

NHS BLOOD AND TRANSPLANT

DCD HEARTS WORKING GROUP

DCD HEART ACTIVITY SUMMARY

INTRODUCTION

- 1 DCD heart retrieval began in February 2015 for a 15 month initial evaluation period involving two centres; Harefield and Papworth. Since the end of the evaluation period, activity has continued with Manchester joining the programme in December 2016 and Newcastle joining in October 2018. This paper looks at activity and patient outcomes from 1 February 2015 to 31 March 2019.

KEY RESULTS

Activity

- 2 In the time period, 153 DCD heart retrieval attendances were identified as having taken place, of which 101 proceeded to retrieval and a total of 90 hearts were successfully transplanted. There has been an increasing trend over time with 14 transplants performed in the most recent quarter. In total, 64 transplants were performed by Papworth, 17 were by Harefield, 7 were by Manchester and 2 were by Newcastle.

Utilisation

- 3 The retrieved but not transplanted rate for DCD hearts was 11%; significantly higher than the retrieved but not transplanted rate for hearts from DBDs aged 16-50, which was 4%. The transplantation rate of lungs, kidneys, livers and pancreases from DCD heart donors was higher than from the general DCD donor population.

Post-transplant survival and support

- 4 Survival information was known for 84 out of the 90 transplants (those where survival was missing were all in February or March 2019). There have been 14 recorded deaths post DCD heart transplantation; two within 30 days, 10 between 30 days and one year, and two after the first year. The 1 year post-transplant survival rate was 82.5%, which is comparable with DBD heart survival rate (however this is unadjusted and unmatched). 33% of the DCD heart recipient required some form of mechanical circulatory support within the first 30 days and one patient required re-transplantation within 30 days.

DCD heart offering

- 5 Between 1 April 2017 and 31 March 2019, offering information recorded by ODT Hub Operations suggests that 265 DCD hearts had been offered from 11 out of 12 SNOD regions; the highest number of offers coming from the Eastern region but also the North-West and London. Of the 265 hearts offered, 186 were from potential DCDs aged 16-50 years; as a proportion, this is 32% of all potential DCDs in this age range where at least one organ was offered.

ACTION

- 6 This paper is to provide the national picture on DCD heart activity. It will be updated for the DCD Heart working group meeting on 22 May 2019 once outstanding survival information for the most recent transplants has been received.
- 7 Participating centres are asked to ensure they return a DCD Heart Supplementary Record form for all proceeding and non-proceeding DCD heart retrieval attendances.

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INTRODUCTION

- 1 DCD heart retrieval began in February 2015 for a 15 month initial evaluation period involving two centres; Harefield and Papworth. Since the end of the evaluation period, activity has continued with Manchester joining the programme in December 2016 and Newcastle joining in October 2018.
- 2 This paper looks at activity and patient outcomes from 1 February 2015 to 31 March 2019. It evaluates the number of attendances, retrievals and transplants performed by each team in the time period, along with the short and medium term outcomes of the recipients. The outcomes of lungs and abdominal organs offered from the DCD heart donors over this period are also considered.

DATA

- 3 For each DCD heart retrieval attendance, a Supplementary DCD Heart Record form should be completed and sent to NHSBT Statistics and Clinical Studies. An attendance is defined as a centre leaving base with the intention of DCD heart retrieval. In cases where the DCD heart was transplanted, the form should be sent in after 30 days of transplant in order to capture key information about the short term outcome of the recipient. For non-transplanted DCD hearts, the form can be sent in immediately after attendance at the donor. DCD heart attendances that do not lead to retrieval are difficult to identify from other data sources (i.e. the Retrieval Team Information Form), so it is important that a Supplementary Record form is completed in these non-proceeding scenarios.
- 4 The data presented in this paper are a combination of data held on the UK Transplant Registry (UKTR) and additional information from the Supplementary Record forms. At time of data analysis, 5 forms were missing for transplanted DCD hearts (in March 2019), 1 form was missing for a retrieved and not transplanted DCD heart, and 11 forms were outstanding for non proceeding attendances.
- 5 DCD heart offering data recorded by ODT Hub Operations were also analysed for offers made between 1 April 2017 and 31 March 2019, however since offering is conducted by Specialist Nurses in Organ Donation (SNODs), it is possible that Hub Operations may not hear about every offer.

