NHS
Blood and Transplant

ANNUAL REPORT ON PANCREAS AND ISLET TRANSPLANTATION

REPORT FOR 2013/2014
(1 APRIL 2004 – 31 MARCH 2014)

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Contents

Executive Summary

This report presents key figures about pancreas and islet transplantation in the UK. The period reported covers 10 years of pancreas transplant data, from 1 April 2004 and six years of islet transplant data, from 1 April 2008. The report presents information on the number of transplants and survival analysis after first simultaneous pancreas and kidney and pancreas only transplantation on a national and centre-specific basis.

Key findings

- On the 31 March 2014, there were 269 patients on the UK active pancreas and islet transplant list, which represents a 1% decrease in number of patients a year earlier. The number of patients on the active pancreas list decreased by 4% to 236 in 2014 while the active islet transplant list increased by 22% to 33 patients in the same time period.

- There were 1848 pancreas transplants performed in the UK in the ten year period and 129 islet transplants performed in the six years since islet transplantation was first commissioned in the UK. The number of transplants from donations after brain death and donations after circulatory death increased in the last year to 203 (6%) and 43 (5%), respectively

- The national rates of graft survival one- and five-years after first simultaneous pancreas and kidney transplant from deceased donors are 85% and 77%, respectively. These rates vary between centres, ranging from 72% to 95% at one-year and 66% to 85% at five-years. All centre rates are risk-adjusted.

- The national rates of patient survival one- and five-years after first simultaneous pancreas and kidney transplant from deceased donors are 96% and 90%, respectively. These rates vary between centres, ranging from 91% to 100% at one-year and 79% to 98% at five-years. All centre rates are risk-adjusted.

- The national rates of graft survival one- and five-years after first pancreas only transplant from deceased donors are 65% and 44%, respectively. The national rates of patient survival one- and five-years are 95% and 85%. 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 survival estimate for graft survival one-year after first routine islet transplant is 87%. Reductions in annual rate of severe hypoglycaemic events, HbA1c, and insulin dose have been reported at one-year post routine islet transplant.

- The national rate of ten year patient survival from listing for deceased donor pancreas, simultaneous pancreas and kidney or islet transplant is 74%. These rates vary between centres, ranging from 68% to 83%. All centre rates are risk-adjusted.

Introduction

This report presents information on pancreas transplant activity between 1 April 2004 and 31 March 2014, for all eight centres performing pancreas transplantation in the UK. Information on islet transplant activity is presented for all seven centres performing islet transplantation, since 1 April 2008 when islet transplantation was first commissioned in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood & Transplant, that holds information relating to donors, recipients and outcomes for all pancreas and islet transplants performed in the UK.

Graft and patient pancreas survival estimates are reported at one-year post-transplant for the period 1 April 2009 to 31 March 2013 and five-year post-transplant for the period 1 April 2005 to 31 March 2009.

Islet transplant survival is measured by four key variables: graft survival, and a reduction in HbA1c, insulin requirements and the annual rate of severe hypoglycaemic events. Islet outcomes are reported at one-year post-transplant for the period 1 April 2008 to 31 March 2013 for the national cohort only. Islet outcomes are unadjusted for risk. Islet outcome data from the UK Transplant Registry is supplemented by data collected from the UK Islet Transplant Consortium.

Pancreas patient survival from listing is reported at one, five and ten year post registration for a deceased donor pancreas, simultaneous pancreas and kidney (SPK) or islet transplant between 1 January 2002 and 31 December 2013.

The centre specific results for survival estimates are adjusted for differences in risk factors between the centres. The risk models used are described in the Appendix.

Methods used are described in the Appendix.

Patients requiring multi-organ transplants (except simultaneous pancreas and kidney transplants (SPK)) are excluded from all analyses and all results are described separately for pancreas and islet patients other than those presented in this Introduction section.

Throughout this report West London Renal and Transplant Centre is labeled as WLRTC.

Figure 2.1 shows the number of patients on the pancreas and islet transplant list at 31 March each year between 2005 and 2014. The number of patients actively waiting for a pancreas or islet transplant increased each year from 120 in 2005 to 333 in 2010, falling to 252 in 2012 and has since remained fairly steady reaching 269 in 2014.

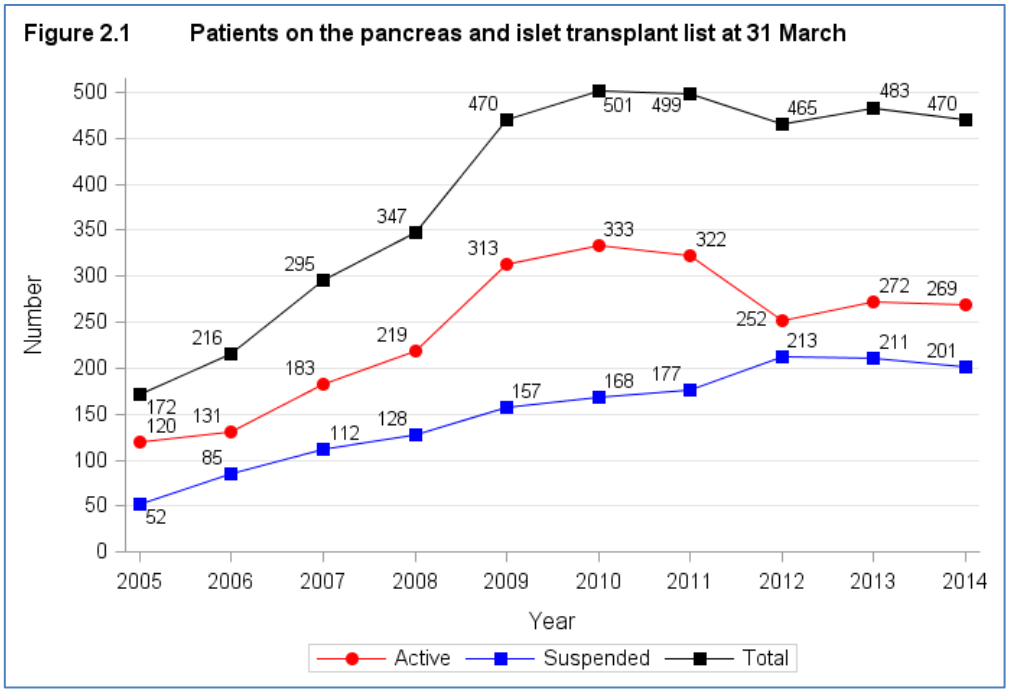


Figure 2.2 shows the number of patients on the pancreas and islet transplant list at 31 March 2014 for each transplant centre. Oxford has the largest transplant list with 77 patients registered for a pancreas or islet transplant. Of these patients, 59 are registered for a simultaneous pancreas and kidney (SPK) transplant, 16 are registered for a pancreas only transplant and two are registered for an islet transplant. Cambridge, Cardiff, Guy's and WLRTC only perform pancreas transplants while Bristol, King's College and the Royal Free only perform islet transplants.

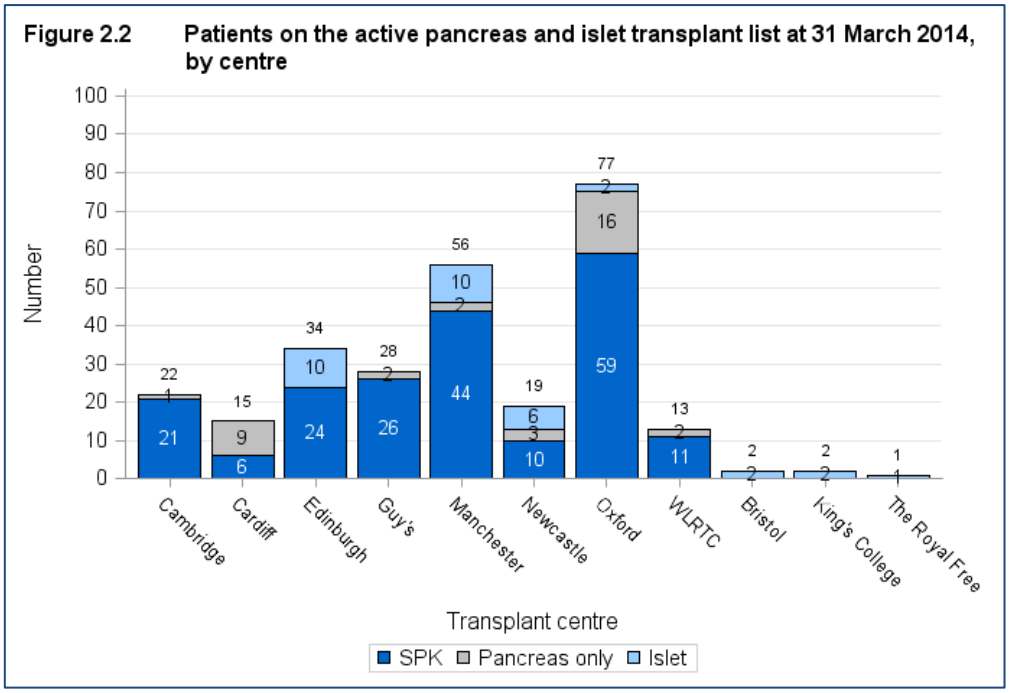


Figure 2.3 shows the total number of pancreas and islet transplants performed in the last ten years. The number of transplants more than doubled in the first four years from 81 in 2004/05 to 245 in 2007/08. Following consecutive falls in 2008/09 and 2009/10, transplant numbers steadily increased to 246 in 2013/14.

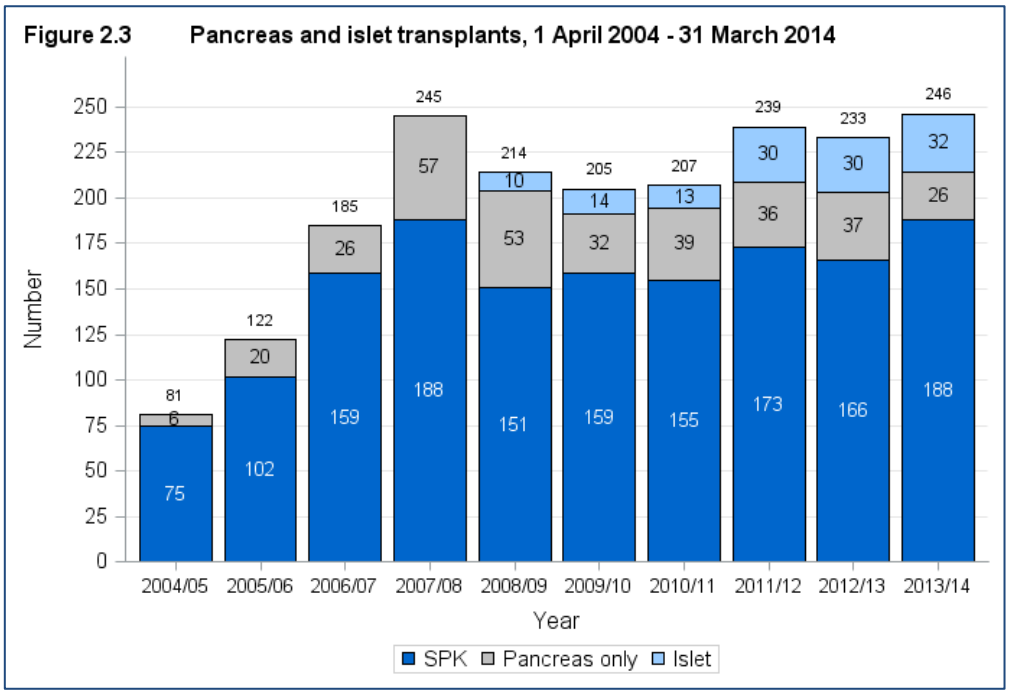


Figure 2.4 shows the total number of pancreas and islet transplants performed in 2013/14 at each transplant centre. Oxford performed the most pancreas and islet transplants last year, a total of 81 transplants. The Royal Free, an islet only transplant centre, performed only one islet transplant last year. Bristol performed no islet transplants last year.

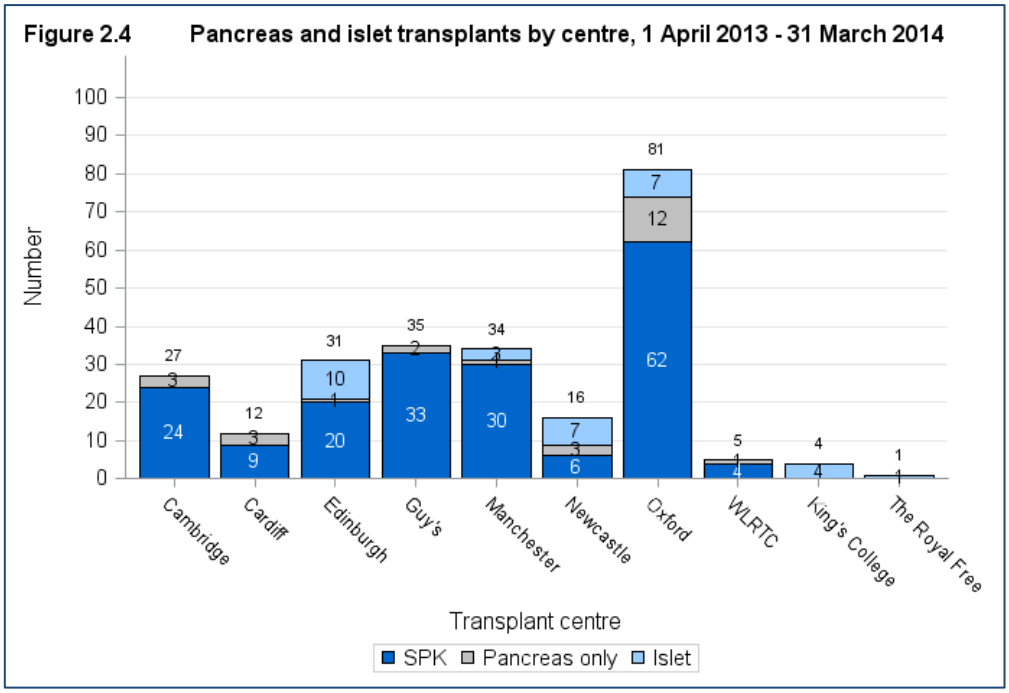
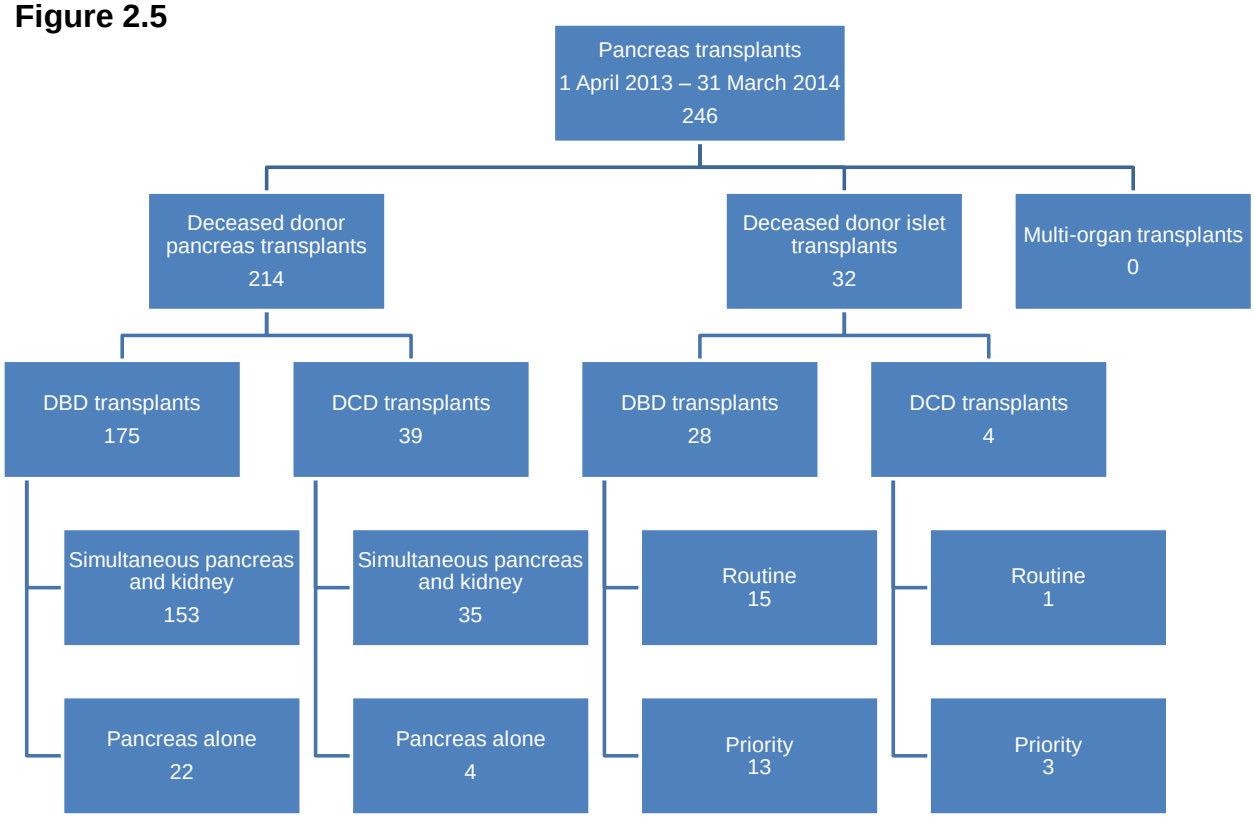


Figure 2.5 details the 246 pancreas and islet transplants performed in the UK between 1 April 2013 and 31 March 2014.

Figure 2.5



Pancreas transplant list

3.1 Patients on the pancreas transplant list as at 31 March, 2005 – 2014

Figure 3.1 shows the number of patients on the pancreas transplant list at 31 March each year between 2005 and 2014. The number of patients actively waiting for a pancreas transplant increased from 120 in 2005 to 317 in 2010 and then fell to 228 in 2012. Since then numbers have remained fairly consistent and 236 patients were listed for a pancreas transplant at 31 March 2014.

