

# A2A LDLT

## International and UK Data

Raj Prasad

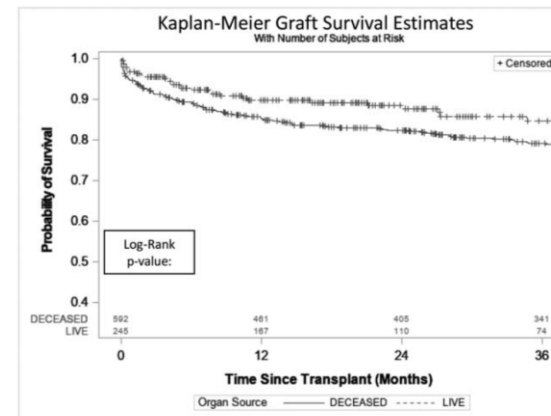
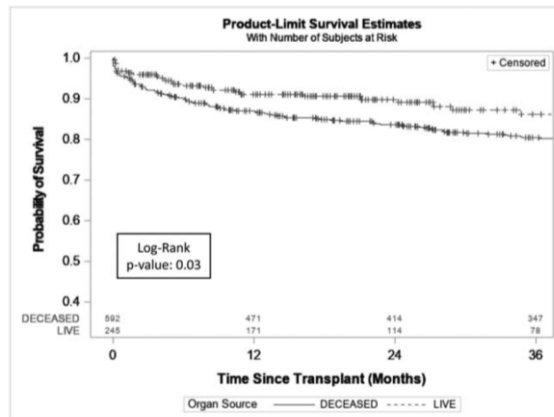
# A2A LDLT - 2023

- Principle/Preferred method for treating liver failure in several health care systems
- Renewed interest in West – organ shortage, new indications
- Techniques –
- Technology – Laparoscopic, Robotic
- Indications – Cancer, ACLF
- Small for Size - GRWR
- Learning curve

# Adult Living Donor Versus Deceased Donor Liver Transplant (LDLT Versus DDLT) at a Single Center

## *Time to Change Our Paradigm for Liver Transplant*

Abhinav Humar, MD,\*✉ Swaytha Ganesh, MD,† Dana Jorgensen, PhD, MPH,\* Amit Tevar, MD,\*  
Armando Ganoza, MD,\* Michele Molinari, MD,\* and Christopher Hughes, MD\*



2009-2019, LDLT (N=245) vs. DDLT (N=592)

**TABLE 4.** Cost and Utilization Comparison of LDLT vs DDLT Done in 2017. Includes All Costs and Utilizations From 6 Months Before Transplant to 1-Year Posttransplant

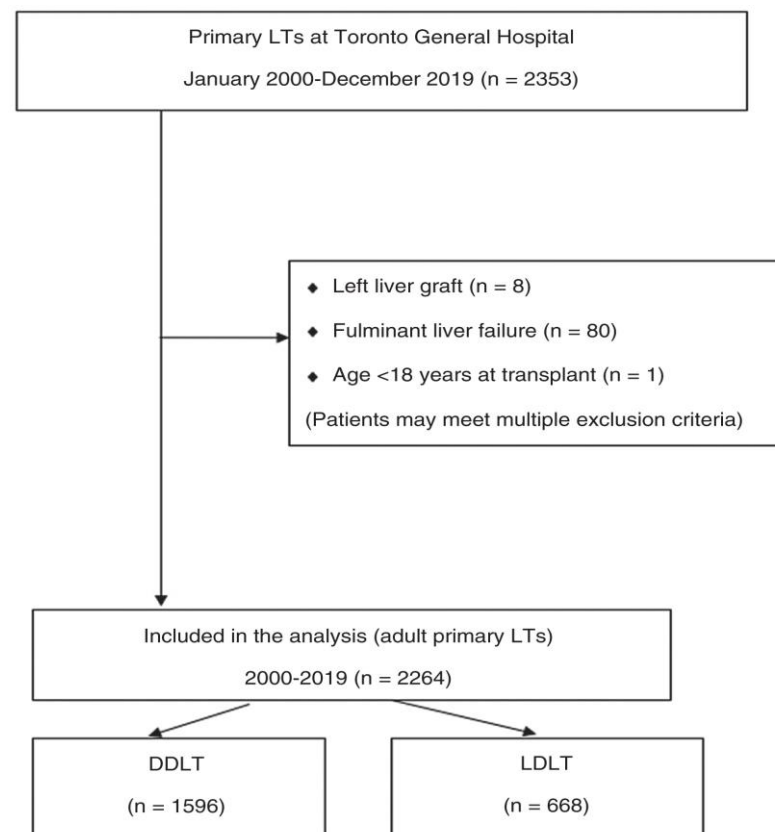
Variable	LDLT N = 60	DDLT N = 52
Pretransplant average number of radiology scans	2.6	3.4
Posttransplant average number of radiology scans	8.6	12.0
Posttransplant average number of emergency room visits	0.5	0.7
Posttransplant average number of GI or other invasive procedures (outpatient)	0.2	0.7
Total Number of outpatient labs	25% Lower	—
Total pretransplant costs (6 mo)	23.5% Lower	—
Total inpatient perioperative costs	31.7% Lower	—
Total posttransplant costs (1 y)	26.0% Lower	—
Total inpatient and outpatient pre and posttransplant costs	29.5% Lower	—

