

NHS BLOOD AND TRANSPLANT**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 summaries of transplant activity and outcomes.

DATA

- 2 Islet transplant activity, including simultaneous islet and kidney (SIK) grafts, and end of year transplant list for the last three financial years were analysed. Data on 174 routine, and subsequent priority, islet transplants performed in the UK between 1 April 2010 and 31 March 2020 were analysed from the UKTR. Outcome data are reported for routine transplants only.

RESULTS

- 3 In 2020/2021 there were 15 islet transplants performed, of which 5 were SIK. There were 19 patients on the islet transplant list at 31 March 2021, 16 routine (11 SIK) and three priority patients.
- 4 One-year graft survival for first routine islet alone grafts is 87% and five-year graft survival is 51%. There is a significant difference in five-year graft survival for those patients receiving a routine and priority top-up graft compared with those receiving a routine only graft, 60% and 34%, respectively, $p < 0.0001$.
- 5 For patients receiving an islet alone routine and a priority graft, the median annual rate of severe hypoglycaemic events fell from 9 events (IQR 0 – 47) at time of transplant, to none at one, two, three and five years' post-transplant. 89 (82%) patients experienced no severe hypoglycaemic events in the first-year post-transplant.
- 6 Median HbA1c fell from 64 mmol/mol (IQR 54 – 75) at time of transplant, to 49 mmol/mol (IQR 42 – 58) at one year and 55 (IQR 47 – 64) at three years post-transplant, for patients who received a routine and a priority graft. Overall, a reduction in HbA1c was reported for 97 (83%) patients at one-year post-transplant.
- 7 The median insulin dose, for patients who received routine and priority grafts, fell from 0.51 units/kg (IQR 0.38 – 0.62) at time of transplant to 0.3 units/kg (IQR 0.18 – 0.52) three years post-transplant. Insulin independence at some point in the first-year post-transplant was achieved for 34% of patients overall where reported.

SUMMARY

- 8 In 2020/2021, the number of islet transplants was lower than it was in 2019/2020 as a consequence of the COVID-19 pandemic. The number on the waiting list at the end of each financial year was similar. One-year graft survival is 87%. Reductions in the annual rate of severe hypoglycaemic events, HbA1c and insulin dose at one-year post routine transplant have been reported.

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

PANCREAS ADVISORY GROUP

PANCREAS TRANSPLANT ACTIVITY AND OUTCOME

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, including simultaneous islet and kidney (SIK) grafts, and end of year transplant list between 1 April 2018 and 31 March 2021 from the UK Transplant Registry (UKTR) are reported, by centre and financial year.
- 11 Between 1 April 2010 and 31 March 2020, there were 174 routine islet transplants performed in the UK. Outcome data on these 174 routine, and any subsequent priority, islet transplants have been analysed from the UKTR. Outcome data are reported for routine transplants only. Where outcome data are unavailable from UKTR, data collected by the UKITC clinical research forms have been considered. These data have 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 financial years, 1 April 2018 to 31 March 2021, 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 financial years by islet status.
- 14 Between 1 April 2010 and 31 March 2020, there were a total of 275 islet transplants performed, 174 (63%) of which were routine (including 19 SIK transplants) and 101 were priority. One patient received only a priority transplant in this time period as their routine transplant was before 1 April 2010.
- 15 For those patients receiving a routine transplant between 1 April 2010 and 31 March 2020, the number of known graft failures at one-year post-transplant is reported in **Table 4**. Of the 174 routine transplants performed, 99 patients subsequently received a priority graft. The majority of these patients received their first priority graft within six months of their routine graft: 0-3 months for 30 (30%) patients; 3-6 months for 35 (35%) patients; 6-12 months for 32 (32%) patients and more than one year for two patients who were highly sensitised.

Table 1 UK islet transplant activity between 1 April 2018 and 31 March 2021, by transplant type and calendar year

Transplant Centre	2018 - 2019							2019 - 2020							2020 - 2021						
	ITA	IAK	IAP	IAPK	SIK	N	%	ITA	IAK	IAP	IAPK	SIK	N	%	ITA	IAK	IAP	IAPK	SIK	N	%
Bristol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edinburgh	5	2	0	0	3	10	36	9 ³	3	0	0	1	13	46	3	1	0	0	1 ¹	5	33
King's	2	0	0	0	0	2	7	2 ¹	0	0	0	0	2	7	1	0	0	0	0	1	7
Manchester	0	4 ²	0	0	4 ²	8	29	0	1	0	0	4	5	18	0	0	0	0	3 ²	3	20
Newcastle	3	1	0	0	1	5	18	4	0	0	0	0	4	14	3	1	0	0	0	4	27
Oxford	3	0	0	0	0	3	11	4	0	0	0	0	4	14	1	0	0	0	1	2	13
Royal Free	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	13	7	0	0	8	28	100	19	4	0	0	5	28	100	8	2	0	0	5	15	100

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

¹ Includes 1 DCD transplant

² Includes 2 DCD transplants

³ Includes 4 DCD transplants

Table 2 UK islet transplant activity between 1 April 2018 and 31 March 2021, by islet status, number of patients and calendar year

Transplant Centre	2018 - 2019						2019 - 2020						2020 - 2021					
			Total		Number of patients				Total		Number of patients				Total		Number of patients	
	Routine	Priority	N	%	N	%	Routine	Priority	N	%	N	%	Routine	Priority	N	%	N	%
Bristol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edinburgh	6 ²	4	10	36	8	36	7 ¹	6	13	46	8	38	3 ¹	2	5	33	4	29
King's	1	1	2	7	2	9	2	0	2	7	2	10	0	1	1	7	1	7
Manchester	5 ³	3	8	29	5	23	4 ³	1	5	18	5	24	3 ²	0	3	20	3	21
Newcastle	4 ¹	1	5	18	4	18	3	1	4	14	3	14	3	1	4	27	4	29
Oxford	3	0	3	11	3	14	2	2	4	14	3	14	2 ¹	0	2	13	2	14
Royal Free	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	19	9	28	100	22	100	18	10	28	100	21	100	11	4	15	100	14	100

