

**NHS BLOOD AND TRANSPLANT**  
**CARDIOTHORACIC ADVISORY GROUP**  
**ACCESS TO HEART TRANSPLANT BY BLOOD GROUP**  
**SUMMARY**

**BACKGROUND**

- 1 Following previously presented analysis, on 1 April 2010 changes were made to the offering sequence of blood group O donor hearts for non-urgent adult patients. These changes mean that blood group O and B patients should initially be offered blood group O donor hearts prior to them being offered to blood group A and AB patients. This paper reports on access to heart transplant by recipient blood group over the last two years.

**DATA ANALYSIS**

- 2 Data on 186 new non-urgent adult active heart only registrations made in the UK between 1 January 2014 and 31 December 2015 were analysed. For the subset of 136 registrations that had six-month follow-up, there was no evidence of a statistically significant difference between the blood groups in the proportion of patients that died within six-months of registration (Fisher's exact  $p=0.93$ ). However, there was strong evidence of a difference between the blood groups in the proportion of patients transplanted at six-months (Fisher's exact  $p=0.0009$ ). Only 7% of blood group O patients had been transplanted compared with over 25% of blood group A, B and AB patients.
- 3 Analysis of waiting time to transplant for the whole cohort showed significant differences between the blood groups ( $p=0.014$ ), with blood group O patients having a longer time to transplant than blood group A and B patients.
- 4 In order to examine the donor to recipient ABO match distribution, data on 50 UK adult non-urgent heart only transplants performed during the same time period were also analysed. Of the 50 heart transplants performed, 14 were hearts from a blood group O donor and 11 of these 14 (79%) were transplanted into blood group O patients. 88% of adult blood group O hearts donated during the time period were transplanted into urgent patients, compared with less than 73% of all A, B and AB donor hearts. This may explain the longer time to transplant for blood group O patients.

**RECOMMENDATIONS**

- 5 Although blood group O patients continue to wait longer than others for non-urgent heart transplant and six month transplant rates differ significantly between the blood groups, it appears that little else can be done to direct blood group O donor hearts without affecting the urgent scheme.
- 6 Selection and allocation policies including blood group prioritisation rules will change under the new impending heart allocation scheme (to be implemented summer 2016). Running this analysis when the new scheme been implemented will provide valuable insight into whether the new scheme addresses this issue.

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**NHS BLOOD AND TRANSPLANT**  
**CARDIOTHORACIC ADVISORY GROUP**

**BLOOD GROUP ACTIVITY**

**BACKGROUND**

- 1 From 1 April 2010, offers of blood group O donor hearts for non-urgent adult patients must be made to blood group O and B patients, first within-zone then to other centres rotationally. If there are no suitable O and B patients, the heart may then be offered to blood group A and AB patients, again first within-zone and then to other centres.
- 2 This paper reports on access to heart transplantation by recipient blood group over the last two years.

