

# NHS BLOOD AND TRANSPLANT

## CARDIOTHORACIC ADVISORY GROUP

### REVIEW OF SUPER-URGENT AND URGENT LUNG ALLOCATION SCHEMES

## SUMMARY

### INTRODUCTION

- 1 On 18 May 2017, the Super-Urgent Lung Allocation Scheme (SULAS) and Urgent Lung Allocation Scheme (ULAS) were introduced, with the primary aim to improve access to transplant for the sickest patients on the transplant list. This report shows an analysis of the first 10 months, from 18 May 2017 to 17 March 2018.

### KEY RESULTS

#### Registration data

- 2 During the 10 month period there have been 10 (3%) adult registrations onto the SULAS, 60 (21%) onto the ULAS and 220 (76%) onto the NULAS. There have been no paediatric registrations onto the SULAS, 4 onto the ULAS and 4 onto the Non-Urgent Lung Allocation Scheme (NULAS). At any given time there are usually fewer than 10 patients active on the ULAS, and no patients active on the SULAS. Median waiting time to transplant in the ULAS and SULAS was 25 days and 7 days respectively, compared with 244 days for all patients combined. Mortality on the waiting list was 8% in the NULAS and ULAS and 40% in the SULAS (4 out of 10 patients).

#### Offering data

- 3 Lungs from 767 adult donors and 24 paediatric donors were offered during the time period. Of the 486 adult donors that were offered to patients in the ULAS and SULAS, 55 were accepted and used (11%). Of the 677 adult donors that were offered to patients in the NULAS, 108 were accepted and used (16%), of which 2 were transplanted into paediatric patients, 13 into small adults, 89 into adult patients (of which 51% were used by the zonal centre) and 4 into combined heart-lung recipients. Lungs from 5 of the 24 paediatric donors were transplanted, all but one into adult recipients.

#### Transplant data

- 4 There was an 18% increase in the total number of lung transplants performed in 18 May 2017 – 17 March 2018 compared with the equivalent period of the previous year, from 143 to 169. The 169 transplants comprise 107 non-urgent, 46 urgent, 6 super-urgent and 10 heart-lung block transplants. Excluding heart-lung block transplants, there have been 19 post-transplant deaths reported; 10 in the non-urgent group, 7 urgent and 2 super-urgent. The 90 days post-transplant survival rate for adult recipients in the SULAS or ULAS was 83.2%, which compares with 89.6% for recipients in the NULAS transplanted during the same time period.

### ACTION

- 5 This report is a first proper evaluation of the new lung allocation schemes. Members are asked comment on any areas of concern.

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**April 2018**

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### REVIEW OF SUPER-URGENT AND URGENT LUNG ALLOCATION SCHEMES

#### INTRODUCTION

- 1 On 18 May 2017, the Super-Urgent Lung Allocation Scheme (SULAS) and Urgent Lung Allocation Scheme (ULAS) were introduced, with the primary aim to improve access to transplant for the sickest patients on the transplant list. Patients not meeting the clinical criteria for the SULAS or ULAS are registered on the Non-Urgent Lung Allocation Scheme (NULAS). All schemes are available to paediatric patients (<16 years), adult patients (age ≥16 years) and small adult patients (age ≥16 years, with height ≤155cm).
- 2 An initial analysis of the first three months of the new schemes was presented at the last CTAG meeting in September 2017. This report shows an analysis of the first 10 months, from 18 May 2017 to 17 March 2018, including registration activity, lung offering activity and transplant activity.

#### DATA AND METHODS

- 3 The registration data that was extracted included all adult and paediatric patients that had been placed onto the SULAS, ULAS or NULAS between 18 May 2017 and 17 March 2018. Any heart-lung block registrations were excluded (since these are offered through the heart allocation schemes). Each individual registration was counted, so for example, if a patient went from the NULAS to the ULAS during the time period, both registrations were counted as separate observations. Registration outcomes (i.e. transplantation, removal, moved to another scheme, death, or still waiting) and waiting times were extracted from the UK Transplant Registry (UKTR) on 12 April 2018.
- 4 All UK adult and paediatric, DBD and DCD consented potential donors whose lungs were offered between 18 May 2017 and 17 March 2018 were extracted. Offering data recorded by Hub Operations were used to track the offering pathway for each donor and the results were summarised. Note that from July 2017 all offers in the NULAS have been simultaneously group offered, whereas offers to patients in the SULAS and ULAS are individual, patient-specific offers. See the Lung Allocation Policy for full details of the offering schemes <https://nhsbt.dbe.blob.core.windows.net/umbraco-assets-corp/6527/pol230-donor-lung-distribution-and-allocation.pdf>. Note also that between September and December 2017, the task of making cardiothoracic organ offers was moved over from Specialist Nurses in Organ Donation (SNODs) to Hub Operations.
- 5 All lung transplants performed by each UK centre between 18 May 2017 and 17 March 2018 were extracted. Post-transplant survival data for these transplants were analysed, as recorded in the UKTR on 16 April 2018.

#### RESULTS

##### Registration data

- 6 The number of patient registrations made by each centre onto each scheme, during the 10 month analysis period, is shown in **Table 1**. Note that each individual registration is counted, so if a patient that was registered in more than one scheme during the time period they are counted more than once.

