NHS BLOOD AND TRANSPLANT

CARDIOTHORACIC ADVISORY GROUP – HEART

REVIEW OF HEART TRANSPLANT ALLOCATION DATA

SUMMARY

INTRODUCTION

1. The super-urgent heart allocation scheme was introduced on 26 October 2016 and more recently, on 29 March 2023, changes were made to the most common urgent category (category 21). This report presents outcomes of adult patients on the heart transplant list, survival from listing and post-transplant survival, by centre and urgency group.

DATA ANALYSIS

2. The cohorts of registrations and transplants both cover three years, from 1 April 2021 to 31 March 2024. The analysis considers adult patients only (age≥16) and includes heart-lung block registrations/transplants. For survival from listing, survival time from first registration was considered, and for post-transplant analysis, re-grafts were excluded.

RESULTS

3. There were 376 non-urgent registrations, 402 urgent registrations and 160 super-urgent registrations in the time period. Super-urgent registrations represented 17% of all registrations. At time of analysis, 82% of super-urgent registrations ended in transplant, compared with 71% for urgent registrations and 26% for non-urgent registrations. Four percent of super-urgent patients died on the list, compared with 3% for urgent registration and 4% for non-urgent registrations.

4. The median waiting times to transplant were 14 days for super-urgent and 56 days for urgent. The median could not be estimated for non-urgent registrations due to the low transplant rate. The two-year rate of patient survival from first heart listing was lower for super-urgent patients (80%) than both urgent (85%) and non-urgent patients (86%), this difference was statistically significant (p=0.01).

5. In the urgent group, 79% of patients were registered under category 21, which reduced slightly from 80% to 76% after the policy change in March 2023. It wasn't possible to analyse the subgroups of category 21 due to poor data.

6. In the transplant cohort, there were 130 (24%) non-urgent transplants, 286 (53%) urgent transplants and 127 (23%) super-urgent transplants. Survival rates up to two years post-transplant were similar across urgency groups. There was also no difference between urgency groups in the proportion of patients requiring renal support or VA-ECMO within 30 days of transplant.

ACTION

7. This information is provided for monitoring purposes and no specific action is required.

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Statistics and Clinical Research **September 2024**

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INTRODUCTION

8. The super-urgent heart allocation scheme was introduced on 26 October 2016 alongside several changes to the urgent heart allocation policy. More recently, on 29 March 2023, changes were made to the most common urgent category (category 21), to improve consistency across centres in patients registered for urgent heart transplant. This report presents outcomes of adult patients on the heart transplant list by urgency and centre. For urgent patients, it examines numbers of registrations under each urgent category. It also presents post-transplant outcomes by urgency group.

DATA AND METHODS

9. Data were extracted from the UK Transplant Registry on 10 September 2024 on all adult (age≥16) patients registered for a heart or heart-lung block transplant between 1 April 2021 and 31 March 2024. The reason for including heart-lung registrations was because these patients are allocated according to the heart urgency tiers. Multiple registrations for the same patient were allowed (so the same patient may appear in different urgency categories if they changed urgency within the time period). Registration outcomes were analysed across urgency groups and by centre.

10. Median waiting time to transplant was analysed by urgency group using the Kaplan-Meier method. Patients were censored if they died on the list, were removed from the list without transplant, moved to a different urgency tier, or still waiting at time of analysis.

11. Unadjusted patient survival from time of *first* heart listing was analysed across urgency groups, using the Kaplan-Meier method. Survival time was defined as the time from first joining the transplant list to death, considering both time on the transplant list and post-transplant survival time if the patient received a transplant. Survival times were censored if the patient was removed from the list without death, was alive post-transplant, or was still waiting on the list at time of analysis. If a patient was registered more than once or changed urgency, they were classified by their first registration/urgency, so these groups were mutually exclusive.

12. The number of adult heart transplants performed in each urgency category by centre was extracted for the analysis period. Unadjusted short-term post-transplant survival was analysed as well as requirement for renal support or VA-ECMO within the first 30 days post-transplant. Data on VA-ECMO was obtained from the Mechanical Circulatory Support Database. Heart-lung transplants were included in this analysis, but re-grafts were excluded from post-transplant analysis.

