



Survival Rates Following Transplantation

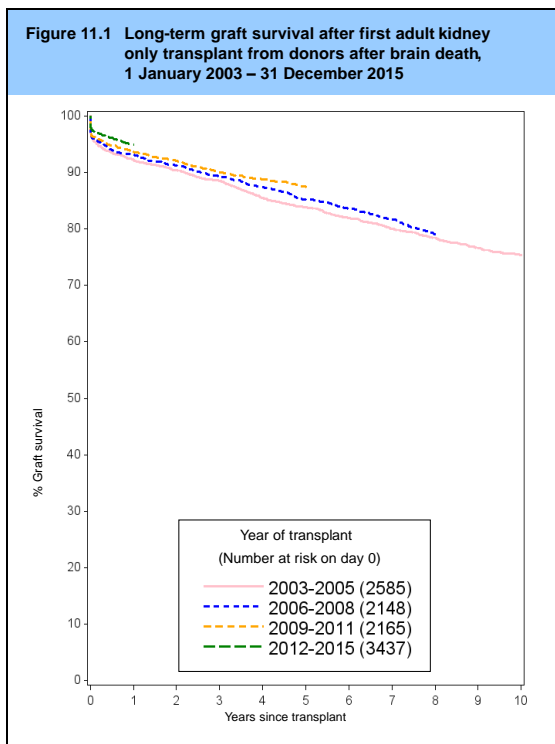
This chapter shows graft survival rates over time for kidney and pancreas transplants, and patient survival estimates for kidney, pancreas, cardiothoracic, liver and intestinal transplants, performed in the UK. Separate estimates are presented for adult and paediatric patients (using organ specific age 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 and five year survival over the time periods shown, $p < 0.01$ in each case. **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 ($p > 0.9$).



Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	2585	92 (91-93)	90 (89-91)	84 (82-85)	75 (74-77)	
2006-2008	2148	93 (92-94)	91 (90-92)	85 (84-87)		
2009-2011	2165	94 (93-95)	92 (91-93)	87 (86-89)		
2012-2015	3437	95 (94-96)				

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)			
		One year	Two year	Five year	Ten year
2003-2005	2588	96 (96-97)	95 (94-95)	89 (88-90)	77 (75-78)
2006-2008	2149	96 (96-97)	95 (94-96)	89 (88-91)	
2009-2011	2165	96 (95-97)	95 (94-95)	90 (88-91)	
2012-2015	3439	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 five years post-transplant ($p=0.06$).

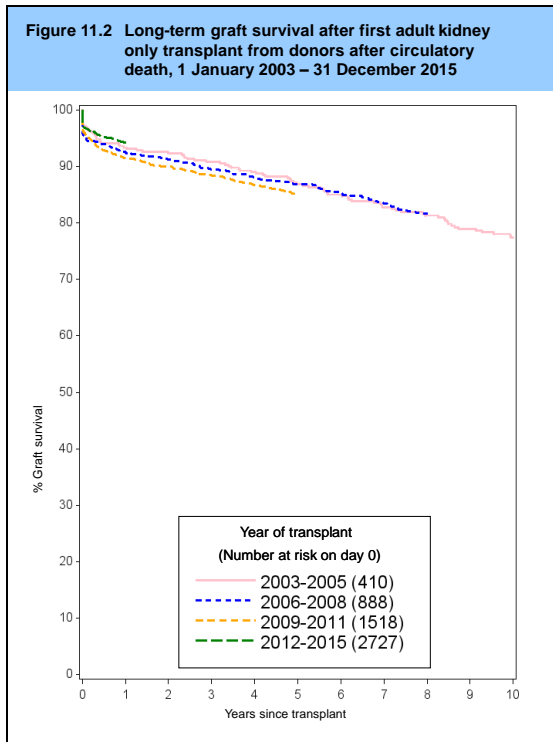
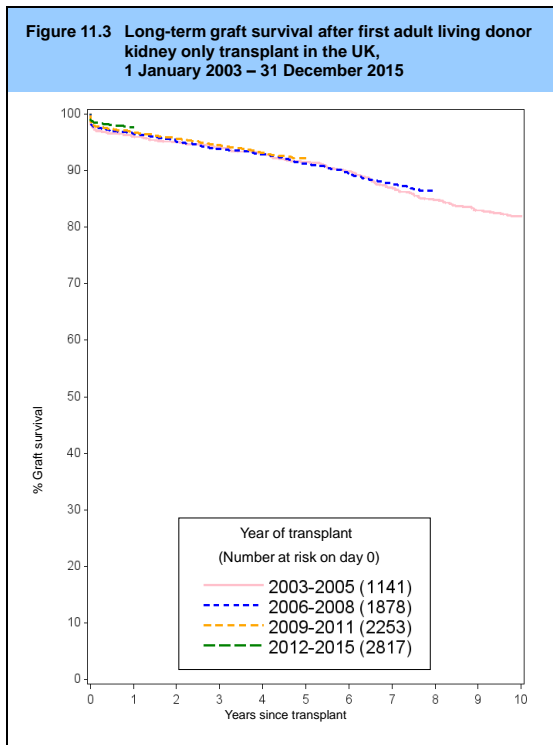


