



Blood and Transplant

**ANNUAL REPORT ON
LIVER TRANSPLANTATION**

**REPORT FOR 2021/2022
(1 APRIL 2012 – 31 MARCH 2022)**

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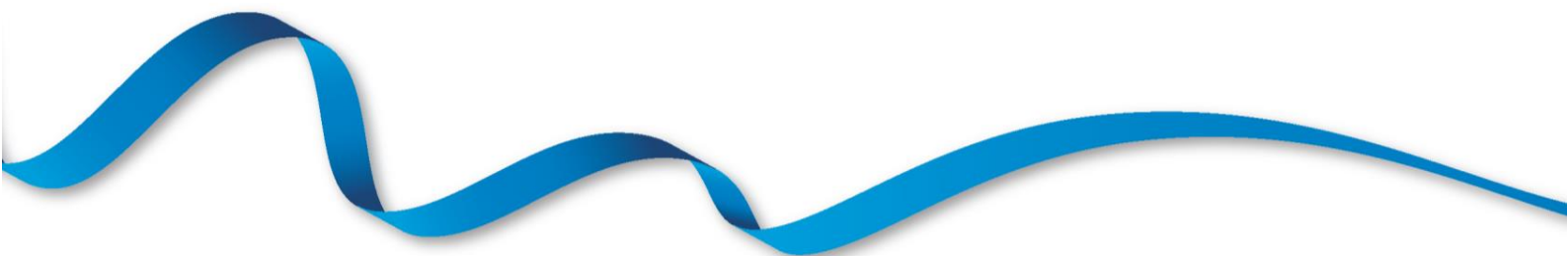


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Executive Summary



This report presents key figures about liver transplantation in the UK. The period reported covers ten years of transplant data, from 1 April 2012 to 31 March 2022. The report presents information of patients on the transplant list, number of transplants, demographic characteristics of donors and transplant recipients, and survival post registration and post first liver transplant. The data are reported both on a national and centre-specific basis, where relevant.

The National Liver Offering Scheme (NLOS) was introduced on 20th March 2018 for offering livers from donors after brain death (DBD).

Key findings

- There were 759 patients on the UK liver transplant list on 31 March 2022 of which 644 patients were on the UK [active transplant list](#).
- Of the patients joining the [elective](#) liver only waiting list, approximately 80% had received a transplant within two years of listing.
- There were 9116 liver transplants performed in the UK in the ten year period. The number of liver transplants using deceased donors increased in 2021/2022 compared with 2020/2021 for both [donors after brain death](#) (0.2%) and [donors after circulatory death](#) (60%). This was potentially due to restrictions imposed in 2020/2021 during the first waves of COVID-19.
- The unadjusted national rates of patient survival one and five years after first liver only transplantation are given below

Unadjusted patient survival (%) post-transplant for first deceased donor liver only transplants		
	One year patient survival (%)	Five year patient survival (%)
Adult		
Elective	95	84
Super-urgent	90	83
Paediatric		
Elective	94	95
Super-urgent	84	89

- The national rates of patient survival after joining the transplant list for adult elective first liver only patients were 86% at one and 74% at five years post-registration.

Introduction



This report presents information on the UK transplant list, transplant activity and transplant outcomes between 1 April 2012 and 31 March 2022, for all seven centres performing liver 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 liver transplants performed in the UK.

[Patient survival](#) post-transplant is reported for cohorts of patients transplanted between 1 April 2013 and 31 March 2017 for 5 year survival, and 1 April 2017 to 31 March 2021 for 1 year survival. Patient survival from registration is presented for the period 1 January 2010 to 31 December 2021. Results are described separately for adults (aged ≥ 17 years) and paediatrics (aged < 17 years) and according to the urgency of the transplantation ([elective and super-urgent](#)). Note, however, that the survival from listing analysis assumes adults are aged ≥ 18 years.

2.1 Transplant list

Figure 2.1 shows the total number of liver patients on the [active transplant list](#) at 31 March each year between 2013 and 2022. It should be noted that the transplant list in 2021 is not reflective of the true active transplant list due to restrictions imposed during COVID-19.

The number of patients active on the liver transplant list increased from 492 in 2013 to 611 in 2015. There has been a decline in the number of active patients since 2015 to 359 patients in 2018 with a subsequent increase to 644 in 2022. The change in the number of patients actively listed in 2018 may be due to the introduction of the National Liver Offering Scheme (NLOS) on 20 March 2018. It may also be due to changes in medical treatment options for patients with certain diseases.

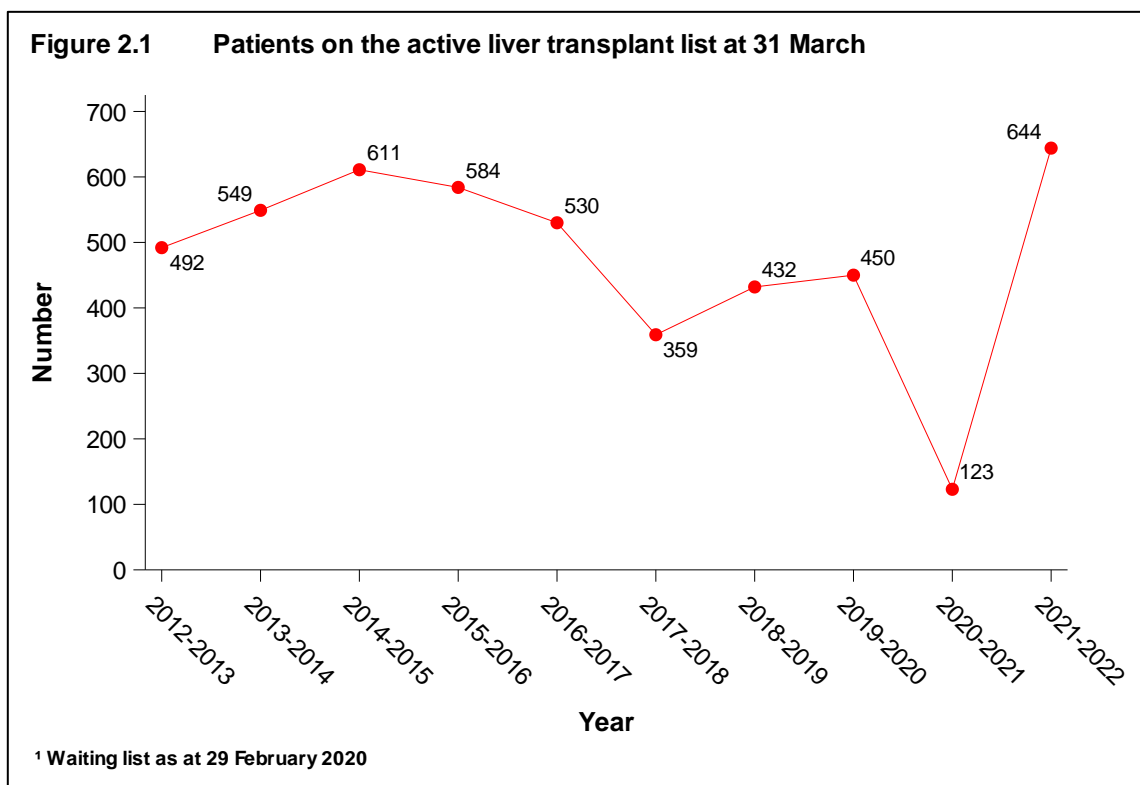
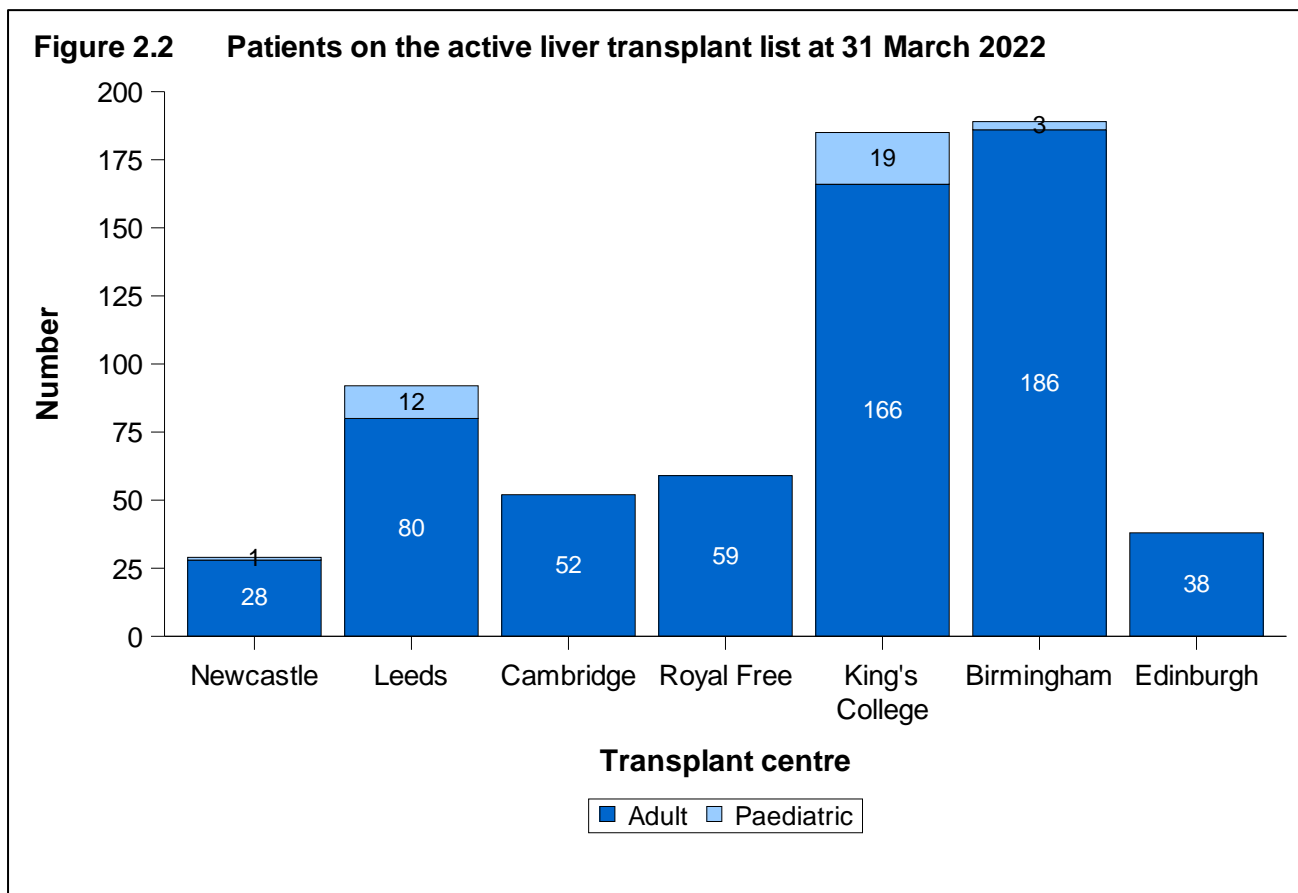


Figure 2.2 shows the number of adults and paediatrics on the active transplant list at 31 March 2022, by centre. In total, there were 609 adults and 35 paediatrics on the active transplant list. Birmingham had the largest share of the transplant list (29%) and Newcastle the smallest (5%). This figure includes [multi-organ](#), [elective](#) and [super-urgent](#) registrations.



An indication of long-term outcomes for patients listed between April 2019 and March 2020 for a liver transplant is summarised in **Figure 2.3**. This shows the proportion of patients transplanted or still waiting six months, one year and two years after joining the transplant list. At six months post-registration, 61% of patients had received a transplant and 32% were still waiting.

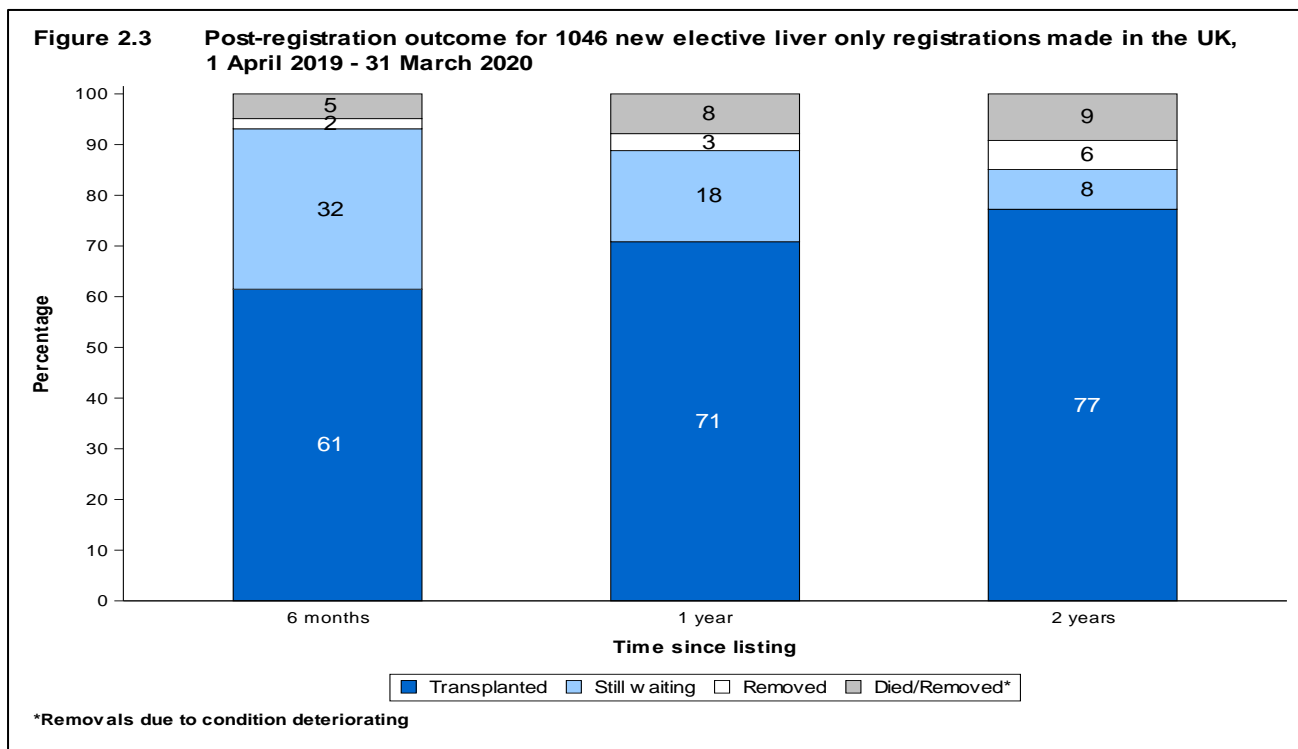
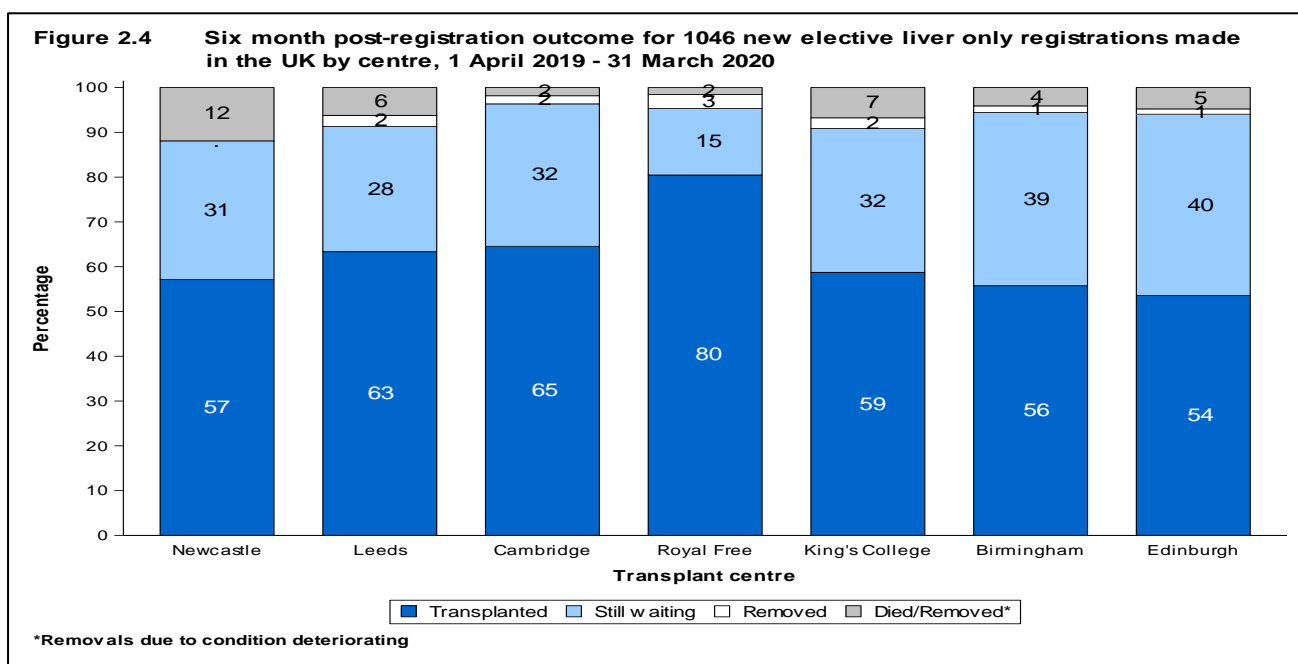


Figure 2.4 shows the six month registration outcome by centre. The proportion of patients transplanted six months after listing at each centre ranges from 54% at Edinburgh to 80% at Royal Free.



2.2 Transplant activity

Figure 2.5 shows the total number of liver transplants performed in the last ten years, by type of donor while **Figure 2.6** shows the equivalent information by transplant centre. The number of transplants from deceased donors steadily increased over the time period to 813 in 2017/2018 for DBD and 209 in 2016/17 for DCD. However, the number of DBD liver transplants has subsequently steadily reduced with 629 transplants performed in 2021/22. The number of DCD liver transplants performed in the UK in the last financial year increased to 194 when compared to 2020/21 (121). There were 25 [living donor](#) liver transplants and 0 [domino](#) transplant performed in the last financial year.

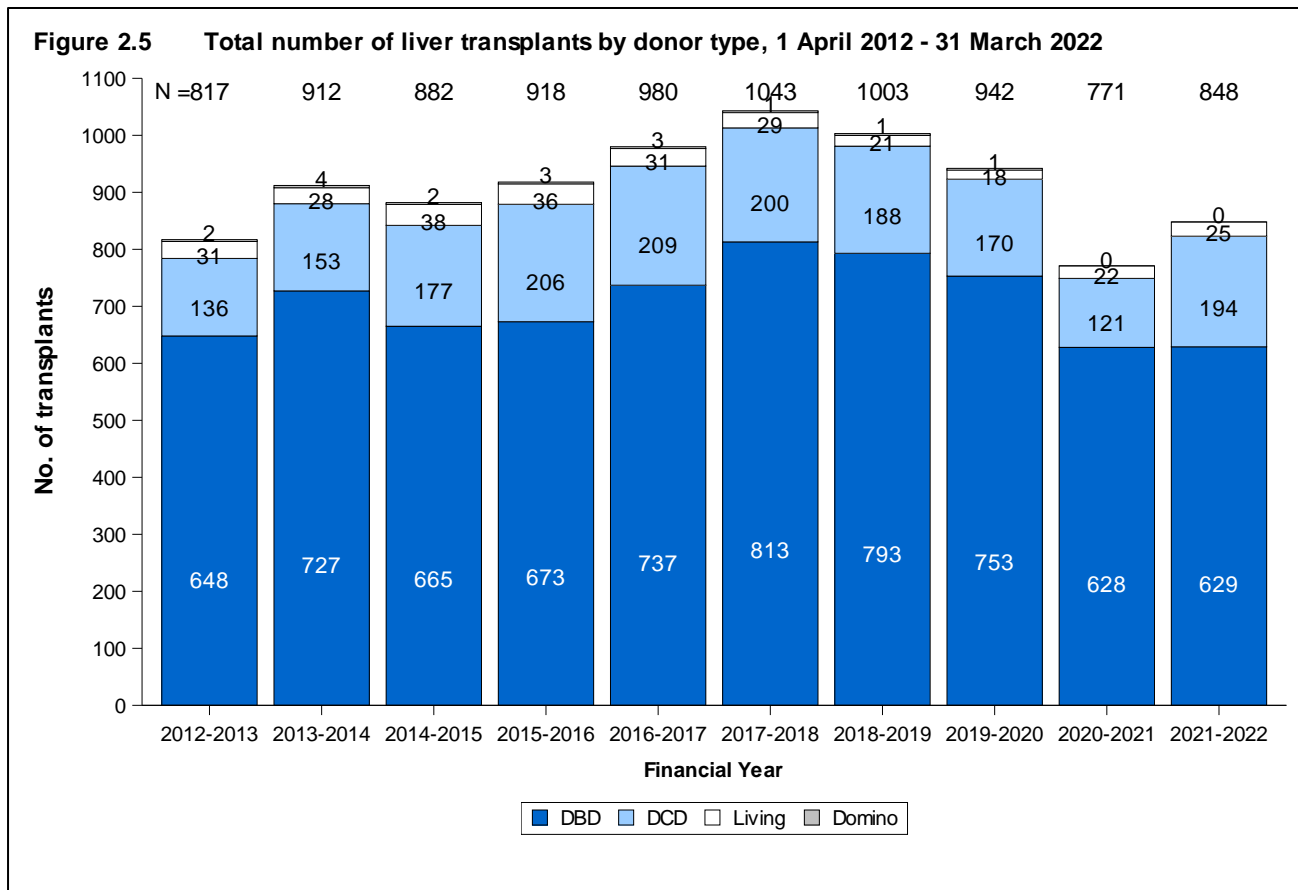


Figure 2.6 Total number of liver transplants by transplant centre and donor type, 1 April 2012 - 31 March 2022

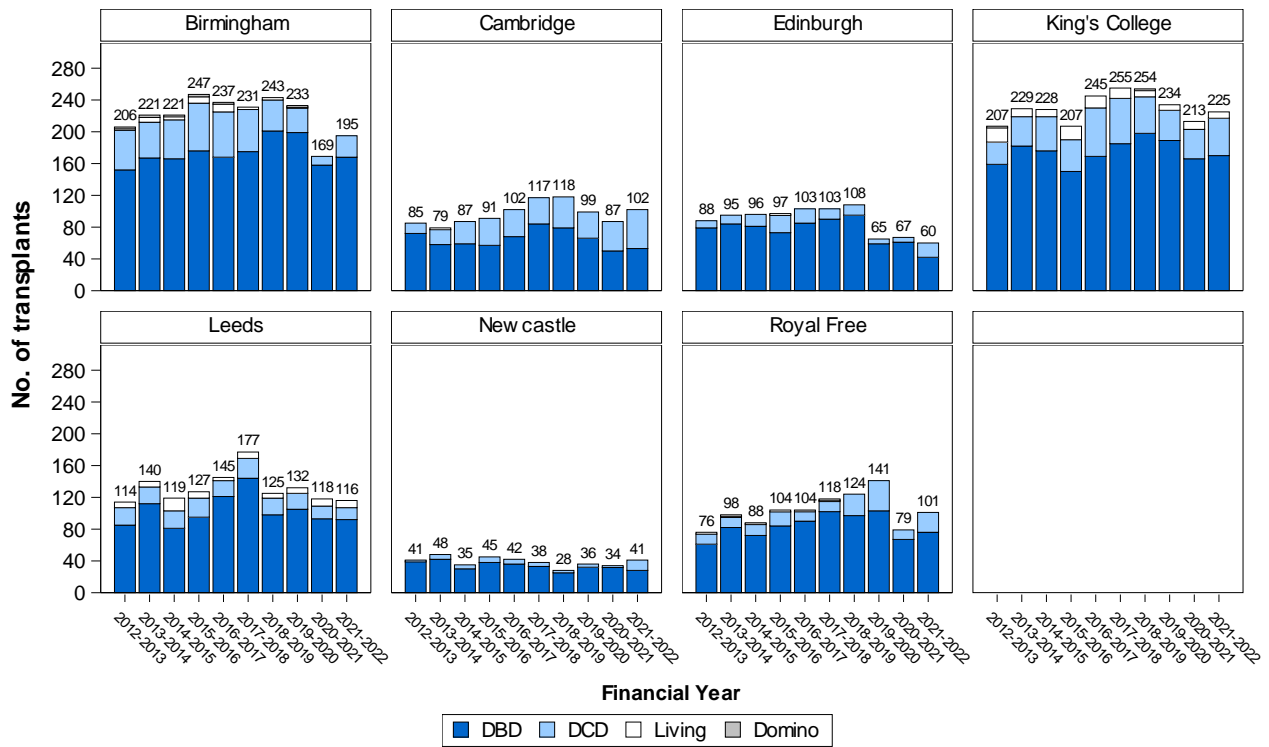


Figure 2.7 details the 9116 liver transplants performed in the UK in the ten year period. Of these, 7823 (86%) were deceased donor first liver only transplants. 7147 (91%) of the deceased donor first liver only transplants were performed in adults and 676 (9%) in paediatrics. Similarly including both adult and paediatric, 7083 (91%) were elective and 740 (9%) were super-urgent transplants.

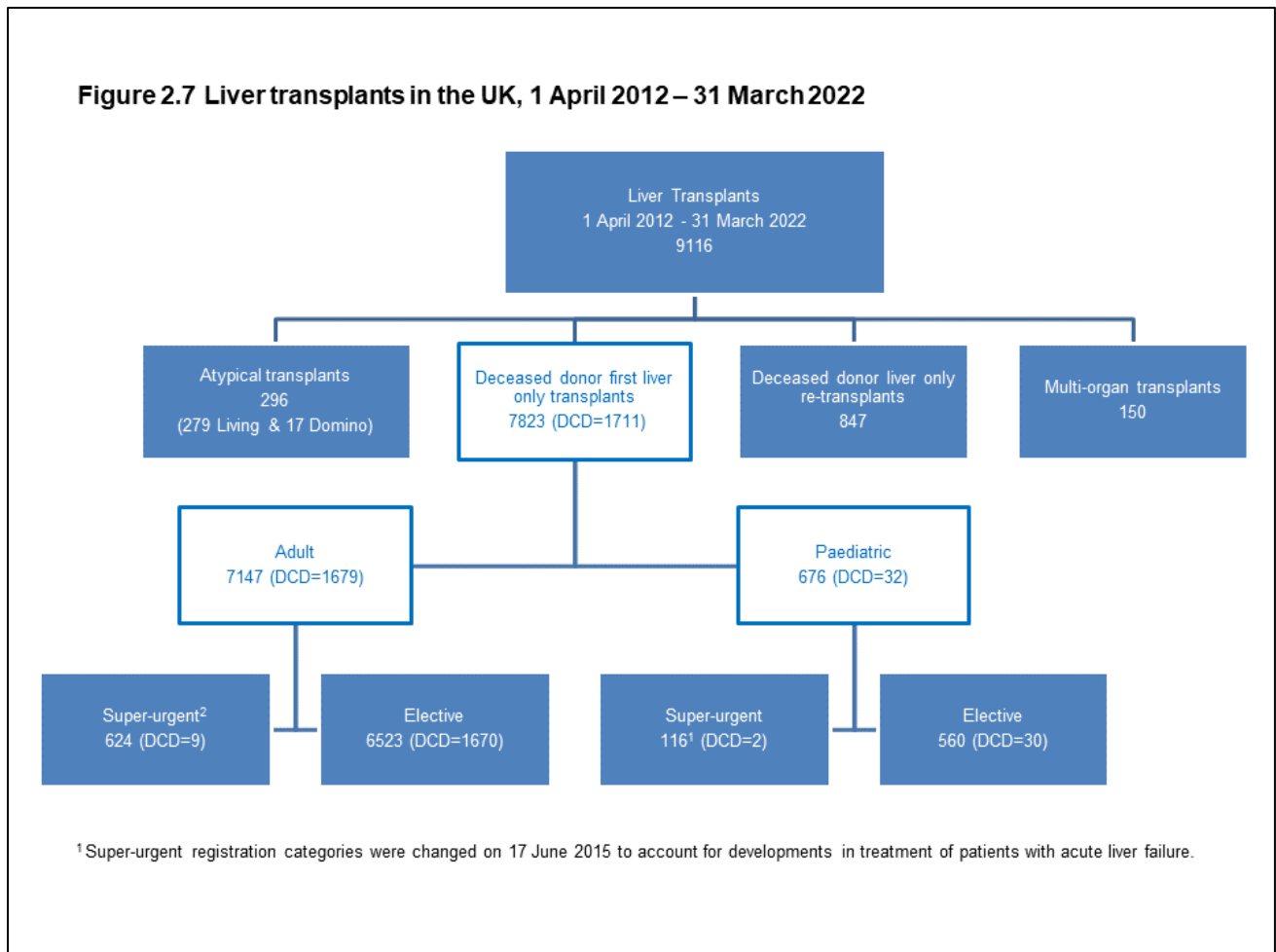


Figure 2.8 shows the number of liver transplants performed in the last ten years, by type of transplant and donor whilst **Figure 2.9** shows the equivalent information by transplant centre. The number of liver only retransplants from donors after brain death (DBD) ranged between 48 in 2021/2022 and 98 in 2013/2014. During the last ten years, 147 DBD and 3 DCD multi-organ transplants involving the liver were performed of which 9 were retransplants. Of the 147 multi-organ DBD transplants, 135 were simultaneous liver and kidney transplants (9 of which were retransplants), seven were simultaneous liver and heart transplants, four were simultaneous liver and lung transplants and one was a simultaneous liver and pancreas transplant.