RESULTS

Registration data

13. **Table 1** shows a breakdown of the non-urgent, urgent and super-urgent heart registrations in the three-year analysis period, by centre and whether the patient was listed for a heart-only transplant or a heart-lung block. There was a total of 26 heart-lung block registrations, 3% of all heart registrations in the period. The highest number of registrations were made by Harefield and Papworth. For most centres the percentage of super-urgent registrations was 19-20%, except for Newcastle where it was 9%. The percentage of non-urgent registrations was 30-42% for all centres apart from Papworth where it was 52%.

Table 1 **Heart registrations by urgency, centre, and whether lungs were also required, 1 April 2021 – 31 March 2024**

Centre	Non-urgent		Urgent		Super-urgent		Total
	Heart-only	Heart-lung	Heart-only	Heart-lung	Heart-only	Heart-lung	
Birmingham	47	2	62	2	26	1	**140**
Glasgow	35	0	58	0	22	0	**115**
Harefield	76	2	82	1	37	0	**198**
Manchester	45	2	42	1	22	0	**112**
Newcastle	62	4	96	2	16	0	**180**
Papworth	96	5	54	2	34	2	**193**
Total	**361**	**15**	**394**	**8**	**157**	**3**	**938**

14. **Tables 2-4** present the outcomes of non-urgent, urgent and super-urgent registrations during the analysis period, by centre. Note that those patients registered towards the end of the time period are more likely to be “still waiting”. There were 376 non-urgent registrations (for 371 patients), 402 urgent registrations (for 92 patients), and 160 super-urgent registrations (for 151 patients). Twenty-six percent of non-urgent registrations ended in transplant compared with 71% for urgent registrations and 82% for super-urgent registrations. The mortality rate was similar across the three urgency lists; 3-4%.

Table 2 **Outcomes of NON-URGENT heart registrations, 1 April 2021 – 31 March 2024, as at 10 September 2024, by centre**

Centre	Still waiting		Died		Removed		Became S-U		Transplanted		Became U		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N
Birmingham	13	27	3	6	4	8	4	8	16	33	9	18	**49**
Glasgow	9	26	1	3	2	6	1	3	20	57	2	6	**35**
Harefield	29	37	3	4	22	28	1	1	13	17	10	13	**78**
Manchester	29	62	2	4	4	9	1	2	9	19	2	4	**47**
Newcastle	24	36	3	5	11	17	0	-	7	11	21	32	**66**
Papworth	24	24	2	2	8	8	6	6	31	31	30	30	**101**
Total	**128**	**34**	**14**	**4**	**51**	**14**	**13**	**3**	**96**	**26**	**74**	**20**	**376**

Table 3 **Outcomes of URGENT heart registrations, 1 April 2021 – 31 March 2024, as at 10 September 2024, by centre**

Centre	Still waiting		Died		Became N-U		Removed		Became S-U		Transplanted		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N
Birmingham	1	2	2	3	0	-	8	13	14	22	39	61	**64**
Glasgow	0	-	0	-	0	-	4	7	5	9	49	84	**58**
Harefield	1	1	2	2	0	-	11	13	10	12	59	71	**83**
Manchester	0	-	0	-	0	-	12	28	4	9	27	63	**43**
Newcastle	2	2	5	5	0	-	18	18	4	4	69	70	**98**
Papworth	1	2	2	4	0	-	8	14	4	7	41	73	**56**
Total	**5**	**1**	**11**	**3**	**0**	**-**	**61**	**15**	**41**	**10**	**284**	**71**	**402**

Table 4 **Outcomes of SUPER-URGENT heart registrations, 1 April 2021 – 31 March 2024, as at 10 September 2024, by centre**

Centre	Still waiting		Died		Became N-U		Removed		Became U		Transplanted		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N
Birmingham	0	-	0	-	0	-	2	7	0	-	25	93	**27**
Glasgow	0	-	0	-	0	-	1	5	0	-	21	95	**22**
Harefield	0	-	3	8	0	-	6	16	0	-	28	76	**37**
Manchester	0	-	2	9	0	-	5	23	0	-	15	68	**22**
Newcastle	0	-	1	6	0	-	3	19	0	-	12	75	**16**
Papworth	0	-	1	3	0	-	5	14	0	-	30	83	**36**
Total	**0**	**-**	**7**	**4**	**0**	**-**	**22**	**14**	**0**	**-**	**131**	**82**	**160**

15. **Table 5** presents median waiting time to transplant estimates across urgency groups, including 95% confidence intervals (CI) for the median. The median waiting time to non-urgent transplant could not be calculated due to low transplant rate.