**Table 1** Number of patient registrations onto each of the Lung Allocation Schemes, between 18 May 2017 and 17 March 2018, by centre

Centre	Urgency category						Total N
	Non-urgent		Urgent		Super-urgent		
	N	%	N	%	N	%	
<b>Adult</b>							
Birmingham	29	76	7	18	2	5	38
Harefield	68	82	10	12	5	6	83
Manchester	32	86	5	14	0	0	37
Newcastle	44	63	24	34	2	3	70
Papworth	47	76	14	23	1	2	62
<b>Total</b>	<b>220</b>	<b>76</b>	<b>60</b>	<b>21</b>	<b>10</b>	<b>3</b>	<b>290</b>
<b>Paediatric</b>							
Great Ormond Street	4	57	3	43	0	0	7
Newcastle	0	0	1	100	0	0	1
<b>Total</b>	<b>4</b>	<b>50</b>	<b>4</b>	<b>50</b>	<b>0</b>	<b>0</b>	<b>8</b>
<b>TOTAL</b>	<b>224</b>	<b>75</b>	<b>64</b>	<b>21</b>	<b>10</b>	<b>3</b>	<b>298</b>

- 7 **Table 2** shows the breakdown of urgent and super-urgent registrations in each registration category. The most common urgent category was 31 - Persisting hypoxia ( $PO_2 < 8$  kPa) despite continuous  $O_2$  at 10 L/min. Four categories had no registrations. Full details of the different categories can be found in the Lung Selection Policy [https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/4973/lung\\_selection\\_policy.pdf](https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/4973/lung_selection_policy.pdf).

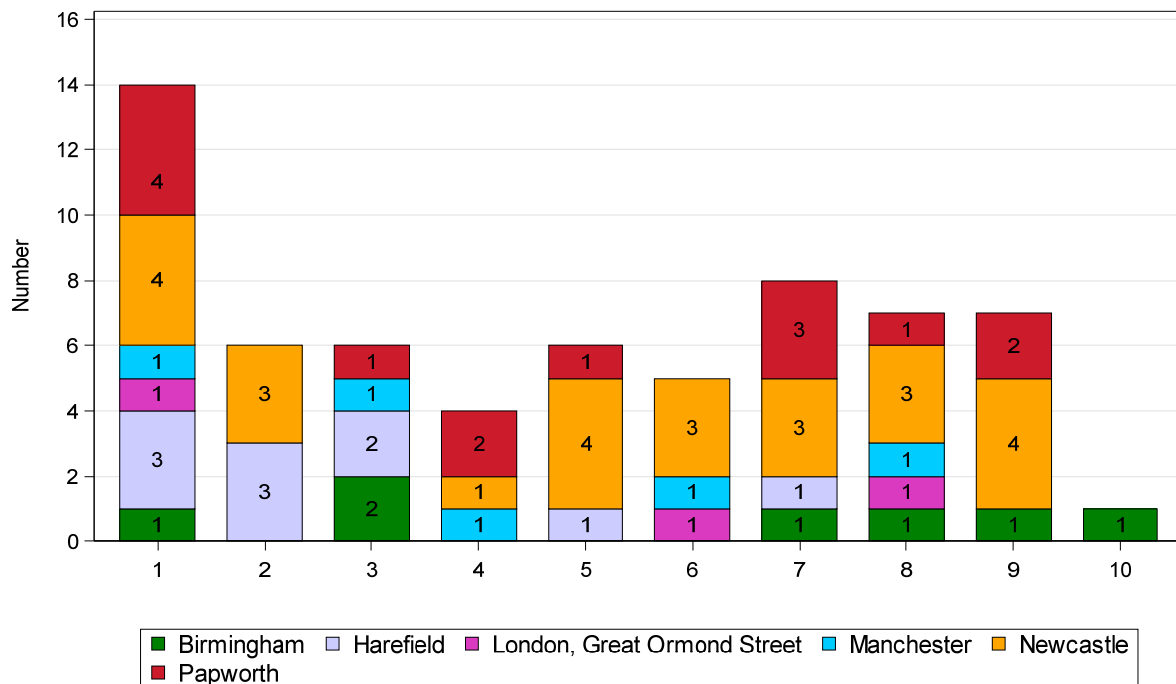
**Table 2** Number of urgent and super-urgent registrations under each category, between 18 May 2017 and 17 March 2018, by centre

Centre	Urgent										Super-urgent	Total	
	COPD	CF			IPF		PAH			Other adult <sup>1</sup>			Other paediatric <sup>1</sup>
	10	21	22	24	31	32	41	42	43	59	69	91	
<b>Adult</b>													
Birmingham	0	1	1	0	1	0	0	2	0	2	0	2	9
Harefield	1	3	1	3	1	0	0	0	0	1	0	5	15
Manchester	1	3	0	1	0	0	0	0	0	0	0	0	5
Newcastle	0	2	0	0	14	3	3	0	1	1	0	2	26
Papworth	0	0	0	0	8	1	2	0	1	2	0	1	15
<b>Total</b>	<b>2</b>	<b>9</b>	<b>2</b>	<b>4</b>	<b>24</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>0</b>	<b>10</b>	<b>70</b>
<b>Paediatric</b>													
GOSH	0	1	0	0	0	0	0	1	0	0	1	0	3
Newcastle	0	0	0	0	0	0	0	0	0	0	1	0	1
<b>Total</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>4</b>
<b>TOTAL</b>	<b>2</b>	<b>10</b>	<b>2</b>	<b>4</b>	<b>24</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>2</b>	<b>10</b>	<b>74</b>

