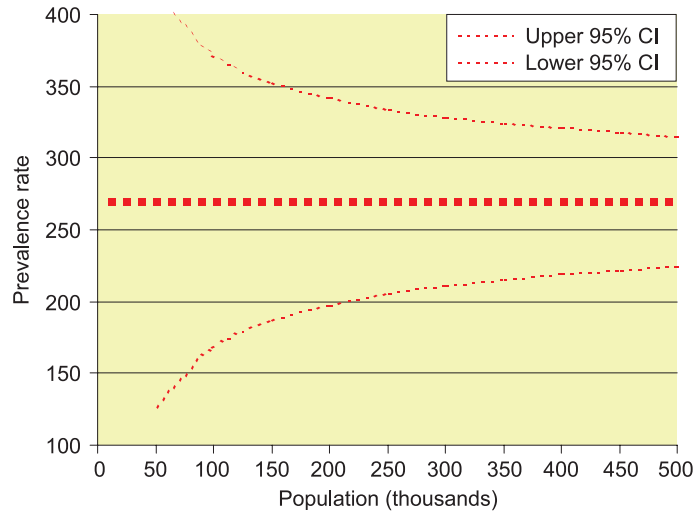


Figure 11.3: 95% Confidence limits for prevalence rate of 270 pmp for population size 50,000–500,000

In both figures, wide variations are seen in the proportion of patients receiving a transplant. There is no simple explanation for this wide variability and previous explanations, such

as the proportion of patients from non-transplant centres being followed up at the main transplant centre after transplantation may account for some of the inconsistency (this

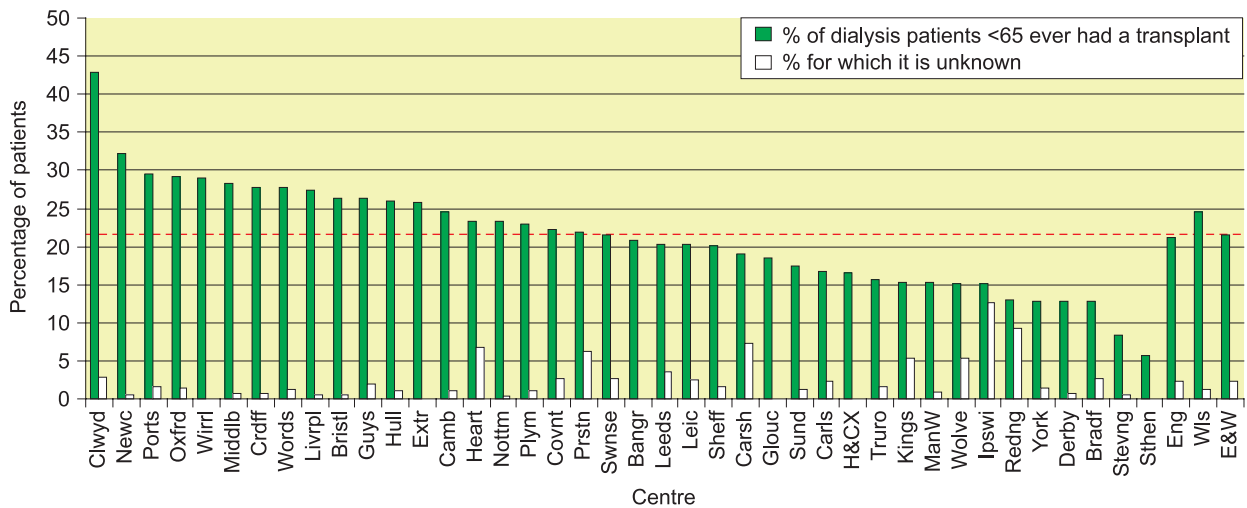


Figure 11.4: Percentage of dialysis patients < 65 who ever had a transplant

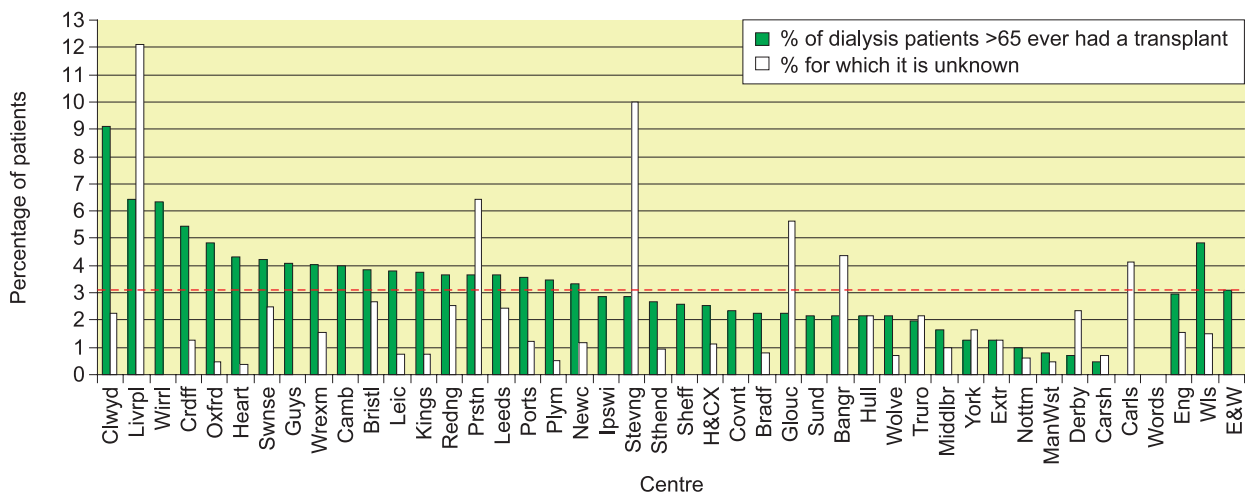


Figure 11.5: Percentage of dialysis patients 65+ who ever had a transplant

Table 11.7: Annual proportion of RRT patients with a functioning transplant, recipient median age and % aged >65 since 1997 (E&W)

Year	% all RRT with functioning transplant	Median age prevalent transplant recipients	% prevalent transplant recipients >65 yrs old
1997	51.0	N/A	11.2
1998	49.9	N/A	12.4
1999	47.3	N/A	12.4
2000	46.9	N/A	13.0
2001	46.6	49.0	13.2
2002	46.0	49.6	14.0
2003	45.8	49.6	14.3

analysis is shown later). There may however, be differences between transplant centres in acceptance criteria for listing on the transplant waiting list. Also, differences in the proportion of dialysis patients made up of ethnic minority groups, who have a high proportion of blood group B and more uncommon HLA typing and are more difficult to transplant, will be significant.

As the take on rate for dialysis continues to increase in the elderly population, so the overall proportion of RRT patients with a functioning transplant continues to fall from 51% in 1997 to 45.8% in reporting centres in 2003 (Table 11.7). Although the median age of new recipients in 2003 is 44.9 years, because of the large numbers of prevalent patients, the percentage of prevalent transplant recipients aged over 65 years is increasing annually and is now 14.3%.

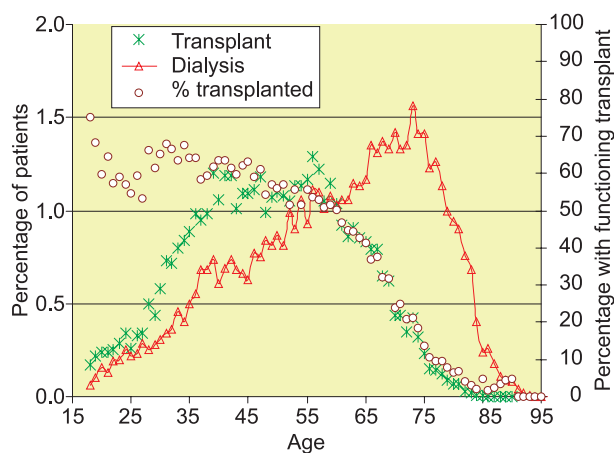
Age and prevalent transplant recipients

The age distribution of prevalent transplant and dialysis patients is shown in Figure 11.6. Within the RRT population there is a higher proportion of transplanted patients compared to dialysis at all ages up to 61 years of age and thereafter the reverse is true (right margin scale of Figure 11.6). The peaks of patients with transplants or on dialysis are 56 and 73 years respectively, a 17 year difference. This compares with a median age of patients with a transplant of 49.6 years and 62.6 years for those on dialysis. In the renal replacement therapy population aged over 65 years, 21.2% have a functioning transplant with 78.8% remaining on dialysis, in keeping with data from other

Registries. Of those aged over 65 years, this accounted for 14% of the total prevalent transplant population compared with 45% of the prevalent dialysis population.

The treatment modality of prevalent patients at each participating centre age <65 years and receiving renal replacement therapy is shown in Figure 11.7. The figure shows that transplant centres tend to have the largest proportion of transplant patients (range 42–73%) compared to dialysis patients with some dialysis centres seeing few or no transplant patients for follow-up.

For those patients aged under 65 years in England & Wales, RRT is provided as transplantation in 57% of patients, haemodialysis in 30% of patients and peritoneal dialysis in 13% of patients. When all patients receiving RRT are included then the proportion of transplanted patients falls to 46% as there is a low level of transplantation above the age of 65 years.

