

ANNUAL REPORT ON LIVING DONOR KIDNEY TRANSPLANTATION

REPORT FOR 2020/2021 (1 APRIL 2006 – 31 MARCH 2021)

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Executive Summary



This report presents key figures about living donor kidney transplantation in the UK. The period reported covers 15 years of transplant data, from 1 April 2006. The report presents information on the number of transplants, follow-up data and survival analysis on a national and centre-specific basis.

Key findings

- There were 369 adult living donor kidney transplants performed in the UK in 2020/21, a decrease of 585 transplants compared to 2019/20. Of these, 187 (441 in 2019/20) were genetically related, 92 (216 in 2019/20) were unrelated, 1 (8 in 2019/20) was HLAi, 4 (30 in 2019/20) were ABOi, 51 (164 in 2019/20) were paired/pooled and 34 (95 in 2019/20) were non-directed altruistic donor transplants. The equivalent number of paediatric transplants was 50, a 32% decrease from the previous year.
- The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 4% at one year, 7% at five years and 11% at ten years post donation.
- Serum creatinine for living donors in the UK is 104 (IQ-range 90-119) at one year, 97 (84-112) at five years and 92 (80-106) at ten years post donation.
- The UK rate of graft survival five years after adult living donor kidney transplant by type is; unrelated 93%, genetically related 93%, non-directed altruistic 88%, paired exchange 90%, ABOi 85% and HLAi 85%.
- 45% of registered patients in the UK Living Kidney Sharing Scheme have been transplanted and 57% of identified transplants proceed.

Use of the contents of this report should be acknowledged as follows: Annual Report on Living Donor Kidney Transplantation 2020/21. NHS Blood and Transplant

Introduction



This report presents information on transplant activity between 1 April 2006 and 31 March 2021, for all 24 centres performing living donor kidney transplantation in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood & Transplant, that holds information relating to donors, recipients and outcomes for all kidney transplants performed in the UK.

Graft and patient survival estimates are reported at one-year post transplant for the period 1 April 2016 to 31 March 2020 and five-year post-transplant for the period 1 April 2012 to 31 March 2016. Results are described separately according to the type of donor.

Throughout this report West London Renal and Transplant Centre is labeled as WLRTC and Great Ormond Street Hospital is labelled as GOSH.

The COVID-19 pandemic has led to unprecedented challenges for UK transplantation. Concerns about the ability to care for transplant recipients, lack of access to resource because it is being used for patients in the pandemic, and the risk versus benefit for immunosuppressed transplant recipients, have resulted in a major reduction in the number of organ transplants undertaken.

Figure 2.1 shows the number of adult living donor kidney transplants per million population (pmp) that were performed in 2020/21 in each transplant centre. The Royal Free had the highest rate of adult living donor kidney transplants per million population.



ADULT

Figure 2.2 shows the number of adult living donor kidney transplants performed in the UK between 1 April 2006 and 31 March 2021. The number of transplants increased from 639 in 2006/07 to 954 in 2019/20 with a decrease to 369 in 2020/21.



Figure 2.3 and **Table 2.1** show the number of adult living donor kidney transplants performed in 2020/21 in each transplant centre. Oxford and Manchester performed the most adult living donor kidney transplants last year each with 34 patients receiving a transplant. All centres perform non-directed altruistic kidney donation and participate in the UK Living Kidney Sharing Scheme. 2 centres (11 centres in 2019/20) performed ABO incompatible (ABOi) transplants and only Cambridge (6 centres in 2019/20) performed HLA incompatible (HLAi) transplants in 2020/21.



Table 2.1	Adult living donor kidney transplants in the UK, 1 April 2020 - 31 March 2021										
Transplant Centre	e Donor type										
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non- directed altruistic donor					
Belfast Birmingham Bristol Cambridge Cardiff Coventry Edinburgh Glasgow Guy's Leeds Leicester Liverpool Manchester Newcastle Nottingham Oxford Plymouth Portsmouth Sheffield St George's The Royal Free	5 4 8 4 4 9 14 3 15 13 7 16 8 20 8 3 6 9 14	0 4 5 4 4 2 7 5 2 4 4 1 2 7 0 8 2 3 1 3 4	0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 5 0 3 1 6 6 0 3 0 2 4 5 0 5 3 0 0 1 3	3 3 1 2 1 0 3 4 1 0 2 2 2 2 1 0 1 0 1 2					
The Royal Londor WLRTC	n 8 3	5 5	0 0	0 0	3 1	1 2					

Figure 2.4 shows the proportion of adult living donor kidney transplants by donor type and centre in 2020/2021.





Figure 2.5 shows the number of adult living donor kidney transplants by donor type and centre between 1 April 2006 and 31 March 2021.

PAEDIATRIC

Figure 2.6 shows the number of paediatric living donor kidney transplants performed in the UK between 1 April 2006 and 31 March 2021. The number of transplants increased from 48 in 2006/07 to 73 in 2019/20 and decreased to 50 in 2020/21.



Figure 2.7 and **Table 2.2** show the number of paediatric living donor kidney transplants performed in 2020/21 in each transplant centre. Guy's transplant team performed the most living donor kidney transplants last year with 20 patients receiving a transplant (9 at GOSH and 11 at Guy's). Children are also benefitting from the UKLKSS and antibody removal programmes to facilitate living donor transplants.



Table 2.2Paediatric living donor kidney transplants in the UK, 1 April 2020 - 31 March 2021								
Transplant Cent	re		Dono	r type		Nen		
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	directed e altruistic donor		
Belfast	6	0	0	0	0	0		
Birmingham	5	0	0	0	0	0		
Bristol	3	0	0	0	0	0		
GOSH*	9	0	0	0	0	0		
Glasgow	4	0	0	0	0	0		
Guy's	10	0	0	0	1	0		
Leeds	4	1	0	0	0	0		
Manchester	3	0	0	0	0	0		
Newcastle	3	0	0	0	0	0		
Nottingham	0	0	0	1	0	0		
*Guy's team assess donors and perform transplants for GOSH recipients								

Figure 2.8 shows the proportion of paediatric living donor kidney transplants by donor type and centre in 2020/21.