The majority of transplants (98%) performed over the last ten years involving donors after circulatory death (DCD) were first liver only transplants, with only 40 DCD retransplant liver only transplants and three simultaneous liver/kidney DCD transplants.

Figure 2.8 Total number of liver transplants by donor and transplant type, 1 April 2012 - 31 March 2022

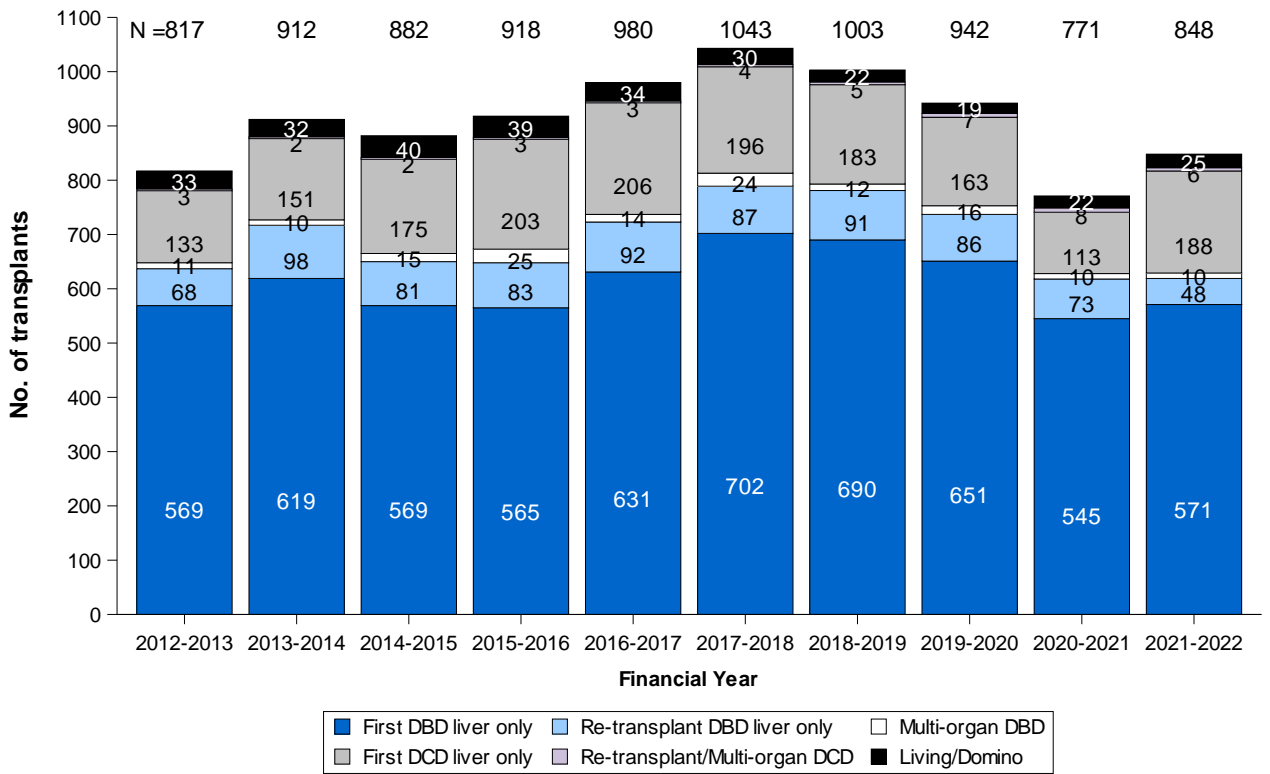
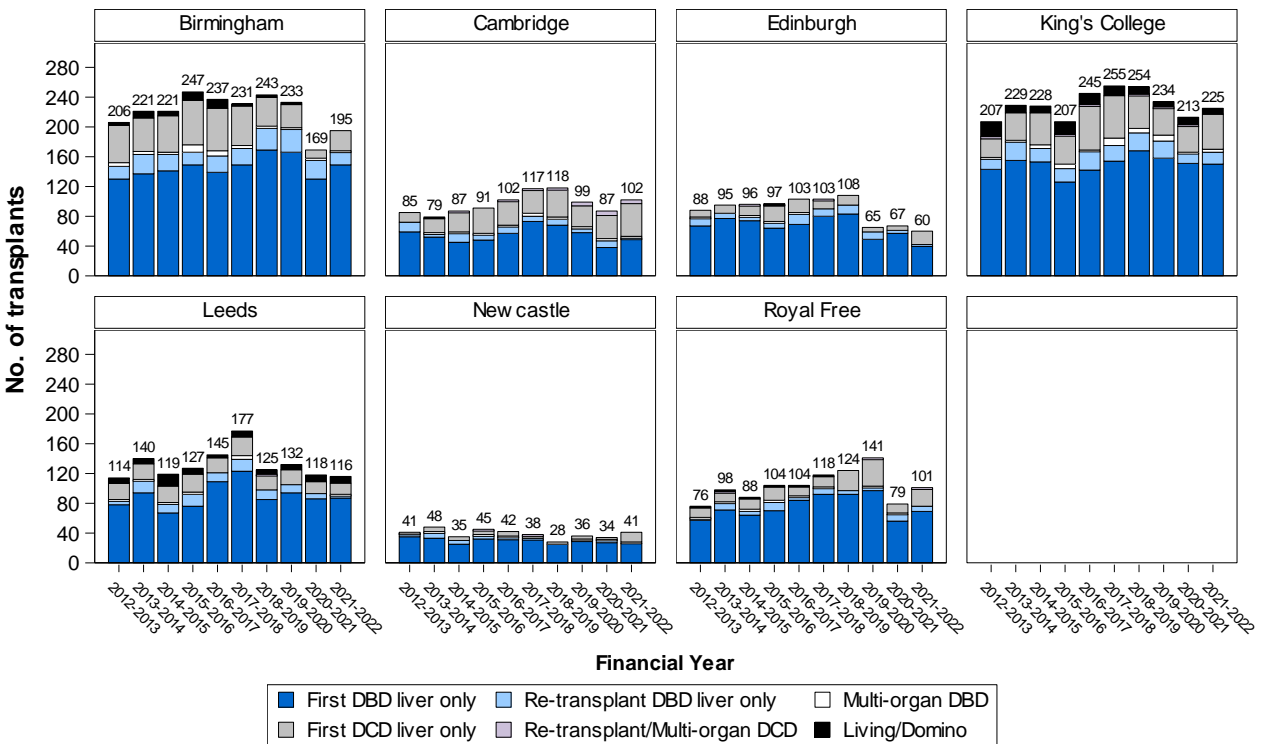


Figure 2.9 Total number of liver transplants by transplant centre, donor type and transplant type, 1 April 2012 - 31 March 2022



Geographical variation in registration and transplant rates

Figure 2.10 shows rates of registration to the liver transplant list per million population (pmp) between 1 April 2021 and 31 March 2022 compared with liver transplant rates pmp for the same time period, by recipient country/NHS region of residence. **Table 2.1** shows the breakdown of these numbers by recipient country/NHS region of residence. No adjustments have been made for potential demographic differences in populations. If a patient has had more than one registration/transplant in the period, each registration/transplant is considered. Note that this analysis only considered NHS Group 1 patients.

Since there will inevitably be some random variation in rates between areas, the systematic coefficient component of variation (SCV) was used to identify if the variation is more (or less) than a random effect for the different NHS regions in England only. Only first registrations and transplants in this period were considered. The larger the SCV the greater the evidence of a high level of systematic variation between areas. Registration and transplant rates yielded an SCV of 0 (p-value >0.999) and 0 (p-value >0.999), respectively. The p-value shows the probability that an SCV of this size (or higher) would be observed by chance if only random variation existed and therefore no evidence of geographical variation beyond what would be expected at random. No adjustment has been made for area-specific demographic characteristics that may impact the rates of registration to the transplant list and transplantation such as age and sex. Therefore, these results should be interpreted with caution.

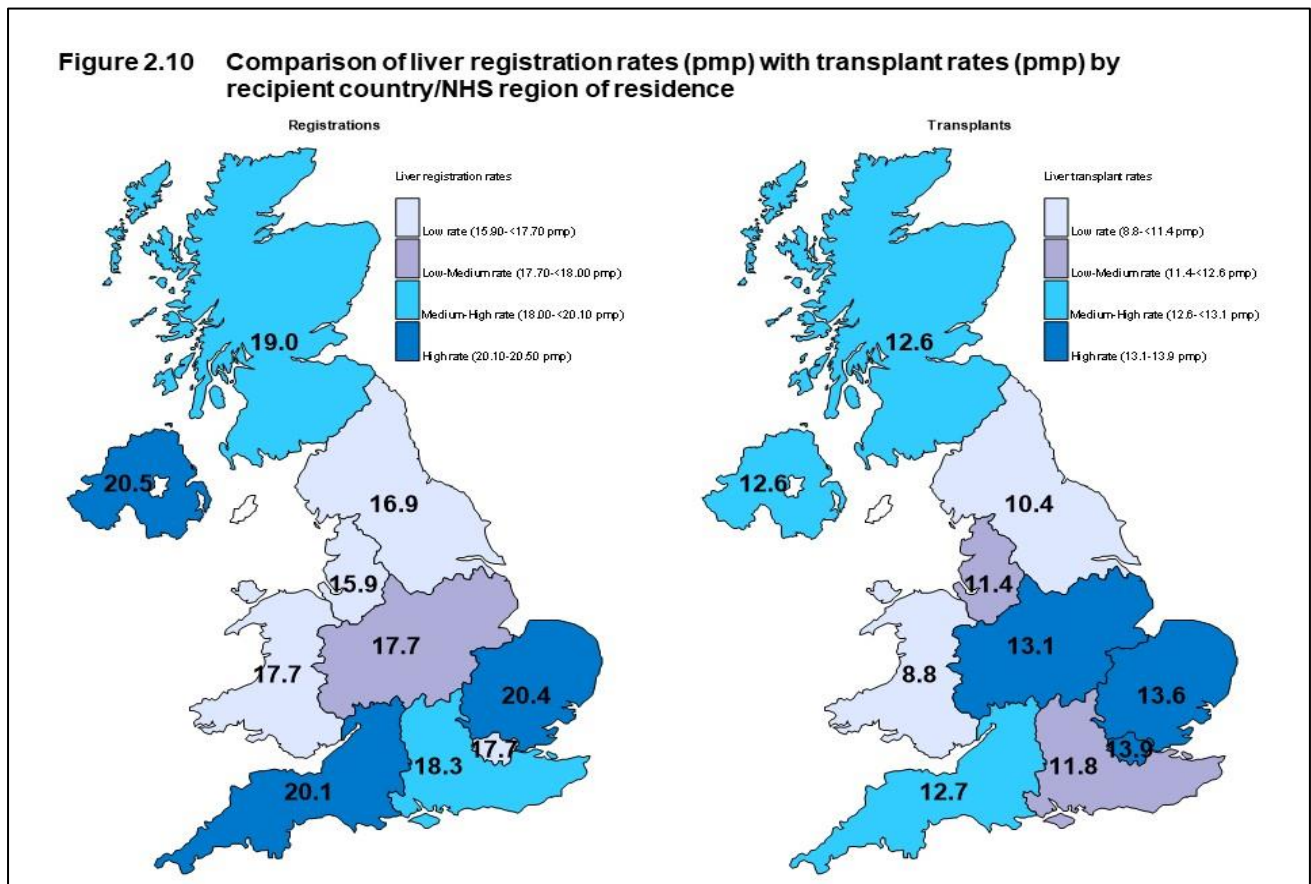


Table 2.1 Liver registration and transplant rates per million population (pmp) in the UK, 1 April 2021 - 31 March 2022, by Country/NHS region

Country/ NHS region	Registrations (pmp)		Transplants (pmp)	
North East and Yorkshire	146	(16.9)	90	(10.4)
North West	113	(15.9)	81	(11.4)
Midlands	189	(17.7)	140	(13.1)
East of England	134	(20.4)	89	(13.6)
London	159	(17.7)	125	(13.9)
South East	163	(18.3)	105	(11.8)
South West	114	(20.1)	72	(12.7)
England	1018	(18.0)	702	(12.4)
Isle of Man	2	(25.0)	1	(12.5)
Channel Islands	0	(0.0)	1	(5.9)
Wales	56	(17.7)	28	(8.8)
Scotland	104	(19.0)	69	(12.6)
Northern Ireland	39	(20.5)	24	(12.6)
TOTAL^{1,2}	1222	(18.2)	828	(12.3)

¹ Registrations include 3 recipients whose postcode was unknown and excludes 4 recipients who reside in the Republic of Ireland and 6 recipients who reside overseas

² Transplants include 3 recipients whose postcode was unknown and excludes 8 recipients who reside in the Republic of Ireland and 4 recipients who reside overseas

Adult Liver Transplantation



3.1 Overview

The number of adult deceased donor first liver only transplants in the last ten years is shown overall and by centre in **Figures 3.1 and 3.2**, respectively. Of the 687 transplants in the latest financial year, 629 (92%) were [elective](#) and 58 (8%) were [super-urgent](#) transplants. See **Appendix 1** for further details.

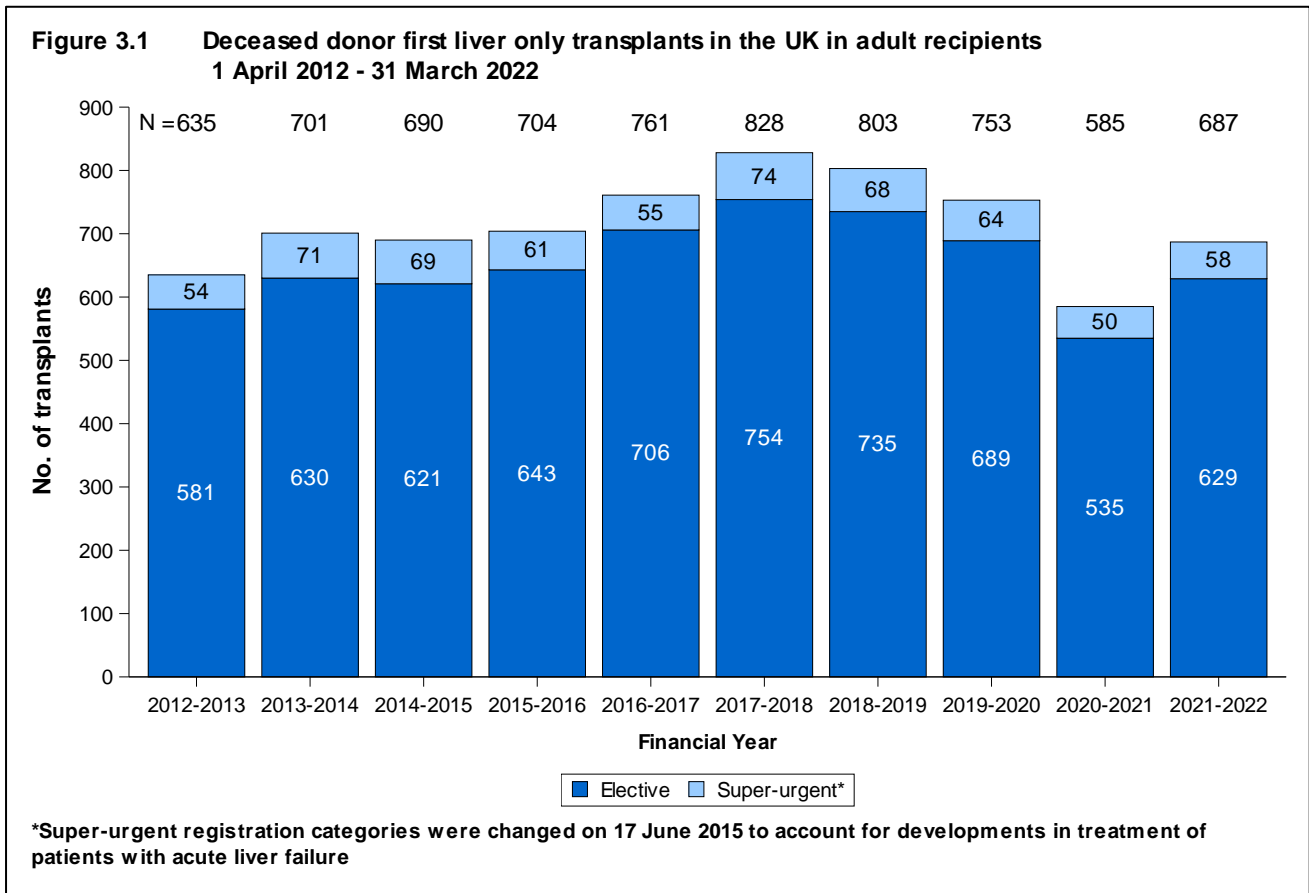
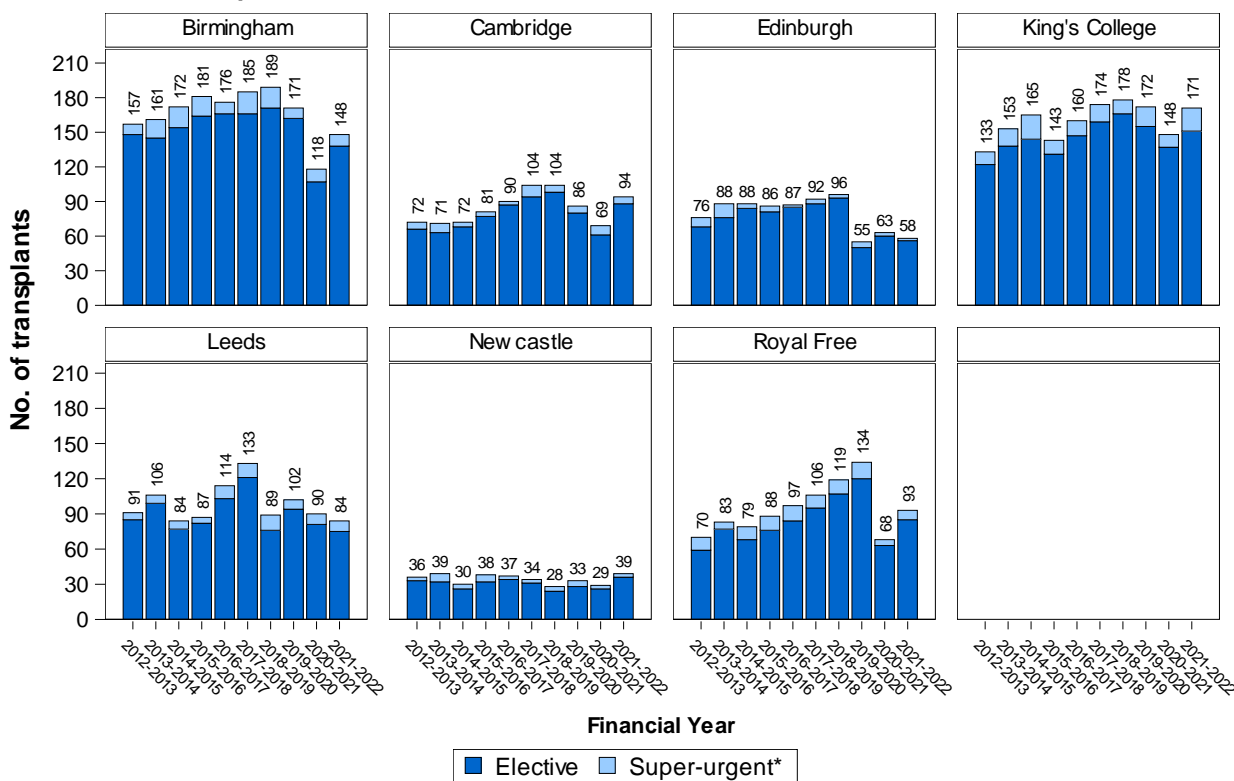


Figure 3.2 Deceased donor first liver only transplants in the UK in adult recipients, 1 April 2012 - 31 March 2022



*Super-urgent registration categories were changed on 17 June 2015 to account for developments in treatment of patients with acute liver failure

The overall [median cold ischaemia times](#) (CIT) for adult transplant recipients are shown by financial year in **Figure 3.3** for [DBD](#) and [DCD](#) donors, respectively. The national median CIT for transplants from DBD donors has remained relatively stable and was 8.8 hours in 2012/13 and 9.0 hours in 2021/22. Similarly, the national median for DCD donor transplants has remained relatively stable over the ten year period and was 7.0 hours in 2012/13 and 8.0 hours in 2021/22.

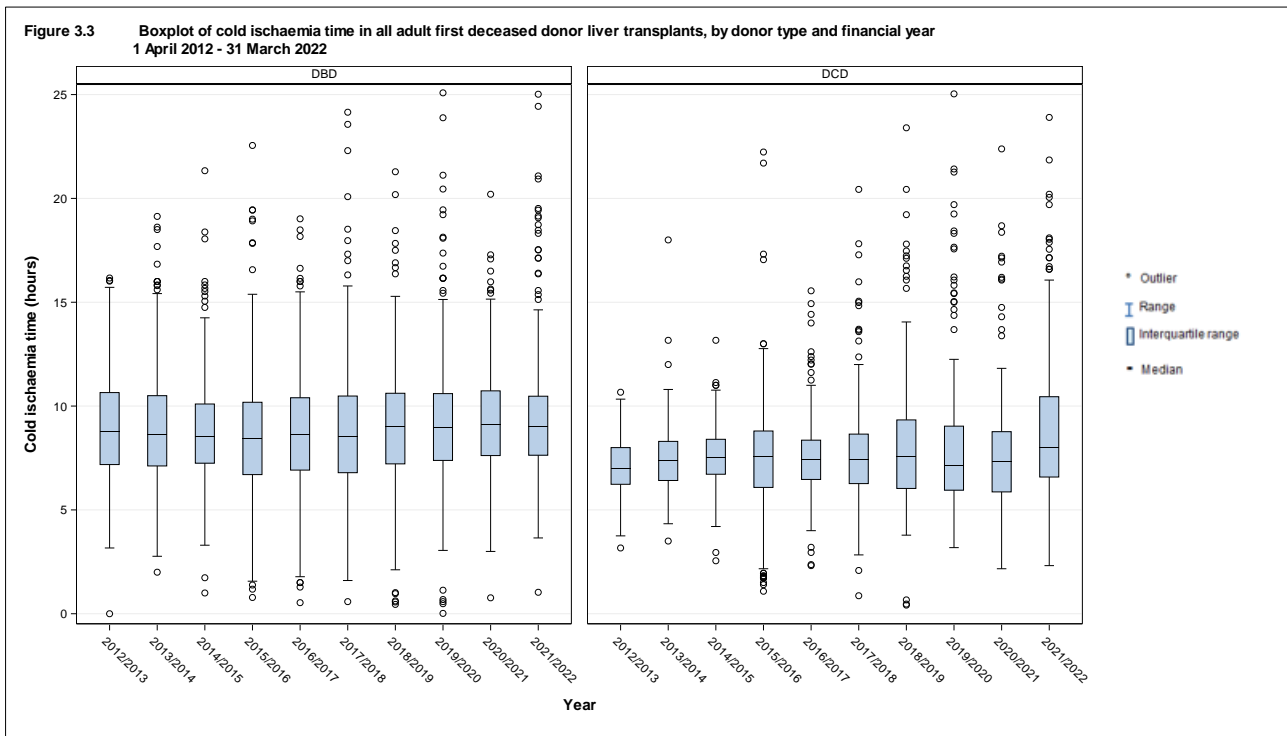


Figure 3.4 shows boxplots of [cold ischaemia times](#) (CIT) for adult transplant recipients by centre and donor type in the latest financial year (2021/2022) while **Figure 3.5** and **Figure 3.6** show the equivalent information by centre over the last ten financial years for [DBD](#) and [DCD](#) donors, respectively. The median CIT for DBD in the last financial year ranged between 7.6 and 12.2 hours across transplant centres whilst the median CIT for DCD ranged between 5.6 and 14.5 hours.

The cold ischaemia time used is as reported on the liver transplant record form and may include periods of machine perfusion; no adjustment has been made for this. 178 (26%) of adult deceased donor first liver only transplants performed in the latest financial year were reported to have involved in situ normothermic regional perfusion or ex situ machine perfusion (either normothermic or hypothermic). This ranged from 4% to 65% by transplant centre.