“Given its advantages, we have expanded LDLT—in 2018, LDLT comprised 53.6% of our transplants (national average 4.8%), and our transplant rate increased from 44.8 (rate per 100-person years) in 2015 to 87.5 in 2018”

# Superior Long-Term Outcomes of Adult Living Donor Liver Transplantation: A Cumulative Single-Center Cohort Study With 20 Years of Follow-Up

Toru Goto,<sup>1,2,\*</sup> Tommy Ivanics<sup>1,3,4,\*</sup> Mark S. Cattral,<sup>1</sup> Trevor Reichman,<sup>1</sup> Anand Ghanekar,<sup>1</sup> Gonzalo Sapisochin,<sup>1</sup> Ian D. McGilvray,<sup>1</sup> Blayne Sayed<sup>1</sup>, Les Lilly,<sup>1</sup> Mamatha Bhat,<sup>1</sup> Markus Selzner,<sup>1</sup> and Nazia Selzner<sup>1</sup>

- 20 year experience
- Comparing patient and graft survival rates between LDLT and DDLT
- Causes of death and graft loss
- Longest follow- up of LDLT recipients from a single Western center



Median follow-up 4.7 years

LDLT recipients were significantly younger, more often male compared with DDLT recipients, more autoimmune diseases, including PSC (5.8% v 15.6%), primary biliary cholangitis (3.1% v 8.8%), AIH (3.1% v 4.9%)

LDLT recipients had significantly lower medical MELD scores at transplant (median 16 v 15  $p = 0.008$ ), shorter waiting time (median 183 v 110  $p < 0.001$ ) and less often inpatients (17% v 30%;  $p < 0.001$ )

Intraoperative transfusions of PRBC, platelets, and FFP in LDLT were lower

LDLT - 54.5% had HJ compared with 12.7% in the DDLT ( $p < 0.001$ )

LDLT - significantly higher HAT (2.2%) v DDLT (0.8%;  $p = 0.005$ ) and higher proportion of retransplantations (6.1% versus 2.4%;  $p < 0.001$ ).

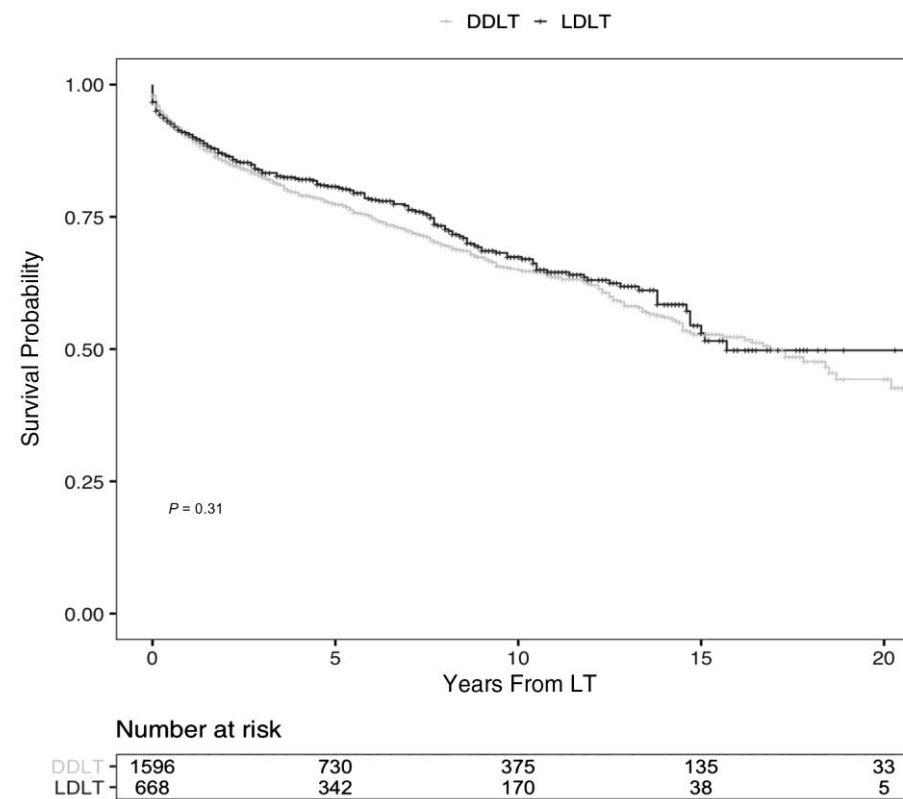
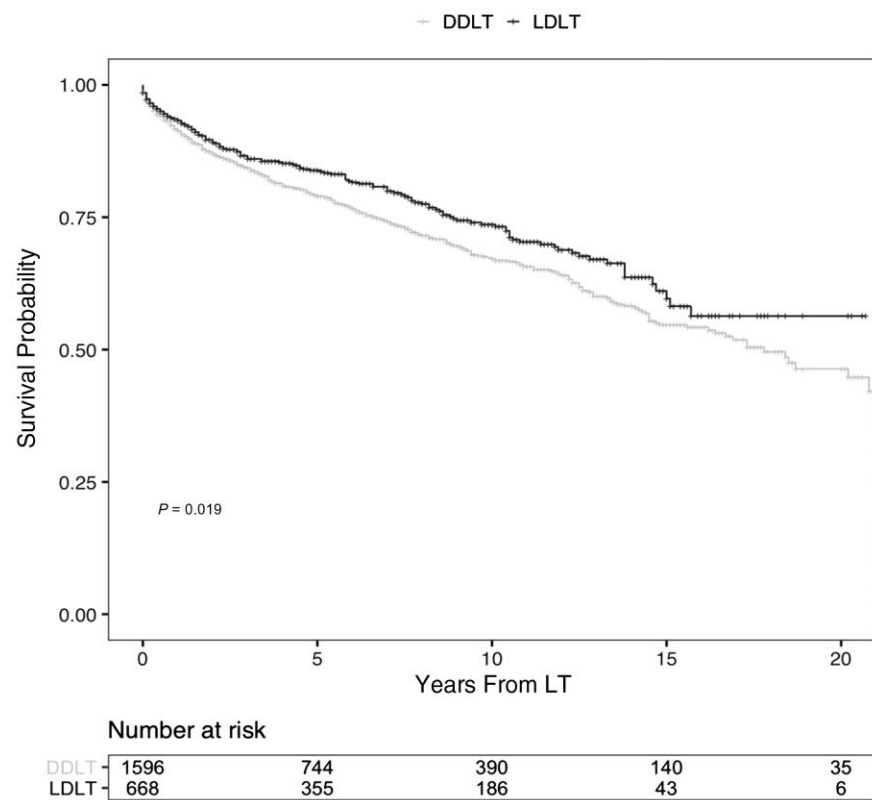