¹ Includes 1 SIK transplant

² Includes 3 SIK transplants

³ Includes 4 SIK transplants

Table 3 UK islet transplant list, 31 March 2019 to 31 March 2021, by islet status and calendar year

Transplant Centre	31 March 2019				31 March 2020				31 March 2021			
	Routine	Priority	Total		Routine	Priority	Total		Routine	Priority	Total	
			N	%			N	%			N	%
Bristol	0	0	0	0	0	0	0	0	0	0	0	0
Edinburgh	6	2	8	19	3 ¹	1	4	20	3 ²	0	3	16
King's	2	0	2	5	0	1	1	5	0	0	0	0
Manchester	18 ⁵	1	19	45	15 ⁴	0	15	75	8 ³	1	9	47
Newcastle	5 ¹	0	5	12	0	0	0	0	4 ¹	1	5	26
Oxford	2	3	5	12	0	0	0	0	1	1	2	11
Royal Free	3	0	3	7	0	0	0	0	0	0	0	0
TOTAL	36	6	42	100	18	2	20	100	16	3	19	100

¹ Includes 1 SIK transplant

² Includes 2 SIK transplants

³ Includes 8 SIK transplants

⁴ Includes 12 SIK transplants

⁵ Includes 15 SIK transplants

Table 4 **One-year graft outcome following routine islet transplant,
1 April 2010 to 31 March 2020**

Number of grafts	No. of transplants	No. with known outcome at one year	No. with known graft failure at one year
Islet routine graft			
Routine only	64	54	16
Routine and one priority graft	90	80	3
Routine and two priority grafts	1	1	0
SIK routine graft			
Routine only	11	8	2
Routine and one priority graft	8	6	0
Routine and two priority grafts	0	0	0
Total	174	149	21

Figure 1 One-year graft function by total IEQ per kg recipient body weight for islet alone routine only grafts, 1 April 2010 to 31 March 2020

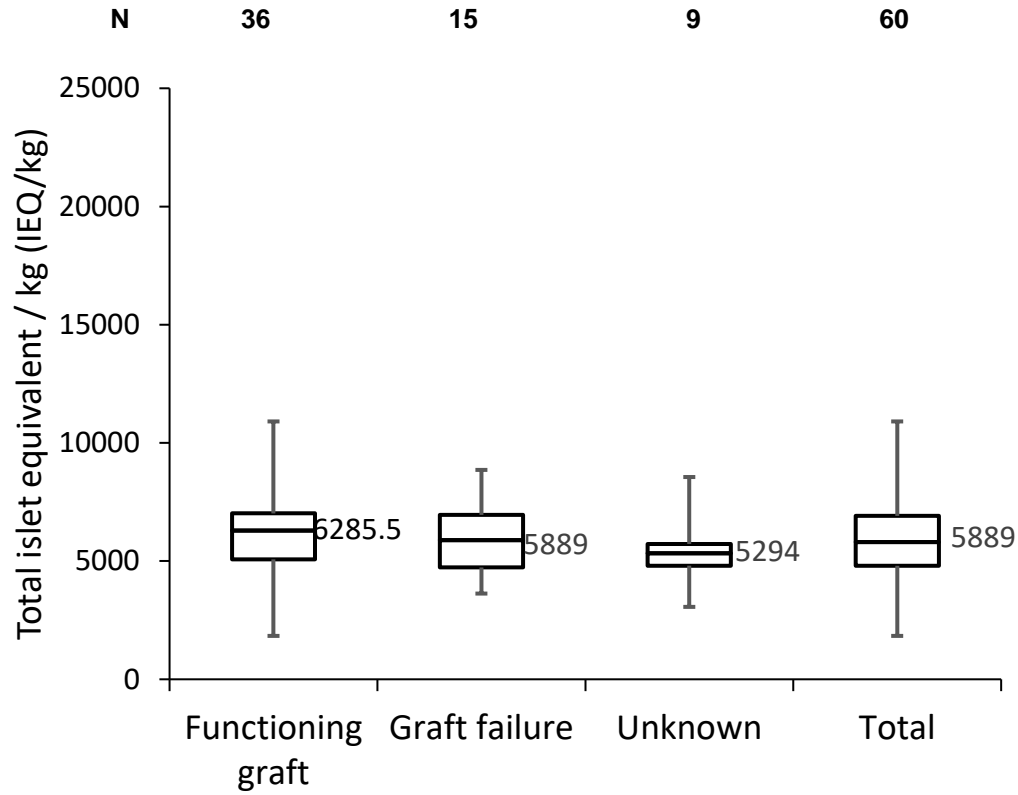
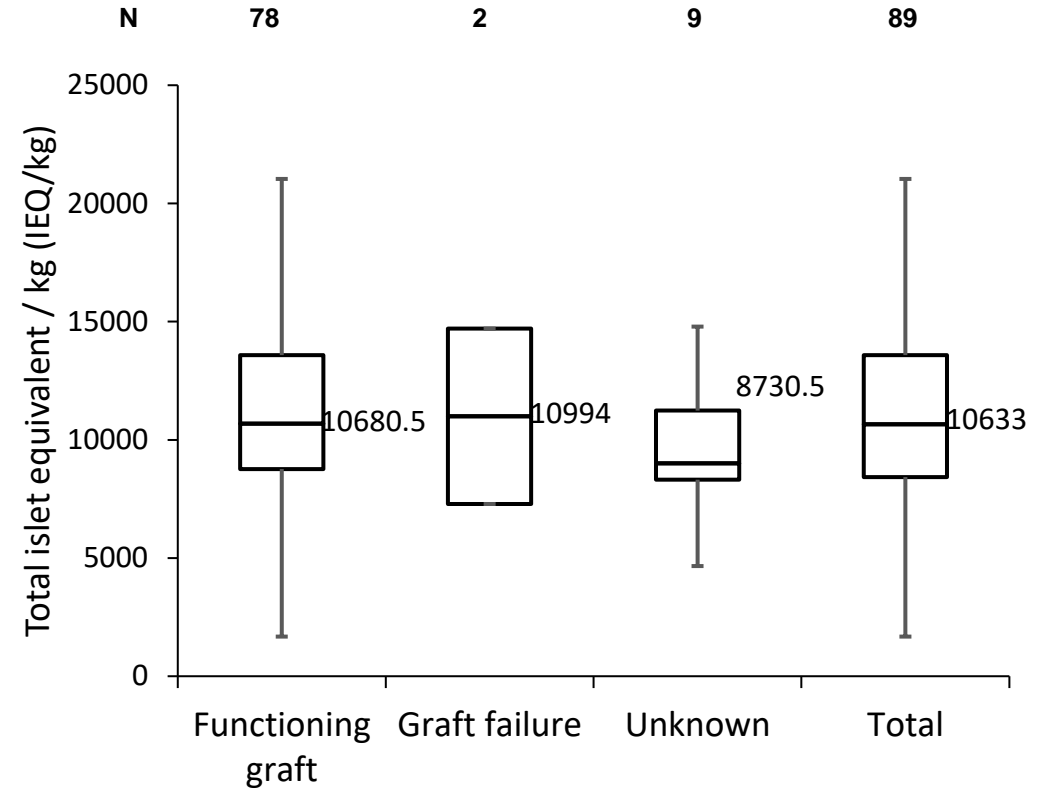


