Survival Rates Following Transplantation

This chapter shows graft survival rates over time for kidney, pancreas and cornea 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.

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, two 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 have been significant improvements in one and two year survival over the time periods shown, p<0.03 in each case.

Figure 11.1 Long-term graft survival after first adult kidney only transplant from donors after brain death, 1 January 1999 – 31 December 2011

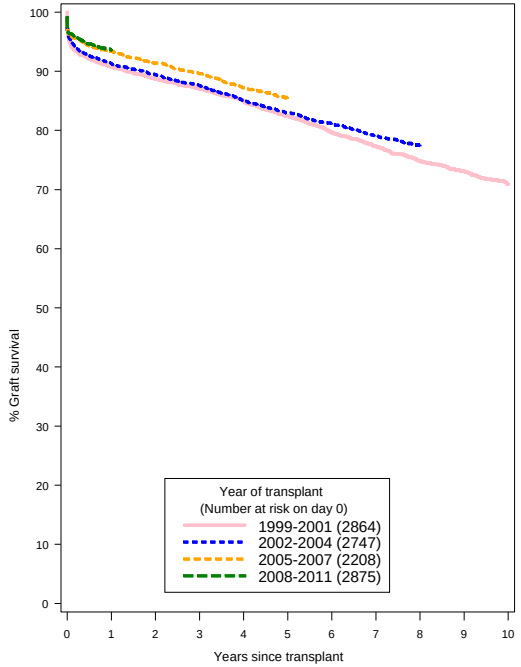

Table 11.1 Graft survival after first adult kidney only transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	2864	91	(90-92)	89	(88-90)	82	(81-84)	71	(69-73)
2002-2004	2747	91	(90-92)	89	(88-91)	83	(82-84)		
2005-2007	2208	93	(92-94)	91	(90-92)	85	(84-87)		
2008-2011	2875	94	(93-94)						

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	
1999-2001	2869	95	(94-96)	93	(92-94)	87	(86-88)	74	(73-76)
2002-2004	2748	96	(95-96)	94	(93-95)	88	(87-89)		
2005-2007	2210	97	(96-98)	95	(94-96)	89	(88-91)		
2008-2011	2875	96	(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 a significant improvement in one, two and five year survival over the time periods shown, p<0.001 in each case. One year patient survival is 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 were no statistically significant changes in patient survival over time (p>0.1).

Figure 11.2 Long-term graft survival after first adult kidney only transplant from donors after circulatory death, 1 January 1999 – 31 December 2011

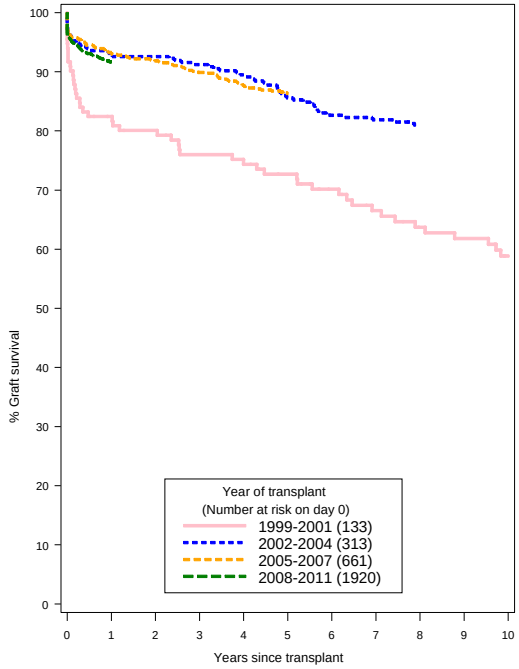

Table 11.3 Graft survival after first adult kidney only transplant from a DCD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	133	82	(75-88)	80	(72-86)	73	(64-80)	59	(49-67)
2002-2004	313	93	(89-95)	93	(89-95)	86	(81-89)		
2005-2007	661	93	(91-95)	92	(89-94)	86	(83-89)		
2008-2011	1920	92	(90-93)						

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	
1999-2001	133	91	(85-95)	90	(83-94)	84	(76-89)	68	(59-75)
2002-2004	314	97	(94-98)	95	(92-97)	87	(83-91)		
2005-2007	661	95	(93-97)	93	(91-95)	87	(84-89)		
2008-2011	1921	95	(94-96)						

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 graft 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 1999 – 31 December 2011

