

NHS BLOOD AND TRANSPLANT
MULTI-VISCERAL AND COMPOSITE TISSUE ADVISORY GROUP
PATIENT SURVIVAL AFTER INTESTINAL TRANSPLANT

INTRODUCTION

1. This regular paper reports on patient survival following first UK deceased donor intestinal transplantation.

DATA AND METHODS

2. Data on 292 first intestinal transplants involving a deceased donor after brain death (DBD) performed in the UK between 1 January 2008 to 31 December 2023 were extracted from the UK Transplant Registry (UKTR) on 9 April 2024. 284 were elective transplants and 8 were super-urgent transplants. Follow-up data were available on the UKTR for 281 (99%) of the 284 elective patients as at 9 April 2024. Please note this report includes six NHS group 2 elective patients and nine elective patients where NHS group was not reported.
3. Kaplan-Meier patient survival curves were produced for first elective intestinal transplants and analysed by age group, transplant type and era. Patient survival is defined as the time from first transplant to death or last known survival reported to NHSBT irrespective of whether the patient received a retransplant after their first transplant. It should be noted that the results are based on small numbers and are not risk-adjusted so should be treated as guidance only.
4. Graft status is reported for patients, where available, where a failed graft is defined as either bowel reported to have failed on follow-up form or patient received a bowel re-transplant.

RESULTS

Overall

5. Ten year survival rate estimates for paediatric and adult elective intestinal transplant recipients are 54.9% and 31.8%, respectively (**Figure 1**). There were no statistically significant differences in the survival rates by age group (log-rank p-value ≥ 0.06) both overall and conditional on both 90 days and 1 year. (**Table 1**).
6. There were no statistically significant differences in the survival rates by era at any time point (log-rank p-value ≥ 0.45) (**data not included**).
7. 222 (79%) of the 281 first elective intestinal transplants were ABO identical. There were no statistically significant differences in the survival rates by ABO compatibility in adult or paediatric patients (**Tables 3,7**).

Paediatric elective patients

8. For paediatric patients, there was no significant difference in survival by transplant type at 90 days and 1 year post-transplant. At five years post-transplant, bowel only (BO) transplants appear to have superior outcomes compared with multivisceral (MV) or liver, bowel and pancreas (LBP) transplants (**Table 2**). Please note that there were too few paediatric BP or MMV transplants to be included in **Table 2** and **Figure 2**.
9. Causes of paediatric patient death, as at 9 April 2024, are reported in **Table 4 (removed as patient identifiable)**. 33 deaths following first paediatric elective intestinal transplant in the UK between 1 January 2008 and 31 December 2023 have been reported, where multi-system failure was the most common cause of death (39%). 4 (12%) deaths occurred within 90 days of transplant. There were no deaths reported after ten years post-transplant.
10. Of the 86 paediatric transplants considered, intestinal graft function status is available for 81 (94%). Of these, 25 (31%) have graft failure reported, with 8 alive at last report (4 without re-transplant). **Table 5 (removed as patient identifiable)** shows the reasons reported for graft failure for the 25 paediatric patient cases.

Adult elective patients

11. For adults, there were no significant differences in outcome at 90 days and 1 year by transplant type (**Table 6, Figure 4**). At five years post-transplant, modified multivisceral (MMV) or bowel and pancreas (BP) transplants appear to have superior five-year outcomes overall and conditional on 1 year survival, compared with bowel only (BO), multivisceral (MV) or liver, bowel and pancreas (LBP) transplants.

12. **Table 8** shows adult patient survival rates by registration due to tumour. There were no significant differences in survival outcomes by tumour. Please note indications of desmoid and familial adenomatous polyposis (FAP) are reported under Tumours.
13. 90 deaths following first adult elective intestinal transplant in the UK between 1 January 2008 and 31 December 2023 have been reported (**Table 9 (removed as patient identifiable)**). 15 (17%) deaths occurred within 90 days of transplant.
14. Of the 195 adult transplants considered, intestinal graft function status is available for 182 (93%). Of these, 20 (11%) have graft failure reported, with 9 alive at last report (7 without re-transplant). **Table 10 (removed as patient identifiable)** shows the reasons reported for graft failure for the 20 cases. Hepatic artery thrombosis (8) was the most common cause of graft failure in adult intestinal patients.
15. There have been 31 transplants including abdominal wall in the time period into 30 different adult patients: 17 bowel only and 14 MMV. Oxford performed 29 (94%) of these transplants with the remaining two at Cambridge. One year patient survival following first elective intestinal transplant containing abdominal wall is 72.5% compared to 82.5% for all adult first elective intestinal transplants (**Table 11, Figure 7**). **Table 12 (removed as patient identifiable)** presents the causes of death of the abdominal wall recipients who died, since 1 January 2023. These are also included in **Table 9 (removed as patient identifiable)**. Transplant and outcome data are not available for abdominal wall only transplants.

