Global Pediatric Cardiovascular Health:

A Small EU Country Perspective

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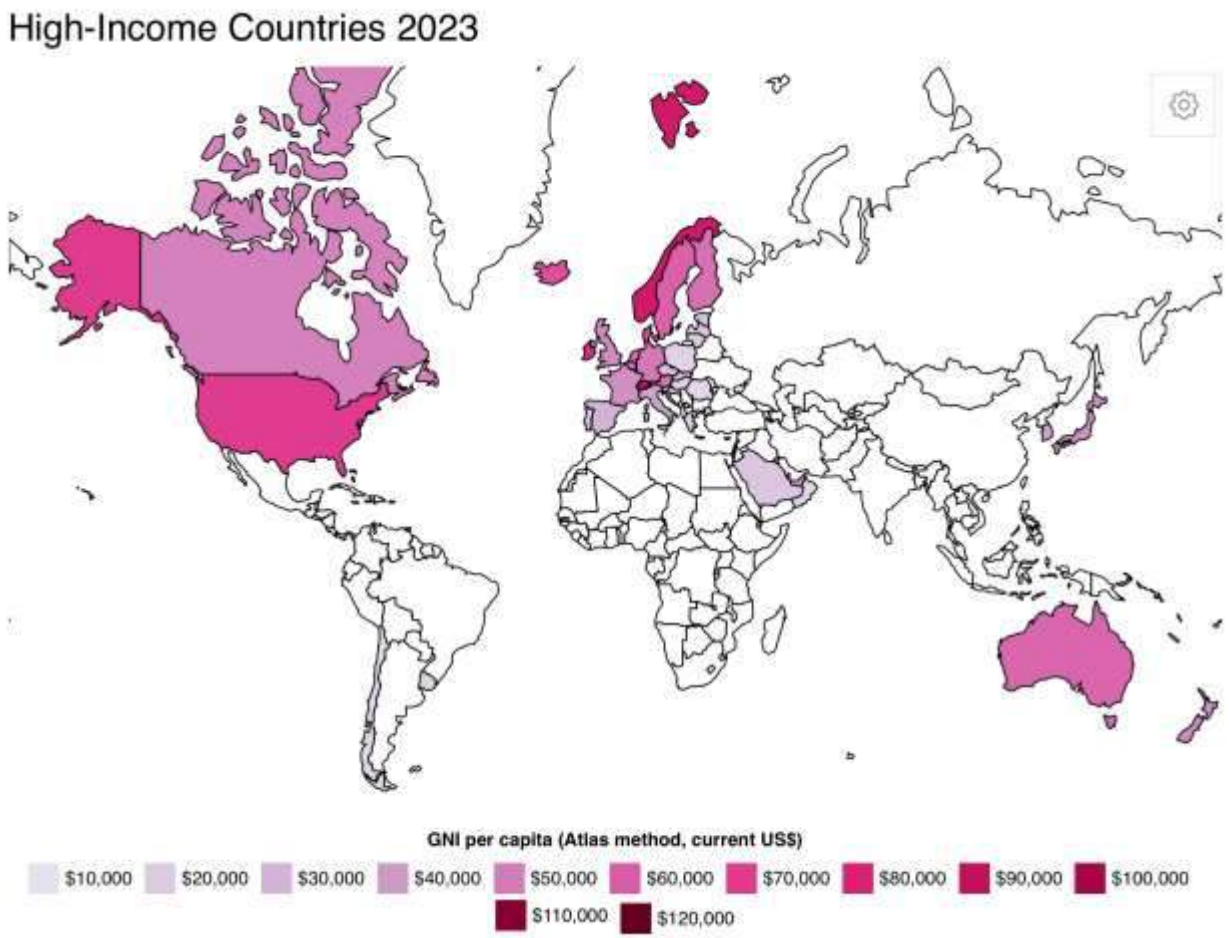
- No disclosures

