

**NHS BLOOD AND TRANSPLANT**  
**CARDIOTHORACIC ADVISORY GROUP – HEART**  
**REVIEW OF HEART TRANSPLANT ALLOCATION DATA**

**SUMMARY**

**INTRODUCTION**

1. The super-urgent heart allocation was introduced on 26 October 2016 alongside several changes to the urgent heart allocation policy. This report presents outcomes of patients on the heart transplant waiting list, considering urgency group, centre and disease group. It also presents post-transplant outcomes by urgency group.

**DATA ANALYSIS**

2. The cohort of registrations covers 6.8 years, from 26 October 2016 and 31 July 2023. The cohort of transplants covers 6.4 years from 26 October 2016 and 31 March 2023, to allow for follow-up submission. The analysis considers adult patients only (age $\geq$ 16) and includes heart-lung block registrations/transplants. For the post-transplant survival analysis, only first-time transplants were considered.

**RESULTS**

3. There were 975 non-urgent registrations, 928 urgent registrations and 309 super-urgent registrations in the time period. Super-urgent registrations represented 14% of all registrations. At time of analysis, 74% of super-urgent registrations ended in transplant, compared with 66% for urgent registrations and 21% for non-urgent registrations. Four percent of super-urgent patients died on the list, compared with 3% for urgent registration and 7% for non-urgent registrations.
4. The most common primary disease in the super-urgent group was cardiomyopathy followed by coronary heart disease. Those patients in the 'Other' disease group had the highest mortality rate in each urgency group (8% in the super-urgent group, 4% in the urgent group and 12% in the non-urgent group).
5. The median waiting times to transplant were 14 days for super-urgent and 59 days for urgent. The median could not be estimated for non-urgent due to the low transplant rate. The 2 year rate of patient survival from first heart listing was lower for super-urgent patients (76%) than both urgent (82%) and non-urgent patients (85%), this difference was statistically significant ( $p < 0.0001$ ).
6. In the transplant cohort, the 90 day patient survival rate post-transplant was 89% for super-urgent patients, compared with 88% for urgent patients and 93% for non-urgent patients. At 1 year the survival rates were 85% for super-urgent, 83% for urgent, and 88% for non-urgent. At 2 years the survival rates were 81% for super-urgent, 80% for urgent, and 85% for non-urgent.
7. The proportion of patients requiring renal support in the first 30 days post-transplant was 49% in the super-urgent group, 53% in the urgent group and 49% in the non-urgent group. The proportion of patients requiring VA-ECMO support in the first 30 days post-transplant was 27% in the super-urgent group, 21% in the urgent group and 18% in the non-urgent group. There was borderline evidence of a difference in VA-ECMO rates between the urgency groups.

**ACTION**

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

## NHS BLOOD AND TRANSPLANT

### CARDIOTHORACIC ADVISORY GROUP – HEART

#### REVIEW OF HEART TRANSPLANT ALLOCATION DATA

##### INTRODUCTION

9. The super-urgent heart allocation was introduced on 26 October 2016 alongside several changes to the urgent heart allocation policy. This report presents outcomes of patients on the heart transplant waiting list, considering urgency group, centre and disease group. It also presents post-transplant outcomes by urgency group.

##### DATA AND METHODS

10. Data were extracted from the UK Transplant Registry on 25 August 2023 for all adult (age $\geq$ 16) patients registered for a heart or heart-lung block transplant between 26 October 2016 and 31 July 2023. Registrations for heart-lung transplant were included, and 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).
11. Registration outcomes were analysed across urgency groups, by centre and primary disease group. Median age at registration was analysed across primary disease groups and urgency as well as median waiting time to transplant.
12. Patient survival from time of first heart listing was analysed across urgency groups. Survival time was defined as the time from joining the transplant list to death, regardless of the length of time on the transplant list or whether a transplant was performed. If a patient was registered more than once or changed urgency, they were classed by their first registration/urgency.
13. The number of adult heart transplants performed in each urgency category was analysed as well as short-term survival outcomes, where survival data were extracted on 1 September 2023. Heart-lung transplants were included.