Super-urgent patients

16. There have been eight super-urgent intestinal transplants performed in the UK to date in seven different patients, with the last occurring in November 2022. Three further deaths for these patients have been recorded since the last report; details can be found in **Table 13 (removed as patient identifiable)**.

ACTION

17. Members are asked to note the contents of this paper. Timely provision of three-month and annual follow-up data to NHSBT will aid more accurate estimation of outcomes following intestinal transplantation.

Maria Jacobs

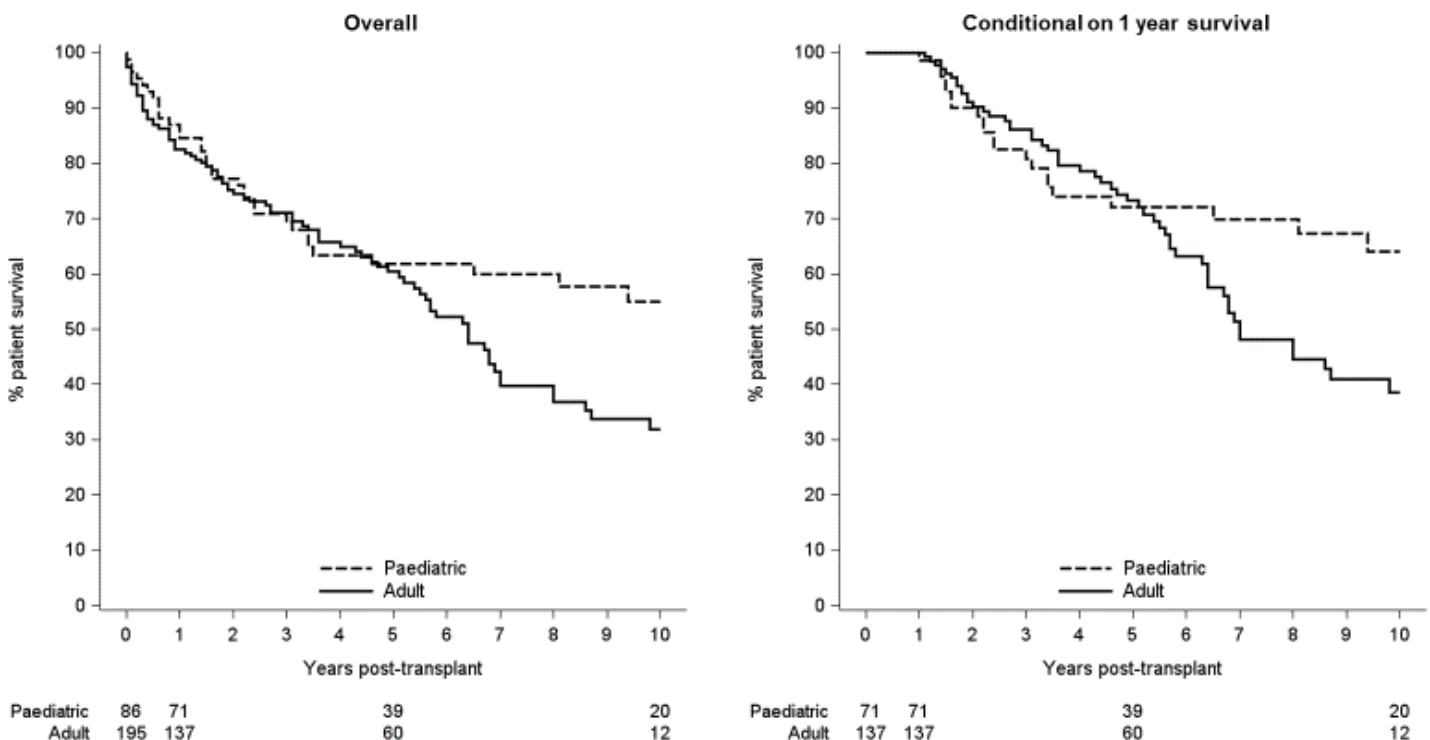
Statistics and Clinical Research

May 2024

1. ALL PATIENTS

Table 1 Patient survival for first intestinal transplants between 1 January 2008 and 31 December 2023, by age group

