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 28 February 2022 and offer data from 1 April 2021 to 28 February 2022.

KEY RESULTS

2 **Activity**
Between 1 February 2015 and 28 February 2022, 334 DCD heart retrieval attendances were recorded, of which 206 proceeded to retrieval and a total of 175 hearts were successfully transplanted. Of the 175 DCD heart transplants, 50 were performed since the start of the JIF DCD heart pilot. There was a total of 14 paediatric DCD heart transplants, 9 performed by Great Ormond Street Hospital, and 5 by Newcastle. There were two multi-organ transplants; one heart-kidney in April 2016 and one heart-lung in June 2019. Thirty five transplants (20%) were performed where another centre retrieved the heart.

3 **Utilisation of other organs**
The discard (retrieved not transplanted) rate for DCD hearts was 15%; significantly higher than the discard rate for hearts from DBDs aged 16-50, which was 3%. The transplantation rate of livers and pancreases was higher in DCD heart donors than from the general DCD donor population (55% and 34% compared with 43% and 24%, for livers and pancreases respectively), and similar for lungs and kidneys (16% and 93% compared with 15% and 94%, respectively).

4 **Post-transplant survival and support**
Of the 174 DCD heart transplants (excluding one heart-lung transplant), there have been 29 recorded deaths post-transplant; 7 within 30 days, 15 between 30 days and one year, and 7 after the first year. The 1-year post-transplant survival rate was 85.7%, which is comparable with the DBD heart survival rate (83.7%). Thirty six percent of the DCD heart recipients required some form of mechanical circulatory support within the first 30 days and one patient required re-transplantation within 30 days.

5 **DCD heart offering**
Between 1 April 2021 and 28 February 2022, 137 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 28%, however offer acceptance rates varied substantially across centres.

ACTION

6 Centres are asked to ensure they return a DCD Heart Passport form for all proceeding and non-proceeding DCD heart retrieval attendances.

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Statistics and Clinical Research **May 2022**

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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 sustain 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.

4 This report presents DCD heart retrieval and transplant activity, and patient outcomes after DCD heart transplant, between 1 February 2015 and 28 February 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 on 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 – 28 February 2022, as of 25 April 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 information about the short-term outcome of the recipient.

RESULTS

Activity

7 Between 1 February 2015 and 28 February 2022, 334 DCD heart retrieval attendances were recorded, of which 206 proceeded to DCD heart retrieval and 128 did not. There was a total of 175 DCD hearts successfully transplanted, including one heart-lung transplant, one heart-kidney transplant and 14 paediatric transplants. Of the paediatric transplants, nine were performed by Great Ormond Street Hospital and five by Newcastle. In **Table 1** this activity is broken down by centre and time period. Since the start of the JIF DCD Heart pilot there have been 50 DCD heart transplants.

Table 1 DCD heart activity by period and centre, 1 February 2015 - 28 February 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 - 28 February 2022	Birmingham	0	0	0	3
	Glasgow	1	1	1	2
	Great Ormond Street	0	0	0	4
	Harefield	32	14	12	1
	Hybrid – Harefield/Papworth	23	13	0	0
	Manchester	6	4	1	0
	Newcastle	0	0	0	13
	Papworth	37	25	8	5
	Total	**99**	**57**	**22**	**28**
Total	Birmingham	0	0	0	3
	Glasgow	3	3	2	2
	Great Ormond Street	0	0	0	9
	Harefield	112	42	32	1
	Hybrid – Harefield/Papworth	23	13	0	0
	Manchester	20	14	10	0
	Newcastle	2	2	2	15
	Papworth	174	132	94	5
TOTAL		**334**	**206**	**140**	**35**

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
- 5 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
- 11 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 (1) 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

