

**NHS BLOOD AND TRANSPLANT  
ORGAN DONATION AND TRANSPLANTATION DIRECTORATE**

**PANCREAS ADVISORY GROUP**

ISLET TRANSPLANT ACTIVITY AND OUTCOME  
SUMMARY

**INTRODUCTION**

- 1 Islet transplant data has been collected by NHSBT since the introduction of four transplant and follow-up forms in July 2010. This paper provides basic summaries of transplant activity and outcomes.

**DATA**

- 2 Islet transplant activity and end of year transplant list for the last three calendar years were analysed. Data on 210 (132 routine and 78 priority) islet transplants performed in the UK where the routine transplant was performed between 1 April 2010 and 31 December 2017 were analysed from the UKTR. Outcome data are reported for all routine transplants.

**RESULTS**

- 3 In 2018 there were 29 islet transplants performed, compared to 27 in 2017. The number of patients on the islet transplant list at 31 December 2018 was 33, 30 routine and three priority, compared with 28 in 2017.
- 4 Kaplan-Meier estimated one-year graft survival for routine grafts between 1 April 2010 – 31 December 2017 is 89%, 95% CI (82 – 94). Kaplan-Meier estimated five-year graft survival, where the graft was still functioning at one-year post-transplant, is 44%, 95% CI (24 – 62) for routine only grafts and 62%, 95% CI (46 – 74) for routine grafts followed by a priority graft. This difference was statistically significant,  $p < 0.03$ .
- 5 For patients receiving an islet alone transplant, the median annual rate of severe hypoglycaemic events fell from 7 events (IQR 0 - 34) at time of transplant, to none at one, two and three years' post-transplant. 82 (81%) patients experienced no severe hypoglycaemic events in the first-year post-transplant.
- 6 Median HbA1c fell from 64 mmol/mol (IQR 55 – 75) at time of transplant, to 51 mmol/mol (IQR 42 – 59) at one year and 54 (IQR 49 – 63) three years post-transplant. Reduction in HbA1c was reported for 90 (84%) patients at one-year post-transplant.
- 7 The median insulin dose fell from 0.50 units/kg (IQR 0.36 – 0.62) at time of transplant to 0.28 units/kg three years post-transplant. Insulin dependence at some point in the first-year post-transplant was achieved for 33% of patients.

**SUMMARY**

- 8 In 2018, the number of islet transplants had increased from 2017 and the number on the waiting list at the end of the calendar year had also increased. One-year graft survival is 89%. Reduction in rate of severe hypoglycaemic events, HbA1c and insulin dose at one-year, two years and three years post routine transplant have been reported.

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## INTRODUCTION

- 9 Islet transplant data has been collected by NHSBT since the introduction of four transplant and follow-up forms in July 2010. This paper provides basic summaries of transplant activity and outcomes.

## DATA

- 10 Recent data on islet transplant activity and end of year transplant list between 1 January 2016 and 31 December 2018 from the UK Transplant Registry (UKTR) are reported, by centre and calendar year.
- 11 Additionally, data on 210 (132 routine and 78 priority) islet transplants performed in the UK where the routine transplant was performed between 1 April 2010 and 31 December 2017 were analysed from the UKTR. Outcome data are reported for all routine transplants. Where outcome data are unavailable from UKTR, data collected by the UKITC clinical research forms have been considered. This data has been provided by the Newcastle research group who collate and maintain the research data base.
- 12 All islet transplant outcome data reported are specific to the routine transplant and one-year centre specific outcomes are presented in the Appendix.

## RESULTS

- 13 The number of islet transplants performed by centre for the last three calendar years, 1 January 2016 to 31 December 2018, is shown by transplant type and islet status in **Tables 1** and **2**, respectively. **Table 3** shows the transplant list at the end of the last three calendar years by islet status.
- 14 Between 1 April 2010 and 31 December 2017, there were a total of 210 islet transplants performed, 132 (63%) of which were routine. The number of known graft failures at one-year post-transplant is reported in **Table 4**. Of the 132 routine transplants performed, 78 patients received priority grafts in the time period analysed. The majority of these patients received their first priority graft within six months of their routine graft: 0-3 months for 21 (27%) patients; 3-6 months for 31 (40%) patients; 6-12 months for 25 (32%) patients and more than one year for one patient who was highly sensitised.
- 15 One-year graft outcome by total IEQ (IEQx1000/kg) transplanted is presented in **Figure 1** and **Figure 2**, for routine only and routine and priority grafts, respectively.
- 16 Kaplan-Meier survival plots showing one-year and five-year graft survival after first routine transplants are presented in **Figure 3** and **Figure 4**, respectively.

