NHS
Blood and Transplant

INTERIM REPORT ON LIVER TRANSPLANTATION

REPORT FOR 2020/2021
(1 OCTOBER 2019 – 30 SEPTEMBER 2020)

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Contents

Executive Summary

This interim report presents key figures about liver transplantation in the UK for the period from 1 October 2019 to 30 September 2020. The report presents information on the number of transplants, patient survival and graft function after liver transplantation; both on a national and centre-specific basis. A full report is produced every year and is published in the summer to include the latest full financial year.

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

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

Key points

- There were 872 **liver transplants** performed in the UK between 1 October 2019 and 30 September 2020. Of these, 749 (86%) were deceased donor first liver only transplants (including liver only transplants due to intestinal failure) and 23 (3%) were living donor first liver only transplants. The remainder were repeated transplants (88) or multi-organ transplants (12).

- Of the 749 **deceased donor first liver only transplants** in the time period, 670 (89%) were in adult recipients and 79 (11%) were in paediatric recipients. The approximate proportion of elective and super-urgent transplants in each of these age groups was 91% to 9% and 76% to 24%, respectively.

- Of the 23 **living donor first liver only (including domino) transplants** in the time period, 5 (22%) were in adult recipients and 18 (78%) were in paediatric recipients. All recipients were elective.

- The unadjusted national **rates of patient survival** 90 days after first liver transplantation from deceased donors were 98% for adult elective and 96% for adult super-urgent registrations. Those for paediatric elective and super-urgent registrations were 94% and 93%, respectively, although this should be regarded as guidance only due to the relatively small number of data points.

- The unadjusted national **rates of graft function** 90 days after first liver transplantation from deceased donors were 95% for adult elective and 92% for adult super-urgent patient registrations. The rates for paediatric elective and super-urgent patient registrations were 90% and 93% respectively but note the caveat above.

- **Table 1.1** provides a summary of liver transplant activity in the UK for 1 October 2019 to 30 September 2020. For comparison, transplant activity figures are also provided for 1 October 2018 to 30 September 2019. Please note that due to the COVID-19 pandemic the number of organs transplanted in 2019/2020 is reduced.

Table 1.1 **Number of first liver only transplants in the UK, by recipient age group and urgency status and by donor type, for 2018/19[1] and for 2019/20[2]**

	2018/19[1]			2019/20[2]		
	Elective	Super-urgent	Total	Elective	Super-urgent	Total
Deceased donor	**768**	**63**	**831**	**671**	**78**	**749**
Adult patient	718	53	771	611	59	670
Paediatric patient	50	10	60	60	19	79
Living donor	**17**	**2**	**19**	**23**	**0**	**23**
Adult patient	4	0	4	5	0	5
Paediatric patient	13	2	15	18	0	18
TOTAL	**785**	**65**	**850**	**694**	**78**	**772**

[1] 1 October 2018 – 30 September 2019
[2] 1 October 2019 – 30 September 2020

- **Table 1.2** provides a summary of unadjusted 90 days patient survival (%) and graft function (%) for deceased donor first liver only transplants for 1 October 2019 to 30 September 2020. For comparison, unadjusted 90 days patient survival (%) and graft function (%) are also provided for 1 October 2018 to 30 September 2019.

Table 1.2 **Unadjusted 90-day patient survival (%) and graft function (%) for deceased donor first liver only transplants, for 2018/19[1] and for 2019/20[2]**

	2018/19[1]		2019/20[2]	
	Elective	Super-urgent	Elective	Super-urgent
90 days patient survival				
Adult patient	97%	94%	98%	96%
Paediatric patient[3]	98%	-	94%	93%
90 days graft function				
Adult patient	94%	94%	95%	92%
Paediatric patient[3]	98%	-	90%	93%

[1] 1 October 2018 – 30 September 2019
[2] 1 October 2019 – 30 September 2020
[3] Survival rates for cohorts with less than 10 patients are not presented due to small numbers

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Introduction

This interim report presents information on liver transplant activity, patient survival and graft function after transplantation between 1 October 2019 and 30 September 2020, 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.

