Přínos moderních přístrojových metod v rozšiřování poolu vhodných orgánů pro transplantaci srdce v ČR

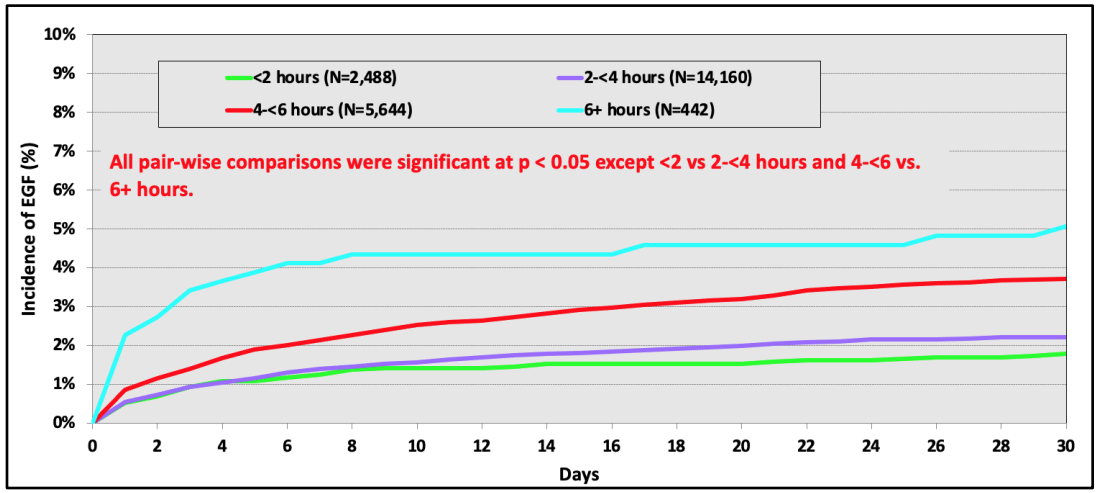
Professor Ivan Netuka, MD, Ph.D.