Figure 3.4 Boxplot of cold ischaemia time in all adult first deceased donor liver transplants, by donor type and transplant centre
1 April 2021 - 31 March 2022

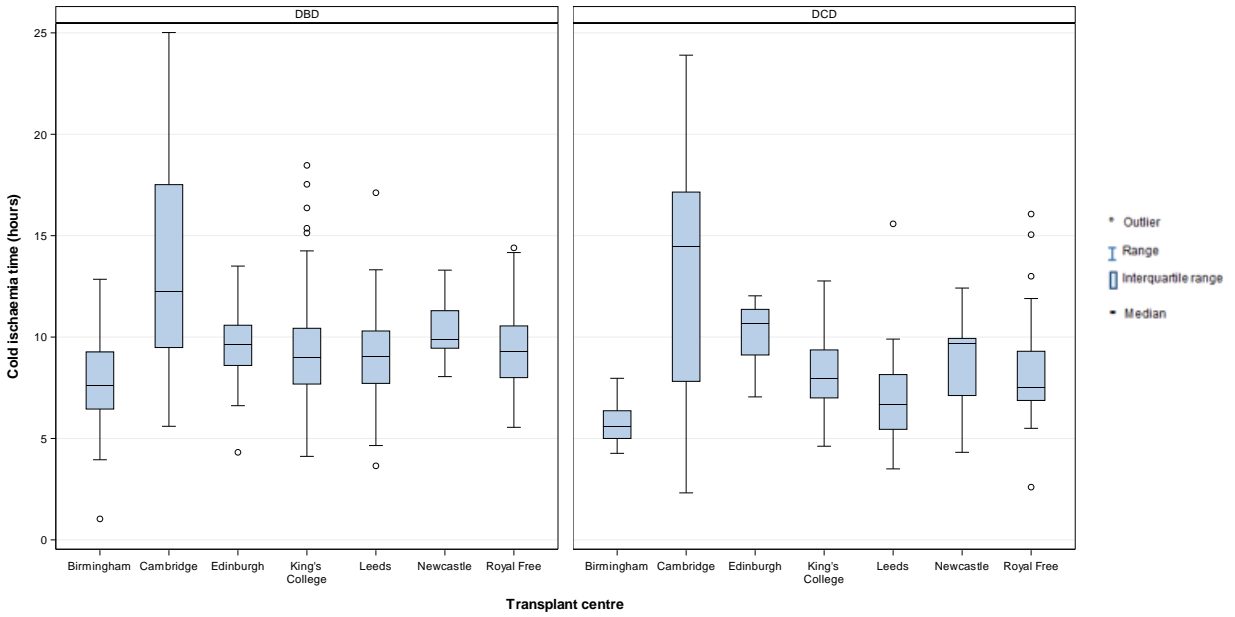


Figure 3.5 Boxplot of cold ischaemia time in all adult first DBD donor liver transplants, 1 April 2012 - 31 March 2022

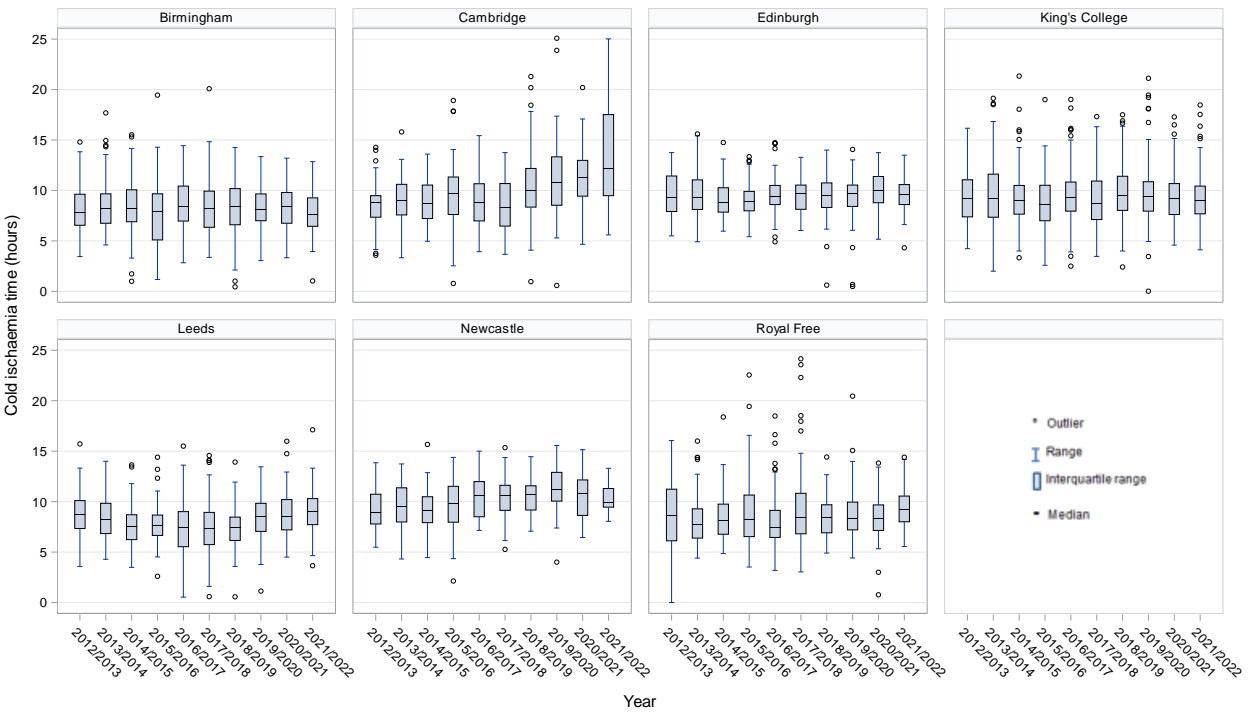
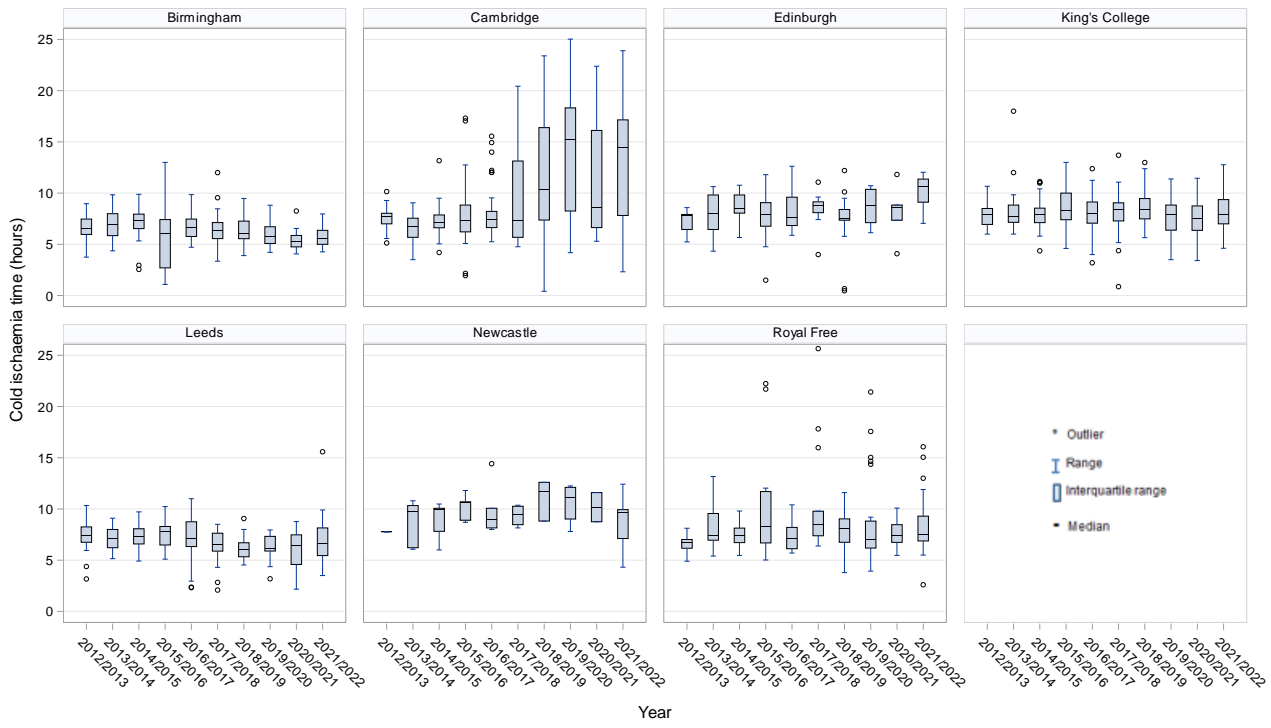


Figure 3.6 Boxplot of cold ischaemia time in all adult first DCD donor liver transplants, 1 April 2012 - 31 March 2022



Adult Liver Transplantation Elective Patients



3.2.1 Transplant list

Figure 3.7 shows the number of adult [elective](#) patients on the first liver only transplant list at 31 March each year between 2013 and 2022. The number of patients on the [active](#) liver only transplant list was stable from 432 in 2013 to 445 in 2016. This reduced to 301 in 2018 and subsequently increased to 581 active patients in 2022.

The total active and suspended transplant list on 31 March 2022 was 682 patients with 581 patients on the active. The majority of patients suspended on 31 March 2021 were reactivated by transplant centres in April 2021 following relaxation of restrictions imposed during COVID-19.

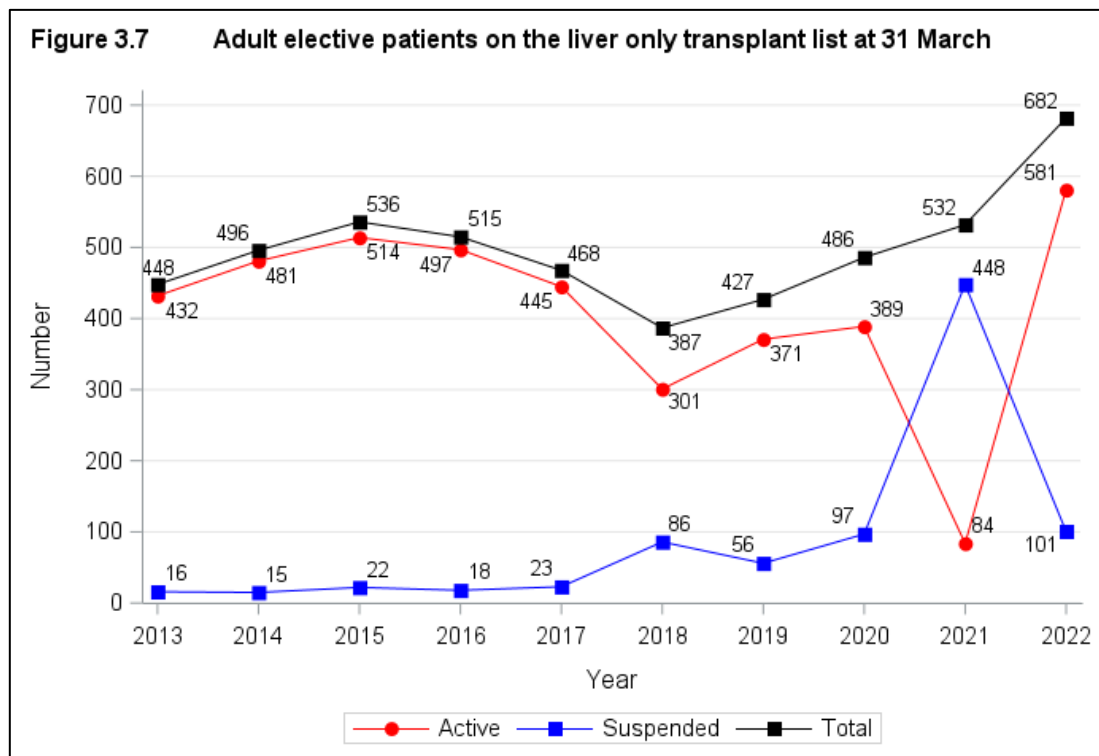
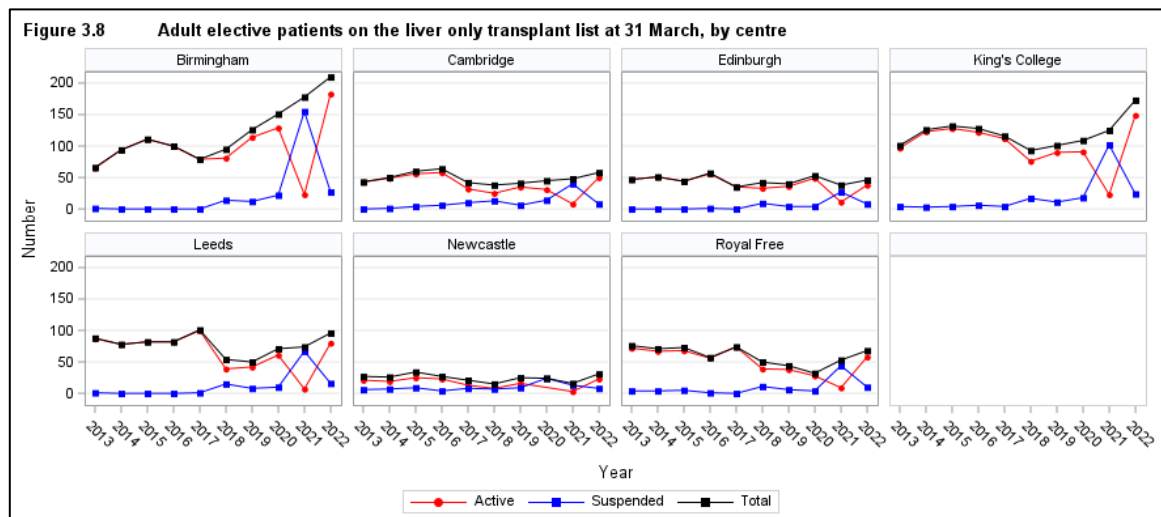


Figure 3.8 shows the number of adults on the transplant list at 31 March each year between 2013 and 2022, by transplant centre.



An indication of outcomes for adult [elective](#) patients listed for a liver transplant is summarised in **Figure 3.9**. This shows the proportion of patients transplanted or still waiting six months, one and two years after joining the list. It also shows the proportion removed from the transplant list and those dying while on the waiting list.

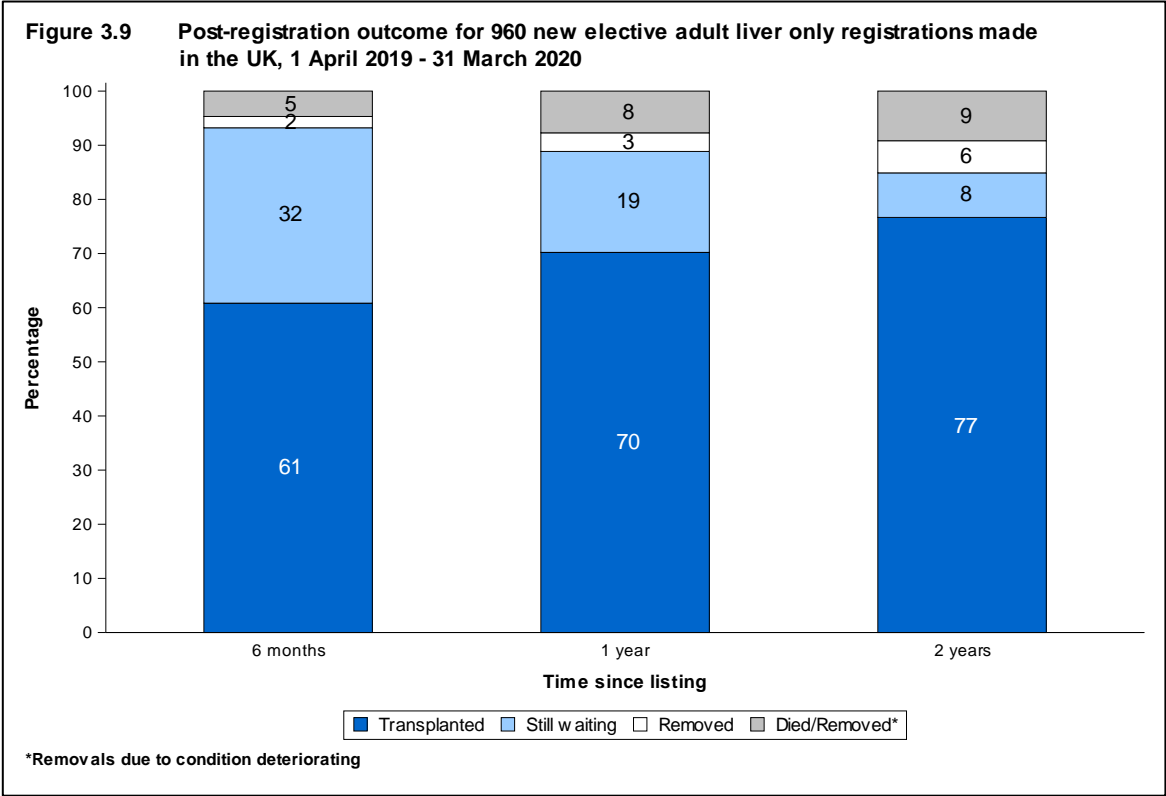


Figure 3.10 shows the proportion of patients transplanted, removed, died while waiting, or still waiting on the list at 6 months after joining the list at each transplant centre. The proportion of patients transplanted six months after listing at each centre ranges from 54% at Birmingham and Edinburgh to 80% at Royal Free.

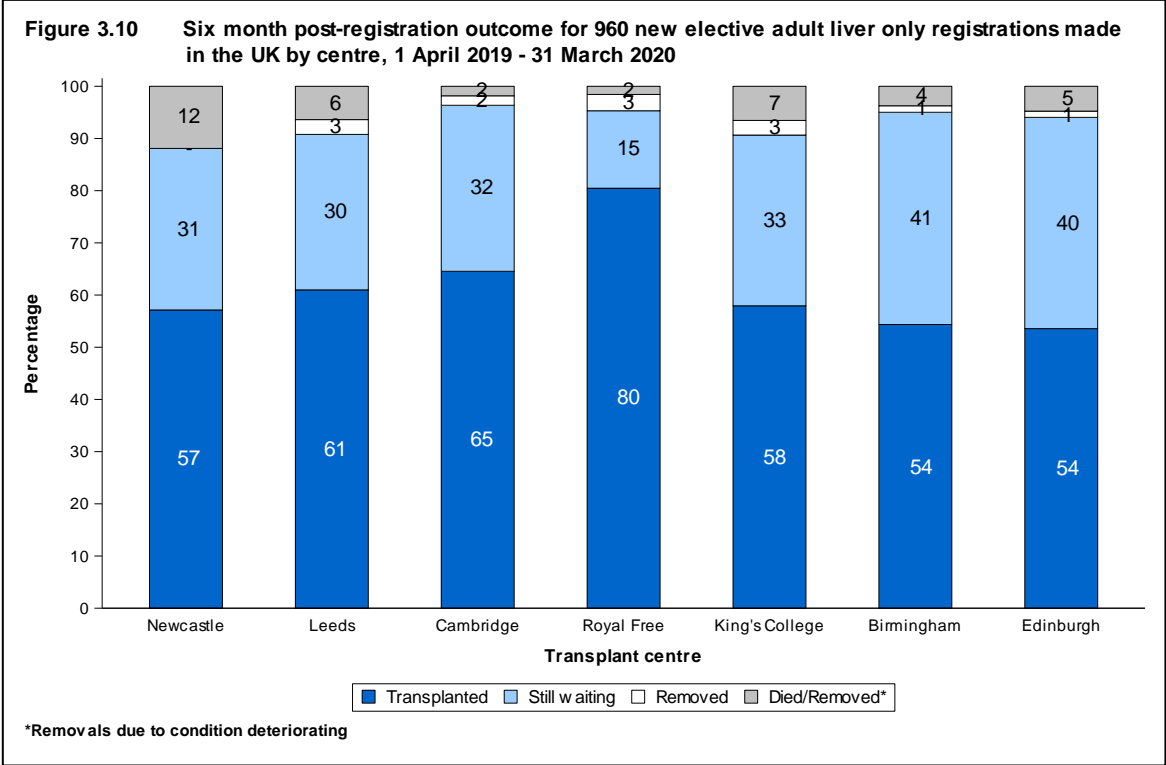


Table 3.1 shows the [median waiting time](#) to deceased donor liver only transplant for adult [elective](#) patients. The national median waiting time to transplant for adult elective patients is 78 days. The median waiting time to transplant was shorter at Royal Free (54 days) and longer at Birmingham (113 days), compared to the national median waiting time.

Note that these waiting times are not adjusted to account for the patient [case-mix](#) at centres.

Table 3.1 Median waiting time to liver only transplant in the UK, for adult elective patients registered 1 April 2018 - 31 March 2021			
Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Adult			
Royal Free	370	54	43 - 65
Edinburgh	253	56	28 - 84
Cambridge	325	59	43 - 75
Leeds	358	74	55 - 93
King's College	624	83	69 - 97
Newcastle	126	95	60 - 130
Birmingham	706	113	87 - 139
UK	2762	78	71 - 85

Table 3.2 shows the demographics of 1054 adult [elective](#) liver patients registered from 1 April 2021 to 31 March 2022, by transplant centre. The majority of patients that were registered were male (66%), white (85%) with a [median](#) age of 55 and a median BMI of 27. The most common indication for registration was alcoholic liver disease, followed by cancer. For some characteristics, due to rounding, percentages may not add up to 100.

Table 3.2 Demographic characteristics of adult elective liver patients registered from 1 April 2021 - 31 March 2022

		Birmingham	Cambridge	Edinburgh	King's college	Leeds	Newcastle	Royal Free	Total
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Number		253	123	91	255	136	61	135	1054
Recipient sex	Male	163 (64)	84 (68)	63 (69)	155 (61)	87 (64)	47 (77)	99 (73)	698 (66)
	Female	90 (36)	39 (32)	28 (31)	100 (39)	49 (36)	14 (23)	36 (27)	356 (34)
Recipient ethnicity	White	202 (80)	114 (93)	89 (98)	209 (82)	121 (89)	57 (93)	99 (73)	891 (85)
	Asian	26 (10)	1 (1)	0 (0)	22 (9)	13 (10)	4 (7)	30 (22)	96 (9)
	Other	2 (1)	1 (1)	2 (2)	9 (4)	2 (1)	0 (0)	1 (1)	17 (2)
	Black	6 (2)	3 (2)	0 (0)	15 (6)	0 (0)	0 (0)	5 (4)	29 (3)
	Not reported	17 (7)	4 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21 (2)
Indication	Cancer	36 (14)	20 (16)	15 (16)	46 (18)	27 (20)	16 (26)	34 (25)	194 (18)
	Hepatitis C	5 (2)	2 (2)	2 (2)	3 (1)	5 (4)	0 (0)	1 (1)	18 (2)
	Alcoholic liver disease	71 (28)	37 (30)	27 (30)	59 (23)	45 (33)	14 (23)	31 (23)	284 (27)
	Hepatitis B	1 (0)	1 (1)	0 (0)	5 (2)	3 (2)	1 (2)	1 (1)	12 (1)
	Primary sclerosing cholangitis	27 (11)	12 (10)	11 (12)	32 (13)	10 (7)	8 (13)	19 (14)	119 (11)
	Autoimmune and cryptogenic disease	13 (5)	4 (3)	8 (9)	20 (8)	8 (6)	4 (7)	14 (10)	71 (7)
	Primary biliary cholangitis	21 (8)	8 (7)	5 (5)	14 (5)	7 (5)	1 (2)	3 (2)	59 (6)
	Metabolic liver disease	39 (15)	21 (17)	16 (18)	27 (11)	16 (12)	8 (13)	14 (10)	141 (13)
	Other	27 (11)	11 (9)	5 (5)	36 (14)	10 (7)	8 (13)	15 (11)	112 (11)
	Acute hepatic failure	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)
	Regraft	12 (5)	6 (5)	2 (2)	12 (5)	5 (4)	1 (2)	2 (1)	40 (4)
Recipient HCV	No	242 (96)	115 (93)	85 (93)	241 (95)	124 (91)	56 (92)	125 (93)	988 (94)
	Yes	11 (4)	8 (7)	6 (7)	14 (5)	12 (9)	5 (8)	10 (7)	66 (6)
Encephalopathy	Absence	148 (58)	66 (54)	69 (76)	164 (64)	75 (55)	42 (69)	96 (71)	660 (63)
	Presence	105 (42)	57 (46)	22 (24)	91 (36)	61 (45)	19 (31)	39 (29)	394 (37)
Renal support	No	248 (98)	122 (99)	90 (99)	245 (96)	133 (98)	61 (100)	131 (97)	1030 (98)
	Yes	5 (2)	1 (1)	1 (1)	10 (4)	3 (2)	0 (0)	4 (3)	24 (2)

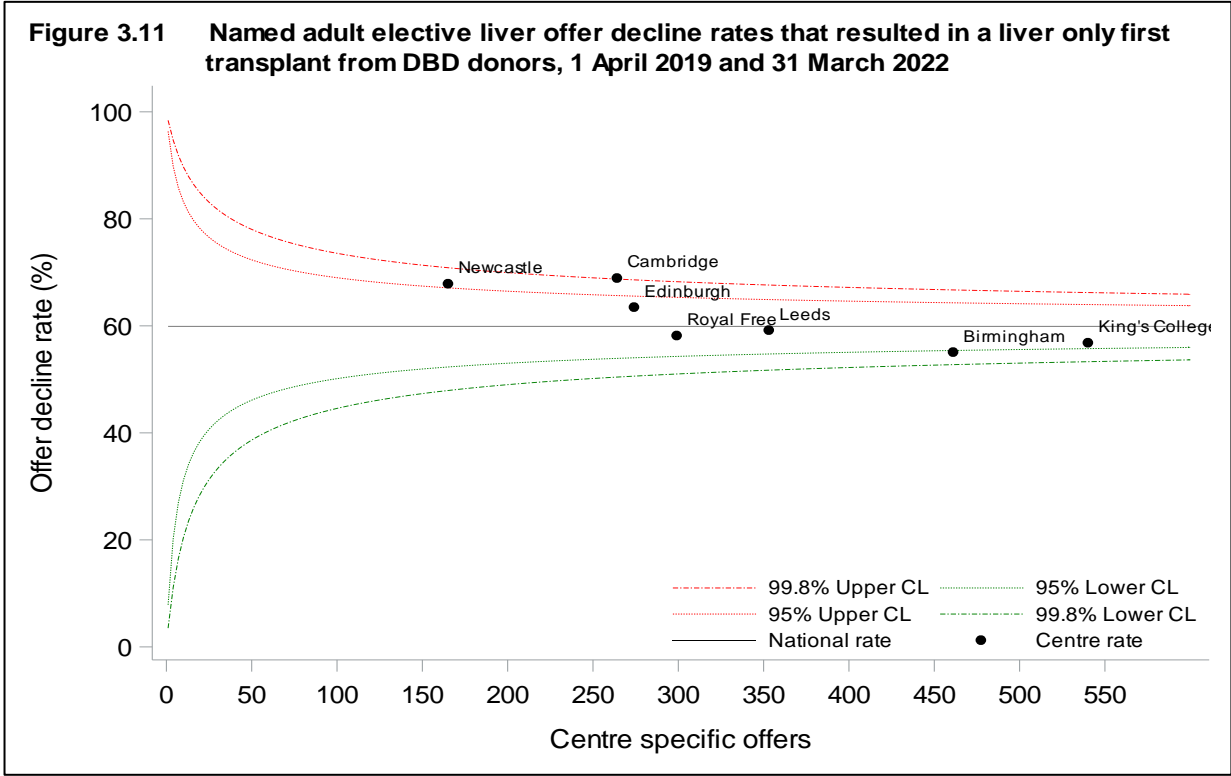
Table 3.2 Demographic characteristics of adult elective liver patients registered from 1 April 2021 - 31 March 2022

		Birmingham	Cambridge	Edinburgh	King's college	Leeds	Newcastle	Royal Free	Total
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Previous abdominal surgery	No	188 (74)	104 (85)	71 (78)	180 (71)	108 (79)	51 (84)	101 (75)	803 (76)
	Yes	65 (26)	19 (15)	20 (22)	75 (29)	28 (21)	10 (16)	34 (25)	251 (24)
Recip age (years)	Median (IQR)	53 (44, 61)	55 (48, 61)	58 (52, 65)	53 (42, 61)	54 (46, 61)	58 (46, 63)	53 (42, 59)	55 (44, 61)
BMI (kg/m ²)	Median (IQR)	28 (24, 32)	27 (24, 33)	27 (23, 31)	26 (23, 30)	28 (25, 31)	29 (24, 32)	27 (24, 29)	27 (24, 31)
Serum bilirubin (umol/l)	Median (IQR)	43 (21, 82)	45 (24, 79)	51 (26, 95)	38 (19, 77)	42 (25, 77)	43 (20, 63)	40 (18, 109)	42 (21, 83)
Serum creatinine (umol/l)	Median (IQR)	67 (55, 83)	68 (56, 92)	75 (62, 95)	68 (55, 89)	73 (59, 94)	76 (57, 94)	83 (73, 105)	72 (59, 90)
Serum sodium (mmol/l)	Median (IQR)	137 (134, 139)	135 (132, 138)	135 (132, 138)	137 (134, 139)	136 (134, 139)	137 (136, 139)	137 (134, 140)	137 (134, 139)
Serum potassium (mmol/l)	Median (IQR)	4 (4, 4)	4 (4, 5)	4 (4, 5)	4 (4, 4)	4 (4, 4)	4 (4, 5)	4 (4, 5)	4 (4, 5)
INR	Median (IQR)	1.3 (1.1, 1.5)	1.4 (1.2, 1.7)	1.3 (1.2, 1.5)	1.2 (1.1, 1.4)	1.3 (1.1, 1.6)	1.2 (1.1, 1.4)	1.2 (1.1, 1.5)	1.3 (1.1, 1.5)
Serum albumin (g/l)	Median (IQR)	31 (27, 35)	28 (24, 32)	27 (23, 31)	34 (29, 39)	29 (24, 35)	37 (33, 41)	34 (30, 39)	32 (27, 37)

Figure 3.11 shows the offer decline rate funnel plot for named adult and large paediatric elective DBD offers. All fast-track offers, regardless of whether the fast-track offer was accepted and the liver transplanted, were excluded along with offers to super-urgent, hepatoblastoma, paediatric, intestinal or liver and cardiothoracic patients. **Figure 3.12** shows the corresponding funnel plot of offer decline rates for DCD. Unlike **Figure 3.11**, fast-track offers were only included in **Figure 3.12** if the offer was accepted and transplanted.

A DBD liver transplant can involve a whole liver, reduced liver or split liver. The term reduced is used when only one lobe of the liver is transplanted and the term split applies when both lobes of the liver are transplanted into two different recipients. Offers of whole livers and right lobes which resulted in transplantation are included in **Figure 3.11** and offer decline rates by centre and organ offered are presented in **Table 3.3**.

DBD liver offers between 27 March and 9 July 2020 were excluded from **Figure 3.11** as transplant centres were able to accept for any clinically urgent patient thus offers during this time were centre based and not named patient offers.



