

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 calendar years were analysed. Data on 172 routine, and subsequent priority, islet transplants performed in the UK between 1 April 2010 and 31 December 2019 were analysed from the UKTR. Outcome data are reported for routine transplants only.

RESULTS

- 3 In 2020 there were 14 islet transplants performed. There were 20 patients on the islet transplant list at 31 December 2020, 19 routine (eight SIK) and one priority patient.
- 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 48 mmol/mol (IQR 42 – 58) at one year and 55 (IQR 47 – 63) at three years post-transplant, for patients who received a routine and a priority graft. Overall, a reduction in HbA1c was reported for 96 (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 – 0.63) 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, the number of islet transplants was lower than it was in 2019 and the number on the waiting list at the end of the calendar year was similar, the reduced number of transplants was as a consequence of the COVID-19 pandemic. 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

ISLET 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 January 2018 and 31 December 2020 from the UK Transplant Registry (UKTR) are reported, by centre and calendar year.
- 11 Between 1 April 2010 and 31 December 2019, there were 172 routine islet transplants performed in the UK. Outcome data on these 172 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 calendar years, 1 January 2018 to 31 December 2020, 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 2019, there were a total of 271 islet transplants performed, 172 (63%) of which were routine and 99 were priority.
- 15 For those patients receiving a routine transplant between 1 April 2010 and 31 December 2019, the number of known graft failures at one-year post-transplant is reported in **Table 4**. Of the 172 routine transplants performed, 98 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 (31%) patients; 3-6 months for 35 (36%) patients; 6-12 months for 31 (32%) patients and more than one year for two patients who were highly sensitised.

Table 1 UK islet transplant activity between 1 January 2018 and 31 December 2020, by transplant type and calendar year

Transplant Centre	2018							2019							2020							
	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	0
Edinburgh	7	1	0	0	2	10	34	8 ³	4	0	0	2	14	44	4 ¹	0	0	0	1 ¹	5	36	
King's	2	0	0	0	0	2	7	3 ¹	0	0	0	0	3	9	1	0	0	0	0	1	7	
Manchester	1	4 ²	0	0	4 ³	9	31	0	3	0	0	5	8	25	0	0	0	0	2 ¹	2	14	
Newcastle	3	1	0	0	1	5	17	2	0	0	0	0	2	6	4	0	0	0	0	4	29	
Oxford	3	0	0	0	0	3	10	5	0	0	0	0	5	16	1	0	0	0	1	2	14	
Royal Free	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	16	6	0	0	7	29	100	18	7	0	0	7	32	100	10	0	0	0	4	14	100	

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

¹ Includes 1 DCD transplant
² Includes 2 DCD transplants
³ Includes 3 DCD transplants

Table 2 UK islet transplant activity between 1 January 2018 and 31 December 2020, by islet status, number of patients and calendar year

Transplant Centre	2018						2019						2020						
	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edinburgh	6 ²	4	10	34	8	35	9 ²	5	14	44	10	42	2 ¹	3	5	36	5	38	
King's	1	1	2	7	1	4	3	0	3	9	3	13	0	1	1	7	1	8	
Manchester	4 ³	5	9	31	7	30	6 ⁴	2	8	25	7	29	2 ²	0	2	14	2	15	
Newcastle	4 ¹	1	5	17	4	17	1	1	2	6	1	4	3	1	4	29	3	23	
Oxford	3	0	3	10	3	13	3	2	5	16	3	13	2 ¹	0	2	14	2	15	
Royal Free	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL	18	11	29	100	23	100	22	10	32	100	24	100	9	5	14	100	13	100	

¹ Includes 1 SIK transplant
² Includes 2 SIK transplants
³ Includes 4 SIK transplants
⁴ Includes 5 SIK transplants

Table 3 UK islet transplant list, 31 December 2018 to 31 December 2020, by islet status and calendar year

Transplant Centre	31 December 2018				31 December 2019				31 December 2020			
	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	3 ¹	1	4	12	1 ¹	2	3	13	4	1	5	25
King's	1	0	1	3	0	1	1	4	0	0	0	0
Manchester	16 ⁴	0	16	48	10 ³	0	10	42	7 ²	0	7	35
Newcastle	6 ¹	0	6	18	6	0	6	25	6 ¹	0	6	30
Oxford	2	2	4	12	2	0	2	8	2	0	2	10
Royal Free	2	0	2	6	2	0	2	8	0	0	0	0
TOTAL	30	3	33	100	21	3	24	100	19	1	20	100

¹ Includes 1 SIK transplant

² Includes 7 SIK transplants

³ Includes 9 SIK transplants

⁴ Includes 14 SIK transplants

Table 4 One-year graft outcome following routine islet transplant, 1 April 2010 to 31 December 2019			
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	63	54	16
Routine and one priority graft	89	78	3
Routine and two priority grafts	1	1	0
SIK routine graft			
Routine only	11	6	2
Routine and one priority graft	8	6	0
Routine and two priority grafts	0	0	0
Total	172	145	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 December 2019

