NHS BLOOD AND TRANSPLANT

CARDIOTHORACIC ADVISORY GROUP – LUNG

REMOVAL OF SMALL ADULT TIER

SUMMARY

INTRODUCTION

1. CTAG were asked in October 2018 to find a solution to the issue of Group Offering which was introduced in June 2017 as a temporary fix to the protracted offering sequence that came in on 18 May 2017.

2. The main reason that the offering sequence had been protracted was the introduction of the non-urgent small adult tier, rather than the new super-urgent and urgent tiers.

3. The CTAG Lung Allocation Subgroup examined the data from the first 12 months of the new offering scheme to determine whether prioritising non-urgent small adults (≥16 years with height≥155cm) above standard adults had been beneficial to this population of patients which had historically been disadvantaged.

DATA ANALYSIS

4. A comparison of 6 month listing outcomes for small adult patients registered in the 12 months since the change (18 May 2017 – 17 May 2018) with those registered before the change (18 Nov 2015 – 17 Nov 2016) was performed (where before the change there was no formal small adult tier, or a super-urgent or urgent tier). This showed no evidence of an improvement in the rate of transplantation within 6 months for non-urgent small adults (33% post-change vs 29% pre-change, p=0.8).

5. The group also considered the impact of registering small adults with an acceptable donor height range, so that offering could be more tailored to individual patients. However, for some patients very wide ranges were specified, especially where lung reduction was considered. This was an interesting exercise as it highlighted that, based on the height ranges given, around 20% of small adult patients were size compatible with less than 1% of the adult donor pool.

CONCLUSION

6. The group decided that reverting the non-urgent sequence back to pre-May 2017, but with centres internally prioritising small adults, was the best solution (Solution 3 as detailed below). This was ratified by the Cardiothoracic Centre Directors in January 2019 and is now with NHSBT for prioritisation.

7. The amended Lung Allocation Sequences would look as follows:

Adult donor sequence:
Super-Urgent Adults, Paediatrics and Small Adults
Urgent Paediatrics and Small Adults
Urgent Adults
Non-Urgent Zonal

Non-Urgent Paediatrics at GOSH
Non-Urgent Adults
(the last 3 steps represent a return to pre May 2017)

Paediatric donor sequence:
Super-Urgent Paediatrics
Urgent Paediatrics
Non-Urgent Paediatrics
Super-Urgent Small Adults and Adults (agreed by CTAG in Oct 2018)
Urgent Small Adults
Urgent Adults
Non-Urgent Adults

