

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 deceased donor intestinal transplantation for transplants performed nationally. The period analysed was 1 January 2006 to 31 December 2021, in which 258 elective intestinal transplants were carried out in first time recipients. Follow-up data were available on the UK Transplant Registry (UKTR) as at 23 February 2022 for 246 (95%) patients. Note that this report excludes one living donor transplant performed at King's College in 2017.

DATA ANALYSIS

2. Kaplan-Meier survival curves were produced separately for paediatric and adult patients and within these cohorts, by transplant type and era. Short/medium-term survival rates are displayed within the plots. The results are based on small numbers and are not risk-adjusted so for these reasons should be treated as guidance only. Ten-year survival rates are presented. Graft status is reported for patients, where available, with a failed graft is defined as bowel reported to have failed on follow-up form or patient received a bowel re-transplant.
3. The key messages are:
 - Ten year survival rate estimates for paediatric and adult elective intestinal transplant recipients are 56.5% and 31.7%, respectively (**Figure 1**). However, these rates should be interpreted with caution due to the low number of patients entering the interval alive, which may produce unstable estimates. **Table 1** shows the 90 day, 1 year, 5 year, and 10 year survival rate estimates. At each time point survival was not significantly different between adult and paediatric recipients.
 - Bowel only (BO) transplants appear to have superior outcomes compared with multivisceral (MV) or liver, bowel and pancreas (LBP) transplants in the paediatric analysis, especially when analysed out to five years post-transplant (**Table 2**). Bowel only (BO) transplants appear to have superior 90-day and one-year outcomes compared with multivisceral (MV) or liver, bowel and pancreas (LBP) transplants and modified multivisceral (MMV) or bowel and pancreas (BP) transplants in the adult analyses (**Table 3**). When analysed out to five years post-transplant, modified multivisceral (MMV) or bowel and pancreas (BP) transplants appeared to have superior outcomes. Please note that there were too few paediatric BP or MMV transplants to be included in **Table 2** and **Figure 2**.
 - Survival estimates by era have been removed as comparisons are not significant.
 - One-year conditional patient survival estimates are shown in **Tables 5-7**. For these analyses, only patients who were known to have survived to one-year post-transplant are included. At each time point survival was not significantly different between adult and paediatric recipients (**Table 5**). For paediatrics, bowel only (BO) transplants appear to have superior outcomes compared with multivisceral (MV) or liver, bowel and pancreas (LBP) transplants, when analysed out to five years post-transplant (**Table 6**). For adults, modified multivisceral (MMV) or bowel and pancreas (BP) transplants appear to have superior five-year outcomes compared with bowel only (BO), multivisceral (MV) or liver, bowel and pancreas (LBP) transplants (**Table 7**).
4. Additional information:
 - There have been seven super-urgent intestinal transplants performed in the UK to date in six different patients, with the last occurring in November 2017. No further deaths for these patients have been recorded since last report, details can be found in **Table 8 (removed as patient identifiable)**.

- There have been 28 transplants including abdominal wall in the time period into 27 different adult patients: 16 bowel only and 12 MMV¹. Oxford performed 27 (96%) of these transplants with the remaining one at Cambridge. No further deaths for these patients have been recorded since last report. **Figure 4** and **Table 4** shows the Kaplan-Meier estimates for abdominal wall recipients where survival data are available (N=26), which is similar to the 5 year rate for all adult patients (**Table 1**).
- A variety of causes of death have been reported to the UKTR for the 95 patients who are deceased within 10 years following intestinal transplantation (**Table 9** and **Table 10, both removed as patient identifiable**).
- Of the 246 transplants considered, intestinal graft function status is available for 224 (91%). Of these, 37 (17%) have graft failure reported, with 15 alive at last report (10 without re-transplant). **Table 11 (removed as patient identifiable)** shows the reasons reported for graft failure for the 37 cases.

ACTION

5. 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.
6. Members are asked to consider the definition of graft failure which can be consistently applied. An agreed definition is required before graft survival rates can be considered in future reporting.

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¹ In addition, we are aware of at least two cases of abdominal wall only registrations in the time period. Transplant and outcome data are not available for this type of transplants in the UKTR.