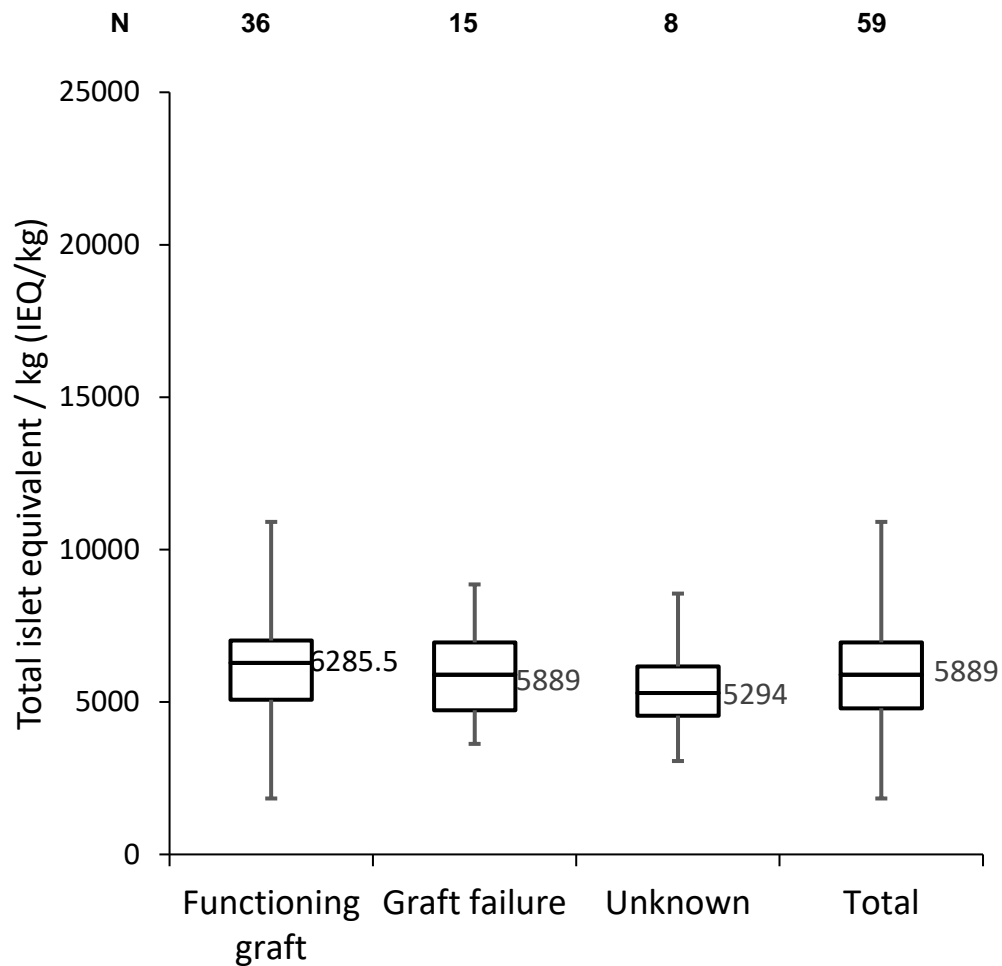
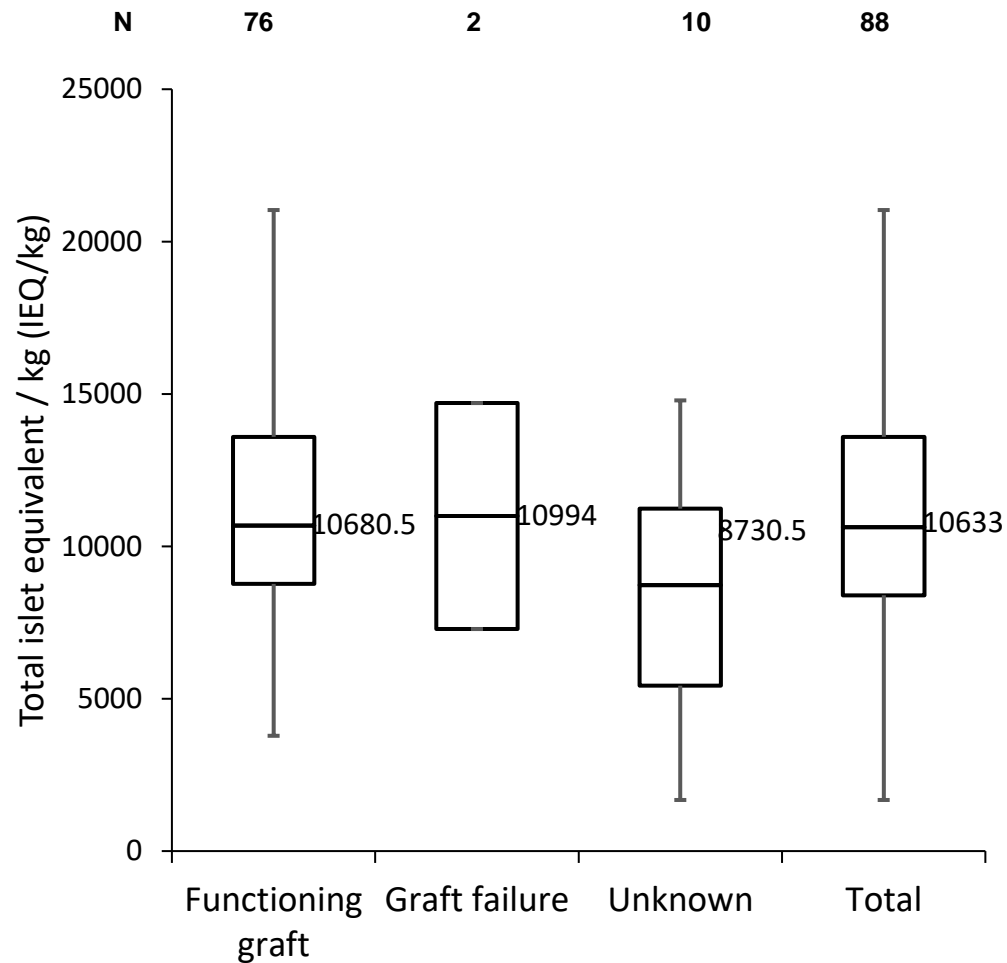