Model example

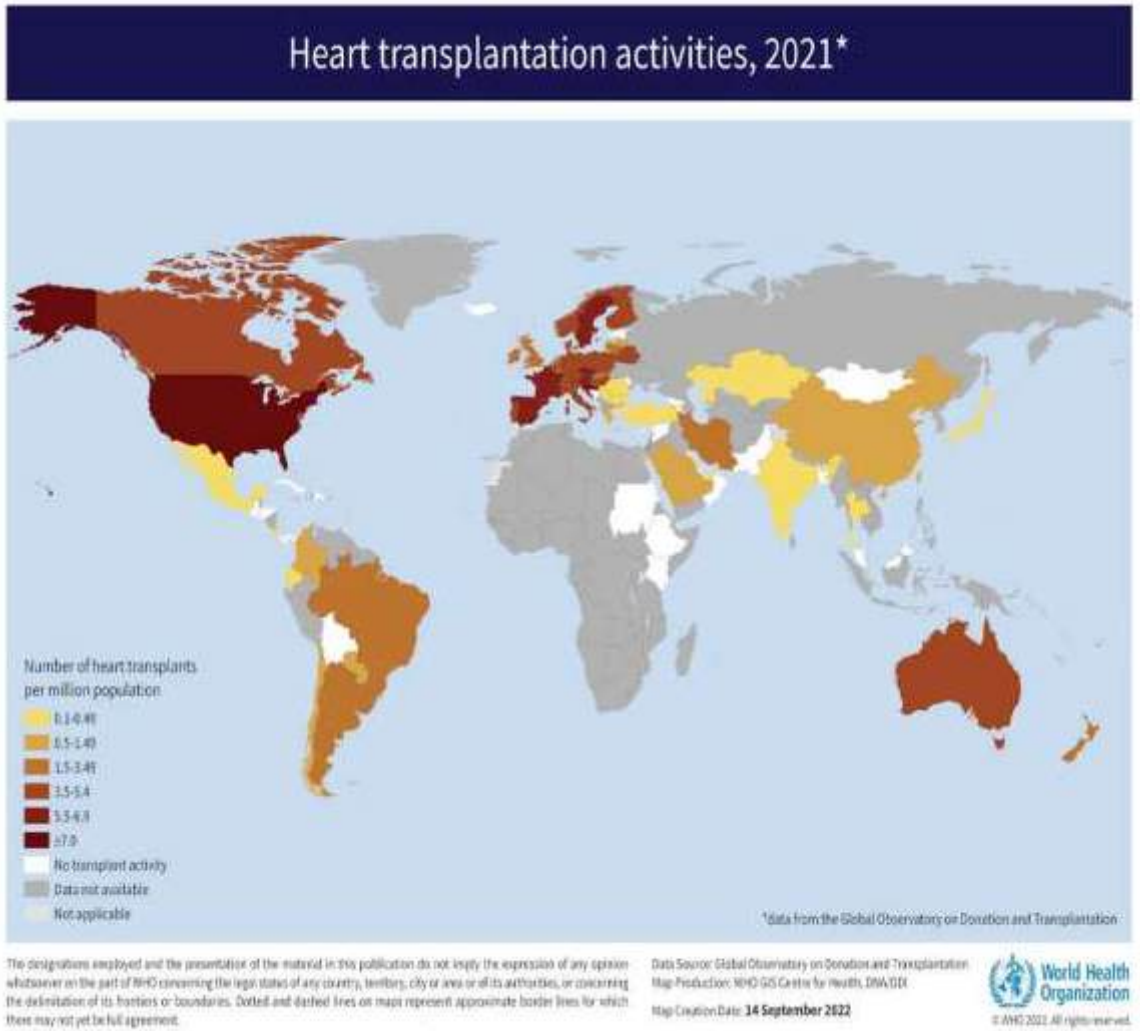
Heart transplantation
&
Therapies for end-stage heart failure

↑ Economic power = ↑ heart transplant rate ?



