

NHS BLOOD AND TRANSPLANT
CARDIOTHORACIC ADVISORY GROUP – HEART
DCD HEART ACTIVITY
SUMMARY

INTRODUCTION

- 1 DCD heart retrieval and transplantation began in February 2015, initially with two centres; Harefield and Papworth. Since then, other centres have joined the programme and on 7 September 2020, national allocation of DCD hearts was introduced as part of the Joint Innovation Fund (JIF) UK-wide DCD heart pilot. This paper presents activity and patient outcomes from 1 February 2015 to 30 June 2022 and offer data from 7 September 2020 to 30 June 2022.

KEY RESULTS

- 2 **Activity**
All DCD Heart Passport forms were returned for the analysis period. Between 1 February 2015 and 30 June 2022, there were 368 DCD heart retrieval attendances, proceeding to 224 heart retrievals and 192 transplants. Of the 192 DCD heart transplants, 67 were performed since the start of the JIF pilot. During the JIF pilot, the conversion from retrieval to transplanted increased from 84% to 89% pre-JIF and 58% of transplants were retrieved and transplanted by a different team compared with 6% pre-JIF. The highest number of transplants were performed between January-March 2022 (15).
- 3 **Utilisation of other organs**
Across the entire analysis period, the utilisation rate (transplanted/offered) of livers and pancreases was higher in DCD heart donors than from the general DCD donor population (56% vs 44% for livers, 34% vs 24% for pancreases), whereas the rates were similar for lungs and kidneys (16% vs 15% for lungs, 93% vs 94% for kidneys). However, there was a reduction in the percentage of livers utilised from DCD heart donors during the JIF pilot compared to pre-JIF (59% to 49%).
- 4 **Post-transplant survival and support**
Of the 192 DCD heart transplants, there have been 31 recorded deaths post-transplant; 8 within 30 days, 16 between 30 days and one year, and 7 after the first year. The 1-year post-transplant survival rate since the start of the JIF was 86.2% which is comparable with the DBD heart survival rate (85.3%). The percentage of recipients requiring mechanical support post-transplant increased during the JIF pilot, from 30% to 45% (DBD rate is 29%).
- 5 **DCD heart offering**
Between 7 September 2020 and 30 June 2022, 279 hearts were offered from potential DCD heart donors across the 6 heart allocation zones; the highest number of offers came from the Harefield and Newcastle zones. The national utilisation (transplanted out of offered) rate was 24%, however offer acceptance rates varied across centres with 2-11% of offers being accepted and transplanted. Common reasons for decline were no suitable recipients, donor past history and poor function.

ACTION

- 6 This report is for monitoring and assurance purposes, there is no specific action.

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NHS BLOOD AND TRANSPLANT
CARDIOTHORACIC ADVISORY GROUP – HEART
DCD HEART ACTIVITY

INTRODUCTION

- 1 The UK DCD heart programme began in February 2015 with an initial 15-month evaluation period involving two centres, Harefield and Papworth. After the initial evaluation period ended, other centres joined the programme including Manchester in December 2016, Newcastle in October 2018 and Glasgow in July 2019. Great Ormond Street Hospital transplanted their first DCD heart in February 2020.
- 2 On 7 September 2020, national retrieval of DCD hearts was introduced as part of the Joint Innovation Fund (JIF) UK-wide DCD heart pilot. Under the JIF pilot, three teams were initially responsible for retrieving DCD hearts (Harefield, Manchester and Papworth) but due to resource constraints, Manchester’s involvement in the service became limited, and so a Hybrid Team of Harefield and Papworth was formed to maintain the service.
- 3 Prior to the JIF pilot, DCD hearts were locally allocated, but since 7 September 2020, DCD hearts have been allocated according to the non-urgent DBD heart allocation sequence. See <https://nhsbtbde.blob.core.windows.net/umbraco-assets-corp/26633/pol228.pdf>.
- 4 This report presents DCD heart retrieval and transplant activity, and patient outcomes after DCD heart transplant, between 1 February 2015 and 30 June 2022. It also includes data on DCD heart offering and utilisation of other organs from DCD heart donors.

