

**INTERIM REPORT ON
LIVER TRANSPLANTATION**

**REPORT FOR 2016/2017
(1 OCTOBER 2015 – 30 SEPTEMBER 2016)**

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EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

This interim report presents key figures about liver transplantation in the UK for the period from 1 October 2015 to 30 September 2016. 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 947 **liver transplants** performed in the UK between 1 October 2015 and 30 September 2016. Of these, 804 (85%) were deceased donor first liver only transplants (including liver only transplants due to intestinal failure) and 38 (4%) were living donor first liver only transplants (including first liver only domino transplants). The remainder were repeated transplants (85) or multi-organ transplants (20).
- Of the 804 **deceased donor first liver only transplants** in the time period, 736 (92%) were in adult recipients and 68 (8%) were in paediatric patients. The approximate proportion of elective to super-urgent transplants in each of these age groups was 90% to 10% and 85% to 15%, respectively.
- Of the 38 **living donor first liver only (including domino) transplants** in the time period, 21 (55%) were in adult recipients and 17 (45%) were in paediatric patients. All recipients were elective.
- The unadjusted national **rates of patient survival** 90 days after first liver transplantation from deceased donors were 97% for adult elective and 91% for adult super-urgent registrations. Those for paediatric elective and super-urgent registrations were 100% in both cases, 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 94% for adult elective and 87% for adult super-urgent patient registrations. The rates for paediatric elective and super-urgent patient registrations were 98% and 100%, respectively, but note the caveat above.

- **Table 1** provides a summary of liver transplant activity in the UK for 1 October 2015 to 30 September 2016. For comparison, transplant activity figures are also provided for 1 October 2014 to 30 September 2015.

Table 1 Number of first liver only transplants in the UK, by recipient age group and urgency status and by donor type, for 2014/15 ¹ and for 2015/16 ²						
	2014/15 ¹			2015/16 ²		
	Elective	Super-urgent	Total	Elective	Super-urgent	Total
Deceased donor	643	81	724	734	70	804
Adult patient	599	69	668	675	61	736
Paediatric patient	44	12	56	59	9	68
Living donor	35	1	36	38	0	38
Adult patient	17	0	17	21	0	21
Paediatric patient	18	1	19	17	0	17
TOTAL	678	82	760	772	70	842

¹ 1 October 2014 – 30 September 2015

² 1 October 2015 – 30 September 2016

- **Table 2** provides a summary of unadjusted 90 days patient survival (%) and graft function (%) for deceased donor first liver only transplants for 1 October 2015 to 30 September 2016. For comparison, unadjusted 90 days patient survival (%) and graft function (%) are also provided for 1 October 2014 to 30 September 2015.

Table 2 Unadjusted 90-day patient survival (%) and graft function (%) for deceased donor first liver only transplants, for 2014/15 ¹ and for 2015/16 ²				
	2014/15 ¹		2015/16 ²	
	Elective	Super-urgent	Elective	Super-urgent
90 days patient survival				
Adult patient	97%	95%	97%	91%
Paediatric patient	100%	100%	100%	100%
90 days graft function				
Adult patient	95%	95%	94%	87%
Paediatric patient	97%	100%	98%	100%

