

NHS BLOOD AND TRANSPLANT
CARDIOTHORACIC ADVISORY GROUP

**POTENTIAL CARDIOTHORACIC RETRIEVAL KPI
OUTCOME VARIABLES**

INTRODUCTION

- 1 CTAG have been asked to propose Key Performance Indicators (KPIs) to monitor the cardiothoracic National Organ Retrieval Service (NORS) teams using short term recipient outcomes. This paper presents potential outcome measures separately for heart and lung using data reported to the UK Transplant Registry.

DATA ANALYSIS

Heart

- 2 Data on UK adult heart only transplants from donors who weighed more than 30kg, from 1 December 2012 to 31 November 2015, were used to assess the following recipient outcomes post- heart transplantation:
- **Potential Outcome Variable 1:** Percentage of heart transplant recipients requiring VAD, ECMO or other mechanical assistance within 30 days post-transplant (**Table 1**)
 - **Potential Outcome Variable 2:** Percentage of heart transplant recipients requiring VAD, ECMO, IABP or other mechanical assistance within 30 days post-transplant (**Table 2**)
 - **Potential Outcome Variable 3:** Unadjusted transplant survival (the earlier of graft failure or recipient death) at 30 days (**Table 3 and Figure 1**)
 - **Potential Outcome Variable 4:** Risk-adjusted post-transplant patient survival at 30 days (first transplants only) (**Table 4 and Figure 2**)

Lung

- 3 Data on UK adult lung only transplants from donors who weighed more than 30kg, from 1 December 2012 to 31 November 2015, were used to assess the following recipient outcomes post- lung transplantation:
- **Potential Outcome Variable 5:** Percentage of lung transplant recipients requiring ECMO support within 30 days post-transplant (**Table 5**)
 - **Potential Outcome Variable 6:** Unadjusted transplant survival (the earlier of graft failure or recipient death) at 90 days (**Table 6 and Figure 3**)
 - **Potential Outcome Variable 7:** Risk-adjusted post-transplant patient survival at 90 days (first transplants only) (**Table 7 and Figure 4**)

ACTION

- 4 Members are asked to consider the data presented here and decided whether these are suitable KPIs for the NORS.

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Heart

Potential outcome variable 1

Table 1 Percentage of adult heart only transplant recipients requiring VAD, ECMO or other mechanical assistance* within 30 days post-transplant, by NORS team

NORS team	No support required		Support required		Total N	Exported**	
	N	%	N	%		N	%
Papworth CT team	117	96	5	4	122	81	66
Newcastle CT team	54	96	2	4	56	31	55
Manchester CT team	60	90	7	10	67	36	54
Harefield CT team	101	92	9	8	110	72	65
Birmingham CT team	60	86	10	14	70	43	61
Scotland MO team	22	71	9	29	31	16	52
UK	414	91	42	9	456	279	61

*where "other mechanical assistance" is indicated on the Transplant Record Form OR where ST/LT/ECMO have been indicated on VAD forms for the purposes of PGF
**percentage of recipients not transplanted by the same centre as the cardiothoracic retrieval team

Potential outcome variable 2

Table 2 Percentage of adult heart only transplant recipients requiring VAD, ECMO, IABP or other mechanical assistance* within 30 days post-transplant, by NORS team