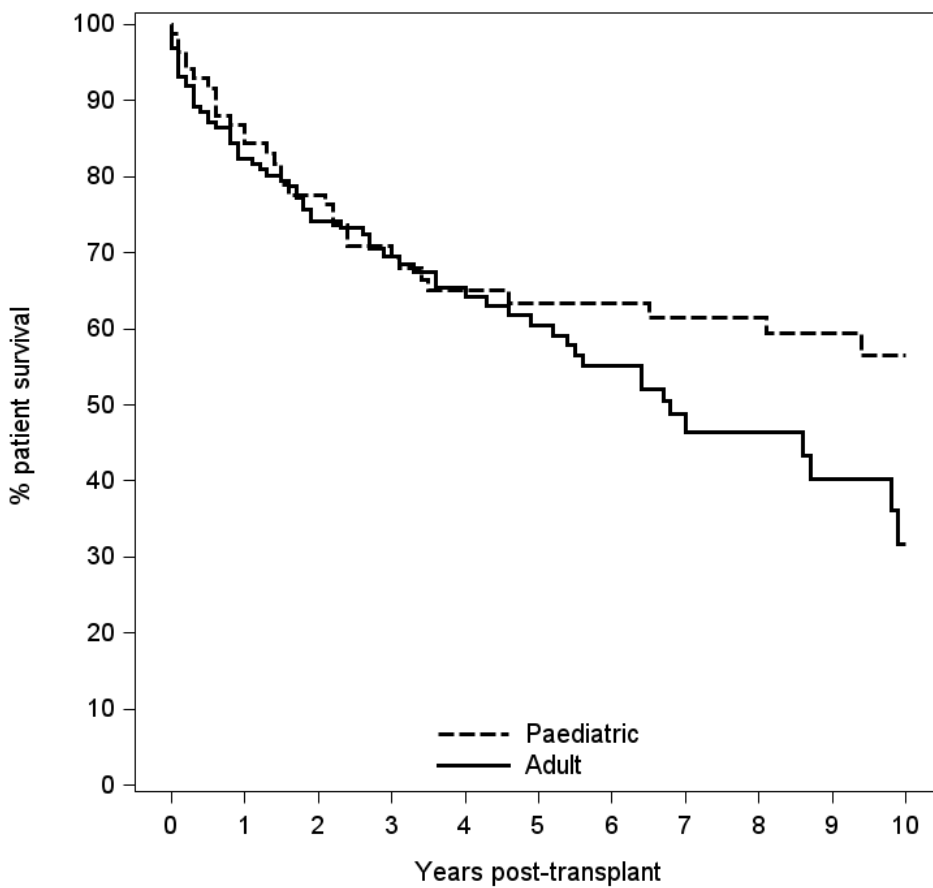
ALL PATIENTS

Table 1 Patient survival for first intestinal transplants between 1 January 2006 and 31 December 2021, by age group

Age group	No. of patients	% 90 day survival (95% CI)		% 1 year survival (95% CI)		% 5 year survival (95% CI)		% 10 year survival (95% CI)	
Paediatric	86	94.1	86.4 – 97.5	85.6	76.1 – 91.6	63.4	51.5 – 73.2	56.5	43.3 – 67.7
Adult	160	91.9	86.4 – 95.2	82.4	75.4 – 87.6	60.5	50.9 – 68.8	31.7	18.2 – 46.1
Log-rank p-value		0.51		0.50		0.70		0.12	

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.

Figure 1 10 year patient survival following intestinal transplantation, by age group