Table 11.3 Graft survival after first adult kidney only transplant from a DCD								
Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)						
		One year	Two year	Five year	Ten year			
2003-2005	410	93 (90-95)	92 (89-95)	87 (83-90)	77 (73-81)			
2006-2008	888	93 (91-94)	91 (89-93)	87 (84-89)				
2009-2011	1518	91 (90-93)	90 (88-91)	85 (83-87)				
2012-2015	2727	94 (93-95)						

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			
2003-2005	411	97 (94-98)	95 (92-97)	89 (85-91)	74 (69-78)			
2006-2008	888	96 (95-97)	95 (93-96)	88 (86-90)				
2009-2011	1518	95 (94-96)	93 (91-94)	85 (83-87)				
2012-2015	2728	96 (95-97)						

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 ($p>0.1$).



Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)					
		One year	Two year	Five year	Ten year		
2003-2005	1141	96 (95-97)	95 (94-96)	91 (90-93)	82 (80-84)		
2006-2008	1878	96 (96-97)	95 (94-96)	91 (90-92)			
2009-2011	2253	97 (96-97)	96 (95-96)	92 (91-93)			
2012-2015	2817	98 (97-98)					

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	1140	99 (98-99)	98 (97-99)	96 (95-97)	90 (89-92)	
2006-2008	1878	99 (98-99)	98 (97-99)	95 (94-96)		
2009-2011	2253	99 (98-99)	98 (97-99)	94 (93-95)		
2012-2015	2816	99 (98-99)				

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 were no statistically significant changes in graft survival over time ($p>0.06$). **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 ($p>0.4$). There were insufficient paediatric recipients of first kidney only transplants from donors after circulatory death to permit reliable analysis.

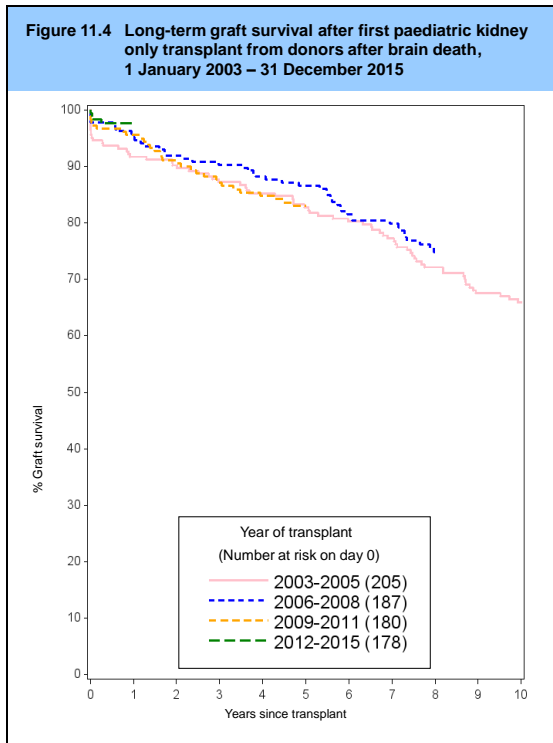


Table 11.7 Graft survival after first paediatric kidney only transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	205	92 (87-95)	90 (85-94)	83 (77-87)	66 (59-72)	
2006-2008	187	95 (91-97)	92 (87-95)	87 (81-91)	-	
2009-2011	180	96 (91-98)	91 (86-94)	83 (77-88)	-	
2012-2015	178	98 (94-99)	-	-	-	

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	
2003-2005	205	100 (-)	100 (-)	98 (95-100)	97 (93-99)	
2006-2008	188	100 (-)	99 (96-100)	99 (96-100)	-	
2009-2011	180	99 (96-100)	99 (96-100)	97 (93-99)	-	
2012-2015	178	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 decrease 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 were no statistically significant differences in patient survival over time ($p>0.7$).