Figure 3.1 Patients on the pancreas transplant list at 31 March

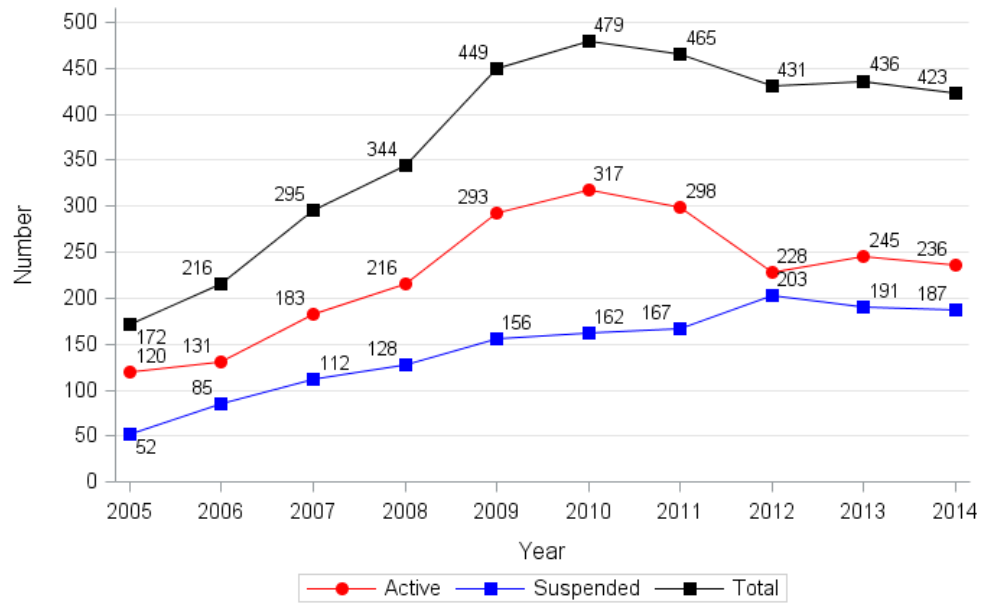


Figure 3.2 shows the number of patients on the active pancreas transplant list at 31 March 2014 by centre. Oxford had the largest proportion of the transplant list (32%) and Newcastle and WLRTC both had the smallest proportion (6%).

Figure 3.2 Patients on the active pancreas transplant list at 31 March 2014, by centre

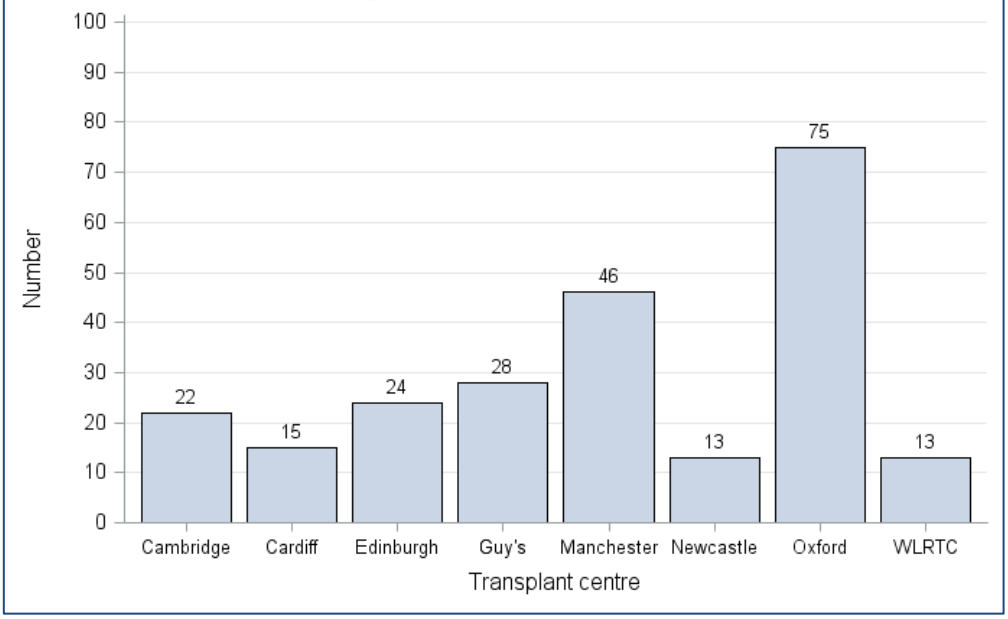
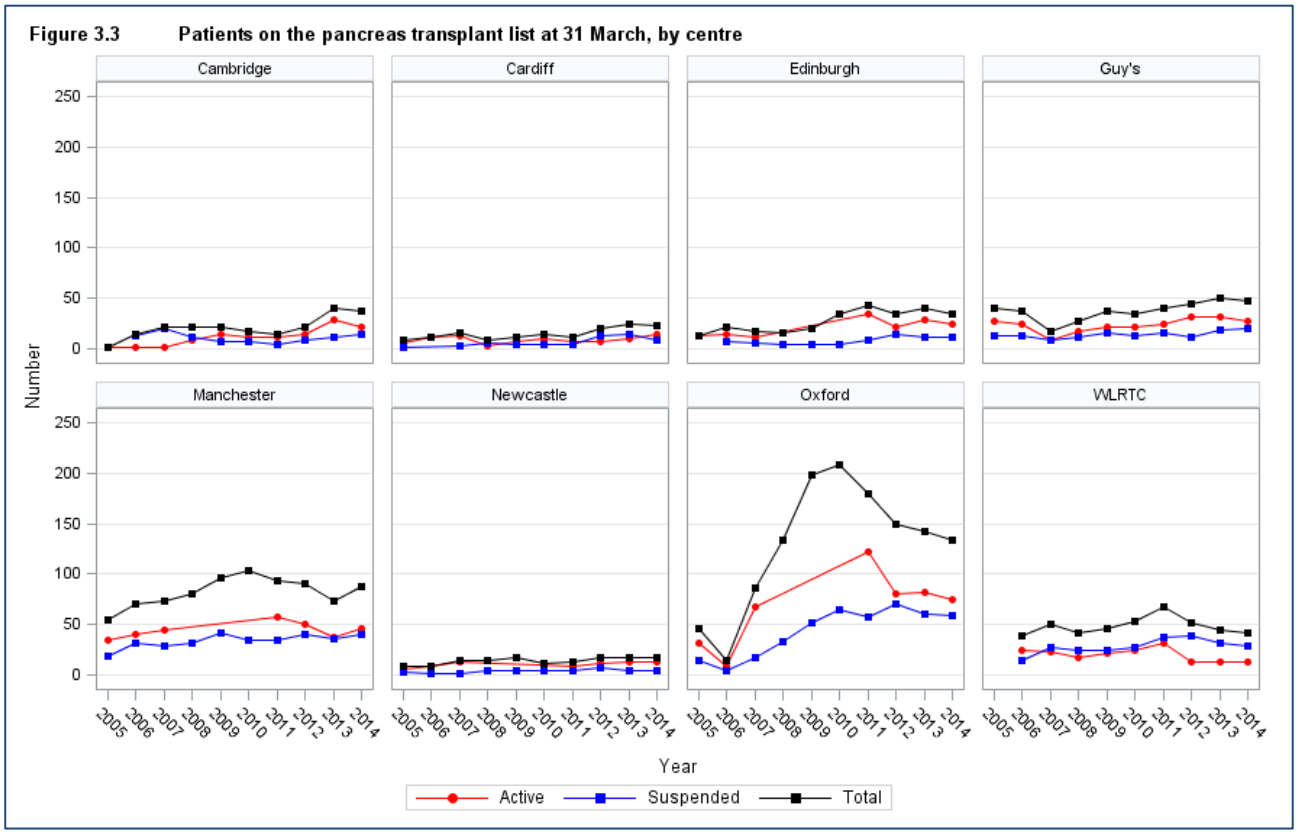


Figure 3.3 shows the number of patients on the pancreas transplant list at 31 March each year between 2005 and 2014 for each transplant centre.



3.2 Post-registration outcomes, 1 April 2010 – 31 March 2011

An indication of outcomes for patients listed for a pancreas transplant is summarised in **Figure 3.4**. This shows the proportion of patients transplanted or still waiting one 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. Only 35% of patients are transplanted within one year, while three years after listing 74% of patients have received a transplant.

Figure 3.4 **Post-registration outcome for 249 new pancreas registrations made in the UK, 1 April 2010 - 31 March 2011**

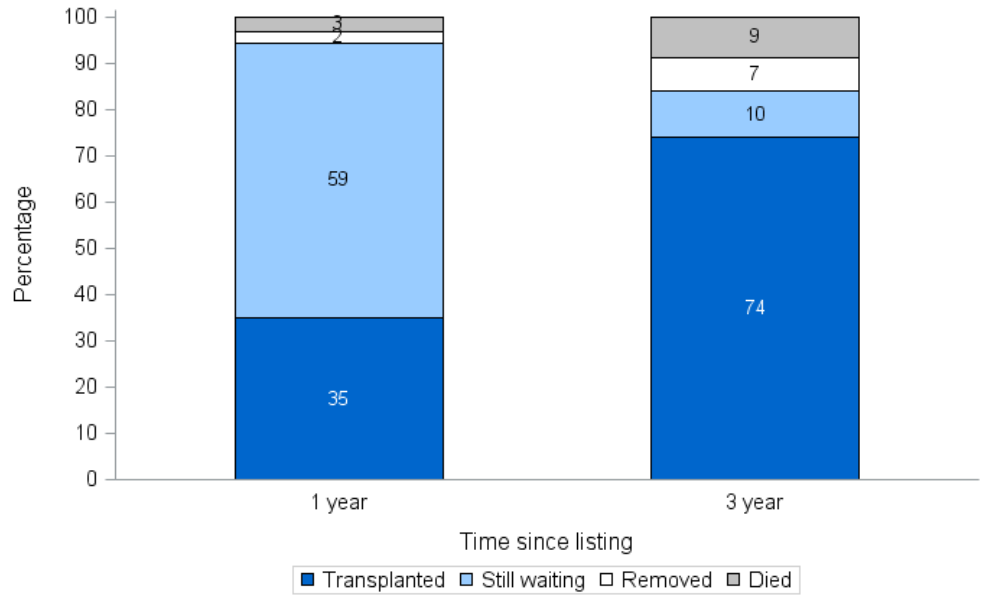
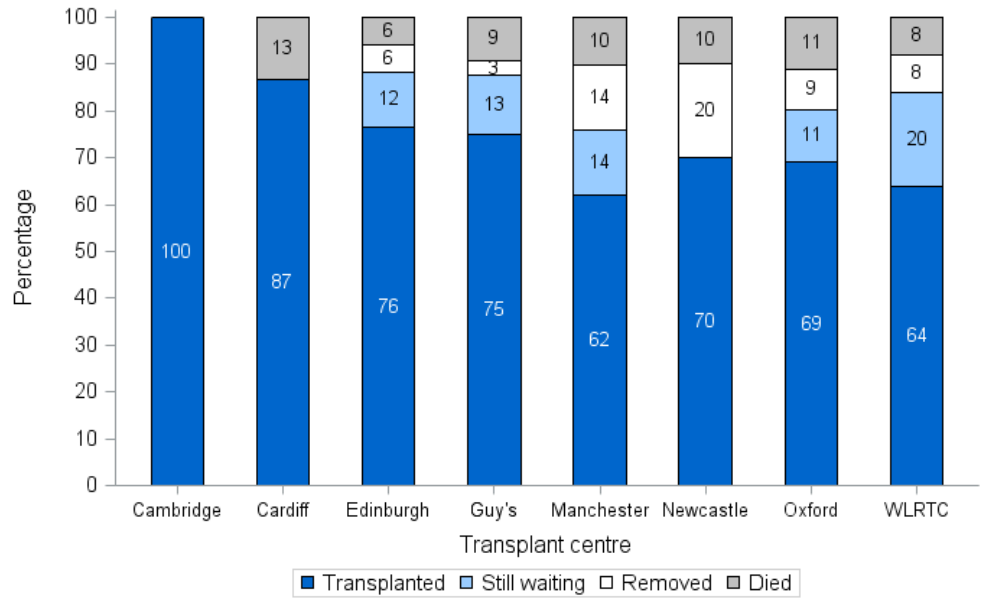


Figure 3.5 shows the proportion of patients transplanted or still waiting three years after joining the list by centre. Three years after listing, Cambridge had transplanted 100% of their patients while Manchester transplanted 62%.

Figure 3.5 **Three-year post-registration outcome for 249 new pancreas registrations made in the UK, 1 April 2010 - 31 March 2011, by centre**



3.3 Demographic characteristics, 1 April 2013 – 31 March 2014

The sex, ethnicity and age group of patients on the transplant list are shown by centre in **Figure 3.6, 3.7** and **3.8,** respectively. Note that all percentages quoted are based only on data where relevant information was available.

Figure 3.6 **Registrations on the active pancreas transplant list, 1 April 2013 and 31 March 2014, by centre**

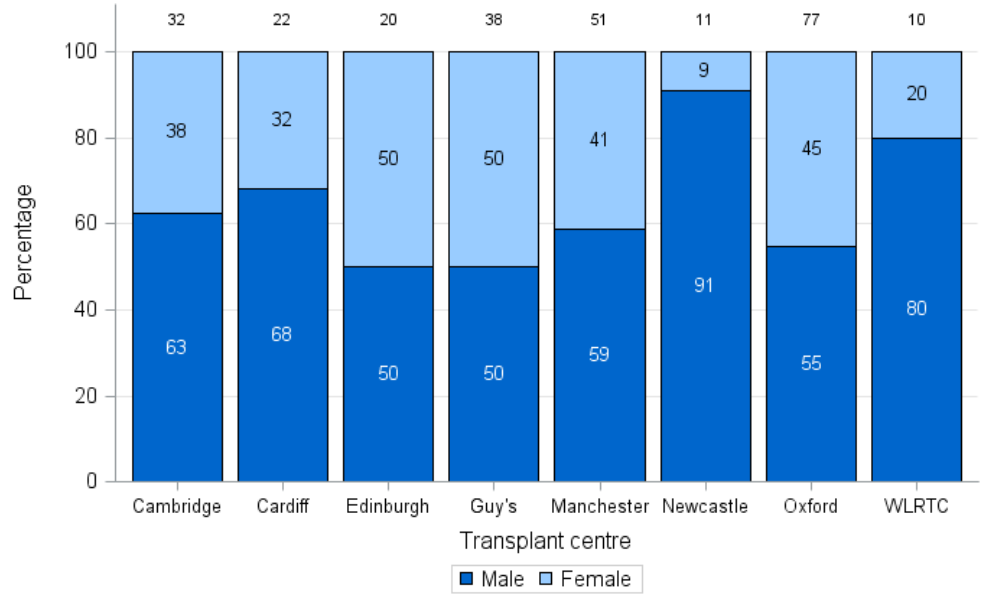


Figure 3.7 **Registrations on the active pancreas transplant list, 1 April 2013 and 31 March 2014, by centre**

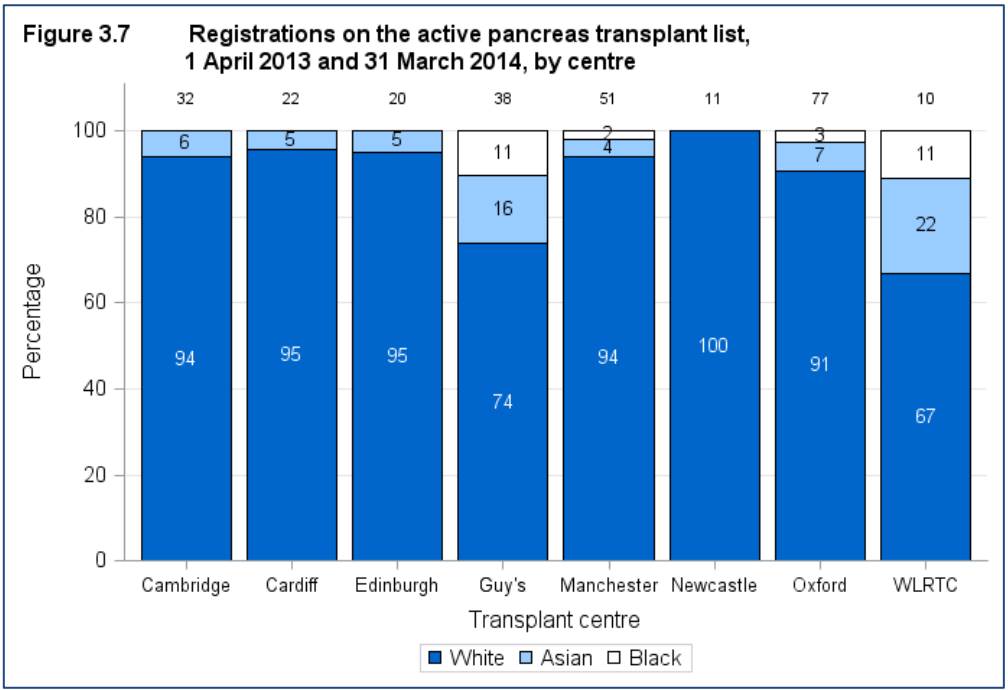
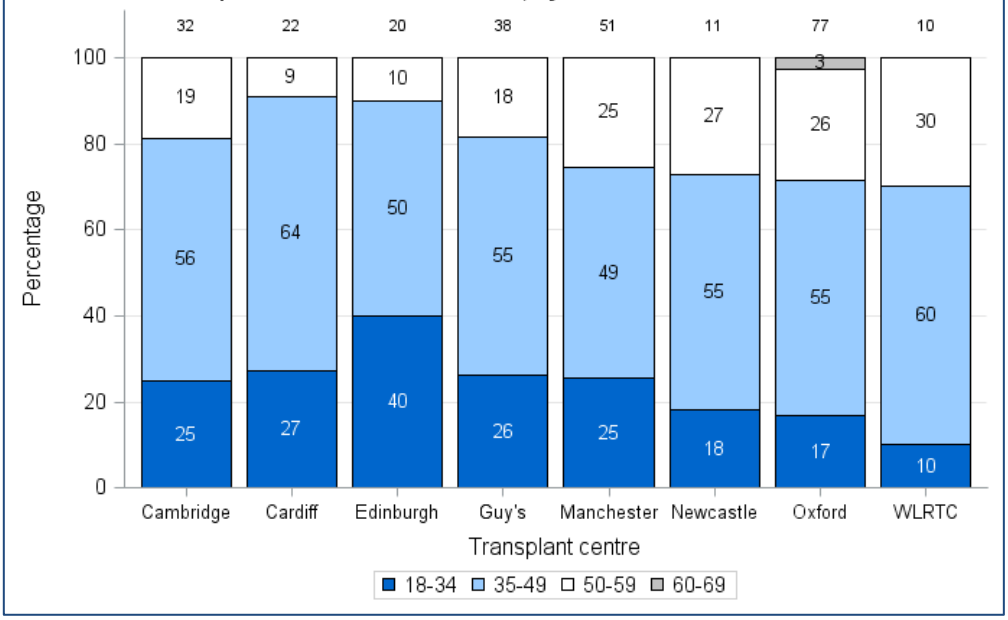


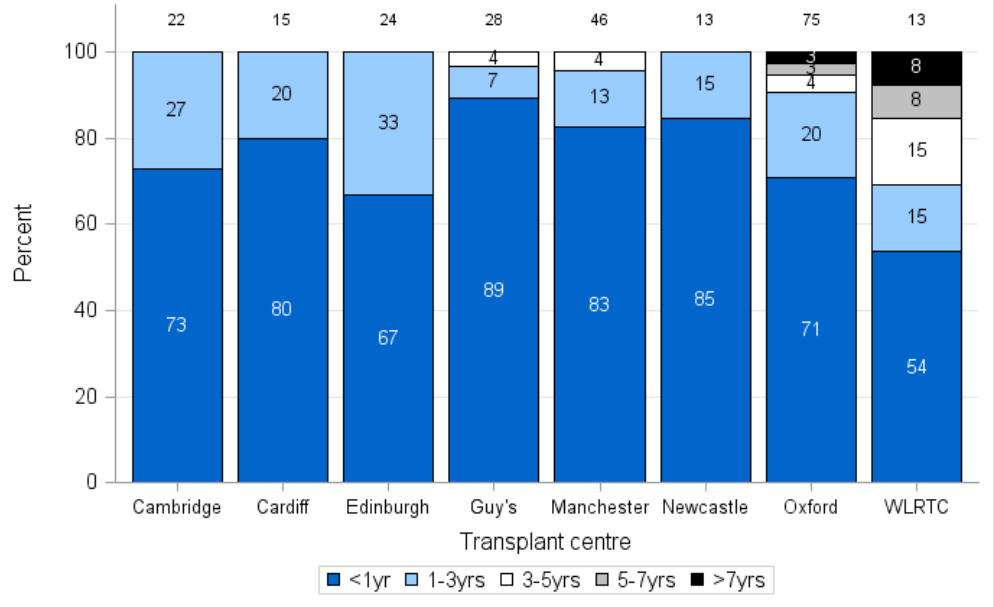
Figure 3.8 Registrations on the active pancreas transplant list, 1 April 2013 and 31 March 2014, by centre



3.4 Patient waiting times for those currently on the list, 31 March 2014

Figure 3.9 shows the length of time patients have been waiting on the pancreas transplant list at 31 March 2014 by centre. The majority of patients currently listed have been waiting less than one year and all patients at Cambridge, Cardiff, Edinburgh and Newcastle have being waiting less than three years. Two patients at Oxford and one at WLRTC have been waiting more than 7 years for transplant, all three patients are highly sensitised with a cRF of 99% or more.