TABLE 3. Cause of Graft Loss: First 5 Years After LT Stratified by Graft Type

Cause of Graft Loss	DDLT (n = 303)	LDLT (n = 114)	P Value*
Biliary complications	5 (2)	6 (5)	0.040
Recurrence of primary disease	32 (11)	9 (8)	0.415
HCC recurrence	36 (12)	8 (7)	0.150
De novo cancer	63 (21)	14 (12)	0.046
Cardiovascular events	23 (8)	5 (4)	0.244
Stroke	7 (2)	5 (4)	0.261
Infections	45 (15)	25 (22)	0.085
HAT	10 (3)	12 (11)	0.003
PVT	1 (0)	2 (2)	0.125
Others	80 (26)	25 (22)	0.348

NOTE: Data are provided as n (%).

\*Pearson chi-square test.

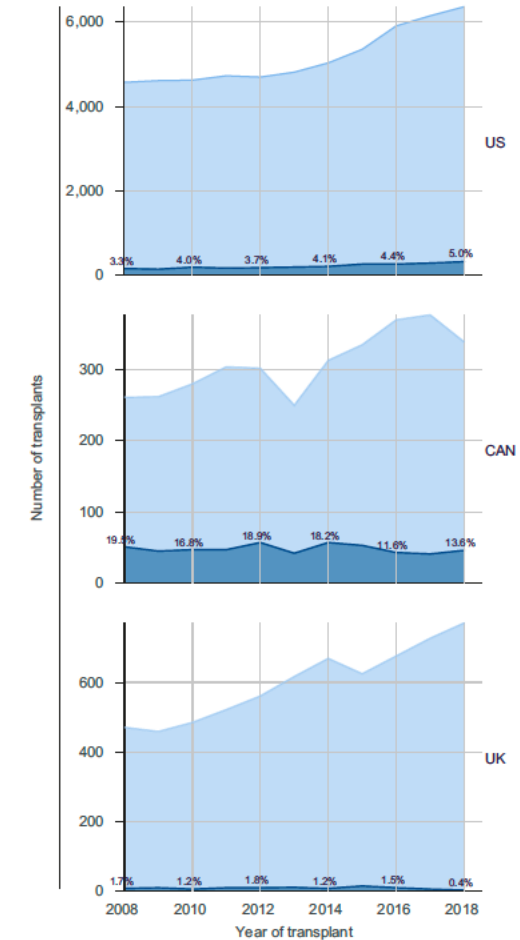
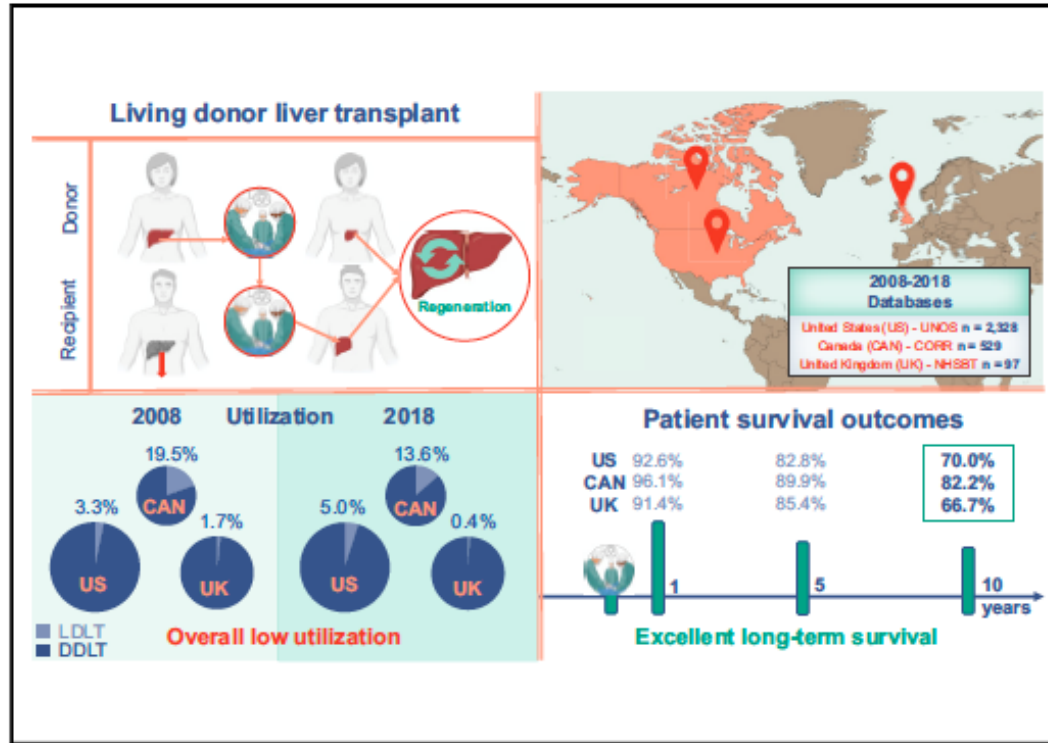
TABLE 4. Cause of Graft Loss: 5 Years or More After LT Stratified by Graft Type

