



Blood and Transplant

ANNUAL REPORT ON CARDIOTHORACIC TRANSPLANTATION

**REPORT FOR 2014/2015
(1 APRIL 2005 – 31 MARCH 2015)**

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CONTENTS



Contents

1. Executive summary	5
2. Introduction.....	7
ADULT HEART TRANSPLANTATION.....	14
3. Transplant list	14
3.1 Adult heart only transplant list as at 31 March, 2006 – 2015.....	15
3.2 Post-registration outcomes, 1 April 2011 – 31 March 2012.....	19
3.3 Median waiting time to transplant, 1 April 2009 - 31 March 2012.....	20
4. Response to offers	22
5. Transplants.....	25
5.1 Adult heart transplants, 1 April 2005 – 31 March 2015	26
5.2 Total ischaemia time, 1 April 2005 – 31 March 2015	34
6. Post-transplant survival	36
7. Survival from listing	41
ADULT LUNG TRANSPLANTATION	45
8. Transplant list	45
8.1 Adult lung and heart/lung transplant list as at 31 March, 2006 – 2015.....	46
8.2 Post-registration outcomes, 1 April 2011 – 31 March 2012.....	50
8.3 Median waiting time to transplant, 1 April 2009 - 31 March 2012.....	50
9. Response to offers.....	52
10. Transplants.....	57
10.1 Adult lung and heart/lung transplants, 1 April 2005 – 31 March 2015.....	58
10.2 Total ischaemia time, 1 April 2005 – 31 March 2015	66
11. Post-transplant survival	68
12. Survival from listing	73
PAEDIATRIC HEART TRANSPLANTATION	77
13. Transplant list	77
13.1 Paediatric heart only transplant list as at 31 March, 2006 – 2015.....	78
13.2 Post-registration outcomes, 1 April 2011 – 31 March 2012	82
13.3 Median waiting time to transplant, 1 April 2009 - 31 March 2012.....	83
14. Response to offers	84
15. Transplants.....	86
15.1 Paediatric heart only transplants, 1 April 2005 – 31 March 2015	87
15.2 Total ischaemia time, 1 April 2005 – 31 March 2015	92
16. Post-transplant survival	94
PAEDIATRIC LUNG TRANSPLANTATION	97

17.	Transplant list	97
17.1	Paediatric lung and heart/lung transplant list as at 31 March, 2006 – 2015.....	98
17.2	Post-registration outcomes, 1 April 2011 – 31 March 2012	102
17.3	Median waiting time to transplant, 1 April 2009 - 31 March 2012.....	102
18.	Response to offers	104
19.	Transplants.....	106
	Transplants	106
19.1	Paediatric lung and heart/lung transplants, 1 April 2005 – 31 March 2015	107
19.2	Total ischaemia time, 1 April 2005 – 31 March 2015	112
20.	Post-transplant survival	113
21	Form return rates.....	116
21.1	Adult heart form return rates, 1 January – 31 December 2014	117
21.2	Adult lung form return rates, 1 January – 31 December 2014.....	118
21.3	Paediatric heart form return rates, 1 January – 31 December 2014.....	119
21.4	Paediatric lung form return rates, 1 January – 31 December 2014	119
APPENDIX	120
A1:	Number of patients analysed	121
A2:	Methods.....	123
A3:	Risk models	126
A4:	Glossary of terms.....	128

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

This report presents key data about cardiothoracic transplantation in the UK. The period reported covers 10 years of transplant data, from 1 April 2005 to 31 March 2015. The report presents information on the number of transplants and survival analysis after first heart and/or lung transplantation; both on a national and centre-specific basis.

Key findings

- On 31 March 2015, there were 267 patients on the UK active heart transplant list which represents a 9% increase in the number of patients a year earlier. The equivalent number of patients on the active lung transplant list was 338, representing a 18% increase from the previous year.
- There were 3099 cardiothoracic **transplants** performed in the UK in the ten year period. Of these, 1432 were first heart-only transplants and 1602 were first lung or heart/lung transplants.
- Centre-specific risk-adjusted survival rates at 30 days, 1 year and 5 years post **heart** transplant are all within the 99.8% confidence limits of the national average survival rate, for **adult** recipients at all transplant centres.
- Centre-specific risk-adjusted survival rates at 90 days and 1 year post **lung** transplant are within the 99.8% confidence limits of the national average survival rate, for **adult** recipients at all transplant centres. Risk-adjusted survival rates at 5 years post lung transplant for one centre are however below the 99.8% lower confidence limit.
- The national rate of survival 30 days after first **heart transplantation of adults** is 88.3%. These rates vary between centres, ranging from 78.9% to 93% (risk-adjusted).
- The national rate of survival 30 days after first **heart transplantation of paediatrics** is 96.9, ranging from 96.7% to 97% (unadjusted). Centre-specific estimates of these rates must be interpreted with caution due to the small number of transplants upon which they are based.
- The national rate of survival 90 days after first **lung transplantation of adults** from deceased donors is 90.4%. These rates vary between centres, ranging from 83.5% to 92.2% (risk-adjusted).
- The national rate of survival 90 days after first **lung transplantation of paediatrics** from deceased donors is 94.4%. These rates vary between centres, ranging from 93.3% to 100% (unadjusted). Centre-specific estimates of these rates must be interpreted with caution due to the small number of transplants upon which they are based.

INTRODUCTION



INTRODUCTION

This report presents information on transplant activity and patient mortality after first heart and/or lung transplantation between 1 April 2005 and 31 March 2015, for all centres performing heart and/or lung transplantation in the UK. Data were obtained from the UK Transplant Registry at NHS Blood & Transplant which holds information relating to donors, recipients and outcomes for all cardiothoracic transplants performed in the UK.

Results are described separately for hearts and lungs and also for adult (aged ≥ 16 years) and paediatric patients (aged < 16 years). There are seven cardiothoracic transplant centres in the UK (six in England and one in Scotland). Five of the seven centres specialize in transplanting adult patients, one in transplanting paediatric patients (Great Ormond Street) and one transplants both adult and paediatric patients (Newcastle). However, both adult and paediatric transplants carried out at Great Ormond Street are included in the paediatric report, and paediatric transplants carried out at non-paediatric centres are included in the adult report. Heart lung blocks are included in the lung analysis.

The centre specific results for adult first transplants are adjusted for differences in [risk factors](#) between the centres. The risk models used are described in the [Appendix](#) and were developed in August 2015 in collaboration with the Cardiothoracic Advisory Group (CTAG) Clinical Audit Group.

Methods used are described in the [Appendix](#).

Patients requiring [multi-organ transplants](#) (other than heart/lung transplants) are excluded from all analyses other than those presented in this Introduction section. In addition, partial lung transplants, heart/lung block transplants and patients receiving their second (or subsequent) graft are excluded from the survival analysis calculations.

Figure 1.1 shows the number of patients on the [active transplant list](#) at 31 March each year between 2006 and 2015. The number of patients waiting for a lung transplant fell each year from 304 in 2006 to 229 in 2009 but has subsequently increased to 338 in 2015. The number of patients waiting for a heart transplant has increased substantially from 93 in 2009 to 267 in 2015.

Figure 1.1 Number of patients on active transplant list at 31 March each year, 2006 to 2015

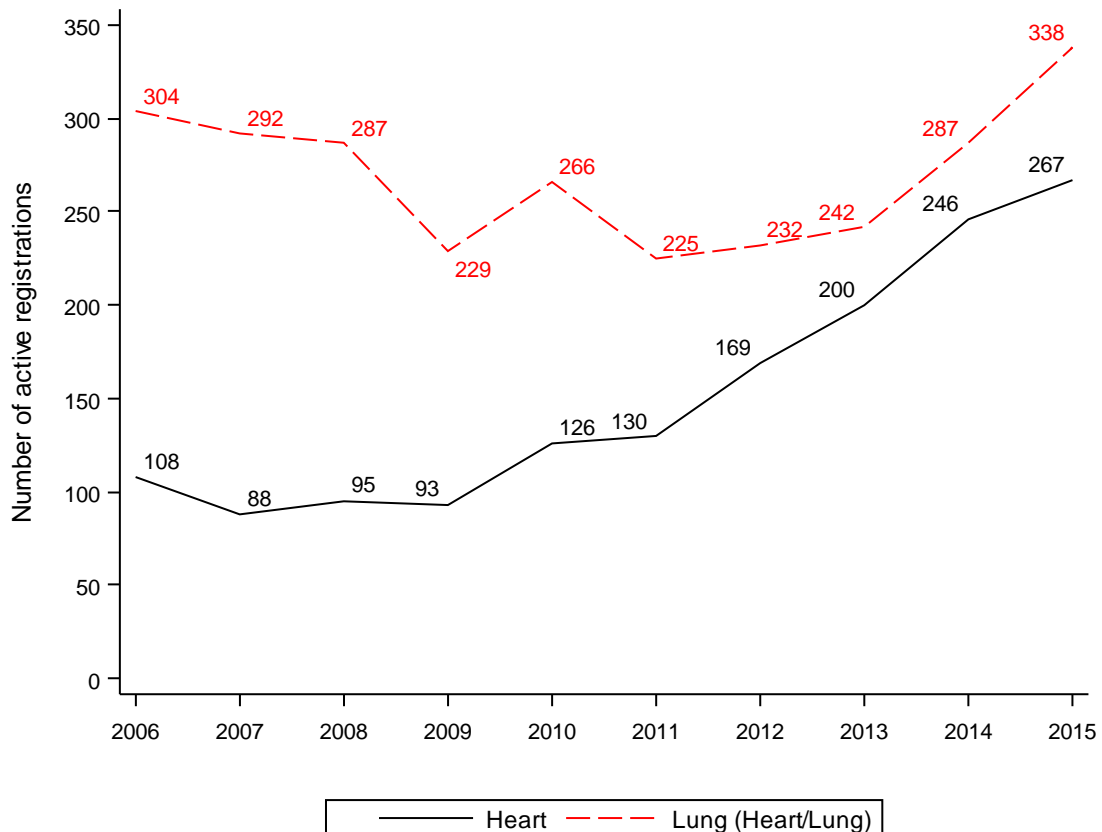


Figure 1.2 shows the number of adult and paediatric patients on the [active transplant list](#) at 31 March 2015 by centre. In total, there were 559 adults and 46 paediatric patients. Harefield had the largest proportion of patients on the adult heart and lung transplant lists. Glasgow does not perform lung transplantation.

Figure 1.2 Patients on heart and lung transplant lists at 31 March 2015, by centre

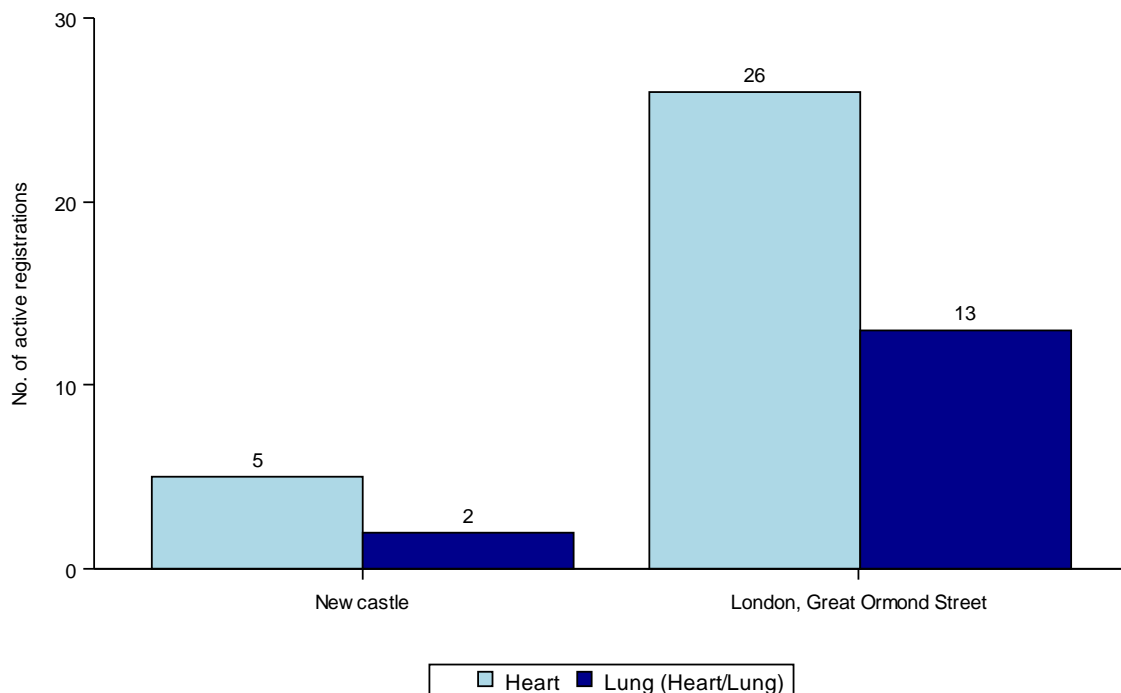
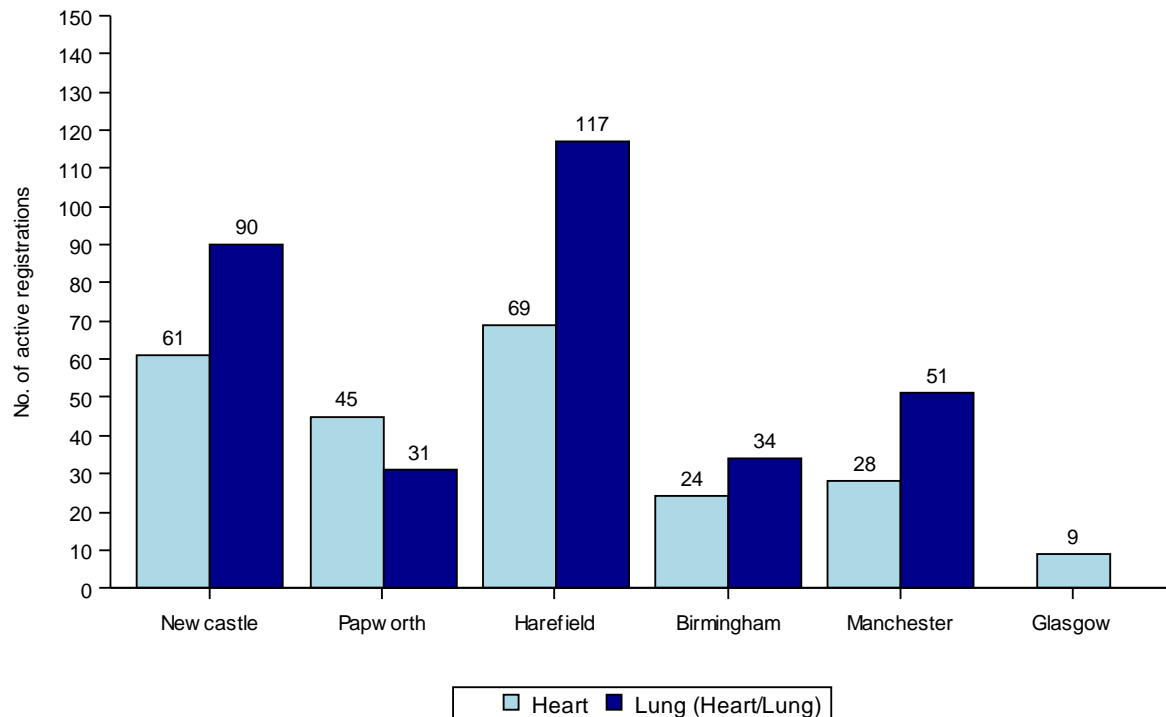


Figure 1.3 shows the total number of transplants performed in the last ten years. The number of heart transplants per year dropped to 128 in 2007/2008 but began increasing slightly in 2010/2011. There was a substantial increase between 2012/2013 and 2014/2015 from 145 to 181. The number of lung transplants per year has been steadily increasing since 2007/08 to 187 in 2014/2015.

Figure 1.3 Number of cardiothoracic transplants in the UK, by financial year, 1 April 2005 to 31 March 2015

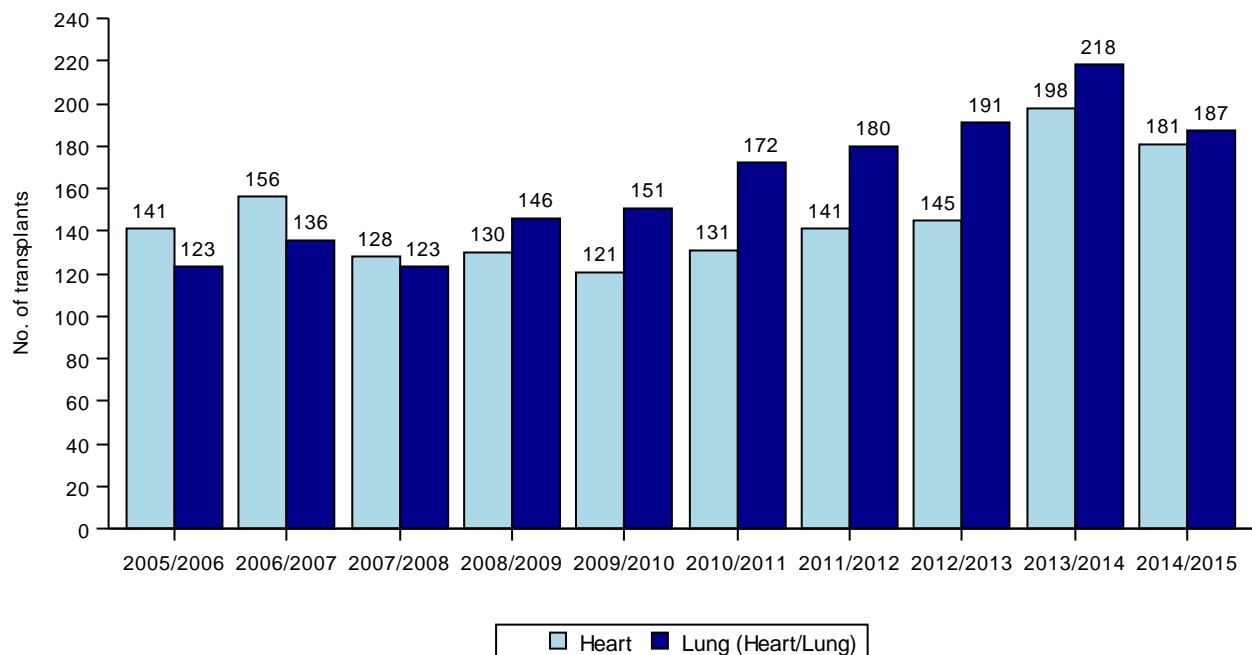
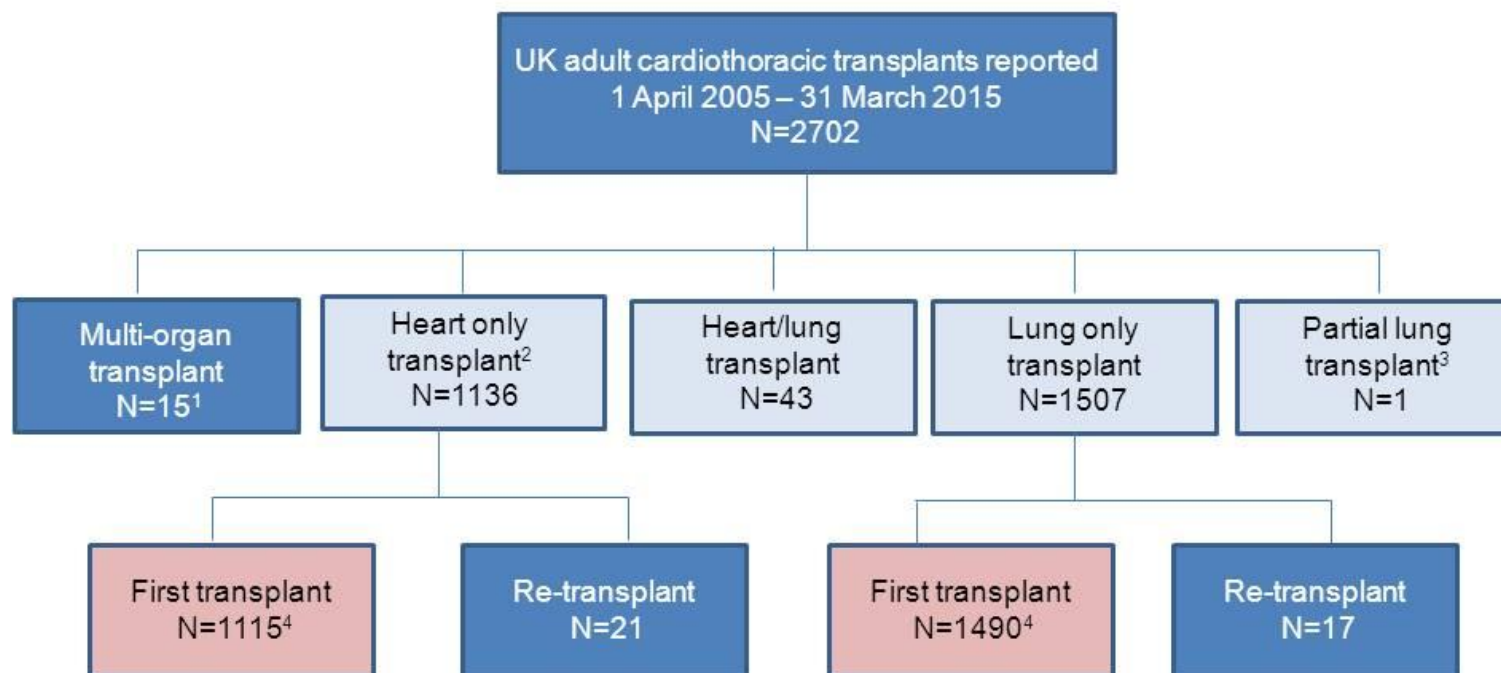


Figure 1.4 details the 2702 adult cardiothoracic transplants performed in the UK in the ten year period whilst **Figure 1.5** shows similar information for 397 paediatric transplants performed during the same time period. Of these, 2687 adult and 397 paediatric transplants are analysed in the following sections as [multi-organ transplants](#) are not included (light blue boxes). The exception to this however is that the survival analyses sections further exclude partial lung transplants, heart/lung transplants and re-transplants along with [multi-organ transplants](#).

Figure 1.4 Adult cardiothoracic organ transplants performed in the UK, 1 April 2005 to 31 March 2015



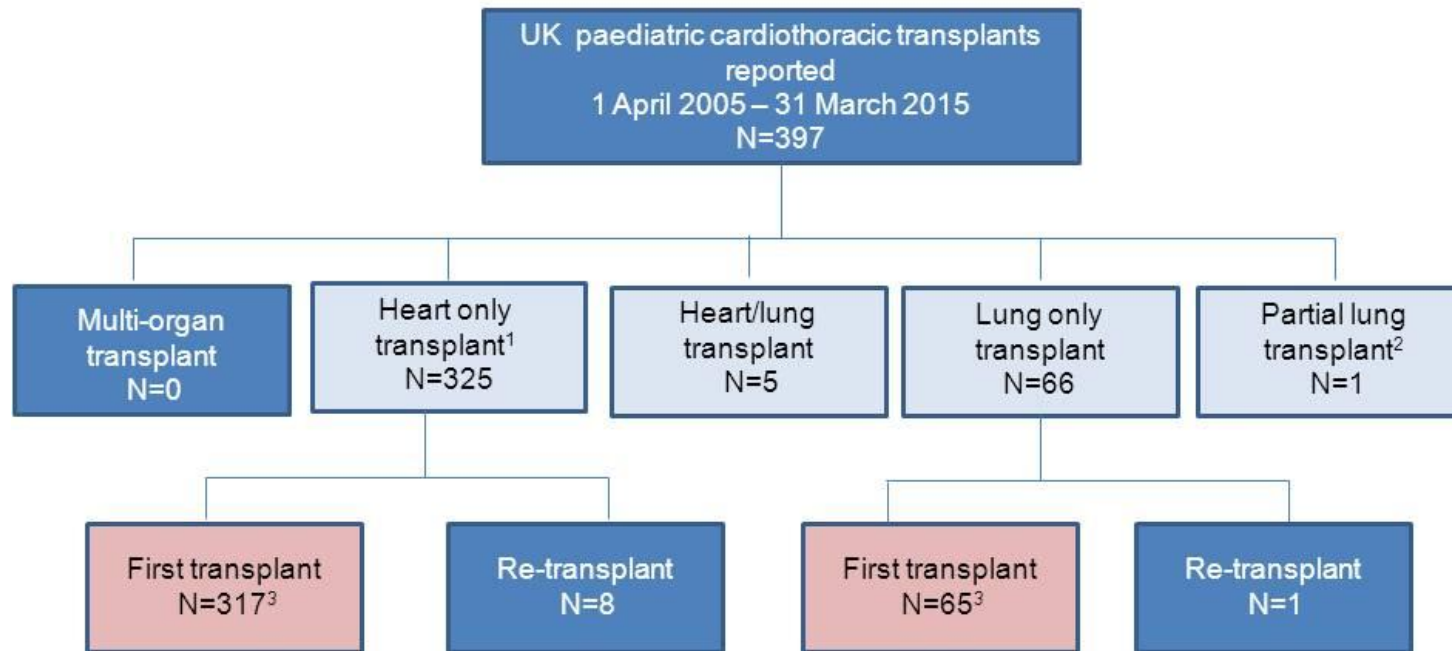
¹ Includes 11 heart and kidney transplants (1 of which was a retransplant), 1 lung and kidney and 3 lung and liver

² Includes 3 domino donor transplants and 1 DCD heart transplant

³ Includes 1 partial lung transplant from a living donor

⁴ Survival sections are split into 1 April 2010 to 31 March 2014 for 30 day (heart) and 90 day post-transplant survival (lung)
1 April 2006 to 31 March 2010 for 1 year and 5 year survival

Figure 1.5 Paediatric cardiothoracic organ transplants performed in the UK, 1 April 2005 to 31 March 2015



¹ Includes 1 domino donor transplant and 1 DCD heart transplant

² Includes 1 partial lung transplant from a deceased donor

³ Survival sections are split into 1 April 2010 to 31 March 2014 for 30 day (heart) and 90 day post-transplant survival (lung)
1 April 2006 to 31 March 2010 for 1 year and 5 year survival

ADULT HEART TRANSPLANTATION

Transplant List



3.1 Adult heart only transplant list as at 31 March, 2006 – 2015

Figure 3.1 shows the number of adult patients on the heart transplant list at 31 March each year between 2006 and 2015. The overall number of patients actively waiting for a heart transplant increased each year from 72 in 2007 to 231 in 2015. The number of patients on the urgent transplant list has increased from 0 in 2006 to 18 in 2015, with an average of 6.7 patients on the list on the 31st March each year.

Figure 3.1 Adult patients on the heart transplant list at 31 March each year for the last 10 years, by year

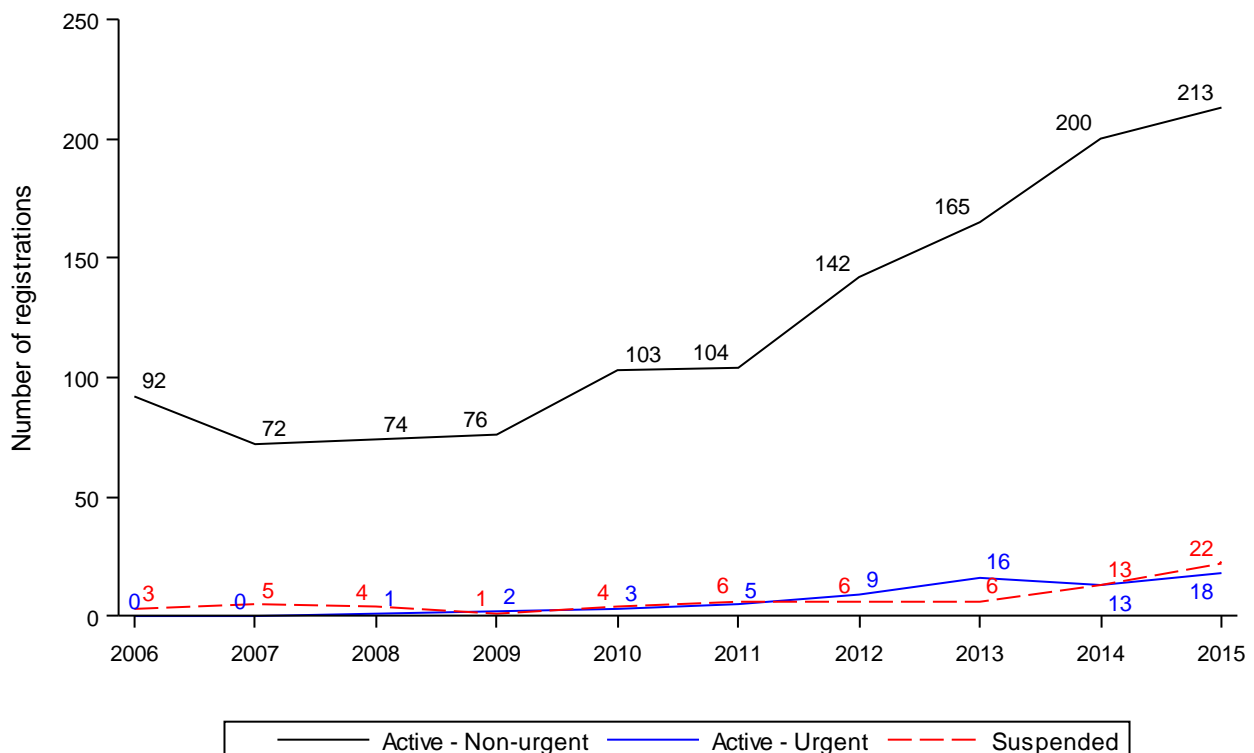


Figure 3.2 shows the number of adult patients on the active heart transplant list at 31 March 2015 by centre. In total, there were 231 adult patients. Harefield had the largest proportion (30%) of the transplant list whilst Glasgow had the smallest (4%). The number of patients on the urgent transplant list at 31 March 2015 ranged from one at Newcastle to five at Papworth.

Figure 3.2 Adult patients on the active heart transplant list at 31 March 2015, by centre

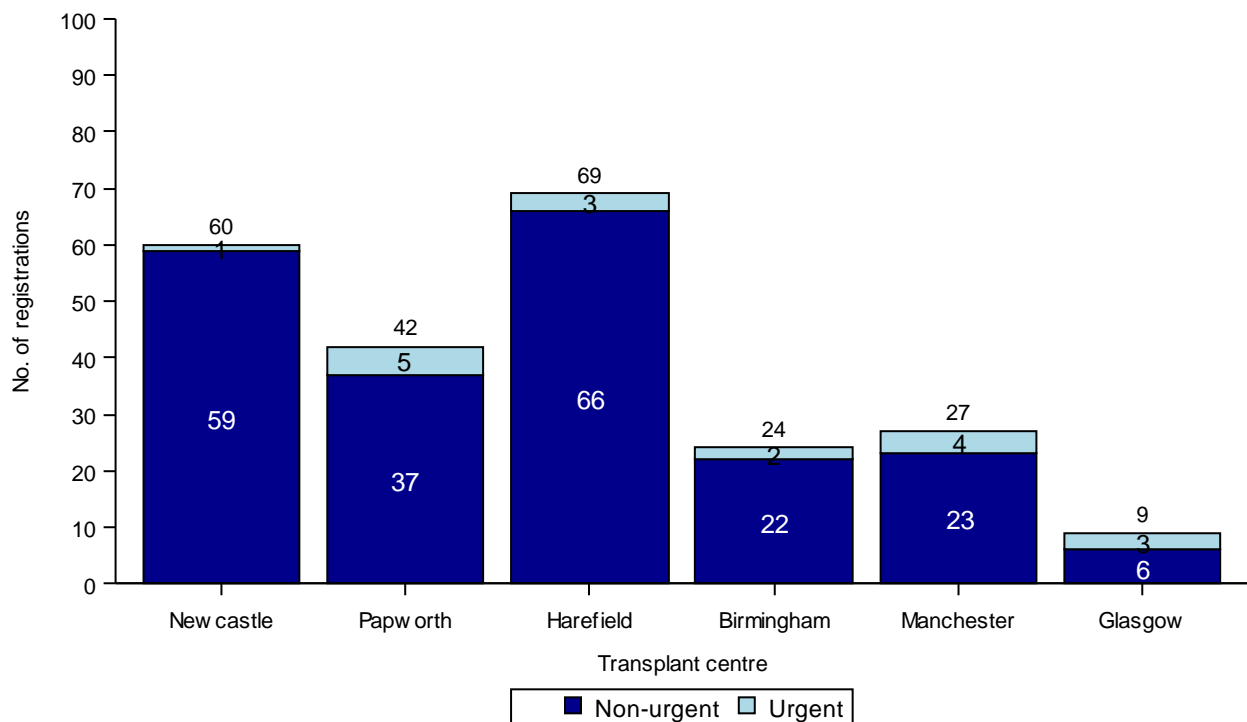
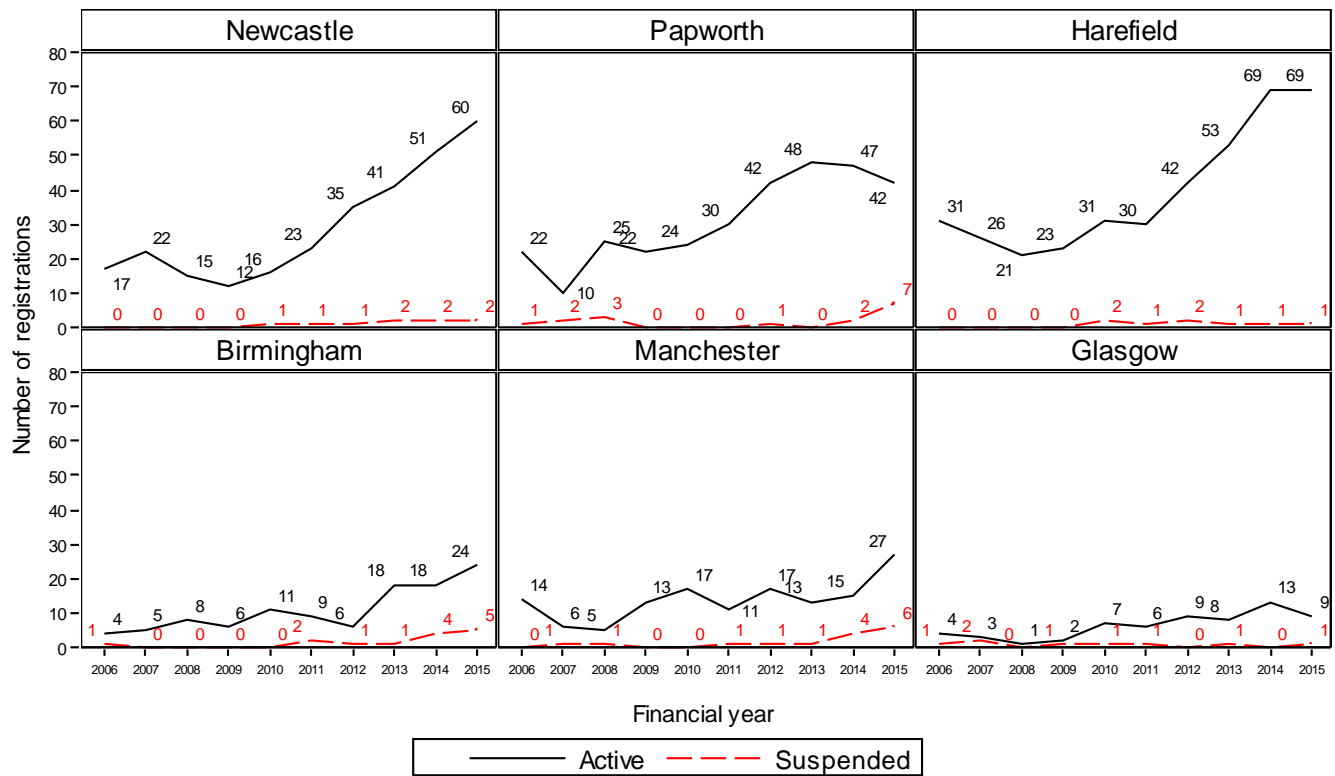


Figure 3.3 shows the number of adult patients on the transplant list at 31 March each year between 2006 and 2015 for each centre.