Paediatric	86	67	38	15
Adult	160	113	46	7

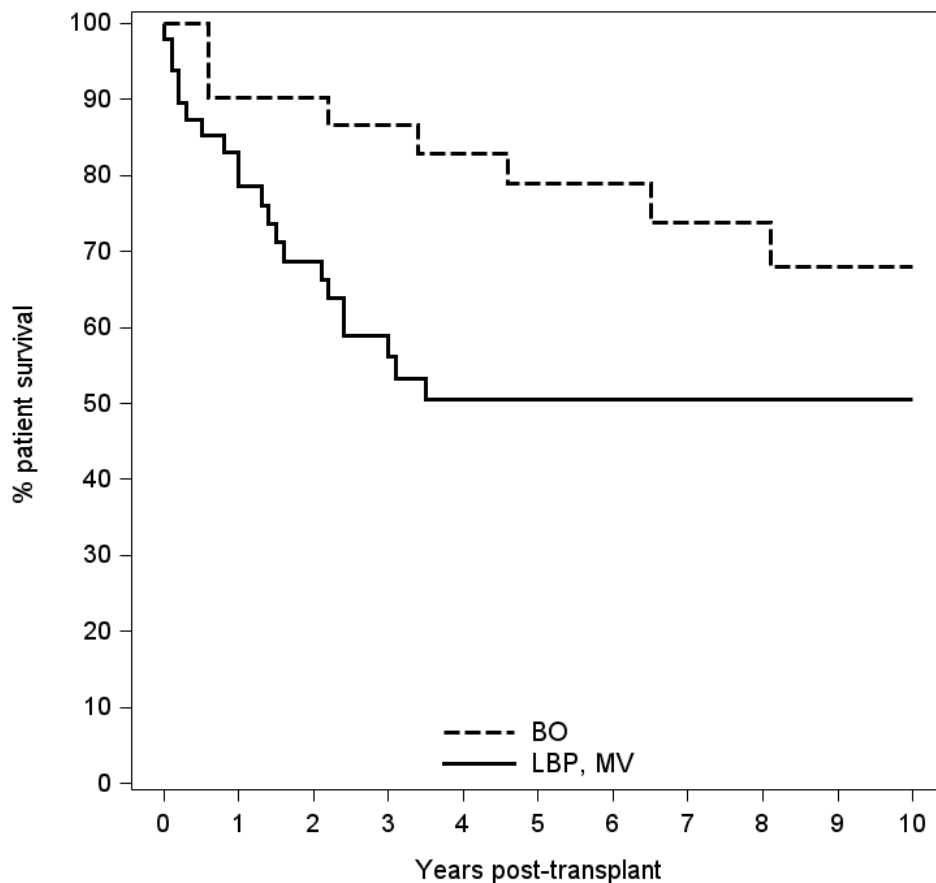
PAEDIATRIC PATIENTS

Table 2 Paediatric patient survival for first intestinal transplants between 1 January 2006 and 31 December 2021, by transplant type

Transplant type	No. of patients	% 90 day survival (95% CI)		% 1 year survival (95% CI)		% 5 year survival (95% CI)		% 10 year survival (95% CI)	
BO	33	100	-	90.3	72.9 – 96.8	79.0	58.9 – 90.0	68.1	44.9 – 83.1
LBP, MV	48	89.5	76.6 – 95.5	80.9	66.4 – 89.6	50.5	34.4 – 64.6	50.5	34.4 – 64.6
Log-rank p-value		0.06		0.2		0.01		0.04	

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.

Figure 2 10 year paediatric patient survival following intestinal transplantation, by transplant type