Figure 2 One-year graft function by total IEQ per kg recipient body weight for islet alone routine and priority grafts, 1 April 2010 to 31 March 2020



- 16 One-year graft outcome by total IEQ (IEQx1000/kg) transplanted is presented in **Figure 1** and **Figure 2**, for islet alone routine only and routine and priority grafts, respectively. The median total IEQ transplanted for 11 SIK routine only transplants was 4101 (IQR 2570 - 6006) and for eight SIK routine and priority grafts was 7766.5 (IQR 6959.5 – 9286.5). This was lower than the median for islet alone transplants in both groups.
- 17 Kaplan-Meier survival plots showing one-year and five-year graft survival after first routine islet alone transplants are presented in **Figure 3** and **Figure 4**, respectively. One year graft survival is 87%, 95% CI (80-92%) and five year graft survival is 51%, 95% CI (42-60%).
- 18 **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 34%, 95% CI (21-49%) and for first routine grafts followed by a priority graft is 60%, 95% CI (47-71%). This difference was statistically significant, $p < 0.0001$.
- 19 **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 49%, 95% CI (30-66%) and for routine grafts followed by a priority graft is 63%, 95% CI (50-74%). This difference was not statistically significant, $p = 0.1$.
- 20 **Figure 7** shows a Kaplan-Meier survival plot of five-year patient survival after first routine islet alone transplant. Five year patient survival is 92%, 95% CI (84-97%).
- 21 Of the 19 SIK islet transplants in the 1 April 2010 to 31 March 2020 time period, 18 were the first islet transplant for the patient. Of these 18, follow-up information was available for 16 and the estimated one-year graft survival rate is 88%, 95% CI (59-97%).

Figure 3 One-year graft survival following first routine islet alone transplantation performed in the UK between 1 April 2010 and 31 March 2020

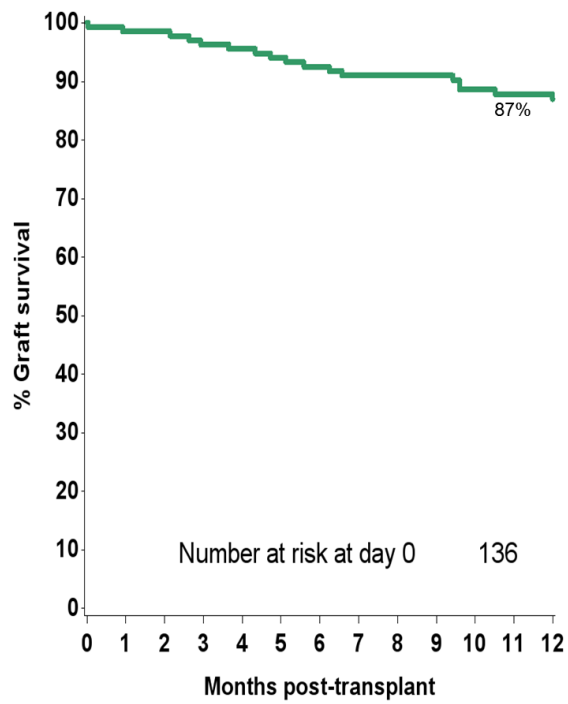


Figure 4 Five-year graft survival following first routine islet alone transplantation performed in the UK between 1 April 2008 and 31 March 2020