Figure 3.9 Patients on the active pancreas transplant list as at 31 March 2014, by centre



3.5 Median waiting time to transplant, 1 April 2008 - 31 March 2011

The length of time a patient waits for a pancreas transplant varies across the UK. The median waiting time for deceased donor pancreas transplantation is shown in **Figure 3.10** and **Table 3.1** for patients registered at each individual unit.

The median waiting time to transplant for patients registered on the pancreas transplant list between 1 April 2008 and 31 March 2011 is 407 days, just over 13 months. This ranged from 119 days at Cambridge to 614 days at Edinburgh.

Figure 3.10 **Median waiting time to deceased donor transplant for patients registered on the pancreas transplant list, 1 April 2008 - 31 March 2011**

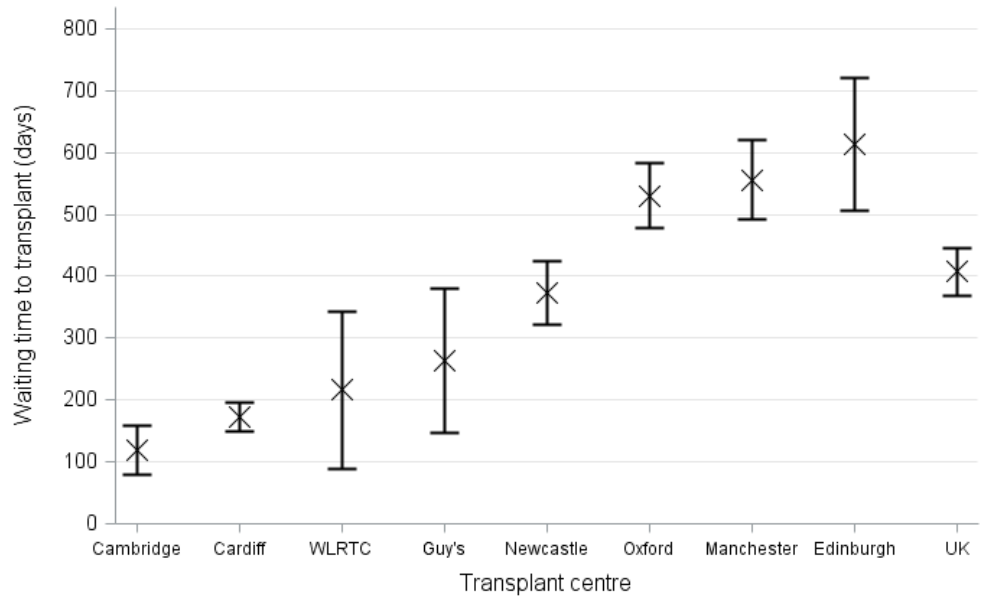


Table 3.1 **Median waiting time to pancreas transplant in the UK, for patients registered 1 April 2008 - 31 March 2011**

Transplant centre	Number of patients registered	Waiting time (days) Median	95% Confidence interval
Cambridge	76	119	80 - 158
Cardiff	38	173	149 - 197
WLRTC	76	216	88 - 344
Guy's	93	264	148 - 380
Newcastle	41	373	321 - 425
Oxford	328	530	478 - 582
Manchester	128	556	492 - 620
Edinburgh	66	614	507 - 721
UK	**846**	**407**	**368 - 446**

Response to pancreas offers

4.1 Offer decline rates, 1 April 2011 – 31 March 2014

Pancreas offers from DBD donors whose pancreas was retrieved, offered directly on behalf of a named individual patient and resulted in transplantation are included in the analysis. Any offers of pancreases declined for transplantation, pancreases offered for multi-organ or small bowel transplant or DCD offers were excluded, as were offers made through the fast track scheme or the reallocation of the pancreas.

Funnel plots are used to compare centre specific offer decline rates and indicate how consistent the rates of the individual transplant centres are with the national rate. Patient case mix is known to influence the number of offers a centre may receive. In this analysis however only individual offers for named patients were considered which excluded any ABO- and HLA-incompatible patients. For this reason it was decided not to risk adjust for known centre differences in patient case mix.

Figure 4.1 compares individual centre offer decline rates with the national rate over the time period, 1 April 2011 and 31 March 2014. Centres can be identified by the information shown in **Table 4.1**. Guy's, Cambridge and Oxford all had offer decline rates which were consistently better than the national rate. Edinburgh and WLRTC both had higher rates than the national average.

Figure 4.1 DBD donor pancreas offer decline rates for pancreases that resulted in a pancreas transplant, 1 April 2011 and 31 March 2014

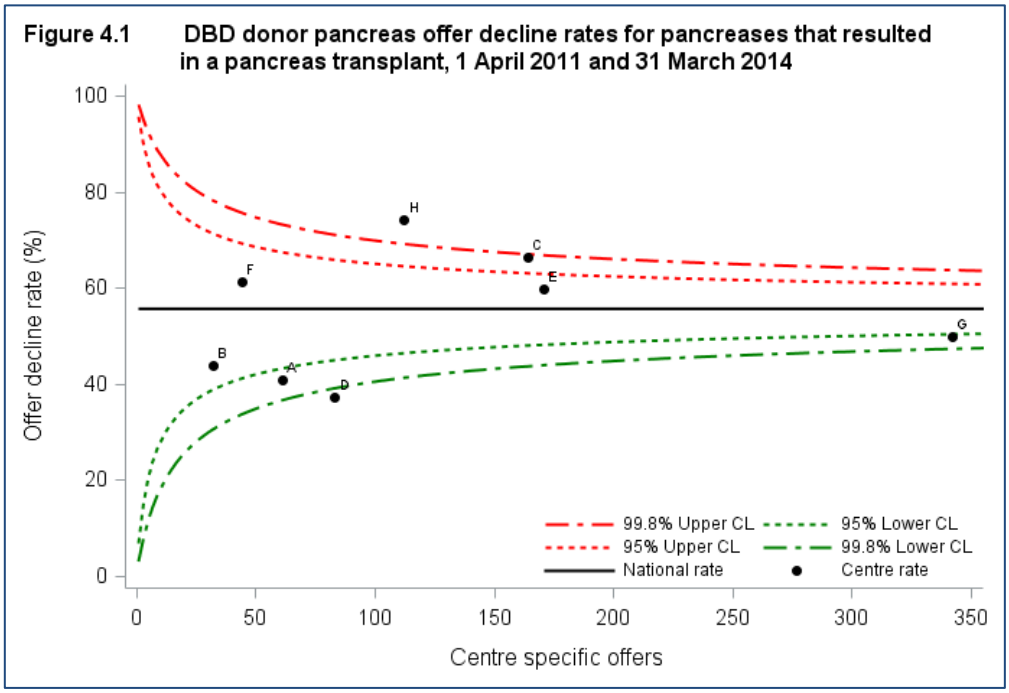


Table 4.1 compares individual centre offer decline rates over time by financial year. In 2011/12 WLRTC had an offer decline rate of 81%, significantly higher than the national rate. Over the last two years WLRTC have reduced their offer decline rate and are now in line with the national average. Improvements in the management of the transplant list and ensuring patients are appropriately suspended or removed from the list when unavailable for transplant have contributed to a reduction in inappropriate offers and consequent improvements in offer decline rates.

Table 4.1 DBD donor pancreas offer decline rates by transplant centre, 1 April 2011 and 31 March 2014

Centre	Code	2011/12		2012/13		2013/14		Overall	
		N	(%)	N	(%)	N	(%)	N	(%)
Cambridge	A	11	(36)	15	(40)	35	(43)	61	(41)
Cardiff	B	6	(50)	12	(33)	14	(50)	32	(44)
Edinburgh	C	46	(65)	52	(63)	66	(70)	164	(66)
Guy's	D	20	(35)	27	(41)	36	(36)	83	(37)
Manchester	E	59	(68)	60	(52)	52	(60)	171	(60)
Newcastle	F	11	(55)	10	(60)	23	(65)	44	(61)
Oxford	G	128	(50)	115	(56)	99	(42)	342	(50)
WLRTC	H	69	(81)	32	(63)	11	(64)	112	(74)
UK		**350**	**(60)**	**323**	**(54)**	**336**	**(52)**	**1009**	**(56)**

4.2 Reallocation of DBD pancreas, 1 April 2011 – 31 March 2014

Since 1 December 2010 all pancreases from donation after brain death (DBD) donors have been allocated through the national Pancreas Allocation Scheme (PAS). On occasion however the pancreas is accepted and dispatched to a named patient but is subsequently declined. In this situation, the centre in receipt of the pancreas can reallocate the organ to a locally listed patient of their choice, based on an individual centre matching run, in order to minimise cold ischaemia time (CIT).

Centre specific reallocation rates are presented as a proportion of the transplants performed. Funnel plots are used to compare centre specific reallocation rates and indicate how consistent the rates of the individual transplant centres are with the national rate.

Figure 4.2 compares individual centre reallocation rates with the national rate over the time period, 1 April 2011 and 31 March 2014. Centres can be identified by the information shown in **Table 4.2**. Newcastle and Edinburgh both have reallocation rates which are consistently lower than the national rate.

Figure 4.2 **Local reallocation of DBD donor pancreases following an acceptance of an offer through the national allocation scheme**

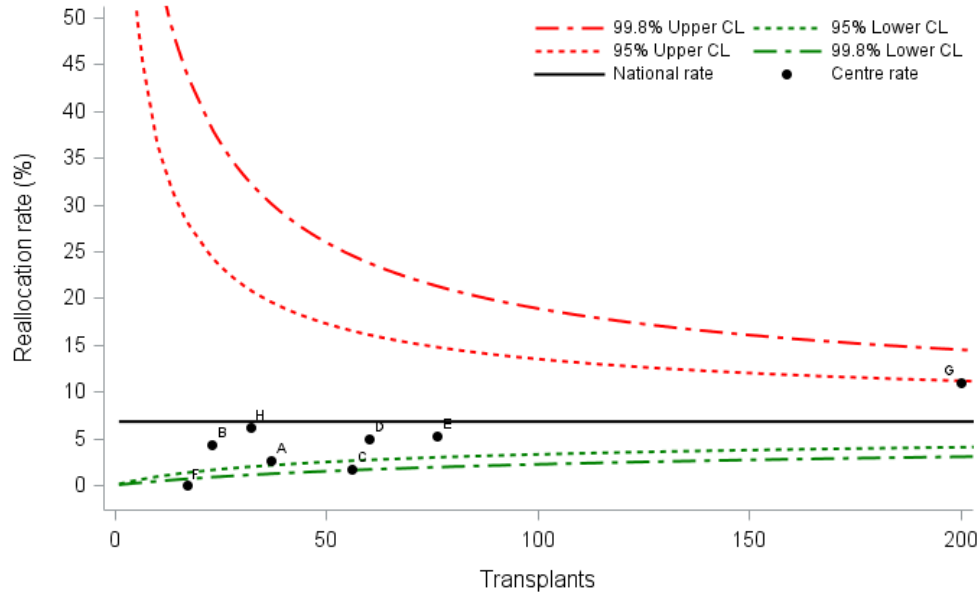


Table 4.2 compares individual centre reallocation rates over time by financial year. Overall pancreas reallocation rates have fallen from 10% in 2011/12 to 2% in 2013/14. No pancreases were reallocated by Newcastle within the time period and Cambridge, Cardiff, Guy's, Manchester and WLRTC all reduced their reallocation rates and did not reallocate any pancreases in 2013/14. Oxford's rate increased to 18% in 2012/13 which was considerably higher than the national rate but their rate reduced to 5% in the following year.

Table 4.2 **Local reallocation of DBD donor pancreases following acceptance of an offer through the national allocation scheme**

Centre	Code	2011/12		2012/13		2013/14		Overall	
		N	(%)	N	(%)	N	(%)	N	(%)
Cambridge	A	8	(13)	9	(0)	20	(0)	37	(3)
Cardiff	B	7	(14)	8	(0)	8	(0)	23	(4)
Edinburgh	C	16	(0)	19	(0)	21	(5)	56	(2)
Guy's	D	16	(13)	18	(6)	26	(0)	60	(5)
Manchester	E	22	(14)	30	(3)	24	(0)	76	(5)
Newcastle	F	5	(0)	4	(0)	8	(0)	17	(0)
Oxford	G	72	(10)	65	(18)	63	(5)	200	(11)
WLRTC	H	15	(13)	12	(0)	5	(0)	32	(6)
UK		**161**	**(10)**	**165**	**(8)**	**175**	**(2)**	**501**	**(7)**

Pancreas transplants

5.1 Pancreas transplants, 1 April 2004 – 31 March 2014

Figure 5.1 shows the total number of pancreas transplants performed in the last ten years, by type of donor. The first DCD pancreas transplant was performed in 2005/06 and by 2007/08 there were 36 DCD transplants (15%). This number has remained between 30 and 40 transplants per year (15% - 19%) for the last seven years with the exception of 2011/12 when there were 48 DCD transplants performed (23%). DBD pancreas transplant numbers increased more than two and a half times in the first four years, to 209 in 2007/08. After a fall in 2008/09 and 2009/10, DBD numbers have steadily increased to 175 in 2013/14.

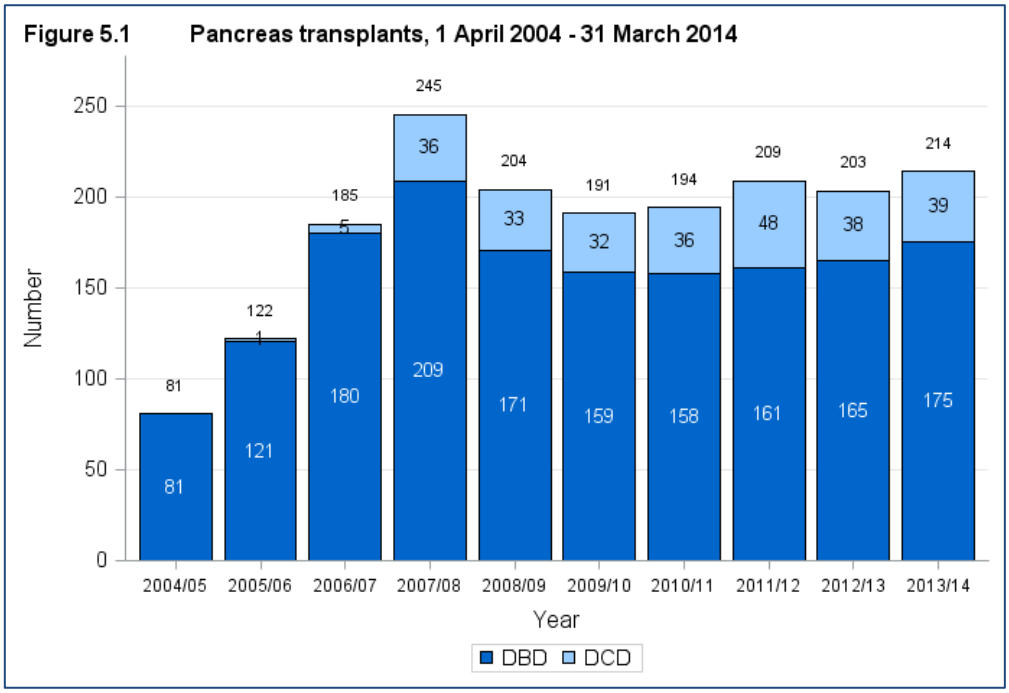


Figure 5.2 shows the total number of pancreas transplants performed in 2013/14, by centre and type of donor. The same information is presented in **Figure 5.3** but this shows the proportion of DBD and DCD transplants performed at each centre. Oxford performed the most DBD and DCD transplants. Edinburgh and WLRTC performed no DCD transplants in the last financial year. Cardiff had the largest proportion of DCD transplants (33%) although the total number of transplants was small. Of the transplants performed last year at Cambridge and Guy's, 26% were from DCD donors.