Figure 2.9 shows the number of paediatric living donor kidney transplants by donor type and centre between 1 April 2006 and 31 March 2021.



Demographic Characteristics



ADULT

The sex, ethnicity, age group, sensitisation (cRF), cRF by transplant type for HSP, blood group, dialysis status of donors and recipients of adult living donor kidney transplants and pre-emptive transplant rates are shown by centre in **Figure 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7** and **3.8** respectively. Note that all percentages quoted are based only on data where relevant information was available.

86% of adult recipients of direct living donor kidney transplants are White and 14% are from Black, Asian or other minority ethnic groups (BAME). 2% of non-directed altruistic and 12% of paired/pooled donors are from BAME donors but 21% of adult recipients receiving a kidney from a non-directed altruistic donor and 19% receiving a kidney from paired-pooled donors are BAME.

There is a higher proportion of non-directed altruistic kidney donors > 50 years of age in comparison with other donor groups.

The adult living donor pre-emptive transplant rates ranged from 86% at Coventry to 0% at Nottingham.

















PAEDIATRIC

The sex, ethnicity, age group, sensitisation (cRF), cRF by transplant type for HSP, blood group and dialysis status of donors and recipients of paediatric living donor kidney transplants and pre-emptive transplant rates are shown by centre in **Figure 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15** and **3.16** respectively. Note that all percentages quoted are based only on data where relevant information was available.

79% of paediatric recipients of direct living donor kidney transplants are White and 21% are from Black, Asian or other minority ethnic groups (BAME). 8% of nondirected altruistic and 14% of paired/pooled donors are from BAME donors but 38% of paediatric recipients receiving a kidney from a non-directed altruistic donor and 32% from paired/pooled donors were BAME.

62% of children transplanted from a non-directed altruistic donor have a cRF \ge 50 and 23% of children transplanted through the paired/pooled scheme have cRF \ge 50.



The paediatric living donor pre-emptive transplant rates ranged from 67% at Manchester to 0% at Nottingham.















UK Living Kidney Sharing Scheme



4.1 Paired Donation Scheme4.1.1 Registrations: Matching Runs, 1 April 2015 – 31 March 2021

Figure 4.1 shows the number of patients included in matching runs from 1 April 2015 to 31 March 2021. The number of patients included has increased over this period with 219 in April 2015 to 231 in October 2020. Overall, there were 1,650 patients included in matching runs over this period. **Figure 4.2** shows the number of pairs included in each matching run, split by pair incompatibility.





Figure 4.3 shows the number of pairs included in matching runs from 1 April 2015 to 31 March 2021 by centre. This is broken down further by the nature of the incompatibility between the pair. It can be seen that Belfast has had the highest number of pairs registered over this time period. Most pairs registered over this period were HLA incompatible (40%). This information is also shown in **Table 4.1**.



Table 4.1Pairs included in matching runs by compatibility and Centre, April 2015 - March 2021						
Centre	Number of pairs	HLAi	ABOi	HLAi and ABOi	Compatible	
Belfast	151	53	56	15	27	
Birmingham	90	33	27	20	10	
Bristol	51	8	20	4	19	
Cambridge	52	27	14	11	0	
Cardiff	40	18	9	7	6	
Coventry	81	47	15	15	4	
Edinburgh	84	30	43	9	2	
Glasgow	102	42	31	11	18	
GOSH*	9	3	5	0	1	
Guy's	135	45	58	17	15	
Leeds	108	46	39	12	11	
Leicester	32	20	6	6	0	
Liverpool	53	24	16	6	7	
Manchester	114	53	35	25	1	
Newcastle	117	59	30	22	6	
Nottingham	36	9	15	6	6	
Oxford	149	67	27	31	24	
Plymouth	32	8	13	6	5	
Portsmouth	35	11	12	4	8	
Sheffield	33	18	5	8	2	
St George's	77	27	41	4	5	
The Royal Free	55	23	12	6	14	
The Royal London	71	21	28	13	9	
WLRTC	120	42	42	22	14	
UK	1827	734	599	280	214	
*Guy's team assess donors and perform transplants for GOSH recipients						

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Table 4.2	Recipients re or unaccepta	gistered ble antig	with differ ens, 1 Apr	ent bloo il 2015 -	d groups 31 March 2021
Year	Registere different grou	Registere unaccep antige	ed with otable ens	Total number of patients registered	
	NŬ	%	N	%	0
15/16	3	1.2	34	14	243
16/17	5	2.1	50	20.7	242
17/18	6	2.4	40	16.3	246
18/19	1	0.3	26	9	290
19/20	3	1.1	25	9.3	270
20/21	-	-	5	5.5	91

4.1.2 Outcomes: Matching Runs, 1 April 2017 – 31 March 2021

Figure 4.4 shows the outcomes of patients included in matching runs from 1 April 2017 to 31 March 2021, split by centre. Overall, 45% of patients registered have had a transplant through the paired donation scheme.



Figure 4.5 shows the transplants identified in each matching run from 1 April 2017 to 31 March 2021. The number of those that proceeded to transplant is also shown. Overall, 57% of transplants identified through the paired donation scheme have proceeded to transplant over this period.



Tables 4.3 and **4.4** show the number of transplants split by patient calculated reaction frequency and patient and donor blood group respectively.