- 17 **Figure 5** shows a Kaplan-Meier survival plot of five-year graft survival by type of graft. Estimated five-year graft survival for first routine only grafts is 33%, 95% CI (18-48%) and for first routine grafts followed by a priority graft is 60%, 95% CI (45-72%). This difference was statistically significant,  $p < 0.0001$ .
- 18 **Figure 6** shows a Kaplan-Meier survival plot of five-year graft survival by type of graft, where the first routine graft was still functioning at one-year post-transplant. Estimated five-year graft survival for routine only grafts is 44%, 95% CI (24 – 62) and for routine grafts followed by a priority graft is 62%, 95% CI (46 – 74). This difference was statistically significant,  $p < 0.03$ .
- 19 The median rate of severe hypoglycaemic events, excluding simultaneous islet and kidney transplants, is presented in **Figure 7**. At one-year post-transplant data were available in 101 cases and 66 (65%) patients had a reduced number of events at one-year post-transplant. 82 (81%) patients experienced no severe hypoglycaemic events during the first year following their routine transplant, whilst 19 (19%) patients experienced between one and nine events.
- 20 Median HbA1c is reported in **Figure 8**. Data were available to calculate the reduction in HbA1c in 107 cases at one-year post-transplant and in 90 (84%) patients a reduction in HbA1c was reported. The proportion of patients with HbA1c of less than 53 mmol/mol was 18% of 128 at time of transplant, 59% of 110 at one-year post-transplant and 39% of 62 patients at three years post-transplant.
- 21 **Figure 9** shows the median insulin dose at transplant and specific time points post-transplant. In 84 (89%) patients a reduction in insulin dose between transplant and one-year post-transplant was reported. Of the 110 patients with insulin independence status reported for the first-year post-transplant, 36 (33%) achieved insulin independence at some point in the year.

## SUMMARY

- 22 In 2018, the number of islet transplants had increased from 2017 and the number on the waiting list at the end of the calendar year had also increased. One-year graft survival is 89%. Reduction in rate of severe hypoglycaemic events, HbA1c and insulin dose at one-year, two years and three years post routine transplant have been reported.

Table 1 UK islet transplant activity between 1 January 2016 and 31 December 2018, by transplant type and calendar year

Transplant Centre	2016							2017							2018									
							Total								Total								Total	
	ITA	IAK	IAP	IAPK	SIK	N	%	ITA	IAK	IAP	IAPK	SIK	N	%	ITA	IAK	IAP	IAPK	SIK	N	%			
Bristol	2	0	0	0	0	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Edinburgh	16 <sup>2</sup>	2 <sup>1</sup>	0	0	0	18	62	11 <sup>2</sup>	0	0	0	0	2	13	48	7	1	0	0	2	10	34		
King's	3	0	0	0	0	3	10	0	0	0	0	0	0	0	0	2	0	0	0	0	2	7		
Manchester	1	0	0	0	0	1	3	2	0	0	0	2 <sup>1</sup>	4	15	1	4 <sup>2</sup>	0	0	4 <sup>3</sup>	9	31			
Newcastle	2	0	0	0	0	2	7	1	0	0	0	0	1	4	3	1	0	0	0	1	5	17		
Oxford	3 <sup>1</sup>	0	0	0	0	3	10	9	0	0	0	0	9	33	3	0	0	0	0	0	3	10		
Royal Free	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
<b>TOTAL</b>	<b>27</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>29</b>	<b>100</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>27</b>	<b>100</b>	<b>16</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>29</b>	<b>100</b>			

ITA = Islet transplant alone IAK = Islet after kidney IAP = Islet after pancreas IAPK = Islet after simultaneous kidney/pancreas  
 SIK = Simultaneous kidney/islet

<sup>1</sup> Includes 1 DCD transplant

<sup>2</sup> Includes 2 DCD transplants

<sup>3</sup> Includes 3 DCD transplants

Table 2 UK islet transplant activity between 1 January 2016 and 31 December 2018, by islet status, number of patients and calendar year

Transplant Centre	2016						2017						2018											
	Routine		Priority		Number of patients		Routine		Priority		Number of patients		Routine		Priority		Number of patients							
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%						
Bristol	1		1		2	7	1	5	0		0		0		0		0		0					
Edinburgh	10		8		18	62	13	62	8 <sup>2</sup>		5		13	48	10	48	6 <sup>2</sup>		4		10	34	8	35
King's	2		1		3	10	2	10	0		0		0		0		1		1		2	7	1	4
Manchester	1		0		1	3	1	5	3 <sup>2</sup>		1		4	15	4	19	4 <sup>3</sup>		5		9	31	7	30
Newcastle	0		2		2	7	2	10	1		0		1	4	1	5	4 <sup>1</sup>		1		5	17	4	17
Oxford	2		1		3	10	2	10	6		3		9	33	6	29	3		0		3	10	3	13
Royal Free	0		0		0	0	0	0	0		0		0	0	0	0	0		0		0	0	0	0
<b>TOTAL</b>	<b>16</b>		<b>13</b>		<b>29</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>18</b>		<b>9</b>		<b>27</b>	<b>100</b>	<b>21</b>	<b>100</b>	<b>18</b>		<b>11</b>		<b>29</b>	<b>100</b>	<b>23</b>	<b>100</b>