Institute for Clinical and Experimental Medicine

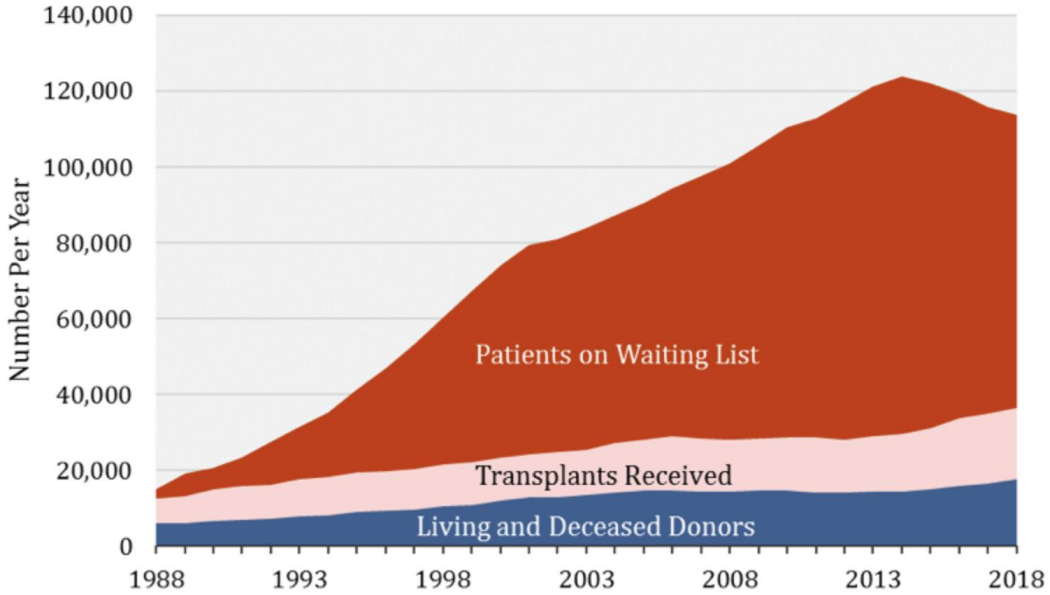
Prague, Czech Republic

Major Limitations of Heart Transplantation

Cold Ischemic Time (CIT) > 4 hours



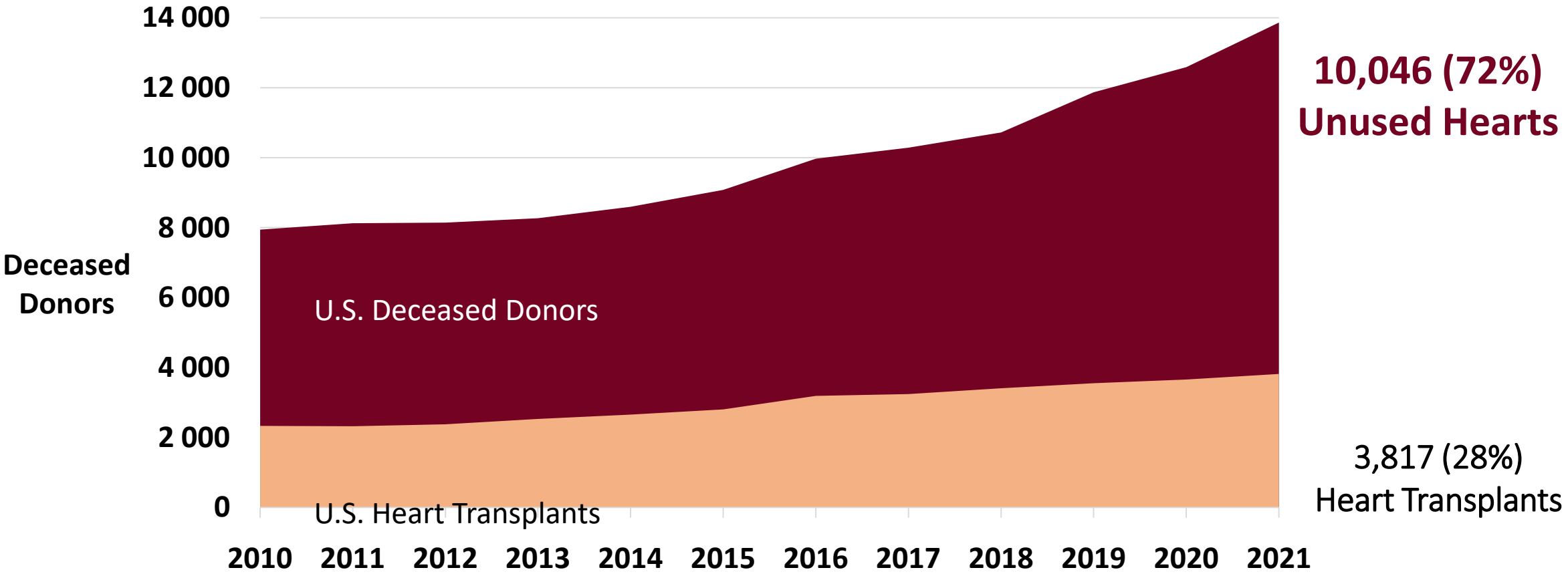
Donor Scarcity



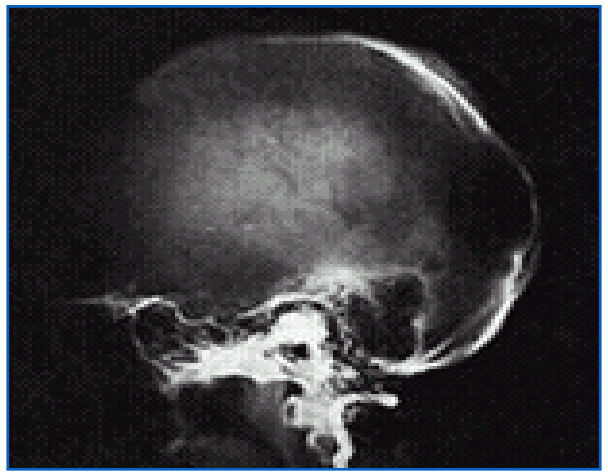
ISHLT Registry

U.S. DHHS

Significant Underutilization of Available Donor Hearts



Source: 2021 OPTN/SRTR National Data on U.S. Heart Transplants



donation after brain death DBD

donation after circulatory death DCD

living donation

Ex-vivo oxygenated perfusion

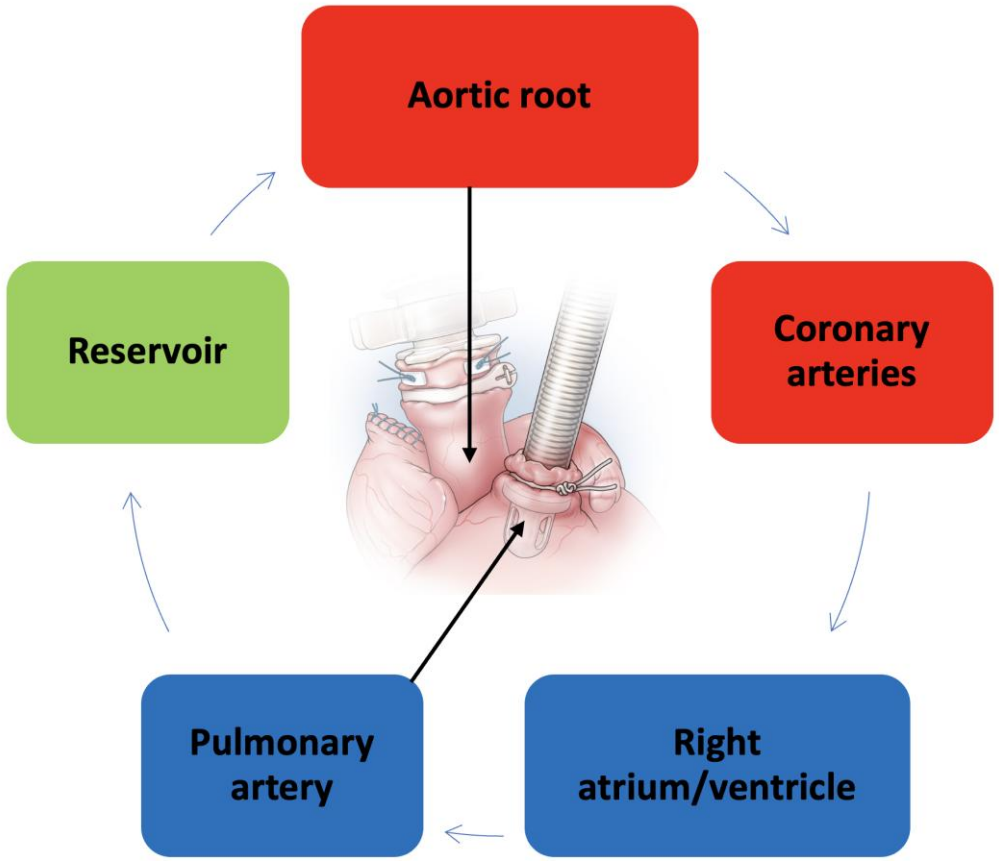
OCS Transmedics

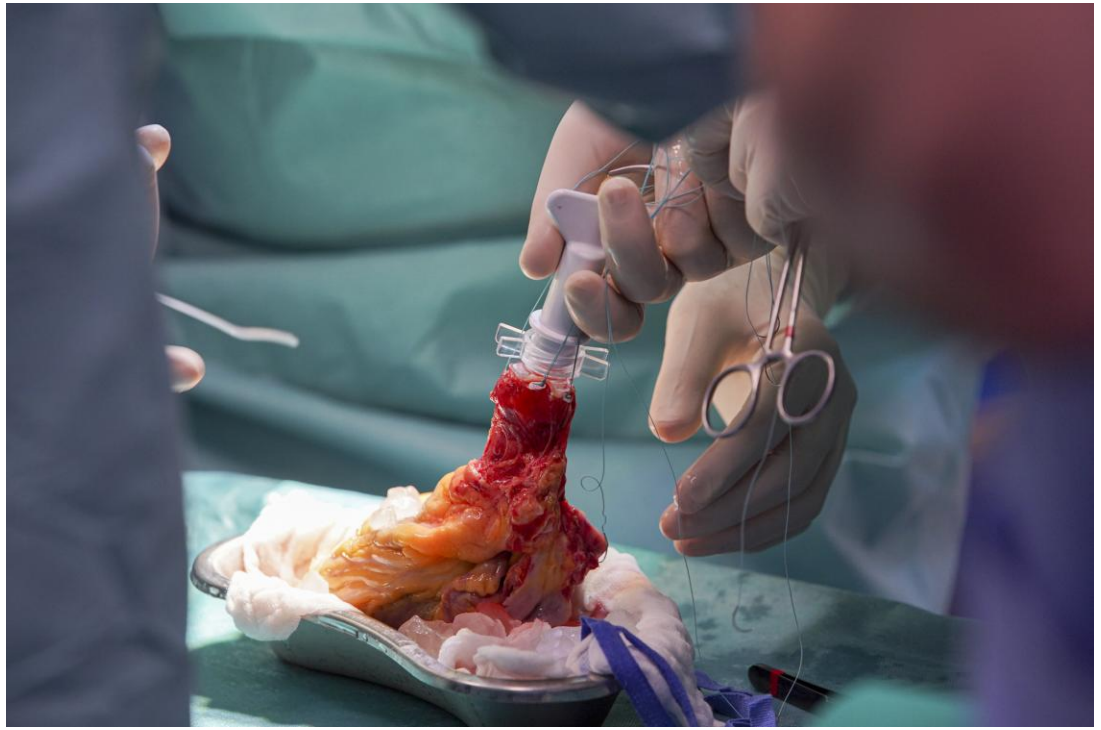
near-physiologic, metabolically active and functioning state

Enabling the first time ever:

- Ex-vivo resuscitation of donor organs from the insult of brain/circulatory death
- Ex-vivo metabolic and functional assessment
- Significant reduction of ischemic time

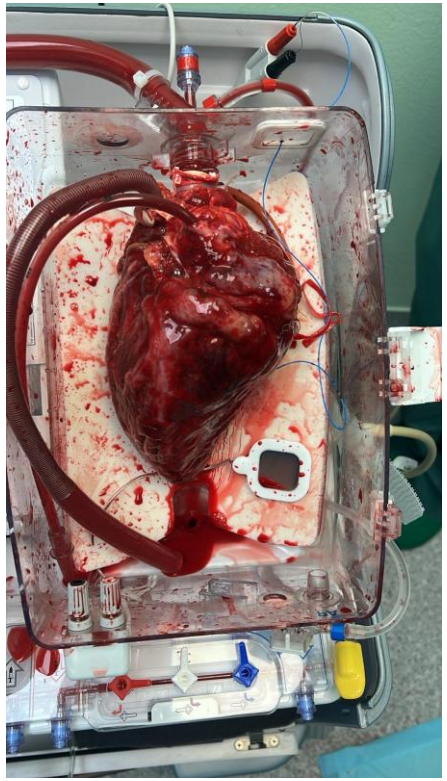
TransMedics OCS Donor Heart Instrumentation