Figure 3.3 Adult patients on the heart transplant list at 31 March each year for the last 10 years, by year and centre



The demographic characteristics of the 231 adult patients on the [active heart transplant list](#) on 31 March 2015 are shown by centre and overall in **Table 3.1**. 86% of the recipients were male and the median age was 53 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 3.1 Demographic characteristics of adult heart transplant list patients at 31 March 2015, by centre								
		Newcastle N (%)	Papworth N (%)	Harefield N (%)	Birmingham N (%)	Manchester N (%)	Glasgow N (%)	TOTAL
Number		60 (100)	42 (100)	69 (100)	24 (100)	27 (100)	9 (100)	231 (100)
Urgency status	Urgent	1 (2)	5 (12)	3 (4)	2 (8)	4 (15)	3 (33)	18 (8)
	Non-urgent	59 (98)	37 (88)	66 (96)	22 (92)	23 (85)	6 (67)	213 (92)
Recipient sex	Male	51 (85)	34 (81)	59 (86)	23 (96)	25 (93)	6 (67)	198 (86)
	Female	9 (15)	8 (19)	10 (14)	1 (4)	2 (7)	3 (33)	33 (14)
Recipient ethnicity	White	56 (93)	32 (76)	61 (88)	22 (92)	25 (93)	8 (89)	204 (88)
	Non-white	4 (7)	10 (24)	8 (12)	2 (8)	1 (4)	1 (11)	26 (11)
	Missing	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	1 (0)
Recipient age	Median (IQR)	53 (42, 58)	55 (44, 61)	51 (43, 59)	56 (44, 61)	54 (42, 59)	49 (42, 50)	53 (42, 59)
	Missing	0	0	0	0	0	0	0
Primary Disease	Coronary heart disease	19 (32)	4 (10)	10 (14)	5 (21)	7 (26)	3 (33)	48 (21)
	Cardiomyopathy	23 (38)	18 (43)	42 (61)	7 (29)	8 (30)	0 (0)	98 (42)
	Congenital heart disease	12 (20)	1 (2)	1 (1)	1 (4)	1 (4)	0 (0)	16 (7)
	Other heart disease	4 (7)	11 (26)	4 (6)	5 (21)	8 (30)	4 (44)	36 (16)
	Others	2 (3)	8 (19)	10 (14)	5 (21)	3 (11)	2 (22)	30 (13)
	Missing	0 (0)	0 (0)	2 (3)	1 (4)	0 (0)	0 (0)	3 (1)
Previous open heart surgery	None	40 (67)	27 (64)	39 (57)	12 (50)	16 (59)	3 (33)	137 (59)
	One	14 (23)	13 (31)	22 (32)	5 (21)	10 (37)	3 (33)	67 (29)
	More than one	6 (10)	2 (5)	8 (12)	3 (13)	1 (4)	3 (33)	23 (10)
	Missing	0 (0)	0 (0)	0 (0)	4 (17)	0 (0)	0 (0)	4 (2)
Previous thoracotomy	No	57 (95)	42 (100)	63 (91)	21 (88)	26 (96)	7 (78)	216 (94)
	Yes	2 (3)	0 (0)	6 (9)	3 (13)	1 (4)	2 (22)	14 (6)
	Missing	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)
Serum Bilirubin (umol/l)	Median (IQR)	14 (9, 25)	13 (9, 19)	14 (11, 21)	13 (10, 21)	21 (12, 32)	12 (7, 15)	14 (10, 23)
	Missing	1	1	0	0	0	4	6
Serum Creatinine (umol/l)	Median (IQR)	104 (81, 135)	114 (94, 138)	91 (80, 114)	87 (82, 109)	90 (71, 116)	108 (97, 136)	98 (81, 121)
	Missing	0	0	0	0	0	4	4

3.2 Post-registration outcomes, 1 April 2011 – 31 March 2012

An indication of outcomes for adult patients listed for a non-urgent heart transplant is summarised in **Figure 3.4** whilst outcomes for patients registered urgently are shown in **Figure 3.5**. **Figure 3.5** includes all patients who have been urgently listed at any point during their registration. These charts show the proportion of patients transplanted or still waiting six months, one, two and three years after joining the list. They also show the proportion removed from the transplant list (typically because they become too unwell for transplant) and those who died while on the transplant list. Within six months of listing, 30% of non-urgent heart patients were transplanted while 9% died waiting. Three years after listing, 48% received a transplant.

Figure 3.4 Post-registration outcome for 88 new non-urgent heart only registrations made in the UK, 1 April 2011 to 31 March 2012

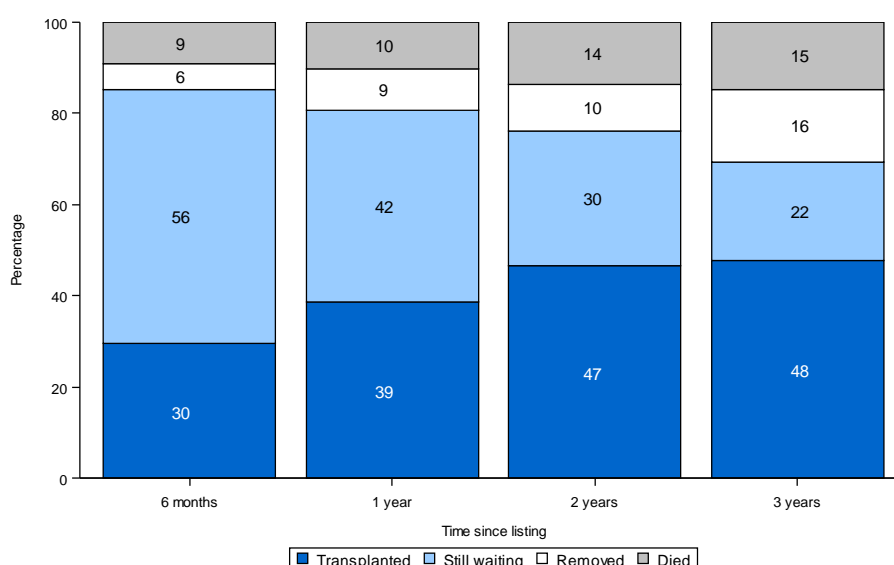
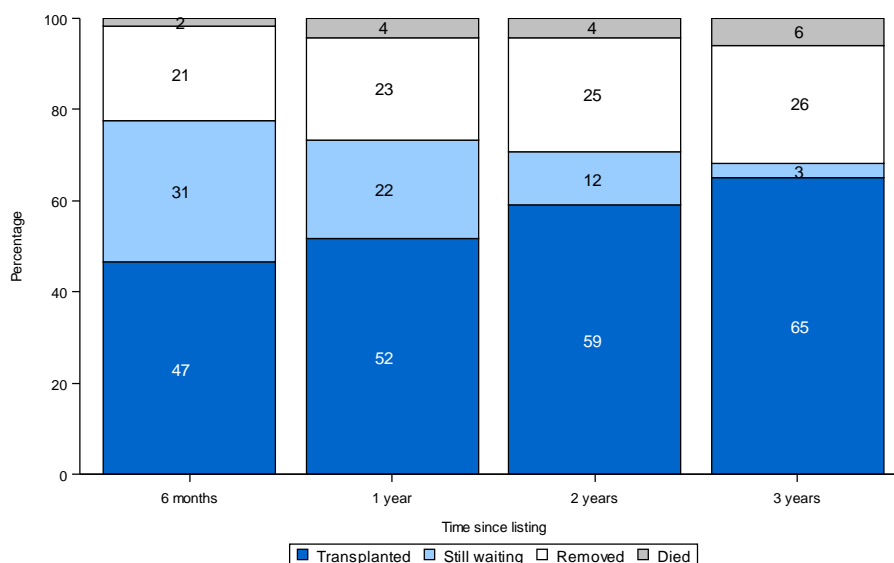


Figure 3.5 Post-registration outcome for 120 new urgent heart only registrations made in the UK, 1 April 2011 to 31 March 2012



3.3 Median waiting time to transplant, 1 April 2009 - 31 March 2012

The [median](#) waiting time to transplant for adult patients on the heart transplant list is shown in **Figure 3.6**. Overall time to transplant is the combination of time on the non-urgent transplant list and time on the urgent transplant list for all patients on the heart transplant list. **Table 3.2** shows the overall [median](#) waiting time and, separately, the [median](#) waiting time for patients on the non-urgent list and patients who were registered on the urgent list at any point during their registration. The overall national [median](#) waiting time is 195 days and ranges from 57 days at Birmingham to 1043 days at Harefield

Figure 3.6 Overall median waiting time to transplant for adult patients registered on the heart only transplant list, from 1 April 2009 to 31 March 2012

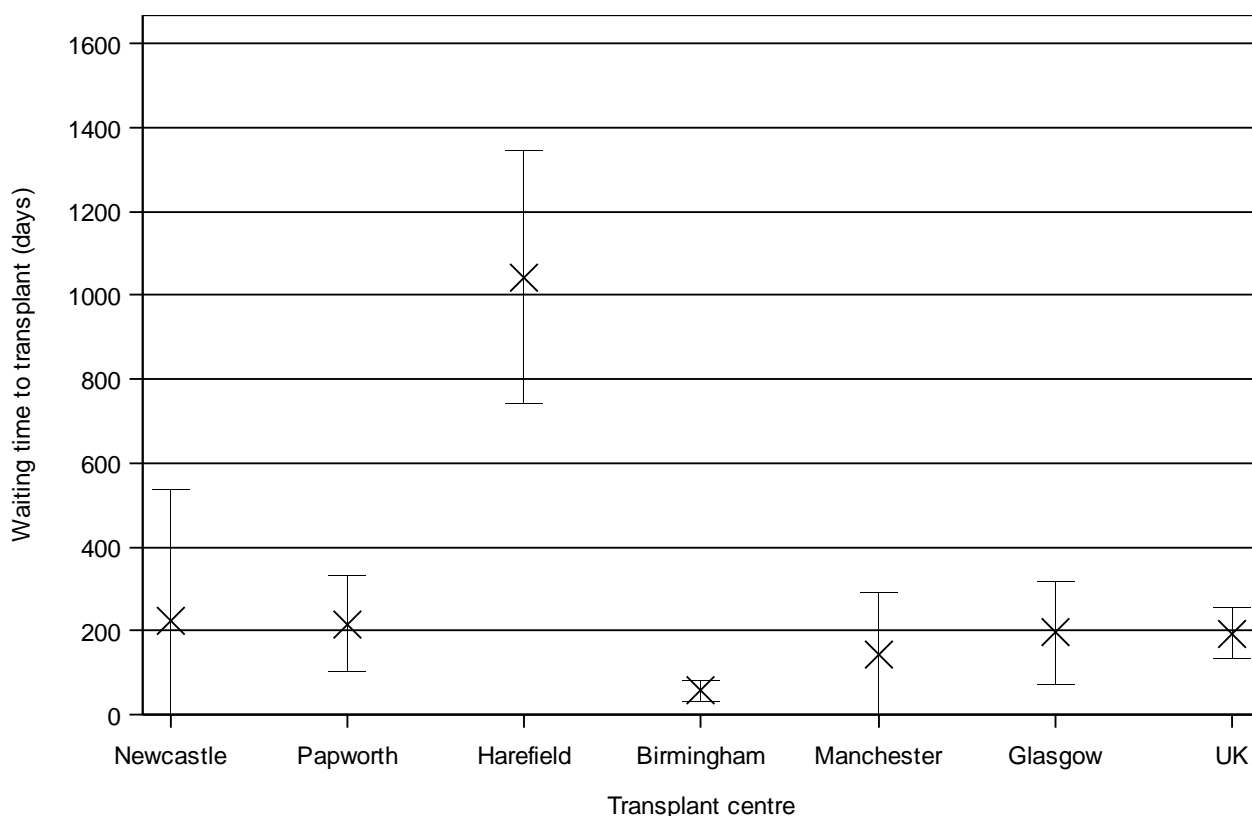


Table 3.2 Median waiting time to deceased donor transplant for adult patients registered on the heart transplant list, 1 April 2009 to 31 March 2012

Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Overall			
Newcastle	85	225	0 - 538
Papworth	137	217	102 - 332
Harefield	81	1043	741 - 1345
Birmingham	86	57	32 - 82
Manchester	57	144	0 - 290
Glasgow	47	196	72 - 320
UK	493	195	134 - 256
Never urgent			
Newcastle	36	840	0 - 1754
Papworth	65	395	221 - 569
Harefield ¹	46	-	-
Birmingham	45	71	51 - 91
Manchester	24	344	301 - 387
Glasgow	25	264	155 - 373
UK	241	366	243 - 489
Ever urgent			
Newcastle	49	140	26 - 254
Papworth	72	34	18 - 50
Harefield	35	293	0 - 666
Birmingham	41	35	6 - 64
Manchester	33	27	12 - 42
Glasgow	22	59	37 - 81
UK	252	58	38 - 78

¹ [Median](#) waiting time cannot be estimated

¹ Median waiting time cannot be estimated

ADULT HEART TRANSPLANTATION

Response to Offers



Figure 4.1 compares individual centre adult heart offer decline rates with the national rate between 1 April 2012 and 31 March 2015. Offer decline rates at Harefield, Newcastle and Papworth fall outside of the 99.8% [confidence limits](#). This indicates that Harefield and Newcastle had a significantly higher and Papworth had a significantly lower offer decline rate than the national average.

This analysis excludes fast track offers and only considers offers of hearts that were eventually transplanted. The offers included those to both urgent and non-urgent patients and first and subsequent offers.

**Figure 4.1 Adult heart offer decline rates that resulted in a transplant,
1 April 2012 to 31 March 2015**

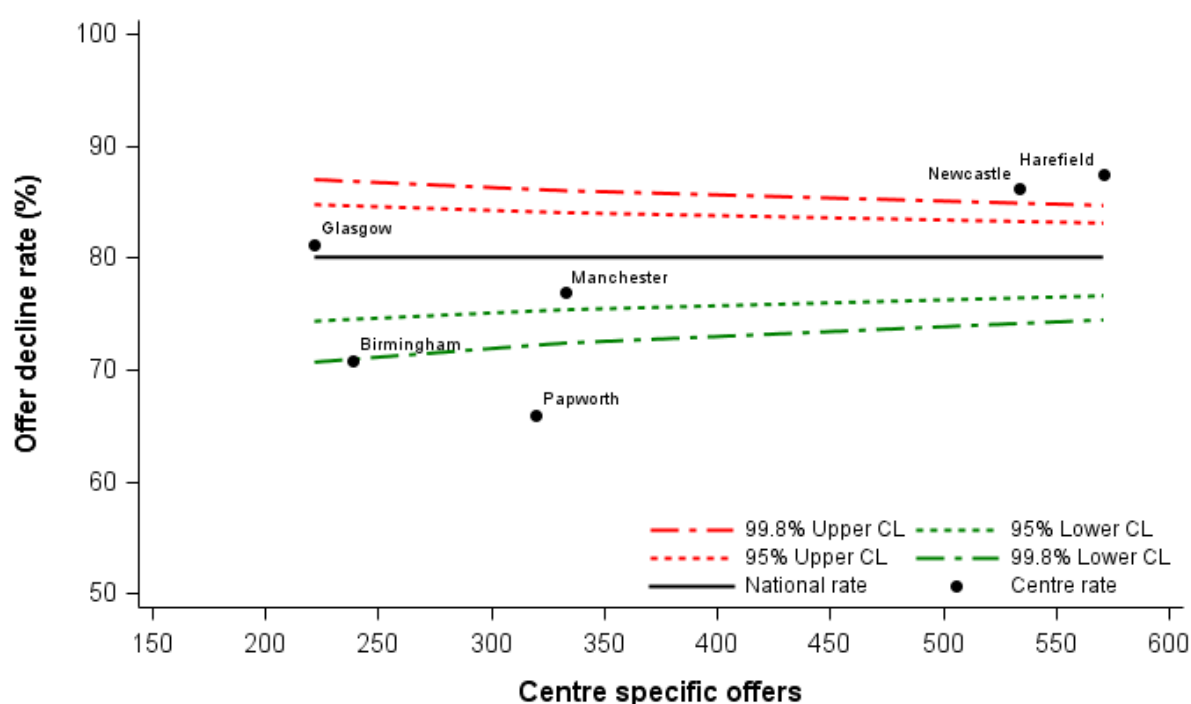


Table 4.1 compares individual centre heart offer decline rates over the same period by financial year. Harefield and Newcastle have had offer decline rates that are consistently higher than national rate over the last three financial years while Papworth and Birmingham have had consistently lower rates. Overall offer decline rates were 10% higher in 2014/2015 compared to the two previous years.

Table 4.1 Adult Heart (including cardiac block) offer results by transplant centre, 1 April 2012 and 31 March 2015

Centre	Financial year	Total Offers	Declined		Accepted, not used		Transplanted	
		N	N	(%)	N	(%)	N	(%)
Birmingham	2012/13	61	41	(67)	0	(0)	20	(33)
	2013/14	67	46	(69)	0	(0)	21	(31)
	2014/15	111	80	(72)	2	(2)	29	(26)
	Overall	239	167	(70)	2	(1)	70	(29)
Glasgow	2012/13	65	55	(85)	0	(0)	10	(15)
	2013/14	60	41	(68)	0	(0)	19	(32)
	2014/15	97	84	(87)	0	(0)	13	(13)
	Overall	222	180	(81)	0	(0)	42	(19)
Harefield	2012/13	102	81	(79)	0	(0)	21	(21)
	2013/14	185	158	(85)	1	(1)	26	(14)
	2014/15	284	259	(91)	0	(0)	25	(9)
	Overall	571	498	(87)	1	(0)	72	(13)
Manchester	2012/13	73	51	(70)	0	(0)	22	(30)
	2013/14	118	88	(75)	1	(1)	29	(25)
	2014/15	142	116	(82)	0	(0)	26	(18)
	Overall	333	255	(77)	1	(0)	77	(23)
Newcastle	2012/13	126	103	(82)	0	(0)	23	(18)
	2013/14	179	146	(82)	2	(1)	31	(17)
	2014/15	229	209	(91)	0	(0)	20	(9)
	Overall	534	458	(86)	2	(0)	74	(14)
Papworth	2012/13	78	48	(62)	2	(3)	28	(36)
	2013/14	112	64	(57)	1	(1)	47	(42)
	2014/15	130	96	(74)	0	(0)	34	(26)
	Overall	320	208	(65)	3	(1)	109	(34)
UK	2012/13	505	379	(75)	2	(0)	124	(25)
	2013/14	721	543	(75)	5	(1)	173	(24)
	2014/15	993	844	(85)	2	(0)	147	(15)
	Overall	2219	1766	(80)	9	(0)	444	(20)

ADULT HEART TRANSPLANTATION

Transplants



5.1 Adult heart transplants, 1 April 2005 – 31 March 2015

Figure 5.1 and **5.2** show the total number of adult heart transplants performed in the last ten years overall and by centre, respectively. The number of transplants increased steadily between 2009 and 2013, after which a substantial increase occurred. The number of transplants have since decreased by 15% over the last financial year. The number of transplants in the latest financial year (2014/2015) is shown by centre in **Figure 5.3**.

Figure 5.1 Number of adult heart transplants in the UK, by financial year, 1 April 2005 to 31 March 2015

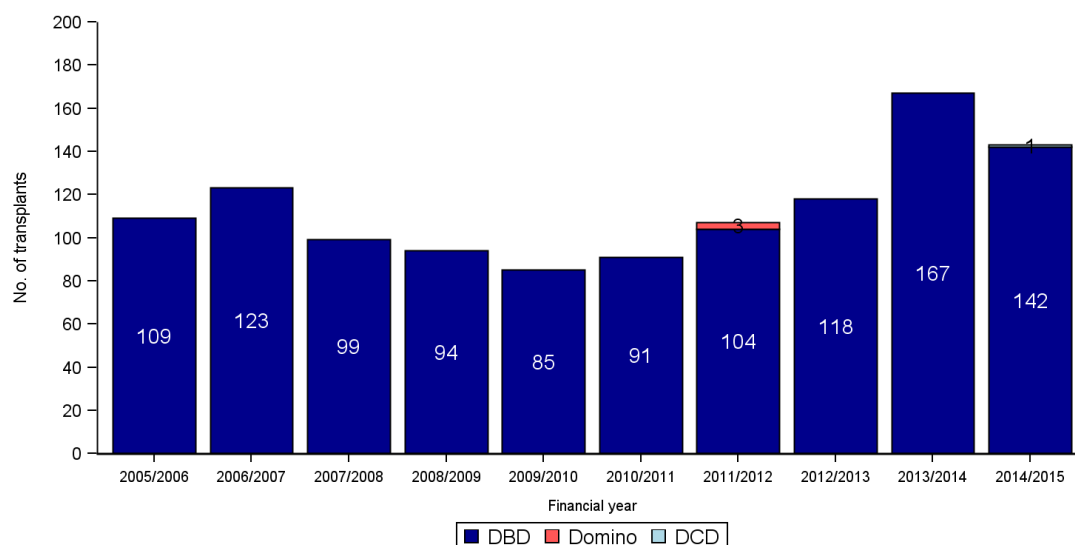


Figure 5.2 Number of adult heart transplants in the UK, by financial year and centre, 1 April 2005 to 31 March 2015

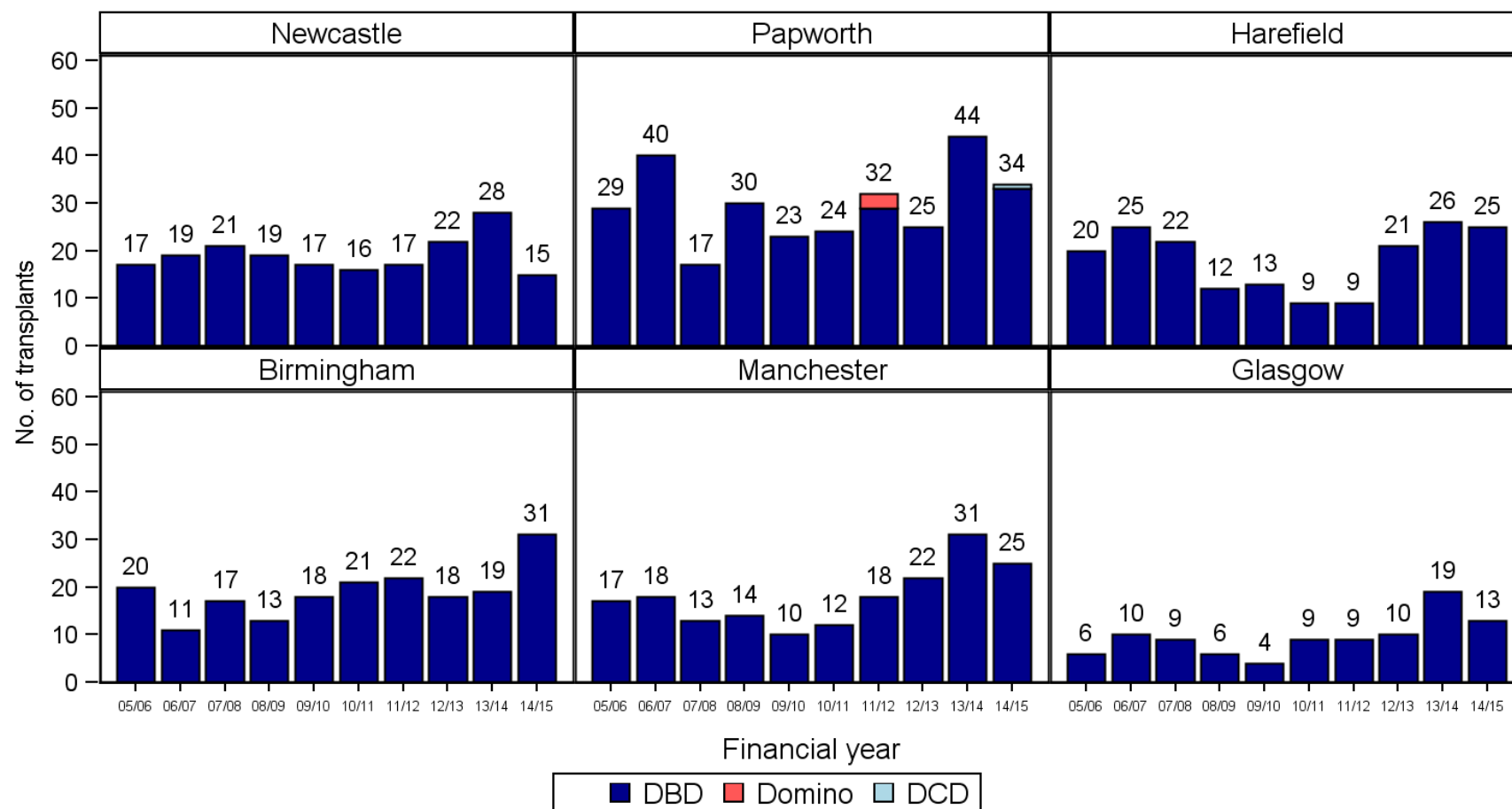


Figure 5.3 Number of adult heart transplants in the UK, by centre, 1 April 2014 to 31 March 2015

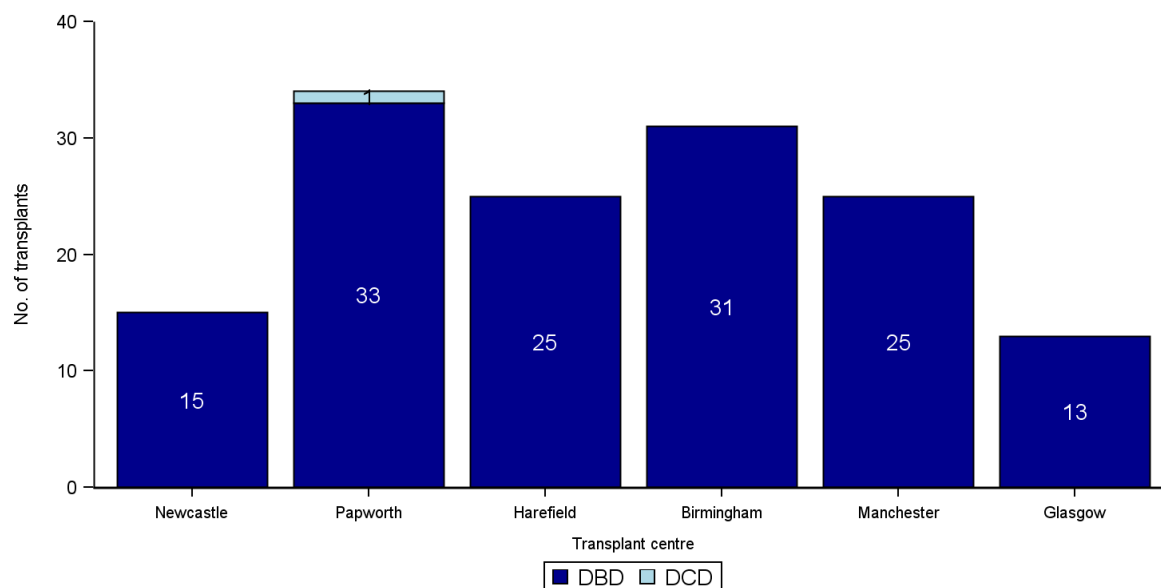


Figure 5.4 and **5.5** show the total number of adult heart transplants performed in the last ten years overall and by centre, respectively, by urgency status. The number of transplants by urgency status in the latest financial year (2014/2015) is shown by centre in **Figure 5.6**. The proportion of urgent transplants performed in each financial year has increased from 26% in 2005/2006 to 83% in 2014/2015. The proportion of urgent transplants performed at each centre in 2014/2015 ranged from 62% at Glasgow to 92% at Harefield and Manchester.

Figure 5.4 Number of adult heart transplants in the UK, by financial year and urgency status, 1 April 2005 to 31 March 2015

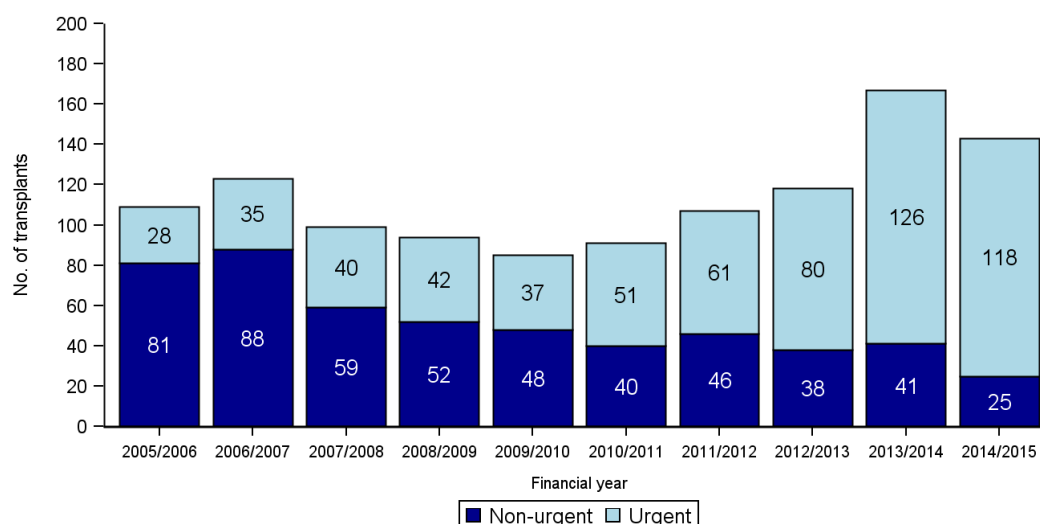
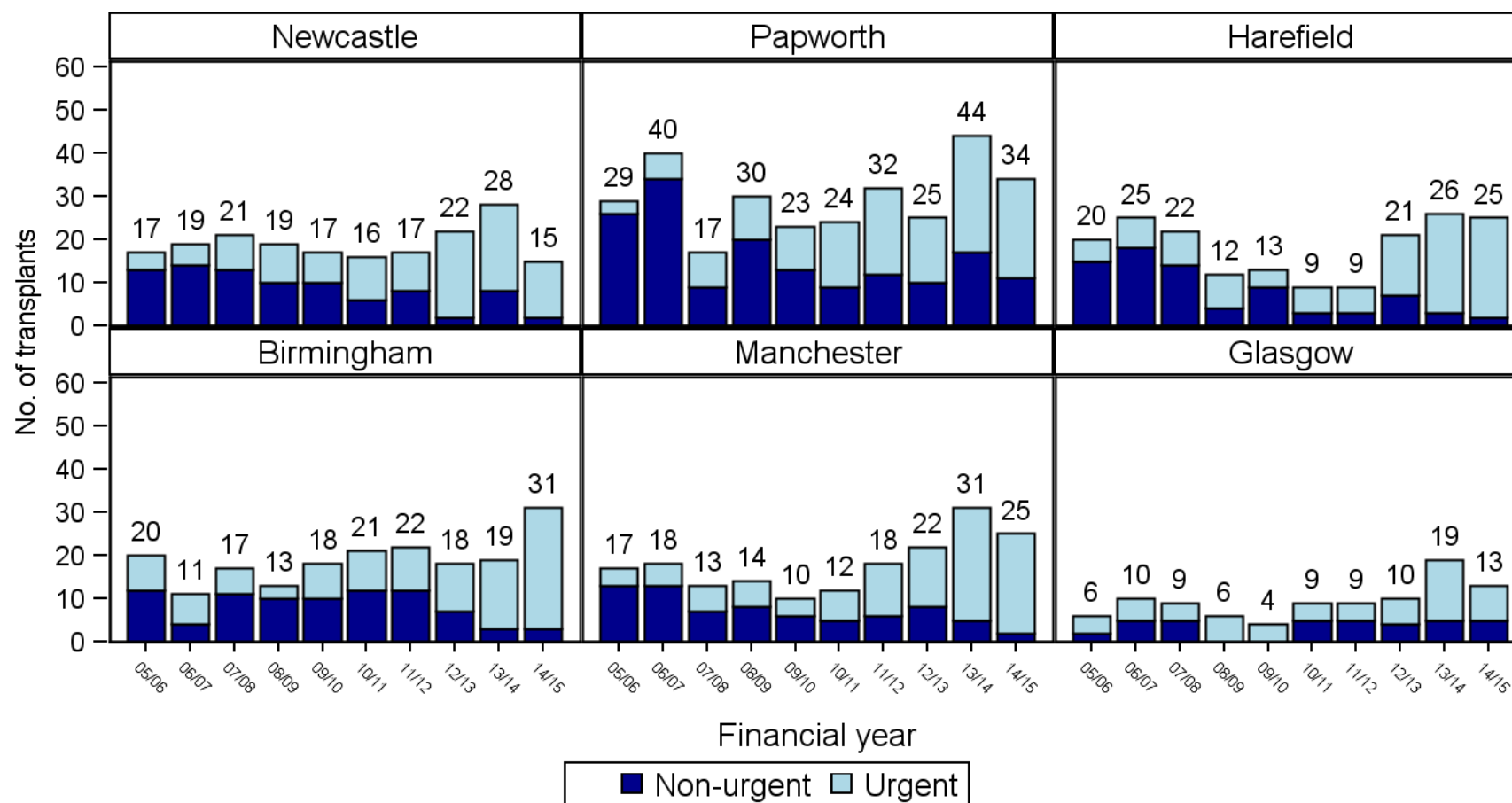
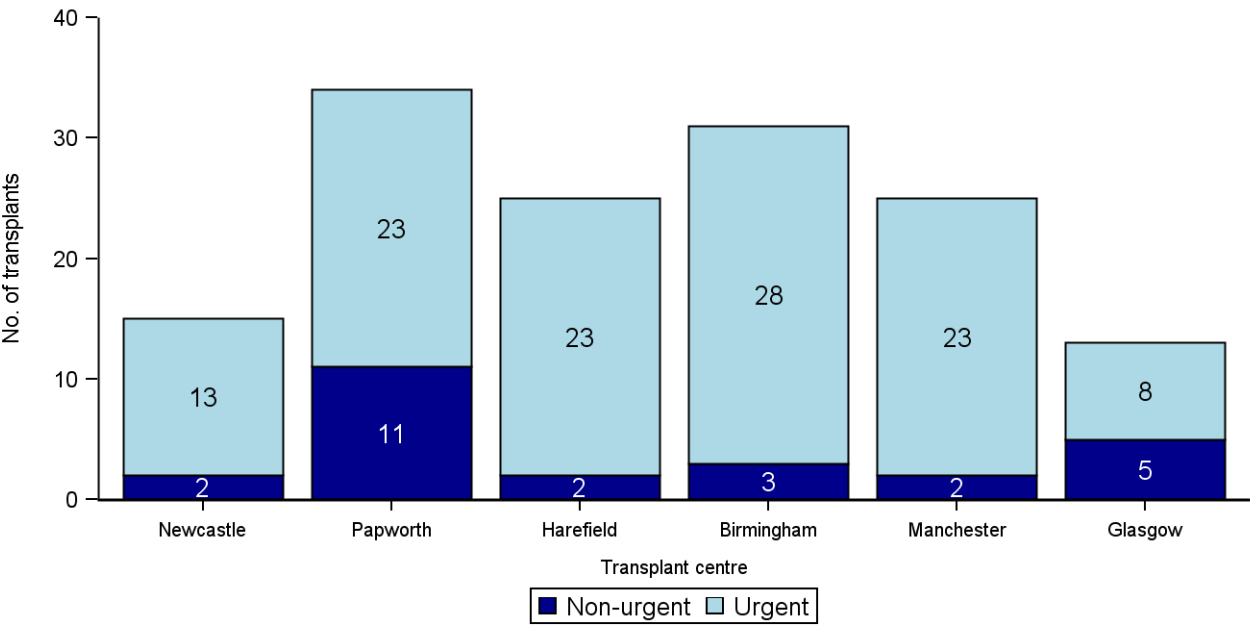


Figure 5.5 Number of adult heart transplants in the UK, by financial year, centre and urgency status, 1 April 2005 to 31 March 2015



**Figure 5.6 Number of adult heart transplants in the UK, by centre,
1 April 2014 to 31 March 2015**



The demographic characteristics of 143 adult heart transplant recipients in the latest year are shown by centre and overall in **Table 5.1**. 76% of these recipients were male and the [median](#) age was 49 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 5.1		Demographic characteristics of adult heart transplants 1 April 2014 to 31 March 2015, by centre						
		Newcastle N (%)	Papworth N (%)	Harefield N (%)	Birmingham N (%)	Manchester N (%)	Glasgow N (%)	TOTAL N (%)
Number		15 (100)	34 (100)	25 (100)	31 (100)	25 (100)	13 (100)	143 (100)
Urgency status at transplant	Urgent	13 (87)	23 (68)	23 (92)	28 (90)	23 (92)	8 (62)	118 (83)
	Non-urgent	2 (13)	11 (32)	2 (8)	3 (10)	2 (8)	5 (38)	25 (18)
Recipient sex	Male	11 (73)	26 (76)	18 (72)	23 (74)	21 (84)	9 (69)	108 (76)
	Female	4 (27)	8 (24)	7 (28)	8 (26)	4 (16)	4 (31)	35 (25)
Recipient ethnicity	White	15 (100)	30 (88)	22 (88)	27 (87)	23 (92)	13 (100)	130 (91)
	Non-white	0 (0)	4 (12)	3 (12)	3 (10)	2 (8)	0 (0)	12 (8)
	Missing	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	1 (1)
Recipient age	Median (IQR)	36 (25, 57)	53 (42, 60)	49 (42, 59)	49 (30, 57)	48 (33, 52)	50 (40, 56)	49 (34, 57)
	Missing	0	0	0	0	0	0	0
Recipient weight	Median (IQR)	70 (59, 80)	80 (70, 87)	77 (66, 88)	83 (72, 92)	77 (72, 86)	75 (72, 88)	77 (69, 88)
	Missing	0	0	0	0	0	0	0
NYHA class	II	0 (0)	1 (3)	0 (0)	1 (3)	0 (0)	1 (8)	3 (2)
	III	3 (20)	15 (44)	12 (48)	0 (0)	4 (16)	5 (38)	39 (27)
	IV	8 (53)	17 (50)	11 (44)	30 (97)	21 (84)	5 (38)	92 (64)
	Missing	4 (27)	1 (3)	2 (8)	0 (0)	0 (0)	2 (15)	9 (6)
Recipient on ventilator	No	7 (47)	25 (74)	22 (88)	31 (100)	22 (88)	7 (54)	114 (80)
	Yes	0 (0)	0 (0)	1 (4)	0 (0)	1 (4)	1 (8)	3 (2)
	Missing	8 (53)	9 (26)	2 (8)	0 (0)	2 (8)	5 (38)	26 (18)
Recipient VAD	None	6 (40)	16 (47)	9 (36)	27 (87)	15 (60)	7 (54)	80 (56)
	Left	5 (33)	0 (0)	11 (44)	2 (6)	1 (4)	0 (0)	19 (13)
	Right	0 (0)	3 (9)	0 (0)	1 (3)	0 (0)	0 (0)	4 (3)
	Both	0 (0)	7 (21)	3 (12)	1 (3)	7 (28)	2 (15)	20 (14)
	Missing	4 (27)	8 (24)	2 (8)	0 (0)	2 (8)	4 (31)	20 (14)