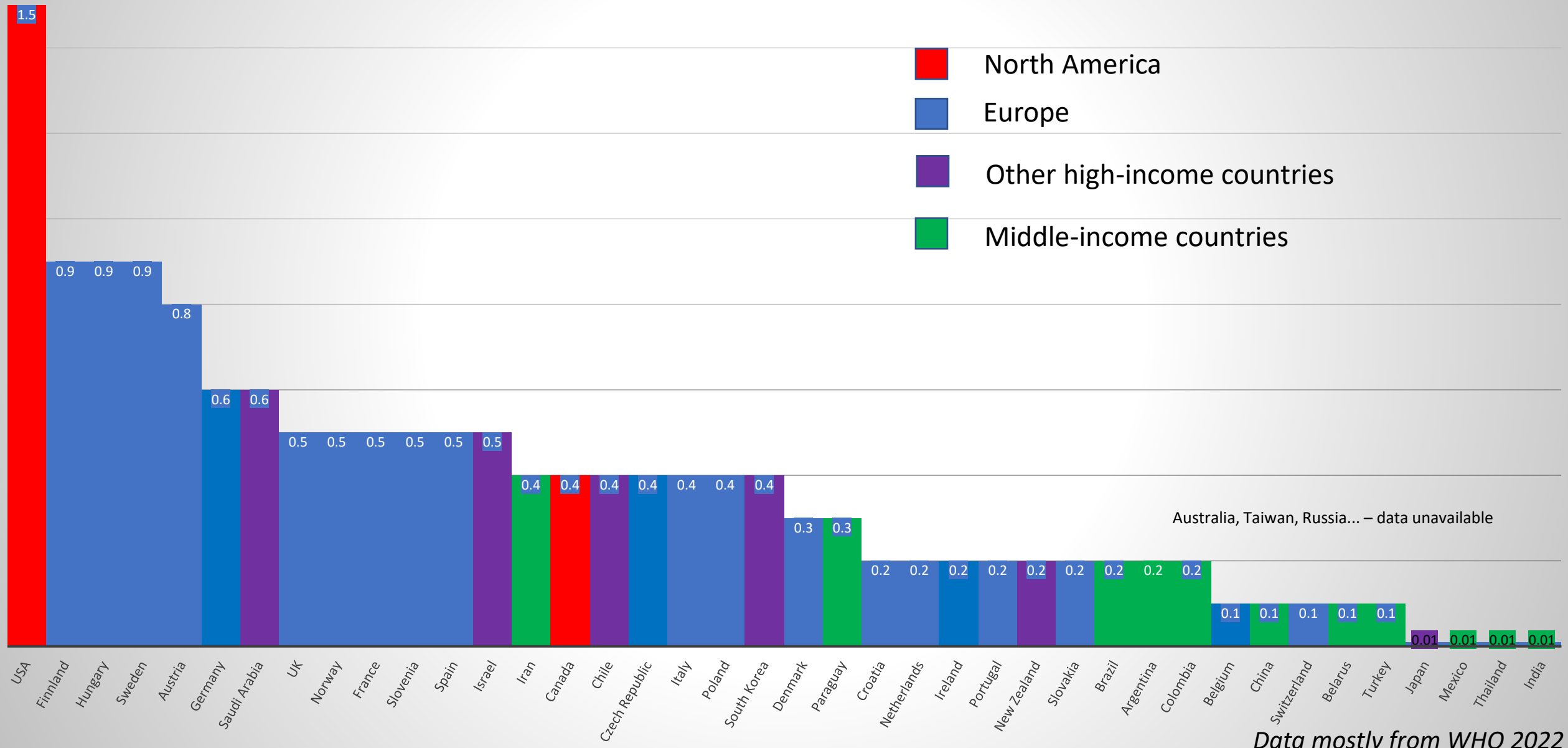
World Bank, 2023

https://worldpopulationreview.com/country-rankings/high-income-countries



WHO, 2022