Figure 5.2 Pancreas transplants, 1 April 2013 - 31 March 2014

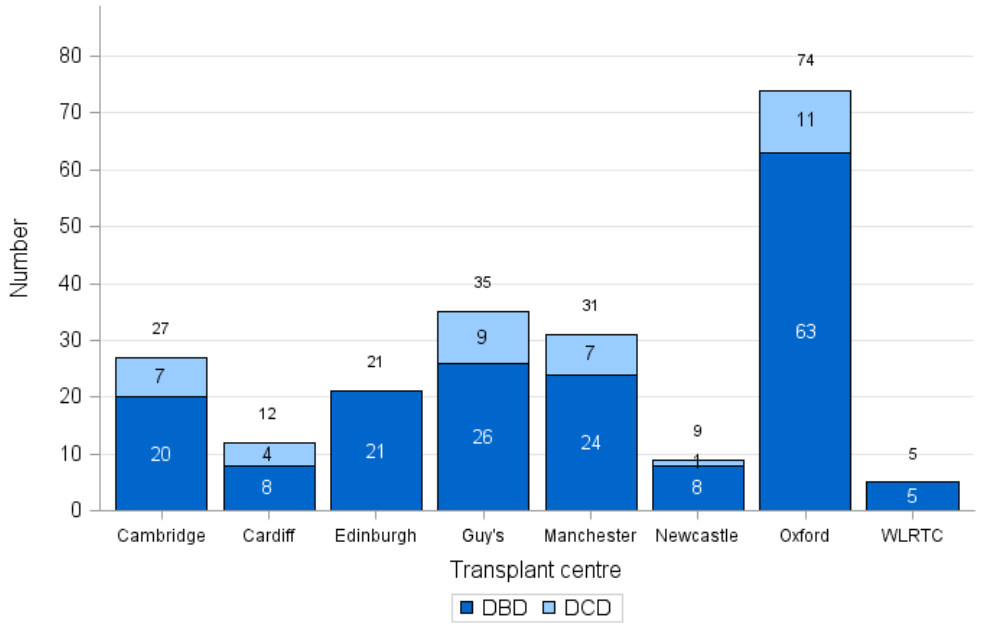


Figure 5.3 Pancreas transplants, 1 April 2013 - 31 March 2014

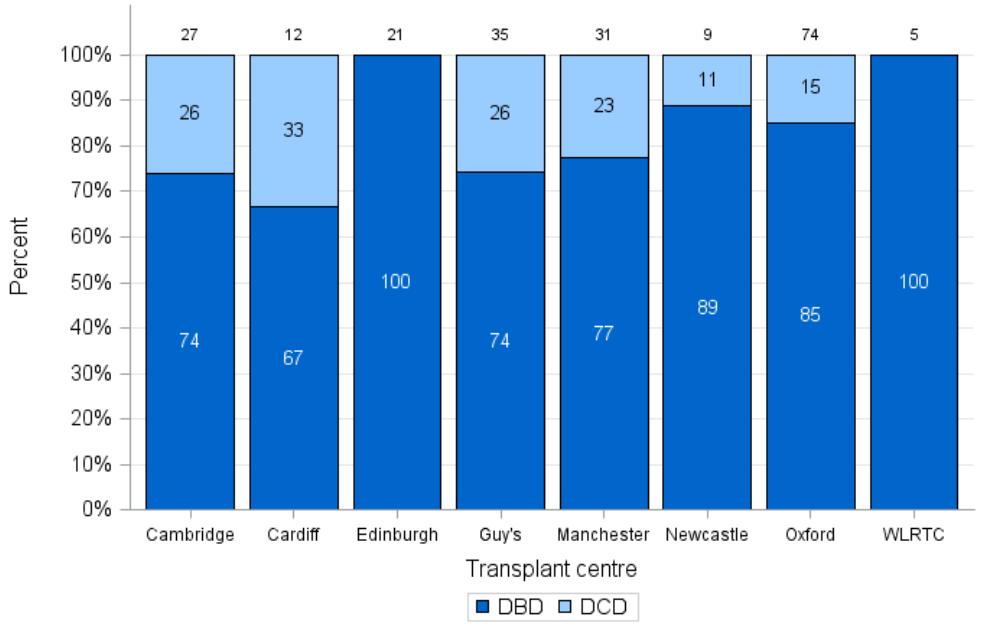
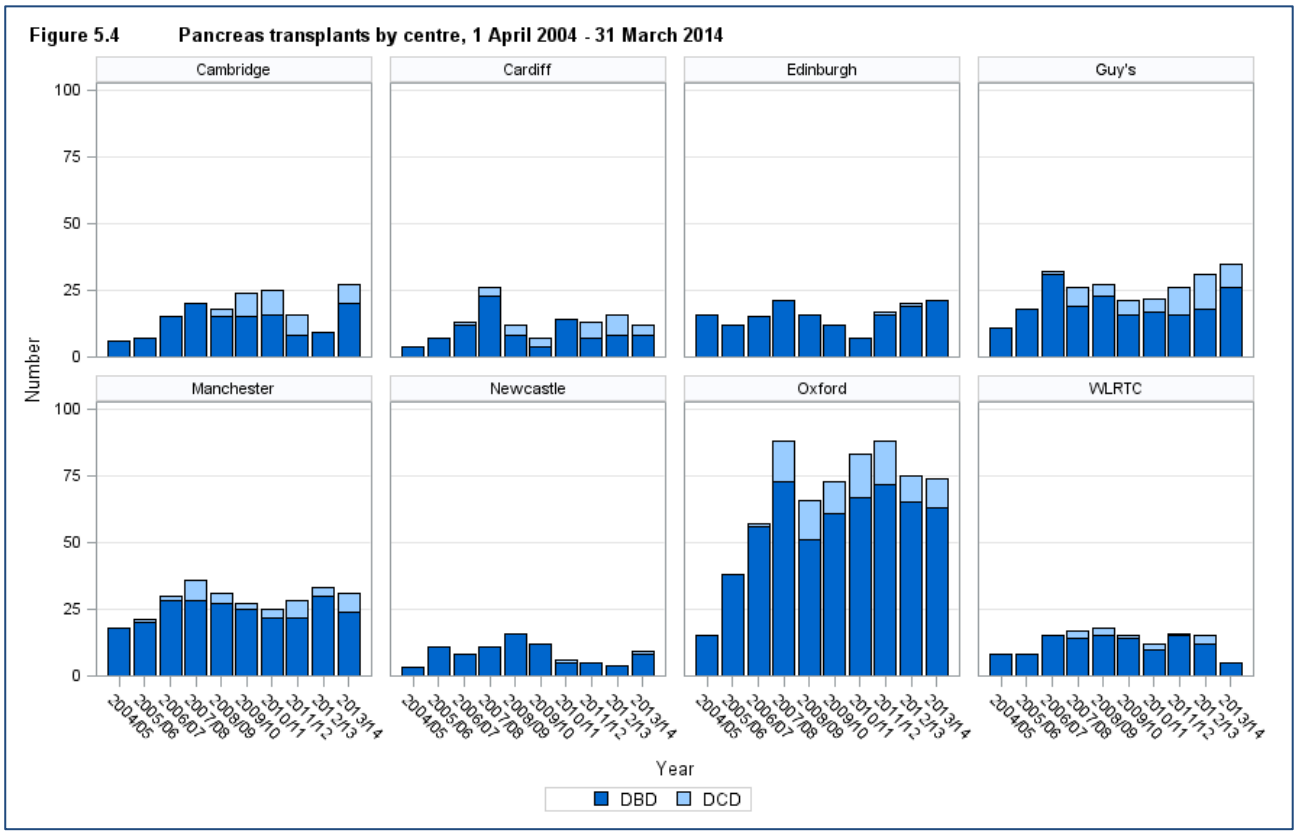


Figure 5.4 shows the total number of pancreas transplants performed in last ten years, by centre and type of donor. Oxford have consistently performed a large number of pancreas transplants since 2006/07 including a number of DCD transplants over the last seven years.



5.2 Cold ischaemia time, 1 April 2011 – 31 March 2014

Median cold ischaemia times (CIT) are shown in addition to inter-quartile ranges in **Figures 5.5** to **5.10**. Fifty percent of the transplants have a CIT within the inter-quartile range (indicated by a box). Where there is only one observation to report, the single data point is represented by a dash as per the median for multiple observations. There is some variation in average (median) CIT between different transplant centres although all centres continually try to reduce this time.

Figure 5.5 shows the median total ischaemia time in DBD donor pancreas transplants over the last 10 years. The overall median cold ischaemia time has been slowly falling over the last 10 years from 14 hours in 2004/05 to 11 hours in 2013/14.

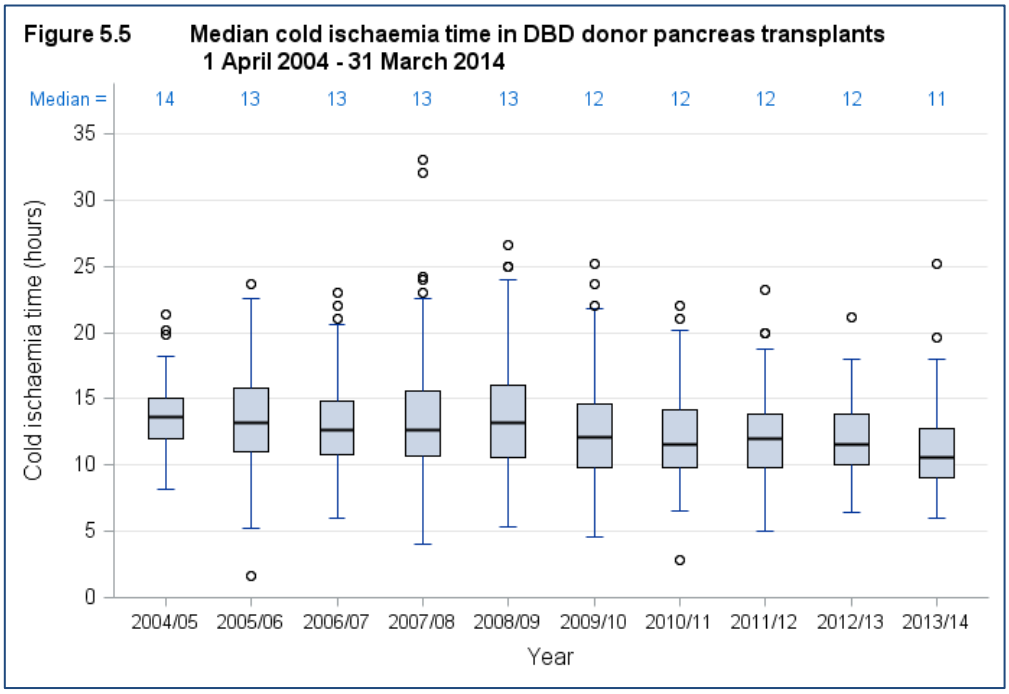


Figure 5.6 shows the median total ischaemia time in DBD donor pancreas transplants in 2013/14 for each transplant centre. WLRTC had the longest median cold ischaemia time in 2013/14 of 16 hours compared with Cambridge, Manchester and Oxford who had the shortest, 10 hours.

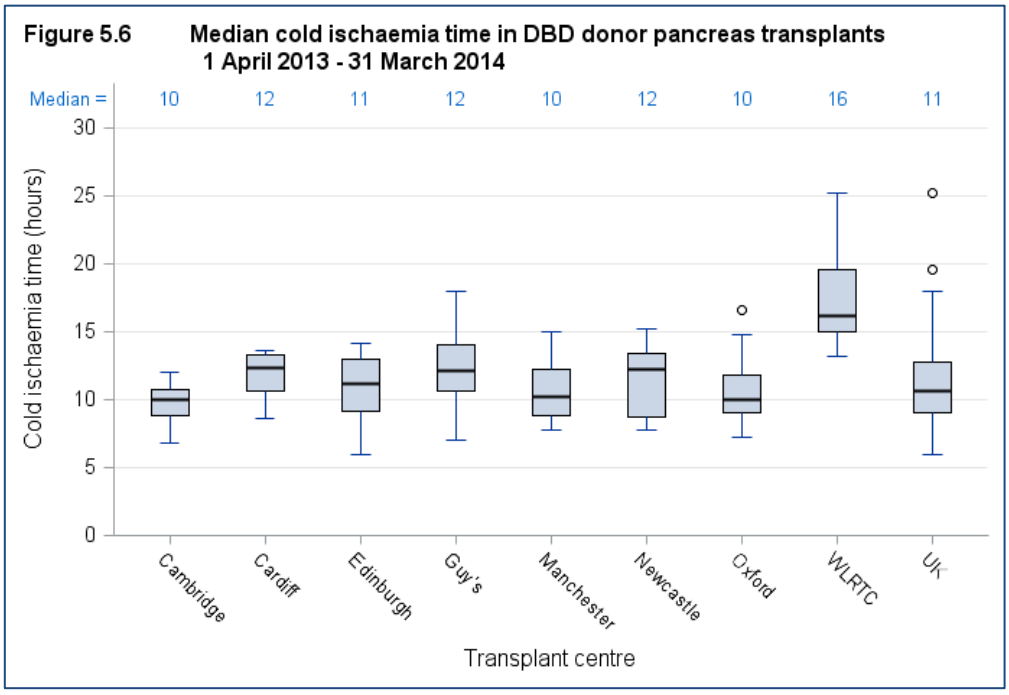


Figure 5.7 shows the median total ischaemia time in DBD donor pancreas transplants over the last ten years for each transplant centre.

Figure 5.7 Median cold ischaemia time in DBD donor pancreas transplants, 1 April 2004 - 31 March 2014

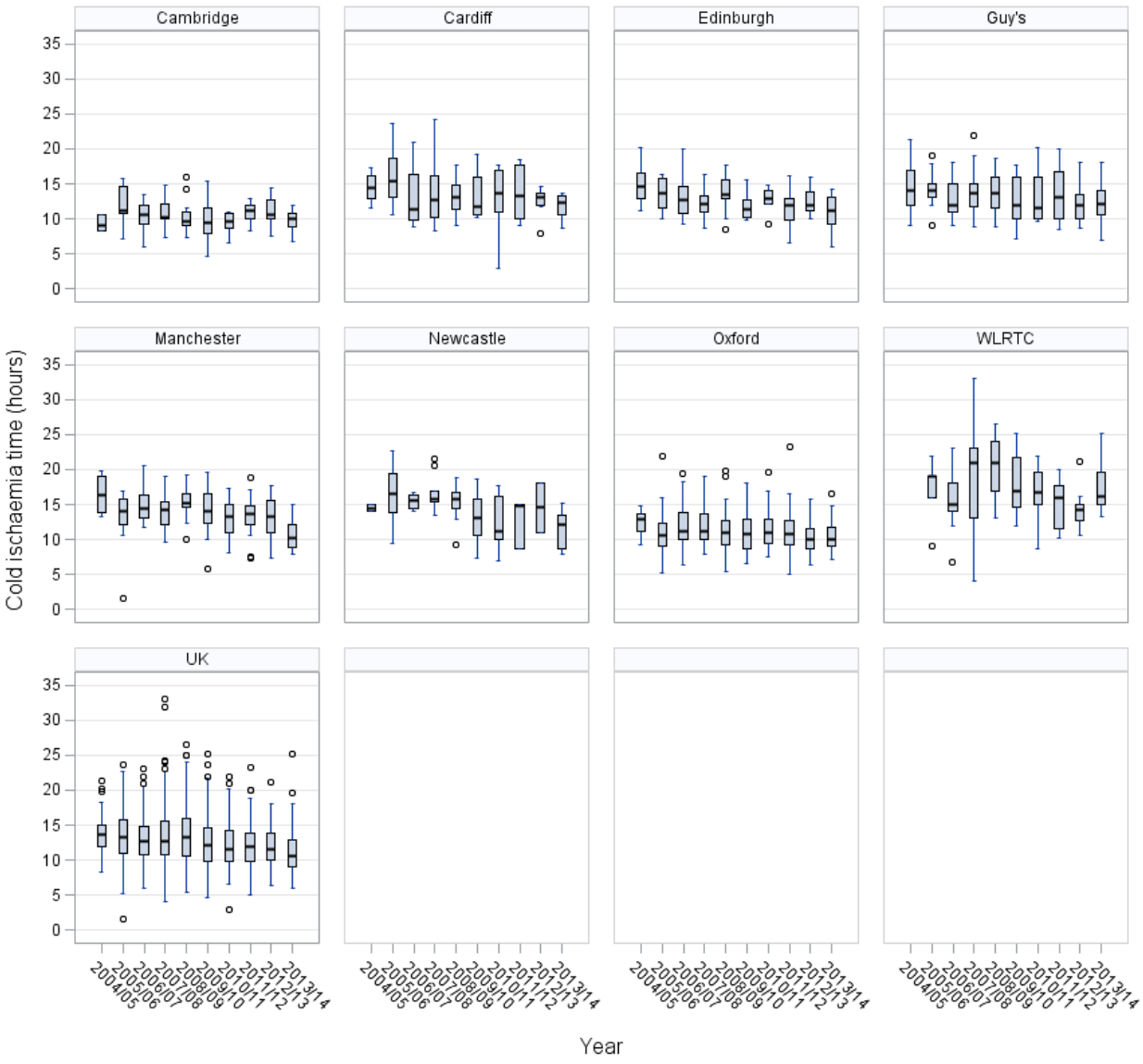


Figure 5.8 shows the median total ischaemia time in DCD donor pancreas transplants over the last nine years since the first DCD pancreas transplant. Overall median cold ischaemia time has fallen from 14 hours in 2005/06 to 10 hours in 2013/14.