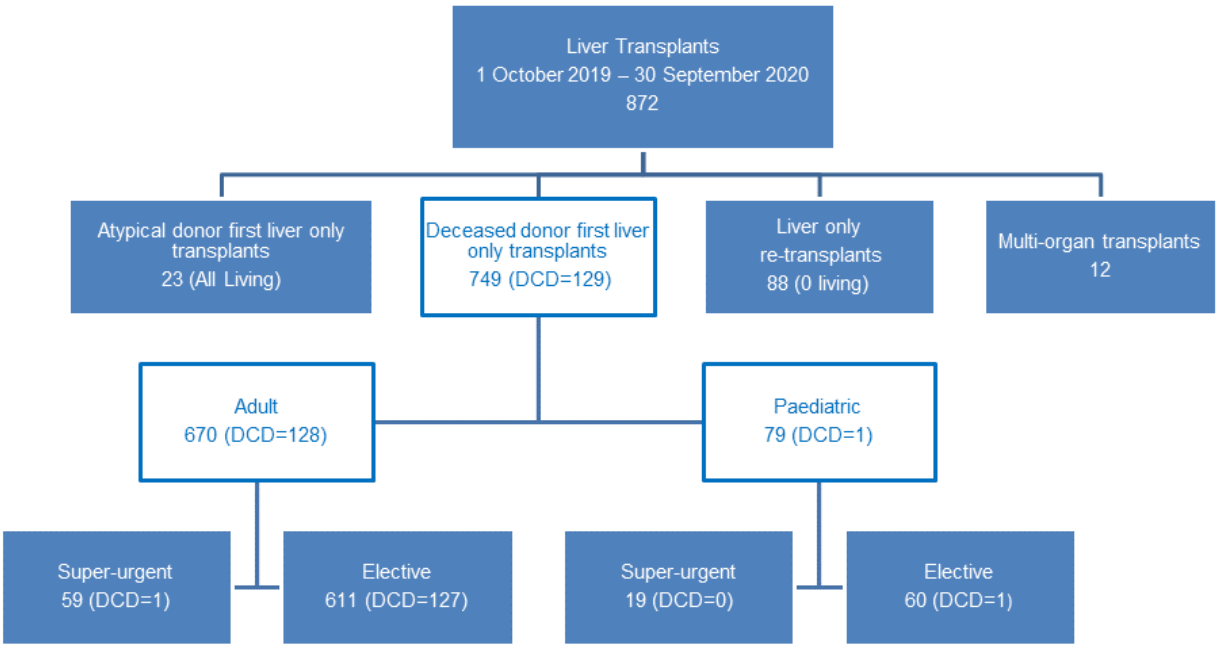
There are three paediatric transplant centres in the UK; Children's Hospital (Birmingham), St James's University Hospital (Leeds) and King's College Hospital (London). Leeds and King's College are adult transplant centres too, in addition to Queen Elizabeth Hospital (Birmingham), Addenbrooke's Hospital (Cambridge), Royal Infirmary (Edinburgh), Royal Free Hospital (London) and Freeman Hospital (Newcastle).

Results in this report are described separately for adult (aged≥17 years) and paediatric recipients (aged<17 years), and according to the urgency of the transplantation (elective and super-urgent). *Note*: Super-urgent registration categories were changed on 17 June 2015 to account for development in treatment of patients with acute liver failure.

Data sources and methods are described in full detail in the **Appendix**.

Figure 1.1 details the 872 liver transplants performed in the UK in the reported time period. Of these, 749 (86%) were deceased donor first liver only transplants: 670 (89%) in adult and 79 (11%) in paediatric patients. Of the 749 transplants, 78 (10%) were super-urgent and 671 (90%) were elective transplants.

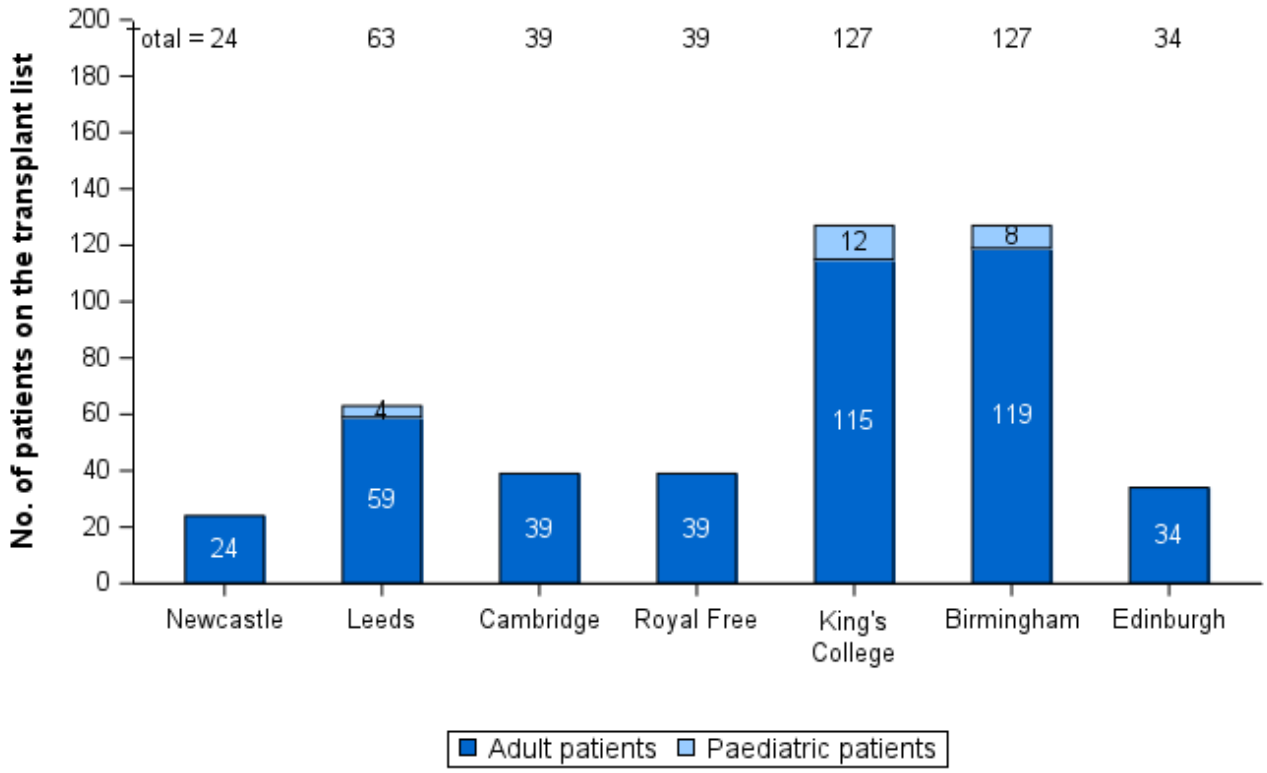
Figure 1.1 **Liver transplants in the UK, 1 October 2019 – 30 September 2020**



2.1 Transplant list

Figure 2.1 shows the number of adult and paediatric patients on the active liver transplant list as at 30 September 2020, by transplant centre. In total, there were 453 patients on the transplant list; 429 were adults and 24 were paediatric patients. King's College and Birmingham Hospitals had the largest share of the transplant list (28% each) and Newcastle the smallest (5%). This figure includes elective and super-urgent registrations. Compared with numbers as at 30 September 2019, there has been a 5% increase (from 430 registrations to 453 registrations) on the active liver transplant list.