Pediatric Heart Transplantation activity, PMP, 2021



Data mostly from WHO 2022

Center volume factor

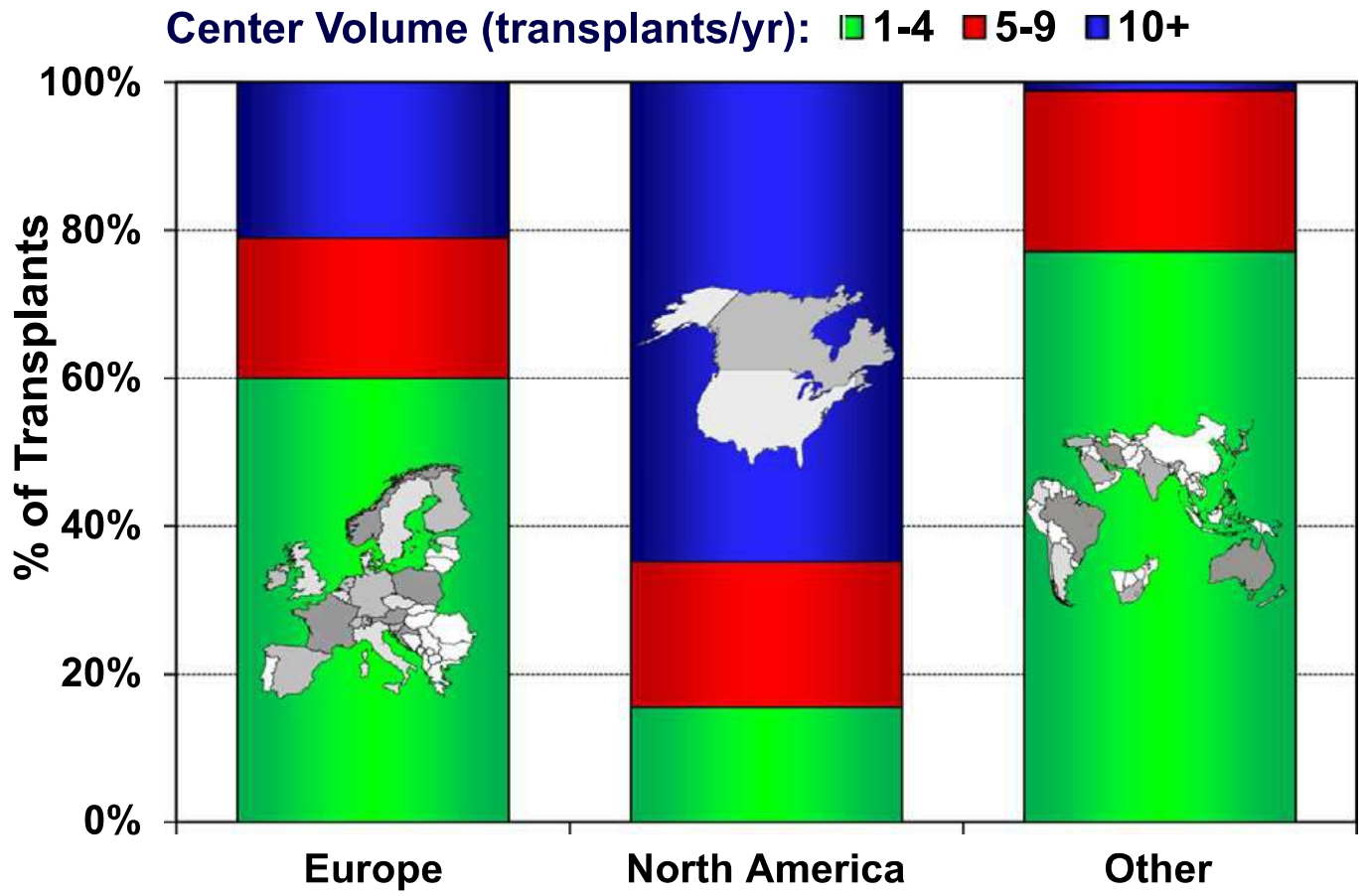
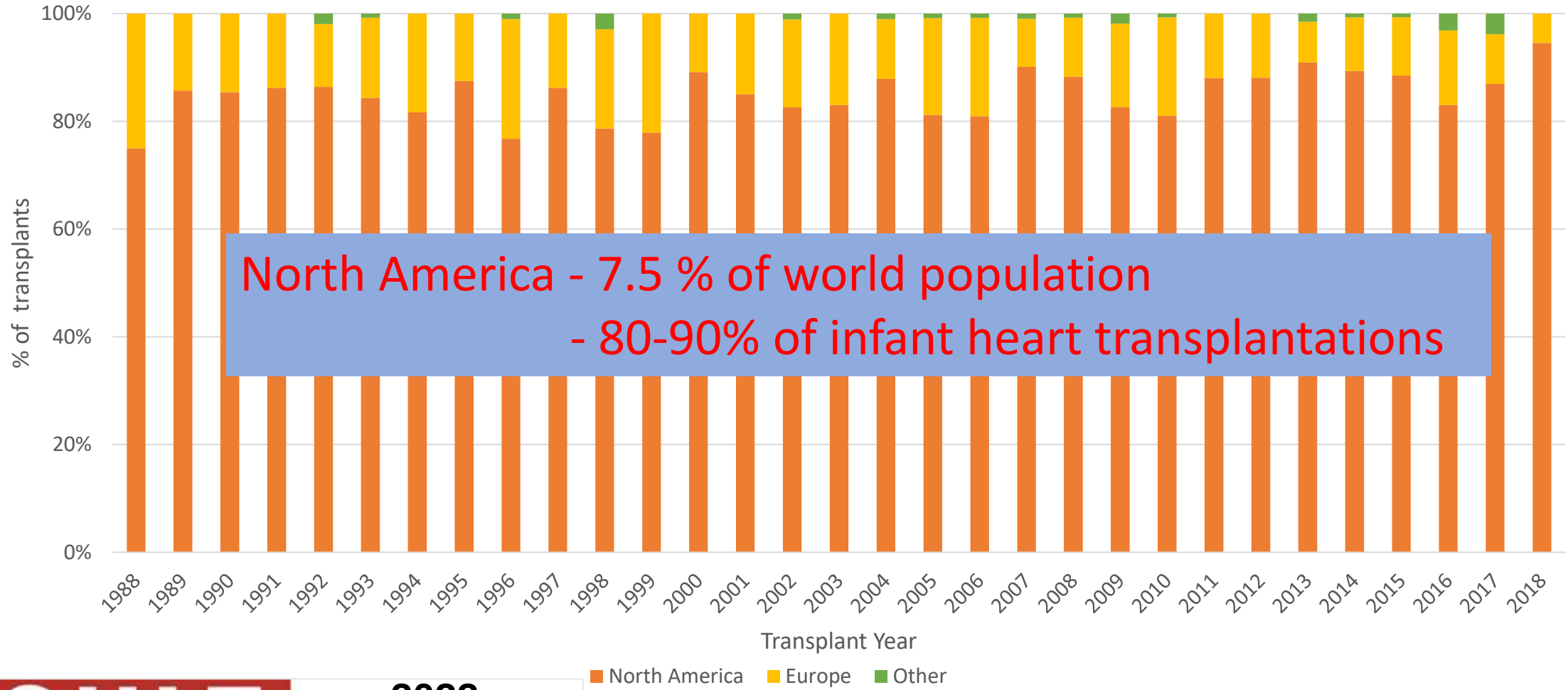