Figure 2 One-year graft function by total IEQ per kg recipient body weight for islet alone routine and priority grafts, 1 April 2010 to 31 December 2019



- 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 2579 - 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 (41-60%).
- 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 (20-48%) 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 48%, 95% CI (29-65%) and for routine grafts followed by a priority graft is 63%, 95% CI (49-74%). This difference was not statistically significant, $p = 0.08$.
- 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 93%, 95% CI (85-97%).
- 21 Of the 19 SIK islet transplants in the 1 April 2010 to 31 December 2019 time period, 18 were the first islet transplant for the patient. Of these 18, one year outcome is known for 11 patients; nine were functioning and two had failed. Of the remaining seven patients, four were known to have a functioning graft at 6 months post-transplant.

Figure 3 One-year graft survival following first routine islet alone transplantation performed in the UK between 1 April 2010 and 31 December 2019

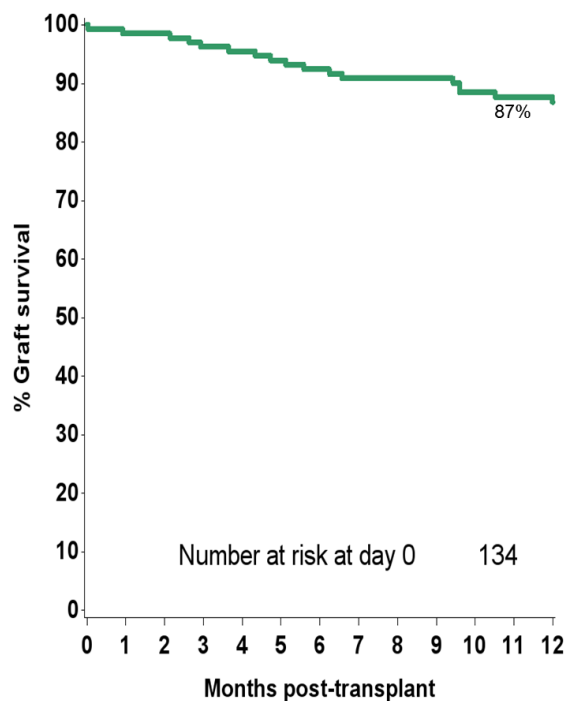


Figure 4 Five-year graft survival following first routine islet alone transplantation performed in the UK between 1 April 2008 and 31 December 2019

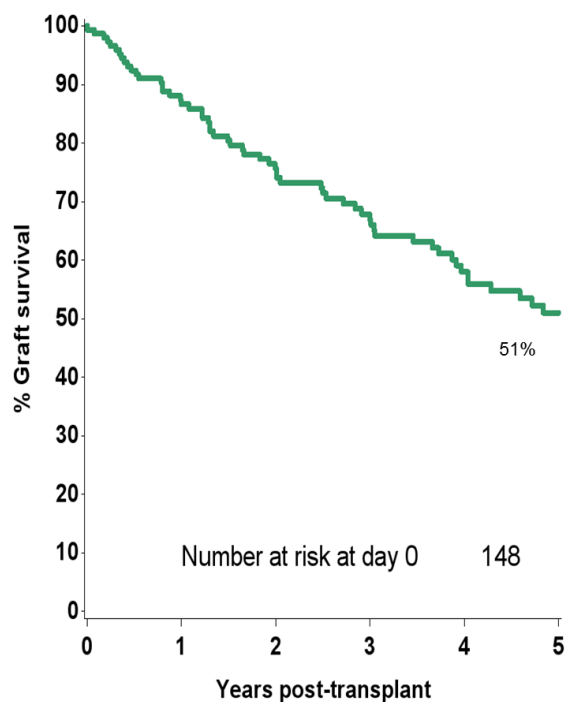


Figure 5 Five-year graft survival following first routine islet alone transplantation performed in the UK between 1 April 2008 and 31 December 2019, by type of graph