Table 4.3Transplants as a proportion of registered patients by calculated reaction frequency, 1 April 2017 - 31 March 2021						
Calculated Reaction Frequency	Patients Registered	Patients T	ransplanted			
		Ν	(%)			
0-9%	432	218	(50)			
10-84%	316	180	(57)			
85-94%	123	65	(53)			
95-99%	197	51	(26)			
100%	118	3	(3)			

Table 4.4	 Transplants as a proportion of registered pairs by blood group, 1 April 2017 - 31 March 2021 											
Donor Blood				(Patier	l hts Tra	Patient Blo	od Gr /Pairs	oup Regis	stered (%))			
Group		0						rtogi				D
_		0			A			L L	3		A	В
0	115/	275	(42%)	70/	126	(56%)	29/	51	(57%)	6/	12	(50%)
А	103/	369	(28%)	63/	160	(39%)	38/	54	(70%)	4/	16	(25%)
В	42/	100	(42%)	31/	48	(65%)	11/	35	(31%)	2/	3	(67%)
AB	4/	17	(24%)	6/	17	(35%)	5/	17	(29%)	1/	6	(17%)

Figure 4.6 shows the number of patients transplanted from matching runs between 1 April 2017 and 31 March 2021. This is split by centre and exchange type.



Figure 4.7 shows the patients transplanted from matching runs between 1 April 2017 and 31 March 2021. This is split by centre and the incompatibility of the patient with their registered donor. **Table 4.5** shows the percentage of pairs transplanted through paired donation given that they have been included in 1 or more, 2 or more or 5 or more matching runs. **Table 4.6** shows the number of transplants by compatibility and centre. **Table 4.7** shows the average waiting time for transplant in the paired donation scheme. Data is censored if the patient received a transplant outside the scheme.



Table 4.5	Transplants by group April 2017 - March 202	type and 21	Centre			
Centre	Number of Transplants	2-way	3-way	Short Chain	Long Chain	
Belfast	53	8	25	14	6	
Birmingham	32	3	9	5	15	
Bristol	18	4	4	6	4	
Cambridge	14	2	4	3	5	
Cardiff	18	4	7	5	2	
Coventry	26	3	8	11	4	
Edinburgh	36	11	9	10	6	
Glasgow	45	5	15	17	8	
GOSH*	3	0	2	1	0	
Guy's	48	10	11	15	12	
Leeds	30	8	8	7	7	
Leicester	16	3	4	5	4	
Liverpool	13	4	3	4	2	
Manchester	28	3	5	14	6	
Newcastle	35	7	10	8	10	
Nottingham	16	1	8	5	2	
Oxford	56	11	12	24	9	
Plymouth	13	3	1	4	5	
Portsmouth	20	7	3	5	5	
Sheffield	14	0	5	6	3	
St George's	38	6	13	11	8	
The Royal Free	25	6	4	8	7	
The Royal Londor	า 28	4	8	6	10	
WLRTC	34	5	8	16	5	
UK	659	118	186	210	145	
*Guy's team assess donors and perform transplants for GOSH recipients						

Table 4.6	Transplants by comp 1 April 2017 - 31 Marcl	atibility ar h 2021	d Centre			
Centre	Number of Transplants	HLAi	ABOi	HLA and ABOi	Compatible	
Belfast	53	1	3	0	49	
Birmingham	32	3	0	0	29	
Bristol	18	1	0	0	17	
Cambridge	14	0	0	0	14	
Cardiff	18	1	0	0	17	
Coventry	26	5	0	2	19	
Edinburgh	36	2	0	0	34	
Glasgow	45	0	0	0	45	
GOSH*	3	0	0	0	3	
Guy's	48	0	0	0	48	
Leeds	30	0	0	0	30	
Leicester	16	0	0	0	16	
Liverpool	13	0	0	0	13	
Manchester	28	1	0	0	27	
Newcastle	35	1	0	0	34	
Nottingham	16	0	0	0	16	
Oxford	56	1	0	0	55	
Plymouth	13	0	0	0	13	
Portsmouth	20	0	0	0	20	
Sheffield	14	0	0	0	14	
St George's	38	0	0	0	38	
The Royal Free	25	0	0	0	25	
The Royal Londo	n 28	0	1	0	27	
WLRTC	34	1	0	0	33	
UK	659	17	4	2	636	
*Guy's team assess donors and perform transplants for GOSH recipients						

Table 4.7Median waiting time to paired donation kidney transplant in the UK, for patients registered 1 April 2011 - 31 March 2017							
Pair Incompatibility	Number of patients	Wa	iting time (days)				
	registered	Median	95% Confidence interval				
HLAi	540	456	343 - 569				
ABOi	428	461	411 - 511				
All Pairs	1200	495	433 - 557				

4.2 Non-directed Altruistic Donation

4.2.1 Transplants, 1 April 2012 – 31 March 2021

Figure 4.8 shows the number of non-directed altruistic donor kidney transplants from 1 April 2012 to 31 March 2021. This is split by whether the donation was to the deceased donor waiting list or the paired donation scheme. The number of transplants has increased from 77 in 2012/13 to 118 in 2013/14 before falling to 96 in 2019/20. In the latest financial year, the number of transplants decreased to 34.



Figure 4.9 shows the number of non-directed altruistic donor kidney transplants from 1 April 2017 to 31 March 2021 by donor centre. Guy's had the highest number of non-directed altruistic donors. **Figure 4.10** shows the number of non-directed altruistic donor kidney transplants from 1 April 2017 to 31 March 2021 by recipient centre. Guy's had the highest number of recipients of non-directed altruistic donors.