DATA

- 5 The DCD Heart Supplementary Form was introduced for the initial evaluation period to collect specific data relating to DCD heart retrievals and transplants. For the JIF DCD heart pilot, this form was discontinued and a new DCD Heart Passport (FRM6356) was introduced. The data presented in this paper are a combination of the information collected on these forms and other data held on the UK Transplant Registry (UKTR).
- 6 There are currently no forms outstanding for the period 1 February 2015 – 30 June 2022, as of 17 August 2022. A form is required to be completed whenever a team goes out to a donor with the intention of DCD heart retrieval. For transplanted DCD hearts, the form should be returned after 30 days of transplant in order to capture key details about the short-term outcome of the recipient.

RESULTS

Activity

- 7 Between 1 February 2015 and 30 June 2022, 368 DCD heart retrieval attendances were recorded, of which 224 proceeded to DCD heart retrieval and 144 did not. There was a total of 192 DCD hearts successfully transplanted, including one heart-lung transplant, one heart-kidney transplant and 13 paediatric transplants (seven by Great Ormond Street Hospital and six by Newcastle). In **Table 1** this activity is broken down by centre and time period. Since the start of the JIF DCD Heart pilot to 30 June 2022 there have been 67 DCD heart transplants. Conversion from retrieval to transplanted has improved from 84% pre-JIF to 89% since the JIF. During the JIF pilot, 58% of transplants were retrieved and transplanted by a different team compared with 6% pre-JIF.

Table 1 DCD heart activity by period and centre, 1 February 2015 – 30 June 2022

Period	Centre	Attended	Retrieved	Transplanted (retrieved by own team)	Transplanted (retrieved by another team)
1 February 2015 – 6 September 2020	Glasgow	2	2	1	0
	Great Ormond Street	0	0	0	5
	Harefield	80	28	20	0
	Manchester	14	10	9	0
	Newcastle	2	2	2	2
	Papworth	137	107	86	0
	Total	235	149	118	7
7 September 2020 – 31 March 2022	Birmingham	0	0	0	3
	Glasgow	1	1	1	2
	Great Ormond Street	0	0	0	4
	Harefield	33	15	12	1
	Hybrid – Harefield/Papworth	26	15	0	0
	Manchester	6	4	1	0
	Newcastle	0	0	0	16
	Papworth	40	27	11	4
	Total	106	62	25	30
1 April 2022 – 30 June 2022	Birmingham	0	0	0	0
	Glasgow	3	1	0	1
	Great Ormond Street	0	0	0	0
	Harefield	6	5	1	1
	Hybrid – Harefield/Papworth	6	0	0	0
	Manchester	0	0	0	3
	Newcastle	0	0	0	1
	Papworth	12	7	2	3
	Total	27	13	3	9
1 February 2015 – 30 June 2022	Birmingham	0	0	0	3
	Glasgow	6	4	2	3
	Great Ormond Street	0	0	0	9
	Harefield	119	48	33	2
	Hybrid – Harefield/Papworth	32	15	0	0
	Manchester	20	14	10	3
	Newcastle	2	2	2	19
	Papworth	189	141	99	7
	TOTAL	368	224	146	46

Notes:

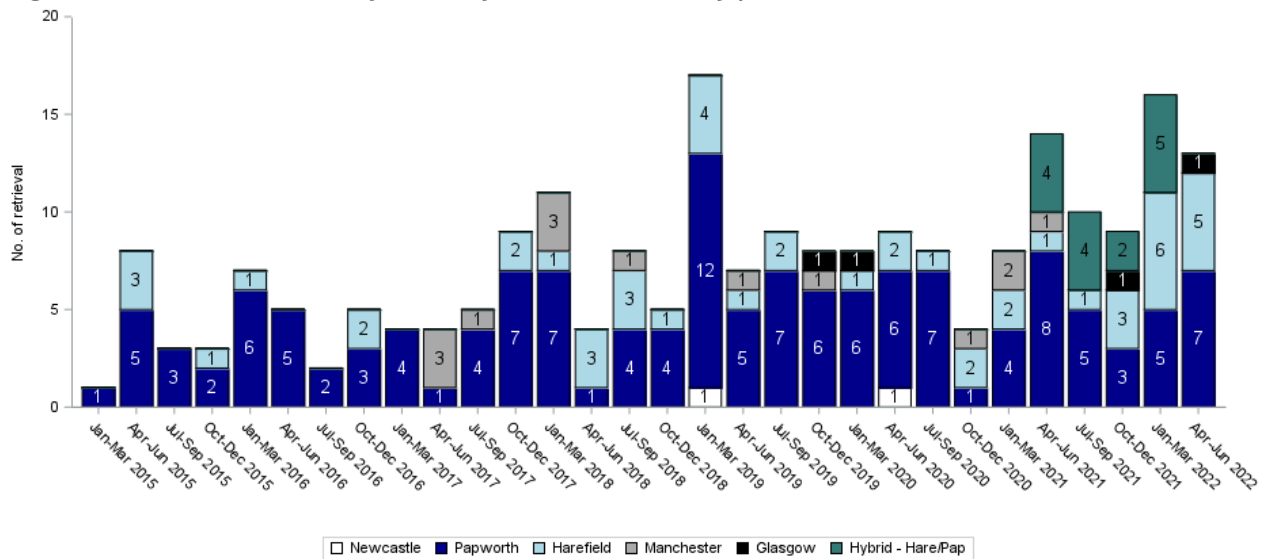
- Non-proceeding attendances are identified by return of the DCD Heart Supplementary form/DCD heart passport or where information on the Retrieval Team Information form suggests that DCD heart retrieval was intended
- Papworth performed one DCD heart-kidney transplant and one DCD heart-lung transplant
- 6 of the transplants performed at Newcastle were in paediatric patients
- Excluded from the total attendances is a case where a donor was changed to DBD after retrieval
- 13 hearts from hybrid team retrievals were transplanted, these are counted in the "Transplanted (retrieved by another team)" numbers for Newcastle (3), Birmingham (2) and Papworth (3) and "Transplanted (retrieved by own team)" for Harefield (5)
- One of Glasgow's retrievals was performed with members of the Papworth team during the JIF period

8 Across the time period, 32 (14%) DCD hearts were retrieved but not transplanted (note for reference, the discard rate for DBD hearts is 3%). The reason for non-use for each is seen below in **Table 2**. This information was primarily taken from the DCD Heart Supplementary Form/DCD Heart Passport, but where this was not available (as the form was returned incomplete), the reason was taken from the Hub Operations records.

Table 2		
Reasons for non-use of hearts retrieved from DCD donors, 1 February 2015 – 30 June 2022		
Centre intending to transplant	Donation Date	Reason for non-use
Glasgow	January 2020	Discovery of coronary artery disease following angiogram
	June 2021	Abnormal cardiac anatomy
Harefield	October 2015	Continuous ventricular fibrillation after reperfusion on OCS
	December 2017	Poor function on OCS
	February 2019	Poor function on OCS
	March 2019	Section dyskinetic on OCS
	September 2019	Heart found not suitable for transplant after placement on OCS
	May 2020	Poor function on OCS
	June 2020	Suboptimal contractibility on OCS
	September 2020	Poor contractability on OCS
	October 2021	Low aortic pressure
	May 2022	Poor function on OCS
Papworth	July 2015	Declined for transplantation due to rising lactate level
	June 2016	Function
	January 2017	Donation ceased at recipient hospital - due to donor pancreatic tumour results
	September 2017	Heart hypertrophic enlarged aorta
	October 2017	Angio performed coronary artery disease noted
	January 2019	Declined on function after being on OCS
	July 2019	Coronary artery disease
	July 2019	Poor function
	August 2019	Rising lactate
	January 2020	Found heart to be too small after being put on OCS, no suitable recipients
	January 2020	Poor function
	February 2020	Poor function on OCS
	August 2020	Poor function
	November 2020	Deemed un-transplantable
	December 2020	Deemed un-transplantable
September 2021	Poor function	
October 2021	Offers withdrawn after team arrived at Addenbrookes	
January 2022	Heart on OCS, CAD identified	
Manchester	June 2017	Function (wall motion abnormality, poor contractility, and poor lactate profile)
Great Ormond Street	May 2020	Heart put on OCS, but function declined