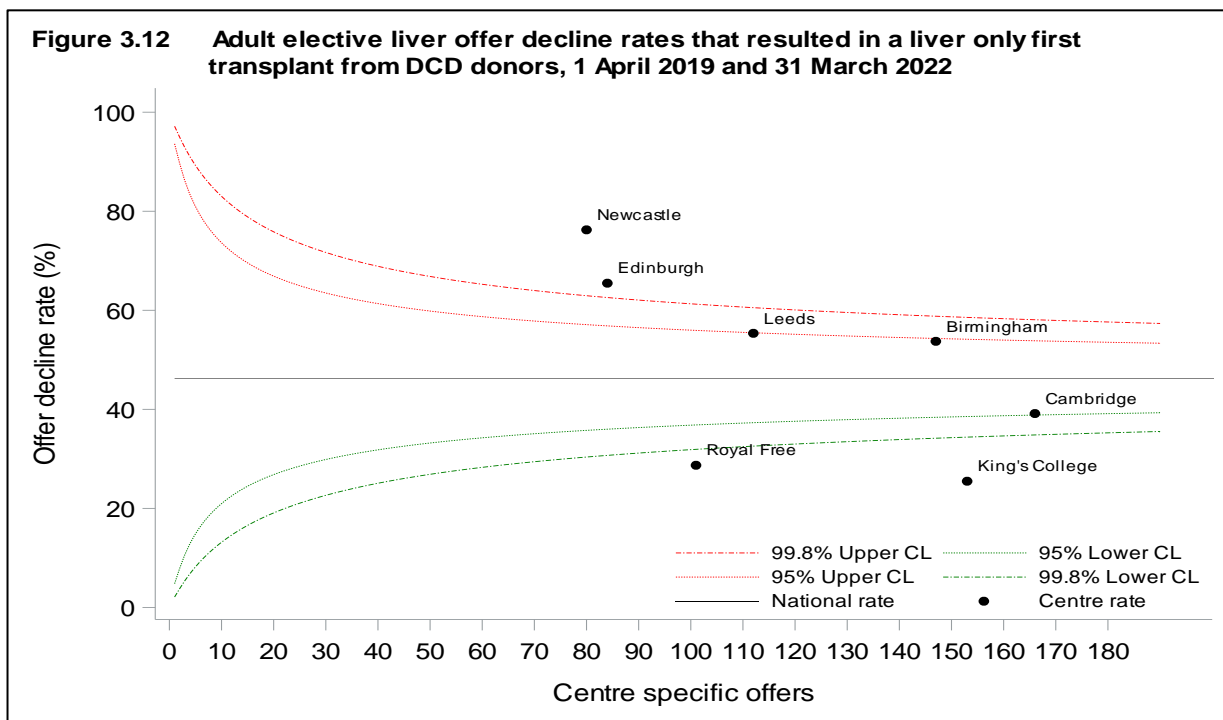


Table 3.3 Offer decline rates for each centre by offered organ and donor type 1 April 2019 and 31 March 2021

Centre	Whole Livers		DBD Donors Right Lobe		All Livers		DCD Donors Whole Livers	
	Offers	% Decline	Offers	% Decline	Offers	% Decline	Offers	% Decline
A. All donors								
Birmingham	408	51	53	83	461	55	147	54
Cambridge	220	65	44	86	264	69	166	39
Edinburgh	214	54	60	98	274	64	84	65
King's College	477	55	63	70	540	57	153	25
Leeds	290	54	63	81	353	59	112	55
Newcastle	125	58	40	100	165	68	80	76
Royal Free	251	55	48	75	299	58	101	29
Total	1985	55	371	84	2356	60	843	46
B. DBD donors ≤65 years and DCD ≤60 years								
Birmingham	280	49	53	83	333	55	115	60
Cambridge	162	59	44	86	206	65	128	37
Edinburgh	165	52	60	98	225	64	59	68
King's College	315	52	63	70	378	55	100	31
Leeds	208	50	63	81	271	57	92	48
Newcastle	82	59	40	100	122	72	61	70
Royal Free	176	48	48	75	224	54	81	30
Total	1388	52	371	84	1759	59	636	47

3.2.2 Transplant activity

Figure 3.13 shows the number of first liver only transplants from deceased and living/domino donors performed in the last ten years, by type of donor. **Figure 3.14** shows the same information by centre. Please note that living liver transplants performed at London Bridge and Cromwell Hospitals are included in **Figure 3.13** but not in **Figure 3.14**.

All centres apart from Edinburgh and Leeds observed an increase in the number of adult elective first liver only transplants performed in 2021/2022 compared with 2020/2021.

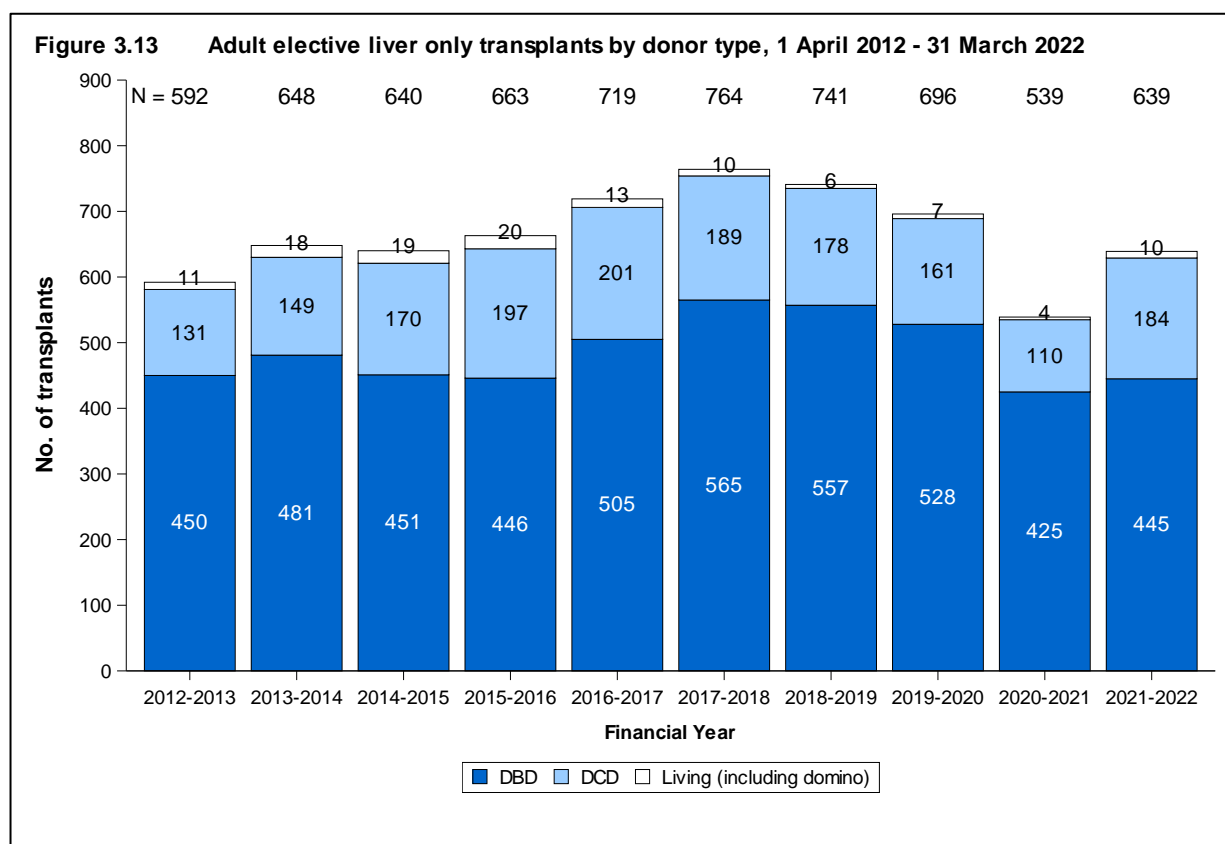
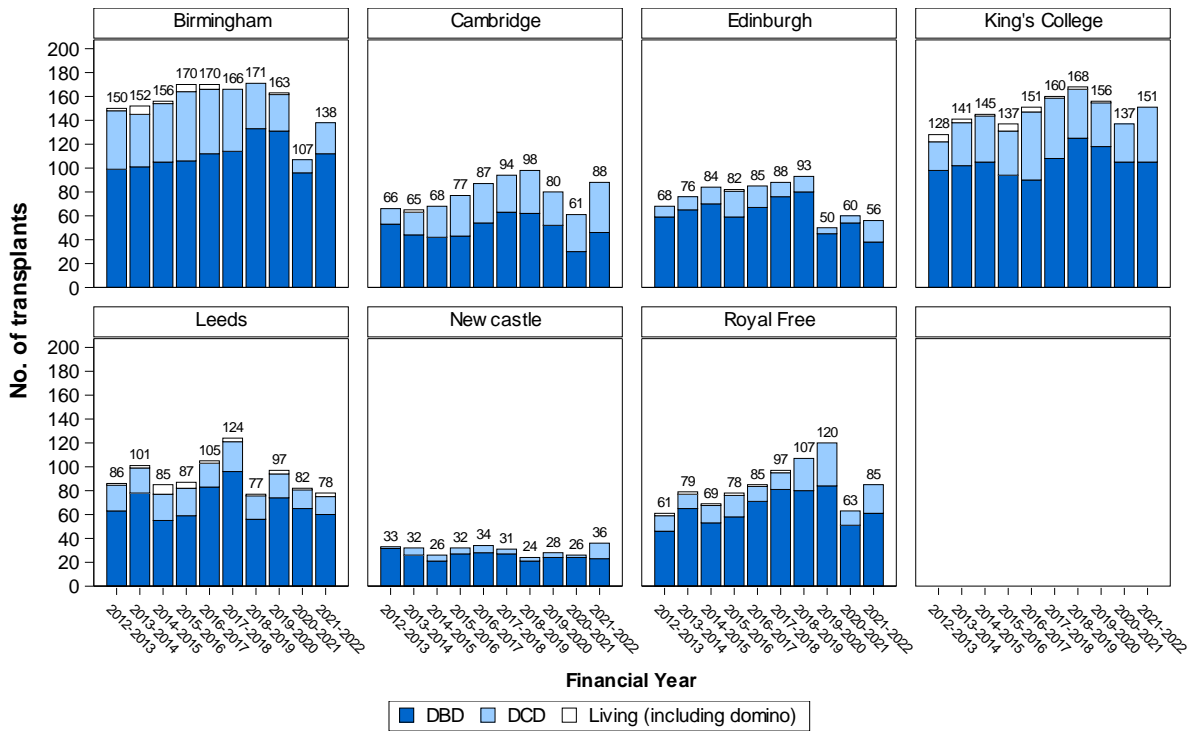


Figure 3.14 Adult elective liver only transplants by donor type and centre, 1 April 2012 - 31 March 2022



*Excludes 23 and 7 living liver transplants at London Bridge Hospital and Cromwell Hospital, respectively

The demographic characteristics of 629 adult [elective](#) first deceased donor liver only transplant recipients in the latest year are shown by centre and overall in **Table 3.4**. The profile of recipients are similar to those in **Table 3.2** which shows the demographics of patients registered. The profile donor was often a white (88%), male (55%), brainstem death (71%) with a [median](#) age of 54 and a median BMI of 26. For some characteristics, due to rounding, percentages may not add up to 100.

Table 3.4		Demographic characteristics of adult elective first deceased donor liver only transplant recipients, 1 April 2021 - 31 March 2022							
		Birmingham	Cambridge	Edinburgh	King's College	Leeds	Newcastle	Royal Free	TOTAL
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Number		138	88	56	151	75	36	85	629 (100)
Recipient sex	Male	89 (64)	61 (69)	36 (64)	94 (62)	53 (71)	29 (81)	67 (79)	429 (68)
	Female	49 (36)	27 (31)	20 (36)	57 (38)	22 (29)	7 (19)	18 (21)	200 (32)
Recipient ethnicity	White	106 (77)	85 (97)	55 (98)	120 (79)	67 (89)	34 (94)	61 (72)	528 (84)
	Asian	21 (15)	1 (1)	0	18 (12)	7 (9)	2 (6)	18 (21)	67 (11)
	Black	3 (2)	2 (2)	0	9 (6)	0	0	3 (4)	17 (3)
	Other	1 (1)	0	1 (2)	4 (3)	1 (1)	0	3 (4)	10 (2)
	Not reported	7 (5)	0	0	0	0	0	0	7 (1)
Indication	Cancer	10 (7)	15 (17)	10 (18)	25 (17)	10 (13)	9 (25)	22 (26)	101 (16)
	Hepatitis C	3 (2)	3 (3)	0	5 (3)	3 (4)	0	1 (1)	15 (2)
	Alcoholic liver disease	51 (37)	28 (32)	19 (34)	43 (28)	28 (37)	11 (31)	19 (22)	199 (32)
	Hepatitis B	3 (2)	1 (1)	0	6 (4)	2 (3)	1 (3)	1 (1)	14 (2)
	Primary sclerosing cholangitis	10 (7)	8 (9)	6 (11)	18 (12)	10 (13)	5 (14)	14 (16)	71 (11)
	Primary biliary cholangitis	15 (11)	8 (9)	5 (9)	13 (9)	3 (4)	1 (3)	2 (2)	47 (8)
	Autoimmune and cryptogenic disease	9 (7)	3 (3)	5 (9)	14 (9)	7 (9)	2 (6)	7 (8)	47 (8)
	Metabolic	25 (18)	15 (17)	10 (18)	15 (10)	10 (13)	5 (14)	11 (13)	91 (15)
	Other	12 (9)	7 (8)	1 (2)	12 (8)	2 (3)	2 (6)	8 (9)	44 (7)
Recipient HCV status	Negative	131 (95)	81 (92)	52 (93)	138 (91)	68 (91)	35 (97)	75 (88)	580 (92)
	Positive	6 (4)	7 (8)	4 (7)	12 (8)	4 (5)	1 (3)	10 (12)	44 (7)
	Not reported	1 (1)	0	0	1 (1)	3 (4)	0	0	5 (1)

Table 3.4 Demographic characteristics of adult elective first deceased donor liver only transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham	Cambridge	Edinburgh	King's College	Leeds	Newcastle	Royal Free	TOTAL
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Pre-transplant in-patient status	Out-patient	133 (96)	79 (90)	51 (91)	126 (83)	65 (87)	36 (100)	73 (86)	563 (90)
	In-patient	5 (4)	9 (10)	5 (9)	23 (15)	9 (12)	0	12 (14)	63 (10)
	Not reported	0	0	0	2 (1)	1 (1)	0	0	3 (1)
Ascites	Absence	68 (49)	21 (24)	23 (41)	48 (32)	30 (40)	22 (61)	38 (45)	250 (40)
	Presence	70 (51)	67 (76)	33 (59)	101 (67)	43 (57)	13 (36)	47 (55)	374 (60)
	Not reported	0	0	0	2 (1)	2 (3)	1 (3)	0	5 (1)
Encephalopathy	Absence	123 (89)	42 (48)	45 (80)	85 (56)	42 (56)	26 (72)	57 (67)	420 (67)
	Presence	14 (10)	46 (52)	11 (20)	65 (43)	28 (37)	10 (28)	28 (33)	202 (32)
	Not reported	1 (1)	0	0	1 (1)	5 (7)	0	0	7 (1)
Pre-transplant renal support	No	135 (98)	77 (88)	55 (98)	144 (95)	71 (95)	34 (94)	80 (94)	596 (95)
	Yes	2 (1)	2 (2)	1 (2)	5 (3)	3 (4)	1 (3)	5 (6)	19 (3)
	Not reported	1 (1)	9 (10)	0	2 (1)	1 (1)	1 (3)	0	14 (2)
Previous abdominal surgery	No	129 (93)	74 (84)	49 (88)	130 (86)	67 (89)	36 (100)	62 (73)	547 (87)
	Yes	9 (7)	14 (16)	7 (13)	20 (13)	5 (7)	0	23 (27)	78 (12)
	Not reported	0	0	0	1 (1)	3 (4)	0	0	4 (1)
Varices & shunt	Absence	49 (36)	23 (26)	13 (23)	42 (28)	37 (49)	5 (14)	36 (42)	205 (33)
	Presence without treatment	88 (64)	57 (65)	43 (77)	102 (68)	23 (31)	29 (81)	33 (39)	375 (60)
	Presence with surgical shunt	0	1 (1)	0	0	0	0	4 (5)	5 (1)
	Presence with TIPS	1 (1)	7 (8)	0	6 (4)	2 (3)	2 (6)	6 (7)	24 (4)
	Not reported	0	0	0	1 (1)	13 (17)	0	6 (7)	20 (3)
Life style activity	Normal	16 (12)	6 (7)	4 (7)	1 (1)	6 (8)	3 (8)	4 (5)	40 (6)
	Restricted	48 (35)	23 (26)	9 (16)	47 (31)	25 (33)	14 (39)	39 (46)	205 (33)
	Self-care	68 (49)	49 (56)	38 (68)	78 (52)	39 (52)	17 (47)	30 (35)	319 (51)
	Confined	6 (4)	8 (9)	2 (4)	15 (10)	1 (1)	2 (6)	8 (9)	42 (7)
	Reliant	0	2 (2)	3 (5)	9 (6)	2 (3)	0	4 (5)	20 (3)
	Not reported	0	0	0	1 (1)	2 (3)	0	0	3 (1)

Table 3.4 Demographic characteristics of adult elective first deceased donor liver only transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham	Cambridge	Edinburgh	King's College	Leeds	Newcastle	Royal Free	TOTAL
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Graft appearance	Normal	112 (81)	66 (75)	50 (89)	147 (97)	59 (79)	35 (97)	71 (84)	540 (86)
	Abnormal	26 (19)	18 (20)	6 (11)	3 (2)	12 (16)	1 (3)	14 (16)	80 (13)
	Not reported	0	4 (5)	0	1 (1)	4 (5)	0	0	9 (1)
Recip age (years)	Median (IQR)	55 (44,62)	56 (48,62)	61 (55,66)	56 (48,63)	55 (46,61)	60 (54,65)	55 (44,60)	56 (47,62)
BMI (kg/m ²)	Median (IQR)	28 (24,31)	28 (25,33)	27 (23,31)	26 (23,30)	28 (25,31)	30 (27,32)	27 (25,32)	27 (24,31)
Serum bilirubin (umol/l)	Median (IQR)	73 (31,171)	48 (29,77)	53 (28,95)	42 (22,109)	61 (33,128)	35 (13,72)	49 (22,101)	50 (25,108)
	Not reported	1	0	0	1	2	0	0	4
Serum creatinine (umol/l)	Median (IQR)	70 (56,91)	70 (55,98)	84 (70,106)	69 (56,90)	72 (58,94)	78 (64,91)	83 (70,100)	73 (60,94)
	Not reported	0	0	0	1	2	0	0	3
Serum sodium (mmol/l)	Median (IQR)	137 (134,139)	135 (131,138)	135 (132,138)	136 (133,139)	137 (135,139)	137 (136,140)	137 (134,139)	136 (133,139)
	Not reported	0	0	0	1	2	0	0	3
Serum potassium (mmol/l)	Median (IQR)	4.2 (3.8,4.5)	4.1 (3.8,4.5)	4.3 (4.0,4.6)	4.2 (3.8,4.5)	4.1 (3.9,4.5)	4.2 (4.0,4.7)	4.2 (3.9,4.5)	4.2 (3.9,4.5)
	Not reported	5	0	0	1	4	0	0	10
INR	Median (IQR)	1.5 (1.3,1.7)	1.4 (1.2,1.7)	1.3 (1.2,1.7)	1.3 (1.1,1.6)	1.5 (1.3,1.9)	1.3 (1.1,1.4)	1.3 (1.1,1.5)	1.4 (1.2,1.7)
	Not reported	0	8	0	1	3	1	0	13
Serum albumin (g/l)	Median (IQR)	29 (25,34)	29 (25,32)	27 (23,30)	35 (30,38)	29 (24,35)	37 (32,43)	34 (31,38)	31 (27,36)
	Not reported	0	0	0	1	5	0	0	6
Cold ischaemia time (hrs)	Median (IQR)	7 (6,9)	13 (9,18)	10 (9,11)	9 (7,10)	9 (7,10)	10 (9,11)	9 (8,10)	9 (7,11)
	Not reported	0	4	0	1	1	0	1	7
Time on list (days)	Median (IQR)	48 (12,158)	45 (14,109)	27 (9,59)	47 (10,140)	45 (12,139)	95 (21,149)	53 (10,148)	47 (12,138)
Donor sex	Male	68 (49)	51 (58)	31 (55)	85 (56)	44 (59)	18 (50)	50 (59)	347 (55)
	Female	70 (51)	37 (42)	25 (45)	66 (44)	31 (41)	18 (50)	35 (41)	282 (45)

Table 3.4 Demographic characteristics of adult elective first deceased donor liver only transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham	Cambridge	Edinburgh	King's College	Leeds	Newcastle	Royal Free	TOTAL
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Donor ethnicity	White	120 (87)	79 (90)	52 (93)	136 (90)	63 (84)	31 (86)	72 (85)	553 (88)
	Asian	7 (5)	2 (2)	1 (2)	6 (4)	3 (4)	1 (3)	4 (5)	24 (4)
	Black	4 (3)	2 (2)	0	2 (1)	2 (3)	0	2 (2)	12 (2)
	Other	5 (4)	1 (1)	2 (4)	3 (2)	3 (4)	2 (6)	3 (4)	19 (3)
	Not reported	2 (1)	4 (5)	1 (2)	4 (3)	4 (5)	2 (6)	4 (5)	21 (3)
Donor cause of death	Intracranial	116 (84)	71 (81)	48 (86)	137 (91)	60 (80)	32 (89)	76 (89)	540 (86)
	Trauma	3 (2)	4 (5)	0	1 (1)	3 (4)	2 (6)	0	13 (2)
	Others	19 (14)	13 (15)	8 (14)	13 (9)	12 (16)	2 (6)	9 (11)	76 (12)
Donor history of diabetes	No	124 (90)	83 (94)	53 (95)	135 (89)	69 (92)	35 (97)	75 (88)	574 (91)
	Yes	11 (8)	5 (6)	3 (5)	11 (7)	4 (5)	1 (3)	8 (9)	43 (7)
	Not reported	3 (2)	0	0	5 (3)	2 (3)	0	2 (2)	12 (2)
Donor type	Donor after brain death	112 (81)	46 (52)	38 (68)	105 (70)	60 (80)	23 (64)	61 (72)	445 (71)
	Donor after cardiac death	26 (19)	42 (48)	18 (32)	46 (30)	15 (20)	13 (36)	24 (28)	184 (29)
ABO match	Identical	128 (93)	85 (97)	55 (98)	143 (95)	73 (99)	36 (100)	82 (96)	602 (96)
	Compatible	10 (7)	3 (3)	1 (2)	8 (5)	1 (1)	0	3 (4)	26 (4)
Graft type	Whole	133 (96)	84 (95)	56 (100)	141 (93)	67 (89)	36 (100)	80 (94)	597 (95)
	Segmental	5 (4)	4 (5)	0	10 (7)	8 (11)	0	5 (6)	32 (5)
Donor age (years)	Median (IQR)	57 (44,66)	48 (35,58)	58 (42,66)	58 (46,67)	45 (35,62)	57 (50,67)	51 (39,60)	54 (40,64)
Donor BMI (kg/m ²)	Median (IQR)	26 (23,30)	26 (24,29)	26 (23,30)	26 (24,30)	27 (24,30)	28 (25,33)	27 (24,31)	26 (24,30)

3.2.3 Post-transplant survival

LONG-TERM PATIENT SURVIVAL

Table 3.5 shows one year [unadjusted](#) and [risk-adjusted patient survival](#) for 2508 of the 2713 transplants in the period, 1 April 2017 to 31 March 2021. Transplants were excluded if they were [auxiliary](#) or if survival information or [risk factors](#) were missing. The overall patient survival rate is 94.8% and, after risk adjustment, three centres had a lower survival rate than the national rate. All centres lie within the lower 95% [confidence limit](#), as shown in **Figure 3.15**.

Table 3.5 One year patient survival for adult elective deceased donor first liver transplants, 1 April 2017 - 31 March 2021					
Centre	Number of transplants	1-year survival % (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	101	95.0	88.5 - 97.9	93.3	84.0 - 97.2
Leeds	321	92.5	89.0 - 95.0	93.4	90.1 - 95.6
Cambridge	315	95.5	92.6 - 97.3	95.8	92.9 - 97.5
Royal Free	355	93.0	89.7 - 95.2	93.3	90.1 - 95.5
King's College	564	96.5	94.6 - 97.8	96.2	94.0 - 97.6
Birmingham	580	95.1	93.0 - 96.6	95.2	93.0 - 96.7
Edinburgh	271	94.9	91.4 - 97.0	94.9	91.2 - 97.0
Total	2507	94.8	93.9 - 95.7		

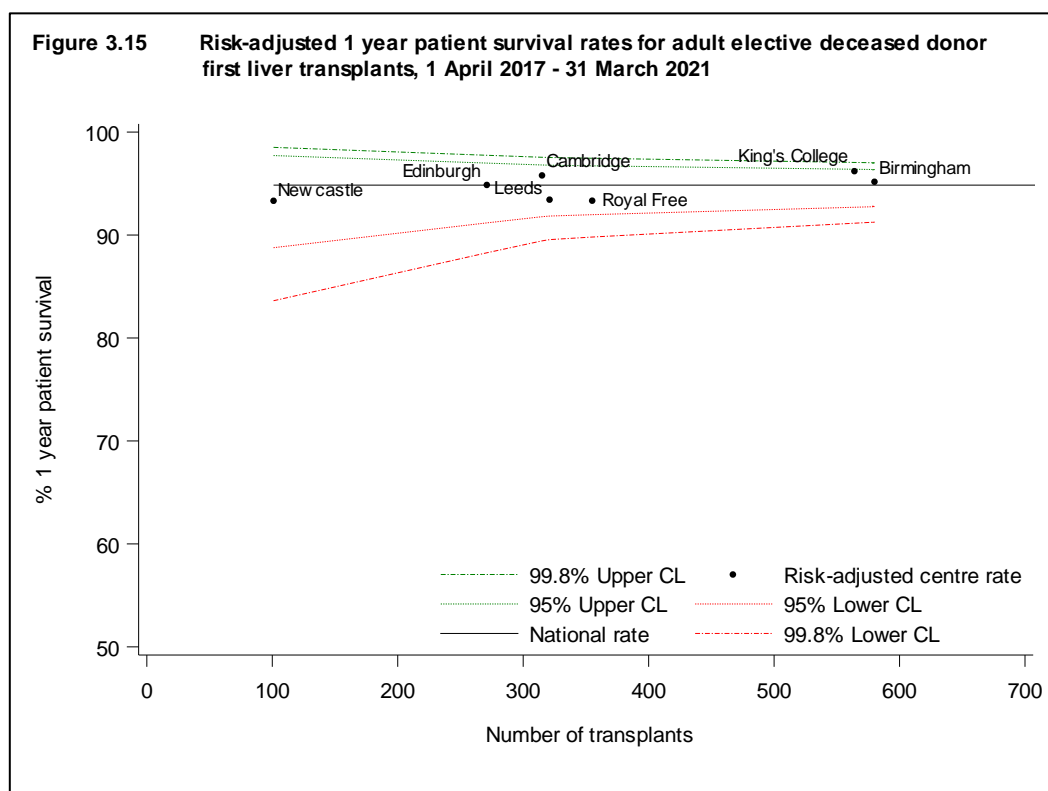


Table 3.6 shows the five year unadjusted and risk-adjusted patient survival for 2290 of the 2600 transplants in the period, 1 April 2013 to 31 March 2017. The national rate is 83.8% and three centres have a lower survival rate after risk adjustment, as shown in **Figure 3.16**. The median number of days between the last known follow-up post-transplantation (for censored cases) and the time of analysis in **Table 3.6** and **Figure 3.16** ranges from 285 days for Birmingham to 503 days for Leeds. The medians for all other centres fall in between these extremes. Results should therefore be interpreted in that light.

