NHS
Blood and Transplant

INTERIM REPORT ON CARDIOTHORACIC ORGAN TRANSPLANTATION

REPORT FOR 2018/2019
(1 OCTOBER 2015 – 30 SEPTEMBER 2018)

PUBLISHED FEBRUARY 2019

PRODUCED IN COLLABORATION WITH NHS ENGLAND

Contents

Contents

Executive Summary

1. Executive Summary

This interim report presents key figures about cardiothoracic organ transplantation in the UK during the three-year period 1 October 2015 to 30 September 2018. The report covers the number of transplants performed and the short-term survival outcomes of patients following heart and lung transplantation; both on a national and centre-specific basis. For longer-term survival rates by centre, with risk-adjustment, the reader is referred to the full Annual Report on Cardiothoracic Organ Transplantation.

Key findings

- There were 586 heart only transplants performed in the UK across the three-year period. Of these, 487 (83%) were in adult patients and 99 (17%) were in paediatric patients.

- There were 560 lung transplants performed in the UK across the three-year period. Of these, 537 (96%) were in adult patients and 23 (4%) were in paediatric patients.

- Over the three-year period, the highest adult heart transplant activity during any individual quarter corresponded with the introduction of the new allocation scheme for heart (October 2016). For adult lung transplants, the greatest activity was seen for the quarter of January-March 2018.

- The national 30-day rate of **survival following adult heart transplantation** in this cohort was 92.6%. Centre-specific rates ranged between 88.2% and 95.2% (unadjusted for case mix).

- The national 90-day rate of **survival following adult lung transplantation** in this cohort was 90.1%. Centre-specific rates ranged between 84.7% and 96.4% (unadjusted for case mix).

- The national 30-day rate of **survival following paediatric heart transplantation** in this cohort was 95.7%. The centre-specific rates for the two paediatric centres were 92.2% and 100% (unadjusted for case mix).

- The national 90-day rate of **survival following paediatric lung transplantation** in this cohort was 91.3%. Centre-specific survival rates were not estimable for both paediatric centres due to small numbers of transplants performed in this category.

Use of the contents of this report should be acknowledged as follows: *Interim Report on Cardiothoracic Organ Transplantation 2018/2019, NHS Blood and Transplant*

INTRODUCTION

2. Introduction

This interim report presents data on activity and outcomes of heart and lung transplant recipients during the three-year period 1 October 2015 to 30 September 2018, for all centres performing heart and/or lung transplantation in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood and Transplant, which holds information relating to donors, recipients and outcomes for all cardiothoracic organ transplants performed in the UK.

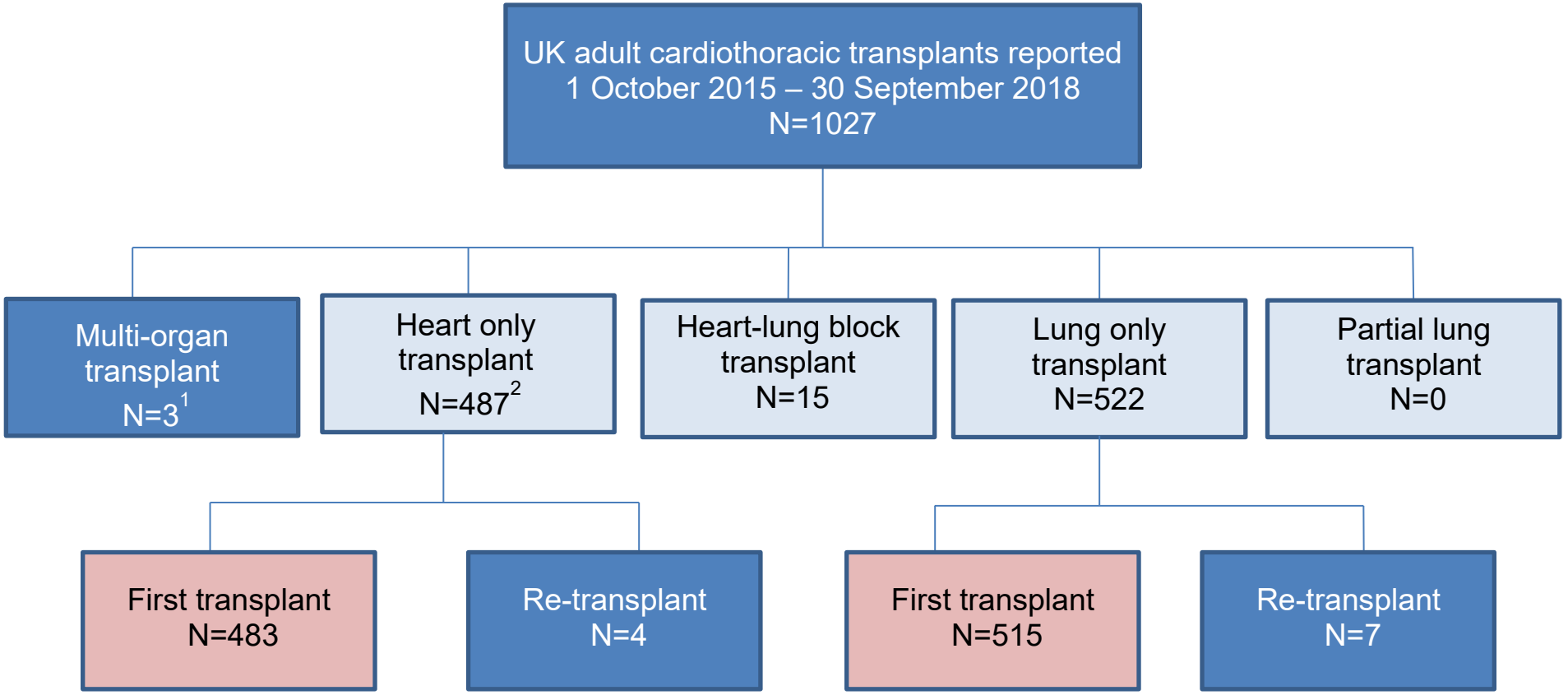
Results are described separately for heart and lung activity and also for adult (aged 16 years or over) and paediatric patients (aged less than 16 years). There are seven cardiothoracic organ transplant centres in the UK; six in England and one in Scotland. Five of the seven centres specialise in adult transplantation, one in paediatric transplantation (Great Ormond Street Hospital) and one in both adult and paediatric transplantation (Newcastle). Any transplants carried out at Great Ormond Street Hospital in patients aged 16 or over are included in the paediatric report, and any transplants carried out at adult only centres in patients less than 16 are included in the adult sections. Combined heart-lung transplants are included in the lung analysis.