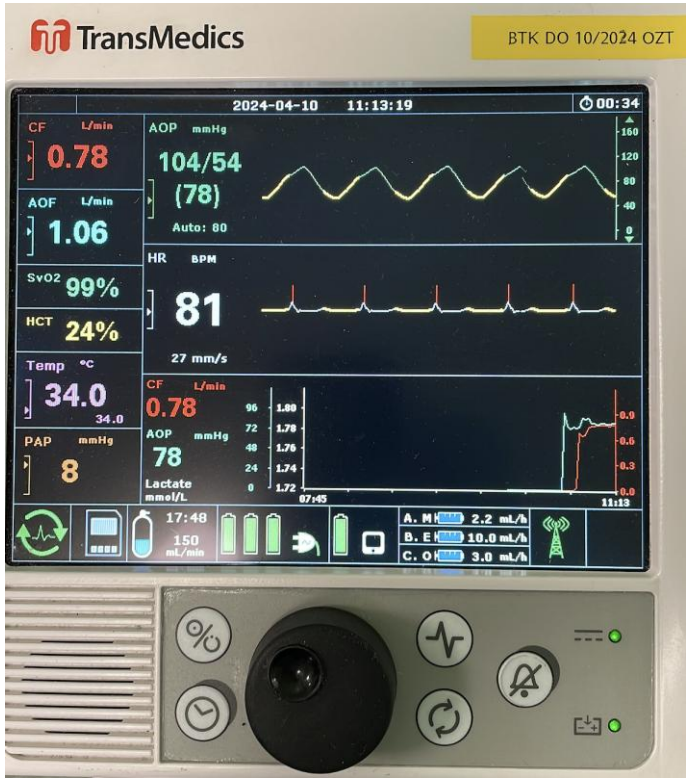


TransMedics OCS Heart Donor Heart Evaluation

1. Macroscopy/Heart Contractility



2. Perfusion Parameters

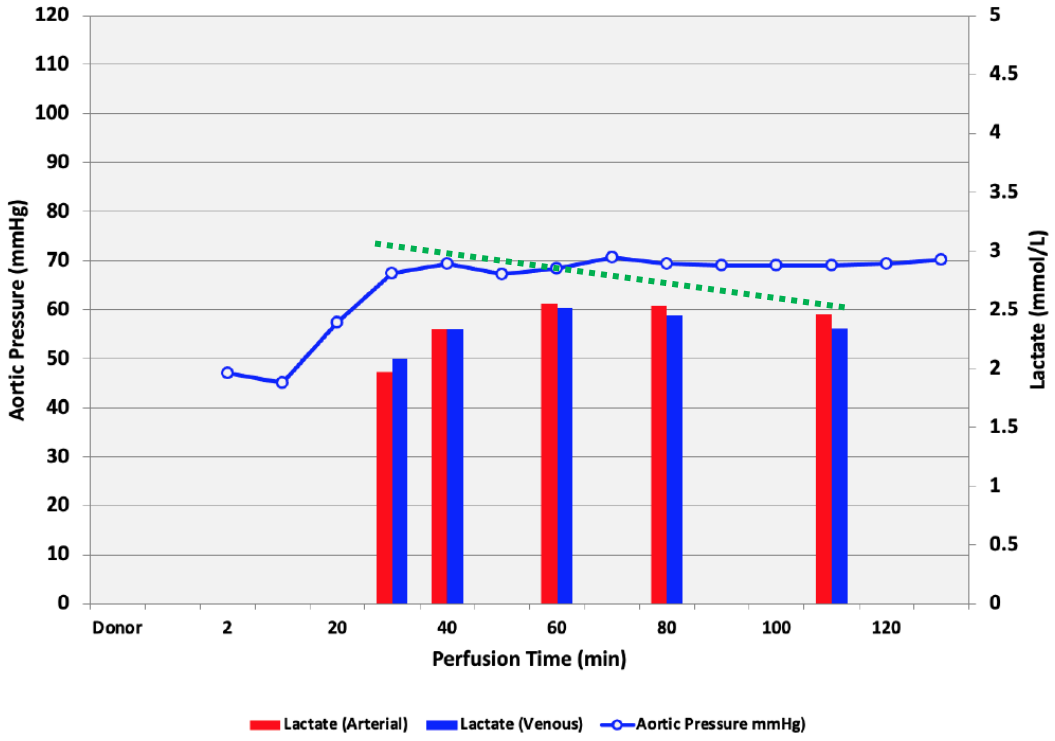


OCS; TransMedics, Andover, MA

TransMedics OCS Heart Donor Heart Evaluation

3. Metabolic State

Favourable trend: organ acceptance



OCS; TransMedics, Andover, MA

„Ex-Vivo“ Coronary Angiography

Contents lists available at ScienceDirect

Journal of the Society for Cardiovascular Angiography & Interventions

journal homepage: www.jscai.org

Imaging and Case Report

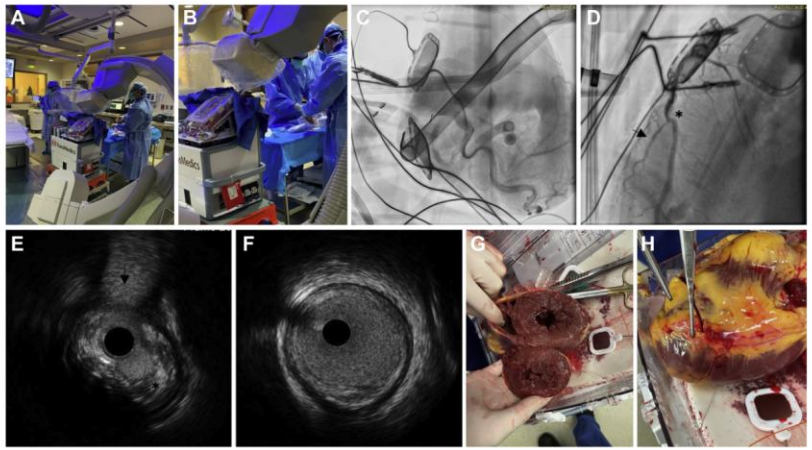
Ex Vivo Coronary Angiography and Intravascular Ultrasound of a Donor Heart in the Organ Care System

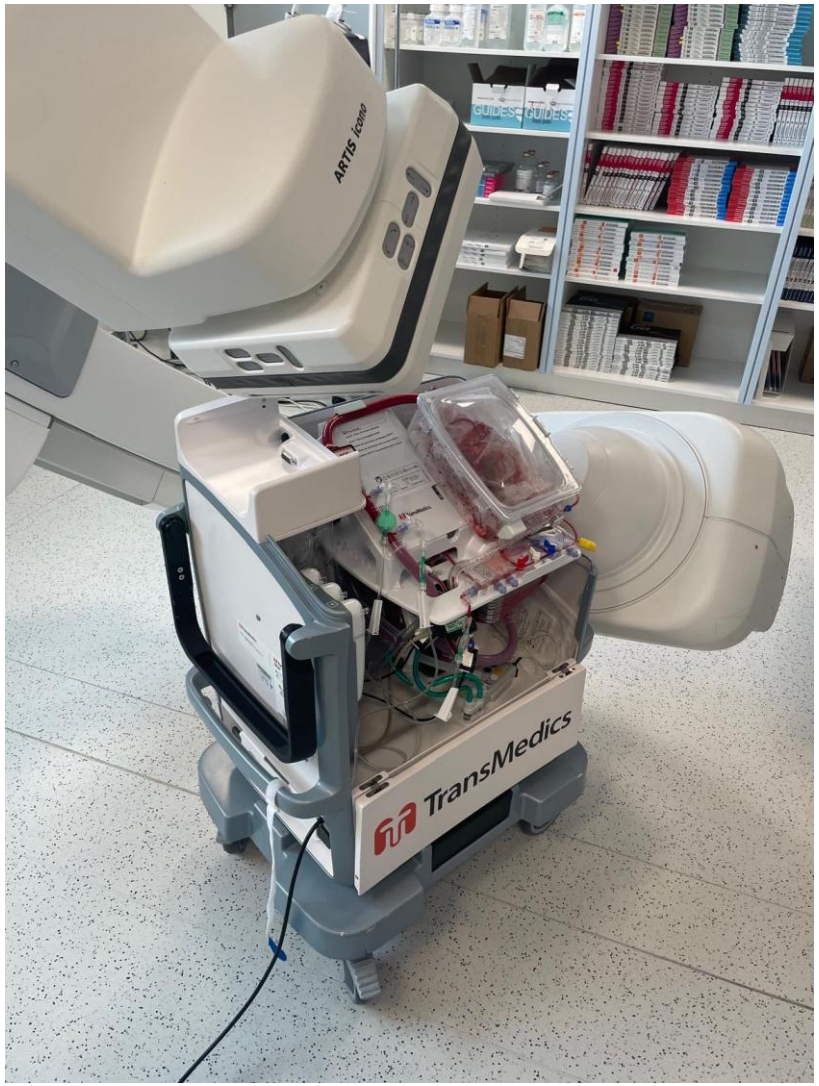
Rodrigo Mendirichaga, MD, Mark Kearns, MD, Victor Pretorius, MD, Jason Duran, MD, Kimberly Hong, MD, Mitul P. Patel, MD *

Sulpizio Cardiovascular Center, University of California San Diego, La Jolla, California

A 38-year-old man with nonischemic cardiomyopathy requiring a left ventricular assist device complicated by recurrent driveline infections presented to the hospital after being informed that a matching heart donated after circulatory death was available. The patient was listed for a heart donated after circulatory death due to his adverse recipient profile.

The donor was a 32-year-old man who had circulatory arrest after sustaining an intracranial hemorrhage. Preharvesting coronary angi-





Facing multiple challenges and indications

1) CIT > 4 hours

2) ECD donors

3) DCD donors

TransMedics™ OCS Heart

Ex-vivo perfusion of donor heart

Shortening

Recondition

Resuscitation

Donor Pool Expansion

OCS Heart (IKEM): **Indication Criteria**

1) **ECD Donors** (prerequisite – coronary angiogram without significant pathological findings):

   - **High dose of vasopressors** (Norepinephrine > 0.6 ug/kg/min)
   - **Potentially reversible LV dysfunction – EF 35-50%**
     (stress-induced cardiomyopathy; s/p CPR – young donors)
   - **LV hypertrophy** (IVS < 15 mm + history of AHT)

OCS Heart (IKEM): **Indication Criteria**

2) Composite indication (2 and more risk factors for HTx):

- Complex Redo surgery (LVADs & GUCH)
- CIT > 180 min
- Donor age > 55 years
- Additional clinical concerns