BO	33	27	19	4
LBP, MV	48	35	15	11

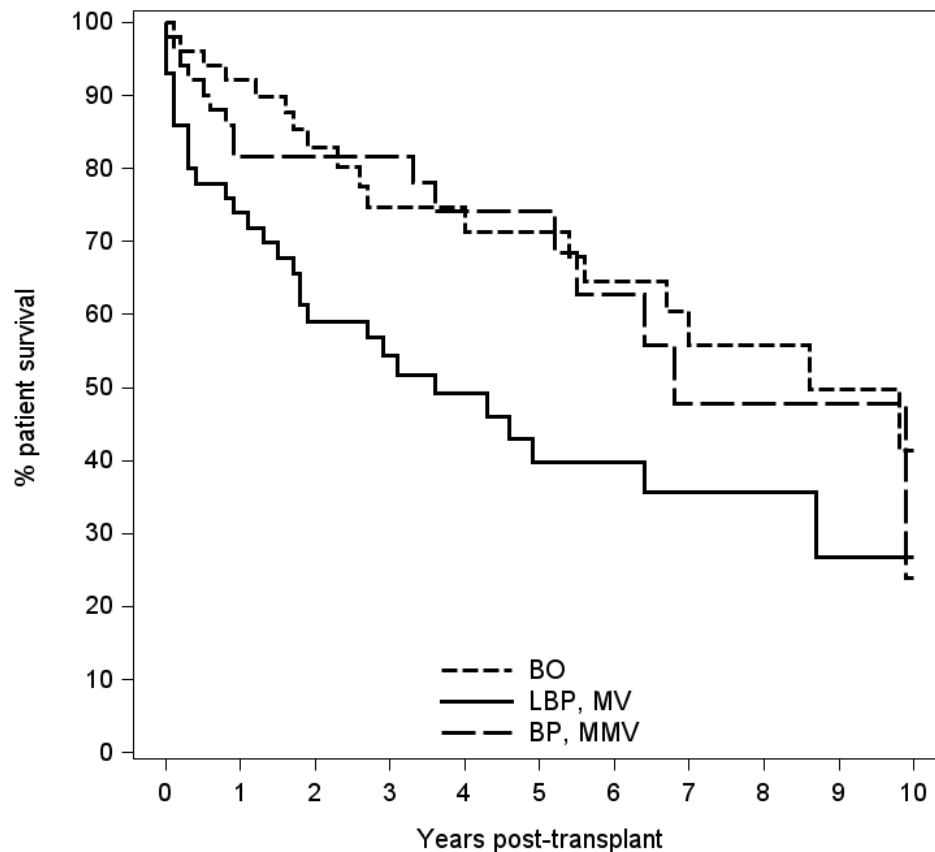
ADULT PATIENTS

Table 3 Adult patient survival for first intestinal transplants between 1 January 2006 and 31 December 2021, by transplant type

Transplant type	No. of patients	% 90 day survival (95% CI)		% 1 year survival (95% CI)		% 5 year survival (95% CI)		% 10 year survival (95% CI)	
BO	52	96.2	85.5 – 99.0	92.1	80.3 – 97.0	71.4	54.5 – 82.9	41.4	20.0 – 61.6
LBP, MV	57	86.0	73.9 – 92.7	73.9	59.8 – 83.7	39.7	24.8 – 54.3	26.8	10.4 – 46.5
BP, MMV	51	94.1	82.9 – 98.1	81.6	67.6 – 90.0	74.2	57.1 – 85.3	23.9	1.8 – 59.9
Log-rank p-value		0.1		0.04		0.001		0.01	

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.

Figure 3 10 year adult patient survival following intestinal transplantation, by transplant type



