Survival Rates Following Transplantation

This chapter shows graft survival rates over time for kidney and pancreas transplants, and patient survival estimates for kidney, pancreas, cardiothoracic, liver and intestinal transplants, performed in the UK. Separate estimates are presented for adult and paediatric patients (using organ specific age definitions) and for transplants from donors after brain death and donors after circulatory death.

In all cases, the Kaplan-Meier estimate of the survivor function was used to provide the survival rate and groups (years) were compared using the log-rank test. The analyses do not take account of risk factors which may change over time. Graft survival is defined as time from transplant to graft failure, censoring for death with a functioning graft and grafts still functioning at time of analysis. Patient survival is defined as time from transplant to patient death, censoring for patients still alive at time of analysis. Both analyses consider only first transplants.

11.1 Kidney graft and patient survival

11.1.1 Adult kidney recipients - donor after brain death (DBD)

Figure 11.1 shows long-term graft survival in adult (≥18 years) recipients for first kidney only transplant from donors after brain death. **Table 11.1** shows the graft survival estimates and confidence intervals for one, two, five and ten years post-transplant. There have been significant improvements in one year survival over the time periods shown, p=0.01. **Table 11.2** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There were no statistically significant changes in patient survival over time (p>0.3).

Figure 11.1 Long-term graft survival after first adult kidney only transplant from donors after brain death, 1 January 2004 – 31 December 2016

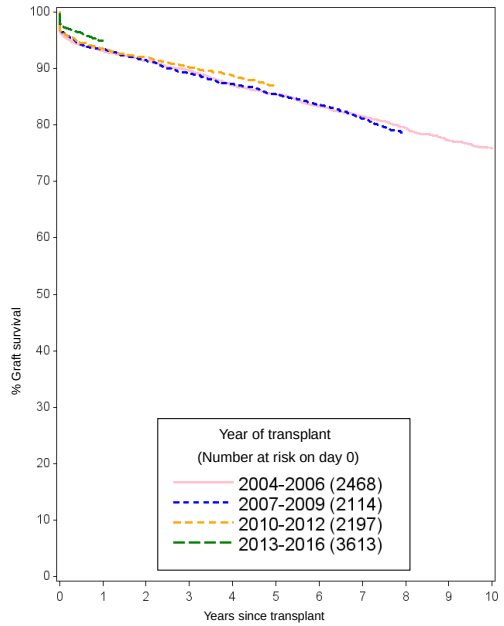

Table 11.1 Graft survival after first adult kidney only transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	2468	93	(92-94)	91	(90-92)	85	(84-87)	76	(74-78)
2007-2009	2114	93	(92-94)	91	(90-93)	85	(84-87)		
2010-2012	2197	93	(92-94)	92	(91-93)	87	(85-88)		
2013-2016	3613	95	(94-96)						

Table 11.2 Patient survival after first adult kidney only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	2471	97	(96-97)	95	(94-96)	90	(88-91)	76	(75-78)
2007-2009	2114	96	(95-97)	95	(93-95)	89	(88-91)		
2010-2012	2198	96	(96-97)	94	(93-95)	88	(87-90)		
2013-2016	3614	97	(96-97)						

11.1.2 Adult kidney recipients - donor after circulatory death (DCD)

Long-term graft survival in adult recipients for kidney transplants from donors after circulatory death is shown in **Figure 11.2**. **Table 11.3** shows the graft survival estimates and confidence intervals for one, two, five and ten years post-transplant. There has been significant variation in one year survival over the time periods shown, p=0.007. One year graft and patient survival are comparable for DBD and DCD donor transplants in the most recent time periods. **Table 11.4** shows the patient survival estimates and confidence intervals for each time period analysed. There was a borderline statistically significant decline in patient survival over time at one years post-transplant (p=0.07).

Figure 11.2 Long-term graft survival after first adult kidney only transplant from donors after circulatory death, 1 January 2004 – 31 December 2016

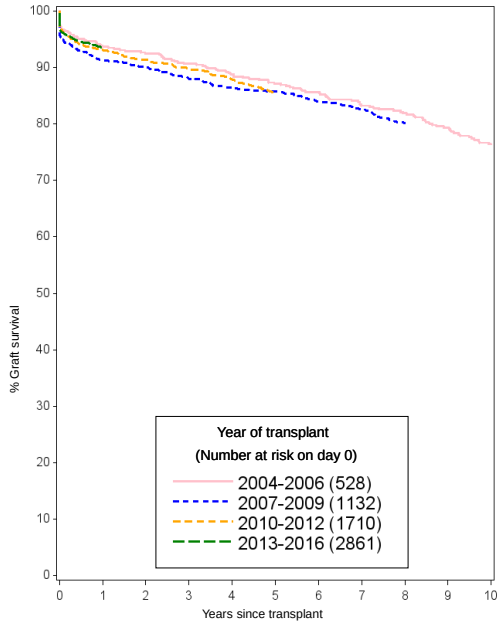

Table 11.3 Graft survival after first adult kidney only transplant from a DCD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	528	94	(91-96)	92	(90-94)	87	(84-90)	76	(72-80)
2007-2009	1132	91	(89-93)	90	(88-92)	86	(83-88)		
2010-2012	1710	93	(92-94)	91	(90-93)	86	(84-87)		
2013-2016	2861	94	(93-94)						