Figure 2.1 Adult and paediatric patients on the active liver transplant list, by transplant centre as at 30 September 2020



2.2 Transplant activity

During the one-year study period, 872 liver transplants were reported. Activity by quarter is shown in **Figure 2.2**, by type of donor while **Figure 2.3** shows the equivalent information by transplant centre. **Figure 2.3** excludes one elective living donor transplant performed at the London Bridge. Transplant activity between April and June 2020 was reduced due to both donor and liver specific restrictions in place due to COVID-19.

Figure 2.2 Liver transplants in the UK, by donor type 1 October 2019 - 30 September 2020

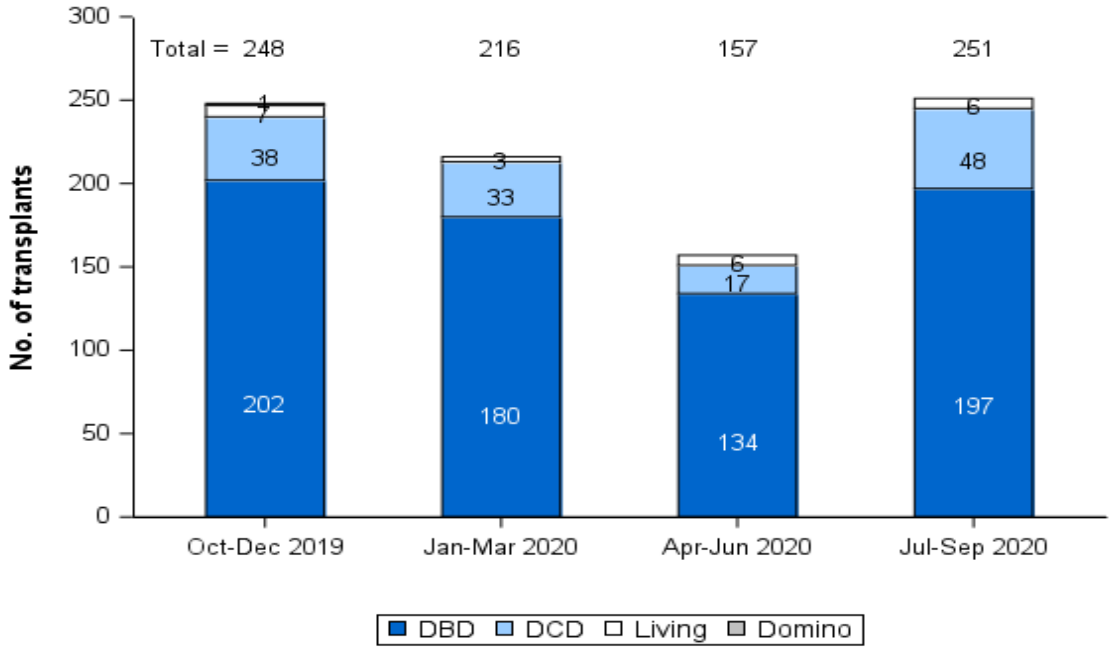
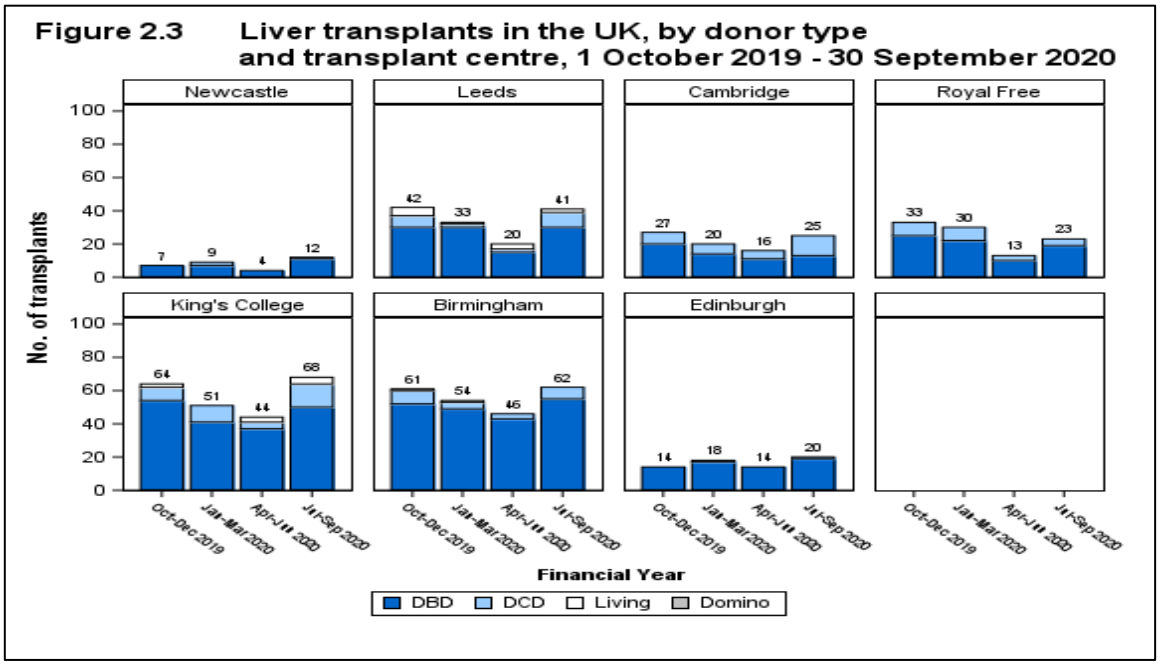