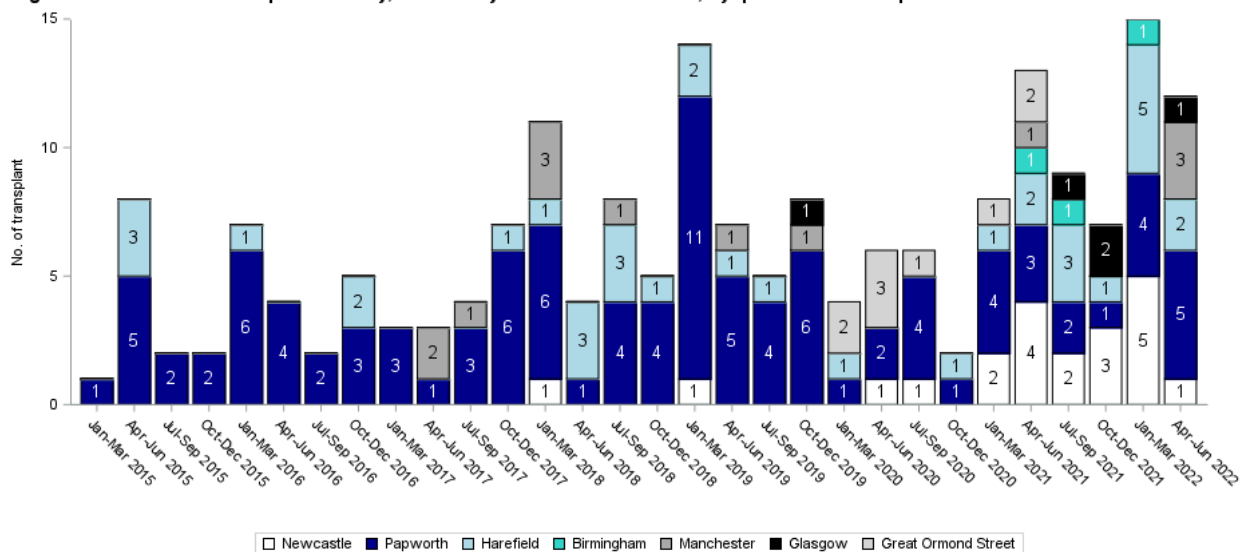
9 **Figure 1** shows the number of DCD heart retrievals by quarter and retrieval team. There has been a general increasing trend over time. There were 13 retrievals in the most recent quarter (April - June).

Figure 1 DCD heart retrieval activity, 1 February 2015 to 30 June 2022, by quarter and retrieval team



10 **Figure 2** shows the number of DCD heart transplants by quarter and transplanting centre. The highest number of transplants were performed between January-March 2022 (15).

Figure 2 DCD heart transplant activity, 1 February 2015 to 30 June 2022, by quarter and transplant centre



Utilisation of other organs

- 11 Of the 224 DCD heart donors, four only donated their heart. Utilisation of other organs from these donors are displayed in **Table 3**, where utilisation rates are compared to the general DCD donor population who donated at least one organ. Overall, the transplantation rate of livers and pancreases was higher in DCD heart donors than from the general DCD donor population, whereas the rates were similar for lungs and kidneys. However, there were a reduction in the percentage of livers utilised from DCD heart donors during the JIF period compared to pre-JIF.

Table 3 Abdominal and lung offer outcomes from 224 DCD heart donors during the period 1 February 2015 – 30 June 2022, split by JIF period

Outcome	Lungs¹	Kidney¹	Liver	Pancreas
1 February 2015 – 6 September 2020				
Offered	116	148	143	134
Retrieved	31	144	111	91
Transplanted (% of offered)	20 (17%)	137 (93%)	84 (59%)	49 (37%)
National DCD organ transplant rate (% of offered) ²	16%	94%	45%	25%
7 September 2020 – 30 June 2022				
Offered	54	73	71	70
Retrieved	9	72	56	44
Transplanted (% of offered)	8 (15%)	69 (95%)	35 (49%)	21 (30%)
National DCD organ transplant rate (% of offered) ²	11%	95%	40%	20%
1 February 2015 – 30 June 2022				
Offered	170	221	214	204
Retrieved	40	216	167	135
Transplanted (% of offered)	28 (16%)	206 (93%)	119 (56%)	70 (34%)
National DCD organ transplant rate (% of offered) ²	15%	94%	44%	24%