Table 11.4 Patient survival after first adult kidney only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	529	95	(93-96)	93	(91-95)	86	(83-89)	72	(68-76)
2007-2009	1132	96	(94-97)	94	(93-95)	88	(86-90)		
2010-2012	1710	95	(94-96)	93	(92-94)	85	(83-87)		
2013-2016	2862	97	(96-97)						

11.1.3 Adult kidney recipients - living donor

Long-term graft survival in adult recipients for living donor kidney transplants in the UK is shown in **Figure 11.3**. **Table 11.5** shows graft survival estimates and confidence intervals for each time period analysed. There has been a significant improvement in one year survival over the time periods shown, p=0.02. **Table 11.6** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There were no statistically significant changes in patient survival over time (p>0.1).

Figure 11.3 Long-term graft survival after first adult living donor kidney only transplant in the UK, 1 January 2004 – 31 December 2016

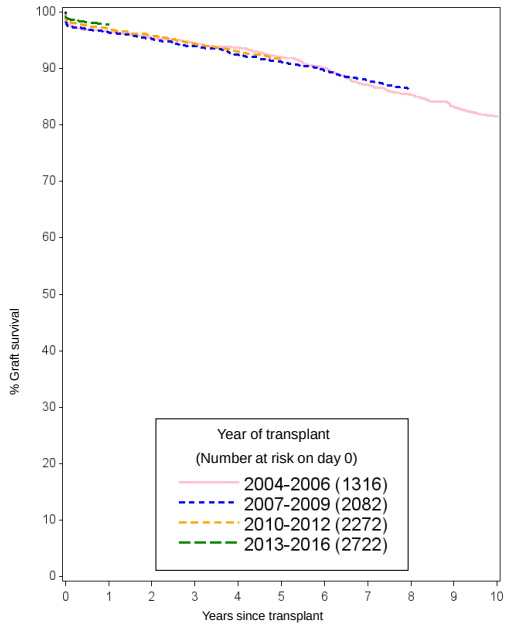

Table 11.5 Graft survival after first adult living donor kidney transplant

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	1316	96	(95-97)	95	(94-96)	92	(90-93)	82	(79-84)
2007-2009	2082	96	(95-97)	95	(94-96)	91	(90-92)		
2010-2012	2272	97	(96-98)	96	(95-97)	92	(90-93)		
2013-2016	2722	98	(97-98)						

Table 11.6 Patient survival after first adult living donor kidney transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	1316	99	(98-99)	98	(97-99)	96	(95-97)	91	(89-93)
2007-2009	2082	99	(98-99)	98	(97-99)	95	(94-96)		
2010-2012	2271	99	(98-99)	98	(97-98)	94	(93-95)		
2013-2016	2722	99	(99-99)						

11.1.4 Paediatric kidney recipients - donor after brain death (DBD)

Figure 11.4 shows long-term graft survival in paediatric (<18 years) recipients for first kidney only transplants from donors after brain death. Graft survival estimates and confidence intervals are shown for each time period analysed in **Table 11.7**. There has been a significant improvement in one year survival over the time periods shown, p=0.01. **Table 11.8** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There were no statistically significant changes in patient survival over time (p>0.1). There were insufficient paediatric recipients of first kidney only transplants from donors after circulatory death to permit reliable analysis.

Figure 11.4 Long-term graft survival after first paediatric kidney only transplant from donors after brain death, 1 January 2004 – 31 December 2016

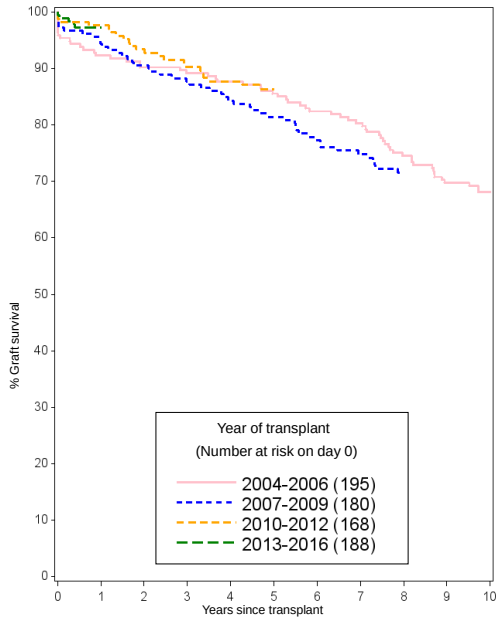

Table 11.7 Graft survival after first paediatric kidney only transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	195	92	(88-95)	90	(85-94)	86	(80-90)	68	(61-74)
2007-2009	180	94	(90-97)	91	(85-94)	81	(75-86)		
2010-2012	168	98	(94-99)	93	(88-96)	86	(80-91)		
2013-2016	188	97	(93-99)						

Table 11.8 Patient survival after first paediatric kidney only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	196	99	(96-100)	99	(96-100)	99	(96-100)	98	(94-99)
2007-2009	180	99	(96-100)	99	(96-100)	98	(95-99)		
2010-2012	168	99	(96-100)	99	(95-100)	95	(91-98)		
2013-2016	188	99	(96-100)						

11.1.5 Paediatric kidney recipients - living donor

Long-term graft survival in paediatric recipients for living donor kidney transplants in the UK is shown in **Figure 11.5**. **Table 11.9** shows graft survival estimates and confidence intervals for each time period analysed. There has been a significant change in five year survival over the time periods shown, p=0.02. **Table 11.10** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There has been a significant change in five year survival over the time periods shown, p=0.05.