RESULTS

Activity

- 6 Between 1 February 2015 and 31 March 2019, 153 DCD heart retrieval attendances were identified as having taken place, of which 101 proceeded to retrieval and 52 were non-proceeding. There were a total of 90 DCD hearts successfully transplanted. In **Table 1** this activity is broken down by team and financial year. Manchester joined the programme on 5 December 2016 and so are only included after this point. Newcastle joined the programme on 16 October 2018 but did perform one DCD heart transplant in March 2018.

Table 1 DCD heart activity by period and centre, 1 February 2015 – 31 March 2019

Period	Centre	Attended*	Retrieved	Transplanted
1 February 2015 – 31 March 2016	Harefield	8	5	4
	Papworth	21	17	16
	Total	29	22	20
1 April 2016 – 31 March 2017	Harefield	3	2	2
	Papworth	20	14	12
	Total	23	16	14
1 April 2017 – 31 March 2018	Harefield	14	3	2
	Manchester	8	7	6
	Newcastle	1	1	1
	Papworth	26	18	16
	Total	49	29	25
1 April 2018 – 31 March 2019	Harefield	24	11	9
	Manchester	3	1	1
	Newcastle	1	1	1
	Papworth	24	21	20
	Total	52	34	31
Total	Harefield	49	21	17
	Manchester	11	8	7
	Newcastle	2	2	2
	Papworth	91	70	64
TOTAL		153	101	90

* Includes 8 cases (all Papworth) where a DCD Heart Supplementary form has not been returned but notes reported on the Retrieval Team Information Form suggest that DCD heart retrieval was intended

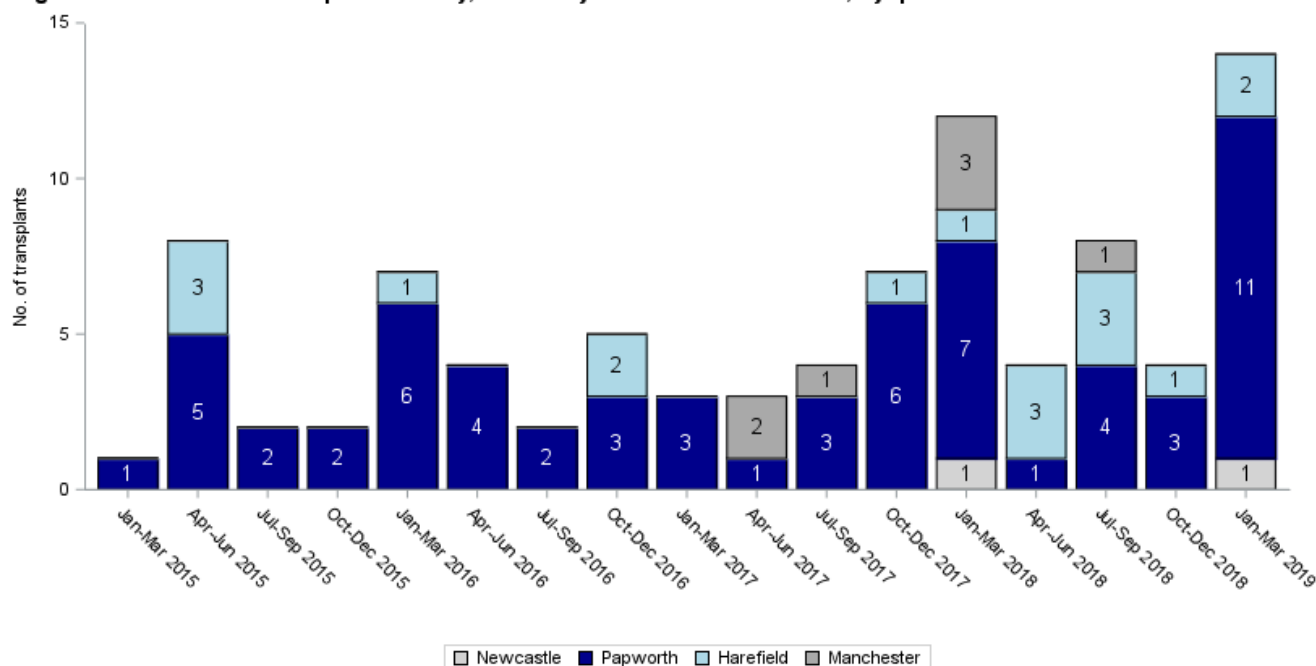
- 7 Across the time period, 11 (11%) DCD hearts were retrieved but not transplanted. The reason for non-use for each is seen below in **Table 2** and is taken from the DCD Heart Transplant Supplementary Record form. Where this is not available, as the form was returned incomplete, the reason was taken from the Hub Operations records.