Table 5.1 Demographic characteristics of adult heart transplants 1 April 2014 to 31 March 2015, by centre								
		Newcastle N (%)	Papworth N (%)	Harefield N (%)	Birmingham N (%)	Manchester N (%)	Glasgow N (%)	TOTAL N (%)
Recipient TAH	No	7 (47)	25 (74)	21 (84)	31 (100)	23 (92)	8 (62)	115 (80)
	Yes	0 (0)	0 (0)	2 (8)	0 (0)	0 (0)	0 (0)	2 (1)
	Missing	8 (53)	9 (26)	2 (8)	0 (0)	2 (8)	5 (38)	26 (18)
Recipient ECMO	No	7 (47)	25 (74)	23 (92)	31 (100)	23 (92)	7 (54)	116 (81)
	Yes	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (8)	1 (1)
	Missing	8 (53)	9 (26)	2 (8)	0 (0)	2 (8)	5 (38)	26 (18)
Recipient on inotropes	No	1 (7)	13 (38)	13 (52)	5 (16)	9 (36)	4 (31)	45 (32)
	Yes	6 (40)	12 (35)	10 (40)	26 (84)	14 (56)	4 (31)	72 (50)
	Missing	8 (53)	9 (26)	2 (8)	0 (0)	2 (8)	5 (38)	26 (18)
Recipient IABP	No	7 (47)	25 (74)	22 (88)	31 (100)	22 (88)	3 (23)	110 (77)
	Yes	0 (0)	0 (0)	1 (4)	0 (0)	1 (4)	5 (38)	7 (5)
	Missing	8 (53)	9 (26)	2 (8)	0 (0)	2 (8)	5 (38)	26 (18)
Recipient CMV status	No	11 (73)	10 (29)	14 (56)	19 (61)	15 (60)	6 (46)	75 (52)
	Yes	4 (27)	24 (71)	11 (44)	12 (39)	10 (40)	7 (54)	68 (48)
Recipient HCV status	No	15 (100)	34 (100)	25 (100)	31 (100)	25 (100)	13 (100)	143 (100)
Recipient HBV status	No	15 (100)	34 (100)	25 (100)	31 (100)	25 (100)	13 (100)	143 (100)
Recipient HIV status	No	15 (100)	34 (100)	25 (100)	31 (100)	25 (100)	13 (100)	143 (100)
Recipient Serum Creatinine	Median (IQR)	116 (75, 146)	128 (101, 139)	87 (64, 99)	100 (72, 123)	76 (70, 100)	114 (82, 141)	99 (73, 130)
	Missing	5	2	3	1	0	3	14
Donor sex	Male	10 (67)	19 (56)	17 (68)	22 (71)	15 (60)	6 (46)	89 (62)
	Female	5 (33)	15 (44)	8 (32)	9 (29)	10 (40)	7 (54)	54 (38)
Donor ethnicity	White	11 (73)	21 (62)	21 (84)	30 (97)	23 (92)	11 (85)	117 (82)
	Non-white	0 (0)	7 (21)	1 (4)	0 (0)	1 (4)	2 (15)	11 (8)
	Missing	4 (27)	6 (18)	3 (12)	1 (3)	1 (4)	0 (0)	15 (11)
Donor age	Median (IQR)	32 (19, 48)	43 (33, 51)	45 (38, 53)	38 (30, 45)	39 (31, 50)	44 (35, 51)	40 (31, 50)
	Missing	0	0	0	0	0	0	0

Table 5.1 Demographic characteristics of adult heart transplants 1 April 2014 to 31 March 2015, by centre								
		Newcastle N (%)	Papworth N (%)	Harefield N (%)	Birmingham N (%)	Manchester N (%)	Glasgow N (%)	TOTAL N (%)
Donor BMI	Median (IQR)	26 (22, 32)	25 (21, 28)	27 (25, 29)	25 (23, 29)	27 (25, 29)	28 (26, 31)	26 (24, 29)
	Missing	0	0	0	0	0	0	0
Donor cause of death	CVA	11 (73)	31 (91)	20 (80)	20 (65)	20 (80)	10 (77)	112 (78)
	Trauma	2 (13)	3 (9)	3 (12)	7 (23)	5 (20)	1 (8)	21 (15)
	Others	2 (13)	0 (0)	2 (8)	4 (13)	0 (0)	2 (15)	10 (7)
Donor hypotension	No	4 (27)	27 (79)	19 (76)	19 (61)	19 (76)	10 (77)	98 (69)
	Yes	5 (33)	7 (21)	4 (16)	10 (32)	6 (24)	2 (15)	34 (24)
	Missing	6 (40)	0 (0)	2 (8)	2 (6)	0 (0)	1 (8)	11 (8)
Donor past diabetes	No	10 (67)	34 (100)	23 (92)	30 (97)	25 (100)	12 (92)	134 (94)
	Yes	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	1 (1)
	Missing	5 (33)	0 (0)	2 (8)	0 (0)	0 (0)	1 (8)	8 (6)
Donor cardiac arrest	No	15 (100)	33 (97)	25 (100)	31 (100)	25 (100)	13 (100)	142 (99)
	Missing	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Donor past hypertension	No	10 (67)	22 (65)	21 (84)	28 (90)	24 (96)	10 (77)	115 (80)
	Yes	0 (0)	11 (32)	2 (8)	3 (10)	1 (4)	3 (23)	20 (14)
	Missing	5 (33)	1 (3)	2 (8)	0 (0)	0 (0)	0 (0)	8 (6)
Donor past tumour	No	10 (67)	31 (91)	22 (88)	28 (90)	25 (100)	13 (100)	129 (90)
	Yes	0 (0)	3 (9)	1 (4)	3 (10)	0 (0)	0 (0)	7 (5)
	Missing	5 (33)	0 (0)	2 (8)	0 (0)	0 (0)	0 (0)	7 (5)
Donor past smoker	No	1 (7)	17 (50)	14 (56)	17 (55)	10 (40)	5 (38)	64 (45)
	Yes	9 (60)	17 (50)	9 (36)	13 (42)	15 (60)	7 (54)	70 (49)
	Missing	5 (33)	0 (0)	2 (8)	1 (3)	0 (0)	1 (8)	9 (6)

5.2 Total ischaemia time, 1 April 2005 – 31 March 2015

Figure 5.7 shows the [median](#) total ischaemia time in adult **DBD** donor heart transplants over the last 10 years. The [median](#) total ischaemia time has remained fairly stable over the last 10 years.

Figure 5.7 Median total ischaemia time in adult DBD donor heart transplants, by financial year, 1 April 2005 to 31 March 2015

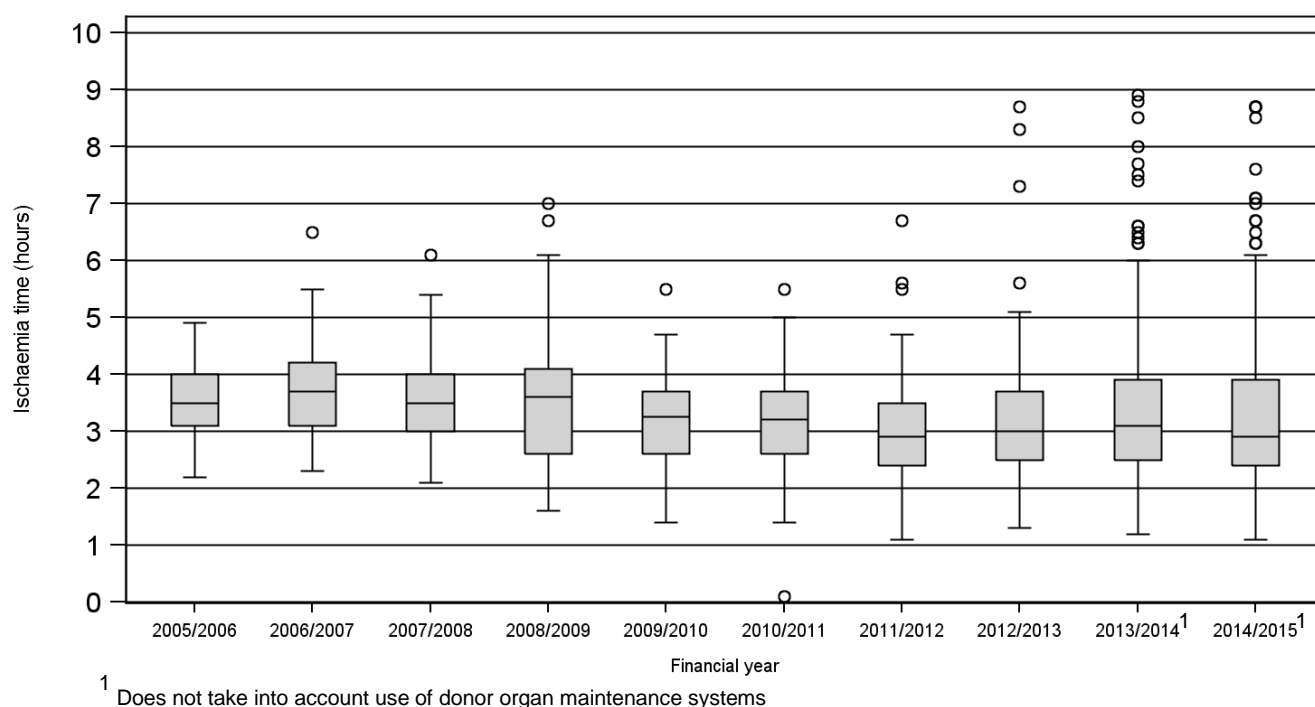


Figure 5.8 and **Figure 5.9** show the [median](#) total ischaemia time in adult **DBD** donor heart transplants, by centre, in the latest financial year (2014/2015) and over the last 10 years respectively. Papworth has seen an overall decrease in [median](#) total ischaemia time. Harefield experienced a substantial increase in [median](#) total ischaemia time during 2013/2014 and 2014/2015 which has led to this centre having a much higher [median](#) time than all other centres. However, this analysis does not take into account the use of donor organ maintenance systems for some transplants. These enable warm blood perfusion to continue ex-vivo during transportation. For such transplants, the definition of total ischemia time used here (cross-clamp to reperfusion) over-estimates the true ischaemia time because the heart is not subject to ischaemia during transportation.

Figure 5.8 Median total ischaemia time in adult DBD donor heart transplants, by transplant centre, 1 April 2014 to 31 March 2015

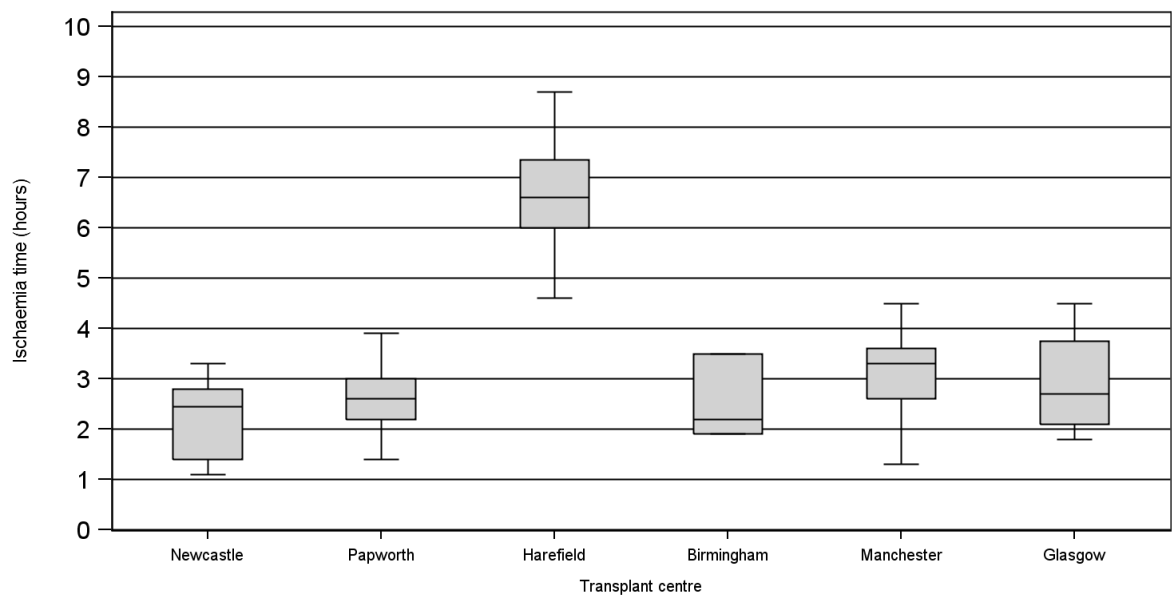
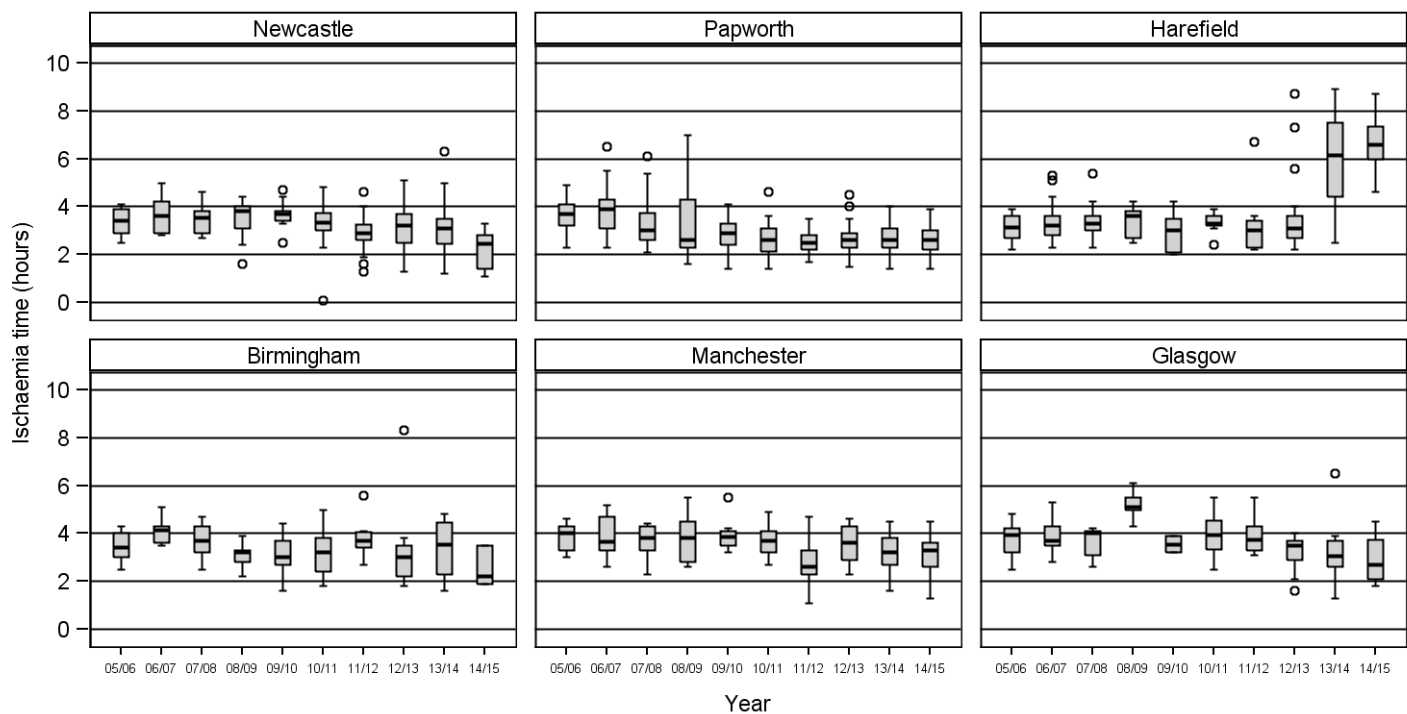


Figure 5.9 Median total ischaemia time in adult DBD donor heart transplants, by transplant centre and financial year, 1 April 2005 to 31 March 2015



ADULT HEART TRANSPLANTATION

Post-Transplant Survival



The survival analysis results presented in this section exclude:

- [Multi-organ transplants](#)
- Second (or greater) graft transplants

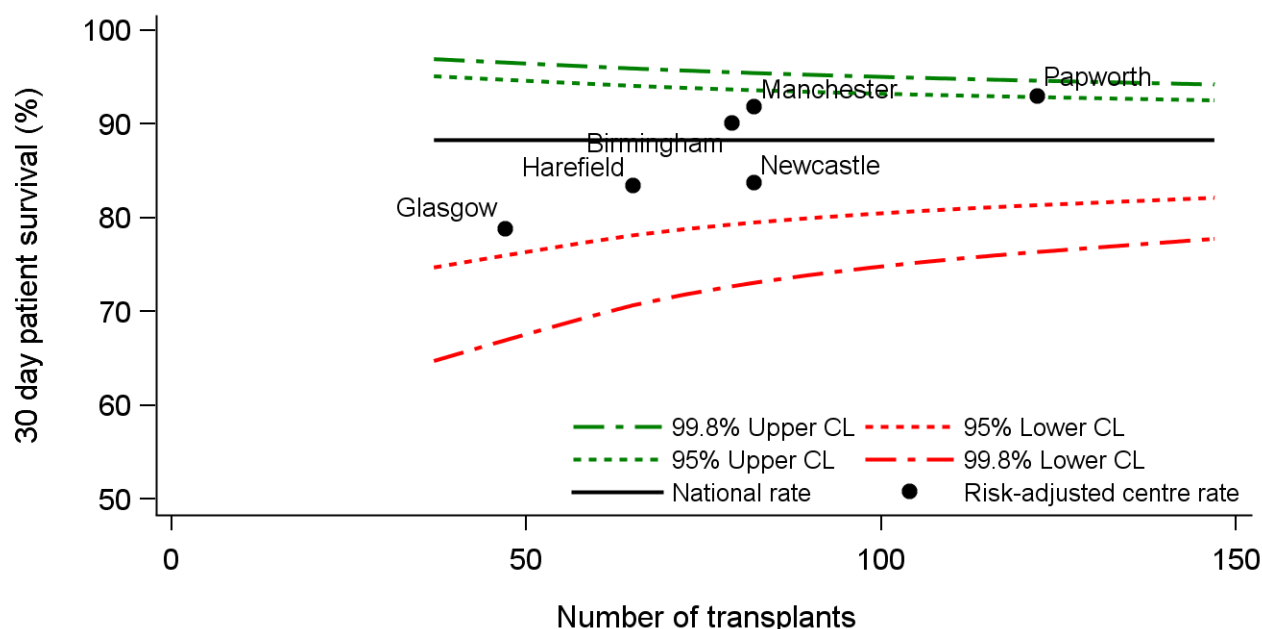
30-day and 1-year [survival rates](#) are based on transplants performed in the period 1 April 2010 to 31 March 2014 while 5-year survival rates are based on transplants performed in the period 1 April 2006 to 31 March 2010.

For the 477 adult heart transplants that were performed in the period 1 April 2010 and 31 March 2014, 30-day outcome information was known for all 477 patients. Thirty day [unadjusted](#) and [risk-adjusted](#) patient survival for these heart transplants is shown in **Table 6.1**. None of the centres were statistically significantly different to the national rate, as shown in the [funnel plot](#) in **Figure 6.1**. 30-day patient survival at Papworth exceeded the 95% [confidence limit](#) but was within the 99.8% [confidence interval](#).

The [risk factors](#) used in these models are found in **Appendix A3.1**. Please note that these models do not include ischaemia time as a risk factor. Ischaemia time is understood to be one of the most dominant factors in terms of short-term survival however the use of donor organ maintenance systems mean that ischaemia time can no longer be calculated in the traditional manner (time between cross clamp and reperfusion). It is therefore not appropriate to include a term for ischaemia time in the models until a detailed data collection process on these systems has taken place and the statistical impact of their use upon post-transplant survival has been investigated.

Table 6.1 30 day patient survival after first adult heart transplants, by centre, 1 April 2010 and 31 March 2014					
Centre	Number of transplants	% 30 day survival (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	82	81.7	(71.5 - 88.5)	83.8	(73.1 - 90.2)
Papworth	122	92.6	(86.3 - 96.1)	93.0	(86.6 - 96.4)
Harefield	65	87.7	(76.9 - 93.6)	83.5	(67.1 - 91.8)
Birmingham	79	88.6	(79.3 - 93.9)	90.1	(81.0 - 94.9)
Manchester	82	92.7	(84.4 - 96.6)	91.9	(81.9 - 96.3)
Glasgow	47	80.9	(66.4 - 89.5)	78.9	(59.5 - 89.0)
UK	477	88.3	(85 - 90.8)		

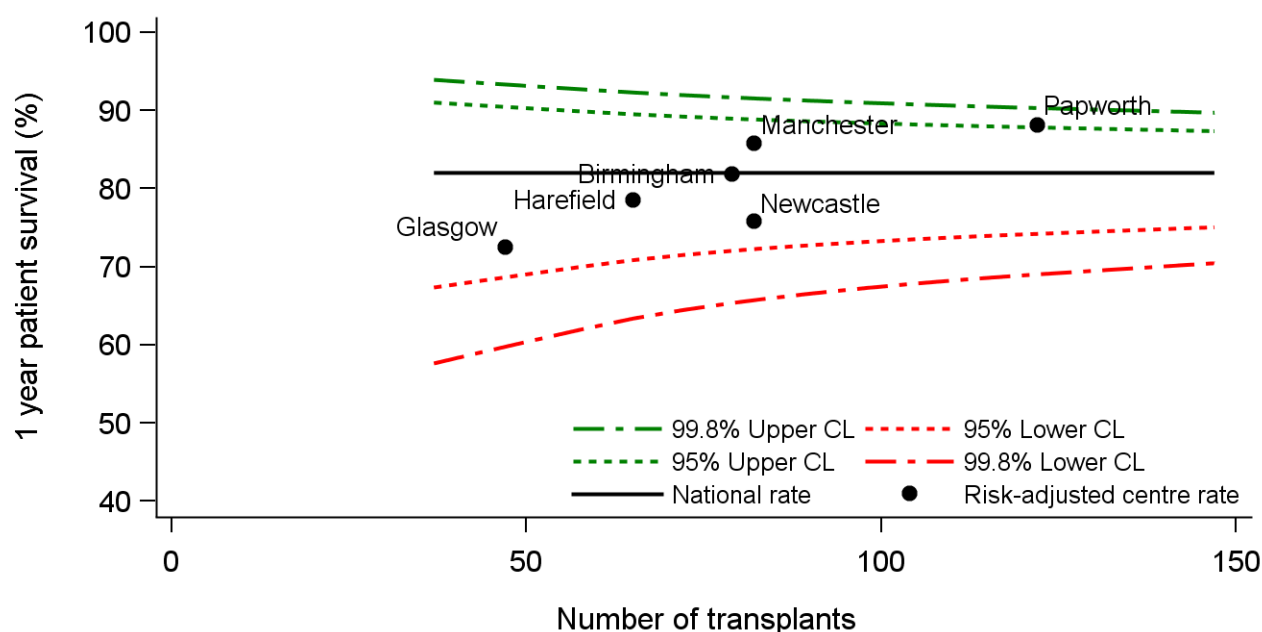
Figure 6.1 Risk-adjusted 30 day patient survival for adult heart transplants, by centre , 1 April 2010 to 31 March 2014



For the 477 adult heart transplants that were performed in the period 1 April 2010 and 31 March 2014, one-year outcome information was known for 419 patients. One year [unadjusted](#) and [risk-adjusted](#) patient survival for these heart transplants is shown in **Table 6.2**. None of the centres were statistically significantly different to the national rate, as shown in the [funnel plot](#) in **Figure 6.2**. 1-year patient survival at Papworth exceeded the 95% [confidence limit](#) but was within the 99.8% [confidence interval](#).

Table 6.2 1 year patient survival after first adult heart transplants, by centre, 1 April 2010 and 31 March 2014					
Centre	Number of transplants	% 1 year survival (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	82	74.4	(63.5 - 82.5)	75.8	(62.9 - 84.2)
Papworth	122	86.9	(79.5 - 91.8)	88.1	(80.6 - 92.7)
Harefield	65	81.5	(69.8 - 89.1)	78.5	(62.2 - 87.8)
Birmingham	79	79.7	(69.1 - 87.1)	81.9	(70.4 - 88.9)
Manchester	82	87.8	(78.5 - 93.2)	85.9	(73.8 - 92.4)
Glasgow	47	76.6	(61.7 - 86.3)	72.5	(50.3 - 84.8)
UK	477	82	(78.2 - 85.1)		

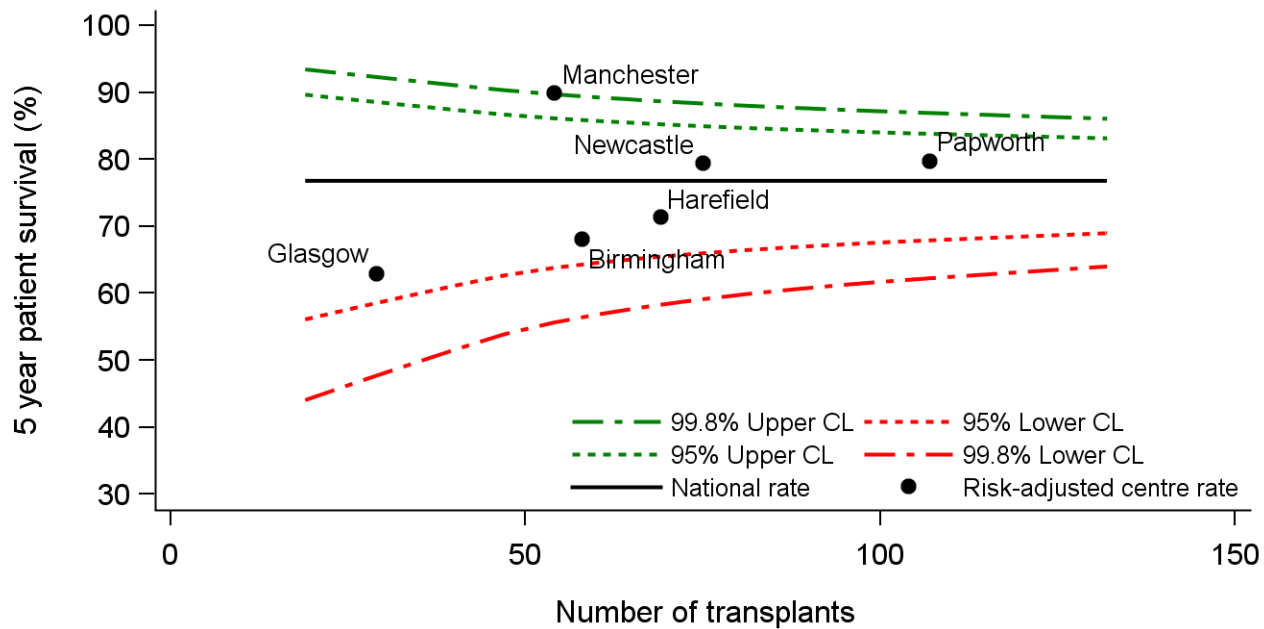
Figure 6.2 Risk-adjusted one-year patient survival for adult heart transplants, by centre, 1 April 2010 to 31 March 2014



For the 392 adult heart transplants that were performed in the period 1 April 2006 and 31 March 2010, 5-year outcome information was known for 351 patients. Five year [unadjusted](#) and [risk-adjusted](#) patient survival for these heart transplants is shown in **Table 6.3**. None of the centres apart from Manchester were statistically significantly different to the national rate, as shown in the [funnel plot](#) in **Figure 6.3**. 5-year patient survival at Manchester exceeded the 99.8% [confidence limit](#) indicating that they their risk-adjusted post-transplant survival was significantly different to the national rate.

Centre	Number of transplants	% 5 year survival (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	75	77.3	(66.1 - 85.2)	79.5	(67.0 - 87.3)
Papworth	107	79.3	(70.3 - 85.9)	79.7	(69.2 - 86.6)
Harefield	69	72.5	(60.3 - 81.5)	71.4	(55.2 - 81.8)
Birmingham	58	68.9	(55.2 - 79.1)	68.1	(49.4 - 79.9)
Manchester	54	90.7	(79.2 - 96)	90.0	(76.0 - 95.8)
Glasgow	29	65.5	(45.4 - 79.7)	63.0	(31.2 - 80.1)
UK	392	76.7	(72.2 - 80.6)		

Figure 6.3 Risk-adjusted five year patient survival for adult heart transplants, by centre, 1 April 2006 to 31 March 2010



ADULT HEART TRANSPLANTATION

Survival from Listing



Survival from listing was analysed for patients ≥ 18 years registered for the first time for a heart transplant between 1 January 2003 and 31 December 2014. 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. Survival time was censored at either date of removal from the list, or at the last known follow-up date post-transplant when no death date was recorded, or at time of analysis if the patient was still active on the transplant list.

One, five and ten year [risk-adjusted](#) survival rates from the point of heart transplant listing are shown by centre in **Figures 7.1, 7.2 and 7.3** respectively. These rates are also shown in **Table 7.1**.

In terms of one year survival rate, two centres fell above and two fell below the upper and lower 95% [confidence intervals](#), respectively, however all survival rates were within the 99.8% [confidence limits](#). Five and ten year survival from listing rates at Newcastle, however, fell below the 99.8% [confidence limit](#) suggesting that these rates may be significantly lower than the national average.

Table 7.1 Risk-adjusted 1, 5 and 10 year patient survival from listing for first deceased donor heart transplant in patients registered between 1 January 2003 to 31 December 2014						
Centre	One year		Five year		Ten year	
	N	(%)	N	(%)	N	(%)
Newcastle	346	(75)	346	(57)	346	(45)
Papworth	472	(84)	472	(72)	472	(61)
Harefield	372	(82)	372	(67)	372	(56)
Birmingham	286	(73)	286	(59)	286	(45)
Manchester	270	(85)	270	(73)	270	(58)
Glasgow	158	(78)	158	(61)	158	(51)
UK	1904	(80)	1904	(66)	1904	(54)

Figure 7.1 Risk-adjusted one year patient survival from listing

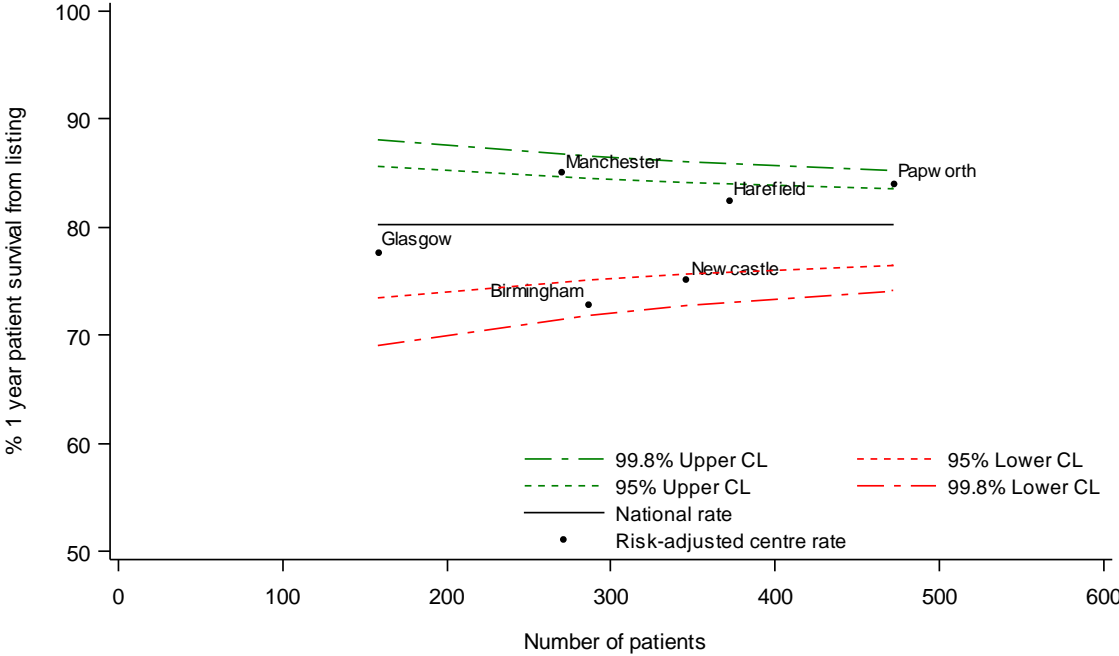


Figure 7.2 Risk-adjusted five year patient survival from listing

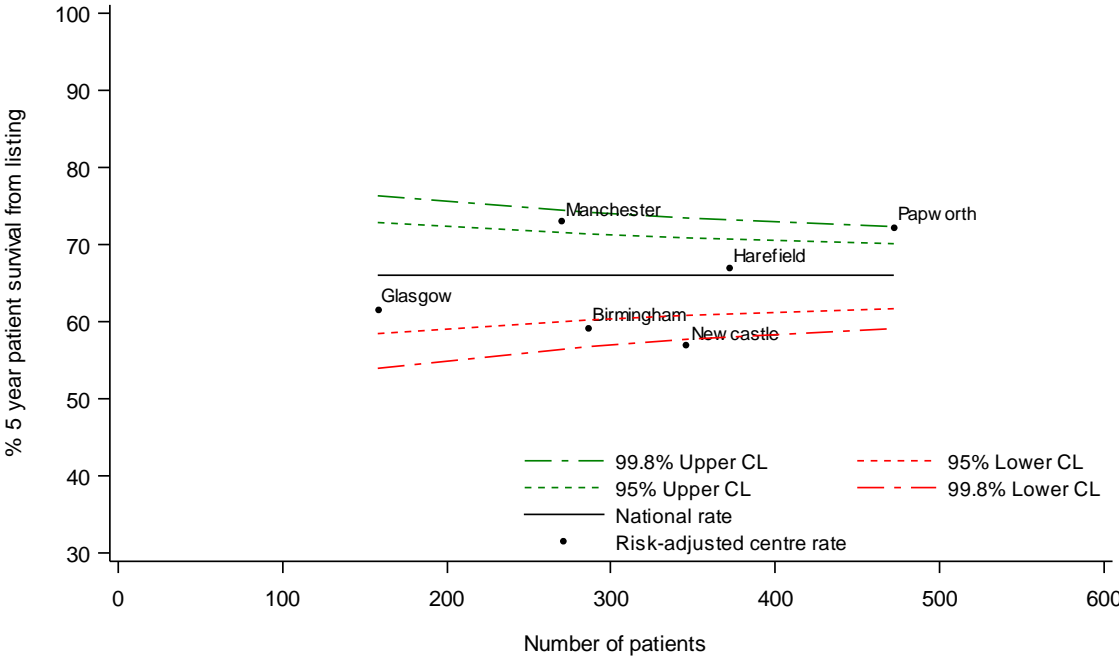
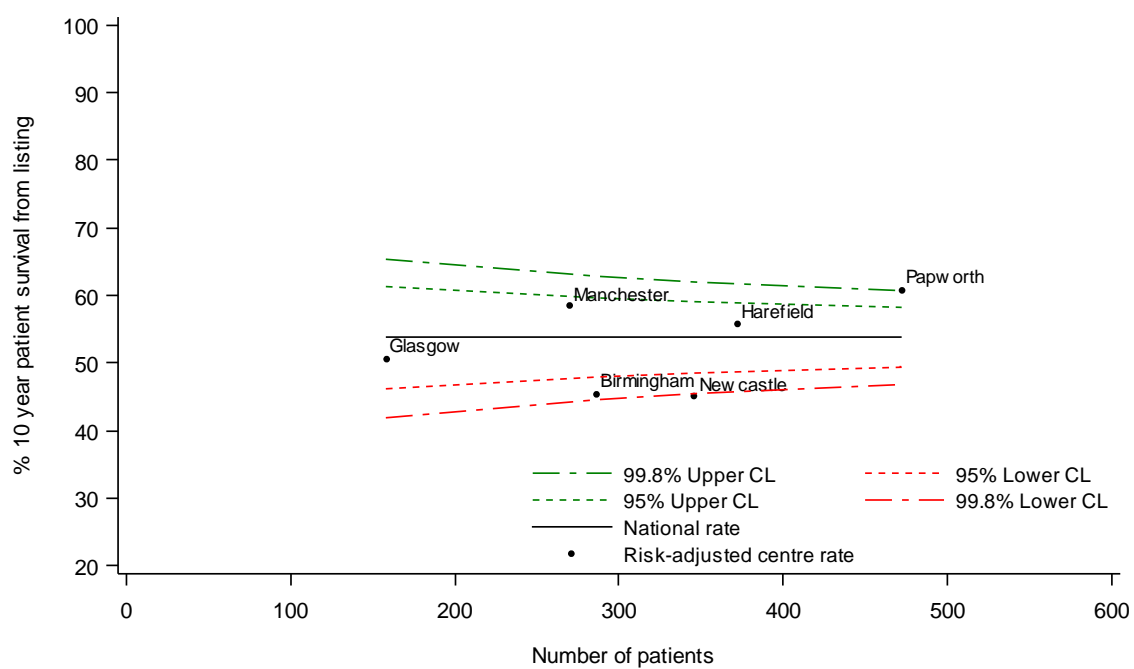


Figure 7.3 Risk-adjusted ten year patient survival from listing



ADULT LUNG TRANSPLANTATION

Transplant List



8.1 Adult lung and heart/lung transplant list as at 31 March, 2006 – 2015

Figure 8.1 shows the number of adult patients on the lung transplant list at 31 March each year between 2006 and 2015. The number of patients actively waiting for a lung transplant decreased from 297 in 2006 to 211 in 2011 and has since been on the increase, reaching 321 in 2015.