4.2.2 Time to donation, 1 April 2017 – 31 March 2021

Figure 4.11 shows the median time in months from notification to donation from 1 April 2017 to 31 March 2021, by centre. This ranged from 1 to 3 months. This data is shown further in **Table 4.7**. The boxplot shows the minimum, lower quartile, median, upper quartile and maximum values. The boxplots are used to show the variation in the data and indicate any outlying values, which are shown by the circles on the plot. The box itself shows the interquartile range and the line inside the box indicates the median value.



l able 4.8	by Centre, Donations	April 201	on and do 7 - March	2021
Centre	Number of donors	Median	Lower quartile	Upper quartile
Belfast	23	2	2	3
Birmingham	7	7	5	9
Bristol	9	3	3	4
Cambridge	6	3	3	3
Cardiff	8	2	1	3
Coventry	4	3	2	4
Edinburgh	22	2	2	3
Glasgow	11	2	2	3
Guy's	31	2	2	3
Leeds	21	2	2	3
Leicester	2	2	2	3
Liverpool	7	2	2	3
Manchester	26	3	1	8
Newcastle	13	3	1	3
Nottingham	5	3	3	3
Oxford	17	2	2	3
Plymouth	16	2	2	3
Portsmouth	21	3	2	3
Sheffield	5	2	2	2
St George's	6	4	3	5
The Royal Free	4	1	1	1
The Royal Londo	n 2	2	1	3
WLRTC	6	2	1	2
UK	272	2	2	3

Antibody Incompatible Transplants

This section only includes living donor antibody incompatible kidney only transplants.

Antibody Incompatible transplant data is collected on the Antibody Incompatible Transplant Details form. **Figure 5.1** and **Table 5.1** show the form return rates by centre and include data on forms relating to antibody incompatible transplants from direct living donation and via the UKLKSS. The remainder of the section contains data on direct transplants only.



Table 5.1	Antibody in 1 April 2011	compatible transplant fo I – 31 March 2021	orm return rate	es,
Transplant Centre	Code	Number of transplants	AITX forms re N	turned %
Belfast	А	58	58	100
Birmingham	В	59	48	81
Bristol	С	24	24	100
Cambridge	D	84	74	88
Cardiff	E	74	74	100
Coventry	F	54	45	83
Edinburgh	G	35	35	100
Glasgow	Н	9	9	100
GOSH*	I	12	10	83
Guy's	J	98	97	99
Leeds	K	36	28	78
Leicester	L	29	15	52
Liverpool	M	41	41	100
Manchester	N	31	31	100
Newcastle	0	82	52	63
Nottingham	P	24	23	96
Oxford	Q	27	-	-
Plymouth	R	1	1	100
Portsmouth	S	3	3	100
Sheffield	Т	16	15	94
St George's	U	8	8	100
The Royal Free	V	21	1	5
The Royal London	W	77	35	45
WLRTC	Х	22	20	91
UK		925	747	81
*Guy's team assess do	nors and perfor	m transplants for GOSH r	ecipients	

ADULT

Figures 5.2 and **5.3** show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively. Activity has reduced from 143 antibody incompatible transplants in 2011/12 to 5 in the latest financial year.





Table 5.2	Donor and transplants	recipient k s, 1 April 20	olood gr 011 - 31	oup for all March 202	adult A 21	BOi
Recipient		C A	onor bl	ood group)	D
biood group		A		D (O()		
	N	(%)	N	(%)	N	(%)
А	1	(0.2)	54	(9.5)	36	(6.3)
В	72	(12.6)	-	()	21	(3.7)
0	272	(47.7)	102	(17.9)	9	(1.6)

Table 5.2 shows the donor and recipient blood group for all ABOi transplants.

Table 5.3 shows the donor and recipient ABO by recipient CRF at transplant.

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Table 5.3	Donor and 1 April 201	recipient 1 - 31 Mar	ABO by ch 2021	recipient	CRF at	transplan	ıt,	
Donor-	-		Rec	cipient CR	F at trai	nsplant		- 400
Recipient AB	5	0-9	1	0-84	5	35-94	9	5-100
	N	(%)	N	(%)	N	(%)	N	(%)
A-A	15	(2)	15	(2)	10	(1)	20	(3)
A-AB	1	(<1)	1	(<1)	1	(<1)	1	(<1)
A-B	54	(7)	9	(1)	3	(<1)	6	(1)
A-O	181	(23)	70	(9)	10	(1)	13	(2)
AB-A	24	(3)	8	(1)	2	(<1)	2	(<1)
AB-AB	-		-		-	. ,	3	(<1)
AB-B	18	(2)	3	(<1)	-		-	
AB-O	6	(1)	1	(<1)	2	(<1)	-	
B-A	38	(5)	8	(1)	3	(<1)	5	(1)
B-AB	-		-		-		1	(<1)
B-B	3	(<1)	4	(1)	4	(1)	7	(1)
B-O	67	(8)	28	(4)	5	(1)	2	(<1)
O-A	17	(2)	6	(1)	5	(1)	8	(1)
O-AB	-		1	(<1)	-		-	
O-B	1	(<1)	4	(1)	2	(<1)	4	(<1)
0-0	26	(3)	24	(3)	15	(2)	37	(5)

Table 5.4 shows the pre and at transplant level group for all HLAi transplants. Data are only presented for cases where an antibody incompatible form has been completed and returned. **Table 5.5** shows the calculated reaction frequency by incompatibility type.