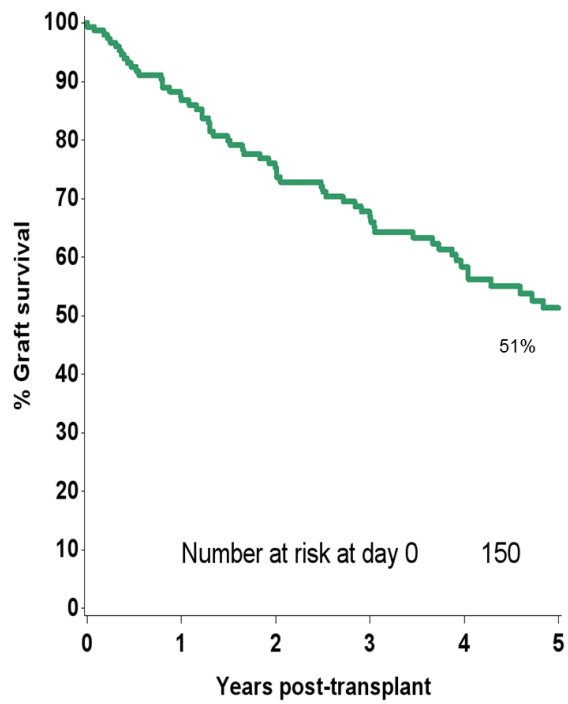


Figure 5 Five-year graft survival following first routine islet alone transplantation performed in the UK between 1 April 2008 and 31 March 2020, by type of graft

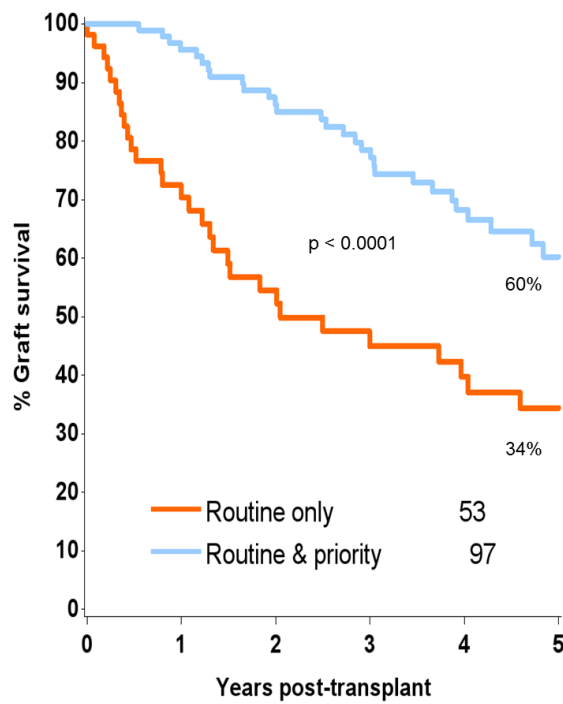


Figure 6 Five-year graft survival following first routine islet alone transplantation where the routine graft was functioning at one year in the UK between 1 April 2008 and 31 March 2020, by type of graft

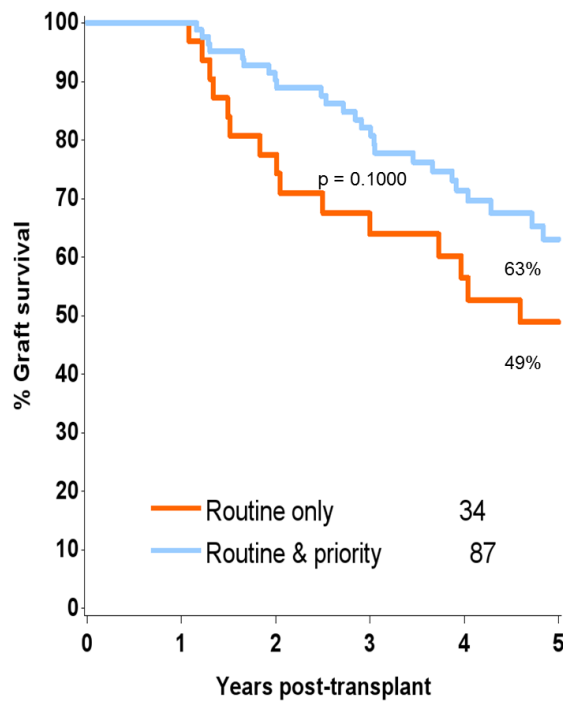
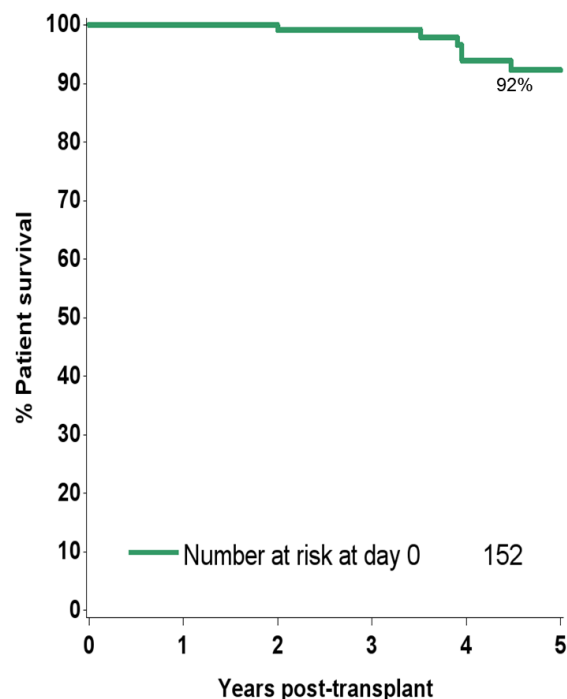


Figure 7 Five-year patient survival following first routine islet alone transplantation performed in the UK between 1 April 2008 and 31 March 2020



- 23 **Figures 8 and 9** show the median rate of severe hypoglycaemic events, excluding SIK transplants, for routine only grafts and for routine and priority grafts, respectively. Overall, at one-year post-transplant data were available in 108 cases and 70 (65%) patients had a reduced number of events. 89 (82%) patients experienced no severe hypoglycaemic events during the first year following their routine transplant, whilst 19 (18%) patients experienced between one and nine events.
- 24 For the 18 SIK transplants where severe hypoglycaemic events were reported at transplant, the median rate was 1.5 (IQR 0-48) and for the 11 reported at one-year post-transplant, the median rate was 0 (IQR 0-1).
- 25 Median HbA1c is reported in **Figure 10** for routine only grafts and **Figure 11** for routine and priority grafts, excluding SIK transplants. Overall, data were available to calculate the reduction in HbA1c in 117 cases at one-year post-transplant and in 97 (83%) patients a reduction in HbA1c was reported. The proportion of patients with HbA1c of less than 53 mmol/mol was 17% of 149 at time of transplant, 58% of 120 patients at one-year post-transplant, 39% of 77 patients at three years and 36% of 39 patients at five years post-transplant.
- 26 For the 18 SIK transplants where HbA1c was reported at transplant, the median was 64 mmol/mol (IQR 60-76) and for the 10 reported at one-year post-transplant, the median was 57 mmol/mol (IQR 43-70).