¹ 1 October 2014 – 30 September 2015

² 1 October 2015 – 30 September 2016

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INTRODUCTION



INTRODUCTION

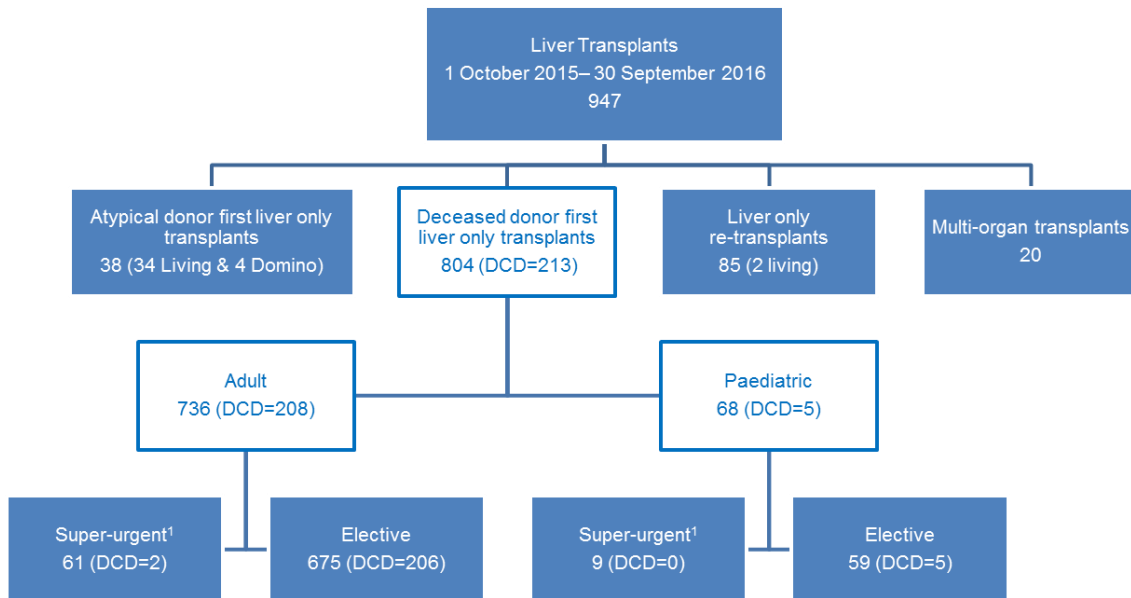
This interim report presents information on liver transplant activity, [patient survival](#) and [graft function](#) after transplantation between 1 October 2015 and 30 September 2016, for all seven centres performing liver transplantation in the UK. Data were obtained from the UK Transplant Registry, 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](#)).

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

Figure 1 details the 947 liver transplants performed in the UK in the reported time period. Of these, 804 (85%) were deceased donor first liver only transplants: 736 (92%) in adult and 68 (8%) in paediatric patients. Of the 804 transplants, 70 (9%) were super-urgent and 734 (91%) were elective transplants.

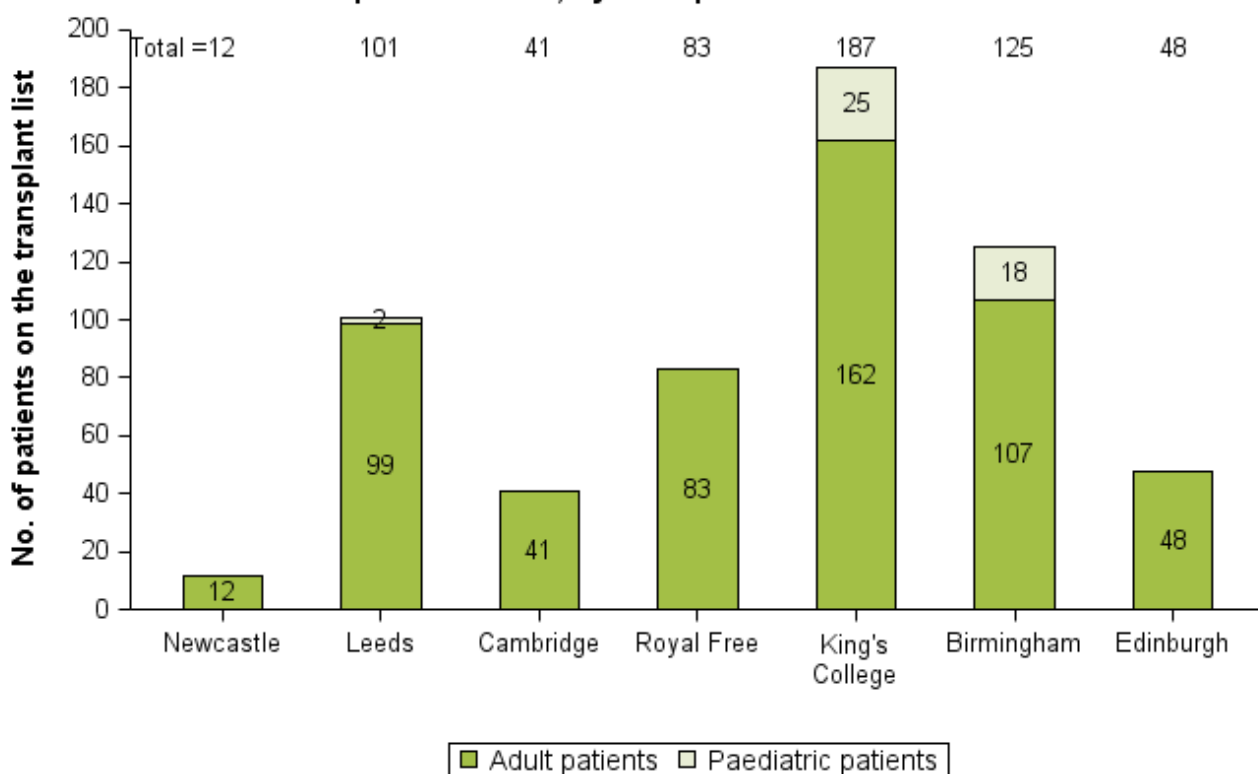
Figure 1 Liver transplants in the UK, 1 October 2015 – 30 September 2016