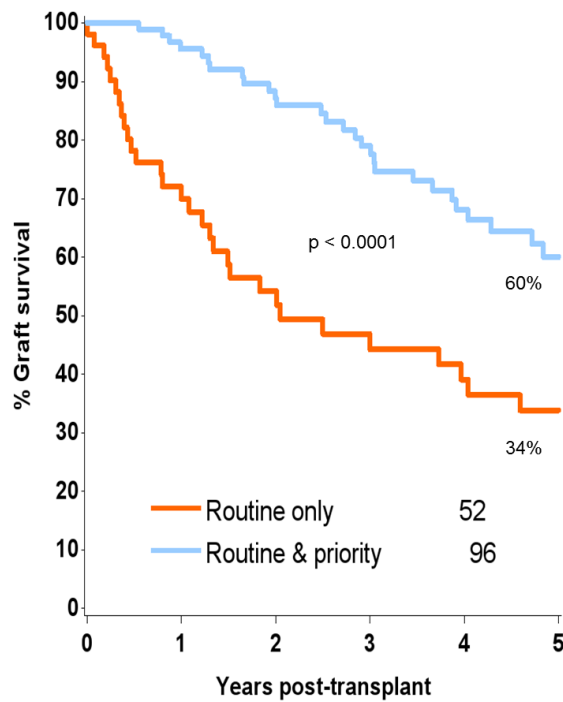


Figure 6 Five-year graft survival following first routine islet alone transplantation where the routine graft was functioning at one year in the UK between 1 April 2008 and 31 December 2019, by type of graph

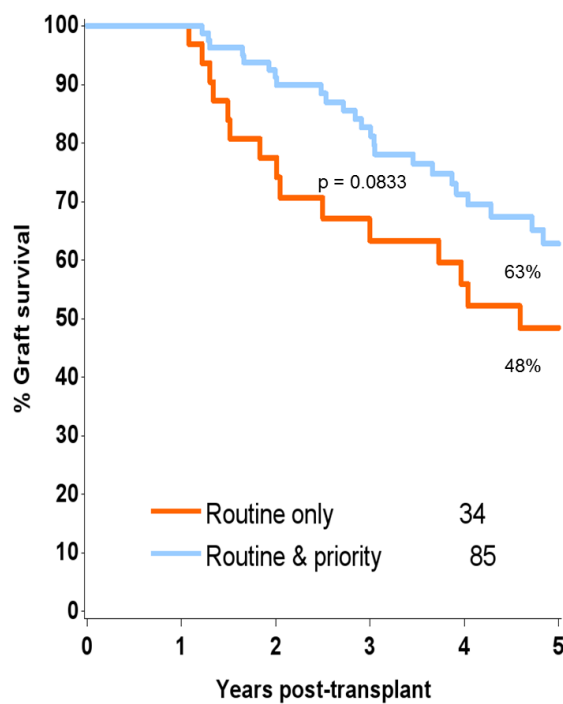
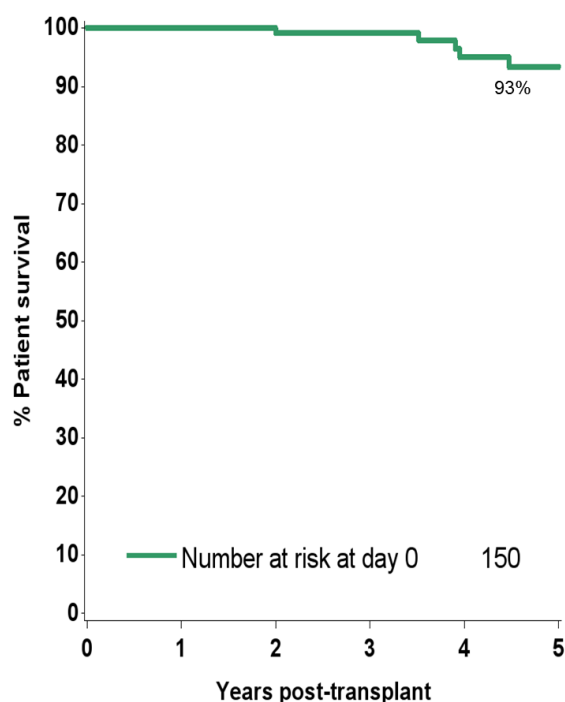


Figure 7 Five-year patient survival following first routine islet alone transplantation performed in the UK between 1 April 2008 and 31 December 2019



- 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 8 reported at one-year post-transplant, the median rate was 0 (IQR 0-0.5).
- 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 116 cases at one-year post-transplant and in 96 (83%) patients a reduction in HbA1c was reported. The proportion of patients with HbA1c of less than 53 mmol/mol was 18% of 147 at time of transplant, 58% of 119 patients at one-year post-transplant, 39% of 75 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 seven reported at one-year post-transplant, the median was 55 mmol/mol (IQR 41-70).