<sup>1</sup> Includes 1 SIK transplant

<sup>2</sup> Includes 2 SIK transplants

<sup>3</sup> Includes 4 SIK transplants

**Table 3 UK islet transplant list, 31 December 2016 to 31 December 2018, by islet status and calendar year**

Transplant Centre	31 December 2016				31 December 2017				31 December 2018			
			Total				Total				Total	
	Routine	Priority	N	%	Routine	Priority	N	%	Routine	Priority	N	%
Bristol	0	0	0	0	0	0	0	0	0	0	0	0
Edinburgh	3	1	4	17	7 <sup>1</sup>	1	8	29	3 <sup>1</sup>	1	4	12
King's	0	0	0	0	1	0	1	4	1	0	1	3
Manchester	4 <sup>1</sup>	2	6	26	7 <sup>2</sup>	4	11	39	16 <sup>3</sup>	0	16	48
Newcastle	2	2	4	17	5 <sup>1</sup>	1	6	21	6 <sup>1</sup>	0	6	18
Oxford	8	1	9	39	2	0	2	7	2	2	4	12
Royal Free	0	0	0	0	0	0	0	0	2	0	2	6
<b>TOTAL</b>	<b>17</b>	<b>6</b>	<b>23</b>	<b>100</b>	<b>22</b>	<b>6</b>	<b>28</b>	<b>100</b>	<b>30</b>	<b>3</b>	<b>33</b>	<b>100</b>