BO	52	42	21	4
LBP, MV	57	36	12	2
BP, MMV	51	35	13	1

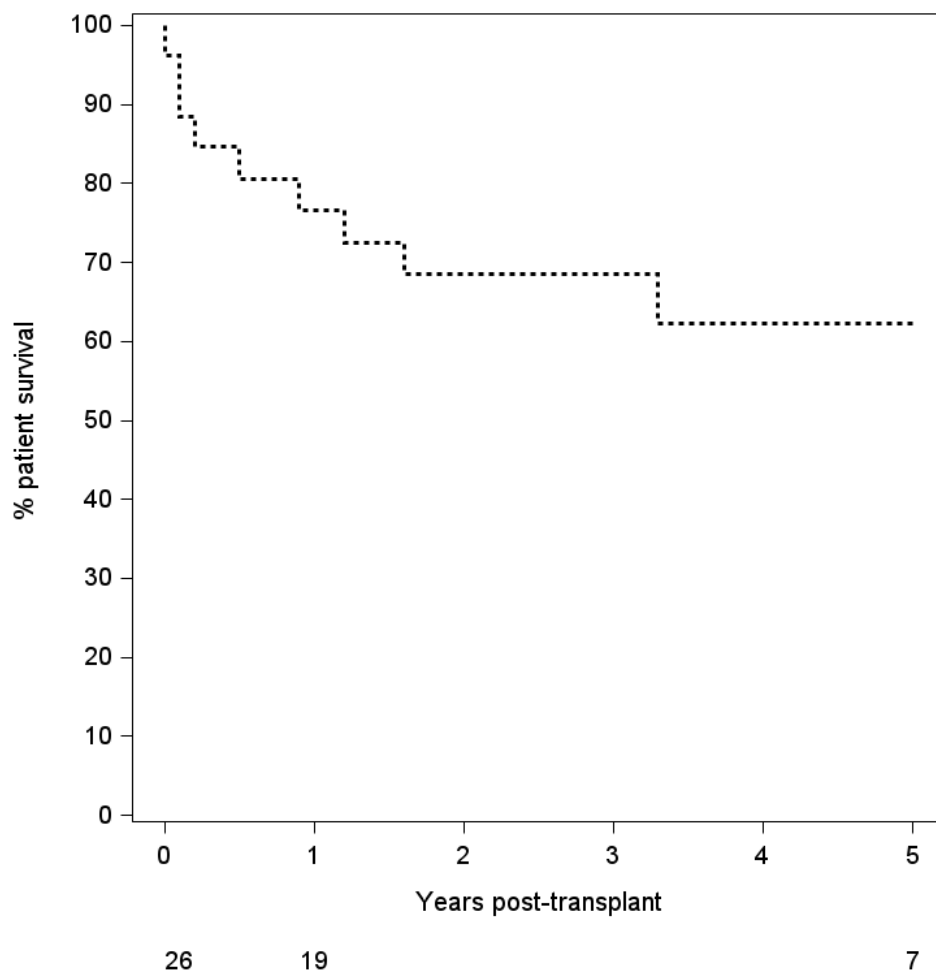
ABDOMINAL WALL PATIENTS

Table 4 Patient survival for first intestinal transplants containing abdominal wall, between 1 January 2006 and 31 December 2021

No. of patients	% 90 day survival (95% CI)		% 1 year survival (95% CI)		% 5 year survival (95% CI)	
26	84.6	64.0 – 93.9	76.6	55.1 – 88.7	62.3	39.1 – 78.7

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 4 5 year adult patient survival following abdominal wall transplantation