¹ at least one

² DCD donors between 1 February 2015 – 30 June 2022, aged 16-50

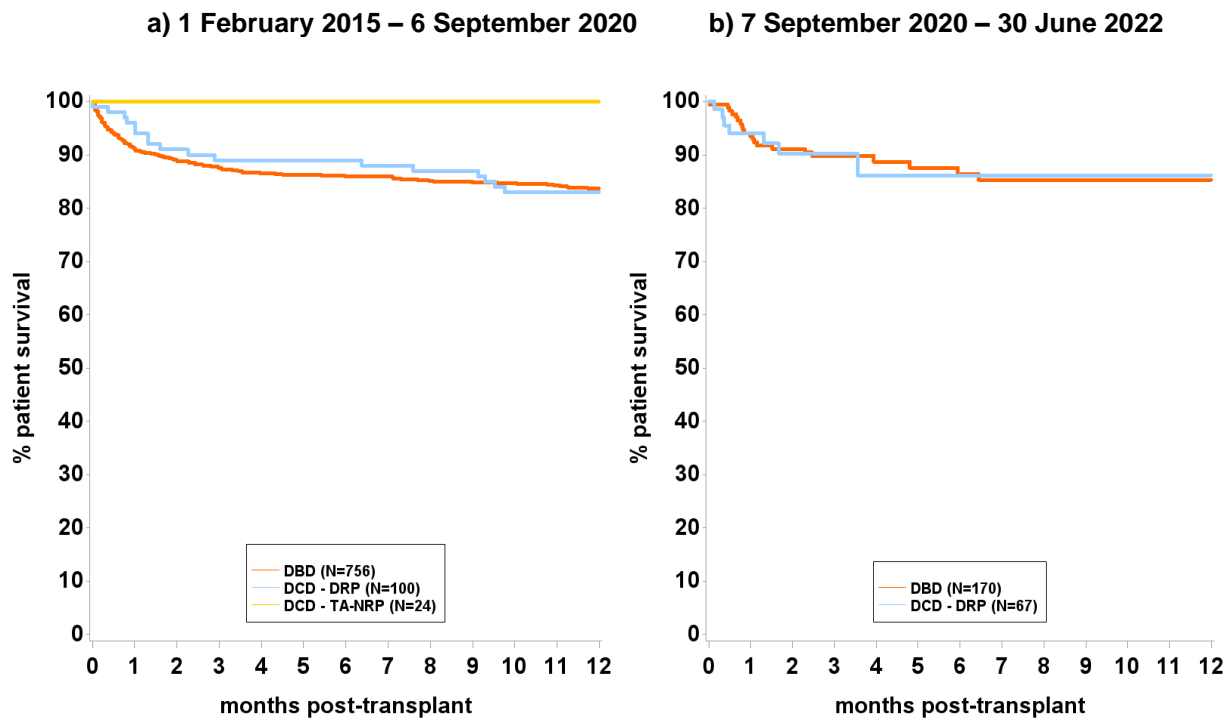
Post-transplant survival and support

- 12 The 30-day outcome for the 192 DCD heart transplant recipients are summarised in **Table 4**. There have been eight deaths within 30 days.

Table 4 DCD heart patient outcomes at 30 days post-transplant, by centre, for transplants performed 1 February 2015 – 30 June 2022		
Centre	Alive at 30 days	Died within 30 days
1 February 2015 – 6 September 2020		
Birmingham	0	0
Glasgow	1	0
Great Ormond Street	5	0
Harefield	18	2
Manchester	9	0
Newcastle	4	0
Papworth	84	2
Total	121	4
7 September 2020 – 30 June 2022		
Birmingham	2	1
Glasgow	4	0
Great Ormond Street	4	0
Harefield	13	2
Manchester	4	0
Newcastle	16	1
Papworth	20	0
Total	63	4
1 February 2015 – 30 June 2022		
Total	184	8

13 **Figures 3** show the Kaplan-Meier patient survival curves up to one year for DCD heart transplants, split by time period and by perfusion method. Survival for adult DBD heart only transplants is shown for comparison. One patient who received a DCD heart-lung transplant was excluded, paediatric transplants and four patients who had had a previous heart transplant were included. There were no deaths within one year in the TA-NRP group. The survival rates at one year are presented in **Table 5**. There was no difference in one year survival for DCD transplants using DRP compared with DBD transplants (pre-JIF $p=0.94$, since JIF $p=0.96$).