Figure 8 Reduction in severe hypoglycaemic events three years post-transplant for routine only grafts, 1 April 2010 – 31 December 2019 (excluding SIK transplants)

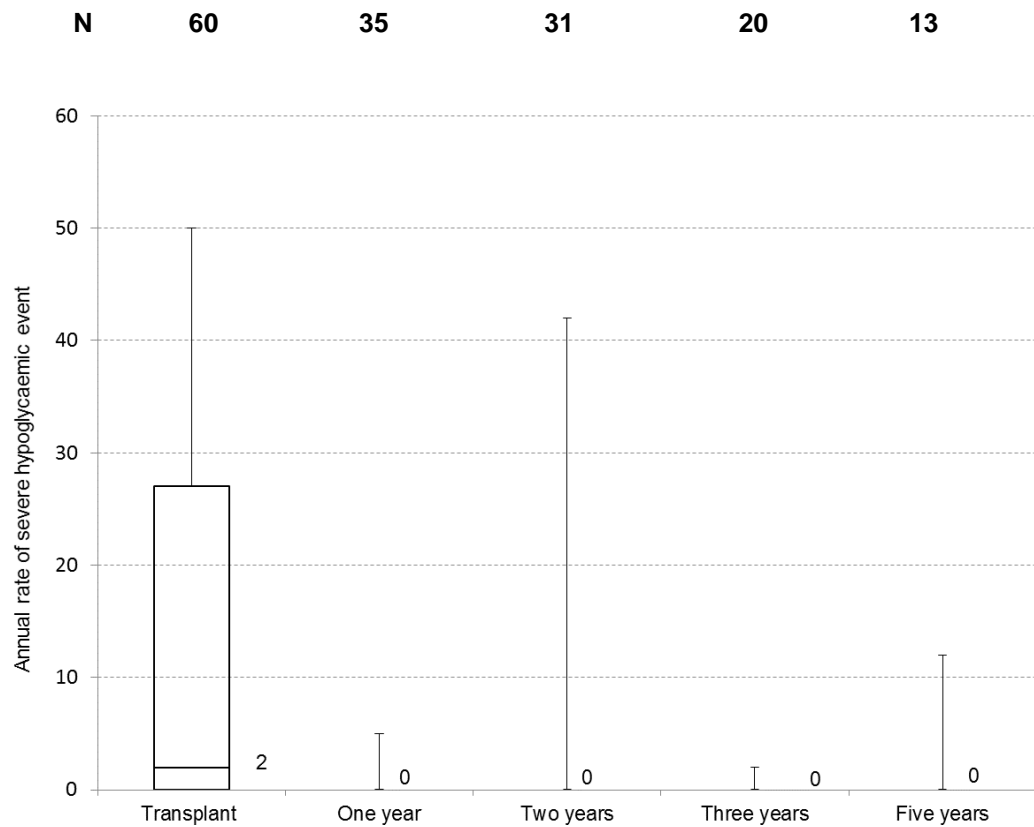


Figure 9 Reduction in severe hypoglycaemic events three years post-transplant for routine and priority grafts, 1 April 2010 – 31 December 2019 (excluding SIK transplants)