##### RESULTS

###### Registration data

14. **Table 1** shows a breakdown of the non-urgent, urgent and super-urgent heart registrations in the analysis period, by centre and whether the patient was listed for a heart-only transplant or a heart-lung block. There were a total of 71 heart-lung block registrations made, 3% of all heart registrations in the period.

**Table 1** Heart registrations by urgency, centre, and whether lungs were also required, 26 October 2016 – 31 July 2023

Centre	Non-urgent		Urgent		Super-urgent		Total
	Heart-only	Heart-lung	Heart-only	Heart-lung	Heart-only	Heart-lung	
Birmingham	119	12	160	5	50	1	<b>347</b>
Glasgow	73	0	91	0	38	0	<b>202</b>
Harefield	182	6	193	5	71	2	<b>459</b>
Manchester	120	11	111	4	38	0	<b>284</b>
Newcastle	202	5	201	4	36	1	<b>449</b>
Papworth	235	10	151	3	70	2	<b>471</b>
<b>Total</b>	<b>931</b>	<b>44</b>	<b>907</b>	<b>21</b>	<b>303</b>	<b>6</b>	<b>2212</b>

15. **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 975 non-urgent registrations (for 955 patients), 928 urgent registrations (for 889 patients), and 309 super-urgent registrations (for 291 patients). Super-urgent registrations represented 14% of all registrations in the period. Twenty-one percent of non-urgent registrations ended in transplant compared with 66% for urgent registrations and 74% for super-urgent registrations.

Centre	Still waiting		Died		Removed		Became S-U		Transplanted		Became U		Total N
	N	%	N	%	N	%	N	%	N	%	N	%	
Birmingham	35	27	9	7	32	24	3	2	25	19	27	21	131
Glasgow	14	19	0	-	14	19	1	1	30	41	14	19	73
Harefield	48	26	12	6	61	32	6	3	22	12	39	21	188
Manchester	51	39	10	8	20	15	2	2	18	14	30	23	131
Newcastle	71	34	31	15	15	7	6	3	20	10	64	31	207
Papworth	38	16	11	4	18	7	13	5	91	37	74	30	245
<b>Total</b>	<b>257</b>	<b>26</b>	<b>73</b>	<b>7</b>	<b>160</b>	<b>16</b>	<b>31</b>	<b>3</b>	<b>206</b>	<b>21</b>	<b>248</b>	<b>25</b>	<b>975</b>

Centre	Still waiting		Died		Became N-U		Removed		Became S-U		Transplanted		Total N
	N	%	N	%	N	%	N	%	N	%	N	%	
Birmingham	2	1	6	4	0	-	31	19	19	12	107	65	165
Glasgow	2	2	2	2	0	-	6	7	13	14	68	75	91
Harefield	7	4	5	3	0	-	46	23	17	9	123	62	198
Manchester	2	2	0	-	0	-	30	26	5	4	78	68	115
Newcastle	9	4	11	5	0	-	47	23	15	7	123	60	205
Papworth	3	2	2	1	0	-	24	16	10	6	115	75	154
<b>Total</b>	<b>25</b>	<b>3</b>	<b>26</b>	<b>3</b>	<b>0</b>	<b>-</b>	<b>184</b>	<b>20</b>	<b>79</b>	<b>9</b>	<b>614</b>	<b>66</b>	<b>928</b>

Centre	Still waiting		Died		Became N-U		Removed		Became U		Transplanted		Total N
	N	%	N	%	N	%	N	%	N	%	N	%	
Birmingham	0	-	2	4	0	-	5	10	1	2	43	84	51
Glasgow	0	-	2	5	0	-	4	11	0	-	32	84	38
Harefield	0	-	4	5	0	-	27	37	0	-	42	58	73
Manchester	0	-	0	-	0	-	7	18	0	-	31	82	38
Newcastle	0	-	3	8	0	-	11	30	0	-	23	62	37
Papworth	1	1	2	3	0	-	10	14	0	-	59	82	72
<b>Total</b>	<b>1</b>	<b>1</b>	<b>13</b>	<b>4</b>	<b>0</b>	<b>-</b>	<b>64</b>	<b>21</b>	<b>1</b>	<b>1</b>	<b>230</b>	<b>74</b>	<b>309</b>

16. **Tables 5-7** present the outcomes of non-urgent, urgent and super-urgent registrations during the analysis period, by disease group. In this time period, cardiomyopathy represented 62% of non-urgent registrations, 67% of urgent registrations and 72% of super-urgent registrations. The 'Other' disease group had the highest mortality in non-urgent, urgent and super-urgent patients.