Cause of Graft Loss	DDLT (n = 155)	LDLT (n = 66)	P Value*
Biliary complications	2 (1)	3 (5)	0.136
Recurrence of primary disease	15 (10)	11 (17)	0.140
HCC recurrence	11 (7)	3 (5)	0.476
De novo cancer	35 (23)	11 (17)	0.322
Cardiovascular events	13 (8)	14 (21)	0.008
Stroke	3 (2)	1 (2)	0.830
Infections	24 (16)	8 (12)	0.516
HAT	3 (2)	2 (3)	0.616
PVT	2 (1)	0 (0)	0.352
Others	46 (30)	14 (21)	0.195

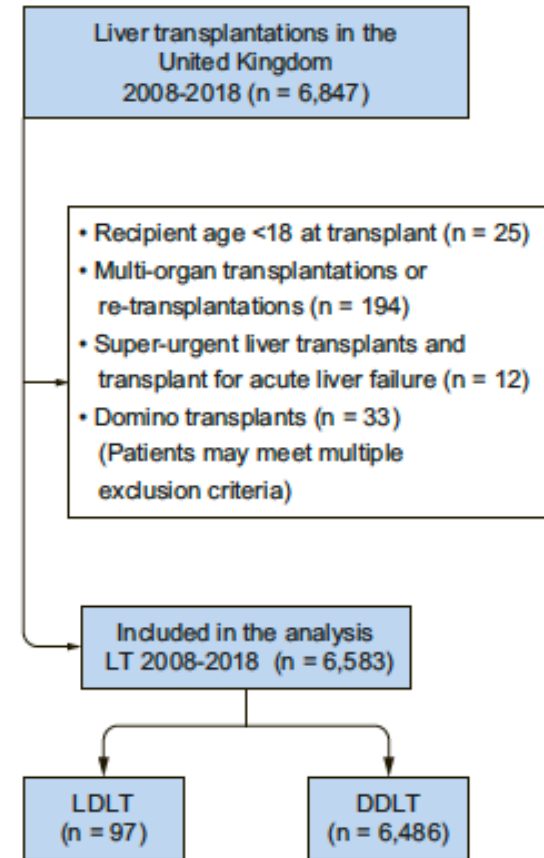
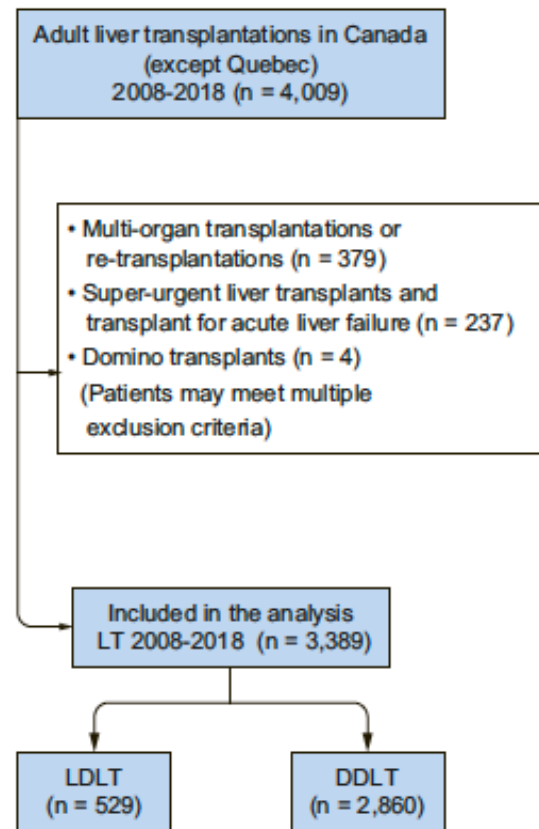
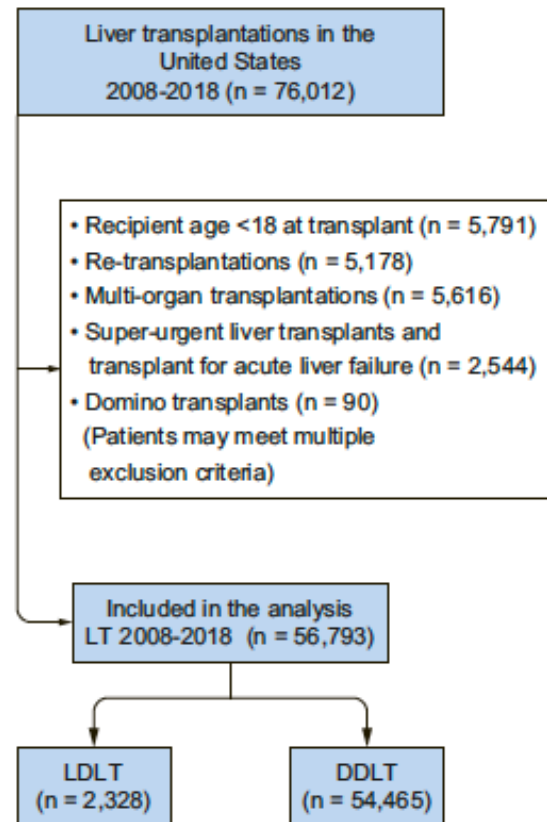
TABLE 2. Impact of Graft Type (LDLT versus DDLT) on Posttransplant Outcomes

