

NHS BLOOD AND TRANSPLANT
CARDIOTHORACIC ADVISORY GROUP - HEART
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 heart allocation zones since this change.
- 2 This report provides up to date figures on each centre's percentage share of registrations onto the national heart transplant list, for the two year period 1 September 2016 to 31 August 2018. It also provides numbers of heart 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 heart registrations made by each centre with the proportion of heart donors in each of the current heart 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. The variation in transplant activity cannot be explained by adjustments to zonal boundaries as they are not in-line with the adjustments that were made.
- 5 More hearts are exported than retained in zone, with the proportion exported increasing over time. This explains why zonal adjustments do not have a significant impact on each centre's transplant activity.
- 6 The utilisation rate (transplanted/offered) of donor hearts is variable across zones (highest for donors that appeared in Papworth's allocation zone and lowest for donors that appeared in Glasgow's zone).

CONCLUSION

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

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CARDIOTHORACIC ADVISORY GROUP - HEART

REVIEW OF ALLOCATION ZONES

INTRODUCTION

- 8 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.
- 9 This report is the first annual review of the heart allocation zones since this change. A similar review of the lung allocation zones will be presented at the CTAG-Lung meeting on 25 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
- 10 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 heart utilisation rates by zone, and zonal and export transplantation rates by zone and transplant centre.

DATA AND METHODS

- 11 Changes to the heart 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).
- 12 Registrations are defined as:

The total number of UK Group 1 heart or heart-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 with no active waiting time (note that registrations made by Harefield of patients < 16 years are included as agreed at the CTAG Core Group meeting in Nov 2017).

Registrations that ended in a domino or live donor transplant, multi-organ registrations and urgent and super-urgent heart registrations are included. Registrations for heart-lung transplantation are included in the number of heart 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. VAD patients listed for transplant are 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 between the non-urgent, urgent or super-urgent lists (without transplantation in between) they will only be counted once.

13 Donors are defined as:

The total number of UK adult (≥ 16 years at time of death) heart donors after brain death over the latest three year period between 1 September 2015 and 31 August 2018. Donors whose heart was not transplanted are excluded. Paediatric donors who donated to adult patients are included, along with adult donors whose organs were transplanted into paediatric patients.

- 14 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.
- 15 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 heart donation are presented.
- 16 The transplant activity section presents the number of zonal and exported transplants both by zone and transplanting centre over the time period.

RESULTS

Comparison of registrations and donors

- 17 **Table 1** summarises the proportion of heart registrations made by each centre over the two year period, and compares this with the number of heart 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 heart registrations and heart 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 heart 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	Heart registrations		Heart donors in current zone		Adjusted p-value*
	N	%	N	%	
Birmingham	92	17	80	16	1.00
Glasgow	40	7	31	6	1.00
Harefield	122	23	101	20	1.00
Manchester	87	16	77	16	1.00
Newcastle	106	20	97	20	1.00
Papworth	90	17	108	22	0.23
UK	537	100	494	100	

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

Registration Activity

- 18 **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, 537 patients were registered, there were 300 transplants (DBD only), and 65 deaths on the list (note that the transplant and death on the list numbers include patients registered prior to 1 September 2016).
- 19 Over the period of zonal changes, Harefield's registration activity varied the most, followed by Newcastle. Manchester's registration activity varied the least, followed by Papworth and Glasgow.
- 20 Comparing the periods before and after the final split of the zones in January 2018, the most noticeable changes in transplant activity were for Manchester (an increase from 9 to 16) and Papworth (a decrease from 26 to 20). These changes are not explained by adjustments to zonal boundaries as Manchester's zone decreased on 8 January 2018 while Papworth's zone increased slightly. Harefield saw the largest reduction in their zone but performed a very similar number of transplants before and after.