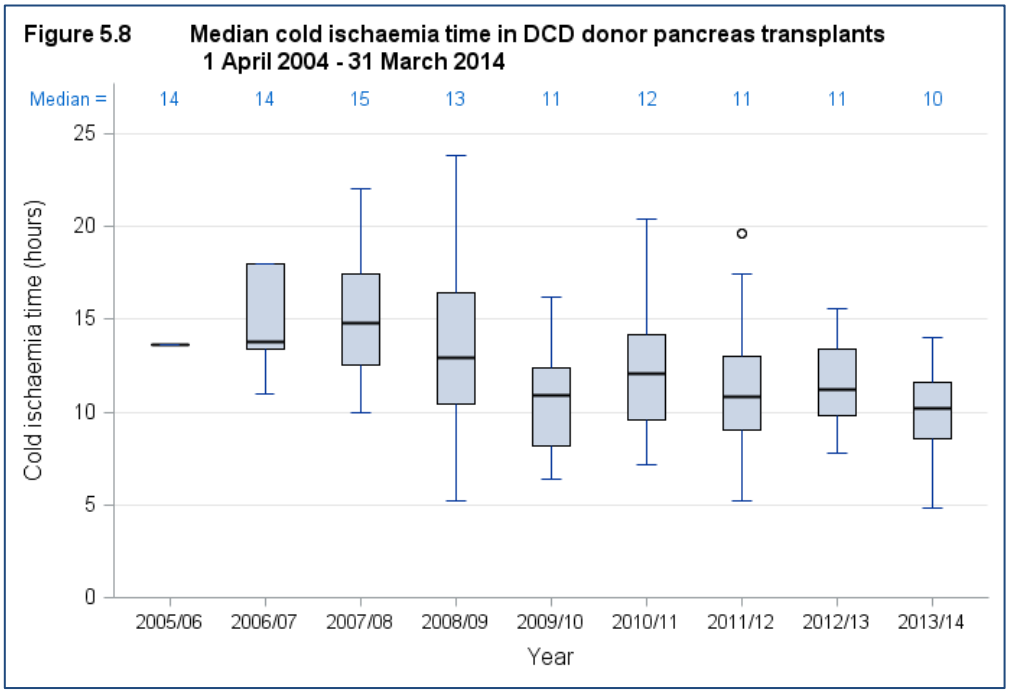


Figure 5.9 shows the median total ischaemia time in DCD donor pancreas transplants in 2013/14 for each transplant centre. Cambridge had the shortest median cold ischaemia time of 8 hours. Newcastle maintained a cold ischaemia time of 8 hours for the one DCD transplant performed in 2013/14. Guy's and Cardiff have the longest median ischaemia times of 11 hours.

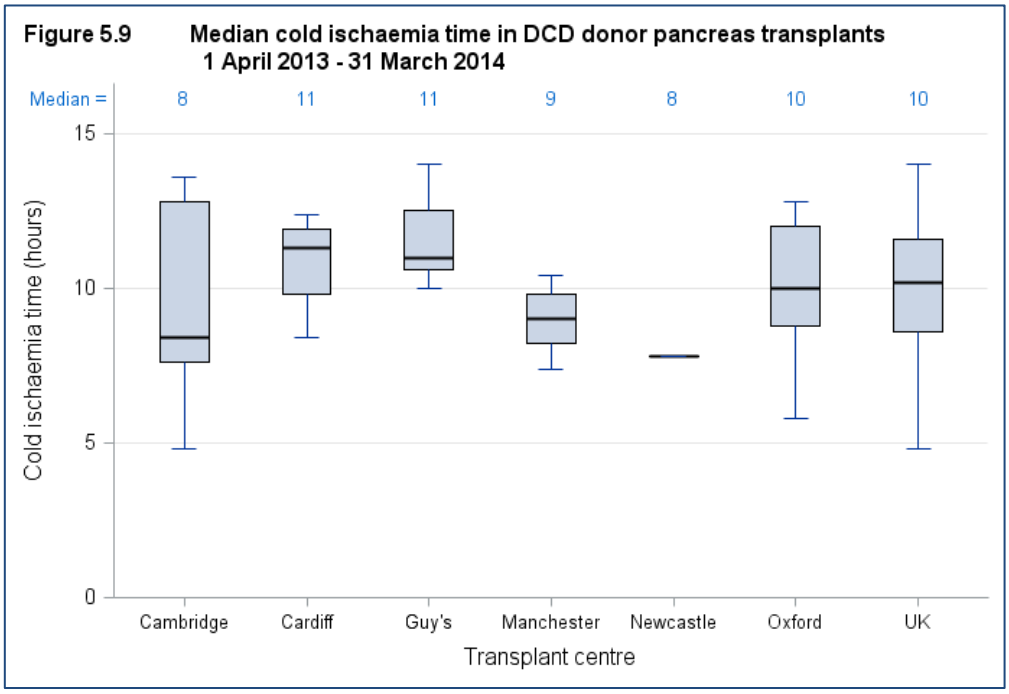
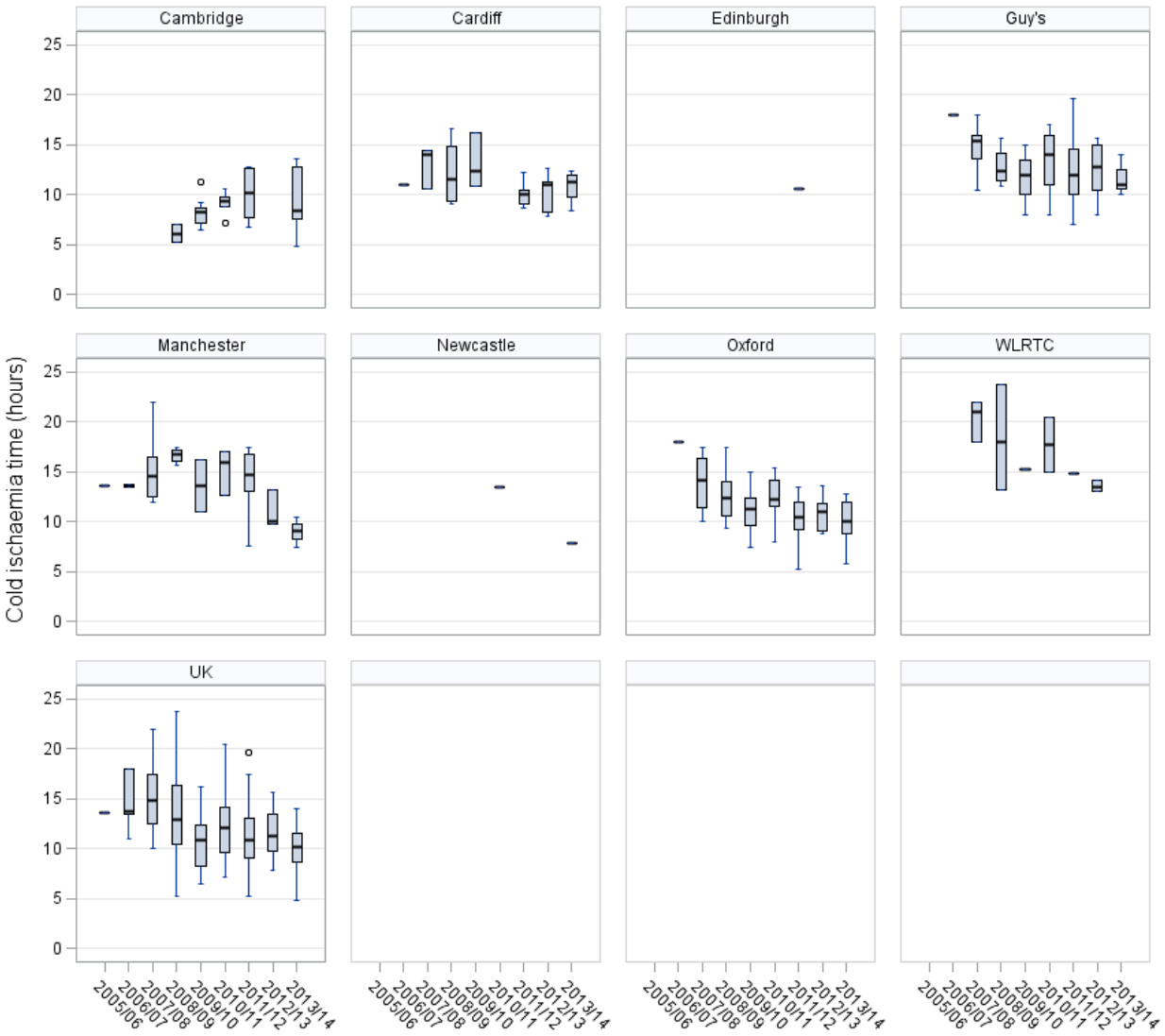


Figure 5.10 shows the median total ischaemia time in DCD donor pancreas transplants for each transplant centre over the last nine years since the first DCD pancreas transplant. Cold ischaemia time was reported for just one of the two DCD transplants performed in Edinburgh and both DCD transplants performed in Newcastle.

Figure 5.10 Median cold ischaemia time in DCD donor pancreas transplants, 1 April 2004 - 31 March 2014



Pancreas outcomes

6.1 Deceased donor graft and patient survival for first SPK transplant

Funnel plots are used to compare centre specific risk-adjusted patient and graft survival rates and indicate how consistent these rates are with the national survival rates. Note that some patients return to local renal units for follow-up care after their transplant and although we report survival according to transplant unit, patients may in fact be followed up quite distantly from their transplant centre. It is important to note that adjusting for patient mix through the use of risk-adjustment models may not account for all possible causes of centre differences. There may be other factors that are not taken into account in the risk-adjustment process that may affect the survival rate of a particular centre.

Figures 6.1 and **6.2** compare individual centre survival estimates with the national rates for one-year patient and graft survival for deceased donor first simultaneous pancreas and kidney (SPK) transplants. **Figures 6.3** and **6.4** compare five-year survival estimates. The funnel plots show that, for the most part, the centres lie within the confidence limits. Some of the funnel plots show some centres to be above the upper 99.8% confidence limit. This suggests that these centres may have survival rates that are considerably higher than the national rate. **Figures 6.3** and **6.4** show one centre lies outside the lower 95% confidence limit, indicating that this centre may have five-year patient and graft survival rates that are significantly lower than the national rate. Centres can be identified by the information shown in **Tables 6.1** and **6.2**.

Figure 6.1 **Risk-adjusted one year patient survival rates for deceased donor first SPK transplants, between 1 April 2009 and 31 March 2013**

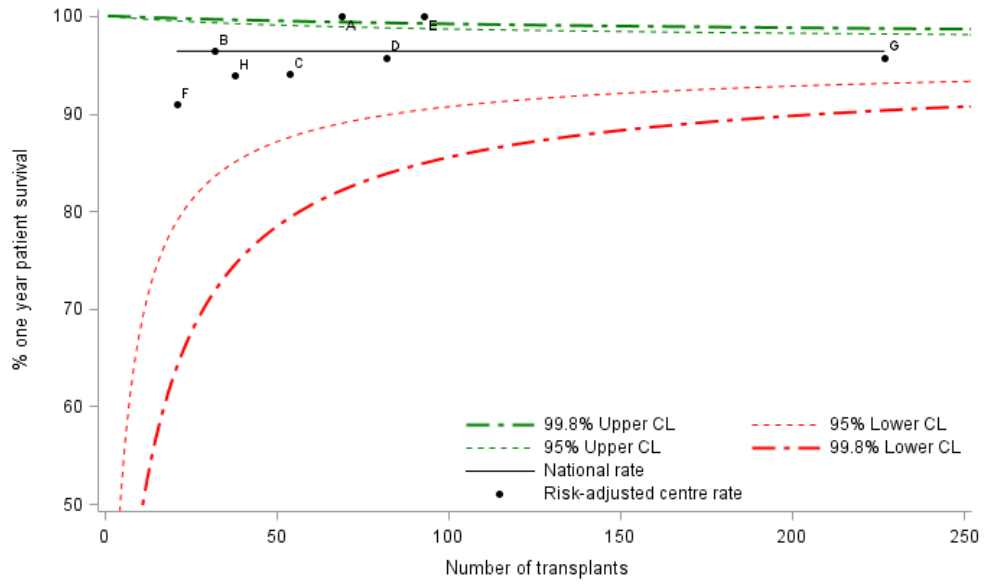


Figure 6.2 **Risk-adjusted one year pancreas graft (death censored) survival rates for all deceased donor first SPK transplants, between 1 April 2009 and 31 March 2013**

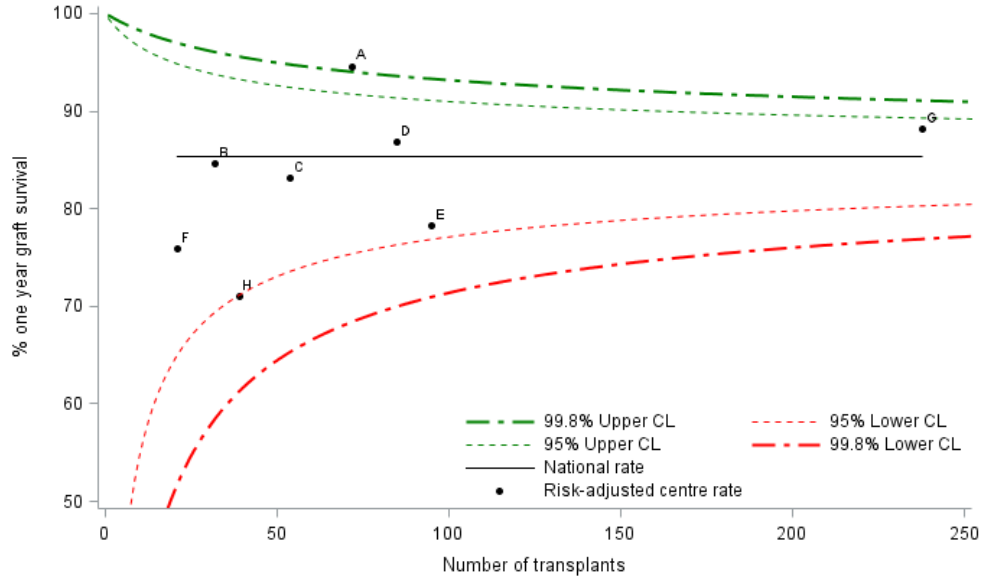


Figure 6.3 **Risk-adjusted five year patient survival rates for deceased donor first SPK transplants, between 1 April 2005 and 31 March 2009**

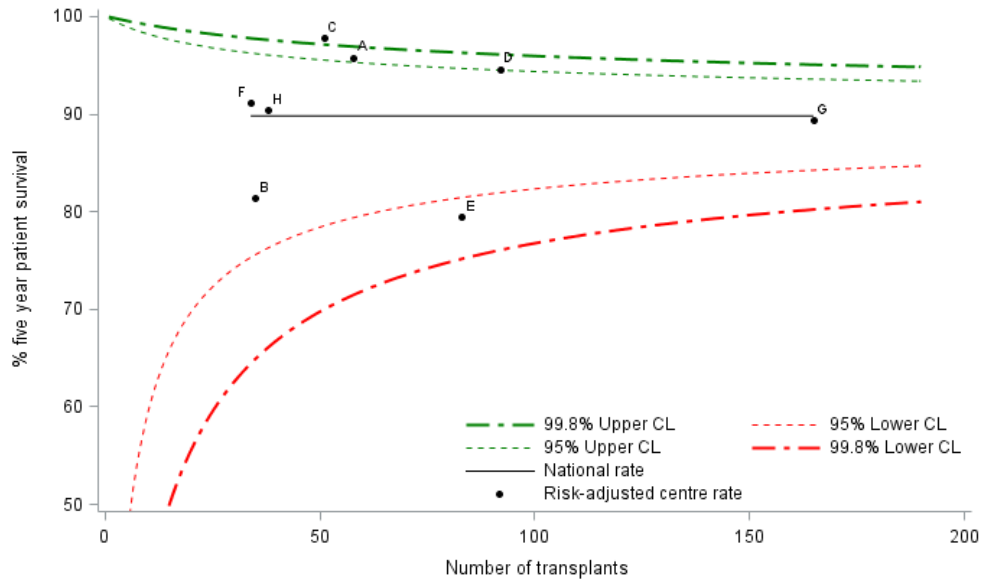


Figure 6.4 **Risk-adjusted five year pancreas graft (death censored) survival rates for all deceased donor first SPK transplants, between 1 April 2005 and 31 March 2009**

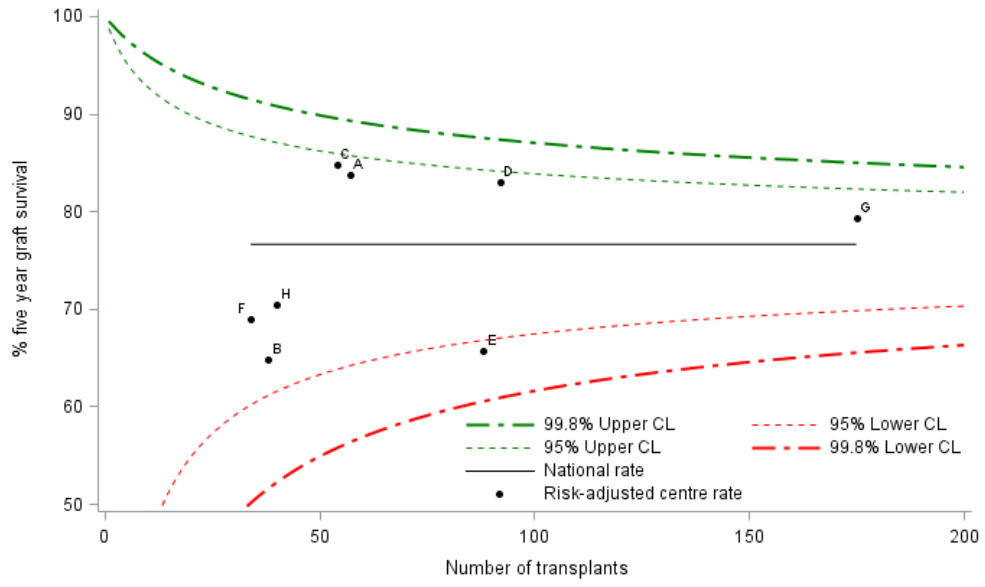


Table 6.1 **Risk-adjusted one and five year patient survival for first SPK transplants using pancreases from deceased donors**

		Patient survival					
		One-year*			Five-year**		
Centre	Code	N	%	(95% CI)	N	%	(95% CI)
Cambridge	A	69	100	N/A	58	96	(85 - 99)
Cardiff	B	32	96	(80 - 100	35	81	(59 - 93)
Edinburgh	C	54	94	(83 - 99)	51	98	(87 - 100
Guy's	D	82	96	(88 - 99)	92	95	(87 - 98)
Manchester	E	93	100	N/A	83	79	(67 - 88)
Newcastle	F	21	91	(67 - 99)	34	91	(75 - 98)
Oxford	G	227	96	(92 - 98)	165	89	(83 - 94)
WLRTC	H	38	94	(79 - 99)	38	90	(72 - 98)
UK		**616**	**96**	**(95 - 98)**	**556**	**90**	**(87 - 92)**

* Includes transplants performed between 1 April 2009 - 31 March 2013
** Includes transplants performed between 1 April 2005 - 31 March 2009

Table 6.2 **Risk-adjusted one and five year pancreas graft survival for first SPK transplants using pancreases from deceased donors**

		Pancreas graft survival					
		One-year*			Five-year**		
Centre	Code	N	%	(95% CI)	N	%	(95% CI)
Cambridge	A	72	95	(86 - 99)	57	84	(69 - 93)
Cardiff	B	32	85	(64 - 95)	38	64	(38 - 81)
Edinburgh	C	54	83	(68 - 92)	54	85	(70 - 93)
Guy's	D	85	87	(76 - 94)	92	83	(72 - 91)
Manchester	E	95	78	(66 - 87)	88	66	(51 - 77)
Newcastle	F	21	76	(47 - 91)	34	70	(46 - 85)
Oxford	G	238	88	(83 - 92)	175	79	(71 - 85)
WLRTC	H	39	72	(50 - 86)	40	70	(48 - 85)
UK		**636**	**85**	**(82 - 88)**	**578**	**77**	**(73 - 80)**

* Includes transplants performed between 1 April 2009 - 31 March 2013
** Includes transplants performed between 1 April 2005 - 31 March 2009

6.2 Deceased donor graft and patient survival for first PO transplants

Individual centre survival estimates and national rates for one-year and five-year patient and pancreas graft survival for deceased donor first pancreas only (PO) transplants are shown in **Tables 6.3** and **6.4**, respectively. Centre specific estimates of these rates must be interpreted with caution due to the small number of transplants upon which they are based.