**Table 5 Outcomes of NON-URGENT heart registrations, 26 October 2016 – 31 Jul 2023, as at 25 August 2023, by primary disease group**

Disease group	Still waiting		Died		Removed		Became S-U		Transplanted		Became U		Total N
	N	%	N	%	N	%	N	%	N	%	N	%	
Coronary HD	75	35	23	11	36	17	4	2	37	17	41	19	216
Cardiomyopathy	140	23	36	6	95	16	24	4	146	24	166	27	607
Congenital HD	27	32	6	7	9	11	1	1	13	15	29	34	85
Other	15	22	8	12	20	30	2	3	10	15	12	18	67
<b>Total</b>	<b>257</b>	<b>26</b>	<b>73</b>	<b>7</b>	<b>160</b>	<b>16</b>	<b>31</b>	<b>3</b>	<b>206</b>	<b>21</b>	<b>248</b>	<b>25</b>	<b>975</b>

HD=Heart Disease

**Table 6 Outcomes of URGENT heart registrations, 26 October 2016 – 31 Jul 2023, as at 25 August 2023, by primary disease group**

Disease group	Still waiting		Died		Removed		Became S-U		Transplanted		Total N
	N	%	N	%	N	%	N	%	N	%	
Coronary HD	4	3	4	3	41	28	6	4	90	62	145
Cardiomyopathy	17	3	17	3	101	16	67	11	422	68	624
Congenital HD	2	2	2	2	16	18	4	4	66	73	90
Other	2	3	3	4	26	38	2	3	36	52	69
<b>Total</b>	<b>25</b>	<b>3</b>	<b>26</b>	<b>3</b>	<b>184</b>	<b>20</b>	<b>79</b>	<b>9</b>	<b>614</b>	<b>66</b>	<b>928</b>

HD=Heart Disease

**Table 7 Outcomes of SUPER-URGENT heart registrations, 26 October 2016 – 31 Jul 2023, as at 25 August 2023, by primary disease group**

Disease group	Still waiting		Died		Removed		Became U		Transplanted		Total N
	N	%	N	%	N	%	N	%	N	%	
Coronary HD	0	-	3	6	5	10	0	-	44	85	52
Cardiomyopathy	1	1	8	4	46	21	1	1	168	75	224
Congenital HD	0	-	0	-	4	57	0	-	3	43	7
Other	0	-	2	8	9	35	0	-	15	58	26
<b>Total</b>	<b>1</b>	<b>1</b>	<b>13</b>	<b>4</b>	<b>64</b>	<b>21</b>	<b>1</b>	<b>1</b>	<b>230</b>	<b>74</b>	<b>309</b>

HD=Heart Disease

17. **Table 8** presents median age at registration and the inter quartile range (IQR), by disease group and urgency. Congenital HD patients were younger on average, with a median of 36-42 years. Patients registered on the super-urgent list in the 'Other' category were younger than other categories with a median age of 32 years. Coronary HD patients were older with a median age of 55-56 years. The overall median age of super-urgent patients was 45 years, compared with 49 for urgent and 52 for non-urgent.

Disease group	Non-urgent			Urgent			Super-urgent		
	N	Median	IQR	N	Median	IQR	N	Median	IQR
Coronary HD	216	56	50-60	145	56	49-59	52	55	49-60
Cardiomyopathy	607	51	40-59	624	49	37-57	224	40	30-51
Congenital HD	85	42	31-51	90	38	28-47	7	36	30-45
Other	67	46	33-58	69	51	39-59	26	32	22-53
<b>Total</b>	<b>975</b>	<b>52</b>	<b>40-59</b>	<b>928</b>	<b>49</b>	<b>38-57</b>	<b>309</b>	<b>45</b>	<b>31-53</b>

HD=Heart Disease

18. **Table 9** presents median waiting time to transplant across urgency groups, including 95% confidence intervals (CI). The median waiting time to transplant from non-urgent registration could not be calculated due to low transplant rate.

