

**NHS BLOOD AND TRANSPLANT**  
**CARDIOTHORACIC ADVISORY GROUP - LUNG**  
**REVIEW OF ALLOCATION ZONES**

**SUMMARY**

**INTRODUCTION**

- 1 The cardiothoracic allocation zones were split into separate heart and lung allocation zones over two phases to stagger the impact of this change. The first phase was implemented on 18 May 2017 and the second phase on 8 January 2018. This report is the first annual review of the lung allocation zones since this change.
- 2 This report provides up to date figures on each centre's percentage share of registrations onto the national lung transplant list, for the two year period 1 September 2016 to 31 August 2018. It also provides numbers of lung donors over the three year period 1 September 2015 to 31 August 2018 under the current allocation zones implemented 8 January 2018.

**RESULTS**

**Comparison of registrations and donors**

- 3 When comparing the proportion of lung registrations made by each centre with the proportion of lung donors in each of the current lung allocation zones, as implemented on 8 January 2018, there were no significant differences observed. Therefore, there is no evidence for a change in the zones at this time.

**Registration, donor and transplant activity**

- 4 Over the period of zonal changes, variation was observed in the number of registrations made by each centre and the number of transplant performed. Zonal boundary changes may have impacted this activity, however the introduction of the super-urgent and urgent lung allocation schemes (which do not have zonal priority) will also have had an impact.
- 5 After the introduction of the super-urgent and urgent schemes on 18 May 2017, the proportion of non-zonal lung transplants increased from 42% to 65%, however in the most recent time period it has gone down to 53%.
- 6 The national utilisation rate (transplanted/offered) for DBD lungs over the three year period was 27% and was very similar across zones (highest in Harefield's zone).

**CONCLUSION**

- 7 There were no significant differences observed in the percentage share of lung registrations and donors across centres/zones, therefore no changes will be made to zonal boundaries at present.

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**Statistics and Clinical Studies**

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# NHS BLOOD AND TRANSPLANT

## CARDIOTHORACIC ADVISORY GROUP - LUNG

### REVIEW OF ALLOCATION ZONES

#### INTRODUCTION

- 1 The cardiothoracic allocation zones were recently split into separate heart and lung allocation zones in order to more appropriately match individual organ support with the demand at each centre. This split was phased in over a period of eight months to stagger the impact of this change. The first phase was implemented on 18 May 2017 and the second phase on 8 January 2018.
- 2 This report is the first annual review of the lung allocation zones since this change. A similar review of the heart allocation zones was presented at the CTAG-Heart meeting on 10 October 2018. It was agreed at CTAG in October 2017 that any review of allocation zones should use the most up to date period of registration and donor data. Therefore this report analyses:
  - Registrations: 1 September 2016 to 31 August 2018
  - Donors: 1 September 2015 to 31 August 2018
- 3 This report also covers activity over the time periods above for registrations and donors. This includes the number of registrations and donors in each centre/zone over the period of zonal changes, the lung utilisation rates by zone, and zonal and export transplantation rates by zone and transplant centre.

#### DATA AND METHODS

- 4 Changes to the lung allocation zones are based on a statistically significant difference being observed between the percentage share of registrations and the percentage share of donors for any one allocation zone (at the 5% significant level after adjusting for multiple testing).
- 5 Registrations are defined as:

The total number of UK Group 1 lung registrations in the latest two year period between 1 September 2016 and 31 August 2018 at adult centres, but excluding a) any registrations made by Newcastle of patients < 16 years, and (b) any patients that were only ever registered as urgent or super-urgent (since these schemes do not use zonal priority).

Registrations that ended in a domino or live donor transplant and multi-organ registrations are included, however registrations for heart-lung transplantation are not included in the number of lung registrations as heart-lung blocks are allocated according to the heart allocation sequence. Retrospective registrations made after an unlisted patient was transplanted are also included.