<sup>1</sup> Includes 1 SIK recipient

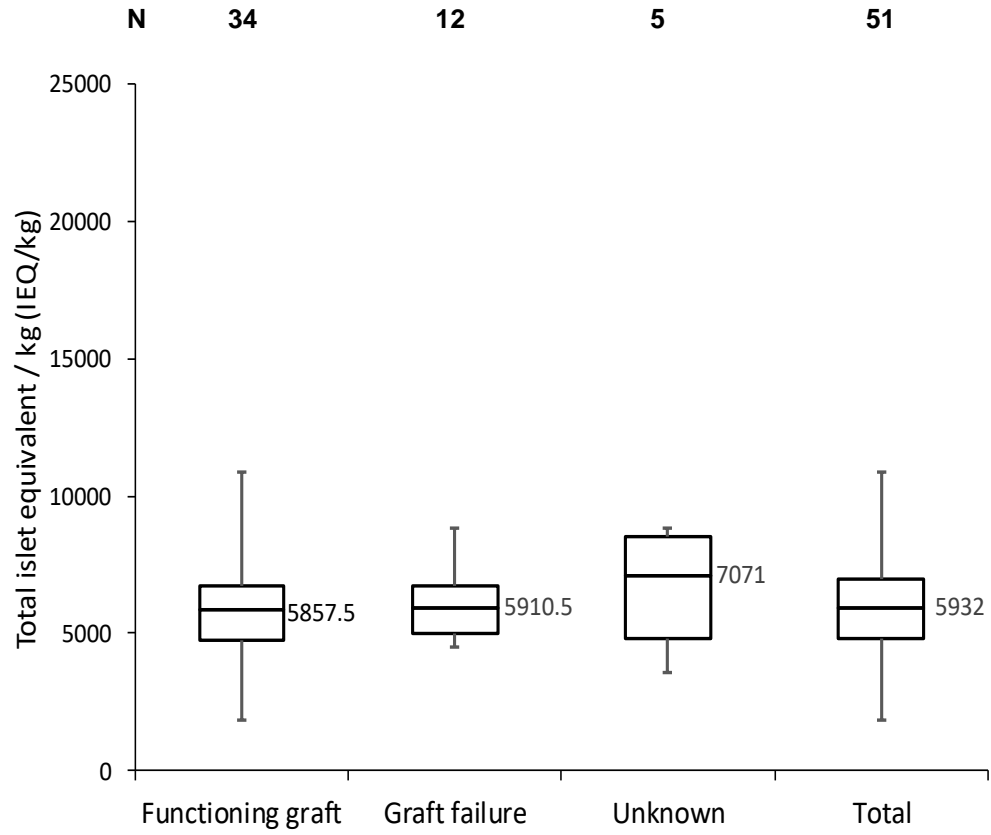
<sup>2</sup> Includes 6 SIK recipients

<sup>3</sup> Includes 14 SIK recipients

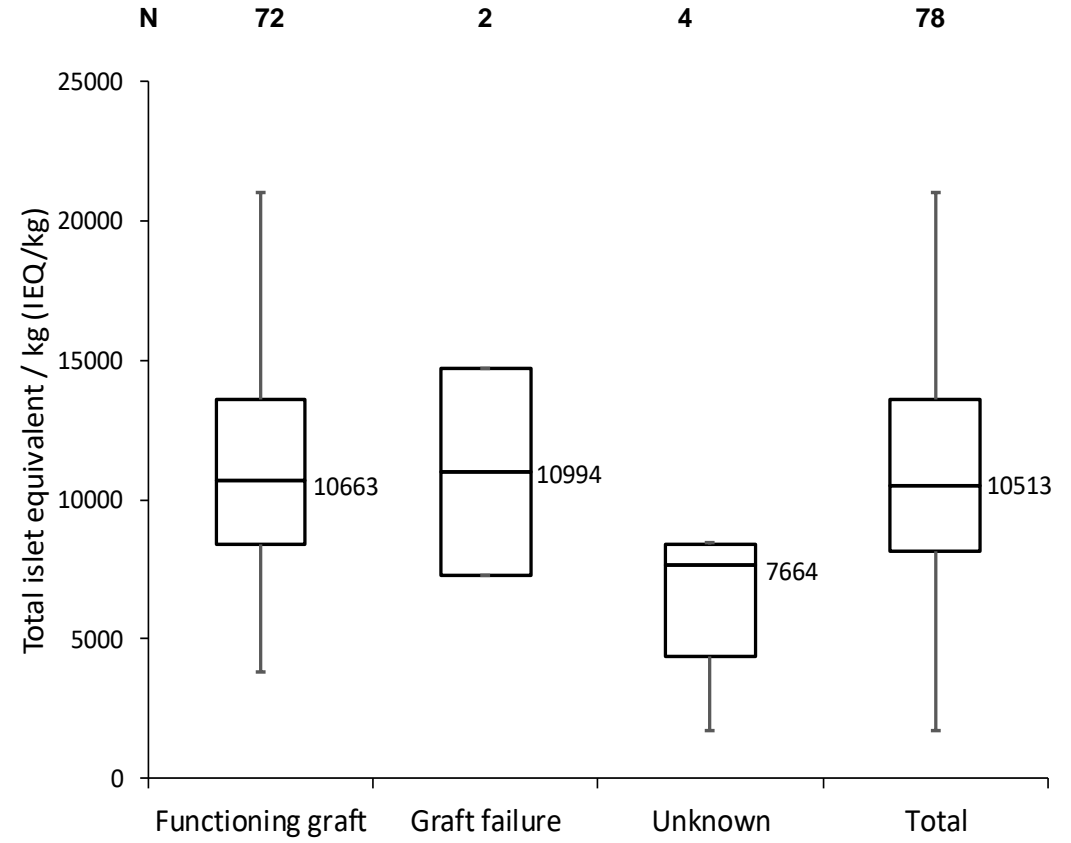
**Table 4 One-year graft outcome following routine islet transplant, 1 April 2010 to 31 December 2017**

Number of grafts	No. of transplants	No. with known outcome at one year	No. with known graft failure at one year
Routine only	54	49	13
Routine and one priority graft	77	73	2
Routine and two priority grafts	1	1	0
<b>Total</b>	<b>132</b>	<b>123</b>	<b>15</b>

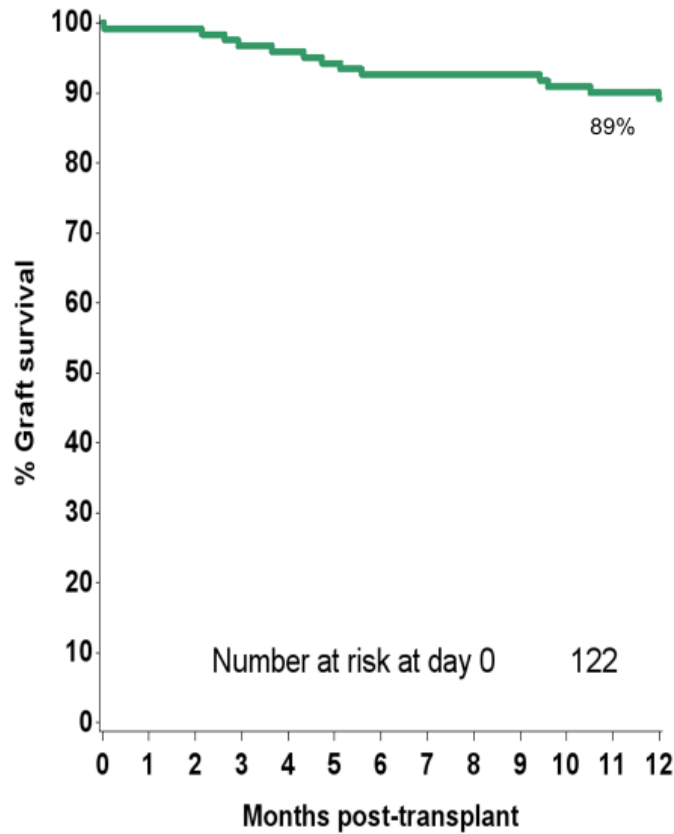
**Figure 1** One-year graft function by total IEQ per kg recipient body weight for routine only grafts, 1 April 2010 to 31 December 2017