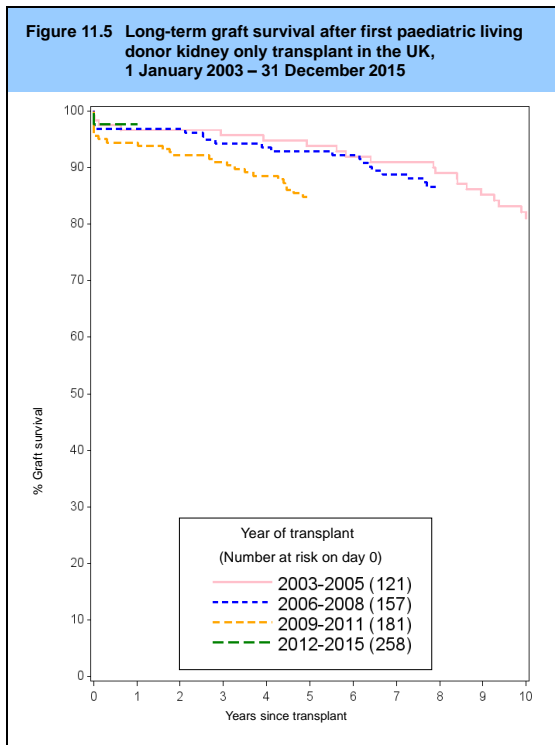


Table 11.9 Graft survival after first paediatric living donor kidney transplant

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)					
		One year	Two year	Five year	Ten year		
2003-2005	121	97 (91-99)	97 (91-99)	94 (87-97)	81 (72-87)		
2006-2008	157	97 (93-99)	97 (93-99)	93 (88-96)			
2009-2011	181	94 (90-97)	92 (87-95)	85 (78-89)			
2012-2015	258	98 (95-99)					

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
2003-2005	121	98 (93-100)	98 (93-100)	98 (93-100)	95 (89-98)
2006-2008	157	99 (96-100)	99 (96-100)	99 (95-100)	
2009-2011	181	99 (96-100)	99 (96-100)	98 (94-99)	
2012-2015	258	99 (97-100)			

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 ($p>0.06$). Differences in patient survival are also not significant over time ($p>0.3$).

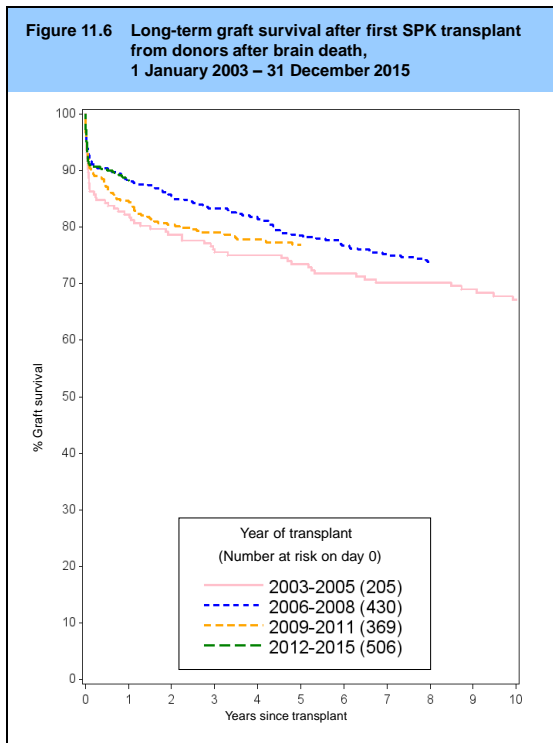


Table 11.11 Graft survival after first SPK transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)			
		One year	Two year	Five year	Ten year
2003-2005	205	82 (76-87)	79 (72-84)	73 (67-79)	67 (60-73)
2006-2008	430	88 (85-91)	85 (82-88)	78 (74-82)	
2009-2011	369	85 (81-88)	80 (76-84)	77 (72-81)	
2012-2015	506	88 (85-91)			

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
2003-2005	206	94 (90-96)	92 (88-95)	86 (81-90)	75 (68-80)
2006-2008	433	96 (93-97)	94 (91-96)	90 (87-92)	
2009-2011	369	96 (94-98)	93 (90-95)	87 (83-90)	
2012-2015	508	96 (94-98)			

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.

