

Supplementary Table 1: Overview on recent literature (adult liver transplantation from controlled DCD donors)

Autor and year	Cohort	Time frame	Study type; No. of DCD transplants (n)	Risk Factors ± suggested Cut-Off	PNF (%)	Biliary Complications (%); (AS(%); IC (%))	Vascular complications (%)	Graft survival 1-3-5-10y (%)	Patient survival 1-3-5-10y (%)	Reatransplantation (%)
USA/Can.										
Abt 2004	UNOS, national	1993-2001	Retrospective, n=144 (117 con)	Donor age < 60y, dWIT: <30min, CIT <8hrs, medically fit recipient (not intubated not on pressors), dialysis/life support	18.1% failed 60d (11.8)	.	.	70.2, 63.3,-,- (mixed)	79.7; 72.1,-,-	13.9
Mathur 2010	UNOS, national	2001-2009	Retrospective n=1567	Donor age>50y, DWIT>35min, CIT>6h, Recipient age >55y, MELD >35, male gender	-	-	-	78,65,-,-	83,78,-,-	13.6
Foley 2011	Wisconsin, USA	1993-2008	Retrospective n=87	Donor age > 60, DWIT 30min, BMI 25 kg/m²2, MELD > 20	2.3	47 (IC 34)	-	69,-,56,43	84,-,68,54	19.0 (1y)
Bellingham 2011	Wisconsin, USA	1980-2008	Retrospective n=87	-	-	51.5	-	69.4,59.6,56,42.9	84,71.8,68,54.4	13.9
Jay 2011	UNOS, national	1996-2007	Retrospective n=1113	Donor age >40y, CIT > 12h, regional sharing, Recipient age >60y, HCV, HCC, renal insufficiency	-	-	-	-	82, 71,-,-	14.7
Taner 2012	Mayo Florida, USA	1998-2010	Retrospective n=200	Race, DWIT	2.5	27 (IC 12)	HAT 3.5	80.9,72.7,68.9,-	92.6,85,80.9,-	10.5
Vanatta 2013	Memphis, Tennessee, USA	2006-2011	Retrospective n=38	Donor age, DWIT, CIT, macrosteatosis, procurement team, donor location	2.6	18.4 (IC 7.9)	HAT 0 HAS 10 ICV thrombus 2.6	92, 74,-,-	92, 80,-,-	2.6
Lee 2014	Mayo Florida, USA		Retrospective n=205							
Doyle 2015	Washington, USA	2005-2014	Retrospective n=49	After 2009 donor age>45, DWIT>20 min	0	Bile leak 14.3 AS [§] 16.3 IC 8.5	0	-,-,79.5,-	-,-,87.1,-	6.1
Firl 2015	Cleveland, Ohio, USA	2005-2014	Retrospective n=92	Increasing donor age	6.5	27.2 (IC 6.5)	HAT 1.1 PVT 1.1	83, 72, 66,-	-	2.2
Croome 2016	UNOS, national	2003-2014 (3 eras)	Retrospective n=3199	Donor age, CIT, Recipient age, MELD, ventilation, HCV, era 2 and 3	-	-	-	Era 1: 72,62,55,- Era 2: 79,69,63,- Era 3: 85,75,67,-	Era 1: 87,76,72,- Era 2: 88,77,73,- Era 3: 90,88,-,-	-
Scalea 2016	UNOS, national	2002-2014	Retrospective n=2185	Donor age <50, CIT <6h	-	-	-	-	-,-, 71,-	-
Croome 2017	Mayo Florida, USA	1998-2015	Retrospective n=300	-	-	27 (AS 9, IC 11.7; Bile leak 11.7,)	HAT 2.3 HAS 4.3	86.1,78.4,73.2,-	92.3,86.1,80.3,-	-
Goldberg 2017	National, IDOL consortium	2005-2014	Retrospective n=744	Donor age >40y, centre volume, DWIT	-	Overall strictures (6 months): 21.8 (IC 11.8)	-	-	-	-
Bohorquez 2017	Ochsner, New Orleans, USA	2003-2015	Retrospective n=138, two groups	DWIT	0	24.6 (IC 3.6)	HAT 4.3	Early:76.3,73.7,- Late:92,91.4,-,-	Early: 86.8,84.3,-,- Late:93, 89.2,-,-	5.8
Kollmann 2018	Toronto, Canada	2009-2017	Retrospective n=77	Immediate posttransplant complications	1.3	5.2 (AS: 2.6, IC 2.6)	HAT 0	88.3,83.2,69.2,-	92.2,85.4,71.6,-	3.9
Croome 2018	3 centres, USA	2002-2016	Retrospective n=471*	Donor age increase >50y, diabetes, CIT, MELD>30, recipient ventilated, on ICU	-	Donor≥50y: 32.3 (AS 16.1, IC 11.6)	Donor≥50y: 1.9	Donor≥50y: 87,75.6,71.8,-	Donor≥50y: 91.1,84.2,81.6,-	-