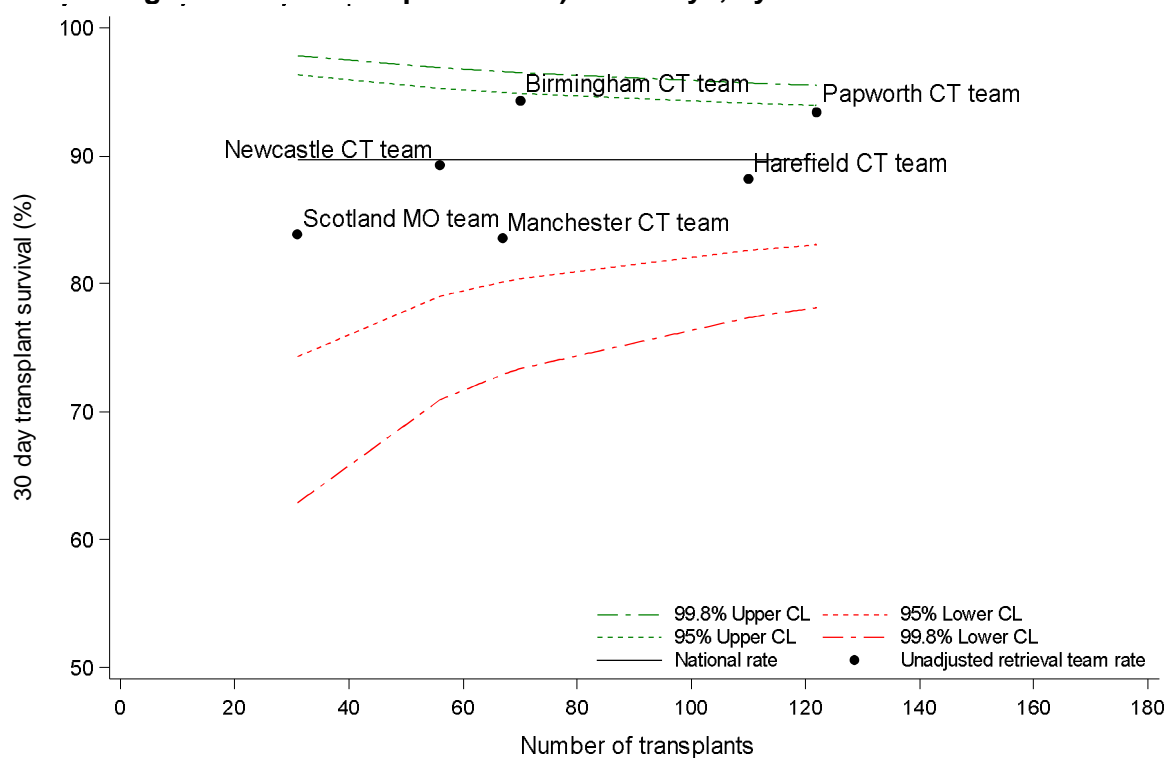
NORS team	No support required		Support required		Total N	Exported**	
	N	%	N	%		N	%
Papworth CT team	90	74	32	26	122	81	66
Newcastle CT team	39	70	17	30	56	31	55
Manchester CT team	38	57	29	43	67	36	54
Harefield CT team	79	72	31	28	110	72	65
Birmingham CT team	44	63	26	37	70	43	61
Scotland MO team	11	35	20	65	31	16	52
UK	301	66	155	34	456	279	61

*where "other mechanical assistance" is indicated on the Transplant Record Form OR where ST/LT/ECMO have been indicated on VAD forms for the purposes of PGF
**percentage of recipients not transplanted by the same centre as the cardiothoracic retrieval team

Potential outcome variable 3

Table 3 Unadjusted adult heart only transplant survival (the earlier of graft failure or recipient death) at 30 days, by NORS team

NORS team	Number of transplants	% survival at 30 days	(95% CI)
Papworth CT team	122	93	(87 - 96)
Newcastle CT team	56	89	(77 - 95)
Manchester CT team	66	83	(71 - 90)
Harefield CT team	110	88	(80 - 92)
Birmingham CT team	70	94	(85 - 97)
Scotland MO team	31	83	(65 - 92)
UK	455	89	(86 - 92)

Figure 1 Funnel plot of unadjusted adult heart only transplant survival (the earlier of graft failure or recipient death) at 30 days, by NORS team