Table 3.6 Five year patient survival for adult elective deceased donor first liver transplants, 1 April 2013 - 31 March 2017					
Centre	Number of transplants	5-year survival % (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	114	80.2	71.5 - 86.5	77.3	65.5 - 85.1
Leeds	311	82.5	77.7 - 86.3	81.5	75.7 - 85.8
Cambridge	232	85.4	80.1 - 89.4	87.0	81.8 - 90.8
Royal Free	254	86.7	81.9 - 90.4	87.6	82.6 - 91.2
King's College	514	86.6	83.3 - 89.4	86.1	82.3 - 89.1
Birmingham	601	81.0	77.6 - 84.0	80.5	76.5 - 83.8
Edinburgh	264	83.8	78.5 - 87.9	84.9	79.4 - 88.9
Total	2290	83.8	82.2 - 85.3		

	Centre has reached the lower 99.8% confidence limit
	Centre has reached the lower 95% confidence limit
	Centre has reached the upper 95% confidence limit
	Centre has reached the upper 99.8% confidence limit

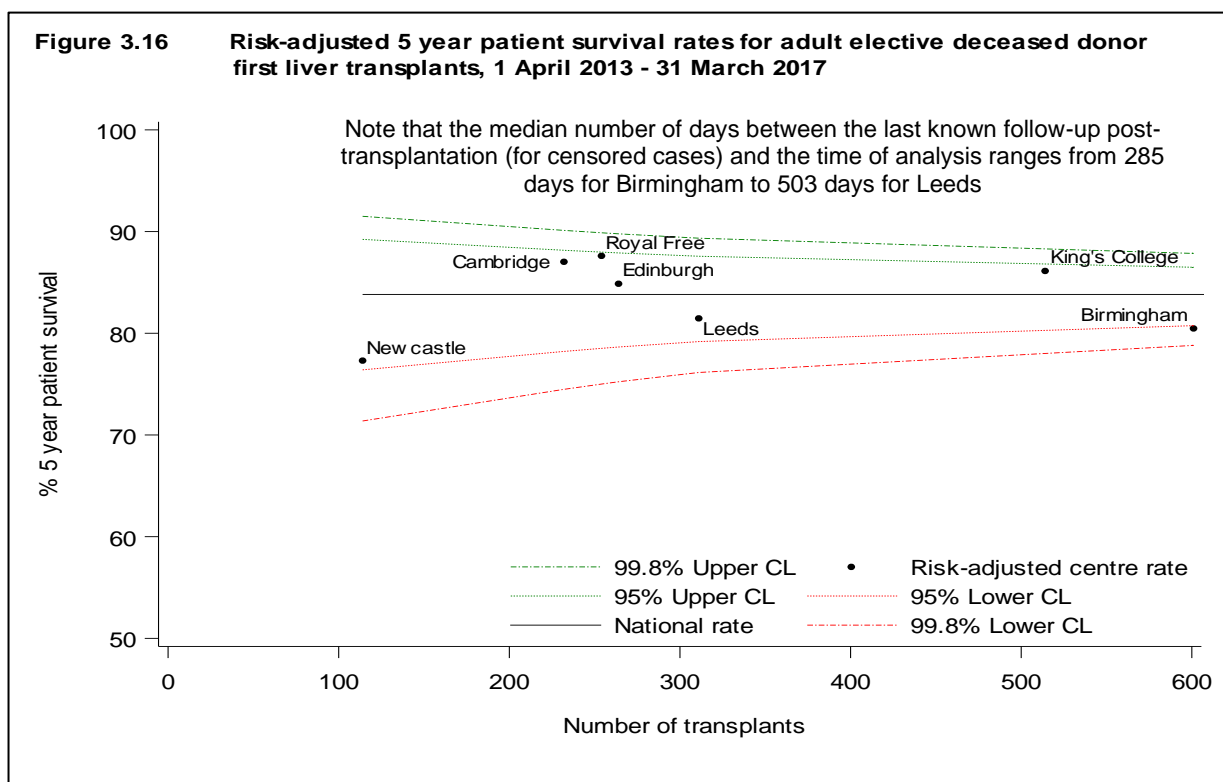


Table 3.7 shows one year [unadjusted](#) and [risk-adjusted patient survival](#), by primary disease group. The overall patient survival rate is 94.8% and, after risk adjustment, patients with cancer, autoimmune and cryptogenic, metabolic disease or other liver disease had lower survival than the national rate.

Table 3.7 One year patient survival for adult elective deceased donor first liver transplants, 1 April 2017 - 31 March 2021				
Primary disease	Number of transplants	1-year survival % (95% CI)		
		Unadjusted		Risk adjusted
Cancer	496	93.1	(90.5 - 95.1)	94.5 (92.3 - 96.1)
Hepatitis B and C	113	97.3	(91.8 - 99.1)	97.3 (91.6 - 99.1)
Alcoholic liver disease	689	97.4	(95.9 - 98.4)	97.1 (95.4 - 98.2)
Primary sclerosing cholangitis	297	95.9	(92.9 - 97.6)	95.2 (91.6 - 97.3)
Primary biliary cholangitis	223	94.5	(90.5 - 96.8)	95.0 (91.2 - 97.2)
Autoimmune and cryptogenic	191	93.8	(89.0 - 96.5)	92.3 (86.1 - 95.7)
Metabolic	343	93.2	(89.9 - 95.4)	93.3 (89.9 - 95.5)
Other	155	90.5	(84.5 - 94.3)	89.8 (82.8 - 94.0)
Total	2507	94.8	(93.9 - 95.7)	

Table 3.8 shows five year [unadjusted](#) and [risk-adjusted patient survival](#), the overall patient survival rate is 83.8%. After risk adjustment, patients with cancer, primary sclerosing cholangitis, autoimmune and cryptogenic, or other liver disease had lower survival than the national rate.

Table 3.8 Five year patient survival for adult elective deceased donor first liver transplants, 1 April 2013 - 31 March 2017				
Primary disease	Number of transplants	5-year survival % (95% CI)		
		Unadjusted		Risk adjusted
Cancer	553	77.7	(73.9 - 81.0)	81.3 (77.6 - 84.3)
Hepatitis B and C	197	89.0	(83.6 - 92.7)	89.4 (83.7 - 93.1)
Alcoholic liver disease	595	84.0	(80.8 - 86.8)	83.8 (80.1 - 86.8)
Primary sclerosing cholangitis	254	85.9	(81.0 - 89.7)	83.3 (76.8 - 88.0)
Primary biliary cholangitis	184	89.7	(84.1 - 93.4)	88.8 (82.2 - 92.9)
Autoimmune and cryptogenic	144	86.2	(79.1 - 91.0)	82.3 (72.2 - 88.7)
Metabolic	232	84.6	(79.0 - 88.8)	84.7 (78.4 - 89.1)
Other	131	84.9	(77.3 - 90.1)	82.4 (72.4 - 88.8)
Total	2290	83.8	(82.2 - 85.3)	

3.2.4 Survival from listing

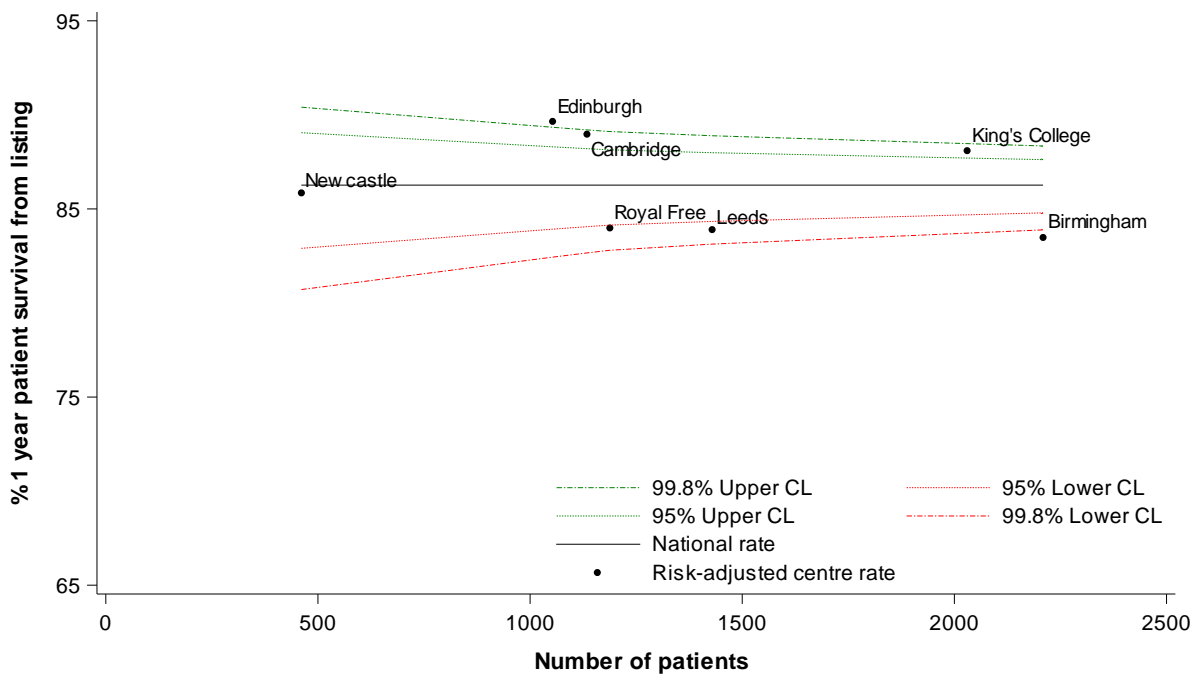
Survival from listing was analysed for patients aged ≥ 18 years registered for the first time for a liver transplant between 1 January 2010 and 31 December 2021. One and five year [risk-adjusted survival rates](#) from the point of liver transplant listing are provided in **Table 3.9** and are shown by centre in **Figures 3.17** and **3.18** respectively.

At one year, centre-specific risk adjusted survival rates range between 83.5% at Birmingham and 89.7% at Edinburgh. At five years, Birmingham had the lowest survival rate at 69.8% and Edinburgh has the highest at 78.9%; the remaining centres achieve survival rates that range in between these two extremes.

Note, however, that the median number of days between the last known follow-up post-transplantation (for censored, transplanted cases) and the time of analysis in **Figure 3.18** ranges from 269 days for Birmingham to 480 days for Edinburgh. The medians for all other centres fall in between these extremes. Results should therefore be interpreted in that light.

Table 3.9 Risk adjusted 1 and 5 year patient survival rate from listing for adult elective first liver registrations, 1 January 2010 - 31 December 2021							
Centre	Number of registrations	Patient survival					
		One year			Five year		
		Number at Risk at 1 year	Survival Rate % (95% CI)	Number at Risk at 5 years	Survival Rate % (95% CI)		
Newcastle	461	332	85.9 (82.6 - 88.5)	145	70.6 (65.4 - 75.0)		
Leeds	1429	1000	83.9 (81.6 - 85.9)	431	70.1 (66.8 - 73.1)		
Cambridge	1134	870	89.0 (87.0 - 90.6)	386	78.3 (75.3 - 80.9)		
Royal Free	1188	853	84.0 (81.5 - 86.2)	346	71.6 (68.1 - 74.8)		
King's College	2030	1498	88.1 (86.5 - 89.5)	687	76.5 (74.1 - 78.7)		
Birmingham	2209	1652	83.5 (81.6 - 85.2)	743	69.8 (67.1 - 72.3)		
Edinburgh	1053	821	89.7 (87.8 - 91.3)	379	78.9 (76.0 - 81.4)		
UK	9504	7026	86.3 (85.5 - 87.0)	3117	73.8 (72.8 - 74.8)		

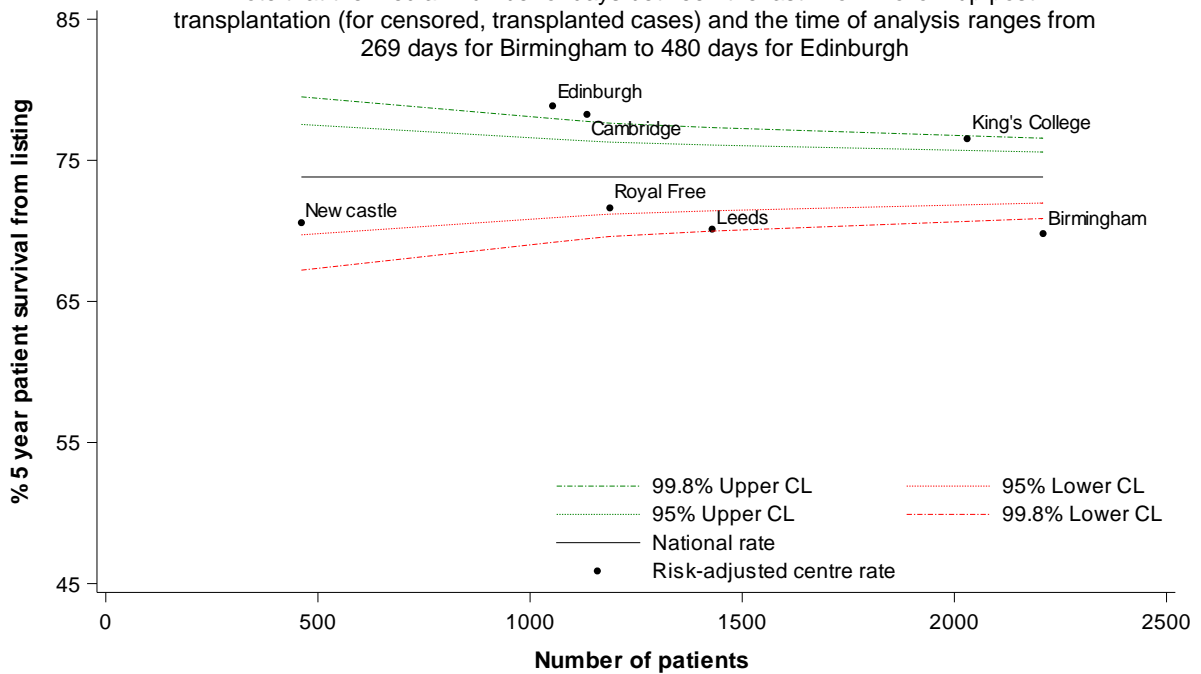
Figure 3.17 Risk-adjusted 1 year patient survival rate from time of listing for adult* elective first liver registrations, 1 January 2010 - 31 December 2021



* In this analysis, adult patients are defined as 18 years old and older.

Figure 3.18 Risk-adjusted 5 year patient survival rate from time of listing for adult* elective first liver registrations, 1 January 2010 - 31 December 2021

Note that the median number of days between the last known follow-up post-transplantation (for censored, transplanted cases) and the time of analysis ranges from 269 days for Birmingham to 480 days for Edinburgh



* In this analysis, adult patients are defined as 18 years old and older.

Adult Liver Transplantation Super-Urgent Patients

3.3.1 Transplant list

Table 3.10 shows the [median waiting time](#) to deceased donor liver only transplant for adult [super-urgent](#) patients. The national median waiting time to transplant is two days and at six of the seven centres.

Table 3.10 Median waiting time to liver only transplant in the UK, for adult super urgent patients registered 1 April 2018 - 31 March 2021			
Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Adult			
Newcastle	16	2	2 - 2
Leeds	57	2	2 - 2
Royal Free	47	2	1 - 3
King's College	57	2	2 - 2
Birmingham	62	2	2 - 2
Edinburgh	31	2	1 - 3
Cambridge	41	3	2 - 4
UK	311	2	2 - 2

The demographic characteristics of 87 adult [super-urgent](#) registrations in the last financial year are shown by centre and overall in **Table 3.11**. The majority of patients listed for a super-urgent liver were male (51%) and the median age was 40 with a median BMI of 26. For some characteristics, due to rounding, percentages may not add up to 100.

Table 3.11 Demographic characteristics of adult super urgent liver patients registered from 1 April 2021 - 31 March 2022

		Birmingham	Cambridge	Edinburgh	King's college	Leeds	Newcastle	Royal Free	Total
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Number		16	10	3	29	13	3	13	87
Recipient sex	Male	7 (44)	3 (30)	2 (67)	15 (52)	8 (62)	1 (33)	8 (62)	44 (51)
	Female	9 (56)	7 (70)	1 (33)	14 (48)	5 (38)	2 (67)	5 (38)	43 (49)
Recipient ethnicity	White	12 (75)	9 (90)	3 (100)	19 (66)	11 (85)	2 (67)	7 (54)	63 (72)
	Asian	1 (6)	0 (0)	0 (0)	7 (24)	1 (8)	1 (33)	5 (38)	15 (17)
	Other	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Black	2 (13)	1 (10)	0 (0)	3 (10)	1 (8)	0 (0)	1 (8)	8 (9)
	Not reported	1 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Recipient HCV	No	16 (100)	10 (100)	3 (100)	29 (100)	13 (100)	3 (100)	13 (100)	87 (100)
	Yes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Encephalopathy	Absence	2 (13)	4 (40)	0 (0)	3 (10)	2 (15)	0 (0)	5 (38)	16 (18)
	Presence	10 (63)	6 (60)	3 (100)	22 (76)	10 (77)	3 (100)	8 (62)	62 (71)
	Not reported	4 (25)	0 (0)	0 (0)	4 (14)	1 (8)	0 (0)	0 (0)	9 (10)
Renal support	No	9 (56)	5 (50)	0 (0)	6 (21)	7 (54)	2 (67)	7 (54)	36 (41)
	Yes	7 (44)	5 (50)	3 (100)	23 (79)	6 (46)	1 (33)	6 (46)	51 (59)
Recip age (years)	Median (IQR)	39 (26, 52)	45 (31, 63)	48 (41, 58)	39 (34, 53)	43 (36, 54)	39 (21, 61)	37 (30, 50)	40 (30, 55)
BMI (kg/m2)	Median (IQR)	26 (24, 31)	32 (28, 37)	31 (29, 37)	24 (23, 27)	26 (24, 28)	24 (23, 24)	23 (21, 31)	26 (23, 31)
	Not reported	0	0	0	0	0	1	0	1
Serum bilirubin (umol/l)	Median (IQR)	214 (103, 399)	270 (75, 487)	98 (71, 133)	190 (87, 433)	225 (67, 361)	171 (110, 224)	350 (82, 396)	219 (82, 396)
	Not reported	0	0	0	0	1	0	0	1
Serum creatinine (umol/l)	Median (IQR)	89 (59, 201)	100 (78, 130)	263 (138, 426)	91 (63, 131)	150 (90, 192)	87 (38, 213)	114 (70, 168)	102 (71, 168)
	Not reported	1	0	0	0	0	0	0	1

Table 3.11 Demographic characteristics of adult super urgent liver patients registered from 1 April 2021 - 31 March 2022

		Birmingham N (%)	Cambridge N (%)	Edinburgh N (%)	King's college N (%)	Leeds N (%)	Newcastle N (%)	Royal Free N (%)	Total N (%)
Serum sodium (mmol/l)	Median (IQR)	138 (134, 141)	134 (131, 144)	139 (138, 146)	140 (135, 146)	137 (133, 140)	132 (132, 138)	138 (136, 141)	138 (133, 143)
Serum potassium (mmol/l)	Median (IQR)	4 (4, 5)	4 (4, 5)	4 (4, 4)	5 (4, 5)	4 (4, 5)	5 (4, 6)	5 (4, 5)	4 (4, 5)
INR	Median (IQR) Not reported	3.6 (2.4, 7.4) 0	3.3 (2.5, 4.3) 0	8.3 (4.3, 10) 0	3.2 (1.9, 5.1) 0	3.5 (1.8, 8.3) 3	5.3 (3, 7.5) 0	3.6 (2.5, 6.4) 0	3.4 (2.4, 6.7) 3
Serum albumin (g/l)	Median (IQR) Not reported	27 (25, 32) 0	23 (21, 25) 0	28 (24, 35) 0	28 (24, 32) 0	26 (22, 29) 2	23 (19, 31) 0	27 (26, 36) 0	26 (23, 31) 2

3.2.2 Transplant activity

Figure 3.19 shows the number of adult [super-urgent](#) first liver only transplants from deceased and living donors performed in the last ten years, by type of donor. There have been 9 DCD super-urgent transplants during the ten year period. The number of super-urgent transplants in 2021/22 has increased slightly compared to the previous financial year. There have been no adult super-urgent liver only transplants from living donors during the decade.

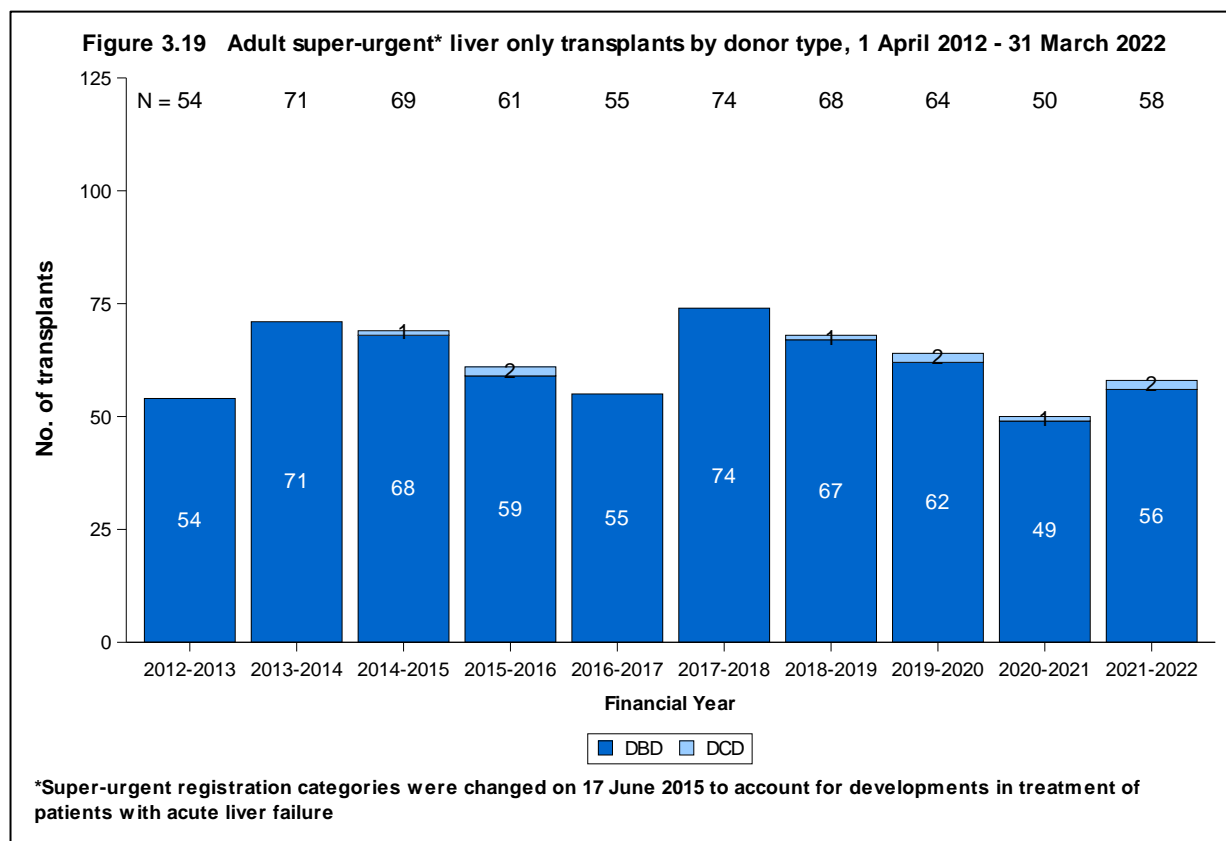
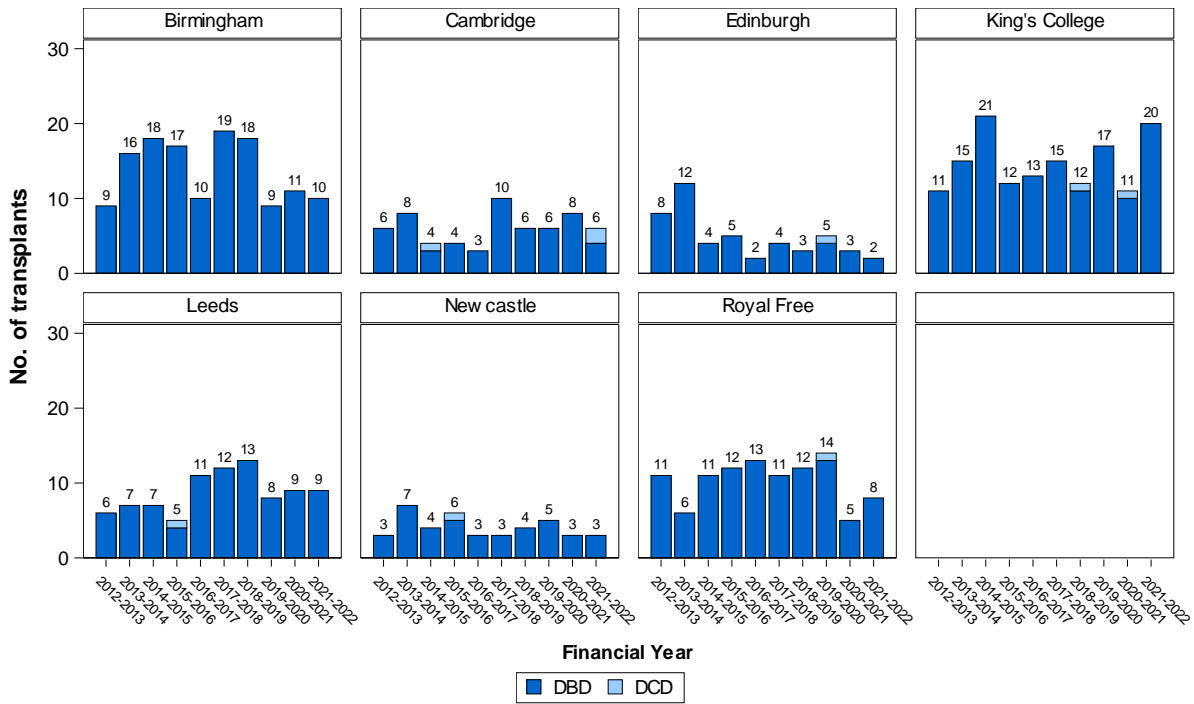


Figure 3.20 shows the number of adult [super-urgent](#) first liver only transplants from deceased and living donors performed in the last ten years, by type of donor and transplant centre.

Figure 3.20 Adult super-urgent* liver only transplants by centre, 1 April 2012 - 31 March 2022



*Super-urgent registration categories were changed on 17 June 2015 to account for developments in treatment of patients with acute liver failure

The demographic characteristics of 58 adult [super-urgent](#) transplant recipients in the last financial year are shown by centre and overall in **Table 3.12**. Fifty five percent of these recipients were female and the [median](#) age was 39 years. All but two super-urgent transplants were performed in this time period using a [DBD](#) donor. The median recipient BMI was 26. For some characteristics, due to rounding, percentages may not add up to 100.

