NHS
Blood and Transplant

INTERIM REPORT ON LIVER TRANSPLANTATION

REPORT FOR 2017/2018
(1 OCTOBER 2016 – 30 SEPTEMBER 2017)

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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 2016 to 30 September 2017. 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.

Key points

- There were 1006 **liver transplants** performed in the UK between 1 October 2016 and 30 September 2017. Of these, 857 (85%) were deceased donor first liver only transplants (including liver only transplants due to intestinal failure) and 32 (3%) were living donor first liver only transplants (including first liver only domino transplants). The remainder were repeated transplants (98) or multi-organ transplants (19).

- Of the 857 **deceased donor first liver only transplants** in the time period, 786 (92%) were in adult recipients and 71 (8%) were in paediatric recipients. The approximate proportion of elective to super-urgent transplants in each of these age groups was 92% to 8% and 89% to 11%, respectively.

- Of the 32 **living donor first liver only (including domino) transplants** in the time period, 10 (31%) were in adult recipients and 22 (69%) were in paediatric recipients. All adult recipients were elective. Of paediatric recipients, 20 (91%) were elective and 2 (9%) were super-urgent.

- The unadjusted national **rates of patient survival** 90 days after first liver transplantation from deceased donors were 96% for adult elective and 92% for adult super-urgent registrations. Those for paediatric elective and super-urgent registrations were 93% and 100%, 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 92% for adult elective and 90% for adult super-urgent patient registrations. The rates for paediatric elective and super-urgent patient registrations were 90% and 100%, respectively, but note the caveat above.

- **Table 1.1** provides a summary of liver transplant activity in the UK for 1 October 2016 to 30 September 2017. For comparison, transplant activity figures are also provided for 1 October 2015 to 30 September 2016.

Table 1.1 **Number of first liver only transplants in the UK, by recipient age group and urgency status and by donor type, for 2015/16[1] and for 2016/17[2]**

	2015/16[1]			2016/17[2]		
	Elective	Super-urgent	Total	Elective	Super-urgent	Total
Deceased donor	**734**	**70**	**804**	**787**	**70**	**857**
Adult patient	675	61	736	724	62	786
Paediatric patient	59	9	68	63	8	71
Living donor	**38**	**0**	**38**	**30**	**2**	**32**
Adult patient	21	0	21	10	0	10
Paediatric patient	17	0	17	20	2	22
TOTAL	**772**	**70**	**842**	**817**	**72**	**889**

[1] 1 October 2015 – 30 September 2016
[2] 1 October 2016 – 30 September 2017

- **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 2016 to 30 September 2017. For comparison, unadjusted 90 days patient survival (%) and graft function (%) are also provided for 1 October 2015 to 30 September 2016.

Table 1.2 **Unadjusted 90-day patient survival (%) and graft function (%) for deceased donor first liver only transplants, for 2015/16[1] and for 2016/17[2]**

	2015/16[1]		2016/17[2]	
	Elective	Super-urgent	Elective	Super-urgent
90 days patient survival				
Adult patient	97%	91%	96%	92%
Paediatric patient[3]	100%	-	93%	-
90 days graft function				
Adult patient	94%	87%	92%	90%
Paediatric patient[3]	98%	-	90%	-

[1] 1 October 2015 – 30 September 2016
[2] 1 October 2016 – 30 September 2017
[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 2016 and 30 September 2017, 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.

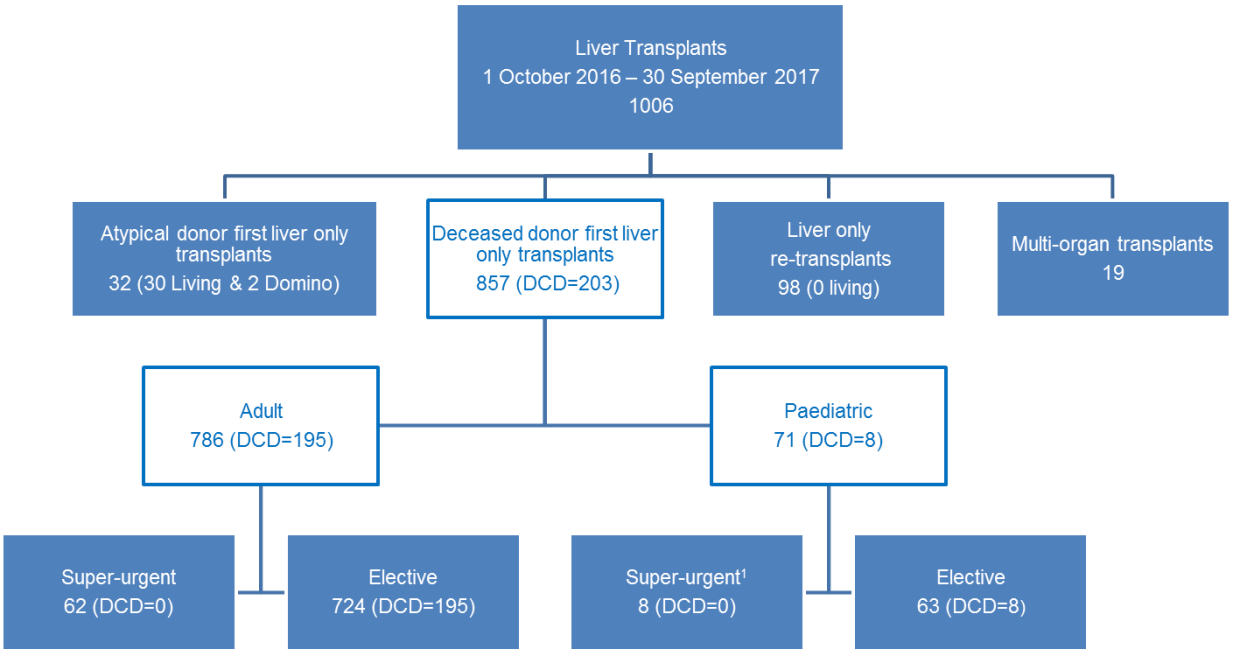
There are three paediatric transplant centres in the UK; Children's Hospital (Birmingham), St James's University Hospital (Leeds) and King's College Hospital (London). Leeds and King's College are adult transplant centres too, in addition to Queen Elizabeth Hospital (Birmingham), Addenbrooke's Hospital (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 1006 liver transplants performed in the UK in the reported time period. Of these, 857 (85%) were deceased donor first liver only transplants: 786 (92%) in adult and 71 (8%) in paediatric patients. Of the 857 transplants, 70 (8%) were super-urgent and 787 (92%) were elective transplants.