Table 2 Number of registrations, transplants (DBD only), and deaths on the heart 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	41	18	2	25	16	3	26	16	3
Glasgow	14	11	0	15	5	1	11	7	0
Harefield	40	22	4	55	20	1	27	21	3
Manchester	30	20	4	29	9	3	28	16	0
Newcastle	48	17	6	30	17	6	28	14	7
Papworth	31	25	7	31	26	0	28	20	0
UK	204	113	23	185	93	14	148	94	13

Donor Activity

21 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 heart zone at time of donation, with the number of hearts offered, accepted, retrieved, and transplanted. In total, 1,533 (59%) hearts were offered, 826 were accepted, 516 were retrieved and 492 were transplanted. The utilisation rate (transplanted/offered) is highest for donors that appeared in Papworth's allocation zone and lowest for donors that appeared in Glasgow's zone.

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

Zone	Number of DBD donors	Offered		Accepted		Retrieved		Transplanted		
		N	(% of donors)	N	(% of offered)	N	(% of accepted)	N	(% of retrieved)	(% of offered)
Birmingham	348	218	(63)	119	(55)	74	(62)	72	(97)	(33)
Glasgow	229	155	(68)	53	(34)	29	(55)	29	(100)	(19)
Harefield	644	353	(55)	207	(59)	129	(62)	120	(93)	(34)
Manchester	487	301	(62)	159	(53)	105	(66)	99	(94)	(33)
Newcastle	375	227	(61)	119	(52)	73	(61)	72	(99)	(32)
Papworth	498	279	(56)	169	(61)	106	(63)	100	(94)	(36)
UK	2581	1533	(59)	826	(54)	516	(62)	492¹	(95)	(32)

¹ Number doesn't match Table 1 because Table 1 includes two 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)

Transplant Activity

22 **Table 5** shows the number of transplants performed in the three year period, by zone of the donor and era, broken down by whether the heart was transplanted by the zonal centre or exported to a different centre. Generally, more hearts were exported than retained in zone, with the proportion exported increasing over time. Proportionally more hearts were exported from Birmingham and Manchester's zones (69%) and fewer from Newcastle's zone (49%).

23 **Table 6** shows similar information but by transplanting centre rather than zone. Overall, 59% of transplants in the time period were performed using imported hearts. This proportion was highest for transplants performed by Birmingham (70%) and Glasgow (71%) and lowest for Harefield (52%), although in the latest era Harefield imported more hearts than previously.

CONCLUSIONS

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

Table 5 Adult DBD heart transplants performed 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	(%)	N	(%)	
Birmingham	35	13	(37)	22	(63)	20	4	(20)	16	(80)	17	5	(29)	12	(71)			
Glasgow	21	6	(29)	15	(71)	3	2	(67)	1	(33)	5	2	(40)	3	(60)			
Harefield	77	22	(29)	55	(71)	25	11	(44)	14	(56)	18	6	(33)	12	(67)			
Manchester	65	23	(35)	42	(65)	15	3	(20)	12	(80)	19	5	(26)	14	(74)			
Newcastle	43	23	(53)	20	(47)	10	7	(70)	3	(30)	19	7	(37)	12	(63)			
Papworth	49	28	(57)	21	(43)	28	11	(39)	17	(61)	23	9	(39)	14	(61)			
UK	290	115	(40)	175	(60)	101	38	(38)	63	(62)	101	34	(34)	67	(66)			

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

Table 6 Adult DBD heart transplants performed in the UK by era, transplanting 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	(%)	N	(%)	
Birmingham	42	13	(31)	29	(69)	16	4	(25)	12	(75)	16	5	(31)	11	(69)			
Glasgow	22	6	(27)	16	(73)	5	2	(40)	3	(60)	7	2	(29)	5	(71)			
Harefield	40	22	(55)	18	(45)	20	11	(55)	9	(45)	21	6	(29)	15	(71)			
Manchester	49	23	(47)	26	(53)	9	3	(33)	6	(67)	15	5	(33)	10	(67)			
Newcastle	45	22	(49)	23	(51)	17	6	(35)	11	(65)	14	5	(36)	9	(64)			
Papworth	63	28	(44)	35	(56)	25	11	(44)	14	(56)	20	9	(45)	11	(55)			
UK	261	114	(44)	147	(56)	92	37	(40)	55	(60)	93	32	(34)	61	(66)			

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