Facing multiple challenges and indications

1) CIT > 4 hours

2) ECD donors

3) DCD donors

TransMedics™ OCS Heart

Ex-vivo perfusion of donor heart

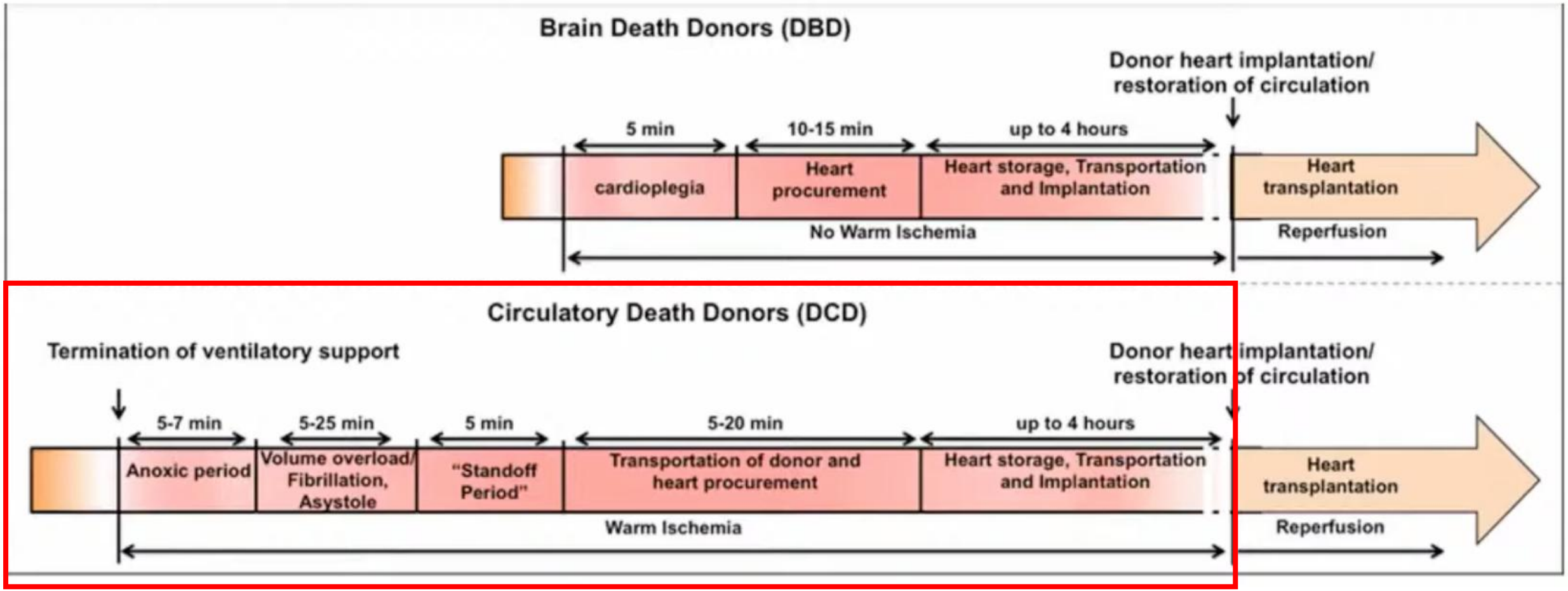
Shortening

Recondition

Resuscitation

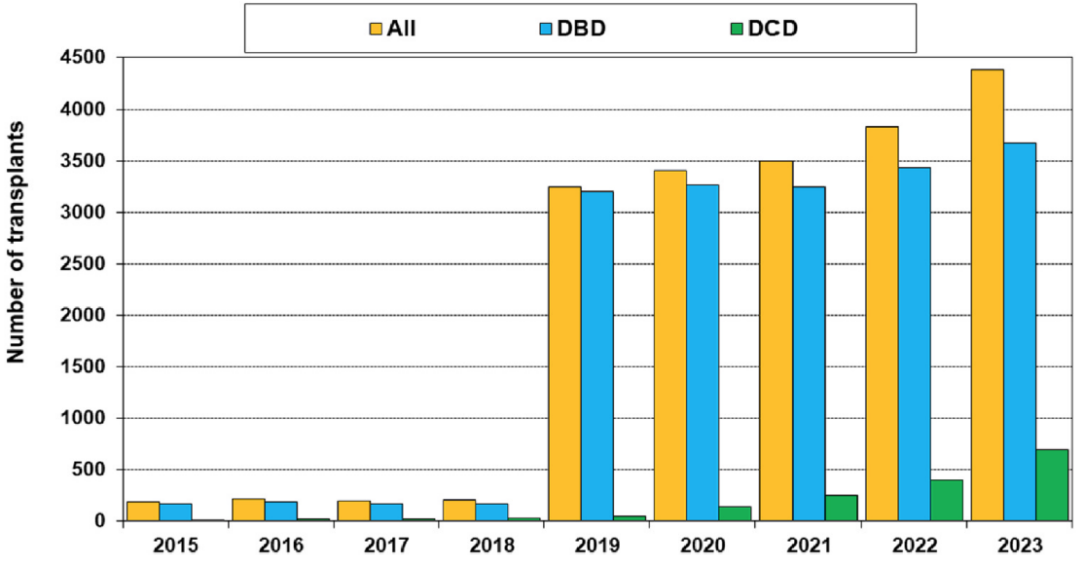
Donor Pool Expansion

DBD versus DCD Process Flow

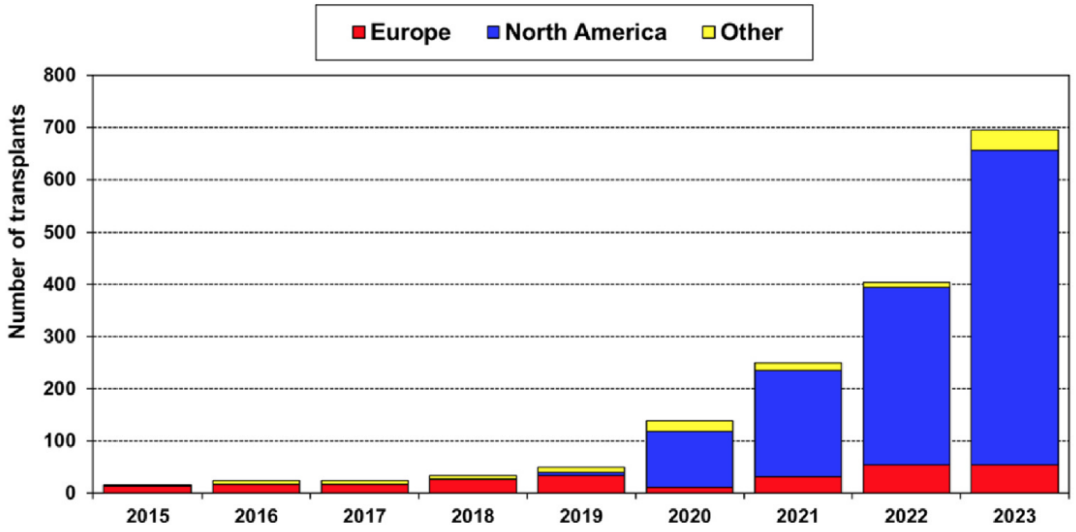


Donation after Circulatory Death - DCD

Annual Heart Transplant



Annual DCD Heart Transplant



JHLT, 2025

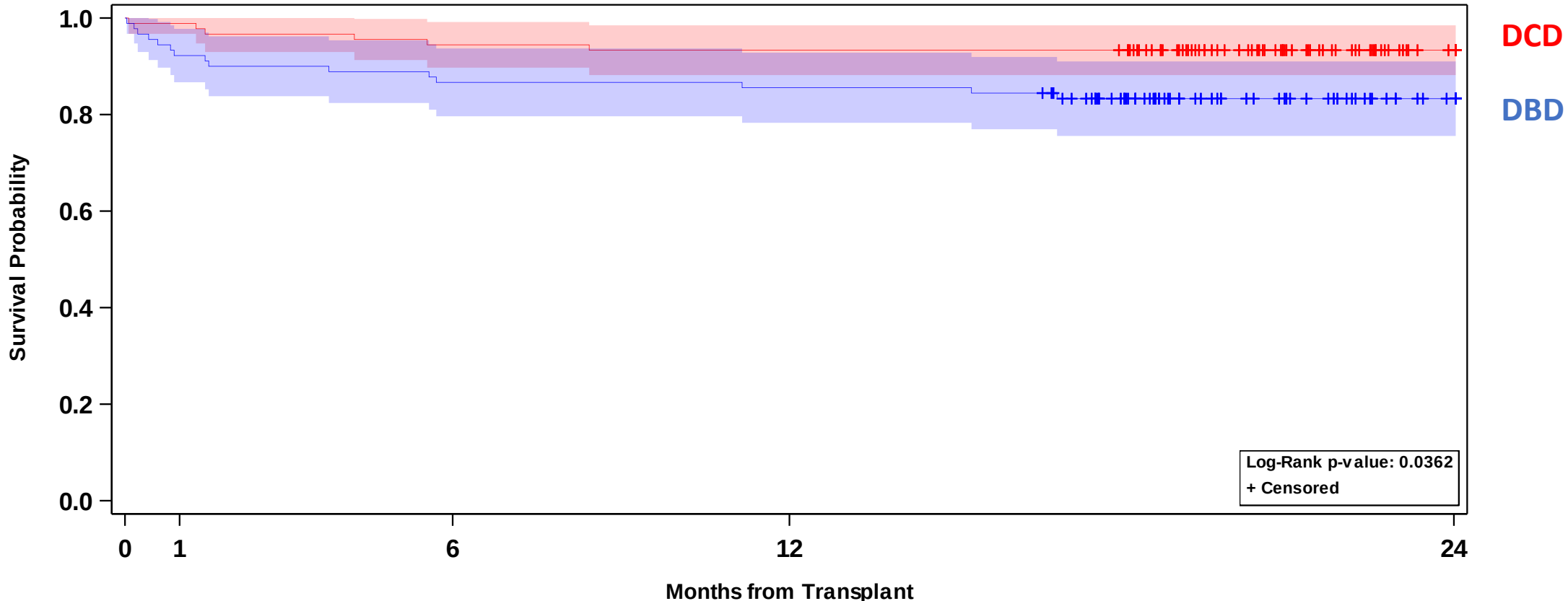
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JUNE 8, 2023 VOL. 388 NO. 23