Figure 2.3 Liver transplants in the UK, by donor type and transplant centre, 1 October 2019 - 30 September 2020



Adult Liver Transplantation

3.1 Transplant activity

The number of adult first liver only transplants performed in the study period is shown in **Figure 3.1**, by quarter and donor type. Of the 675 transplants of this type, 670 (99%) were deceased donor transplants and, of these, 611 (91%) were elective and 59 (9%) were super-urgent transplants. Of the remaining 5 transplants, all were elective living donor transplants.

Figure 3.1 Adult first liver only transplants in the UK, by donor type 1 October 2019 - 30 September 2020

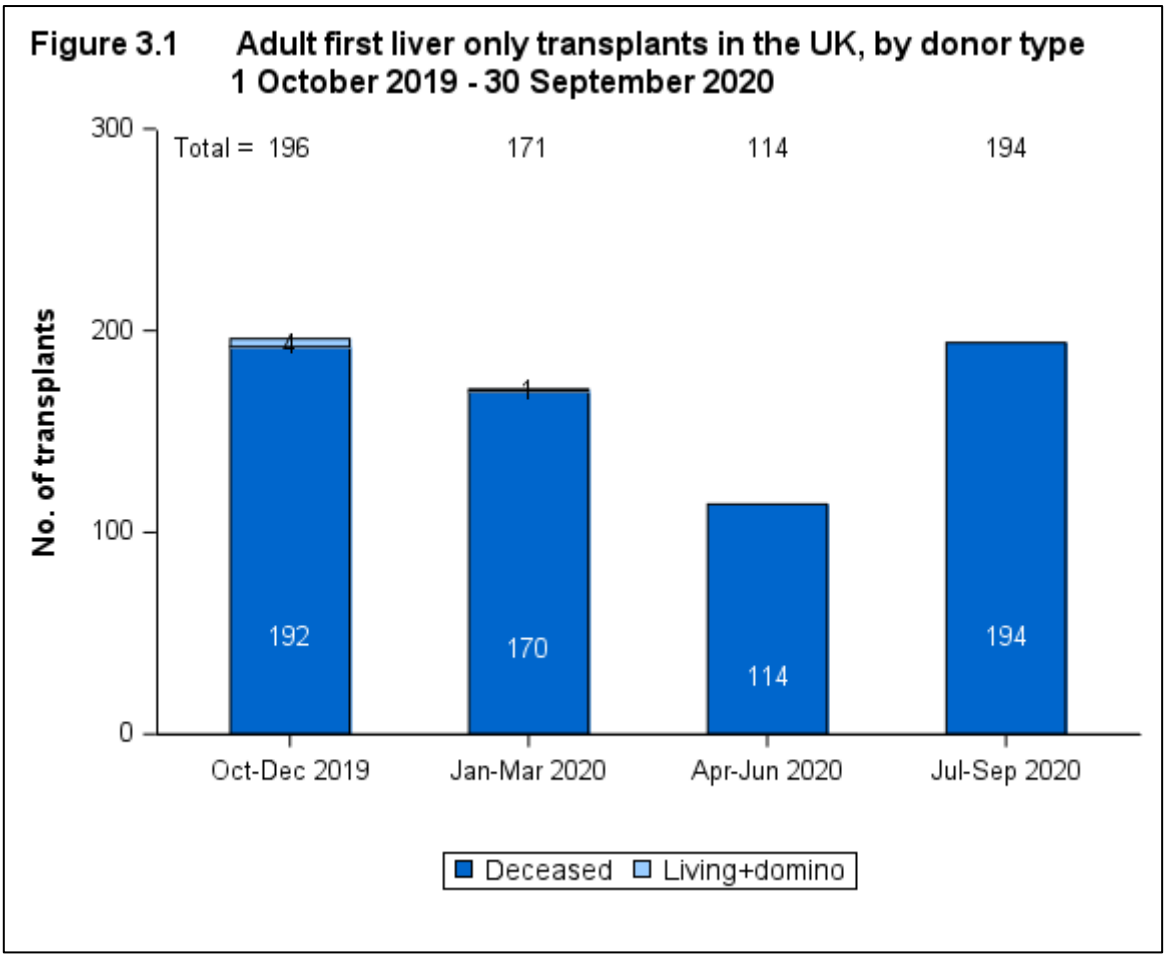


Table 3.1 shows the total number of adult transplants performed in the reported time period, including atypical donor, multi-organ and re-transplants. It also shows the number of adult deceased and living (including domino) donor first liver only transplants, by transplant centre.

Table 3.1 **Number of UK adult liver transplants between, 1 October 2019 and 30 September 2020, by transplant centre and urgency status**

Centre	Total number of transplants		Deceased donor first liver only transplants		Living donor first liver only transplants	
	Elective	Super-urgent	Elective	Super-urgent	Elective	Super-urgent
Newcastle	29	3	25	2	0	0
Leeds	100	10	90	7	3	0
Cambridge	77	11	68	7	0	0
Royal Free	85	14	81	13	0	0
King's College	159	18	143	14	0	0
Birmingham	177	16	149	10	1	0
Edinburgh	58	8	55	6	0	0
TOTAL	**686**[1]	**80**	**611**	**59**	**5**[1]	**0**

[1]Includes 1 living donor transplant at London Bridge

Figure 3.2 shows adult elective deceased donor first liver only transplants, by quarter and transplant centre.