Age group	No. at risk on day 0	% patient survival (95% confidence interval)								
		90 day	1 year	5 year	10 year					
A. Overall										
Paediatric	86	95.3	88.1 – 98.2	85.8	76.4 – 91.7	61.9	50.0 – 71.7	54.9	41.9 – 66.2	
Adult	195	92.3	87.6 – 95.3	82.5	76.3 – 87.2	60.5	52.1 – 67.8	31.8	22.3 – 41.7	
Log-rank p-value		0.35		0.46		0.82		0.06		
Overall	281	93.2	89.6 - 95.6	83.5	78.5 – 87.4	60.9	54.3 – 67.0	40.7	32.9 – 48.4	
B. Conditional on 90 day survival										
Paediatric	82	100	-	90.0	81.0 – 94.9	64.9	52.7 – 74.7	57.6	44.1 – 69.0	
Adult	180	100	-	89.4	83.7 – 93.2	65.5	56.7 – 72.9	34.5	24.2 – 45.0	
Log-rank p-value		-		0.86		0.83		0.10		
Overall	260	100	-	89.6	85.1 – 92.8	65.4	58.4 – 71.4	43.7	35.3 – 51.7	
C. Conditional on 1 year survival										
Paediatric	74	100	-	100	-	72.1	59.3 – 81.5	64.0	49.3 – 75.5	
Adult	162	100	-	100	-	73.3	64.0 – 80.5	38.6	27.1 – 50.0	
Log-rank p-value		-		-		0.70		0.07		
Overall	236	100	-	100	-	73.0	65.8 – 78.9	48.8	39.5 - 57.4	

Figure 1 Unadjusted 10 year patient survival after first intestinal transplantation from deceased donor after brain death (DBD), by age group, 1 January 2008 to 31 December 2023

2. PAEDIATRIC ELECTIVE PATIENTS

Table 2 Paediatric patient survival for first intestinal transplants between 1 January 2008 and 31 December 2023, by transplant type

Transplant type	No. at risk on day 0	% patient survival (95% confidence interval)							
		90 day	1 year	5 year	10 year				
A. Overall									
BO	33	100	-	90.9	74.4 – 97.0	74.1	54.6 – 86.2	64.5	43.1 – 79.5
LBP, MV	45	91.1	78.0 – 96.6	79.7	64.6 – 89.9	49.5	33.3 – 63.8	49.5	33.3 – 63.8
Log-rank p-value		0.08		0.16		0.02		0.05	
Overall	78	94.9	86.9 – 98.0	84.5	74.3 – 90.9	60.0	47.6 – 70.4	55.5	42.5 – 66.7
B. Conditional on 90 day survival									
BO	33	100	-	90.9	74.7 - 97.0	74.1	54.6 - 86.2	64.5	43.1 – 79.5
LBP, MV	41	100	-	87.5	72.5 - 94.6	54.3	36.8 – 68.9	54.3	36.8 – 68.9
Log-rank p-value		-		0.63		0.07		0.16	
Overall	74	100	-	89.0	79.3-94.4	63.3	50.5 – 73.6	58.5	45.0 – 69.8
C. Conditional on 1 year survival									
BO	30	100	-	100	-	81.5	60.9 – 91.9	70.9	47.7 – 85.3
LBP, MV	34	100	-	100	-	62.1	42.6 – 76.6	62.1	42.6 – 76.6
Log-rank p-value		-		-		0.06		0.17	
Overall	64	100	-	100	-	71.1	67.5 – 81.0	65.7	51.0 – 76.9

Survival rates at 10 years should be interpreted with caution due to the low number of patients entering the interval alive, which may produce unstable estimates.
 BO = bowel only (may require stomach/colon/abdominal wall/spleen/kidney),
 LBP = liver, bowel, pancreas only,
 MV = multivisceral (liver, bowel, pancreas plus stomach/colon/abdominal wall/spleen/kidney)

