Outcomes of liver transplantation for non-alcoholic steatohepatitis: A European Liver Transplant Registry study

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Fig. S1. Prevalence of liver disease aetiologies in patients with HCC in different era.

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A

B

	At risk; N	Patient survival; % Years since transplant			
		1.0	2.5	5.0	10.0
NASH	2740	84.3	78.6	71.4	56.9
ARLD	22220	87.0	81.9	74.6	58.5
HCV	16121	83.1	74.3	64.8	51.4
AiLD	9291	90.1	86.9	82.0	73.0
HBV	7330	88.0	83.2	77.7	71.3
CC	7006	84.6	78.5	70.5	56.5
Other	4209	89.0	85.0	79.4	68.3

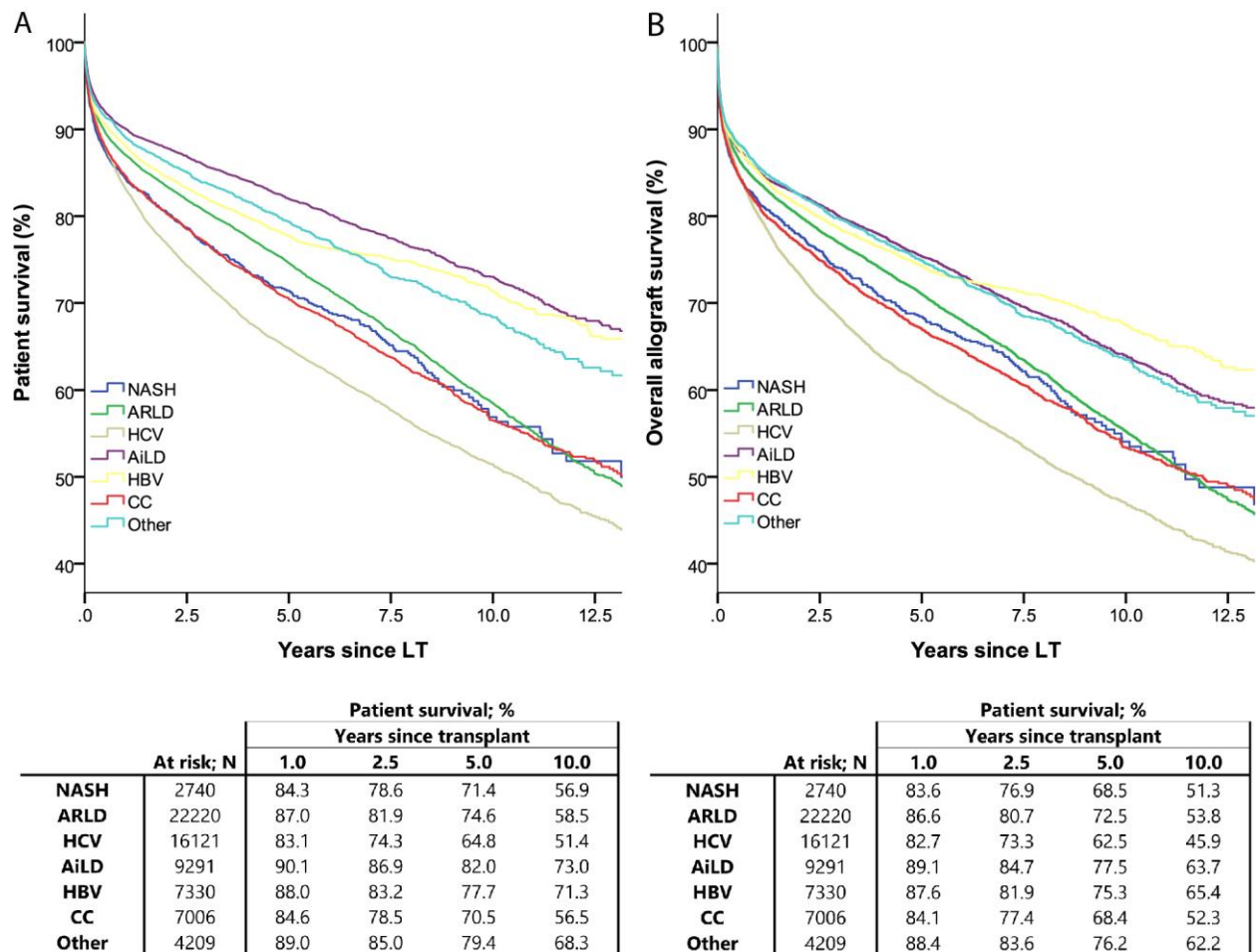|	At risk; N	Patient survival; % Years since transplant			
		1.0	2.5	5.0	10.0
NASH	2740	83.6	76.9	68.5	51.3
ARLD	22220	86.6	80.7	72.5	53.8
HCV	16121	82.7	73.3	62.5	45.9
AiLD	9291	89.1	84.7	77.5	63.7
HBV	7330	87.6	81.9	75.3	65.4
CC	7006	84.1	77.4	68.4	52.3
Other	4209	88.4	83.6	76.2	62.2

Fig. S2. Kaplan-Meier curves of patient survival (A) and overall allograft survival (B) analysis for all patients undergoing primary LT for different indications (log-rank: $P<0.001$ for both).

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		Patient survival; %			
		Years since transplant			
	At risk; N	1.0	2.5	5.0	10.0
Presumed NASH	1570	82.9	75.9	68.2	53.4
Pure NASH	1170	86.3	82.8	76.8	65.6

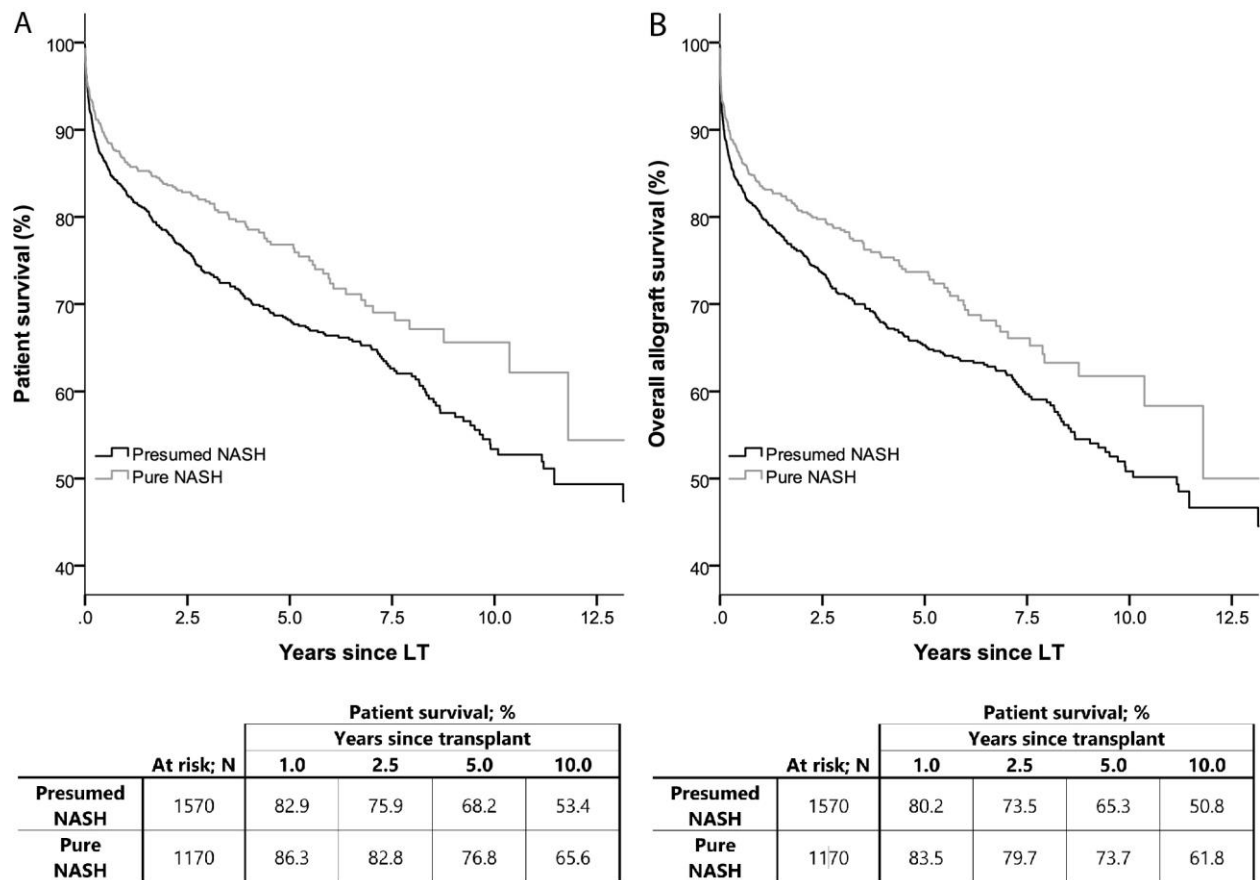|		Patient survival; %			
		Years since transplant			
	At risk; N	1.0	2.5	5.0	10.0
Presumed NASH	1570	80.2	73.5	65.3	50.8
Pure NASH	1170	83.5	79.7	73.7	61.8