Table 2 Reasons for non-use of hearts retrieved from DCD donors, 1 February 2015 – 31 March 2019

Centre	Donation Date	Reason for non-use
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
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 from histology
	September 2017	Heart hypertrophic enlarged aorta
	October 2017	Angio performed coronary artery disease noted
January 2019	Declined on function after being on OCS	
Manchester	June 2017	Function (wall motion abnormality, poor contractility and poor lactate profile)

8 **Figure 1** shows the number of DCD heart transplants by quarter and centre. There has been an increasing trend over time with 14 transplants performed in the most recent quarter.

Figure 1 DCD heart transplant activity, 1 January 2015 to 31 March 2019, by quarter and centre



Organ utilisation

9 Between 1 February 2015 to 31 March 2019, there were 553 hearts retrieved from UK DBD heart donors aged 16 to 50. Of these, 4% were not transplanted, which is significantly lower than the DCD discard rate of 11% (Fisher’s Exact p-value: 0.01).

10 Of the 101 DCD heart donors, three 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. The transplantation rate of lungs, kidneys, livers, and pancreases from DCD heart donors was higher than from the general DCD donor population.

Outcome	Lungs ¹	Kidney ¹	Liver	Pancreas
Offered	78	101	97	92
Retrieved	20	97	78	65
Transplanted (% of offered)	16 (21%)	91 (90%)	59 (61%)	34 (37%)
National DCD organ transplant rate (% of offered) ²	12%	64%	32%	18%

¹ at least one
² DCD donors between 1 February 2015 – 31 March 2019, aged 16-50 inclusive

11 The most commonly reported reasons for non-transplantation of offered organs from DCD heart donors were poor function for lungs, donor related issues (such as poor function and history) for livers, poor function/perfusion for kidneys, and donor history and fatty organ for pancreases.

Post-transplant survival and support

- 12 The 30 day patient outcome for 84 of the 90 heart transplants are summarised in **Table 4**; survival information was unknown for the remaining 6 cases in February and March 2019. This information is taken from one of three sources: the DCD Heart Supplementary Record form, the Cardiothoracic Transplant Record Form, or the Three Month Follow-up Form. There have only been two deaths within 30 days.

Table 4 DCD heart patient outcomes at 30 days post-transplant, by centre, for transplants performed 1 February 2015 – 31 March 2019

Centre	Alive at 30 days	Died within 30 days	Unknown
Harefield	14	2	1
Manchester	7	0	0
Newcastle	2	0	0
Papworth	59	0	5
Total	82	2	6

- 13 Perfusion method was known for 83 of the 90 DCD heart transplants and **Figure 2** below shows the Kaplan-Meier patient survival function up to one year split by perfusion method. The overall one year survival estimate for DCD heart recipients was 82.5% (95% CI: 70.9–89.7) and is comparable with DBD heart recipients (83.2% survival in 2017/2018 NHSBT Cardiothoracic Annual Report). **Table 5** shows the one year survival estimates by perfusion method. There were 12 patient deaths within one year which were all in the DPP group.

Figure 2 Kaplan-Meier patient survival function for DCD heart transplant recipients by perfusion method, 1 February 2015 – 31 March 2019