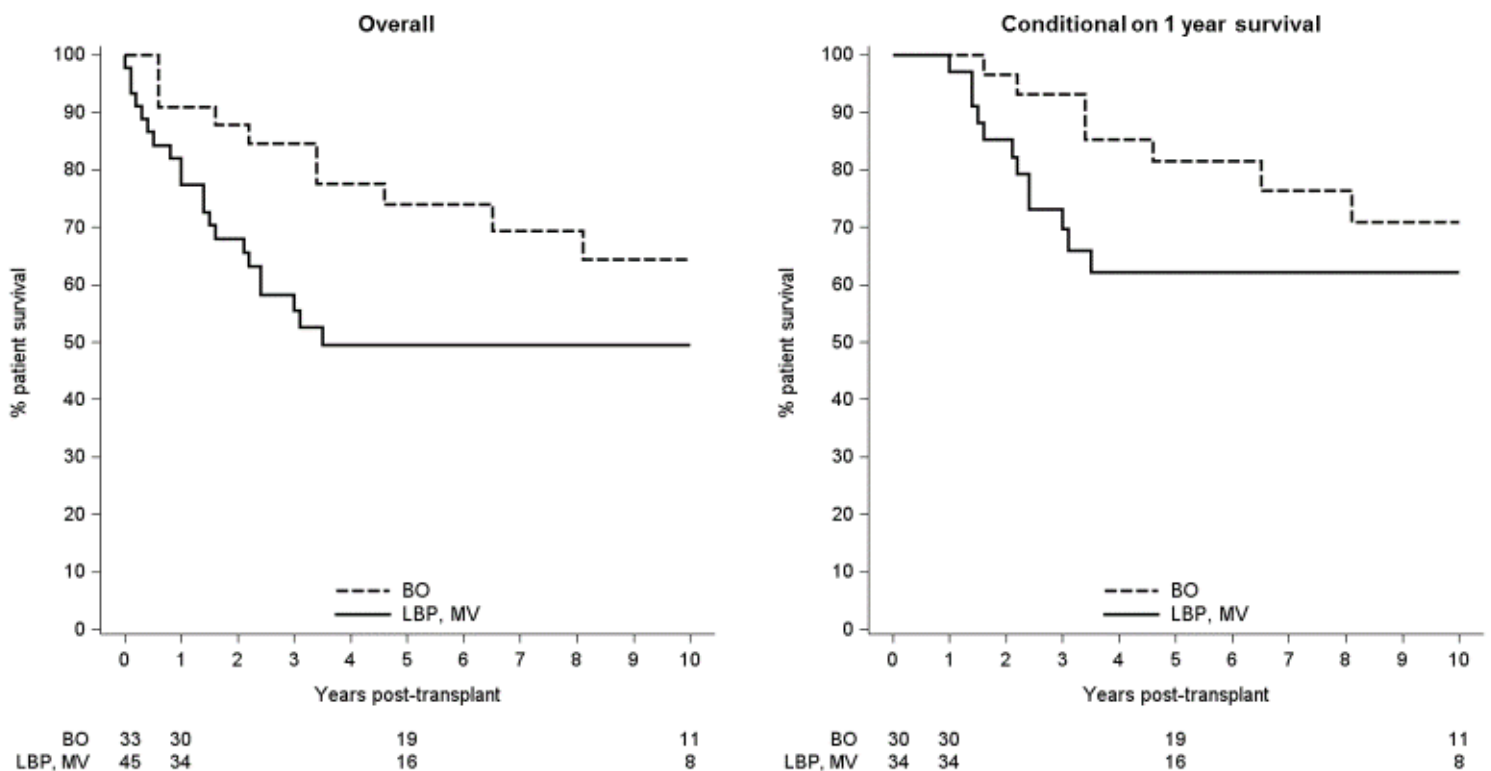
Figure 2 Unadjusted 10 year paediatric patient survival after first intestinal transplantation from deceased donor after brain death (DBD), by transplant type, 1 January 2008 to 31 December 2023

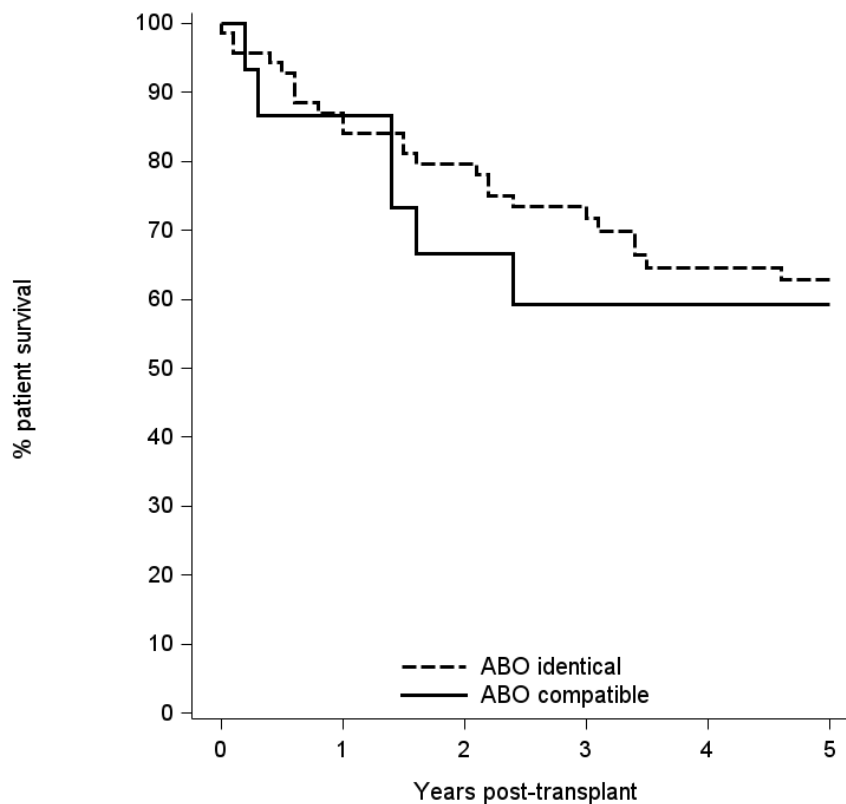
Table 3

Paediatric patient survival for first intestinal transplants between 1 January 2008 and 31 December 2023, by ABO compatibility