Figure 8.1 Adult patients on the lung transplant list at 31 March each year for the last 10 years, by year

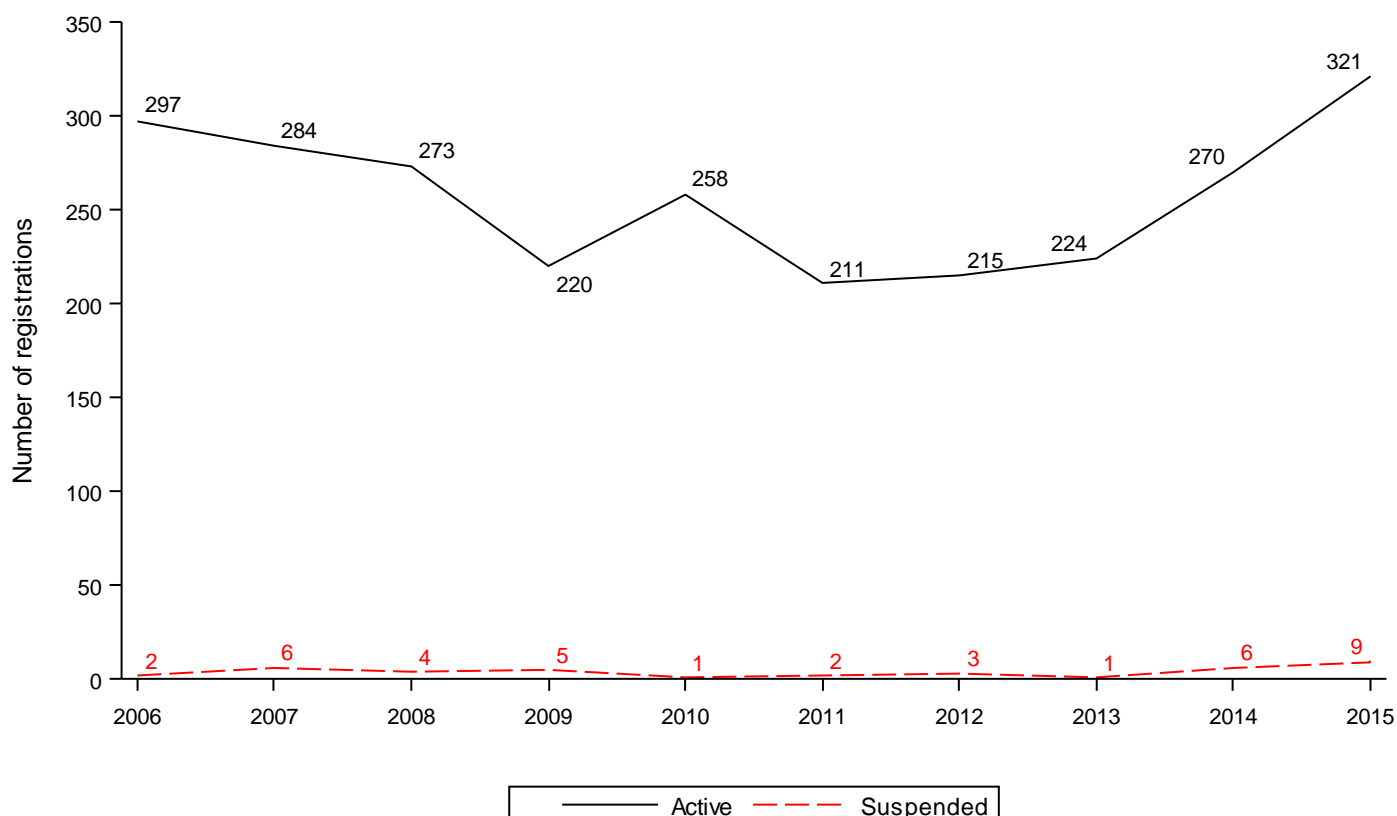


Figure 8.2 shows the number of adult patients on the active lung transplant list on 31 March 2015 by centre. In total, there were 321 adult patients. Harefield had the largest proportion (36%) of the transplant list whilst Papworth had the smallest (9%)

Figure 8.2 Adult patients on the active lung transplant list at 31 March 2015, by centre

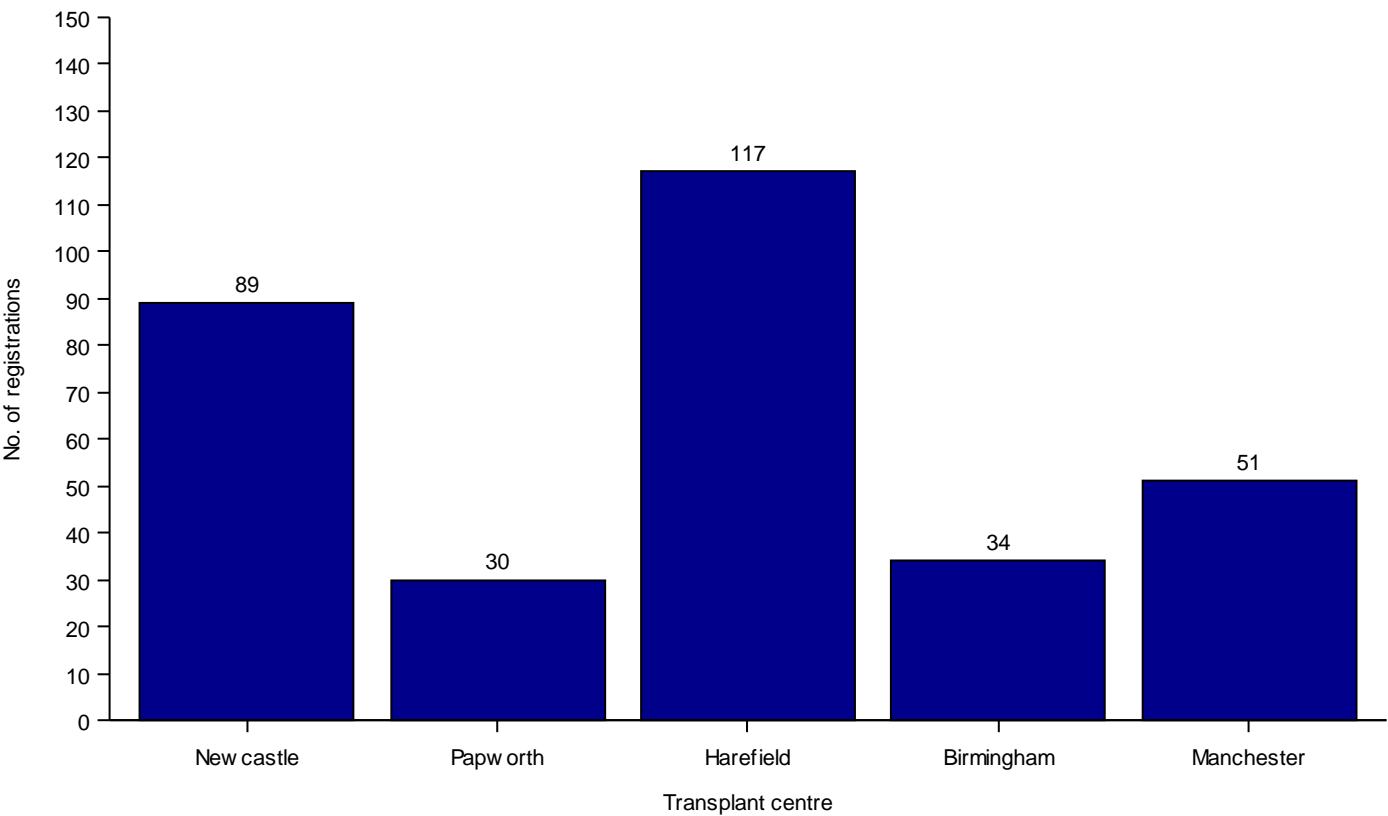
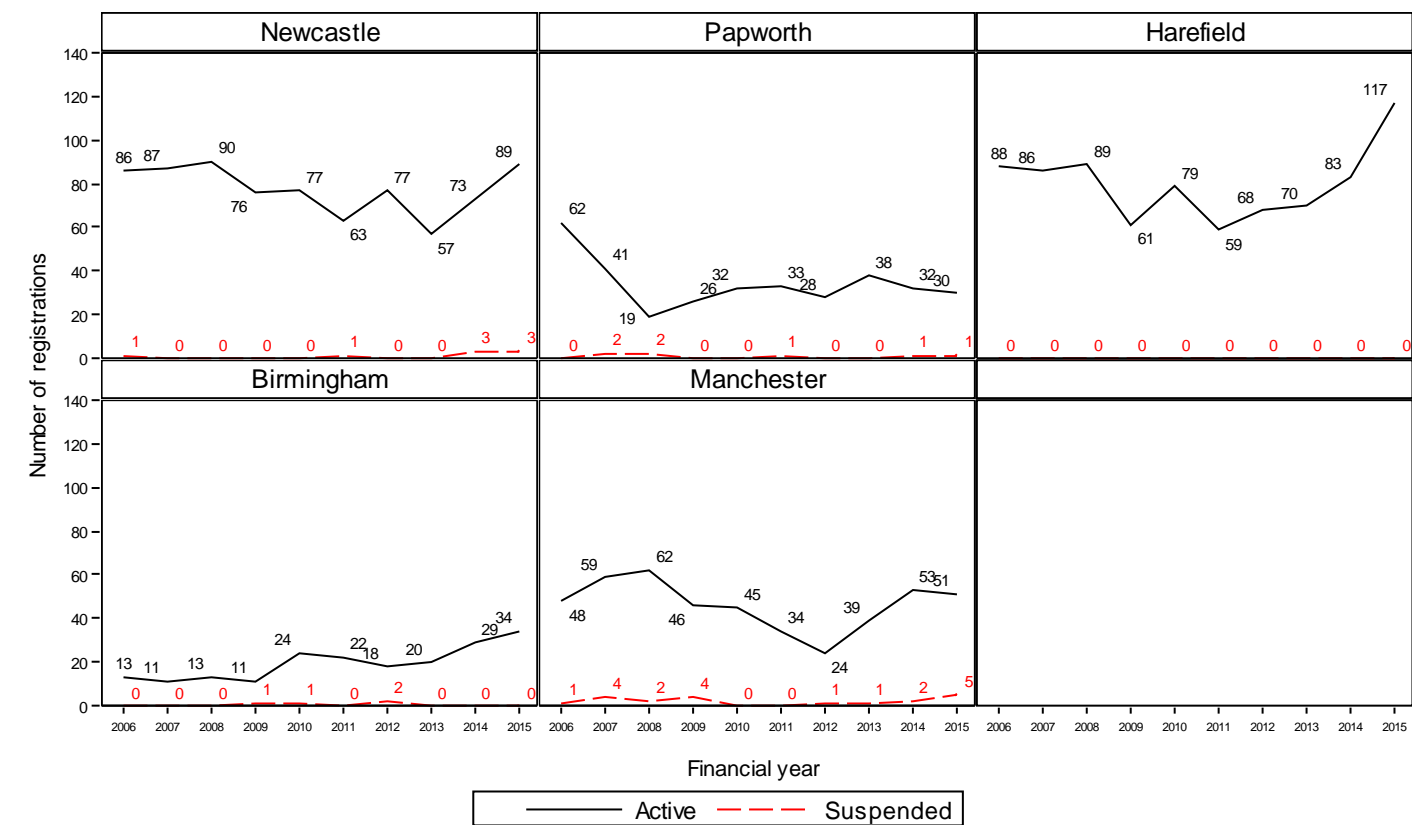


Figure 8.3 shows the number of adult patients on the transplant list at 31 March each year between 2006 and 2015 for each centre.

Figure 8.3 Adult patients on the lung transplant list at 31 March each year for the last 10 years, by year and centre



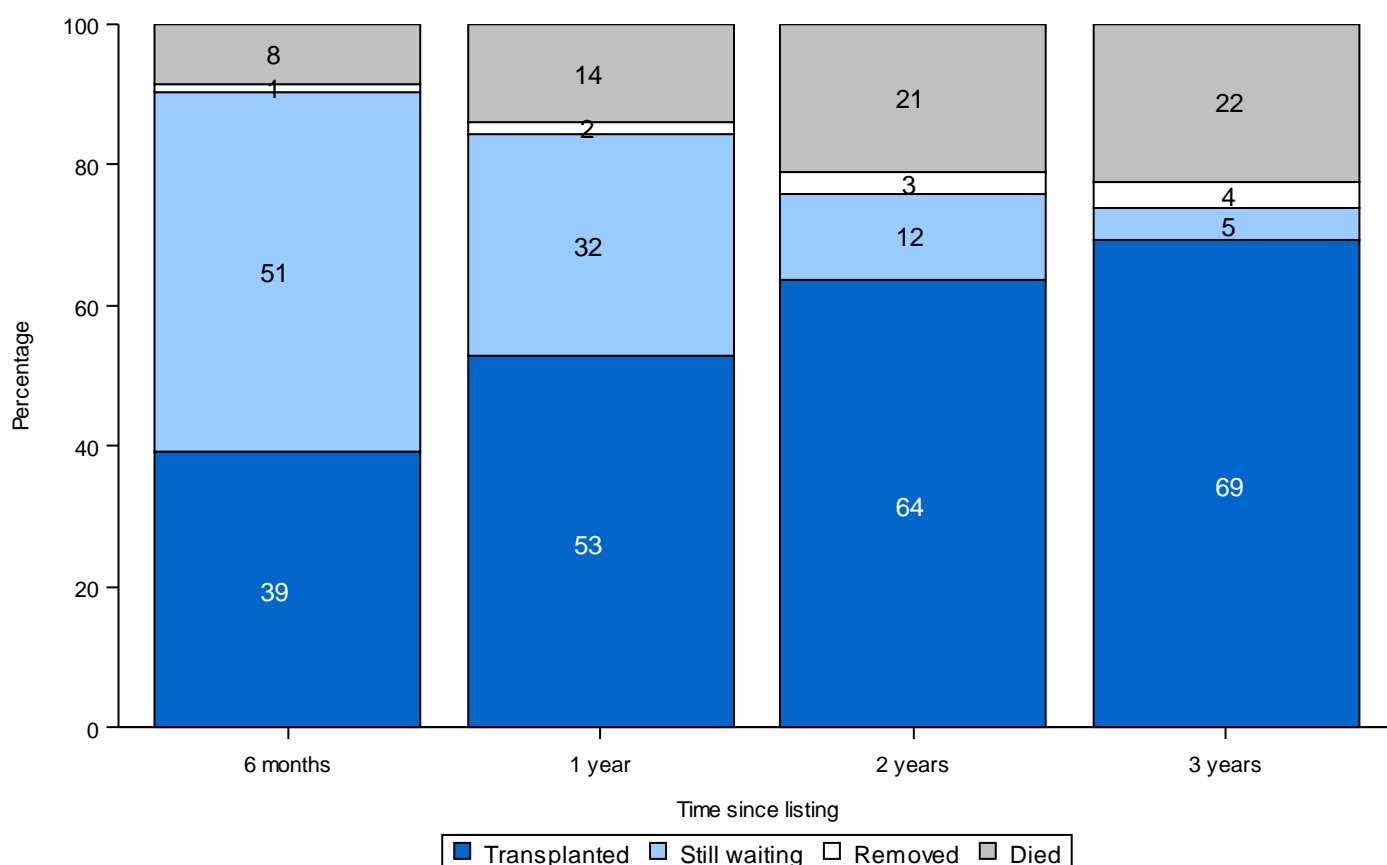
The demographic characteristics of the 321 adult patients on the active lung transplant list on the 31 March 2015 are shown by centre and overall in **Table 8.1**. 45% of the recipients were male and the median age was 52 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 8.1		Demographic characteristics of adult lung transplant list patients at 31 March 2015, by centre					
		Newcastle N (%)	Papworth N (%)	Harefield N (%)	Birmingham N (%)	Manchester N (%)	TOTAL N (%)
Number		89 (100)	30 (100)	117 (100)	34 (100)	51 (100)	321 (100)
Recipient sex	Male	35 (39)	15 (50)	57 (49)	13 (38)	23 (45)	143 (45)
	Female	54 (61)	15 (50)	60 (51)	21 (62)	28 (55)	178 (56)
Recipient ethnicity	White	85 (96)	27 (90)	103 (88)	30 (88)	45 (88)	290 (90)
	Non-white	4 (4)	3 (10)	14 (12)	4 (12)	3 (6)	28 (9)
	Missing	0 (0)	0 (0)	0 (0)	0 (0)	3 (6)	3 (1)
Recipient age	Median (IQR)	52 (39, 58)	49 (34, 57)	52 (33, 59)	55 (49, 61)	54 (49, 60)	52 (40, 60)
	Missing	0	0	0	0	0	0
Primary Disease	Cystic fibrosis and bronchiectasis	19 (21)	6 (20)	37 (32)	5 (15)	6 (12)	73 (23)
	Fibrosing lung disease	34 (38)	10 (33)	30 (26)	9 (26)	17 (33)	100 (31)
	COPD and emphysema	18 (20)	1 (3)	29 (25)	6 (18)	18 (35)	72 (22)
	Primary pulmonary hypertension	4 (4)	1 (3)	2 (2)	1 (3)	3 (6)	11 (3)
	Other	14 (16)	12 (40)	19 (16)	13 (38)	6 (12)	64 (20)
	Missing	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	1 (0)
Smoker	No	84 (94)	30 (100)	116 (99)	32 (94)	50 (98)	312 (97)
	Yes	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	1 (0)
	Missing	5 (6)	0 (0)	1 (1)	1 (3)	1 (2)	8 (3)
Lung function - FEV1	Median (IQR)	0.90 (0.63, 1.36)	1.30 (0.80, 1.82)	0.98 (0.70, 1.46)	0.98 (0.67, 1.57)	1.15 (0.66, 1.47)	0.99 (0.67, 1.48)
	Missing	4	0	2	0	2	8
Lung function - FVC	Median (IQR)	1.80 (1.33, 2.34)	2.16 (1.69, 3.02)	1.79 (1.45, 2.44)	1.88 (1.30, 2.77)	2.06 (1.54, 2.81)	1.88 (1.41, 2.53)
	Missing	4	0	2	0	2	8
Lung function - VO2 (max)	Median (IQR)	-	-	9	-	-	9
	Missing	89	30	116	34	51	320

8.2 Post-registration outcomes, 1 April 2011 – 31 March 2012

An indication of outcomes for adult patients listed for a lung transplant is summarised in **Figure 8.4**. This shows the proportion of patients transplanted or still waiting six months, one, two and three years after joining the list. It also shows the proportion removed from the transplant list (typically because they become too unwell for transplant) and those who died while on the transplant list. Within six months of listing, 39% of lung patients were transplanted while 8% died waiting. Three years after listing, 69% received a transplant.

Figure 8.4 Post-registration outcome for 237 new lung only registrations made in the UK, 1 April 2011 to 31 March 2012



8.3 Median waiting time to transplant, 1 April 2009 - 31 March 2012

The [median](#) waiting time to transplant for adult patients on the lung transplant list is shown in **Figure 8.5** and **Table 8.2**. The national [median](#) waiting time is 265 days and ranges from 200 days at Papworth to 353 days at Birmingham

Figure 8.5 Median waiting time to transplant for adult patients registered on the transplant list, 1 April 2009 to 31 March 2012

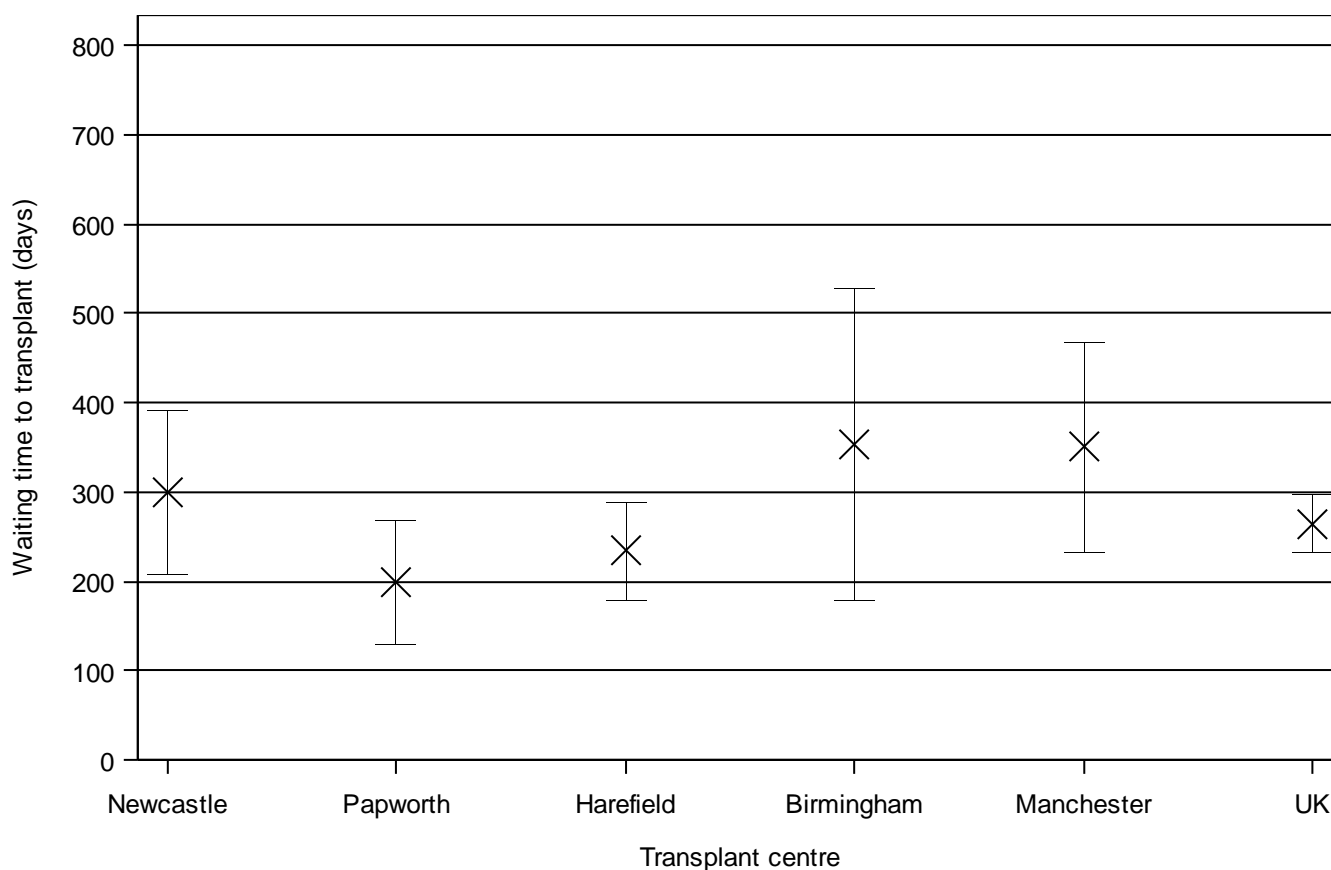


Table 8.2 Median waiting time to deceased donor transplant for adult patients registered on the lung transplant list, 1 April 2009 to 31 March 2012			
Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Newcastle	193	300	209 - 391
Papworth	134	200	131 - 269
Harefield	198	234	179 - 289
Birmingham	61	353	179 - 527
Manchester	92	350	232 - 468
UK	678	265	233 - 297

ADULT LUNG TRANSPLANTATION

Response to Offers



Figures 9.1a and 9.1b compare individual centre adult lung offer decline rates with the national rate between 1 April 2012 and 31 March 2015 for bilateral lung offers and single lung offers, respectively. Offer decline rates at Harefield and Birmingham fall outside of the 99.8% [confidence limits](#). This indicates that Birmingham had a significantly higher and Harefield had a significantly lower offer decline rate than the national average. No centres significantly differed from the national rate in terms of single lung offer decline rates however.

This analysis excludes fast track offers and considers only those offers that resulted in transplant. Heart lung blocks are treated as bilateral lungs in this analysis.

Figure 9.1a Adult bilateral lung offer decline rates for organs that resulted in transplant, 1 April 2012 to 31 March 2015

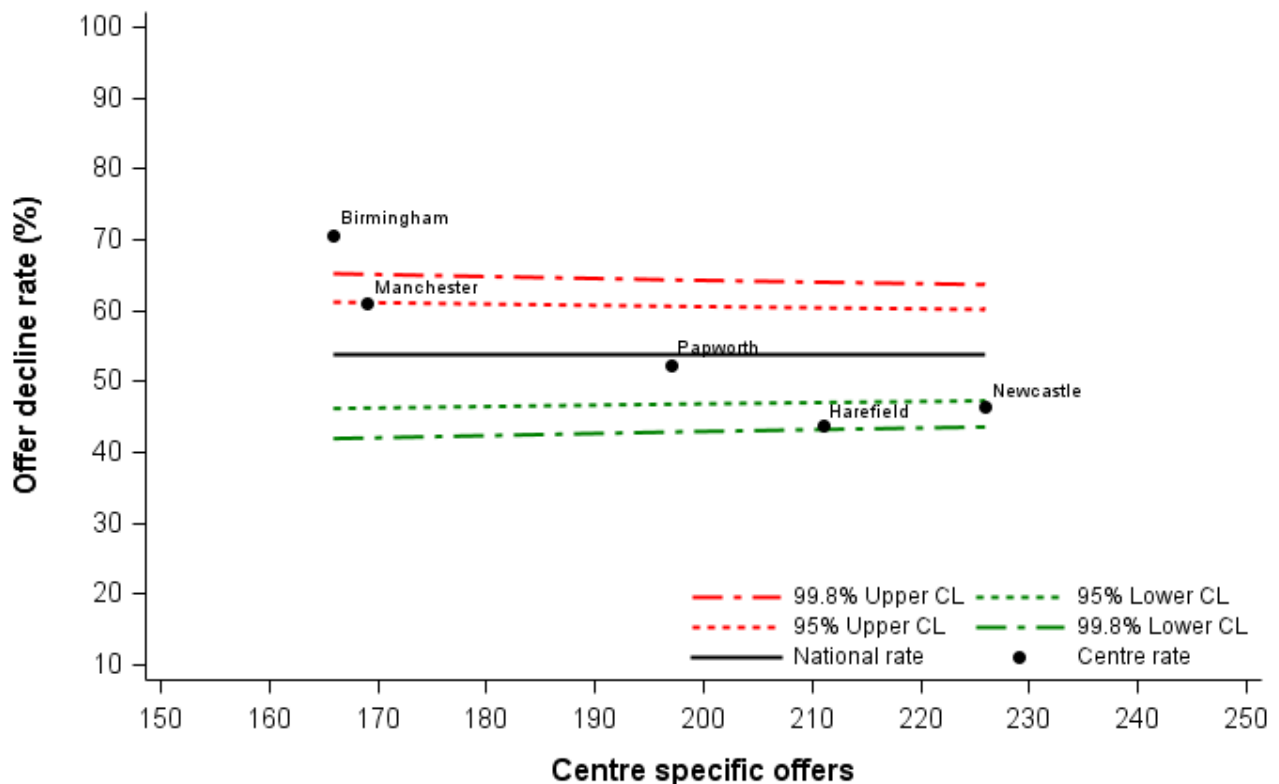


Figure 9.1b Adult single lung offer decline rates for organs that resulted in transplant, 1 April 2012 to 31 March 2015

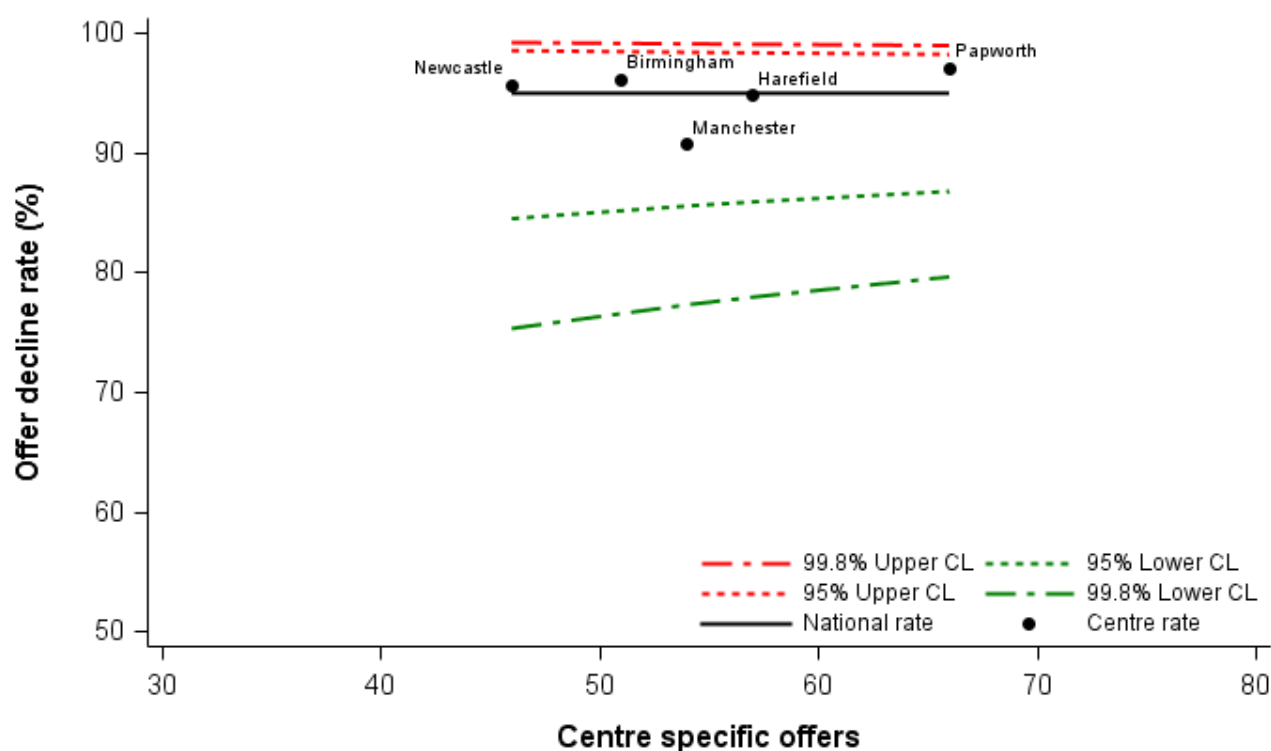


Table 9.1 and **9.2** compare individual centre lung offer decline rates over the same period by financial year, for bilateral lung offers and single lung offers respectively. Declines and acceptances with non-use in **Table 9.1** are counted only for cases where the full bilateral lung was declined or accepted with non-use. Transplanted organs are then split by bilateral organ and single lungs.

Table 9.1 Adult bilateral lung offer results, by transplant centre, 1 April 2012 to 31 March 2015

Centre	Financial year	Total Offer N	Declined		Accepted, not used		Transplanted		
			Bilateral lungs	(%)	Bilateral lungs	(%)	Bilateral lungs	Single lungs	(%)
Birmingham	2012/13	60	44	(73)	2	(3)	13	1	(23)
	2013/14	65	47	(72)	0	(0)	14	4	(28)
	2014/15	41	24	(59)	0	(0)	15	2	(41)
	Overall	166	115	(69)	2	(1)	42	7	(30)
Harefield	2012/13	67	33	(49)	1	(1)	33	0	(50)
	2013/14	88	41	(47)	0	(0)	46	1	(53)
	2014/15	56	17	(30)	0	(0)	37	2	(70)
	Overall	211	91	(43)	1	(0)	116	3	(56)
Manchester	2012/13	57	33	(58)	1	(2)	18	5	(40)
	2013/14	72	45	(63)	1	(1)	20	6	(36)
	2014/15	40	23	(58)	0	(0)	12	5	(43)
	Overall	169	101	(60)	2	(1)	50	16	(39)
Newcastle	2012/13	84	39	(46)	0	(0)	41	4	(54)
	2013/14	91	44	(48)	3	(3)	40	4	(49)
	2014/15	51	18	(35)	1	(2)	30	2	(63)
	Overall	225	100	(44)	4	(2)	111	10	(54)
Papworth	2012/13	71	39	(55)	0	(0)	27	5	(45)
	2013/14	77	43	(56)	1	(1)	27	6	(43)
	2014/15	49	19	(39)	1	(2)	26	3	(59)
	Overall	197	101	(51)	2	(1)	80	14	(48)
UK	2012/13	339	188	(55)	4	(1)	132	15	(43)
	2013/14	392	219	(56)	5	(1)	147	21	(43)
	2014/15	237	101	(43)	2	(1)	120	14	(57)
	Overall	969	509	(53)	11	(1)	399	50	(46)

Table 9.2 Adult single lung offer results, by transplant centre, 1 April 2012 to 31 March 2015

Centre	Financial year	Total Offer	Declined		Accepted, not used		Transplanted	
		N	N	(%)	N	(%)	N	(%)
Birmingham	2012/13	23	22	(96)	0	(0)	1	(4)
	2013/14	20	19	(95)	0	(0)	1	(5)
	2014/15	8	8	100	0	(0)	0	(0)
	Overall	51	49	(96)	0	(0)	2	(4)
Harefield	2012/13	23	22	(96)	0	(0)	1	(4)
	2013/14	24	22	(92)	0	(0)	2	(8)
	2014/15	10	10	(100)	0	(0)	0	(0)
	Overall	57	54	(95)	0	(0)	3	(5)
Manchester	2012/13	19	18	(95)	0	(0)	1	(5)
	2013/14	21	18	(86)	0	(0)	3	(14)
	2014/15	14	13	(93)	0	(0)	1	(7)
	Overall	54	49	(91)	0	(0)	5	(9)
Newcastle	2012/13	12	11	(92)	1	(8)	0	(0)
	2013/14	20	19	(95)	0	(0)	1	(5)
	2014/15	14	13	(93)	0	(0)	1	(7)
	Overall	46	43	(93)	1	(2)	2	(4)
Papworth	2012/13	25	23	(92)	1	(4)	1	(4)
	2013/14	25	24	(96)	0	(0)	1	(4)
	2014/15	16	16	100	0	(0)	0	(0)
	Overall	66	63	(95)	1	(2)	2	(3)
UK	2012/13	102	96	(94)	2	(2)	4	(4)
	2013/14	110	102	(93)	0	(0)	8	(7)
	2014/15	62	60	(97)	0	(0)	2	(3)
	Overall	274	258	(94)	2	(1)	14	(5)

ADULT LUNG TRANSPLANTATION

Transplants



10.1 Adult lung and heart/lung transplants, 1 April 2005 – 31 March 2015

Figure 10.1 and **10.2** show the total number of adult lung transplants performed in the last ten years overall and by centre, respectively. The number of transplants from donors after brain death (DBD) has generally increased since 2007 from 111 to 177 in 2013/2014. This number decreased to 140 in 2014/2015. The number of transplants in the latest financial year (2014/2015) is shown by centre in **Figure 10.3**.