Figure 8 Reduction in severe hypoglycaemic events three years post-transplant for routine only grafts, 1 April 2010 – 31 March 2020 (excluding SIK transplants)

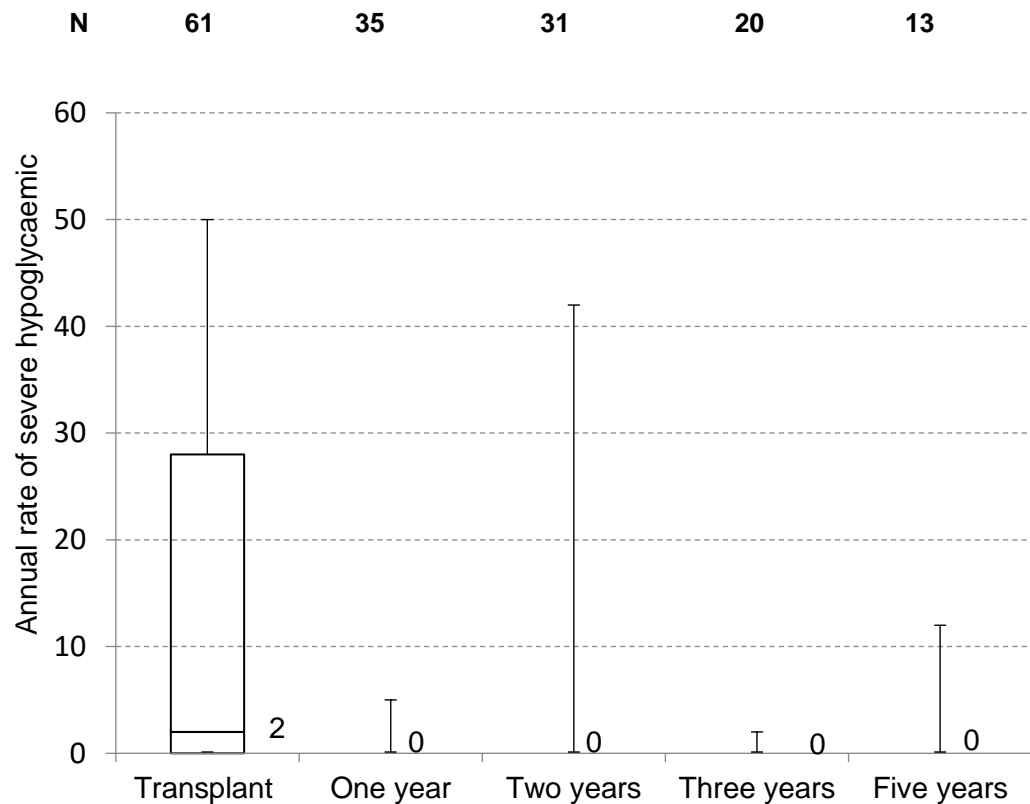


Figure 9 Reduction in severe hypoglycaemic events three years post-transplant for routine and priority grafts, 1 April 2010 – 31 March 2020 (excluding SIK transplants)