Patients receiving multi-organ transplants (other than heart-lung transplants) are excluded from all analyses other than those presented in this Introduction section. In addition, partial lung transplants, heart-lung transplants and patients receiving their second (or subsequent) graft are excluded from the survival analysis calculations. Only short-term unadjusted survival rates are presented. For longer-term survival rates by centre, with risk-adjustment, the reader is referred to the full Annual Report on Cardiothoracic Organ Transplantation. Methods used are described in the Appendix.

In the last 3 years, the UK has made changes to the listing and allocation policies for heart and lung transplantation. As of 26 October 2016, patients can be registered super-urgently on the heart transplant list. This additional tier is a result of the growing number of patients registered urgently and will help to prioritise those with a greatest need for heart transplantation. National urgent and super-urgent allocation tiers were also introduced for those with the greatest clinical need on the lung transplant list on 18 May 2017.

Figure 2.1 shows a breakdown the 1027 adult cardiothoracic organ transplants performed in the UK in the three-year period whilst **Figure 2.2** shows the same information for the 122 paediatric transplants performed during the same period. In the remainder of this report, multi-organ transplants are excluded, hence 1024 adult and 122 paediatric transplants are analysed further (those in the light blue boxes). In the survival sections, first transplants only are analysed (those in the pink boxes).

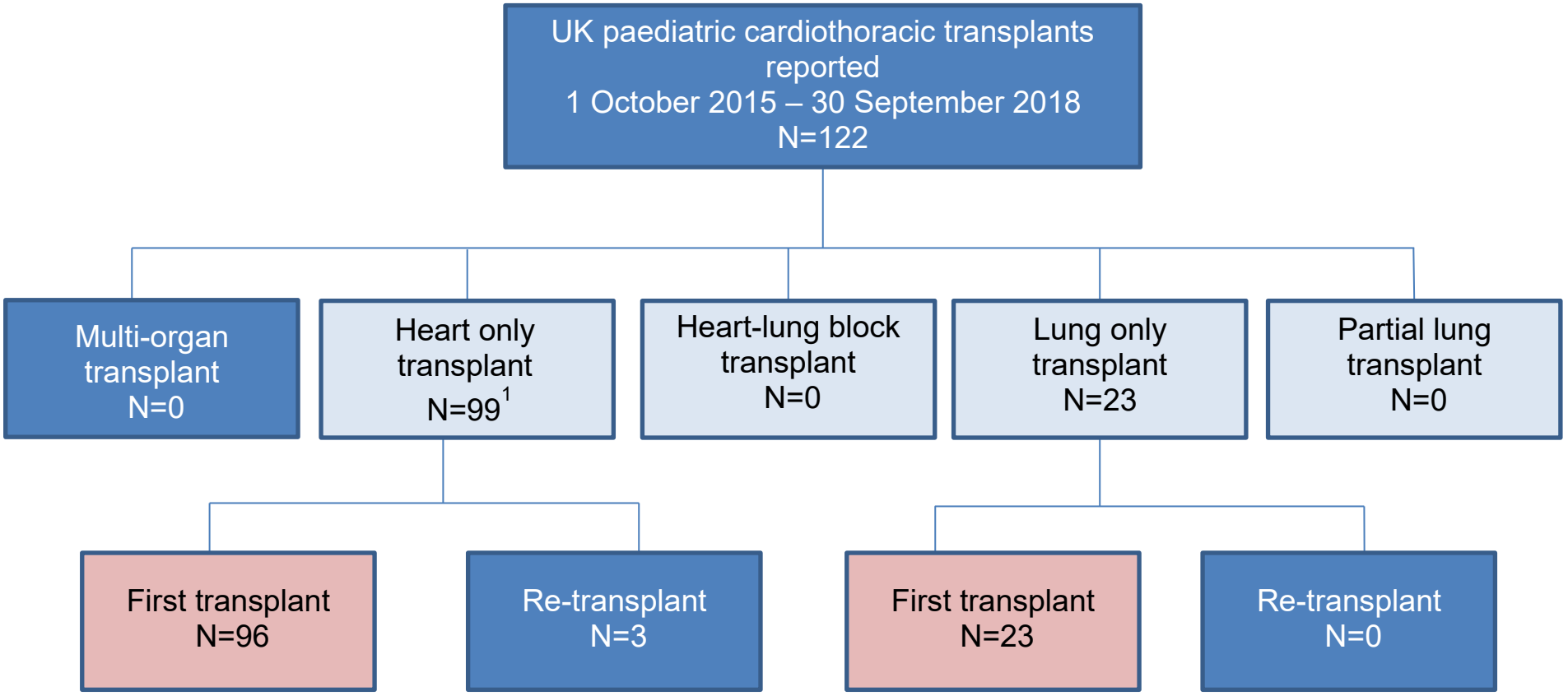
Figure 2.1 Adult cardiothoracic organ transplants performed in the UK, 1 October 2015 to 30 September 2018



[1] Includes 1 heart and kidney transplant, 1 heart and liver transplant, 1 lung and liver transplant (all excluded from remainder of report)

[2] Includes 58 DCD heart transplants

Figure 2.2 Paediatric cardiothoracic organ transplants performed in the UK, 1 October 2015 to 30 September 2018



[1] Includes 1 DCD heart transplant

ADULT HEART TRANSPLANTATION

3.1 Transplant Activity

Between 1 October 2015 and 30 September 2018, 487 adult heart only transplants were performed. **Figure 3.1** shows the quarterly trend in activity over the three-year time period, stratified by transplant centre. Quarterly activity has remained stable, fluctuating between 35 and 48 transplants, with a slight downward trend. There were 39 adult heart transplants in the most recent quarter, July–September 2018, and the highest number was performed in October–December 2016 when the super-urgent heart allocation tier was introduced.

Figure 3.2 shows quarterly activity stratified by donor type and **Figure 3.3** is stratified by urgency status. In the latest quarter, July-September 2018, 72% of transplants performed were either urgent or super-urgent.