**Figure 11.6: Age distribution of prevalent dialysis and transplant patients**

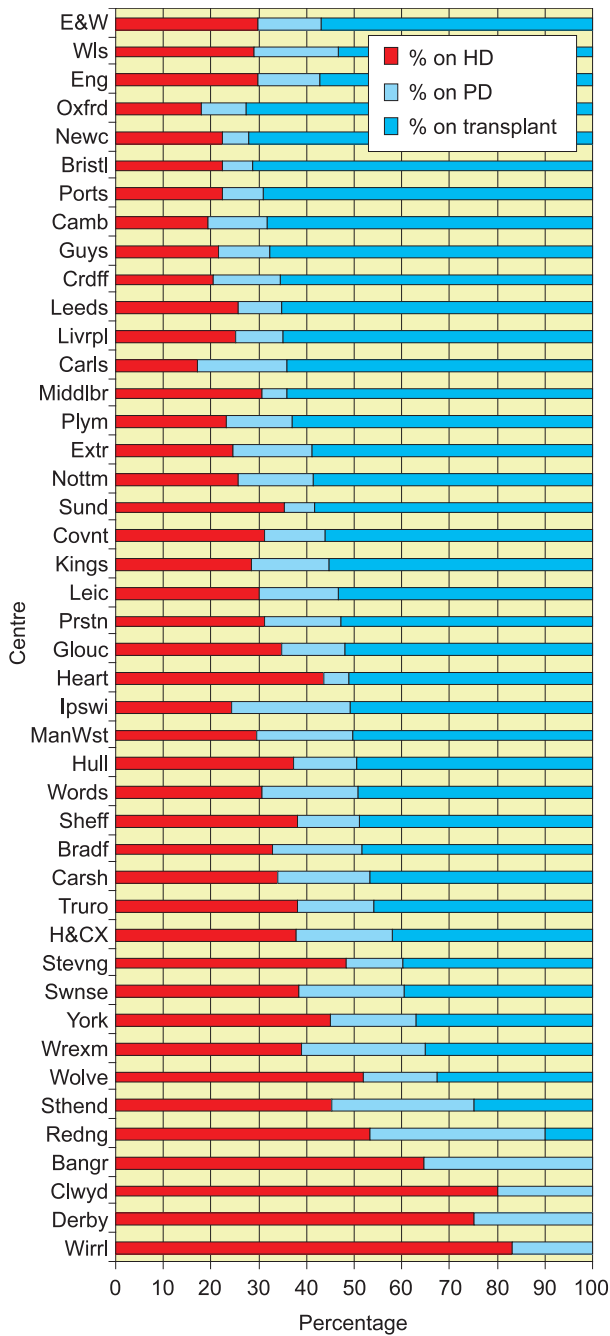


Figure 11.7: Treatment modality of prevalent patients <65 years old

In 2003, renal units contributing data to the Registry accounted for 11,194 transplanted patients, 9,759 on haemodialysis and 3,490 on peritoneal dialysis. The median age of these patients by modality was 50, 64 and 58 respectively. Patients with transplants in general are younger than those on peritoneal dialysis, who

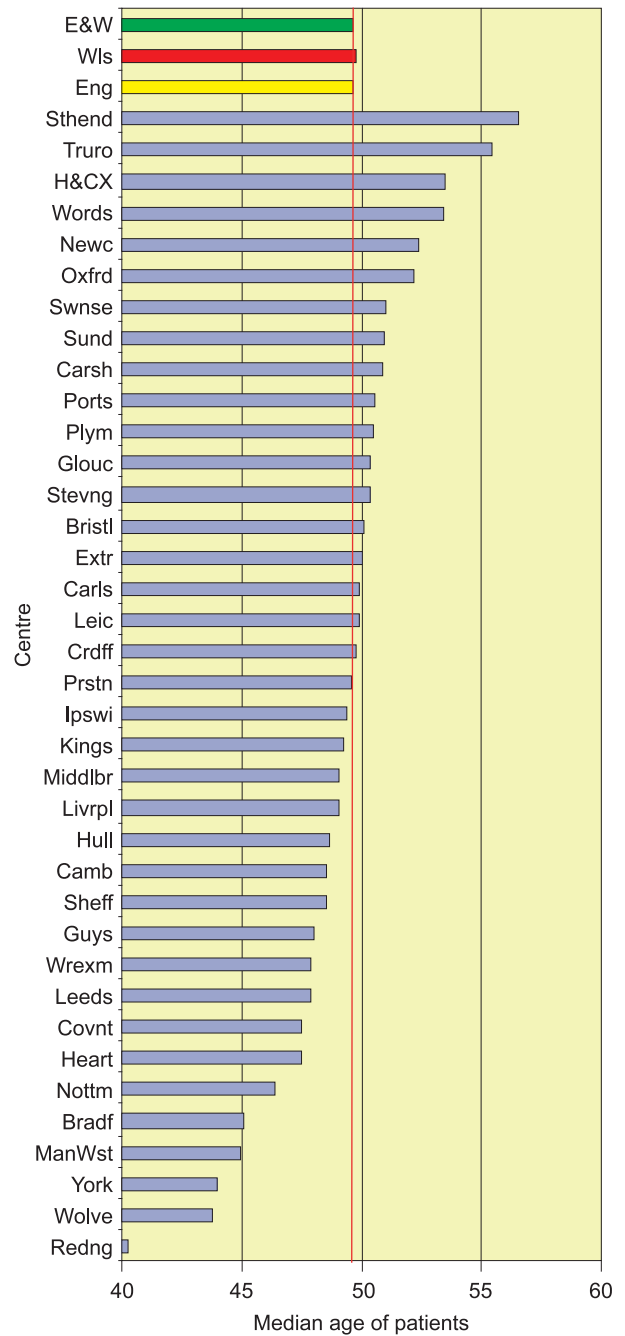


Figure 11.8: Median age of prevalent patients with a transplant

are younger than those on haemodialysis in all centres.

The median age of prevalent patients by centre with a functioning transplant is shown in Figure 11.8.

Ethnicity

The Registry continues to collect ethnicity data although it remains incomplete. The ethnicity of transplanted patients is shown in Figure 11.9. While the overall percentage of transplant patients aged <65 years who are White is 85.4%, African Caribbean 4.5%, South Asian 7.5%, Chinese 0.2%, and “other” 2.4%, there is marked variation in the proportion of different ethnic minority patients within and between centres. African Caribbean patients are predominantly drawn from the South-East of England while South Asians are more widespread but concentrated in London (H&CX, Reading, Stevenage), Midlands (Leicester, Wolverhampton, Coventry) and Bradford. Chinese patients comprise only a very small proportion of the transplant population.

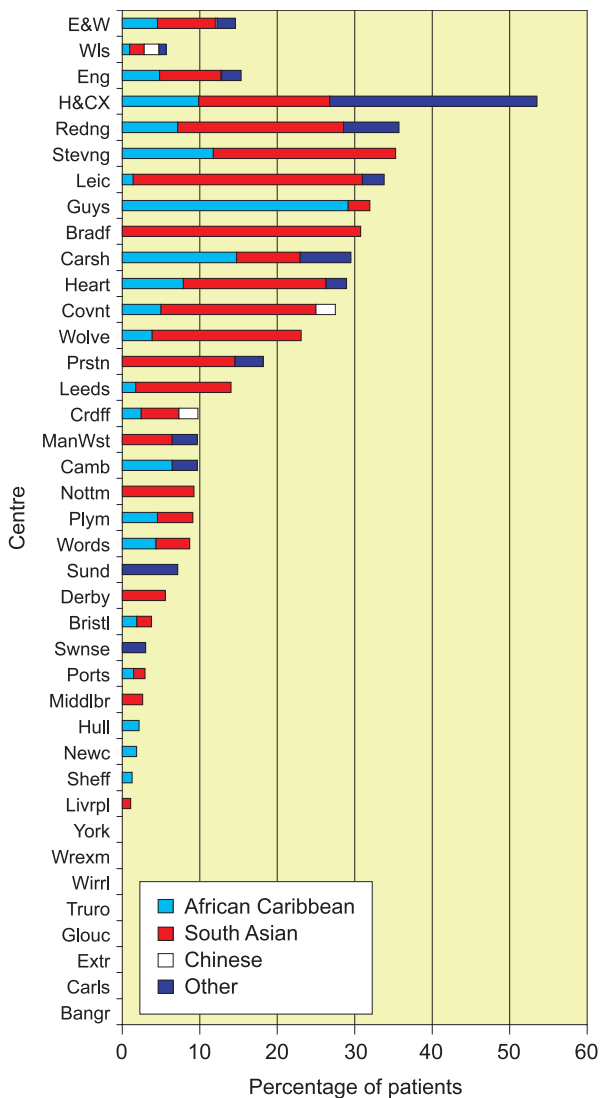


Figure 11.9: Ethnicity of dialysis patients under 65 who have ever had a transplant

Hammersmith & Charing Cross have an unusually high percentage of patients (26.8%) listed in the “other” category.

Table 11.8 shows the proportion of dialysis patients aged <65 years by ethnicity in each centre that has never had a transplant. Eight centres did not have any transplant patients from ethnic minorities. Donors from ethnic minorities comprise 2.7% of all cadaveric solid organ donors in the UK and they receive 15.6% of solid organ transplants (source UKTransplant).

Figure 11.10 shows the ethnic distribution of patients receiving RRT who have never received a renal transplant. 78.2% of the total are White patients, 6.6% Black patients, 11.1% South Asian, 0.6% Chinese and 3.5% “other” patients.