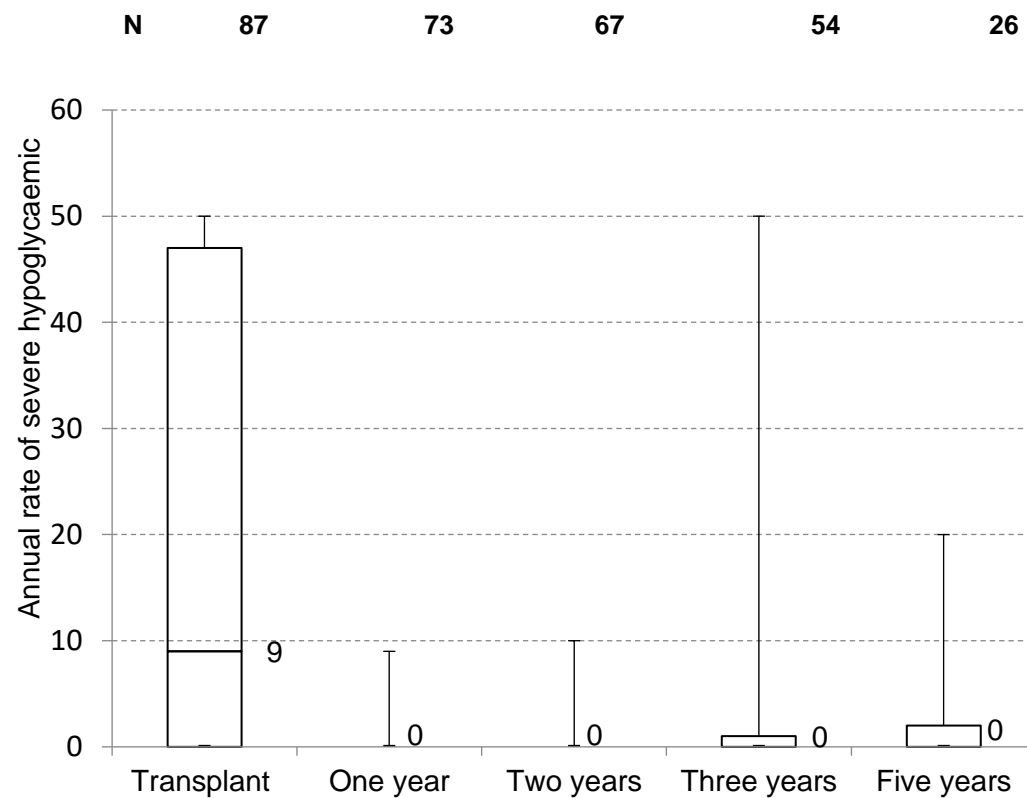


Figure 10 Reduction in HbA1C three years post-transplant for routine only grafts, 1 April 2010 – 31 March 2020 (excluding SIK transplants)

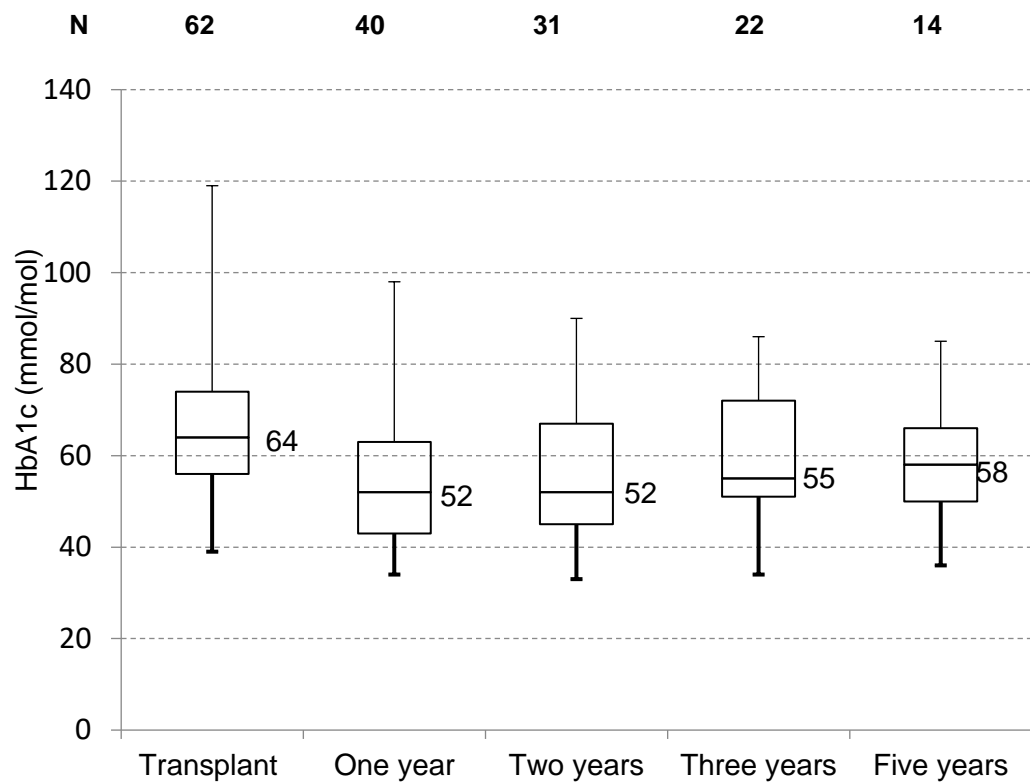


Figure 11 Reduction in HbA1C three years post-transplant for routine and priority grafts, 1 April 2010 – 31 March 2020 (excluding SIK transplants)

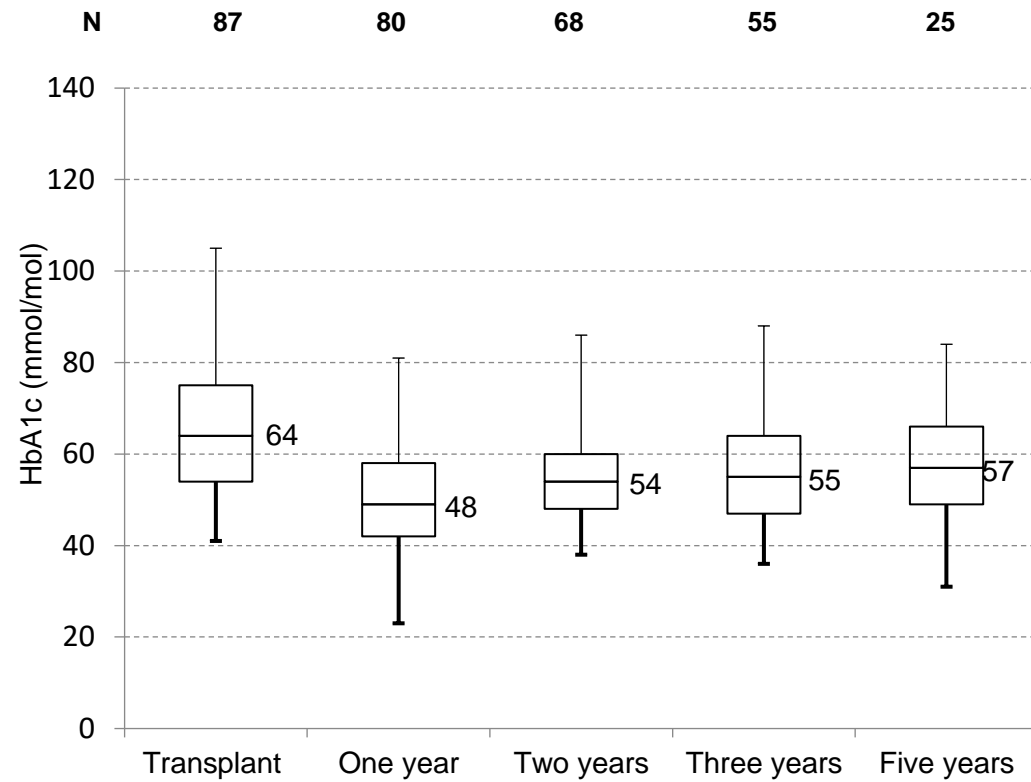


Figure 12 Insulin dose three-years post-transplant for routine only grafts, 1 April 2010 – 31 March 2020 (excluding SIK transplants)