¹ Super-urgent registration categories were changed on 17 June 2015 to account for developments in treatment of patients with acute liver failure

Figure 2 shows the number of adult and paediatric patients on the active liver transplant list as at 30 September 2016, by transplant centre. In total, there were 597 patients on the transplant list; 552 were adults and 45 were paediatric patients. King’s College Hospital had the largest share of the transplant list (31%) and Newcastle the smallest (2%). This figure includes [elective](#) and [super-urgent](#) registrations. Compared with numbers as at 30 September 2015, there has been a 6% decrease on the active liver transplant list.

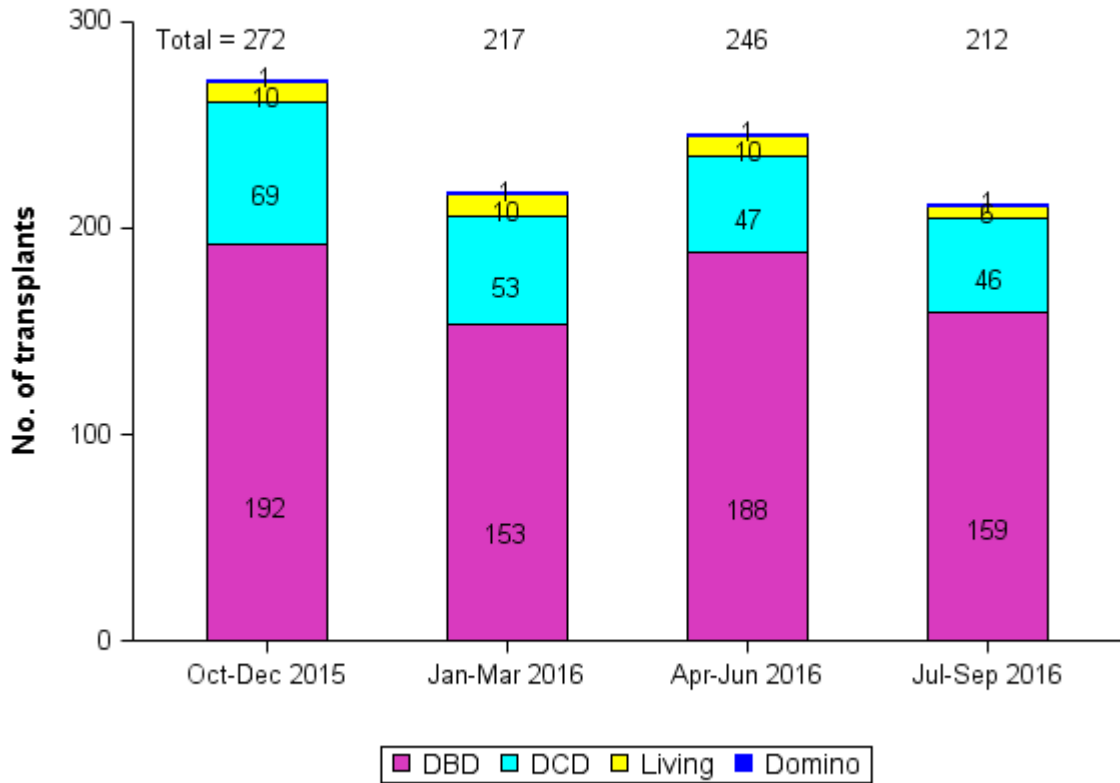
Figure 2 Adult and paediatric patients on the active liver transplant list, as at 30 September 2016, by transplant centre



TOTAL TRANSPLANT ACTIVITY

During the one-year study period, 947 liver transplants were reported. Activity by quarter is shown in **Figure 3**, by [type of donor](#).

Figure 3 Liver transplants in the UK, 1 October 2015 - 30 September 2016, by donor type



ADULT LIVER TRANSPLANTATION



ADULT LIVER TRANSPLANTATION

TRANSPLANT ACTIVITY

The number of all adult first liver only transplants in the study period is shown in **Figure 4**, by quarter. Of the 757 transplants of this type, 736 were deceased donor transplants and, of these, 675 were [elective](#) and 61 were [super-urgent](#) transplants. Of the remaining 21 transplants, 17 were elective living donor transplants and 4 were elective domino donor transplants.