Figure 3.1 Number of adult heart transplants, by quarter and transplant centre, 1 October 2015 - 30 September 2018

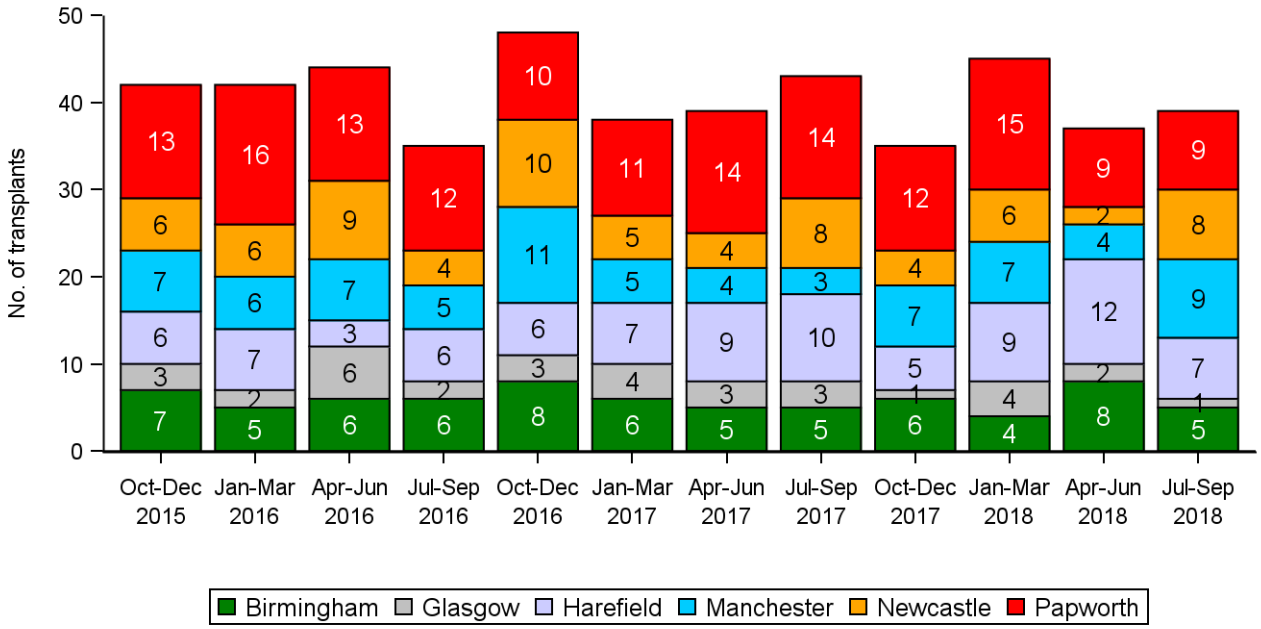


Figure 3.2 Number of adult heart transplants, by quarter and donor type, 1 October 2015 - 30 September 2018

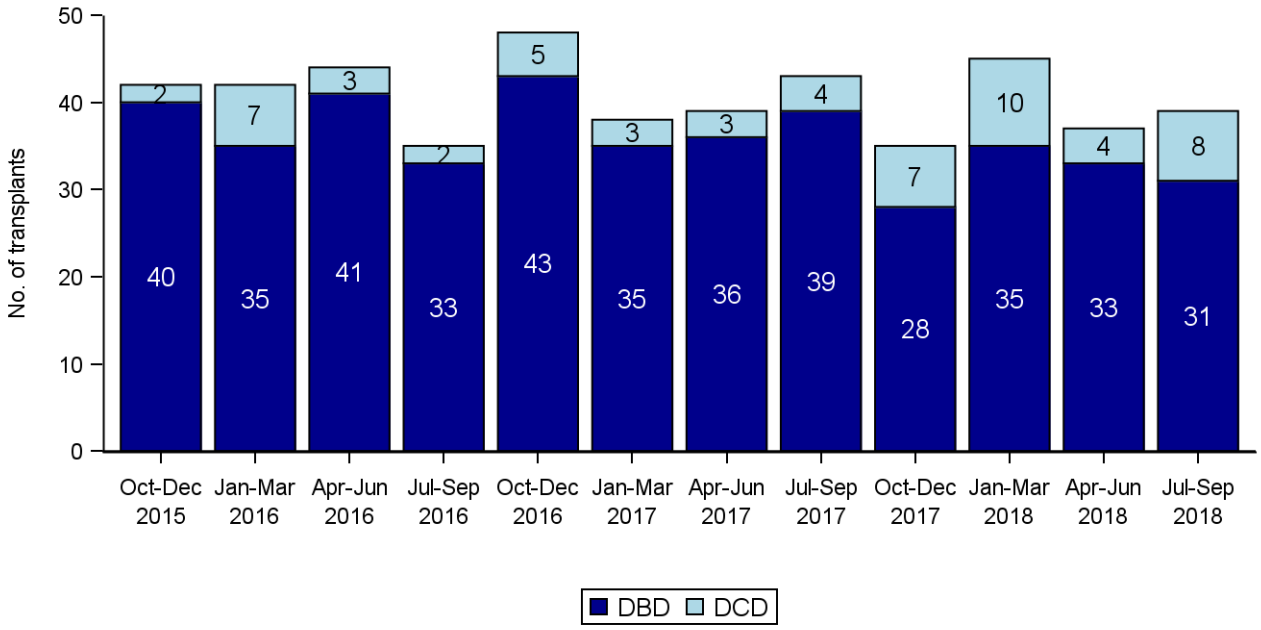
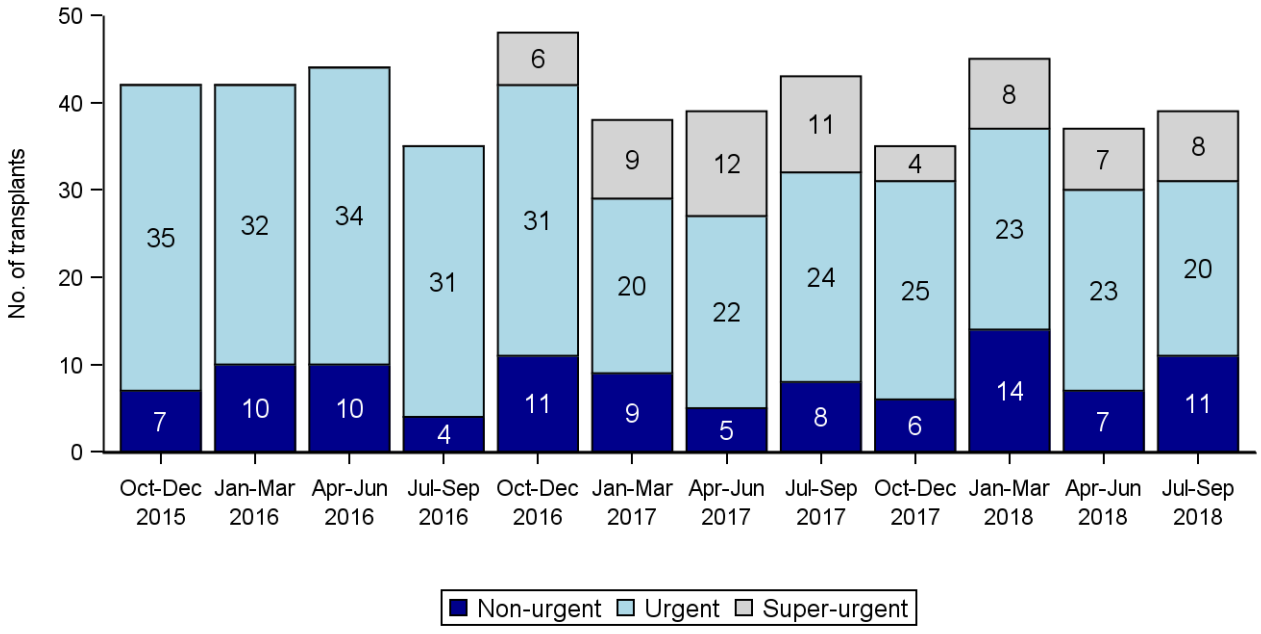


Figure 3.3 Number of adult heart transplants, by quarter and urgency status, 1 October 2015 - 30 September 2018



3.2 Post-Transplant Survival

This section includes first time transplants only. DCD heart transplants are included.