Fig. S3. Kaplan-Meier curves of patient survival (A) and overall allograft survival (B) analysis for patients with pure NASH and presumed NASH undergoing primary LT (log-rank: *P*<0.001 for both).
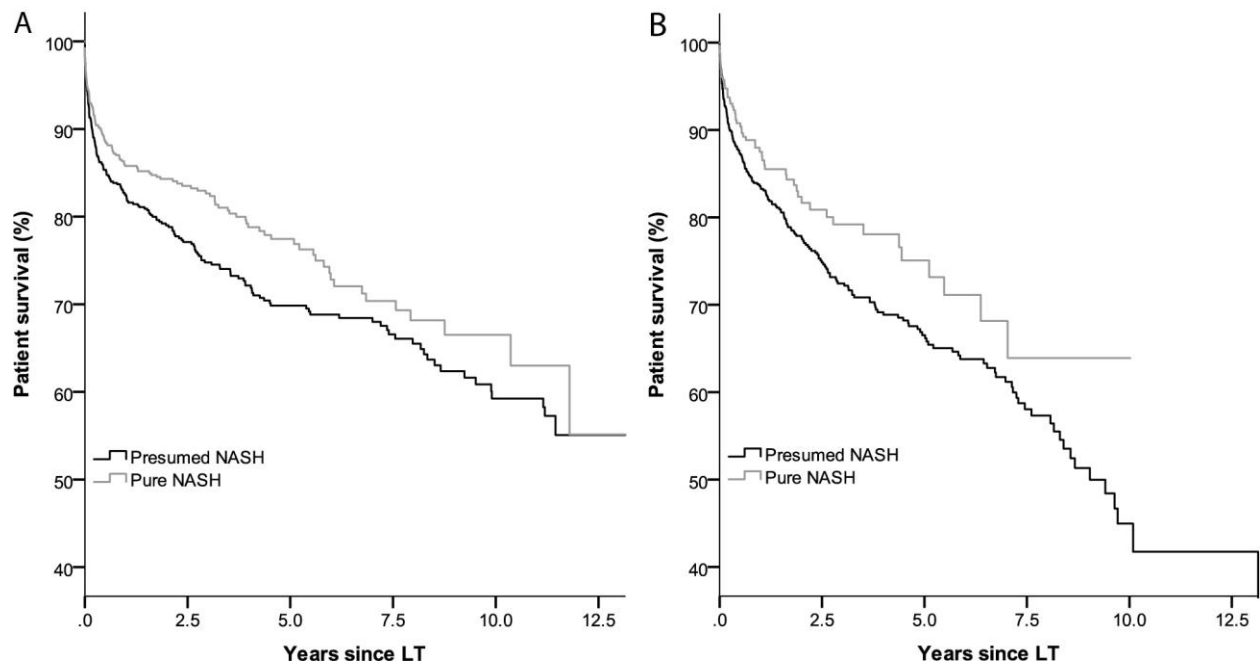
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Fig. S4. Kaplan-Meier curves of patient survival comparing those transplanted for pure and presumed NASH stratified by the absence (A) and presence (B) of HCC (A: log-rank: *P*=0.019; B: log-rank *P*=0.046).
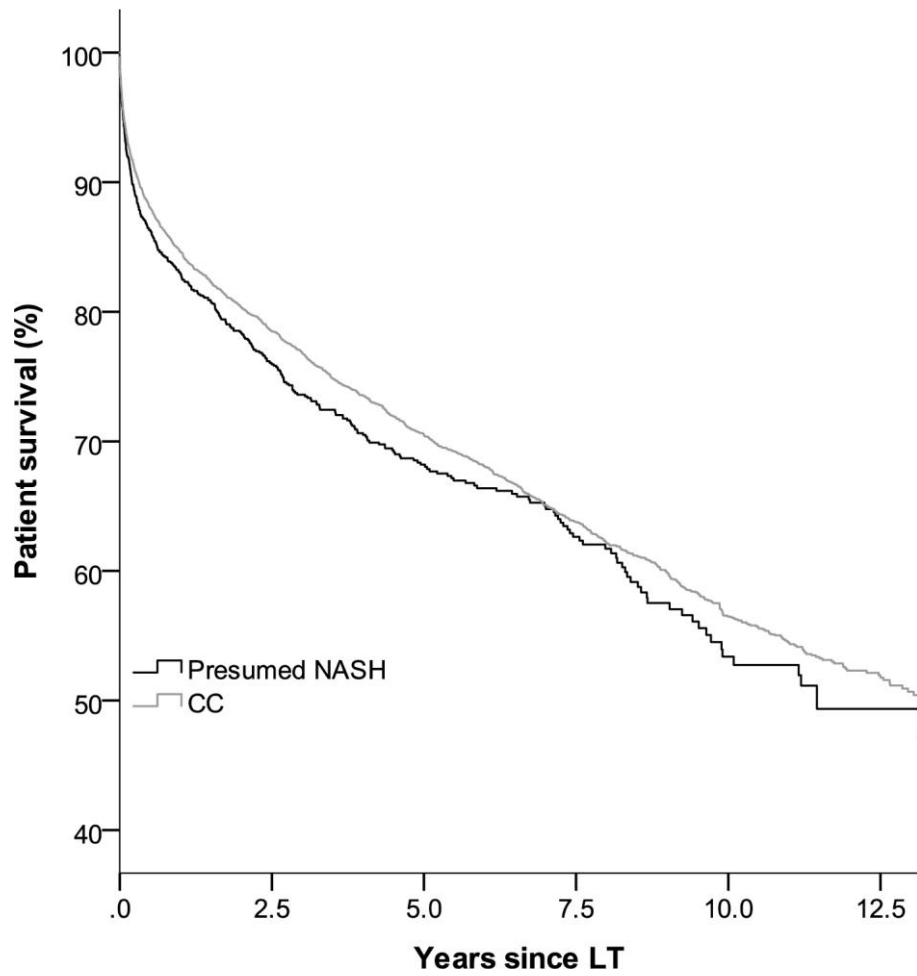
Fig. S5. Kaplan-Meier curves of patient survival comparing those transplanted for presumed NASH and those with CC (log-rank: *P*=0.072).

Indication for Transplant		Year of Transplant															Total
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016*	
	NASH	45 (1.2)	53 (1.4)	44 (1.1)	72 (1.7)	106 (2.4)	132 (2.8)	175 (3.6)	178 (3.7)	205 (4.2)	219 (4.3)	232 (4.6)	274 (5.3)	331 (6.2)	343 (6.8)	332 (8.4)	2741
	ARLD	1135 (30.2)	1103 (29.8)	1246 (30.2)	1257 (29.4)	1297 (30.1)	1507 (32.5)	1540 (31.8)	1620 (33.8)	1611 (33.4)	1721 (33.7)	1713 (33.9)	1727 (33.5)	1717 (32.3)	1756 (34.6)	1276 (32.3)	22226
	HCV	994 (26.4)	1047 (28.2)	1077 (26.1)	1148 (26.8)	1110 (25.8)	1139 (24.5)	1184 (24.4)	1155 (24.1)	1106 (22.9)	1180 (23.1)	1111 (22.0)	1190 (23.1)	1176 (22.1)	977 (19.2)	533 (13.5)	16127
	AiLD	553 (14.7)	482 (13.0)	567 (13.7)	610 (14.2)	550 (12.8)	573 (12.4)	582 (12.0)	543 (11.4)	568 (11.8)	672 (13.1)	667 (13.2)	686 (13.3)	785 (14.7)	768 (15.1)	694 (17.6)	9300
	HBV	458 (12.2)	418 (11.3)	488 (11.8)	506 (11.8)	436 (10.1)	552 (11.9)	579 (12.0)	523 (10.9)	529 (10.9)	539 (10.5)	547 (10.8)	508 (9.9)	493 (9.3)	394 (7.8)	367 (9.3)	7337
	CC	342 (9.1)	361 (9.7)	442 (10.7)	462 (10.8)	563 (13.1)	462 (10.0)	469 (9.7)	505 (10.5)	509 (10.5)	477 (9.3)	463 (9.2)	466 (9.0)	486 (9.1)	525 (10.3)	477 (12.1)	7009
	Other	229 (6.1)	243 (6.6)	267 (6.4)	229 (5.3)	245 (5.7)	274 (5.9)	313 (6.5)	266 (5.6)	305 (6.3)	308 (6.0)	314 (6.2)	301 (5.9)	334 (6.3)	315 (6.2)	267 (6.8)	4210
	Total	3756	3707	4131	4284	4307	4639	4842	4790	4833	5116	5047	5152	5322	5078	3946	68950
	Pure NASH	7 (0.2)	7 (0.2)	11 (0.3)	18 (0.4)	28 (0.7)	26 (0.6)	40 (0.8)	56 (1.2)	66 (1.4)	106 (2.1)	98 (1.9)	144 (2.8)	186 (3.5)	194 (3.8)	184 (4.7)	1171
	Pres' NASH	38 (1.0)	46 (1.2)	33 (0.8)	54 (1.3)	78 (1.7)	106 (2.2)	135 (2.8)	122 (2.5)	139 (2.8)	113 (2.2)	134 (2.7)	130 (2.5)	145 (2.7)	149 (3.0)	148 (3.7)	1570