Figure 4 Adult first liver only transplants in the UK, 1 October 2015 - 30 September 2016, by donor type

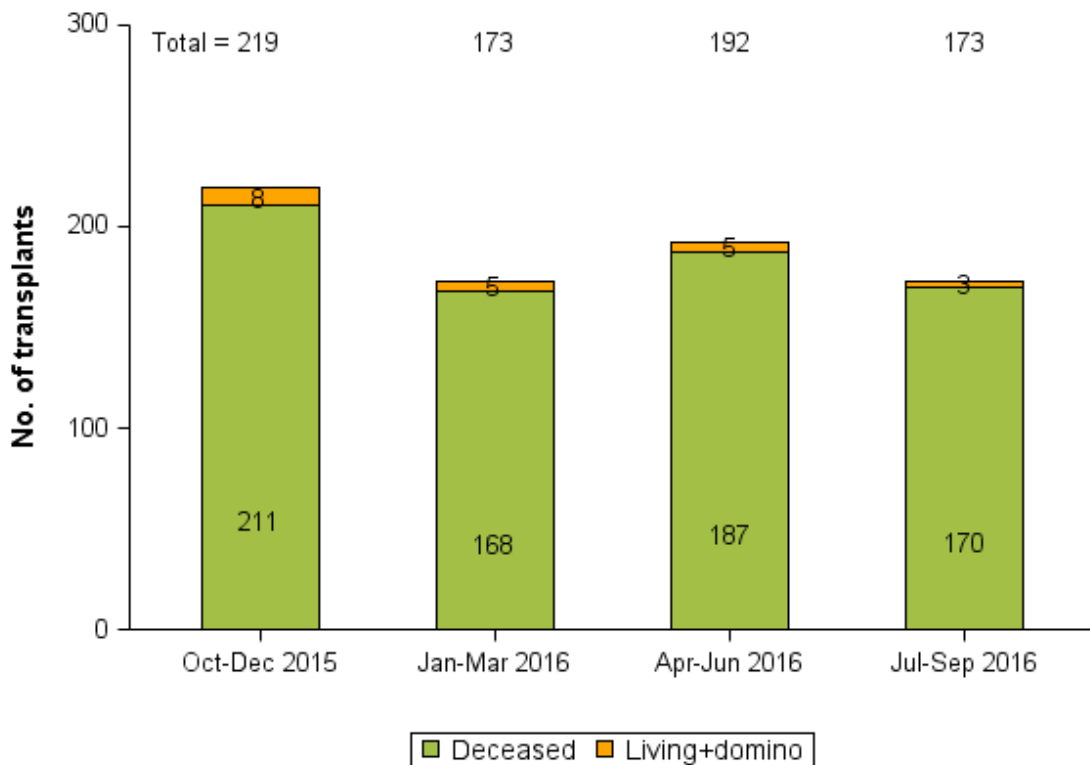


Table 3 shows the total number of adult transplants in the reported time period, including atypical donor, [multi-organ](#) and re-transplants. It also shows the number of adult deceased and living (including domino) donor first liver only transplants, by transplant centre.

Table 3 Number of adult liver transplants between, 1 October 2015 and 30 September 2016, 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	41	8	36	7	0	0
Leeds	97	12	86	7	4	0
Cambridge	96	5	91	3	0	0
Royal Free	82	18	73	14	2	0
King's College	167	13	141	12	7	0
Birmingham	184	19	161	14	7	0
Edinburgh	99	9	87	4	1	0
TOTAL	766	84	675	61	21	0

Figure 5 shows adult elective deceased donor first liver only transplants, by quarter and transplant centre.

Figure 5 Adult elective deceased donor first liver only transplants, 1 October 2015 - 30 September 2016, by quarter and transplant centre