Posttransplant Survival	Compared With DDLT	
	Overall HR (95% CI)	P Value
Unadjusted analysis		
Patient survival	0.80 (0.67-0.97)	0.02
Graft survival	0.91 (0.77-1.09)	0.30
Adjusted for recipient characteristics*		
Patient survival	1.16 (0.86-1.57)	0.33
Graft survival	1.35 (1.03-1.77)	0.03
Adjusted for donor characteristics†		
Patient survival	0.94 (0.70-1.27)	0.68
Graft survival	1.12 (0.85-1.47)	0.43
Adjusted for recipient and donor characteristics‡		
Patient survival	1.00 (0.72-1.38)	0.99
Graft survival	1.17 (0.87-1.57)	0.29

## Low utilization of adult-to-adult LDLT in Western countries despite excellent outcomes: International multicenter analysis of the US, the UK, and Canada

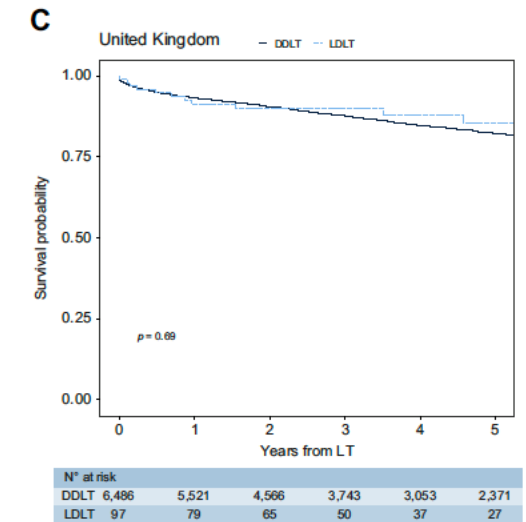
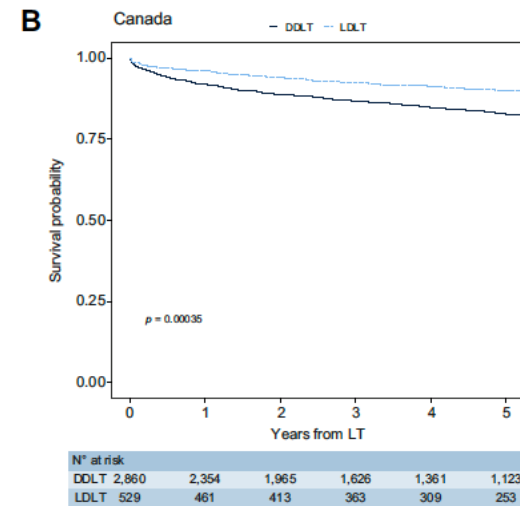
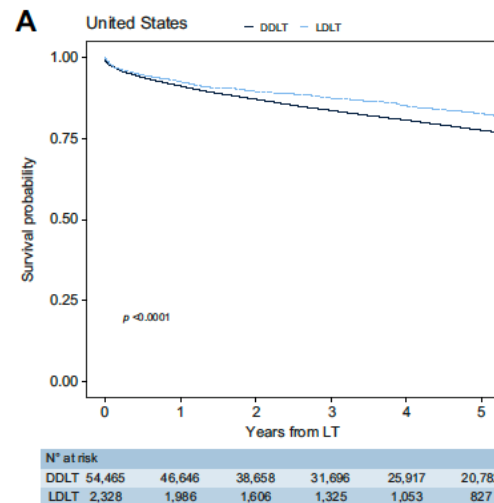