Figure 2 Distribution of transplants by location and average center volume (transplants: January 2004 to June 2016).

Rossano JW et al, JHLT 2017

Infant Heart Transplants (Age at Transplant <1 Year)
by Location and Year (Transplants: January 1988 – June 2018)

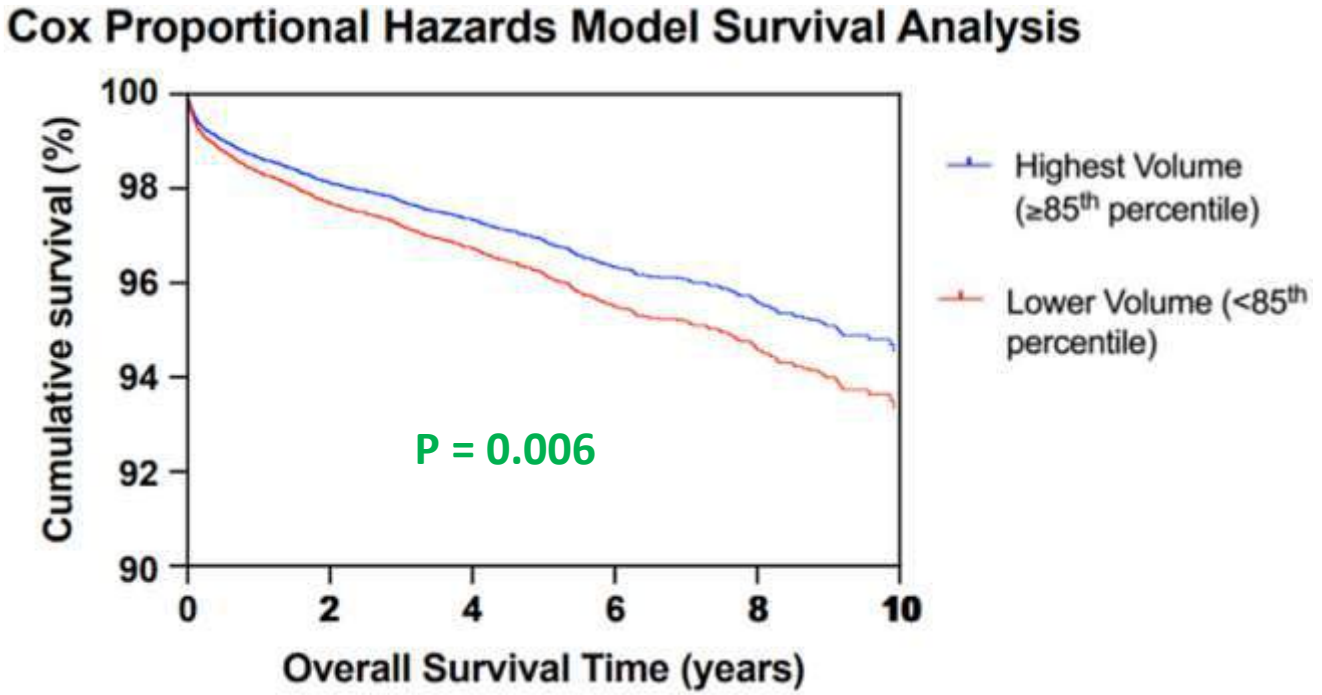


ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
2022
JHLT. 2022 Oct; 41(10): 1335-1375