Table 5.4	Pre a 1 Ap	ind at tra ril 2011 -	nsplant 31 Marc	antibody l h 2021	evel grou	ip for all ac	lult HL/	Ai transpl	ants,			
Pre treatment antibody level group	CE Fic DS N	DC pos, ow pos, SA SPA pos (%)	CD Flo DSA S N	C neg, w pos, SPA pos (%)	At Tra CDC n neg, D P N	eg, Flow SA SPA os (%)	Intiboc CD Flov DS r N	ly level g C neg, w neg, A SPA neg (%)	Iroup CD Flov DS, N	C NT, w pos, A SPA pos (%)	N	Unknown (%)
CDC NT, Flow pos, DSA SPA pos CDC neg,	-		- 1	(<1)	15 68	(5) (24)	- 16	(6)	-	(3.9)	1	(<1) (<1)
Flow neg, DSA SPA pos CDC neg, Flow pos, DSA SPA pos	-		50	(18)	31	(11)	29	(10)	-		17	(6)
CDC pos, Flow pos, DSA SPA pos Unknown	3	(1)	10 2	(4) (1)	8	(3)	4 2	(1) (1)	-		1 13	(<1) (5)

Table 5.5	At trar by inc	nsplant ca ompatibili	lculated r ty type, 1	eaction fro April 201	equency 1 - 31 Mar	ch 2021	
Calculated							
Reaction	A	BOi	Н	LAi	HLAi and ABOi		
Frequency	Ν	%	Ν	%	Ν	%	
0-9	384	(72)	60	(26)	7	(19)	
10-84	119	(22)	56	(24)	7	(19)	
85-94	20	(4)	37	(16)	5	(13)	
95-100	10	(2)	81	(34)	18	(49)	

PAEDIATRIC

Figures 5.4 and **5.5** show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively.





Living Donor Follow-Up



This section contains information on all living donors who have donated to both adult and paediatric recipients from 2006/07 to 2019/20. Percentages are omitted if the reported proportion of the data item at 1 year is less than 75%, at 5 years is less than 50% or at 10 years is less than 35% at each centre.

Figure 6.1 shows the number of living donor kidney donors by financial year from 2006/07 to 2019/20. The number of living donors has increased from 690 in 2006/07 to 1036 in 2019/20.



Of the living donors over this period, 98 deaths have been recorded. The causes of death are shown in **Table 6.1**. No donors have joined the kidney waiting list, although one has received a kidney transplant from a living donor.

Table 6.1	Cause of death for living donors 1 April 2006 -	- 31 March :	2020
Cause of Death		N	%
Cancer		40	41
Bowel		3	3
Breast		4	4
Colonic		2	2
Gastric		1	1
Liver		1	1
Lung		3	3
Oesophagus		2	2
Pancreatic		6	6
Prostate		1	1
Testicular		1	1
Other		16	16
Brain Tumor		2	2
Intracranial hemorrh	age	2	2
Seizure		2	2
Parkinson's disease		2	2
RTA		3	3
Suicide		2	2
Bronchopneumonia		2	2
Other		13	13
Unknown		30	31
TOTAL		98	100

6.1 Prescription of Antihypertensive drugs, 1 April 2007– 31 March 2021

Figure 6.2, 6.3 and 6.4 show the proportion of living donor kidney donors where the donor has been prescribed antihypertensive drugs at 1, 5 and 10 year follow-up by centre, respectively. The same information is summarised in **Table 6.2**. The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 4% at one year, 7% at five years and 11% at ten years post donation.







Table 6.2 F	Percentag	ercentage of Donors Prescribed Antihypertensive Drugs y Centre, Donations April 2006 - March 2020							
Centre		1 Year			5 Year			10 Year	
	Ν	% ¹	%²	Ν	% ¹	%²	Ν	% ¹	%²
Belfast	294	91	4	291	70	2	88	52	7
Birmingham	203	66	-	294	45	-	312	34	-
Bristol	126	89	4	203	65	7	203	35	14
Cambridge	148	86	6	228	66	7	180	60	12
Cardiff	131	93	6	181	84	11	161	74	22
Coventry	96	77	8	147	54	8	163	50	7
Edinburgh	200	75	2	176	48	-	117	40	2
Glasgow	194	85	3	200	18	-	137	13	-
Guy's	416	81	4	579	60	8	541	40	11
Leeds	202	83	4	238	61	8	202	54	6
Leicester	127	68	-	162	52	14	214	43	23
Liverpool	152	87	4	176	57	4	124	35	2
Manchester	315	76	7	489	49	-	293	31	-
Newcastle	244	70	-	283	48	-	203	29	-
Nottingham	67	84	0	84	62	2	96	52	4
Oxford	217	85	3	265	60	5	195	35	6
Plymouth	94	72	-	108	50	6	89	27	-
Portsmouth	118	87	3	140	88	11	98	64	22
Sheffield	77	81	2	104	80	8	93	67	10
St George's	170	82	4	205	61	6	238	40	11
The Royal Free	142	67	-	186	54	7	154	42	12
The Royal London	150	58	-	213	54	9	169	41	12
WLRTC	183	64	-	278	44	-	415	32	-
UK	4066	79	4	5230	57	7	4485	41	11

¹% of donors with follow-up reported
²% of donors that have been prescribed antihypertensive drugs (where follow-up returned)
Percentages are omitted where less than 75%, 50% or 35% of data reported at 1yr, 5yrs or 10yrs



Figure 6.5 shows the percentage of donors with follow-up reported by centre, for donations between April 2006 - March 2020.

6.2 Serum creatinine, 1 April 2006 – 31 March 2020

Figure 6.6, 6.7 and 6.8 show the median serum creatinine at 1, 5 and 10 year follow-up by centre, respectively. The same information is summarised in **Table 6.3**. Serum creatinine for living donors in the UK is 104 (IQ-range 90-119) at one year, 97 (84-112) at five years and 92 (80-106) at ten years post donation.