Figures 3 Patient survival post- DCD heart transplant by perfusion method with DBD comparison



Perfusion method	Number of transplants	Number of deaths	1-year survival (95% CI)
1 February 2015 – 6 September 2020			
DRP	100	17	83.0 (74.1 - 89.1)
TA-NRP	24	0	100 (-)
Total DCD¹	124	17	86.3 (78.9 - 91.2)
Total DBD	756	123	83.7 (80.9 - 86.2)
7 September 2020 – 30 June 2022			
DRP	67	7	86.2 (71.1 - 93.7)
TA-NRP	0	-	-
Total DCD¹	67	7	86.2 (71.1 - 93.7)
Total DBD	170	21	85.3 (77.9 - 90.4)

¹ Includes 13 paediatric transplants and 4 re-transplants; excludes one heart-lung transplant

14 **Table 6** gives a breakdown of the urgency status of DCD heart recipients at the time of transplant for the period 1 February 2015 – 30 June 2022 split by period. The number of urgent and super-urgent transplants has increased since the start of the JIF.

Table 6 Urgency status of DCD heart recipients, by time period and centre, 1 February 2015 – 30 June 2022				
Transplant centre	Non-urgent (%)	Urgent (%)	Super-urgent (%)	(% DBD transplant urgent/super-urgent)
1 February 2015 – 6 September 2020				
Birmingham	0 (-)	0 (-)	0 (-)	(93)
Glasgow	1 (100)	0 (0)	0 (0)	(88)
Great Ormond Street	2 (40)	3 (60)	0 (0)	(81)
Harefield	9 (45)	8 (40)	3 (15)	(95)
Manchester	4 (44)	4 (44)	1 (11)	(87)
Newcastle	2 (50)	2 (50)	0 (0)	(85)
Papworth	52 (60)	28 (33)	6 (7)	(69)
Total	70 (56)	45 (36)	10 (8)	(83)
7 September 2020 – 30 June 2022				
Birmingham	0 (0)	2 (67)	1 (33)	(81)
Glasgow	3 (75)	0 (0)	1 (25)	(69)
Great Ormond Street	3 (75)	0 (0)	1 (25)	(76)
Harefield	4 (27)	8 (53)	3 (20)	(79)
Manchester	1 (25)	3 (75)	0 (0)	(89)
Newcastle	8 (47)	7 (41)	2 (12)	(85)
Papworth	8 (40)	8 (40)	4 (20)	(66)
Total	27 (40)	28 (42)	12 (18)	(77)
1 February 2015 – 30 June 2022				
Total	97 (51)	73 (38)	22 (11)	(82)

- 15 The need for post-transplant mechanical support within 30 days is shown in **Table 7** along with the devices used. Information on whether mechanical support was needed was received for 190 of the 192 DCD heart transplants. Of these, 67 (35%) required support (including IABP only); broken down by time period this was 30% of pre-JIF cases and 45% of JIF cases (Fisher's Exact p-value: 0.039). The number of DBD transplants requiring mechanical support is also shown for reference (29%).

Mechanical support post-transplant	Pre-JIF	JIF	DBD
Yes	37 (30%)	30 (45%)	339 (29%)
-IABP only	16	5	112
-ECMO only	14	22	143
-VAD only	0	0	9
-ECMO and IABP	5	0	38
-VAD and IABP	0	0	2
-ST VAD and ECMO	2	2	26
-ST VAD, ECMO and IABP	0	0	9
-Unknown	0	1	0
No	87	36	837
Unknown	1	1	0
Total	125	67	1176

DCD heart offering

- 16 **Table 8** shows a breakdown of the number of potential DCD donors whose heart was offered between 7 September 2020 and 30 June 2022 by DBD heart allocation zone and whether the heart was accepted, retrieved, transplanted and if transplanted whether it was within zone. The 279 potential donors include 56 who did not proceed to donation, it also includes 9 aged less than 16 whose heart was offered to paediatric centres first. Of the 279 hearts offered, 164 (59%) were accepted, 74 (27%) were retrieved and 67 (24%) were transplanted. The highest number of offers came from the Newcastle and Harefield zones.

