

Appendix/Supplementary tables

Table A1 Percentage of missing values for each variable of interest, for liver only transplants in the UK, 1st January 2000 to 31st December 2014

Total number of transplants	8816
	% missing
Recipient characteristics	
Transplant year	0
Super - urgent	0
Age at transplant, mean (SD)	0
Male gender	0
Caucasian	0
MELD at transplant, mean (SD)	3.2
UKELD at transplant, mean (SD)	3.2
Primary liver disease	0
ABO Blood group	0
Renal support	0.2
In-patient	0.1
Ventilated	0.1
Oesophageal varices	0.4
Presence of TIPS	0
Sepsis confirmed	0.3
Portal vein thrombosis	0
BMI kg/m ² , mean (SD)	3.5
Donor characteristics	
Donor age, mean (SD)	0
DCD	0
Split liver	0
Organ appearance suboptimal	0.2
Cause of death	0
Operative characteristics	
Night-time procurement	2.3
Night-time transplant	2.5
Weekend transplant	0
CIT (hours), mean (SD)	4.7
Previous abdominal surgery	0.3

Table A2 Risk adjusted hazard ratio from Cox regression model for chance of graft failure or death following liver transplantation in the UK, 1st January 2000 to 31st December 2014

Risk factor	Hazard ratio (95% confidence interval)		
	30 days	1 year	3 years
Recipient characteristics			
Transplant year			
2000	1.00 (-)	1.00 (-)	1.00 (-)
2001	1.07 (0.74 - 1.54)	0.94 (0.71 - 1.23)	0.90 (0.71 - 1.14)
2002	0.82 (0.56 - 1.21)	0.76 (0.58 - 1.01)	0.79 (0.62 - 1.01)
2003	0.92 (0.62 - 1.35)	0.90 (0.68 - 1.18)	0.84 (0.66 - 1.07)
2004	0.92 (0.63 - 1.35)	0.96 (0.74 - 1.25)	0.88 (0.70 - 1.11)
2005	0.75 (0.49 - 1.13)	0.73 (0.54 - 0.98)	0.72 (0.56 - 0.93)
2006	0.75 (0.50 - 1.12)	0.76 (0.58 - 1.02)	0.75 (0.59 - 0.96)
2007	0.71 (0.48 - 1.06)	0.64 (0.48 - 0.86)	0.63 (0.49 - 0.81)
2008	0.59 (0.38 - 0.89)	0.62 (0.46 - 0.82)	0.63 (0.49 - 0.80)
2009	0.58 (0.38 - 0.88)	0.58 (0.43 - 0.78)	0.59 (0.46 - 0.76)
2010	0.64 (0.42 - 0.96)	0.57 (0.42 - 0.76)	0.56 (0.43 - 0.72)
2011	0.58 (0.38 - 0.88)	0.46 (0.33 - 0.62)	0.50 (0.38 - 0.65)
2012	0.50 (0.32 - 0.76)	0.45 (0.33 - 0.62)	0.51 (0.39 - 0.66)
2013	0.62 (0.42 - 0.92)	0.51 (0.39 - 0.69)	0.50 (0.38 - 0.65)
2014	0.48 (0.31 - 0.73)	0.44 (0.33 - 0.60)	0.46 (0.34 - 0.60)
Age at transplant	1.01 (1.00 - 1.01)	1.01 (1.01 - 1.01)	1.01 (1.00 - 1.01)
Caucasian	0.89 (0.71 - 1.11)	0.85 (0.72 - 1.01)	0.85 (0.74 - 0.97)
Primary liver disease			
Cancer	1.00 (-)	1.00 (-)	1.00 (-)
HCV	0.79 (0.50 - 1.24)	0.87 (0.65 - 1.17)	0.94 (0.74 - 1.19)
Alcohol related liver disease	1.05 (0.69 - 1.59)	0.89 (0.67 - 1.18)	0.76 (0.61 - 0.96)
HBV	1.00 (0.55 - 1.82)	0.96 (0.64 - 1.44)	0.83 (0.59 - 1.17)
PSC	1.17 (0.73 - 1.85)	1.16 (0.85 - 1.59)	1.03 (0.80 - 1.33)
PBC	0.90 (0.57 - 1.44)	0.84 (0.61 - 1.14)	0.65 (0.50 - 0.84)
Autoimmune hepatitis	1.06 (0.66 - 1.70)	1.00 (0.73 - 1.38)	0.85 (0.65 - 1.11)
Metabolic liver disease	1.24 (0.75 - 2.05)	1.14 (0.81 - 1.61)	0.91 (0.68 - 1.23)
Acute liver disease	1.56 (0.91 - 2.67)	1.34 (0.91 - 1.96)	1.07 (0.77 - 1.49)
Re-transplants	1.77 (1.08 - 2.91)	1.74 (1.24 - 2.44)	1.52 (1.14 - 2.02)
Other	0.95 (0.55 - 1.65)	1.04 (0.72 - 1.49)	0.83 (0.61 - 1.13)
Renal support	1.42 (1.13 - 1.80)	1.44 (1.21 - 1.71)	1.42 (1.22 - 1.67)
In-patient	1.08 (0.85 - 1.36)	1.29 (1.10 - 1.50)	1.22 (1.07 - 1.40)
Ventilated	1.85 (1.36 - 2.51)	1.59 (1.26 - 2.01)	1.42 (1.14 - 1.76)
Oesophageal varices	1.18 (1.00 - 1.39)	1.09 (0.96 - 1.23)	1.03 (0.93 - 1.14)
Presence of TIPS	1.08 (0.71 - 1.64)	1.20 (0.91 - 1.60)	1.22 (0.96 - 1.56)
Sepsis confirmed	1.49 (1.14 - 1.95)	1.33 (1.08 - 1.63)	1.29 (1.07 - 1.56)
Acute failure grade prior to transplant	1.06 (0.74 - 1.51)	0.81 (0.62 - 1.05)	0.78 (0.61 - 0.99)
Donor characteristics			
Donor age (years)	1.00 (0.99 - 1.01)	1.01 (1.00 - 1.01)	1.01 (1.00 - 1.01)
DCD	2.21 (1.69 - 2.88)	2.00 (1.65 - 2.43)	1.84 (1.55 - 2.17)
Split liver	1.18 (0.73 - 1.93)	2.12 (1.63 - 2.76)	2.01 (1.59 - 2.53)
Organ appearance suboptimal	2.32 (1.80 - 2.98)	1.64 (1.39 - 1.92)	1.48 (1.29 - 1.70)