Figure 10.1 Number of adult lung transplants in the UK, by financial year, 1 April 2005 to 31 March 2015

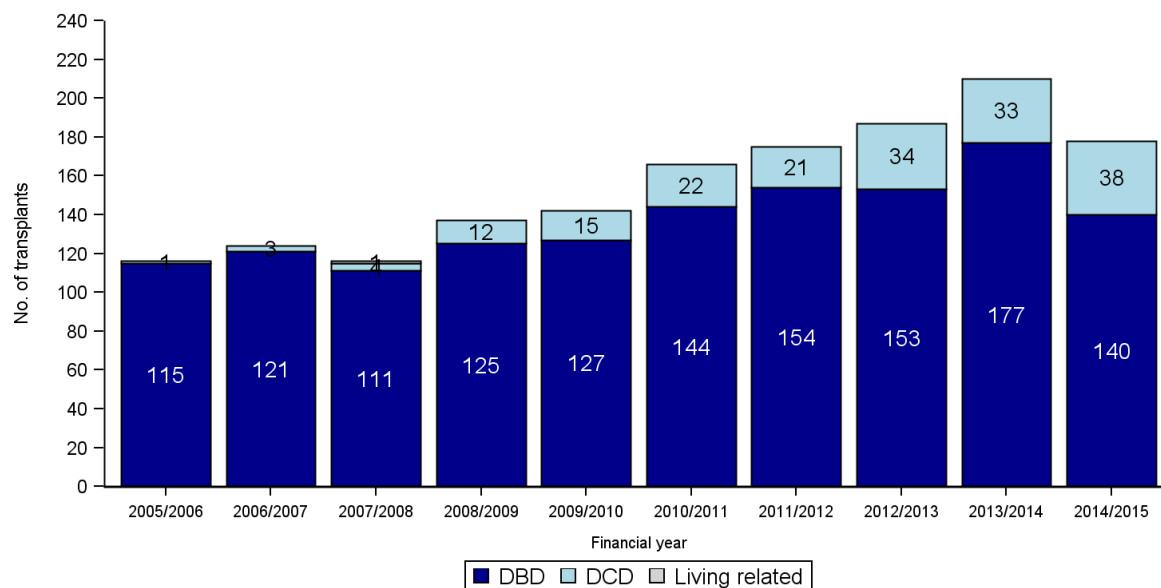


Figure 10.2 Number of adult lung transplants in the UK, by financial year and centre, 1 April 2005 to 31 March 2015

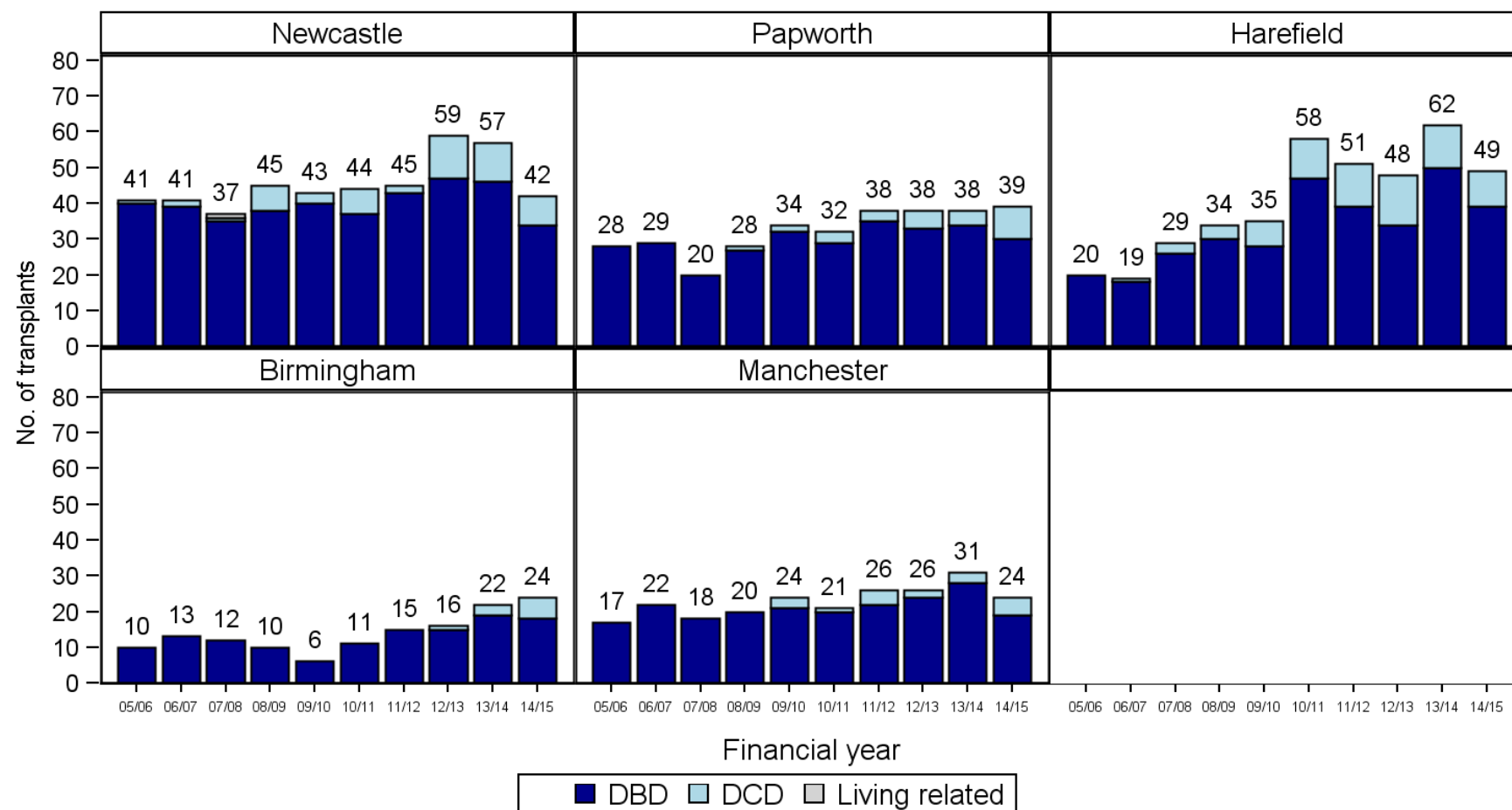


Figure 10.3 Number of adult lung transplants in the UK, by centre, 1 April 2014 to 31 March 2015

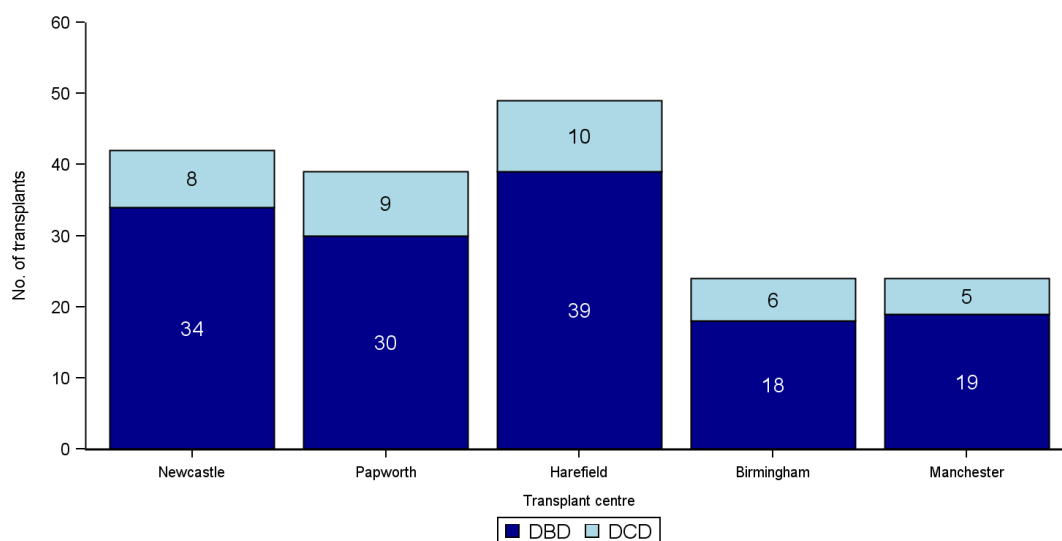


Figure 10.4 and **10.5** show the total number of adult lung transplants performed in the last ten years overall and by centre, respectively, by transplant type. The number of transplants by transplant type in the latest financial year (2014/2015) is shown by centre in **Figure 10.6**. The proportion of bilateral lung transplants has increased from 63% in 2005/2006 to 86% in 2014/2015. The proportion of bilateral lung transplants performed at each centre in 2014/2015 ranged from 67% at Manchester to 98% at Harefield.

Figure 10.4 Number of adult lung transplants in the UK, by financial year and transplant type, 1 April 2005 to 31 March 2015

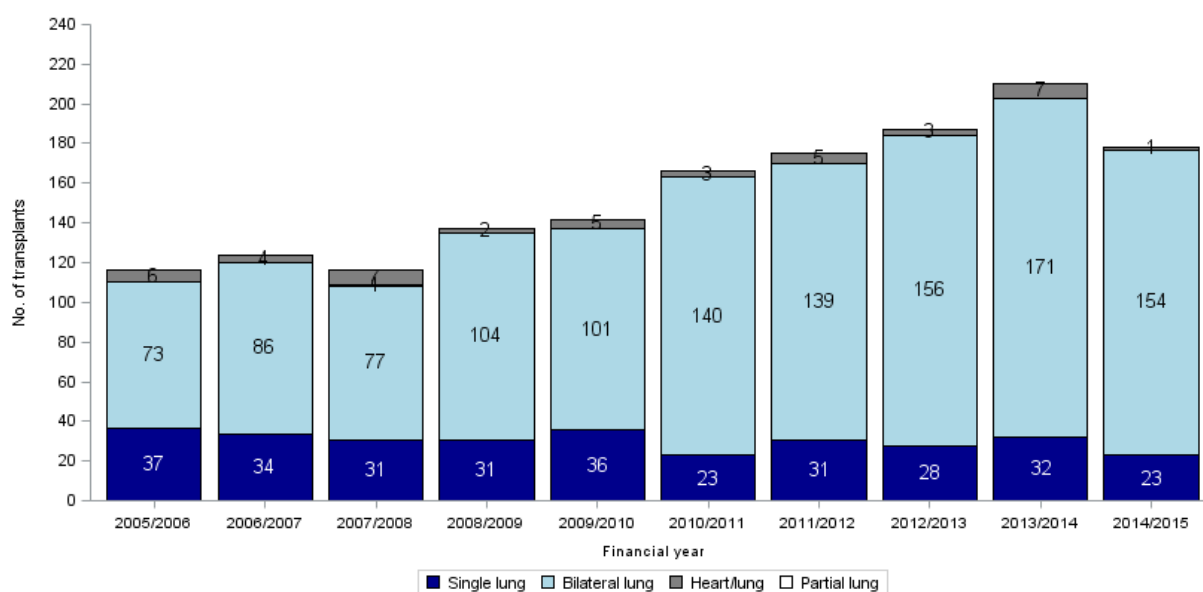
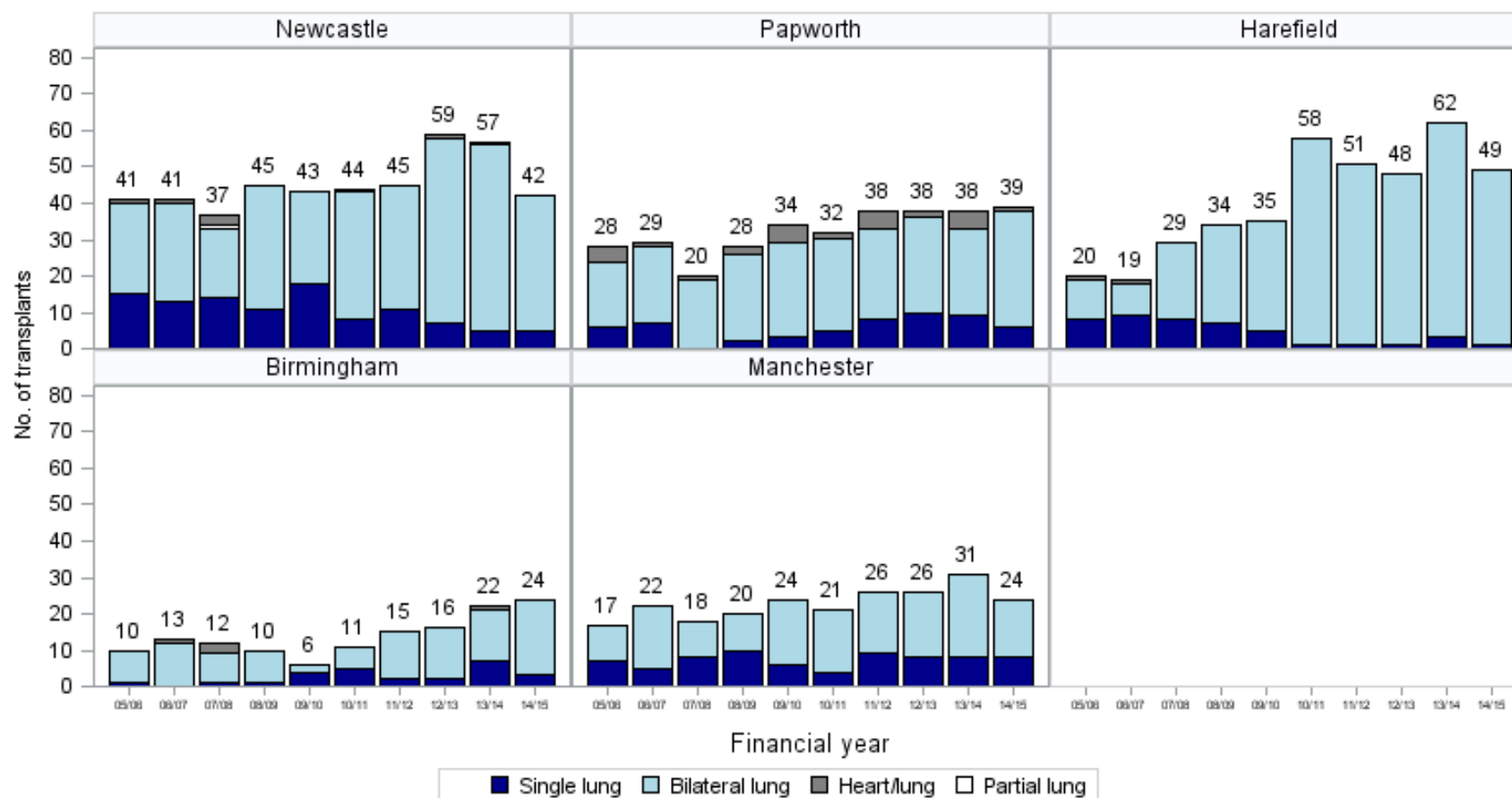
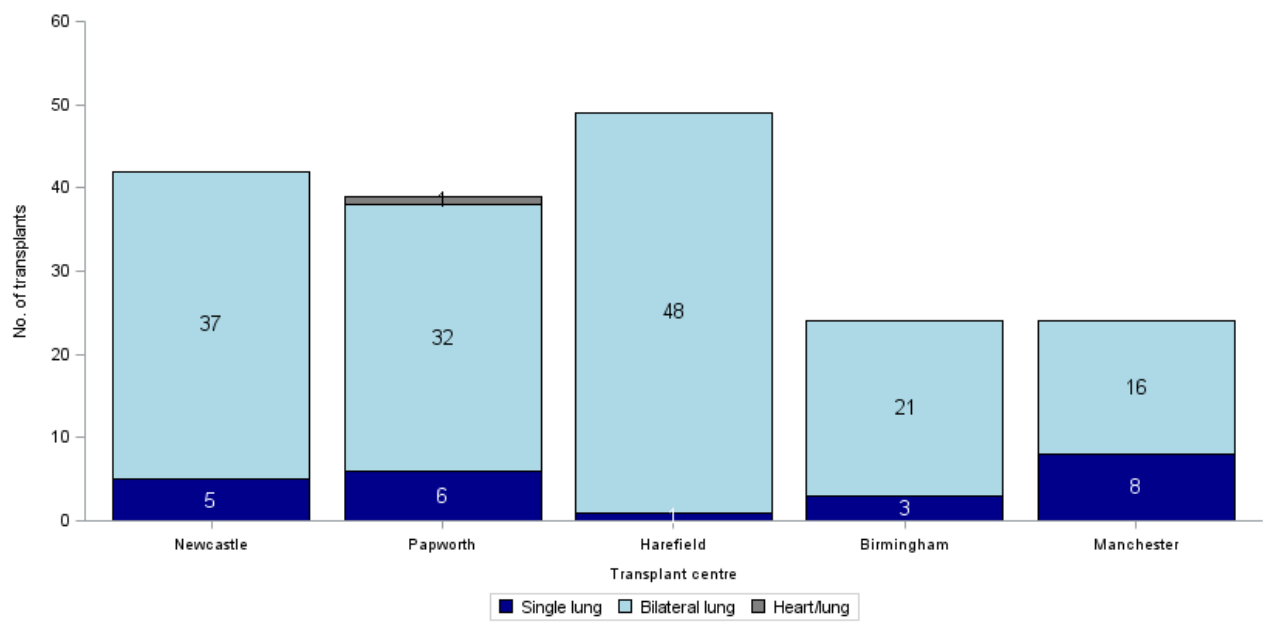


Figure 10.5 Number of adult lung transplants in the UK, by financial year, centre and transplant type, 1 April 2005 to 31 March 2015



**Figure 10.6 Number of adult lung transplants in the UK, by centre,
1 April 2014 to 31 March 2015**



The demographic characteristics of 178 adult lung transplant recipients in the latest year are shown by centre and overall in **Table 10.1**. 58% of these recipients were male and the [median](#) age was 53 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 10.1 Demographic characteristics of adult lung transplants 1 April 2014 to 31 March 2015, by centre							
		Newcastle N (%)	Papworth N (%)	Harefield N (%)	Birmingham N (%)	Manchester N (%)	TOTAL
Number		42 (100)	39 (100)	49 (100)	24 (100)	24 (100)	178 (100)
Transplant type	Single lung	5 (12)	6 (15)	1 (2)	3 (13)	8 (33)	23 (13)
	Bilateral lung	37 (88)	32 (82)	48 (98)	21 (88)	16 (67)	154 (86)
	Partial lung	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Heart/lung	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	1 (1)
Recipient sex	Male	24 (57)	21 (54)	26 (53)	16 (67)	16 (67)	103 (58)
	Female	18 (43)	18 (46)	23 (47)	7 (29)	8 (33)	74 (42)
	Missing	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	1 (1)
Recipient ethnicity	White	42 (100)	39 (100)	46 (94)	24 (100)	22 (92)	173 (97)
	Non-white	0 (0)	0 (0)	3 (6)	0 (0)	0 (0)	3 (2)
	Missing	0 (0)	0 (0)	0 (0)	0 (0)	2 (8)	2 (1)
Recipient age	Median (IQR)	52 (41, 57)	58 (52, 62)	48 (34, 57)	52 (36, 59)	56 (47, 60)	53 (40, 59)
	Missing	0	0	0	0	0	0
Recipient weight	Median (IQR)	71 (59, 80)	64 (55, 75)	63 (54, 72)	74 (61, 87)	67 (59, 87)	67 (56, 78)
	Missing	0	1	0	0	0	1
NYHA class	I	0 (0)	0 (0)	0 (0)	23 (96)	0 (0)	23 (13)
	II	0 (0)	5 (13)	3 (6)	0 (0)	1 (4)	9 (5)
	III	28 (67)	20 (51)	32 (65)	0 (0)	21 (88)	101 (57)
	IV	5 (12)	13 (33)	8 (16)	0 (0)	2 (8)	28 (16)
	Missing	9 (21)	1 (3)	6 (12)	1 (4)	0 (0)	17 (10)
Recipient on ventilator	No	11 (26)	15 (38)	22 (45)	23 (96)	1 (4)	72 (40)
	Yes	1 (2)	0 (0)	7 (14)	0 (0)	0 (0)	8 (5)
	Missing	30 (71)	24 (62)	20 (41)	1 (4)	23 (96)	98 (55)
Recipient on inotropes	No	11 (26)	15 (38)	26 (53)	23 (96)	1 (4)	76 (43)
	Yes	1 (2)	0 (0)	3 (6)	0 (0)	0 (0)	4 (2)
	Missing	30 (71)	24 (62)	20 (41)	1 (4)	23 (96)	98 (55)

Table 10.1 Demographic characteristics of adult lung transplants 1 April 2014 to 31 March 2015, by centre

		Newcastle N (%)	Papworth N (%)	Harefield N (%)	Birmingham N (%)	Manchester N (%)	TOTAL
Recipient CMV status	No	24 (57)	17 (44)	23 (47)	13 (54)	15 (63)	92 (52)
	Yes	18 (43)	21 (54)	26 (53)	11 (46)	9 (38)	85 (48)
	Missing	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	1 (1)
Recipient HCV status	No	42 (100)	38 (97)	49 (100)	24 (100)	24 (100)	177 (99)
	Missing	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	1 (1)
Recipient HBV status	No	42 (100)	38 (97)	49 (100)	24 (100)	24 (100)	177 (99)
	Missing	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	1 (1)
Recipient HIV status	No	42 (100)	38 (97)	49 (100)	24 (100)	24 (100)	177 (99)
	Missing	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	1 (1)
Recipient Serum Creatinine	Median (IQR)	64 (50, 85)	74 (63, 94)	53 (42, 77)	63 (57, 86)	71 (67, 77)	68 (53, 85)
	Missing	4	0	6	1	0	11
Donor sex	Male	16 (38)	21 (54)	29 (59)	6 (25)	12 (50)	84 (47)
	Female	26 (62)	18 (46)	20 (41)	18 (75)	12 (50)	94 (53)
Donor ethnicity	White	38 (90)	30 (77)	43 (88)	22 (92)	19 (79)	152 (85)
	Non-white	0 (0)	5 (13)	3 (6)	1 (4)	3 (13)	12 (7)
	Missing	4 (10)	4 (10)	3 (6)	1 (4)	2 (8)	14 (8)
Donor age	Median (IQR)	48 (31, 57)	48 (39, 56)	43 (33, 53)	44 (36, 56)	43 (36, 52)	46 (35, 54)
	Missing	0	0	0	0	0	0
Donor BMI	Median (IQR)	25 (22, 28)	25 (23, 27)	24 (22, 27)	24 (21, 27)	26 (23, 29)	25 (22, 28)
	Missing	0	0	0	0	0	0
Donor cause of death	CVA	38 (90)	34 (87)	38 (78)	23 (96)	22 (92)	155 (87)
	Trauma	3 (7)	4 (10)	7 (14)	0 (0)	2 (8)	16 (9)
	Others	1 (2)	1 (3)	4 (8)	1 (4)	0 (0)	7 (4)
Donor hypotension	No	14 (33)	36 (92)	36 (73)	16 (67)	18 (75)	120 (67)
	Yes	19 (45)	3 (8)	7 (14)	6 (25)	6 (25)	41 (23)
	Missing	9 (21)	0 (0)	6 (12)	2 (8)	0 (0)	17 (10)
Donor cardiac arrest	No	40 (95)	35 (90)	43 (88)	22 (92)	23 (96)	163 (92)
	Yes	2 (5)	2 (5)	3 (6)	0 (0)	1 (4)	8 (5)
	Missing	0 (0)	2 (5)	3 (6)	2 (8)	0 (0)	7 (4)

Table 10.1 Demographic characteristics of adult lung transplants 1 April 2014 to 31 March 2015, by centre							
		Newcastle	Papworth	Harefield	Birmingham	Manchester	TOTAL
		N (%)	N (%)	N (%)	N (%)	N (%)	
Donor past hypertension	No	33 (79)	24 (62)	37 (76)	20 (83)	20 (83)	134 (75)
	Yes	5 (12)	14 (36)	6 (12)	3 (13)	4 (17)	32 (18)
	Missing	4 (10)	1 (3)	6 (12)	1 (4)	0 (0)	12 (7)
Donor past tumour	No	38 (90)	37 (95)	41 (84)	20 (83)	24 (100)	160 (90)
	Yes	0 (0)	0 (0)	2 (4)	2 (8)	0 (0)	4 (2)
	Missing	4 (10)	2 (5)	6 (12)	2 (8)	0 (0)	14 (8)
Donor past smoker	No	21 (50)	18 (46)	29 (59)	12 (50)	10 (42)	90 (51)
	Yes	17 (40)	21 (54)	14 (29)	11 (46)	14 (58)	77 (43)
	Missing	4 (10)	0 (0)	6 (12)	1 (4)	0 (0)	11 (6)

10.2 Total ischaemia time, 1 April 2005 – 31 March 2015

Figure 10.7 shows the [median](#) total ischaemia time in adult [DBD](#) donor lung transplants over the last 10 years. The [median](#) total ischaemia time has remained fairly stable over the last 10 years.

Figure 10.7 Median total ischaemia time in adult DBD donor lung transplants, by financial year, 1 April 2005 to 31 March 2015

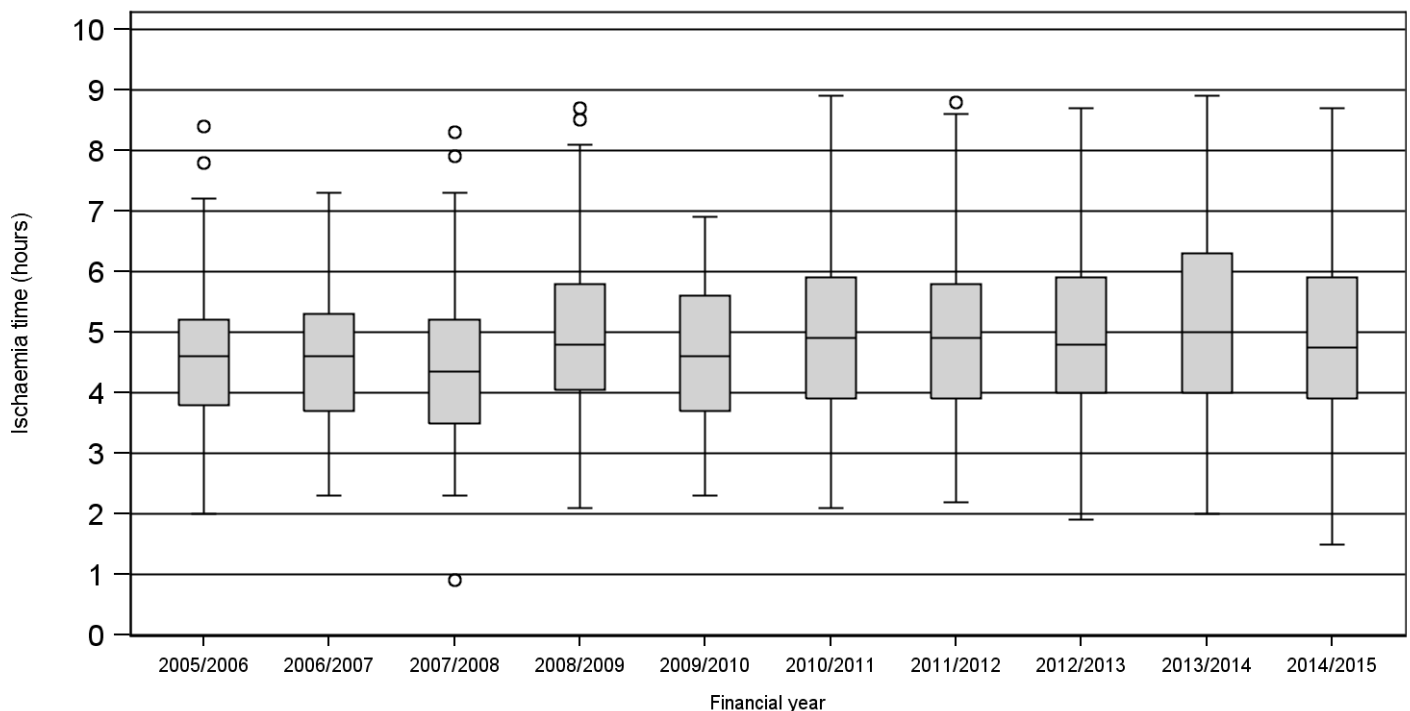


Figure 10.8 and **Figure 10.9** show the [median](#) total ischaemia time in adult [DBD](#) donor lung transplants, by centre, for the latest financial year (2014/2015) and over the last 10 years respectively. This analysis does not take into account the use of donor organ maintenance systems for some transplants. These enable warm blood perfusion to continue ex-vivo during transportation. For such transplants, the definition of total ischaemia time used here (cross-clamp to reperfusion) over-estimates the true ischaemia time because the lungs are not subject to ischaemia during transportation.

Figure 10.8 Median total ischaemia time in adult DBD donor lung transplants, by transplant centre, 1 April 14 to 31 March 2015

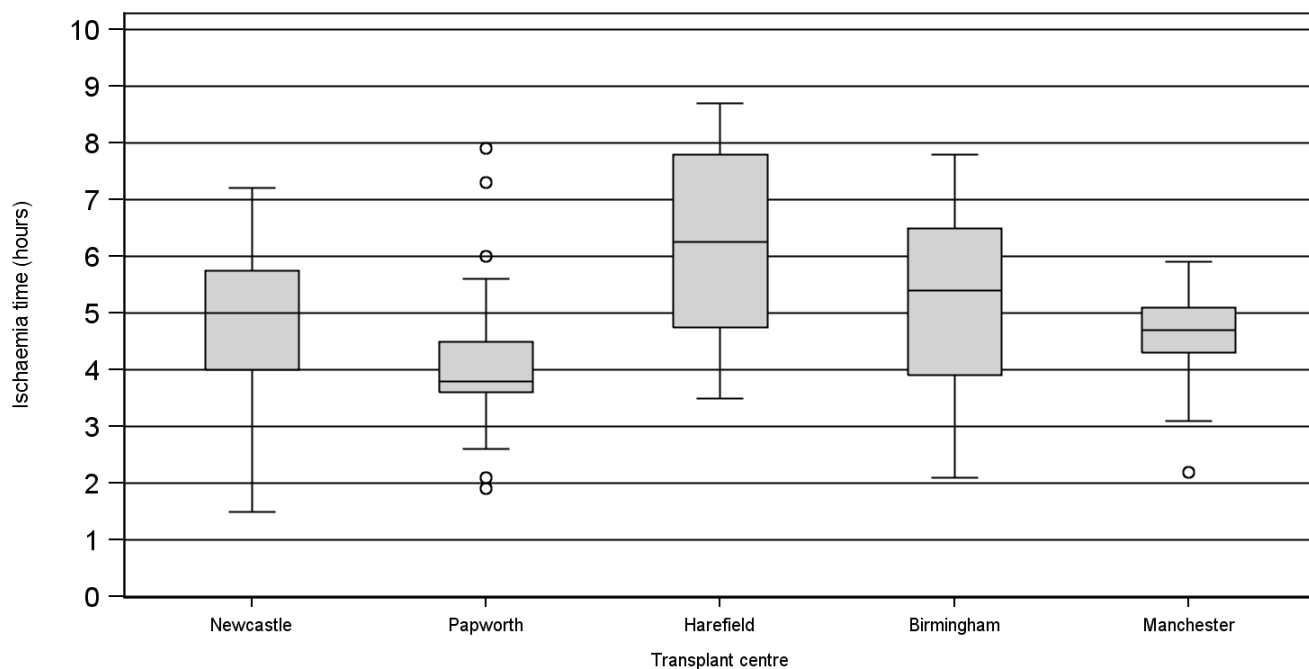
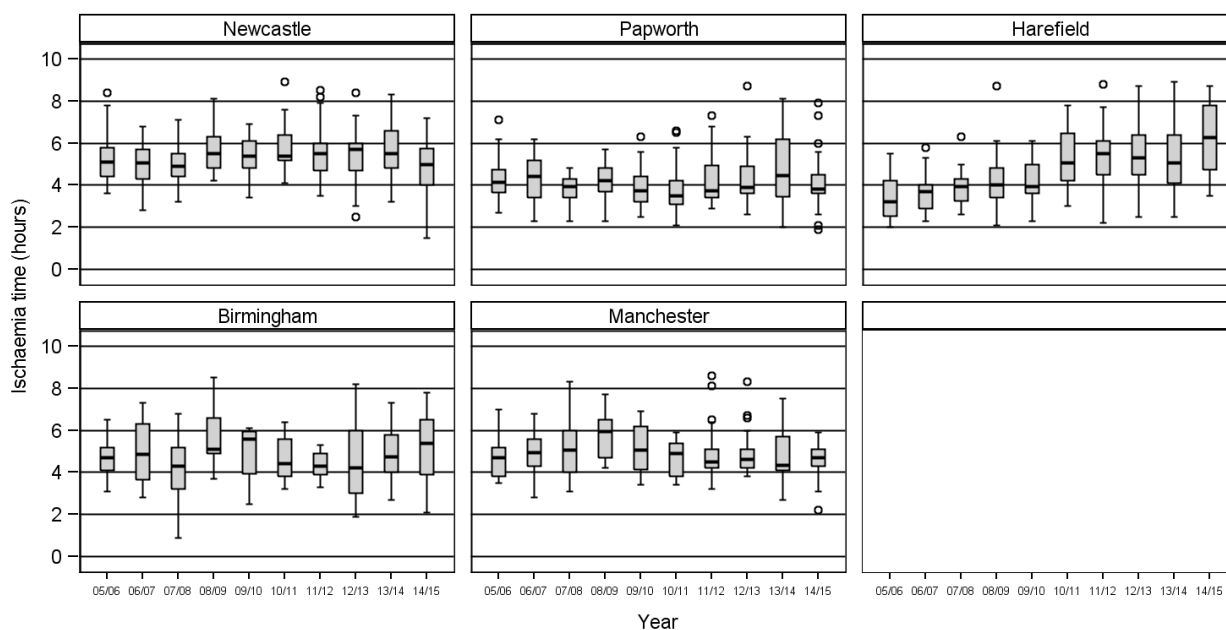


Figure 10.9 Median total ischaemia time in adult DBD donor lung transplants, by transplant centre and financial year, 1 April 2005 to 31 March 2015



ADULT LUNG TRANSPLANTATION

Post-Transplant Survival



The survival analysis results presented in this section exclude:

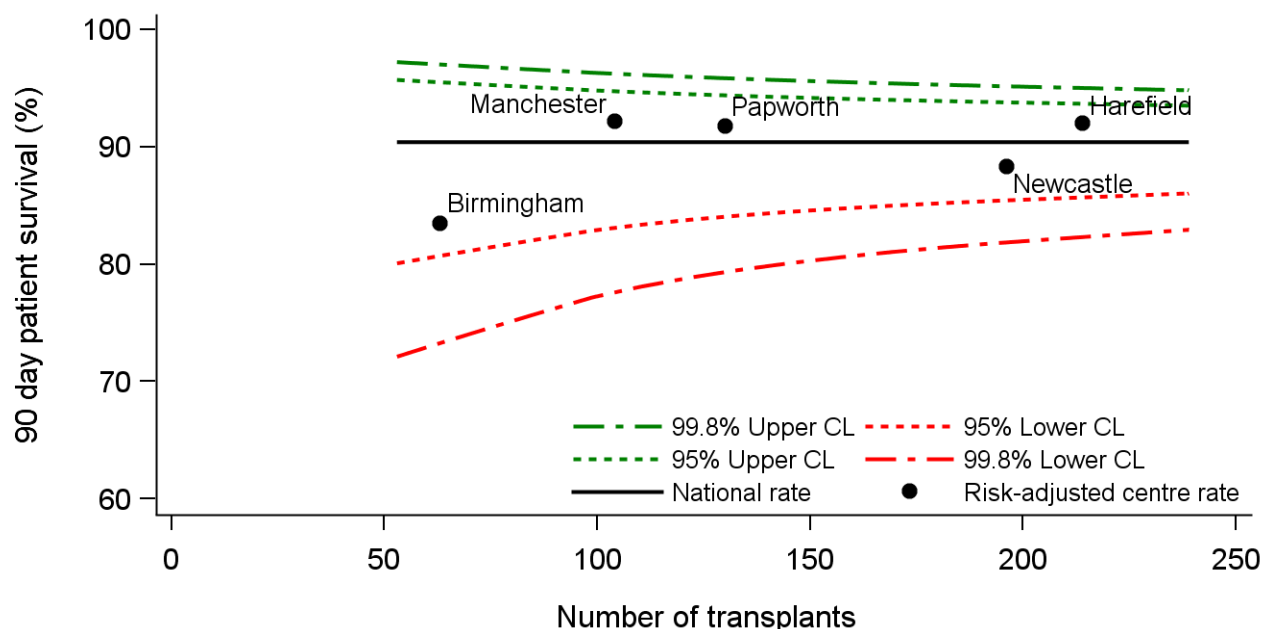
- [Multi-organ transplants](#) (including heart/lung transplants)
- Second (or greater) graft transplants
- Partial lung transplants

90-day and 1-year [survival rates](#) are based on transplants performed in the period 1 April 2010 to 31 March 2014 while 5-year survival rates are based on transplants performed in the period 1 April 2006 to 31 March 2010

For the 707 adult lung transplants that were performed in the period 1 April 2010 and 31 March 2014, 90-day outcome information was known for 703 patients. Ninety day [unadjusted](#) and [risk-adjusted](#) patient survival for these lung transplants is shown in **Table 11.1**. None of the centres were statistically significantly different to the national rate, as shown in the [funnel plot](#) in **Figure 11.1**. The [risk factors](#) used in the model are described in **Appendix A3.2**.

Table 11.1 90 day patient survival after first adult lung transplants, by centre, 1 April 2010 and 31 March 2014					
Centre	Number of transplants	% 90 day survival (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	196	89.8	(84.6 - 93.3)	88.3	(81.9 - 92.5)
Papworth	130	92.3	(86.2 - 95.8)	91.8	(84.7 - 95.6)
Harefield	214	90.7	(85.9 - 93.9)	92.0	(87.6 - 94.8)
Birmingham	63	84.1	(72.5 - 91.1)	83.5	(69.3 - 91.1)
Manchester	104	92.3	(85.2 - 96.1)	92.2	(84.3 - 96.1)
UK	707	90.4	(87.9 - 92.3)		

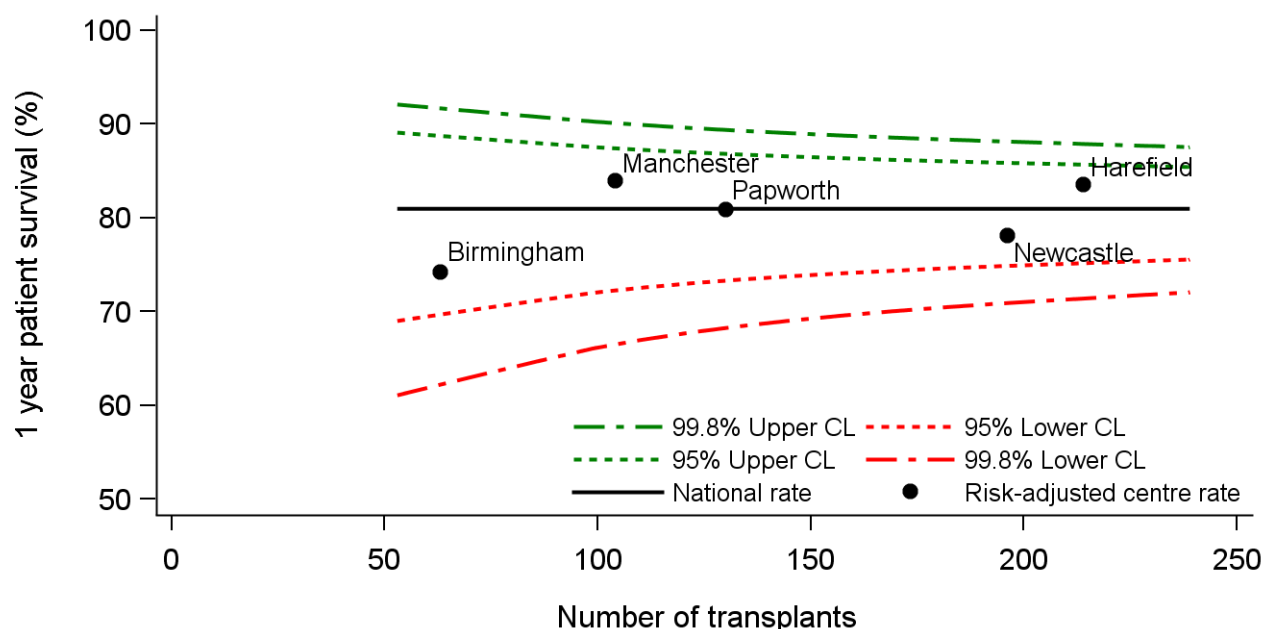
Figure 11.1 Risk-adjusted 90 day patient survival for adult lung transplants, by centre, 1 April 2010 to 31 March 2014



For the 707 adult lung transplants that were performed in the period 1 April 2010 and 31 March 2014, one-year outcome information was known for 617 patients. One year [unadjusted](#) and [risk-adjusted](#) patient survival for these lung transplants is shown in **Table 11.2**. None of the centres were statistically significantly different to the national rate, as shown in the [funnel plot](#) in **Figure 11.2**.