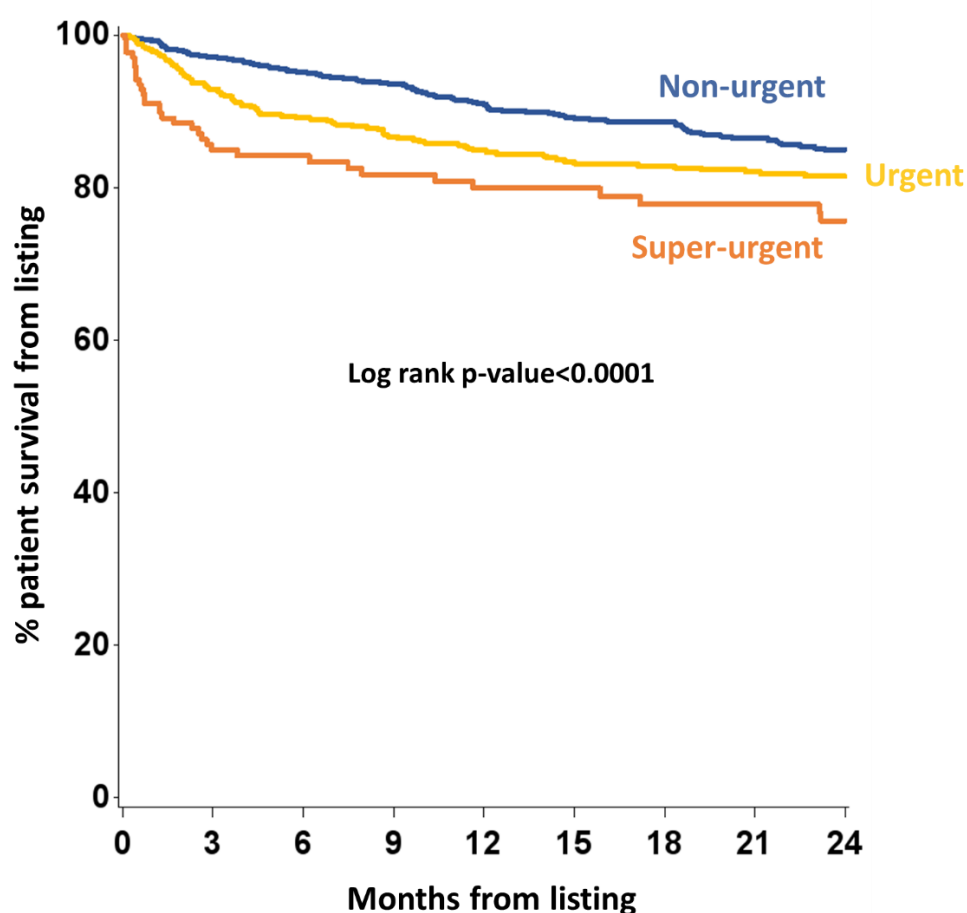
Urgency	Number of registrations	Number transplanted as at 01 Sep 2023	Waiting time (days)	
			Median	95% CI
Non-urgent <sup>1</sup>	975	206 (21%)	-	-
Urgent	928	614 (64%)	59	52 - 66
Super-urgent	309	230 (74%)	14	11 - 17
<b>Overall</b>	<b>2212</b>	<b>1050 (47%)</b>	<b>183</b>	<b>145 - 221</b>

<sup>1</sup>Medians and 95% confidence interval could not be calculated due to low transplant rate

## Survival from listing

19. **Figure 1** and **Table 10** present two year patient survival from first heart or heart-lung transplant listing curves by urgency. Survival time was defined as the time from joining the transplant list to death, regardless of the length of time on the transplant list, whether or not the patient was transplanted and any factors associated with such a transplant e.g. primary disease. There was a significant difference in the two year survival rates by urgency, 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, 26 October 2016 – 31 July 2023, by urgency



**Table 10** Patient survival from heart listing by urgency for adult patients first listed 26 October 2016 – 31 July 2023