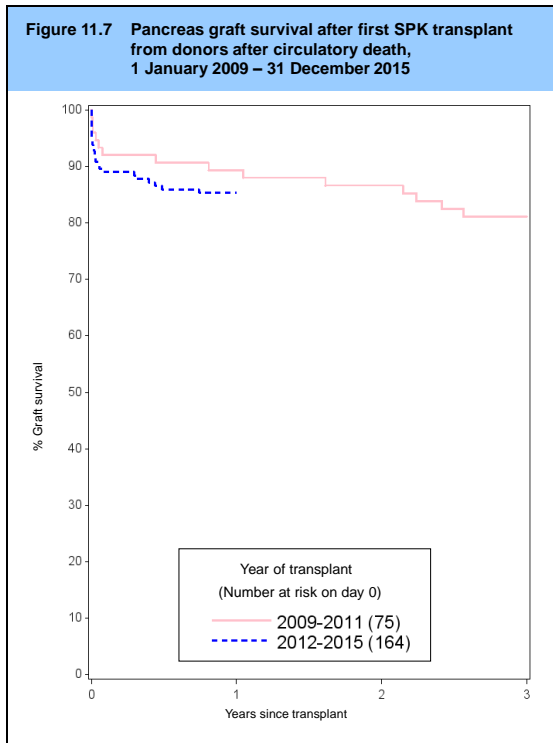


Table 11.13 Graft survival after first SPK transplant from a DCD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)			
		One year	Two year	Three year	
2009-2011	75	89 (80-95)	87 (77-93)	81 (70-88)	
2012-2015	164	85 (79-90)			

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
2009-2011	75	99 (91-100)	94 (86-98)	94 (86-98)
2012-2015	164	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 $p>0.2$).

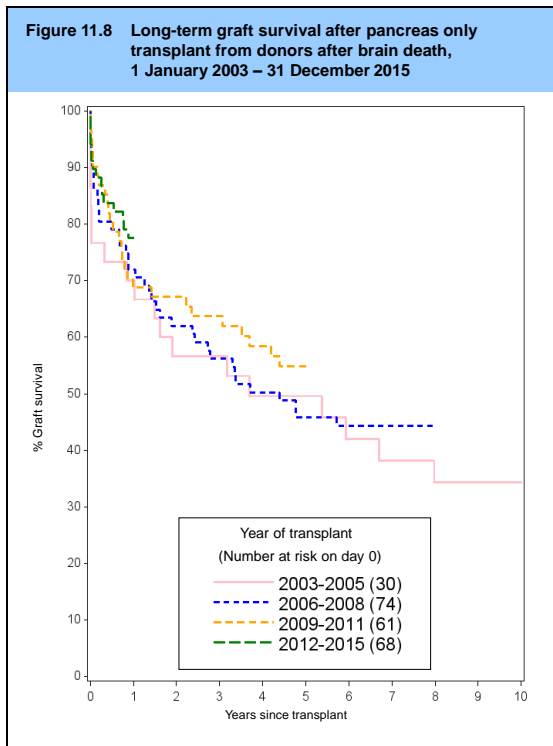


Table 11.15 Graft survival after first pancreas only transplant from a DBD									
Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)							
		One year	Two year	Five year	Ten year				
2003-2005	30	70 (50-83)	57 (37-72)	50 (31-66)	34 (18-52)				
2006-2008	74	72 (60-81)	62 (50-72)	46 (34-57)					
2009-2011	61	69 (56-79)	67 (54-77)	55 (41-66)					
2012-2015	68	78 (66-86)							

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				
2003-2005	31	100 (-)	100 (-)	92 (73-98)	50 (29-68)				
2006-2008	74	94 (86-98)	91 (82-96)	86 (75-93)					
2009-2011	62	96 (85-99)	94 (83-98)	81 (66-90)					
2012-2015	68	98 (88-100)							

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.

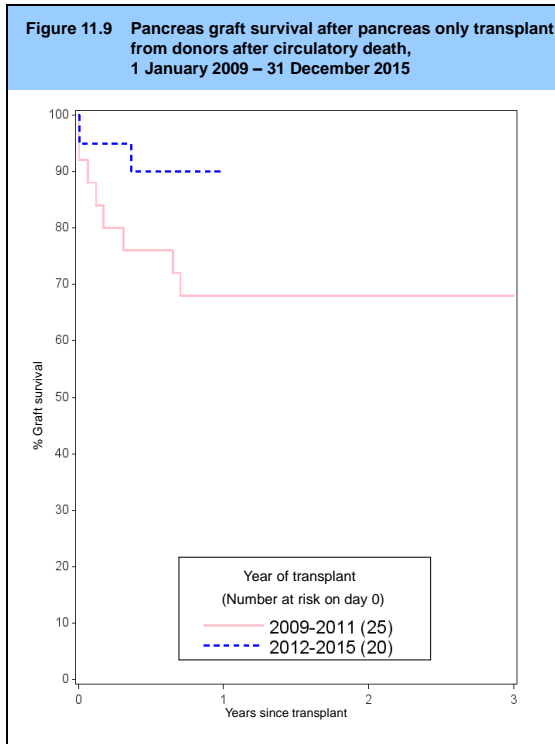


Table 11.17 Graft survival after first pancreas only transplant from a DCD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval)			
		One year	Two year	Three year	
2009-2011	25	68 (46-83)	68 (46-83)	68 (46-83)	
2012-2015	20	90 (66-97)			

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	
2009-2011	25	100 (-)	100 (-)	95 (71-99)	
2012-2015	20	95 (69-99)			

11.3 Cardiothoracic patient survival

11.3.1 Adult heart recipients

Long-term patient survival for adult (≥ 16 years) recipients after first heart only transplant is shown in **Figure 11.10**. Domino and deceased donor (DBD only) transplants are included as well as both urgent and non-urgent patients. **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 was statistically significant variation in patient survival across eras at five years post-transplant ($p=0.02$).