Of the 483 adult patients receiving a first heart only transplant between 1 October 2015 and 30 September 2018, survival information post-transplant was known for 475 (98.3%). The 30-day post-transplant unadjusted patient survival rates for each centre and nationally are shown in **Table 3.1**. The national 30-day survival rate was 92.6%, ranging from 88.2% to 95.2% across centres.

Table 3.1 30-day patient survival rates after first adult heart transplants, by centre, 1 October 2015 to 30 September 2018

Centre	Number of transplants	Number of deaths	30 day survival % (95% CI) Unadjusted	
Birmingham	70	7	90.0	(80.2 - 95.1)
Glasgow	34	2	94.1	(78.5 - 98.5)
Harefield	85	10	88.2	(79.2 - 93.5)
Manchester	75	4	94.7	(86.4 - 98.0)
Newcastle	64	5	92.2	(82.2 - 96.7)
Papworth	147	7	95.2	(90.3 - 97.7)
UK	**475**	**35**	**92.6**	**(89.9 - 94.7)**

ADULT LUNG TRANSPLANTATION

4.1 Transplant Activity

During the three-year period, 537 adult lung transplants were performed (including 15 combined heart-lung transplants). **Figure 4.1** shows the quarterly trend in activity over the period, stratified by transplant centre. Activity was lowest during the latest quarter, July-September 2018, and highest during January-March 2018.

Figure 4.2 shows the quarterly activity stratified by donor type and **Figure 4.3** shows lung only transplant activity stratified by urgency status. The national urgent and super-urgent lung allocation tiers were introduced in May 2017 and up to the end of September 2018 there had been 52 urgent lung transplants and 9 super-urgent lung transplants.

Figure 4.4 shows combined heart-lung transplant activity stratified by urgency status.

Figure 4.1 Number of adult lung transplants, by quarter and transplant centre, 1 October 2015 - 30 September 2018

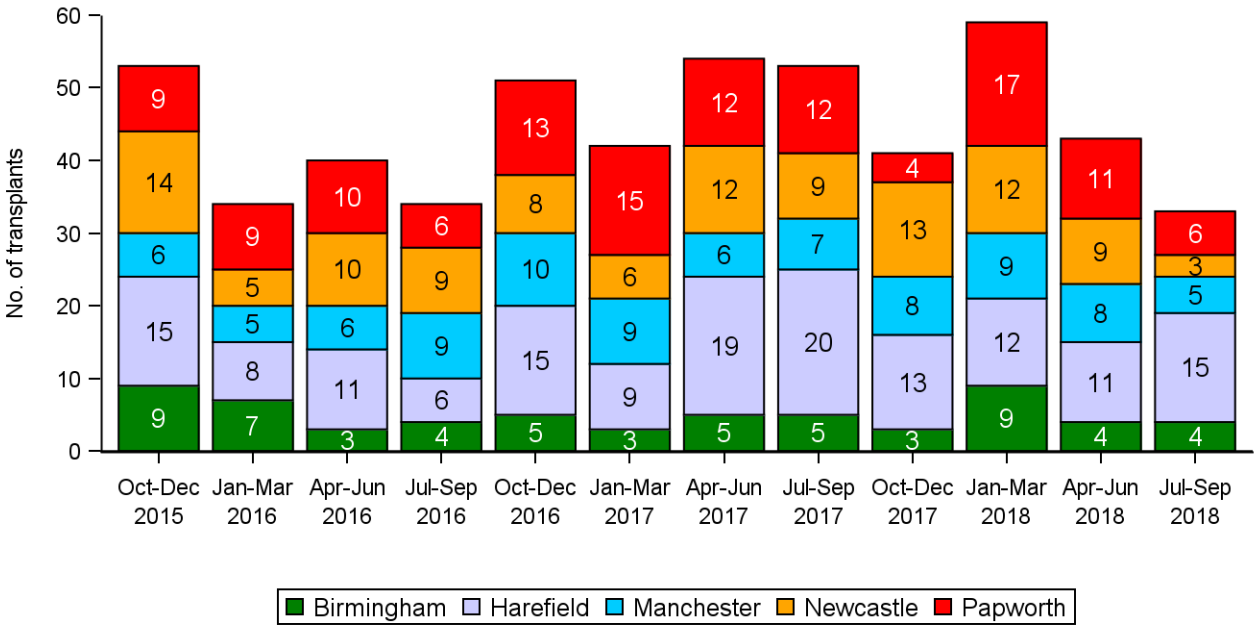


Figure 4.2 Number of adult lung transplants, by quarter and donor type, 1 October 2015 - 30 September 2018