**DATA AND METHODS**

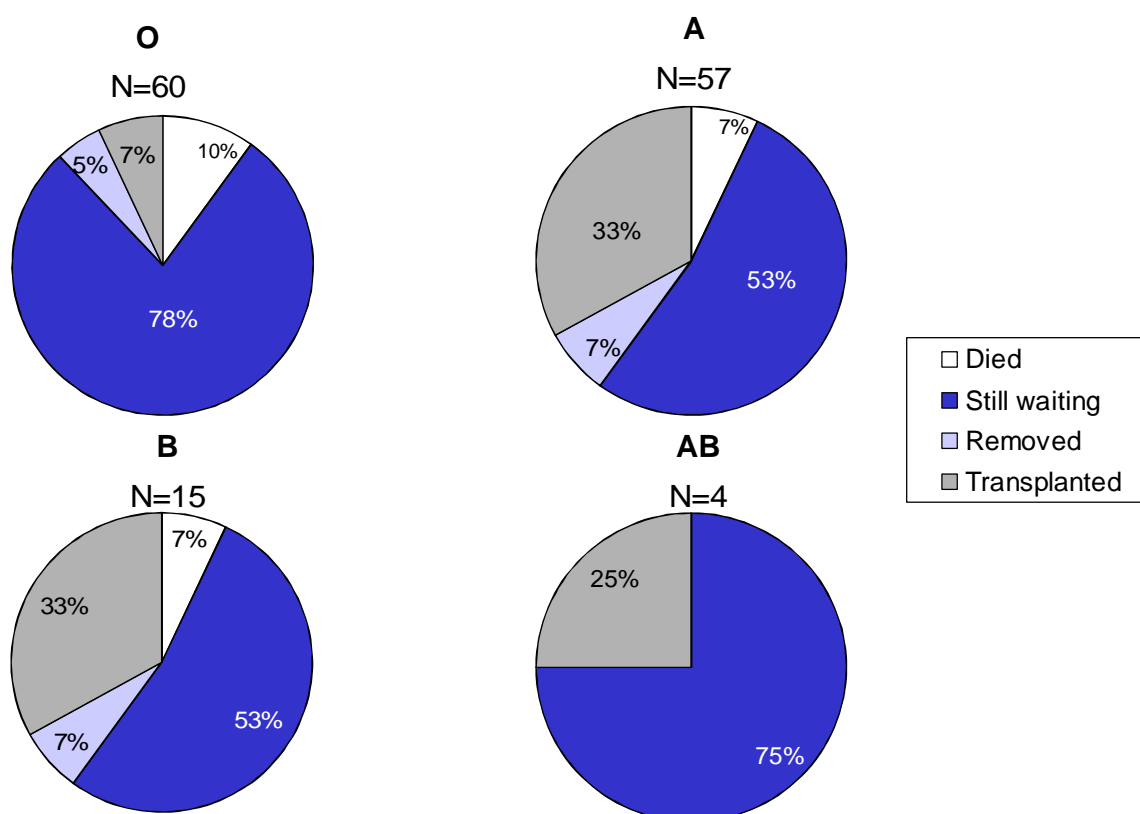
- 3 Data on 186 new non-urgent adult active heart only registrations made in the UK between 1 January 2014 and 31 December 2015 were obtained from the UK Transplant Registry (UKTR) to examine waiting time to transplant. Six-month post-registration outcomes for the subset of patients (136 patients) with six month follow-up were also analysed to examine the proportion of deaths and transplants.
- 4 To examine the donor to recipient ABO match distribution, data on 50 adult non-urgent heart only transplants performed in the UK from donors after brain death (DBD) during the same time period were also obtained from the UK Transplant Registry. Data were also obtained on all 299 DBD heart transplants performed during the time period.

**RESULTS**

**Registration outcome**

- 5 Registration outcomes (death, transplant, removal, still waiting) within six months of registration are shown in **Figure 1** by blood group. There is no evidence of a statistically significant difference between blood groups in the proportion of patients that died within six months of registration (Fisher's exact test  $p=0.93$ ). However, there is strong evidence of a difference between blood groups in the proportion of patients transplanted at six months post-registration (Fisher's exact test  $p=0.0009$ ). Only 7% of blood group O patients had been transplanted compared with 25% or over for blood group A, B and AB patients.

**Figure 1 Six-month post-registration outcome by recipient blood group, 1 January 2014 to 30 June 2015**



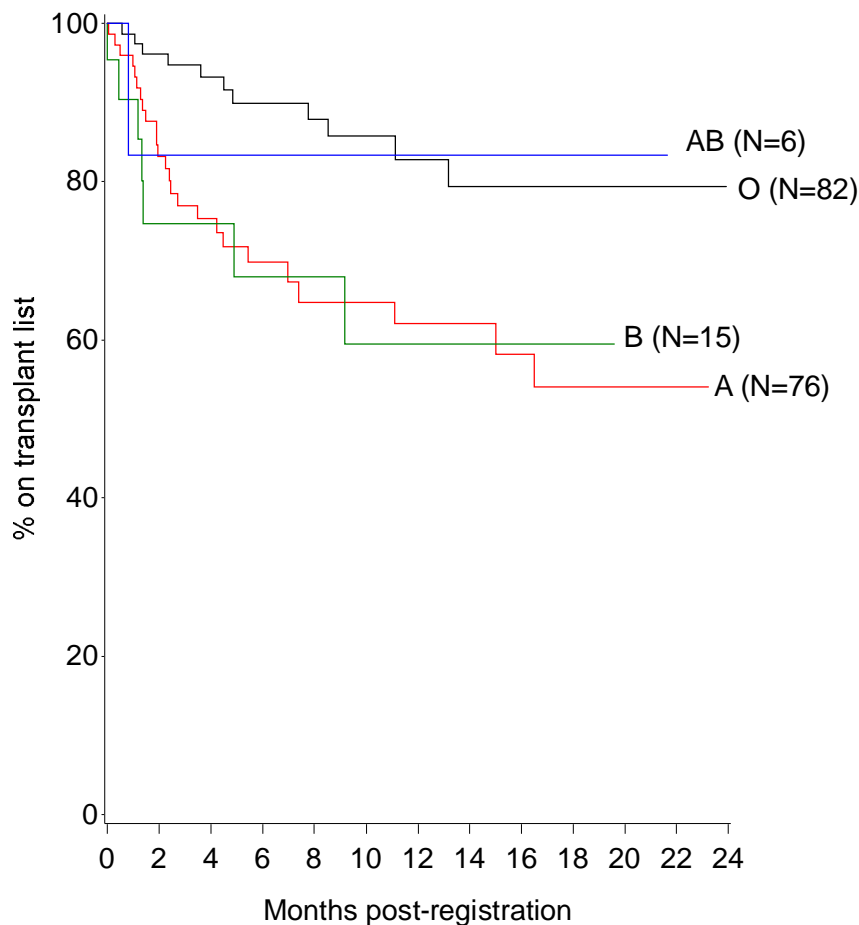
Eight patients were removed from the transplant list within six months of registration and **Table 1** shows the reasons for removal. Of the 8 patients removed, one blood group O patient was removed due to condition improving and three patients have been reported as dying after being removed.