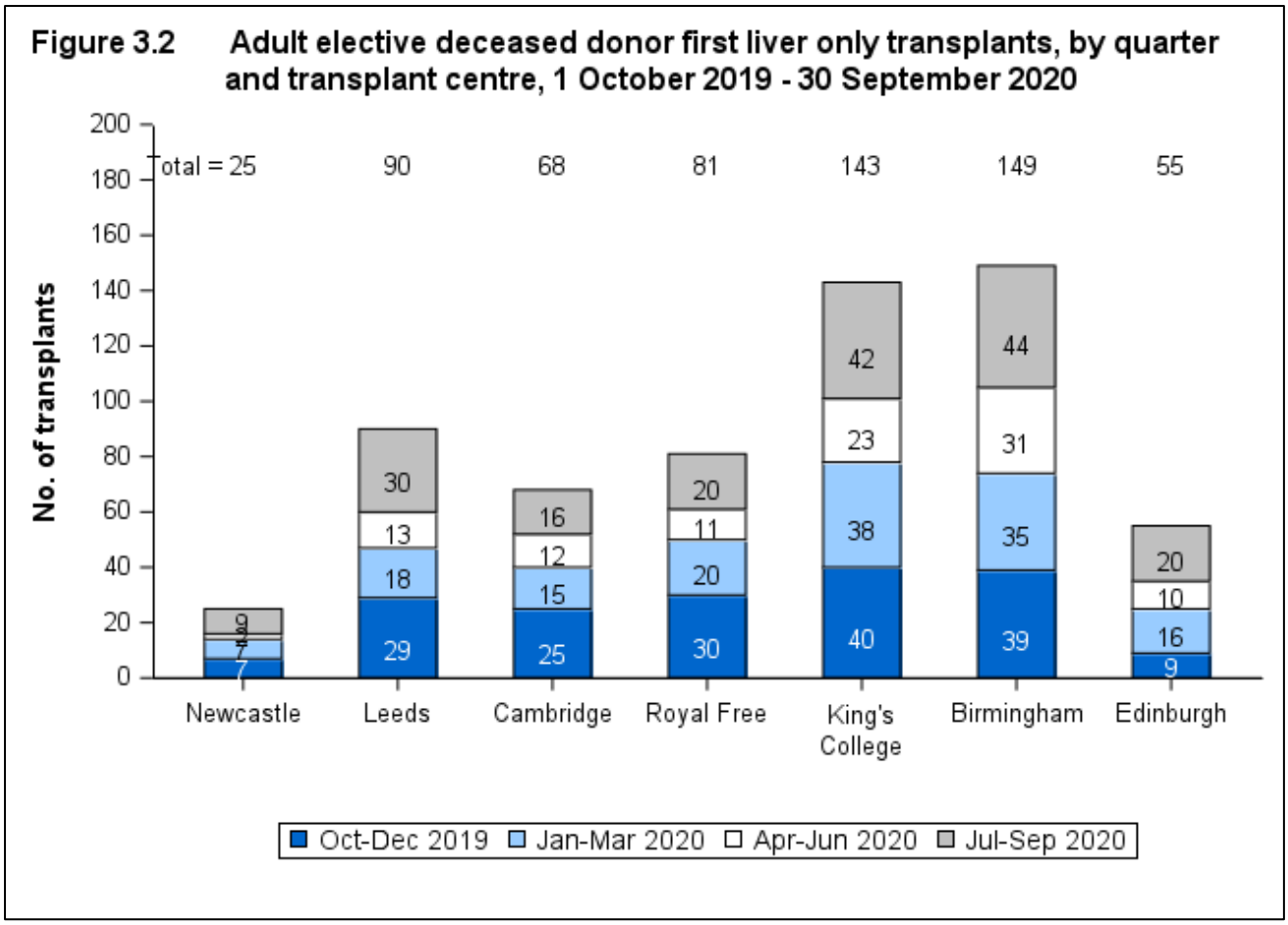
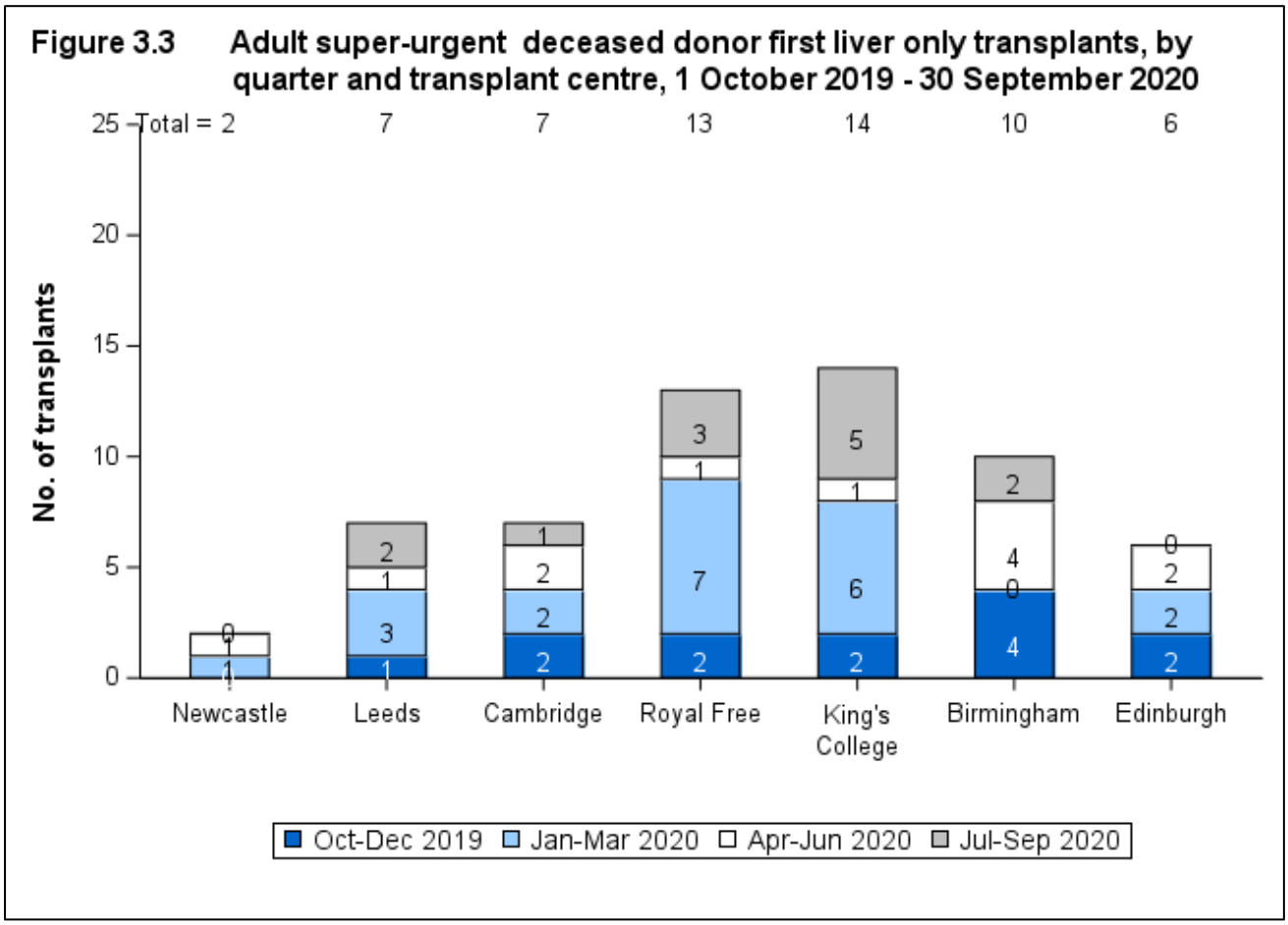