8. With this change it is hoped that Group Offering could be discontinued, and sequential offering be re-introduced.

Sally Rushton and Frederick Smith
Statistics and Clinical Studies **March 2019**

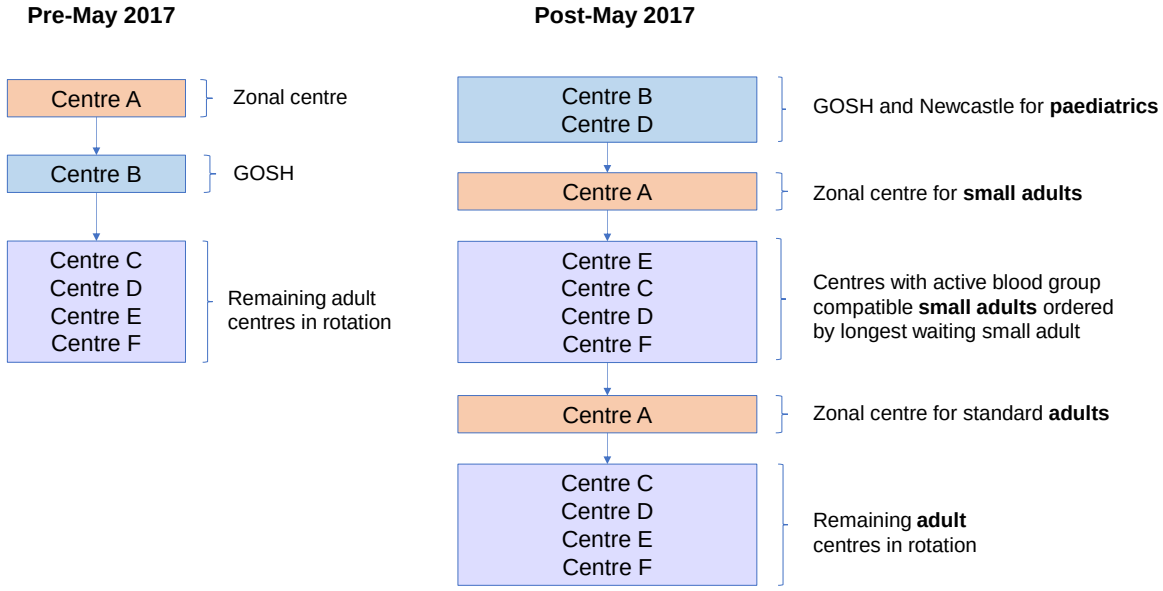
CTAG LUNG ALLOCATION SUBGROUP

PROPOSED CHANGES TO THE NON-URGENT LUNG ALLOCATION SEQUENCE

BACKROUND

1. The UK Lung Allocation Sequence was altered on 18 May 2017 and several new tiers of offering were introduced; a super-urgent tier, an urgent tier and a small adult (defined as age≥16 and height≤155cm) section within the non-urgent tier. As a consequence, the non-urgent tier of the adult donor sequence was extended from 6 steps to 12 steps:

Figure 1 **Non-urgent adult donor lung sequence**



2. This extension to the offering sequence was unmanageable operationally due to the time required to go through each offer sequentially, and so ODT Hub Operations introduced "Group Offering" in June 2017. Group Offering means that for lungs not accepted for named patients in the super-urgent/urgent tiers, a simultaneous offer is sent to all centres allowing 45-60 minutes for acceptance or decline. After 45 minutes the Hub allocate the lungs to the highest centre in the sequence depending on whether the centre wishes to accept for a paediatric, small adult or standard adult. This practice has not been popular due to the frequency of offers and the uncertainty around whether a centre will be allocated the organ.

KEY QUESTIONS

- Have the changes to the non-urgent tier implemented in May 2017 been beneficial for small adults and paediatrics?
- Are there any clinically acceptable solutions that would shorten the non-urgent tier and prevent Group Offering?

ANALYSIS

Have the changes to the non-urgent tier implemented in May 2017 been beneficial for small adults and paediatrics?

Registration outcomes were compared for two independent cohorts:

- Post change: patients registered between 18 May 2017 and 17 May 2018
- Prior to change: patients registered between 18 Nov 2015 and 17 Nov 2016

The status of each patient after 6 months of waiting is summarised below.

Table 1 **Six-month waiting list outcome for non-urgent small adults and paediatrics registered between 18 May 2017 and 17 May 2018**

	Transplanted		Still waiting		Died		Became urgent		Total
	N	%	N	%	N	%	N	%	N
Adult									
Birmingham	0	0	8	100	0	0	0	0	8
Harefield	3	50	3	50	0	0	0	0	6
Manchester	1	25	3	75	0	0	0	0	4
Newcastle	2	40	2	40	0	0	1	20	5
Papworth	3	75	1	25	0	0	0	0	4
Total	**9**	**33**	**17**	**63**	**0**	**0**	**1**	**4**	**27**
Paediatric									
GOSH	1	25	1	25	1	25	1	25	4
Newcastle	0	-	0	-	0	-	0	-	0
Total	**1**	**25**	**1**	**25**	**1**	**25**	**1**	**25**	**4**

Table 2 **Six-month waiting list outcome for small adults and paediatrics registered between 18 Nov 2015 and 17 Nov 2016**

	Transplanted		Still waiting		Died		Total
	N	%	N	%	N	%	N
Adult							
Birmingham	0	0	4	100	0	0	4
Harefield	1	50	1	50	0	0	2
Manchester	2	33	3	50	1	17	6
Newcastle	1	25	3	75	0	0	4
Papworth	1	100	0	0	0	0	1
Total	**5**	**29**	**11**	**65**	**1**	**6**	**17**
Paediatric							
GOSH	2	33	3	50	1	17	6
Newcastle	1	33	2	67	0	0	3
Total	**3**	**33**	**5**	**56**	**1**	**11**	**9**

3. **Table 1** shows that 9 out of 27 (33%) small adult patients registered in the 12 months since the changes to the non-urgent scheme were introduced were transplanted within 6 months of listing (all but one of these transplants were from non-zonal donors).

4. **Table 2** shows that 5 out of 17 (29%) small adult patients registered in a 12 month period before the changes were introduced were transplanted within 6 months of listing (when there was no small adult scheme or urgent or super-urgent scheme).

5. Therefore, there is no evidence of an improvement in the rate of transplant for non-urgent small adults (p=0.8). Numbers are too small to make a conclusion about paediatric patients.

6. **Table 3** shows two years of registrations instead of one (prior to the changes). The 6 month transplantation rate for small adults was 17% which was lower (p=0.1) than in Table 1, although numbers are small.