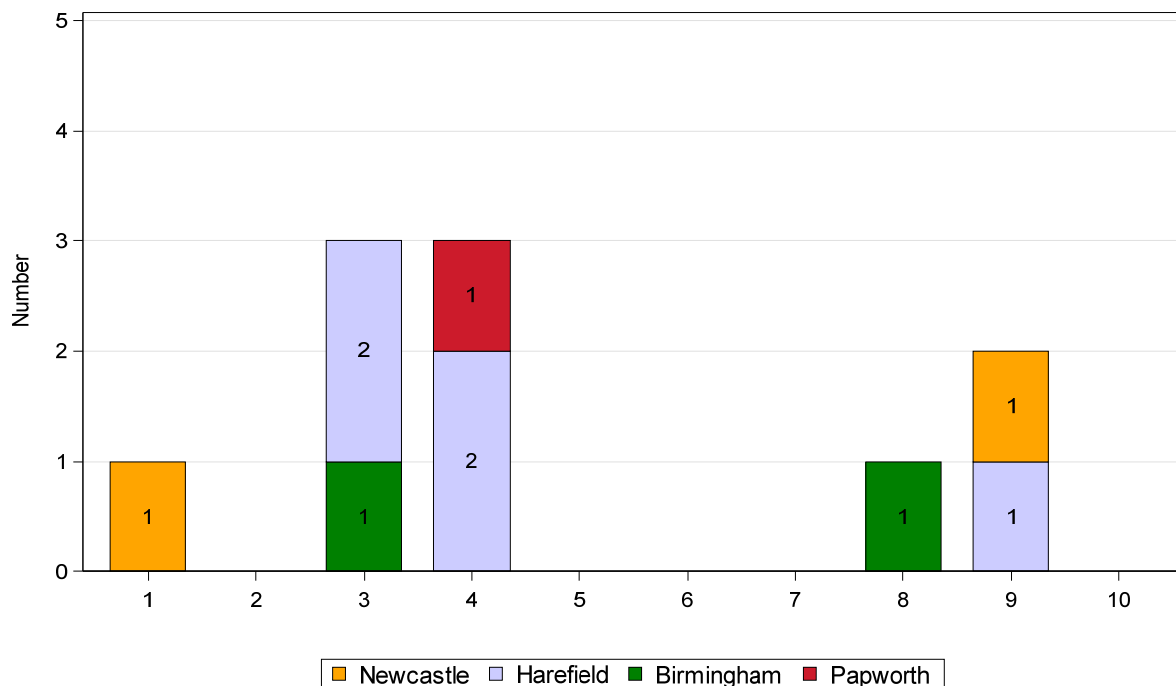
<sup>1</sup> These categories require CTAG Adjudication Panel agreement. See **Table 6**.

8 **Figure 1** shows the number of registrations onto the ULAS per month over the 10 month period, by centre (where month 1 is 18 May 2017 – 17 June 2017 for example). **Figure 2** shows the monthly trend in SULAS registrations.

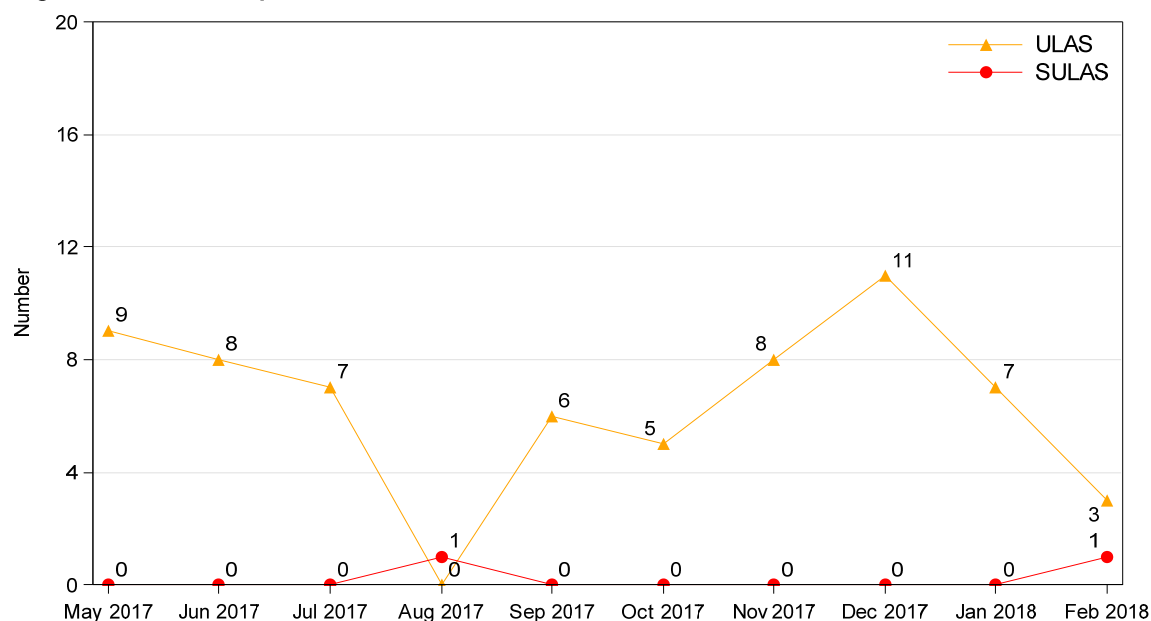
**Figure 1** Number of registrations onto the ULAS, by month and transplant centre



**Figure 2** Number of registrations onto the SULAS, by month and transplant centre



9 **Figure 3** shows the number of patients active on the ULAS and SULAS at the end of each month between May 2017 and February 2018. There are usually fewer than 10 patients active on the ULAS, and usually no patients active on the SULAS.