Table 6.3

Median serum creatinine at 1, 5 and 10 year follow up by centre, donations 1 April 2006 - 31 March 2020

Centre	1 Year				5 Year			10 Year		
			Median			Median			Median	
	N	%1	(IQ range)	Ν	% ¹	(IQ range)	Ν	% ¹	(IQ range)	
Belfast	294	90	108 (92-126)	291	70	97 (86-111)	88	52	91.5 (80-103	
Birmingham	203	65	- ()	294	45	(-)	312	33	(-	
Bristol	126	88	108 (92-121)	203	64	99 (83-115)	203	35	92 (79-115	
Cambridge	148	84	104 (92-118)	228	65	100 (85-115)	180	58	95 (83-105	
Cardiff	131	92	103 (89-116)	181	83	94 (81-112)	161	74	92 (79-113	
Coventry	96	77	109 (96-125)	147	54	101 (86-115)	163	50	92 (82-109	
Edinburgh	200	73	- ()	176	47	(-)	117	39	87 (74-104	
Glasgow	194	85	101 (88-116)	200	18	(-)	137	13	(-	
Guy's	416	81	107 (93-122)	579	60	97 (85-114)	541	39	96 (84-110	
Leeds	202	82	98 (86-111)	238	59	96 (84-115)	202	53	88 (77.5-101	
Leicester	127	66	- ()	162	51	86 (79-104)	214	42	88.5 (75-105	
Liverpool	152	78	110 (92-125)	176	56	96 (86-108)	124	35	91 (77-106	
Manchester	315	72	- ()	489	46	(-)	293	31	(-	
Newcastle	244	70	- ()	283	48	(-)	203	29	(-	
Nottingham	67	84 9	98.5 (85.5-116)	84	62	88.5 (75.5-107)	96	51	89 (81-101	
Oxford	217	84	103 (89-119)	265	60	94 (82-111)	195	34	(-	
Plymouth	94	72	- ()	108	50	100.5 (85-116)	89	27	(-	
Portsmouth	118	84	103 (89-119)	140	86	99.5 (83-110.5)	98	63	90.5 (81-105	
Sheffield	77	79	102 (92-119)	104	79	94.5 (84-105)	93	67	87.5 (77-101	
St George's	170	81	102 (89-117)	205	60	97 (86-111)	238	39	92 (80-102	
The Royal Free	142	67	- ()	186	54	95 (87-107)	154	42	91 (78-105	
The Royal London	150	58	- ()	213	54	104 (90-121)	169	41	98 (87-113	
WLRTC	183	64	- ()	278	44	(-)	415	32	(-	
UK	4066	77	104 (90-119)	5230	56	97 (84-112)	4485	40	92 (80-106	

6.3 Return to normal activity, 1 April 2006 – 31 March 2020

Figure 6.9 shows the median time (in months) to return to normal activity after donation, by centre. The median ranged from 1 to 3 months post-transplant.



Figure 6.10 shows the median time (in months) to return to normal activity after donation in the UK, by financial year.



Recipient Graft and Patient survival



ADULT

One and five year graft and patient survival are shown in **Figures 7.1-7.4** following adult living donor kidney transplants by donor type. **Tables 7.1-7.4** show the survival rates and 95% confidence limits.



Table 7.1	1 year graft survival following living kidney transplant
	between 1 April 2016 and 31 March 2020(p=0.0038)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1717	98.9	(98-99)
ABO incompatible donor	164	98.7	(95-100)
Unrelated donor (directed)	898	98.4	(97-99)
Paired exchange donor	529	97.8	(96-99)
HLA incompatible donor	41	97.1	(81-100)
Non-directed altruistic donor	313	95.7	(93-98)



Table 7.25 year graft su between 1 Ap	urvival following	living kidney trans	splant
	ril 2012 and 31 M	Iarch 2016 (p<0.00	01)
Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Unrelated donor (directed)	968	93.2	(91-95)
Related donor	1810	92.6	(91-94)
Paired exchange donor	315	90.2	(86-93)
Non-directed altruistic donor	375	87.9	(84-91)
HLA incompatible donor	159	85.0	(78-90)
ABO incompatible donor	285	84.6	(80-88)



able 7.31 year patient survival following living kidney transplantbetween 1 April 2016 and 31 March 2020 (p=0.002)									
Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)						
Related donor	1490	99.6	(99-100)						
Unrelated donor (directed)	792	99.1	(98-100)						
Non-directed altruistic donor	211	99.0	(96-100)						
Paired exchange donor	398	98.9	(97-100)						
ABO incompatible donor	141	96.2	(91-98)						
HLA incompatible donor*	26	-	-						



Table 7.45 year patient survival following living kidney transplant between 1 April 2012 and 31 March 2016 (p<0.0001)									
Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)						
Related donor	1625	96.0	(95-97)						
Unrelated donor (directed)	875	93.8	(92-95)						
Paired exchange donor	237	92.9	(88-96)						
ABO incompatible donor	257	92.7	(89-95)						
Non-directed altruistic donor	278	90.5	(86-94)						
HLA incompatible donor	88	84.8	(75-91)						

We present a visual comparison of survival rates among centres that is based on a graphical display known as a funnel plot (1, 2). This display is used to show how consistent the rates of the different transplant units are with the national rate. Funnel plots show the survival rate plotted against the number of transplants for each centre, with the overall national survival rate (solid line), and its 95% (thin dotted lines) and 99.8% (thick dotted lines) confidence limits superimposed. Each dot in the plot represents one of the centres. Note that many patients return to local renal units for follow-up care after their transplant and although we report survival according to transplant unit, patients may in fact be followed up quite distantly from their transplant centre.

Interpreting the funnel plots

If a centre lies within all the limits, then that centre has a survival rate that is statistically consistent with the national rate. If a centre lies outside the 95% confidence limits, this serves as an alert that the centre may have a rate that is significantly different from the national rate. If a centre lies outside the 99.8% limits, then further investigations may be carried out to determine the reasons for the possible difference. When a centre lies above the upper limits, this indicates a survival rate that is higher than the national rate, while a centre that lies below the lower limits has a survival rate that is lower than the national rate. It is important to note that adjusting for patient mix through the use of risk-adjustment models may not account for all possible causes of centre differences. There may be other factors that are not taken into account in the risk-adjustment process that may affect the survival rate of a particular centre.