ABO compatibility	No. of patients	% patient survival (95% confidence interval)					
		90 day	1 year	5 year			
A. Overall							
ABO identical	71	95.8	87.5 – 98.6	85.6	74.9 – 92.0	62.8	49.6 – 73.4
ABO compatible	15	93.3	61.3 – 99.0	86.7	56.4 – 96.5	59.3	30.7 – 79.3
Log-rank p-value		0.70		0.95		0.58	
Overall	86	95.3	88.1 – 98.2	85.8	76.4 – 91.7	61.9	50.0 – 71.7
B. Conditional on 90 day survival							
ABO identical	68	100	-	89.4	79.0 – 94.8	65.6	52.0 – 76.1
ABO compatible	14	100	-	92.9	59.1 – 99.0	63.5	33.1 – 83.0
Log-rank p-value		-		0.73		0.65	
Overall	82	100	-	90.0	81.0 – 94.9	64.9	52.7 – 74.7
C. Conditional on 1 year survival							
ABO identical	30	100	-	100	-	73.4	59.1 – 83.3
ABO compatible	34	100	-	100	-	68.4	35.9 – 86.8
Log-rank p-value		-		-		0.43	
Overall	74	100	-	100	-	72.1	59.3 – 81.5

Survival rates at 5 years should be interpreted with caution due to the low number of patients entering the interval alive, which may produce unstable estimates.

Figure 3 5 year paediatric patient survival following intestinal transplantation, by ABO compatibility



ABO identical	71	58	33
ABO compatible	15	13	6

3. ADULT ELECTIVE PATIENTS

Table 6 Adult patient survival for first intestinal transplants between 1 January 2008 and 31 December 2023, by transplant type

Transplant type	No. of patients	% patient survival (95% confidence interval)							
		90 day	1 year	5 year	10 year				
A. Overall									
BO	62	95.2	85.7 – 98.4	88.3	77.0 – 94.2	64.6	49.3 – 76.3	40.8	24.4 – 56.6
LBP, MV	69	87.0	76.4 – 93.0	77.9	66.1 – 86.1	46.7	32.8 – 59.4	21.4	9.1 – 37.1
BP, MMV	64	95.3	86.2 – 98.5	81.7	69.4 – 89.4	71.8	56.9 – 82.2	36.3	18.9 – 53.9
Log-rank p-value		0.10		0.25		0.02		0.03	
Overall	195	92.3	87.6 – 95.3	82.5	76.3 – 87.2	60.5	52.1 – 67.8	31.8	22.3 – 41.7
B. Conditional on 90 day survival									
BO	58	100	-	92.8	81.9 – 97.2	67.9	52.0 – 79.5	42.9	25.6 – 59.1
LBP, MV	60	100	-	89.6	78.3 – 95.2	53.7	38.0 – 67.0	24.6	10.3 – 42.0
BP, MMV	60	100	-	85.7	73.5 – 92.6	75.3	60.0 – 85.4	38.1	19.8 – 56.3
Log-rank p-value		-		0.47		0.13		0.16	
Overall	178	100	-	89.4	83.7 – 93.2	65.5	56.7 – 72.9	34.5	24.2 – 45.0
C. Conditional on 1 year survival									
BO	48	100	-	100	-	73.1	56.4 – 84.3	46.2	27.5 – 63.0
LBP, MV	45	100	-	100	-	59.9	42.6 – 73.5	27.4	11.4 – 46.3
BP, MMV	44	100	-	100	-	87.8	70.5 – 95.3	44.4	22.8 – 64.1
Log-rank p-value		-		-		0.01		0.08	
Overall	137	100	-	100	-	73.3	64.0 – 80.5	38.6	27.1 – 50.0

Survival rates at 10 years should be interpreted with caution due to the low number of patients entering the interval alive, which may produce unstable estimates.

BO = bowel only (may require stomach/colon/abdominal wall/spleen/kidney), BP= bowel, pancreas only, LBP = liver, bowel, pancreas only, MV=multivisceral (liver, bowel, pancreas plus stomach/colon/abdominal wall/spleen/kidney), MMV = modified multivisceral (bowel, pancreas plus stomach/colon/abdominal wall/spleen/kidney)

Figure 4 Unadjusted 10 year adult patient survival after first intestinal transplantation from deceased donor after brain death (DBD), by transplant type, 1 January 2008 to 31 December 2023