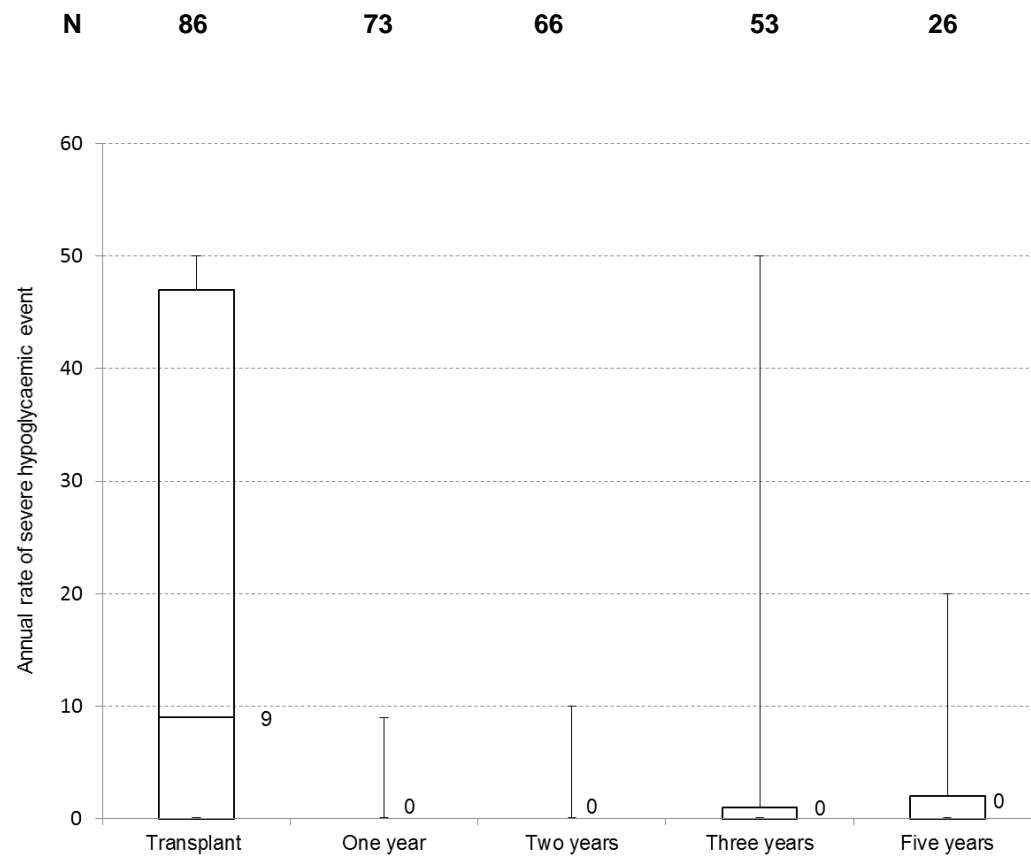


Figure 10 Reduction in HbA1c three years post-transplant for routine only grafts, 1 April 2010 – 31 December 2019 (excluding SIK transplants)

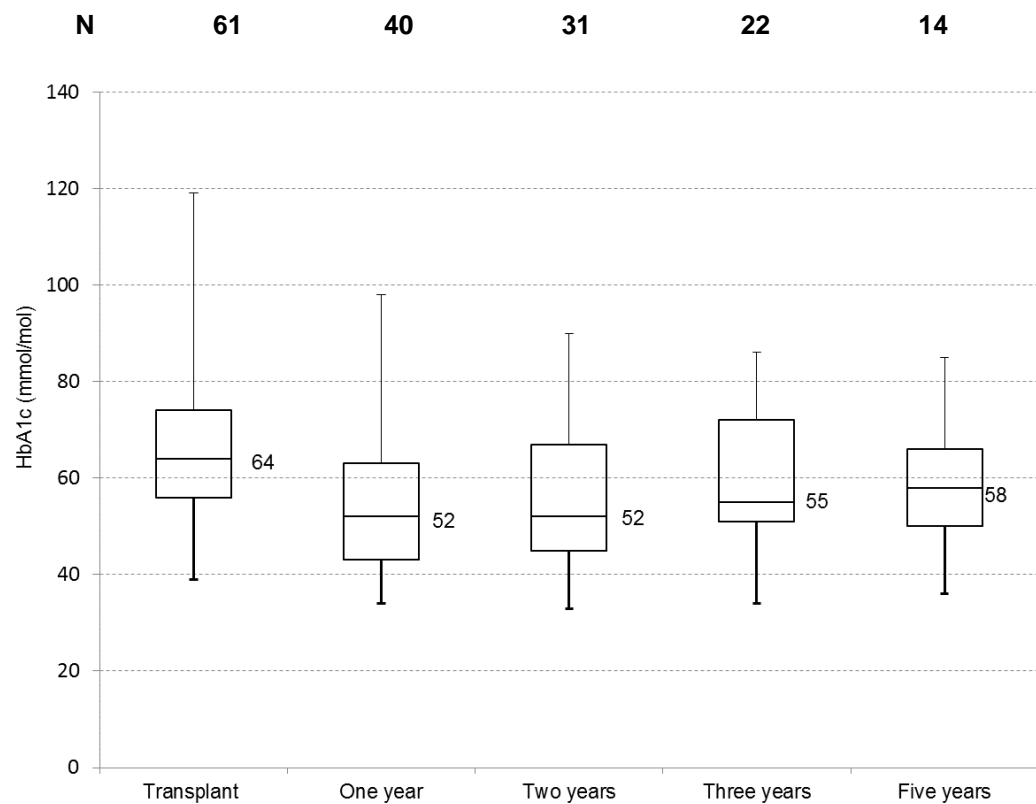


Figure 11 Reduction in HbA1c three years post-transplant for routine and priority grafts, 1 April 2010 – 31 December 2019 (excluding SIK transplants)