**Figure 3** Number of patients active on the SULAS and ULAS at the end of each month

- 10 **Table 3** shows the median waiting time to transplant in the different schemes and **Table 4** shows the outcomes of patient registrations in the different schemes, by centre, as at 12 April 2018 (which is represented in graphical form, for adults only, in **Figure 4**). The transplantation rate is higher in the ULAS and SULAS than in the NULAS. The waiting list mortality rate is similar between the NULAS and ULAS, but higher in the SULAS (4 out of 10 patients). Median waiting time to transplant in the ULAS and SULAS was 25 days and 7 days respectively, compared with 244 days for all patients combined.

<b>Table 3</b> Median waiting time to lung transplantation across each of the Lung Allocation Schemes for patients registered 18 May 2017 – 17 March 2018				
Scheme	Number of registrations	Number of transplants as at 12 April 2018 (%)	Waiting time (days)	
			Median	95% Confidence interval
NULAS <sup>1</sup>	224	60 (27%)	-	-
ULAS	64	49 (77%)	25	7 - 43
SULAS	10	6 (60%)	7	5 - 9
<b>Overall</b>	<b>298</b>	<b>115 (39%)</b>	<b>244</b>	<b>193 - 295</b>

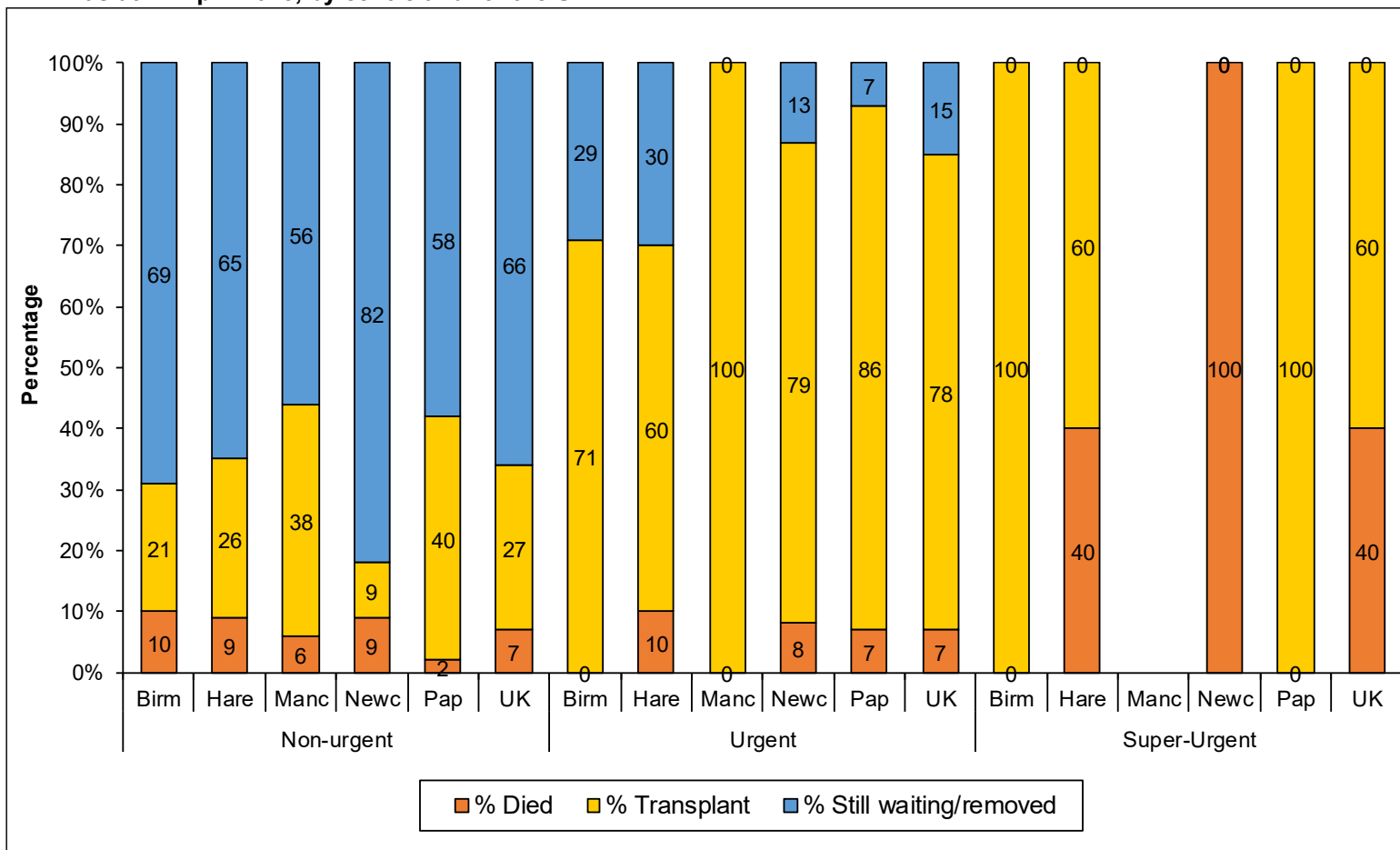
<sup>1</sup> Not possible to estimate a median

**Table 4 Outcomes of patient registrations onto each of the Lung Allocation Schemes, between 18 May 2017 and 17 March 2018, as at 12 April 2018**