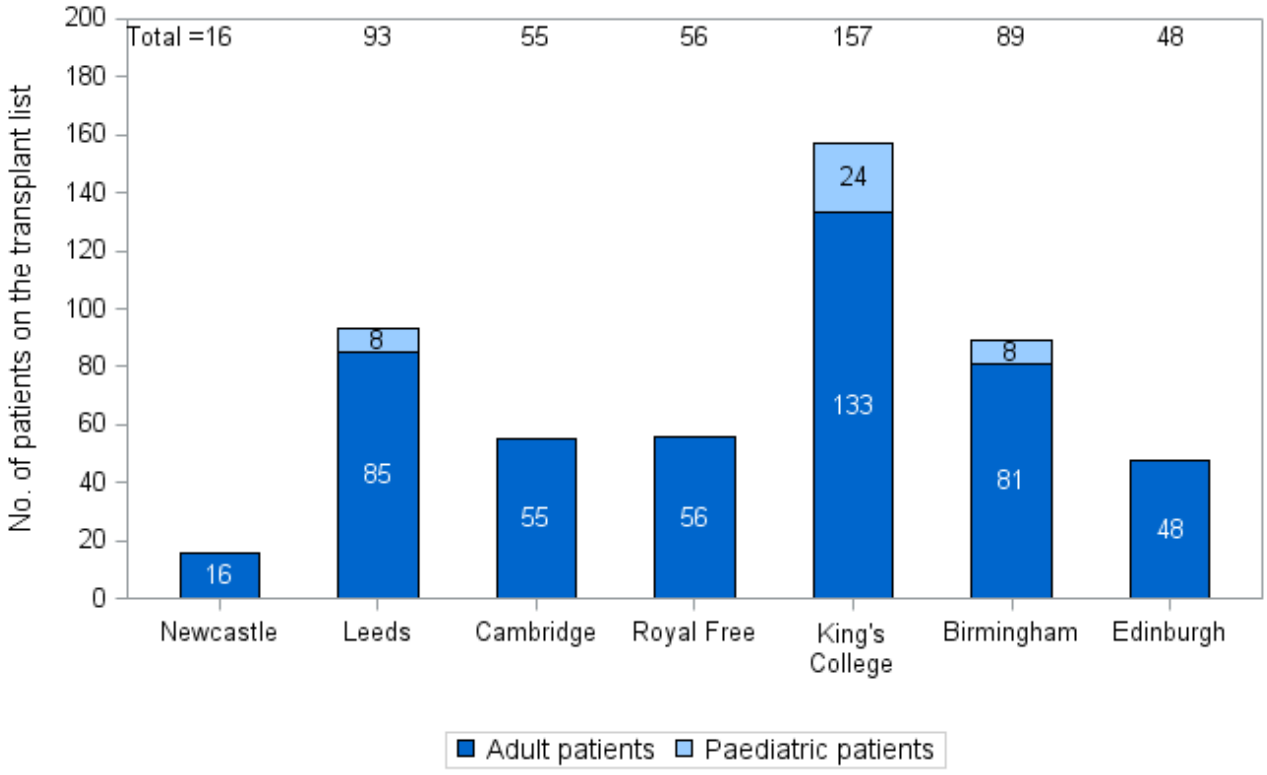
Figure 1.1 Liver transplants in the UK, 1 October 2016 – 30 September 2017