Table 6.3 Risk-adjusted one and five year patient survival for first PO transplants using pancreases from deceased donors

	Patient survival					
	One-year*			Five-year**		
Centre	N	%	(95% CI)	N	%	(95% CI)
Cambridge	0	-	-	0	-	-
Cardiff	9	100	N/A	0	-	-
Edinburgh	1	100	N/A	1	100	N/A
Guy's	4	100	N/A	1	100	N/A
Manchester	5	100	N/A	8	92	(58 – 100)
Newcastle	2	100	N/A	2	100	N/A
Oxford	51	93	(81 - 99)	28	84	(58 - 96)
WLRTC	0	-	-	2	100	N/A
UK	**72**	**95**	**(85 - 98)**	**42**	**85**	**(67 - 94)**

* Includes transplants performed between 1 April 2009 - 31 March 2013
** Includes transplants performed between 1 April 2005 - 31 March 2009
- No transplants performed in time period or insufficient survival data

Table 6.4 Risk-adjusted one and five year pancreas graft survival for first PO transplants using pancreases from deceased donors

	Pancreas graft survival					
	One-year*			Five-year**		
Centre	N	%	(95% CI)	N	%	(95% CI)
Cambridge	1	-	-	0	-	-
Cardiff	14	52	(0 - 82)	15	59	(10 - 85)
Edinburgh	1	-	-	5	34	(0 - 86)
Guy's	7	45	(0 - 85)	7	23	(0 - 75)
Manchester	11	35	(0 - 74)	20	28	(0 - 60)
Newcastle	4	61	(0 - 95)	5	34	(0 - 86)
Oxford	60	73	(56 - 85)	59	56	(35 - 71)
WLRTC	11	90	(43 – 100)	14	3	(0 - 50)
UK	**109**	**65**	**(55 - 73)**	**125**	**44**	**(35 - 52)**

* Includes transplants performed between 1 April 2009 - 31 March 2013
** Includes transplants performed between 1 April 2005 - 31 March 2009
- No transplants performed in time period or insufficient survival data

Islet transplant list

7.1 Patients on the islet transplant list as at 31 March, 2008 – 2014

Figure 7.1 shows the number of patients on the islet transplant list at 31 March each year between 2008 and 2014. The number of patients active on the islet transplant list has increased from 3 in 2008 (when islet transplantation was first commissioned in the UK) to 33 in 2014.

Figure 7.1 Patients on the islet transplant list at 31 March

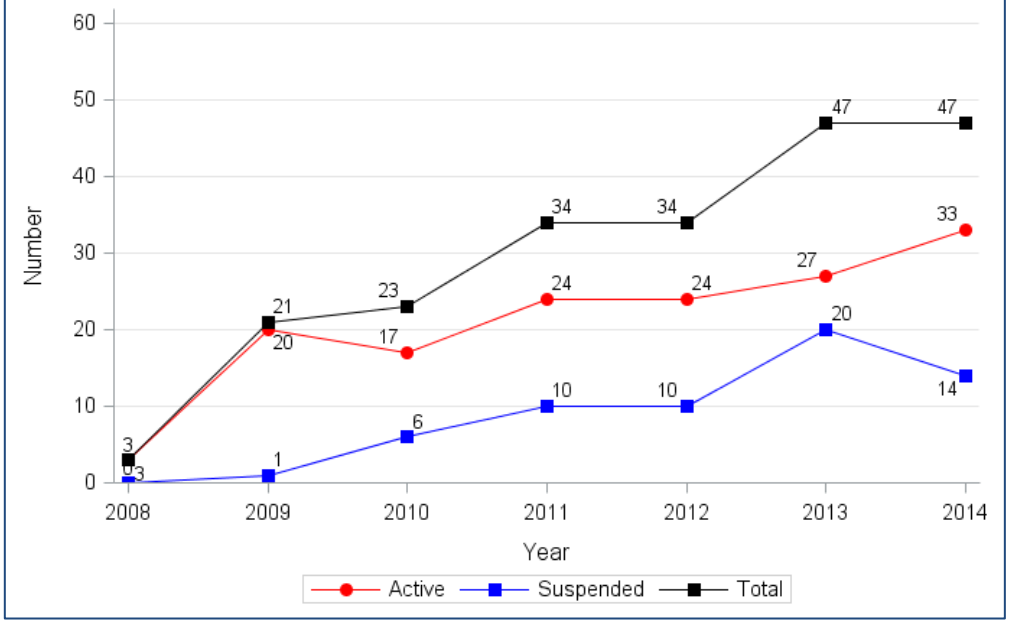


Figure 7.2 shows the number of patients on the active islet transplant list at 31 March 2014 by centre. Edinburgh and Manchester have the largest proportion, each with 30% of the active transplant list.

Figure 7.2 Patients on the active islet transplant list at 31 March 2014, by centre

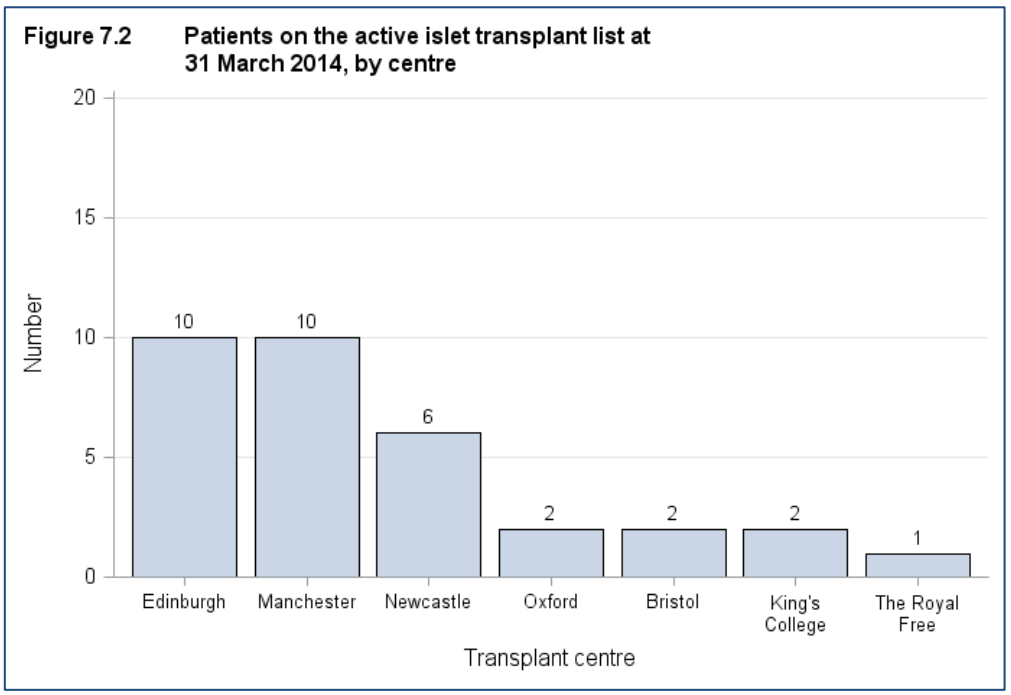
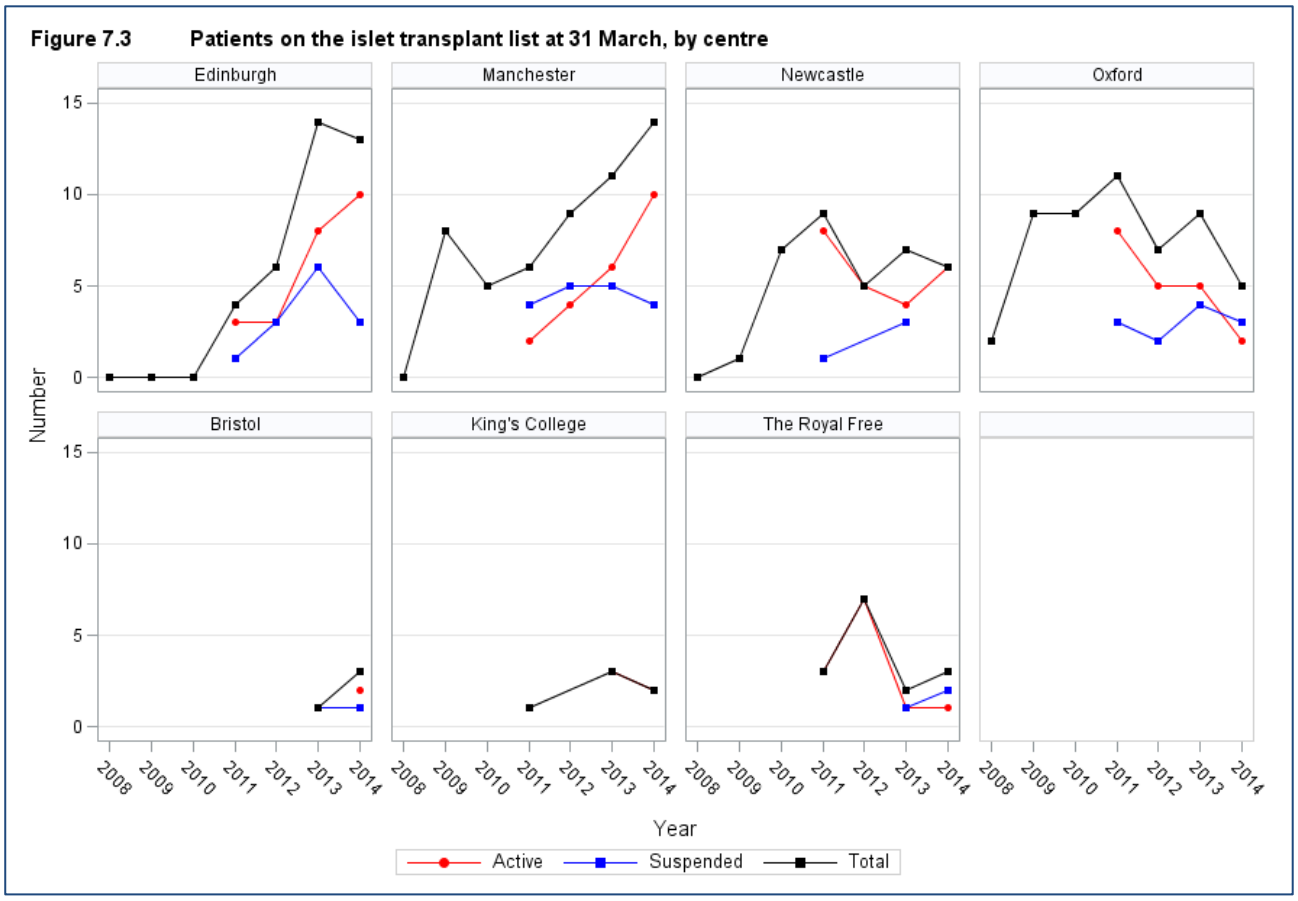


Figure 7.3 shows the number of patients on the islet transplant list at 31 March each year between 2008 and 2014 for each transplant centre. The number of active and suspended patients by centre is not recorded prior to 2011, hence only the total number are reported between 2008 and 2010.



7.2 Post-registration outcomes, 1 April 2010 – 31 March 2011

An indication of outcomes for patients listed for an islet transplant is summarised in **Figure 7.4**. This shows the proportion of patients transplanted or still waiting one 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. Only 56% of patients are transplanted within one year, while three years after listing 80% of patients have received a transplant.

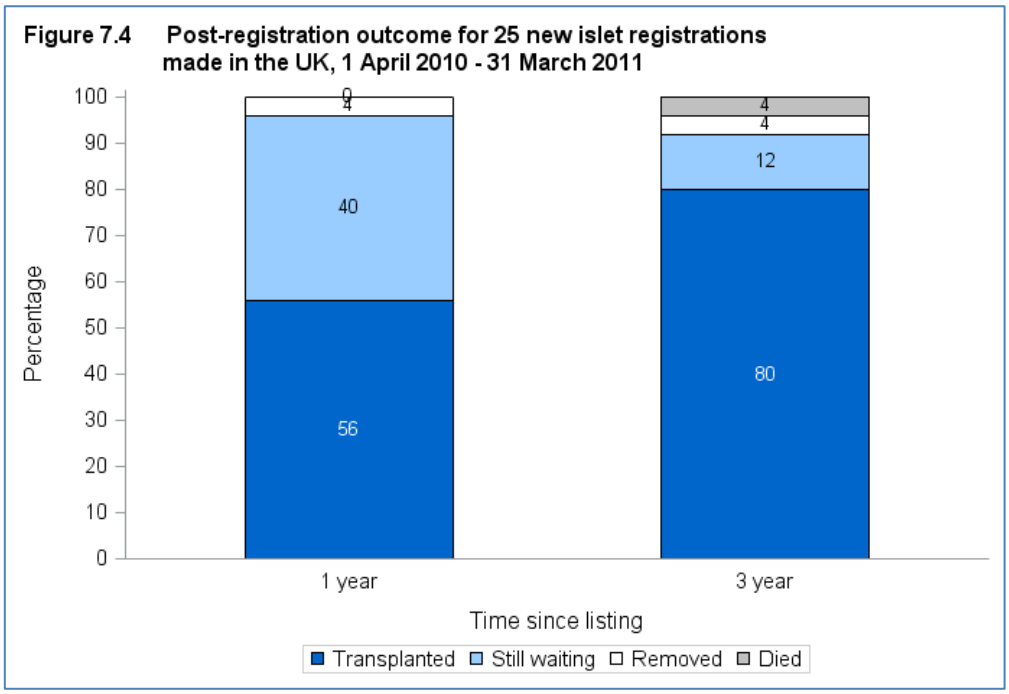
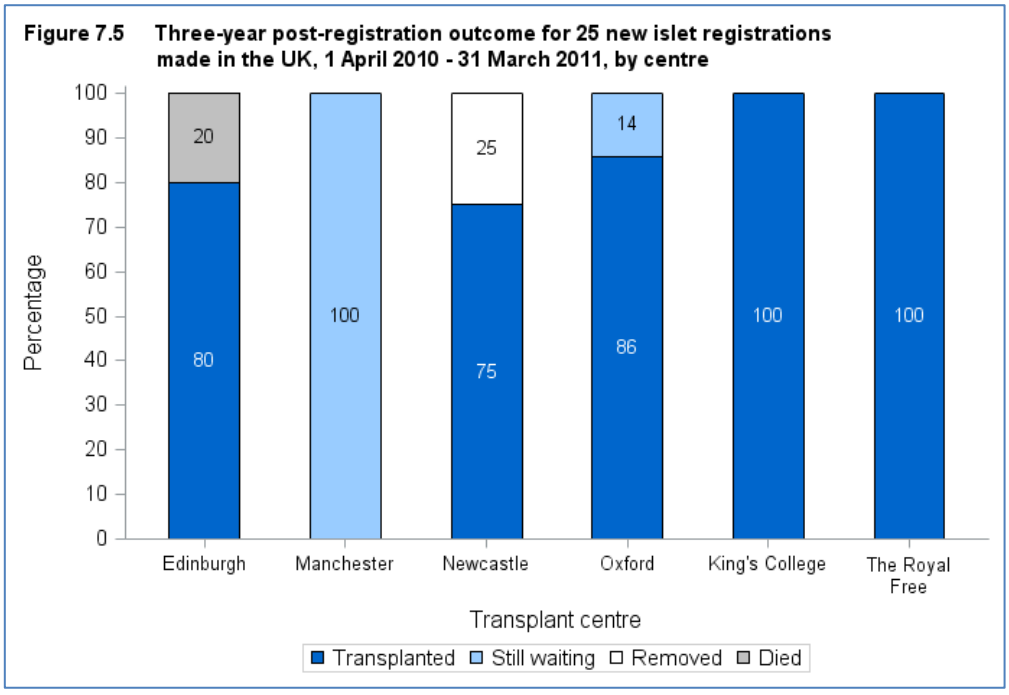


Figure 7.5 shows the proportion of patients transplanted or still waiting three years after joining the list by centre. Three years after transplant King's College and the Royal Free had transplanted 100% of their patients while the two patients registered at Manchester were still waiting. Of the five new registrations at Edinburgh one patient died before receiving a transplant.



7.3 Demographic characteristics, 1 April 2013 – 31 March 2014

All 44 patients on the transplant list during 2013/14 were white. The sex and age group of patients on the transplant list are shown by centre in **Figures 7.6,** and **7.7,** respectively. Note that all percentages quoted are based only on data where relevant information was available.