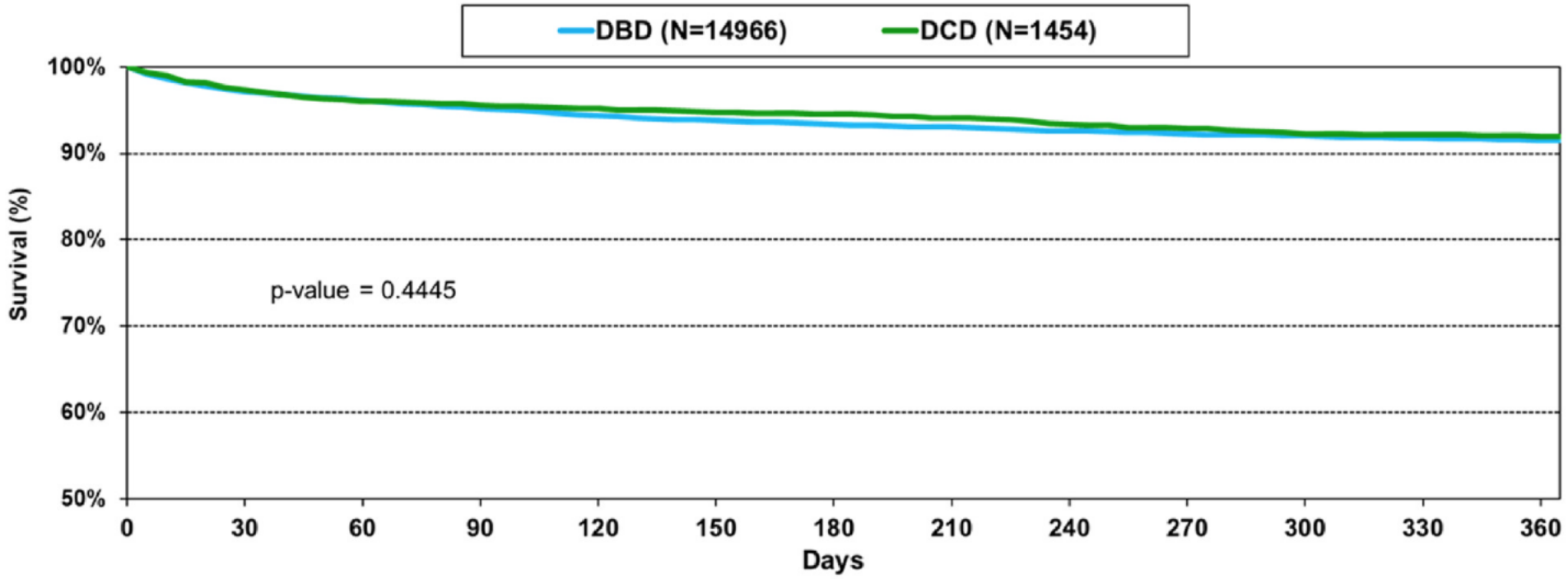
Transplantation Outcomes with Donor Hearts after Circulatory Death

J.N. Schroder, C.B. Patel, A.D. DeVore, B.S. Bryner, S. Casalinova, A. Shah, J.W. Smith, A.G. Fiedler, M. Daneshmand, S. Silvestry, A. Geirsson, V. Pretorius, D.L. Joyce, J.Y. Um, F. Esmailian, K. Takeda, K. Mudy, Y. Shudo, C.T. Salerno, S.M. Pham, D.J. Goldstein, J. Philpott, J. Dunning, L. Lozonschi, G.S. Couper, H.R. Mallidi, M.M. Givertz, D.T. Pham, A.W. Shaffer, M. Kai, M.A. Quader, T. Absi, T.S. Attia, B. Shukrallah, B.C. Sun, M. Farr, M.R. Mehra, J.C. Madsen, C.A. Milano, and D.A. D'Alessandro

NEJM 2023

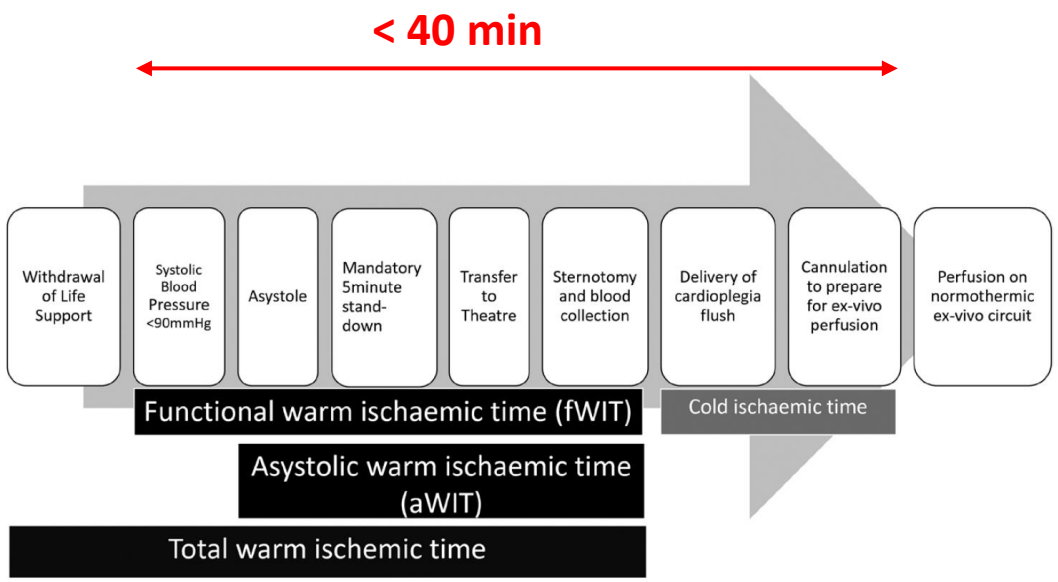


ISHLT Registry Heart Transplant Survival



Challenges of DCD Heart Procurement

Warm ischemic time is a critical determinant of graft function.



- OCS set-up/priming

……..

- Transport, draping
- Sternotomy
- Blood collection
- Aortic cross-clamp/cardioplegia delivery
- Excision of the heart
- Instrumentation 2.0 (OCS “ON”)

20 min

- **Timing …. Downtime < 10 min** (20)

Transplantation 2023; Circulation 2025; Royal Papworth DCD retrieval protocol

DCD Direct Procurement and Perfusion

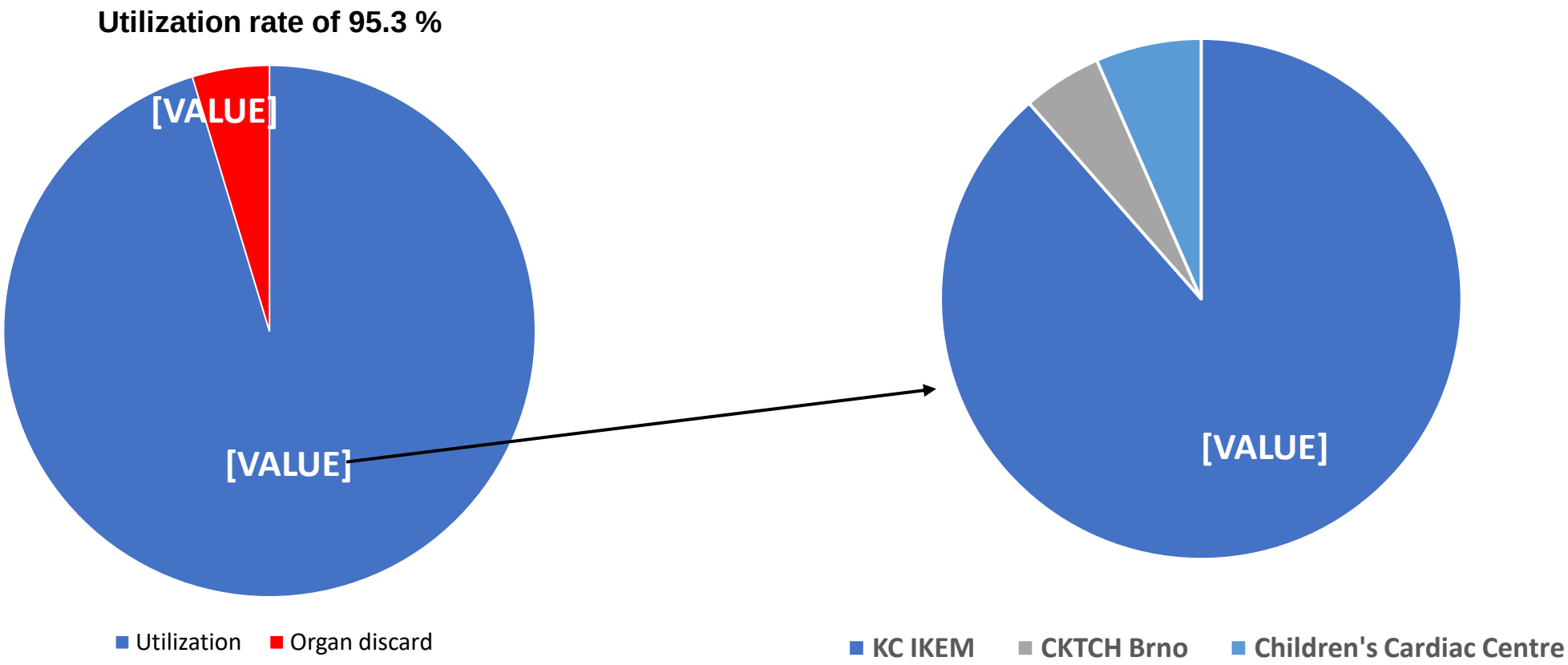
- Safe and prompt organ procurement, e.g. blood collection