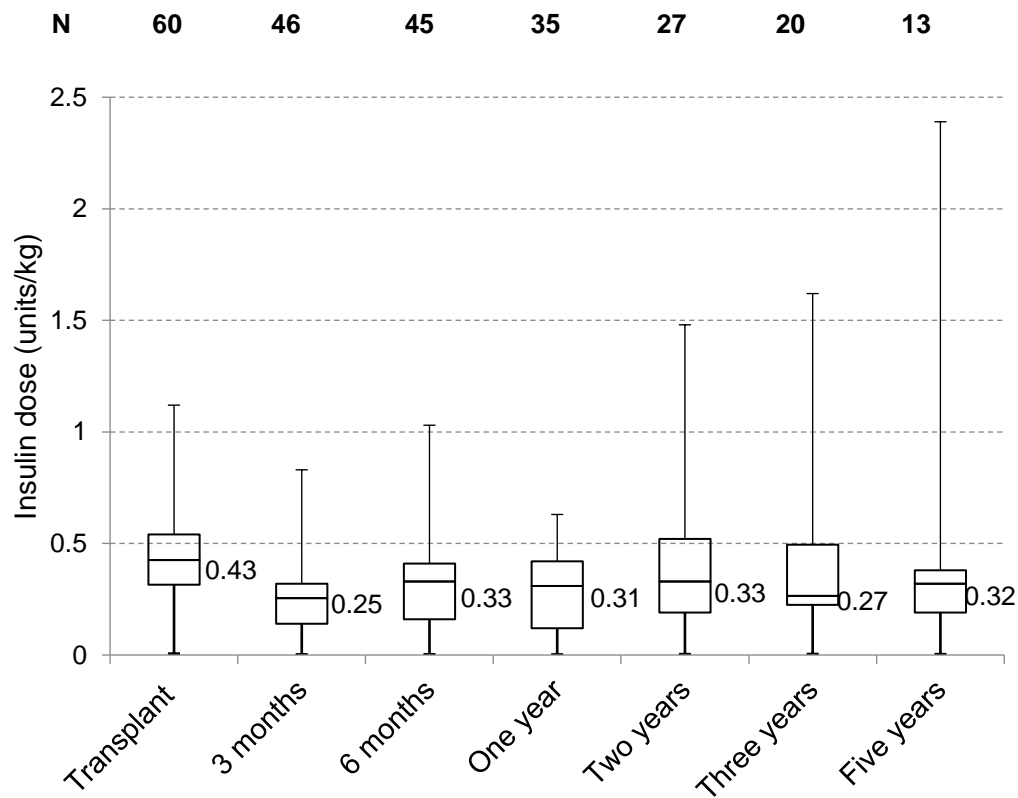
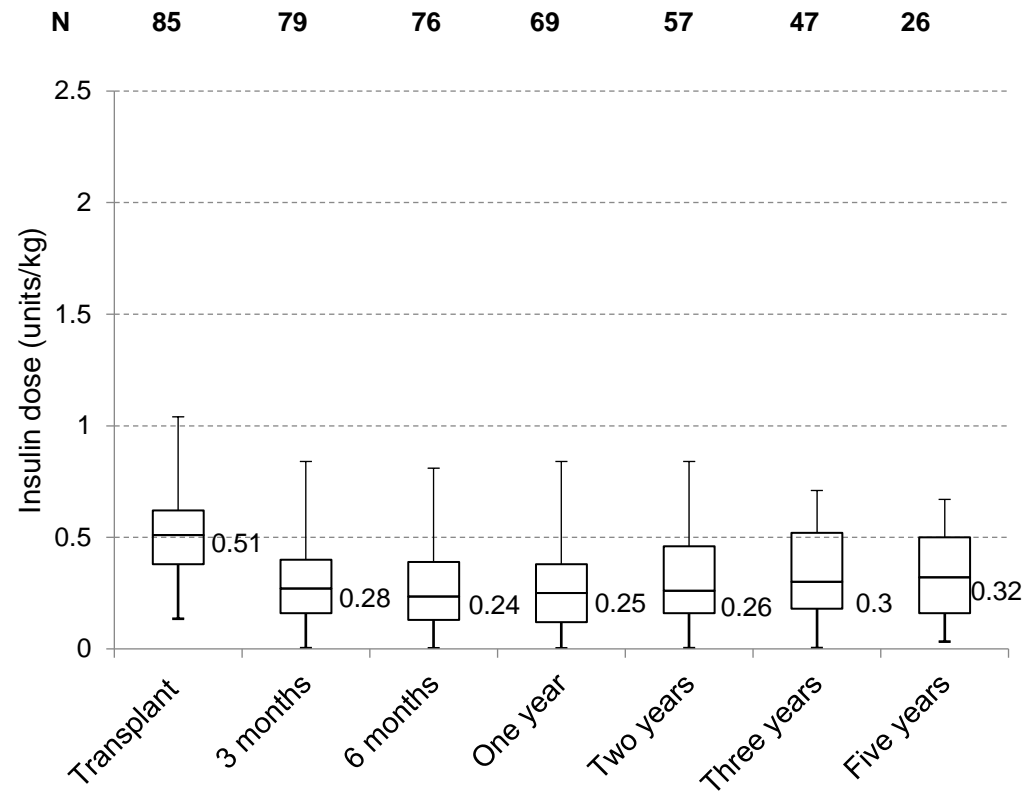