Table 11.2 1 year patient survival after first adult lung transplants, by centre, 1 April 2010 and 31 March 2014					
Centre	Number of transplants	% 1 year survival (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	196	80	(73.5 - 85)	78.1	(70.0 - 84.1)
Papworth	130	81.4	(73.5 - 87.1)	80.9	(71.6 - 87.2)
Harefield	214	82.6	(76.8 - 87.1)	83.6	(77.4 - 88.1)
Birmingham	63	73	(60.2 - 82.3)	74.2	(58.5 - 84.0)
Manchester	104	83.6	(75 - 89.5)	84.0	(74.2 - 90.0)
UK	707	80.9	(77.8 - 83.7)		

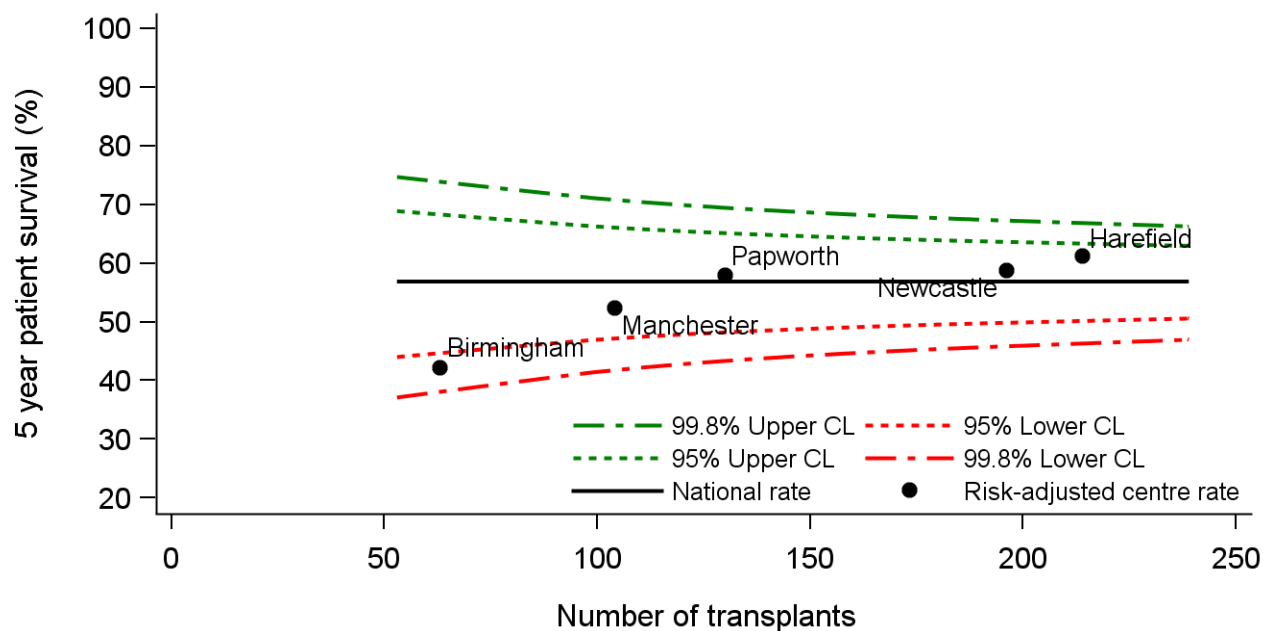
Figure 11.2 Risk-adjusted one-year patient survival for adult lung transplants, by centre, 1 April 2010 to 31 March 2014



For the 495 adult lung transplants that were performed in the period 1 April 2006 and 31 March 2010, 5-year outcome information was known for 418 patients. Five year [unadjusted](#) and [risk-adjusted](#) patient survival for these lung transplants is shown in **Table 11.3**. None of the centres were statistically significantly different to the national rate, as shown in the [funnel plot](#) in **Figure 11.3**.

Table 11.2 5 year patient survival after first adult lung transplants, by centre, 1 April 2006 and 31 March 2010					
Centre	Number of transplants	% 5 year survival (95% CI)			
		Unadjusted		Risk-adjusted	
Newcastle	159	62.7	(54.2 - 70)	58.8	(45.3 - 68.9)
Papworth	102	53.6	(43.4 - 62.8)	57.9	(42.8 - 69.0)
Harefield	114	62.5	(52.8 - 70.8)	61.2	(49.9 - 70.0)
Birmingham	36	43.8	(27.3 - 59.2)	42.2	(14.5 - 61.0)
Manchester	84	48.8	(37.7 - 58.9)	52.3	(34.7 - 65.2)
UK	495	56.8	(52.2 - 61.1)		

Figure 11.4 Risk-adjusted five year patient survival for adult lung transplants, by centre, 1 April 2006 to 31 March 2010



ADULT LUNG TRANSPLANTATION

Survival from Listing



Survival from listing was analysed for patients ≥ 18 years registered for the first time for a lung transplant between 1 January 2003 and 31 December 2014. 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. Survival time was censored at either date of removal from the list, or at the last known follow-up date post-transplant when no death date was recorded, or at time of analysis if the patient was still active on the transplant list.

One, five and ten year [risk-adjusted](#) survival rates from the point of lung transplant listing are shown by centre in **Figures 12.1, 12.2 and 12.3** respectively. These rates are also shown in **Table 12.1**.

In terms of one year survival rate, one centre fell above and one fell below the upper and lower 95% [confidence intervals](#), respectively, however all survival rates were within the 99.8% [confidence limits](#). Five and ten year survival from listing rates at Birmingham, however, fell below the 99.8% [confidence limit](#) suggesting that these rates may be significantly lower than the national average.

Table 12.1 Risk-adjusted 1, 5 and 10 year patient survival from listing for first deceased donor lung only transplant in patients registered between 1 January 2003 and 31 December 2014						
Centre	One year		Five year		Ten year	
	N	(%)	N	(%)	N	(%)
Birmingham	235	(68)	235	(33)	235	(15)
Harefield	696	(80)	696	(52)	696	(37)
Manchester	436	(78)	436	(46)	436	(27)
Newcastle	761	(74)	761	(47)	761	(32)
Papworth	434	(74)	434	(41)	434	(24)
UK	2562	(76)	2562	(46)	2562	(30)

Figure 12.1 Risk-adjusted one year patient survival from listing

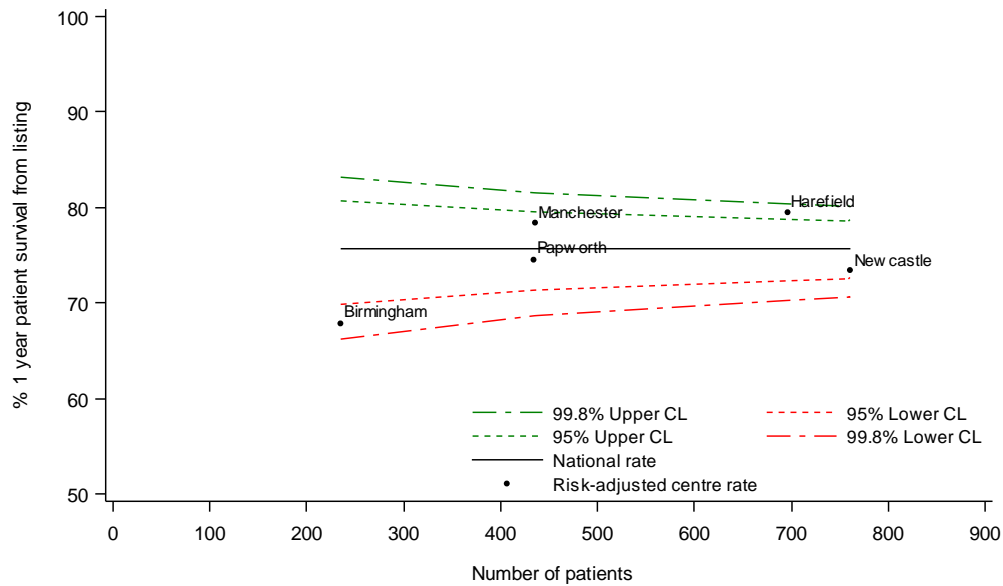


Figure 12.2 Risk-adjusted five year patient survival from listing

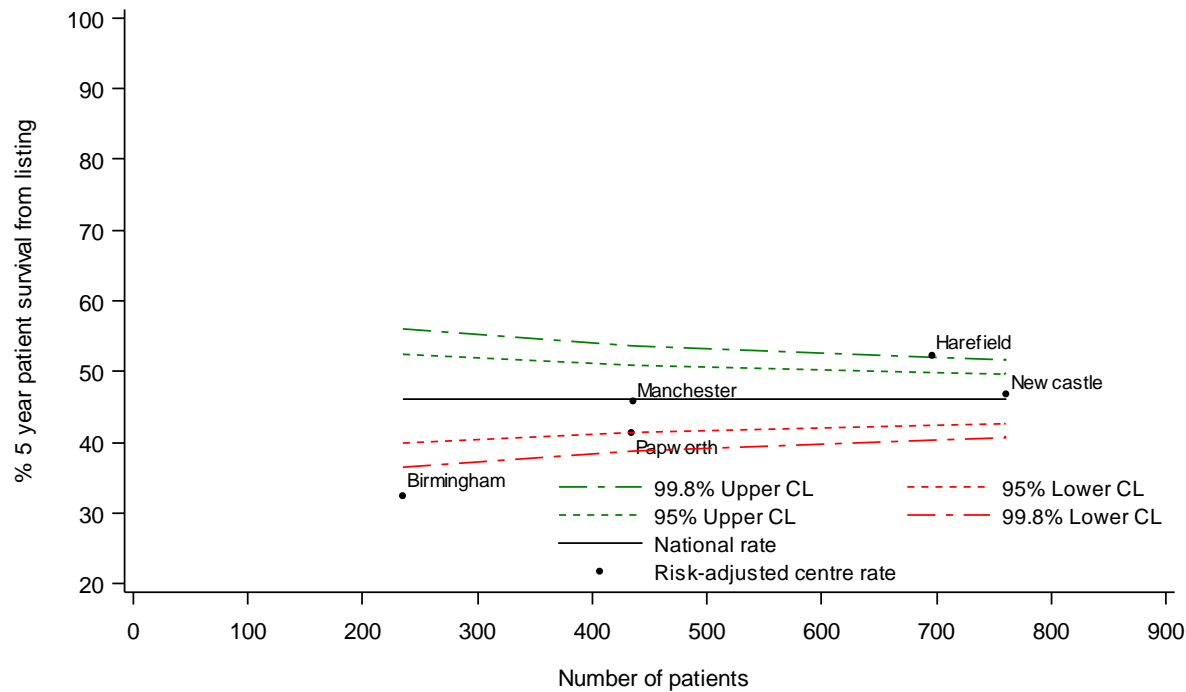
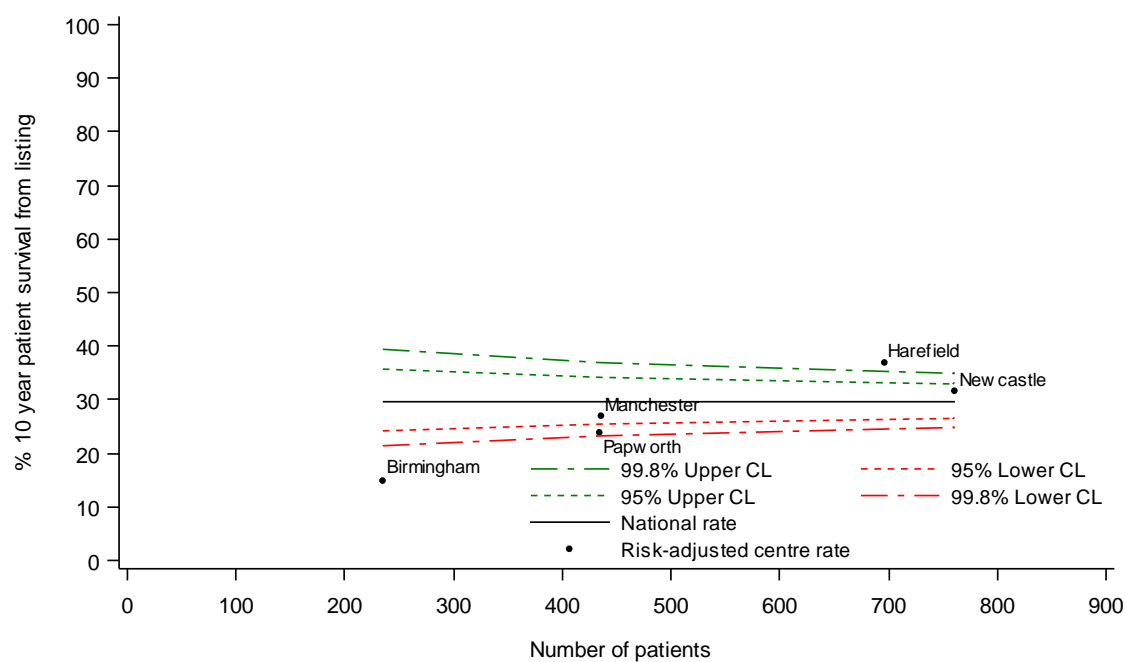


Figure 12.3 Risk-adjusted ten year patient survival from listing



PAEDIATRIC HEART TRANSPLANTATION

Transplant List



13.1 Paediatric heart only transplant list as at 31 March, 2006 – 2015

Figure 13.1 shows the number of paediatric patients on the heart transplant list at 31 March each year between 2006 and 2015. The overall number of patients actively waiting for a heart transplant increased substantially from 16 in 2013 to 31 in 2015. The number of patients on the urgent transplant list has increased from 0 in 2006 to 5 in 2015, with an average of 4.9 patients on the list on the 31st March each year.

Figure 13.1 Paediatric patients on the heart transplant list at 31 March each year for the last 10 years, by year

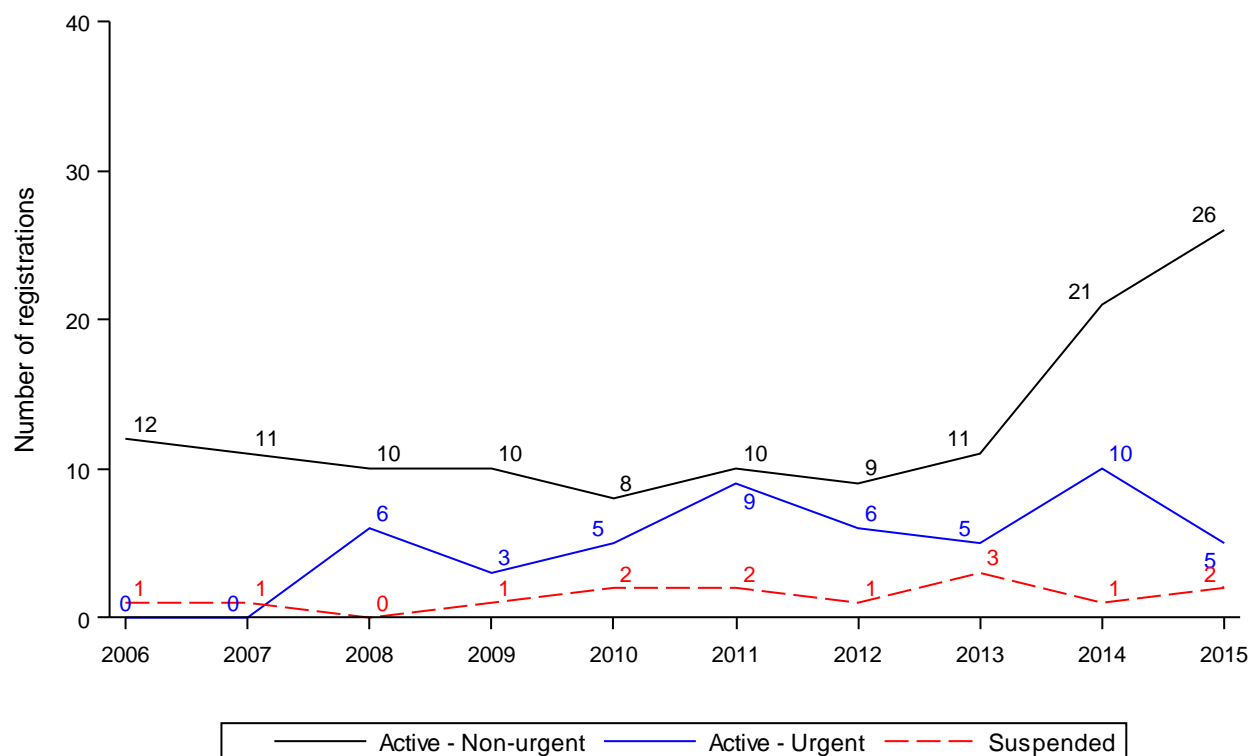


Figure 13.2 shows the number of paediatric patients on the active heart transplant list at 31 March 2015 by centre. In total, there were 31 paediatric patients. Great Ormond Street Hospital (GOSH) had the largest proportion (84%) of the transplant list. One patient at Newcastle and four at GOSH were on the urgent transplant list at this time.

Figure 13.2 Paediatric patients on the active heart transplant list at 31 March 2015, by centre

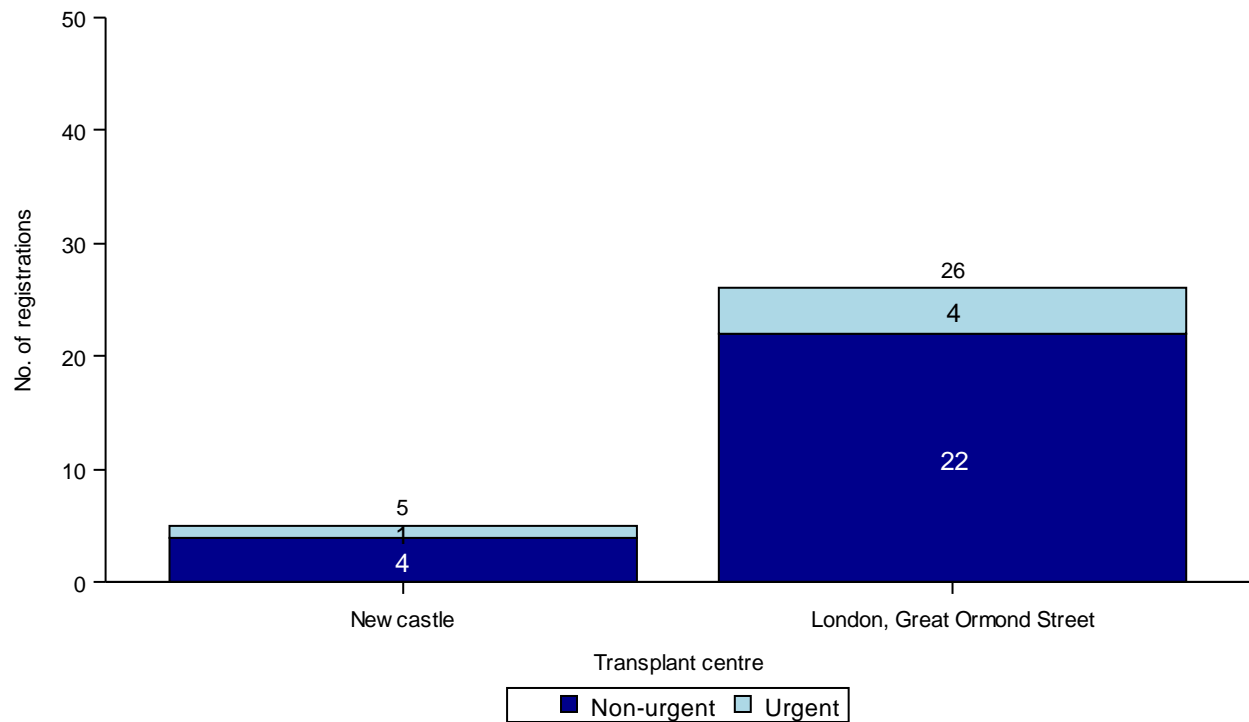
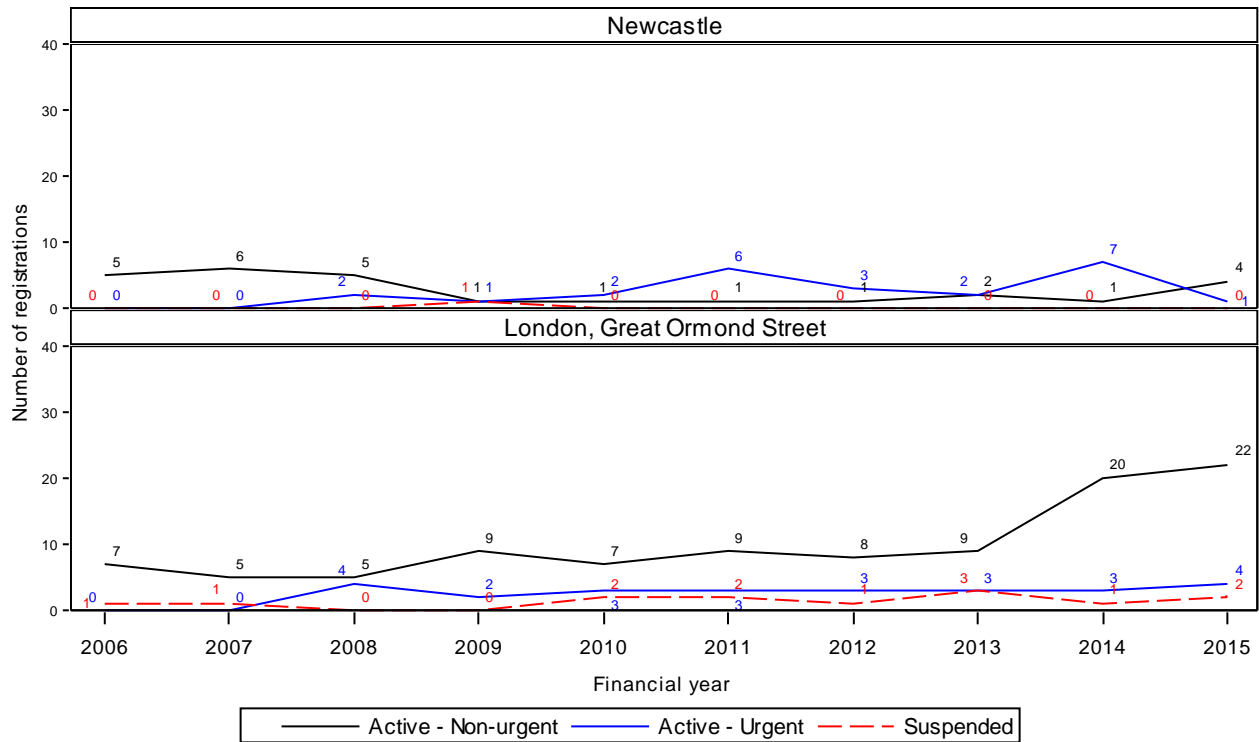


Figure 13.3 shows the number of paediatric patients on the transplant list at 31 March each year between 2006 and 2015 for each centre.

Figure 13.3 Paediatric patients on the heart transplant list at 31 March each year for the last 10 years, by year and centre



The demographic characteristics of the 31 paediatric patients on the active heart transplant list on 31 March 2015 are shown by centre and overall in **Table 13.1**. 77% of the recipients were male and the median age was 7 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 13.1 Demographic characteristics of paediatric heart transplant list patients at 31 March 2015, by centre				
		Newcastle	Great Ormond Street	TOTAL
		N (%)	N (%)	
Number		5 (100)	26 (100)	31 (100)
Urgency status	Urgent	1 (20)	4 (15)	5 (16)
	Non-urgent	4 (80)	22 (85)	26 (84)
Recipient sex	Male	4 (80)	20 (77)	24 (77)
	Female	1 (20)	6 (23)	7 (23)
Recipient ethnicity	White	1 (20)	21 (81)	22 (71)
	Non-white	4 (80)	5 (19)	9 (29)
Recipient age	Median (IQR)	4 (3, 6)	8 (2, 12)	7 (2, 11)
	Missing	0	0	0
Primary Disease	Cardiomyopathy	2 (40)	2 (8)	4 (13)
	Congenital heart disease	2 (40)	8 (31)	10 (32)
	Other heart disease	0 (0)	2 (8)	2 (7)
	Graft failure/Rejection	0 (0)	3 (12)	3 (10)
	Others	1 (20)	11 (42)	12 (39)
Previous open heart surgery	None	1 (20)	7 (27)	8 (26)
	One	2 (40)	0 (0)	2 (7)
	More than one	1 (20)	5 (19)	6 (19)
	Missing	1 (20)	14 (54)	15 (48)
Previous thoracotomy	No	3 (60)	11 (42)	14 (45)
	Yes	0 (0)	2 (8)	2 (7)
	Missing	1 (20)	13 (50)	14 (45)
Serum Bilirubin (umol/l)	Median (IQR)	14 (7, 21)	12 (6, 16)	12 (7, 18)
	Missing	0	14	14
Serum Creatinine (umol/l)	Median (IQR)	27 (24, 33)	42 (32, 49)	35 (27, 44)
	Missing	0	14	14

13.2 Post-registration outcomes, 1 April 2011 – 31 March 2012

An indication of outcomes for paediatric patients listed for a non-urgent heart transplant is summarised in **Figure 13.4** whilst outcomes for patients registered urgently are shown in **Figure 13.5**. **Figure 13.5** includes all patients who have been urgently listed at any point during their registration. These charts show the proportion of patients transplanted or still waiting six months, one, two and three years after joining the list. They also show the proportion removed from the transplant list (typically because they become too unwell for transplant) and those who died while on the transplant list. Within six months of listing, 27% of non-urgent heart patients were transplanted while 18% died waiting. Three years after listing, 36% received a transplant.

Figure 13.4 Post-registration outcome for 11 new non-urgent heart only registrations made in the UK, 1 April 2011 to 31 March 2012

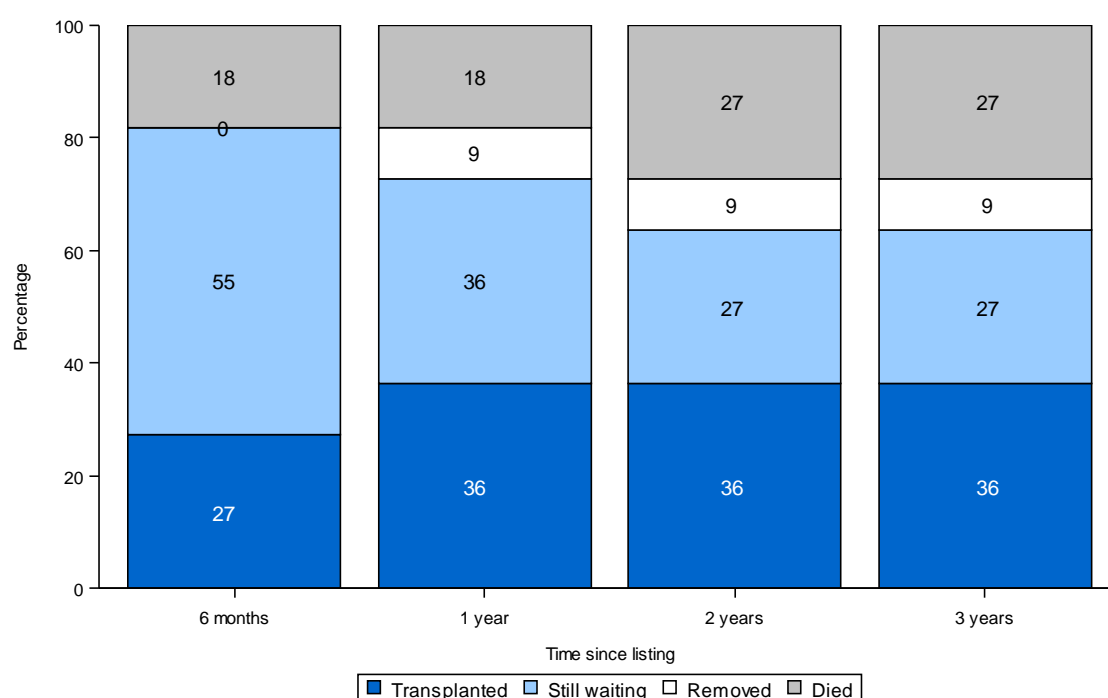
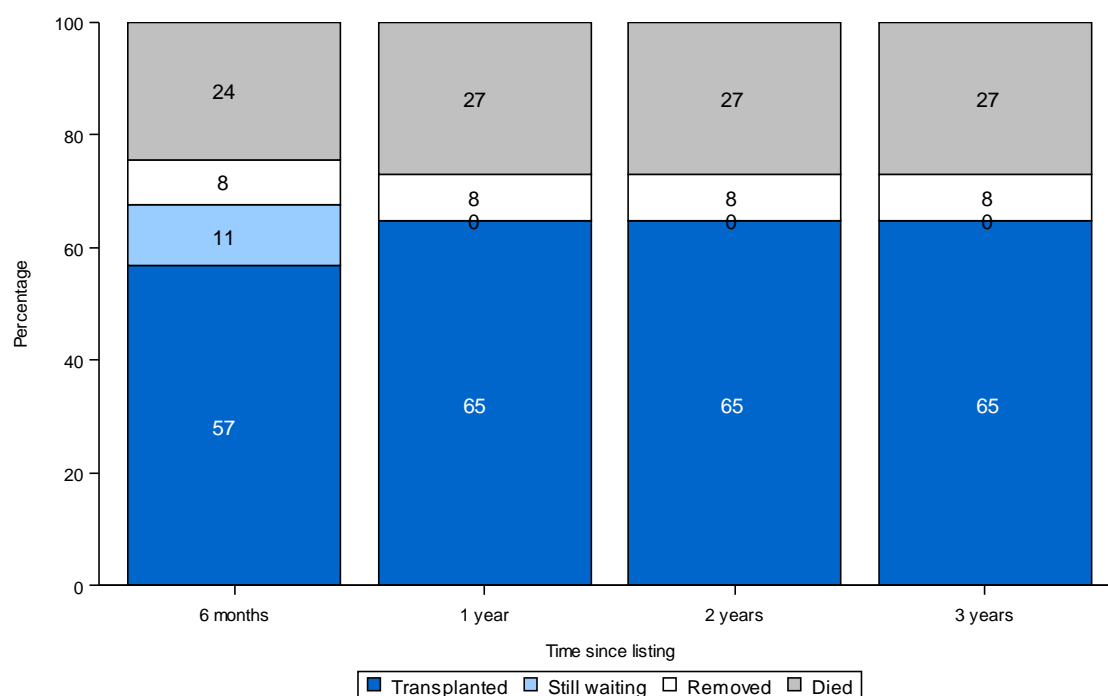


Figure 13.5 Post-registration outcome for 37 new ever urgent heart only registrations made in the UK, 1 April 2011 to 31 March 2012



13.3 Median waiting time to transplant, 1 April 2009 - 31 March 2012

The [median](#) waiting time to transplant for paediatric patients on the non-urgent heart transplant list between 1 April 2009 and 31 March 2012 was too small to present meaningful summary statistics regarding patient waiting time

PAEDIATRIC HEART TRANSPLANTATION

Response to Offers



Table 14.1 compares individual centre paediatric heart offer decline rates over time by financial year. Over the three year period 1 April 2012 to 31 March 2015, offer decline rates at Newcastle were slightly lower than at Great Ormond Street.

Table 14.1 Paediatric Heart(including cardiac block) offer results by transplant centre, between 1 April 2012 and 31 March 2015								
Centre	Financial year	Total Offer	Declined		Accepted, not used		Transplanted	
		N	N	(%)	N	(%)	N	(%)
London, Great Ormond Street	2012/13	11	6	(55)	0	(0)	5	(45)
	2013/14	18	12	(67)	0	(0)	6	(33)
	2014/15	26	18	(69)	0	(0)	8	(31)
	Overall	55	36	(65)	0	(0)	19	(35)
Newcastle	2012/13	18	5	(28)	1	(6)	12	(67)
	2013/14	27	19	(70)	0	(0)	8	(30)
	2014/15	26	13	(50)	0	(0)	13	(50)
	Overall	71	37	(52)	1	(1)	33	(46)
UK	2012/13	29	11	(38)	1	(3)	17	(59)
	2013/14	45	31	(69)	0	(0)	14	(31)
	2014/15	52	31	(60)	0	(0)	21	(40)
	Overall	126	73	(58)	1	(1)	52	(41)

PAEDIATRIC HEART TRANSPLANTATION

Transplants



15.1 Paediatric heart only transplants, 1 April 2005 – 31 March 2015

Figure 15.1 and **15.2** show the total number of paediatric heart transplants performed in the last ten years overall and by centre, respectively. The number of transplants fell from 40 in 2010/2011 to 24 in 2012/2013 and has since risen to 37 in 2014/2015. All paediatric heart only transplants performed in 2014/2015 were [DBD](#) transplants.

Figure 15.1 Number of paediatric heart transplants in the UK, by financial year, 1 April 2005 to 31 March 2015

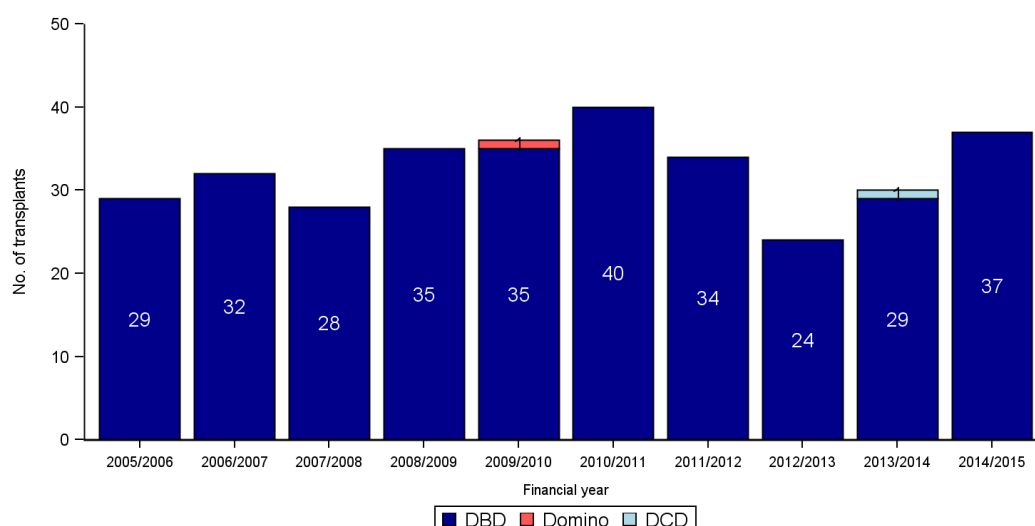


Figure 15.2 Number of paediatric heart transplants in the UK, by financial year and centre, 1 April 2005 to 31 March 2015

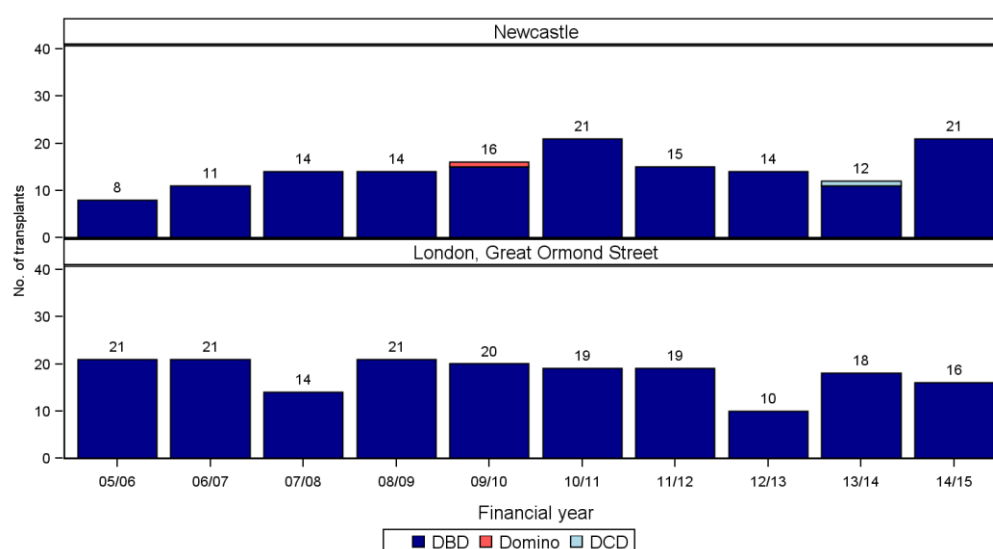


Figure 15.3 and **15.4** show the total number of paediatric heart transplants performed in the last ten years overall and by centre, respectively, by urgency status. The number of transplants by urgency status in the latest financial year (2014/2015) is shown by centre in **Figure 15.5**. The proportion of urgent transplants performed in each financial year has increased from 45% in 2005/2006 to 89% in 2014/2015. The proportion of urgent transplants performed at both Newcastle and Great Ormond Street Hospital (GOSH) was over 85%.