For patients registered more than once in the registration period, the following rules apply:

- If a patient was registered, removed then reregistered, only the first registration is included.
- If a patient was registered, transplanted then reregistered, both registrations are included.
- If a patient was active, suspended then reactivated, only the first activation is included.
- If a patient moved from the non-urgent list to the urgent or super-urgent list and then back to the non-urgent list (without transplantation in between) they will only be counted once.

#### 6 Donors are defined as:

The total number of UK adult ( $\geq 16$  years at time of death) lung donors after brain death over the latest three year period between 1 September 2015 and 31 August 2018. Donors resulting in no lung transplant are excluded. Paediatric donors who donated to adult patients are included, along with adult donors whose organs were transplanted into paediatric patients.

- 7 The registration activity section splits the time period into three eras corresponding to changes in the zones, 1 September 2016 – 17 May 2017, 18 May 2017 – 7 January 2018, and 8 January 2018 – 31 August 2018. It considers the number of registrations (as defined above) by each centre by era, along with the number of transplants performed by the centre, and number of deaths on the list. Transplant and death on the list numbers include patients who were registered prior to 1 September 2016 along with any registered in the period.
- 8 The donor activity section splits the time period into three eras corresponding to changes in the zones, 1 September 2015 – 17 May 2017, 18 May 2017 – 7 January 2018, and 8 January 2018 – 31 August 2018, and uses the zone the donor was in at time of donation, rather than what the current zone is. The total number of adult donors in each zone and the number proceeding to lung donation are presented.
- 9 The transplant activity section presents the number of zonal and exported transplants both by zone and transplanting centre over the time period. The transplants include UK adult DBD and DCD donor lungs transplanted into adult or paediatric patients in the UK and heart-lung block transplants are excluded.

## RESULTS

### Comparison of registrations and donors

- 10 **Table 1** summarises the proportion of lung registrations made by each centre over the two year period, and compares this with the number of lung donors that arose under each allocation zone as they are currently defined (as at 8 January 2018) over the three year period. This shows that the proportion of lung registrations and lung donors are reasonably balanced across centres and there is no evidence to adjust the zonal boundaries as all adjusted p-values are greater than 0.05.

**Table 1 Number of lung registrations (1 September 2016 – 31 August 2018) and donors (1 September 2015 – 31 August 2018), by registering centre/current allocation zone (since 8 January 2018)**

Centre/zone	Lung registrations		Lung donors in current zone		Adjusted p-value*
	N	%	N	%	
Birmingham	71	13	70	16	0.99
Harefield	175	31	138	31	1.00
Manchester	79	14	61	14	1.00
Newcastle	139	25	105	23	1.00
Papworth	95	17	77	17	1.00
<b>UK</b>	<b>559</b>	<b>100</b>	<b>451</b>	<b>100</b>	

\* Chi-squared test comparison of proportion of registrations with proportion of donors, p-value adjusted for multiple comparisons using Bonferroni correction

### Registration Activity

- 11 **Table 2** shows the breakdown of waiting list activity by centre for the registration period, broken down by era (note that the first era is 8.5 months, while the other two eras are 7.7 months). Overall, 559 patients were registered, there were 360 transplants, and 138 deaths on the list (note that the transplant and death on the list numbers include patients registered prior to 1 September 2016, and DCD transplants are included).
- 12 Over the period of zonal changes, Harefield and Newcastle's registration activity varied the most and Manchester and Birmingham's registration activity varied the least. Note that the super-urgent and urgent lung schemes were introduced on 18 May 2017.
- 13 Comparing the periods before and after the final split of the zones in January 2018, the most noticeable changes in transplant activity were for Harefield (a decrease from 40 to 32) and Birmingham (an increase from 9 to 14). Birmingham's zone increased slightly on 8 January 2018 which may help to explain this increase in activity (but there will be many factors influencing this change), while Harefield's zone had only a marginal change which does not explain their decrease in activity. Manchester saw the largest reduction in their zone but performed only slightly fewer transplants after the change.