**Table 1. Donor characteristics.**

	US (n = 2,328)	CAN (n = 529)	UK (n = 97)
Sex, n (%)			
Female	1,229 (53%)	231 (44%)	35 (36%)
Male	1,099 (47%)	298 (56%)	62 (64%)
Age, years			
Median (Q1, Q3)	36 (28, 45)	35 (27, 46)	33 (25, 40)
BMI			
Median (Q1, Q3)	26 (24, 29)	25 (23, 28)	n.a.
Graft laterality, n (%)			
Missing	21	0	0
Left lobe	309 (13%)	34 (6%)	23 (24%)
Right lobe	1,998 (87%)	495 (94%)	74 (76%)
CTT, minutes			
Median (Q1, Q3)	84 (56, 120)	88 (58, 128)	110 (72, 162)



# Post-transplant survival

- US - unadjusted 1, 3, 5 and 10 year survival 92.6%, 87.6%, 82.8%, and 70.0% for LDLT v. 91.3%, 83.8%, 77.7%, and 62.4% for DDLT ( 1 year  $p=0.04$ ; 3 year  $p<0.001$ ; 5 year  $p<0.001$ ; 10year  $p<0.001$ )
- Canada - unadjusted 1, 3, 5 and 10 year survival 96.1%, 92.3%, 89.9%, and 82.2% for LDLT v. 92.0%, 86.7%, 82.7%, and 75.0% for DDLT (1 year  $p=0.001$ ; 3 year  $p<0.001$ ; 5 year  $p<0.001$ ; 10 year  $p<0.001$ )
- UK - unadjusted 1, 3, 5 and 10 year survival 91.4%, 90.0%, 85.4%, and 66.7% for LDLT v. 93.2%, 87.7%, 82.2%, and 69.4% for DDLT (1 year  $p=0.52$ ; 3 year  $p=0.69$ ; 5 year  $p=0.63$ ; 10 year  $p=0.69$ )
- Retransplantation was highest in UK and lowest in US (5 year cumulative - US 3.7%, Canada 6.5%, UK 9.7%  $p<0.001$ )

# UK and low LDLT

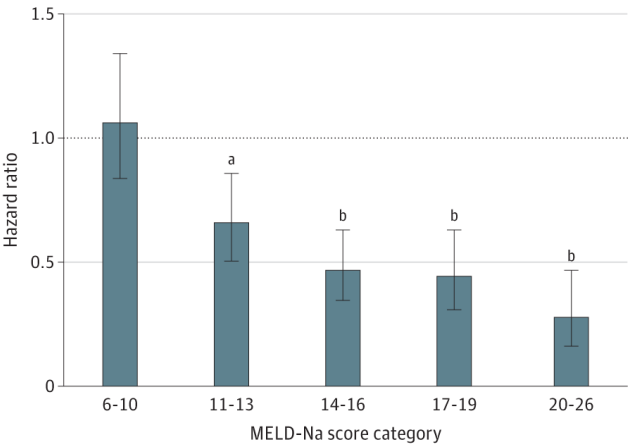
*The recently implemented Transplant Benefit Score in 2018 is expected to increase the number of life-years gained from transplanted livers and reduce the number of waiting list deaths. As a result, this may further reduce the incentive to expand LDLT practices. Moreover, the full impact of the recently adopted 'opt-out' policy, which came into effect in 2020, is not clear. It may result in a higher availability of better quality deceased donors, further potentially reducing the pressure on the waitlist. Lastly, the increased use of normothermic machine perfusion, which can lead to reduced organ discard rates and therein result in a greater transplant rate and better outcomes, may impede future LDLT expansion.*

# Survival Benefit of Living-Donor Liver Transplant

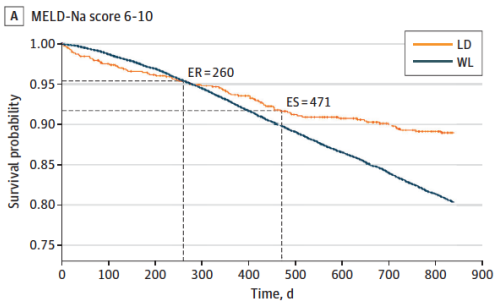
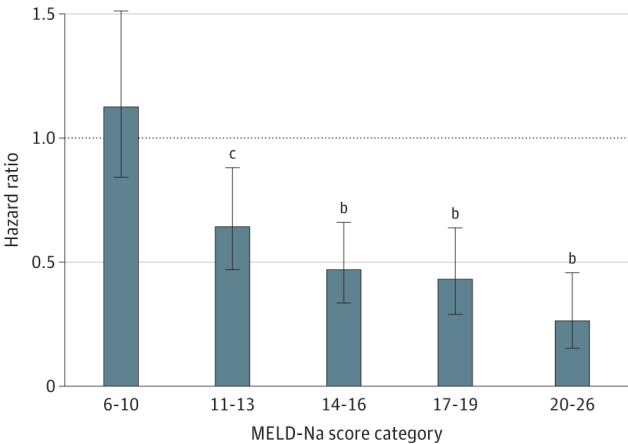
Whitney E. Jackson, MD; John S. Malamon, PhD; Bruce Kaplan, MD; Jessica L. Saben, PhD; Jesse D. Schold, PhD; James J. Pomposelli, MD, PhD; Elizabeth A. Pomfret, MD, PhD