Table 3.12 Demographic characteristics of adult super-urgent deceased donor liver transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham N (%)	Cambridge N (%)	Edinburgh N (%)	King's College N (%)	Leeds N (%)	Newcastle N (%)	Royal Free N (%)	TOTAL N (%)
Number		10	6	2	20	9	3	8	58 (100)
Recipient sex	Male	5 (50)	0	1 (50)	10 (50)	4 (44)	1 (33)	5 (63)	26 (45)
	Female	5 (50)	6 (100)	1 (50)	10 (50)	5 (56)	2 (67)	3 (38)	32 (55)
Recipient ethnicity	White	6 (60)	5 (83)	2 (100)	12 (60)	8 (89)	2 (67)	3 (38)	38 (66)
	Asian	1 (10)	0	0	6 (30)	0	1 (33)	4 (50)	12 (21)
	Black	2 (20)	1 (17)	0	2 (10)	1 (11)	0	1 (13)	7 (12)
	Not reported	1 (10)	0	0	0	0	0	0	1 (2)
Recipient HCV status	Negative	10 (100)	6 (100)	2 (100)	20 (100)	6 (67)	3 (100)	8 (100)	55 (95)
	Not reported	0	0	0	0	3 (33)	0	0	3 (5)
Pre-transplant in-patient status	Out-patient	9 (90)	0	0	0	0	0	0	9 (16)
	In-patient	1 (10)	6 (100)	2 (100)	20 (100)	8 (89)	3 (100)	8 (100)	48 (83)
	Not reported	0	0	0	0	1 (11)	0	0	1 (2)
Ascites	Absence	7 (70)	5 (83)	2 (100)	7 (35)	6 (67)	2 (67)	2 (25)	31 (53)
	Presence	3 (30)	1 (17)	0	13 (65)	1 (11)	1 (33)	6 (75)	25 (43)
	Not reported	0	0	0	0	2 (22)	0	0	2 (3)
Encephalopathy	Absence	10 (100)	1 (17)	0	0	0	0	3 (38)	14 (24)
	Presence	0	5 (83)	2 (100)	20 (100)	8 (89)	3 (100)	5 (63)	43 (74)
	Not reported	0	0	0	0	1 (11)	0	0	1 (2)
Pre-transplant renal support	No	9 (90)	2 (33)	0	4 (20)	1 (11)	2 (67)	5 (63)	23 (40)
	Yes	1 (10)	3 (50)	2 (100)	16 (80)	7 (78)	1 (33)	3 (38)	33 (57)
	Not reported	0	1 (17)	0	0	1 (11)	0	0	2 (3)
Previous abdominal surgery	No	10 (100)	5 (83)	2 (100)	20 (100)	8 (89)	3 (100)	7 (88)	55 (95)
	Yes	0	1 (17)	0	0	0	0	1 (13)	2 (3)
	Not reported	0	0	0	0	1 (11)	0	0	1 (2)

Table 3.12 Demographic characteristics of adult super-urgent deceased donor liver transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham	Cambridge	Edinburgh	King's College	Leeds	Newcastle	Royal Free	TOTAL
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Varices & shunt	Absence	7 (70)	4 (67)	1 (50)	12 (60)	7 (78)	2 (67)	6 (75)	39 (67)
	Presence without treatment	3 (30)	2 (33)	1 (50)	7 (35)	0	1 (33)	2 (25)	16 (28)
	Presence with TIPS	0	0	0	1 (5)	0	0	0	1 (2)
	Not reported	0	0	0	0	2 (22)	0	0	2 (3)
Life style activity	Normal	7 (70)	0	0	0	2 (22)	0	1 (13)	10 (17)
	Restricted	1 (10)	0	0	0	0	0	0	1 (2)
	Self-care	1 (10)	0	0	0	0	0	0	1 (2)
	Confined	0	2 (33)	0	2 (10)	0	1 (33)	1 (13)	6 (10)
	Reliant	1 (10)	3 (50)	2 (100)	18 (90)	6 (67)	2 (67)	6 (75)	38 (66)
	Not reported	0	1 (17)	0	0	1 (11)	0	0	2 (3)
Graft appearance	Normal	9 (90)	3 (50)	1 (50)	19 (95)	6 (67)	3 (100)	7 (88)	48 (83)
	Abnormal	1 (10)	3 (50)	1 (50)	1 (5)	2 (22)	0	1 (13)	9 (16)
	Not reported	0	0	0	0	1 (11)	0	0	1 (2)
Recip age (years)	Median (IQR)	34 (26,47)	45 (26,66)	45 (41,48)	37 (27,51)	40 (35,45)	39 (21,61)	49 (33,57)	39 (28,51)
BMI (kg/m ²)	Median (IQR)	28 (26,36)	35 (28,40)	33 (29,37)	23 (23,27)	28 (24,28)	24 (23,24)	24 (23,30)	26 (23,31)
Serum bilirubin (umol/l)	Median (IQR)	174 (81,285)	414 (108,545)	93 (82,103)	274 (148,506)	179 (83,397)	155 (107,202)	374 (326,547)	271 (107,428)
	Not reported	0	0	0	0	1	0	0	1
Serum creatinine (umol/l)	Median (IQR)	67 (50,89)	85 (64,218)	125 (74,175)	101 (70,138)	196 (116,238)	82 (36,161)	104 (68,139)	92 (67,142)
	Not reported	0	0	0	0	1	0	0	1
Serum sodium (mmol/l)	Median (IQR)	138 (135,144)	135 (134,136)	151 (147,154)	139 (132,146)	139 (138,143)	135 (129,141)	139 (134,142)	138 (134,144)
	Not reported	0	0	0	0	1	0	0	1
Serum potassium (mmol/l)	Median (IQR)	4.2 (4.0,4.8)	4.0 (3.6,4.7)	4.0 (3.9,4.0)	4.6 (4.1,4.8)	4.8 (4.1,5.1)	4.5 (3.8,4.9)	4.6 (4.4,5.5)	4.5 (4.1,4.8)
	Not reported	0	0	0	0	1	0	0	1

Table 3.12 Demographic characteristics of adult super-urgent deceased donor liver transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham N (%)	Cambridge N (%)	Edinburgh N (%)	King's College N (%)	Leeds N (%)	Newcastle N (%)	Royal Free N (%)	TOTAL N (%)
INR	Median (IQR)	2.6 (1.8,3.4)	4.0 (2.7,9.7)	6.4 (3.4,9.4)	3.0 (1.9,4.1)	2.6 (1.7,4.0)	4.0 (2.8,5.4)	3.1 (1.8,4.3)	3.0 (1.8,4.2)
	Not reported	0	2	0	0	1	0	0	3
Serum albumin (g/l)	Median (IQR)	31 (23,33)	24 (20,28)	25 (22,27)	26 (24,28)	22 (20,25)	24 (17,25)	28 (26,33)	25 (23,29)
	Not reported	0	0	0	0	1	0	0	1
Time on list (days)	Median (IQR)	2 (1,3)	3 (2,3)	2 (1,2)	3 (2,6)	2 (1,3)	2 (2,6)	1 (1,4)	2 (1,4)
Donor sex	Male	6 (60)	4 (67)	2 (100)	11 (55)	4 (44)	1 (33)	2 (25)	30 (52)
	Female	4 (40)	2 (33)	0	9 (45)	5 (56)	2 (67)	6 (75)	28 (48)
Donor ethnicity	White	8 (80)	6 (100)	2 (100)	17 (85)	6 (67)	3 (100)	8 (100)	50 (86)
	Asian	0	0	0	2 (10)	1 (11)	0	0	3 (5)
	Black	1 (10)	0	0	1 (5)	0	0	0	2 (3)
	Other	1 (10)	0	0	0	2 (22)	0	0	3 (5)
Donor cause of death	Intracranial	9 (90)	5 (83)	2 (100)	18 (90)	6 (67)	1 (33)	7 (88)	48 (83)
	Trauma	0	0	0	0	0	1 (33)	0	1 (2)
	Others	1 (10)	1 (17)	0	2 (10)	3 (33)	1 (33)	1 (13)	9 (16)
Donor history of diabetes	No	7 (70)	6 (100)	2 (100)	19 (95)	8 (89)	3 (100)	8 (100)	53 (91)
	Yes	3 (30)	0	0	1 (5)	1 (11)	0	0	5 (9)
Donor type	DBD	10 (100)	4 (67)	2 (100)	20 (100)	9 (100)	3 (100)	8 (100)	56 (97)
	DCD	0	2 (33)	0	0	0	0	0	2 (3)
ABO match	Identical	6 (60)	5 (83)	2 (100)	11 (55)	9 (100)	2 (67)	5 (63)	40 (69)
	Compatible	4 (40)	1 (17)	0	9 (45)	0	1 (33)	3 (38)	18 (31)
Graft type	Whole	10 (100)	6 (100)	2 (100)	17 (85)	9 (100)	3 (100)	8 (100)	55 (95)
	Reduced	0	0	0	3 (15)	0	0	0	3 (5)
Donor age (years)	Median (IQR)	59 (35,72)	50 (34,70)	46 (33,59)	48 (29,59)	41 (24,62)	52 (48,54)	50 (36,64)	50 (33,62)
Donor BMI (kg/m ²)	Median (IQR)	26 (22,28)	26 (24,32)	27 (21,33)	26 (24,28)	26 (22,29)	24 (22,37)	26 (21,26)	26 (23,28)

3.3.3 Post-transplant survival

LONG-TERM PATIENT SURVIVAL

Table 3.13 shows one year [unadjusted](#) and [risk-adjusted patient survival](#) for 198 of the 248 transplants in the period 1 April 2017 to 31 March 2021. Transplants were excluded if they were [auxiliary](#) or if survival information or [risk factors](#) were missing. The overall patient survival rate is 90.3% and, after risk adjustment, four of the seven centres had a lower survival rate than the national rate but within the [confidence limits](#), as shown in **Figure 3.21**.

Table 3.13 One year patient survival for adult super-urgent deceased donor first liver transplants, 1 April 2017 - 31 March 2021					
Centre	Number of transplants	1-year survival % (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	13	76.9	44.2 - 91.9	70	6.9 - 90.3
Leeds	31	89.8	71.5 - 96.6	89.8	68.4 - 96.7
Cambridge	26	96.2	75.7 - 99.4	96.1	72.5 - 99.5
Royal Free	32	87.5	70.0 - 95.1	90.7	75.3 - 96.5
King's College	38	83.9	67.6 - 92.4	89.5	76.7 - 95.3
Birmingham	44	95.4	82.8 - 98.8	88.7	54.7 - 97.2
Edinburgh	15		. - .	100	. - .
Total	199	90.3	85.1 - 93.7		

	Centre has reached the lower 99.8% confidence limit
	Centre has reached the lower 95% confidence limit
	Centre has reached the upper 95% confidence limit
	Centre has reached the upper 99.8% confidence limit

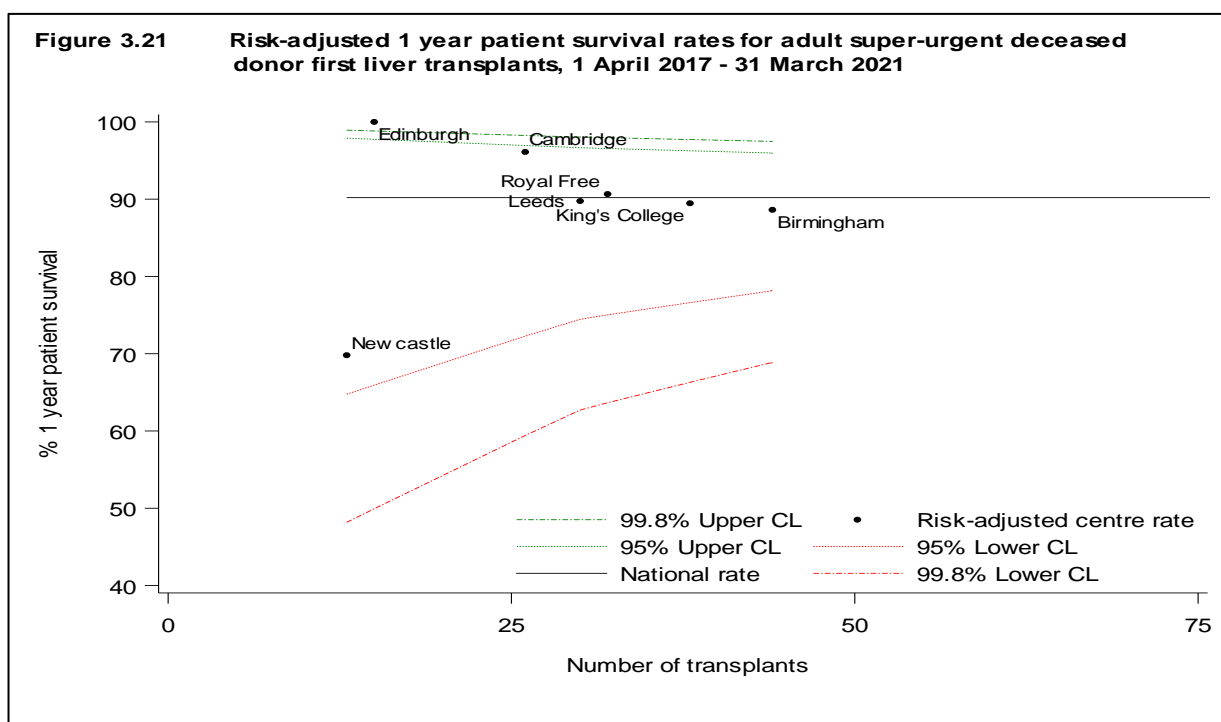
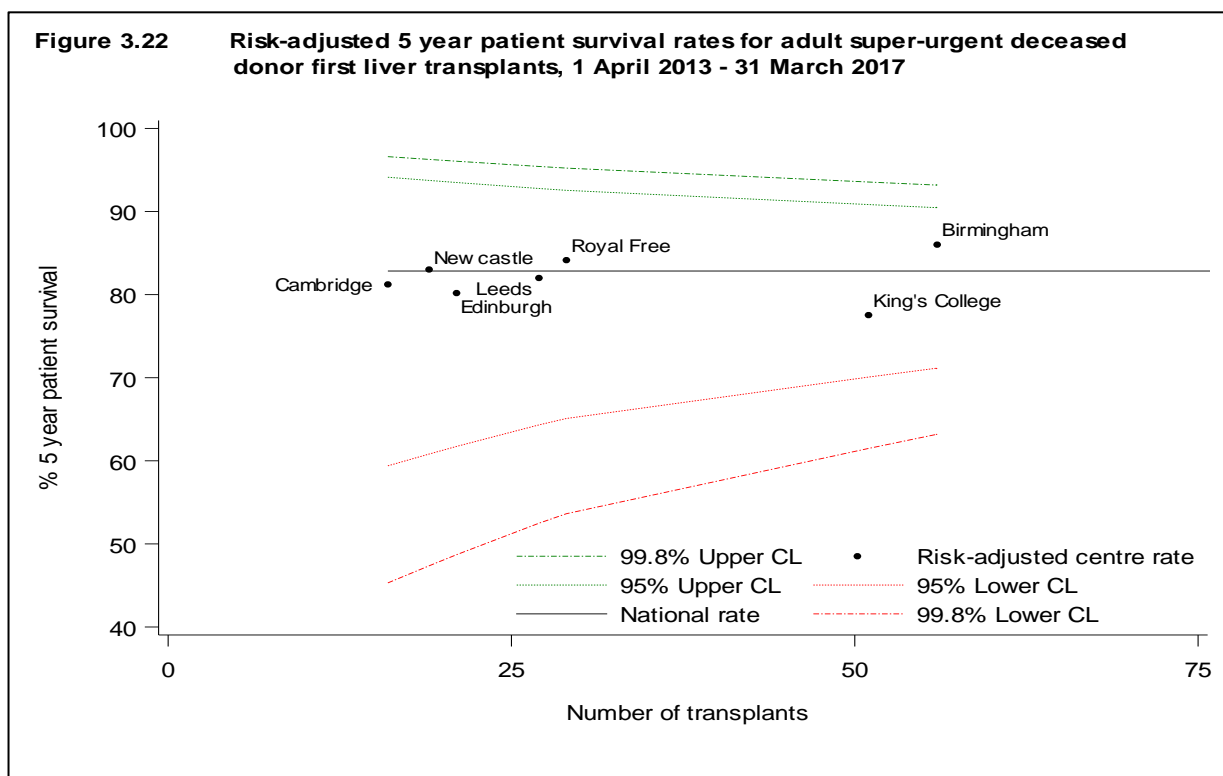


Table 3.14 shows the five year [unadjusted](#) and [risk-adjusted patient survival](#) for 219 of the 249 transplants in the period, 1 April 2013 to 31 March 2017. The national rate is 82.9% and four centres have a lower survival rate after risk adjustment as shown in **Figure 3.22**. All fall within the 95% confidence limits.

The median number of days between the last known follow-up post-transplantation (for censored recipients) and the time of analysis in **Table 3.14** and **Figure 3.22** ranges from 220.5 days for Birmingham to 537 days for Edinburgh. The medians for all other centres fall in between these extremes.

Table 3.14 Five year patient survival for adult super-urgent deceased donor first liver transplants, 1 April 2013 - 31 March 2017					
Centre	Number of transplants	5-year survival % (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	19	78.9	53.2 - 91.5	83.2	55.3 - 93.7
Leeds	27	88.9	69.4 - 96.3	82.1	44.5 - 94.2
Cambridge	16	81.3	52.5 - 93.5	81.3	42.0 - 94.0
Royal Free	29	76.8	54.4 - 89.2	84.1	64.6 - 92.9
King's College	51	86.2	73.2 - 93.2	77.7	53.2 - 89.4
Birmingham	56	82.9	69.7 - 90.7	86.1	73.2 - 92.8
Edinburgh	21	80.4	55.6 - 92.2	80.4	47.8 - 92.6
Total	219	82.9	77.1 - 87.4		

	Centre has reached the lower 99.8% confidence limit
	Centre has reached the lower 95% confidence limit
	Centre has reached the upper 95% confidence limit
	Centre has reached the upper 99.8% confidence limit



Adult Liver Transplantation Form return rates

Form return rates are reported in **Table 3.15** for the liver transplant record, three month and one year follow up forms, along with lifetime follow up (after the first year). These include all adult [elective and super-urgent](#) deceased donor transplants between 1 January 2021 and 31 December 2021 for the transplant record, and all requests for follow-up forms issued in this time period.

It should be noted that some of the forms issued later in 2021 may not have yet been “chased” by NHSBT when the report was produced in July 2022.

Table 3.15 Form return rates for adult liver transplants, 1 January 2021 to 31 December 2021

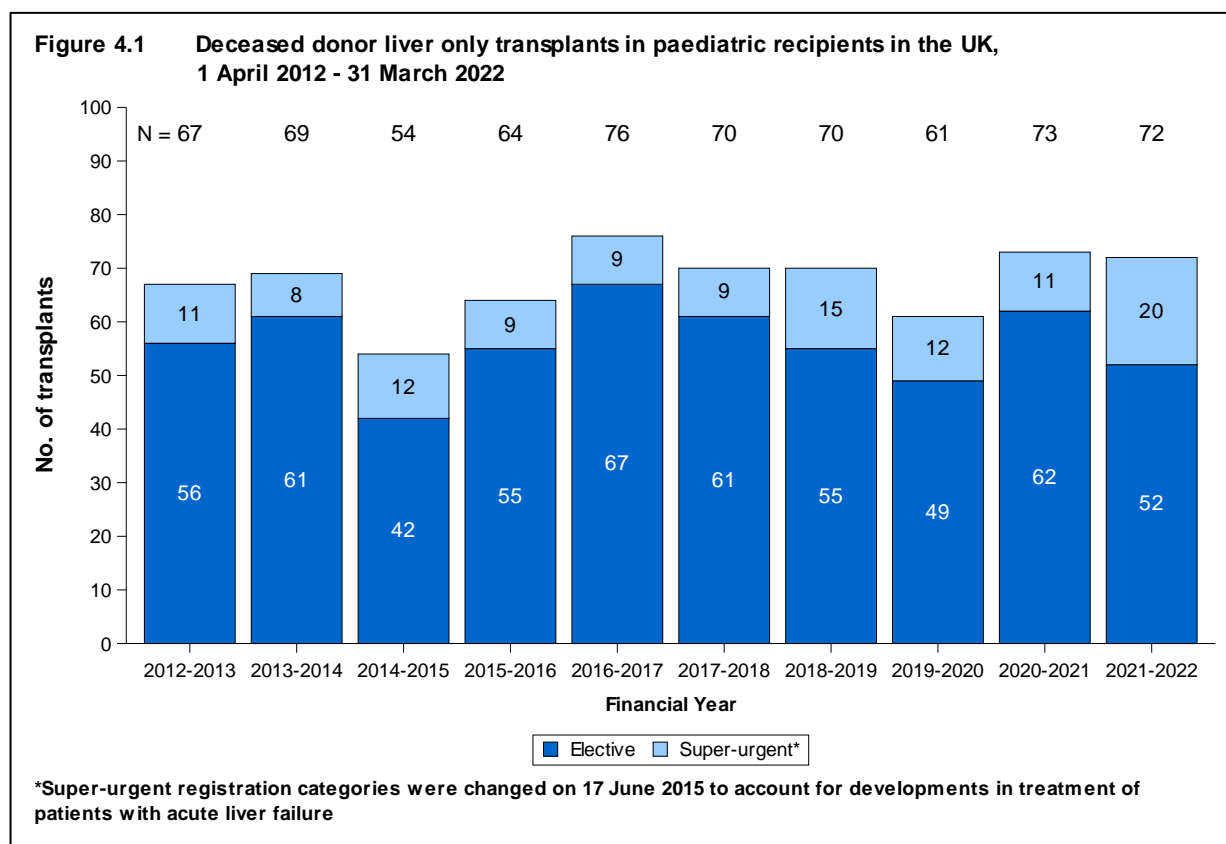
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% Returned	N	% Returned	N	% Returned	N	% Returned
Newcastle	44	100	43	95	27	96	214	100
Leeds	84	98	83	100	84	95	632	91
Cambridge	92	99	89	100	65	100	537	97
Royal Free	87	100	76	100	62	92	631	85
King's College	166	100	176	99	135	88	1013	91
Birmingham	122	100	111	100	111	100	1062	93
Edinburgh	53	98	53	98	57	63	509	56
Total	648	99	631	99	541	91	4598	88

Paediatric Liver Transplantation

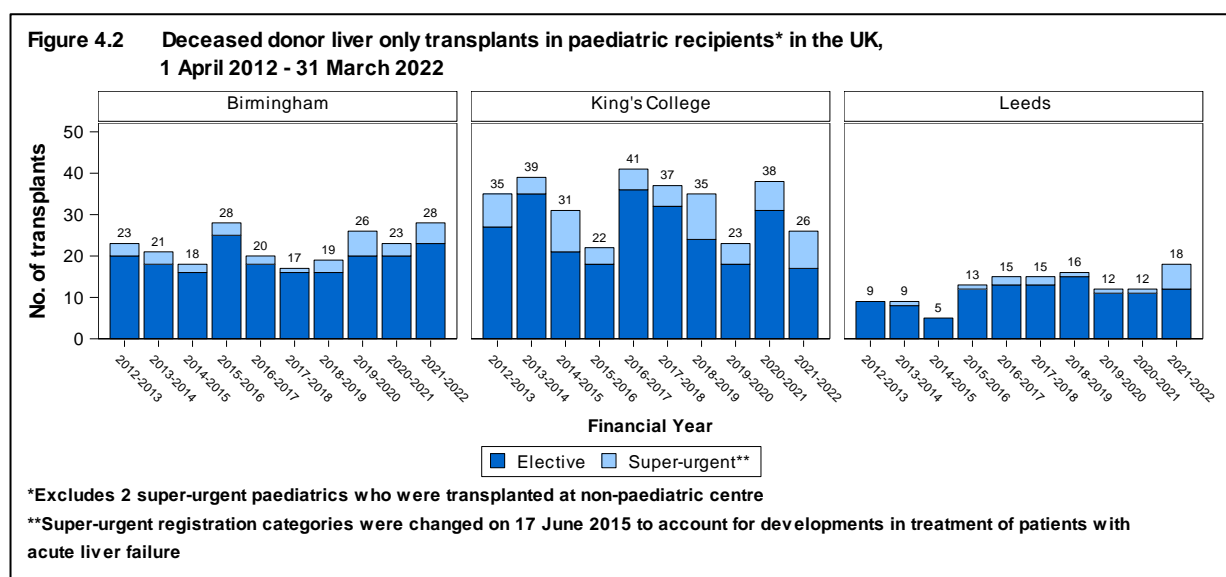


4.1 Overview

The number of deceased donor liver only transplants for paediatric recipients in the last ten years is shown overall and by centre in **Figures 4.1 and 4.2**, respectively. See **Appendix 1** for further details.



In the last year, 72 transplants in paediatric recipients were performed. Fifty two (72%) of these transplants were for patients on the [elective](#) list and twenty (28%) for patients on the [super-urgent](#) list.



The overall [median cold ischaemia times](#) (CIT) for paediatric transplant recipients are shown by financial year in **Figure 4.3** for [DBD](#) and [DCD](#) donors, respectively. The national median CIT for transplants from DBD donors has decreased slightly from 9.38 hours in 2012/13 to 8.39 hours in 2021/22. The corresponding national median for DCD donor transplants has also decreased over the ten year period, from 8.67 hours in 2012/13 to 6.83 hours in 2021/22. It should be noted the number of DCD paediatric transplants ranged between 0 and 7 per financial year with 2 in 2021/22.

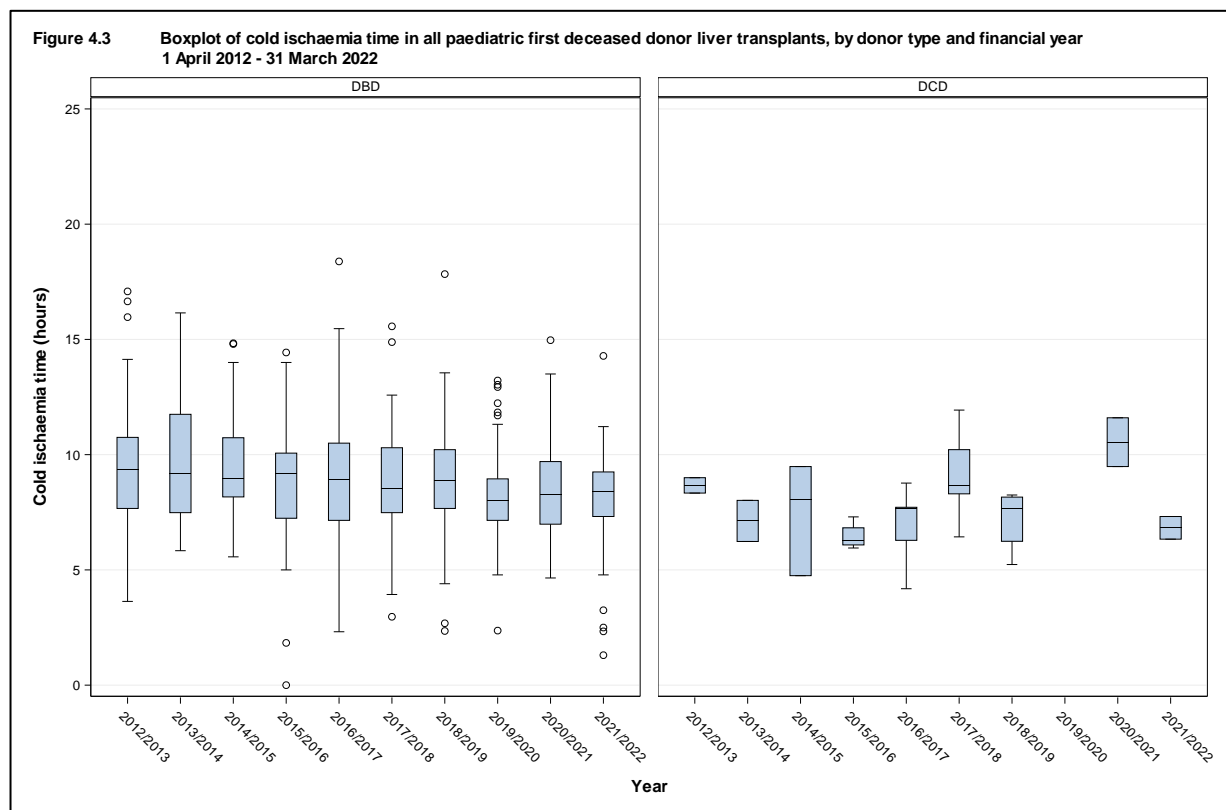


Figure 4.4 shows boxplots of [cold ischaemia times](#) (CIT) for paediatric transplant recipients by centre in the latest financial year (2021/2022) while **Figure 4.5** and **Figure 4.6** show the equivalent information by centre and donor type over the last ten financial years for [DBD](#) and [DCD](#) donors, respectively. The median (IQR) CIT for DBD in the last financial year were 8.1 (7.4, 8.5) hours at Birmingham, 8.7 (7.9, 9.9) hours at King’s College and 8.2 (6.2, 9.3) hours at Leeds.

The cold ischaemia time used is as reported on the liver transplant record form and may include periods of machine perfusion; no adjustment has been made for this. Two of paediatric deceased donor first liver only transplants performed in the latest financial year were reported to have involved machine perfusion.