Split liver * time (days post-transplant)	1.05 (1.01 - 1.08)	0.999 (0.997 - 1.001)	0.999 (0.998 - 1)
Organ appearance suboptimal * time (days post-transplant)	0.98 (0.96 - 1.00)	0.998 (0.997 - 0.999)	0.999 (0.999 - 1)
Operative characteristics			
CIT (hours)	1.04 (1.01 - 1.07)	1.03 (1.01 - 1.05)	1.02 (1.00 - 1.04)
Previous abdominal surgery	1.24 (0.97 - 1.58)	1.20 (1.01 - 1.42)	1.13 (0.97 - 1.31)
Night-time transplant	1.02 (0.85 - 1.23)	1.01 (0.88 - 1.15)	1.00 (0.89 - 1.12)
Weekend transplant	0.77 (0.66 - 0.91)	0.86 (0.77 - 0.97)	0.89 (0.81 - 0.99)

Table A3 Risk adjusted hazard ratio from Cox regression model for chance of graft failure following liver transplantation in the UK, 1st January 2000 to 31st December 2014

Risk factor	Hazard ratio (95% confidence interval)		
	30 days	1 year	3 years
Recipient characteristics			
Transplant year			
2000	1.00 (-)	1.00 (-)	1.00 (-)
2001	1.17 (0.72 - 1.90)	1.01 (0.70 - 1.46)	0.92 (0.67 - 1.26)
2002	0.95 (0.57 - 1.57)	0.80 (0.54 - 1.17)	0.83 (0.60 - 1.14)
2003	1.17 (0.72 - 1.90)	1.05 (0.72 - 1.51)	0.95 (0.69 - 1.30)
2004	0.97 (0.59 - 1.61)	1.10 (0.77 - 1.57)	0.95 (0.70 - 1.29)
2005	0.88 (0.52 - 1.50)	0.93 (0.64 - 1.37)	0.86 (0.62 - 1.19)
2006	1.15 (0.70 - 1.87)	1.12 (0.78 - 1.59)	0.98 (0.72 - 1.34)
2007	1.00 (0.60 - 1.65)	0.86 (0.59 - 1.26)	0.81 (0.59 - 1.12)
2008	0.78 (0.46 - 1.32)	0.82 (0.57 - 1.20)	0.81 (0.59 - 1.10)
2009	0.81 (0.48 - 1.36)	0.86 (0.59 - 1.25)	0.84 (0.61 - 1.14)
2010	0.79 (0.47 - 1.33)	0.70 (0.48 - 1.03)	0.64 (0.46 - 0.90)
2011	0.93 (0.56 - 1.53)	0.62 (0.42 - 0.92)	0.59 (0.42 - 0.83)
2012	0.64 (0.38 - 1.10)	0.61 (0.41 - 0.90)	0.62 (0.45 - 0.86)
2013	0.91 (0.56 - 1.48)	0.76 (0.53 - 1.10)	0.71 (0.52 - 0.98)
2014	0.73 (0.43 - 1.21)	0.62 (0.42 - 0.91)	0.63 (0.45 - 0.89)
Age at transplant	1.01 (1.00 - 1.02)	1.01 (1.00 - 1.01)	1.00 (1.00 - 1.01)
Caucasian	0.92 (0.70 - 1.21)	0.87 (0.71 - 1.07)	0.87 (0.73 - 1.03)
Primary liver disease			
Cancer	1.00 (-)	1.00 (-)	1.00 (-)
HCV	0.87 (0.51 - 1.48)	1.12 (0.77 - 1.64)	1.30 (0.95 - 1.77)
Alcohol related liver disease	1.13 (0.69 - 1.85)	1.08 (0.75 - 1.56)	0.97 (0.71 - 1.32)
HBV	1.26 (0.64 - 2.49)	1.18 (0.71 - 1.96)	1.11 (0.72 - 1.71)
PSC	1.51 (0.88 - 2.58)	1.61 (1.09 - 2.38)	1.49 (1.07 - 2.07)
PBC	1.10 (0.64 - 1.89)	1.09 (0.73 - 1.63)	0.90 (0.64 - 1.27)
Autoimmune hepatitis	1.14 (0.65 - 2.01)	1.09 (0.71 - 1.65)	0.95 (0.66 - 1.36)
Metabolic liver disease	1.58 (0.89 - 2.80)	1.61 (1.06 - 2.46)	1.34 (0.93 - 1.93)
Acute liver disease	1.99 (1.04 - 3.83)	2.02 (1.23 - 3.31)	1.72 (1.12 - 2.65)
Re-transplants	2.26 (1.26 - 4.05)	2.48 (1.61 - 3.81)	2.29 (1.59 - 3.30)
Other	1.14 (0.61 - 2.15)	1.15 (0.72 - 1.84)	0.93 (0.62 - 1.40)
Renal support	1.39 (1.03 - 1.86)	1.30 (1.03 - 1.63)	1.26 (1.03 - 1.54)
In-patient	0.99 (0.75 - 1.30)	1.11 (0.91 - 1.34)	1.14 (0.96 - 1.35)