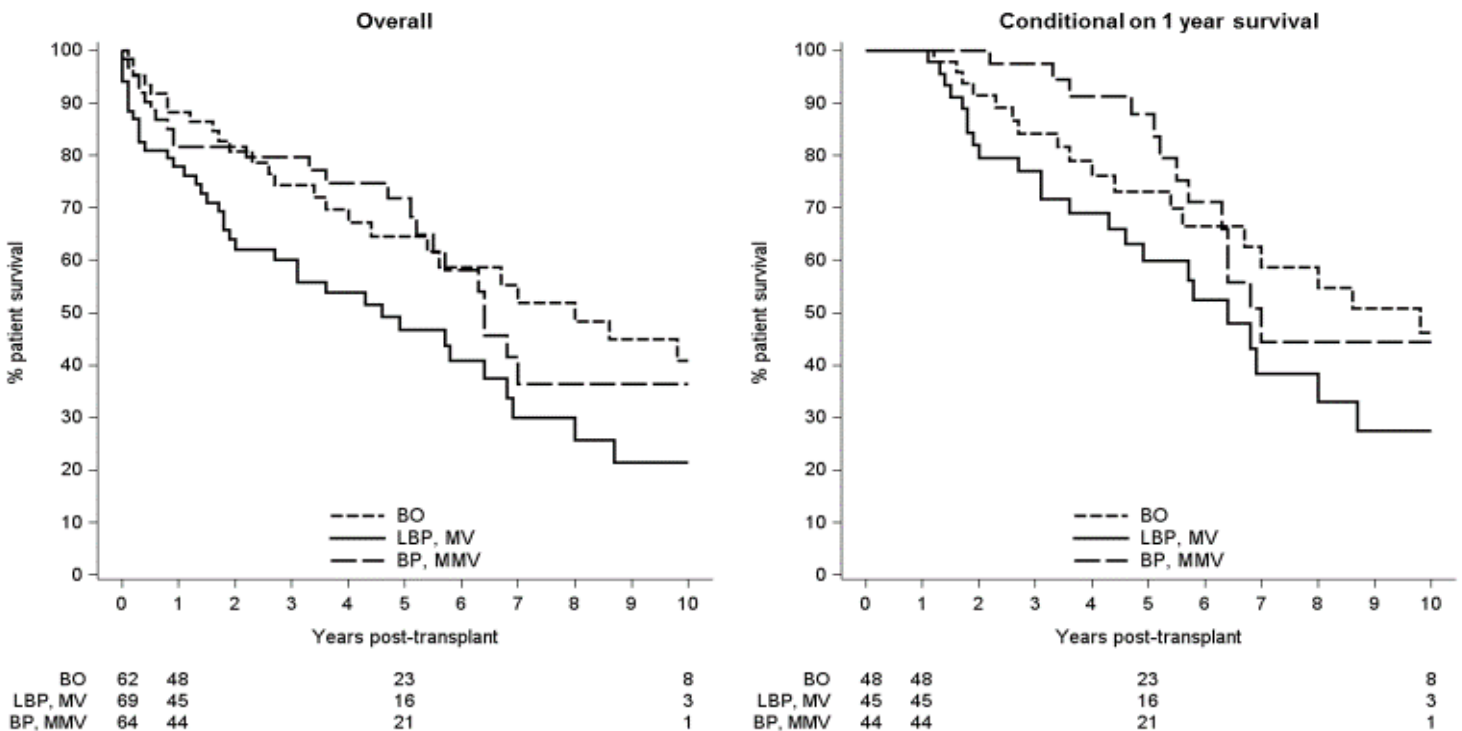


Table 7 Adult patient survival for first intestinal transplants between 1 January 2008 and 31 December 2023, by ABO compatibility

ABO compatibility	No. of patients	% patient survival (95% confidence interval)					
		90 day		1 year		5 year	
A. Overall							
ABO identical	151	92.1	86.4 – 95.4	83.0	75.8 – 88.2	61.8	52.3 – 70.0
ABO compatible	44	93.2	80.3 – 97.7	81.0	65.6 – 90.0	62.1	38.4 – 71.0
Log-rank p-value		0.83		0.73		0.63	
Overall	195	92.3	87.6 – 95.3	82.5	76.3 – 87.2	60.5	52.1 – 67.8
B. Conditional on 90 day survival							
ABO identical	137	100	-	90.1	83.6 – 94.2	67.2	57.2 – 75.4
ABO compatible	41	100	-	87.0	71.5 – 94.4	60.5	41.4 – 75.2
Log-rank p-value		-		0.51		0.51	
Overall	178	100	-	89.4	83.7 – 93.2	65.5	56.7 – 72.9
C. Conditional on 1 year survival							
ABO identical	108	100	-	100	-	74.5	64.0 – 82.4
ABO compatible	29	100	-	100	-	69.6	48.0 – 83.6
Log-rank p-value		-		-		0.74	
Overall	137	100	-	100	-	73.3	64.0 – 80.5

Survival rates at 10 years are not provided due to insufficient follow-up

Figure 5 Unadjusted 10 year adult patient survival after first intestinal transplantation from deceased donor after brain death (DBD), by ABO compatibility, 1 January 2008 to 31 December 2023