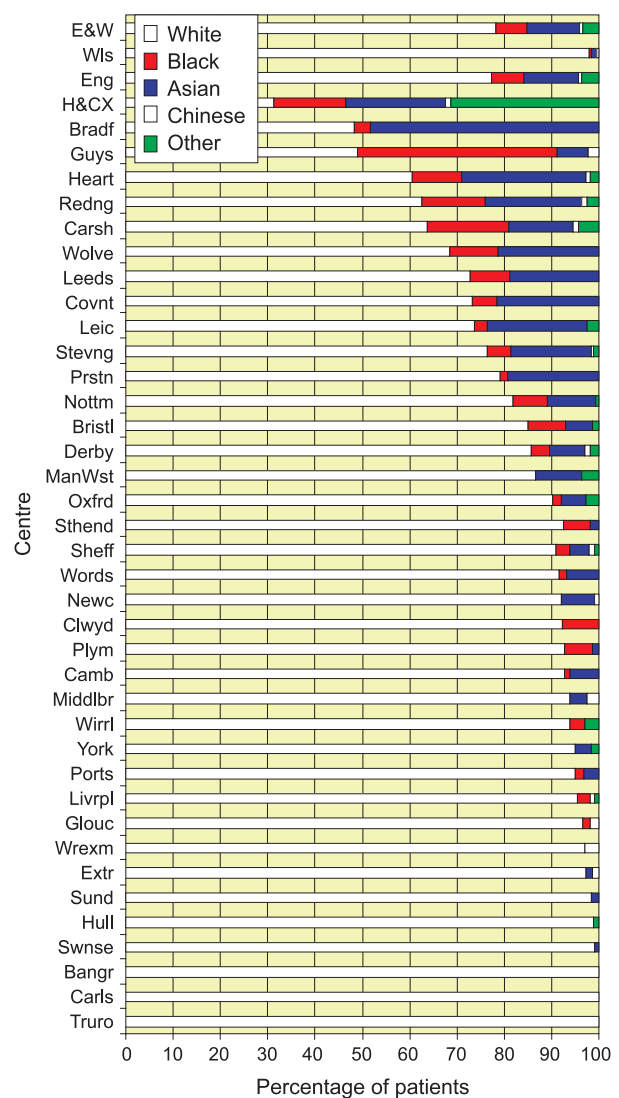


Figure 11.10: Ethnicity of dialysis patients under 65 who have never had a transplant

Table 11.8: Ethnicity of dialysis patients <65 who have never had a transplant

Centre	% White	% Black	% Asian	% Chinese	% Other
Bradf	48.4	3.2	48.4	0.0	0.0
Sthend	90.7	5.6	1.9	0.0	0.0
Stevng	76.5	4.9	16.9	0.6	1.1
Carsh	63.8	17.2	13.5	1.2	4.3
Wirrl	93.9	3.0	0.0	0.0	3.0
York	94.9	0.0	3.4	0.0	1.7
Middlbr	93.9	0.0	3.7	2.4	0.0
Nottm	81.8	7.4	10.2	0.0	0.6
Bristl	85.1	7.8	5.7	0.0	1.4
Truro	100.0	0.0	0.0	0.0	0.0
Hull	98.9	0.0	0.0	0.0	1.1
Leic	73.8	2.6	21.0	0.0	2.6
Derby	85.7	3.8	7.6	1.0	1.9
Ipswi	100.0	0.0	0.0	0.0	0.0
Camb	92.8	1.2	6.0	0.0	0.0
Glouc	96.5	1.8	0.0	1.8	0.0
Extr	97.2	0.0	1.4	1.4	0.0
Ports	95.0	1.9	3.1	0.0	0.0
Redng	62.7	13.3	20.5	1.2	2.4
Guys	48.9	42.2	6.7	2.2	0.0
Kings	0.0	50.0	50.0	0.0	0.0
Sheff	90.8	3.0	4.3	1.0	1.0
Plym	92.7	5.9	1.5	0.0	0.0
Covnt	73.3	5.2	21.6	0.0	0.0
Clwyd	92.3	7.7	0.0	0.0	0.0
Wrexm	97.0	0.0	0.0	3.0	0.0
Wolve	68.4	10.3	21.3	0.0	0.0
Heart	60.5	10.5	26.3	0.9	1.8
Carls	100.0	0.0	0.0	0.0	0.0
Sund	98.3	0.0	1.7	0.0	0.0
ManWst	86.7	0.0	9.7	0.0	3.6
Prstn	79.1	1.7	19.2	0.0	0.0
Words	91.5	1.7	6.8	0.0	0.0
Oxfrd	90.4	1.8	5.3	0.0	2.6
Leeds	72.9	8.4	18.7	0.0	0.0
Livrpl	95.5	2.7	0.0	0.9	0.9
Bangr	100.0	0.0	0.0	0.0	0.0
Swmse	99.1	0.0	0.9	0.0	0.0
H&CX	31.4	15.0	21.1	1.1	31.4
Crdff	94.4	0.0	5.6	0.0	0.0
Newc	92.0	0.0	7.1	0.9	0.0
Eng	77.3	6.9	11.6	0.6	3.6
Wls	98.0	0.5	1.0	0.5	0.0
E&W	78.2	6.6	11.1	0.6	3.5

Failed transplants 2003

In 2003, 2.2% of transplanted patients returned to dialysis (range 0–6.3%) which is unchanged from that reported in 2002.

UKTransplant calculates graft survival data by including death with a functioning graft as a transplant failure. Primary graft non-function (which accounts for the loss of 5% of all grafts) is also included within the graft failure figure. Some countries do not include primary non-function within the graft survival data and therefore one year graft survival rates may appear 5% lower in the UK when comparing data with those countries.

According to UKTransplant, in the period 1999–2002 year of transplant, there was a one

year graft survival of 87% (86–89%) for cadaveric heart beating donors and 93% (91–95%) for live donors. The 5 year survival for the 1996–1998 transplant cohorts are 71% and 84% for cadaveric and live donors respectively.

Quality of transplant function

Transplant function was assessed by the most recent serum creatinine within six months and by estimated GFR using the abbreviated MDRD equation.

There was variable collection of serum creatinine data in the centres but overall 91% of patients had a serum creatinine available for analysis. Figure 11.11 shows the median serum creatinine values in contributing centres with a