- Resuscitation and recondition of “dying” heart

- Reliable graft evaluation

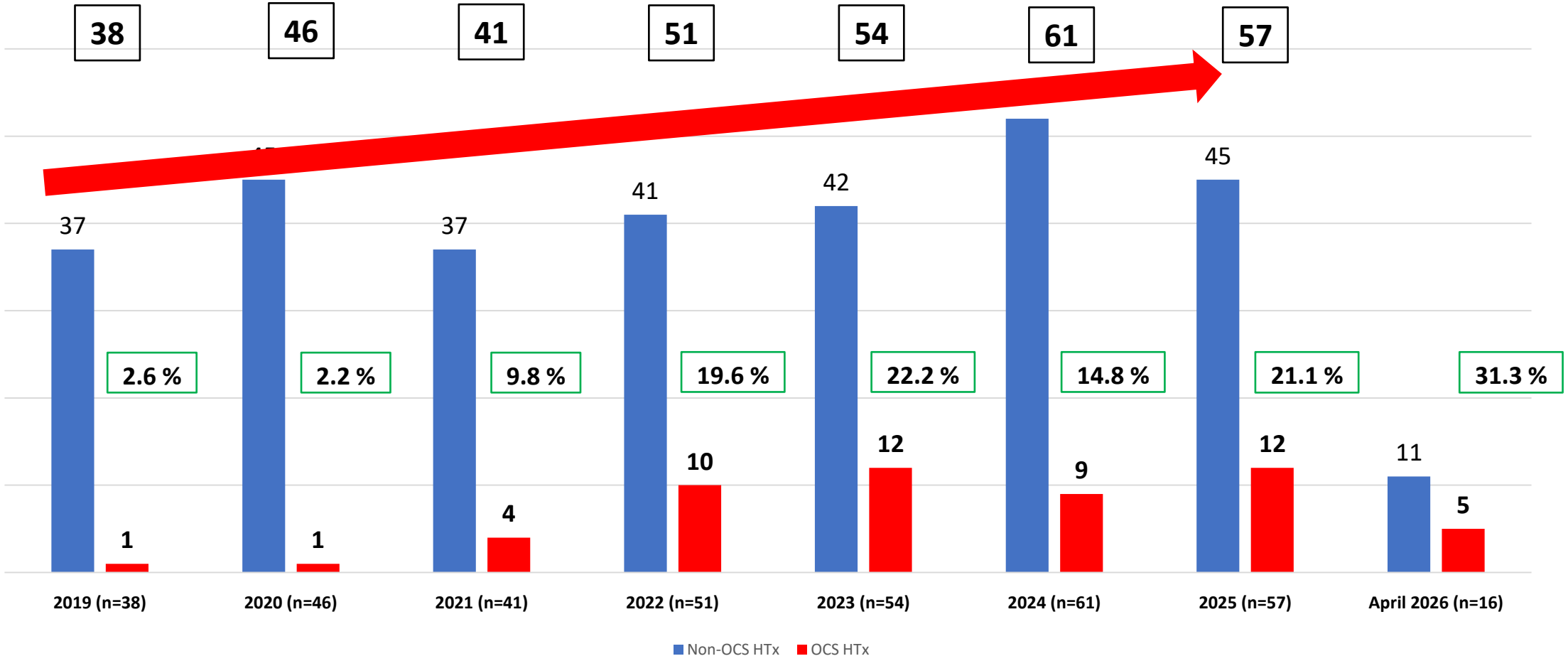
- **IKEM – team availability 24/7**
- **DCD – 3 HTx**

OCS Donor Hearts Utilization
(n = 61)



Proportion of OCS Heart Transplants (n = 54)

IKEM (10/2019 – 4/2026)

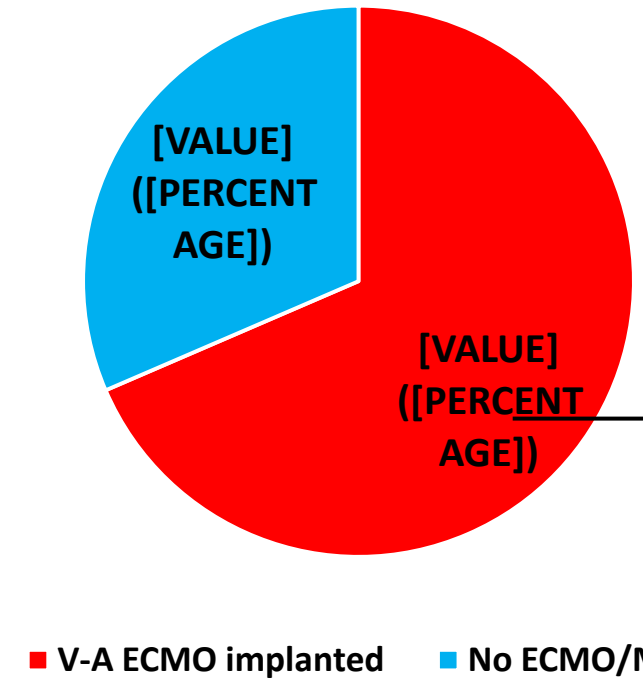


Conclusions

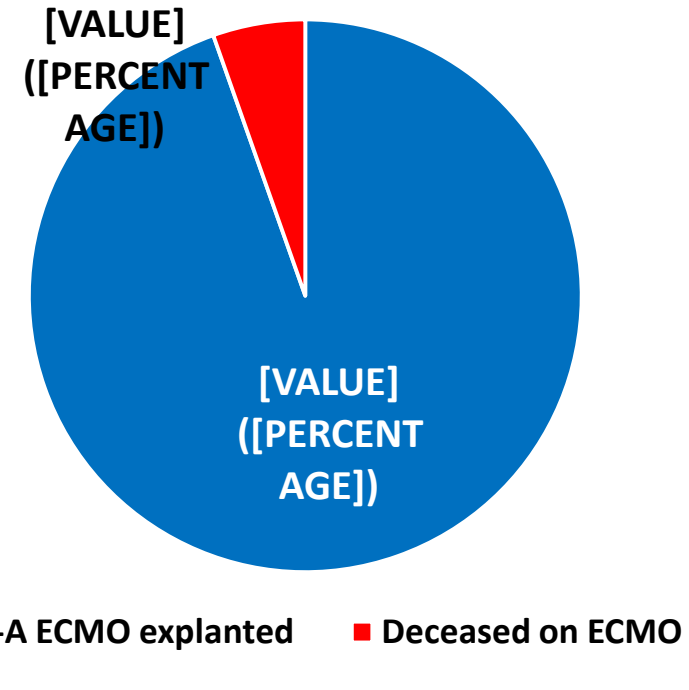
- **OCS expands HTx donor pool in long-distance procurement**
- **Enables recondition of otherwise non-eligable DBD and DCD donor hearts**
- **Safe perfusion interval up to 8 hours**
- **Metabolically active, near-physiological condition**
- **Allows for comprehensive longitudinal heart performance assessment**
- **Well-established program both in IKEM and the Czech Republic**

Procedure Considerations; Pre-emptive V-A ECMO Strategy (IKEM)

V-A ECMO Implantation (Pre-emptive)