**Table 2 Number of registrations, transplants (DBD and DCD), and deaths on the lung list by centre and period, 1 September 2016 - 31 August 2018**

Centre	1 September 2016 - 17 May 2017			18 May 2017 - 7 January 2018			8 January 2018 - 31 August 2018		
	Registrations	Transplants	Deaths on list	Registrations	Transplants	Deaths on list	Registrations	Transplants	Deaths on list
Birmingham	25	11	10	24	9	9	22	14	4
Harefield	71	35	14	61	40	14	43	32	10
Manchester	27	24	6	27	18	5	25	15	3
Newcastle	63	26	19	36	24	10	40	22	16
Papworth	32	36	12	38	25	2	25	29	4
<b>UK</b>	<b>218</b>	<b>132</b>	<b>61</b>	<b>186</b>	<b>116</b>	<b>40</b>	<b>155</b>	<b>112</b>	<b>37</b>

## Donor Activity

14 In the three year period 1 September 2015 to 31 August 2018, there were 2,581 adult DBD donors who donated at least one organ. **Table 3** shows the breakdown of these donors by lung zone at time of donation, with the number of donors who had their lungs offered, accepted, retrieved, and transplanted. In total, 1,643 (64%) donors had their lungs offered, 757 donors had at least one lung accepted, 474 had at least one lung retrieved and 437 had at least one transplanted. The utilisation rate (transplanted/offered) is similar across all zones, but highest in Harefield's zone. **Table 4** shows similar information but for the 1,759 DCD donors in the period. Again, the utilisation rates are fairly similar across zones.

**Table 3 Adult DBD lung organ donation and retrieval rates in the UK by allocation zone, 1 September 2015 - 31 August 2018**

Zone	Number of DBD donors	Offered (% of donors)	Accepted (% of offered)	Retrieved (% of accepted)	Transplanted (% of retrieved)	(% of offered)
	N	N	N	N	N	
Birmingham	341	216 (63)	95 (44)	60 (63)	58 (97)	(27)
Harefield	720	452 (63)	223 (49)	133 (60)	125 (94)	(28)
Manchester	485	286 (59)	124 (43)	75 (60)	74 (99)	(26)
Newcastle	553	391 (71)	172 (44)	126 (73)	102 (81)	(26)
Papworth	482	298 (62)	143 (48)	80 (56)	78 (98)	(26)
<b>UK</b>	<b>2581</b>	<b>1643 (64)</b>	<b>757 (46)</b>	<b>474 (63)</b>	<b>437<sup>1</sup> (92)</b>	<b>(27)</b>

<sup>1</sup> Number doesn't match Table 1 because Table 1 includes 14 paediatric donors used in adult recipients. Additionally, the breakdown by zone differs due to the fact that donors are assigned to the zone they were in at time of donation for the purposes of this table (Table 1 uses the zones since 8 January 2018)

**Table 4 Adult DCD lung organ donation and retrieval rates in the UK by allocation zone, 1 September 2015 - 31 August 2018**

Zone	Number of DCD donors	Offered (% of donors)	Accepted (% of offered)	Retrieved (% of accepted)	Transplanted (% of retrieved)	(% of offered)
	N	N	N	N	N	
Birmingham	218	83 (38)	34 (41)	15 (44)	12 (80)	(14)
Harefield	407	154 (38)	51 (33)	28 (55)	22 (79)	(14)
Manchester	383	131 (34)	38 (29)	15 (39)	14 (93)	(11)
Newcastle	359	168 (47)	51 (30)	27 (53)	22 (81)	(13)
Papworth	392	150 (38)	60 (40)	24 (40)	21 (88)	(14)
<b>UK</b>	<b>1759</b>	<b>686 (39)</b>	<b>234 (34)</b>	<b>109 (47)</b>	<b>91 (83)</b>	<b>(13)</b>

## Transplant Activity

15 **Table 5** shows the number of lung transplants from adult DBD and DCD donors performed in the three year period, by zone of the donor and era, broken down by whether the lungs were transplanted by the zonal centre or exported to a different centre. Before the super-urgent and urgent lung schemes were introduced on 18 May 2018, more lungs were transplanted zonally (57%) than exported (43%). In comparison, during the first phase of zonal changes and the start of the new

schemes, only 34% of lungs were transplanted zonally and 66% were exported. In the second phase of zone changes, the overall number of zonal transplants increased again to 45%, but this varied across individual zones (26-60%).