2.1 Transplant list

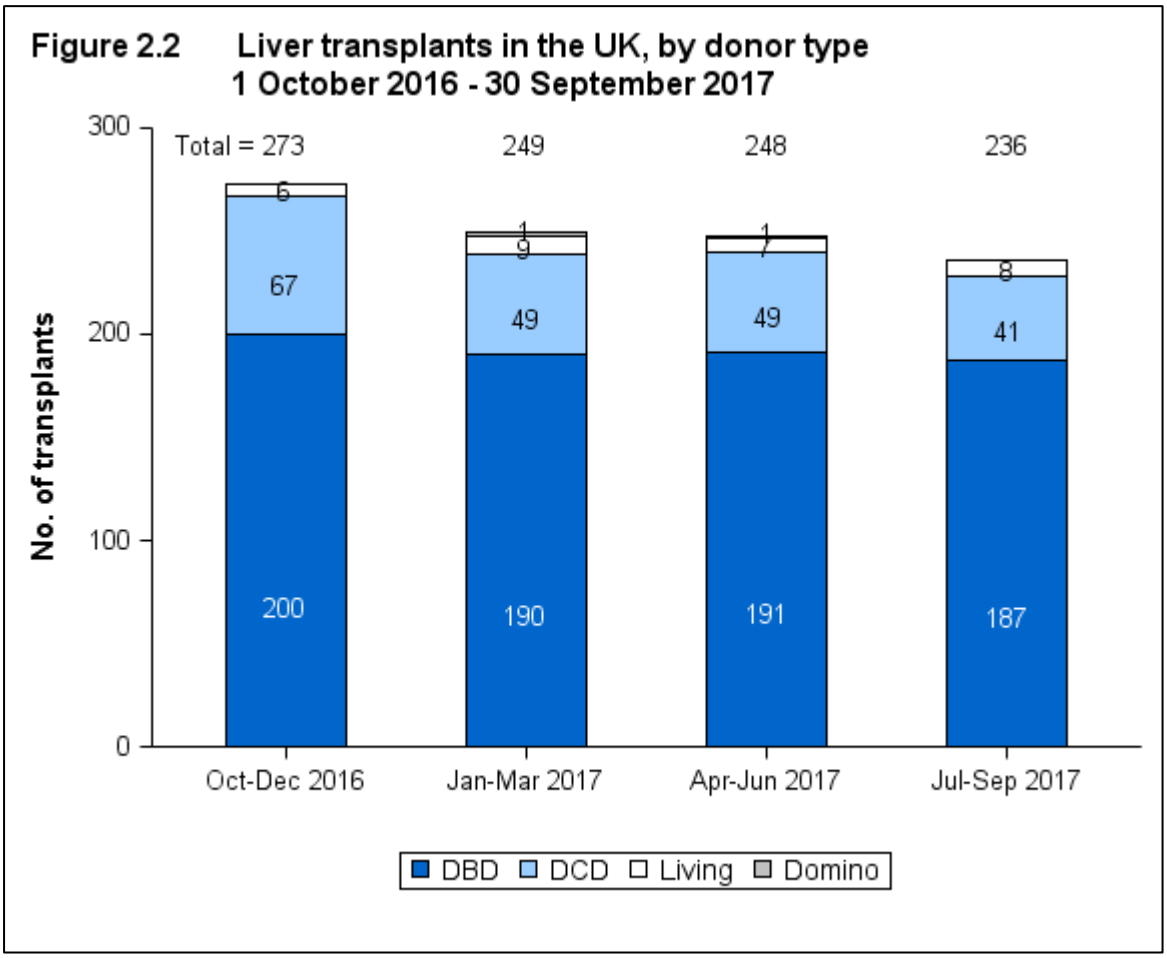
Figure 2.1 shows the number of adult and paediatric patients on the active liver transplant list as at 30 September 2017, by transplant centre. In total, there were 514 patients on the transplant list; 474 were adults and 40 were paediatric patients. King's College Hospital had the largest share of the transplant list (31%) and Newcastle the smallest (3%). This figure includes elective and super-urgent registrations. Compared with numbers as at 30 September 2016, there has been a 14% decrease (from 597 registrations to 514 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 2017



2.2 Transplant activity

During the one-year study period, 1006 liver transplants were reported. Activity by quarter is shown in **Figure 2.2**, by type of donor.



Adult Liver Transplantation

3.1 Transplant activity

The number of all adult first liver only transplants in the study period is shown in **Figure 3.1**, by quarter. Of the 796 transplants of this type, 786 were deceased donor transplants and, of these, 724 were elective and 62 were super-urgent transplants. Of the remaining 10 transplants, 8 were elective living donor transplants and 2 were elective domino donor transplants.