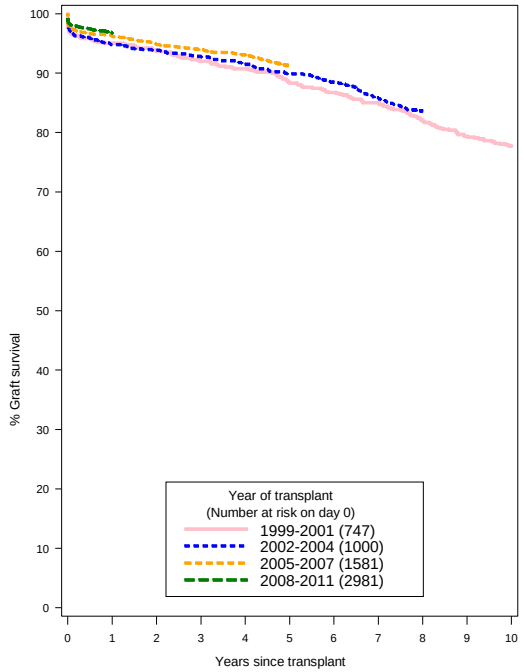

Table 11.5 Graft survival after first adult living donor kidney transplant

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	747	95	(93-96)	94	(92-95)	88	(86-91)	78	(74-81)
2002-2004	1000	95	(93-96)	94	(92-95)	90	(88-92)		
2005-2007	1581	96	(95-97)	95	(94-96)	91	(90-93)		
2008-2011	2981	97	(96-97)						

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	
1999-2001	748	98	(97-99)	97	(96-98)	95	(93-96)	90	(87-92)
2002-2004	1000	98	(97-99)	98	(96-98)	95	(94-97)		
2005-2007	1580	99	(98-99)	98	(97-99)	96	(94-97)		
2008-2011	2981	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 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).

Figure 11.4 Long-term graft survival after first paediatric kidney only transplant from donors after brain death, 1 January 1999 – 31 December 2011

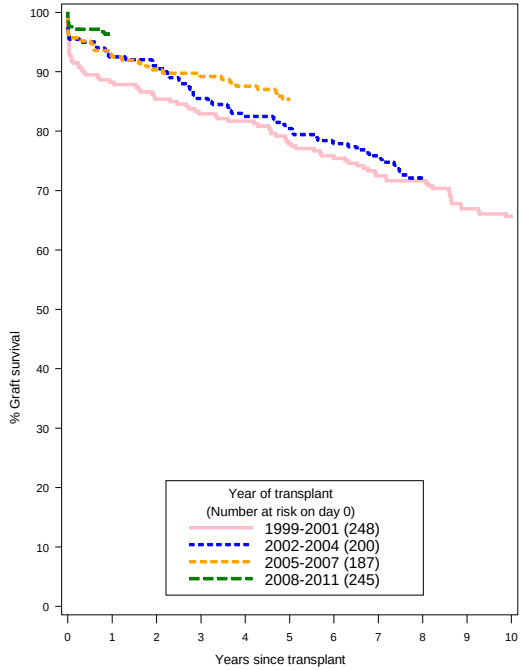

Table 11.7 Graft survival after first paediatric kidney only transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	248	88	(84-92)	85	(80-89)	78	(72-83)	66	(59-71)
2002-2004	200	93	(88-95)	91	(86-94)	80	(74-85)		
2005-2007	187	92	(88-95)	90	(85-94)	85	(79-90)		
2008-2011	245	96	(93-98)						

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	
1999-2001	248	99	(97-100)	99	(97-100)	98	(95-99)	96	(93-98)
2002-2004	201	100	(-)	100	(-)	98	(95-99)		
2005-2007	188	99	(96-100)	99	(96-100)	99	(96-100)		
2008-2011	245	100	(97-100)						

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 improvement in two and five year survival over the time periods shown, p<0.03. **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>0.05). There were insufficient paediatric recipients of first kidney only transplants from donors after circulatory death to permit reliable analysis.

Figure 11.5 Long-term graft survival after first paediatric living donor kidney only transplant in the UK, 1 January 1999 – 31 December 2011