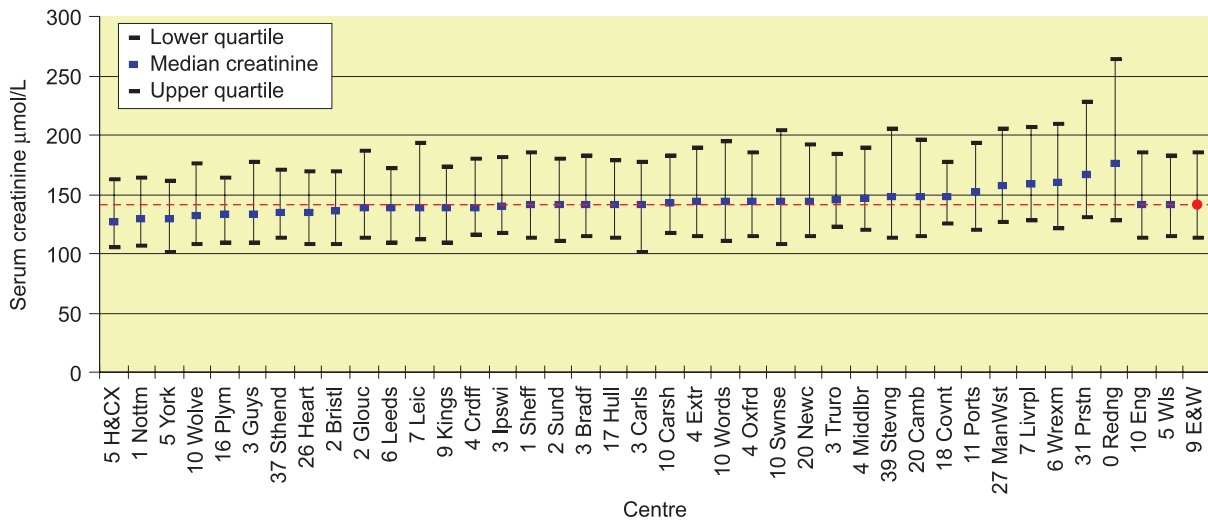


Figure 11.11: Median serum creatinine by centre

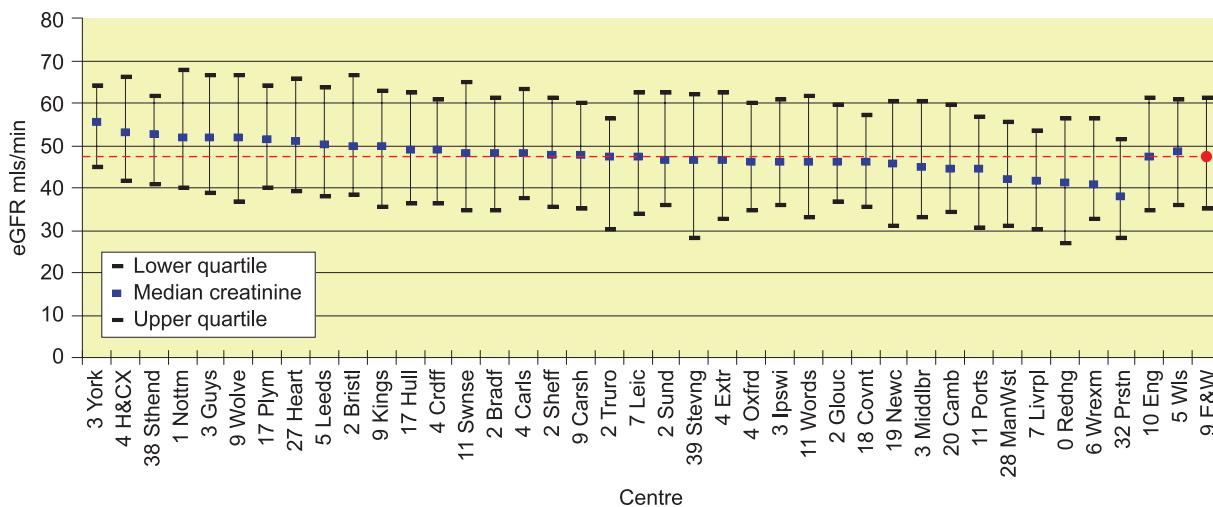


Figure 11.12: Median eGFR by centre

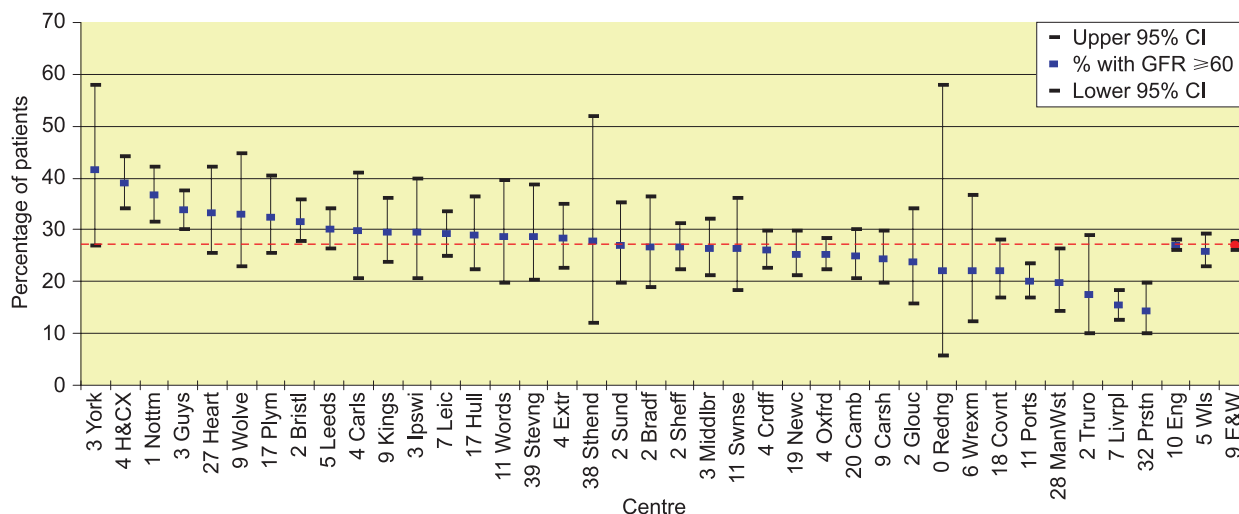


Figure 11.13: Percentage of patients with eGFR >60 mls/min by centre

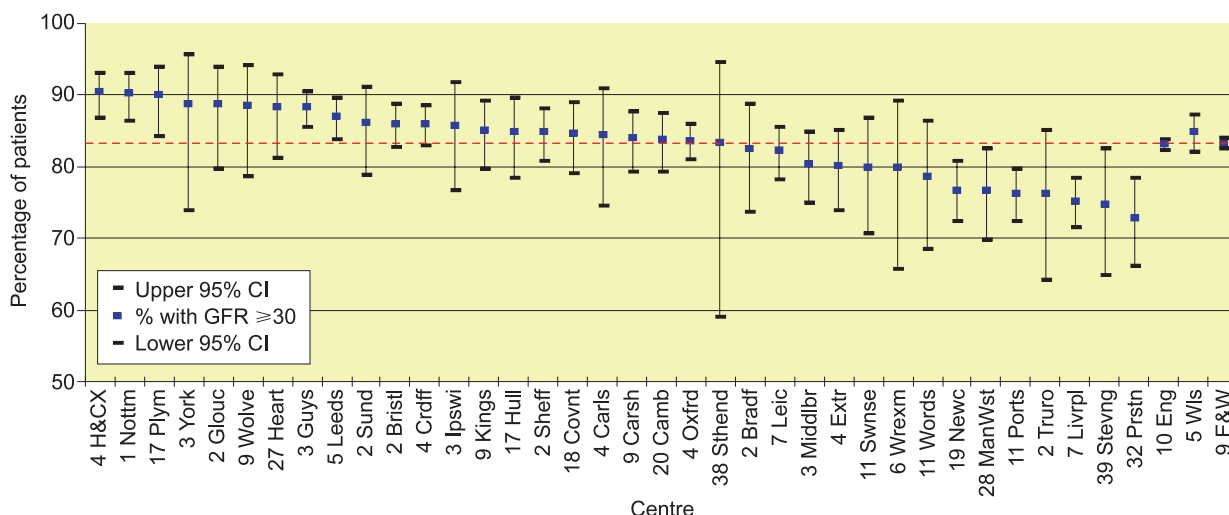


Figure 11.14: Percentage of patients with eGFR >30 mls/min by centre

median of 142 μmol/L and range of 127 to 167 μmol/L in 9,987 patients. The median eGFR (Figure 11.12) of prevalent transplant patients in England & Wales was 47.6 mls/min/1.73 m² and median values ranged from 38.1–55.5 mls/min/1.73 m². The wide discrepancy in transplant function between centres is unexplained. Differences in immunosuppression policies, use of marginal donor kidneys, HLA matching policies and the number of acute rejection episodes patients undergo, may all have some influence. The relationship between creatinine/eGFR and long-term graft survival needs clarification using the UKTransplant database. Figures 11.13 and 11.14 show the percentage of patients in each centre with the calculated eGFR of greater than 60 and 30 mls/min/1.73 m² respectively, the average for England & Wales being 27% and 83% respectively.

Analysis of transplant patients classed by CKD stages

This new analysis analyses the transplant patients as if they had chronic kidney disease and classes them by CKD stages 1–5 with stages 1 and 2 being grouped together. For conversion factors from SI units see Appendix H.

In Table 11.9, 2.7% of prevalent transplant patients have an eGFR of <15 mls/min and a further 15% an eGFR between 15–29 mls/min. The median eGFR in patients with CKD stages 1 and 2 has not been presented due to the inaccuracy inherent in the MDRD formula in calculating eGFRs >60 mls/min.

Lower eGFR is associated with a rise in both systolic and diastolic blood pressure. These data

Table 11.9: Analysis by CKD stage

	Stage 1–2 (≥60)	Stage 3 (30–59)	Stage 4 (15–29)	Stage 5 (<15)
Number of patients	2,123	4,658	1,212	225
% of patients	25.8	56.7	14.8	2.7
eGFR mean ± SD	Not calculated	44.9 ± 8.3	23.8 ± 4.1	11.4 ± 2.9
eGFR median	Not calculated	44.8	24.5	12.2
Systolic BP mean ± SD	138 ± 19	141 ± 21	143 ± 22	147 ± 22
Diastolic BP mean ± SD	80 ± 10	80 ± 11	81 ± 11	83 ± 14
Cholesterol mean ± SD	5.0 ± 1.0	5.1 ± 1.1	5.1 ± 1.2	5.0 ± 1.8
Cholesterol % ≥5 mmol/L	49	51	47	39
Haemoglobin mean	13.6 ± 1.6	12.8 ± 1.6	11.6 ± 1.6	11.0 ± 1.8
Haemoglobin % <10 g/dl	2	4	14	30
Haemoglobin % <11 g/dl	5	13	34	51
Ferritin median µg/L	89	111	168	212
Ferritin % <100 µg/L	53	46	33	16
Phosphate mean ± SD	0.9 ± 0.23	1.0 ± 0.23	1.2 ± 0.29	1.6 ± 0.42
Phosphate % >1.8 mmol/L	0.2	0.3	2.7	32.7
Corr calcium mean ± SD	2.45 ± 0.16	2.45 ± 0.15	2.41 ± 0.17	2.36 ± 0.21
Corr calcium % >2.6 mmol/L	9	9	7	7
Calcium % <2.2 mmol/L	4	3	8	16
iPTH median	9	10	16	31
iPTH % >32 pmol/L	5	9	27	48
Albumin mean ± SD	41 ± 4	40 ± 4	39 ± 5	37 ± 6
Albumin % <35 g/L	7	9	15	32
Bicarbonate mean ± SD	26 ± 3	25 ± 3	23 ± 4	22 ± 4
Bicarbonate % <22 mmol/L	8	14	32	49

are observational data from clinics and have not been adjusted for any increase in anti-hypertensive medications used within the groups. The percentage of patients with a serum cholesterol <5 mmol/L appears to increase with decreasing eGFR, which may be as a result of increased statin use in patients with poorer renal function rather than a direct fall related to renal function.

Haemoglobins fell with decreasing eGFR, such that of the 2.7% of transplant patients with eGFR <15 ml/min, 30% had an Hb <10 g/dl and 41% <11 g/dl. It is of interest that the standard deviation is constant at 1.6 g/dl across all groups until eGFR <15 ml/min and then it increases to 2.0 g/dl. This implies that centre factors may be coming into play with regard to variation in the management of these patients. The fall in haemoglobin contrasts with a rise in median serum ferritin from 89 to

206 µg/L with decreasing eGFR. The reasons for this may be multi-factorial including decreased utilisation of ferritin with lower erythropoietin levels, ferritin acting as an inflammatory marker (as albumin also fell) and iron infusions given for anaemia.

Of the 2.7% of transplant patients with eGFR <15 ml/min, 29% had a serum phosphate >1.8 mmol/L and 42% had an iPTH >32 pmol/L (=300 ng/L). PTH control was also poor in patients with CKD stage 4 with 27% of patients with iPTH values >32 pmol/L. These results appear worse than one would expect in non-transplant CKD patients in these groups. The contribution of poorer recognition and/or management of these patients, who may remain under transplant clinic follow up rather than under CKD clinic protocols, remains to be explored.