Table S1. Trends of annual primary LTs performed for different indications in the ELTR region. Both absolute numbers and percentages (in brackets) are reported. Additional figures for patients classified as "pure NASH" (patients coded as NASH in the ELTR) and "pres' NASH" (presumed NASH = patients coded as cryptogenic cirrhosis with a BMI > 30kg.m^{-2} in the ELTR) are also provided. *Data from 2016 is incomplete, as not all centres had entered data on to ELTR at the time of collection

	Odds ratio of receiving a DCD organ	
	OR (95% CI)	***P***
NASH	1.53 (0.21-11.11)	0.677
Era of transplant		**<0.001**
2002-2004	1.00	
2005-2007	2.12 (1.54-2.92)	**<0.001**
2008-2010	5.10 (3.81-6.83)	**<0.001**
2011-2013	7.60 (5.72-10.10)	**<0.001**
2014-2016	12.18 (9.20-16.12)	**<0.001**
Era of transplant * NASH (interaction term)		0.765
2002-2004*NASH	1.00	
2005-2007*NASH	1.99 (0.24-16.25)	0.521
2008-2010*NASH	1.19 (0.57-9.07)	0.867
2011-2013*NASH	1.23 (0.17-9.19)	0.839
2014-2016*NASH	1.32 (0.18-9.71)	0.787

Table S2. Interaction analysis between NASH and era of transplant on the rate of DCD transplants. Binary logistic model: the interaction term (Era of transplant*NASH) tests whether the difference in the DCD rate between NASH and non-NASH varies with time. Bold *P*-values are significant at *P*<0.05

	Recipients without HCC			Recipients with HCC		
	NASH N=1667	**Non-NASH** N=47087	***P***	**NASH** N=1073	**Non-NASH** N=19122	***P***
RECIPIENT CHARACTERISTICS						
Age; years; *median (IQR)*	58 (51-63)	53 (46-59)	**<0.001**	61 (57-65)	58 (53-63)	**<0.001**
Sex: male; %	64.4	67.3	**0.011**	81.6	83.8	0.061
Blood group; %			0.875			0.076
A	43.8	43.3		43.2	44.3	
AB	5.8	5.8		5.9	5.1	
B	12.4	13.1		14.0	11.7	
O	38.0	37.8		37.0	38.9	
BMI; kg.m^{-2}; *mean (SD)*	32.6 (4.91)	25.6 (4.57)	**<0.001**	32.6 (4.98)	26.4 (4.05)	**<0.001**
MELD; *median (IQR)*	18 (14-23)	18 (13-26)	**0.019**	13 (9-17)	12 (9-16)	**0.016**
DONOR CHARACTERISTICS						
Age; *median (IQR)*	51 (38-62)	50 (36-63)	0.522	55 (41-68)	55 (44-67)	0.553
Sex: male; %	61.1	57.1	**0.001**	64.2	58.7	**<0.001**
Blood group; %			0.170			0.229
A	41.9	42.4		41.7	43.3	
AB	4.4	4.3		4.7	3.9	
B	10.4	12.0		12.5	11.0	
O	43.4	41.3		41.1	41.7	
BMI; kg.m^{-2}; *mean (SD)*	26.8 (4.70)	25.4 (4.26)	**<0.001**	27.1 (4.96)	25.7 (4.38)	**<0.001**
Type of donor; %			**<0.001**			**<0.001**
DBD	82.4	90.4		88.0	90.3	
DCD	6.1	2.5		7.3	2.8	
Domino	0.5	0.7		1.2	1.6	
Living	10.9	6.4		3.5	5.2	

Table S3. Donor and recipient factors in patients transplanted for NASH and non-NASH indications described by the absence or presence of concomitant HCC. Bold *P*-values are significant at *P*<0.05

	Univariable	Multivariable
	HR (95% CI)	HR (95% CI)
RECIPIENT CHARACTERISTICS		
NASH (vs non-NASH)	*1.09 (0.97-1.23)*	*1.10 (0.97-1.24)*
Cirrhosis aetiology	**Overall****	
NASH	1.00	
ARLD	**0.87 (0.76-0.99)***	
HCV	1.07 (0.94-1.21)	
AiLD	**0.76 (0.58-0.98)***	n/a
HBV	**0.68 (0.59-0.79)****	
CC	0.93 (0.81-1.06)	
Other	**0.74 (0.62-0.88)***	
Age (years)	**Overall****	**Overall****
</=45	1.00	1.00
46-55	**1.14 (1.01-1.29)***	**1.18 (1.05-1.34)***
56-60	**1.27 (1.13-1.44)****	**1.33 (1.18-1.51)****
61-65	**1.42 (1.26-1.60)***	**1.51 (1.33-1.70)****
>65	**1.52 (1.34-1.73)***	**1.67 (1.46-1.91)****
Sex: male	0.97 (0.90-1.04)	not in final model
MELD	**Overall****	**Overall****
≤11	1.00	1.00
>11, ≤14	0.93 (0.84-1.02)	0.94 (0.85-1.03)
>14, ≤18	0.94 (0.85-1.03)	0.93 (0.85-1.03)
>18, ≤23	1.03 (0.92-1.16)	1.04 (0.92-1.17)
>23	**1.40 (1.24-1.59)****	**1.41 (1.25-1.60)****
Missing value	**1.17 (1.09-1.25)****	**1.24 (1.14-1.36)****
Blood group	**Overall**	
A	1.00	
AB	0.94 (0.83-1.06)	not in final model
B	0.95 (0.97-1.04)	
O	1.02 (0.96-1.08)	
BMI (kg.m^{-2})	**Overall**	
≤18.5	1.11 (0.81-1.51)	
>18.5, ≤25.0	1.00	
>25.0, ≤30.0	0.97 (0.89-1.05)	
>30.0, ≤35.0	1.02 (0.93-1.14)	not in final model
>35.0, ≤40.0	0.90 (0.74-1.10)	
>40.0	1.13 (0.77-1.67)	
Missing value	1.01 (0.94-1.09)	
DONOR CHARACTERISTICS		
Age (years)	**Overall****	**Overall****
</=34	1.00	1.00
35-47	1.03 (0.94-1.13)	1.03 (0.94-1.13)
48-57	1.09 (1.00-1.19)	**1.10 (1.00-1.20)***
58-67	**1.17 (1.07-1.27)****	**1.18 (1.07-1.29)***

>68	**1.19 (1.09-1.29)****	**1.19 (1.09-1.30)****
Sex: male	0.95 (0.90-1.00)	not in final model
Blood group	**Overall**	
A	1.00	
AB	0.90 (0.78-1.04)	not in final model
B	0.96 (0.88-1.05)	
O	1.02 (0.97-1.08)	
BMI (kg.m^{-2})	**Overall**	**Overall****
≤18.5	1.01 (0.82-1.26)	0.99 (0.79-1.24)
>18.5, ≤25.0	1.00	1.00
>25.0, ≤30.0	1.07 (0.99-1.14)	1.06 (0.99-1.14)
>30.0, ≤35.0	**1.13 (1.01-1.26)***	**1.13 (1.01-1.27)***
>35.0, ≤40.0	**1.23 (1.00-1.51)***	**1.28 (1.04-1.58)***
>40.0	1.05 (0.75-1.47)	1.11 (0.79-1.57)
Missing value	1.02 (0.95-1.09)	0.94 (0.87-1.01)
Type of donor	**Overall****	**Overall****
DBD	1.00	1.00
DCD	1.01 (0.85-1.20)	1.09 (0.91-1.29)
Domino	1.08 (0.89-1.31)	1.09 (0.90-1.32)
Living	**1.25 (1.11-1.40)****	**1.45 (1.28-1.64)****
OTHER SIGNIFICANT VARIABLES		
Re-transplant	**1.78 (1.63-1.95)****	**1.81 (1.65-1.98)****
Era of transplant	**Overall****	**Overall***
2002-2004	1.00	1.00
2005-2007	1.00 (0.93-1.08)	1.05 (0.96-1.13)
2008-2010	0.95 (0.87-1.03)	1.02 (0.93-1.11)
2011-2013	**0.85 (0.78-0.93)****	0.93 (0.84-1.04)
2014-2016	**0.77 (0.68-0.86)****	**0.84 (0.73-0.95)***

Table S4. Recipient and donor factors that influence patient survival in transplant recipients with HCC. The final multivariable models were based on 19,514 patients. *$P<0.05$; **$P<0.001$