Urgency	Number at risk on day 0	Number of deaths as at 1 Sep 2023 <sup>1</sup>	90 days		1 year		2 years	
			Survival (%)	95% CI	Survival (%)	95% CI	Survival (%)	95% CI
Non-urgent	902	58	97	96 – 98	91	89 – 93	85	82 – 87
Urgent	617	71	93	91 – 95	85	81 – 88	82	78 – 85
Super-urgent	179	24	85	78 – 90	80	72 – 86	76	67 – 82
<b>Overall</b>	<b>1698</b>	<b>153</b>	<b>94</b>	<b>93 – 95</b>	<b>88</b>	<b>86 – 89</b>	<b>83</b>	<b>81 – 85</b>

<sup>1</sup>Deaths within 2-years of first listing

## Transplant data

20. **Table 11** presents the number of transplants performed by each centre in each urgency category between 26 October 2016 and 31 March 2023. Note that these numbers will not match those transplanted in the previous section due to the different time period restriction and the fact that some of the non-urgent and urgent patients would have been registered prior to 26 October 2016.

Centre	Non-urgent		Urgent		Super-urgent		Total N
	N	%	N	%	N	%	
Birmingham	19	12	104	64	40	25	<b>163</b>
Glasgow	30	25	63	52	29	24	<b>122</b>
Harefield	26	14	118	65	37	20	<b>181</b>
Manchester	22	17	77	61	27	21	<b>126</b>
Newcastle	28	17	121	72	20	12	<b>169</b>
Papworth	108	39	111	41	55	20	<b>274</b>
<b>Total</b>	<b>233</b>	<b>23</b>	<b>594</b>	<b>57</b>	<b>208</b>	<b>20</b>	<b>1035</b>

21. **Figure 2** and **Table 12** present two year patient survival curves by urgency, where re-grafts (N=11) and patients with missing survival data were excluded (8 urgent transplant and 2 super-urgent transplants). Of the 203 super-urgent transplants considered, there were 34 deaths recorded up to 2 years post-transplant.



Figure 2 Two year Kaplan-Meier patient survival curves for adult patients transplanted 26 October 2016 – 31 March 2023, by urgency