Re-allocation of transplant patients to parent dialysis centre

Each transplant centre serves a number of renal units and each transplant centre has a different policy of post-transplant patient management. In some transplant centres, patients are transferred back almost immediately to the referring dialysis unit while in other centres management of the patient remains in the transplant centre until the graft is failing. This is the reason why for Bangor, Clywd, Derby and Wirral, there appeared to be no transplant patients under their care and only those with poor graft function in other renal units. The transplant data have been reanalysed after re-allocating the patients to the original referring dialysis centre (Table 11.10). The transplant numbers remain low at the Wirral and Swansea renal units as they are a relatively new renal unit so patients transplanted in the 1980s would never have had dialysis at these units and in this analysis remain at their transplant centre.

After reallocation, the main exchanges were seen to be between Swansea and Cardiff, Oxford and Reading, Derby and Nottingham, Bangor, Clywd, Wirral, Wrexham and Liverpool.

Data on median age, median eGFR and median haemoglobin were analysed after re-allocation (Table 11.11). Apart from the changes in the data for Reading (median age increased by 6 years and the median eGFR increased by 6ml/min), there were no other large differences in these analyses of median age, median eGFR and median haemoglobin before and after centre re-allocation.

Table 11.10: Comparison of number of transplant patients before and after reallocation to original referring dialysis centre

Centre	Before reallocation	After reallocation	Difference
	Number of transplant		
Bangr	0	13	13
Bradf	114	119	5
Bristol	600	569	-31
Camb	421	390	-31
Carls	86	89	3
Carsh	344	341	-3
Clwyd	0	15	15
Covnt	269	257	-12
Crdff	645	586	-59
Derby	0	31	31
Extr	228	245	17
Glouc	88	117	29
Guys	707	696	-11
H&CX	381	379	-2
Heart	192	194	2
Hull	203	207	4
Ipswi	92	100	8
Kings	246	245	-1
Leeds	664	646	-18
Leic	484	484	0
Livrpl	730	651	-79
ManWst	254	254	0
Middlbr	293	304	11
Newc	525	416	-109
Nottm	375	339	-36
Oxfrd	860	788	-72
Plym	203	191	-12
Ports	625	622	-3
Prstn	321	322	1
Redng	12	77	65
Sheff	429	425	-4
Stevng	155	178	23
Sthend	31	21	-10
Sund	137	141	4
Swmse	119	178	59
Truro	70	73	3
Wirrl	0	13	13
Wolve	93	91	-2
Words	99	97	-2
Wrexm	51	83	32
York	48	56	8

Table 11.11: Comparing median age, eGFR and Hb before and after centre reallocation

Centre	Median age			Median eGFR			Median Hb		
	Before	After	Diff	Before	After	Diff	Before	After	Diff
Bangr	0.0	55.5	55.5	N/A	42.6	42.6	N/A	12.7	12.7
Bradf	45.1	45.0	-0.1	48.3	48.6	0.3	13.1	13.1	0.0
Bristol	50.1	50.4	0.3	49.9	49.8	-0.1	13.1	13.1	0.0
Camb	48.5	48.8	0.3	44.6	44.2	-0.4	12.3	12.3	0.0
Carls	49.9	49.3	-0.5	48.2	48.2	0.0	12.8	12.9	0.1
Carsh	50.9	50.9	0.0	47.6	47.6	0.0	12.9	12.9	0.0
Clwyd	0.0	53.3	53.3	N/A	45.2	45.2	N/A	13.4	13.4
Covnt	47.5	47.0	-0.5	46.0	46.0	0.0	12.8	12.9	0.1
Crdff	49.8	49.4	-0.4	48.9	48.6	-0.4	13.2	13.1	-0.1
Derby	0.0	43.5	43.5	N/A	54.2	54.2	N/A	12.9	12.9
Extr	50.0	49.7	-0.3	46.4	46.7	0.3	13.0	13.1	0.1
Glouc	50.4	50.3	0.0	46.2	48.4	2.2	12.7	12.8	0.1
Guys	48.0	48.0	0.0	51.9	51.9	0.0	12.9	12.9	0.0
H&CX	53.5	53.5	0.0	53.2	53.1	0.0	12.5	12.5	0.0
Heart	47.5	47.6	0.1	51.0	50.3	-0.7	13.3	13.2	-0.1
Hull	48.7	48.5	-0.2	49.1	49.1	0.0	13.2	13.2	0.0
Ipswi	49.4	49.4	0.0	46.3	46.3	0.0	12.5	12.5	0.0
Kings	49.2	49.5	0.3	49.9	49.9	0.0	12.0	12.0	0.0
Leeds	47.9	48.0	0.1	50.2	50.1	-0.1	13.0	13.0	0.0
Leic	49.9	49.9	0.0	47.3	47.3	0.0	12.9	12.9	0.0
Livrpl	49.1	49.1	0.0	41.6	40.7	-0.9	12.6	12.6	0.0
ManWst	45.0	45.0	0.0	42.2	42.2	0.0	12.7	12.7	0.0
Middlbr	49.1	49.0	-0.1	44.7	44.7	0.0	13.4	13.4	0.0
Newc	52.4	52.8	0.4	45.6	46.5	0.9	12.7	12.7	0.0
Nottm	46.4	46.7	0.2	52.0	51.6	-0.3	13.2	13.2	0.0
Oxfrd	52.2	52.7	0.5	46.3	46.2	-0.1	12.4	12.4	0.0
Plym	50.5	51.3	0.9	51.5	51.5	0.0	12.5	12.4	-0.1
Ports	50.5	50.6	0.0	44.4	44.4	0.0	12.4	12.4	0.0
Prstn	49.6	49.5	-0.1	38.1	38.1	0.0	12.7	12.7	0.0
Redng	40.3	46.4	6.2	41.2	47.2	6.1	12.4	12.5	0.1
Sheff	48.5	48.7	0.2	47.7	47.9	0.2	13.0	13.0	0.0
Stevng	50.4	49.8	-0.5	46.5	46.8	0.3	13.0	12.9	-0.1
Sthend	56.6	56.6	0.0	52.9	53.2	0.4	12.3	12.4	0.0
Sund	51.0	50.1	-0.9	46.6	46.6	0.0	13.2	13.2	0.0
Swkse	51.0	51.0	0.0	48.4	49.6	1.3	12.6	13.0	0.4
Truro	55.5	55.1	-0.4	47.5	46.1	-1.4	13.1	13.1	0.0
Wirrl	0.0	38.8	38.8	N/A	54.3	54.3	N/A	13.7	13.7
Wolve	43.8	45.5	1.7	51.8	51.0	-0.8	12.9	12.9	0.0
Words	53.4	53.4	0.0	46.2	46.2	0.0	12.8	12.8	0.0
Wrexm	47.9	48.8	0.9	40.9	44.1	3.2	12.7	12.6	-0.1
York	44.0	44.1	0.1	55.3	55.7	0.4	13.1	13.0	-0.1

Haemoglobin in transplanted patients

There are no recommended haemoglobin standards for renal transplant patients although patients with failing transplants (eGFR <30 ml/min) should fall into the same category as patients with chronic kidney disease and the Renal Association Standard (Hb >10 g/dl) should be applied for these patients.

Haemoglobin data are quite incomplete in many contributing centres and range from as low as 63.3% availability to 100%, with a mean of 90.1%.

Figure 11.15 shows the median haemoglobin values for all prevalent transplant patients at least six months following transplantation in

contributing centres with the median haemoglobin value of 12.8 g/dl (range 12.0–13.4 g/dl) not dissimilar to the 2002 Registry Report. Figure 11.16 shows the percentage of transplant patients in each unit with a haemoglobin <10 g/dl. In 2003, 5.1% of transplant patients who were at least six months following transplantation have haemoglobin below this figure, compared to 5.4% in 2002. Quality of graft function (eGFR), the use of bone marrow suppressants (azathioprine, mycophenolate mofetil, and sirolimus) and the variable use of erythropoietin in the failing graft population may provide some explanation. Analysis was performed to find the percentage of patients who had haemoglobin <11 g/dl and 14.5% of patients fell into this category. Figure 11.17 shows the median haemoglobin value achieved at each