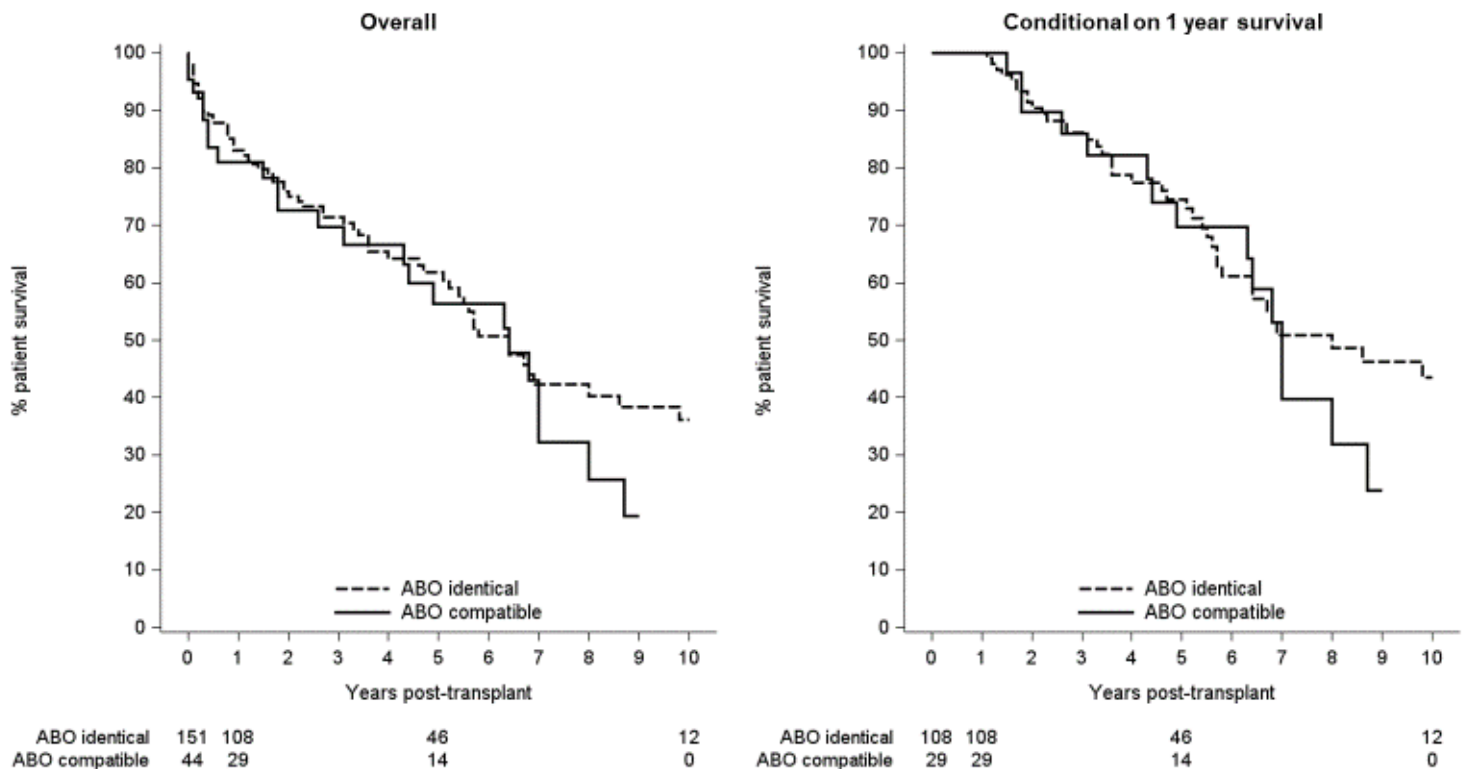
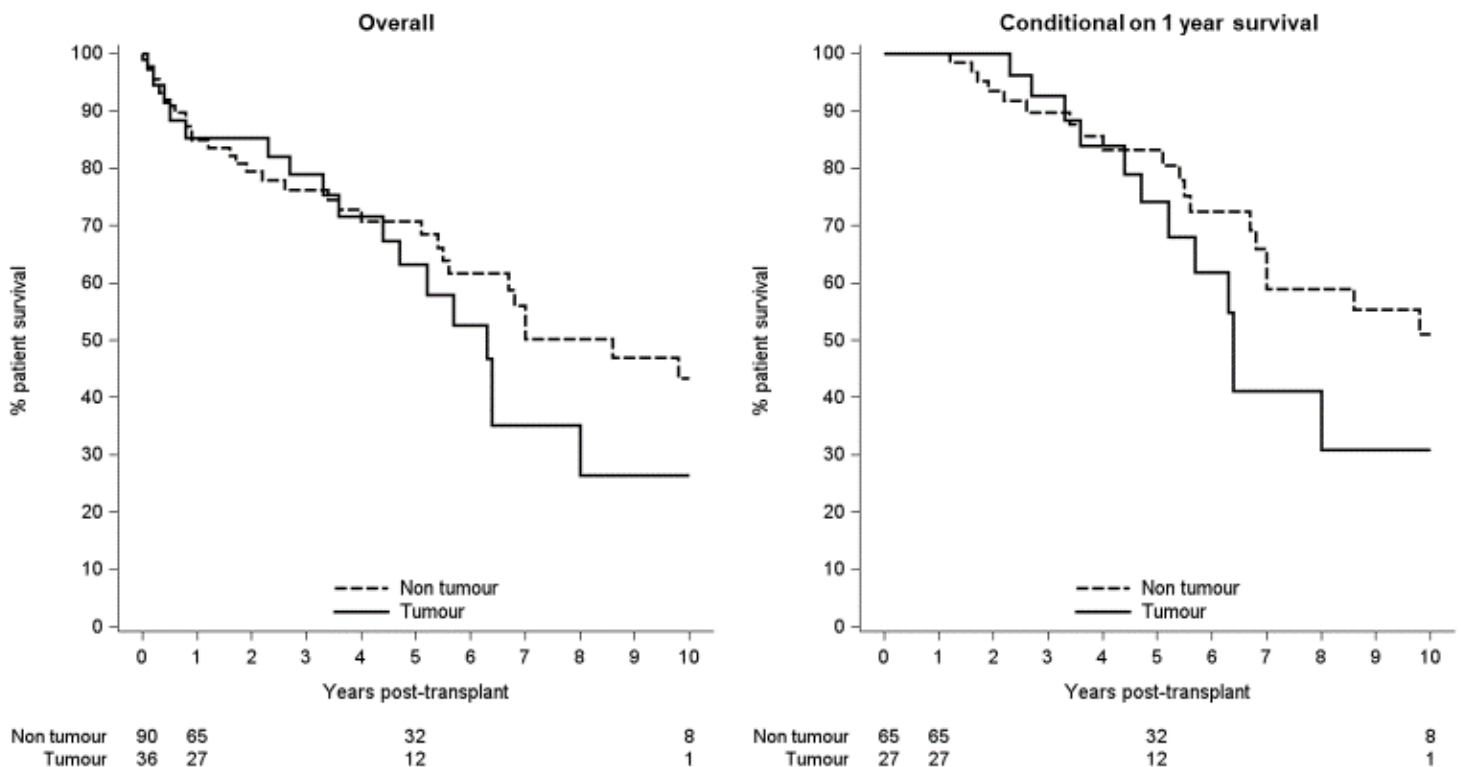