Figure 3.3 shows adult super-urgent deceased donor first liver only transplants, by quarter and transplant centre.



The demographic characteristics of 611 adult elective first-time transplant recipients of a deceased donor liver in the time period are shown, by centre and overall, in **Table 3.2.** 62% of these recipients were male and the median recipient age and BMI was 57 years and 27 kg/m^2 respectively. The most common indication for transplantation was alcoholic liver disease (28% of cases) followed cancer (17% of cases). For some characteristics, due to rounding, percentages may not add up to 100.

Table 3.2 Demographic characteristics of adult elective deceased donor first liver only transplant recipients, 1 October 2019 and 30 September 2020

		Birmingham N (%)	Cambridge N (%)	Edinburgh N (%)	King's College N (%)	Leeds N (%)	Newcastle N (%)	Royal Free N (%)	**TOTAL N (%)**
Number		149	68	55	143	90	25	81	**611 (100)**
Recipient sex	Male	90 (60)	43 (63)	33 (60)	82 (57)	59 (66)	19 (76)	53 (65)	**379 (62)**
	Female	59 (40)	25 (37)	22 (40)	61 (43)	31 (34)	6 (24)	28 (35)	**232 (38)**
Recipient ethnicity	White	113 (76)	64 (94)	52 (95)	122 (85)	83 (92)	25 (100)	64 (79)	**523 (86)**
	Non-white	17 (11)	4 (6)	3 (5)	21 (15)	7 (8)	0	17 (21)	**69 (11)**
	Not reported	19 (13)	0	0	0	0	0	0	**19 (3)**
Indication	Cancer	24 (16)	7 (10)	8 (15)	19 (13)	23 (26)	3 (12)	22 (27)	**106 (17)**
	Hepatitis C	2 (1)	2 (3)	2 (4)	6 (4)	3 (3)	0	1 (1)	**16 (3)**
	Alcoholic liver disease	35 (23)	19 (28)	11 (20)	38 (27)	32 (36)	7 (28)	26 (32)	**168 (28)**
	Hepatitis B	3 (2)	0	1 (2)	0	0	0	1 (1)	**5 (1)**
	Primary sclerosing cholangitis	16 (11)	5 (7)	9 (16)	21 (15)	6 (7)	1 (4)	8 (10)	**66 (11)**
	Primary biliary cholangitis	14 (9)	10 (15)	7 (13)	15 (10)	9 (10)	1 (4)	3 (4)	**59 (10)**
	Autoimmune and cryptogenic disease	13 (9)	4 (6)	3 (5)	16 (11)	5 (6)	6 (24)	7 (9)	**54 (9)**
	Metabolic	21 (14)	19 (28)	9 (16)	16 (11)	10 (11)	7 (28)	12 (15)	**94 (15)**
	Other	21 (14)	2 (3)	5 (9)	12 (8)	1 (1)	0	1 (1)	**42 (7)**
Recipient HCV status	Negative	145 (97)	61 (90)	50 (91)	124 (87)	72 (80)	25 (100)	68 (84)	**545 (89)**
	Positive	4 (3)	7 (10)	3 (5)	13 (9)	10 (11)	0	8 (10)	**45 (7)**
	Not reported	0	0	2 (4)	6 (4)	7 (8)	0	5 (6)	**20 (3)**
Pre-transplant in-patient status	Out-patient	146 (98)	57 (84)	47 (85)	120 (84)	80 (89)	24 (96)	74 (91)	**548 (90)**
	In-patient	3 (2)	11 (16)	8 (15)	20 (14)	6 (7)	1 (4)	3 (4)	**52 (9)**
	Not reported	0	0	0	3 (2)	4 (4)	0	4 (5)	**11 (2)**
Recip age (years)	Median (IQR)	55 (41,62)	57 (50,62)	56 (51,62)	56 (46,64)	57 (53,64)	62 (55,66)	58 (50,62)	**57 (49,63)**
BMI kg/m2	Median (IQR)	27 (24,31)	29 (25,33)	27 (25,33)	27 (23,30)	27 (25,31)	29 (25,34)	27 (25,30)	**27 (24,31)**
Cold Ischaemia Time (hrs)	Median (IQR)	8 (7,10)	12 (8,15)	10 (8,11)	9 (7,10)	8 (6,10)	11 (10,12)	8 (7,10)	**9 (7,11)**
	Not reported	0	0	0	3	3	0	6	**12**