Figure 7.6 Registrations on the active islet transplant list, 1 April 2013 and 31 March 2014, by centre

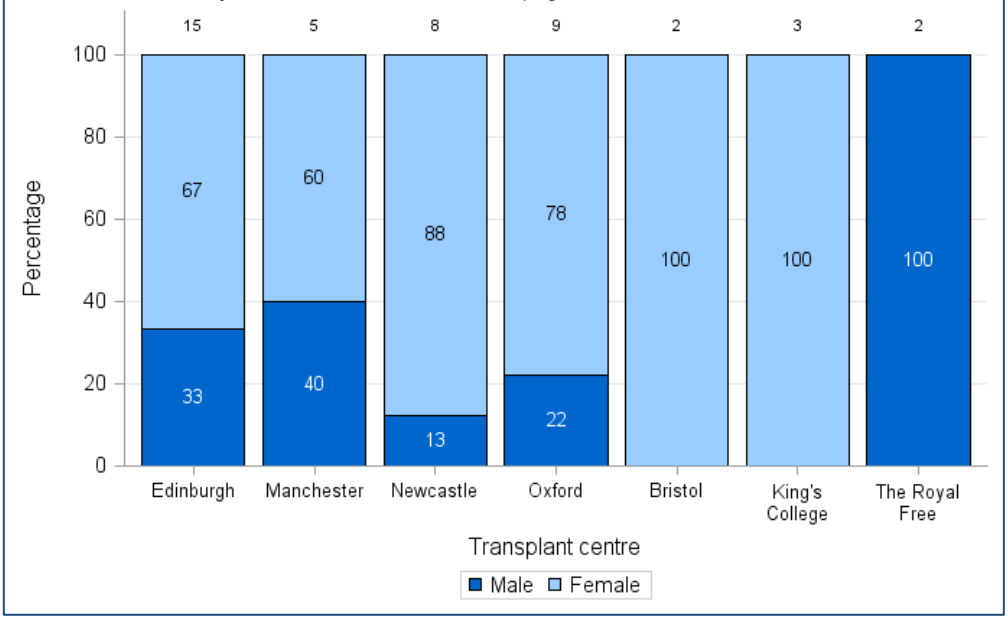
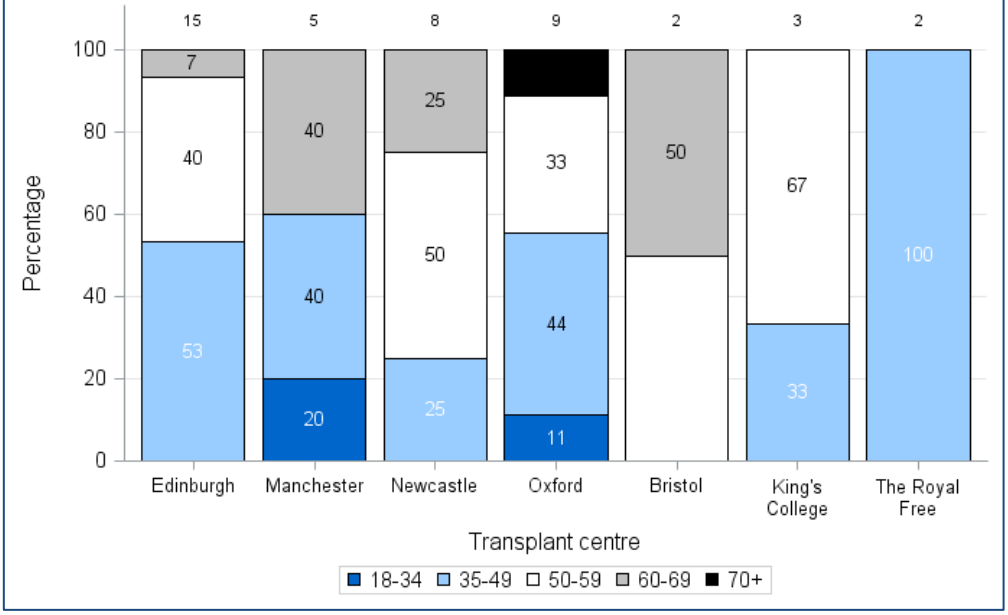


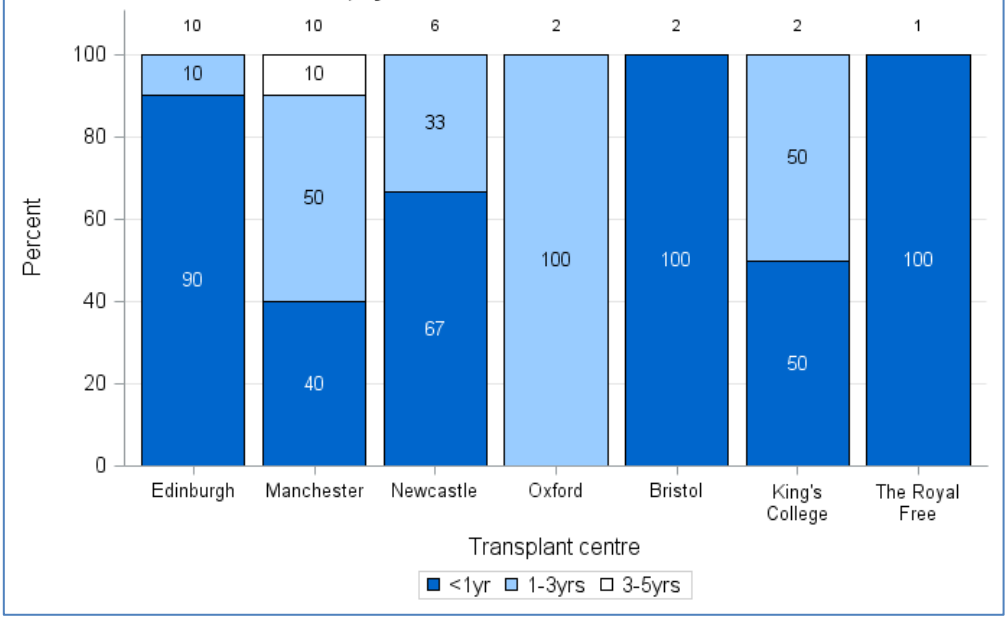
Figure 7.7 Registrations on the active islet transplant list, 1 April 2013 and 31 March 2014, by centre



7.4 Patient waiting times for those currently on the list, 31 March 2014

Figure 7.8 shows the length of time patients have been waiting on the pancreas transplant list at 31 March 2014 by centre. One highly sensitised patient (98% cRF) registered at Manchester has been waiting more than three years for transplant.

Figure 7.8 Patients on the active islet transplant list as at 31 March 2014, by centre



7.5 Median waiting time to transplant, 1 April 2008 - 31 March 2011

The length of time a patient waits for an islet transplant varies across the UK. The median waiting time for deceased donor islet transplantation is shown in **Figure 7.9** and **Table 7.1** for patients registered at each individual unit.

The median waiting time to transplant for patients registered on the islet transplant list between 1 April 2008 and 31 March 2011 is 450 days, nearly 15 months, ranging from 186 days at the Royal Free to 657 days at Oxford.

Figure 7.9 Median waiting time to deceased donor transplant for patients registered on the islet transplant list, 1 April 2008 - 31 March 2011

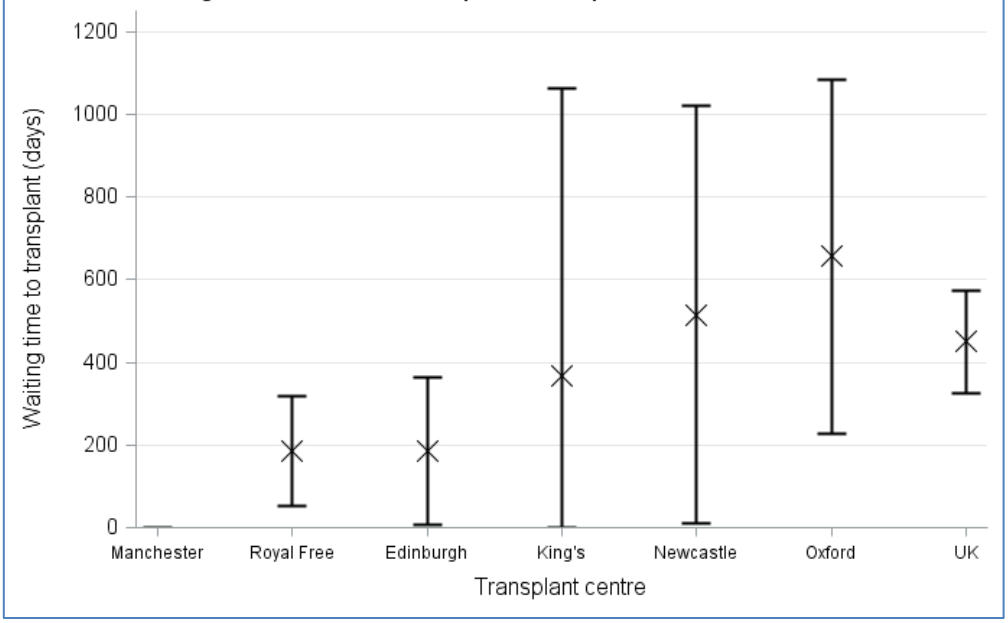


Table 7.1 Median waiting time to islet transplant in the UK, for patients registered 1 April 2008 - 31 March 2011

Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Manchester	11	-	-
Royal Free	8	186	54 - 318
Edinburgh	5	187	9 - 365
King's	5	369	0 - 1063
Newcastle	14	516	10 - 1022
Oxford	18	657	229 - 1085
UK	**61**	**450**	**325 - 575**

Response to islet offers

Offer decline rates

Islet offers from DBD donors whose pancreas was retrieved, offered directly on behalf of a named individual patient and resulted in islet transplantation are included in the analysis. Any offers of pancreases declined for transplantation, pancreases offered for multi-organ or small bowel transplant or DCD offers were excluded, as were offers made through the fast track scheme or the reallocation of the pancreas.

8.1 Offer decline rates, 1 April 2011 – 31 March 2014

Individual centre offer decline rates by financial year and over the time period, 1 April 2011 and 31 March 2014 are shown in **Table 8.1**. Bristol and King's College had the lowest overall rates while Manchester had the highest rate of 54%.

Table 8.1 DBD donor islet offer decline rates by transplant centre, 1 April 2011 and 31 March 2014

Centre	2011/12		2012/13		2013/14		Overall	
	N	(%)	N	(%)	N	(%)	N	(%)
Bristol	0	-	1	(0)	0	-	1	(0)
Edinburgh	6	(0)	8	(50)	11	(27)	25	(28)
King's College	2	(50)	1	(0)	5	(20)	8	(25)
Manchester	3	(33)	3	(67)	7	(57)	13	(54)
Newcastle	9	(0)	9	(44)	10	(50)	28	(32)
Oxford	9	(44)	9	(56)	8	(25)	26	(42)
Royal Free	5	(40)	9	(44)	0	-	14	(43)
UK	**34**	**(24)**	**40**	**(48)**	**41**	**(37)**	**115**	**(37)**

Islet transplants

9.1 Islet transplants, 1 April 2004 – 31 March 2014

Figure 9.1 shows the total number of islet transplants performed in the last six years since islet transplantation was first commissioned in the UK, by type of donor. The number of transplants increased year on year from 10 in 2008/09 to 32 in 2013/14. There was a significant increase in 2011/12 from 13 to 30 transplants a year, following the introduction of the national Pancreas Allocation Scheme in 2010 which provided islet patients with equal access to donated pancreases for the first time. In 2013/14 there were four DCD islet transplants the most in any one year to date.

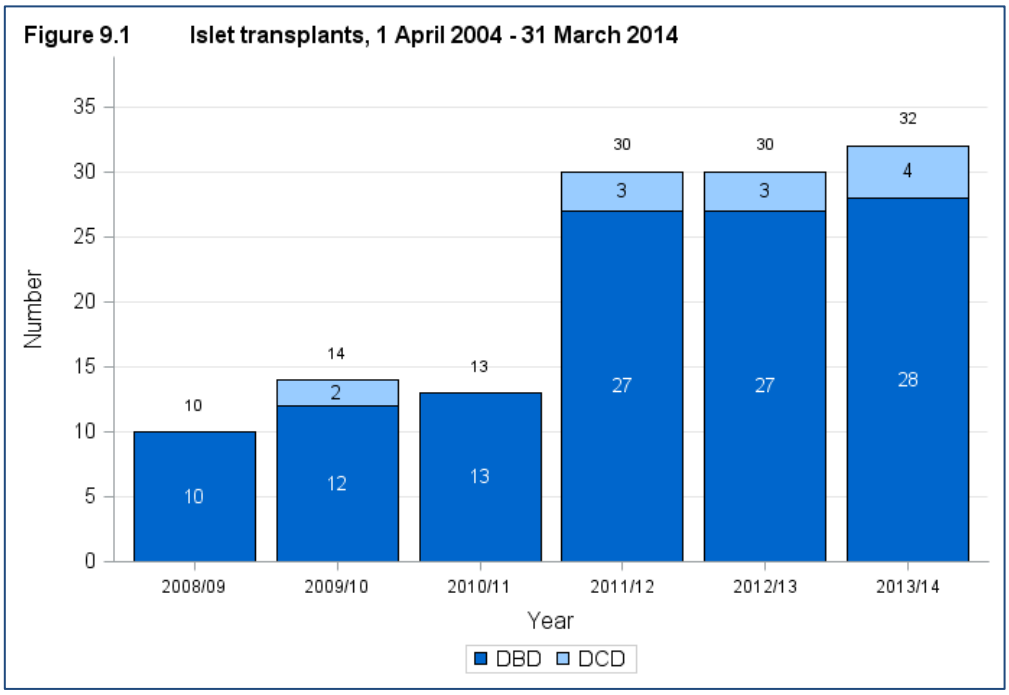


Figure 9.2 shows the total number of pancreas transplants performed in 2013/14, by centre and type of donor. The same information is presented in **Figure 9.3** but this shows the proportion of DBD and DCD transplants performed at each centre. Edinburgh performed the most islet transplants in 2013/14. Newcastle, Edinburgh and the Royal Free all performed at least one DCD transplant. There were no islet transplants performed at Bristol last year as the transplant programme was on hold. Bristol has recently recommenced transplanting islets.

Figure 9.2 Islet transplants, 1 April 2013 - 31 March 2014

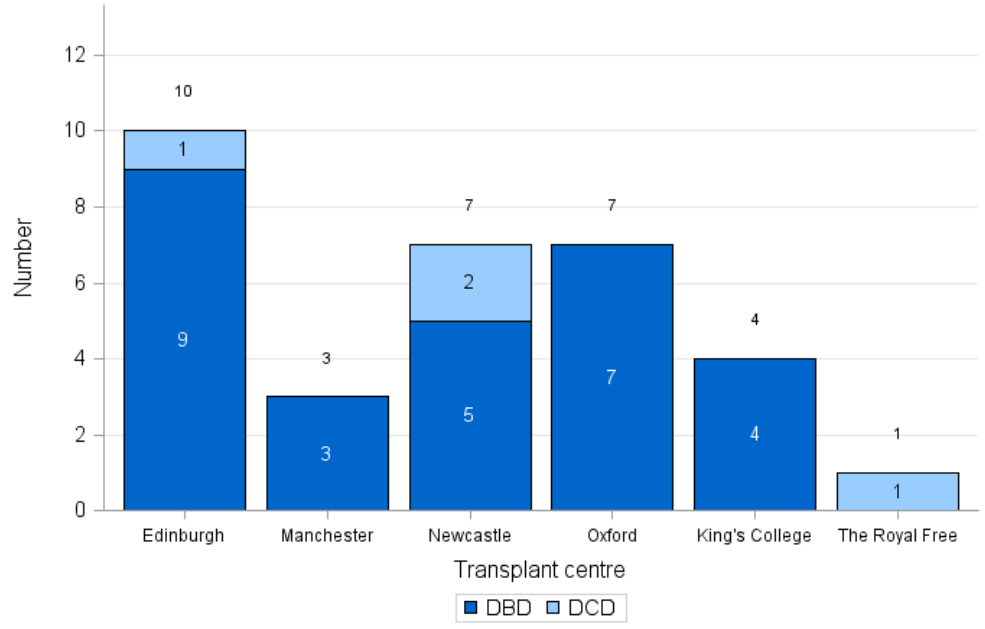


Figure 9.3 Islet transplants, 1 April 2013 - 31 March 2014

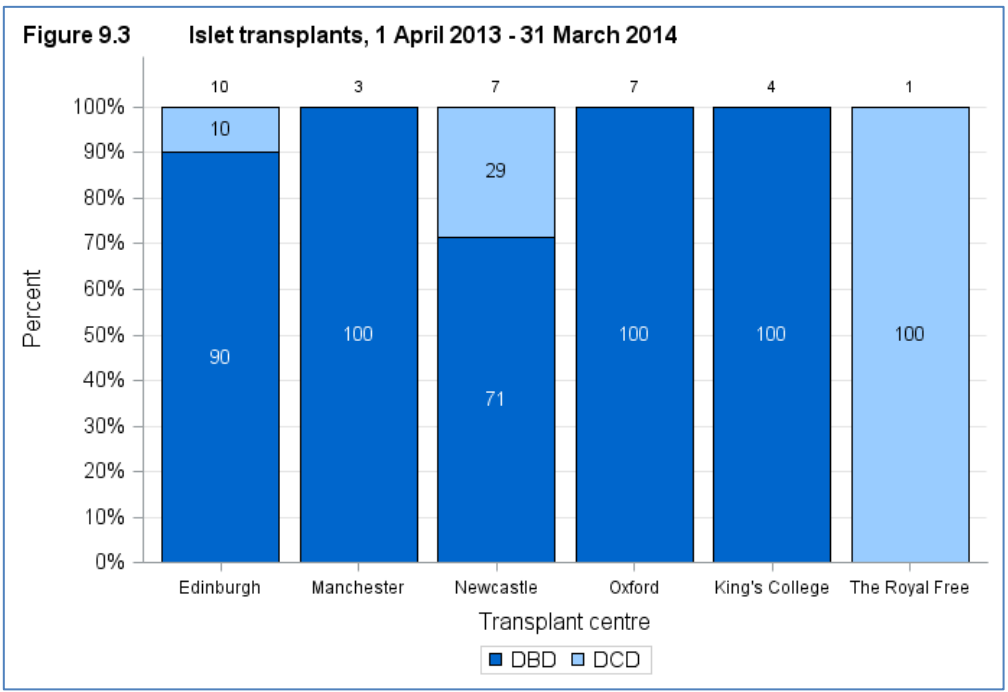
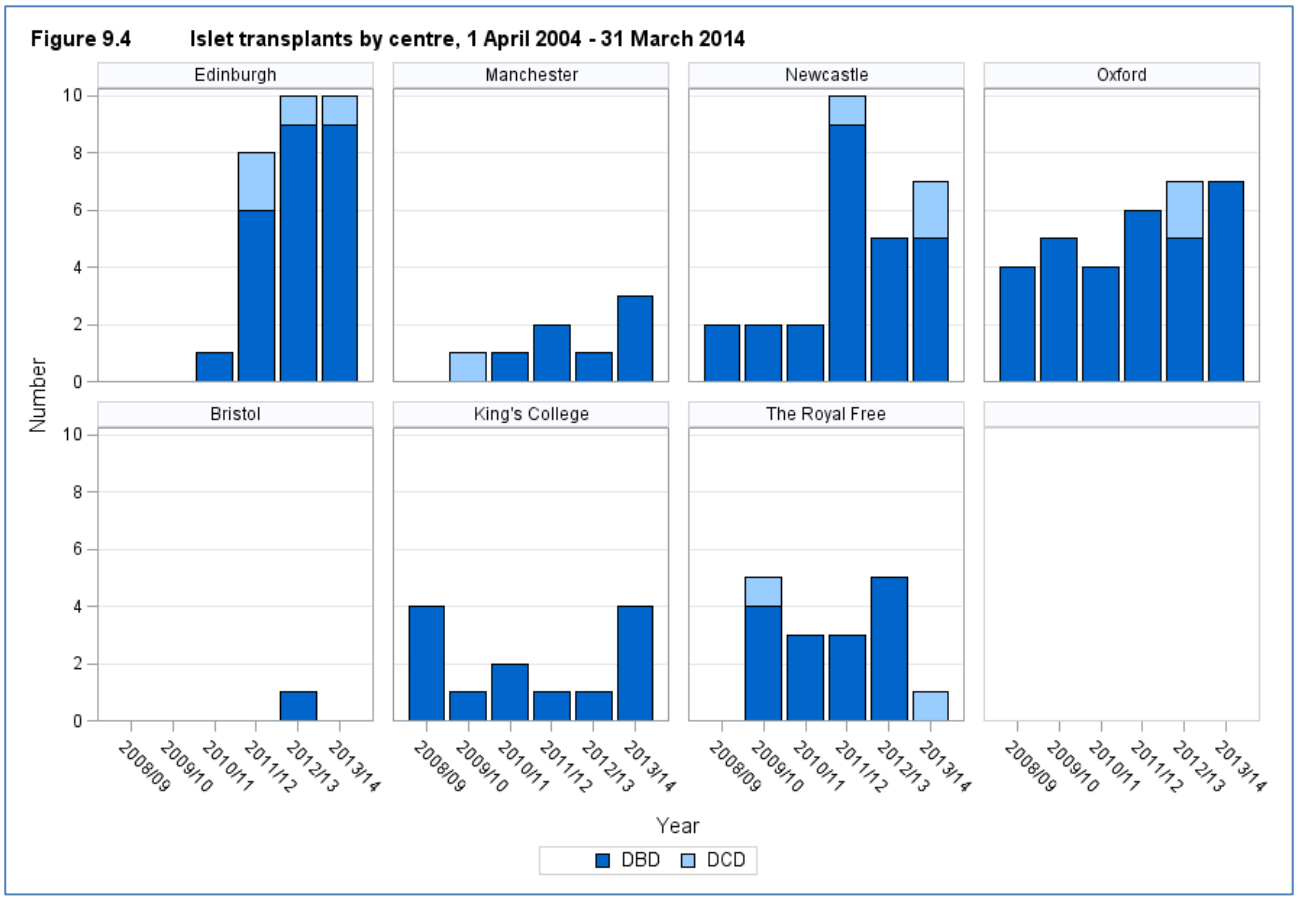