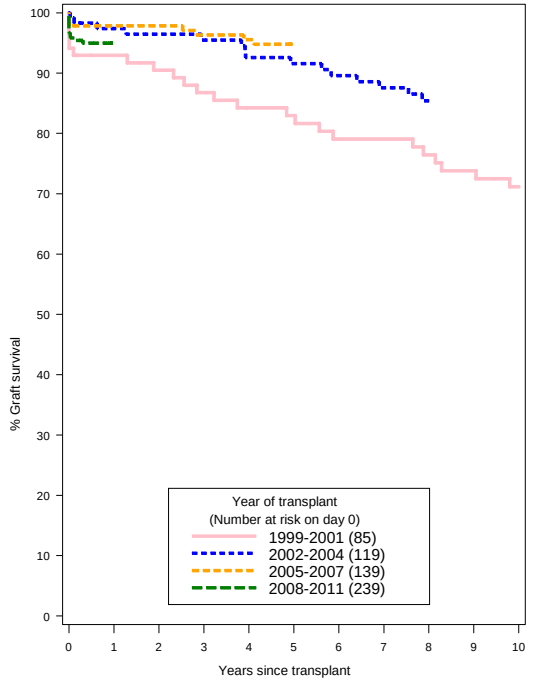

Table 11.9 Graft survival after first paediatric living donor kidney transplant

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	85	93	(85-97)	90	(82-95)	83	(73-90)	71	(60-80)
2002-2004	119	97	(92-99)	96	(91-99)	92	(84-96)		
2005-2007	139	98	(93-99)	98	(93-99)	95	(89-97)		
2008-2011	239	95	(91-97)						

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	
1999-2001	86	98	(91-99)	96	(89-99)	95	(88-98)	93	(84-97)
2002-2004	119	97	(92-99)	97	(92-99)	96	(91-99)		
2004-2006	139	100	(-)	100	(-)	100	(-)		
2008-2011	239	99	(96-100)						

11.2 Pancreas graft and patient survival

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

National pancreas follow-up data are only available for transplants performed since 1 January 2001. There are insufficient data available to analyse long-term survival. **Figure 11.6** shows pancreas graft survival in recipients receiving their first simultaneous kidney/pancreas (SPK) transplant performed from donors after brain death, 2002 - 2004, 2005 - 2007 and 2008 - 2011. Graft and patient survival estimates and confidence intervals are shown at one year, two years and five years in **Table 11.11** and **Table 11.12** respectively. Results relate to adults only as there are no paediatric pancreas transplant recipients.

Figure 11.6 Pancreas graft survival after first SPK transplant from donors after brain death, 1 January 2002 – 31 December 2011

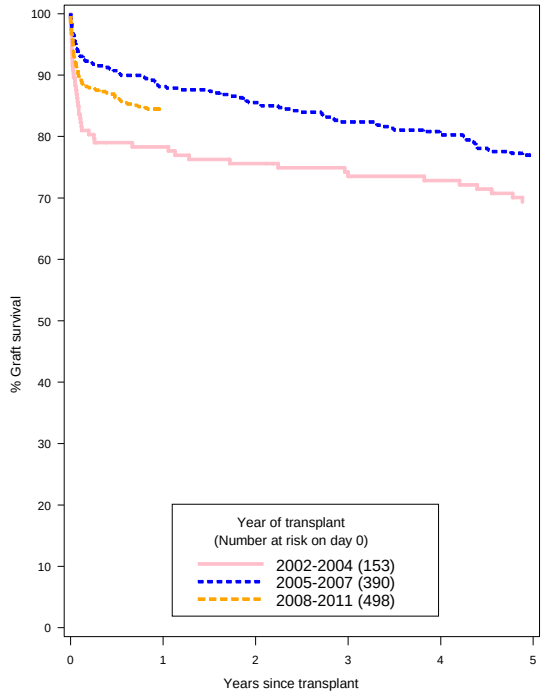

Table 11.11 Graft survival after first SPK transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year	
2002-2004	153	78	(71-84)	76	(68-82)	69	(61-76)
2005-2007	390	88	(84-91)	86	(82-89)	77	(72-81)
2008-2011	498	84	(81-87)				

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	
2002-2004	153	91	(85-95)	90	(83-94)	83	(76-88)
2005-2007	393	95	(93-97)	94	(91-96)	90	(86-92)
2008-2011	500	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, 2008 - 2011. Graft and patient survival estimates and confidence intervals are shown at one year 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 2008 – 31 December 2011

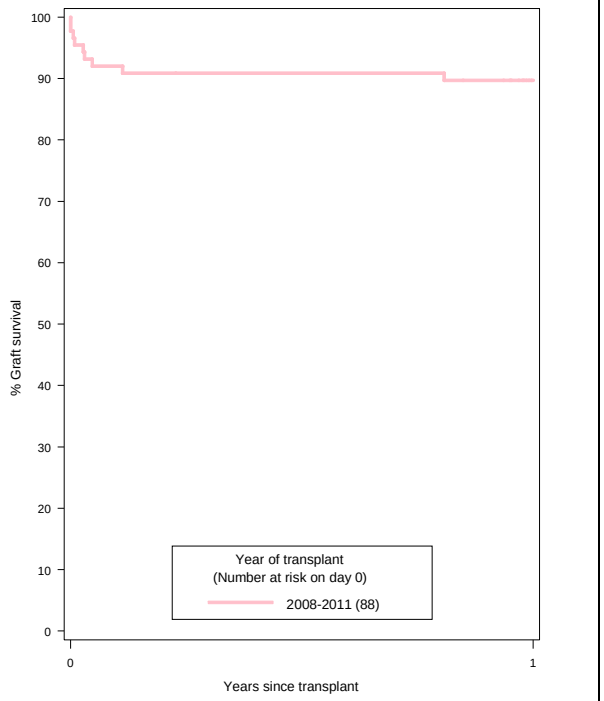

Table 11.13 Graft survival after first SPK transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year	
2008-2011	88	90	(81-95)