Figure 4.4 Boxplot of cold ischaemia time in all paediatric first deceased donor liver transplants, by donor type and transplant centre
1 April 2021 - 31 March 2022

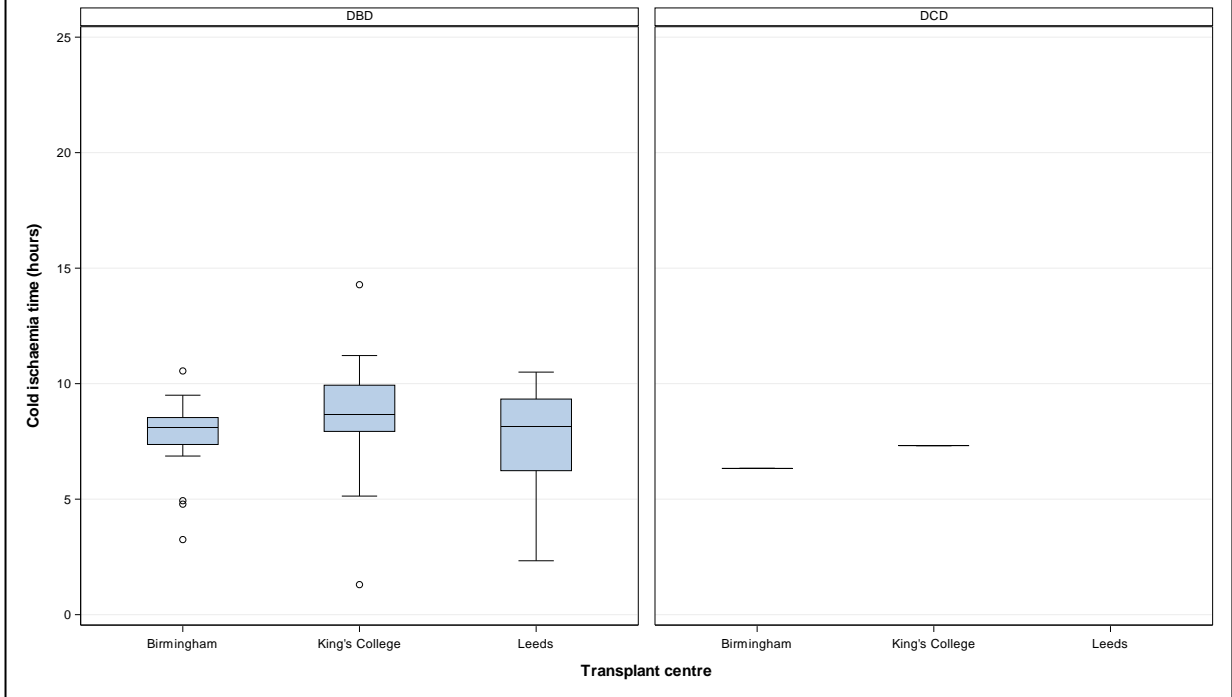
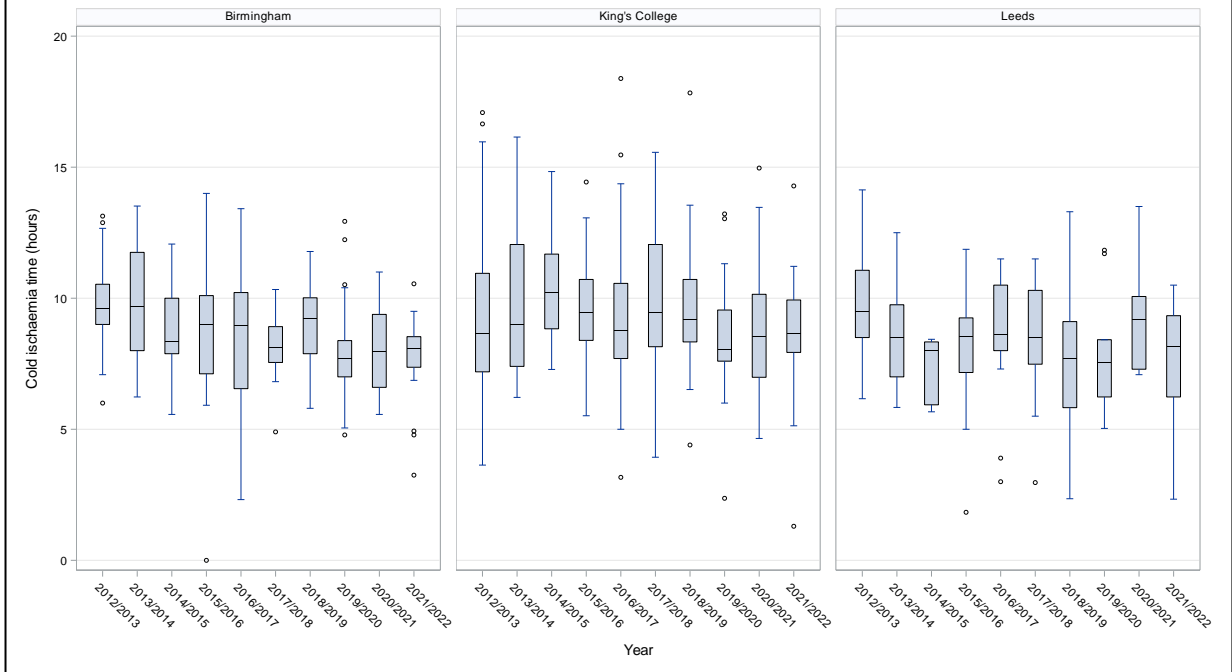
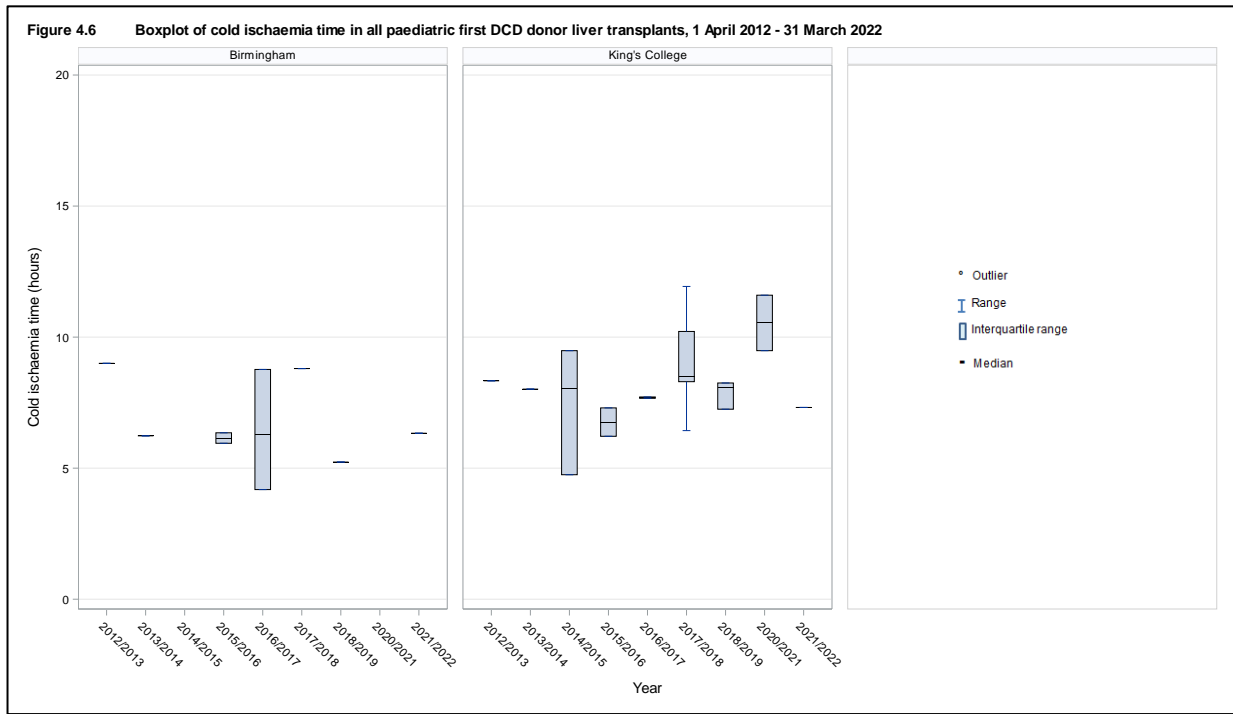


Figure 4.5 Boxplot of cold ischaemia time in all paediatric first DBD donor liver transplants, 1 April 2012 - 31 March 2022





The demographic characteristics of 91 paediatric registrations and 72 paediatric transplant recipients in the latest year are shown by centre and nationally in **Table 4.1**. Of the patients registered for a liver transplant, 48% were male, 27% were between 1 - 4 years old and 25% were registered as super-urgent. Of the transplant recipients, 53% were male, 32% were aged between one and four years old and 28% were of [super-urgent](#) status. For some characteristics, due to rounding, percentages may not add up to 100.

Table 4.1 Demographic characteristics of paediatric registrations and deceased donor liver transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham N (%)		King's College N (%)		Leeds N (%)		TOTAL N (%)	
		Registration	Transplant	Registration	Transplant	Registration	Transplant	Registration	Transplant
Number		29	28	37	26	25	18	91 (100)	72 (100)
Recip age years	<1	6 (21)	5 (18)	9 (24)	2 (8)	6 (24)	2 (11)	21 (23)	9 (13)
	1-4	6 (21)	6 (21)	14 (38)	13 (50)	5 (20)	4 (22)	25 (27)	23 (32)
	5-12	15 (52)	13 (46)	10 (27)	8 (31)	11 (44)	8 (44)	36 (40)	29 (40)
	13-16	2 (7)	4 (14)	4 (11)	3 (12)	3 (12)	4 (22)	9 (10)	11 (15)
Recipient sex	Male	15 (52)	16 (57)	20 (54)	15 (58)	9 (36)	7 (39)	44 (48)	38 (53)
	Female	14 (48)	12 (43)	17 (46)	11 (42)	16 (64)	11 (61)	47 (52)	34 (47)
Indication	Super Urgent	5 (17)	5 (18)	12 (32)	9 (35)	6 (24)	6 (33)	23 (25)	20 (28)
	Biliary Atresia	6 (21)	9 (32)	6 (16)	6 (23)	5 (20)	2 (11)	17 (19)	17 (24)
	Other	0 (0)	0	0 (0)	0	0 (0)	1 (6)	0 (0)	1 (1)
	Cholestatic								
	Metabolic	1 (3)	1 (4)	1 (3)	1 (4)	4 (16)	2 (11)	6 (7)	4 (6)
	Other	17 (59)	13 (46)	18 (49)	10 (38)	10 (40)	7 (39)	45 (49)	30 (42)
Pre-transplant in-patient status	Out-patient		18 (64)		12 (46)		10 (56)		40 (56)
	In-patient		10 (36)		14 (54)		8 (44)		32 (44)
Pre-transplant renal support	No		27 (96)		20 (77)		13 (72)		60 (83)
	Yes		0		6 (23)		5 (28)		11 (15)
	Not reported		1 (4)		0		0		1 (1)
Ascites	Absence		12 (43)		17 (65)		11 (61)		40 (56)
	Presence		16 (57)		9 (35)		5 (28)		30 (42)
	Not reported		0		0		2 (11)		2 (3)
Previous abdominal surgery	No	17 (59)	13 (46)	13 (35)	17 (65)	11 (44)	12 (67)	41 (45)	42 (58)
	Yes	7 (24)	15 (54)	12 (32)	9 (35)	8 (32)	5 (28)	27 (30)	29 (40)
	Not reported	0	0	0	0	0	1 (6)	0	1 (1)
	Not collected for super-urgent	5 (17)		12 (32)		6 (24)		23 (25)	

Table 4.1 Demographic characteristics of paediatric registrations and deceased donor liver transplant recipients, 1 April 2021 - 31 March 2022

		Birmingham N (%)		King's College N (%)		Leeds N (%)		TOTAL N (%)	
		Registration	Transplant	Registration	Transplant	Registration	Transplant	Registration	Transplant
INR	<=1.0	9 (31)	15 (54)	9 (24)	6 (23)	5 (20)	0	23 (25)	21 (29)
	1.1-1.5	11 (38)	8 (29)	10 (27)	9 (35)	10 (40)	9 (50)	31 (34)	26 (36)
	1.6-3.0	5 (17)	0	7 (19)	8 (31)	4 (16)	4 (22)	16 (18)	12 (17)
	>3.0	4 (14)	4 (14)	11 (30)	3 (12)	6 (24)	5 (28)	21 (23)	12 (17)
	Not reported	0 (0)	1 (4)	0 (0)	0	0 (0)	0	0 (0)	1 (1)
Serum sodium mmol/l	<135	7 (24)	5 (18)	7 (19)	3 (12)	2 (8)	1 (6)	16 (18)	9 (13)
	>=135	22 (76)	22 (79)	30 (81)	23 (88)	22 (88)	16 (89)	74 (81)	61 (85)
	Not reported	0 (0)	1 (4)	0 (0)	0	1 (4)	1 (6)	1 (1)	2 (3)
Donor age years	<5		1 (4)		1 (4)		0		2 (3)
	5-16		2 (7)		1 (4)		2 (11)		5 (7)
	17-30		12 (43)		17 (65)		6 (33)		35 (49)
	>=31		13 (46)		7 (27)		10 (56)		30 (42)
Donor sex	Male		13 (46)		15 (58)		12 (67)		40 (56)
	Female		15 (54)		11 (42)		6 (33)		32 (44)
Donor type	Donor after brain death		27 (96)		25 (96)		18 (100)		70 (97)
	Donor after cardiac death		1 (4)		1 (4)		0		2 (3)
Graft appearance	Normal		25 (89)		26 (100)		17 (94)		68 (94)
	Abnormal		3 (11)		0		1 (6)		4 (6)
Graft type	Whole		9 (32)		6 (23)		5 (28)		20 (28)
	Segmental		5 (18)		7 (27)		7 (39)		19 (26)
Urgency Status	Elective	24 (83)	23 (82)	25 (68)	17 (65)	19 (76)	12 (67)	68 (75)	52 (72)
	Super Urgent	5 (17)	5 (18)	12 (32)	9 (35)	6 (24)	6 (33)	23 (25)	20 (28)

Paediatric Liver Transplantation Elective Patients



4.2.1 Transplant list

Figure 4.7 shows the number of paediatric [elective](#) patients on the liver only transplant list at 31 March each year between 2013 and 2022. The number of patients on the [active](#) liver only transplant list has ranged between 24 and 42 each year with 28 paediatrics active on the liver only transplant list on 31 March 2022.

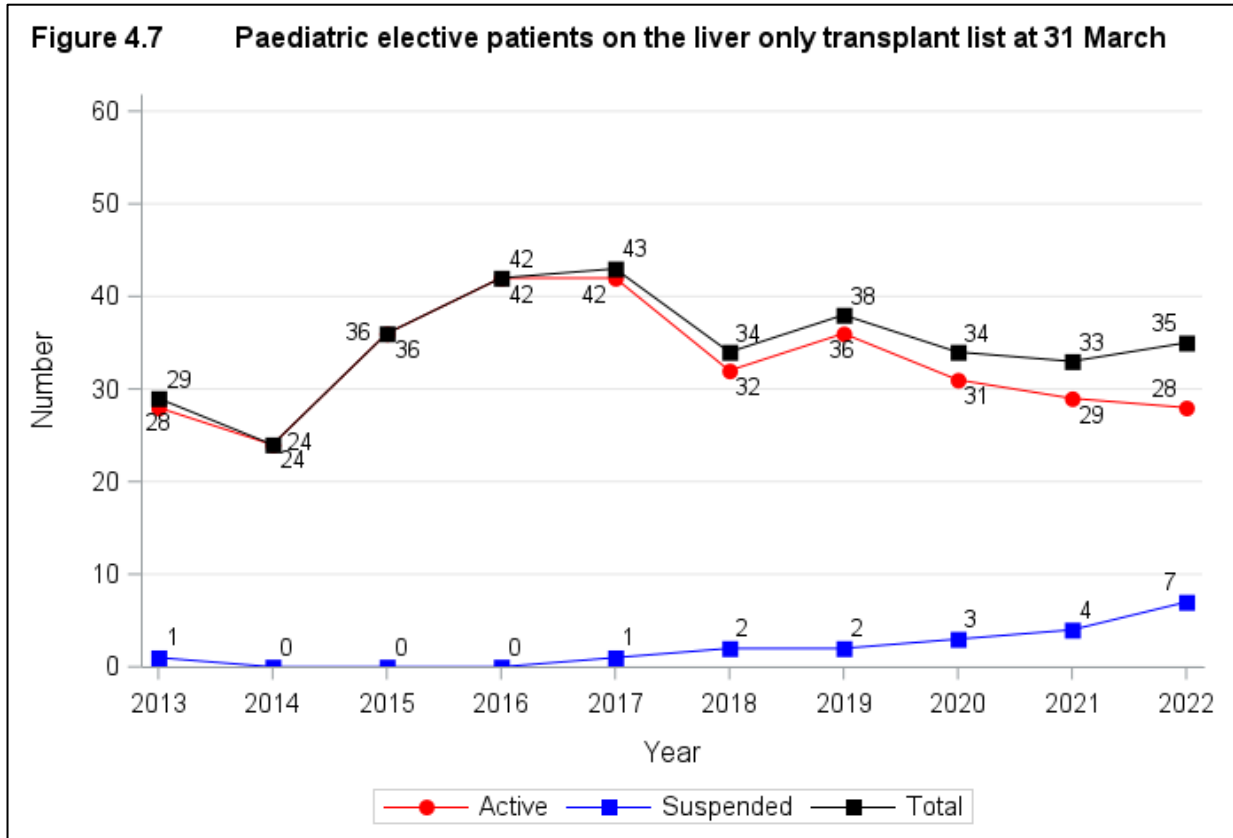
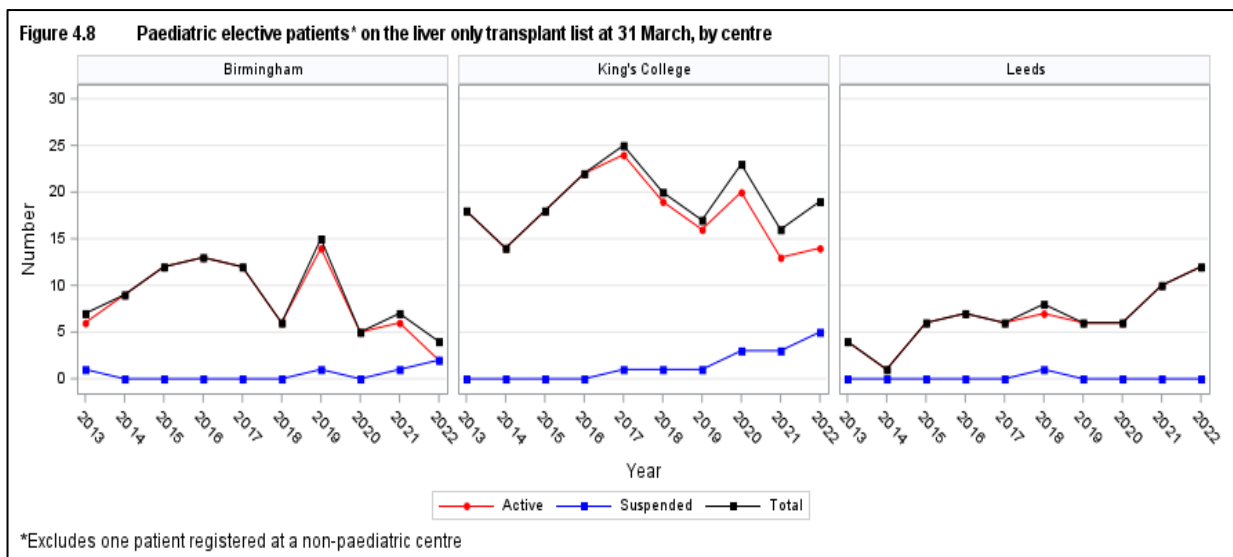


Figure 4.8 shows the number of [elective](#) patients on the transplant list at 31 March each year between 2013 and 2022 for each transplant centre.



An indication of outcomes for paediatrics listed for a liver transplant is summarised in **Figure 4.9**. This shows the proportion of paediatrics transplanted or still waiting six months, one and two years after joining the list. After six months, 69% of paediatrics have had a liver transplant, and 23% were still waiting.

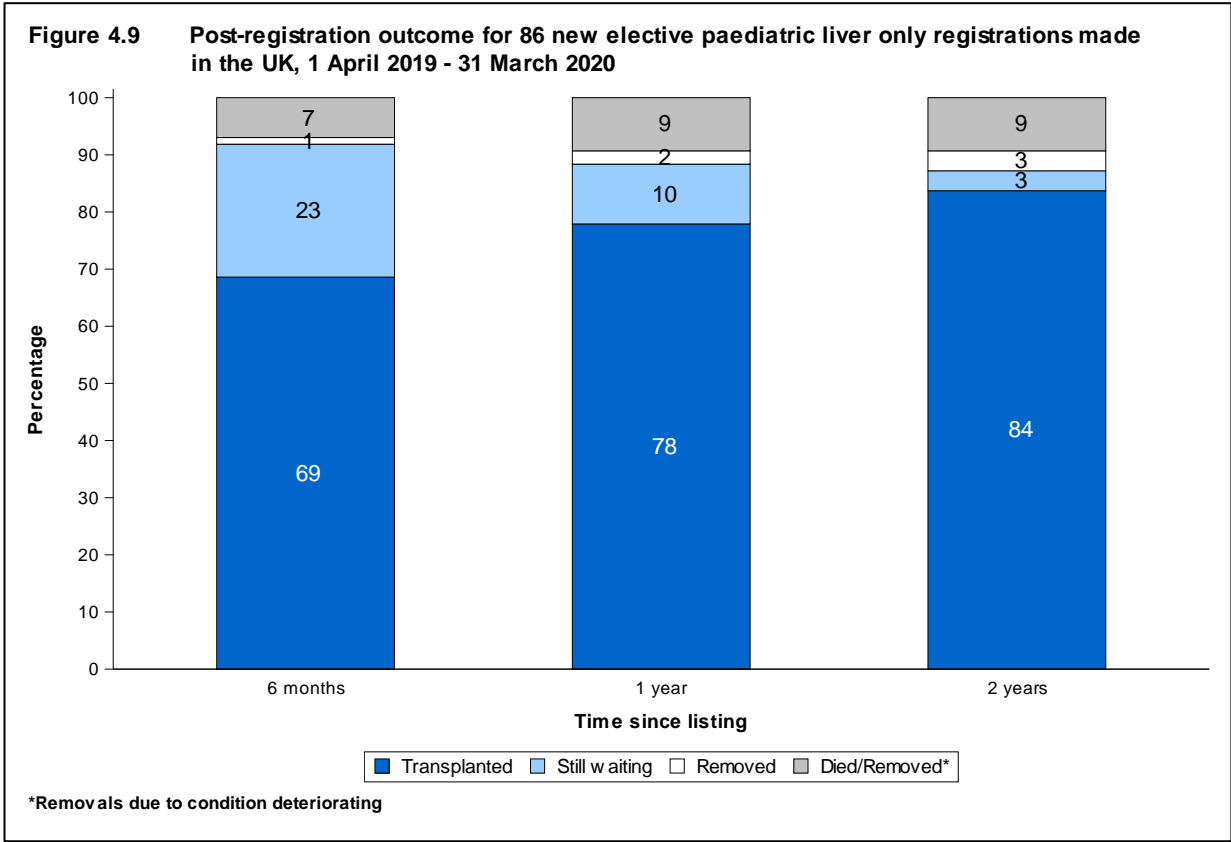


Figure 4.10 shows the proportion of patients transplanted, removed, died while waiting, or still waiting on the list at 6 months after joining the list at each transplant centre. The proportion of patients transplanted six months after listing at each centre ranges from 63% at King’s College to 80% at Leeds.

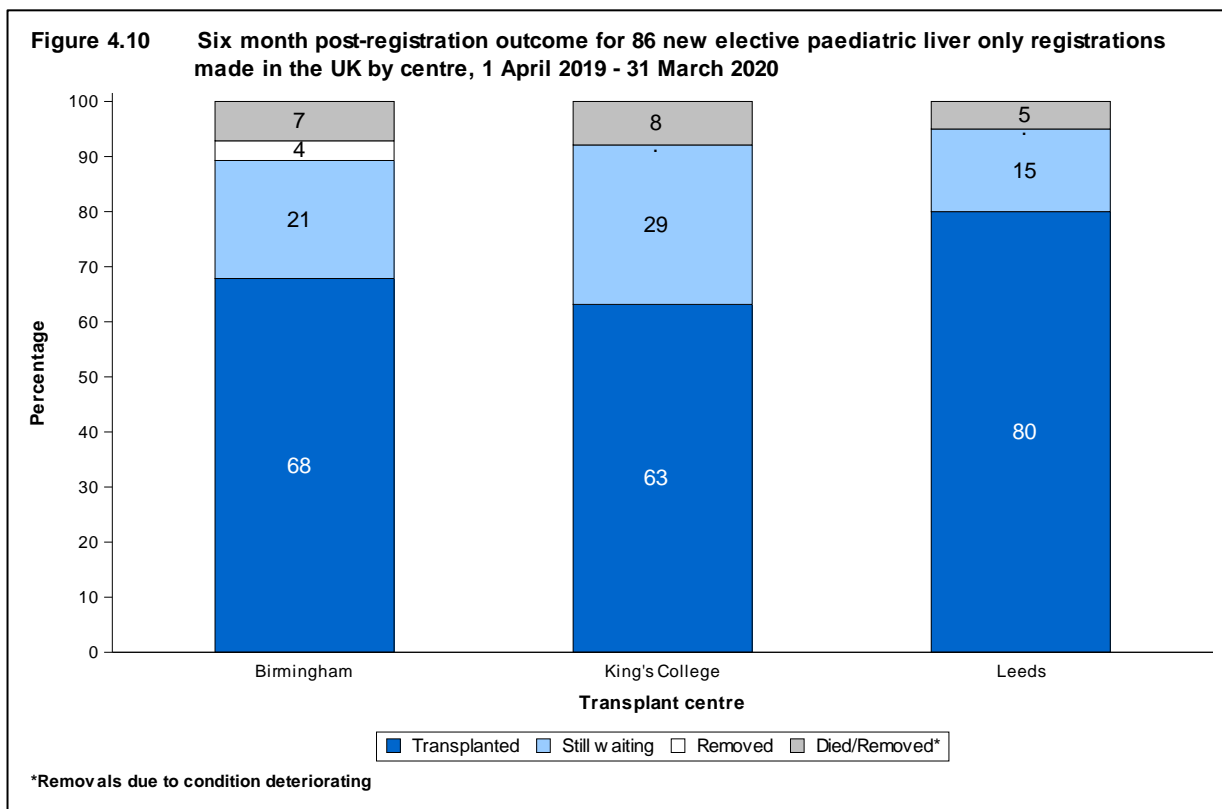
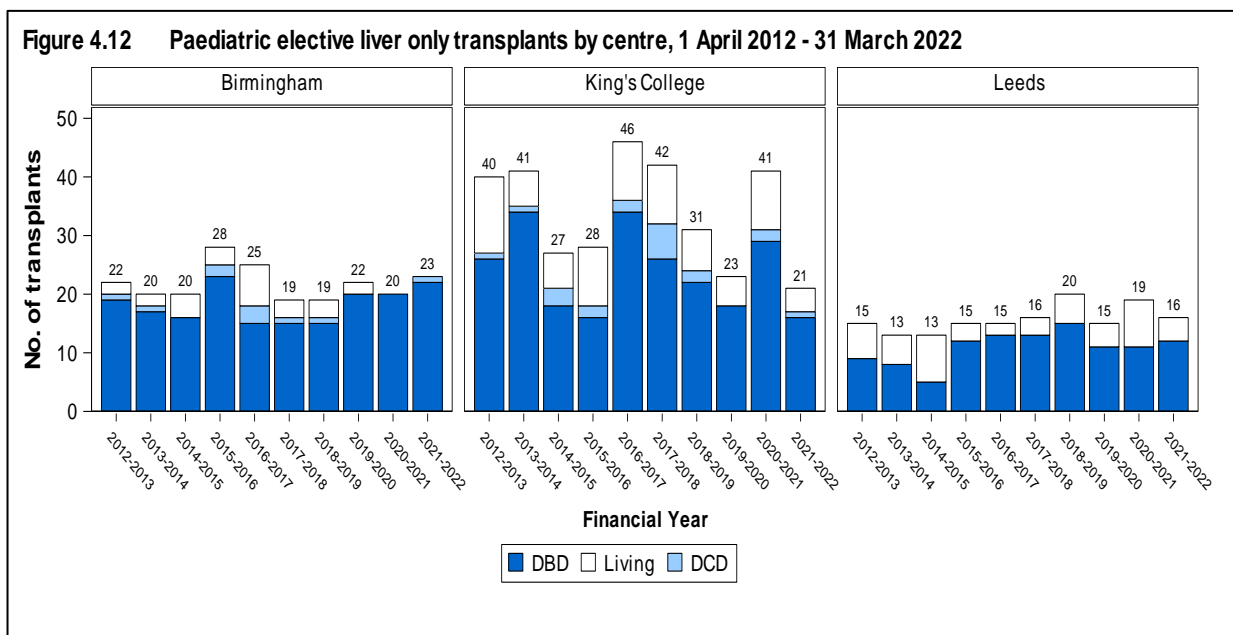
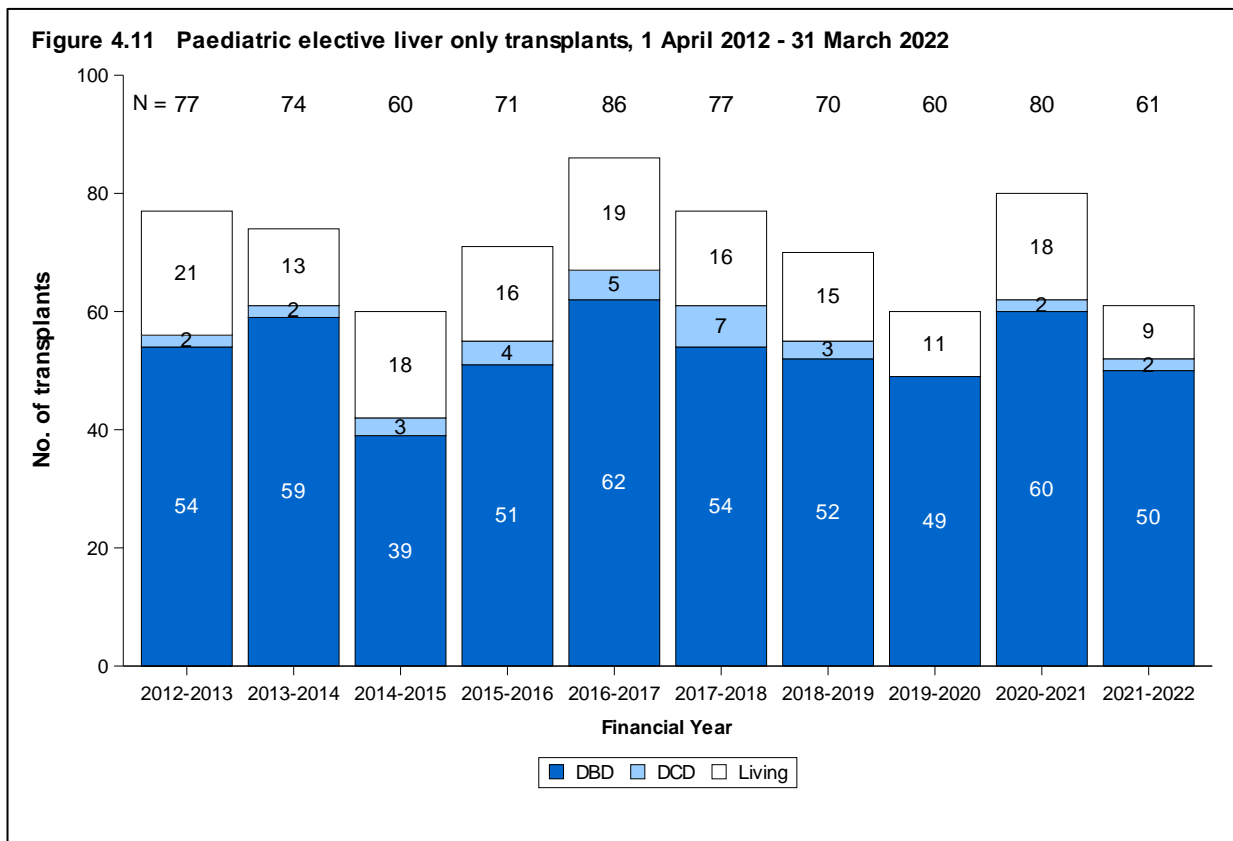


Table 4.2 shows the [median waiting time](#) to deceased donor liver only transplant for paediatric [elective](#) patients. The median waiting time to transplant is longest at King's College at 72 days, and shortest at Birmingham, at 61 days. The national median waiting time to transplant is 67 days.