	Patient survival				Overall allograft survival			
	Univariable		Multivariable		Univariable		Multivariable	
	HR (95% CI)	*P*	HR (95% CI)	*P*	HR (95% CI)	*P*	HR (95% CI)	*P*
RECIPIENT CHARACTERISTICS								
NASH (vs non-NASH)	*1.12 (1.04-1.22)*	***0.005***	*1.02 (0.93-1.11)*	*0.713*	*1.06 (0.98-1.14)*	*0.132*	*0.99 (0.91-1.08)*	*0.815*
Aetiology of cirrhosis		**<0.001**				**<0.001**		
NASH	1.00				1.00			
ARLD	0.89 (0.82-0.97)	**0.006**			0.92 (0.85-0.99)	**0.034**		
HCV	1.19 (1.09-1.29)	**<0.001**	n/a		1.21 (1.12-1.31)	**<0.001**	n/a	
AiLD	0.58 (0.53-0.63)	**<0.001**			0.75 (0.69-0.81)	**<0.001**		
HBV	0.68 (0.62-0.75)	**<0.001**			0.73 (0.67-0.80)	**<0.001**		
CC	0.99 (0.91-1.09)	0.890			1.02 (0.93-1.11)	0.732		
Other	0.68 (0.61-0.76)	**<0.001**			0.76 (0.69-0.83)	**<0.001**		
Age (years)		**<0.001**		**<0.001**		**<0.001**		**<0.001**
≤45	1.00		1.00		1.00		1.00	
46-55	1.26 (1.20-1.32)	**<0.001**	1.25 (1.19-1.32)	**<0.001**	1.13 (1.08-1.17)	**<0.001**	1.08 (1.04-1.13)	**<0.001**
56-60	1.48 (1.41-1.56)	**<0.001**	1.48 (1.41-1.56)	**<0.001**	1.24 (1.19-1.30)	**<0.001**	1.18 (1.13-1.24)	**<0.001**
61-65	1.73 (1.65-1.82)	**<0.001**	1.72 (1.63-1.82)	**<0.001**	1.39 (1.33-1.46)	**<0.001**	1.31 (1.25-1.37)	**<0.001**
>65	1.90 (1.78-2.01)	**<0.001**	1.94 (1.82-2.07)	**<0.001**	1.49 (1.41-1.58)	**<0.001**	1.42 (1.34-1.51)	**<0.001**
Sex: male	1.12 (1.08-1.16)	**<0.001**	1.08 (1.04-1.12)	**<0.001**	1.09 (1.06-1.13)	**<0.001**	1.07 (1.03-1.10)	**<0.001**
MELD		**<0.001**		**<0.001**		**<0.001**		**<0.001**
≤11	1.00		1.00		1.00		1.00	
>11, ≤14	0.90 (0.85-0.96)	**0.002**	0.96 (0.90-1.03)	0.230	0.91 (0.86-0.97)	**0.003**	0.95 (0.90-1.01)	0.091
>14, ≤18	0.90 (0.85-0.96)	**<0.001**	1.00 (0.94-1.06)	0.913	0.91 (0.86-0.96)	**<0.001**	0.97 (0.92-1.03)	0.270
>18, ≤23	0.91 (0.86-0.97)	**0.005**	1.05 (1.05-1.12)	0.164	0.90 (0.85-0.95)	**<0.001**	0.98 (0.92-1.04)	0.438
>23	1.30 (1.23-1.38)	**<0.001**	1.52 (1.52-1.62)	**<0.001**	1.24 (1.17-1.30)	**<0.001**	1.36 (1.29-1.44)	**<0.001**
Missing value	1.08 (1.03-1.13)	**0.002**	1.24 (1.24-1.32)	**<0.001**	1.06 (1.01-1.11)	**0.010**	1.25 (1.18-1.32)	**<0.001**
Blood group		0.393				0.763		**0.012**
A	1.00				1.00		1.00	
AB	0.96 (0.90-1.03)	0.246	not in final model		0.97 (0.91-1.04)	0.385	1.18 (1.05-1.33)	**0.008**
B	0.98 (0.93-1.02)	0.304			0.98 (0.94-1.03)	0.480	1.07 (0.95-1.22)	0.262
O	1.01 (0.97-1.04)	0.705			1.00 (0.97-1.03)	0.905	0.96 (0.88-1.06)	0.417
BMI (kg.m^{-2})		**0.002**		**<0.001**		**0.005**		**<0.001**
≤18.5	1.15 (1.03-1.29)	**0.017**	1.30 (1.16-1.47)	**<0.001**	1.17 (1.05-1.30)	**0.005**	1.29 (1.15-1.44)	**<0.001**
>18.5, ≤25.0	1.00		1.00		1.00		1.00	
>25.0, ≤30.0	1.01 (0.97-1.06)	0.608	0.95 (0.91-0.99)	**0.023**	0.98 (0.94-1.02)	0.359	0.93 (0.89-0.97)	**0.001**
>30.0, ≤35.0	1.09 (1.03-1.15)	**0.003**	1.02 (0.96-1.08)	0.582	1.03 (0.98-1.09)	0.232	0.99 (0.93-1.04)	0.601
>35.0, ≤40.0	1.04 (0.94-1.16)	0.460	0.99 (0.89-1.11)	0.894	0.96 (0.87-1.06)	0.417	0.93 (0.84-1.03)	0.137
>40.0	1.30 (1.08-1.57)	**0.005**	1.26 (1.06-1.55)	**0.010**	1.21 (1.01-1.44)	**0.038**	1.19 (1.00-1.42)	0.056
Missing value	1.04 (1.00-1.08)	0.068	1.00 (0.94-1.05)	0.889	0.99 (0.95-1.02)	0.410	0.94 (0.89-0.99)	**0.021**
HCC	1.25 (1.21-1.29)	**<0.001**	1.18 (1.14-1.22)	**<0.001**	1.17 (1.14-1.21)	**<0.001**	1.13 (1.09-1.17)	**<0.001**
DONOR CHARACTERISTICS								
Age (years)		**<0.001**		**<0.001**		**<0.001**		**<0.001**
≤34	1.00		1.00		1.00		1.00	
35-47	1.15 (1.10-1.21)	**<0.001**	1.12 (1.07-1.18)	**<0.001**	1.16 (1.11-1.22)	**<0.001**	1.14 (1.09-1.20)	**<0.001**
48-57	1.24 (1.19-1.30)	**<0.001**	1.21 (1.15-1.27)	**<0.001**	1.26 (1.21-1.32)	**<0.001**	1.26 (1.20-1.32)	**<0.001**
58-67	1.39 (1.32-1.45)	**<0.001**	1.32 (1.26-1.39)	**<0.001**	1.40 (1.34-1.47)	**<0.001**	1.39 (1.33-1.46)	**<0.001**
>68	1.51 (1.44-1.58)	**<0.001**	1.40 (1.33-1.48)	**<0.001**	1.54 (1.47-1.61)	**<0.001**	1.53 (1.46-1.60)	**<0.001**
Sex: male	0.98 (0.95-1.01)	0.221	not in final model		0.97 (0.94-0.99)	**0.031**	not in final model	
Blood group		0.314				**0.027**		**0.010**
A	1.00				1.00		1.00	
AB	0.91 (0.84-0.98)	**0.014**	not in final model		0.91 (0.85-0.98)	**0.017**	0.82 (0.72-0.95)	**0.006**
B	0.96 (0.91-1.01)	0.091			0.97 (0.92-1.01)	0.149	0.93 (0.81-1.05)	0.238
O	1.02 (0.99-1.05)	0.272			1.01 (0.98-1.04)	0.590	1.04 (0.95-1.14)	0.421
BMI (kg.m^{-2})		**<0.001**		**<0.001**		**<0.001**		**<0.001**

≤18.5	0.94 (0.84-1.06)	0.317	0.92 (0.82-1.06)	0.263	0.97 (0.87-1.08)	0.566	0.97 (0.86-1.09)	0.559
>18.5, ≤25.0	1.00		1.00		1.00		1.00	
>25.0, ≤30.0	1.09 (1.05-1.13)	**<0.001**	1.03 (0.99-1.08)	0.114	1.11 (1.11-1.07)	**<0.001**	1.06 (1.02-1.10)	**0.004**
>30.0, ≤35.0	1.11 (1.04-1.18)	**0.001**	1.05 (0.99-1.13)	0.111	1.11 (1.04-1.18)	**0.001**	1.06 (1.00-1.13)	**0.044**
>35.0, ≤40.0	1.15 (1.02-1.30)	**0.022**	1.10 (0.98-1.25)	0.106	1.12 (1.00-1.26)	**0.049**	1.10 (0.98-1.23)	0.126
>40.0	0.95 (0.77-1.16)	0.616	0.92 (0.76-1.14)	0.475	0.94 (0.78-1.14)	0.530	0.93 (0.77-1.13)	0.467
Missing value	0.96 (0.93-0.99)	**0.037**	0.89 (0.85-0.94)	**<0.001**	0.94 (0.91-0.98)	**0.001**	0.87 (0.83-0.91)	**<0.001**
Type of donor		**<0.001**		**<0.001**		**<0.001**		**<0.001**
DBD	1.00		1.00		1.00		1.00	
DCD	0.80 (0.71-0.89)	**<0.001**	0.85 (0.76-0.96)	**0.006**	0.98 (0.89-1.08)	0.719	1.07 (0.97-1.18)	0.191
Domino	1.19 (1.05-1.36)	**0.009**	1.14 (1.00-1.31)	0.052	1.20 (1.06-1.36)	**0.005**	1.24 (1.09-1.40)	**0.001**
Living	1.17 (1.10-1.25)	**<0.001**	1.47 (1.37-1.57)	**<0.001**	1.12 (1.06-1.19)	**<0.001**	1.36 (1.27-1.46)	**<0.001**
OTHER CHARACTERISTICS								
Re-transplant	1.74 (1.66-1.83)	**<0.001**	1.80 (1.72-1.89)	**<0.001**		n/a		
Era of transplant		**<0.001**		**<0.001**		**<0.001**		**<0.001**
2002-2004	1.00		1.00		1.00		1.00	
2005-2007	1.05 (1.01-1.10)	**0.019**	1.04 (0.99-1.09)	0.063	1.04 (1.00-1.09)	**0.042**	1.04 (0.99-1.08)	0.088
2008-2010	1.10 (1.05-1.15)	**<0.001**	1.05 (1.00-1.11)	**0.047**	1.07 (1.03-1.12)	**0.001**	1.04 (0.99-1.09)	0.110
2011-2013	0.98 (0.98-1.03)	0.427	0.93 (0.88-0.99)	**0.021**	0.98 (0.94-1.03)	0.443	0.94 (0.89-0.99)	**0.034**
2014-2016	0.85 (0.85-0.91)	**<0.001**	0.82 (0.76-0.88)	**<0.001**	0.87 (0.84-0.94)	**<0.001**	0.85 (0.80-0.91)	**<0.001**