Table 5 **Median waiting time to transplant by urgency**

Urgency	Number of registrations	Number transplanted by 11 Sep 2023	Waiting time (days) Median	95% CI
Non-urgent[1]	376	96 (26%)	-	-
Urgent	402	284 (71%)	56	46 - 66
Super-urgent	160	131 (82%)	14	11 - 17

[1]Medians and 95% confidence interval could not be calculated due to low transplant rate

16. **Table 6** presents a breakdown of urgent heart registrations during the analysis period by centre, category of registration and time period (split into the latest financial year versus the previous two due to the change in definition of category 21 in March 2023). Overall, the

most common registration category was 21, representing 79% of all urgent registrations, which reduced slightly from 80% to 76% between the two time periods.

Table 6 URGENT heart registrations by category, centre, and financial year, 1 April 2021 – 31 March 2024

Centre	Urgent category						
	21	22	23	31	32	Unknown	Total
April 2021 - March 2023							
Birmingham	32 (91%)	1 (3%)	1 (3%)	0 (-)	1 (3%)	0 (-)	35
Glasgow	38 (95%)	1 (3%)	0 (-)	0 (-)	0 (-)	1 (3%)	40
Harefield	45 (80%)	6 (11%)	5 (9%)	0 (-)	0 (-)	0 (-)	56
Manchester	26 (76%)	5 (15%)	3 (9%)	0 (-)	0 (-)	0 (-)	34
Newcastle	46 (71%)	7 (11%)	3 (5%)	6 (9%)	0 (-)	3 (5%)	65
Papworth	27 (75%)	3 (8%)	5 (14%)	0 (-)	0 (-)	1 (3%)	36
Total	**214 (80%)**	**23 (9%)**	**17 (6%)**	**6 (2%)**	**1 (0%)**	**5 (2%)**	**266**
April 2023 - March 2024							
Birmingham	22 (79%)	2 (7%)	0 (-)	0 (-)	1 (4%)	3 (11%)	28
Glasgow	18 (100%)	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)	18
Harefield	23 (82%)	2 (7%)	1 (4%)	0 (-)	1 (4%)	1 (4%)	28
Manchester	7 (78%)	2 (22%)	0 (-)	0 (-)	0 (-)	0 (-)	9
Newcastle	18 (55%)	0 (-)	5 (15%)	7 (21%)	2 (6%)	1 (3%)	33
Papworth	15 (75%)	3 (15%)	2 (10%)	0 (-)	0 (-)	0 (-)	20
Total	**103 (76%)**	**9 (7%)**	**8 (6%)**	**7 (5%)**	**4 (3%)**	**5 (4%)**	**136**
TOTAL	**317 (79%)**	**32 (8%)**	**25 (6%)**	**13 (3%)**	**5 (1%)**	**10 (2%)**	**402**

Category definitions:
21=Adult inpatient with advanced heart failure requiring continuous inotrope therapy and/or IABP meeting one of three sub-categories
22=Adult long-term VAD or TAH patient agreed by CTAG Adjudication Panel
23=Exceptionally sick adult patient agreed by CTAG Adjudication Panel
31=Adult congenital heart disease (ACHD) arrhythmia patient
32=ACHD patient with no option for conventional escalation of therapy

17. For the 103 patients registered under category 21 since March 2023, **Table 7** shows a breakdown by sub-category and centre. Note however that sub-category information was missing for a high proportion of registrations. Where reported, Adverse Pulmonary Haemodynamics only was most common.

Table 7 Category 21 registrations by sub-category and centre, 1 April 2023 – 31 March 2024

Centre	Category 21 sub-category						
	CS only	CHI only	APH only	CS and CHI	CHI and APH	Unknown	**Total**
Birmingham	3	2	7	0	1	9	22
Glasgow	2	1	7	0	2	6	18
Harefield	2	3	6	1	1	10	23
Manchester	0	0	0	0	0	7	7
Newcastle	3	6	3	0	1	5	18
Papworth	0	1	3	0	0	11	15
Total	**10**	**13**	**26**	**1**	**5**	**48**	**103**

CS=Cardiogenic Shock, CHI=Cardiorenal or Hepatic Indication, APH=Adverse Pulmonary Haemodynamics

Survival from listing

18. **Figure 1** and **Table 8** present patient survival from *first* heart or heart-lung transplant listing by urgency, up to two years. Survival time was defined as the time from first joining the transplant list to death, considering both time on the transplant list and post-transplant survival time if the patient received a transplant. There was a significant difference in the two year survival rates by urgency (p=0.01), with super-urgent patients having the lowest survival rate.