Ventilated	1.59 (1.08 - 2.35)	1.41 (1.04 - 1.92)	1.28 (0.97 - 1.69)
Oesophageal varices	1.15 (0.94 - 1.40)	1.15 (0.99 - 1.33)	1.07 (0.94 - 1.22)
Presence of TIPS	1.39 (0.90 - 2.15)	1.45 (1.06 - 2.00)	1.30 (0.97 - 1.74)
Sepsis confirmed	1.51 (1.08 - 2.10)	1.35 (1.03 - 1.75)	1.31 (1.04 - 1.67)
Acute failure grade prior to transplant	0.84 (0.54 - 1.31)	0.70 (0.50 - 0.98)	0.64 (0.47 - 0.86)
Donor characteristics			
Donor age (years)	1 (0.99 - 1)	1 (1 - 1.01)	1.01 (1.00 - 1.01)
DCD	2.22 (1.65 - 2.99)	2.18 (1.74 - 2.72)	2.07 (1.71 - 2.52)
Split liver	1.13 (0.65 - 1.96)	2.33 (1.72 - 3.16)	2.32 (1.77 - 3.04)
Organ appearance suboptimal	2.74 (2.06 - 3.65)	1.85 (1.53 - 2.24)	1.73 (1.47 - 2.05)
Split liver * time (days post-transplant)	1.05 (1.01 - 1.09)	0.999 (0.996 - 1.001)	0.999 (0.998 - 1)
Organ appearance suboptimal * time (days post-transplant)	0.96 (0.94 - 0.99)	0.998 (0.997 - 1)	0.999 (0.999 - 1)
Operative characteristics			
CIT (hours)	1.04 (1.00 - 1.08)	1.03 (1.00 - 1.06)	1.02 (1.00 - 1.04)
Previous abdominal surgery	1.26 (0.95 - 1.67)	1.23 (1.00 - 1.51)	1.16 (0.97 - 1.40)
Night-time transplant	1.14 (0.91 - 1.41)	1.07 (0.91 - 1.26)	1.11 (0.97 - 1.28)
Weekend transplant	0.81 (0.67 - 0.97)	0.87 (0.76 - 1.01)	0.89 (0.79 - 1.01)

Table A4 Cox regression model for the chance of transplant failure following liver transplantation at night-time compared to daytime

Time from transplant	Unadjusted			Risk adjusted		
	Hazard ratio	95% interval	p-value	Hazard ratio	95% interval	p-value
30 days	1.254	1.059 - 1.483	0.009	1.021	0.851 - 1.226	0.8
One year	1.247	1.104 - 1.408	0.0004	1.007	0.882 - 1.149	0.9
Three years	1.187	1.068 - 1.319	0.002	0.995	0.887 - 1.116	0.9

Table A5 Cox regression model for the chance of graft failure following liver transplantation at night-time compared to daytime

Time from transplant	Unadjusted			Risk adjusted		
	Hazard ratio	95% interval	p-value	Hazard ratio	95% interval	p-value
30 days	1.279	1.046 - 1.564	0.02	1.137	0.914 - 1.413	0.2
One year	1.227	1.058 - 1.424	0.007	1.071	0.912 - 1.259	0.4
Three years	1.233	1.082 - 1.406	0.002	1.112	0.965 - 1.282	0.1