Figure 11.5 Long-term graft survival after first paediatric living donor kidney only transplant in the UK, 1 January 2004 – 31 December 2016

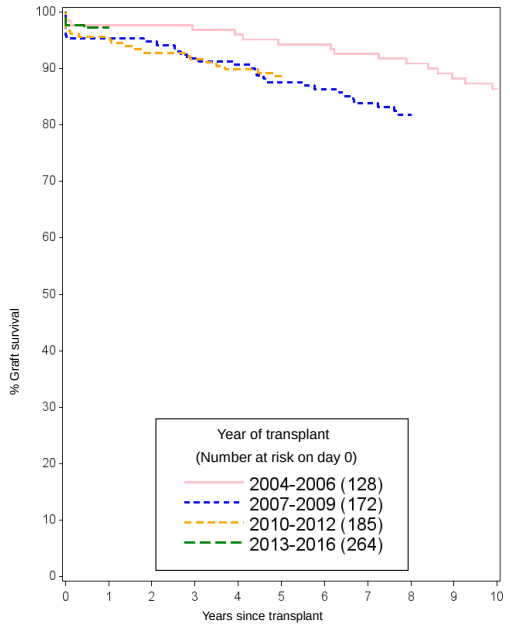

Table 11.9 Graft survival after first paediatric living donor kidney transplant

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	128	98	(93-99)	98	(93-99)	94	(88-97)	86	(79-91)
2007-2009	172	95	(91-98)	95	(90-97)	88	(82-92)		
2010-2012	185	96	(92-98)	93	(88-96)	89	(83-92)		
2013-2016	264	97	(94-99)						

Table 11.10 Patient survival after first paediatric living donor kidney transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	128	100	(-)	100	(-)	100	(-)	98	(93-100)
2007-2009	172	99	(95-100)	99	(95-100)	97	(93-99)		
2010-2012	185	99	(96-100)	99	(96-100)	99	(96-100)		
2013-2016	264	99	(96-100)						

11.2 Pancreas graft and patient survival

11.2.1 Simultaneous kidney/pancreas transplants - donor after brain death (DBD)

Figure 11.6 shows long-term graft survival in recipients receiving their first simultaneous kidney/pancreas (SPK) transplant performed from donors after brain death. Graft and patient survival estimates and confidence intervals are shown at one, two, five and ten years post-transplant in **Table 11.11** and **Table 11.12** respectively. Results relate to adults only as there are no paediatric pancreas transplant recipients. There has been no significant variation in graft survival over time (p>0.2). Differences in patient survival are also not significant over time (p>0.3).

Figure 11.6 Long-term graft survival after first SPK transplant from donors after brain death, 1 January 2004 – 31 December 2016

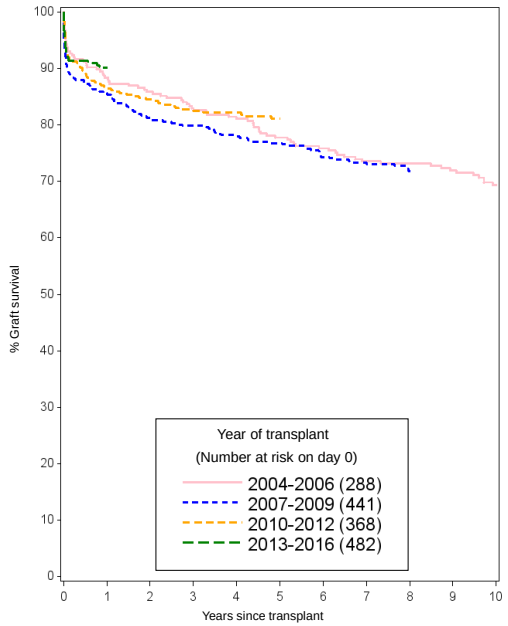

Table 11.11 Graft survival after first SPK transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	288	88	(84-92)	86	(81-89)	78	(72-82)	69	(63-75)
2007-2009	441	86	(82-89)	81	(77-84)	77	(73-80)		
2010-2012	368	86	(83-90)	85	(80-88)	81	(77-85)		
2013-2016	482	90	(87-92)						

Table 11.12 Patient survival after first SPK transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	290	94	(91-96)	92	(89-95)	88	(83-91)	74	(68-79)
2007-2009	442	96	(94-98)	94	(92-96)	89	(86-92)		
2010-2012	368	96	(94-98)	94	(90-96)	87	(83-90)		
2013-2016	484	97	(95-98)						

11.2.2 Simultaneous kidney/pancreas transplants - donor after circulatory death (DCD)

The majority of simultaneous kidney/pancreas (SPK) transplants from a DCD have been performed since 1 January 2007, so there are insufficient data available to analyse long-term survival. **Figure 11.7** shows pancreas graft survival in recipients receiving their first SPK transplant performed from donors after circulatory death, 2009-2011 and 2012-2015. Graft and patient survival estimates and confidence intervals are shown at one, two and three years in **Table 11.13** and **Table 11.14** respectively. Results are for adult patients only.