Figure 3.1 Adult first liver only transplants in the UK, by donor type 1 October 2016 - 30 September 2017

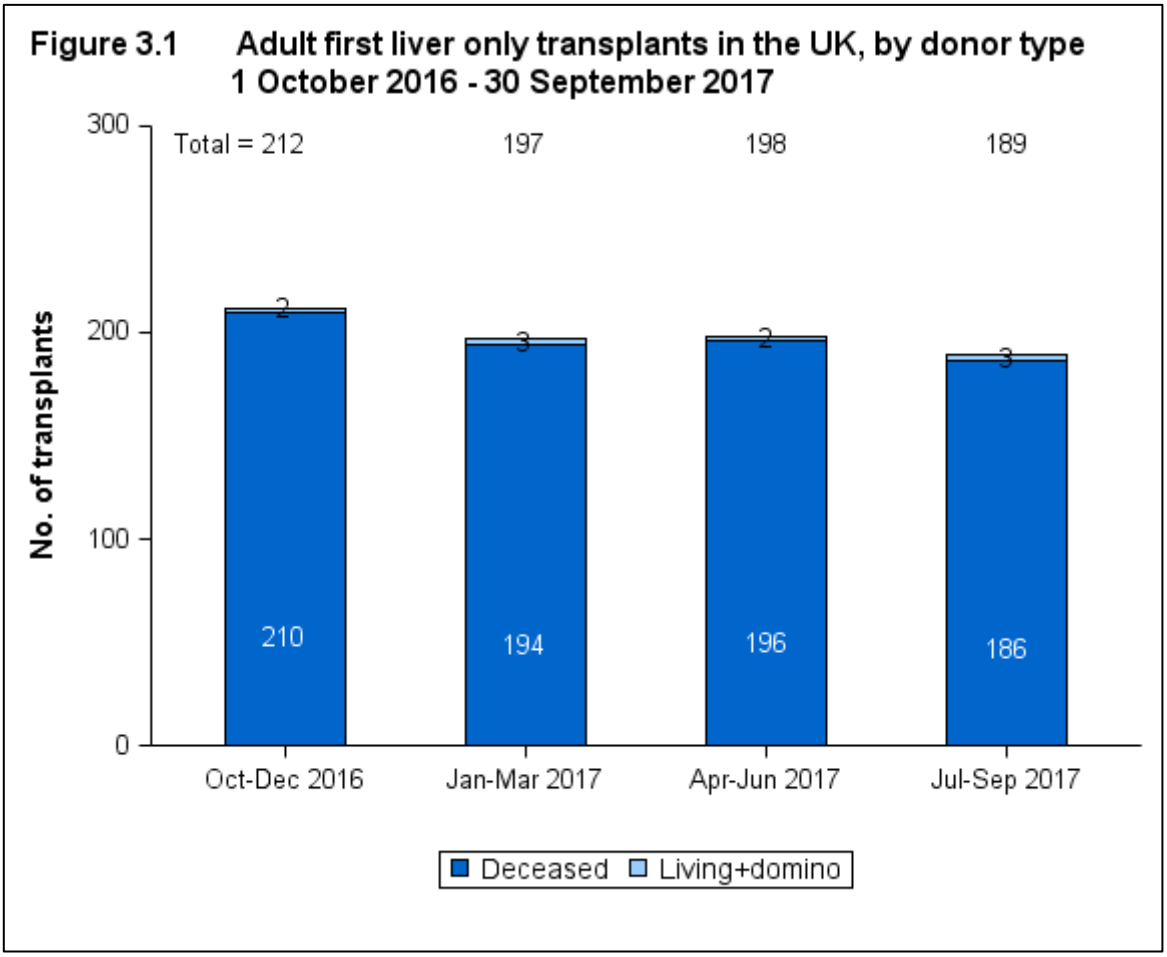


Table 3.1 shows the total number of adult transplants in the reported time period, including atypical donor, multi-organ and re-transplants. It also shows the number of adult deceased and living (including domino) donor first liver only transplants, by transplant centre.

Table 3.1 **Number of adult liver transplants between, 1 October 2016 and 30 September 2017, 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	33	1	29	1	0	0
Leeds	129	17	118	11	4	0
Cambridge	89	10	81	6	0	0
Royal Free	105	17	100	11	2	0
King's College	177	20	145	18	2	0
Birmingham	187	15	169	12	1	0
Edinburgh	89	8	82	3	0	0
TOTAL	**810**[1]	**88**	**724**	**62**	**10**[1]	**0**

[1] Includes one living donor first liver only transplant performed at London Bridge Hospital