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	
2008-2011	89	98	(91-99)

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

Figure 11.8 shows pancreas graft survival in recipients receiving their first pancreas only transplant performed from donors after brain death, 2002 - 2004, 2005 - 2007 and 2008 - 2011. Graft and patient survival estimates and confidence intervals are shown at one year, two years and five years in **Table 11.15** and **Table 11.16** respectively. Results are for adult patients only.

Figure 11.8 Pancreas graft survival after pancreas only transplant from donors after brain death, 1 January 2002 – 31 December 2011

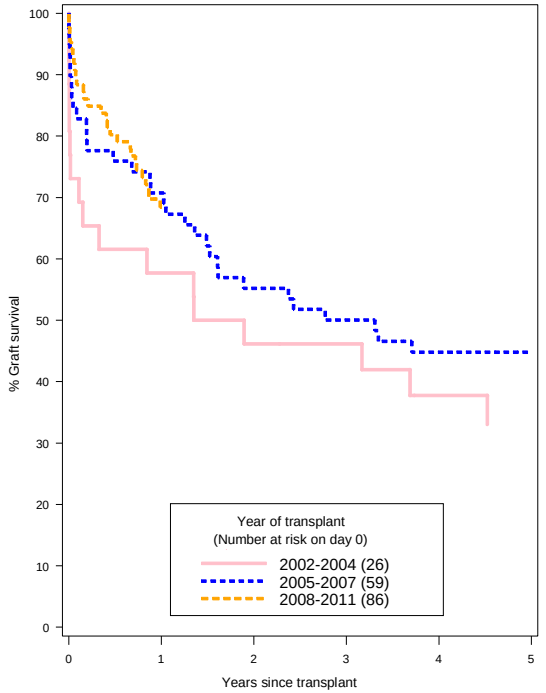

Table 11.15 Graft survival after first pancreas only transplant from a DBD

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year	
2002-2004	26	58	(37-74)	46	(27-64)	33	(16-51)
2005-2007	59	71	(57-81)	55	(42-67)	45	(32-57)
2008-2011	86	68	(57-77)				

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	
2002-2004	26	100	(-)	100	(-)	77	(50-91)
2005-2007	60	97	(87-99)	95	(84-98)	92	(81-97)
2008-2011	90	94	(85-97)				

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, 2008 - 2011. Graft and patient survival estimates and confidence intervals are shown at one year 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 2008 – 31 December 2011

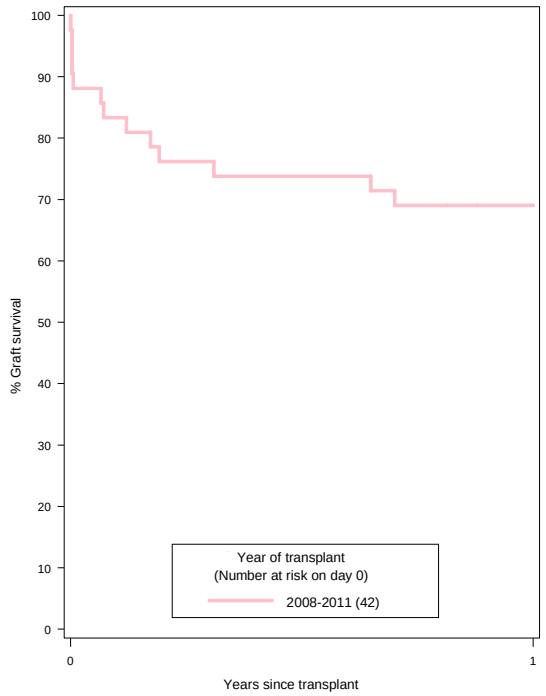

Table 11.17 Graft survival after first pancreas only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year	
2008-2011	42	69	(53-81)

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	
2008-2011	43	98	(84-100)

11.3 Cardiothoracic patient survival

11.3.1 Adult heart recipients

Long-term patient survival for adult (≥16 years) recipients after first heart only transplants is shown in **Figure 11.10**. Domino and deceased donor (DBD only) transplants are included as well as urgent patients. **Table 11.19** shows the patient survival estimates and confidence intervals for one, two, five and ten years post-transplant. There were no statistically significant changes in survival rates over the time periods analysed (p>0.1).