Figure 11.7 Pancreas graft survival after first SPK transplant from donors after circulatory death, 1 January 2010 – 31 December 2016

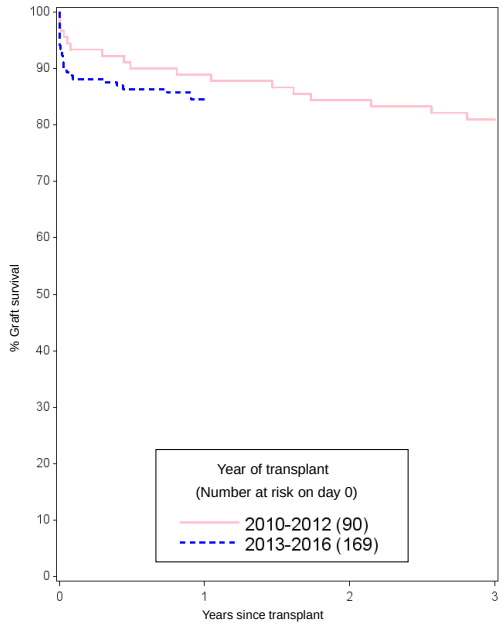

Table 11.13 Graft survival after first SPK transplant from a DCD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Three year	
2010-2012	90	89	(80-94)	84	(75-90)	81	(71-88)
2013-2016	169	85	(78-89)				

Table 11.14 Patient survival after first SPK transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Three year	
2010-2012	90	98	(91-99)	95	(88-98)	94	(87-98)
2013-2016	169	99	(95-100)				

11.2.3 Pancreas only transplants - donor after brain death (DBD)

Figure 11.8 shows long-term graft survival in recipients receiving their first pancreas only transplant performed from donors after brain death. Graft and patient survival estimates and confidence intervals are shown at one, two, five and ten years in **Table 11.15** and **Table 11.16** respectively. Results are for adult patients only. There were no statistically significant differences in graft or patient survival over time (p>0.6 and p>0.1).

Figure 11.8 Long-term graft survival after pancreas only transplant from donors after brain death, 1 January 2004 – 31 December 2016

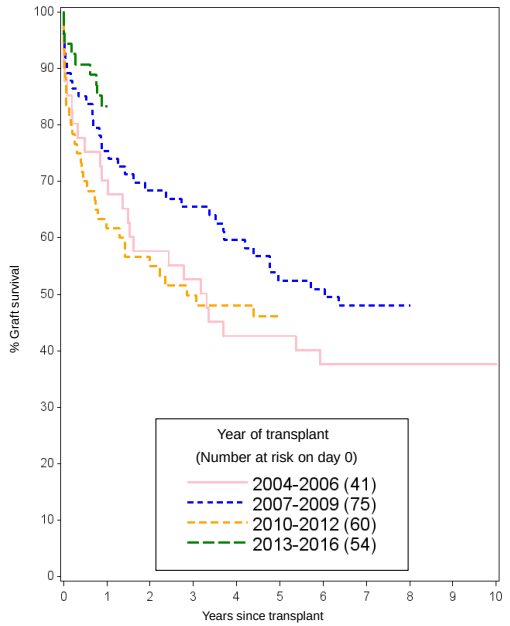

Table 11.15 Graft survival after first pancreas only transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	41	70	(53-82)	58	(41-71)	43	(27-57)	38	(23-52)
2007-2009	75	75	(64-84)	68	(56-78)	52	(40-63)		
2010-2012	60	62	(48-73)	55	(42-66)	46	(33-58)		
2013-2016	54	83	(70-91)						

Table 11.16 Patient survival after first pancreas only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	42	98	(84-100)	95	(81-99)	95	(81-99)	57	(38-73)
2007-2009	76	95	(86-98)	93	(84-97)	87	(76-93)		
2010-2012	60	98	(86-100)	96	(84-99)	74	(56-85)		
2013-2016	55	96	(86-99)						

11.2.4 Pancreas only transplants - donor after circulatory death (DCD)

Figure 11.9 shows pancreas graft survival in recipients receiving their first pancreas only transplant performed from donors after circulatory death, 2009-2011 and 2012-2015. Graft and patient survival estimates and confidence intervals are shown at one, two and three years in **Table 11.17** and **Table 11.18** respectively. Results are for adult patients only.