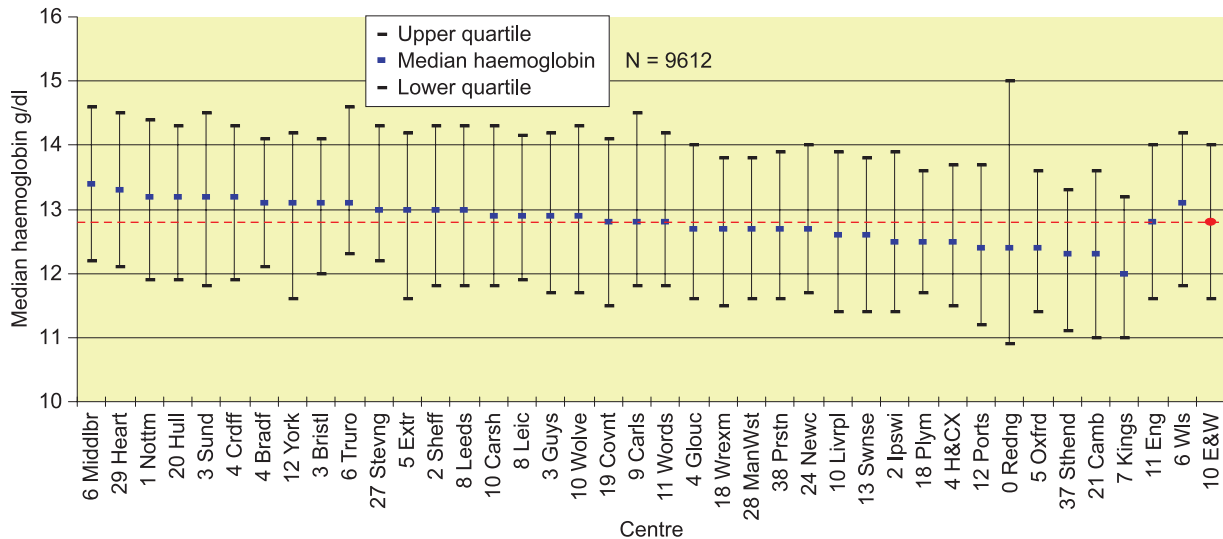


Figure 11.15: Median haemoglobin of prevalent transplant patients by centre

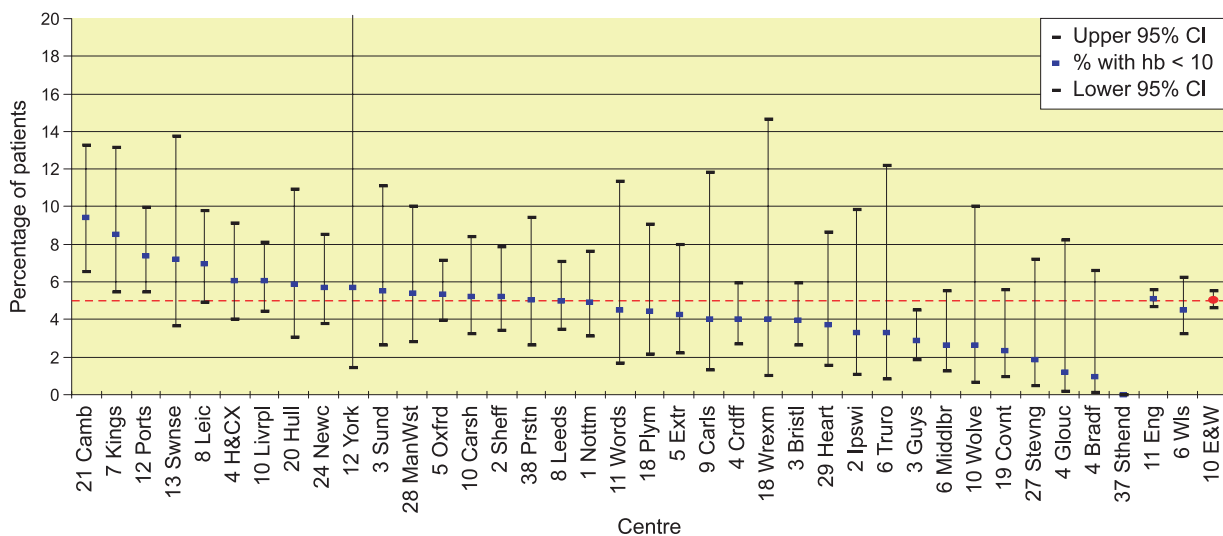


Figure 11.16: Percentage of patients Hb <10 g/dl by centre

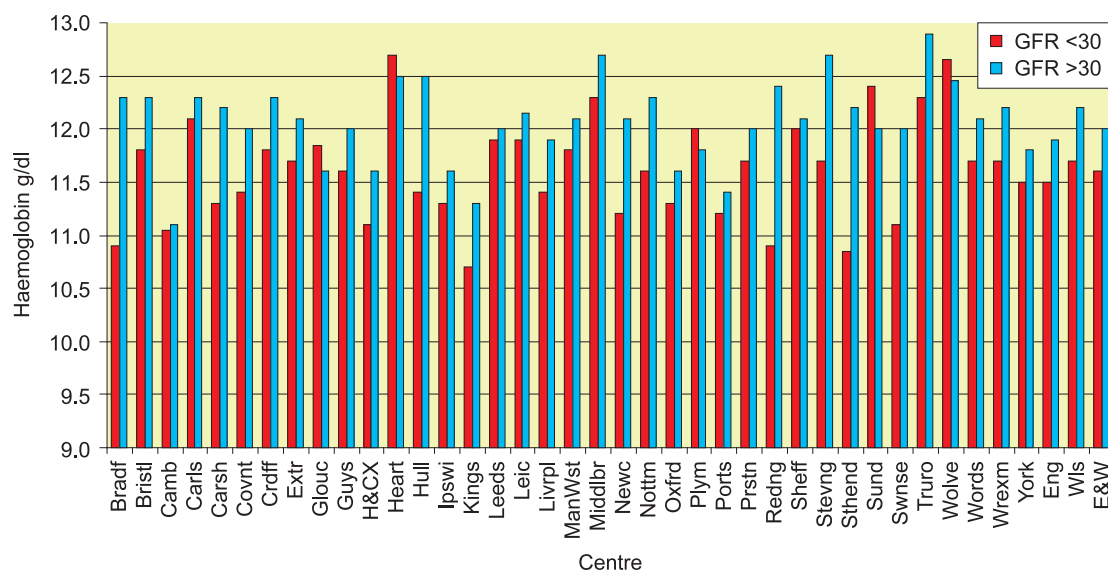


Figure 11.17: eGFR <30 and >30 with median Hb by centre

Table 11.12: Relationship between Hb, GFR and gender in transplant patients

Gender	eGFR mls/min	Mean Hb g/dl	Std dev	5th–95th centile	Median Hb	Quartile range	No. with data
Male	<30	11.8	1.7	9.1–14.7	11.7	10.7–12.9	646
Male	30+	13.4	1.6	10.7–16.0	13.5	12.4–14.5	3,645
Female	<30	11.3	1.5	8.6–13.7	11.3	10.3–12.4	600
Female	30+	12.5	1.5	10.1–15.0	12.5	11.5–13.5	2,133

centre by level of renal function (eGFR < or >30 mls/min). Not unexpectedly, the better the GFR, the higher the haemoglobin values.

As in the previous year's analysis, haemoglobin values are lower in women for the same level of eGFR than in men (Table 11.12).

Serum cholesterol

As in previous years, current analyses evaluate all transplant patients whose grafts have been functioning for at least a year. Returns on serum cholesterol data continue to improve, with 67.6% of patients from reporting centres producing data on 7,447 patients. As in previous years there are no recommendations in either the Renal Association or British Transplant Society Standards documents regarding a desirable cholesterol level in renal transplant recipients, so those data have been analysed as though patients are at a high cardiovascular risk.

The median cholesterol level was 4.9 mmol/L with a range between centres of 4.3–5.6 mmol/L (Figure 11.18). The percentage of patients in each centre with a cholesterol value within the Renal Association reference range varies between 25–72%, with a mean value of 53% in England & Wales (Figure 11.19). This continues to show a small annual improvement over previous years (Figure 11.20).

The Leeds renal unit has significantly lower serum cholesterol in transplanted patients than the average for England & Wales. This renal unit has seen an improvement from 33% to 66% of patients with a cholesterol <5 mmol/L after implementing software which provides an automated prompting system within the clinic visit. The software checks the serum cholesterol value and if required suggests atorvastatin and an appropriate dose. If the serum cholesterol has not been measured a prompt reminds the clinician to do so¹.