Figure 11.10 Long-term patient survival after first adult heart only transplant in the UK, 1 January 1999 – 31 December 2011

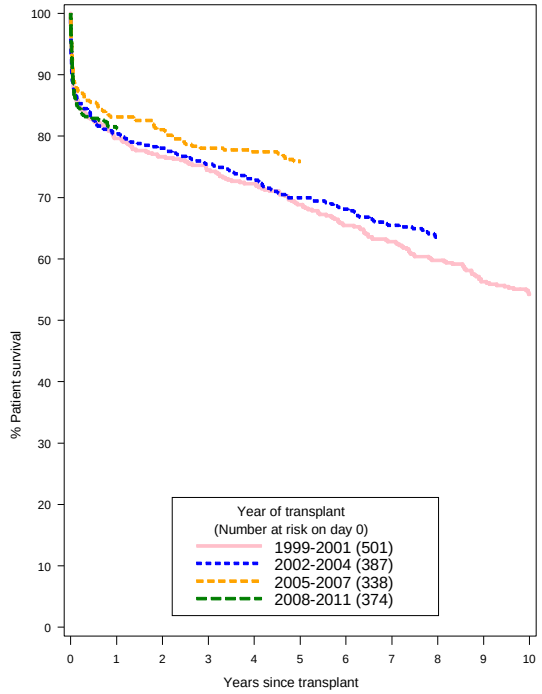

Table 11.19 Patient survival after first adult heart only transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	501	80	(76-83)	77	(73-80)	69	(65-73)	54	(50-58)
2002-2004	387	80	(76-84)	78	(74-82)	70	(65-74)		
2005-2007	338	83	(79-87)	81	(76-85)	76	(71-80)		
2008-2011	374	81	(77-85)						

11.3.2 Adult heart/lung block recipients

Patient survival for adult recipients after first heart/lung block transplants is shown in **Figure 11.11**. Patient survival estimates and confidence intervals for each time period analysed are shown in **Table 11.20**. There were no statistically significant differences in patient survival over time (p>0.2).

Figure 11.11 Long-term patient survival after first adult heart/lung block transplant in the UK, 1 January 1999 – 31 December 2011

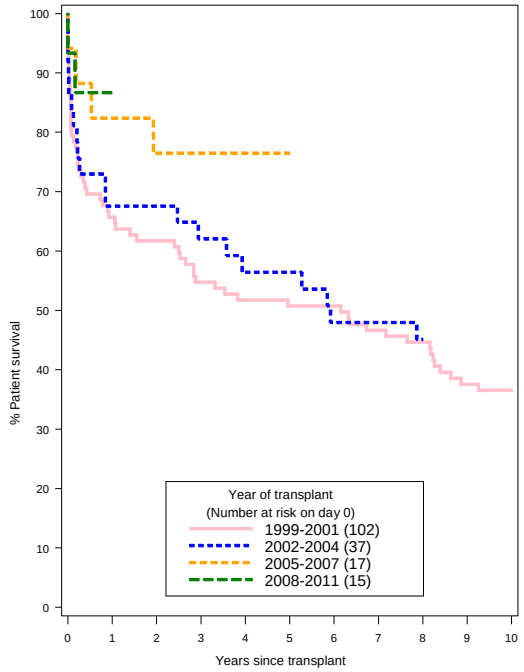

Table 11.20 Patient survival after first adult heart/lung block transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	102	66	(56-74)	62	(52-70)	51	(41-60)	37	(27-46)
2002-2004	37	68	(50-80)	68	(50-80)	56	(39-71)		
2005-2007	17	82	(55-94)	76	(49-90)	76	(49-90)		
2008-2011	15	87	(56-96)						

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>0.08).