Figure 1 **Two year Kaplan-Meier patient survival from listing curves for adult patients listed on the heart transplant list, 1 April 2021 – 31 March 2024, by urgency**

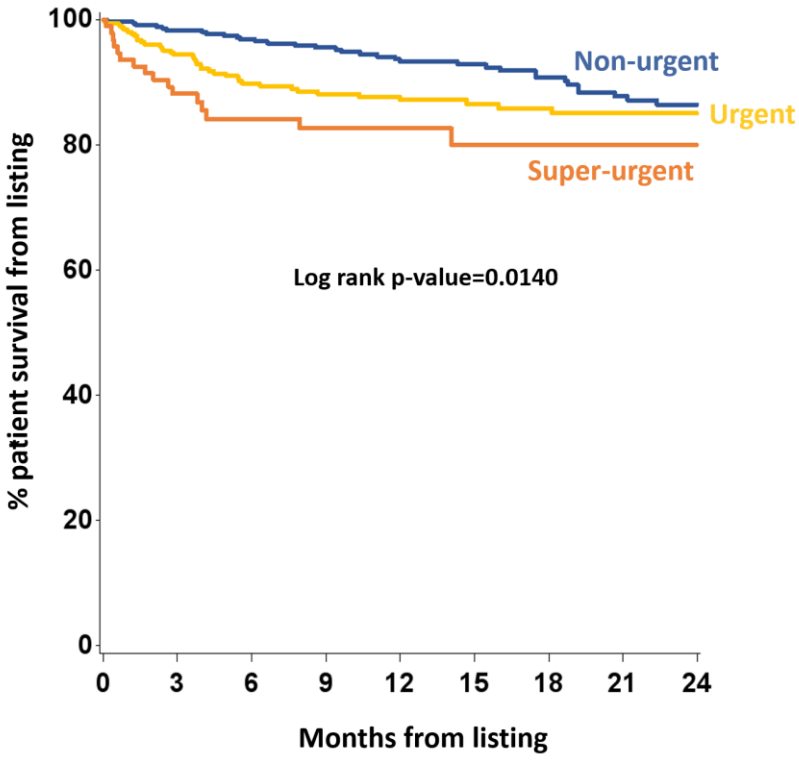

Table 8 **Patient survival from heart listing by urgency for adult patients first listed 1 April 2021 – 31 March 2024**

Urgency	Number of patients	Number of deaths as at 11 Sep 2024[1]	90 days		1 year		2 years	
			Survival (%)	95% CI	Survival (%)	95% CI	Survival (%)	95% CI
Non-urgent	358	33	98	96 – 99	93	90 – 96	86	81 – 90
Urgent	319	38	94	91 – 96	87	83 – 91	85	80 – 89
Super-urgent	97	16	88	80 – 93	83	73 – 89	80	69 – 88
Overall	**774**	**87**	**95**	**94 – 97**	**90**	**87 – 92**	**85**	**82 – 88**

[1]or within 2 years

Transplant data

19. **Table 9** presents the number of transplants performed by each centre in each urgency category between 1 April 2021 and 31 March 2024. Note that these numbers will not match those transplanted in the previous section because some of the patients transplanted would have been registered prior to 1 April 2021. Newcastle performed the lowest number of super-urgent transplants, while Papworth performed the highest number of non-urgent transplants.

Table 9 **Adult heart transplants performed in the UK, 1 April 2021 – 31 March 2024, by centre and urgency**

Centre	Non-urgent		Urgent		Super-urgent		Total
	N	%	N	%	N	%	N
Birmingham	18	22	41	50	23	28	82
Glasgow	29	30	46	48	21	22	96
Harefield	20	19	61	57	26	24	107
Manchester	9	18	27	53	15	29	51
Newcastle	12	13	71	76	11	12	94
Papworth	42	37	40	35	31	27	113
Total	**130**	**24**	**286**	**53**	**127**	**23**	**543**

20. **Figure 2** and **Table 10** present patient survival by urgency, up to two years, where 4 re-grafts were excluded. All patients had survival data reported. There was no difference in the patient survival rates by urgency group at two years post-transplant (p=0.7).