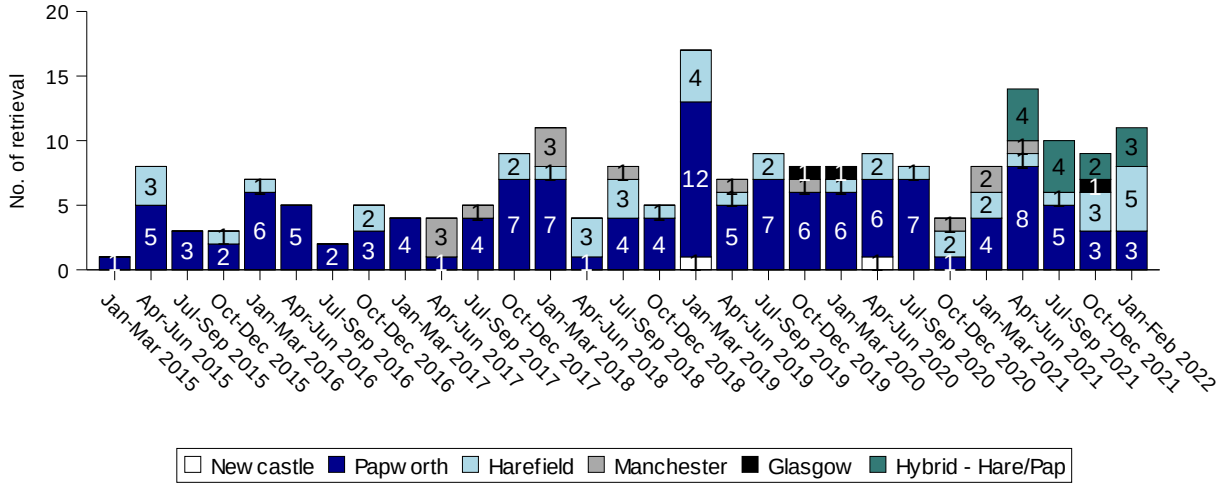
8 Across the time period, 31 (15%) DCD hearts were retrieved but not transplanted. The reason for non-use for each is seen below in **Table 2**. This information was primarily taken from the DCD Heart Supplementary Form/DCD Heart Passport, but where this was not available (as the form was returned incomplete), the reason was taken from the Hub Operations records.

Table 2 **Reasons for non-use of hearts retrieved from DCD donors, 1 February 2015 – 28 February 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
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

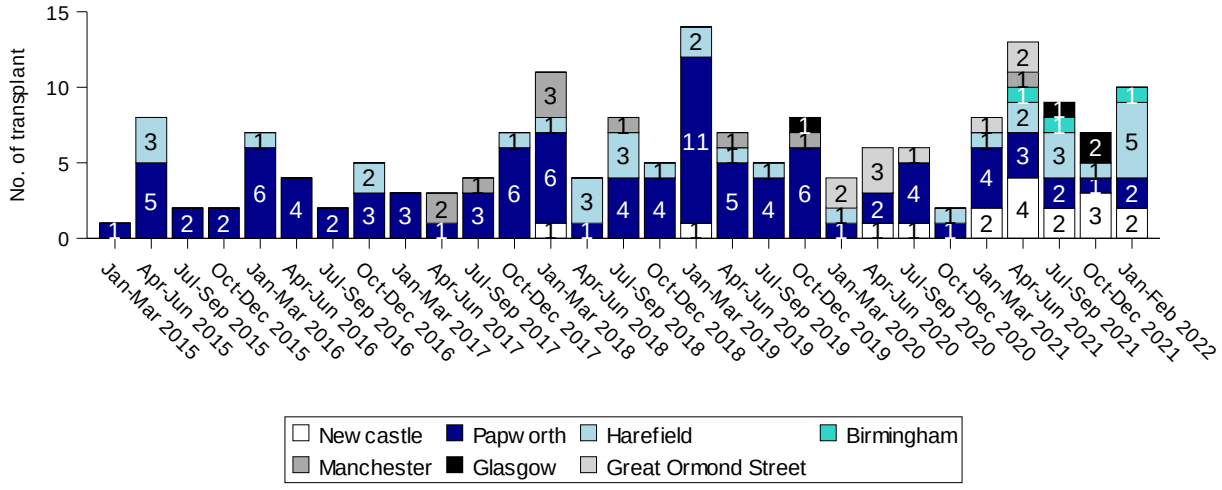
9 **Figure 1** shows the number of DCD heart retrievals by quarter and retrieval team. There has been a general increasing trend over time with activity higher this financial year than last. There have been 11 retrievals so far this quarter (January-February).

Figure 1 DCD heart retrieval activity, 1 February 2015 to 28 February 2022, by quarter and retrieval team



10 **Figure 2** shows the number of DCD heart transplants by quarter and transplanting centre.

Figure 2 DCD heart transplant activity, 1 February 2015 to 28 February 2022, by quarter and transplant centre



Utilisation of other organs

11 Between 1 February 2015 to 28 February 2022, there were 900 hearts retrieved from UK DBD heart donors aged 16 to 50. Of these, 3% were not transplanted, which is significantly lower than the DCD discard rate of 15% (Fisher's Exact p-value: <0.001).

12 Of the 206 DCD heart donors, four only donated their heart. The outcomes of the other organs are displayed in **Table 3**, where utilisation rates are compared to the general DCD donor population donating at least one organ. The transplantation rate of livers and pancreases was higher in DCD heart donors than from the general DCD donor population, and similar for lungs and kidneys.