Centre	Non-urgent												Urgent										Super-urgent <sup>1</sup>								
	Became S-U		Became U		Died		Remov- ed		Still waiting		Transpl- anted		Total	Became S-U		Became N-U		Died		Remov- ed		Still waiting		Transpl- anted		Total	Died		Transpl- anted		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	N	N	%	N	%	N	%	N	%	N	%	N	N	%	N	%	N	
<b>Adult</b>																															
Birmingham	0	0	3	10	3	10	1	3	16	55	6	21	29	2	29	0	0	0	0	0	0	0	0	5	71	7	0	0	2	100	2
Harefield	1	1	1	1	6	9	0	0	42	62	18	26	68	2	20	0	0	1	10	1	10	0	0	6	60	10	2	40	3	60	5
Manchester	0	0	0	0	2	6	1	3	17	53	12	38	32	0	0	0	0	0	0	0	0	0	0	5	100	5	0	-	0	-	0
Newcastle	0	0	8	18	4	9	1	2	27	61	4	9	44	1	4	1	4	2	8	1	4	0	0	19	79	24	2	100	0	0	2
Papworth	1	2	6	13	1	2	0	0	20	43	19	40	47	0	0	1	7	1	7	0	0	0	0	12	86	14	0	0	1	100	1
<b>Total</b>	<b>2</b>	<b>1</b>	<b>18</b>	<b>8</b>	<b>16</b>	<b>7</b>	<b>3</b>	<b>1</b>	<b>122</b>	<b>55</b>	<b>59</b>	<b>27</b>	<b>220</b>	<b>5</b>	<b>8</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>7</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>47</b>	<b>78</b>	<b>60</b>	<b>4</b>	<b>40</b>	<b>6</b>	<b>60</b>	<b>10</b>
<b>Paediatric</b>																															
GOSH	0	0	1	25	1	25	0	0	1	25	1	25	4	0	0	0	0	1	33	0	0	1	33	1	33	3	0	-	0	-	0
Newcastle	0	-	0	-	0	-	0	-	0	-	0	-	0	0	0	0	0	0	0	0	0	0	0	1	100	1	0	-	0	-	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>25</b>	<b>1</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>25</b>	<b>1</b>	<b>25</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>25</b>	<b>2</b>	<b>50</b>	<b>4</b>	<b>0</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>0</b>
<b>TOTAL</b>	<b>2</b>	<b>1</b>	<b>19</b>	<b>8</b>	<b>17</b>	<b>8</b>	<b>3</b>	<b>1</b>	<b>123</b>	<b>55</b>	<b>60</b>	<b>27</b>	<b>224</b>	<b>5</b>	<b>8</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>8</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>49</b>	<b>77</b>	<b>64</b>	<b>4</b>	<b>40</b>	<b>6</b>	<b>60</b>	<b>10</b>

<sup>1</sup> 5 patients were previously urgent, 2 were previously non-urgent in the time period, 2 were previously non-urgent prior to 18 May 2017, and one was registered straight onto the SULAS (Harefield, patient subsequently died)

**Figure 4 Percentage of registrations in each Lung Allocation Scheme ending in death, transplant or still waiting/removed, as at 12 April 2018, by centre and for the UK**



11 **Table 5** shows the causes of death reported to the UKTR for the 24 adult patients and 2 paediatric patients that were registered in the 10 month period and had died on the list by 12 April 2018.

**Table 5 Causes of death reported to the UKTR for patients that died on the transplant list in each of the schemes between 18 May 2017 and 17 March 2018**

Cause of death	Non-urgent	Urgent	Super-Urgent	Total
<b>Adult</b>				
Pulmonary infection (bacterial)	3	0	0	3
Therapy ceased for any other reason	1	0	0	1
Early graft dysfunction <sup>1</sup>	1	0	0	1
Respiratory failure	3	0	1	4
Multi-system failure	0	0	1	1
Other identified cause of death	1	2	0	3
Unknown	7	2	2	11
<b>Total</b>	<b>16</b>	<b>4</b>	<b>4</b>	<b>24</b>
<b>Paediatric</b>				
Respiratory failure	1	0	0	1
Unknown	0	1	0	1
<b>Total</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>2</b>
<b>TOTAL</b>	<b>17</b>	<b>5</b>	<b>4</b>	<b>26</b>

<sup>1</sup> This was a registration for a re-transplant

- 12 **Table 6** summarises the number of applications made to the CTAG Lung Adjudication Panel between 18 May 2017 and 17 March 2018 and the results of these requests. The clinical details submitted for each patient are included in **Appendix I (removed as patient identifiable)**.

**Table 6 Applications to the CTAG Lung Adjudication Panel for listing on the ULAS under category 59 for adults and 69 for paediatrics, 18 May 2017 – 17 March 2018**