Table 3 **Six-month waiting list outcome for non-urgent small adults and paediatrics registered between 18 Nov 2014 and 17 Nov 2016**

	Transplanted		**Still waiting**		**Removed**		**Died**		**Total**
	N	%	N	%	N	%	N	%	N
Adult									
Birmingham	0	0	7	88	1	13	0	0	8
Harefield	1	8	9	75	0	0	2	17	12
Manchester	3	23	6	46	1	8	3	23	13
Newcastle	1	14	6	86	0	0	0	0	7
Papworth	3	50	3	50	0	0	0	0	6
Total	**8**	**17**	**31**	**67**	**2**	**4**	**5**	**11**	**46**
Paediatric									
GOSH	5	42	6	50	0	0	1	8	12
Newcastle	1	20	4	80	0	0	0	0	5
Total	**6**	**35**	**10**	**59**	**0**	**0**	**1**	**6**	**17**

Are there any clinically acceptable solutions that would shorten the non-urgent tier and prevent Group Offering?

Possible solution 1. Register non-urgent small adults and paediatrics with donor size ranges.

This solution would require alterations to the non-urgent registration form to capture minimum and maximum donor heights, as per the Urgent/Super-Urgent Registration Form. There would also need to be IT changes to incorporate these ranges into the matching algorithm.

Analysis suggests that this would not necessarily be beneficial because based on height ranges provided, some patients would be “compatible” with 30% or more of adult donors offered (see **Appendix I**).

Possible solution 2. Only prioritise paediatrics and small adults for adult donors under a certain height, e.g. 170cm.

This solution would require an IT change and would only shorten the sequence in 60% of scenarios for a 170cm cut-off, or alternatively 91% for a 160cm cut-off (see Table 4).

Table 4 **Heights of adult donors whose lungs were offered for transplant 1 April 2016 – 31 March 2018**

Height (cm)	Number of donors	Percent	Cumulative N	Cumulative percentage
<150	8	0.4	8	0.4
150-160	163	8.9	171	9.3
160-170	564	30.7	735	40.0
170-180	702	38.2	1437	78.3
180-190	347	18.9	1784	97.2
190+	52	2.8	1836	100.0

Table 5 **Weights of adult donors whose lungs were offered for transplant 1 April 2016 – 31 March 2018**

Weight (kg)	Number of donors	Percent	Cumulative N	Cumulative percentage
<50	33	1.8	33	1.8
50-60	133	7.2	166	9.0
60-70	329	17.9	495	27.0
70-80	467	25.4	962	52.4
80-90	418	22.8	1380	75.2
90-100	250	13.6	1630	88.8
100+	206	11.2	1836	100.0

Over the three year period from 1 April 2015 to 31 March 2018, there were 44 small adult lung transplants and 9 paediatric lung transplants using adult donors. 96% of adult donors accepted for small adults and 88% accepted for paediatrics were less than 170cm.

Table 6 **Summary of heights and weights of donors and recipients in small adult and paediatric lung transplants from adult donors, 1 April 2015 to 31 March 2018**

	Donors			Recipients		
	Median	Minimum	Maximum	Median	Minimum	Maximum
Small adult transplants (N=44)						
Height (cm)	160	143	182	153	136	155
Weight (kg)	65	44	117	50	29	74
Paediatric transplants (N=9)						
Height (cm)	162	153	185	155	119	162
Weight (kg)	65	49	95	40	21	49

Possible solution 3. Revert the non-urgent sequence back to pre-May 2017, but centres would prioritise small adults and paediatrics internally.

The downside is that a standard adult at the zonal centre would be prioritised ahead of a small adult at a non-zonal centre, but the impact of this would be monitored.

This solution would require an IT change.

CONCLUSION

7. When comparing 6 month listing outcomes for small adult patients before and after the change in allocation was introduced there was no evidence that an improvement in the rate of transplantation within 6 months had occurred (33% post-change vs 29% pre-change, p=0.8). Numbers are too small to make a conclusion about paediatric patients.

8. The most straight forward solution is to revert the non-urgent sequence back to pre-May 2017, but with centres prioritising small adults and paediatrics internally. With this change it is hoped that Group Offering could be discontinued, and sequential offering be re-introduced.

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Statistics and Clinical Studies **March 2019**

Appendix I – Donor size restrictions for Small Adults and Paediatric on the Lung Transplant Waiting List

Background

This report investigates whether specifying donor size restrictions for non-urgent Small Adults (age≥16 and height≤155cm) and Paediatrics (age<16) on the Lung Transplant Waiting List would lead to more efficient offering. Patients waiting for a non-urgent combined Heart-Lung transplant are also considered.