Allocation zone	Number of hearts offered	Number accepted	Number retrieved	Number transplanted	Number transplanted by zonal centre
Birmingham	31	13	5	5	0
Glasgow	20	9	3	2	0
Harefield	64	40	22	20	9
Manchester	37	17	9	7	2
Newcastle	77	51	21	21	10
Papworth	50	34	14	12	10
Total	279	164	74	67	31 (46%)

- 17 The 279 DCD hearts offered between 7 September 2020 and 30 June 2022 generated 1,230 offers. The results of these offers are shown in **Table 9**, split by centre. Each centre received 130-200 DCD heart offers, with all centres utilising at least one offer. The highest utilisation of offers was for Papworth (11%).

Centre	Offers N	Declined		Accepted, not used		Accepted and used	
		N	%	N	%	N	%
Birmingham	155	139	90	13	8	3	2
Glasgow	134	123	92	7	5	4	3
Great Ormond Street	191	180	94	7	4	4	2
Harefield	192	144	75	33	17	15	8
Manchester	175	170	97	1	1	4	2
Newcastle	199	162	81	20	10	17	9
Papworth	184	127	69	37	20	20	11
Total	1230	1045	85	118	10	67	5

- 18 The reasons for decline for the 1,045 DCD heart offers that were declined between 7 September 2020 and 30 June 2022 are shown in **Table 10**, split by centre. The most common reasons for decline were no suitable recipients (26% of declines), donor past history (20% of declines) and poor function (19% of declines).

Table 10 Primary reason for decline of DCD heart offers, 7 September 2020 – 30 June 2022

Reason for decline	Birmingham		Glasgow		GOSH		Harefield		Manchester		Newcastle		Papworth		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Donor	36	26	47	38	67	37	54	38	75	44	44	27	38	30	361	35
Donor unsuitable - age	0	0	0	0	3	2	1	1	31	18	2	1	0	0	37	4
Donor unsuitable – cause of death	2	1	0	0	0	0	0	0	1	1	0	0	0	0	3	0
Donor unsuitable - past history	20	14	25	20	35	20	37	26	32	19	33	20	32	25	214	20
Donor unsuitable - size	12	9	18	15	26	15	12	8	8	5	6	4	5	4	87	8
Donor unsuitable - virology	1	1	3	2	2	1	3	2	3	2	2	1	0	0	14	1
Infection	1	1	1	1	1	1	1	1	0	0	1	1	1	1	6	1
Logistics	14	10	4	3	0	0	14	10	21	12	20	12	6	5	79	8
Capacity/resource issues	12	9	3	2	0	0	12	8	7	4	20	12	6	5	60	6
Distance/transport difficulties	0	0	0	0	0	0	2	1	14	8	0	0	0	0	16	2
Unable to x-match	2	1	1	1	0	0	0	0	0	0	0	0	0	0	3	0
Organ	28	20	22	18	10	6	37	26	27	16	42	26	32	25	198	19
Ischaemia time too long - warm	0	0	0	0	0	0	0	0	1	1	1	1	0	0	2	0
Poor function	28	20	22	18	10	6	37	26	26	15	41	25	32	25	196	19
Other	20	14	17	14	28	16	11	8	29	16	15	9	15	12	135	13
HLA/ABO type	2	1	6	5	21	12	2	1	3	2	2	1	3	2	39	4
Other/not reported	18	13	11	9	7	3	9	6	26	15	13	8	12	9	96	9
Recipient	41	29	33	27	75	41	28	19	18	11	41	25	36	28	272	26
No suitable recipients	41	30	33	27	75	42	28	19	18	11	41	25	36	28	272	26
Total	139	100	123	100	180	100	144	100	170	100	162	100	127	100	1045	100