Table 3 Abdominal and lung offer outcomes from 206 DCD heart donors during the period 1 February 2015 – 28 February 2022

Outcome	Lungs[1]	Kidney[1]	Liver	Pancreas
Offered	158	203	196	187
Retrieved	38	197	150	124
Transplanted (% of offered)	26 (16%)	189 (93%)	107 (55%)	63 (34%)
National DCD organ transplant rate (% of offered)[2]	15%	94%	43%	24%

[1] at least one
[2] DCD donors between 1 February 2015 – 28 February 2022, aged 16-50

Post-transplant survival and support

13 The 30-day outcome for the 175 DCD heart transplant recipients are summarised in **Table 4**. There have been seven deaths within 30 days.

Table 4 DCD heart patient outcomes at 30 days post-transplant, by centre, for transplants performed 1 February 2015 – 28 February 2022

Centre	Alive at 30 days	Died within 30 days
Birmingham	2	1
Glasgow	4	0
Great Ormond Street	9	0
Harefield	30	3
Manchester	10	0
Newcastle	16	1
Papworth	97	2
Total	**168**	**7**

14 **Figure 3** shows the Kaplan-Meier patient survival curves up to one year for DCD heart transplants, split by perfusion method. It also displays the Kaplan-Meier survival curve for adult DBD heart only transplants during the same time period for comparison. One patient who received a DCD heart-lung transplant was excluded, however 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**, along with the overall survival rate for DCD heart transplants which is 85.7% and is comparable with DBD heart transplants (83.7%).

Figure 3 Kaplan-Meier patient survival function for DCD heart transplant recipients by perfusion method and DBD adult heart transplant recipients, 1 February 2015 – 28 February 2022

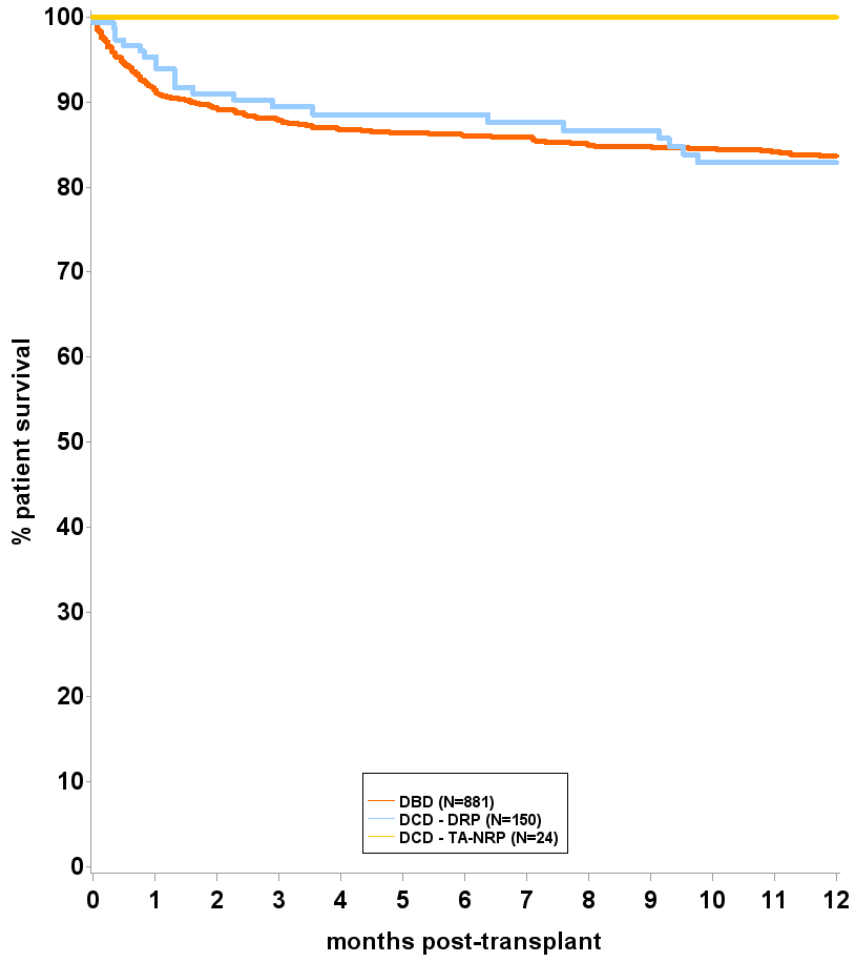


Table 5 1-year patient survival rates after DCD heart transplant, by perfusion method, and adult DBD heart transplant survival, 1 February 2015 – 28 February 2022

Perfusion method	Number of transplants	Number of deaths	1-year survival (95% CI)
DRP	150	22	82.9 (75.0 – 88.5)
TA-NRP	24	0	100 (-)
Total DCD[1]	174	22	85.7 (78.9 - 90.4)
Total DBD	881	140	83.7 (81.0 – 86.0)

[1] Includes 14 paediatric transplants and 4 re-transplants; excludes one heart-lung transplant

15 As of 25 April 2022, there have been 29 recorded deaths of DCD heart recipients (all but seven within one year of transplant). **Table 6** gives a breakdown of the recorded causes of deaths for these patients by perfusion method.