**Table 1 Reasons for removal from transplant list within six months of registration, by blood group, 1 January 2014 to 31 December 2015**

| Reason for removal from transplant list | O              | A              | Blood group B  | AB            | Total           |
|---|----------------|----------------|----------------|---------------|-----------------|
| Condition improved                      | 1 (25%)        | 2 (50%)        | 1 (25%)        | 0 (0%)        | 4 (50%)         |
| Condition deteriorated                  | 2 (67%)        | 1 (33%)        | 0 (0%)         | 0 (0%)        | 3 (38%)         |
| Patient wishes                          | 0 (0%)         | 1 (100%)       | 0 (0%)         | 0 (0%)        | 1 (13%)         |
| <b>Total</b>                            | <b>3 (38%)</b> | <b>4 (50%)</b> | <b>1 (12%)</b> | <b>0 (0%)</b> | <b>8 (100%)</b> |

6 **Figure 2** shows the Kaplan-Meier time to transplant curves by blood group for the 186 patients registered on the non-urgent transplant list between 1 January 2014 and 31 December 2015 and indicates there are statistically significant differences in waiting time to transplant between the four blood groups ( $p$ -value=0.014). Of the 6 blood group AB patients, 1 was transplanted within two years. Due to such low numbers, comparisons should not be drawn with the other blood groups. Blood group O patients had a longer time to transplant than blood group A and B patients.

**Figure 2 Time to transplant, by blood group, for non-urgent adult registration on the UK heart only transplant list, 1 January 2014 to 31 December 2015**



### Non-urgent transplants

- 7 **Table 2** shows the donor to recipient ABO blood group match for adult non-urgent heart only transplants. 79% of blood group O donor hearts were used in blood group O patients, and overall 92% of patients received a blood group identical transplant. **Table 3** shows that 88% of adult blood group O hearts transplanted during the time period were transplanted into urgent patients, comparing with less than 73% of blood group A and B donor hearts. This may explain with longer time to transplant for blood group O patients.
- 8 There was one potential case of non-compliance between 1 January 2014 and 31 December 2015 where a blood group O donor heart was transplanted into a non-urgent blood group A patient. This would be non-compliance if there was a suitable blood group O or B patient registered at the centre at time of offer. This case is being investigated.