3.2 Elective patient survival and graft function

Table 3.3 shows the 90-day unadjusted patient survival and graft function for adult elective deceased donor first liver only transplants in the reported time period, overall and by centre. Survival information was known for 544 (89%) of the 611 adult elective deceased donor first liver only transplants performed in this time period. Ninety-eight percent of patients were alive 90 days post-transplant and the graft function rate at 90 days was 94.8%.

Table 3.3 Unadjusted 90-day patient survival (%) and graft function (%) for adult elective deceased donor first liver only transplants between, 1 October 2019 and 30 September 2020, by transplant centre

Centre	Number of transplants	90-day survival (95% CI)		90-day graft function (95% CI)	
Newcastle	25	100	-	100	-
Leeds	57	98.0	(86.4-99.7)	92.8	(81.8-97.2)
Cambridge	68	97.1	(88.7-99.3)	95.6	(86.9-98.6)
Royal Free	51	98.0	(86.9-99.7)	93.9	(82.4-98.0)
King's College	140	98.5	(94.1-99.6)	95.6	(90.6-98.0)
Birmingham	149	98.0	(93.9-99.3)	94.6	(89.6-97.3)
Edinburgh	54	94.4	(83.7-98.2)	92.6	(81.4-97.1)
TOTAL	**544**	**97.7**	**(96.6-98.7)**	**94.8**	**(92.4-96.6)**

3.3 Super-urgent patient survival and graft function

One of the 59 adult super-urgent deceased donor first liver transplants in the period of study were auxiliary. Ninety-day survival was known for 52 of the remaining 58 non-auxiliary transplants. Fifty of the 52 patients with known 90 day survival survived the first ninety days and the resulting unadjusted national 90-day patient survival and graft function rates (95% confidence intervals) for adult super-urgent transplants were 95.6% (84.0-98.7) and 91.6% (79.8, 96.6) respectively. Survival rates for individual centres are not presented due to all but two centres performing less than 10 adult super-urgent deceased donor first liver only transplants during the time period.

Paediatric Liver Transplantation

4.1 Transplant activity

The number of all paediatric first liver only transplants in the reported period is shown in **Figure 4.1**, by quarter. Of the 97 transplants in total for paediatric patients, 78 were elective and 19 were super-urgent transplants. There were 79 deceased donor transplants (one DCD) and 18 living donor transplants.