Figure 9.4 shows the total number of islet transplants performed in last six years, by centre and type of donor. Oxford have consistently performed a number of islet transplants each year, while Edinburgh and Newcastle have increased their transplant activity in the last three years.



Islet outcomes

10.1 Outcome measures for routine islet transplants

The Kaplan-Meier graft survival estimate for one-year post-transplant for routine islet transplant in the UK is 87% with a 95% confidence interval between 73% and 94%. Other key measures of islet outcome include annual rate of severe hypoglycaemic events, HbA1c and insulin requirements.

The median annual rate of severe hypoglycaemic events prior to transplant was 9 events per year, and at one-year post-transplant this had been reduced to no events per year. In the year post-transplant, 81% of patients experienced no severe hypoglycaemic events and ten patients experience between one and five events.

Figure 10.1 shows the reduction in median HbA1c (%) for routine islet transplants. Median HbA1c dropped from 8.0% prior to transplant to 6.6% at one-year post-transplant. At one-year, 32 patients (58%) had an HbA1c less than 7%.

Figure 10.1 Median HbA1c (%) for routine islet transplants, 1 April 2008 to 31 March 2013

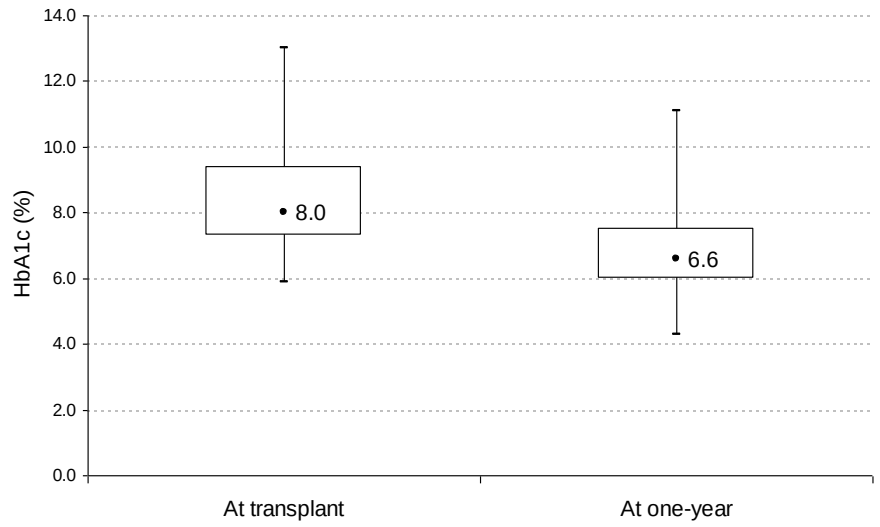
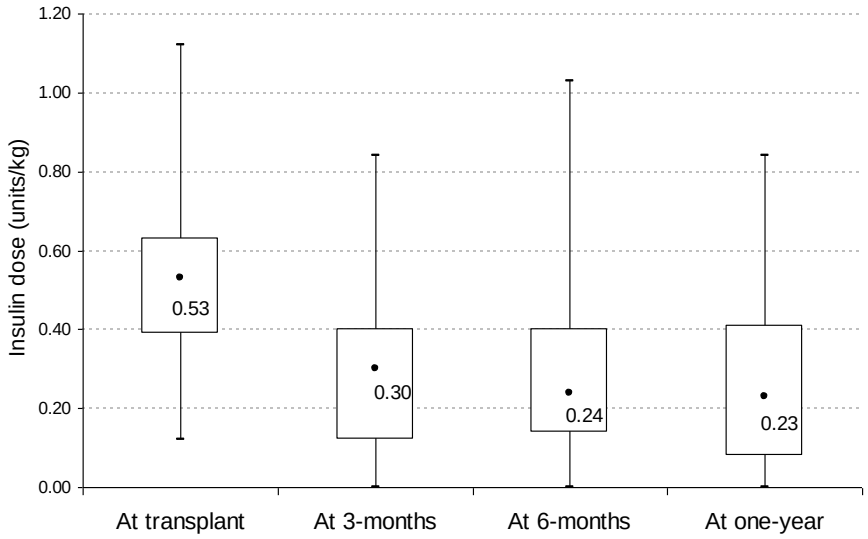


Figure 10.2 shows the median reduction in insulin dose per kilo recipient body weight at three-months, six-months and one-year post-transplant. Prior to transplant the median insulin dose is 0.53 units/kg, by three-months the median dose has dropped to 0.30 units/kg and this reduction has been maintained at one-year post-transplant with a median dose of 0.23 units/kg. Following islet transplantation, 25 patients (39%) were insulin independent at some point during the first year.

Figure 10.2 **Median insulin dose for routine islet transplants, 1 April 2008 to 31 March 2013**



Survival from listing

11.1 Patient survival from listing for pancreas, SPK and islet transplant

Survival from listing was analysed for all adult (≥ 18 years) patients registered for the first time for a pancreas, simultaneous pancreas and kidney (SPK) or islet transplant between 1 January 2002 and 31 December 2013. Patients registered at an islet only transplant centre have been excluded from this analysis. 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 eg 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 the time of analysis if the patient was still active on the transplant list.

The funnel plot shown in **Figure 11.1**, compares centre specific ten-year risk-adjusted patient survival rates from the point of pancreas, simultaneous pancreas and kidney (SPK) or islet transplant listing and indicates how consistent the rates of the individual transplant centres are with the national rate. Cambridge, Edinburgh and Guy's all have 10 year survival rates above the upper 95% confidence limit indicating that these centres have 10 year survival rates from listing that are considerably higher than the national rate. Manchester fell just below the 95% lower confidence limit. This suggests that 10 year survival from listing at Manchester may be significantly lower than the national rate. Centres can be identified by the information shown in **Table 11.1**, which also shows one- and five-year risk-adjusted survival rates from the point of transplant listing.

Figure 11.1 **Risk-adjusted 10 year patient survival from listing for first deceased donor pancreas, SPK or islet transplant in patients registered between 1 January 2002 and 31 December 2013**

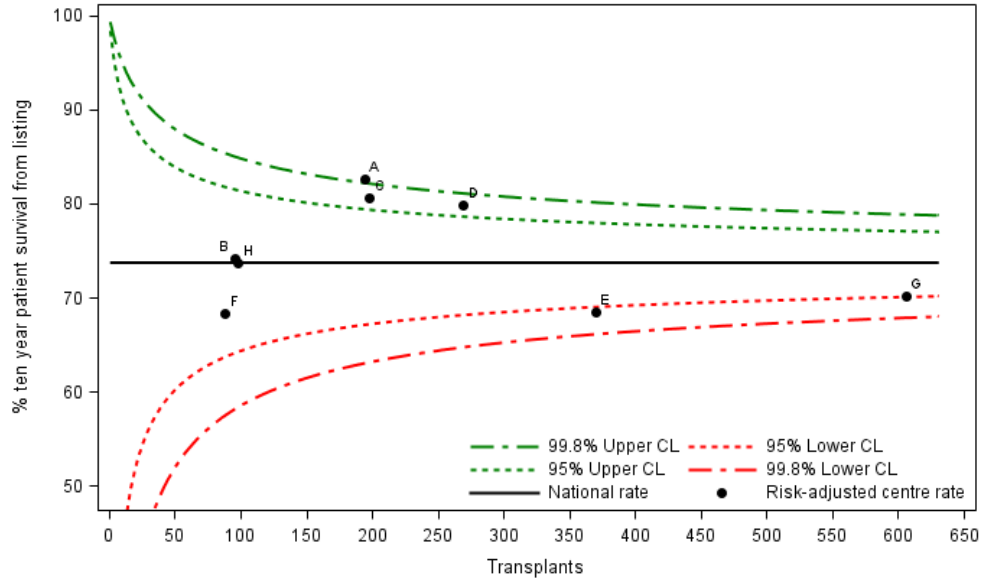


Table 11.1 **Risk-adjusted 1, 5 and 10 year patient survival from listing for first deceased donor pancreas, SPK or islet transplant in patients registered between 1 January 2002 and 31 December 2013**

Centre	Code	One year		Five year		Ten year	
		N	(%)	N	(%)	N	(%)
Cambridge	A	194	(97)	194	(90)	194	(83)
Cardiff	B	96	(96)	96	(85)	96	(74)
Edinburgh	C	198	(97)	198	(89)	198	(81)
Guy's	D	269	(97)	269	(89)	269	(80)
Manchester	E	370	(96)	370	(81)	370	(68)
Newcastle	F	88	(95)	88	(81)	88	(68)
Oxford	G	606	(96)	606	(82)	606	(70)
WLRTC	H	98	(97)	98	(85)	98	(74)
UK		**1919**	**(97)**	**1919**	**(85)**	**1919**	**(74)**

Patients registered at an islet only transplant centre have been excluded

Appendix

A1 Glossary of terms

ABO
The most important human blood group system for transplantation is the ABO system. Every human being is of blood group O, A, B, AB, or one of the minor variants of these four groups. ABO blood groups are present on other tissues and, unless special precautions are taken, a blood group A pancreas transplanted to a blood group O patient will be rapidly rejected.

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 pancreas becomes available, the patient is included among those who are matched against the donor to determine whether or not the pancreas 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 pancreases that become available.

Calculated Reaction Frequency (cRF)
For a given patient with detectable HLA antibodies, the proportion of blood group identical donors from a pool of 10,000 and for which they would be HLA compatible is calculated. This percentage of donors is termed the 'calculated Reaction Frequency' (cRF), more commonly referred to as the sensitisation level. Patients with no detectable HLA antibodies will have 0 sensitisation (0% cRF).

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. For example the case mix for patients registered for a pancreas transplant is defined in terms of various factors such as the blood group, tissue type and age of the patient. These factors have an influence on the chance of a patient receiving a transplant.

Cold ischaemia time (CIT)
The length of time that elapses between a pancreas being removed from the donor to its transplantation into the recipient is called the Cold Ischaemia Time (CIT). Generally, the shorter this time, the more likely the pancreas is to work immediately and the better the long-term outcome. The factors which determine CIT include a) transportation of the pancreas from the retrieval hospital to the hospital where the transplant is performed, b) the need to tissue type the donor and cross-match the donor and potential recipients, c) the occasional necessity of moving the pancreas to another hospital if a transplant cannot go ahead, d) contacting and preparing the recipient for the transplant, and e) access to the operating theatre.

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 graft failure or patient death, across different groups of patients.

Cross-match
A cross-match is a test for patient antibodies against donor antigens. A positive cross-match shows that the donor and patient are incompatible. A negative cross-match means there is no reaction between donor and patient and that the transplant may proceed.

Donor after brain death
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
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 survival rates of the different transplant units are compared to the national rate. 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.

Graft survival rate
The percentage of patients whose grafts are still functioning. This is usually specified for a given time period after transplant. For example, a five-year transplant survival rate is the percentage of transplants still functioning five years after transplant. For the purposes of pancreas transplantation, graft failure is defined as a return to permanent insulin dependence while for islet transplantation graft failure is defined as a C-peptide less than 50 pmol/l.

HbA1c
HbA1c refers to glycated haemoglobin which is measured by clinicians to obtain an overall picture of an individual's average blood sugar levels over a particular period. HbA1c is a valuable indicator of diabetes control.

HLA mismatch
Human Leucocyte Antigen (HLA) antigens are carried on many cells in the body and the immune system can distinguish between those that can be recognised as 'self' (belonging to you or identical to your own) and those that can be recognised as 'nonself'. The normal response of the immune system is to attack foreign/non-self material by producing antibodies against the foreign material. This is one of the mechanisms that provide protection against infection. This is unfortunate from the point of view of transplantation as the immune system will see the graft as just another 'infection' to be destroyed, produce antibodies against the graft and rejection of the grafted organ will take place. To help overcome this response, it is recognised that 'matching' the recipient and donor on the basis of HLA (and blood group) reduces the chances of acute rejection and, with the added use of immunosuppressive drugs, very much improves the chances of graft survival. 'Matching' refers to the similarity of the recipient HLA type and donor HLA type. HLA mismatch refers to the number of mismatches between the donor and the recipient at the A, B and DR (HLA) loci. There can only be a total of two mismatches at each locus. For example, an HLA mismatch value of 000, means that the donor and recipient are identical at all three loci, while an HLA mismatch value of 210 means that the donor and recipient differ completely at the A locus, are partly the same at the B locus and are identical at the DR locus.

Hypoglycaemia
Hypoclycaemia occurs when the level of glucose present in the blood falls below a set point and is the most common complication of insulin therapy. Severe hypoglycaemia is defined as having low blood glucose levels that requires third party assistance to treat and is classed as a diabetic emergency.

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, in a cohort for estimating one year patient survival rates, a patient was followed up for only nine months before they relocated. 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 pancreas and liver.

National Pancreas Allocation Scheme
A nationally agreed set of rules for sharing and allocating deceased donor pancreases for pancreas or islet transplant between transplant centres in the UK. The scheme was introduced on 1 December 2010 and is administered by NHS Blood and Transplant. Prior to December 2010 deceased donors were allocated on a centre basis.

The Pancreas Allocation Scheme prioritises all blood group eligible patients and assigns an individual point score to all patients based on a number of clinically relevant donor, recipient and transplant related factors. The individual points score assigns more points to patients with lower levels of HLA mismatch, longer waiting times, higher levels of patient sensitisation, short travel times between retrieval to transplant centre, longer duration of dialysis and better donor to recipient age matching. In addition, donors with a lower BMI are clinically desirable for pancreas transplantation whereas donors with a higher BMI are preferable for islet transplantation. As a result, where the donor has a low BMI more points are awarded for patients waiting for a pancreas transplant and where the donor has a high BMI more points are awarded to islet patients. Patients listed nationally for either a pancreas or islet transplant are then ranked by their total points score and the pancreas is offered preferentially to the patient with the highest total number of points, no matter where in the UK they receive their treatment or whether they are waiting for a pancreas or islet transplant.

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.

Sensitisation
Potential recipients can develop a number of different HLA antibodies as a result of exposure to the different HLA antigens through blood transfusion, previous transplants and pregnancy. Many patients however, have no detectable HLA antibodies. If a potential recipient has an antibody to an HLA antigen then they cannot receive a transplant from a donor with that HLA antigen, thus restricting the pool of potential donors. Patients who are clinically incompatible with the donor are excluded from the offering sequence by the Pancreas Allocation Scheme.

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.

A2 Statistical methodology and risk-adjustment for survival rate estimation

Unadjusted and risk-adjusted estimates of patient and graft survival for pancreas and simultaneous pancreas and kidney (SPK) transplant are given for each centre. Unadjusted rates give an estimate of what the survival rate at a centre is, assuming that all patients at the centre have the same chance of surviving a given length of time after transplant. In reality, patients differ and a risk-adjusted rate that allows for these differences would give a more meaningful estimate of survival.

Computing unadjusted survival rates

Unadjusted survival rates were calculated using the Kaplan-Meier method, which allows patients with incomplete follow-up information to be included in the computation. For example, in a cohort for estimating one-year patient survival rates, a patient was followed up for only nine months before they relocated. 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 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 in the analysis of survival data and the Kaplan-Meier method therefore allows the computation of survival estimates that are more meaningful.

Computing risk-adjusted 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 table below.

First transplants from deceased donors	
Simultaneous pancreas and kidney (SPK) and pancreas only survival	
1 and 5 year patient and graft survival	Donor age, donor type, donor BMI and waiting time

Funnel plots for comparing risk-adjusted survival rates

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.

A fundamentally similar method was used to conduct the survival from listing analysis. The risk factors used are detailed in the table below.

First registrations for pancreas, simultaneous pancreas and kidney (SPK) or islet transplant	
1, 5 and 10 year patient survival from listing	Age, gender, ethnicity, blood group, BMI, cRF>85%, transplant type

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