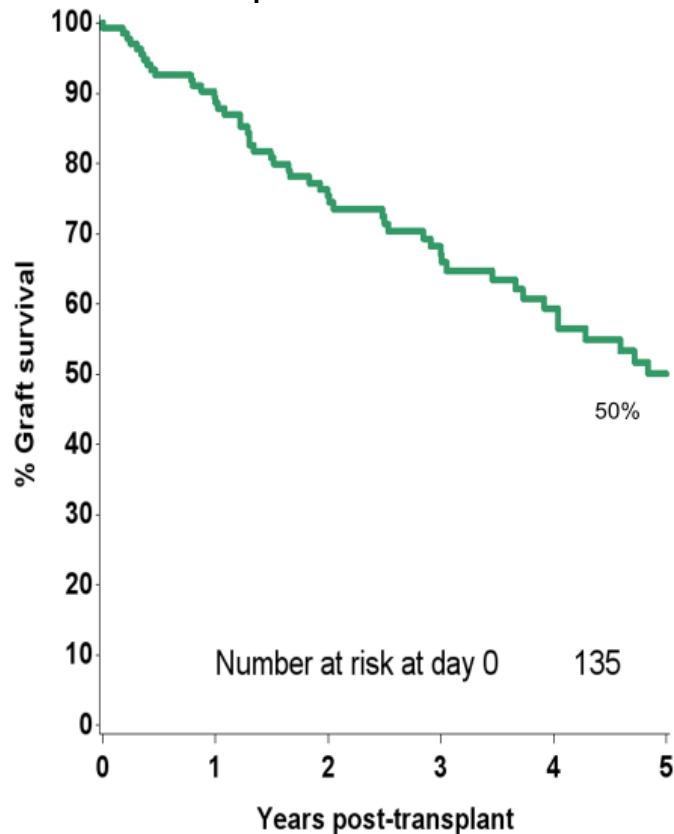
**Figure 2** One-year graft function by total IEQ per kg recipient body weight for routine and priority grafts, 1 April 2010 to 31 December 2017



**Figure 3** One-year graft survival following first routine islet transplantation performed in the UK between 1 April 2010 and 31 December 2017

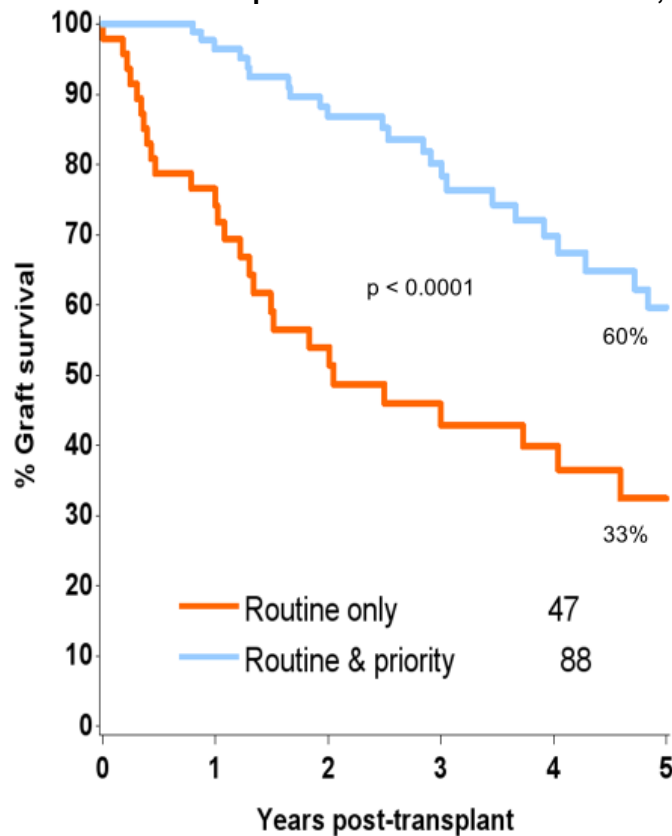


**Figure 4** Five-year graft survival following first routine islet transplantation performed in the UK between 1 April 2008 and 31 December 2017