Figure 11.9 Pancreas graft survival after pancreas only transplant from donors after circulatory death, 1 January 2010 – 31 December 2016

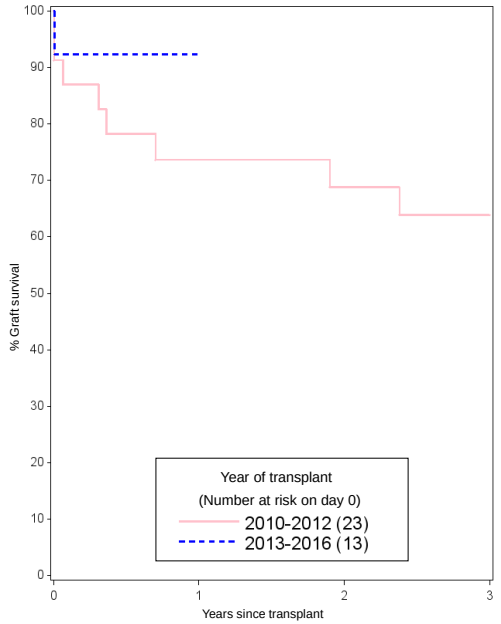

Table 11.17 Graft survival after first pancreas only transplant from a DCD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Three year	
2010-2012	23	74	(50-87)	69	(45-84)	64	(40-80)
2013-2016	13	92	(57-99)				

Table 11.18 Patient survival after first pancreas only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Three year	
2010-2012	23	95	(72-99)	95	(72-99)	90	(66-97)
2013-2016	13	100	(-)				

11.3 Cardiothoracic patient survival

11.3.1 Adult heart recipients – donors after brain death (DBD)

Long-term patient survival for adult (≥16 years) recipients after first heart only transplant performed from donors after brain death is shown in **Figure 11.10**. Both urgent and non-urgent patients are included. **Table 11.19** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant for each transplant era. There were no statistically significant differences in patient survival over time (p>0.3).

Figure 11.10 Long-term patient survival after first adult heart only transplant from donors after brain death, 1 January 2004 – 31 December 2016

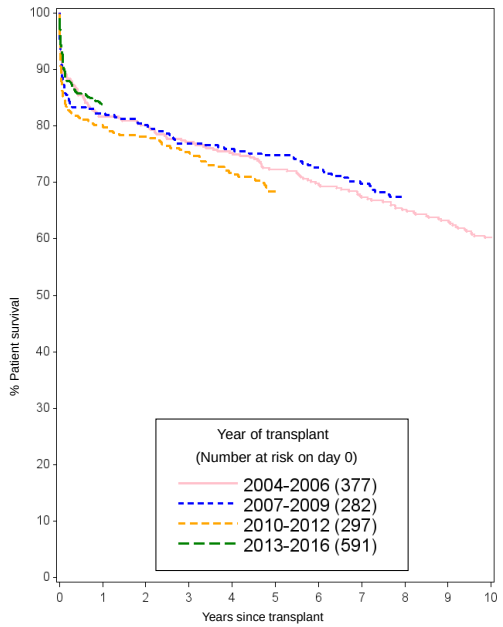

Table 11.19 Patient survival after first adult heart only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	377	82	(77-85)	80	(76-84)	72	(67-77)	60	(55-65)
2007-2009	282	82	(77-86)	80	(75-84)	75	(69-79)		
2010-2012	297	80	(75-84)	78	(73-82)	68	(63-73)		
2013-2016	591	84	(81-87)						

11.3.2 Adult heart-lung block recipients – donors after brain death (DBD)

Patient survival for adult recipients after first heart-lung block transplant from donors after brain death is shown in **Figure 11.11**. Patient survival estimates and confidence intervals for each time period analysed are shown in **Table 11.20**. There is some variation between survival rates across transplant eras, with shorter term outcomes generally seeing an improvement, however these statistics are based on small numbers and are not statistically significantly different (p>0.1).

Figure 11.11 Long-term patient survival after first adult heart/lung block transplant from donors after brain death, 1 January 2004 – 31 December 2016

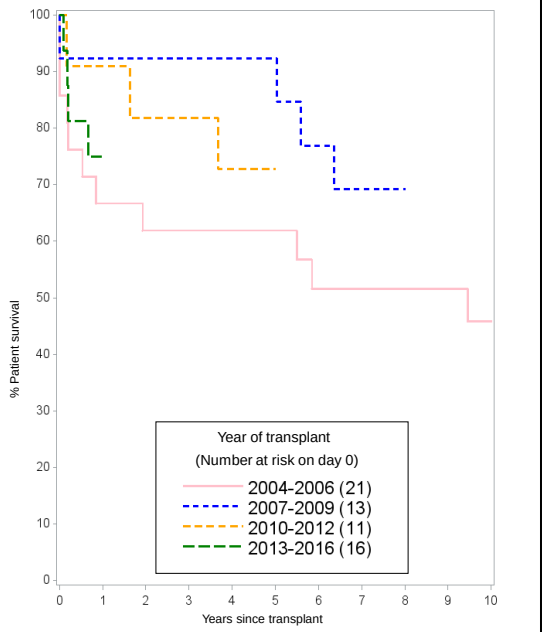

Table 11.20 Patient survival after first adult heart-lung block transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	21	67	(43-83)	62	(38-79)	62	(38-79)	46	(24-66)
2007-2009	13	92	(57-99)	92	(57-99)	92	(57-99)		
2010-2012	11	91	(51-99)	82	(45-95)	73	(37-90)		
2013-2016	16	75	(46-90)						

11.3.3 Adult lung recipients - donors after brain death (DBD)

Patient survival for adult recipients after first lung only transplant from donors after brain death is shown in **Figure 11.12**, with survival estimates and confidence intervals shown in **Table 11.21**. There were no statistically significant differences in patient survival over time (p>0.3).