Table 8 Adult patient survival for first intestinal non-liver transplants between 1 January 2008 and 31 December 2023, by registration due to tumour

Registration type	No. of patients	% patient survival (95% confidence interval)							
		90 day	1 year		5 year		10 year		
A. Overall									
Non tumour	90	95.6	88.6 – 98.3	85.0	75.5 – 91.0	70.7	58.5 – 79.9	43.4	28.0 – 57.7
Tumour	36	94.4	79.6 – 98.6	85.2	67.9 – 93.6	63.1	42.7 – 78.0	26.3	8.4 – 48.6
Log-rank p-value		0.79		0.99		0.68		0.29	
Overall	126	95.2	89.7 – 97.8	85.0	77.3 – 90.3	68.1	57.8 – 76.4	37.7	25.2 – 50.2
B. Conditional on 90 day survival									
Non tumour	85	100	-	88.9	79.8 – 94.1	74.0	61.5 – 83.0	45.4	29.3 – 60.1
Tumour	33	100	-	90.2	72.6 – 96.7	66.8	45.4 – 81.4	27.8	8.8 – 51.0
Log-rank p-value		-		0.84		0.74		0.30	
Overall	118	100	-	89.3	81.9 – 93.8	71.5	60.9 – 79.7	39.6	26.5 – 52.5
C. Conditional on 1 year survival									
Non tumour	65	100	-	100	-	83.2	70.0 – 91.0	51.0	32.8 – 66.6
Tumour	27	100	-	100	-	74.1	50.7 – 87.6	30.9	9.6 – 55.5
Log-rank p-value		-		-		0.55		0.18	
Overall	92	100	-	100	-	80.1	69.0 – 87.6	44.4	29.6 – 58.1

Survival rates at 10 years should be interpreted with caution due to the low number of patients entering the interval alive, which may produce unstable estimates.

Indications of desmoid and familial adenomatous polyposis (FAP) are reported under Tumours.

Figure 6 Unadjusted 10 year adult patient survival after first non-liver intestinal transplantation from deceased donor after brain death (DBD), by registration due to tumour, 1 January 2008 to 31 December 2023

3B. ABDOMINAL WALL PATIENTS

Table 11 Patient survival for first intestinal transplants containing abdominal wall, between 1 January 2008 and 31 December 2023

No. of patients	% 90 day survival (95% CI)		% 1 year survival (95% CI)		% 5 year survival (95% CI)	
30	83.3	64.5 – 92.7	72.5	52.3 – 85.2	51.9	31.7 – 68.9

The survival rate at 5 years should be interpreted with caution due to the low number of patients entering the interval alive, which may produce unstable estimates.

Figure 7 5 year adult patient survival following abdominal wall transplantation