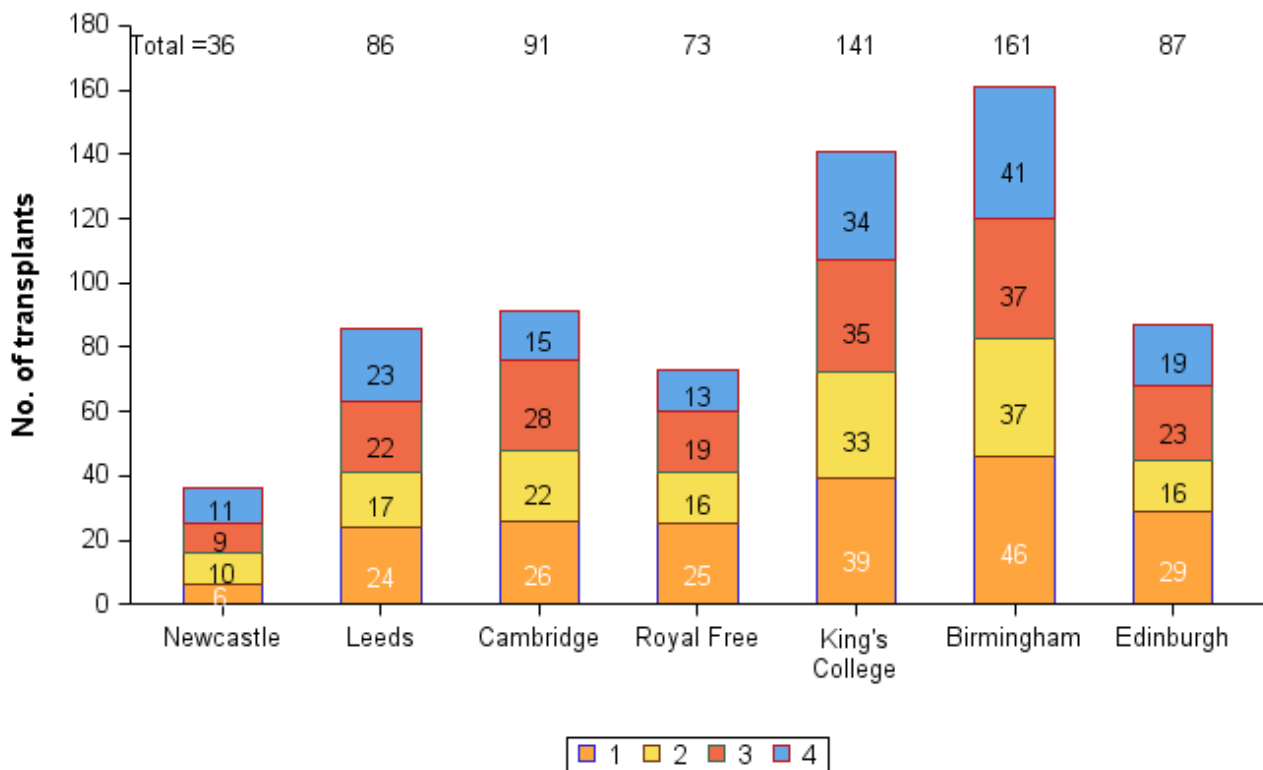
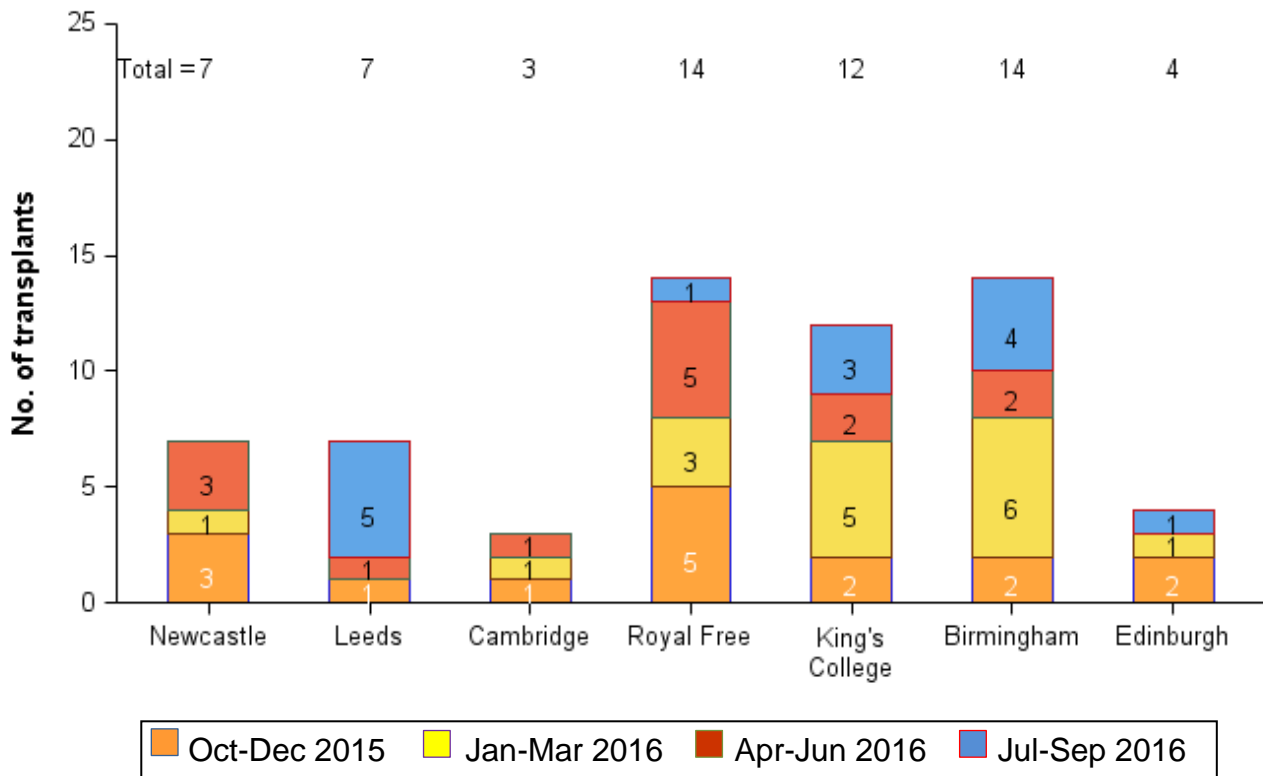