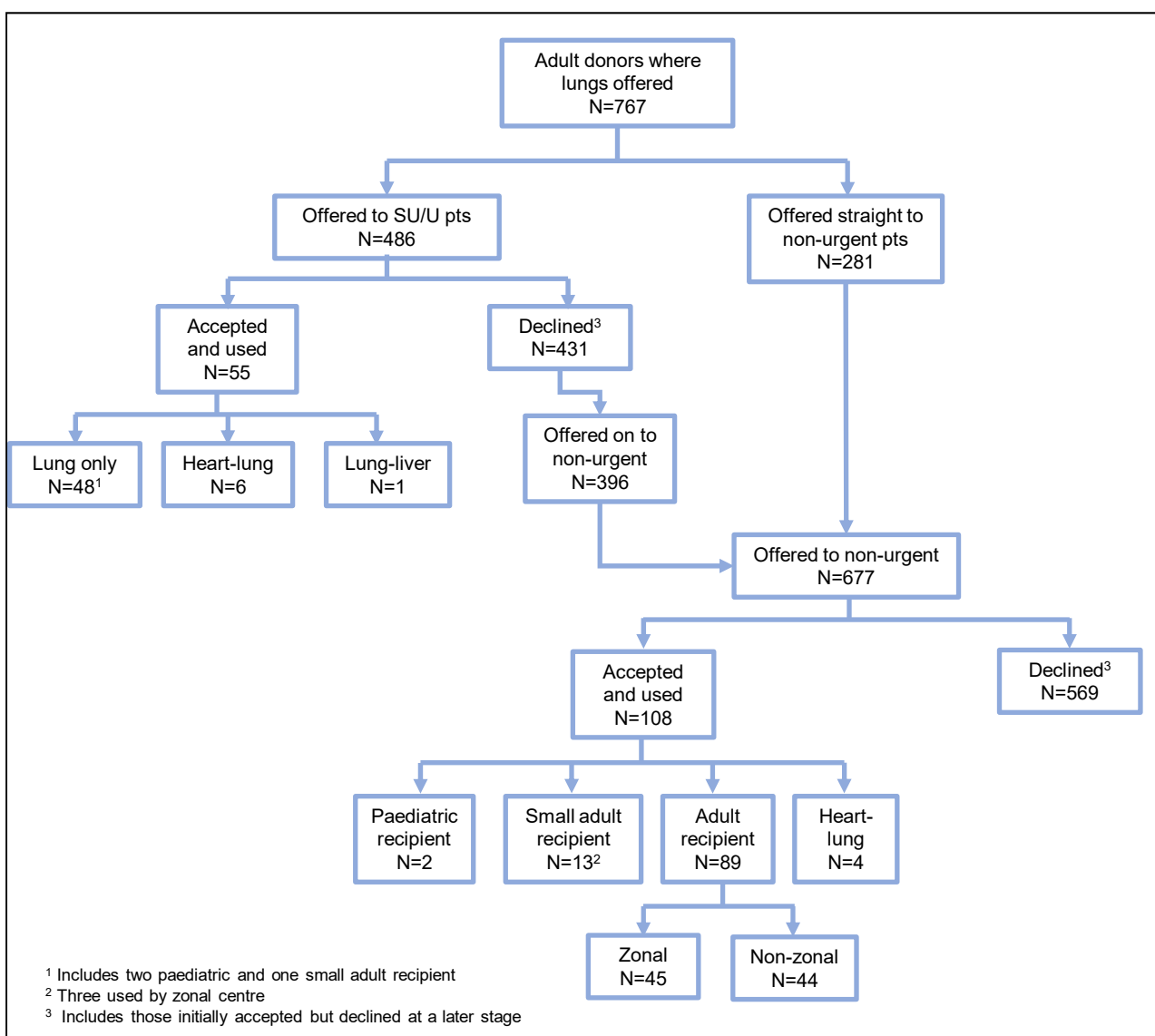
Centre	Number of applications	Number approved	Number rejected	Outcome unknown	Notes (removed as patient identifiable)
<b>Adult</b>					
Birmingham	2	2			
Harefield	2	1	1		
Manchester	1		1		
Newcastle	2	1		1	
Papworth	1		1		
<b>Total</b>	<b>8</b>	<b>4</b>	<b>3</b>	<b>1</b>	
<b>Paediatric</b>					
GOSH	1	1			
Newcastle	1	1			
<b>Total</b>	<b>2</b>	<b>2</b>			
<b>TOTAL</b>	<b>10</b>	<b>6</b>	<b>3</b>	<b>1</b>	



## Offering data

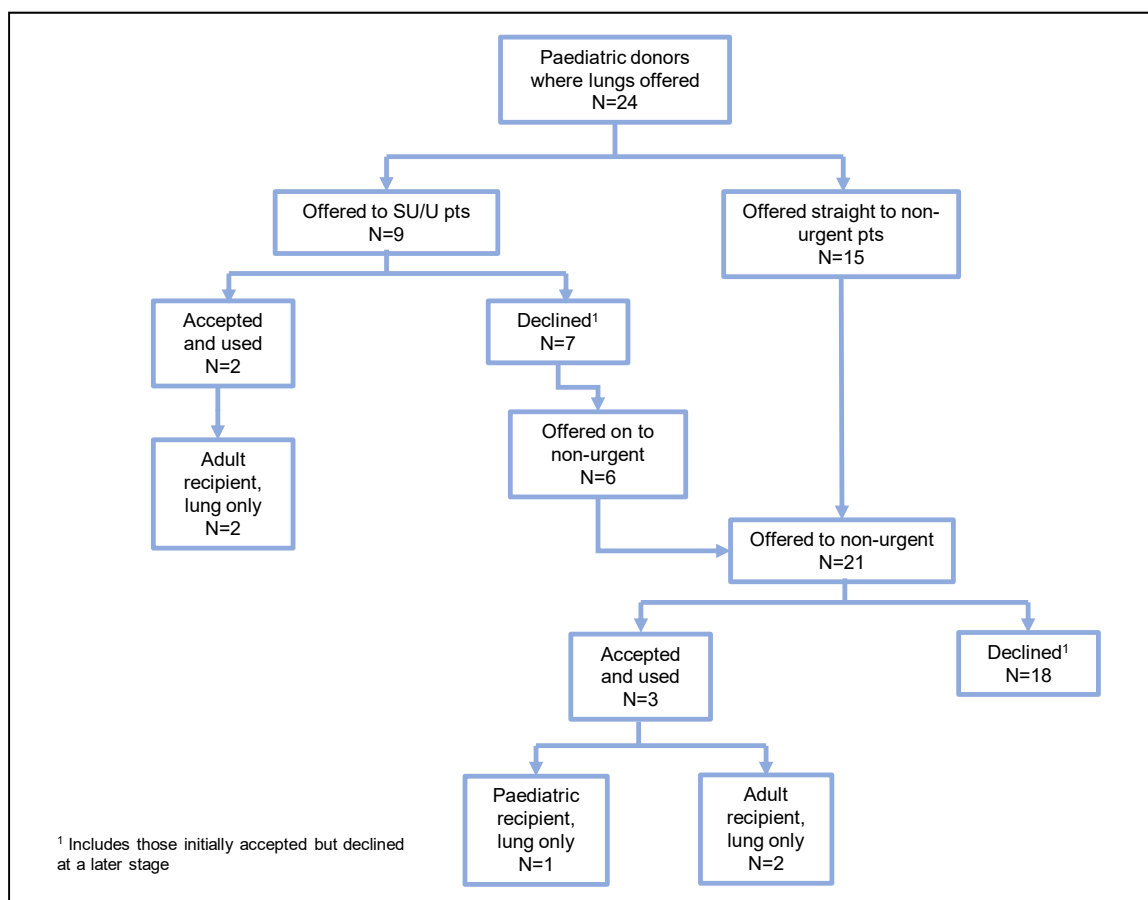
- 13 **Figure 5** and **Figure 6** show flow diagrams of DBD and DCD donor lungs offered by Hub Operations and SNODs in the 10 month analysis period, for adult and paediatric donors respectively. Note that this analysis classes lung offers that were withdrawn as not offered. Note also that the analysis includes DCD lung offers for donors that did not proceed.
- 14 There were only 24 paediatric donors offered during the time period, compared with 767 adult donors. 55 adult donors were accepted for super-urgent or urgent patients and 108 were accepted for non-urgent patients, of which 14% were accepted for paediatric (age<16) or small adult (age≥16 and height≤155cm) recipients. **Appendix II** shows the heights and weights of the adult donors that were accepted for paediatrics or small adults, compared with those accepted for adults and those that were declined.