Analysis of UNOS: Pediatric Heart Transplantation Over 36 Years and Contemporary Volume-Outcome Relationship

Omar M. Sharaf, MD,[1] Ahmet Bilgili, BS,[1] Zachary Brennan, DO,[2] John A. Treffalls, MD,[3] Giles J. Peek, MD,[1] Mark S. Bleiweis, MD,[1] and Jeffrey P. Jacobs, MD[1]

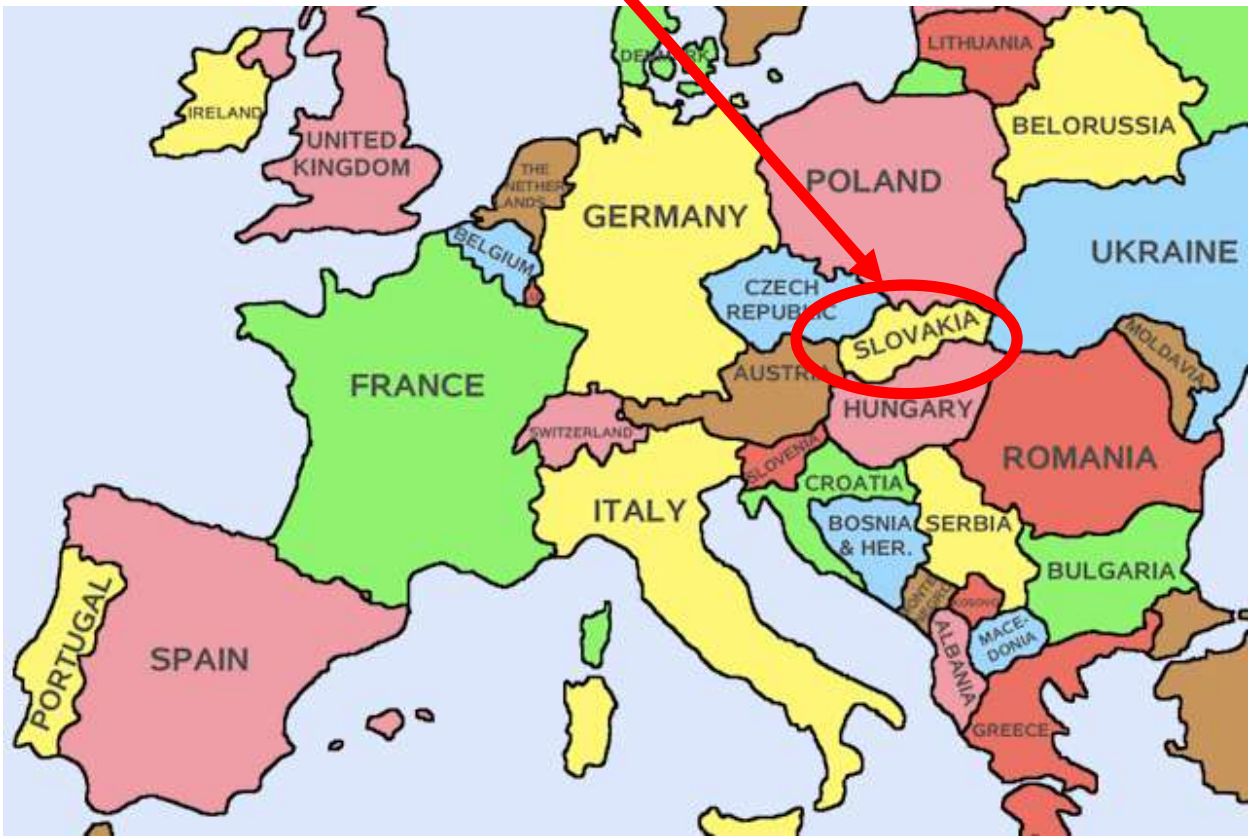
- 2012-2022
- 89 centers – 4959 PedHTx´s
- 48% in 13 highest-volume c´s.
  - More complex HTx´s
  - Better longitudinal survival



(Ann Thorac Surg 2024;118:1288-98)

Pediatric heart transplantation - **Slovakia** experience

- ~ 1 million of children < 18 y.
- centralized ped. cardiac care
- 11 ped HTx (1998-2017)
- in 2018 only 4 of them alive



Transatlantic medical consultation and second opinion in pediatric cardiology has benefit past patient care: A case study in videoconferencing

Congenital Heart Disease. 2017;1–6.