Table 4.2 Median waiting time to liver only transplant in the UK, for paediatric elective patients registered 1 April 2018 - 31 March 2021			
Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Birmingham	79	61	21 - 101
Leeds	46	67	47 - 87
King's College	87	72	44 - 100
UK	212	67	53 - 81

4.2.2 Transplant activity

Figure 4.11 shows the number of paediatric elective liver only transplants from deceased and living donors performed in the last ten years, by type of donor. Figure 4.12 shows the same information by centre.



4.2.3 Post-transplant survival

Table 4.3 shows the [unadjusted](#) one year paediatric [patient survival](#) for all 226 deceased donor transplants (excluding [auxiliary](#) transplants) from 1 April 2017 to 31 March 2021, nationally and by centre. Note that these survival rates should be interpreted with caution as one-year patient follow-up is incomplete for two of the three transplant centres (refer to **Table 4.8**).

Table 4.3 One year unadjusted patient survival for paediatric elective deceased donor first liver transplants, 1 April 2017 - 31 March 2021			
Centre	Number of transplants	1-year survival % (95% CI)	
Leeds	50	98.0	(86.6 - 99.7)
King's College Birmingham	104	95.0	(88.3 - 97.9)
	72	90.1	(80.3 - 95.2)
Total	226	94.0	(90.0 - 96.5)

Table 4.4 shows the [unadjusted](#) five year paediatric [patient survival](#) for all 222 transplants (excluding [auxiliary](#) transplants) from 1 April 2013 to 31 March 2017, nationally and by centre. Note that these survival rates should be interpreted with caution as lifetime patient follow-up is incomplete for all centres (refer to **Table 4.8**).

Table 4.4 Five year unadjusted patient survival for paediatric elective deceased donor first liver transplants, 1 April 2013 - 31 March 2017			
Centre	Number of transplants	5-year survival % (95% CI)	
Leeds	38	97.3	(82.3 - 99.6)
King's College Birmingham	107	95.1	(88.7 - 97.9)
	77	92.2	(83.4 - 96.4)
Total	222	94.5	(90.4 - 96.8)

Paediatric Liver Transplantation Super-Urgent Patients



4.3.1 Transplant list

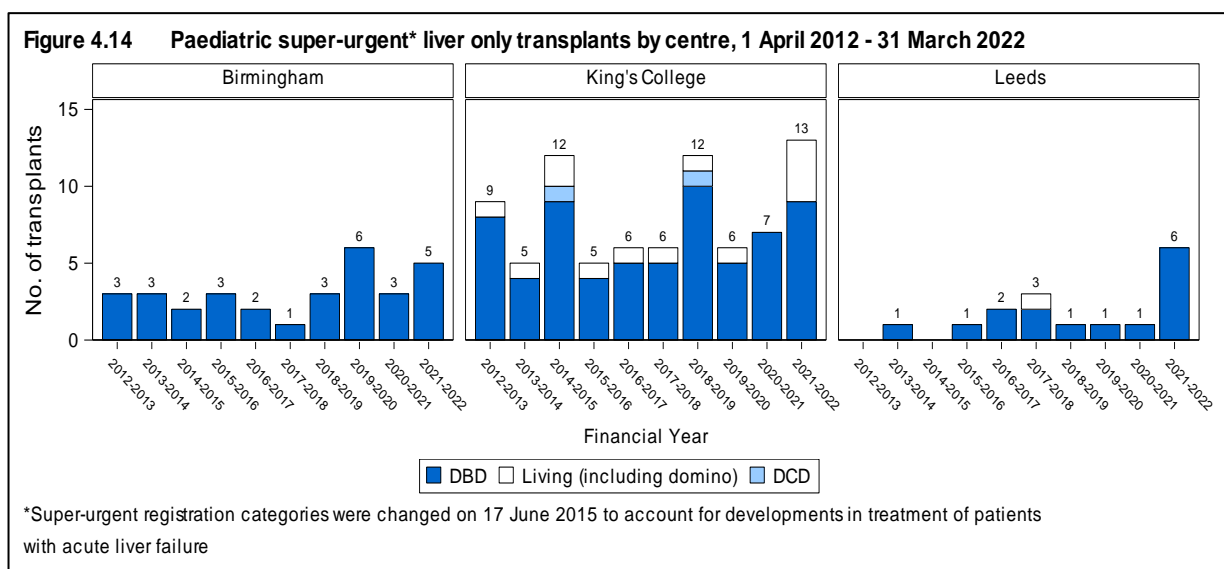
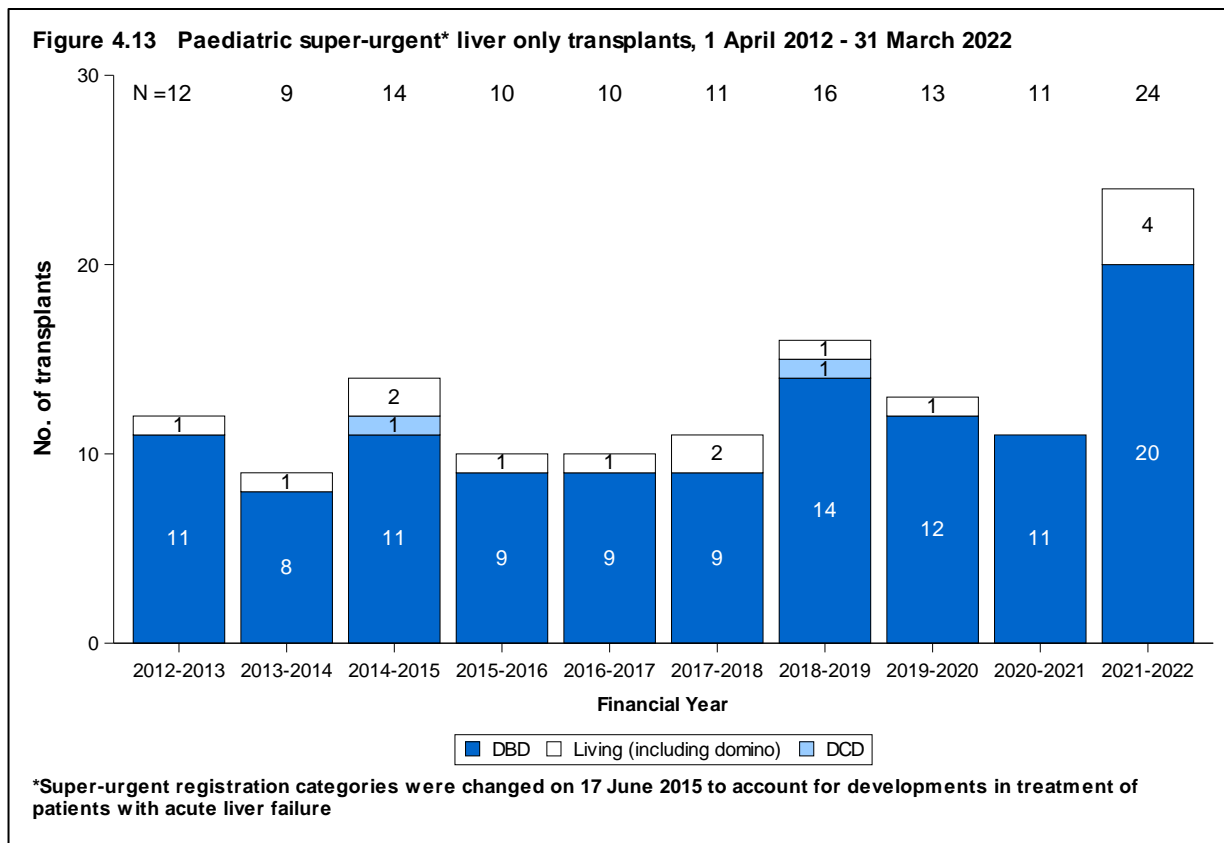
Table 4.5 shows the [median waiting time](#) to deceased donor liver only transplant for paediatric [super-urgent](#) patients. The median waiting time to transplant is shortest at Birmingham but there is no statistically significant difference across the three centres (log-rank p-value=0.3). The national median waiting time to transplant is four days.

Table 4.5 Median waiting time to liver only transplant in the UK for, paediatric super urgent patients registered 1 April 2018 - 31 March 2021			
Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Paediatric			
Birmingham	22	3	2 - 4
King's College	31	5	3 - 7
Leeds	5	6	1 - 11
UK	58	4	3 - 5

Table 4.5 includes registrations for re-transplants. Of the 59 registrations for the UK in the time period, 48 led to transplants. 10 of the 48 transplants were re-transplants, hence, the difference between the 38 *first* deceased donor liver only transplants reported in **Figure 4.13** for the period 2018 – 2021 and **Table 4.5**.

4.3.2 Transplant activity

Figure 4.13 shows the number of paediatric super-urgent first liver only transplants from deceased and living (including domino) donors performed in the last ten years, by type of donor. **Figure 4.14** shows the same information by transplant centre.



4.3.3 Post-transplant survival

One year [unadjusted patient survival](#) for 33 transplants (excluding [auxiliary](#) transplants) between 1 April 2017 and 31 March 2021 is shown in **Table 4.6**. Note that these survival rates should be interpreted with caution as one-year patient follow-up is incomplete for two of the three transplant centres (refer to **Table 4.8**).

Table 4.6 One year unadjusted patient survival for paediatric deceased donor super urgent first transplants, 1 April 2017 - 31 March 2021			
Centre	Number of transplants	1-year survival % (95% CI)	
Leeds	5 ¹	-	-
King's College	14	78.6	(47.2 - 92.5)
Birmingham	13	83.9	(49.4 - 95.7)
Total*	33	84.4	(66.5 - 93.2)

* Includes 1 patient transplanted at a non-paediatric centre
¹ Survival rates for less than 10 transplants are not presented due to small numbers

Table 4.7 shows the [unadjusted](#) five year paediatric [patient survival](#) for 36 transplants (excluding [auxiliary](#) transplants) between 1 April 2013 and 31 March 2017, nationally and by centre. Note that these survival rates should be interpreted with caution as lifetime patient follow-up is incomplete for all centres (refer to **Table 4.8**).

Table 4.7 Five year unadjusted patient survival for paediatric deceased donor super urgent first transplants, 1 April 2013 - 31 March 2017			
Centre	Number of transplants	5-year survival % (95% CI)	
Leeds	4 ¹	-	-
King's College	21	90.5	(67.0 - 97.5)
Birmingham	10	80.0	(40.9 - 94.6)
Total*	36	88.6	(72.4 - 95.5)

* Includes 1 patient transplanted at a non-paediatric centre
¹ Survival rates for less than 10 transplants are not presented due to small numbers

The survival rates presented in the two tables have wide confidence intervals due to the small number of transplants performed and should, therefore, be interpreted with caution.

Paediatric Liver Transplantation Form return rates



Form return rates are reported in **Table 4.8** for the liver transplant record, three month and one year follow up forms, along with lifetime follow-up (after the first year). These include all paediatric [elective and super-urgent](#) deceased donor transplants between 1 January 2021 and 31 December 2021 for the transplant record, and all requests for follow-up forms issued in this time period.

Table 4.8 Form Return rates 1 January 2021 - 31 December 2021								
Centre	Transplant Record		3 Month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Leeds	16	100	15	87	14	79	83	75
King's College Birmingham	25	100	29	100	35	94	210	88
	26	100	26	100	21	100	139	99
Total	67	100	70	97	70	93	432	89



Appendix



A1 Data

Data were obtained from the UK Transplant Registry for the ten year time period, 1 April 2012 to 31 March 2022 and include NHS Group 2 transplants, [auxiliary](#) transplants, liver only transplants for intestinal failure patients and exclude all other transplants involving the liver for intestinal failure patients.

Geographical variation analysis Registration rates

All NHS group 1 patients who were registered onto the liver transplant list with an active status between 1 April 2021 and 31 March 2022 were extracted from the UK Transplant Registry on 12 July 2022 (numerator). Patients registered for an intestinal transplant requiring a liver were excluded. Patients were assigned to NHS regions in England using their postcode of residence, as reported at registration. The number of registrations per million population (pmp) by NHS region was obtained using mid-2020 population estimates based on the Office for National Statistics (ONS) 2011 Census figures (denominator). No NHS region age- or sex-specific standardisation of rates was performed.

The registration rates pmp were categorised into four groups – low, low-medium, medium-high and high – based on the quartiles of their distribution and visualised in a map using contrasting colours.

Transplant rates

Transplant rates pmp were obtained as the number of liver transplants on NHS group 1 recipients between 1 April 2021 and 31 March 2022 (numerator), divided by the mid-2020 population estimates from the ONS (denominator). Patients who received an intestinal transplant containing a liver were excluded. Transplant rates pmp were categorised and visualised in a map as done for the registration rates.

Systematic component of variation

Only registrations or transplants in England between 1 April 2021 and 31 March 2022 were included. If a patient was re-registered during the time period, only the first registration was considered. If a patient underwent more than one liver transplant in the time period, only the first transplant was considered.

Adult and paediatric analysis

The adult and paediatric sections are limited to first liver only transplants, and survival is only estimated for deceased donor transplants, excluding [auxiliary](#) transplants.

Table A1.1 shows the total number of adult transplants in the three time periods defined in the report, including atypical donor, [multi-organ](#) and re-transplants. **Table A1.2** shows the number of adult deceased donor first liver only transplants.

Table A1.1 Number of adult liver transplants in each time period, by transplant centre and urgency status

Transplant centre	Latest year		Last 3 years		Last 10 years	
	April 2021-March 2022		April 2019-March 2022		April 2012-March 2022	
	Elective	Super-urgent	Elective	Super-urgent	Elective	Super-urgent
Newcastle	38	3	99	12	340	47
Leeds	80	12	271	33	992	127
Cambridge	95	7	259	29	863	103
Royal Free	90	11	288	33	896	135
King's College	160	28	487	63	1652	189
Birmingham	152	14	466	41	1713	183
Edinburgh	58	2	178	14	798	84
TOTAL	680¹	77	2061²	225	7286³	868

¹ Includes 4 and 3 transplants performed at London Bridge Hospital and Cromwell Hospital, respectively

² Includes 10 and 3 transplants performed at London Bridge Hospital and Cromwell Hospital, respectively

³ Includes 25 and 7 transplants performed at London Bridge Hospital and Cromwell Hospital, respectively

Table A1.2 Number of deceased donor adult first liver only transplants in each time period, by transplant centre and urgency status

Transplant centre	Latest year		Last 3 years		Last 10 years	
	April 2021-March 2022		April 2019-March 2022		April 2012-March 2022	
	Elective	Super-urgent	Elective	Super-urgent	Elective	Super-urgent
Newcastle	36	3	90	11	302	41
Leeds	75	9	250	26	893	87
Cambridge	88	6	229	20	782	61
Royal Free	85	8	268	27	834	103
King's College	151	20	443	48	1450	147
Birmingham	138	10	407	30	1521	137
Edinburgh	56	2	166	10	741	48
TOTAL	629	58	1853	172	6523	624

Table A1.3 shows the total number of paediatric transplants in the three time periods defined in the report, including atypical donor, [multi-organ](#) and re-transplants. **Table A1.4** shows the number of paediatric deceased donor first liver only transplants. Transplants were excluded from the [patient survival](#) analysis if [risk factors](#) were missing. Therefore, missing factors were not imputed.

Table A1.3 Number of paediatric liver transplants in each time period, by transplant centre and urgency status

Transplant centre	Latest year		Last 3 years		Last 10 years	
	April 2021-March 2022		April 2019-March 2022		April 2012-March 2022	
	Elective	Super-urgent	Elective	Super-urgent	Elective	Super-urgent
Newcastle	0	0	0	0	0	1
Leeds	18	6	54	8	170	24
Cambridge	0	0	0	0	0	1
Royal Free	0	0	0	0	1	1
King's College	22	15	92	30	362	94
Birmingham	23	6	73	17	259	48
TOTAL	64¹	27	220¹	55	793¹	169

¹ Includes 1 transplant performed at Cromwell Hospital

Table A1.4 Number of deceased donor paediatric first liver only transplants in each time period, by transplant centre and urgency status

Transplant centre	Latest year		Last 3 years		Last 10 years	
	April 2021-March 2022		April 2019-March 2022		April 2012-March 2022	
	Elective	Super-urgent	Elective	Super-urgent	Elective	Super-urgent
Newcastle	0	0	0	0	0	1
Leeds	12	6	34	8	109	15
Cambridge	0	0	0	0	0	1
King's College	17	9	66	21	259	68
Birmingham	23	5	63	14	192	31
TOTAL	52	20	163	43	560	116

A2 Methods

Waiting time to transplant

Waiting time is calculated from date of registration to date of transplant, for patients registered for a liver. Patients who are registered for another organ within the timeframe are excluded and only deceased donor transplants are included. Registrations for a re-transplant are included. [Kaplan-Meier](#) estimates are used to calculate waiting time, where patients who are removed or died on the waiting list are censored at the date of the event. Patients who are still actively waiting for a transplant are censored at that time. Any periods of suspension are not included in the waiting time.

Geographical variation analysis

For a given individual who is a resident in a given NHS region registration to the transplant list is modelled as a Bernoulli trial. At the whole area level, this becomes a Binomial process which can be approximated by a Poisson distribution when rare events are modelled. Transplant counts follow similar assumptions.

To allow for the possibility that, even after allowing for area-specific Poisson rates, area differences remain, introduce an additional multiplicative rate factor which varies from area to area. Postulate a non-parametric distribution for the multiplicative factor, with variance σ^2 . If the factor is one for all areas, then area differences are fully explained by the area-specific Poisson rate. If the factor varies with a nonzero variance, σ^2 , then we conclude that there are unexplained area differences.

The systematic component of variation (SCV; McPherson et al., N Engl J Med 1982, 307: 1310-4) is the moment estimator of σ^2 . Under the null hypothesis of homogeneity across areas, the SCV would be zero. The SCV, therefore, allows us to detect variability across areas beyond that expected by chance; the larger the SCV, the greater the evidence of systematic variation across areas.

A one-sided p-value for the hypothesis that the SCV is greater than zero versus the null hypothesis that the SCV is equal to zero was derived using a parametric bootstrap where data were simulated from the Poisson distribution that would be consistent with the null hypothesis (multiplicative rate factor is equal to one in all areas and σ^2 equal to zero). The observed SCV was then compared against this simulated data to

calculate the probability that an SCV of at least this size would be observed due to chance if the null hypothesis were true.

10,000 bootstrap samples of size 7 (number of areas) were simulated, where the registration/transplant count in each area was drawn from a Poisson distribution with its expected value being the area-specific expected count (the rate of transplants/registrations in the total population multiplied by the population of the area) . The SCV was then calculated in each of the 10,000 samples and a bootstrap p-value for the SCV in the observed data was estimated as:

$$P_{boot} = \frac{1 + \#\{SCV_{sim} \geq SCV_{obs}\}}{10000 + 1}$$

where $\#\{SCV_{sim} \geq SCV_{obs}\}$ is the number of SCV values in the simulated datasets which are greater than or equal to the SCV in the observed data. This follows the simulation method given in Ibanez et al., BMC Health Services Research, 2009, 9:60. No adjustment was made for area-specific demographic characteristics that may impact the rates of registration to the transplant list and transplantation such as age and sex.

Unadjusted survival rates

[Unadjusted patient survival](#) and [graft function](#) rates were estimated using [Kaplan-Meier](#) methods. Patient survival rates are based on the number of patients transplanted and the number and timing of those that die within the post-transplant period of interest. Patients can be included in this method of analysis irrespective of the length of follow-up recorded. If a patient is alive at the end of the follow-up, then information about the survival of the patient is censored at the time of analysis. Death, irrespective of whether the graft is still functioning or not, is classed as an event. Estimates of graft function follow similar principles but the event of interest is graft failure in living post-transplant recipients instead of recipient death.

Risk-adjusted survival rates

A [risk-adjusted survival rate](#) is an estimate of what the survival rate at a centre would have been if they had the same mix of patients as the one seen nationally. The risk-adjusted rate therefore presents estimates for which differences in the patient mix across centres have been removed as much as possible. For that reason, it is valid to only compare centres using risk-adjusted rather than unadjusted rates, as differences among the latter can be attributed to differences in the patient mix.

Risk-adjusted survival estimates were obtained through indirect standardisation. A [Cox Proportional Hazards model](#) was used to determine the probability of survival for each patient based on their individual risk factor values. The sum of these probabilities for all patients at a centre gives the number, E , of patients or grafts expected to survive at least one year or five years after transplant at that centre. The number of patients who actually survive the time period of interest is given by O . The risk-adjusted estimate is then calculated by multiplying the ratio O/E by the overall unadjusted survival rate across all centres. The risk-adjustment models used were based on results from previous studies that looked at factors affecting the survival rates of interest. The factors included in the **survival post transplantation** models are shown in **Tables A3.1 and A3.2** below.

The [funnel plot](#) is a graphical method to show how consistent the survival rates of the different transplant centres are compared to the national rate. The graph shows for each centre, 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.

A fundamentally similar method was used to conduct the **survival from listing** analysis. The [risk factors](#) used in this case were: recipient blood group, recipient age at registration, recipient ethnic group, recipient primary disease at registration, recipient sex, recipient BMI, serum creatinine, serum sodium, serum bilirubin, INR and year of registration, as shown in **Table A3.3**.

A3 Risk models

Table A3.1 Risk factors and categories used in the adult elective risk adjusted survival models post transplantation	
Recipient sex	Male Female
Recipient ethnicity	White Non-white
Indication	Cancer HCV ALD HBV PSC PBC AID Metabolic Other Acute hepatic failure
Recipient HCV status	Negative Positive
Pre-transplant in-patient status	Out-patient In-patient
Ascites	Absence Presence
Encephalopathy	Absence Presence
Pre-transplant renal support	No Yes
Previous abdominal surgery	No Yes
Varices & shunt	Absence Presence without treatment Presence with surgical shunt Presence with TIPS
Life style activity	Normal Restricted Self-care Confined Reliant
Graft appearance	Normal Abnormal
Recipient age years	Per 1 year increase
BMI kg/m ²	Per 1 kg/m ² increase
Serum Bilirubin µmol/l	≤30 31-50 51-70

Table A3.1 Risk factors and categories used in the adult elective risk adjusted survival models post transplantation	
	71-90
	≥91
Serum Creatinine µmol/l	≤70
	71-90
	91-110
	111-130
	≥131
Serum sodium mmol/l	Per 10 mmol/l increase
Serum potassium mmol/l	Per 1 mmol/l increase
INR	Per 1 unit increase
Serum Albumin g/l	Per 5g/l increase
Cold Ischaemia time	Per 1 hour increase
Time on transplant list	Per 1 month increase
Donor sex	Male
	Female
Donor ethnicity	White
	Non-white
Donor cause of death	Trauma
	CVA
	Others
Donor history of diabetes	No
	Yes
Donor type	Donor after brain death
	Donors after circulatory death
ABO match	Identical
	Compatible
	Incompatible
Graft type	Whole
	Segmental
Donor age years	Per 1 year increase
Donor BMI kg/m ²	Per 1 kg/ m ² increase

Table A3.2 Risk factors and categories used in the adult super-urgent risk adjusted survival models post transplantation	
Recipient sex	Male
	Female
Recipient ethnicity	White
	Non-white
Recipient HCV status	Negative
	Positive
Pre-transplant in-patient status	Out-patient
	In-patient
Ascites	Absence
	Presence
Encephalopathy	Absence
	Presence
Pre-transplant renal support	No
	Yes
Previous abdominal surgery	No
	Yes
Varices & shunt	Absence
	Presence without treatment
	Presence with surgical shunt
	Presence with TIPS

Table A3.2 Risk factors and categories used in the adult super-urgent risk adjusted survival models post transplantation

Life style activity	Normal Restricted Self-care Confined Reliant
Graft appearance	Normal Abnormal
Recip age years	Per 1 year increase
BMI kg/m ²	Per 1 kg/m ² increase
Serum Bilirubin µmol/l	≤100 101-200 201-300 301-400 ≥401
Serum Creatinine µmol/l	≤100 101-130 131-160 161-190 ≥191
Serum sodium mmol/l	Per 10 mmol/l increase
Serum potassium mmol/l	Per 1 mmol/l increase
INR	Per 1 unit increase
Serum Albumin g/l	Per 5g/l increase
Cold Ischaemia time	Per 1 hour increase
Time on transplant list	Per 1 day increase
Donor sex	Male Female
Donor ethnicity	White Non-white
Donor cause of death	Trauma CVA Others
Donor history of diabetes	No Yes
Donor type	Donor after brain death Donors after circulatory death
ABO match	Identical Compatible Incompatible
Graft type	Whole Segmental
Donor age years	Per 1 year increase
Donor BMI kg/m ²	Per 1 kg/ m ² increase

Table A3.3 Risk factors and categories used in the adult elective risk adjusted survival models post registration

Recipient sex	Male Female
Recipient ethnicity	White Non-white
Recipient age at registration years	Per 1 year increase
Recipient BMI kg/m ²	Per 1 kg/m ² increase
Recipient blood group	O A B AB
Indication	Cancer HCV ALD HBV PSC PBC AID Metabolic Other
Serum sodium mmol/l	Per 10 mmol/l increase
Serum creatinine μ mol/l	Per 10 μ mol/l increase
Serum bilirubin μ mol/l	Per 10 μ mol/l increase
INR	Per 1 unit increase
Year of registration	Split into three time intervals equally divided

A4 Glossary of terms

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 organ becomes available, the patient is included among those who are matched against the donor to determine whether or not the organ 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 organs that become available. Permanent suspension is known as a removal from the waiting list and is not included in suspended figures.

Auxiliary transplant

An auxiliary liver transplant involves surgically attaching part of a donor liver to the whole liver of the recipient without removal. The donor liver supports the native liver until it recovers. The donor liver can then be removed or left attached.

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.

Cold ischaemia time (CIT)

The length of time that elapses between an organ being removed from the donor to its transplantation into the recipient is called Cold Ischaemia Time (CIT). Generally, the shorter this time, the more likely the organ is to work immediately and the better the long-term outcome. The factors which determine CIT include a) transportation of the organ from the retrieval hospital to the hospital where the transplant is performed, b) the need to tissue type the donor and cross-match the donor and potential recipients, c) the occasional necessity of moving the organ to another hospital if a transplant cannot go ahead, d) contacting and preparing the recipient for the transplant and e) access to the operating theatre. In cases where organ maintenance systems were used not all of this time duration is ischaemic, and no adjustment has been made for this in this report.

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.

Donor type

Liver donors can be of different types.

Donor after brain death (DBD) means donation which takes place following the diagnosis of death using neurological criteria.

Donor after circulatory death (DCD) means donation which takes place following the diagnosis of death using circulatory criteria.

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 part of their liver to their child.

Domino donor. A donor with a certain type of rare degenerative liver disease who receives a liver transplant to treat their condition. This donor gives their liver to another recipient in a domino liver transplant, because the liver still functions well for other recipients.

Elective and super-urgent patients

Separate selection criteria to join the liver transplant list have been devised for those patients requiring emergency transplantation (super-urgent) compared to those who require a routine procedure (elective transplantation). The two groups have a different range of aetiologies with markedly different short-term prognoses; different criteria are required to define that prognosis. Similarly, processes to allocate a donor liver are different for super-urgent and elective transplantation, reflecting those patient groups with a different risk of death without transplantation.

Funnel plot

A graphical method that shows how consistent the rates, such as survival rates or decline rates, of the different transplant units are compared to the national rate. For survival rates, 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 function

The percentage of patients who are alive with a functioning graft. This is usually specified for a given time period after transplant. For example, a 90 day graft function rate is the percentage of patients alive with a functioning graft 90 days after transplant.

Inter-quartile range (IQR)

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.

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 recipient receives more than one organ. For example, a patient may undergo a transplant of a liver and kidney.

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 first 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.

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 recipient 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.

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