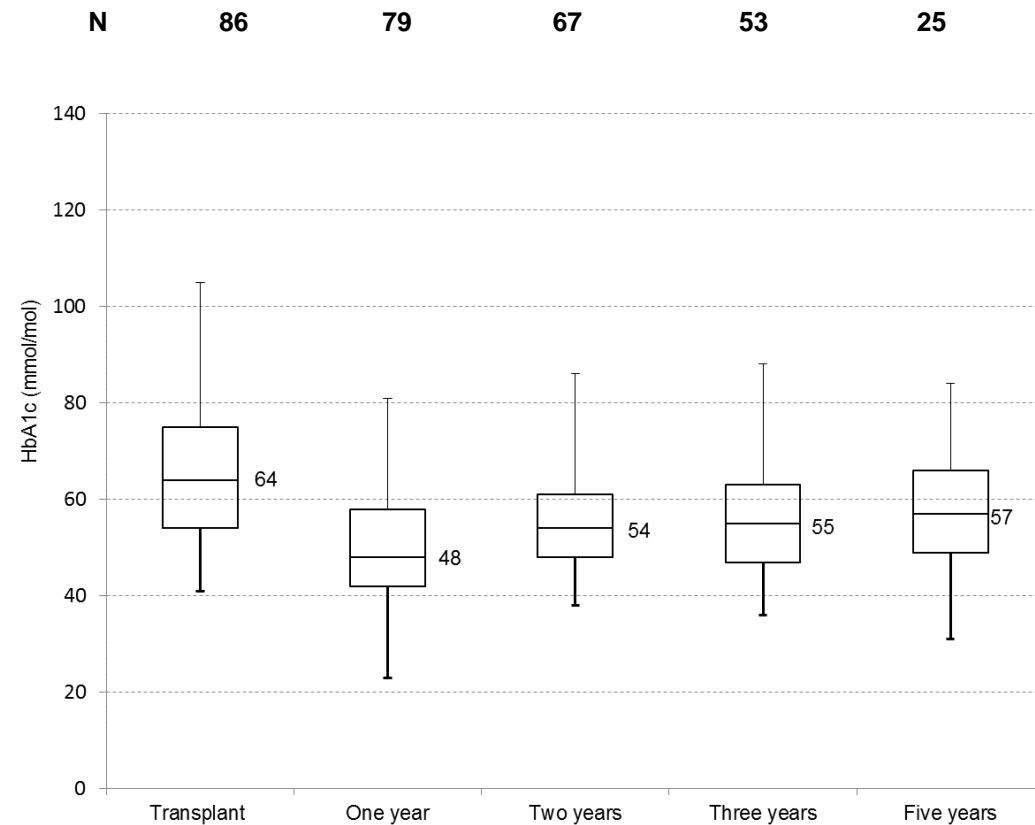


Figure 12 Insulin dose three-years post-transplant for routine only grafts, 1 April 2010 – 31 December 2019 (excluding SIK transplants)