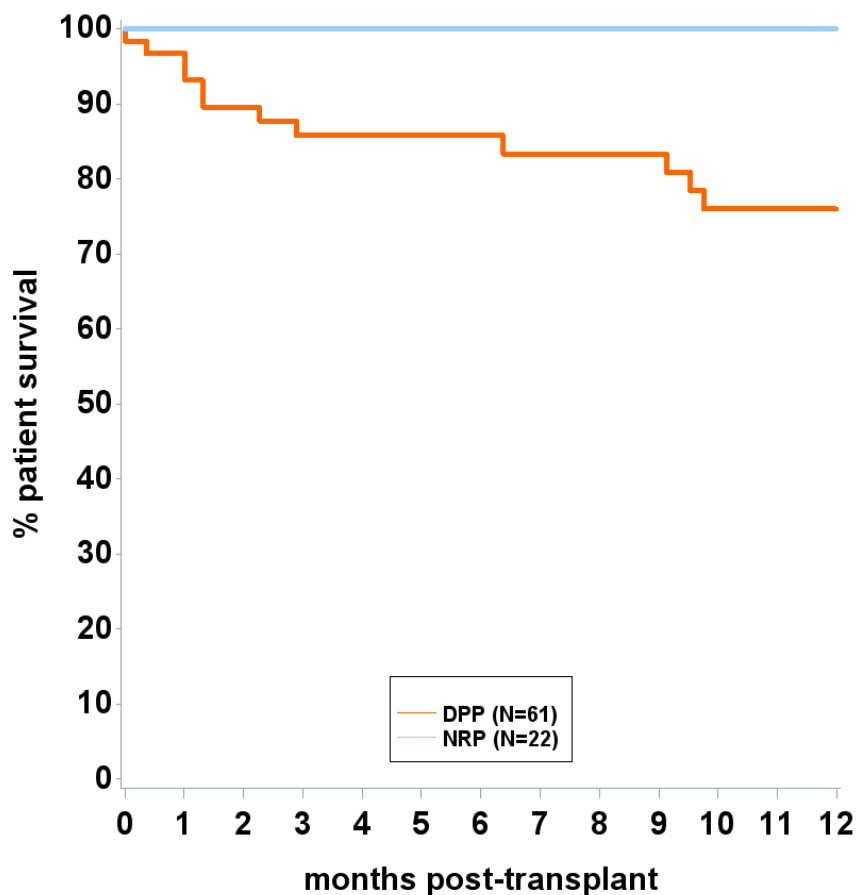


Table 5 1 year patient survival rates after DCD heart transplant, by perfusion method, 1 February 2015 – 31 March 2019

Perfusion method	Number of transplants	Number of deaths	1 year survival (95% CI)	P-value
DPP	61	12	76.0 (61.2 - 85.8)	0.03
NRP	22	0	100 (-)	
Total	84²	12	82.5 (70.9 - 89.7)	

¹ Of these, 10 died post mechanical circulatory support

² Perfusion method missing in one case

- 14 **Table 6** below shows the perfusion methods used by centre. Of the 90 transplants between 1 February 2017 and 31 March 2019, perfusion method was known in 83 of these cases. Of these, DPP was utilised 61 (73%) times and NRP the remaining 22 (27%) times. Papworth are the predominant centre in using NRP in 21 of the 22 cases shown, with Newcastle as the remaining case.

Table 6 Perfusion method by centre, for transplants performed 1 February 2015 – 31 March 2019

Centre	DPP	NRP	Unknown	Total
Harefield	16	0	1	17
Manchester	7	0	0	7
Newcastle	0	1	1	2
Papworth	38	21	5	64
Total	61	22	7¹	90

¹5 cases where the form was missing and 2 cases by Newcastle and Papworth where perfusion information was not provided

- 15 As at 14 April 2019, there have been 14 recorded deaths of DCD heart recipients (all but two within one year of transplant). **Table 7** gives a breakdown of the recorded causes of deaths for these patients. One patient received a re-transplant with a DBD heart within 30 days but died shortly after.

Table 7 Causes of death of 14 patients who have died post DCD transplant, 1 February 2015 – 31 March 2019

Cause of death	DPP	NRP	Total
Brain haemorrhage	1	0	1
Cerebro-vascular accident	1	0	1
Donor organ failure	1	0	1
End-stage heart failure	1	0	1
Multi-system failure	3	0	3
Pulmonary infection (bacterial)	1	0	1
Septicaemia	1	0	1
Sudden unexplained cardiac death	1	0	1
Other (no further information provided)	3	0	3
Unknown	1	0	1
Total	14	0	14

- 16 The need for post-transplant mechanical support within 30 days is shown in **Table 8** along with the devices used. Information on whether mechanical support was needed was received for 84 of the 90 transplants and information on perfusion method was known for 83 of these cases. Of the 84 cases where information on mechanical support was known, 28 (33%) required support; broken down by perfusion method this was 38% of DPP cases and 23% of NRP cases (Fisher's Exact p-value: 0.3).