References

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- 2. Stark J, Gallivan S, Lovegrove J, Hamilton JRL, Monro JL, Pollock JCS, Watterson KG. Mortality rates after surgery for congenital heart defects in children and surgeons' performance. Lancet 2000; 355: 1004 1007.

Figures 7.5 to 7.10 shows one year risk adjusted survival rates following adult living donor kidney transplants by centre for each donor type. Table 7.5 shows the survival rates by centre and donor type.













Table 7.5

1 year graft survival following adult living donor kidney transplant between 1 April 2016 and 31 March 2020, by donor type and centre

		Rela	ted	Unrela	ated	HLAi		ABOi		Paired		Non-directed altruistic	
Centre	Code	Ν	% ¹	Ν	% ¹	Ν	% ¹	Ν	% ¹	Ν	% ¹	Ν	% ¹
Belfast	А	127	98	38	100	3	100	26	100	50	100	14	100
Birmingham	В	92	98	46	100	1	100	16	88	20	95	20	100
Bristol	С	55	94	29	100	1	100	3	100	12	100	8	100
Cambridge	D	72	99	36	100	5	100	11	100	10	90	12	92
Cardiff	E	30	97	37	95	3	50	11	100	14	100	12	92
Coventry	F	38	100	13	100	3	100	-		20	95	10	100
Edinburgh	G	75	100	54	100	-		13	100	21	100	17	91
Glasgow	I	88	99	28	96	-		2	100	28	93	29	100
Guy's	J	98	100	70	99	4	100	14	100	29	96	23	100
Leeds	К	85	99	47	96	3	100	1	100	27	100	15	80
Leicester	L	59	98	42	98	-		10	100	13	100	5	100
Liverpool	Μ	86	98	27	100	5	100	10	100	11	91	14	100
Manchester	Ν	143	99	73	100	-		2	100	23	96	19	84
Newcastle	0	109	100	66	98	8	100	8	100	28	100	13	100
Nottingham	Р	22	100	11	100	-		6	100	8	100	4	75
Oxford	Q	111	100	28	100	2	100	2	100	48	96	31	93
Plymouth	R	29	100	27	91	-		-		11	100	4	100
Portsmouth	S	52	100	26	96	-		-		22	100	8	100
Sheffield	Т	25	100	25	96	-		6	100	16	100	7	100
St George's	U	82	99	46	100	-		-		42	100	12	100
The Royal	V												
Free		81	100	37	100	-		1	100	19	100	10	100
The Royal	W	-		-						-		-	
London		67	100	41	100	2	100	16	100	22	100	13	92
WLRTC	Х	90	98	51	96	-		6	100	35	97	13	100
UK		1716	99	898	98	40	97	164	99	529	97	313	96
¹ % 1 year graft survival													

PAEDIATRIC

Numbers are too small to present paediatric graft and patient survival broken down by living donor transplant type. Overall living donor survival is presented in the Annual report on kidney transplantation.

Appendix



A1 Glossary of terms

ABO

The most important human blood group system for transplantation is the ABO system. Every human being is of blood group O, A, B or AB, or of one of the minor variants of these four groups. ABO blood groups are present on other tissues and, unless special precautions are taken, a group A kidney transplanted to a group O patient will be rapidly rejected.

Active transplant list

When a patient is registered for a transplant, they are registered on what is called the 'active' transplant list. This means that when a donor kidney becomes available, the patient is included among those who are matched against the donor to determine whether or not the kidney is suitable for them. It may sometimes be necessary to take a patient off the transplant list, either temporarily or permanently. This may be done, for example, if someone becomes too ill to receive a transplant. The patient is told about the decision to suspend them from the list and is informed whether the suspension is temporary or permanent. If a patient is suspended from the list, they are not included in the matching of any donor kidneys that become available.

Case mix

The types of patients treated at a unit for a common condition. This can vary across units depending on the facilities available at the unit as well as the types of people in the catchment area of the unit. The definition of what type of patient a person is depends on the patient characteristics that influence the outcome of the treatment. For example the case mix for patients registered for a kidney transplant is defined in terms of various factors such as the blood group, tissue type and age of the patient. These factors have an influence on the chance of a patient receiving a transplant.

Confidence interval (CI)

When an estimate of a quantity such as a survival rate is obtained from data, the value of the estimate depends on the set of patients whose data were used. If, by chance, data from a different set of patients had been used, the value of the estimate may have been different. There is therefore some uncertainty linked with any estimate. A confidence interval is a range of values whose width gives an indication of the uncertainty or precision of an estimate. The number of transplants or patients analysed influences the width of a confidence interval. Smaller data sets tend to lead to wider confidence intervals compared to larger data sets. Estimates from larger data sets are therefore more precise than those from smaller data sets. Confidence intervals are calculated with a stated probability, usually 95%. We then say that there is a 95% chance that the confidence interval includes the true value of the quantity we wish to estimate.

Confidence limit

The upper and lower bounds of a confidence interval.

Cox Proportional Hazards model

A statistical model that relates the instantaneous risk (hazard) of an event occurring at a given time point to the risk factors that influence the length of time it takes for the

event to occur. This model can be used to compare the hazard of an event of interest, such as graft failure or patient death, across different groups of patients.

Cross-match

A cross-match is a test for patient antibodies against donor antigens. A positive cross-match shows that the donor and patient are incompatible. A negative cross-match means there is no reaction between donor and patient and that the transplant may proceed.