Figure 2 **Two year Kaplan-Meier patient survival curves for adult patients transplanted 1 April 2021 – 31 March 2024, by urgency**

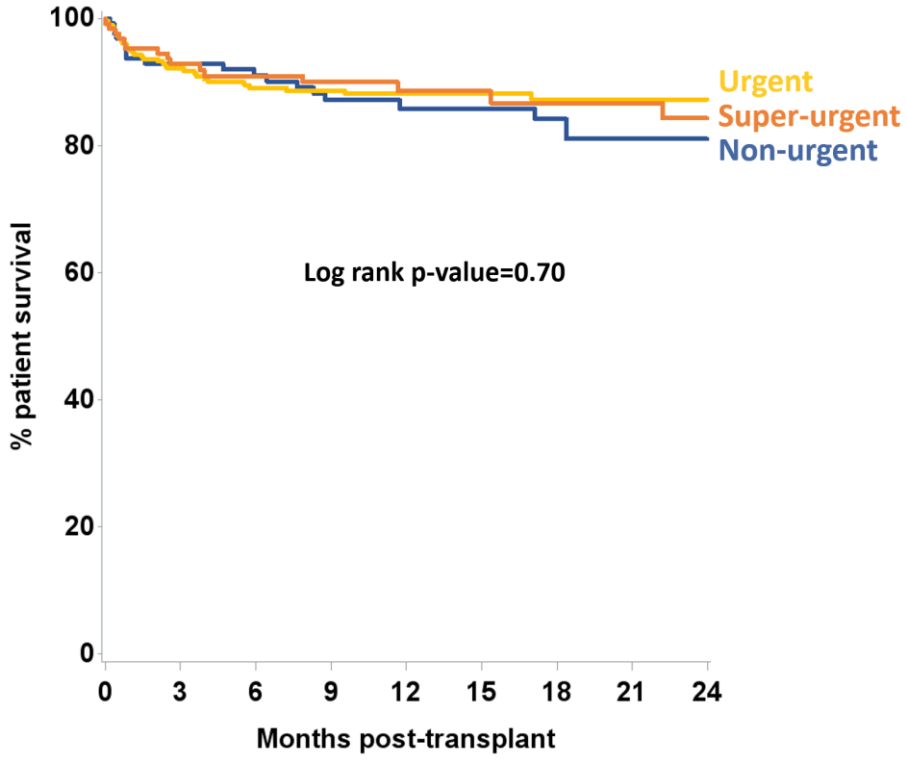

Table 10 **Patient survival post-heart transplant by urgency for adult patients first transplanted 1 April 2021 – 31 March 2024**

Urgency	Number of transplants	Number of deaths as at 11 Sep 2024[1]	90 days		1 year		2 years	
			Survival (%)	95% CI	Survival (%)	95% CI	Survival (%)	95% CI
Non-urgent	128	19	93	87 – 96	86	78 – 91	81	71 – 88
Urgent	284	32	92	88 – 95	88	84 – 92	87	82 – 91
Super-urgent	127	15	93	87 – 96	89	81 – 93	84	74 – 91
Overall	**539**	**166**	**93**	**90 – 94**	**88**	**84 – 90**	**85**	**81 – 88**

[1]or within 2 years

21. **Table 11** shows the numbers of patients requiring renal support within 30 days of first heart transplant, by urgency. There was no significant difference in the proportion of transplants requiring renal support between the different urgency groups (p=0.9).

Table 11 **Requirement for renal support within 30 days post-heart transplant by urgency for adult patients first transplanted 1 April 2021 – 31 March 2024**

Urgency	Number of transplants[1]	Haemofiltration/Haemodialysis required		Chi-square p-value
		Number	%	
Non-urgent	125	56	45	0.92
Urgent	276	121	44	
Super-urgent	123	52	42	
Overall	**524**	**229**	**44**	

[1]15 transplants excluded due to missing renal support data

22. **Table 12** shows the numbers of patients requiring VA-ECMO support within 30 days of first heart transplant, by urgency, as reported on the MCS database. There was no significant difference in the proportion of patients requiring VA-ECMO support between the different urgency groups (p=0.2)

Table 12 **Requirement for VA-ECMO support within 30 days post-heart transplant by urgency for adult patients first transplanted 1 April 2021 – 31 March 2024**

Urgency	Number of transplants	VA-ECMO support required		Chi-square p-value
		Number	%	
Non-urgent	128	28	22	0.20
Urgent	284	58	20	
Super-urgent	127	36	28	
Overall	**539**	**122**	**23**	