**Figure 5** Flow diagram of UK adult (age≥16) donor lung offering in 10 months between 18 May 2017 and 17 March 2018



- 15 **Table 7** shows a summary of the primary reasons for non-use as recorded by Hub Operations, for the 604 (569+(431-396)) adult donors that were declined and the 19 (18+(7-6)) paediatric donors that were declined. The most common reasons recorded were poor function and the past history of the donor.

**Figure 6 Flow diagram of UK paediatric (age<16) donor lung offering in 10 months between 18 May 2017 and 17 March 2018**



**Table 7 Reasons for non-use of adult and paediatric donor lungs offered from potential deceased donors between 18 May 2017 and 17 March 2018**

Primary reason recorded for non-use	Adult	Paediatric	Total	%
	N	N		
Poor function	223	2	225	36
Donor unsuitable - past history	177	3	180	29
Other	57	2	59	9
No suitable recipients	33	5	38	6
Donor unsuitable - size	31	6	37	6
Donor unsuitable - age	31	0	31	5
Used for research after declined by centres	16	0	16	3
HLA/ABO type	8	1	9	1
Donor unsuitable - virology	8	0	8	1
Infection	5	0	5	1
Organ damaged	3	0	3	0
No response to fast track offer	3	0	3	0
Consent withdrawn	2	0	2	0
Donor unstable	2	0	2	0
Tumour	2	0	2	0
Organ used elsewhere	2	0	2	0
Donor unsuitable - medical reason	1	0	1	0
<b>Total</b>	<b>604</b>	<b>19</b>	<b>623</b>	<b>100</b>

## Transplants

16 **Table 8** shows the number of lung transplants performed in each urgency group in the 10 month period, by centre. It also shows the number of heart-lung combined transplants and provides a comparison with the equivalent time period of the previous year. Overall there has been a 18% increase in lung transplants.

**Table 8** Number of lung transplants split by centre, transplant type and allocation scheme, between 18 May 2017 and 17 March 2018, and a comparison with the previous year

Centre	Non-urgent		Lung only		Super-urgent		Total lung only	Heart-lung <sup>3</sup>	Total	Previous year <sup>1</sup>		% change	
	N	%	N	%	N	%	N	N	N	N	N		
<b>Adult</b>													
Birmingham	10	63	4	25	2	13	16	2	18	13	0	13	38.5
Harefield	39	83	5	11	3	6	47	3	50	36	0	36	38.9
Manchester	18	75	6	25	0	0	24	1	25	26	1	27	-7.4
Newcastle	16	48	17	52	0	0	33	3	36	27	0	27	33.3
Papworth	21	62	12	35	1 <sup>2</sup>	3	34	1	35	32	0	32	9.4
<b>Total</b>	<b>104</b>	<b>68</b>	<b>44</b>	<b>29</b>	<b>6</b>	<b>4</b>	<b>154</b>	<b>10</b>	<b>164</b>	<b>134</b>	<b>1</b>	<b>135</b>	<b>21.5</b>
<b>Paediatric</b>													
Great Ormond Street	2	67	1	33	0	0	3	0	3	6	0	6	-50.0
Newcastle	1	50	1	50	0	0	2	0	2	2	0	2	0.0
<b>Total</b>	<b>3</b>	<b>60</b>	<b>2</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>5</b>	<b>8</b>	<b>0</b>	<b>8</b>	<b>-37.5</b>
<b>TOTAL</b>	<b>107</b>	<b>67</b>	<b>46</b>	<b>29</b>	<b>6</b>	<b>4</b>	<b>159</b>	<b>10</b>	<b>169</b>	<b>142</b>	<b>1</b>	<b>143</b>	<b>18.2</b>

<sup>1</sup> 18 May 2016 – 17 March 2017

<sup>2</sup> Lung-liver combined

<sup>3</sup> 4 non-urgent, 4 urgent (1 each at Birmingham, Harefield, Manchester and Newcastle) and 2 super-urgent (both Harefield)