Table S5. Recipient and donor factors that influence patient and overall allograft survival in all primary transplant recipients. Missing values were treated as a separate category for MELD, recipient BMI and donor BMI. Significant determinants of were analysed by univariable Cox regression, and independent predictors were sought in a multivariable Cox regression model with a backwards stepwise approach. NASH was not selected for inclusion in the final regression models, and so was entered into models alongside the factors identified as significant. The final multivariable models were based on 66,672 patients for patient survival, and 66,491 patients for graft survival. Bold *P* values are significant at *P*<0.05.

	Recipients without HCC				Recipients with HCC			
	Univariable		Multivariable		Univariable		Multivariable	
	HR (95% CI)	*P*	HR (95% CI)	*P*	HR (95% CI)	*P*	HR (95% CI)	*P*
RECIPIENT CHARACTERISTICS								
NASH (vs non-NASH)	*1.06 (0.96-1.17)*	*0.082*	*0.98 (0.88-1.09)*	*0.644*	*1.02 (0.91-1.15)*	*0.156*	*1.02 (0.90-1.15)*	*0.797*
Aetiology of cirrhosis		**<0.001**				**<0.001**		
NASH	1.00				1.00			
ARLD	0.95 (0.86-1.05)	0.291			0.93 (0.82-1.05)	0.240		
HCV	1.27 (1.14-1.40)	**<0.001**	n/a		1.14 (1.01-1.28)	**0.040**	n/a	
AiLD	0.78 (0.70-0.86)	**<0.001**			0.88 (0.69-1.11)	0.278		
HBV	0.72 (0.64-0.80)	**<0.001**			0.75 (0.65-0.86)	**<0.001**		
CC	1.01 (0.90-1.13)	0.892			0.99 (0.87-1.12)	0.842		
Other	0.76 (0.67-0.85)	**<0.001**			0.82 (0.70-0.98)	**0.025**		
Age (years)		**<0.001**		**<0.001**		**<0.001**		**<0.001**
</=45	1.00		1.00		1.00		1.00	
46-55	1.10 (1.05-1.16)	**<0.001**	1.07 (1.02-1.12)	**0.009**	1.08 (0.97-1.21)	0.167	1.09 (0.98-1.22)	0.126
56-60	1.23 (1.17-1.29)	**<0.001**	1.18 (1.12-1.25)	**<0.001**	1.14 (1.02-1.27)	**0.024**	1.14 (1.02-1.28)	**0.023**
61-65	1.40 (1.32-1.48)	**<0.001**	1.33 (1.26-1.41)	**<0.001**	1.22 (1.10-1.37)	**<0.001**	1.22 (1.09-1.37)	**<0.001**
>65	1.53 (1.43-1.64)	**<0.001**	1.48 (1.38-1.59)	**<0.001**	1.28 (1.13-1.44)	**<0.001**	1.30 (1.15-1.47)	**<0.001**
Sex: male	1.10 (1.06-1.14)	**<0.001**	1.09 (1.05-1.13)	**<0.001**	0.97 (0.91-1.03)	0.324	not in final model	
MELD		**<0.001**		**<0.001**		**<0.001**		**<0.001**
≤11	1.00		1.00		1.00		1.00	
>11, ≤14	0.95 (0.87-1.03)	0.183	0.94 (0.87-1.02)	0.142	0.93 (0.85-1.02)	0.118	0.94 (0.85-1.02)	0.133
>14, ≤18	0.94 (0.87-1.01)	0.078	0.95 (0.88-1.02)	0.164	0.97 (0.89-1.05)	0.420	0.96 (0.88-1.05)	0.341
>18, ≤23	0.93 (0.86-1.00)	0.061	0.94 (0.87-1.02)	0.144	1.00 (0.89-1.11)	0.964	0.99 (0.89-1.11)	0.862
>23	1.31 (1.31-1.40)	**<0.001**	1.31 (1.22-1.40)	**<0.001**	1.37 (1.22-1.54)	**<0.001**	1.36 (1.21-1.54)	**<0.001**
Missing value	1.07 (1.07-1.15)	**0.032**	1.20 (1.11-1.30)	**<0.001**	1.15 (1.08-1.23)	**<0.001**	1.26 (1.15-1.37)	**<0.001**
Blood group		0.967		**0.002**		0.565		
A	1.00		1.00		1.00			
AB	0.99 (0.92-1.07)	0.803	1.21 (1.05-1.40)	**0.008**	0.94 (0.83-1.06)	0.314	not in final model	
B	0.99 (0.94-1.05)	0.817	1.13 (0.97-1.30)	0.109	0.97 (0.89-1.05)	0.477		
O	0.99 (0.96-1.03)	0.628	0.94 (0.84-1.05)	0.252	1.01 (0.96-1.07)	0.690		
BMI (kg.m⁻²)		**0.001**		**<0.001**		0.359		
≤18.5	1.69 (1.04-1.31)	**0.007**	1.26 (1.12-1.42)	**<0.001**	1.28 (0.97-1.70)	0.084		
>18.5, ≤25.0	1.00		1.00		1.00			
>25.0, ≤30.0	0.97 (0.92-1.01)	0.166	0.92 (0.88-0.97)	**0.001**	0.98 (0.91-1.05)	0.540	not in final model	
>30.0, ≤35.0	1.03 (0.96-1.09)	0.444	0.98 (0.92-1.05)	0.642	1.02 (0.93-1.12)	0.683		
>35.0, ≤40.0	0.98 (0.87-1.10)	0.770	0.96 (0.85-1.08)	0.450	0.89 (0.73-1.07)	0.210		
>40.0	1.25 (1.03-1.53)	**0.025**	1.25 (1.02-1.53)	**0.029**	1.03 (0.70-1.51)	0.884		
Missing value	0.96 (0.92-0.99)	**0.031**	0.94 (0.88-1.00)	**0.047**	1.02 (0.95-1.09)	0.623		
DONOR CHARACTERISTICS								
Age (years)		**<0.001**		**<0.001**		**<0.001**		**<0.001**
</=34	1.00		1.00		1.00		1.00	
35-47	1.20 (1.13-1.27)	**<0.001**	1.18 (1.11-1.24)	**<0.001**	1.05 (0.96-1.14)	0.275	1.05 (0.97-1.15)	0.237
48-57	1.31 (1.24-1.38)	**<0.001**	1.30 (1.23-1.37)	**<0.001**	1.13 (1.04-1.23)	**0.004**	1.16 (1.06-1.26)	**0.001**
58-67	1.46 (1.46-1.54)	**<0.001**	1.45 (1.37-1.53)	**<0.001**	1.22 (1.12-1.33)	**<0.001**	1.25 (1.15-1.37)	**<0.001**
>68	1.65 (1.65-1.74)	**<0.001**	1.65 (1.56-1.75)	**<0.001**	1.26 (1.16-1.36)	**<0.001**	1.31 (1.20-1.42)	**<0.001**
Sex: male	0.97 (0.94-1.00)	0.051	not in final model		0.97 (0.92-1.02)	0.178	not in final model	
Blood group		0.145		**0.003**		0.334		
A	1.00		1.00		1.00			
AB	0.93 (0.85-1.01)	0.087	0.81 (0.69-0.96)	**0.013**	0.89 (0.78-1.02)	0.097	not in final model	
B	0.96 (0.91-1.02)	0.175	0.88 (0.76-1.03)	0.109	0.99 (0.91-1.07)	0.749		
O	1.01 (0.97-1.04)	0.748	1.06 (0.95-1.19)	0.278	1.01 (0.96-1.07)	0.698		
BMI (kg.m⁻²)		**<0.001**		**<0.001**		0.281		**0.001**
≤18.5	0.94 (0.83-1.07)	0.364	0.94 (0.82-1.08)	0.400	1.05 (0.85-1.28)	0.667	1.03 (0.84-1.27)	0.781
>18.5, ≤25.0	1.00		1.00		1.00		1.00	
>25.0, ≤30.0	1.12 (1.08-1.17)	**<0.001**	1.05 (1.01-1.10)	**0.018**	1.07 (0.99-1.14)	0.065	1.05 (0.98-1.13)	0.160