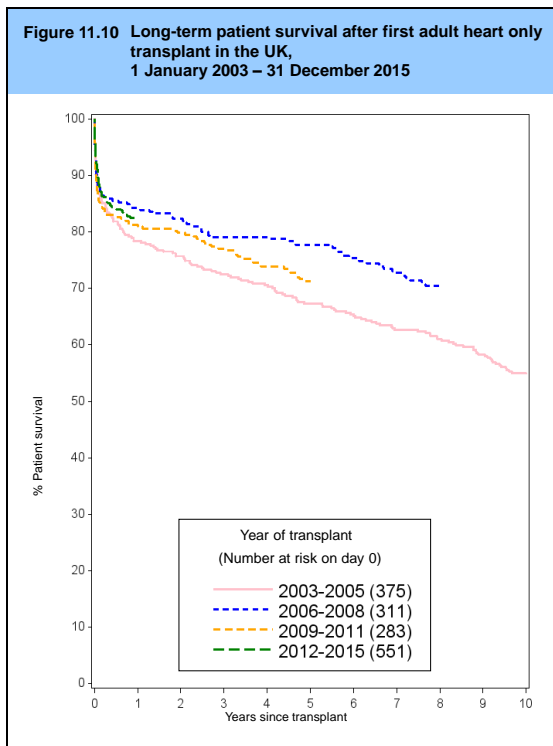


Table 11.19 Patient survival after first adult heart only transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	375	78 (74-82)	76 (71-80)	67 (62-72)	55 (50-60)	
2006-2008	311	84 (80-88)	82 (78-86)	78 (73-82)	55 (50-60)	
2009-2011	283	81 (76-85)	80 (75-84)	71 (66-76)	55 (50-60)	
2012-2015	551	83 (79-85)	80 (75-84)	71 (66-76)	55 (50-60)	

11.3.2 Adult heart-lung block recipients

Patient survival for adult recipients after first heart-lung block transplant 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 ($p>0.4$).

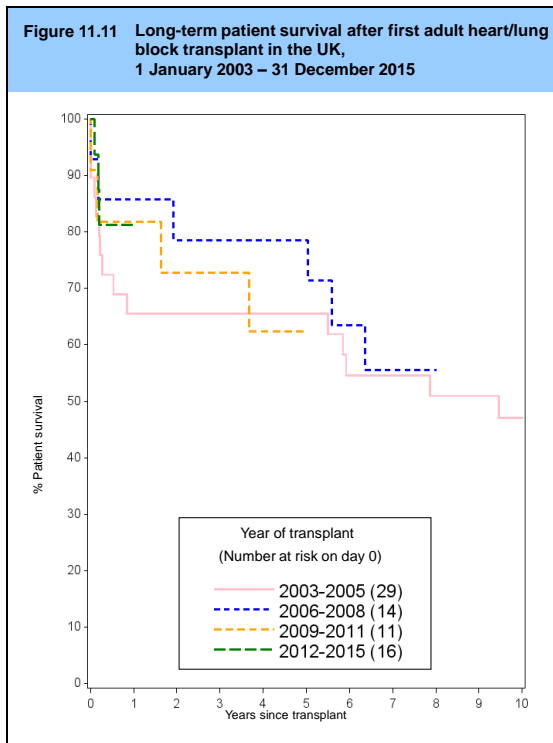


Table 11.20 Patient survival after first adult heart-lung block transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	29	66 (45-80)	66 (45-80)	66 (45-80)	47 (28-64)	
2006-2008	14	86 (54-96)	79 (47-93)	79 (47-93)	47 (28-64)	
2009-2011	11	82 (45-95)	73 (37-90)	62 (28-84)	47 (28-64)	
2012-2015	16	81 (52-94)	73 (37-90)	62 (28-84)	47 (28-64)	

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 was statistically significant variation in patient survival at one year post-transplant ($p=0.005$).