| <b>Table 2</b>   |                                  | <b>ABO blood group match for adult non-urgent heart only transplants,<br/>1 January 2014 – 31 December 2015</b> |             |           |             |          |             |           |            |
|------------------|----------------------------------|---|-------------|-----------|-------------|----------|-------------|-----------|------------|
|                  | <b>Donor<br/>blood<br/>group</b> | <b>Recipient blood group</b>  |             |           |             |          |             |           |            |
|                  |                                  | <b>O</b>  |             | <b>A</b>  |             | <b>B</b> |             | <b>AB</b> |            |
|                  |                                  | <b>N</b>  | <b>(%)</b>  | <b>N</b>  | <b>(%)</b>  | <b>N</b> | <b>(%)</b>  | <b>N</b>  | <b>(%)</b> |
| <b>Zonal</b>     | <b>O</b>                         | 4   | (100)       | 0         | (0)         | 0        | (0)         | 0         | (0)        |
|                  | <b>A</b>                         | -   | (-)         | 13        | (93)        | -        | (-)         | 1         | (7)        |
|                  | <b>B</b>                         | -   | (-)         | -         | (-)         | 4        | (100)       | 0         | (0)        |
|                  | <b>AB</b>                        | -   | (-)         | -         | (-)         | -        | (-)         | 0         | (0)        |
|                  | <b>Total</b>                     | <b>4</b>  | <b>(18)</b> | <b>13</b> | <b>(59)</b> | <b>4</b> | <b>(18)</b> | <b>1</b>  | <b>(5)</b> |
| <b>Non-zonal</b> | <b>O</b>                         | 7   | (70)        | 2         | (20)        | 1        | (10)        | 0         | (0)        |
|                  | <b>A</b>                         | -   | (-)         | 13        | (100)       | -        | (-)         | 0         | (0)        |
|                  | <b>B</b>                         | -   | (-)         | -         | (-)         | 3        | (100)       | 0         | (0)        |
|                  | <b>AB</b>                        | -   | (-)         | -         | (-)         | -        | (-)         | 2         | (100)      |
|                  | <b>Total</b>                     | <b>7</b>  | <b>(25)</b> | <b>15</b> | <b>(54)</b> | <b>4</b> | <b>(14)</b> | <b>2</b>  | <b>(7)</b> |
| <b>Overall</b>   | <b>O</b>                         | 11  | (79)        | 2         | (14)        | 1        | (7)         | 0         | (0)        |
|                  | <b>A</b>                         | -   | (-)         | 26        | (96)        | -        | (-)         | 1         | (4)        |
|                  | <b>B</b>                         | -   | (-)         | -         | (-)         | 7        | (100)       | 0         | (0)        |
|                  | <b>AB</b>                        | -   | (-)         | -         | (-)         | -        | (-)         | 2         | (100)      |
|                  | <b>Total</b>                     | <b>11</b>   | <b>(22)</b> | <b>28</b> | <b>(56)</b> | <b>8</b> | <b>(16)</b> | <b>3</b>  | <b>(6)</b> |

- Blood group incompatible transplants

| <b>Table 3</b>               |               | <b>Adult heart transplants from UK adult DBD donors,<br/>1 January 2014 – 31 December 2015</b> |  |             |                          |            |                    |
|------------------------------|---------------|--|--|-------------|--------------------------|------------|--------------------|
| <b>Donor blood<br/>group</b> | <b>Urgent</b> |  | <b>Type of transplant<br/>Non-urgent</b> |             | <b>Other<sup>1</sup></b> |            | <b>Total<br/>N</b> |
|                              | <b>N</b>      | <b>(%)</b>   | <b>N</b>                                 | <b>(%)</b>  | <b>N</b>                 | <b>(%)</b> |                    |
| O                            | 139           | (88)   | 14                                       | (9)         | 5                        | (3)        | 158                |
| A                            | 85            | (72)   | 27                                       | (23)        | 6                        | (5)        | 118                |
| B                            | 13            | (65)   | 7  | (35)        | 0                        | (0)        | 20                 |
| AB                           | 1             | (33)   | 2  | (67)        | 0                        | (0)        | 3                  |
| <b>Total</b>                 | <b>238</b>    | <b>(80)</b>  | <b>50</b>                                | <b>(17)</b> | <b>11</b>                | <b>(3)</b> | <b>299</b>         |

<sup>1</sup> Includes heart/lung transplants (n=9), heart/kidney transplant (n=1), heart/liver transplant (n=1)

## CONCLUSION

- 9 During the time period, 11 of the 14 blood group O hearts transplanted into non-urgent patients were blood group identical. Blood group O patients continue to wait longer than blood group A or B patients for a non-urgent heart transplant and six month transplant rates differ significantly between the blood groups. It appears that little else can be done to direct blood group O donor hearts to O recipients without affecting the urgent scheme.
- 10 Selection and allocation policies including blood group prioritisation rules will change under the new impending heart allocation scheme (to be implemented summer 2016). Running this analysis when the new scheme been implemented will provide valuable insight into whether the new scheme addresses this issue.

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