Table 6 Causes of death of 29 patients who have died post DCD transplant, 1 February 2015 – 28 February 2022

Cause of death	DRP	TA-NRP	Total
Brain haemorrhage	1	0	**1**
Cerebro-vascular accident	2	0	**2**
Donor organ failure	3	0	**3**
Early graft dysfunction	1	0	**1**
End-stage heart failure	1	0	**1**
Infections elsewhere (except viral hepatitis)	1	0	**1**
Multi-system failure	6	0	**6**
Non-lymphoid malignant disease not induced by immunosuppressive therapy	1	0	**1**
Other causes of cardiac failure	0	1	**1**
Pulmonary infection (bacterial)	1	0	**1**
Pulmonary infection (viral)	1	0	**1**
Septicaemia	1	0	**1**
Sudden unexplained cardiac death	2	0	**2**
Other (no further information provided)	5[1]	1	**6**
Unknown	1	0	**1**
Total	**27**	**2**	**29**

[1] Includes one patient who received a re-transplant with a DBD heart within 30 days but died shortly after

16 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 173 of the 175 transplants. Of these, 62 (36%) required support; broken down by perfusion method this was 37% of DRP cases and 25% of TA-NRP cases (Fisher's Exact p-value: 0.4).

Table 7 Use of mechanical support within 30 days post-transplant, for DCD heart transplants performed 1 February 2015 – 28 February 2022

Mechanical support post-transplant	DRP	TA-NRP	Total
Yes	56	6	**62**
-IABP only	16	4	**20**
-ECMO only	31	1	**32**
-ECMO and IABP	4	1	**5**
-STVAD and ECMO	4	0	**4**
-Unknown	1	0	**1**
No	93	18	**111**
Unknown	2	0	**2**
Total	**151**	**24**	**175**

DCD heart offering

17 **Table 8** shows a breakdown of the number of potential donors offers for DCD heart transplants between 1 April 2021 and 28 February 2022 by DBD heart allocation zone and whether the heart was accepted, retrieved, and transplanted. The 137 potential donors include 27 who did not proceed to donation. Of the 137 donors offered, 81 hearts (59%) were accepted, 43 (31%) were retrieved and 39 (28%) were transplanted. The highest number of offers came from the Harefield and Newcastle zones. Most of the donors (130) were in the age range 16-50 years, but a small number (7) were less than 16 or over 50.

Table 8 DCD hearts offered, accepted, retrieved, and transplanted by heart allocation zone, 1 April 2021 – 28 February 2022 (DBD heart donors for comparison)

Allocation zone	Number of hearts offered	Number accepted	Number retrieved	Number transplanted	(Number of DBD heart donors)
Birmingham	13	6	4	4	(19)
Glasgow	10	3	1	1	(9)
Harefield	39	23	14	13	(32)
Manchester	18	10	5	4	(15)
Newcastle	38	26	13	13	(25)
Papworth	19	13	6	4	(20)
Total	**137**	**81**	**43**	**39**	**(120)**

18 The 137 DCD hearts offered between 1 April 2021 and 28 February 2022 generated 587 offers. The results of these offers are shown in **Table 9**, split by centre. Each centre received 60-100 DCD heart offers, with all centres utilising at least one offer. The highest utilisation of offers was for Harefield (12%). Of the 498 declined offers, the most common reason for decline was no suitable recipients (25% of declines), donor past history (20% of declines), poor function (19% of declines) and donor size (10%).

Table 9 DCD heart offers made during 1 April 2021 – 28 February 2022, by centre and result

Centre	Offers	Declined		Accepted, not used		Accepted and used	
	N	N	%	N	%	N	%
Birmingham	78	71	91	4	5	3	4
Glasgow	62	54	87	5	8	3	5
Great Ormond Street	92	89	97	1	1	2	2
Harefield	95	70	74	14	15	11	12
Manchester	81	80	99	0	-	1	1
Newcastle	96	77	80	9	9	11	11
Papworth	83	57	69	18	22	8	10
Total	**587**	**498**	**85**	**51**	**9**	**39**	**6**

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