Figure 11.12 Long-term patient survival after first adult lung only transplant from donors after brain death, 1 January 1999 – 31 December 2011

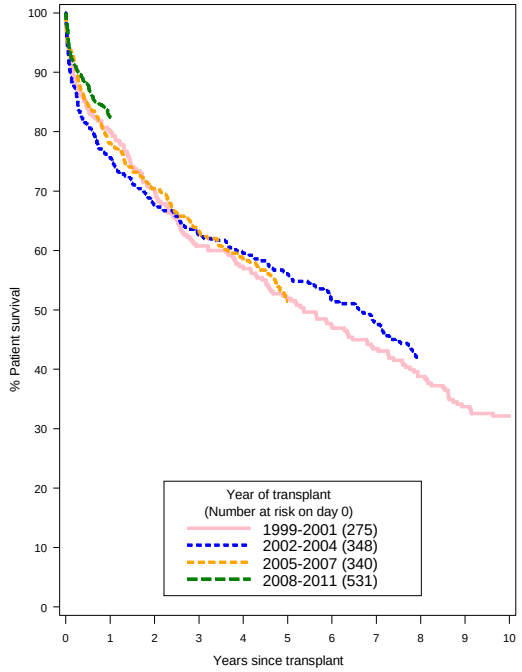

Table 11.21 Patient survival after first adult lung only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	275	80	(75-84)	70	(64-75)	52	(46-58)	32	(27-38)
2002-2004	348	76	(71-80)	68	(62-72)	56	(51-61)		
2005-2007	340	78	(73-82)	70	(65-75)	51	(46-57)		
2008-2011	531	82	(79-85)						

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 2008 – 31 December 2011

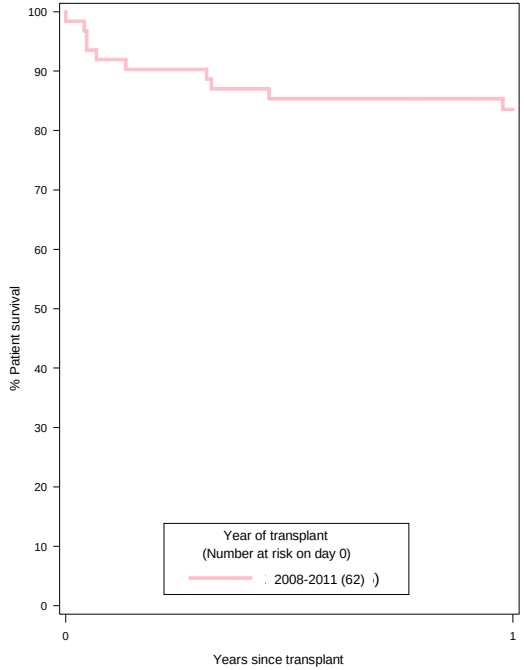

Table 11.22 Patient survival after first adult lung only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year	
2008-2011	62	84	(72-91)

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 have been significant improvements in two year survival over the time periods shown, p<0.02. The number of paediatric lung and heart/lung transplant recipients was too small for analysis.

Figure 11.14 Long-term patient survival after first paediatric heart only transplant in the UK, 1 January 1999 – 31 December 2011

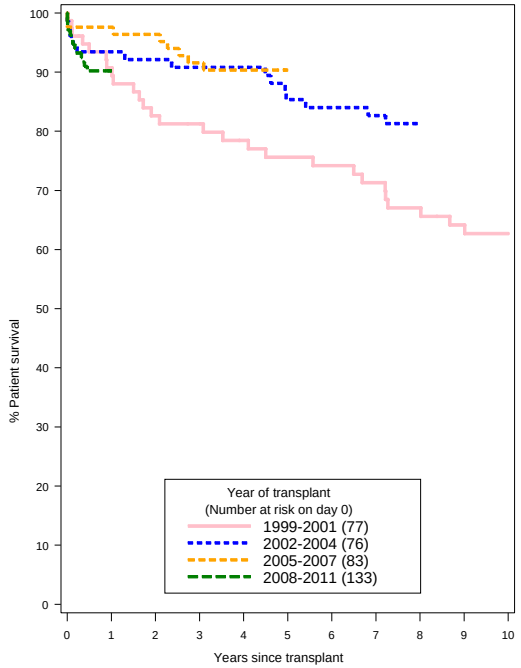

Table 11.23 Patient survival after first paediatric heart only transplant

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	77	91	(82-95)	83	(72-90)	76	(64-84)	63	(50-73)
2002-2004	76	93	(85-97)	92	(83-96)	85	(75-92)		
2005-2007	83	98	(91-99)	96	(89-99)	90	(82-95)		
2008-2011	133	90	(84-94)						

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 11.15**. **Table 11.24** 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 over the time periods analysed, p<0.001, p<0.04 and p<0.03, respectively.