Lubica Kovacikova, MD, PhD[1] | Martin Zahorec, MD, PhD[1] | Peter Skrak, MD, PhD[1] | Brian D. Hanna, MDCM, PhD[2] | R. Lee Vogel, MD[2]

- 62 videoconferences since 2013 (174 pts.)
- 9 professorships by CHOP experts in BA
- 11 observerships at CHOP
- 6 OMI Satellite Symposia









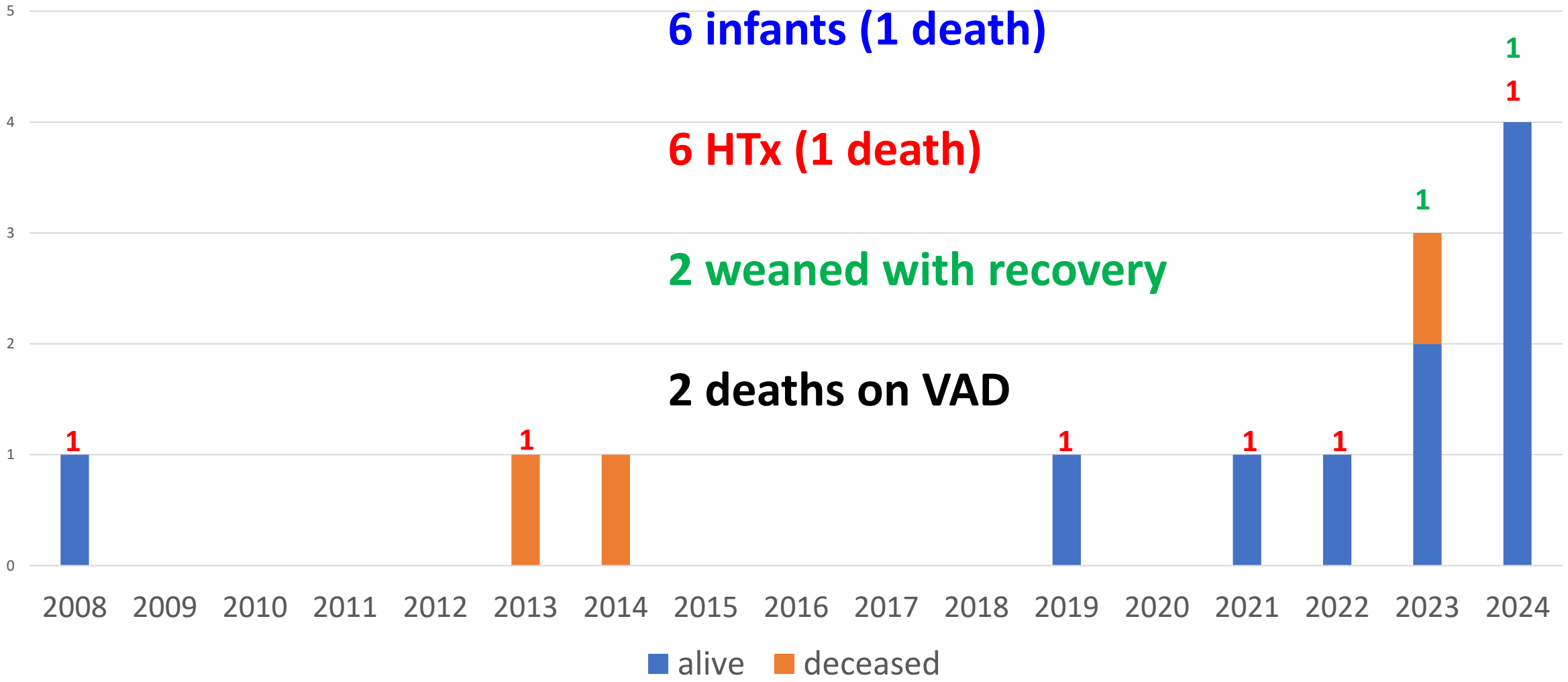
Bratislava - complex revision of Ped HTx program (2018)