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

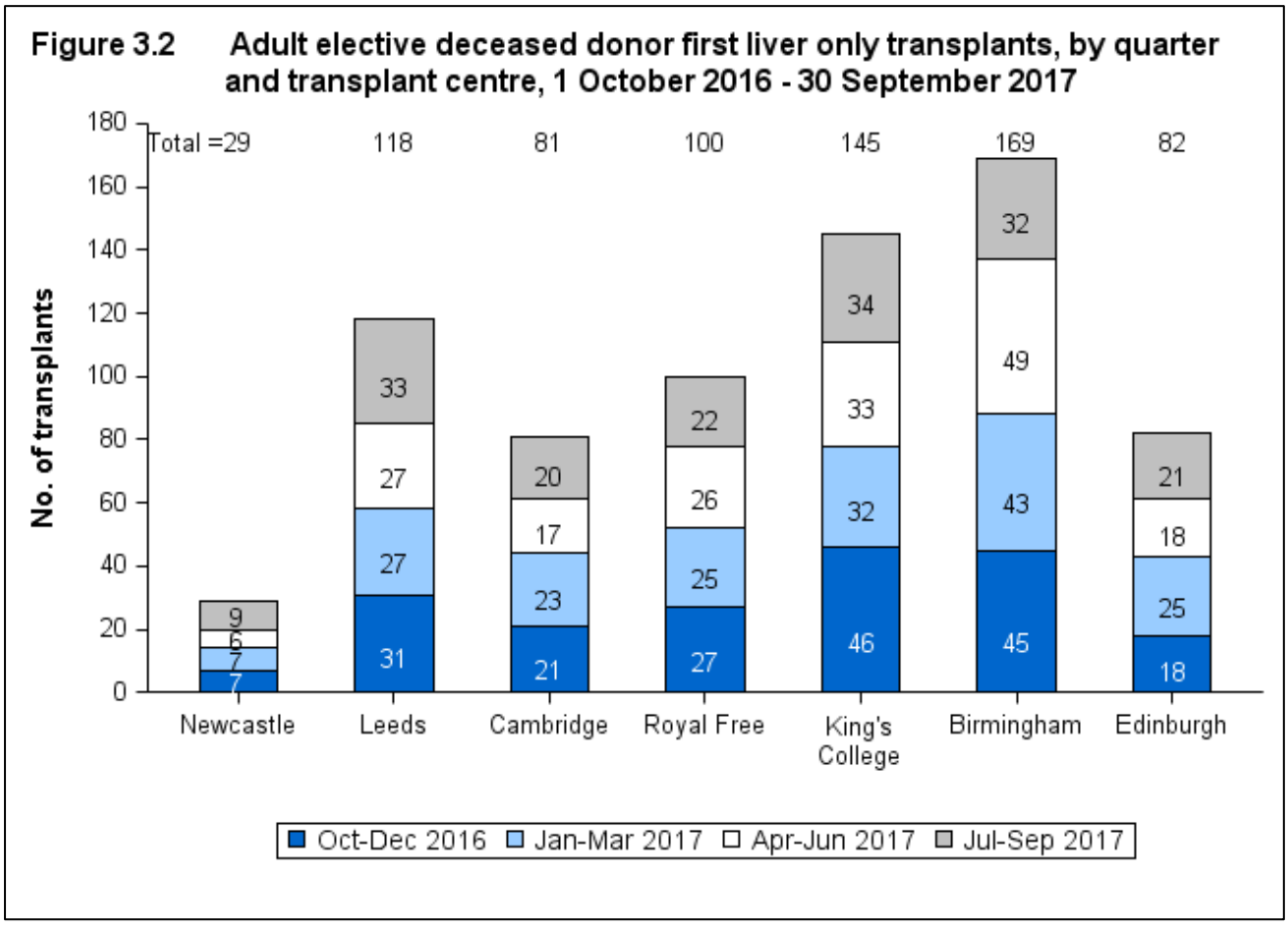
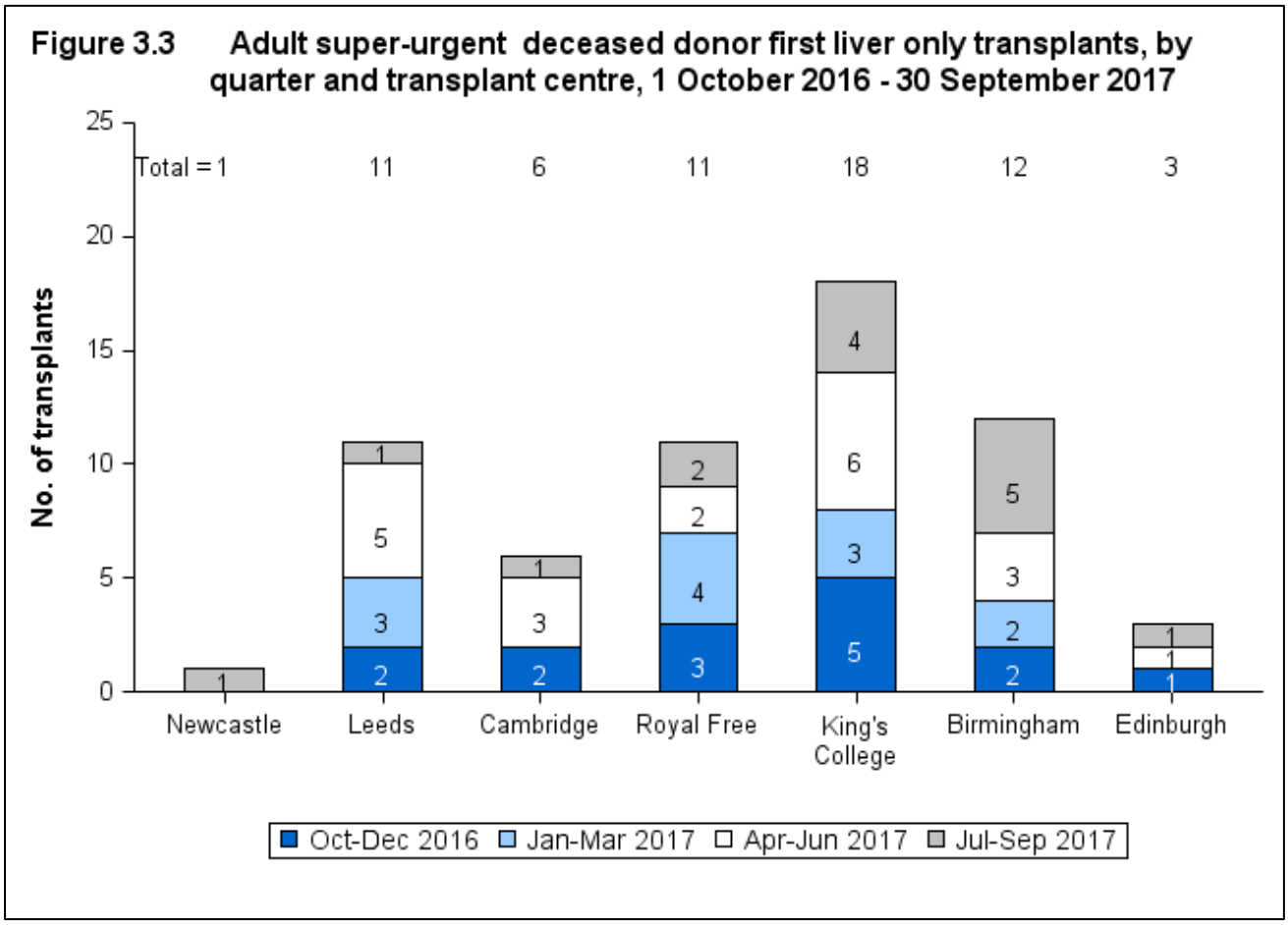