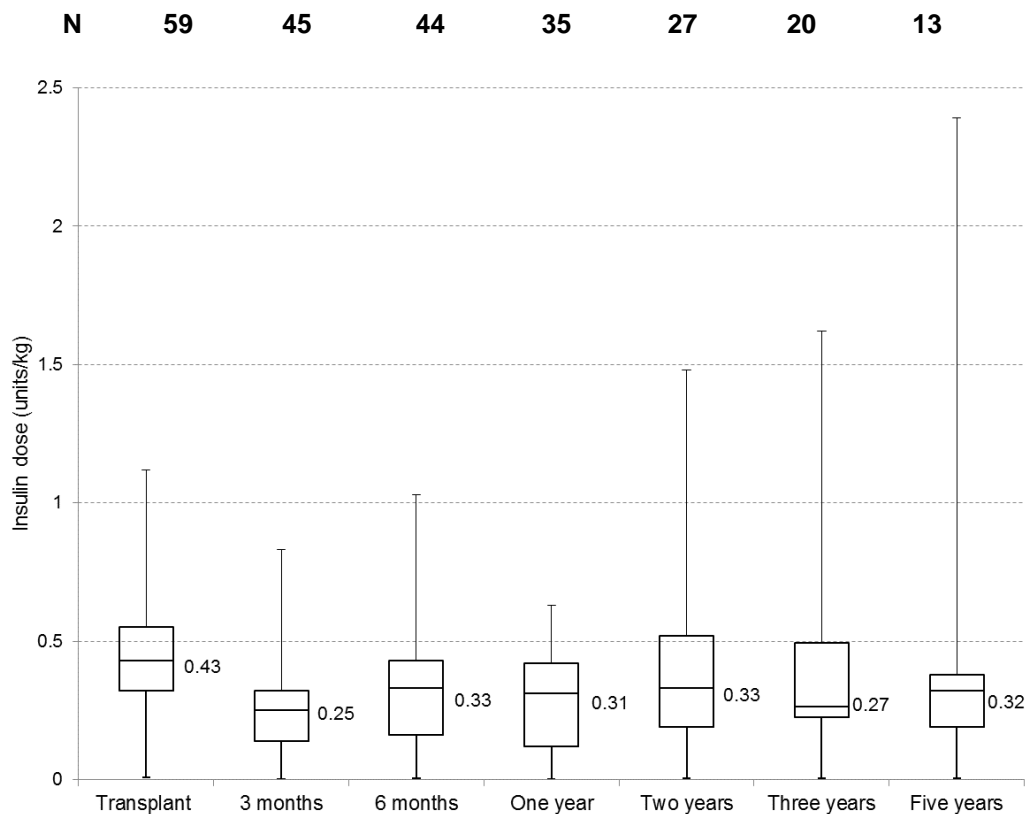
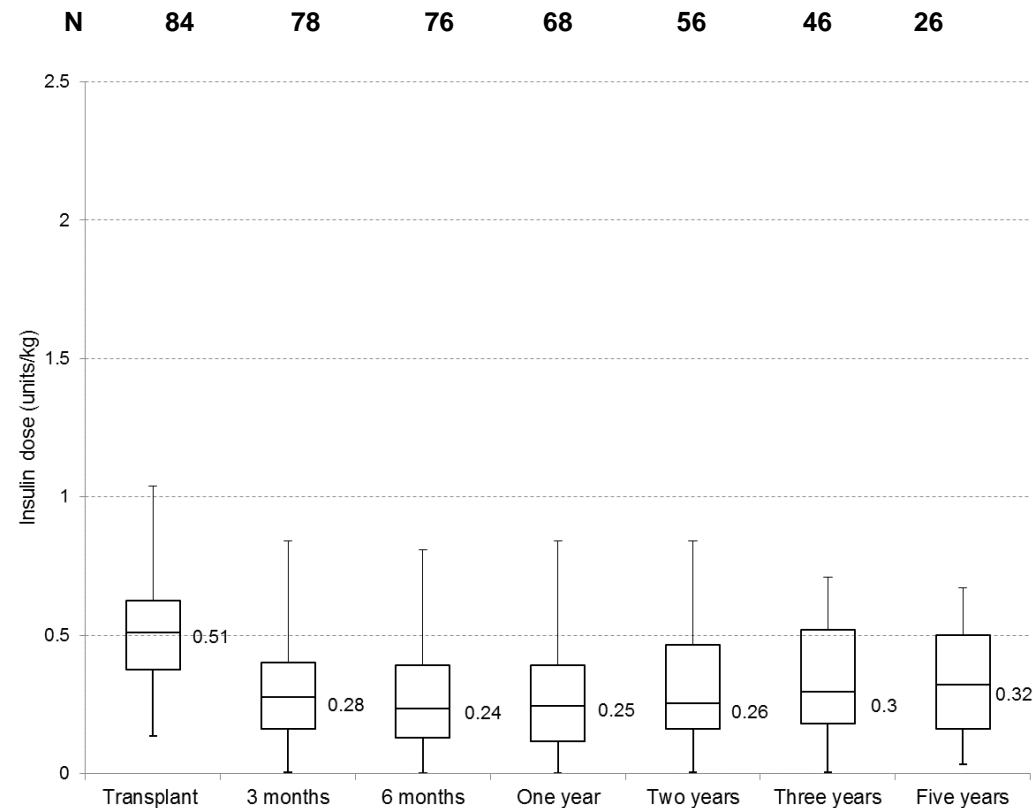


Figure 13 Insulin dose three-years post-transplant for routine and priority grafts, 1 April 2010 – 31 December 2019 (excluding SIK transplants)



- 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 102 patients where the difference in insulin dose between transplant and one-year post-transplant could be calculated, 90 (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 7 reported at one-year post-transplant, the median was 0.27 units/kg (IQR 0.24-0.49).

SUMMARY

- 29 In 2020, the number of islet transplants was lower than it was in 2019 and the number on the waiting list at the end of the calendar year was similar, the reduced number of transplants was as a consequence of the COVID-19 pandemic.
- 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	43	51	3	1
King's College	11	6	8	2	0
Manchester	20	12	17	3	0
Newcastle	30	15	27	3	0
Oxford	34	17	28	9	2
Royal Free	11	5	11	1	0
Total	172¹	99	145²	21³	3

¹ Includes 19 SIK transplants: Edinburgh (7), Manchester (11), Newcastle (1)
² Includes 12 SIK transplants: Edinburgh (3), Manchester (8), 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	29	18 (5 – 25)	20 (2 – 31)	0 (0 – 1)	19 (1 – 29)	15	9 (31)
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	153	19 (4 – 50)	8 (0 – 34)	0 (0 – 0)	7 (0 – 36)	70	45 (29)

¹ Excluding SIK transplants
² Only available for 88 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	29	75 (63 – 83)	50 (41 – 58)	17 (13 – 31)	20	7 (24)	
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	153	64 (55 – 75)	51 (42 – 59)	12 (3 – 21)	96	37 (24)	

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	29	0.48 (0.35 – 0.59)	0.36 (0.23 – 0.46)	0.19 (-0.02 – 0.28)	5	11 (38)
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	153	0.48 (0.33 – 0.60)	0.26 (0.12 – 0.41)	0.23 (0.10 – 0.32)	40	51 (33)

¹ Excluding SIK transplants