Cont. Supplementary Table 1: Overview on recent literature (adult liver transplantation from controlled DCD donors)

Autor and year	Cohort	Time frame	Study type; No. of DCD transplants (n)	Risk Factors ± suggested Cut-Off	PNF (%)	Biliary Complications (%); (AS (%); IC (%); leak (%))	Vascular complications (%)	Graft survival 1-3-5-10y (%)	Patient survival 1-3-5-10y (%)	Reatransplantation (%)
Europe										
Dubbeld 2011	Netherlands, national	2001-2006	Retrospective n=55	DWIT, CIT, RWIT, transplant centre	1.8	IC 24	HAT 7.3 Other 7.3	74,68,-,-	85,80,-,-	18.2
DeOliveira 2011	London, UK	2001-2010	Retrospective n=152	No statistical difference	-	19.7 (IC 2.6)	HAT 2.6	-, -,78,-	-, -,80,-	1.3
Mallik 2011	Cambridge, UK	2004-2010	Retrospective n=32	-	-	50 (IC 18.8)	-	95,-,-,-	100,-,-,-	-
Meurisse 2012	Leuven, Belgium	2003-2010	Retrospective n=30	Donor age >60y, DWIT>30min, CIT>8hrs	0	50 (IC 33.3)	-	90, 82.1,-,-	93.3, 85.5,-,-	3
Callaghan 2013	UK, national	2005-2010	Retrospective n=352	-	-	6% cause of graft loss, 4% strictures require intervention	-	-,72.7,-,-	-,80.6,-,-	-
Detry 2014	Liège, Belgium	2003-2012	Retrospective n=69	Donor age	0	20.3 (AS 14.5, IC 1.4, Leak 4.3)	HAT 1.4	-,72,-,-	-,73,-,-	1.4
O'Neill 2014	Medline Embase, Cochrane	1993-2011	Meta-analysis (25 studies), n=2478	Donor age, Recipient age, MELD, CIT	-	26 (IC 16)	-	-,73,-,-	-,82,-,-	-
Blok 2016	Belgium and Netherlands	2003-2007	Retrospective n=126	DWIT>25min,	3.2	(IC 6.3)	HAT 0.8	74.8,-,54.4,44.2	87.8,-,68.1,55.9	14.3
Laing 2016	Birmingham, UK	2004-2014	Retrospective n=234, propensity matched (n=187)	-	-	32.6 (AS 14.4, IC 9.1)	HAT 4.8 HAS 2.7	82.7,-,-,-	87.6,-,-,-	3.4
Kalisvaart 2017	Rotterdam, Netherlands	2001-2015	Retrospective n=115	-	3.5	34 (AS 18, IC 11)	-	-, -,60,-	-, -,75,-	15
Schlegel 2018	Birmingham, UK	2004-2017	Retrospective n=315	Donor age > 60y with Donor BMI >25kg/ m², CIT	2.9	28.9 (AS 13, IC 11.4, Leak 3.3)	HAT 7	-, -, >80,- (donor age>60, donor BMI≤25kg/m²)	-, -, >88,- (donor age>60, donor BMI≤25kg/m²)	7
Gilbo 2019	Leuven, Belgium	2009-2015	Retrospective n=78	-	-	-	-	-, 82,-,-	-, 84.6,-,-	-
Taylor 2019	UK, national	2008-2015	Retrospective n=953	Donor age, Recipient age, recipient status, liver appearance	3.5	-	-	83.7,-,69.1,-	91.5,-,78.1,-	-
Martinez 2019	Malaga, Spain	2013-2017	Retrospective n=25 [§]	Donor age, DWIT, CIT	0	20 (AS 4, IC 12, leak 4)	-	-, -, -, -	-,84,-,-	8

Supplementary Table 2: Clinical studies on outcomes after DCD liver transplantation for a specific recipient disease