Figure 15.3 Number of paediatric heart transplants in the UK, by financial year and urgency status, 1 April 2005 to 31 March 2015

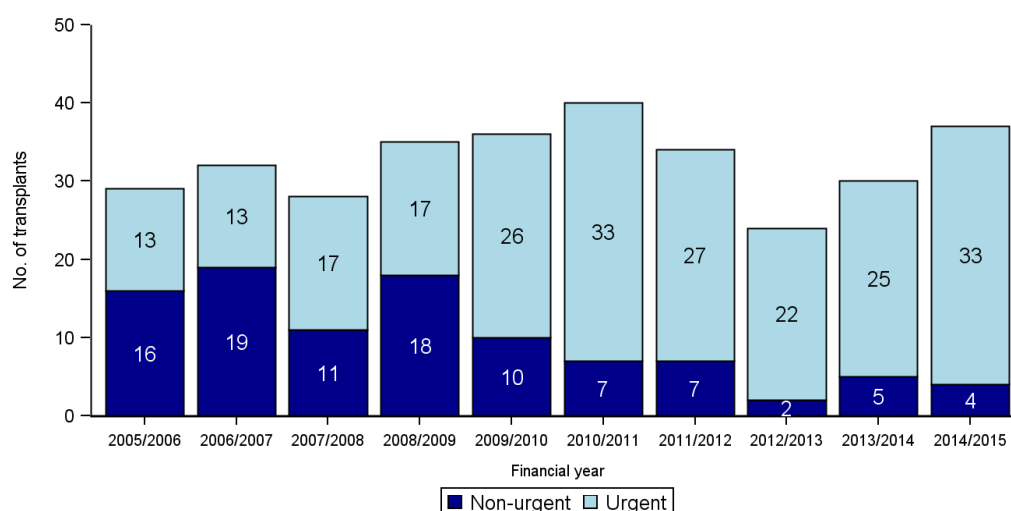
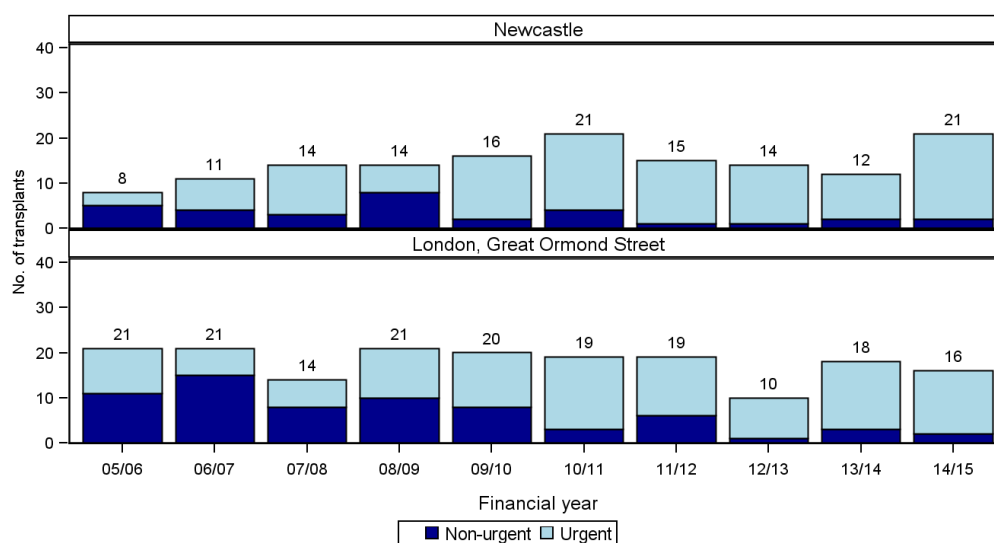
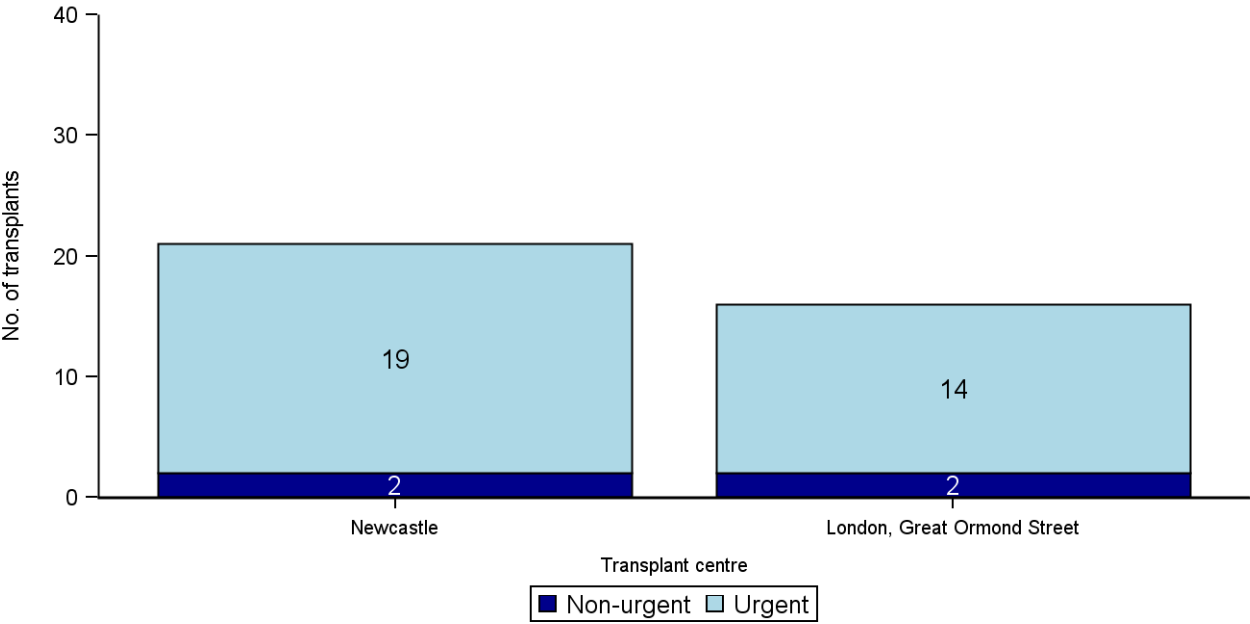


Figure 15.4 Number of paediatric heart transplants in the UK, by financial year, centre and urgency status, 1 April 2005 to 31 March 2015



**Figure 15.5 Number of paediatric heart transplants in the UK, by centre,
1 April 2014 to 31 March 2015**



The demographic characteristics of 37 paediatric heart transplant recipients on 31 March 2015 are shown by centre and overall in **Table 15.1**. 49% of these recipients were male and the [median](#) age was 5 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 15.1 Demographic characteristics of paediatric heart transplants 1 April 2014 to 31 March 2015, by centre				
		Newcastle	Great Ormond Street	TOTAL
		N (%)	N (%)	
Number		21 (100)	16 (100)	37 (100)
Urgency status at transplant	Urgent	19 (90)	14 (88)	33 (89)
	Non-urgent	2 (10)	2 (13)	4 (11)
Recipient sex	Male	8 (38)	10 (63)	18 (49)
	Female	13 (62)	6 (38)	19 (51)
Recipient ethnicity	White	13 (62)	13 (81)	26 (70)
	Non-white	7 (33)	3 (19)	10 (27)
	Missing	1 (5)	0 (0)	1 (3)
Recipient age	Median (IQR)	3 (1, 8)	8 (5, 15)	5 (1, 10)
	Missing	0	0	0
Recipient weight	Median (IQR)	15 (8, 22)	20 (15, 44)	17 (8, 26)
	Missing	0	0	0
NYHA class	I	0 (0)	1 (6)	1 (3)
	II	0 (0)	1 (6)	1 (3)
	III	1 (5)	1 (6)	2 (5)
	IV	16 (76)	3 (19)	19 (51)
	Missing	4 (19)	10 (63)	14 (38)
Recipient on ventilator	No	10 (48)	5 (31)	15 (41)
	Yes	6 (29)	1 (6)	7 (19)
	Missing	5 (24)	10 (63)	15 (41)
Recipient VAD	None	4 (19)	1 (6)	5 (14)
	Left	5 (24)	3 (19)	8 (22)
	Both	7 (33)	2 (13)	9 (24)
	Missing	5 (24)	10 (63)	15 (41)
Recipient TAH	No	16 (76)	5 (31)	21 (57)
	Missing	5 (24)	11 (69)	16 (43)
Recipient ECMO	No	15 (71)	5 (31)	20 (54)
	Yes	1 (5)	1 (6)	2 (5)
	Missing	5 (24)	10 (63)	15 (41)
Recipient on inotropes	No	3 (14)	3 (19)	6 (16)
	Yes	13 (62)	3 (19)	16 (43)
	Missing	5 (24)	10 (63)	15 (41)
Recipient IABP	No	16 (76)	4 (25)	20 (54)
	Yes	0 (0)	1 (6)	1 (3)
	Missing	5 (24)	11 (69)	16 (43)
Recipient CMV status	No	10 (48)	8 (50)	18 (49)
	Yes	3 (14)	4 (25)	7 (19)
	Missing	8 (38)	4 (25)	12 (32)
Recipient HCV status	No	14 (67)	12 (75)	26 (70)
	Missing	7 (33)	4 (25)	11 (30)

Table 15.1 Demographic characteristics of paediatric heart transplants 1 April 2014 to 31 March 2015, by centre

		Newcastle	Great Ormond Street	TOTAL
		N (%)	N (%)	
Recipient HBV status	No	14 (67)	12 (75)	26 (70)
	Missing	7 (33)	4 (25)	11 (30)
Recipient HIV status	No	14 (67)	12 (75)	26 (70)
	Missing	7 (33)	4 (25)	11 (30)
Recipient Serum Creatinine	Median (IQR)	40 (26, 56)	34 (34, 34)	40 (26, 56)
	Missing	4	15	19
Donor sex	Male	10 (48)	8 (50)	18 (49)
	Female	11 (52)	8 (50)	19 (51)
Donor ethnicity	White	10 (48)	7 (44)	17 (46)
	Non-white	0 (0)	4 (25)	4 (11)
	Missing	11 (52)	5 (31)	16 (43)
Donor age	Median (IQR)	8 (4, 14)	15 (9, 33)	10 (6, 29)
	Missing	0	0	0
Donor BMI	Median (IQR)	18 (14, 21)	17 (14, 24)	18 (14, 22)
	Missing	0	1	1
Donor cause of death	CVA	10 (48)	9 (56)	19 (51)
	Trauma	4 (19)	2 (13)	6 (16)
	Others	7 (33)	5 (31)	12 (32)
Donor hypotension	No	7 (33)	4 (25)	11 (30)
	Yes	6 (29)	2 (13)	8 (22)
	Missing	8 (38)	10 (63)	18 (49)
Donor past diabetes	No	17 (81)	6 (38)	23 (62)
	Missing	4 (19)	10 (63)	14 (38)
Donor cardiac arrest	No	12 (57)	13 (81)	25 (68)
	Yes	1 (5)	0 (0)	1 (3)
	Missing	8 (38)	3 (19)	11 (30)
Donor past hypertension	No	16 (76)	6 (38)	22 (60)
	Yes	1 (5)	0 (0)	1 (3)
	Missing	4 (19)	10 (63)	14 (38)
Donor past tumour	No	16 (76)	6 (38)	22 (60)
	Yes	1 (5)	0 (0)	1 (3)
	Missing	4 (19)	10 (63)	14 (38)
Donor past smoker	No	14 (67)	6 (38)	20 (54)
	Yes	3 (14)	0 (0)	3 (8)
	Missing	4 (19)	10 (63)	14 (38)

15.2 Total ischaemia time, 1 April 2005 – 31 March 2015

Figure 15.6 shows the [median](#) total ischaemia time in paediatric [DBD](#) donor heart transplants over the last 10 years. The [median](#) total ischaemia time has remained fairly stable over the last 10 years.

Figure 15.6 Median total ischaemia time in paediatric DBD donor heart transplants, by financial year, 1 April 2005 to 31 March 2015

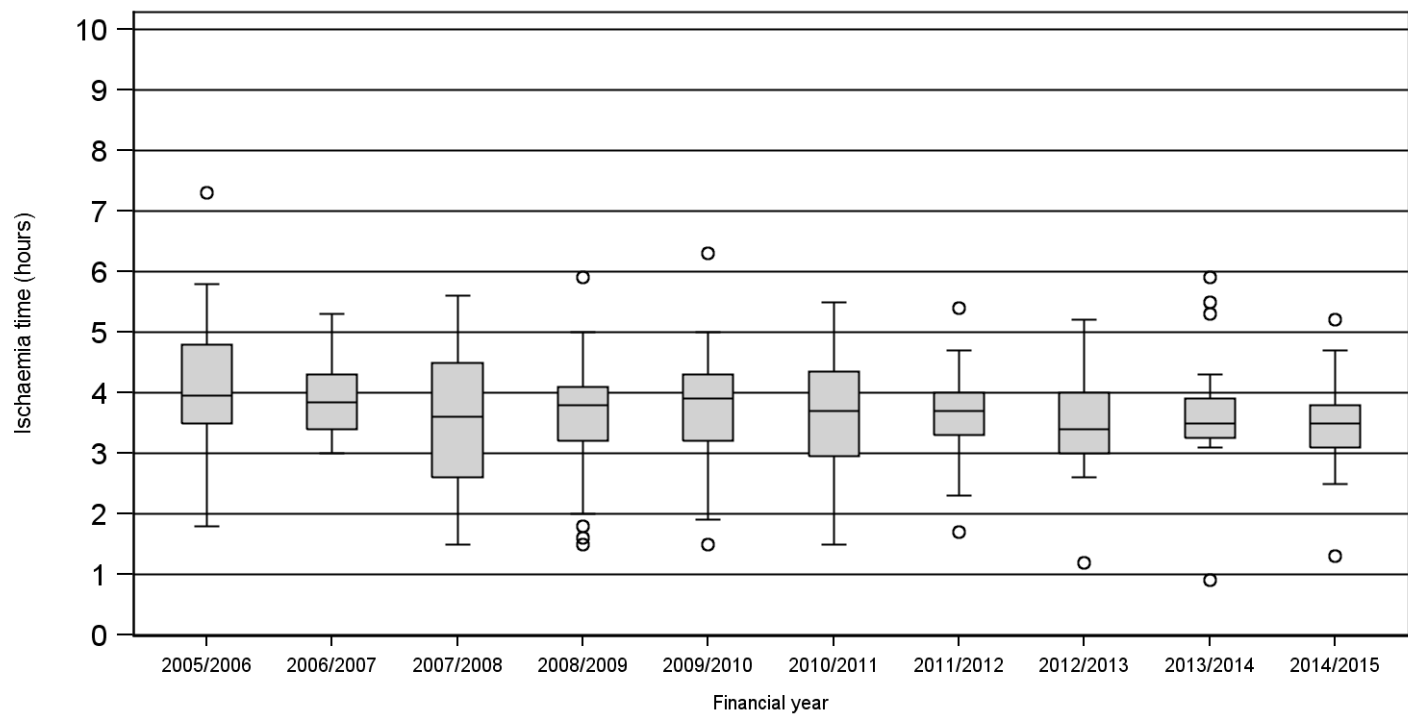


Table 15.2 shows the [median](#) total ischaemia time, where reported, in paediatric [DBD](#) donor heart transplants, by centre, over the last 10 years. This analysis does not take into account the use of donor organ maintenance systems for some transplants. These enable warm blood perfusion to continue ex-vivo during transportation. For such transplants, the definition of total ischemia time used here (cross-clamp to reperfusion) over-estimates the true ischaemia time because the heart is not subject to ischaemia during transportation.

Table 15.2 Median total ischaemia time for paediatric DBD heart transplants, by centre and financial year, 1 April 2005 - 31 March 2015				
Transplant centre	Financial year	Number of transplants with total ischaemia time reported	Total ischaemia time (hours)	
			Median	Interquartile range
Newcastle	2005/2006	8	3.7	(3.3 - 4.3)
	2006/2007	11	3.6	(3.3 - 4.3)
	2007/2008	10	3.2	(3 - 3.6)
	2008/2009	13	3.5	(2.9 - 3.9)
	2009/2010	13	3.6	(3.5 - 4.3)
	2010/2011	17	3.3	(2.8 - 4.3)
	2011/2012	15	3.8	(3.4 - 4.1)
	2012/2013	13	3.4	(3 - 3.6)
	2013/2014	10	3.3	(3.2 - 3.5)
	2014/2015	17	3.5	(2.9 - 3.8)
	Total	127	3.5	(3.1 - 3.9)
London, Great Ormond Street	2005/2006	20	4.4	(3.6 - 5.1)
	2006/2007	15	4	(3.6 - 4.6)
	2007/2008	13	4.3	(2.6 - 4.5)
	2008/2009	12	3.9	(3.4 - 4.3)
	2009/2010	18	4	(2.3 - 4.3)
	2010/2011	7	4.1	(3.8 - 4.6)
	2011/2012	6	3	(2.3 - 4)
	2012/2013	4	3.6	(2.9 - 4.7)
	2013/2014	10	3.9	(3.7 - 5.3)
	2014/2015	4	3.6	(3.3 - 3.9)
	Total	109	4	(3.3 - 4.5)
Overall	Total	236	3.7	(3.2 - 4.3)

PAEDIATRIC HEART TRANSPLANTATION

Post-Transplant Survival



The survival analysis results presented in this section exclude:

- [Multi-organ transplants](#)
- Second (or greater) graft transplants

30-day and 1-year [survival rates](#) are based on transplants performed in the period 1 April 2010 to 31 March 2014 while 5-year survival rates are based on transplants performed in the period 1 April 2006 to 31 March 2010

For the 127 paediatric heart transplants that were performed in the period 1 April 2010 and 31 March 2014, 30-day outcome information was known for all 127 patients. Thirty day [unadjusted](#) patient survival for these heart transplants is shown in **Table 16.1**. As the 95% [confidence limits](#) for Great Ormond Street and Newcastle overlap, this suggests that there is no statistically significant difference between the two centres.

Table 16.1 30 day patient survival after first paediatric heart transplants, by centre, 1 April 2010 and 31 March 2014				
Centre	Number of transplants	Number of deaths	% 30 day survival (95% CI) (unadjusted)	
Newcastle	61	2	96.7	(87.5 - 99.2)
London, Great Ormond Street	66	2	97	(88.4 - 99.2)
UK	127	4	96.9	(91.8 - 98.8)

For the 127 paediatric heart transplants that were performed in the period 1 April 2010 and 31 March 2014, 1-year outcome information was known for 114 patients. One year [unadjusted](#) patient survival for these heart transplants is shown in **Table 16.2**. As the 95% [confidence limits](#) for Great Ormond Street and Newcastle overlap, this suggests that there is no statistically significant difference between the two centres.

Table 16.2 1 year patient survival after first paediatric heart transplants, by centre, 1 April 2010 and 31 March 2014				
Centre	Number of transplants	Number of deaths	% 1 year survival (95% CI) (unadjusted)	
Newcastle	61	6	90.2	(79.4 - 95.5)
London, Great Ormond Street	66	5	92.1	(81.9 - 96.6)
UK	127	11	91.2	(84.6 - 95)

For the 124 paediatric heart transplants that were performed in the period 1 April 2006 and 31 March 2010, 5-year outcome information was known for 99 patients. Five year [unadjusted](#) patient survival for these heart transplants is shown in **Table 16.3**. As the 95% [confidence limits](#) for Great Ormond Street and Newcastle overlap, this suggests that there is no statistically significant difference between the two centres.

Table 16.3 5 year patient survival after first paediatric heart transplants, by centre, 1 April 2006 and 31 March 2010				
Centre	Number of transplants	Number of deaths	% 5 year survival (95% CI) (unadjusted)	
Newcastle	50	6	88	(75.2 - 94.4)
London, Great Ormond Street	74	10	86.3	(76.1 - 92.4)
UK	124	16	87	(79.7 - 91.8)

PAEDIATRIC LUNG TRANSPLANTATION

Transplant List



17.1 Paediatric lung and heart/lung transplant list as at 31 March, 2006 – 2015

Figure 17.1 shows the number of paediatric patients on the lung transplant list at 31 March each year between 2006 and 2015. The number of patients actively waiting for a lung transplant has increased from 4 in 2006 to 15 in 2015.

Figure 17.1 Paediatric patients on the lung transplant list at 31 March each year for the last 10 years, by year



Figure 17.2 shows the number of paediatric patients on the active lung transplant list at 31 March 2015 by centre. In total, there were 15 paediatric patients. Great Ormond Street Hospital had the largest proportion (87%) of the transplant list

Figure 17.2 Paediatric patients on the active lung transplant list at 31 March 2015, by centre

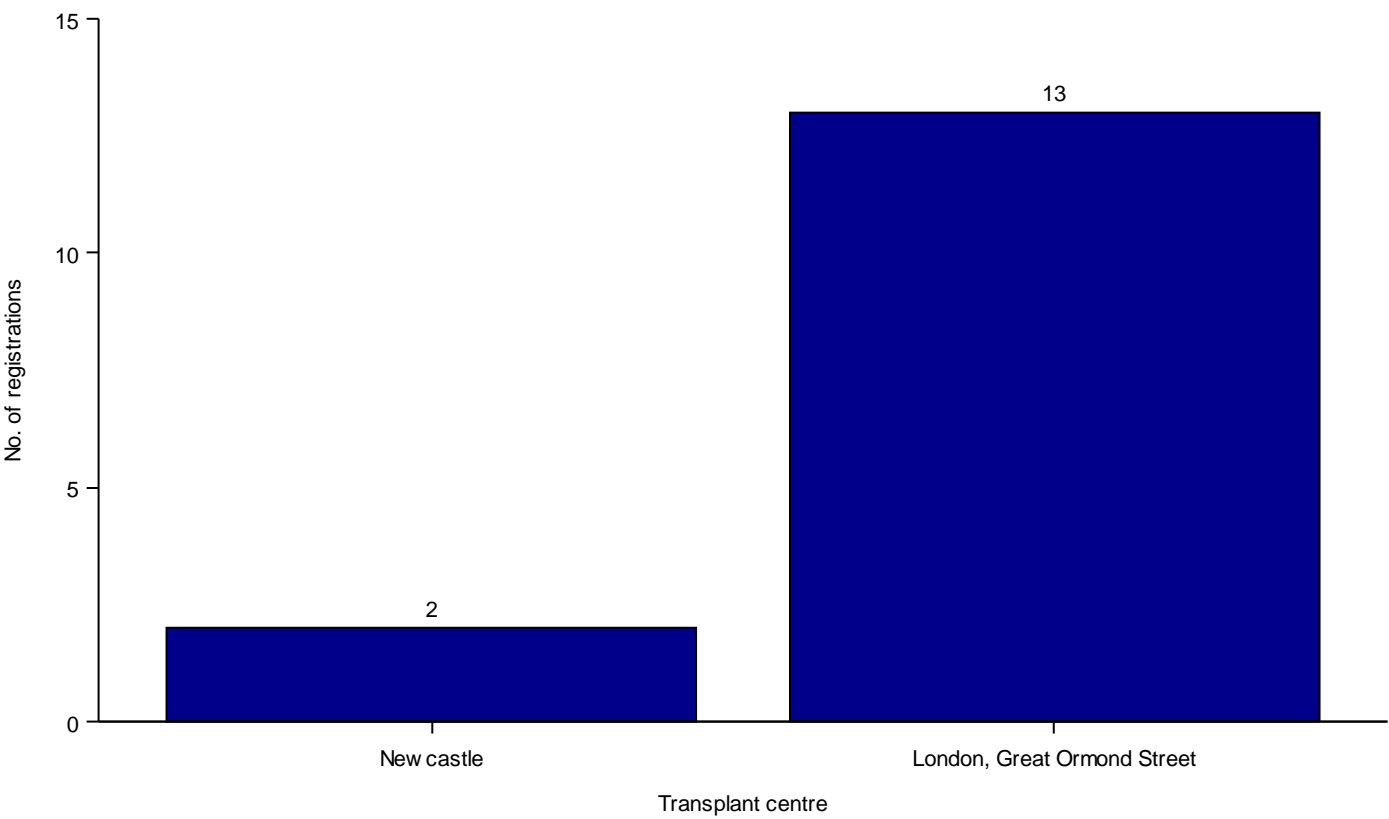
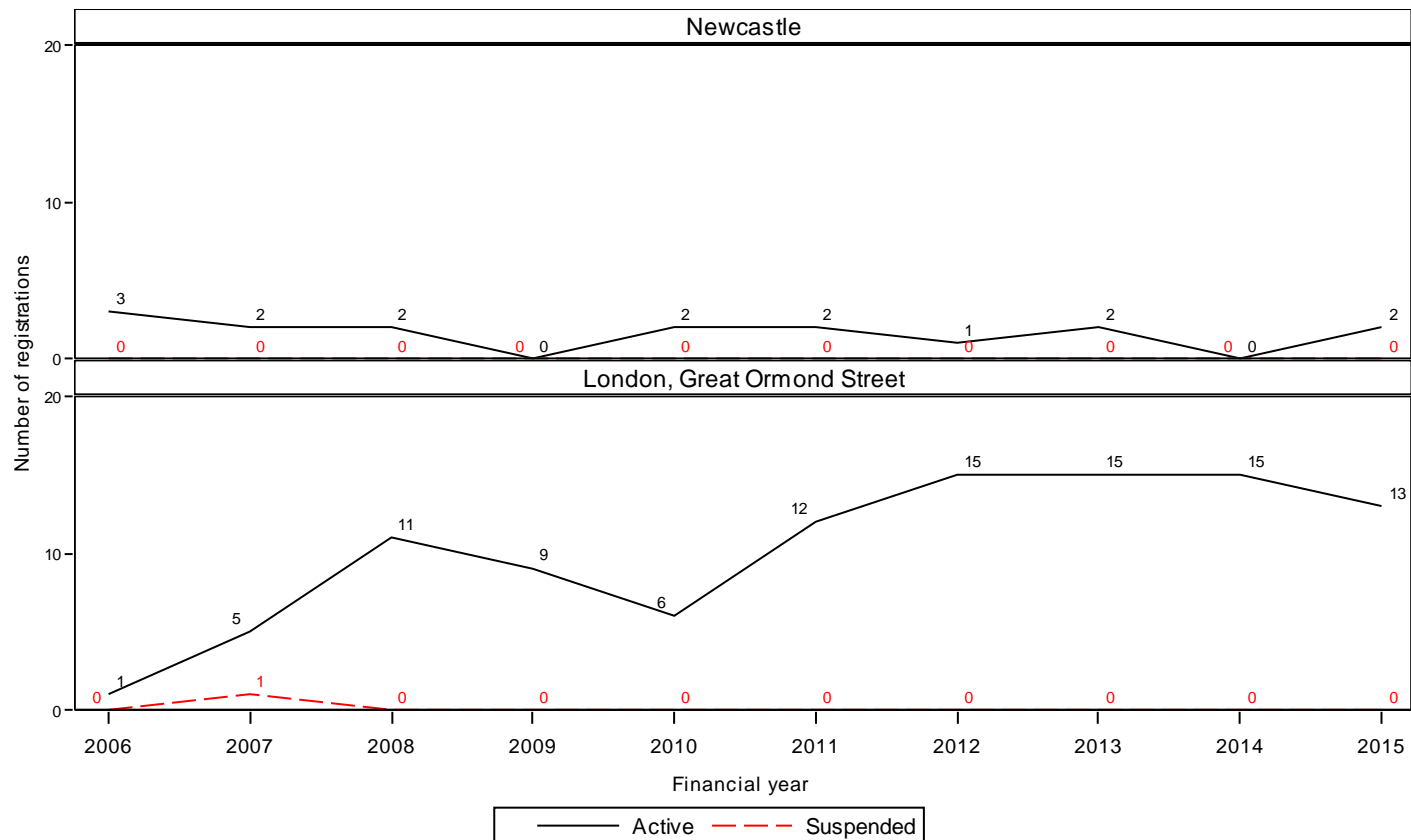


Figure 17.3 shows the number of paediatric patients on the transplant list at 31 March each year between 2006 and 2015 for each centre.

Figure 17.3 Paediatric patients on the lung transplant list at 31 March each year for the last 10 years, by year and centre



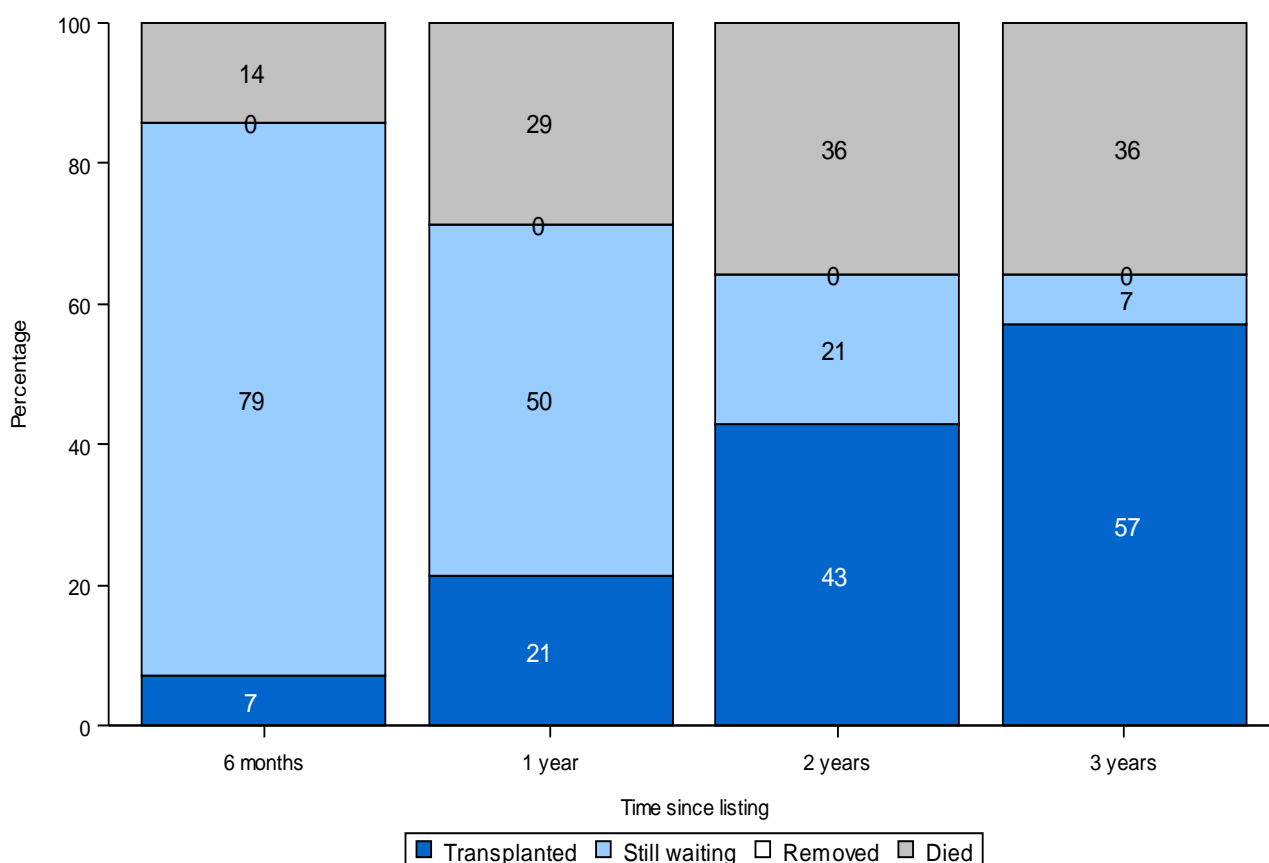
The demographic characteristics of the 15 paediatric patients on the active lung transplant list on 31 March 2015 are shown by centre and overall in **Table 17.1**. 47% of the recipients were male and the median age was 10 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 17.1 Demographic characteristics of paediatric lung transplant list patients at 31 March 2015, by centre				
		Newcastle	Great Ormond Street	TOTAL
		N (%)	N (%)	N (%)
Number		2 (100)	13 (100)	15 (100)
Recipient sex	Male	1 (50)	6 (46)	7 (47)
	Female	1 (50)	7 (54)	8 (53)
Recipient ethnicity	White	2 (100)	11 (85)	13 (87)
	Non-white	0 (0)	2 (15)	2 (13)
Recipient age	Median (IQR)	13 (10, 15)	10 (8, 13)	10 (8, 15)
	Missing	0	0	0
Primary Disease	Cystic fibrosis and bronchiectasis	2 (100)	3 (23)	5 (33)
	Fibrosing lung disease	0 (0)	1 (8)	1 (7)
	COPD and emphysema	0 (0)	0 (0)	0 (0)
	Primary pulmonary hypertension	0 (0)	5 (38)	5 (33)
	Other	0 (0)	4 (31)	4 (27)
	Missing	0 (0)	0 (0)	0 (0)
Smoker	No	2 (100)	9 (69)	11 (73)
	Missing	0 (0)	4 (31)	4 (27)
Lung function - FEV1	Median (IQR)	0.74 (0.53, 0.95)	1.77	0.95 (0.53, 1.77)
	Missing	0	12	12
Lung function - FVC	Median (IQR)	1.24 (0.92, 1.56)	2.21	1.56 (0.92, 2.21)
	Missing	0	12	12
Lung function - VO2 (max)	Median (IQR)	-	-	-
	Missing	2	13	15

17.2 Post-registration outcomes, 1 April 2011 – 31 March 2012

An indication of outcomes for paediatric patients listed for a lung transplant is summarised in **Figure 17.4**. This shows the proportion of patients transplanted or still waiting six months, one, two and three years after joining the list. It also shows the proportion removed from the transplant list (typically because they become too unwell for transplant) and those dying while on the transplant list. Within six months of listing, 7% of lung patients were transplanted while 14% died waiting. Three years after listing, 57% received a transplant.

Figure 17.4 Post-registration outcome for 14 new lung only registrations made in the UK, 1 April 2011 to 31 March 2012



17.3 Median waiting time to transplant, 1 April 2009 - 31 March 2012

The [median](#) waiting time to transplant for paediatric patients on the lung transplant list between 1 April 2009 and 31 March 2012 was too small to present meaningful summary statistics regarding patient waiting time

PAEDIATRIC LUNG TRANSPLANTATION

Response to Offers

Table 18.1 compares individual centre paediatric lung offer decline rates over the period 1 April 2012 to 31 March 2015 by financial year, for bilateral lung offers and single lung offers respectively. This analysis excludes fast track offers and considers only those offers that resulted in transplant. Heart-lung blocks are treated as bilateral lungs in the analysis. Declines and acceptances with non-use in **Table 18.1** are counted only for cases where the full bilateral lung was declined or accepted with non-use. Transplanted organs are then split by bilateral organ and single lungs.

Transplanted organs are then split into bilateral and single lungs.

Table 18.1 Paediatric bilateral lung offer results by transplant centre, 1 April 2012 to 31 March 2015									
Centre	Financial year	Total Offer N	Declined		Accepted, not used		Transplanted		
			Bilateral lungs	(%)	Bilateral lungs	(%)	Bilateral lungs	Single lungs	(%)
London, Great Ormond Street	2012/13	4	3	(75)	0	(0)	1	0	(0)
	2013/14	4	0	(0)	0	(0)	4	0	(0)
	2014/15	11	7	(64)	0	(0)	4	0	(0)
	Overall	19	10	(53)	0	(0)	9	0	(0)
Newcastle	2012/13	4	2	(50)	0	(0)	2	0	(0)
	2013/14	5	4	(80)	0	(0)	1	0	(0)
	2014/15	13	12	(92)	0	(0)	1	0	(0)
	Overall	22	18	(82)	0	(0)	4	0	(0)
UK	2012/13	8	5	(63)	0	(0)	3	0	(0)
	2013/14	9	4	(44)	0	(0)	5	0	(0)
	2014/15	24	19	(79)	0	(0)	5	0	(0)
	Overall	41	28	(68)	0	(0)	13	0	(0)

PAEDIATRIC LUNG TRANSPLANTATION

Transplants



19.1 Paediatric lung and heart/lung transplants, 1 April 2005 – 31 March 2015

Figure 19.1 and **19.2** show the total number of paediatric lung transplants performed in the last ten years overall and by centre, respectively. The number of transplants decreased each year from 9 in 2008/2009 to 4 in 2012/2013 and has since risen to 8 in 2014/2015. The number of transplants in the latest financial year (2014/2015) is shown by centre in **Figure 19.3**.