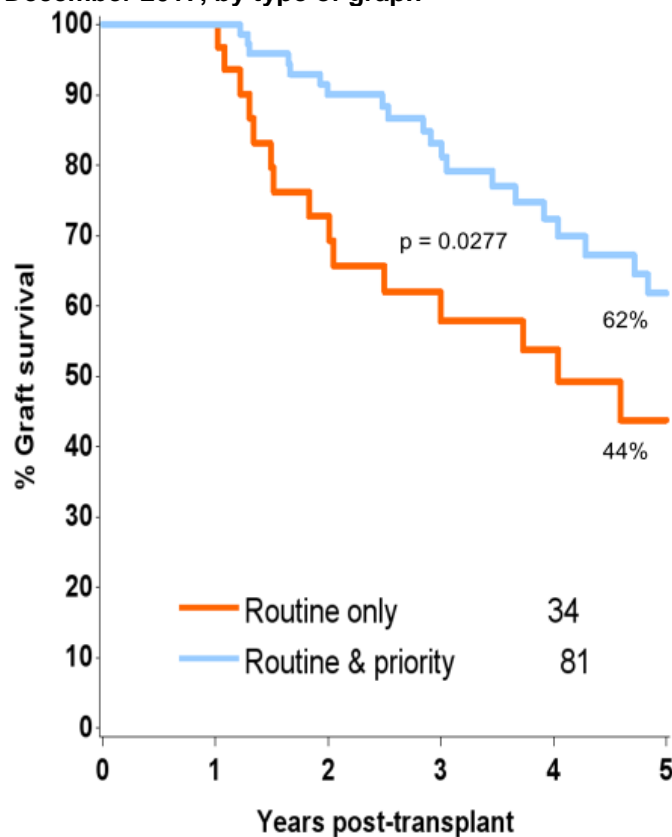




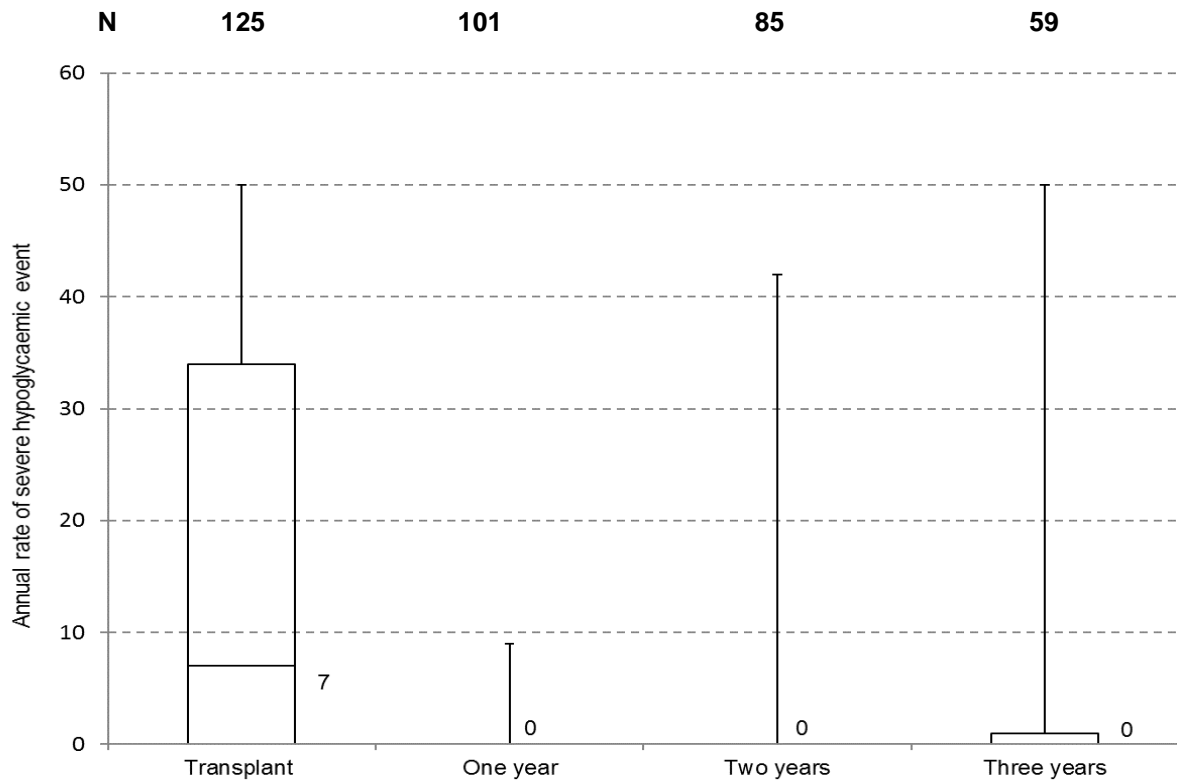
**Figure 5** Five-year graft survival following first routine islet transplantation performed in the UK between 1 April 2008 and 31 December 2017, by type of graph



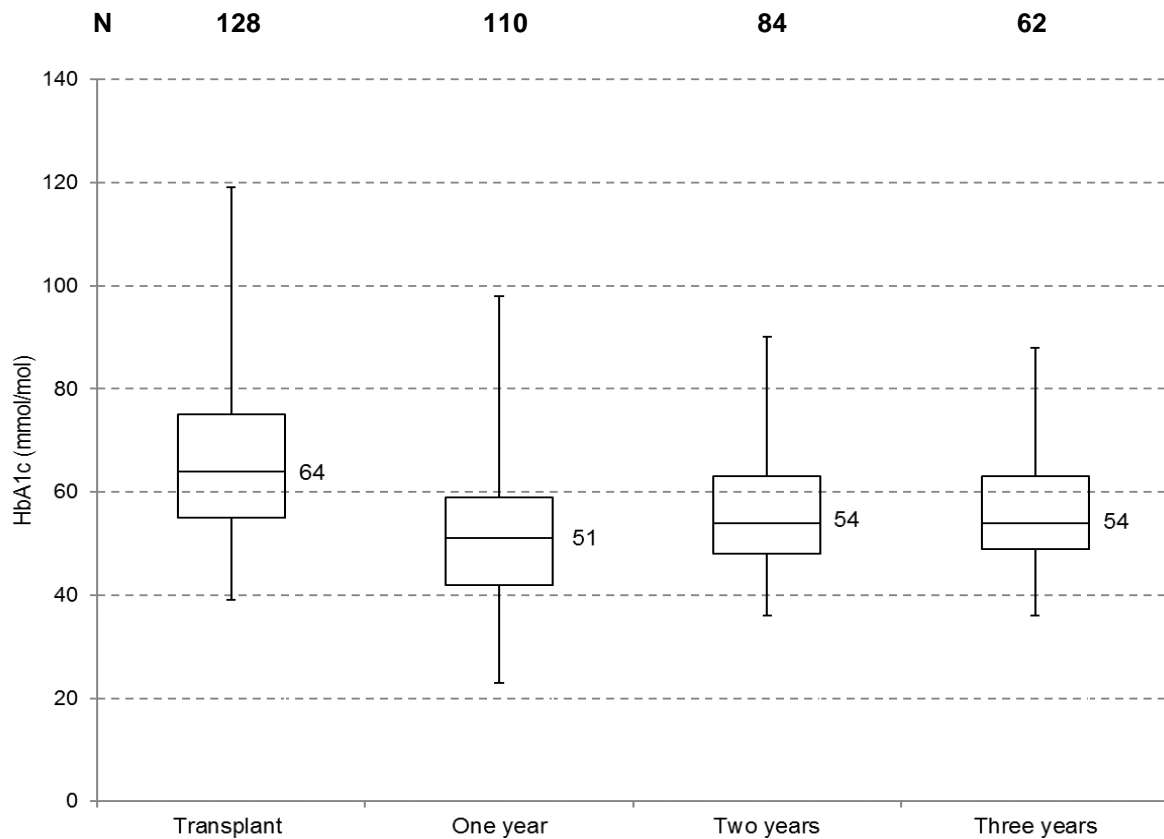
**Figure 6** Five-year graft survival following first routine islet transplantation where the routine graft was functioning at one year in the UK between 1 April 2008 and 31 December 2017, by type of graph