CONDITIONAL SURVIVAL POST ONE YEAR TRANSPLANT

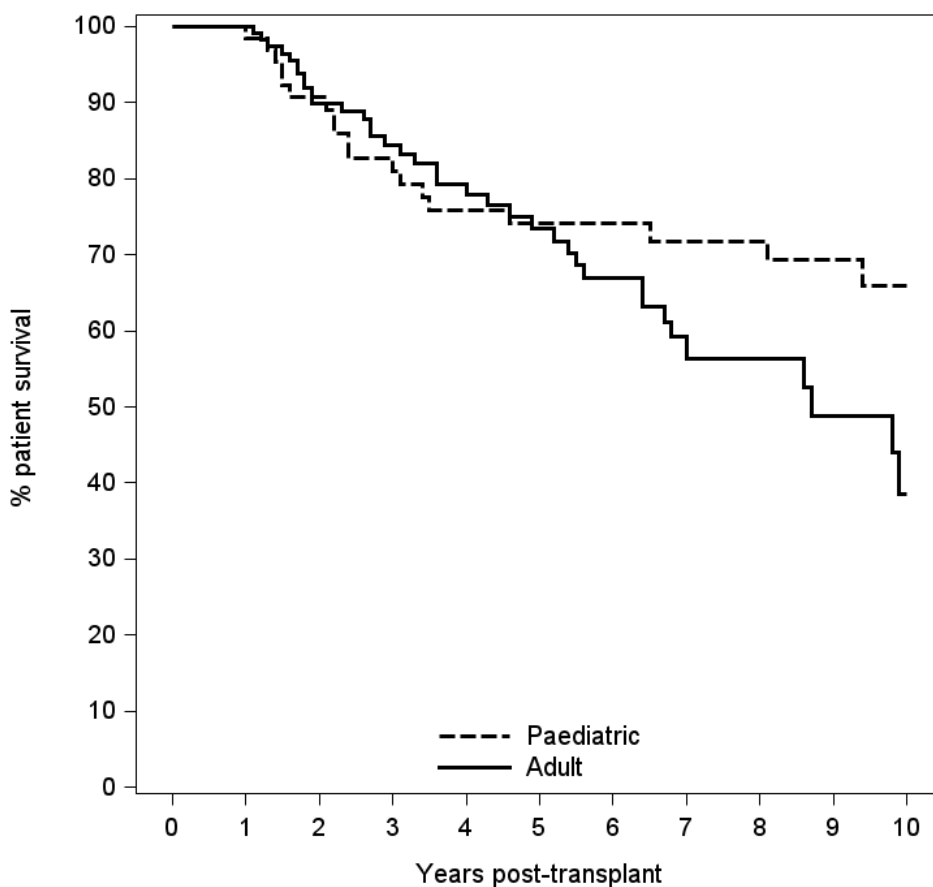
ALL PATIENTS

Table 5 Patient survival for first intestinal transplants, conditional on surviving to one year post-transplant. Transplants between 1 January 2006 and 31 December 2021, by age group

Age group	No. of patients	% 5 year survival (95% CI)		% 10 year survival (95% CI)	
Paediatric	67	74.1	61.2 – 83.3	66.0	51.1 – 77.3
Adult	113	73.4	62.6 – 81.6	38.5	21.8 – 54.9
Log-rank p-value		0.91		0.14	

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.

Figure 5 10 year patient survival following intestinal transplantation, by age group



Paediatric	67	67	38	15
Adult	113	113	46	7

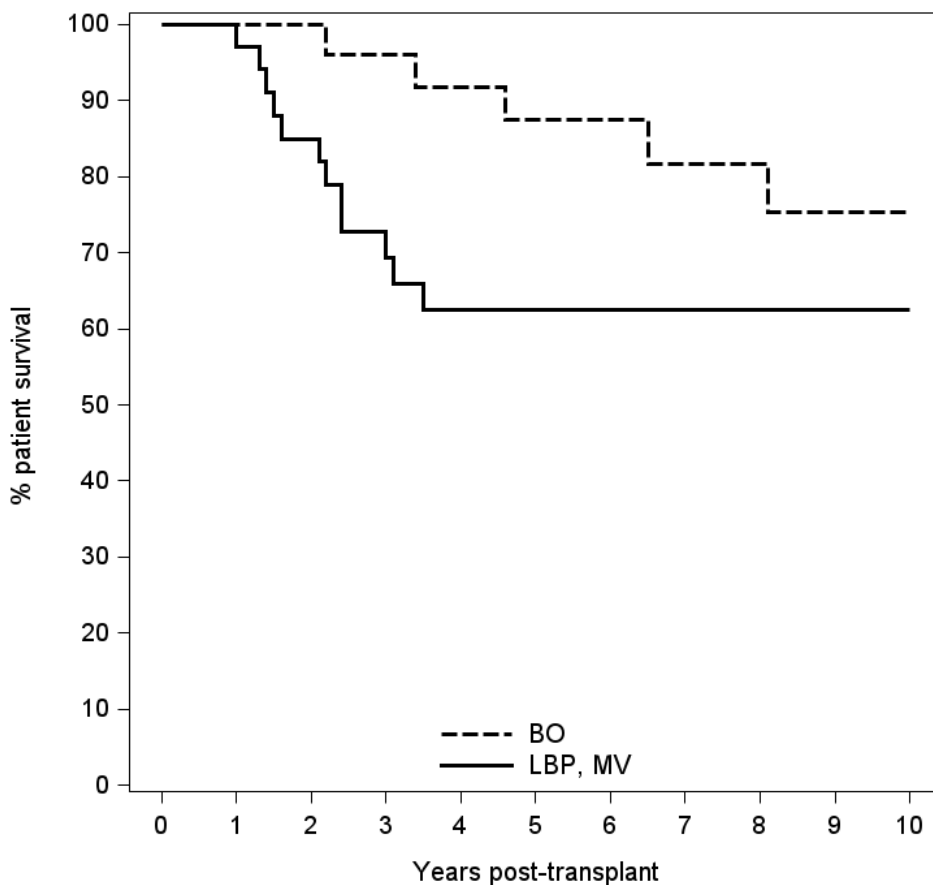
PAEDIATRIC PATIENTS

Table 6 Paediatric patient survival for first intestinal transplants, conditional on surviving to one year post-transplant. Transplants between 1 January 2006 and 31 December 2021, by transplant type

Transplant type	No. of patients	% 5 year survival (95% CI)		% 10 year survival (95% CI)	
BO	27	87.5	65.9 – 95.8	75.3	49.6 – 89.2
LBP, MV	35	62.4	43.3 – 76.8	62.4	43.3 – 76.8
Log-rank p-value		0.02		0.10	

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.