Figure 11.15 Long-term patient survival after first elective adult liver only transplant from donors after brain death, 1 January 1999 – 31 December 2011

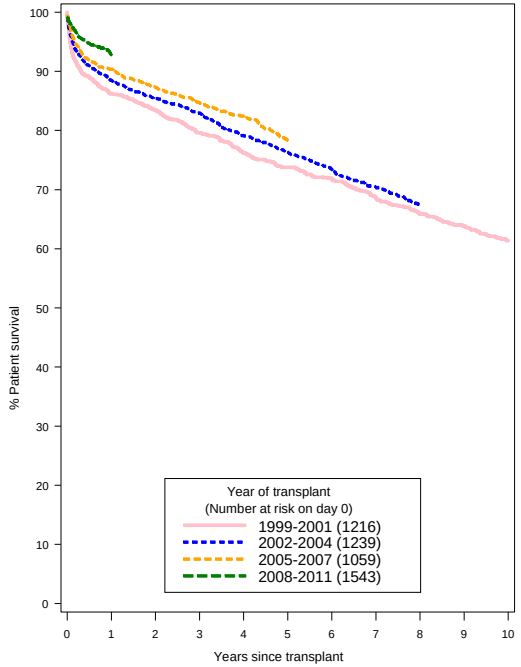

Table 11.24 Patient survival after first elective adult liver only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	1216	86	(84-88)	83	(81-85)	74	(71-76)	61	(59-64)
2002-2004	1239	89	(87-90)	85	(83-87)	76	(74-79)		
2005-2007	1059	90	(88-92)	87	(85-89)	78	(76-81)		
2008-2011	1543	93	(91-94)						

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 11.16**. The majority of these liver transplants have been performed since 1 January 2002, so it is not possible to estimate long term patient survival. **Table 11.25** shows patient survival estimates at one, two and three years post transplant.

Figure 11.16 Liver patient survival after first elective adult liver only transplant from donors after circulatory death, 1 January 2005 – 31 December 2010

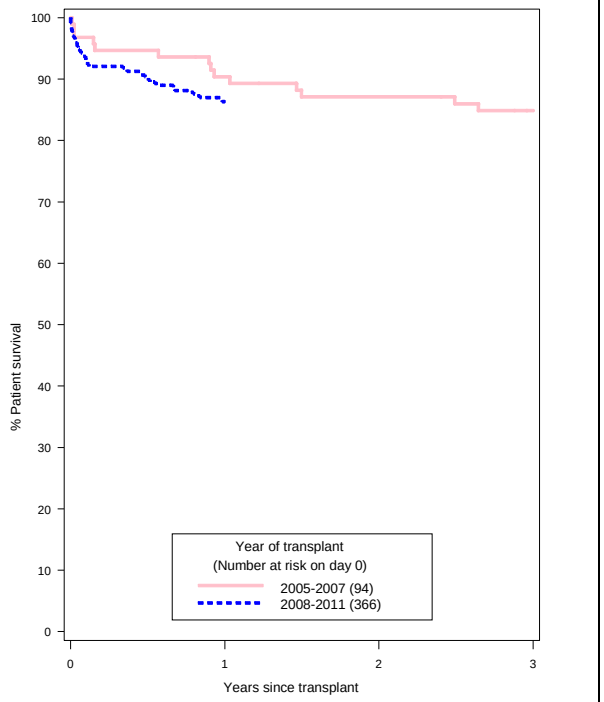

Table 11.25 Patient survival after first elective adult liver only transplant from a DCD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Three year	
2005-2007	94	90	(82-95)	87	(78-92)	85	(76-91)
2008-2011	366	86	(82-89)				

11.4.3 Paediatric recipients - donor after brain death (DBD)

Figure 11.17 and **Table 11.26** 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 significant improvements in patient survival over the time period analysed (p>0.05). The number of paediatric transplants from donors after circulatory death was too small to estimate patient survival.

Figure 11.17 Long-term patient survival after first elective paediatric liver only transplant from donors after brain death, 1 January 1999 – 31 December 2011

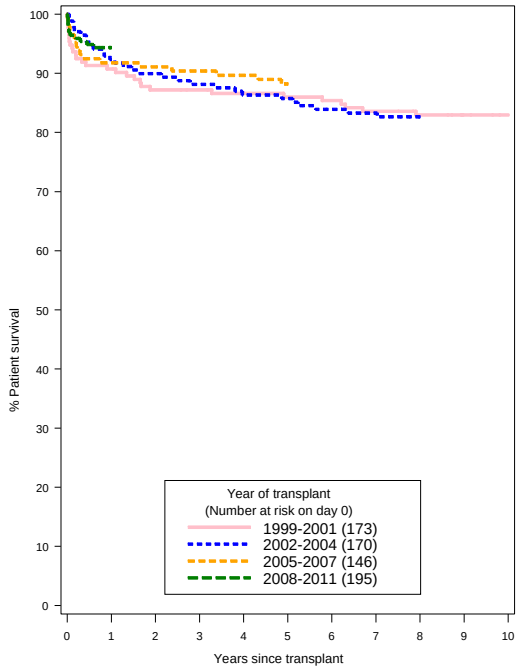

Table 11.26 Patient survival after first elective paediatric liver only transplant from a DBD