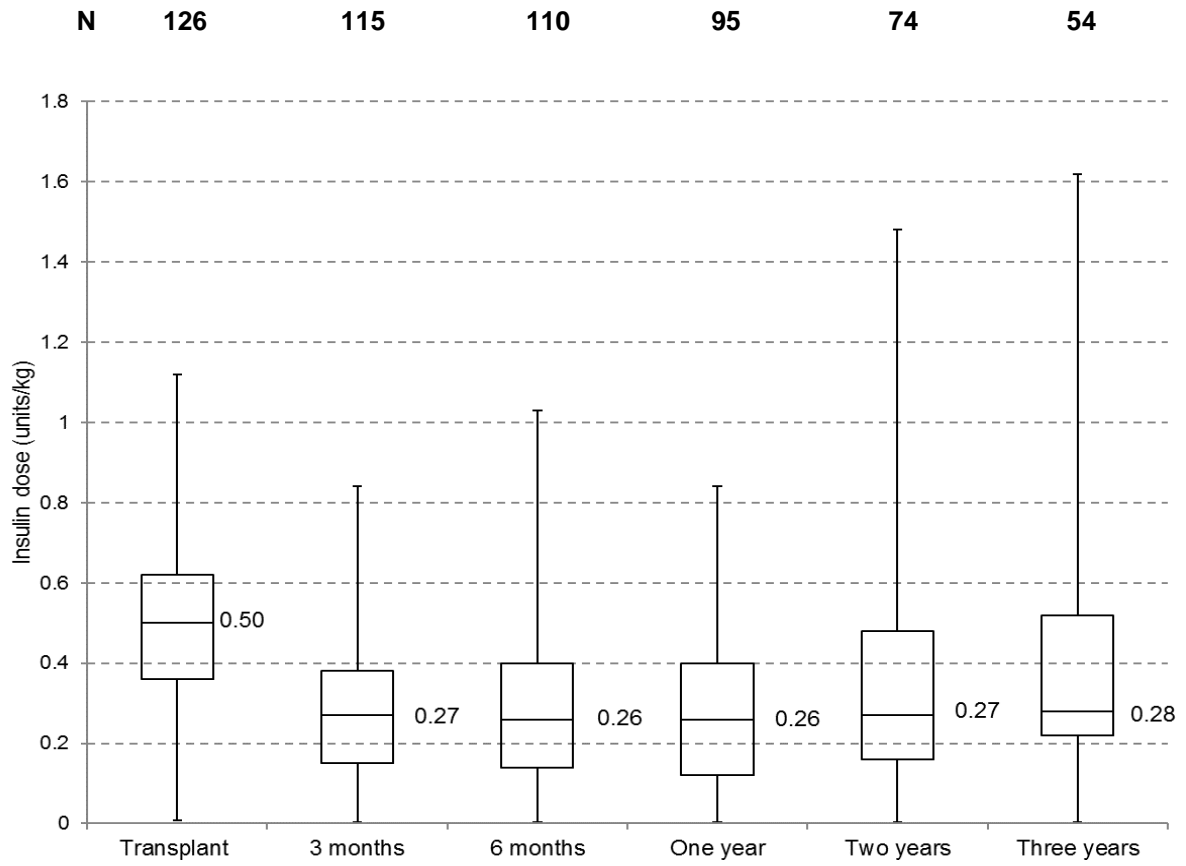
**Figure 7** Reduction in severe hypoglycaemic events three years post-transplant, 1 April 2010 – 31 December 2017 (excluding SIK transplants)