Table 8 Use of mechanical support within 30 days post-transplant, for DCD heart transplants performed 1 February 2015 – 31 March 2019

Mechanical support post-transplant	DPP	NRP	Unknown	Total
Yes	23	5	0	28
-IABP	9	3	0	12
-ECMO only	10	1	0	11
-ECMO and IABP	2	1	0	3
-STVAD and ECMO	2	0	0	2
No	38	17	1	56
Unknown	0	0	6 ¹	6
Total	61	22	7	90

¹Includes 5 cases where no form was provided and 1 case where a form was provided but information on mechanical support and perfusion method were not stated

DCD heart offering

- 17 The offering information that has been recorded by ODT Hub Operations suggests that 265 DCD hearts had been offered during the two year period 1 April 2017 to 31 March 2019. **Table 9** shows a breakdown of these donors by Organ Donation Services Team and whether or not the heart was accepted, retrieved and transplanted. These offers came from 11 out of 12 SNOD regions. Of the 265 hearts offered, 186 were from potential DCDs aged 16-50 years; as a proportion, this is 32% of all potential DCDs in this age range where at least one organ was offered.

Table 9 DCD hearts offered, accepted, retrieved and transplanted by Organ Donation Services Team, 1 April 2017 – 31 March 2019

Organ Donation Services Team	Number of hearts offered	Number accepted	Number retrieved	Number transplanted
Eastern	76	28	15	15
London	35	14	9	7
Midlands	20	5	5	4
North West	36	16	11	10
Northern	2	1	1	1
Scotland	1	1	0	0
South Central	21	7	4	4
South East	30	10	4	3
South West	3	2	2	1
South West	7	5	2	2
Yorkshire	34	15	10	9
Total	265	104	63	56

- 18 These 265 hearts generated 503 offers, 201 (40%) made to Papworth, 200 (40%) to Harefield, 99 (20%) to Manchester and 3(1%) to Newcastle, as shown in **Table 10**. Overall, 394(78%) of offers were declined, mostly due to donor past history (23% of declines) and no suitable recipients (20% of declines), but also poor function (12%), donor age (8%) and donor size (6%) (see **Appendix**). Of the 54 offers accepted and not used, 7 hearts were declined after retrieval, and 13 donors did not proceed to solid organ donation due to prolonged time to asystole; the remaining hearts were declined before retrieval mainly on donor related reasons (history, function, age and size).

Table 10 DCD heart offers recorded on the UKTR as being made to participating centres during 1 April 2017 - 31 March 2019 and results, by financial year

Centre	Offers	1 April 2017 - 31 March 2018						1 April 2018 - 31 March 2019						
		Declined		Accepted, not used		Accepted and used		Declined		Accepted, not used		Accepted and used		
		N	%	N	%	N	%	N	%	N	%	N	%	
Harefield	81	68	84	11	14	2	2	119	91	76	19	16	9	8
Manchester	51	43	84	2	4	6	12	48	45	94	2	4	1	2
Newcastle	0	0	-	0	-	0	-	3	2	67	0	0	1	33
Papworth	94	66	70	12	13	16	17	107	79	74	8	7	20	19
Total	226	177	78	25	11	24	11	277	217	78	29	10	31	11

ACTION

- 19 This paper is to provide the national picture on DCD heart activity. Numbers of transplants have now reached 90 and unadjusted/unmatched survival outcomes are comparable to that of DBD transplants. The report will be updated for the DCD Heart working group meeting on 22 May 2019 once outstanding survival information for the most recent transplants has been received.
- 20 Participating centres are asked to ensure they return a DCD Heart Supplementary Record form for all proceeding and non-proceeding DCD heart retrieval attendances.

APPENDIX

Appendix Primary reasons for declining DCD heart offers, by centre, 1 April 2017 - 31 March 2019

Reason for decline	Harefield	Manchester	Newcastle	Papworth	Total
Donor unsuitable - past history	43	14	1	31	89
No suitable recipients	33	5	1	41	80
Logistics	17	22	0	11	50
Poor function	24	11	0	13	48
Donor unsuitable - age	7	12	0	11	30
HLA/ABO type	9	3	0	11	23
Donor unsuitable - size	7	4	0	11	22
Donor unsuitable - virology	3	1	0	6	10
No beds/staff/theatre	6	4	0	0	10
No ECHO	2	0	0	2	4
Out of area	0	4	0	0	4
Centre already retrieving/transplanting	1	2	0	0	3
Miscellaneous/other ¹	7	6	0	8	21
Total	159	88	2	145	394

¹ Any where total frequency less than 3