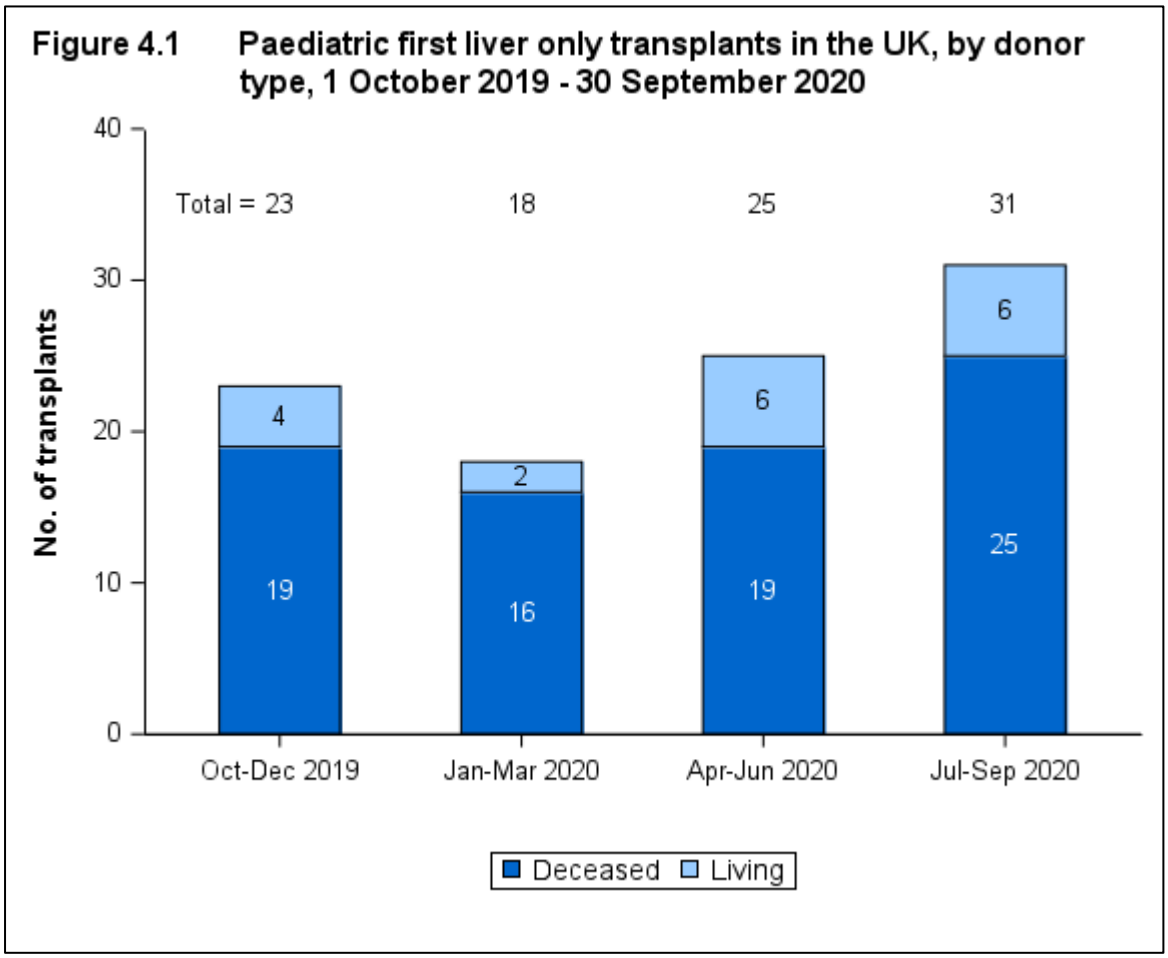


Table 4.1 shows the total number of paediatric transplants in the reported time period, including atypical donor, multi-organ and re-transplants. It also shows the number of paediatric deceased and living (including domino) donor first liver only transplants, by transplant centre.

Table 4.1	Number of paediatric transplants between 1 October 2019 and 30 September 2020, by transplant centre and urgency status					
Centre	**Total number of transplants**		**Deceased donor first liver only transplants**		**Living donor first liver only transplants**	
	Elective	**Super-urgent**	**Elective**	**Super-urgent**	**Elective**	**Super-urgent**
Newcastle	0	0	0	0	0	0
Leeds	24	2	14	2	8	0
Cambridge	0	0	0	0	0	0
Royal Free	0	0	0	0	0	0
King's College	39	11	28	10	9	0
Birmingham	22	8	18	7	1	0
Edinburgh	0	0	0	0	0	0
TOTAL	**85**	**21**	**60**	**19**	**18**	**0**

4.2 Patient survival and graft function

Table 4.2 shows the 90-day unadjusted patient survival and graft function for paediatric elective deceased donor first liver only transplants in the reported period, nationally and by centre. Survival information was known for 52 (87%) of the 60 paediatric elective deceased donor first liver only transplants performed in this time period and none of these transplants were auxiliary. Ninety-four percent of patients were alive 90 days post-transplant and the graft function rate at 90 days was 90.4%.

Table 4.2	Unadjusted 90-day patient survival (%) and graft function (%) for paediatric elective deceased donor first liver only transplants between, 1 October 2019 and 30 September 2020, by transplant centre				
Centre	**Number of transplants**	**90-day survival (95% CI)**		**90-day graft function (95% CI)**	
Leeds[1]	7	100	-	100	-
King's College	27	96.3	(76.5-99.5)	92.6	(73.5-98.1)
Birmingham	18	88.9	(62.4–97.1)	83.3	(56.8-94.3)
TOTAL	**52**	**94.2**	**(84.0-98.7)**	**90.4**	**(77.7-96.6)**

There were 19 paediatric super-urgent deceased donor first liver transplants in the period of study; ten at King's College, seven at Birmingham and two at Leeds; four of the 19 transplants were auxiliary. Ninety-day survival was not known for one of the remaining 15 non-auxiliary transplants. All but one patient survived the first ninety days and the resulting unadjusted national 90-day patient survival and graft function rates (95% confidence interval) for paediatric super-urgent transplants were both at 92.9% (58.8, 98.7). These rates should be regarded as guidance only due to the small number of transplants.

Appendix

A1 Data

Data were obtained from the UK Transplant Registry for the time period 1 October 2019 to 30 September 2020 and include all transplants performed in the UK, 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. The Adult and Paediatric sections are limited to first liver only transplants, and unadjusted survival is only estimated for deceased donor transplants, excluding auxiliary transplants.

A2 Methods

Unadjusted patient survival and graft function 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 time of analysis, 4th March 2021. 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 patients instead of patient death.

For the purposes of this report, no adjustment was made for risk factors that might make a patient more or less likely to die or a graft to fail. Comparison of unadjusted patient survival or graft function rates across centres and to the national rate should therefore be made with caution.

A3 Glossary of terms

Auxiliary transplant

Auxiliary transplantation uses a partial left or right lobe from the donor which acts as temporary support for the recipient's injured liver, which remains in place.

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.

Donor type
Liver donors can be of different types.
Donor after brain death (DBD)
Donation after Brainstem Death (DBD) means donation which takes place following the diagnosis of death using neurological criteria.

Donor after circulatory death (DCD)
Donation 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. *Note:* Super-urgent registration categories were changed on 17 June 2015 to account for development in treatment of patients with acute liver failure.

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.

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 in clinical settings and the Kaplan-Meier method allows the computation of estimates that are more meaningful in these cases.

Multi-organ transplant
A transplant in which the patient 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.

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