Potential Outcome variable 4

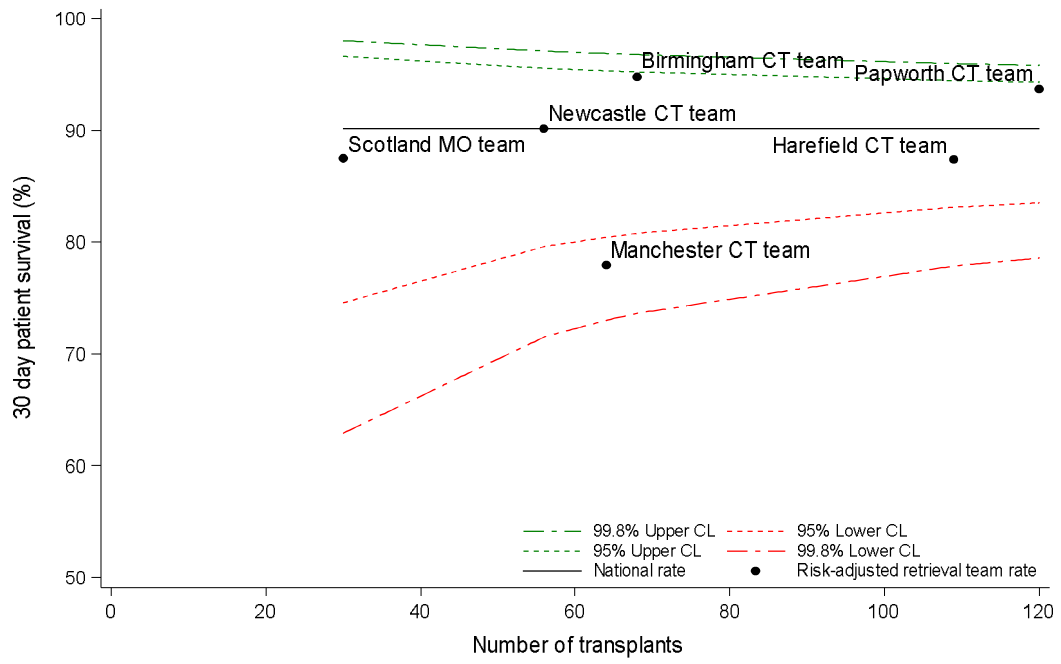
The following factors, as used in the NHSBT Annual Report on Transplantation, have been used to risk-adjust:

- Donor cause of death (vascular/trauma/hypoxic/other)
- Donor BMI (modelled as continuous variable)
- Donor age (modelled as continuous variable)
- Respiratory arrest (yes/no)
- Recipient BMI (modelled as continuous variable)
- Recipient creatinine at transplant (modelled as non-linear spline)
- ECMO at transplant (yes/no)
- Hospital status at transplant (in hospital/not in hospital)
- Primary disease (dilated cardiomyopathy/coronary heart disease/congenital heart disease/other)
- Sex mismatch (RM:DM/RM:DF/RF:DM/RF:DF)

Table 4 Risk-adjusted first adult heart only post-transplant patient survival at 30 days, by NORS team

NORS team	Number of transplants	% survival at 30 days	(95% CI)
Papworth CT team	120	93	(93 - 95)
Newcastle CT team	56	90	(88 - 92)
Manchester CT team	64	78	(75 - 81)
Harefield CT team	109	87	(86 - 89)
Birmingham CT team	68	94	(93 - 96)
Scotland MO team	30	87	(84 - 90)
UK	447	89	

Figure 2 Funnel plot of risk-adjusted first adult heart only post-transplant patient survival at 30 days, by NORS team



Lung

Potential Outcome Variable 5

Table 5 Percentage of adult lung only transplant recipients requiring ECMO* support within 30 days post-transplant, by NORS team

NORS team	No support required		Support required		Total N	Exported**	
	N	%	N	%		N	%
Papworth CT team	84	82	18	18	102	65	64
Newcastle CT team	76	86	12	14	88	65	74
Manchester CT team	90	87	14	13	104	48	46
Harefield CT team	149	94	10	6	159	101	64
Birmingham CT team	64	76	20	24	84	30	36
Scotland MO team	25	96	1	4	26	0	0
UK	488	87	75	13	563	309	55

*where "other mechanical assistance" is indicated on the Transplant Record Form (assumed to be ECMO)