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>30.0, ≤35.0	1.11 (1.03-1.19)	**0.006**	1.05 (0.98-1.13)	0.161	1.09 (0.98-1.21)	0.114	1.07 (0.97-1.19)	0.192
>35.0, ≤40.0	1.10 (0.96-1.27)	0.176	1.06 (0.92-1.22)	0.432	1.14 (0.94-1.39)	0.189	1.16 (0.95-1.42)	0.151
>40.0	0.88 (0.69-1.11)	0.277	0.85 (0.67-1.08)	0.192	1.07 (0.78-1.47)	0.687	1.12 (0.81-1.53)	0.500
Missing value	0.91 (0.87-0.95)	<0.001	0.84 (0.80-0.89)	**<0.001**	1.00 (0.94-1.07)	0.961	0.89 (0.83-0.96)	**0.002**
Type of donor		**0.001**		**<0.001**		0.078		**<0.001**
DBD	1.00		1.00		1.00		1.00	
DCD	0.91 (0.81-1.02)	0.123	0.98 (0.87-1.11)	0.783	1.12 (0.96-1.30)	0.147	1.23 (1.05-1.43)	**0.010**
Domino	1.21 (1.02-1.44)	**0.032**	1.30 (1.08-1.55)	**0.004**	1.10 (0.92-1.32)	0.287	1.15 (0.96-1.38)	0.127
Living	1.12 (1.04-1.20)	**0.003**	1.37 (1.26-1.48)	**<0.001**	1.13 (1.00-1.26)	**0.046**	1.30 (1.15-1.47)	**<0.001**
OTHER VARIABLES								
Era of transplant		**<0.001**		**<0.001**		**<0.001**		0.012
2002-2004	1.00		1.00		1.00		1.00	
2005-2007	1.04 (0.99-1.09)	0.125	1.03 (0.98-1.08)	0.251	1.00 (0.93-1.08)	0.908	1.04 (0.96-1.12)	0.361
2008-2010	1.10 (1.04-1.15)	**<0.001**	1.04 (0.98-1.10)	0.166	0.96 (0.89-1.04)	0.293	1.02 (0.94-1.11)	0.646
2011-2013	1.00 (0.95-1.06)	0.970	0.93 (0.87-0.99)	**0.029**	0.88 (0.81-0.95)	**0.002**	0.96 (0.87-1.06)	0.416
2014-2016	0.90 (0.85-0.97)	**<0.001**	0.85 (0.78-0.91)	**<0.001**	0.81 (0.73-0.89)	**<0.001**	0.87 (0.77-0.98)	**0.019**

Table S6. Recipient and donor factors that influence overall allograft survival in transplant recipients. Missing values were treated as a separate category for MELD, recipient BMI and donor BMI. Determinants of graft survival were analysed by univariable Cox regression. Independent predictors were sought in a multivariable Cox regression model with a backwards stepwise approach. NASH was not selected for inclusion in the final regression models, and so was entered into models alongside the factors identified as significant. The final multivariable models were based on 47,040 patients for those without HCC, and 19,514 patients for those with HCC. Bold *P* values are significant at *P*<0.05

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Causes of deaths in transplant recipients (without HCC)										
N; (%)	ARLD N=4664	HCV N=3022	AiLD N=1523	HBV N=770	CC N=980	Other N=645	Non-NASH cumulative N=11604	NASH N=359	HR (CI)	P
Infection	1011 (21.7)	629 (20.8)	347 (22.8)	179 (23.2)	197 (20.1)	149 (23.1)	2512 (21.6)	86 (24.0)	1.15 (0.92-1.42)	0.216
Cardio/cerebrovascular complication	417 (8.9)	245 (8.1)	104 (6.8)	54 (7.0)	61 (6.2)	56 (8.7)	937 (8.1)	19 (5.3)	0.70 (0.44-1.10)	0.123
Primary non-function or dysfunction	128 (2.7)	96 (3.2)	63 (4.1)	37 (4.8)	33 (3.4)	21 (3.3)	378 (3.3)	16 (4.5)	1.26 (0.77-2.08)	0.360
Rejection (acute or chronic)	111 (2.4)	73 (2.4)	49 (3.2)	22 (2.9)	30 (3.1)	17 (2.6)	302 (2.6)	14 (3.9)	1.69 (0.99-2.89)	0.055
Gastrointestinal complications	132 (2.8)	102 (3.4)	35 (2.3)	19 (2.5)	30 (3.1)	15 (2.3)	333 (2.9)	10 (2.8)	0.73 (0.32-1.64)	0.967
Malignancy – solid organ extrahepatic	603 (12.9)	122 (4.0)	101 (6.6)	52 (6.8)	42 (4.3)	37 (5.7)	957 (8.2)	9 (2.5)	0.41 (0.21-0.79)	**0.008**
Other liver complication	116 (2.5)	68 (2.3)	47 (3.1)	20 (2.6)	27 (2.8)	20 (3.1)	298 (2.6)	7 (1.9)	0.79 (0.37-1.67)	0.534
Biliary complications	93 (2.0)	55 (1.8)	46 (3.0)	28 (3.6)	14 (1.4)	10 (1.6)	246 (2.1)	6 (1.7)	0.84 (0.37-1.88)	0.663
Vascular complications	115 (2.5)	46 (1.5)	31 (2.0)	31 (4.0)	24 (2.4)	13 (2.0)	260 (2.2)	6 (1.7)	0.73 (0.32-1.64)	0.444
Malignancy – recurrence of HCC	55 (1.2)	66 (2.2)	42 (2.8)	19 (2.5)	16 (1.6)	7 (1.1)	205 (1.8)	6 (1.7)	1.11 (0.49-2.51)	0.798
Malignancy – lymphoproliferative	40 (0.9)	34 (1.1)	25 (1.6)	6 (0.8)	5 (0.5)	13 (2.0)	123 (1.1)	5 (1.4)	1.65 (0.67-4.03)	0.274
Intraoperative	49 (1.1)	39 (1.3)	16 (1.1)	13 (1.7)	10 (1.0)	9 (1.4)	136 (1.2)	5 (1.4)	1.06 (0.43-2.58)	0.902
Recurrence of 1° liver pathology (non-malignant)	190 (4.1)	651 (21.5)	42 (2.8)	28 (3.6)	12 (1.2)	12 (1.9)	935 (8.1)	2 (0.6)	0.08 (0.02-0.33)	**<0.001**
Other	146 (3.1)	112 (3.7)	45 (3.0)	35 (4.5)	44 (4.5)	24 (3.7)	406 (3.5)	9 (2.5)	0.76 (0.39-1.47)	0.418
Unknown	1458 (31.3)	684 (22.6)	530 (34.8)	227 (29.5)	435 (44.4)	242 (37.5)	3576 (30.8)	159 (44.3)	1.61 (1.38-1.89)	**<0.001**

Table S7. Causes of death in patients without HCC undergoing primary LT.

Univariable Cox regression models were used to compare cause-specific mortality rates between NASH and non-NASH recipients. Causes of death were grouped into 15 categories: 1) Intraoperative deaths; 2) Primary non- or dysfunction; 3) Vascular complications (hepatic artery/vein thrombosis, early portal vein thrombosis, outflow impairment); 4) Biliary complications; 5) Recurrence of primary non-malignant liver pathology; 6) Rejection; 7) Other liver complications (massive hemorrhagic necrosis, de-novo viral hepatitis, other); 8) Malignancy: HCC; 9) Malignancy: extra-hepatic solid organ; 10) Malignancy: lymphoproliferative; 11) Gastrointestinal complications (visceral

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perforation, pancreatitis, other); 12) Infection; 13) Cardio/cerebrovascular complication (myocardial infarction, ischaemic stroke, intracranial hemorrhage, other); 14) Other (including any complication with an overall burden of <1% of deaths – kidney failure, venous thromboembolism, trauma, suicide, bone marrow depression, neurological complication, other); 15) Unknown. Causes of death listed in order of frequency in patients transplanted for NASH. Bold P values are significant at $P<0.05$.