Figure 6 shows adult super-urgent deceased donor first liver only transplants, by quarter and transplant centre.

Figure 6 Adult super-urgent deceased donor first liver only transplants, 1 October 2015 - 30 September 2016, by quarter and transplant centre



The demographic characteristics of 675 adult [elective](#) first-time transplant recipients of a deceased donor liver in the time period are shown, by centre and overall, in **Table 4**. Two thirds of these recipients were male and the median age was 56 years. The most common indication for transplantation was alcoholic liver disease (28% of cases) followed by cancer (22% of cases). The median recipient BMI was 27 kg/m². For some characteristics, due to rounding, percentages may not add up to 100.

SURVIVAL AND GRAFT FUNCTION – ADULT ELECTIVE TRANSPLANTS

Table 5 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 675 transplants in this time period, survival information was known for 640 transplants and none of these transplants were [auxiliary](#). Of these, 97% of patients were alive 90 days post-transplant and the graft function rate at 90 days was 94%.

Table 4 Demographic characteristics of adult elective deceased donor first liver transplant recipients between 1 October 2015 and 30 September 2016

		Birmingham N (%)	Cambridge N (%)	Edinburgh N (%)	King's College N (%)	Leeds N (%)	Newcastle N (%)	Royal Free N (%)	TOTAL N (%)
Number		161	91	87	141	86	36	73	675 (100)
Recipient sex	Male	105 (65)	58 (64)	65 (75)	84 (60)	59 (69)	22 (61)	54 (74)	447 (66)
	Female	56 (35)	33 (36)	22 (25)	57 (40)	27 (31)	14 (39)	19 (26)	228 (34)
Recipient ethnicity	White	150 (93)	86 (95)	82 (94)	122 (87)	75 (87)	36 (100)	54 (74)	605 (90)
	Non-white	11 (7)	5 (5)	5 (6)	19 (13)	11 (13)	0	19 (26)	70 (10)
Indication ¹	Cancer	30 (19)	12 (13)	25 (29)	35 (25)	24 (28)	7 (19)	18 (25)	151 (22)
	Hepatitis C	6 (4)	4 (4)	8 (9)	7 (5)	5 (6)	1 (3)	3 (4)	34 (5)
	Alcoholic liver disease	49 (30)	23 (25)	19 (22)	37 (26)	30 (35)	12 (33)	21 (29)	191 (28)
	Hepatitis B	1 (1)	1 (1)	0	3 (2)	2 (2)	0	3 (4)	10 (2)
	Primary sclerosing cholangitis	21 (13)	17 (19)	7 (8)	10 (7)	8 (9)	4 (11)	11 (15)	78 (12)
	Primary biliary cirrhosis	12 (7)	8 (9)	6 (7)	8 (6)	3 (3)	6 (17)	6 (8)	49 (7)
	Autoimmune and cryptogenic disease	10 (6)	3 (3)	1 (1)	14 (10)	5 (6)	2 (6)	5 (7)	40 (6)
	Metabolic	22 (14)	18 (20)	17 (20)	10 (7)	7 (8)	3 (8)	4 (5)	81 (12)
	Other	9 (6)	5 (5)	4 (5)	17 (12)	2 (2)	1 (3)	2 (3)	40 (6)
	Acute hepatic failure	1 (1)	0	0	0	0	0	0	1 (0)
Recipient HCV status ²	Negative	142 (88)	61 (67)	72 (83)	117 (83)	73 (85)	35 (97)	66 (90)	566 (84)
	Positive	17 (10)	6 (7)	14 (16)	24 (17)	11 (13)	1 (3)	7 (10)	80 (12)
	Not reported	2 (1)	24 (26)	0	0	2 (2)	0	0	28 (4)

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.