2012-2021, LDLT (N=2820) vs. Wait list (N=116,455)

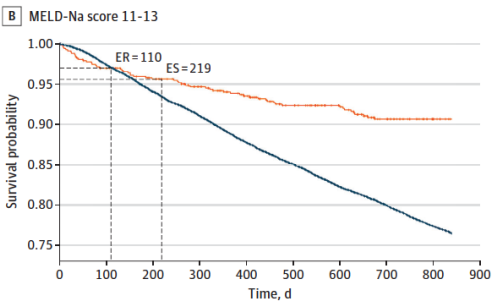
A 1-y Unadjusted hazard ratios



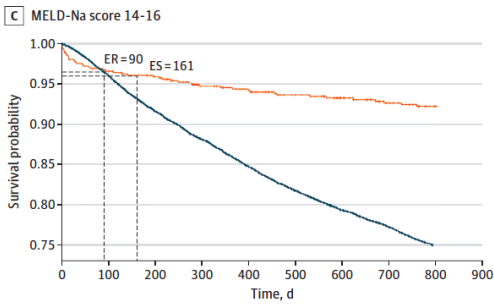
B Covariate-adjusted hazard ratios



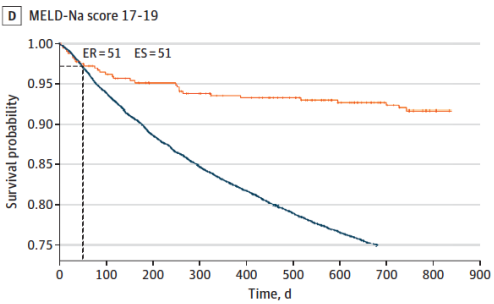
No. at risk									
LD	11038	10347	9944	9509	9119	8680	8286	7891	7443
WL	23312	22530	21639	20751	19909	19119	18349	17623	16935



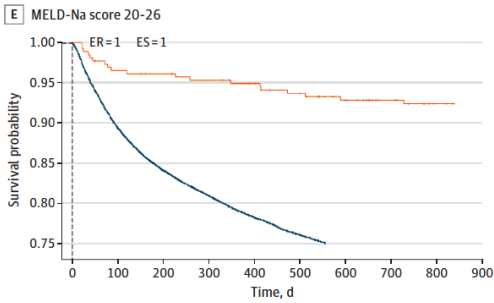
No. at risk									
LD	7129	6584	6263	5941	5640	5353	5068	4777	4500
WL	16588	15806	14930	14219	13495	12923	12308	11803	11332



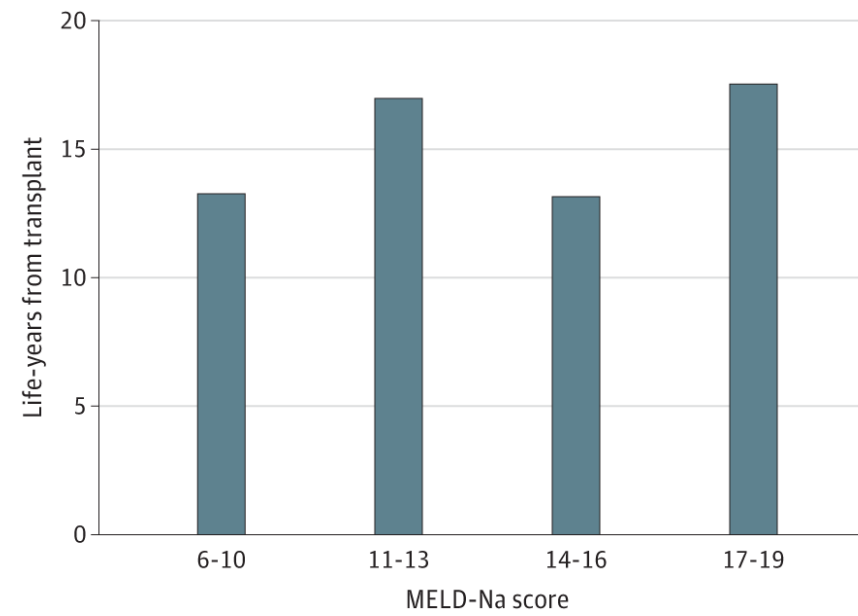
No. at risk									
LD	8434	7848	7460	7130	6730	6376	6084	5733	5392
WL	17369	16331	15299	14512	13810	13197	12679	12222	11775



No. at risk									
LD	6999	6484	6160	5878	5584	5269	5002	4717	4433
WL	12597	11633	10836	10249	9796	9388	9043	8735	8471