Figure 3.3 shows adult super-urgent deceased donor first liver only transplants, by quarter and transplant centre.



The demographic characteristics of 724 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.** Two thirds of these recipients were male and the median age was 56 years. The most common indication for transplantation was alcoholic liver disease (27% of cases) followed by cancer (22% of cases). The median recipient BMI was 28 kg/m^2. For some characteristics, due to rounding, percentages may not add up to 100.

Table 3.2 Demographic characteristics of adult elective deceased donor liver transplant recipients, 1 October 2016 and 30 September 2017

		Birmingham N (%)	Cambridge N (%)	Edinburgh N (%)	King's College N (%)	Leeds N (%)	Newcastle N (%)	Royal Free N (%)	**TOTAL N (%)**
Number		169	81	82	145	118	29	100	**724 (100)**
Recipient sex	Male	113 (67)	51 (63)	49 (60)	97 (67)	75 (64)	18 (62)	70 (70)	**473 (65)**
	Female	56 (33)	30 (37)	33 (40)	48 (33)	43 (36)	11 (38)	30 (30)	**251 (35)**
Recipient ethnicity	White	150 (89)	75 (93)	78 (95)	129 (89)	110 (93)	28 (97)	81 (81)	**651 (90)**
	Non-white	19 (11)	6 (7)	4 (5)	16 (11)	8 (7)	1 (3)	19 (19)	**73 (10)**
Indication[1]	Cancer	23 (14)	12 (15)	24 (29)	34 (23)	31 (26)	5 (17)	27 (27)	**156 (22)**
	Hepatitis C	10 (6)	6 (7)	2 (2)	6 (4)	5 (4)	1 (3)	4 (4)	**34 (5)**
	Alcoholic liver disease	43 (25)	15 (19)	27 (33)	38 (26)	40 (34)	11 (38)	18 (18)	**192 (27)**
	Hepatitis B	5 (3)	1 (1)	1 (1)	2 (1)	0	1 (3)	7 (7)	**17 (2)**
	Primary sclerosing cholangitis	32 (19)	13 (16)	6 (7)	14 (10)	11 (9)	0	13 (13)	**89 (12)**
	Primary biliary cirrhosis	13 (8)	9 (11)	11 (13)	11 (8)	10 (8)	5 (17)	5 (5)	**64 (9)**
	Autoimmune and cryptogenic disease	8 (5)	2 (2)	3 (4)	11 (8)	9 (8)	3 (10)	7 (7)	**43 (6)**
	Metabolic	21 (12)	17 (21)	7 (9)	18 (12)	9 (8)	2 (7)	11 (11)	**85 (12)**
	Other	13 (8)	6 (7)	1 (1)	11 (8)	3 (3)	1 (3)	8 (8)	**43 (6)**
	Acute Hepatic failure	1 (1)	0	0	0	0	0	0	**1 (0)**
Recipient HCV status[2]	Negative	155 (92)	34 (43)	69 (84)	131 (90)	104 (88)	27 (93)	87 (87)	**607 (84)**
	Positive	14 (8)	8 (10)	7 (9)	14 (10)	10 (8)	2 (7)	13 (13)	**68 (9)**
	Not reported	0	38 (48)	6 (7)	0	3 (3)	0	0	**47 (7)**
Pre-transplant in-patient status	Out-patient	159 (94)	71 (89)	72 (88)	126 (87)	104 (88)	28 (97)	96 (96)	**656 (91)**
	In-patient	10 (6)	9 (11)	10 (12)	19 (13)	14 (12)	1 (3)	4 (4)	**67 (9)**