Table 4 Demographic characteristics of adult elective deceased donor first liver transplant recipients between 1 October 2015 and 30 September 2016

		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	154 (96)	79 (87)	78 (90)	115 (82)	79 (92)	31 (86)	71 (97)	607 (90)
	In-patient	7 (4)	12 (13)	9 (10)	26 (18)	7 (8)	5 (14)	2 (3)	68 (10)
Recip age (years)	Median (IQR)	57 (46,62)	56 (48,63)	60 (53,63)	54 (44,61)	56 (51,61)	60 (52,66)	53 (42,61)	56 (48,62)
	Not reported	0	0	0	0	0	0	0	0
BMI kg/m ²	Median (IQR)	27 (24,31)	29 (24,32)	29 (25,33)	27 (24,30)	27 (24,30)	27 (23,32)	26 (23,31)	27 (24,31)
	Not reported	0	0	0	0	0	0	0	0
Cold Ischaemia Time (hrs)	Median (IQR)	7 (6,9)	8 (7,10)	9 (8,10)	9 (8,11)	8 (6,9)	10 (8,12)	8 (7,11)	8 (7,10)
	Not reported	0	3	0	80	2	0	0	85

Table 5 Unadjusted 90-day patient survival (%) and graft function (%) for adult elective deceased donor first liver only transplants between 1 October 2015 and 30 September 2016, by transplant centre					
Centre	Number of transplants	90-day survival (95% CI)		90-day graft function (95% CI)	
Newcastle	28	96	(77-98)	96	(77-98)
Leeds	74	96	(86-98)	91	(81-96)
Cambridge	91	97	(90-98)	96	(88-98)
Royal Free	73	94	(86-98)	89	(79-94)
King's College	141	100	--	100	--
Birmingham	160	94	(90-96)	93	(88-96)
Edinburgh	72	98	(90-100)	91	(81-96)
TOTAL	640	97	(94-98)	94	(92-96)

SURVIVAL AND GRAFT FUNCTION – ADULT SUPER-URGENT TRANSPLANTS

Table 6 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 61 transplants in this time period, survival information was known for 58 transplants. Two of these transplants were [auxiliary](#) transplants and were excluded from survival analyses. Of the remaining 56 transplants, 91% of patients were alive 90 days post-transplant and the graft function rate at 90 days was 87%. 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 6 Unadjusted 90-day patient survival (%) and graft function (%) for adult super-urgent deceased donor first liver only transplants between, 1 October 2015 and 30 September 2016, by transplant centre					
Centre	Number of transplants	90-day survival (95% CI)		90-day graft function (95% CI)	
Newcastle	7	100	--	100	--
Leeds	4	100	--	75	(12-96)
Cambridge	3	100	--	100	--
Royal Free	14	85	(54-96)	85	(54-96)
King's College	12	91	(54-98)	91	(54-98)
Birmingham	12	100	--	91	(54-98)
Edinburgh	4	50	(6-84)	50	(6-84)
TOTAL	56	91	(79-96)	87	(75-94)

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

PAEDIATRIC LIVER TRANSPLANTATION



PAEDIATRIC LIVER TRANSPLANTATION

TRANSPLANT ACTIVITY

The number of all paediatric first liver only transplants in the reported period is shown in **Figure 7**, by quarter. Of the 85 transplants in total for paediatric patients, 76 were [elective](#) and 9 were [super-urgent](#) transplants. There were 68 deceased donor transplants and 17 living donor transplants.