Figure 11.12 Long-term patient survival after first adult lung only transplant from donors after brain death, 1 January 2004 – 31 December 2016

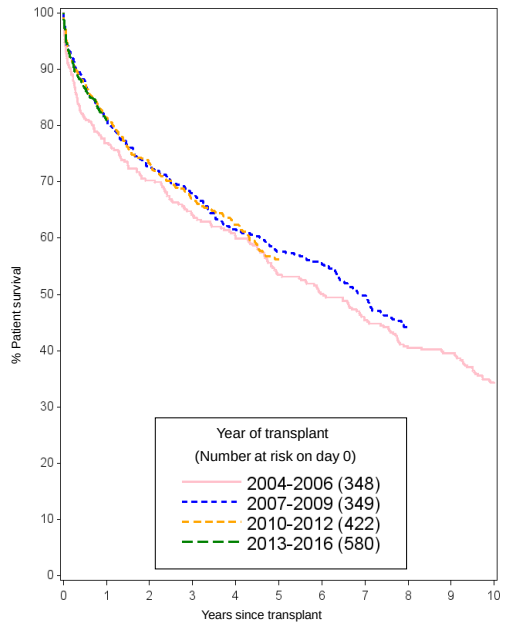

Table 11.21 Patient survival after first adult lung only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	348	77	(72-81)	70	(65-75)	53	(48-59)	34	(29-39)
2007-2009	349	81	(77-85)	73	(67-77)	58	(52-63)		
2010-2012	422	81	(77-85)	73	(69-77)	56	(51-61)		
2013-2016	580	81	(77-84)						

11.3.4 Adult lung recipients - donors after circulatory death (DCD)

The majority of lung transplants from a DCD have been performed since 1 January 2007, so there are insufficient data available to analyse long-term patient survival. Patient survival for adult recipients after first lung only transplant from donors after circulatory death is shown in **Figure 11.13**, with survival estimates and confidence intervals shown in **Table 11.22**.

Figure 11.13 Patient survival after first adult lung only transplant from donors after circulatory death, 1 January 2010 – 31 December 2016

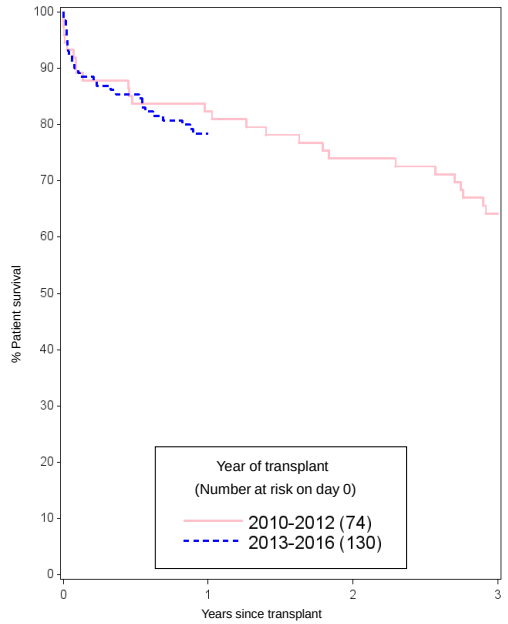

Table 11.22 Patient survival after first adult lung only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Three year	
2010-2012	74	82	(72-89)	74	(62-83)	64	(52-74)
2013-2016	130	78	(70-85)				

11.3.5 Paediatric heart recipients – donors after brain death (DBD)

Long-term patient survival for paediatric recipients after first heart only transplant from donors after brain death is shown in **Figure 11.14**. Both urgent and non-urgent patients are included. **Table 11.23** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There was no statistically significant variation in survival over the time period analysed, p>0.4. The number of heart-lung transplant recipients was too small for analysis.

Figure 11.14 Long-term patient survival after first paediatric heart only transplant from donors after brain death, 1 January 2004 – 31 December 2016

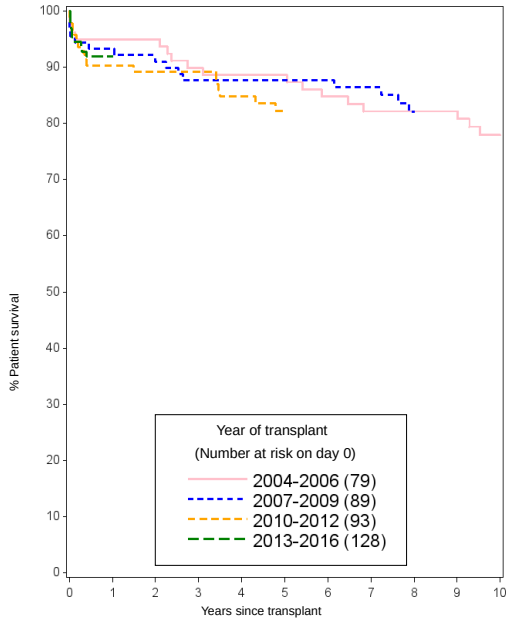

Table 11.23 Patient survival after first paediatric heart only transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	79	95	(87-98)	95	(87-98)	89	(79-94)	78	(67-86)
2007-2009	89	93	(86-97)	91	(83-95)	88	(79-93)		
2010-2012	93	90	(82-95)	89	(81-94)	82	(73-89)		
2013-2016	128	92	(86-96)						