Figure 19.1 Number of paediatric lung transplants in the UK, by financial year, 1 April 2005 to 31 March 2015

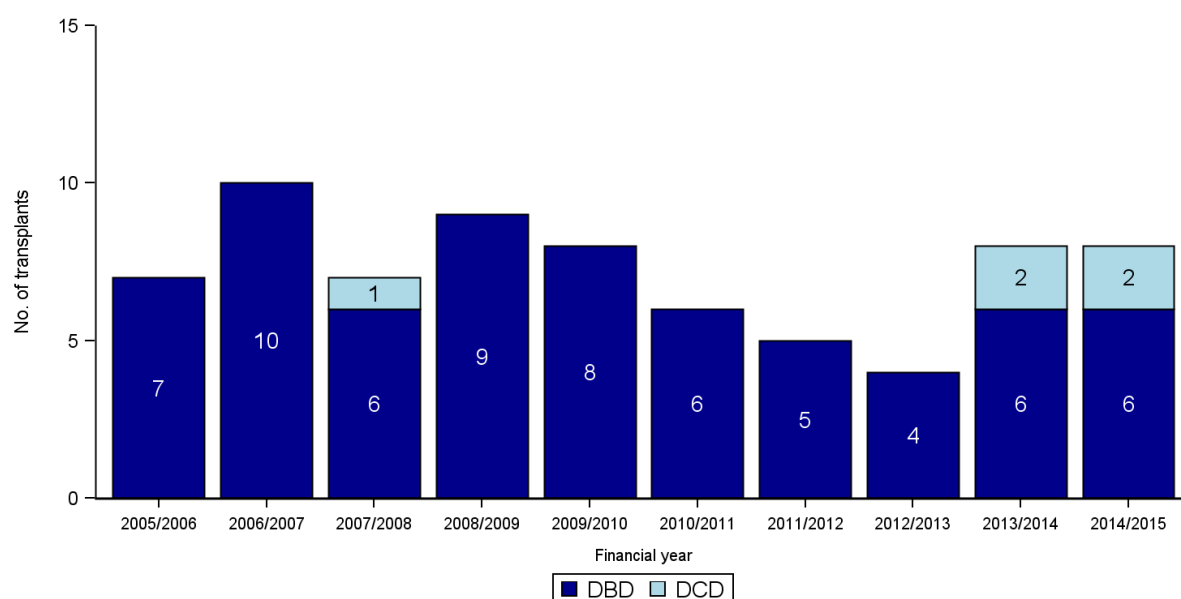


Figure 19.2 Number of paediatric lung transplants in the UK, by financial year and centre, 1 April 2005 to 31 March 2015

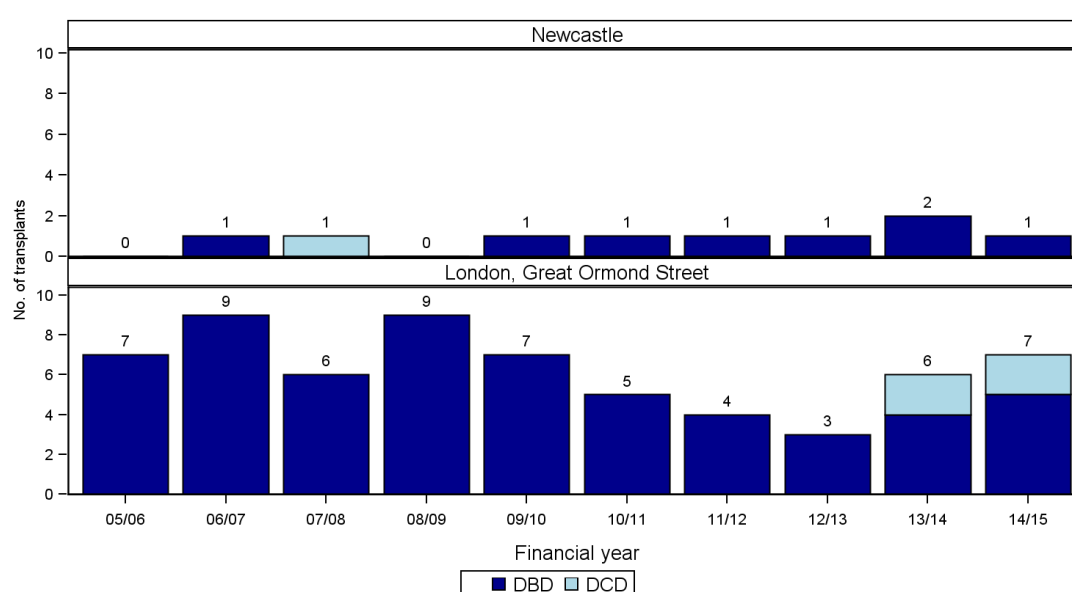


Figure 19.3 Number of paediatric lung transplants in the UK, by centre, 1 April 2014 to 31 March 2015

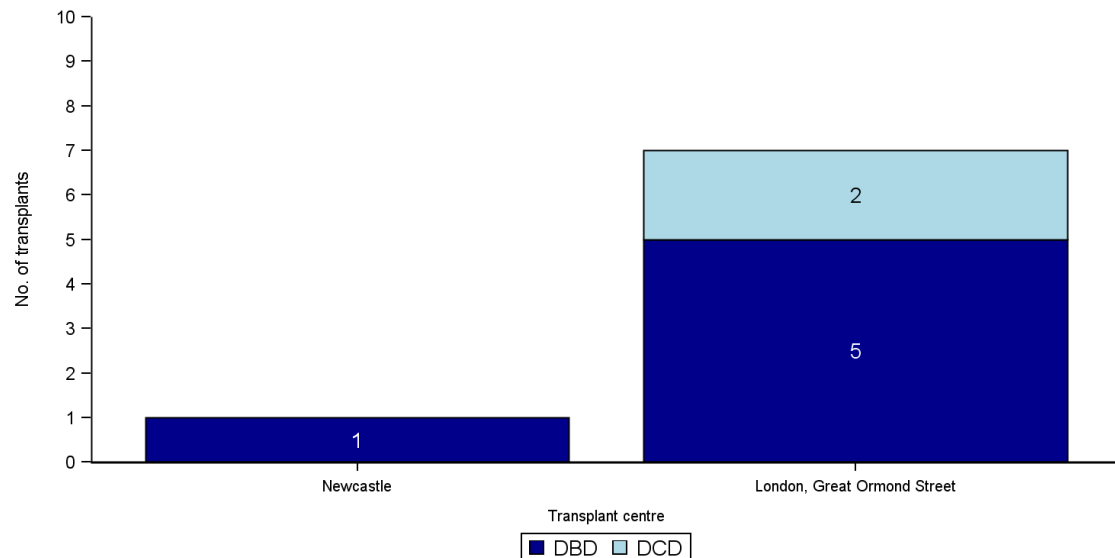


Figure 19.4 and **19.5** show the total number of paediatric lung transplants performed in the last ten years overall and by centre, respectively, by transplant type. The number of transplants by transplant type in the latest financial year (2014/2015) is shown by centre in **Figure 19.6**.

Figure 19.4 Number of paediatric lung transplants in the UK, by financial year and transplant type, 1 April 2005 to 31 March 2015

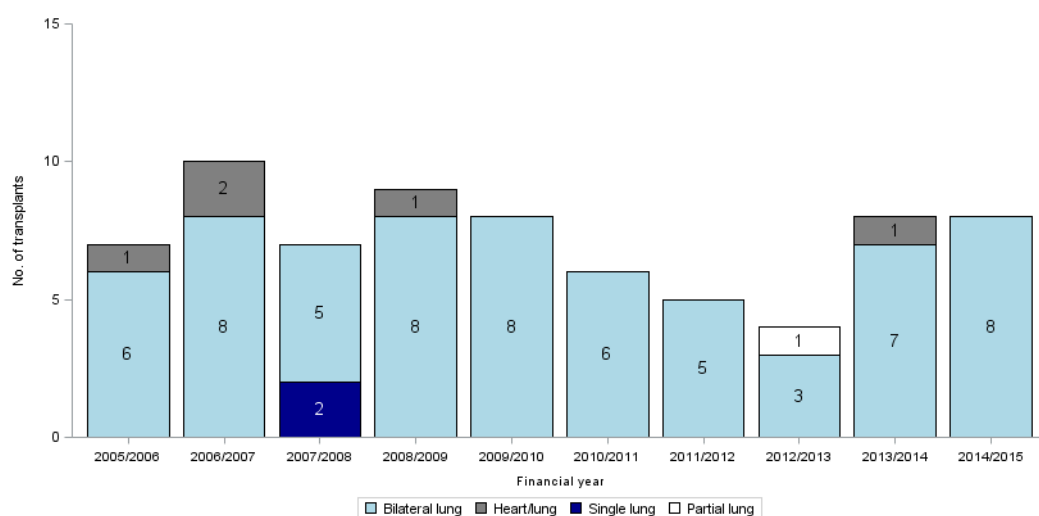


Figure 19.5 Number of paediatric lung transplants in the UK, by financial year, centre and transplant type, 1 April 2005 to 31 March 2015

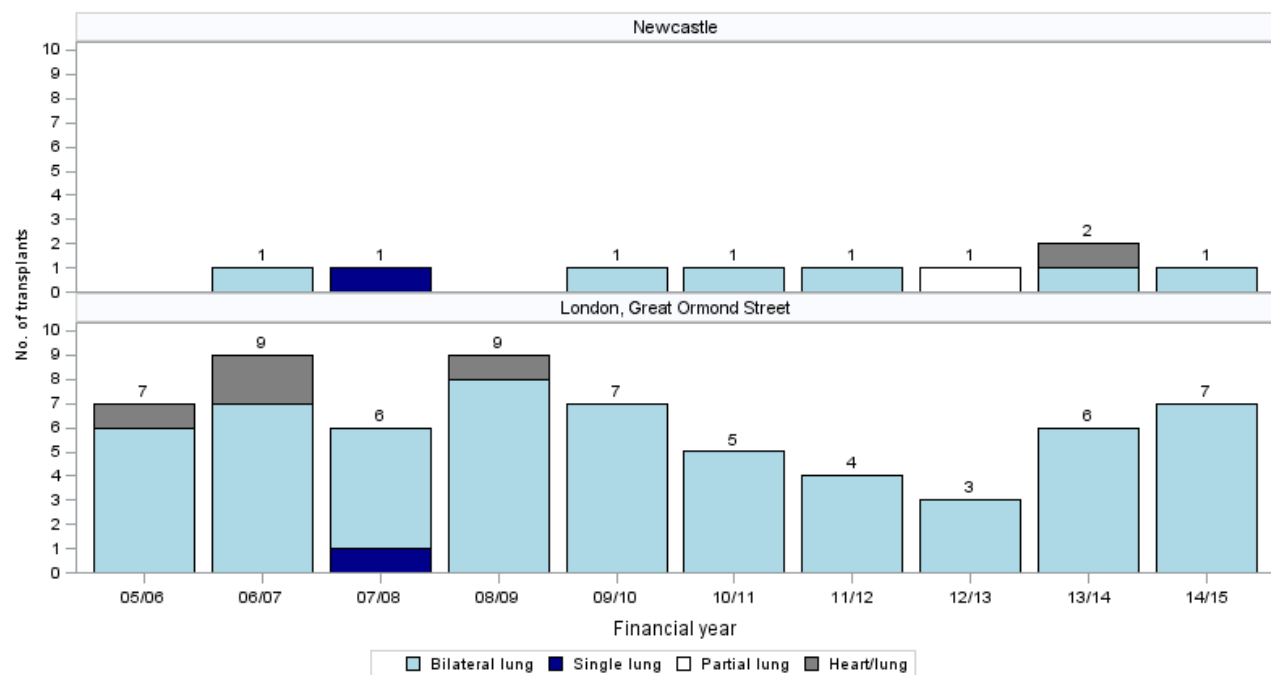
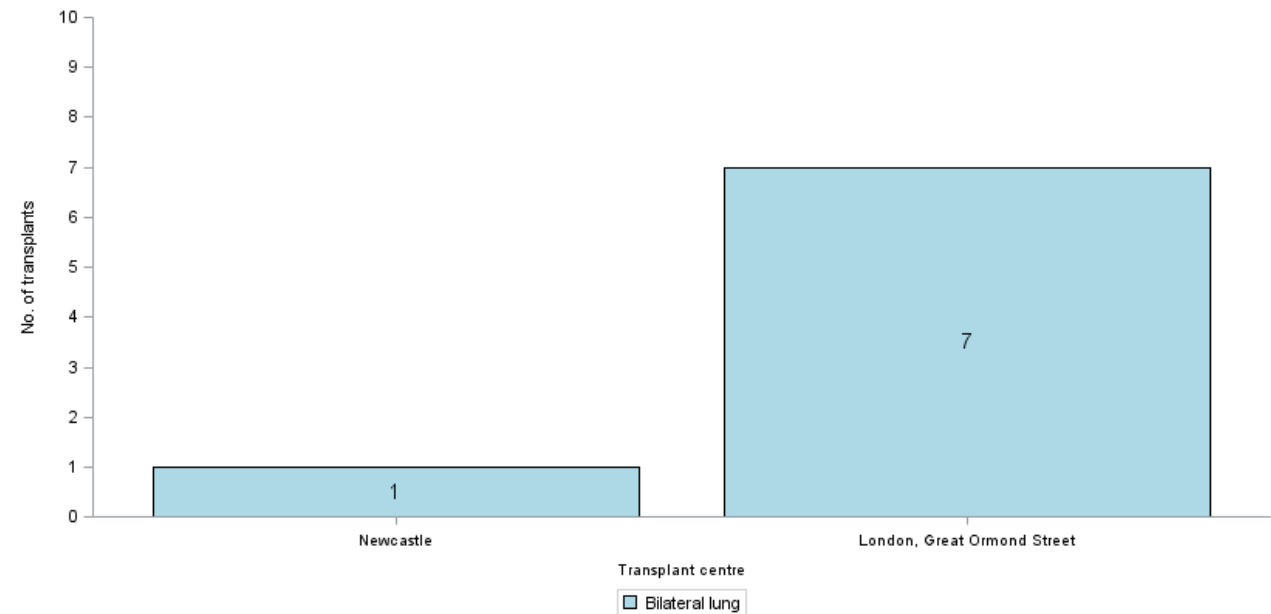


Figure 19.6 Number of paediatric lung transplants in the UK, by centre, 1 April 2014 to 31 March 2015



The demographic characteristics of 8 paediatric lung transplant recipients on 31 March 2015 are shown by centre and overall in **Table 19.1**. 38% of these recipients were male and the [median](#) age was 10 years. For some characteristics, due to rounding, percentages may not add up to 100.

Table 19.1 Demographic characteristics of paediatric lung transplants 1 April 2014 to 31 March 2015, by centre				
		Newcastle	Great Ormond Street	TOTAL
		N (%)	N (%)	
Number		1 (100)	7 (100)	8 (100)
Recipient sex	Male	1 (100)	2 (29)	3 (38)
	Female	0 (0)	5 (71)	5 (63)
Recipient ethnicity	White	1 (100)	5 (71)	6 (75)
	Non-white	0 (0)	1 (14)	1 (13)
	Missing	0 (0)	1 (14)	1 (13)
Recipient age	Median (IQR)	10 (10, 10)	10 (4, 14)	10 (7, 13)
	Missing	0	0	0
Recipient weight	Median (IQR)	35 (35, 35)	29 (17, 41)	30 (21, 38)
	Missing	0	0	0
NYHA class	I	0 (0)	1 (14)	1 (13)
	III	1 (100)	1 (14)	2 (25)
	Missing	0 (0)	5 (71)	5 (63)
Recipient on ventilator	No	0 (0)	1 (14)	1 (13)
	Missing	1 (100)	6 (86)	7 (88)
Recipient on inotropes	No	0 (0)	1 (14)	1 (13)
	Missing	1 (100)	6 (86)	7 (88)
Recipient CMV status	No	0 (0)	7 (100)	7 (88)
	Missing	1 (100)	0 (0)	1 (13)
Recipient HCV status	No	0 (0)	7 (100)	7 (88)
	Missing	1 (100)	0 (0)	1 (13)
Recipient HBV status	No	0 (0)	7 (100)	7 (88)
	Missing	1 (100)	0 (0)	1 (13)
Recipient HIV status	No	0 (0)	7 (100)	7 (88)
	Missing	1 (100)	0 (0)	1 (13)
Recipient Serum Creatinine	Median (IQR)	26 (26, 26)	29 (29, 29)	28 (26, 29)
	Missing	0	6	6
Donor sex	Male	1 (100)	3 (43)	4 (50)
	Female	0 (0)	4 (57)	4 (50)
Donor ethnicity	White	0 (0)	6 (86)	6 (75)
	Missing	1 (100)	1 (14)	2 (25)
Donor age	Median (IQR)	8 (8, 8)	8 (4, 41)	8 (6, 25)
	Missing	0	0	0
Donor BMI	Median (IQR)	13 (13, 13)	14 (11, 22)	14 (11, 19)
	Missing	0	0	0

Table 19.1 Demographic characteristics of paediatric lung transplants 1 April 2014 to 31 March 2015, by centre

		Newcastle	Great Ormond Street	TOTAL
		N (%)	N (%)	
Donor cause of death	CVA	0 (0)	4 (57)	4 (50)
	Trauma	1 (100)	0 (0)	1 (13)
	Others	0 (0)	3 (43)	3 (38)
Donor hypotension	No	0 (0)	1 (14)	1 (13)
	Yes	1 (100)	1 (14)	2 (25)
	Missing	0 (0)	5 (71)	5 (63)
Donor cardiac arrest	No	1 (100)	7 (100)	8 (100)
Donor past hypertension	No	1 (100)	1 (14)	2 (25)
	Missing	0 (0)	6 (86)	6 (75)
Donor past tumour	No	1 (100)	1 (14)	2 (25)
	Missing	0 (0)	6 (86)	6 (75)
Donor past smoker	No	1 (100)	1 (14)	2 (25)
	Missing	0 (0)	6 (86)	6 (75)

19.2 Total ischaemia time, 1 April 2005 – 31 March 2015

Table 19.2 shows the [median](#) total ischaemia time, where reported, in paediatric [DBD](#) donor lung transplants, by centre, over the last 10 years. This analysis does not take into account the use of donor organ maintenance systems for some transplants. These enable warm blood perfusion to continue ex-vivo during transportation. For such transplants, the definition of total ischemia time used here (cross-clamp to reperfusion) over-estimates the true ischaemia time because the lungs are not subject to ischaemia during transportation.

Table 19.2 Median total ischaemia time for paediatric DBD lung transplants, by centre and financial year, 1 April 2005 - 31 March 2015				
Transplant centre	Financial year	Number of transplants with total ischaemia time reported	Total ischaemia time (hours)	
			Median	Interquartile range
Newcastle	2006/2007	1	4.8	-
	2009/2010	1	5.8	-
	2010/2011	1	4.8	-
	2011/2012	1	7.8	-
	2012/2013	1	8.8	-
	2013/2014	2	5.4	(4.4 - 6.3)
	2014/2015	1	5.2	-
	Total	8	5.5	(4.8 - 7.1)
London, Great Ormond Street	2005/2006	7	3.7	(3.5 - 4.3)
	2006/2007	8	4.1	(3.9 - 5.6)
	2007/2008	5	4.3	(4.3 - 4.4)
	2008/2009	8	4.4	(3.8 - 4.8)
	2009/2010	7	4.6	(2.8 - 5)
	2010/2011	5	4.9	(3.9 - 5)
	2011/2012	4	6	(5.1 - 6.5)
	2012/2013	2	5.2	(4.1 - 6.3)
	2013/2014	4	4.7	(4.5 - 5.6)
	2014/2015	0	-	-
	Total	50	4.4	(3.9 - 5)
Overall	Total	58	4.5	(4 - 5.3)

PAEDIATRIC LUNG TRANSPLANTATION

Post-Transplant Survival



The survival analysis results presented in this section exclude:

- [Multi-organ transplants](#) (including heart/lung transplants)
- Second (or greater) graft transplants
- Partial lung transplants

90-day and 1-year [survival rates](#) are based on transplants performed in the period 1 April 2010 to 31 March 2014 while 5-year survival rates are based on transplants performed in the period 1 April 2006 to 31 March 2010

For the 18 paediatric heart transplants that were performed in the period 1 April 2010 and 31 March 2014, 90-day outcome information was known for 17 patients. Ninety day [unadjusted](#) patient survival for these lung transplants is shown in **Table 20.1**. As the 95% [confidence limits](#) for Great Ormond Street and Newcastle overlap, this suggests that there is no statistically significant difference between the two centres.

Table 20.1 90 day patient survival after first paediatric lung transplants, by centre, 1 April 2010 and 31 March 2014				
Centre	Number of transplants	Number of deaths	% 90 day survival (95% CI) (unadjusted)	
Newcastle	3	0	100	(-)
London, Great Ormond Street	15	1	93.3	(61.3 - 99)
UK	18	1	94.4	(66.6 - 99.2)

For the 18 paediatric heart transplants that were performed in the period 1 April 2010 and 31 March 2014, 1-year outcome information was known for 16 patients. One year [unadjusted](#) patient survival for these heart transplants is shown in **Table 20.2**. As the 95% [confidence limits](#) for Great Ormond Street and Newcastle overlap, this suggests that there is no statistically significant difference between the two centres.

Table 20.2 1 year patient survival after first paediatric lung transplants, by centre, 1 April 2010 and 31 March 2014				
Centre	Number of transplants	Number of deaths	% 1 year survival (95% CI) (unadjusted)	
Newcastle	3	0	100	(-)
London, Great Ormond Street	15	1	93.3	(61.3 - 99)
UK	18	1	94.4	(66.6 - 99.2)

For the 31 paediatric heart transplants that were performed in the period 1 April 2006 and 31 March 2010, 5-year outcome information was known for 25 patients. Five year unadjusted patient survival for these lung transplants is shown in **Table 20.3**. As the 95% confidence limits for Great Ormond Street and Newcastle overlap, this suggests that there is no statistically significant difference between the two centres.

Table 20.2 5 year patient survival after first paediatric lung transplants, by centre, 1 April 2006 and 31 March 2010				
Centre	Number of transplants	Number of deaths	% 5 year survival (95% CI) (unadjusted)	
Newcastle	3	1	66.7	(5.4 - 94.5)
London, Great Ormond Street	28	8	70	(48.7 - 83.8)
UK	31	9	69.8	(49.9 - 83.1)

FORM RETURN RATES



21.1 Adult heart form return rates, 1 January – 31 December 2014

Form return rates are reported in **Table 21.1** for the cardiothoracic transplant record, three month and 1 year follow up form, along with lifetime follow up (more than 2 years). These include all adult heart only transplants between 1 January and 31 December 2014 for the transplant record, and all requests for follow up forms for heart transplants (regardless of whether it was a [multi-organ transplant](#)) issued in this time period. Centres highlighted are transplant centres.

Table 21.1 Form return rates for adult heart only transplants, 1 January 2014 to 31 December 2014								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Aberdeen Royal Infirmary	-	-	-	-	-	-	1	100
Birmingham, Queen Elizabeth Hospital	29	100	24	92	13	100	192	96
Glasgow, Golden Jubilee National Hospital	14	100	13	100	18	100	129	99
Harefield, Harefield Hospital	25	100	23	100	28	100	550	89
Manchester, Wythenshawe Hospital	30	100	29	100	28	100	220	95
Newcastle, Freeman Hospital	18	94	11	100	20	100	289	99
Oxford, John Radcliffe Hospital	-	-	-	-	-	-	1	0
Papworth, Papworth Hospital	33	100	33	100	35	100	495	100
Sheffield, Northern General Hospital	-	-	-	-	-	-	68	100
Overall	149	99	133	98	142	100	1945	96

21.2 Adult lung form return rates, 1 January – 31 December 2014

Form return rates are reported in **Table 21.1** for the cardiothoracic transplant record, three month and 1 year follow up form, along with lifetime follow up (more than 2 years). These include all adult lung and heart/lung transplants between 1 January and 31 December 2014 for the transplant record, and all requests for follow up forms issued in this time period. Centres highlighted are transplant centres.

Table 21.2 Form return rates for adult lung transplants, 1 January 2014 to 31 December 2014								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Birmingham, Queen Elizabeth Hospital	26	100	23	91	14	100	71	99
Harefield, Harefield Hospital	47	100	50	100	53	100	352	89
Manchester, Wythenshawe Hospital	25	100	27	100	30	100	128	98
Newcastle, Freeman Hospital	50	100	52	100	53	98	302	98
Papworth, Papworth Hospital	39	100	34	100	35	100	248	100
Sheffield, Northern General Hospital	-	-	-	-	-	-	6	83
Overall	187	100	186	99	185	99	1107	9

21.3 Paediatric heart form return rates, 1 January – 31 December 2014

Form return rates are reported in **Table 21.3** for the cardiothoracic transplant record, three month and 1 year follow up form, along with lifetime follow up (more than 2 years). These include all paediatric heart only transplants between 1 January and 31 December 2014 for the transplant record, and all requests for follow up forms issued in this time period. Centres highlighted are transplant centres.

Table 21.3 Form return rates for paediatric heart only transplants, 1 January 2014 to 31 December 2014								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
London, Great Ormond Street Hospital	17	76	15	67	15	80	129	71
Newcastle, Freeman Hospital	16	94	13	92	15	100	163	98
Overall	33	85	28	79	30	90	292	86

21.4 Paediatric lung form return rates, 1 January – 31 December 2014

Form return rates are reported in **Table 21.4** for the cardiothoracic transplant record, three month and 1 year follow up form, along with lifetime follow up (more than 2 years). These include all paediatric lung and heart/lung transplants between 1 January and 31 December 2014 for the transplant record, and all requests for follow up forms issued in this time period. Centres highlighted are transplant centres.

Table 21.4 Form return rates for adult lung transplants, 1 January 2014 to 31 December 2014								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
London, Great Ormond Street Hospital	6	33	8	25	6	67	16	88
Newcastle, Freeman Hospital	1	100	1	100	2	50	12	100
Overall	7	43	9	33	8	63	28	93

APPENDIX



A1: Number of patients analysed

The cohort of patients in this report varies by section/analysis. Tables **A1.1** and **A1.2** below summarise the number of adult and paediatric (respectively) transplants in each cohort and the section this applies to. For the survival from listing analysis, see the Methods section in **A2** below.

Table A1.1 Adult transplants analysed				
Time period	Report Section	Exclusion criteria	No.heart transplants	No. lung (+ heart/lung) transplants
1 April 2005 – 31 March 2015	• Introduction	None	1147	1555
1 April 2005 – 31 March 2015	• Transplants	• Multi-organ transplants	1136	1551
1 April 2010 – 31 March 2014	Post-transplant survival – • 30/90-day • 1-year survival	• Multi-organ transplants (including heart/lung txs) • Partial lung transplants • Second (or more) graft transplants	477	724
1 April 2006 – 31 March 2010	Post-transplant survival – • 5-year survival	• Multi-organ transplants (including heart/lung txs) • Partial lung transplants • Second (or more) graft transplants	392	513

Table A1.2 Paediatric transplants analysed					
Time period	Report Section	Exclusion criteria	No.heart transplants	No. lung (+ heart/lung) transplants	
1 April 2005 – 31 March 2015	• Introduction	None	325	72	
1 April 2005 – 31 March 2015	• Transplants	• Multi-organ transplants	325	72	
1 April 2010 – 31 March 2014	Post-transplant survival – • 30/90-day • 1-year survival	• Multi-organ transplants (including heart/lung txs) • Partial lung transplants • Second (or more) graft transplants	127	19	
1 April 2006 – 31 March 2010	Post-transplant survival – • 5-year survival	• Multi-organ transplants (including heart/lung txs) • Partial lung transplants • Second (or more) graft transplants	124	34	

A2: Methods

Offer Decline rates

The offer decline rate analysis was limited to heart-only (or lung/heart-lung only) offers from [DBD](#) donors who had at least one heart (or lung /heart-lung) retrieved and resulted in transplantation. Any from donations after circulatory death donors were excluded.

[Funnel plots](#) were used to compare centre specific offer decline rates and indicate how consistent the rates of the individual transplant centres are with the national rate. The overall national [unadjusted](#) offer decline rate is shown by the solid line while the 95% and 99.8% confidence lines are indicated via a thin and thick dotted line, respectively. Each dot in the plot represents an individual transplant centre. Centres that are positioned above the upper limits indicate an offer decline rate that is higher than the national rate, while centres positioned below the lower limits indicate an offer decline

Unadjusted post-transplant survival rates

[Kaplan-Meier](#) methods were used to estimate the [unadjusted](#) 30-day patient [survival rates](#) for hearts and 90-day patient [survival rates](#) for lungs. Patients can be included in this method of analysis irrespective of the length of follow-up recorded. If a patient is alive at the end of the follow-up then information about the survival of the patient is censored.

Risk-adjusted post-transplant survival rates

A risk-adjusted [survival rate](#) is an estimate of what the survival rate at a centre would have been if they had had the same mix of patients as that seen nationally. The risk-adjusted rate therefore presents estimates in which differences in patient mix across centres have been removed as much as possible. For that reason, it is valid to only compare centres using risk-adjusted rather than unadjusted rates, as differences among the latter can be attributed to differences in patient mix.

Risk-adjusted survival estimates were obtained through indirect standardisation. A [Cox Proportional Hazards model](#) was used to determine the probability of survival for each patient based on their individual risk factor values. The sum of these probabilities for all patients at a centre gives the number, E, of patients or grafts expected to survive at least one year or five years after transplant at that centre. The number of patients who actually survive the given time period is given by O. The risk-adjusted estimate is then calculated by multiplying the ratio O/E by the overall unadjusted survival rate across all centres. The risk-adjustment models used were based on results from previous studies that looked at factors affecting the survival rates of interest. The factors included in the models are shown in the tables below.

The [funnel plot](#) is a graphical method to show how consistent the survival rates of the different transplant centres are compared to the national rate. The graph shows for each centre, a survival rate plotted against the number of transplants undertaken, with the national rate and [confidence limits](#) around this national rate superimposed. In this report, 95% and 99.8% [confidence limits](#) were used. Units that lie within the [confidence limits](#) have survival rates that are statistically consistent with the national rate. When a unit is close to or outside the limits, this is an indication that the centre may have a rate that is considerably different from the national rate.

Survival from listing

Data were obtained for all patients ≥ 18 years registered for the first time for a heart or lung transplant between 1 January 2003 and 31 December 2014. 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. donor type. Survival time was censored at either the date of removal from the list, or at the last known follow up date post-transplant when no death date was recorded, or at 30 April 2015 if the patient was on the transplant list at time of analysis.

Exclusions from the analysis:

- patients with ethnic group not reported
- patients with unknown gender
- patient registered for a heart-lung block or other [multi-organ transplant](#)
- patients who were not listed prior to transplant
- patients first registered on another transplant list (e.g. kidney list)
- patients registered outside the UK or not entitled to NHS treatment
- adult patients registered at paediatric centres
- patients with missing BMI

Patients registered for a heart transplant who were non-urgent and then urgently listed on the same day (or vice-versa) were recorded as urgent at registration. Patients who received a VAD and were registered on the transplant list on the same day were assumed to have received the VAD prior to registration.

In [risk-adjusted](#) survival analysis, factors recorded at time of transplant listing were adjusted for. These are detailed in **Table A2.1** and were included in the modelling whether or not statistically significant.

Table A2.1 Factors used in risk-adjusted models for patient survival from listing	
Heart	Age, gender, ethnicity, blood group, BMI, urgency status, primary disease, previous heart surgery, in hospital at registration, on VAD/ECMO support at registration, era
Lung	Age, gender, ethnicity, blood group, BMI, primary disease, previous thoracotomy, in hospital at registration, era

[Survival rates](#) at one, five and ten years post registration were calculated from the risk adjusted survival rate (RASR), obtained as $1 - \{\text{observed number of deaths in follow up period} / \text{expected number}\} \times \text{national mortality rate}$. The expected survival rates were estimated from fitting a [Cox model](#) to the national data, excluding transplant centre, evaluated at each patient's observed survival time. Interval estimates for one, five and ten year rates, and the significance of differences between them across centres, were found using Poisson regression models for the logarithm of the observed number of deaths, with centre as a random effect.

Continuous monitoring of centre outcomes

The continuous monitoring performed combines the use of two types of cumulative sum (CUSUM) chart; the 'Observed – Expected' (O-E) chart and the tabular CUSUM of centre outcomes.

The O-E chart is a useful tool for observing centre performance over time. A downward trend indicates a lower than expected rate of mortality compared with the baseline period (i.e. improved performance), whereas an upward trend points to an observed mortality rate that is higher than expected (i.e. inferior performance). From the O-E chart, it is not possible to determine when a significant change in the mortality rate has occurred. To identify statistically significant changes the tabular CUSUM chart is used to complement the O-E chart. A significant shift in the underlying mortality rate is evident when the chart crosses the limit and generates a signal.

The O-E chart plots the cumulative difference between the observed and expected patient mortality. Expected mortality has been determined from an [unadjusted](#) national average mortality rate based on transplants in the baseline period (between 2008 and 2011), with more recent transplants given greater weight. The chart is not reset but continues to monitor each successive transplant in the monitoring period. For transplants with a positive 30-day outcome the chart goes down a small step (p ; $0 \leq p \leq 1$), while for each patient death the chart goes up by a larger step ($1-p$). The step sizes reflect that there is a small probability of death (p). For example, if the expected death rate in the centre is 10%, each transplant that is functioning at 30 days will cause the chart to go down by 0.1 and each patient death within 30 days will cause the chart to go up by 0.9.

A3: Risk models

Table A3.1 **Risk factors** and categories used in the adult heart risk adjusted 30-day, 1-year and 5-year survival models

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	Non-linear spline with knots at 60, 95, 119, 181
ECMO at transplant (<i>30 day model only</i>)	Yes No
VAD at transplant (<i>1 and 5 year models only</i>)	Short-term Long-term (including total artificial hearts) ECMO None
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 A3.2 <u>Risk factors</u> and categories used in the adult lung risk adjusted 90-day, 1- year and 5-year survival model	
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)
ECMO at transplant	No Yes
Recipient bilirubin at registration	(modelled as continuous variable)
Recipient cholesterol at registration	(modelled as continuous variable)
Recipient age at transplant	Non-linear spline with knots at 22, 45, 56, and 63.
Ischaemia time (hours)	Non-linear spline with knots at 3.283, 4.883, 6.1 and 9.817
Transplant type	Single lung Bilateral lung
Primary disease group	COPD and emphysema Cystic fibrosis and bronchiectasis Fibrosing lung disease Primary pulmonary hypertension Other
Transplant type*Primary disease group	COPD and emphysema – single lung COPD and emphysema – bilateral lung Cystic fibrosis and bronchiectasis – single lung Cystic fibrosis and bronchiectasis – bilateral lung Fibrosing lung disease – single lung Fibrosing lung disease – bilateral lung Primary pulmonary hypertension – single lung Primary pulmonary hypertension – bilateral lung Other – single lung Other – bilateral lung

A4: Glossary of terms

Active transplant list

When a patient is registered for a transplant, they are registered on what is called the 'active' transplant list. This means that when a donor organ becomes available, the patient is included among those who are matched against the donor to determine whether or not the organ is suitable for them. It may sometimes be necessary to take a patient off the transplant list, either temporarily or permanently. This may be done, for example, if someone becomes too ill to receive a transplant. The patient is told about the decision to suspend them from the list and is informed whether the suspension is temporary or permanent. If a patient is suspended from the list, they are not included in the matching of any donor organs that become available.

Case mix

The types of patients treated at a unit for a common condition. This can vary across units depending on the facilities available at the unit as well as the types of people in the catchment area of the unit. The definition of what type of patient a person is depends on the patient characteristics that influence the outcome of the treatment.

Confidence interval (CI)

When an estimate of a quantity such as a [survival rate](#) is obtained from data, the value of the estimate depends on the set of patients whose data were used. If, by chance, data from a different set of patients had been used, the value of the estimate may have been different. There is therefore some uncertainty linked with any estimate. A [confidence interval](#) is a range of values whose width gives an indication of the uncertainty or precision of an estimate. The number of transplants or patients analysed influences the width of a confidence interval. Smaller data sets tend to lead to wider confidence intervals compared to larger data sets. Estimates from larger data sets are therefore more precise than those from smaller data sets. Confidence intervals are calculated with a stated probability, usually 95%. We then say that there is a 95% chance that the [confidence interval](#) includes the true value of the quantity we wish to estimate.

Confidence limit

The upper and lower bounds of a [confidence interval](#).

Cox Proportional Hazards model

A statistical model that relates the instantaneous risk (hazard) of an event occurring at a given time point to the [risk factors](#) that influence the length of time it takes for the event to occur. This model can be used to compare the hazard of an event of interest, such as patient death, across different groups of patients.

Donor after brain death (DBD)

A donor whose heart is still beating when their entire brain has stopped working so that they cannot survive without the use of a ventilator. Organs for transplant are removed from the donor while their heart is still beating, but only after extensive tests determine that the brain cannot recover and they have been certified dead.

Donor after circulatory death (DCD)

A donor whose heart stops beating before their brain stops working and who is then certified dead. The organs are then removed.

Funnel plot

A graphical method that shows how consistent the rates, such as [survival rates](#) or decline rates, of the different transplant units are compared to the national rate. For survival rates, the graph shows for each unit, a survival rate plotted against the number of transplants undertaken, with the national rate and [confidence limits](#) around this national rate superimposed. In this report, 95% and 99.8% [confidence limits](#) were used. Units that lie within the [confidence limits](#) have survival rates that are statistically consistent with the national rate. When a unit is close to or outside the limits, this is an indication that the centre may have a rate that is considerably different from the national rate.

Inter-quartile range

The values between which the middle 50% of the data fall. The lower boundary is the lower quartile, the upper boundary the upper quartile.

Kaplan-Meier method

A method that allows patients with incomplete follow-up information to be included in estimating [survival rates](#). For example, when estimating one year [patient survival rates](#), a patient may be followed up for only nine months before they relocate. If we calculated a crude survival estimate using the number of patients who survived for at least a year, this patient would have to be excluded as it is not known whether or not the patient was still alive at one year after transplant. The Kaplan-Meier method allows information about such patients to be used for the length of time that they are followed-up, when this information would otherwise be discarded. Such instances of incomplete follow-up are not uncommon and the Kaplan-Meier method allows the computation of estimates that are more meaningful in these cases.

Median

The midpoint in a series of numbers, so that half the data values are larger than the median, and half are smaller.

Multi-organ transplant

A transplant in which the patient receives more than one organ. For example, a patient may undergo a transplant of a heart and kidney.

Patient survival rate

The percentage of patients who are still alive (whether the graft is still functioning or not). This is usually specified for a given time period after transplant. For example, a five-year patient survival rate is the percentage of patients who are still alive five years after their first transplant.

p value

In the context of comparing [survival rates](#) across centres, the p value is the probability that the differences observed in the rates across centres occurred by chance. As this is a probability, it takes values between 0 and 1. If the p value is small, say less than 0.05, this implies that the differences are unlikely to be due to chance and there may be some identifiable cause for these differences. If the p value is large, say greater than 0.1, then it is quite likely that any differences seen are due to chance.

Risk-adjusted survival rate

Some transplants have a higher chance than others of failing at any given time. The differences in expected survival times arise due to differences in certain factors, the [risk factors](#), among patients. A risk-adjusted [survival rate](#) for a centre is the expected survival rate for that centre given the [case mix](#) of their patients. Adjusting for [case mix](#) in estimating centre-specific survival rates allows valid comparison of these rates across centres and to the national rate.

Risk factors

These are the characteristics of a patient, transplant or donor that influence the length of time that a graft is likely to function or a patient is likely to survive following a transplant. For example, when all else is equal, a transplant from a younger donor is expected to survive longer than that from an older donor and so donor age is a risk factor.

Unadjusted survival rate

Unadjusted [survival rates](#) do not take account of [risk factors](#) and are based only on the number of transplants at a given centre and the number and timing of those that fail within the post-transplant period of interest. In this case, unlike for risk-adjusted rates, all transplants are assumed to be equally likely to fail at any given time. However, some centres may have lower unadjusted survival rates than others simply because they tend to undertake transplants that have increased risks of failure. Comparison of unadjusted survival rates across centres and to the national rate is therefore inappropriate.

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