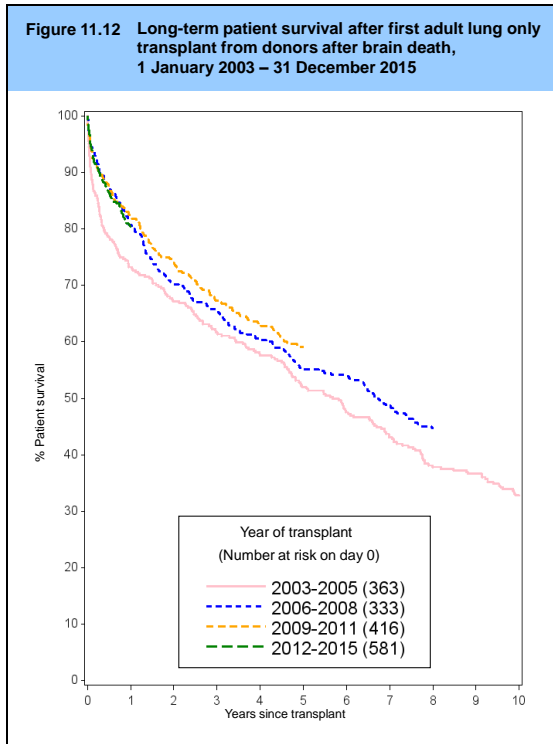


Table 11.21 Patient survival after first adult lung only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)					
		One year	Two year	Five year	Ten year		
2003-2005	363	73 (68-78)	67 (62-72)	52 (47-57)	33 (28-38)		
2006-2008	333	81 (76-85)	70 (65-75)	55 (49-60)	33 (28-38)		
2009-2011	416	82 (78-86)	74 (69-78)	59 (54-64)	33 (28-38)		
2012-2015	581	80 (77-83)	74 (69-78)	59 (54-64)	33 (28-38)		

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**.

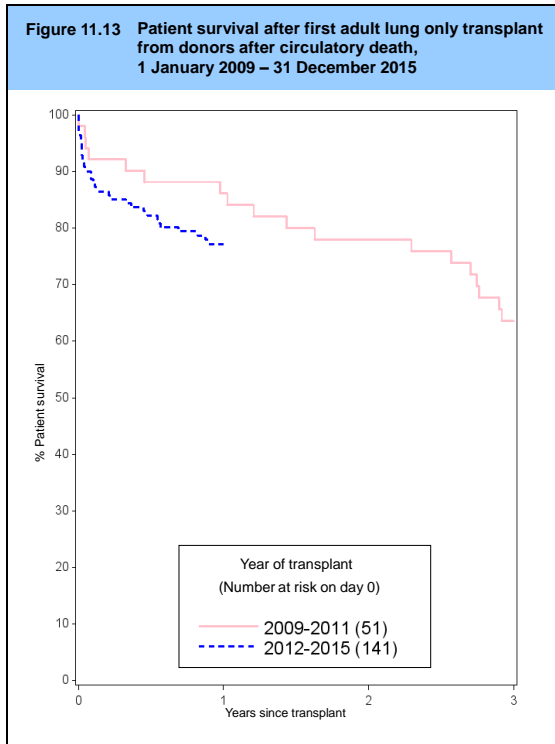


Table 11.22 Patient survival after first adult lung only transplant from a DCD						
Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Three year		
2009-2011	51	86 (73-93)	78 (64-87)	64	(49-75)	
2012-2015	141	77 (69-83)				

11.3.5 Paediatric heart recipients

Long-term patient survival for paediatric recipients after first heart only transplant is shown in **Figure 11.14**. Domino and deceased donor transplants (DBD donors only) are included as well as transplants for urgent patients. **Table 11.23** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There is statistically significant variation in one, two or five year survival over the time period analysed, $p < 0.05$. The number of heart-lung transplant recipients was too small for analysis.

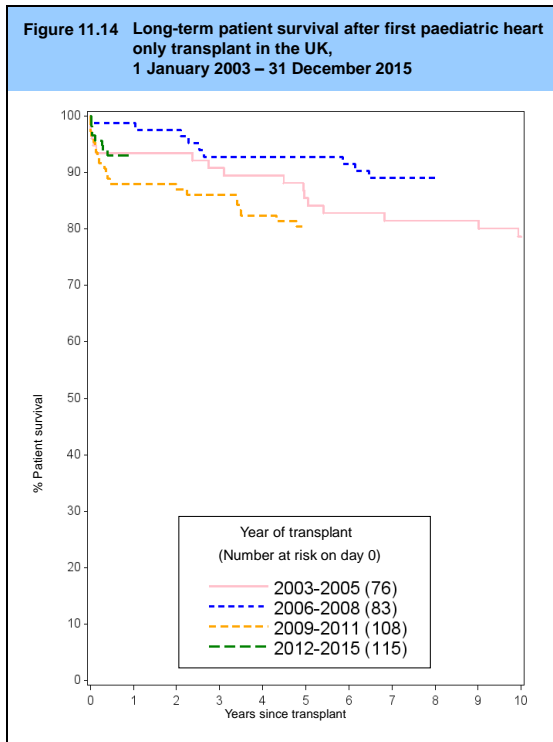


Table 11.23 Patient survival after first paediatric heart only transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	76	93 (85-97)	93 (85-97)	85 (75-92)	79 (67-86)	
2006-2008	83	99 (92-100)	98 (91-99)	93 (85-97)		
2009-2011	108	88 (80-93)	87 (79-92)	80 (72-87)		
2012-2015	115	93 (87-96)				

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 ($p>0.4$).