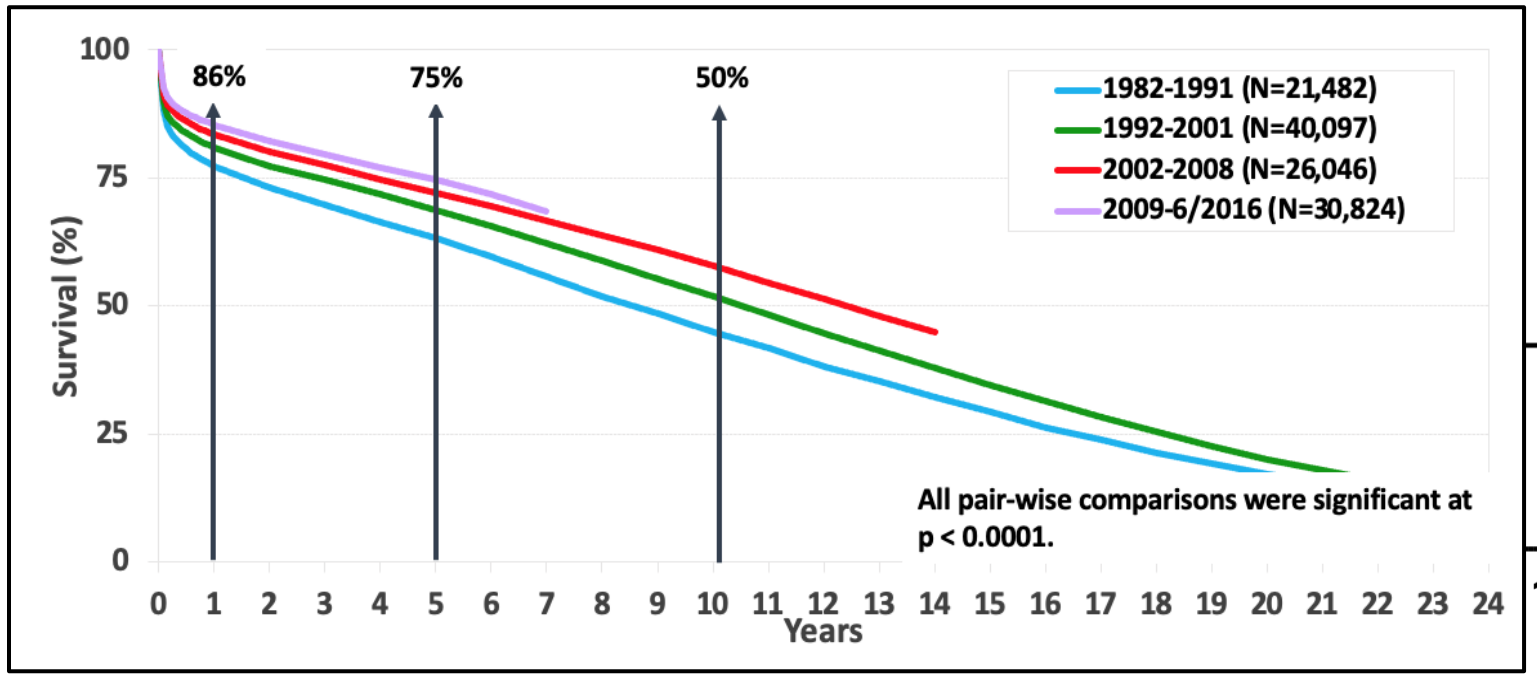
V-A ECMO Explantation (4.6 days)

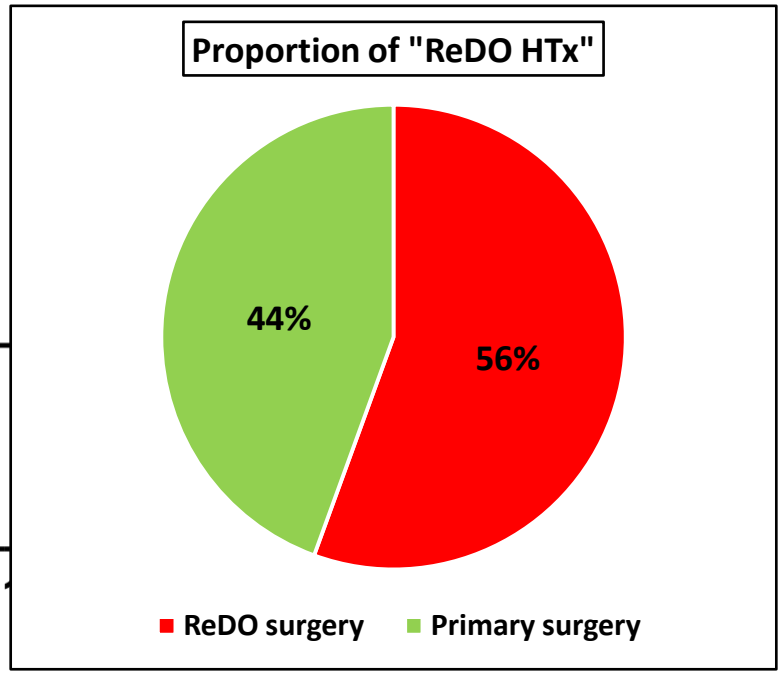


OCS HTx IKEM: **Recipients Survival** (n = 54 pts.)

30-day survival of OCS HTx **(88.7%)**

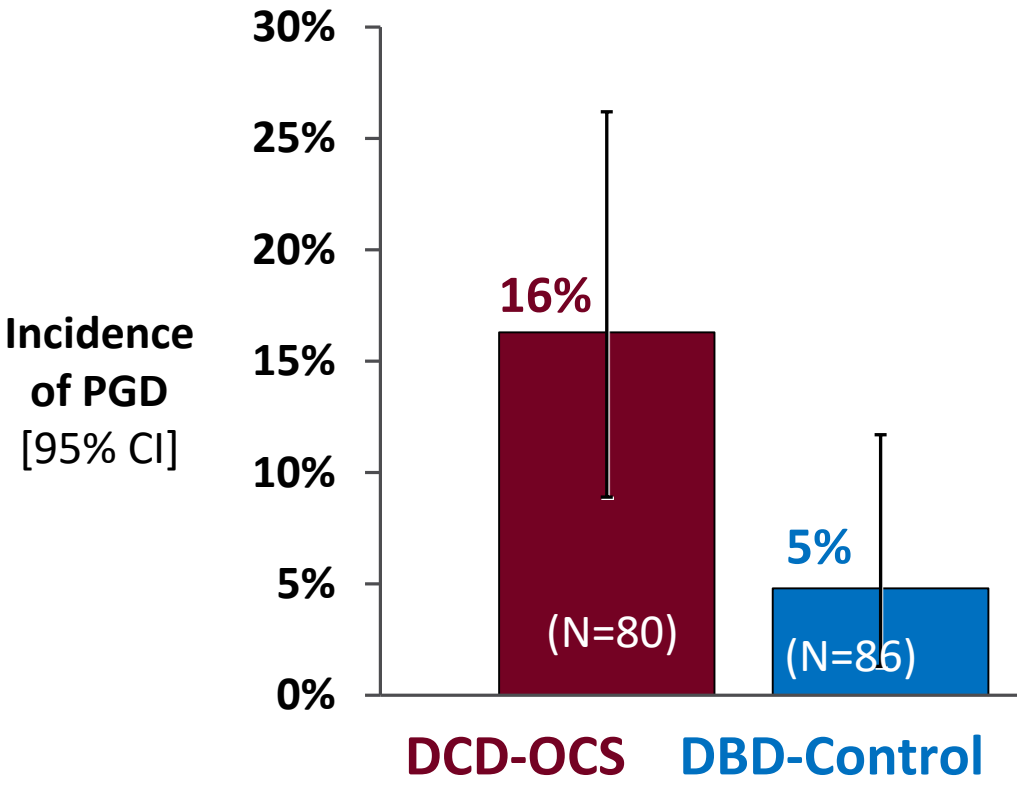
1-year survival of OCS HTx (**76.2%**)