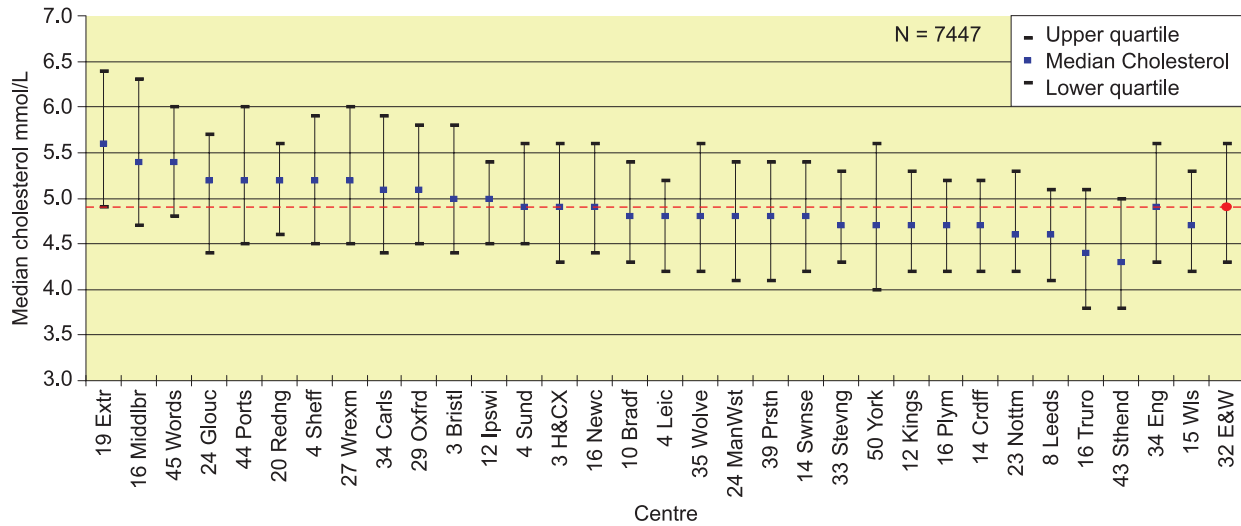


Figure 11.18: Median cholesterol in prevalent transplant patients by centre

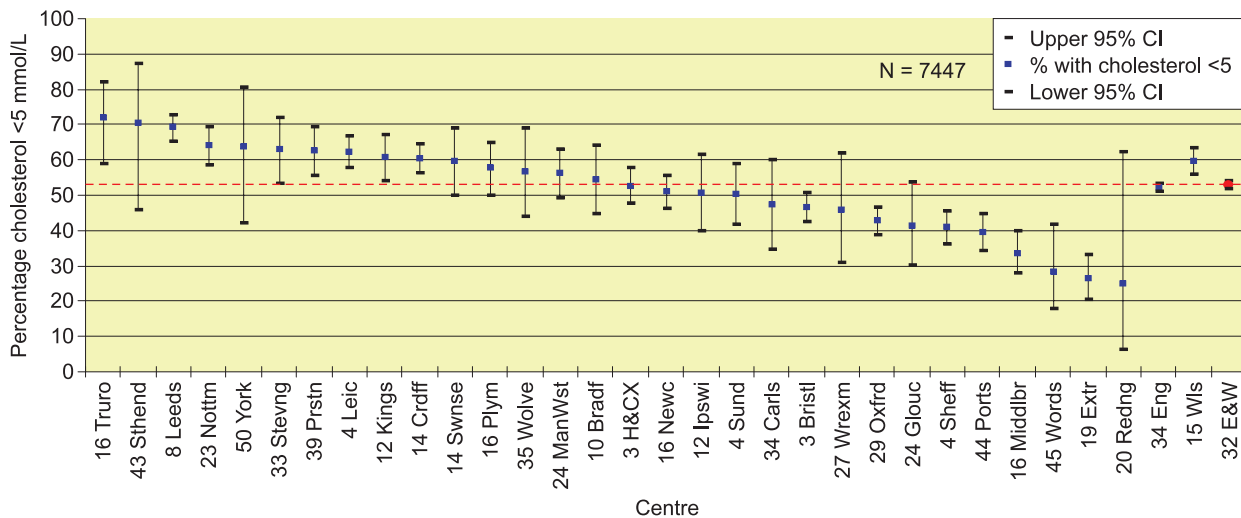


Figure 11.19: Percentage of transplant patients with cholesterol <5 mmol/L by centre

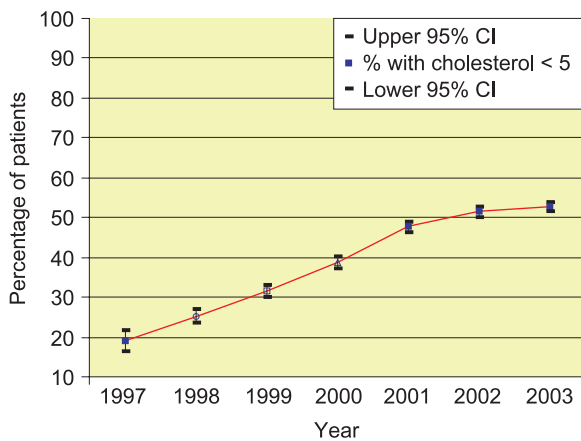


Figure 11.20: Percentage of transplant patients with cholesterol <5 mmol/L 1997-2003

Blood pressure

The third edition of the Renal Association's Standards and Audit Measures, published in August 2002, recommends:

Blood pressure targets for renal transplant recipients of less than 130 mmHg systolic blood pressure (SBP) and less than 80 mmHg diastolic blood pressure (DBP) (strength of recommendation B)

There continue to be incomplete blood pressure data returns, as shown in Table 11.13, despite the importance of this given by the Renal Association Standards. There needs to be

Table 11.13: Completeness of BP returns for transplant patients.

Centre	% BP return from last 6 m 2003
York	97.2
Nottm	96.4
Sheff	96.3
Crdff	93.3
Bradf	85.9
Leic	77.7
Camb	73.7
Leeds	71.1
Livrpl	67.4
Covnt	63.5
Words	57.7
Middlbr	52.6
Bristl	49.6
Glouc	38.9
Truro	38.2
Wrexm	26.0
Redng	11.1
Extr	7.4
Oxfrd	6.6
Stevng	4.7
Sthend	4.4
Sund	4.3
Hull	4.0
Carls	3.8
Swmse	1.9
Guys	1.3
Heart	1.2
Plym	1.1
Carsh	0.3
Newc	0.2
H&CX	0.0
Ipswi	0.0
Kings	0.0
ManWst	0.0
Ports	0.0
Prstn	0.0
Wolve	0.0
Eng	33.0
Wls	76.0
E&W	36.3

greater efforts to capture these data automatically when measured in the clinic, for downloading to the Renal Registry. Currently, only 36% of patients have blood pressure data available.

Overall only 26% of transplant patients achieved both a systolic and diastolic BP within the RA Standard (Figure 11.21). Median systolic blood pressure in transplant patients was 138 mmHg (range 130–144 mmHg) as shown in Figure 11.22 and median diastolic BP was 80 mmHg (range 40–120 mmHg), Figure 11.23. The percentage of patients with a systolic blood pressure <130 mmHg is shown in Figure 11.24. Overall, only 31% of patients conformed to RA systolic BP criteria. Figure 11.25 reveals that only 44% of patients have a diastolic blood pressure within RA guidelines.

Clearly blood pressure recordings are subject to well-known biases and this was discussed in detail in Chapter 11 of the 2003 Registry Report. Such biases may be reduced if electronic measurement of blood pressure is undertaken, provided that the instruments used are appropriately validated and any necessary transcription is accurate. In addition, the clinic setting may not be the best place to undertake blood pressure measurements, although this remains a contentious area of debate.

The relationship between eGFR and systolic and diastolic blood pressure is shown earlier in Table 11.9. In the main, the higher the eGFR the lower the diastolic and systolic blood pressure.