Author / year publication	Cohort	Recipient Disease	Study type; No. of DBD:DCD transplants (n)	Risk Factors ± suggested Cut-Off	Main findings / Conclusion
Silverstein J et al, 2020	UNOS	HCC	Retrospective, DBD: n=6996; DCD: n=567	DCD organs (low cumulative risk, short cold ischemia time of 6 and 5.4 hrs; young median donor age with 45 and 33 years), donor age, DRI, MELD	Liver transplantation with DCD liver grafts was an independent predictor of mortality. Differences in survival were observed in subgroups with higher risk of recurrence, including RETREAT score >4, AFP > 100ng/ml, viable tumours on last imaging. Donor or graft quality and HCC parameters impact on outcomes
Martinez-Insfran A.L. et al, 2019	Single Centre (Europe)	HCC	Retrospective, DBD: n=18; DCD: n=18	Cold ischemia time (overall low risk DCD grafts, short donor warm and cold ischemia times)	DCD liver recipients have inferior patient survival, not significant with p=0.266 and n=18 in both groups; Low risk DCD grafts can be used for standard HCC recipient
Khorsandi SE et al, 2016	Single Centre (UK) (2001-2014)	HCC	Retrospective, DBD: n=256; DCD: n=91	DCD vs. DBD grafts, donor warm and cold ischemia times, HCC risk factors	DCD livers release more transaminases (AST) and have an impaired function (INR),recipients of good quality DCD livers have a similar risk of HCC recurrence compared to standard DBD donor liver recipients. HCC recurrence is 11.8% in DCD.
Orci LA, et al, 2015	UNOS	HCC	Retrospective, DBD: n=9724; DCD: n=518	Donor WIT in DCD organs, donor age, donor BMI	Donor age > 60y and donor WIT was a risk factor for an increased HCC recurrence (p = 0.025)
Croome et al, 2015	Single Centre (USA) (2003-2012)	HCC	Retrospective, DBD: n=340; DCD: n=57	Cold ischemia time and donor WIT, recipient AFP, recipient disease severity	Good DCD livers have a similar risk of HCC recurrence compared to standard DBD donor livers, HCC recurrence was 11.8% in DCD
Croome K et al, 2013	UNOS (1995-2011)	HCC	Retrospective, DBD: n=5638; DCD: n=242	Warm ischemia time, cold ischemia time, recipient age, lab MELD (DCD, donor age, donor WIT >15min; recipient age, HR DCD HCC 2.148; CIT 6hrs 20min, MELD, AFP levels)	DCD liver recipients have a higher risk of HCC recurrence compared to DBD graft recipients, recipients of livers with a donor warm ischemia time of > 15min or a cold ischemia time of > 6hrs 20 min had lower survival rates;
Trivedi et al, 2018	Single Centre (UK) (2006-2016)	PSC	Retrospective, n=35	Outcomes comparable to DBD/Split graft	PNF 2.9%; Bile Leak: 17%, Graft loss: 5.9%

All DCD liver transplants in the here collected studies were done with cold storage preservation; DCD: donation after circulatory death, HCC: Hepatocellular carcinoma; AFP: alpha feto protein; AST: Aspartate aminotransferase; MELD: Model of end-stage liver disease; UNOS: United network of organ sharing;

Supplementary Table 3: Overview on current prediction models used in DCD liver transplantation.

Model	Database	Data Collection	Principle of Allocation	Risk Factors	Suggested Cut-off	Predicted endpoint	External Validation	Strength	Discussion
Scores with Donor Risk Factors									
Donor Risk Index (DRI), 2006	US national, n=20023 (DBD & DCD)	1998-2002	Donor based	DCD yes/no	DRI>1.5 (1.4-1.8)	Graft survival	Europe	Single value for each donor, metric	Pre-MELD era, hazard model, donor age-related, no recipient variables
European- DRI, 2012	Eurotransplant Database, n=5939 (DBD & DCD)	2003-2007	Donor based	DCD yes/no (HR 1.71)	ET-DRI >1.8	Graft survival	No	Adjustment of DRI in Europe, metric	No recipient variables, donor GGT not always available, hazard model
Donor – Liver Index (DLI), 2016	UK national, n= 5586 (DBD & DCD)	2000-2014	Donor Based	DCD yes/no (HR 1.89)	DLI>1.82	Graft survival	No, internal validation, UK data set, n=2343	Single value for each donor, metric	Livers with a DLI >1.82 achieve 5-year graft survival of 80%, hazard model, no recipient variables
Scores with combined Donor-Recipient- Risk Factors									
UCLA-DCDScore, 2011	UCLA, single centre, n=81 (DCD)	1994-2010	Combined Donor-Recipient	Two donor, three recipient factors and CIT	>4 points (high risk)	Graft survival	No	Donor and Recipient factors	Hazard ratio used to define risk points, Small cohort, 21% (17/81) in high risk group)
DCD-Risk Index, 2017	KCH, single centre, n=261 (DCD)	2005-2013	Combined Donor-Recipient	One donor, three recipient factors and CIT; DHT	>4 points (high risk)	Graft survival	No	Donor and Recipient factors + hepatectomy time	Hazard ratio used to define risk points, fDWIT (>25min) and CIT (>10hrs) get only limited score points
UK-DCD-Risk-Score, 2018	UK national, n=1153 (DCD)	2000-2015	Combined Donor-Recipient	Three donor and three recipient factors and CIT	>10 points (futile)	Graft survival	UNOS Dataset	Donor and Recipient factors, Framingham Risk scheme used to develop score points	Risk factor retransplantation, not further specified regarding timing/ethiology

BMI: Body-Mass-Index; DCD: donation after circulatory death; UCLA: University of California Los Angeles; DLI: Donor Liver Index, DRI: Donor Risk Index; ET-DRI: European-Donor Risk Index; UK: United Kingdom; D: donor; R: Recipient; CIT: cold ischemia time; DHT: donor hepatectomy time = duration of donor hepatectomy; KCH: Kings College Hospital; GGT: Gammaglutamyltransferase; HR: Hazard ratio;