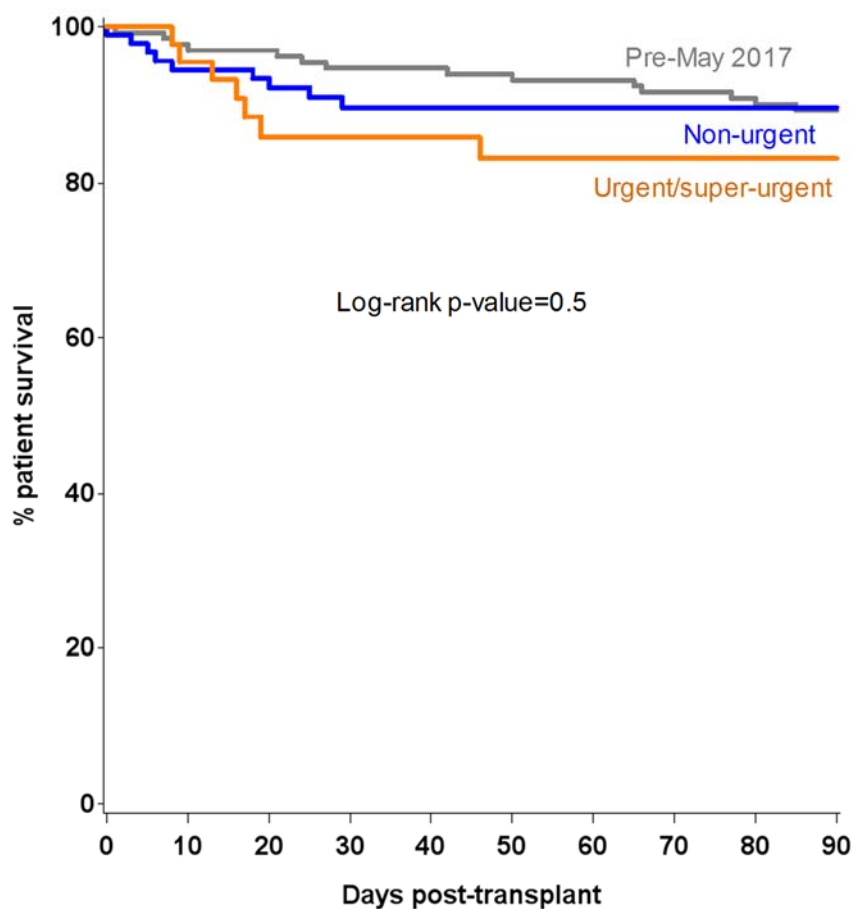
<b>Scheme</b>	<b>Alive</b>	<b>Dead</b>	<b>Unknown</b>	<b>Total</b>
<b>Adult</b>				
NULAS	83	10	11	104
ULAS	30	6	8	44
SULAS	4	2	0	6
<b>Total</b>	<b>117</b>	<b>18</b>	<b>19</b>	<b>154</b>
<b>Paediatric</b>				
NULAS	3	0	0	3
ULAS	1	1	0	2
<b>Total</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>5</b>
<b>TOTAL</b>	<b>121</b>	<b>19</b>	<b>19</b>	<b>159</b>

<sup>1</sup> Excludes heart-lung block recipients

	<b>Non-urgent</b>	<b>Urgent</b>	<b>Super-urgent</b>	<b>Total</b>
<b>Adult</b>				
Pulmonary embolus	1	0	0	1
Cerebro-vascular accident	1	0	0	1
Infections elsewhere (except viral hepatitis)	0	1	0	1
Therapy ceased for any other reason	0	0	0	0
Early graft dysfunction	1	1	0	2
Multi-system failure	4	2	0	6
Donor organ failure	0	0	1	1
Other identified cause of death	3	2	1	6
<b>Total</b>	<b>10</b>	<b>6</b>	<b>2</b>	<b>18</b>
<b>Paediatric</b>				
Therapy ceased for any other reason	0	1	0	1
<b>Total</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>TOTAL</b>	<b>10</b>	<b>7</b>	<b>2</b>	<b>19</b>

- 17 **Figure 7** shows an analysis of patient survival after transplantation from the different schemes. This includes adult patients only and excludes heart-lung block transplants and re-transplantations. Transplants from the SULAS and ULAS are combined due to small numbers. Transplants performed in the 10 month time period 18 May 2016 to 17 March 2017 are included for comparison. 14 patients, all from the latter time period, had to be removed due to missing follow-up data.

**Figure 7 90 day Kaplan-Meier patient survival curves for adult patients transplanted in different urgency groups, 18 May 2017 – 17 March 2018, and transplants 18 May 2016 – 17 March 2017**



**Table 11 90 day patient survival rates following lung transplantation across the Lung Allocation Schemes for patients transplanted 18 May 2017 – 17 March 2018 and compared with previous year**

<b>Scheme</b>	<b>Number of transplants</b>	<b>Number of deaths within 90 days</b>	<b>90 day survival %</b>	<b>95% Confidence interval</b>
<b>18/05/17-17/03/18</b>	<b>136<sup>1</sup></b>	<b>16</b>	<b>87.5</b>	<b>82.5 – 93.5</b>
NULAS	91	9	89.6	80.9 – 94.5
ULAS/SULAS	45	7	83.2	67.9 – 91.6
<b>18/05/16-17/03/17</b>	<b>131</b>	<b>14</b>	<b>89.3</b>	<b>82.5 – 93.5</b>

<sup>1</sup> 14 patients were removed due to missing follow-up data

APPENDIX

Appendix I Details of CTAG Lung Adjudication Panel Requests (Removed as patient identifiable)

Appendix II Size of adult donors offered to non-urgent recipients