Causes of deaths in transplant recipients (with HCC)										
N; (%)	ARLD N=1228	HCV N=2250	AiLD N=73	HBV N=609	CC N=1015	Other N=210	Non-NASH cumulative N=5385	NASH N=272	HR (CI)	*P*
Malignancy – recurrence of HCC	178 (14.5)	407 (18.1)	7 (9.6)	166 (27.3)	146 (14.4)	33 (15.7)	937 (17.4)	53 (19.5)	1.24 (0.94-1.64)	0.123
Infection	187 (15.2)	376 (16.7)	17 (23.3)	74 (12.2)	128 (12.6)	47 (22.4)	829 (15.4)	28 (10.3)	0.69 (0.47-1.00)	**0.049**
Malignancy – solid organ extrahepatic	216 (17.6)	146 (6.5)	6 (8.2)	48 (7.9)	126 (12.4)	22 (10.5)	564 (10.5)	18 (6.6)	0.77 (0.48-1.23)	0.277
Cardio/cerebrovascular complication	83 (6.8)	124 (5.5)	4 (5.5)	40 (6.6)	44 (4.3)	14 (6.7)	309 (5.7)	13 (4.8)	0.89 (0.51-1.56)	0.693
Other liver complication	16 (1.3)	29 (1.3)	1 (1.4)	12 (2.0)	17 (1.7)	5 (2.4)	80 (1.5)	11 (4.0)	2.76 (1.47-5.19)	**0.002**
Primary non-function or dysfunction	31 (2.5)	55 (2.4)	4 (5.5)	22 (3.6)	28 (2.8)	2 (1.0)	142 (2.6)	8 (2.9)	1.02 (0.50-2.08)	0.960
Gastrointestinal complications	34 (2.8)	49 (2.2)	2 (2.7)	19 (3.1)	24 (2.4)	5 (2.4)	133 (2.5)	7 (2.6)	1.11 (0.52-2.38)	0.788
Recurrence of 1° liver pathology (non-malignant)	85 (6.9)	468 (20.8)	3 (4.1)	32 (5.3)	63 (6.2)	6 (2.9)	657 (12.2)	6 (2.2)	0.21 (0.09-0.46)	**<0.001**
Vascular complications	22 (1.8)	44 (2.0)	1 (1.4)	13 (2.1)	15 (1.5)	4 (1.9)	99 (1.8)	4 (1.5)	0.76 (0.28-2.07)	0.596
Rejection (acute or chronic)	19 (1.5)	36 (1.6)	1 (1.4)	7 (1.1)	11 (1.1)	7 (3.3)	81 (1.5)	4 (1.5)	1.05 (0.38-2.86)	0.928
Malignancy – lymphoproliferative	11 (0.9)	25 (1.1)	3 (4.1)	10 (1.6)	3 (0.3)	4 (1.9)	56 (1.0)	3 (1.1)	1.28 (0.40-4.09)	0.681
Biliary complications	22 (1.8)	34 (1.5)	1 (1.4)	6 (1.0)	9 (0.9)	2 (1.0)	74 (1.4)	1 (0.4)	0.28 (0.04-2.01)	0.205
Intraoperative	9 (0.7)	24 (1.1)	0 (0.0)	4 (0.7)	10 (1.0)	0 (0.0)	47 (0.9)	2 (0.7)	0.79 (0.19-3.26)	0.748
Other	38 (3.1)	63 (2.8)	1 (1.4)	11 (1.8)	37 (3.6)	4 (1.9)	154 (2.9)	7 (2.6)	1.09 (0.48-2.47)	0.846
Unknown	277 (22.6)	370 (16.4)	22 (30.1)	145 (23.8)	354 (34.9)	55 (26.2)	1223 (22.7)	107 (39.3)	1.89 (1.55-2.30)	**<0.001**

Table S8. Causes of death in patients with HCC undergoing primary LT. Univariable
Cox regression models were used to compare cause-specific mortality rates between
NASH and non-NASH recipients. Causes of death were grouped into 15 categories: 1)
Intraoperative deaths; 2) Primary non- or dysfunction; 3) Vascular complications (hepatic
artery/vein thrombosis, early portal vein thrombosis, outflow impairment); 4) Biliary
complications; 5) Recurrence of primary non-malignant liver pathology; 6) Rejection; 7)
Other liver complications (massive hemorrhagic necrosis, de-novo viral hepatitis, other);
8) Malignancy: HCC; 9) Malignancy: extra-hepatic solid organ; 10) Malignancy:

lymphoproliferative; 11) Gastrointestinal complications (visceral perforation, pancreatitis, other); 12) Infection; 13) Cardio/cerebrovascular complication (myocardial infarction, ischaemic stroke, intracranial hemorrhage, other); 14) Other (including any complication with an overall burden of <1% of deaths – kidney failure, venous thromboembolism, trauma, suicide, bone marrow depression, neurological complication, other); 15) Unknown. Causes of death listed in order of frequency in patients transplanted for NASH. Bold *P* values are significant at *P*<0.05.

	Univariable	Multivariable
	HR (95% CI)	
RECIPIENT CHARACTERISTICS		
Age (years)	Overall	
≤45	1.00	not in final model
46-55	1.94 (0.82-4.56)	
56-60	2.30 (1.00-5.29)	
61-65	2.20 (0.96-5.05)	
>65	2.85 (1.23-6.59)	
Sex: male	1.03 (0.76-1.40)	not in final model
MELD	Overall	
≤11	1.00	not in final model
>11, ≤14	0.59 (0.40-0.86)	
>14, ≤18	0.85 (0.61-1.18)	
>18, ≤23	0.88 (0.57-1.36)	
>23	1.23 (0.80-1.89)	
Missing value	0.75 (0.47-1.19)	
Blood group	Overall	
A	1.00	not in final model
AB	1.22 (0.75-1.98)	
B	0.85 (0.58-1.24)	
O	0.93 (0.72-1.22)	
BMI (kg.m^{-2})	Overall	
≤18.5	n/a	not in final model
>18.5, ≤25.0	1.94 (0.63-5.95)	
>25.0, ≤30.0	1.00	
>30.0, ≤35.0	1.98 (1.13-3.47)	
>35.0, ≤40.0	1.63 (0.87-3.06)	
>40.0	2.58 (1.15-5.75)	
Missing value	1.94 (0.63-5.95)	
DONOR CHARACTERISTICS		
Age (years)	Overall	
≤45	1.00	not in final model
46-55	1.26 (0.82-1.93)	
56-60	1.06 (0.71-1.60)	
61-65	1.15 (0.75-1.75)	
>65	1.33 (0.89-1.99)	
Sex: male	0.97 (0.76-1.24)	not in final model
Blood group	Overall	
A	1.00	not in final model
AB	1.28 (0.76-2.15)	
B	0.74 (0.49-1.12)	
O	0.96 (0.74-1.25)	
BMI (kg.m^{-2})	Overall	not in final model
≤18.5	1.23 (0.30-4.96)	

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>18.5, ≤25.0	0.99 (0.75-1.30)	
>25.0, ≤30.0	1.00	
>30.0, ≤35.0	0.74 (0.49-1.12)	
>35.0, ≤40.0	1.14 (0.64-2.03)	
>40.0	1.85 (0.90-3.78)	
Missing value	0.66 (0.39-1.09)	
Type of donor	Overall	
DBD	1.00	not in final model
DCD	0.78 (0.45-1.34)	
Domino	0.77 (0.25-2.41)	
Living	1.54 (0.84-1.82)	
OTHER VARIABLES		
Era of transplant	Overall	
2002-2004	1.00	n/a
2005-2007	0.76 (0.43-1.32)	
2008-2010	1.05 (0.62-1.78)	
2011-2013	0.72 (0.41-1.26)	
2014-2016	0.56 (0.31-1.02)	

Table S9. Recipient and donor factors that significantly affect post-transplant survival in patients transplanted for NASH without HCC. The final multivariable models were based on 1,043 patients. *P<0.05; **P<0.001

	Pure NASH N=1171	Presumed NASH N=1570	*P*
RECIPIENT CHARACTERISTICS			
Age; years; *median (IQR)*	60 (54-65)	59 (53-64)	**<0.001**
Sex: male; %	68.7	72.9	**0.017**
Blood group; %			**0.002**
A	43.6	43.5	
AB	4.0	7.2	
B	12.7	13.3	
O	39.7	36.0	
BMI; kg.m^{-2}; *mean (SD)*	31.2 (5.2)	33.5 (3.8)	**<0.001**
MELD; *median (IQR)*	16 (13-21)	15 (11-21)	**0.002**
HCC; %	28.5	47.1	**<0.001**
DONOR CHARACTERISTICS			
Age; years; *median (IQR)*	53 (41-64)	52 (39-63)	0.139
Sex: male; %	59.9	64.1	**0.030**
Blood group; %			**0.003**
A	41.6	42.0	
AB	2.9	5.7	
B	10.9	11.5	
O	44.6	40.9	
BMI; kg.m^{-2}; *mean (SD)*	26.8 (4.7)	27.0 (4.9)	0.719
Type of donor; %			**<0.001**
DBD	80.5	87.6	
DCD	12.1	2.5	
Domino	1.1	0.6	
Living	6.3	9.2	

Table S10. Donor and recipient factors in patients transplanted for pure NASH and presumed NASH. Comparisons between groups were performed using Mann-Whitney U tests, chi-squared tests and t-tests, as applicable, and bold *P*-values are significant at *P*<0.05.