Funnel plot

A graphical method that shows how consistent the survival rates of the different transplant units are compared to the national rate. The graph shows for each unit, a survival rate plotted against the number of transplants undertaken, with the national rate and confidence limits around this national rate superimposed. In this report, 95% and 99.8% confidence limits were used. Units that lie within the confidence limits have survival rates that are statistically consistent with the national rate. When a unit is close to or outside the limits, this is an indication that the centre may have a rate that is considerably different from the national rate.

Graft survival rate

The percentage of patients whose grafts are still functioning. This is usually specified for a given time period after transplant. For example, a five-year transplant survival rate is the percentage of transplants still functioning five years after transplant.

HLA mismatch

Human Leucocyte Antigen (HLA) antigens are carried on many cells in the body and the immune system can distinguish between those that can be recognised as 'self' (belonging to you or identical to your own) and those that can be recognised as 'nonself'. The normal response of the immune system is to attack foreign/non-self material by producing antibodies against the foreign material. This is one of the mechanisms that provide protection against infection. This is unfortunate from the point of view of transplantation as the immune system will see the graft as just another 'infection' to be destroyed, produce antibodies against the graft and rejection of the grafted organ will take place. To help overcome this response, it is recognised that 'matching' the recipient and donor on the basis of HLA (and blood group) reduces the chances of acute rejection and, with the added use of immunosuppressive drugs, very much improves the chances of graft survival. 'Matching' refers to the similarity of the recipient HLA type and donor HLA type. HLA mismatch refers to the number of mismatches between the donor and the recipient at the A, B and DR (HLA) loci. There can only be a total of two mismatches at each locus. For example, an HLA mismatch value of 000, means that the donor and recipient are identical at all three loci, while an HLA mismatch value of 210 means that the donor and recipient differ completely at the A locus, are partly the same at the B locus and are identical at the DR locus.

Inter-quartile range

The values between which the middle 50% of the data fall. The lower boundary is the lower quartile, the upper boundary the upper quartile.

Kaplan-Meier method

A method that allows patients with incomplete follow-up information to be included in estimating survival rates. For example, in a cohort for estimating one year patient survival rates, a patient was followed up for only nine months before they relocated. If we calculated a crude survival estimate using the number of patients who survived for at least a year, this patient would have to be excluded as it is not known whether or not the patient was still alive at one year after transplant. The Kaplan-Meier method allows information about such patients to be used for the length of time that they are followed-up, when this information would otherwise be discarded. Such instances of incomplete follow-up are not uncommon and the Kaplan-Meier method allows the computation of estimates that are more meaningful in these cases.

Living donor

A donor who is a living person and who is usually, but not always, a relative of the transplant patient. For example, a parent may donate one of their kidneys to their child.

Median

The midpoint in a series of numbers, so that half the data values are larger than the median, and half are smaller.

Multi-organ transplant

A transplant in which the patient receives more than one organ. For example, a patient may undergo a transplant of a kidney and liver.

National Kidney Allocation Scheme

A nationally agreed set of rules for sharing and allocating kidneys for transplant between transplant centres in the UK. The scheme is administered by NHS Blood and Transplant.

Patient survival rate

The percentage of patients who are still alive (whether the graft is still functioning or not). This is usually specified for a given time period after transplant. For example, a five-year patient survival rate is the percentage of patients who are still alive five years after their first transplant.

p value

In the context of comparing survival rates across centres, the p value is the probability that the differences observed in the rates across centres occurred by chance. As this is a probability, it takes values between 0 and 1. If the p value is small, say less than 0.05, this implies that the differences are unlikely to be due to chance and there may be some identifiable cause for these differences. If the p value is large, say greater than 0.1, then it is quite likely that any differences seen are due to chance.

Pre-emptive

Patients that are placed on the kidney transplant list or receive a transplant prior to the need for dialysis are termed as pre-emptive. Patients listed pre-emptively will usually require dialysis within six months of being placed on the transplant list.

Risk-adjusted survival rate

Some transplants have a higher chance than others of failing at any given time. The differences in expected survival times arise due to differences in certain factors, the risk factors, among patients. A risk-adjusted survival rate for a centre is the expected survival rate for that centre given the case mix of their patients. Adjusting for case mix in estimating centre-specific survival rates allows valid comparison of these rates across centres and to the national rate.

Risk factors

These are the characteristics of a patient, transplant or donor that influence the length of time that a graft is likely to function or a patient is likely to survive following a transplant. For example, when all else is equal, a transplant from a younger donor is expected to survive longer than that from an older donor and so donor age is a risk factor.

Unadjusted survival rate

Unadjusted survival rates do not take account of risk factors and are based only on the number of transplants at a given centre and the number and timing of those that fail within the post-transplant period of interest. In this case, unlike for risk-adjusted rates, all transplants are assumed to be equally likely to fail at any given time. However, some centres may have lower unadjusted survival rates than others simply because they tend to undertake transplants that have increased risks of failure. Comparison of unadjusted survival rates across centres and to the national rate is therefore inappropriate.

A2 Statistical methodology for survival rate estimation

Unadjusted estimates of patient and graft survival are given for each centre. Unadjusted rates give an estimate of what the survival rate at a centre is, assuming that all patients at the centre have the same chance of surviving a given length of time after transplant.

Computing unadjusted survival rates

Unadjusted survival rates were calculated using the Kaplan-Meier method, which allows patients with incomplete follow-up information to be included in the computation. For example, in a cohort for estimating one-year patient survival rates, a patient was followed up for only nine months before they relocated. If we calculated a crude survival estimate using the number of patients who survived for at least a year, this patient would have to be excluded, as it is not known whether or not the patient was still alive one year after transplant. The Kaplan-Meier method allows information about such patients to be used for the length of time that they are followed-up, when this information would otherwise be discarded. Such instances of incomplete follow-up are not uncommon in the analysis of survival data and the Kaplan-Meier method therefore allows the computation of survival estimates that are more meaningful.
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