Recipient Data

Centres were asked to provide size ranges for their active non-urgent Small Adults, Paediatrics (Newcastle only) and Heart-Lung block patients as at 14 September 2018 (Great Ormond Street had no active lung patients on this date). The number of patients in question was as follows:

	Number of active patients, 14/09/18		
Centre	Small Adult	Paediatric	Heart-Lung
Birmingham	11		1
Harefield	8		2
Manchester	4		5
Newcastle	5	3	3
Papworth	4		1
Total	**32**	**3**	**12**

For Small Adults and Paediatrics, sex-specific minimum and maximum donor heights were requested. Centres were also asked if they would consider a partial lung transplant for any of these patients.

For Heart-Lung block patients, minimum and maximum donor weights and heights were requested however one centre (Papworth) specified min/max donor heights instead (highlighting differences in the relevant size measurements across centres?). One centre (Manchester) specified adult and paediatric donor specific ranges (as well as sex specific) and so for ease, the smaller of the two minimums and larger of the two maximums was taken.

A couple of centres (Harefield and Newcastle) disagreed with the list of active patients, stating that some should be suspended or hadn't been activated yet when they had, or were listed for one organ only not Heart-Lung block. This lack of accuracy on the National Transplant Database is an issue and centres should ensure the status of their patients is correct.

Donor Data

We aimed to identify potentially suitable donors for each patient that was active on 14 September 2018 based on the size ranges provided in order to quantify how likely or unlikely each patient would find a match within the existing donor pool.

To do this we interrogated a retrospective cohort of DBD and DCD donors who died in the UK and whose lungs were offered for donation between 1 April 2016 and 31 March 2018. For Small Adult and Paediatric patients, potential donors were restricted to adults only (aged ≥ 16, N=1,836) in order to assess the benefit of the current adult donor lung sequence.

For Heart-Lung patients, both adult and paediatric donors were considered, and donors were restricted to those where both the lungs and the heart were offered for donation (N=1,111). This

was to inform the current practice of delaying lung only offering until the heart has been placed which is to account for the small number of patients requiring lungs with the heart.

In matching the recipients with suitable donors, ABO blood type was also considered. The matching criteria is as follows:

Donor blood group	**Potential recipient blood group**			
	O	A	B	AB
O	✓	✓	✓	✓
A		✓		✓
B			✓	✓
AB				✓

For example, given a recipient of blood group AB, donors of blood groups O, A, B and AB would be considered. Whereas for a recipient of blood group A, only donor blood groups of O and A would be considered.

Results

Table 1 **Donor size ranges and patient details for non-urgent Small Adults, Paediatrics and Heart-Lung block patients that were active on the lung transplant list as at 14 September 2018**

Removed as patient specific

Table 2 Small Adults and Paediatrics – number and percentage of adult donors offered between 1 April 2016 and 31 March 2018 that each patient is compatible with

Removed as patient specific

Table 3 Heart-Lung patients – number and percentage of adult and paediatric donors offered between 1 April 2016 and 31 March 2018 that each patient is compatible with

Removed as patient specific

Table 4 Small Adults and Paediatrics – number and percentage of adult donors offered between 1 April 2016 and 31 March 2018 that each patient is compatible with

Percentage of adult donor population compatible with	Number of patients	Percent
<1%	10	29
1-2%	2	6
3-5%	4	11
6-10%	2	6
11-20%	6	17
21-30%	6	17
>30%	5	14
Total	35	100

Table 5 Heart-Lung patients – number and percentage of adult and paediatric donors offered between 1 April 2016 and 31 March 2018 that each patient is compatible with

Percentage of donor population compatible with	Number of patients	Percent
<1%	1	8
1-2%	0	0
3-5%	1	8
6-10%	2	17
11-20%	6	50
21-30%	1	8
>30%	1	8
Total	12	100

Key findings

- Of the 32 Small Adult patients, centres said they would consider partial lung transplantation for 5; 1 at Newcastle, 4 at Harefield (patients 15, 16, 19, 20 and 32). Based on the donor size ranges provided for partial lung transplantation, these patients were compatible with over 30% of the adult donor pool.
- 8 of the Small Adult patients and 2 of the Paediatric patients were compatible with less than 1% of the adult donor pool, which represents 29% of the 35 Small Adult and Paediatric patients.
- 6 out of 12 (50%) of the Heart-Lung block patients were compatible with 11-20% of the adult and paediatric donor pool.

Sally Rushton and Frederick Smith
Statistics and Clinical Studies **December 2018**