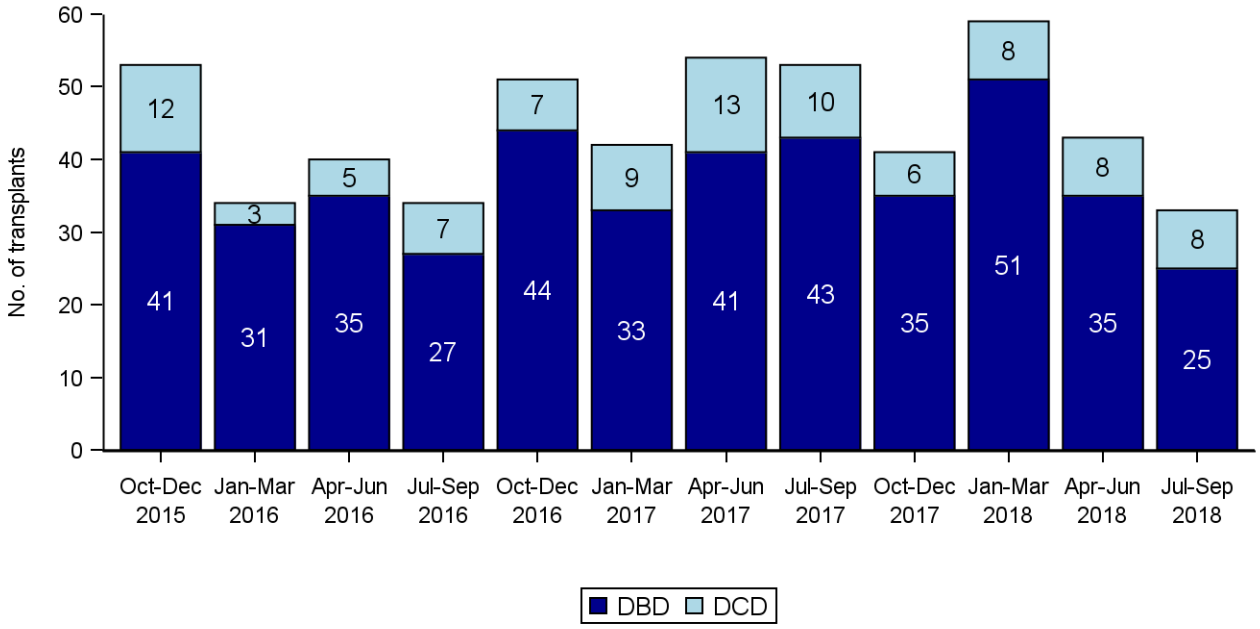


Figure 4.3 Number of adult lung only transplants, by quarter and urgency status, 1 October 2015 - 30 September 2018

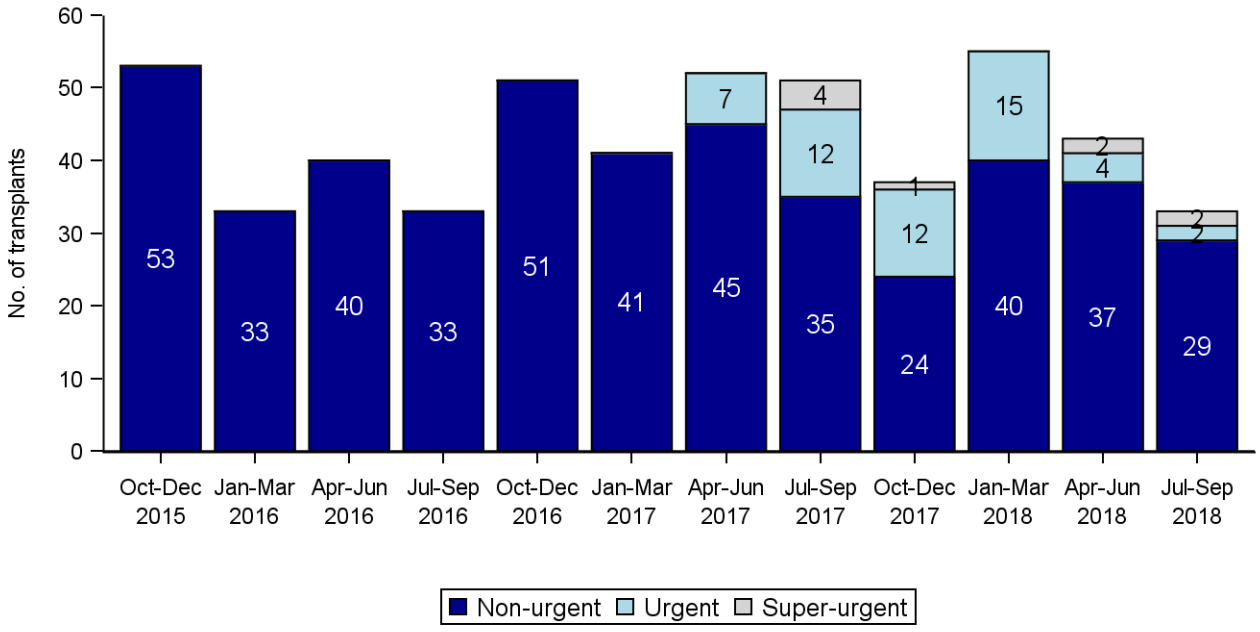
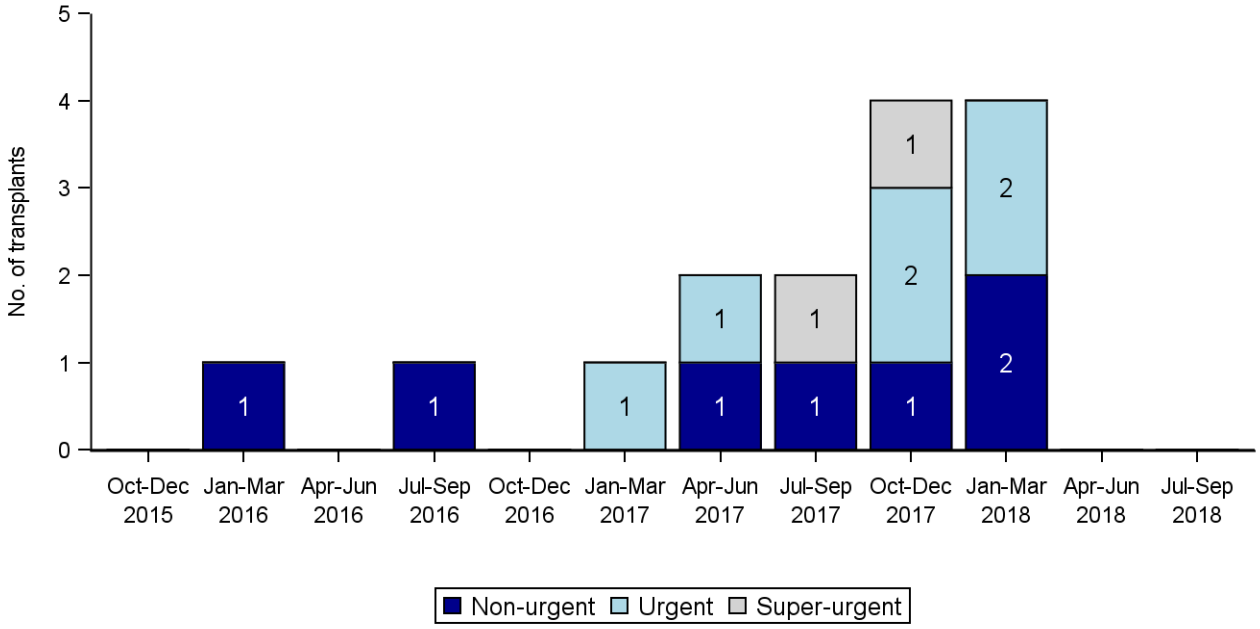


Figure 4.4 Number of adult heart-lung transplants, by quarter and urgency status, 1 October 2015 - 30 September 2018



4.2 Post-Transplant Survival

This section excludes combined heart-lung transplants. It includes first time transplants only and both single and bilateral lung transplants.