Figure 7 Paediatric first liver only transplants in the UK, 1 October 2015 - 30 September 2016, by donor type

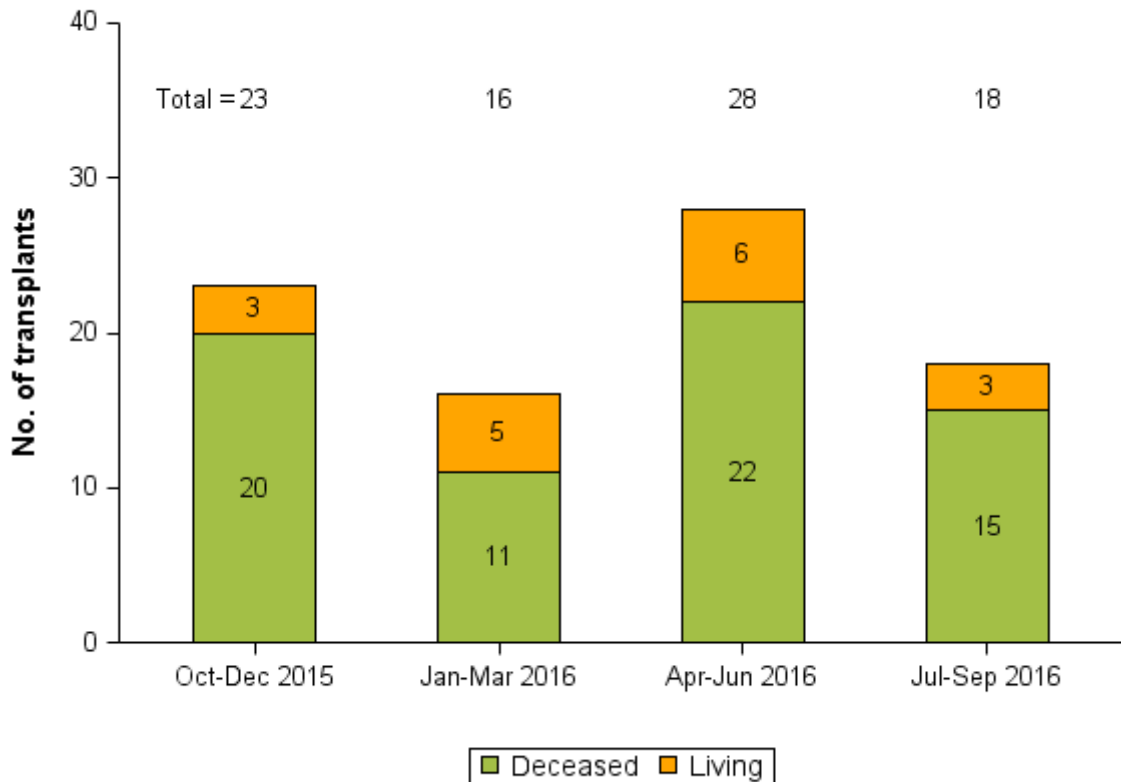


Table 7 shows the total number of paediatric transplants in the reported time period, including atypical donor, [multi-organ](#) and re-transplants. It also shows the number of paediatric deceased and living (including domino) donor first liver only transplants, by transplant centre.

Table 7 Number of paediatric transplants between 1 October 2015 and 30 September 2016, 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	15	0	14	0	1	0
Cambridge	0	1	0	1	0	0
Royal Free	0	0	0	0	0	0
King's College	37	6	27	5	9	0
Birmingham	35	3	18	3	7	0
Edinburgh	0	0	0	0	0	0
TOTAL	87	10	59	9	17	0

SURVIVAL AND GRAFT FUNCTION – PAEDIATRIC TRANSPLANTS

Table 8 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 59 transplants in this time period, survival information was known for 57 transplants and one of these transplants was [auxiliary](#) and therefore removed from the analysis. Of the remaining 56 transplants for analysis, 100% of patients were alive 90 days post-transplant and the graft function rate at 90 days was 98%.

Table 8 Unadjusted 90-day patient survival (%) and graft function (%) for paediatric elective deceased donor liver only transplants after first graft between 1 October 2015 and 30 September 2016, by transplant centre					
Centre	Number of transplants	90-day survival (95% CI)		90-day graft function (95% CI)	
Leeds	13	100	-	100	-
King's College	25	100	-	96	(75-98)
Birmingham	18	100	-	100	-
TOTAL	56	100	-	98	(88-99)

There were nine paediatric [super-urgent](#) deceased donor first liver transplantations in the period of study; one at Cambridge, three at Birmingham and five at King's College. 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

APPENDIX

DATA

Data were obtained from the UK Transplant Registry for the time period 1 October 2015 to 30 September 2016 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](#).

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, 10 March 2017. 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.

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.

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.

Prepared by:

Statistics and Clinical Studies, NHS Blood and Transplant

Dr Elisa Allen