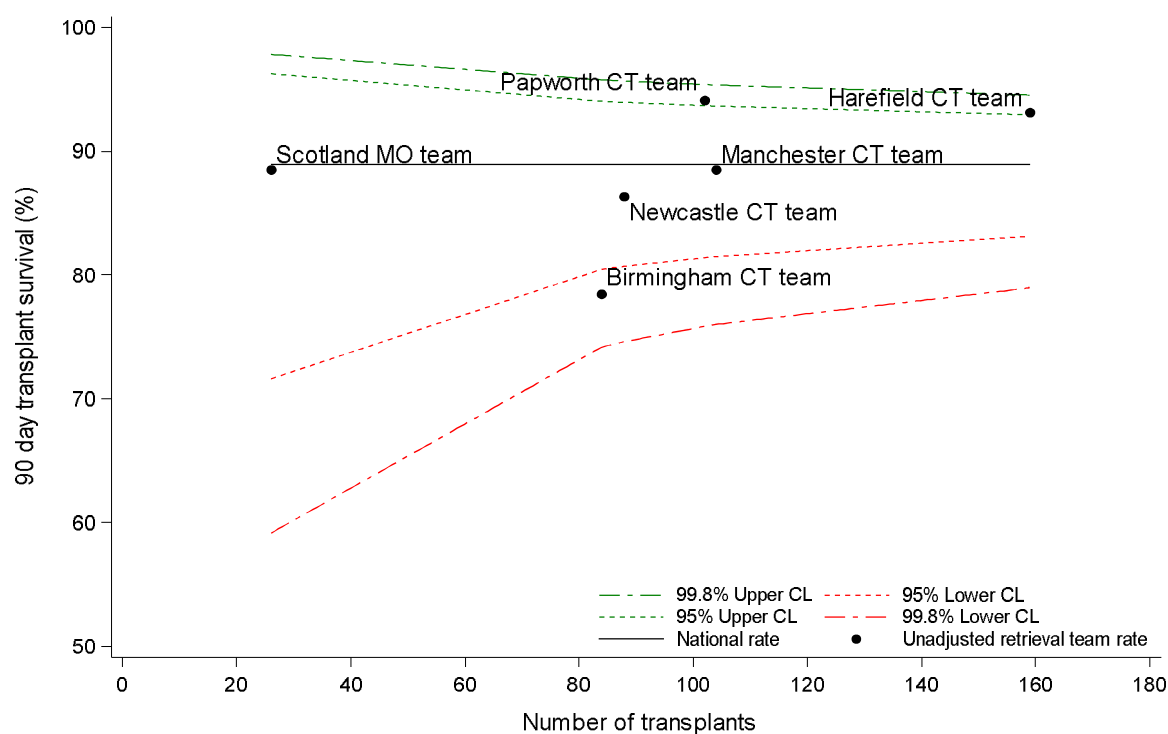
**percentage of recipients not transplanted by the same centre as the cardiothoracic retrieval team

Potential Outcome variable 6

Table 6 Unadjusted adult lung only transplant survival (the earlier of graft failure or recipient death) at 90 days, by NORS team

NORS team	Number of transplants	% survival at 90 days	(95% CI)
Papworth CT team	102	94	(87 - 97)
Newcastle CT team	88	86	(77 - 91)
Manchester CT team	104	88	(80 - 93)
Harefield CT team	159	93	(87 - 96)
Birmingham CT team	84	78	(67 - 85)
Scotland MO team	26	88	(67 - 96)
UK	563	88	(86 - 91)

Figure 3 Funnel plot of unadjusted adult lung only transplant survival (the earlier of graft failure or recipient death) at 90 days, by NORS team



Potential Outcome variable 7

The following factors, as used in the NHSBT Annual Report on Transplantation, have been used to risk-adjust:

- Donor CMV (negative/positive)
- Donor history of smoking (no/yes)
- Recipient daily dose of prednisolone at registration (0/1-14/≥15)
- Donor: recipient predicted TLC mismatch (recipient-donor) (modelled as continuous variable)
- Recipient FVC at registration (modelled as continuous variable)
- Recipient bilirubin at registration (modelled as continuous variable)
- Recipient cholesterol at registration (modelled as continuous variable)
- Recipient age at transplant (modelled as non-linear spline)
- Ischaemia time (hours) (modelled as non-linear spline)
- Transplant type (single lung/bilateral lung)
- Primary disease group (COPD and emphysema/cystic fibrosis and bronchiectasis/fibrosing lung disease/primary pulmonary hypertension/other)
- Modelled transplant type and primary disease group as an interaction term

Table 7 Risk-adjusted first adult lung only post-transplant patient survival at 90 days, by NORS team

NORS team	Number of transplant	% survival at 90 days	(95% CI)
Papworth CT team	100	94	(92.8 - 95.0)
Newcastle CT team	87	86	(84.2 - 87.7)
Manchester CT team	103	89	(87.8 - 90.5)
Harefield CT team	156	92	(91.1 - 93.3)
Birmingham CT team	82	82	(80.8 - 84.6)
Scotland MO team	25	86	(82.0 - 89.2)
UK	553	89	

Figure 4 Funnel plot of risk-adjusted first adult lung only post-transplant patient survival at 90 days, by NORS team