	HCC N (%)
NASH	1073 (39.1)
ARLD	4717 (21.2)
HCV	7118 (44.1)
AiLD	320 (3.4)
HBV	2857 (38.9)
CC	3229 (46.1)
Other	881 (20.9)
Total	20195 (29.3)

Table S11. The prevalence of HCC in patients transplanted with liver disease of different aetiologies.

	Complete cases N=38,084	Cases with missing values* N=30,886	*P*
RECIPIENT CHARACTERISTICS			
Age; years; *median (IQR)*	55 (48-61)	55 (48-61)	**<0.001**
Sex: male; %	71.1	73.3	**<0.001**
Aetiology			**<0.001**
NASH	6.1	1.3	
ARLD	30.9	33.9	
HCV	17.7	30.4	
AiLD	15.2	11.4	
HBV	11.1	10.0	
CC	11.0	9.1	
Other	8.0	3.8	
Blood group; %			**<0.001**
A	43.2	44.1	
AB	6.0	5.2	
B	13.3	11.9	
O	37.5	38.8	
HCC; %	28.6	30.1	**<0.001**
DONOR CHARACTERISTICS			
Age; *median (IQR)*	52 (38-64)	52 (38-65)	0.241
Sex: male; %	56.7	59.1	**<0.001**
Blood group; %			**0.001**
A	42.1	43.3	
AB	4.3	4.2	
B	12.0	11.2	
O	41.6	41.2	
Type of donor; % **			**<0.001**
DBD	86.2	95.1	
DCD	4.7	0.3	
Domino	0.5	1.5	
Living	8.6	3.1	

Table S12. Comparison of donor and recipient factors in patients transplanted for NASH and non-NASH indications. **Missing data points in one of MELD, recipient BMI or donor BMI.*

	Missing indicator analysis N = 47,040	Available case analysis N = 28,643
	HR (95% CI)	
RECIPIENT CHARACTERISTICS		
NASH (vs non-NASH)	*0.97 (0.86-1.09)*	*1.02 (0.90-1.16)*
Age (years)	**Overall****	**Overall****
</=45	1.00	1.00
46-55	**1.24 (1.18-1.31)****	**1.37 (1.27-1.48)****
56-60	**1.49 (1.41-1.59)****	**1.63 (1.50-1.77)****
61-65	**1.78 (1.67-1.89)****	**1.99 (1.82-2.17)****
>65	**2.04 (1.89-2.20)****	**2.19 (1.97-2.42)****
Sex: male	**1.11 (1.06-1.15)****	**1.12 (1.06-1.18)****
MELD	**Overall****	**Overall****
≤11	1.00	1.00
>11, ≤14	0.98 (0.89-1.07)	0.97 (0.88-1.06)
>14, ≤18	1.02 (0.94-1.11)	1.01 (0.92-1.10)
>18, ≤23	1.05 (0.96-1.15)	1.05 (0.95-1.15)
>23	**1.52 (1.40-1.64)****	**1.54 (1.41-1.67)****
Missing value	**1.22 (1.12-1.33)****	n/a
Blood group	**Overall***	**Overall***
A	1.00	1.00
AB	**1.18 (1.01-1.38)***	**1.27 (1.06-1.54)***
B	1.12 (0.95-1.31)	**1.23 (1.01-1.50)***
O	0.94 (0.84-1.07)	1.05 (0.90-1.23)
BMI (kg.m^{-2})	**Overall****	**Overall****
≤18.5	**1.34 (1.18-1.52)****	**1.30 (1.13-1.51)****
>18.5, ≤25.0	1.00	1.00
>25.0, ≤30.0	0.95 (0.90-1.01)	0.95 (0.89-1.01)
>30.0, ≤35.0	1.04 (0.97-1.12)	1.02 (0.95-1.11)
>35.0, ≤40.0	1.06 (0.93-1.21)	1.01 (0.88-1.16)
>40.0	**1.35 (1.09-1.67)***	**1.38 (1.10-1.73)***
Missing value	1.04 (0.98-1.11)	n/a
DONOR CHARACTERISTICS		
Age (years)	**Overall****	**Overall****
</=34	1.00	1.00
35-47	**1.16 (1.09-1.23)****	**1.16 (1.07-1.26)****
48-57	**1.25 (1.18-1.33)****	**1.25 (1.15-1.36)****
58-67	**1.38 (1.29-1.47)****	**1.38 (1.26-1.50)****
>68	**1.52 (1.43-1.62)****	**1.54 (1.41-1.68)****
Sex: male	not in final model	not in final model
Blood group	**Overall***	**Overall***
A	1.00	1.00
AB	**0.82 (0.68-0.97)***	**0.75 (0.60-0.93)***
B	0.90 (0.76-1.06)	**0.78 (0.64-0.96)***
O	1.07 (0.95-1.21)	0.96 (0.82-1.12)

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BMI (kg.m^{-2})	Overall**	
≤18.5	0.91 (0.79-1.06)	
>18.5, ≤25.0	1.00	
>25.0, ≤30.0	1.02 (0.97-1.07)	not in final model
>30.0, ≤35.0	1.02 (0.94-1.11)	
>35.0, ≤40.0	1.02 (0.88-1.19)	
>40.0	0.85 (0.66-1.10)	
Missing value	**0.85 (0.80-0.90)****	n/a
Type of donor	**Overall****	**Overall****
DBD	1.00	1.00
DCD	**0.73 (0.62-0.85)****	**0.73 (0.62-0.85)****
Domino	1.20 (0.99-1.45)	1.22 (0.88-1.68)
Living	**1.43 (1.31-1.56)****	**1.59 (1.44-1.76)****
OTHER VARIABLES		
Re-transplant	**1.80 (1.71-1.91)****	**1.95 (1.81-2.11)****
Era of transplant	**Overall****	**Overall****
2002-2004	1.00	1.00
2005-2007	1.03 (0.98-1.09)	**1.18 (1.06-1.30)****
2008-2010	**1.07 (1.00-1.13)***	**1.20 (1.09-1.33)****
2011-2013	**0.93 (0.87-0.99)***	1.03 (0.93-1.15)
2014-2016	**0.81 (0.75-0.89)****	**0.90 (0.80-1.01)***

Table S13. Multivariable analyses by different methods to determine recipient and donor factors that influence patient survival in transplant recipients without HCC.

*P<0.05; **P<0.001

	Missing indicator analysis N = 1,628	Available case analysis N = 1,493
RECIPIENT CHARACTERISTICS		
Age (years)	**Overall****	**Overall****
≤45	1.00	1.00
46-55	1.31 (0.87-1.98)	1.33 (0.87-2.04)
56-60	1.23 (0.81-1.87)	1.37 (0.89-2.12)
61-65	**2.07 (1.39-3.08)****	**2.20 (1.46-3.31)****
>65	**1.72 (1.10-2.71)***	**1.70 (1.07-2.71)***
Sex: male	**0.79 (0.63-0.98)***	**0.78 (0.62-0.98)***
MELD	**Overall****	**Overall****
≤11	1.00	1.00
>11, ≤14	1.03 (0.66-1.62)	1.03 (0.67-1.59)
>14, ≤18	0.66 (0.44-1.06)	0.66 (0.44-1.01)
>18, ≤23	0.71 (0.47-1.15)	0.71 (0.46-1.10)
>23	**1.48 (1.04-2.30)***	**1.49 (1.01-2.19)***
Missing value	0.93 (0.57-1.51)	n/a
Blood group		
A		
AB	not in final model	not in final model
B		
O		
BMI (kg.m⁻²)	**Overall***	**Overall***
≤18.5	**4.29 (1.01-18.21)***	**4.71 (1.11-20.11)***
>18.5, ≤25.0	**2.24 (1.27-3.96)***	**2.13 (1.99-3.80)***
>25.0, ≤30.0	1.00	1.00
>30.0, ≤35.0	1.38 (0.95-2.01)	1.34 (0.92-1.94)
>35.0, ≤40.0	1.43 (0.93-2.18)	1.30 (0.85-1.99)
>40.0	**1.96 (1.16-3.32)***	**1.82 (1.07-3.11)***
Missing value	1.13 (0.49-2.63)	n/a
DONOR CHARACTERISTICS		
Age (years)		
≤45		
46-55		
56-60	not in final model	not in final model
61-65		
>65		
Sex: male	not in final model	not in final model
Blood group	**Overall***	**Overall***
A	1.00	1.00
AB	0.99 (0.58-1.70)	1.20 (0.67-1.59)
B	**0.37 (0.22-0.63)****	**0.45 (0.27-0.75)****
O	1.06 (0.85-1.32)	1.06 (0.84-1.34)
BMI (kg.m⁻²)	not in final model	not in final model
≤18.5		

>18.5, ≤25.0		
>25.0, ≤30.0		
>30.0, ≤35.0		
>35.0, ≤40.0		
>40.0		
Missing value		
OTHER VARIABLES		
Type of donor		
DBD		
DCD	not in final model	not in final model
Domino		
Living		

Table S14. Multivariable analyses by different methods to determine recipient and donor factors that significantly affect post-transplant survival in patients transplanted for NASH without HCC. *$P<0.05$; **$P<0.001$