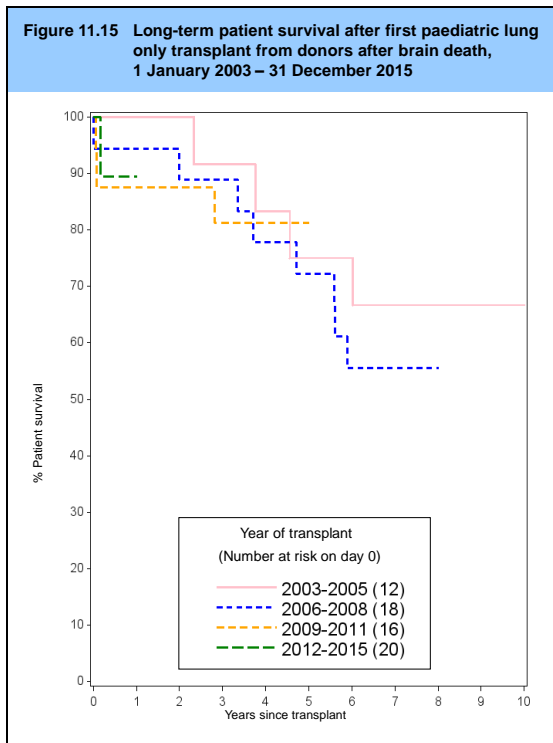


Table 11.24 Patient survival after first paediatric lung only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	12	100 (-)	100 (-)	75 (41-91)	67 (34-86)	
2006-2008	18	94 (67-99)	89 (62-97)	72 (46-87)	-	
2009-2011	16	88 (59-97)	88 (59-97)	81 (52-94)	-	
2012-2015	20	89 (64-97)	-	-	-	

11.4 Liver patient survival

11.4.1 Adult 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, $p < 0.003$ in each case, over the time periods analysed from 2003-2005 to 2012-2015.

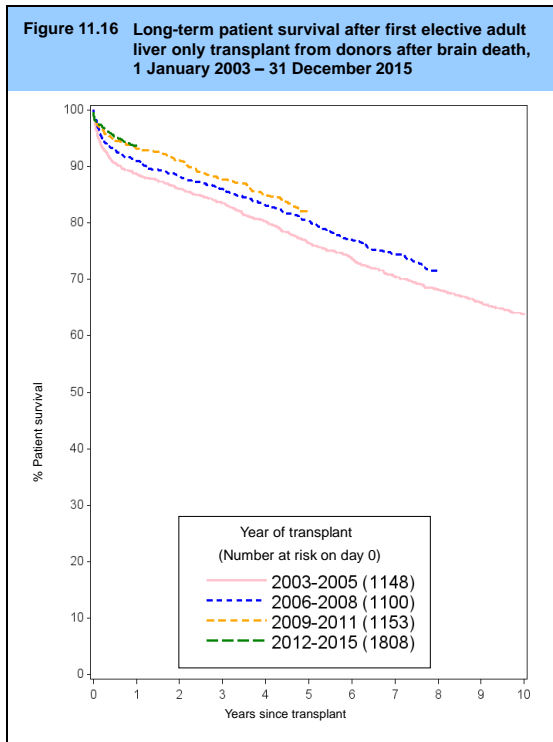


Table 11.25 Patient survival after first elective adult liver only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	1148	89 (87-90)	86 (84-88)	76 (74-79)	64 (61-67)	
2006-2008	1100	91 (89-93)	88 (86-90)	80 (78-83)		
2009-2011	1153	93 (92-95)	91 (89-93)	82 (79-84)		
2012-2015	1808	94 (92-95)				