11.3.6 Paediatric lung recipients - donors after brain death (DBD)

Long-term patient survival for paediatric recipients after first lung only transplant from donors after brain death is shown in **Figure 11.15**. **Table 11.24** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There were no statistically significant differences in patient survival over time (p>0.3).

Figure 11.15 Long-term patient survival after first paediatric lung only transplant from donors after brain death, 1 January 2004 – 31 December 2016

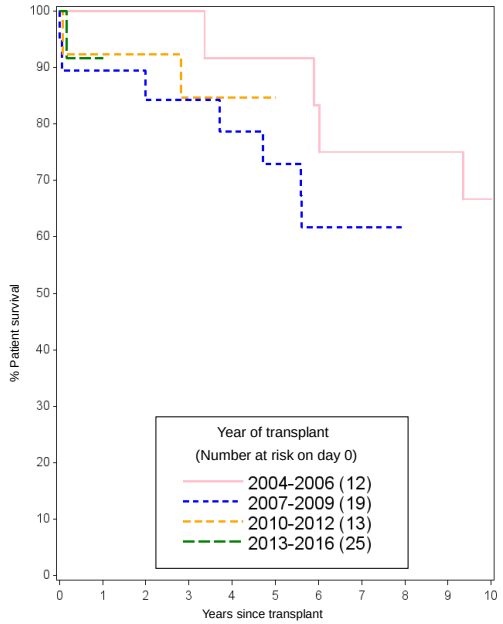

Table 11.24 Patient survival after first paediatric lung only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)							
		One year		Two year		Five year		Ten year	
2004-2006	12	100	(-)	100	(-)	92	(54-99)	67	(34-86)
2007-2009	19	89	(64-97)	84	(59-95)	73	(47-88)		
2010-2012	13	92	(57-99)	92	(57-99)	85	(51-96)		
2013-2016	25	92	(71-98)						

11.4 Liver patient survival

11.4.1 Adult liver recipients - donor after brain death (DBD)

Long-term patient survival for adult (>=17 years) recipients after first elective liver only transplants from donors after brain death is shown in **Figure 11.16**. **Table 11.25** shows patient survival estimates at one, two, five and ten years post-transplant. There have been significant improvements in one, two and five year patient survival, p<0.001 in each case, over the time periods analysed from 2004-2006 to 2013-2016.

Figure 11.16 Long-term patient survival after first elective adult liver only transplant from donors after brain death, 1 January 2004 – 31 December 2016

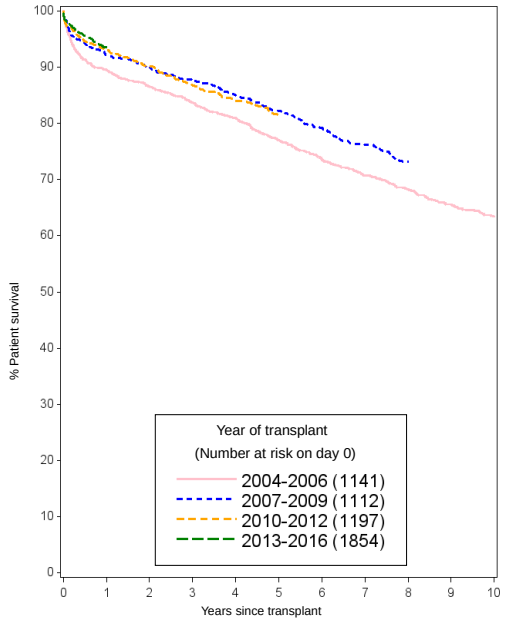

Table 11.25 Patient survival after first elective adult liver only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	1141	90	(88-91)	87	(84-88)	77	(74-79)	63	(60-66)
2007-2009	1112	92	(90-94)	90	(88-92)	82	(80-84)		
2010-2012	1197	93	(91-94)	90	(88-92)	81	(79-83)		
2013-2016	1854	94	(92-95)						

11.4.2 Adult liver recipients - donor after circulatory death (DCD)

Patient survival for adult (>=17 years) recipients after first elective liver only transplants from donors after circulatory death is shown in **Figure 11.17**. Due to small numbers prior to 2006 it is not possible to estimate long term patient survival. **Table 11.26** shows patient survival estimates at one, two and five years post-transplant.