No. at risk									
LD	11705	10760	10123	9568	9061	8563	8067	7632	7168
WL	19114	16883	15716	15005	14424	13954	13545	13138	12789



# Leeds 2007-23 Graft Demographics

	Total No. of Donors (N=123)	Adult to Adult (n=50; 40.7%)	Adult to Paediatric (n=73; 59.3%)
Graft type			
Left lateral	67 (54.5%)	0 (0.0%)	67 (91.8%)
Reduced left lateral	4 (3.2%)	0 (0.0%)	4 (5.5%)
Left lobe	8 (6.5%)	7 (14.0%)	1 (1.4%)
Right lobe	44 (35.8%)	43 (86.0%)	1 (1.4%)
Estimated graft weight (gms)	NA	808 (351-1125)	219 (108-393)
Actual graft weight (gms)	NA	701 (306-1019)	261 (185-395)
Estimated graft-recipient weight ratio (GRWR)	NA	1.13 (0.71-1.88)	2.78 (0.76-8.79)
Actual graft-recipient weight ratio (GRWR)	NA	0.99 (0.58-1.75)	3.00 (0.84-7.29)

Year	Donor No.	Milestone
2012	34	First left lateral segment altruistic
2014	48	Two graft hepatic arteries
2015	59	First right lobe altruistic
2021	102	LDLT in a recipient assessed in another centre
2021	106	First dual portal vein
2022	111	First three ducts
2022	109	First right lobe regraft

# Donor Demographics (TOTAL 127 – 4)

	Total No. of Donors (N=123)	Adult to Adult (n=50; 40.7%)	Adult to Paediatric (n=73; 59.3%)
Donor age (years)	32 (18-59)	34 (18-57)	32 (19-59)
Female gender	65 (52.8%)	23 (46.0%)	42 (57.5%)
Donor weight (kg)	70 (47-105)	72 (47-99)	70 (48-105)
Donor BMI	24 (17-30)	24 (20-30)	24 (17-29)
Donor relation			
First degree	75 (61.0%)	32 (64.0%)	43 (58.9%)
Second degree	29 (23.6%)	13 (26.0%)	16 (21.9%)
Unrelated (friend)	2 (1.6%)	1 (2.0%)	1 (1.4%)
Altruistic donor	17 (13.8%)	4 (8.0%)	13 (17.8%)

- 17 non-directed altruistic donors
- Median age – 29 years (19-54 years)
- One of them previously donated kidney





# Recipient Outcomes

	Adult LDLT (N=50)	Paediatric LDLT (N=73)
Recipient age	50 (18-71) years	1 (0-17) years
Female gender	53.5%	52.3%
Common aetiology	Cholestatic liver disease (34.9%)	Biliary atresia (52.3%)
MELD/PELD	13 (6-32)	17 (6-36)
90-days biliary complications	10 (20.0%)	7 (9.6%)
90-days graft loss	2 (4.0%) – immune mediated graft injury and intravascular microangiopathy	6 (8.2%) – HAT (5) and no cause on explant (1)
90-days patient death	1 (2.0%) - sepsis	4 (5.5%) – sepsis (3) and haemorrhage (1)
1- & 5-year graft survival	90% & 85%	91% & 90%
1- & 5-year patient survival	92% & 88%	93% & 93%



Pre-regraft with donor



Post-regraft

Regraft with LDLT (18-year-old son as the donor)

*\*Images used with patients' permission*

# Donor Outcomes

	<b>Total No. of Donors (N=123)</b>	<b>Adult-to-Adult (n=50; 40.7%)</b>	<b>Adult-to-Paediatric (n=73; 59.3%)</b>
<b>Maximum post-op bilirubin (mg/dL)</b>	24 (8-131)	41 (18-111)	19 (8-131)
<b>Maximum post-op ALT (IU/L)</b>	244 (73-1204)	206 (95-420)	322 (73-1204)
<b>Blood transfusion</b>	1 (0.8%)	1 (2.0%)	0 (0.0%)
<b>No complications</b>	103 (83.7%)	38 (76.0%)	64 (87.7%)
<b>Grade 1</b>	11 (8.9%)	5 (10.0%)	6 (8.2%)
<b>Grade 2</b>	3 (2.4%)	2 (4.0%)	2 (2.7%)
<b>Grade 3a</b>	2 (1.6%)	2 (4.0%; USS guided drainage of collection)	0 (0.0%)
<b>Grade 3b</b>	4 (3.2%)	3 (6.0%; reexploration for bleeding)	1 (1.4%; gastrojejunostomy for GOO)
<b>Length of hospital stay (days)</b>	13 (2-17)	7 (4-17)	5 (2-12)
<b>Readmissions within first 3 months</b>	12 (10.5%)	7 (14.0%)	6 (8.2%)
<b>Survival status (alive)</b>	100%	100%	100%
<b>Follow-up (months)</b>	85 (1-172)	86 (1-172)	82 (1-170)

# Conclusions

- Outcomes are excellent, even in western centres
  - Avoids waiting time
  - Planned surgery
  - Resilience of workforce
- 
- Learning curve
  - NHS