11.4.2 Adult 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.

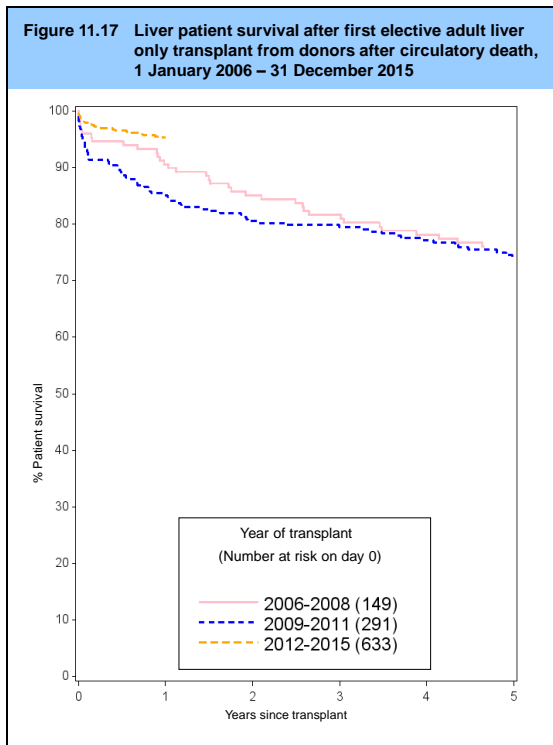


Table 11.26 Patient survival after first elective adult liver only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)			
		One year	Two year	Five year	
2006-2008	149	91 (85-94)	85 (78-90)	76 (68-82)	
2009-2011	291	85 (80-89)	81 (75-85)	74 (68-79)	
2012-2015	633	95 (93-97)			

11.4.3 Paediatric 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 ($p>0.2$). The number of paediatric transplants from donors after circulatory death was too small to estimate meaningful patient survival.

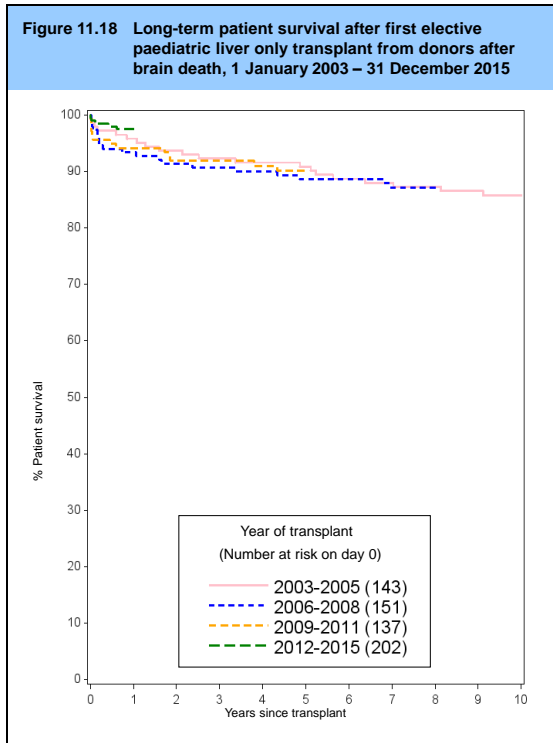


Table 11.27 Patient survival after first elective paediatric liver only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval)				
		One year	Two year	Five year	Ten year	
2003-2005	143	96 (91-98)	94 (88-97)	91 (85-95)	86 (79-91)	
2006-2008	151	93 (88-96)	91 (86-95)	89 (82-93)		
2009-2011	137	94 (89-97)	92 (86-95)	90 (84-94)		
2012-2015	202	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).

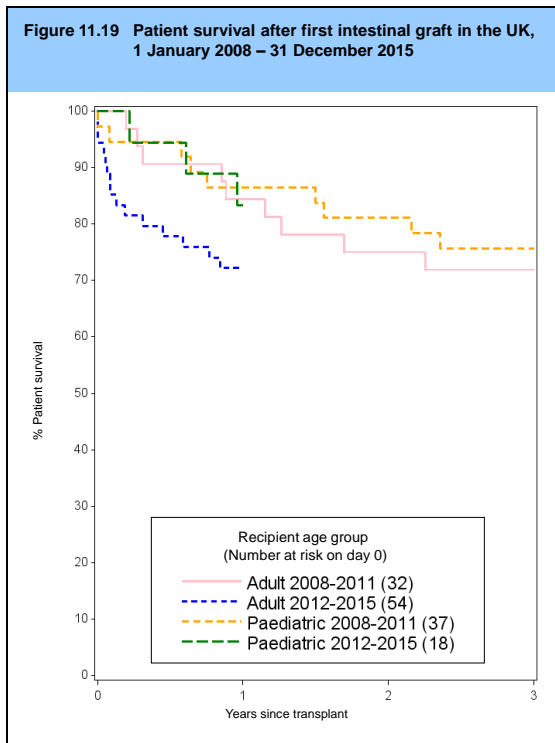


Table 11.28 Patient survival after first intestinal transplant in the UK, 1 January 2008 - 31 December 2015

Recipient age group	No. at risk on day 0	% Patient survival (95% confidence interval) One year	
Adult			
2008-2011	32	84	(66-93)
2012-2015	54	72	(58-82)
Paediatric			
2008-2011	37	86	(71-94)
2012-2015	18	83	(57-94)