Table 3.2 Demographic characteristics of adult elective deceased donor liver transplant recipients, 1 October 2016 and 30 September 2017

		Birmingham N (%)	Cambridge N (%)	Edinburgh N (%)	King's College N (%)	Leeds N (%)	Newcastle N (%)	Royal Free N (%)	**TOTAL N (%)**
Recipient age (years)	Median (IQR)	54 (44,63)	57 (48,62)	59 (54,65)	58 (49,62)	56 (48,63)	60 (50,65)	54 (42,62)	**56 (47,63)**
	Not reported	0	0	0	0	0	0	0	**0**
BMI kg/m2	Median (IQR)	28 (24,32)	28 (25,31)	28 (24,31)	28 (24,31)	28 (24,32)	28 (24,31)	27 (24,32)	**28 (24,32)**
	Not reported	0	1	0	0	0	0	0	**1**
Cold Ischaemia Time (hrs)	Median (IQR)	7 (6,10)	9 (7,13)	9 (9,10)	9 (7,10)	7 (6,9)	10 (9,12)	8 (7,11)	**8 (7,10)**
	Not reported	0	2	1	6	1	0	0	**10**

[1] Based on the Robert's hierarchy of indications that considers three reported diseases (Roberts *et al.* 2004, *Liver Transplantation,* 10(7), pp. 886-897).
[2] Based on the Anti HCV variable in the "Recipient investigations immediately prior to transplant" section of the NHSBT First Week Transplant Record Form.

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. Of the 724 transplants in this time period, survival information was known for 96% (698) of transplants and none of these transplants was auxiliary. Of these, 96% of patients were alive 90 days post-transplant and the graft function rate at 90 days was 92%.

Table 3.3 Unadjusted 90-day patient survival (%) and graft function (%) for adult elective deceased donor first liver only transplants between, 1 October 2016 and 30 September 2017, by transplant centre

Centre	Number of transplants	90-day survival (95% CI)		90-day graft function (95% CI)	
Newcastle	26	91	(69 - 99)	91	(69 - 99)
Leeds	111	91	(84 - 95)	89	(82 - 95)
Cambridge	81	98	(90 - 99)	94	(86 - 97)
Royal Free	97	95	(88 - 99)	89	(80 - 95)
King's College	144	98	(92 - 99)	96	(90 - 99)
Birmingham	169	95	(90 - 97)	93	(88 - 97)
Edinburgh	70	100	–	93	(84 - 97)
TOTAL	**698**	**96**	**(95 - 97)**	**92**	**(90 - 95)**

3.3 Super-urgent patient survival and graft function

Table 3.4 shows the 90-day unadjusted patient survival and graft function for adult super-urgent deceased donor first liver only transplants in the reported time period, overall and by transplant centre. Of the 62 transplants in this time period, survival information was known for 60 transplants. One of these transplants was an auxiliary transplant and was excluded from the survival analysis. Of the 59 transplants, 92% of patients were alive 90 days post-transplant and the graft function rate at 90 days was 90%. These rates have wide confidence intervals due to the small number of transplants performed and the rates shown should, therefore, be interpreted with caution.

Table 3.4 Unadjusted 90-day patient survival (%) and graft function (%) for adult super-urgent deceased donor first liver only transplants between, 1 October 2016 and 30 September 2017, by transplant centre

Centre	Number of transplants	90-day survival (95% CI)		90-day graft function (95% CI)	
Newcastle	1[1]	-	-	-	-
Leeds	10	100	-	100	-
Cambridge	6[1]	-	-	-	-
Royal Free	11	82	(44 - 95)	82	(44 - 95)
King's College	18	89	(63 - 97)	89	(63 - 97)
Birmingham	11	91	(50 - 99)	82	(44 - 95)
Edinburgh	2[1]	-	-	-	-
TOTAL	**59**	**92**	**(80 - 97)**	**90**	**(80 - 95)**

[1] Survival rates for cohorts with less than 10 patients are not presented due to small numbers

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 93 transplants in total for paediatric patients, 83 were elective and 10 were super-urgent transplants. There were 71 deceased donor transplants and 22 living donor transplants.

Figure 4.1 Paediatric first liver only transplants in the UK, by donor type, 1 October 2016 - 30 September 2017