Figure 11.17 Liver patient survival after first elective adult liver only transplant from donors after circulatory death, 1 January 2007 – 31 December 2016

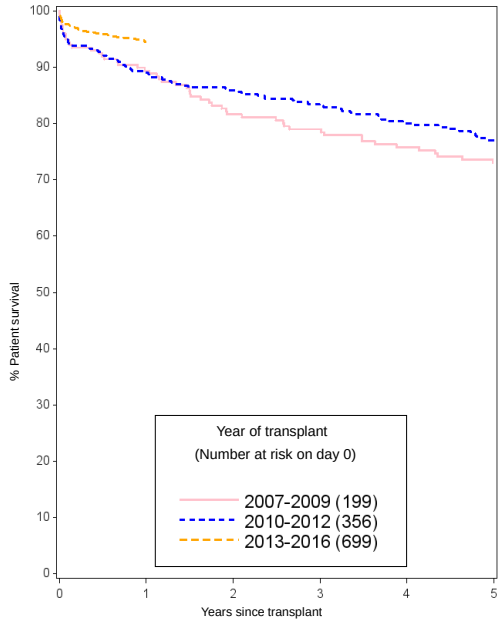

Table 11.26 Patient survival after first elective adult liver only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year	
2007-2009	199	89	(84-93)	82	(75-86)	73	(66-79)
2010-2012	356	89	(85-92)	86	(82-89)	77	(72-81)
2013-2016	699	95	(93-96)				

11.4.3 Paediatric liver recipients - donor after brain death (DBD)

Figure 11.18 and **Table 11.27** show long-term patient survival estimates for first elective liver only transplants from donors after brain death in paediatric (<17 years) recipients. There have been no statistically significant improvements in one, two or five year patient survival over the time period analysed (p>0.5). The number of paediatric transplants from donors after circulatory death was too small to estimate meaningful patient survival.

Figure 11.18 Long-term patient survival after first elective paediatric liver only transplant from donors after brain death, 1 January 2004 – 31 December 2016

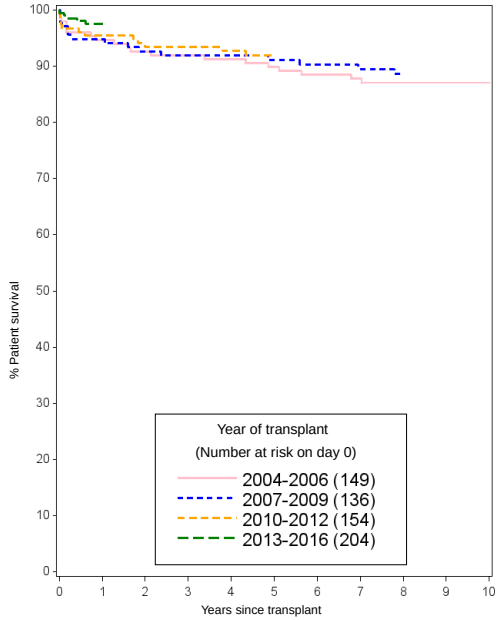

Table 11.27 Patient survival after first elective paediatric liver only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
2004-2006	149	95	(90-97)	93	(87-96)	90	(84-94)	87	(80-92)
2007-2009	136	95	(90-98)	93	(87-96)	91	(85-95)		
2010-2012	154	95	(91-98)	93	(88-96)	92	(86-95)		
2013-2016	204	98	(94-99)						

11.5 Intestinal patient survival

The majority of intestinal transplants have been performed since 1 January 2006, so there are insufficient data available to analyse long-term patient survival. **Figure 11.19** and **Table 11.28** show one-year patient survival estimates for recipients receiving their first intestinal transplant, 2008-2011 and 2012-2015, by recipient age group (adults aged ≥ 18 years).

Figure 11.19 Patient survival after first intestinal graft in the UK, 1 January 2009 – 31 December 2016

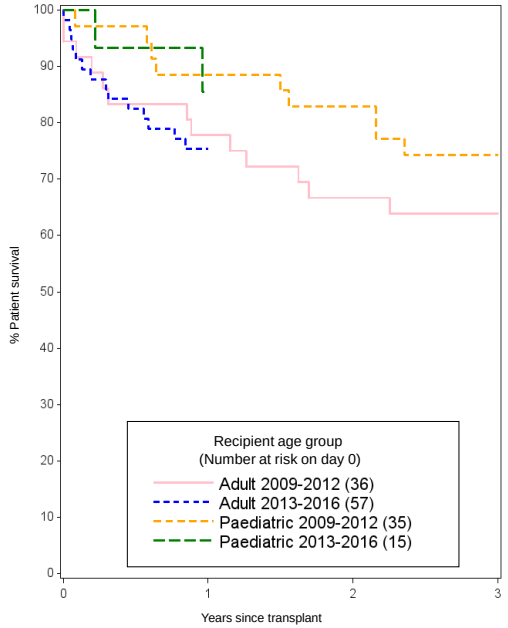

Table 11.28 Patient survival after first intestinal transplant in the UK, 1 January 2009 - 31 December 2016

Recipient age group	No. at risk on day 0	% Patient survival One year	(95% confidence interval)
Adult			
2009-2012	36	78	(60-88)
2013-2016	57	75	(62-85)
Paediatric			
2009-2012	35	89	(72-96)
2013-2016	15	86	(53-96)