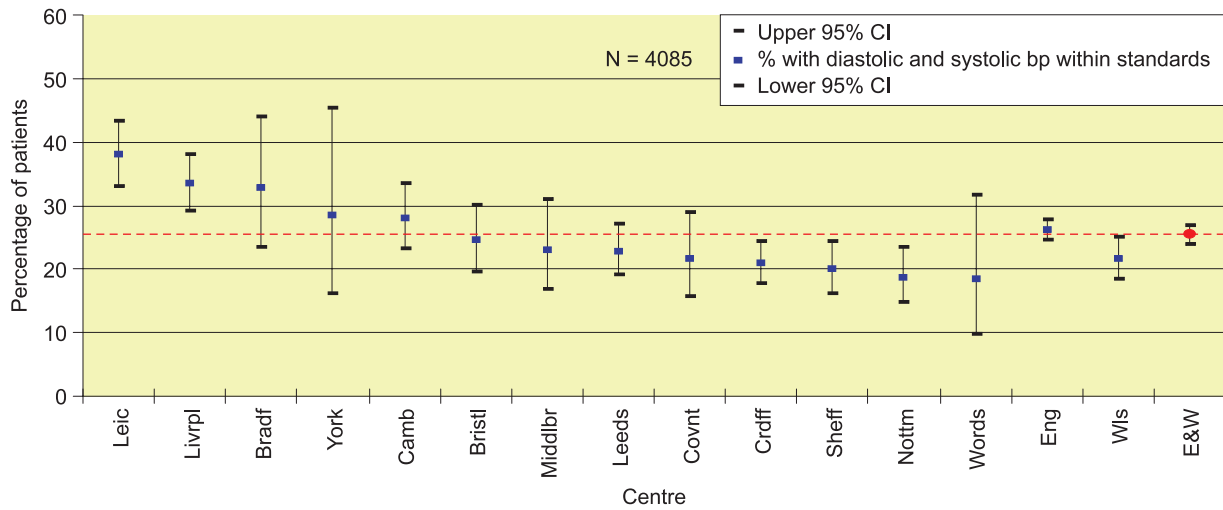


Figure 11.21: Percentage of patients with a BP below 130/80 mmHg

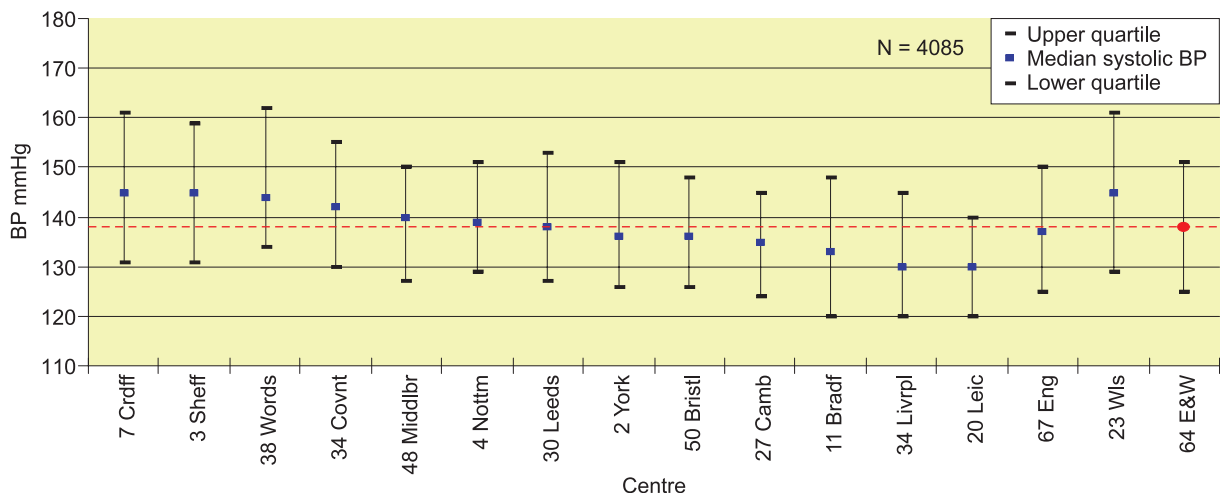


Figure 11.22: Median systolic BP by centre

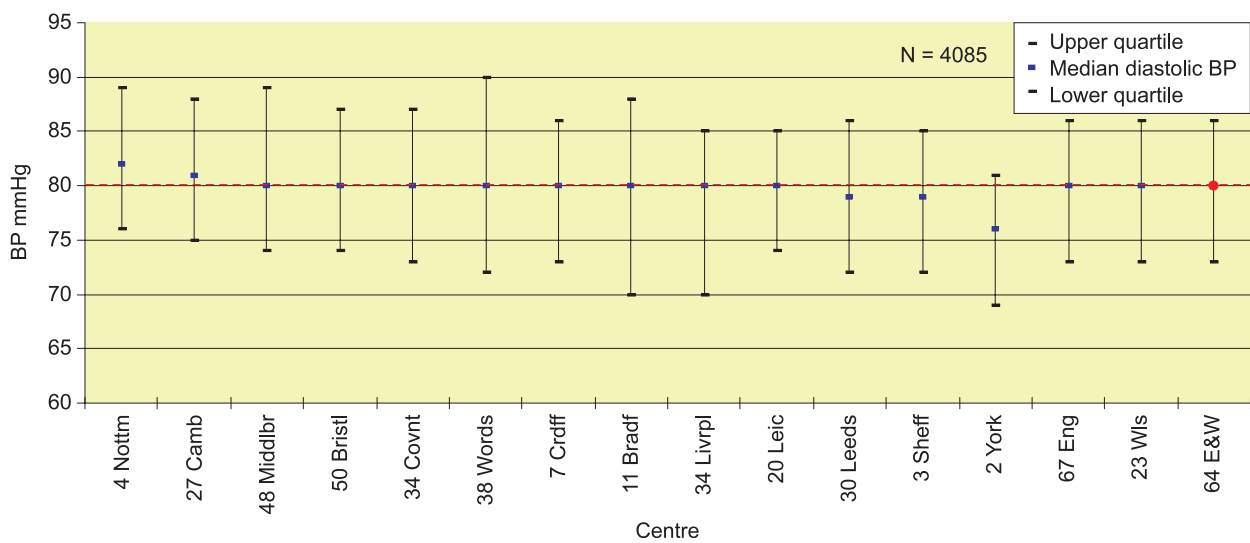


Figure 11.23: Median diastolic BP by centre

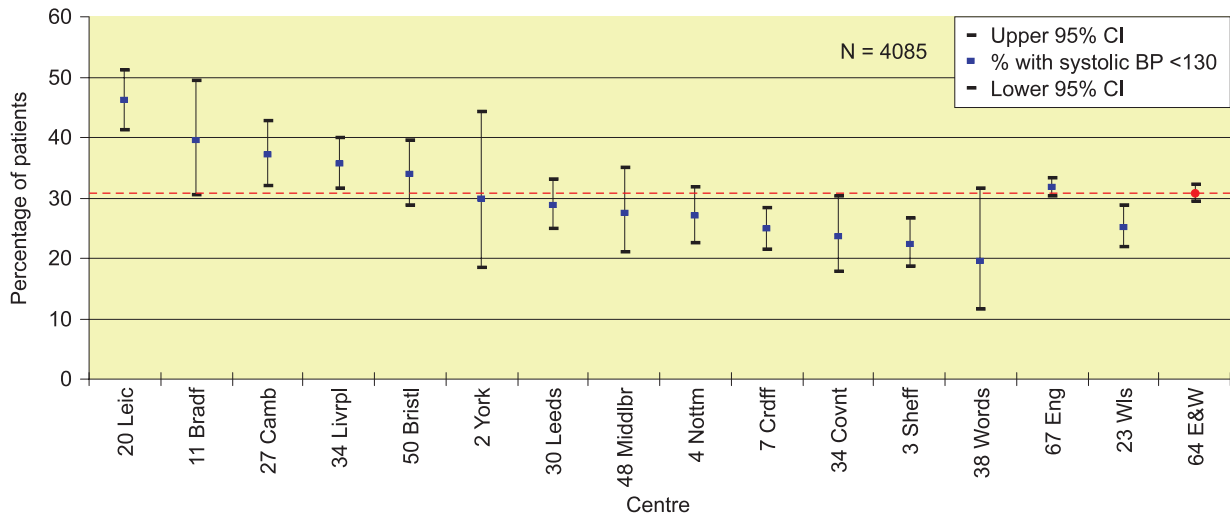


Figure 11.24: Percentage of patients with a systolic BP below 130 mmHg

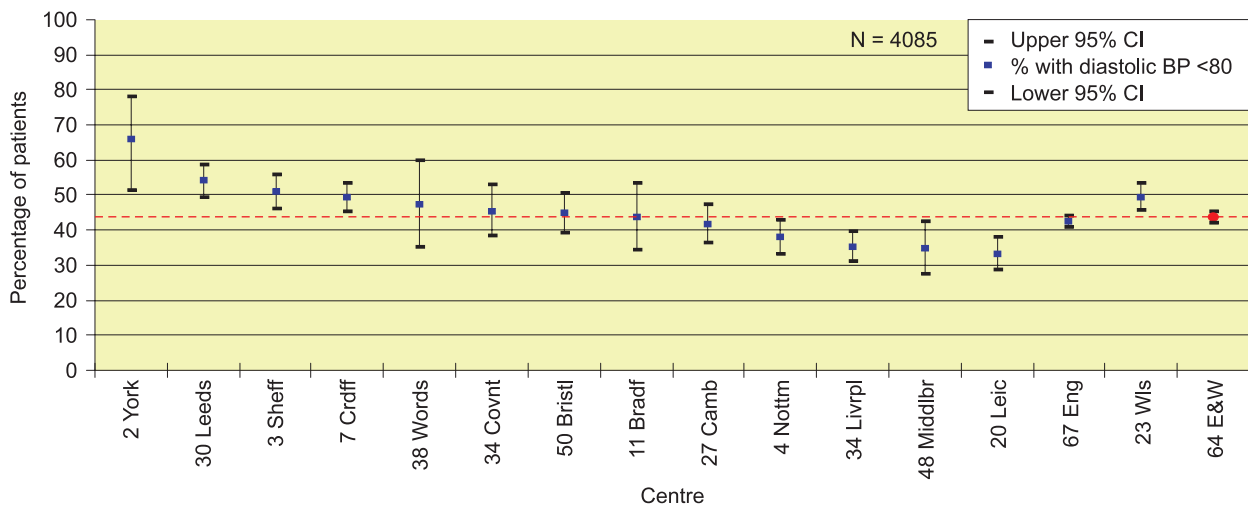


Figure 11.25: Percentage of patients with a diastolic BP below 80 mmHg

Transplant patient survival

Table 11.14 shows the survival of patients in 2003 with an established renal transplant. The one year survival of prevalent transplant

patients was 97.5% in England & Wales for patients in contributing centres censored at dialysis and 97.3% if patients returning to dialysis are included. This is unchanged from previous years.

Table 11.14: Survival during 2003 of established transplant patients alive on 1/1/2003

	Transplant censored at dialysis			Transplant including dialysis returns		
	Eng	Wales	E&W	Eng	Wales	E&W
No. of patients	8,992	758	9,750	8,994	758	9,752
No. of deaths	222	15	237	758	16	255
Death Rate	2.5	2.1	2.5	2.5	3.1	2.6
(95% CI)	2.2–2.9	1.1–3.3	2.2–2.9	2.2–2.9	2–4.7	2.3–2.9
K-M* 1 yr survival	97.4	97.9	97.5	97.3	98	97.3
(95% CI)	97.1–97.8	96.9–98.9	97.2–97.8	97.0–97.6	97.0–99.0	97.1–97.7

*Kaplan-Meier

Conclusions

This Chapter reports on data returned from 41 units, 37 of which follow prevalent transplant patients. Currently 16 units perform renal transplantation and follow-up 73.8% of the Registry prevalent transplant cohort. Data on 60.2% of all UK renal transplants performed in 2003 are presented. With the increase in the number of patients over the age of 65 years maintained on dialysis, the proportion of RRT provided by transplantation is declining progressively and stood at 45% in 2003. As pointed out in previous years, many unexplained variations exist between centres with respect to access for transplantation in patients receiving dialysis and patients whose underlying renal disease diagnosis is diabetes mellitus appear under-represented in the transplant cohort.

During 2003, 2.2% of all prevalent renal grafts failed and the annual death rate in prevalent patients with renal transplants was 2.4% (excluding patients with failed grafts returning to dialysis).

There remains considerable room for improvement in terms of data collection. Explanations are needed for the significant variations in haemoglobin, serum cholesterol and blood pressure in the different centre transplant cohorts. Nevertheless, with more centres contributing data to the Renal Registry the opportunities for comparative audit, clinical policy development and improved outcomes will increase. CKD Staging appears to provide a framework for this effort in regard to renal transplant patients. With 17% of prevalent transplant recipients being classified as CKD stage 4–5 this has organisational implications for structuring specific services (eg anaemia and phosphate management) for these patients.

References

1. Garthwaite EA, Will EJ, Bartlett C, Richardson D, Newstead CG. Patient-specific prompts in the cholesterol management of renal transplant outpatients: results and analysis of underperformance. *Transplantation* 2004 Oct 15;78(7):1042–7.