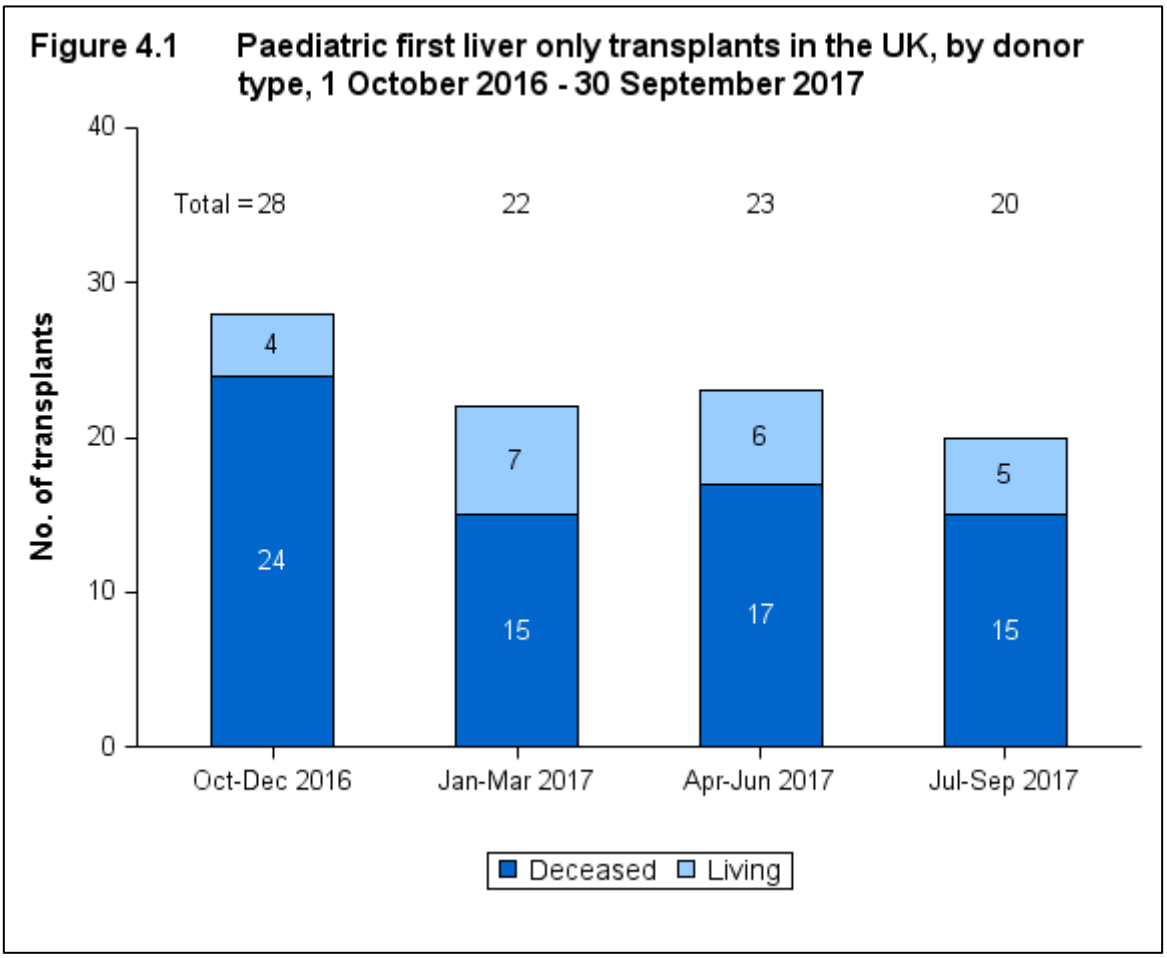


Table 4.1 shows the total number of paediatric transplants in the reported time period, including atypical donor, multi-organ and re-transplants. It also shows the number of paediatric deceased and living (including domino) donor first liver only transplants, by transplant centre.

Table 4.1 Number of paediatric transplants between 1 October 2016 and 30 September 2017, 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	1	0	1	0	0
Leeds	16	4	10	3	3	0
Cambridge	0	0	0	0	0	0
Royal Free	0	0	0	0	0	0
King's College	49	7	34	4	13	2
Birmingham	29	2	19	0	4	0
Edinburgh	0	0	0	0	0	0
TOTAL	**94**	**14**	**63**	**8**	**20**	**2**

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. Of the 63 transplants in this time period, survival information was known for 61 transplants, and none of these transplants was auxiliary. Of the 61 transplants for analysis, 93% of patients were alive 90 days post-transplant and the graft function rate at 90 days was 90%.

Table 4.2 Unadjusted 90-day patient survival (%) and graft function (%) for paediatric elective deceased donor first liver only transplants between, 1 October 2016 and 30 September 2017, by transplant centre

Centre	Number of transplants	90-day survival (95% CI)		90-day graft function (95% CI)	
Leeds	9[1]	-	-	-	-
King's College	33	100	-	97	(80 - 99)
Birmingham	19	79	(53 - 92)	79	(53 - 92)
TOTAL	**61**	**93**	**(82 - 97)**	**90**	**(80 - 95)**

[1] Survival rates for cohorts with less than 10 patients are not presented due to small numbers

There were eight paediatric super-urgent deceased donor first liver transplantations in the period of study; one at Newcastle, three at Leeds and four at King's College; three of the eight transplants were auxiliary. There were no patient deaths or graft failures at 90 days and so the resulting national 90-day patient survival and graft function rates for paediatric super-urgent transplants were both at 100%. 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 2016 to 30 September 2017 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, 1 February 2018. 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). A donor whose heart is still beating when their entire brain has stopped working so that they cannot survive without the use of a ventilator. Organs for transplant are removed from the donor while their heart is still beating, but only after extensive tests determine that the brain cannot recover and they have been certified dead.

Donor after circulatory death (DCD). A donor whose heart stops beating before their brain stops working and who is then certified dead. The organs are then removed.

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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