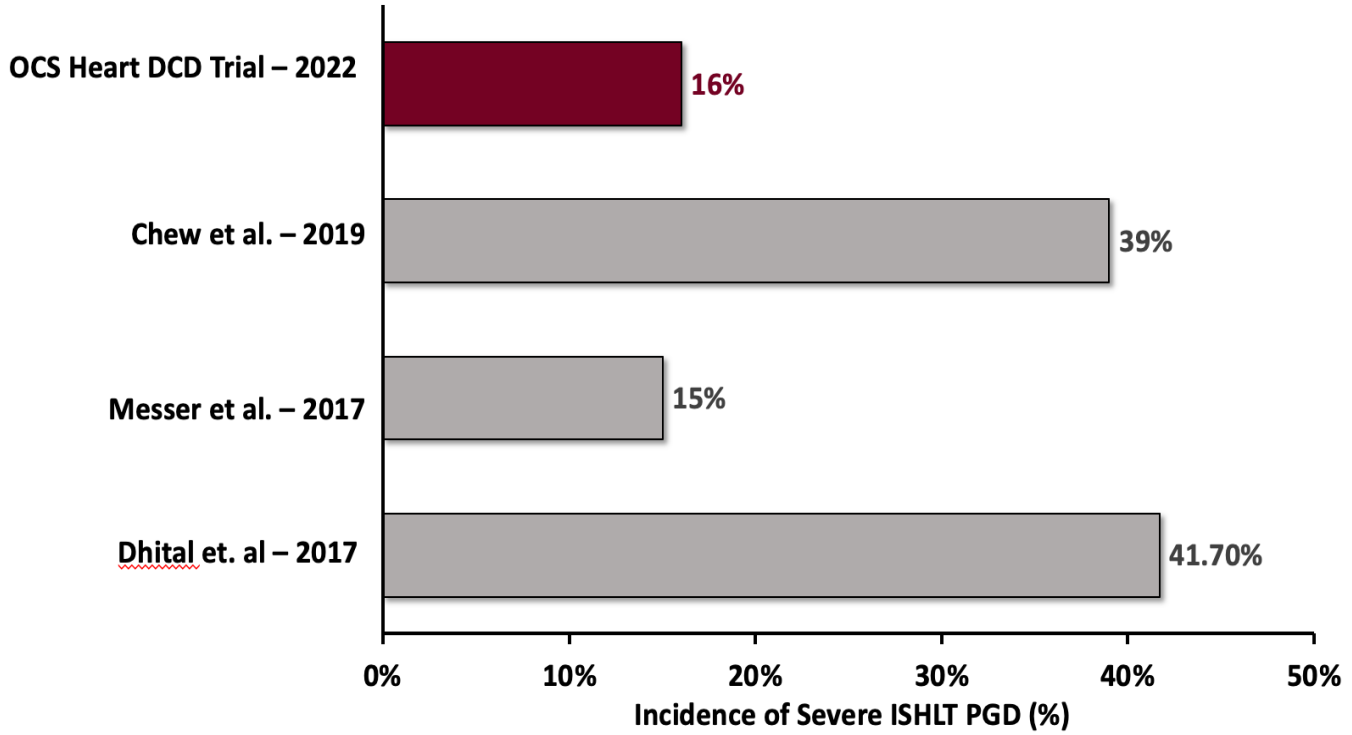


Incidence of ISHLT Severe LV or RV PGD

Per Protocol



Comparison to DCD Published PGD Data



Relevant Dislosures Statement

I will discuss off-label use of medical devices.

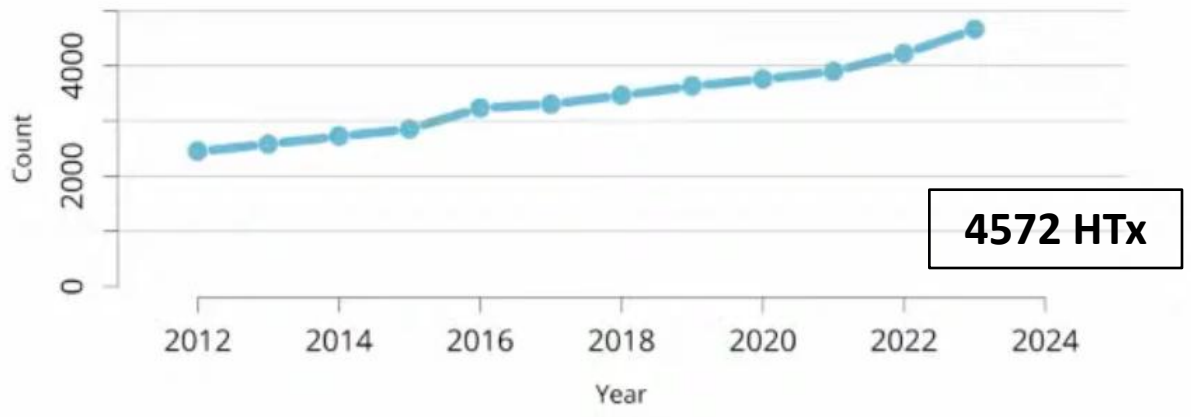
The following relevant financial relationships exist related to this presentation:

Ivan Netuka, MD, Ph.D.:
Surgical Proctor and Consultant Abbott, U.S.A., Abiomed Inc.
Overall PI and Advisory Board: Carmat TAH CE Mark Trial, Carmat SA, France
FineHeart SA, France
Advisory Board and Board Member; Stockholder: LeviticusCardio Ltd., Israel

Institutional (IKEM, Prague) research grant: Abbott, U.S.A.

U.S. Heart Transplant Dynamics and DCD Status Advent

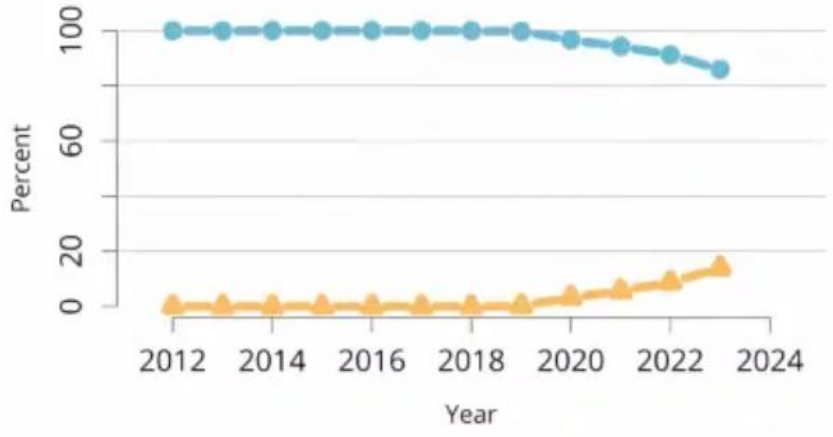
Figure HR 63: Overall deceased heart donor count



4572 HTx

OPTN/SRTR 2023 Annual Data Report

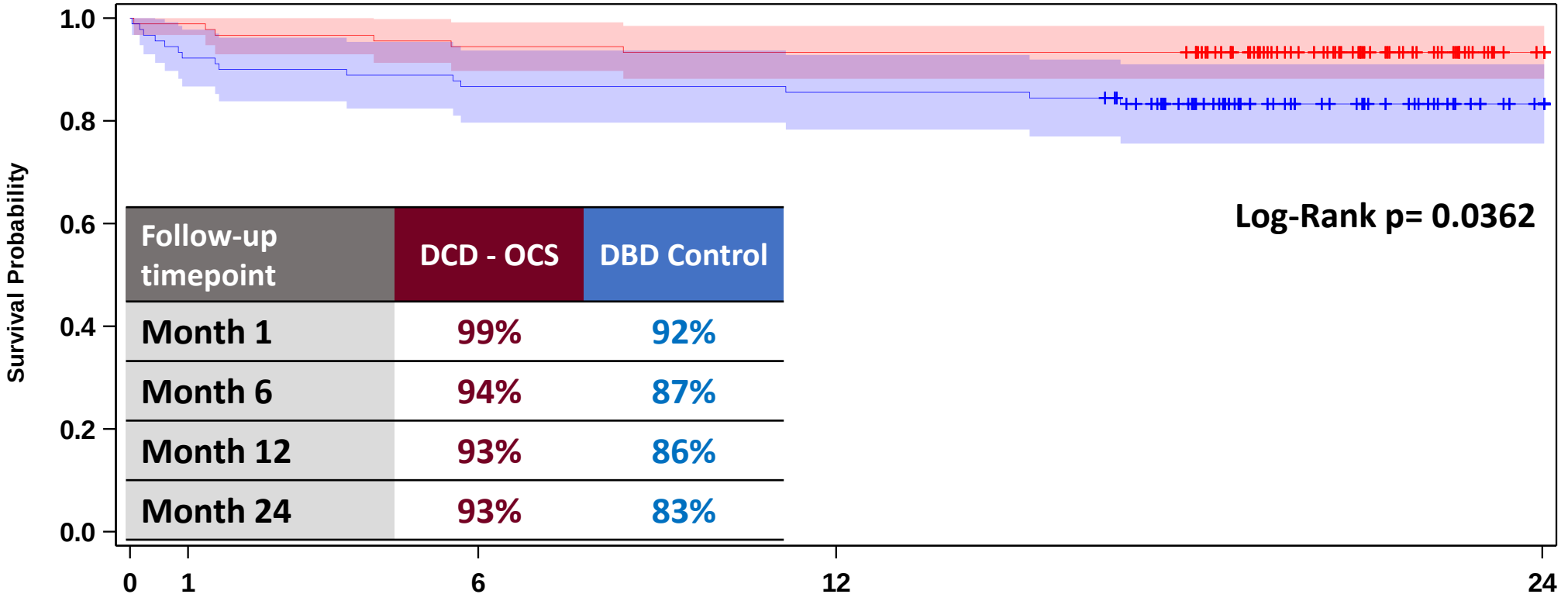
Figure HR 69: Distribution of deceased heart donors by DCD status



823 DCD HTx

OPTN/SRTR 2023 Annual Data Report

Overall Patient & Graft Survival at 2 Years Post-Transplant



Follow-up timepoint	DCD - OCS	DBD Control
Month 1	99%	92%
Month 6	94%	87%
Month 12	93%	86%
Month 24	93%	83%

DCD OCS	Subjects at Risk	90	89	85	84	21
	Subjects Censored	-	0	0	0	63
DBD Control	Subjects at Risk	90	83	78	77	15
	Subjects Censored	-	0	0	0	60