Of the 515 adult patients receiving a first lung only transplant between 1 October 2015 and 30 September 2018, survival information post-transplant was known for 507 (98.4%). The 90-day post-transplant unadjusted patient survival rates for each centre and nationally are shown in **Table 4.1**. The national 90-day survival rate was 90.1%, ranging from 84.7% to 96.4% across centres.

Table 4.1 90-day patient survival rates after first adult lung transplants, by centre, 1 October 2015 to 30 September 2018

Centre	Number of transplants	Number of deaths	90 day survival % (95% CI) Unadjusted	
Birmingham	59	9	84.7	(72.7 - 91.8)
Harefield	143	15	89.5	(83.2 - 93.5)
Manchester	85	3	96.4	(89.3 - 98.8)
Newcastle	100	14	86.0	(77.5 - 91.5)
Papworth	120	9	92.4	(85.9 - 96.0)
UK	**507**	**50**	**90.1**	**(87.1 - 92.4)**

PAEDIATRIC HEART TRANSPLANTATION

5.1 Transplant Activity

During the three-year period, 99 paediatric heart transplants were performed. **Figure 5.1** shows the quarterly trend in activity over the period, stratified by transplant centre. Quarterly activity has fluctuated, with between 3 and 13 transplants performed, with the lowest number in the most recent quarter, July-September 2018. **Figure 5.2** shows quarterly activity stratified by urgency status. Eighty three percent of the transplants over the three-year period were urgent.

Figure 5.1 Number of paediatric heart transplants, by quarter and transplant centre, 1 October 2015 - 30 September 2018

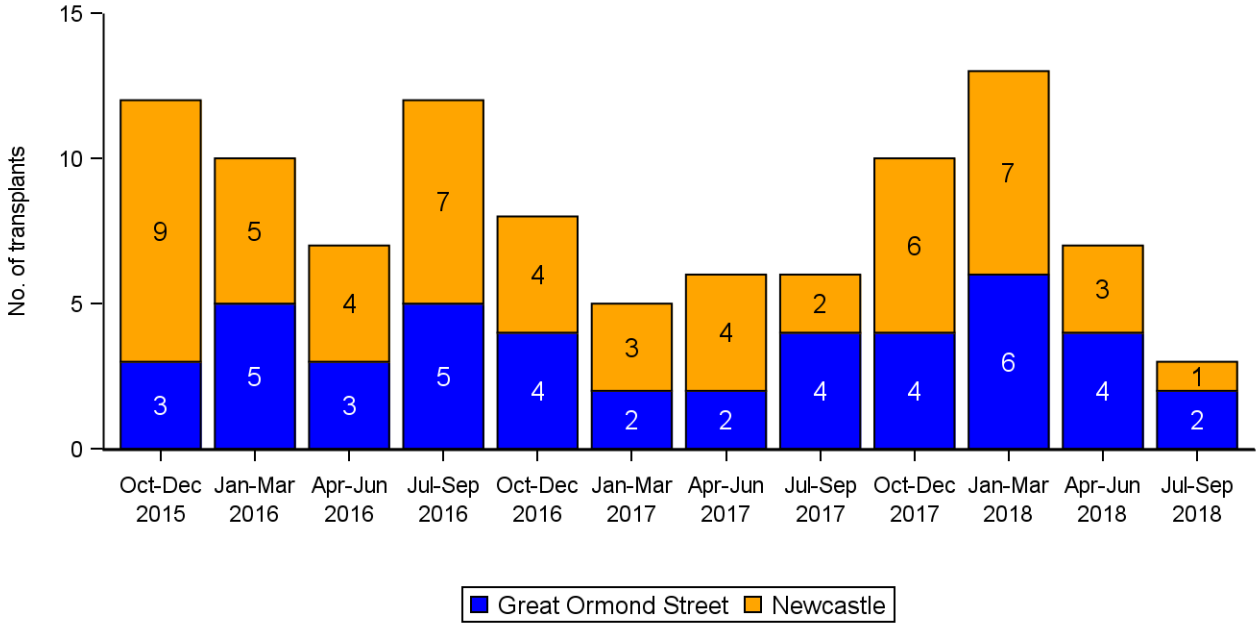
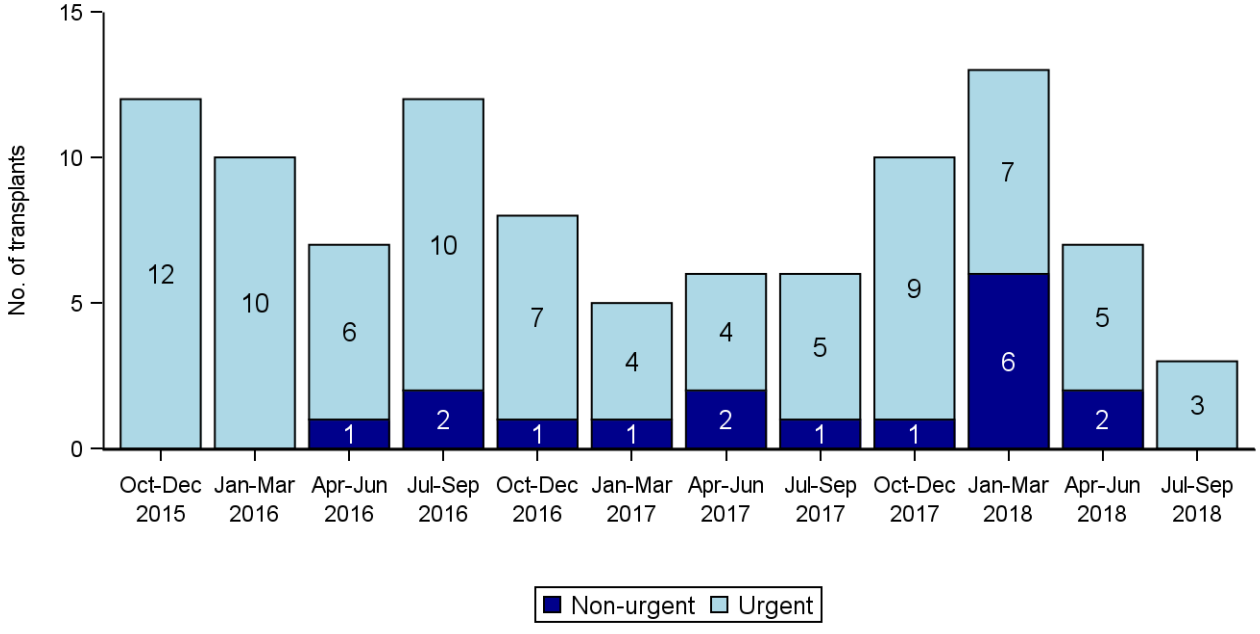


Figure 5.2 Number of paediatric heart transplants, by quarter and urgency status, 1 October 2015 - 30 September 2018



5.2 Post-Transplant Survival

This section includes first time transplants only.