Year of transplant	No. at risk on day 0	% Patient survival (95% confidence interval) One year		Two year		Five year		Ten year	
1999-2001	173	91	(85-94)	87	(81-91)	86	(80-90)	83	(76-88)
2002-2004	170	92	(87-95)	90	(84-94)	86	(79-90)		
2005-2007	146	92	(86-95)	91	(85-95)	88	(82-92)		
2008-2011	195	94	(90-97)						

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 11.18** and **Table 11.27** show one-year patient survival estimates for recipients receiving their first intestinal transplant, 2007 – 2011, by recipient age group.

Figure 11.18 Patient survival after first intestinal graft in the UK, 1 January 2007 – 31 December 2011

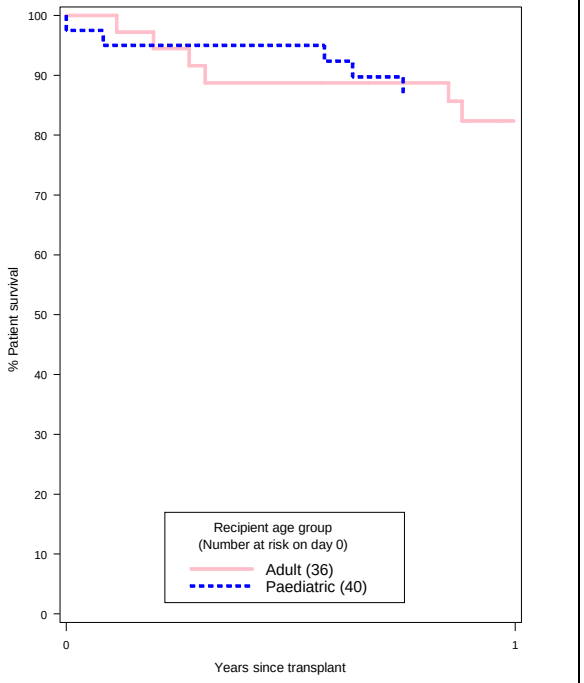

Table 11.27 Patient survival after first intestinal transplant in the UK, 1 January 2007 - 31 December 2011

Recipient age group	No. at risk on day 0	% Patient survival One year	(95% confidence interval)
Adult	36	82	(65-92)
Paediatric	40	87	(72-94)

11.6 Cornea graft survival

Good quality cornea follow-up data were only available for transplants performed since 1 April 1999. There are insufficient data available to analyse long-term survival effects. **Figure 11.19** shows graft survival estimates for first penetrating keratoplasty (PK) for grafts 2002 - 2004, 2005 - 2007 and 2008 - 2011. Graft survival estimates and confidence intervals are shown by transplant year at one, two and five years in **Table 11.28.**

Figure 11.19 Cornea graft survival after first PKP graft in the UK, 1 January 2002 – 31 December 2011

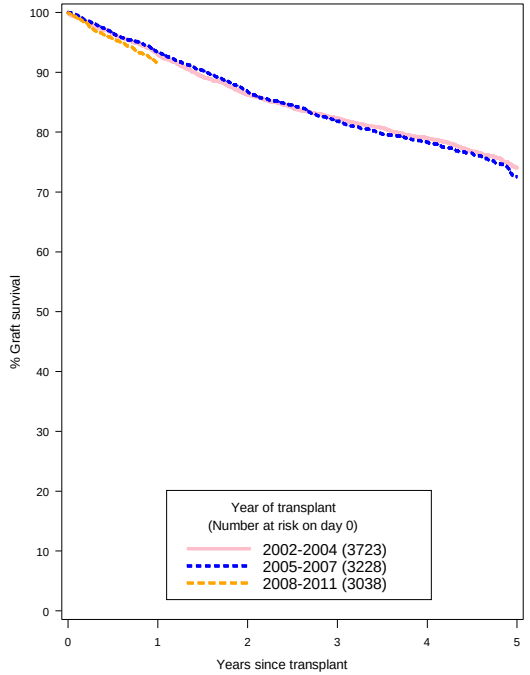

Table 11.28 Cornea graft survival after first PK in the UK

Year of transplant	No. at risk on day 0	% Graft survival (95% confidence interval) One year		Two year		Five year	
2002-2004	3723	93	(92-94)	86	(85-87)	74	(72-76)
2005-2007	3228	93	(92-94)	87	(86-88)	73	(71-74)
2008-2011	3038	91	(90-92)				