- 16 **Table 6** shows the same data but by transplanting centre rather than zone (lungs used in paediatric recipients or transplanted overseas are excluded). Again, the highest proportion of imported transplants occurred during the middle time period, which is also evident when observed on a centre basis. Newcastle have maintained a high proportion of imported transplants (70% in most recent time period).

## **CONCLUSIONS**

- 17 There were no significant differences observed in the percentage share of lung registrations and donors across centres/zones, therefore no changes will be made to zonal boundaries at present.

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**Table 5 Lung transplants from adult DBD and DCD donors in the UK by era, allocation zone and zonal status, 1 September 2015 - 31 August 2018**

Zone	1 September 2015 - 17 May 2017					18 May 2017 - 7 January 2018					8 January 2018 - 31 August 2018				
	Trans- plants	Zonal		Exported		Trans- plants	Zonal		Exported		Trans- plants	Zonal		Exported	
	N	N	(%)	N	(%)	N	N	(%)	N	(%)	N	N	(%)	N	(%)
Birmingham	36	16	(44)	20	(56)	17	3	(18)	14	(82)	16	6	(38)	10	(63)
Harefield	77	44	(57)	33	(43)	38	16	(42)	22	(58)	29	15	(52)	14	(48)
Manchester	51	30	(59)	21	(41)	20	5	(25)	15	(75)	15	9	(60)	6	(40)
Newcastle	80	41	(51)	39	(49)	21	8	(38)	13	(62)	23	6	(26)	17	(74)
Papworth	46	33	(72)	13	(28)	23	9	(39)	14	(61)	27	14	(52)	13	(48)
<b>UK</b>	<b>290</b>	<b>164</b>	<b>(57)</b>	<b>126</b>	<b>(43)</b>	<b>119</b>	<b>41</b>	<b>(34)</b>	<b>78</b>	<b>(66)</b>	<b>110</b>	<b>50</b>	<b>(45)</b>	<b>60</b>	<b>(55)</b>

Exported numbers include a small number transplanted by Great Ormond Street or overseas

**Table 6 Lung transplants from adult DBD and DCD donors in the UK by era, transplant centre and zonal status, 1 September 2015 – 31 August 2018**

Centre	1 September 2015 - 17 May 2017					18 May 2017 - 7 January 2018					8 January 2018 - 31 August 2018				
	Trans- plants	Zonal		Imported		Trans- plants	Zonal		Imported		Trans- plants	Zonal		Imported	
	N	N	(%)	N	(%)	N	N	(%)	N	(%)	N	N	(%)	N	(%)
Birmingham	32	16	(50)	16	(50)	9	3	(33)	6	(67)	14	6	(43)	8	(57)
Harefield	74	44	(59)	30	(41)	40	16	(40)	24	(60)	31	15	(48)	16	(52)
Manchester	49	30	(61)	19	(39)	17	5	(29)	12	(71)	14	9	(64)	5	(36)
Newcastle	61	41	(67)	20	(33)	23	7	(30)	16	(70)	20	6	(30)	14	(70)
Papworth	65	33	(51)	32	(49)	25	9	(36)	16	(64)	27	14	(52)	13	(48)
<b>UK</b>	<b>281</b>	<b>164</b>	<b>(58)</b>	<b>117</b>	<b>(42)</b>	<b>114</b>	<b>40</b>	<b>(35)</b>	<b>74</b>	<b>(65)</b>	<b>106</b>	<b>50</b>	<b>(47)</b>	<b>56</b>	<b>(53)</b>

Numbers are lower in this table compared with Table 5 as lungs transplanted by Great Ormond Street, paediatric recipients at Newcastle and overseas transplants are excluded