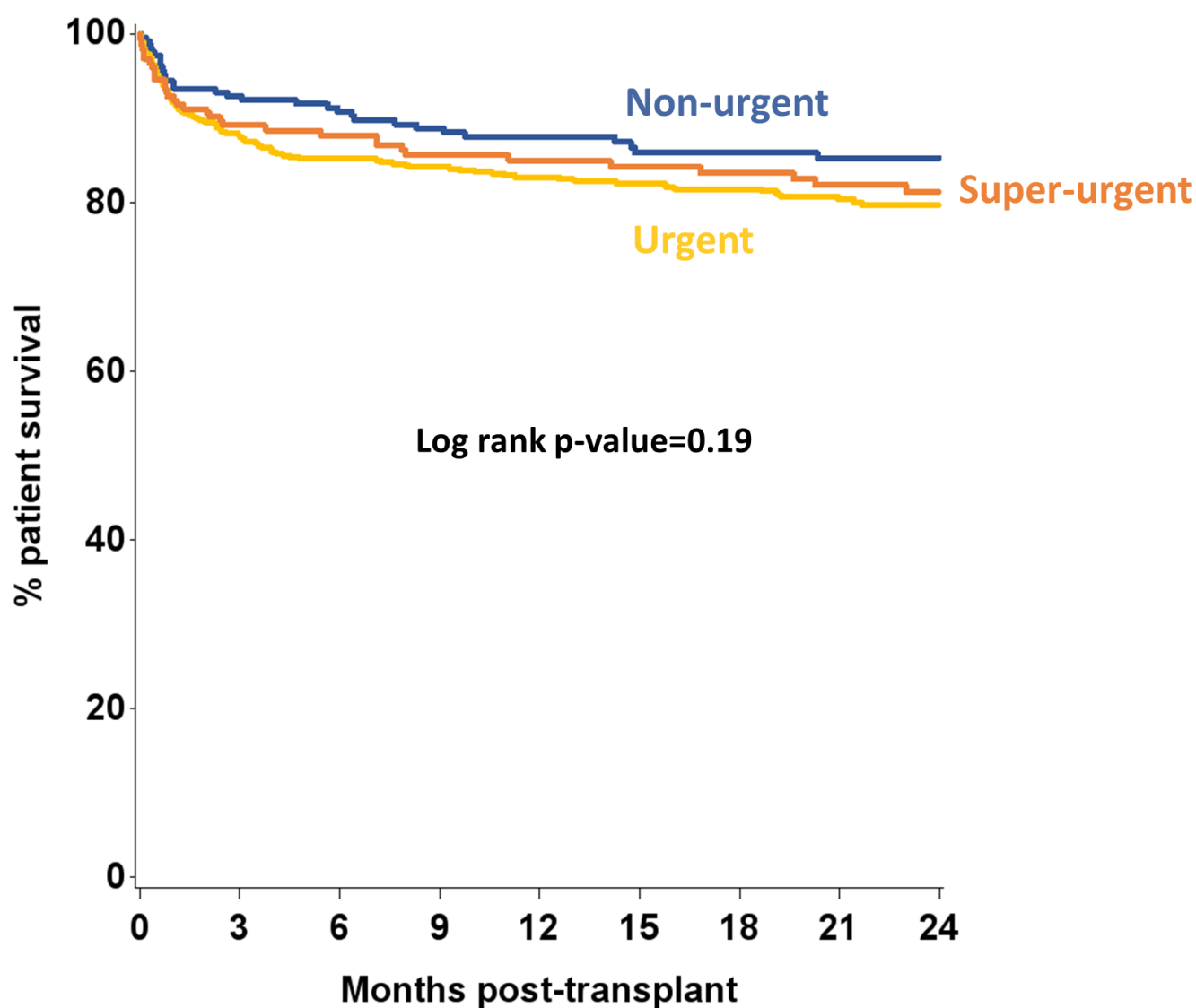


Table 12 Patient survival post-heart transplant by urgency for adult patients first transplanted 26 October 2016 – 31 March 2023

Urgency	Number of transplants	Number of deaths as at 1 Sep 2023 <sup>1</sup>	90 days		1 year		2 years	
			Survival (%)	95% CI	Survival (%)	95% CI	Survival (%)	95% CI
Non-urgent	232	31	93	88 – 95	88	83 – 91	85	80 – 89
Urgent	579	109	88	85 – 90	83	80 – 86	80	76 – 83
Super-urgent	203	34	89	84 – 93	85	79 – 89	81	75 – 86
<b>Overall</b>	<b>1014</b>	<b>174</b>	<b>89</b>	<b>87 – 91</b>	<b>85</b>	<b>82 – 87</b>	<b>81</b>	<b>79 – 84</b>

<sup>1</sup>Deaths within 2-years post-transplant

22. **Table 13** shows the numbers of patients requiring renal support within 30 days post-first heart transplant, by urgency. There was no significant difference in the proportion of transplants requiring renal support between the different urgency groups.

<b>Table 13 Requirement for renal support within 30 days post-heart transplant by urgency for adult patients first transplanted 26 October 2016 – 31 March 2023</b>				
<b>Urgency</b>	<b>Number of transplants<sup>1</sup></b>	<b>Haemofiltration/Haemodialysis required</b>		<b>Chi-square p-value</b>
		<b>Number</b>	<b>%</b>	
Non-urgent	225	110	49	0.47
Urgent	576	305	53	
Super-urgent	201	99	49	
<b>Overall</b>	<b>1002</b>	<b>514</b>	<b>51</b>	

<sup>1</sup>33 transplants excluded due to missing renal support data

23. **Table 14** shows the numbers of patients requiring VA-ECMO support within 30 days post-first heart transplant, by urgency, as reported on the VAD database. There was borderline evidence of a difference in the proportion of transplants requiring VA-ECMO support between the different urgency groups.

<b>Table 13 Requirement for VA-ECMO support within 30 days post-heart transplant by urgency for adult patients first transplanted 26 October 2016 – 31 March 2023</b>				
<b>Urgency</b>	<b>Number of transplants<sup>1</sup></b>	<b>VA-ECMO support required</b>		<b>Chi-square p-value</b>
		<b>Number</b>	<b>%</b>	
Non-urgent	233	43	18	0.07
Urgent	594	126	21	
Super-urgent	208	57	27	
<b>Overall</b>	<b>1035</b>	<b>226</b>	<b>22</b>	