Figure 13 Insulin dose three-years post-transplant for routine and priority grafts, 1 April 2010 – 31 March 2020 (excluding SIK transplants)



- 27 **Figure 12** and **Figure 13** show the median insulin dose for routine only grafts and routine and priority grafts, respectively, excluding SIK transplants. Overall, in 103 patients where the difference in insulin dose between transplant and one-year post-transplant could be calculated, 91 (88%) reported a reduction. Of the 117 patients with insulin independence status reported for the first-year post-transplant, 40 (34%) achieved insulin independence at some point in the year.
- 28 For the 19 SIK transplants where insulin dose was reported at transplant, the median was 0.64 units/kg (IQR 0.35-0.76) and for the 10 reported at one-year post-transplant, the median was 0.38 units/kg (IQR 0.26-0.49).

SUMMARY

- 29 In 2020/2021, the number of islet transplants was lower than it was in 2019/2020 as a consequence of the COVID-19 pandemic and the number on the waiting list at the end of each financial year was similar.
- 30 One-year graft survival was 87% and five-year graft survival was 51%. Those patients receiving a routine and a priority top-up graft had significantly better five-year graft survival than those receiving a routine only, 60% and 34%, respectively, $p < 0.0001$. Reductions in the rate of severe hypoglycaemic events, HbA1c and insulin dose at one-year, two years and three years post routine transplant have been reported.

APPENDIX

Transplant centre	Routine transplants performed	Priority transplants performed	Graft function at one year following routine transplant in the time period		
			No. with known outcome	Graft failure	Priority grafts with graft failure
Bristol	3	1	3	0	0
Edinburgh	63	45	51	3	1
King's College	11	6	8	2	0
Manchester	20	12	19	3	0
Newcastle	32	15	28	3	0
Oxford	34	17	29	9	2
Royal Free	11	5	11	1	0
Total	174¹	101	149²	21³	3

¹ Includes 19 SIK transplants: Edinburgh (7), Manchester (11), Newcastle (1)
² Includes 14 SIK transplants: Edinburgh (3), Manchester (10), Newcastle (1)
³ Includes 2 SIK transplants: Manchester (2)

Transplant centre	No. of routine transplants	Annual rate of severe hypoglycaemic events					
		Median at registration ² (IQ range)	Median at transplant (IQ range)	Median at one year (IQ range)	Median reduction (IQ range)	No. with reduced events	Missing ³ N (%)
Bristol	3	2 (2 – 3)	3 (2 – 50)	0 (0 – 0)	3 (2 – 50)	3	0 (0)
Edinburgh	56	50 (20 – 50)	31 (9 – 50)	0 (0 – 0)	31 (8 – 50)	38	12 (21)
King's College	11	4 (2 – 16)	3 (0 – 16)	0 (0 – 0)	0 (0 – 3)	2	6 (55)
Manchester	9	5 (1 – 8)	3 (1 – 8)	0 (0 – 0)	3 (1 – 9)	6	1 (11)
Newcastle	31	18 (5 – 25)	20 (2 – 33)	0 (0 – 1)	19 (1 – 29)	15	11 (35)
Oxford	34	3 (1 – 4)	0 (0 – 1)	0 (0 – 0)	0 (0 – 2)	5	15 (44)
Royal Free	11	4 (0 – 8)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)	1	2 (18)
Total	155	19 (3 – 50)	8 (0 – 34)	0 (0 – 0)	7 (0 – 36)	70	47 (30)

¹ Excluding SIK transplants
² Only available for 90 observations
³ 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)	0 (0 – 37)	1	0 (0)	
Edinburgh	56	62 (51 – 69)	53 (46 – 62)	5 (0 – 13)	34	10 (18)	
King's College	11	70 (55 – 86)	44 (42 – 45)	15 (9 – 33)	6	5 (45)	
Manchester	9	64 (57 – 75)	45 (43 – 47)	18 (8 – 36)	8	1 (11)	
Newcastle	31	75 (63 – 83)	51 (41 – 58)	17 (13 – 31)	21	8 (26)	
Oxford	34	62 (55 – 69)	48 (41 – 54)	17 (10 – 25)	21	12 (35)	
Royal Free	11	61 (56 – 86)	51 (43 – 57)	4 (0 – 20)	6	2 (18)	
Total	155	64 (55 – 75)	51 (42 – 59)	12 (3 – 21)	97	38 (25)	

¹ Excluding SIK transplants

Transplant centre	No. of routine transplants	Insulin dose/kg			No. 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	56	0.50 (0.36 – 0.61)	0.23 (0.10 – 0.38)	0.23 (0.12 – 0.33)	21	14 (25)
King's College	11	0.35 (0.22 – 0.42)	0.13 (0.07 – 0.21)	0.20 (0.15 – 0.27)	3	7 (64)
Manchester	9	0.52 (0.45 – 0.55)	0.30 (0.23 – 0.38)	0.27 (0.25 – 0.35)	3	2 (22)
Newcastle	31	0.48 (0.33 – 0.59)	0.35 (0.23 – 0.46)	0.19 (-0.02 – 0.28)	5	12 (39)
Oxford	34	0.45 (0.32 – 0.62)	0.26 (0.12 – 0.38)	0.26 (0.07 – 0.43)	5	14 (41)
Royal Free	11	0.56 (0.40 – 0.80)	0.42 (0.24 – 0.50)	0.14 (0.01 – 0.35)	2	3 (27)
Total	155	0.48 (0.33 – 0.59)	0.26 (0.12 – 0.41)	0.23 (0.10 – 0.32)	40	52 (34)

¹ Excluding SIK transplants