Of the 96 paediatric patients receiving a first heart only transplant between 1 October 2015 and 30 September 2018, survival information was known for 93 (96.9%). The 30-day post-transplant unadjusted patient survival rates for each centre and nationally are shown in **Table 5.1**. The national 30-day survival rate was 95.7%.

Table 5.1 30-day patient survival rates after first paediatric heart transplants, by centre, 1 October 2015 to 30 September 2018

Centre	Number of transplants	Number of deaths	30 day survival % (95% CI) Unadjusted	
Great Ormond Street	42	0	100.0	-
Newcastle	51	4	92.2	(80.4 - 97.0)
UK	**93**	**4**	**95.7**	**(88.9 - 98.4)**

PAEDIATRIC LUNG TRANSPLANTATION

6.1 Transplant Activity

During the three-year period, 23 paediatric lung transplants were performed (none were combined heart-lung). **Figure 6.1** shows the quarterly trend in activity over the period, stratified by transplant centre. Quarterly activity has consistently totalled less than 5 transplants nationally and there has been a decreasing trend over time. This decrease can be explained by a change in policy by Great Ormond Street Hospital to no longer accept patients infected with Mycobacterium abscessus for lung transplant because of the poor outcomes (50% mortality).

Figure 6.2 shows quarterly activity stratified by donor type and **Figure 6.3** is stratified by urgency status (national urgent and super-urgent lung allocation tiers were introduced in May 2017).

Figure 6.1 Number of paediatric lung transplants, by quarter and transplant centre, 1 October 2015 - 30 September 2018

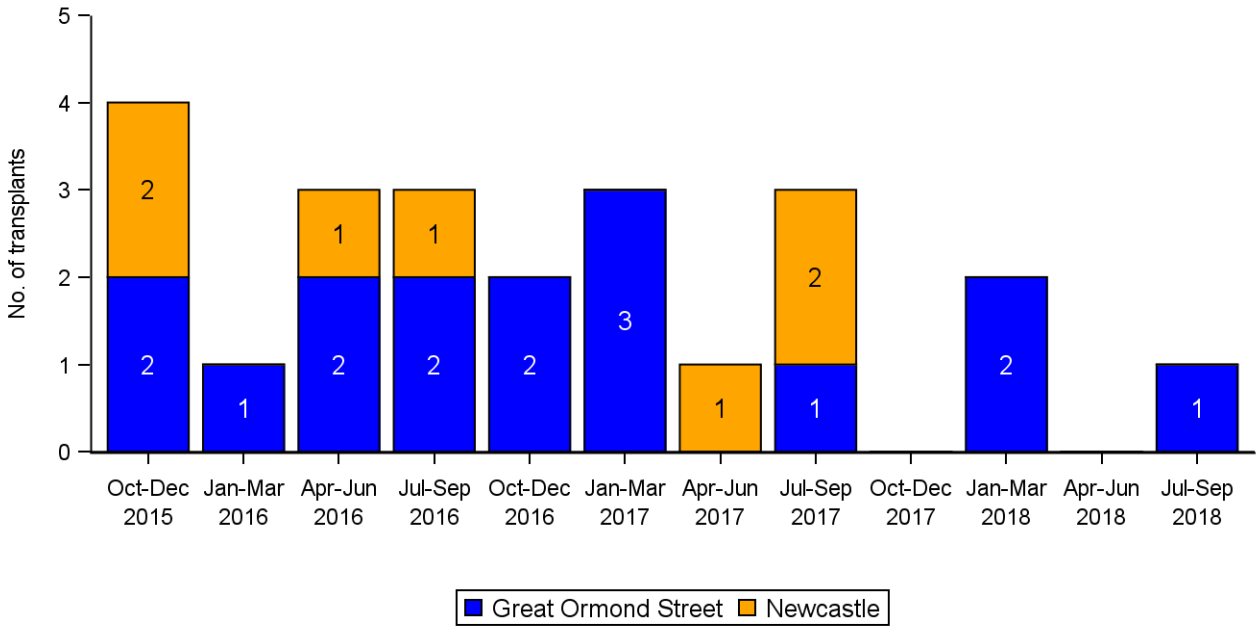


Figure 6.2 Number of paediatric lung transplants, by quarter and donor type, 1 October 2015 - 30 September 2018