**Figure 8** Reduction in HbA1C three years post-transplant, 1 April 2010 – 31 December 2017



**Figure 9** Insulin dose three-years post-transplant,  
1 April 2010 – 31 December 2017



## APPENDIX

Transplant centre	Routine transplants	Priority transplants	Graft function at one year		
			No. with known outcome	Graft failure	Priority grafts with graft failure
Bristol	3	1	3	0	0
Edinburgh	48	36	44	1	1
King's College	7	4	7	2	0
Manchester	10	7	9	1	0
Newcastle	25	12	24	3	0
Oxford	28	13	26	7	1
Royal Free	11	5	10	1	0
<b>Total</b>	<b>132</b>	<b>78</b>	<b>123</b>	<b>15</b>	<b>2</b>

Transplant centre	No. of routine transplants	Annual rate of severe hypoglycaemic events					
		Median at registration <sup>2</sup> (IQ range)	Median at transplant (IQ range)	Median at one year (IQ range)	Median reduction (IQ range)	No. with reduced events	Missing <sup>3</sup> N (%)
Bristol	3	2 (2 – 3)	3 (2 – 50)	0 (0 – 0)	3 (2 – 50)	3	0 (0)
Edinburgh	45	50 (20 – 50)	32 (9 – 50)	0 (0 – 0)	27 (7 – 50)	35	4 (9)
King's College	7	3 (0 – 4)	2 (0 – 50)	0 (0 – 0)	2 (0 – 27)	2	3 (43)
Manchester	8	5 (5 – 8)	4 (1 – 9)	0 (0 – 0)	3 (1 – 10)	6	1 (13)
Newcastle	25	10 (5 – 25)	20 (2 – 33)	0 (0 – 1)	19 (0 – 30)	14	6 (24)
Oxford	28	2 (1 – 4)	0 (0 – 0)	0 (0 – 0)	0 (0 – 2)	5	9 (32)
Royal Free	11	4 (0 – 8)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)	1	3 (27)
<b>Total</b>	<b>127</b>	<b>15 (4 – 50)</b>	<b>7 (0 – 34)</b>	<b>0 (0 – 0)</b>	<b>7 (0 – 35)</b>	<b>66</b>	<b>26 (20)</b>

<sup>1</sup> Excluding SIK transplants  
<sup>2</sup> Only available for 66 observations  
<sup>3</sup> Information missing at either transplant or one-year post-transplant

Transplant centre	No. of routine transplants	HbA1c mmol/mol				No. with lower HbA1c	Missing N (%)
		Median at transplant (IQ range)	Median at one year (IQ range)	Median reduction (IQ range)			
Bristol	3	68 (53 – 70)	56 (33 – 81)	-3 (-13 – 37)	1	0 (0)	
Edinburgh	48	61 (53 – 68)	53 (46 – 61)	5 (-1 – 13)	31	6 (13)	
King's College	7	64 (54 – 97)	45 (42 – 45)	11 (9 – 19)	5	2 (29)	
Manchester	10	64 (54 – 75)	44 (43 – 47)	22 (9 – 40)	7	3 (30)	
Newcastle	25	77 (67 – 88)	52 (42 – 60)	18 (4 – 33)	19	5 (20)	
Oxford	28	62 (55 – 70)	48 (41 – 56)	17 (10 – 25)	21	6 (21)	
Royal Free	11	61 (56 – 86)	53 (42 – 61)	9 (1 – 21)	6	3 (27)	
<b>Total</b>	<b>132</b>	<b>64 (55 – 75)</b>	<b>51 (42 – 59)</b>	<b>13 (3 – 21)</b>	<b>90</b>	<b>25 (19)</b>	

Transplant centre	No. of routine transplants	Insulin dose/kg			Number insulin independent at some point	Missing N (%)
		Median at transplant (IQ range)	Median at one year (IQ range)	Median reduction (IQ range)		
Bristol	3	0.42 (0.37 – 0.48)	0.20 (0.12 – 0.47)	0.22 (0.01 – 0.25)	1	0 (0)
Edinburgh	48	0.52 (0.37 – 0.62)	0.30 (0.11 – 0.44)	0.23 (0.14 – 0.32)	18	11 (23)
King's College	7	0.35 (0.24 – 0.39)	0.13 (0.07 – 0.21)	0.20 (0.15 – 0.27)	2	3 (43)
Manchester	10	0.53 (0.45 – 0.64)	0.29 (0.25 – 0.38)	0.27 (0.24 – 0.30)	3	3 (30)
Newcastle	25	0.51 (0.36 – 0.63)	0.36 (0.18 – 0.47)	0.20 (0.14 – 0.29)	5	9 (36)
Oxford	28	0.46 (0.33 – 0.63)	0.26 (0.12 – 0.38)	0.26 (0.07 – 0.43)	5	8 (29)
Royal Free	11	0.56 (0.40 – 0.80)	0.44 (0.21 – 0.57)	0.10 (0.00 – 0.46)	2	4 (36)
<b>Total</b>	<b>132</b>	<b>0.50 (0.36 – 0.62)</b>	<b>0.26 (0.12 – 0.42)</b>	<b>0.23 (0.11 – 0.32)</b>	<b>36</b>	<b>38 (29)</b>