Figure 6 10 year paediatric patient survival following intestinal transplantation, by transplant type



BO	27	27	19	4
LBP, MV	35	35	15	11

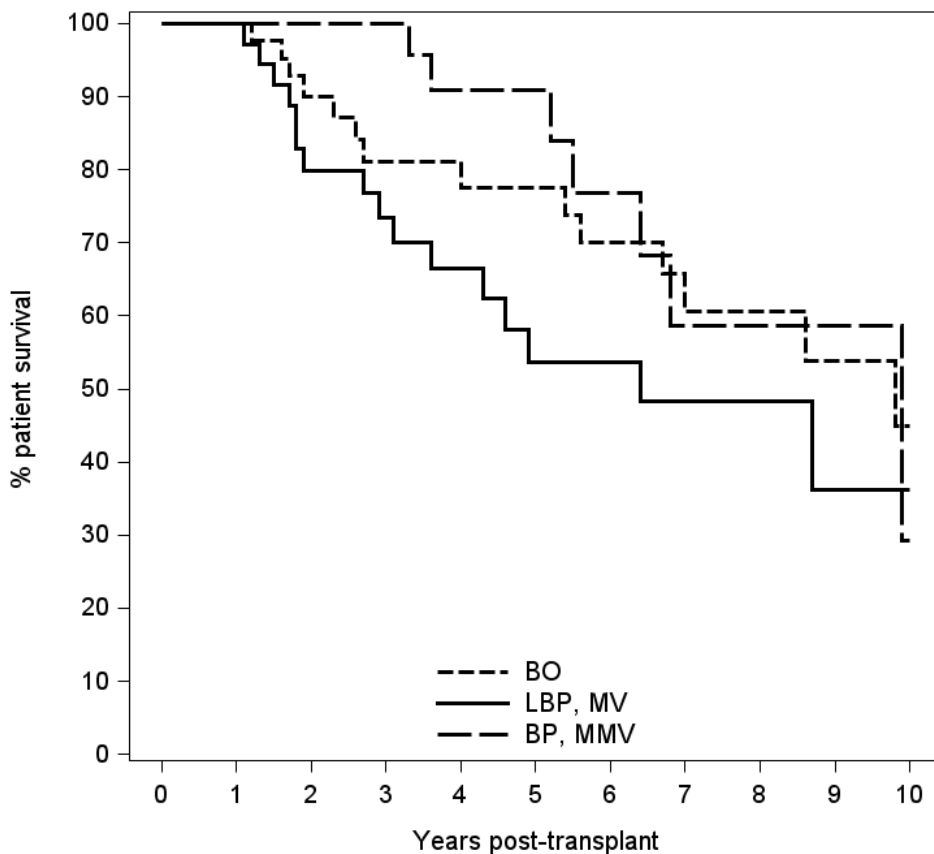
ADULT PATIENTS

Table 7 Adult patient survival for first intestinal transplants, conditional on surviving to one year post-transplant. Transplants between 1 January 2006 and 31 December 2021, by transplant type

Transplant type	No. of patients	% 5 year survival (95% CI)		% 10 year survival (95% CI)	
BO	42	77.5	59.5 – 88.2	44.9	21.5 – 66.0
LBP, MV	36	53.7	33.8 – 70.0	36.3	13.4 – 60.0
BP, MMV	35	90.9	68.1 – 97.6	29.3	1.8 – 68.8
Log-rank p-value		0.005		0.12	

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.

Figure 7 10 year adult patient survival following intestinal transplantation, by transplant type



BO	42	42	21	4
LBP, MV	36	36	12	2
BP, MMV	35	35	13	1