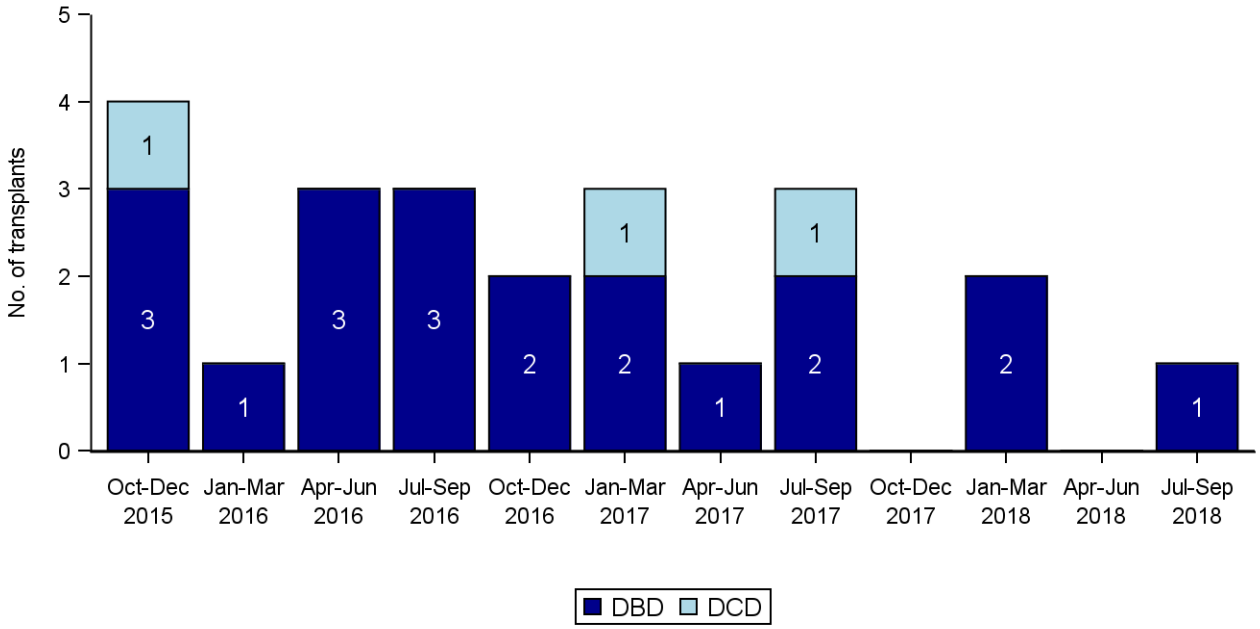
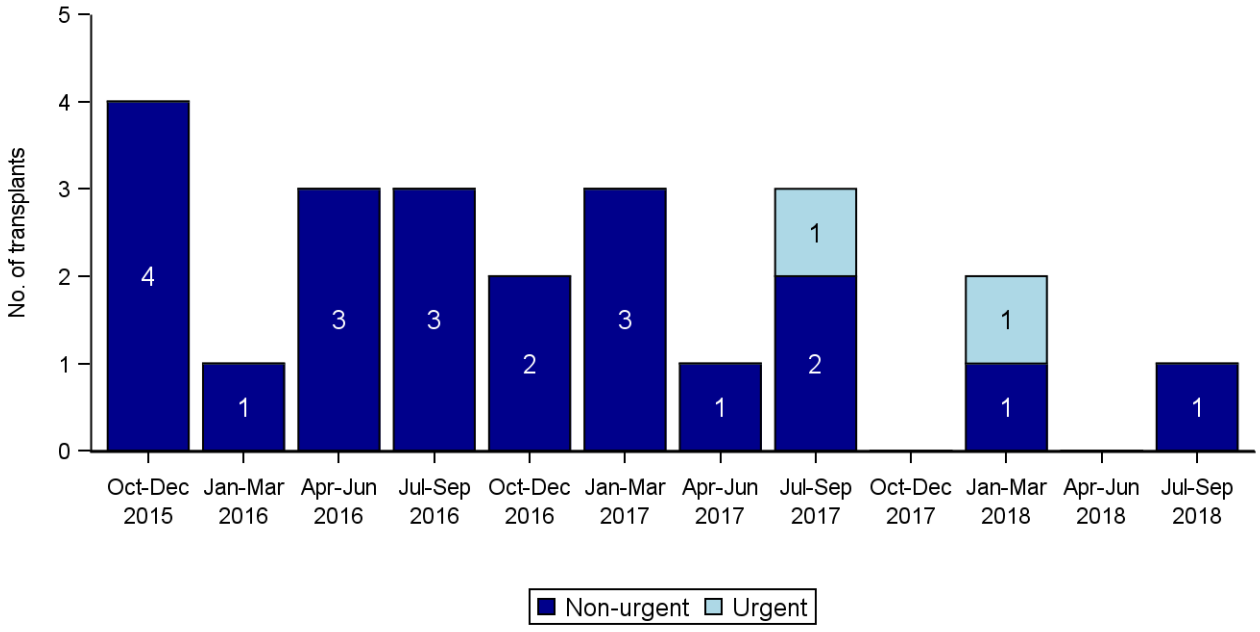


Figure 6.3 Number of paediatric lung transplants, by quarter and urgency status, 1 October 2015 - 30 September 2018



6.2 Post-Transplant Survival

This section includes first time transplants only. Both single and bilateral lung transplants are included.

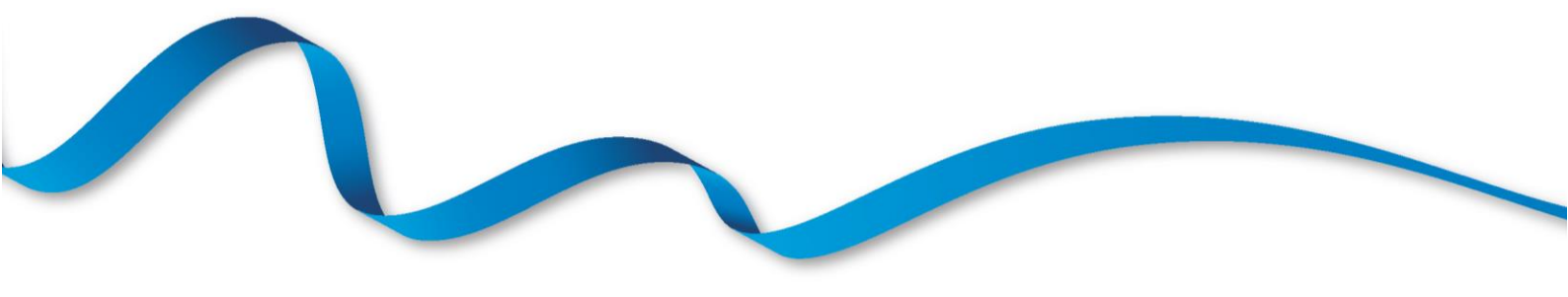
Of the 23 paediatric patients receiving a first lung only transplant between 1 October 2015 and 30 September 2018, survival information was known for 100% of these patients. The 90-day post-transplant unadjusted patient survival rates are shown in **Table 6.1** where numbers allow. The national 90-day survival rate was 91.3%.

Table 6.1 90-day patient survival rates after first paediatric lung transplants, by centre, 1 October 2015 to 30 September 2018

Centre	Number of transplants	Number of deaths	90 day survival % (95% CI) Unadjusted	
Great Ormond Street	16	2	87.5	(58.6 - 96.7)
Newcastle[1]	7	0	-	-
UK	**23**	**2**	**91.3**	**(69.5 - 97.8)**

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

APPENDIX



A1: Methods

Unadjusted survival rates

The Kaplan-Meier method was used to estimate the 30-day unadjusted patient survival rates for heart transplants and the 90-day unadjusted patient survival rates for lung transplants. For each patient in the study cohort, time from transplant to death or last known survival if still alive is taken and used to calculate an overall survival rate. 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.

A2: Glossary of terms

Case mix

The types of patients treated at a centre for a common condition. This can vary across centres depending on the facilities available at the centre as well as the types of people in the catchment area of the centre. The definition of what type of patient a person is depends on the patient characteristics that influence the outcome of the treatment.

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 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.

Kaplan-Meier method

A method that allows patients with incomplete follow-up information to be included in estimating survival rates. For example, when estimating one year patient survival rates, a patient may be followed up for only nine months before they relocate. If we calculated a crude survival rate 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.

Multi-organ transplant
A transplant in which the patient receives more than one different organ. For example, a patient may undergo a transplant of a heart and kidney. Transplantation of both lungs is not classed as a multi-organ transplant.

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

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 die within the post-transplant period of interest. In this case, unlike for risk-adjusted rates, all patients are assumed to be equally likely to die at any given time. However, a centre may have a lower unadjusted survival rate than others because their patients had a higher risk of death due to their clinical condition at time of transplant. Such differences in case-mix may explain any variation in the unadjusted survival rates, thus no conclusions can be made about differences in the standard of care between centres.

Prepared by:

Statistics and Clinical Studies, NHS Blood and Transplant

Frederick Smith
Sally Rushton