1. Multilevel cooperation with CHOP Philadelphia

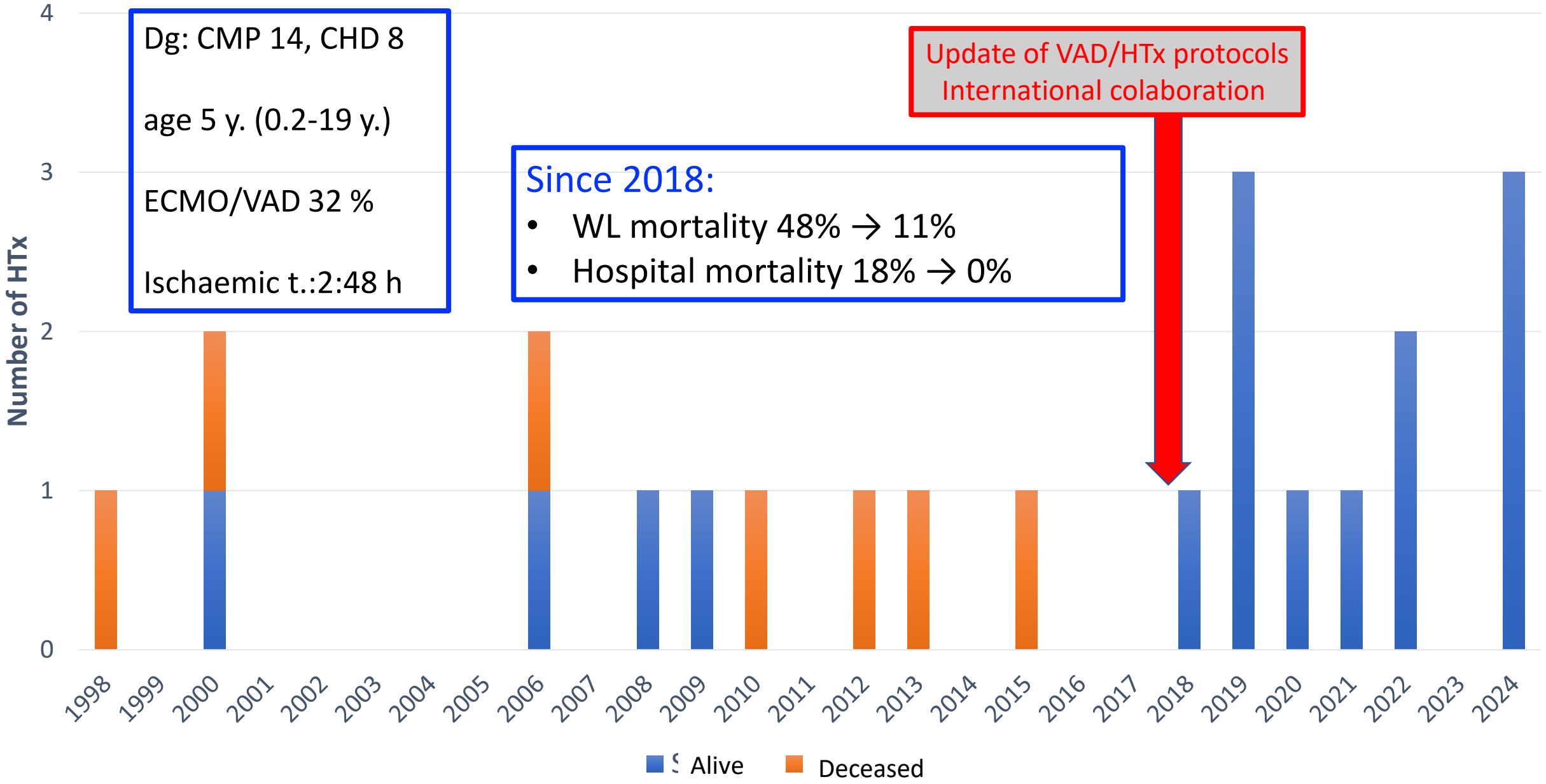
- Initial site visit by CHOP expert (1/2018), check-up visit (4/2024)
- Adoption of CHOP transplantation protocols in Bratislava
- Observerships of 2 doctors at CHOP
- Consultations on individual patients (2018-2024)
  - 15x HTx-devoted videoconferences
  - e-mail communications & phone calls

2. Durable VAD program – in cooperation with center for adults (& CHOP)

Durable VAD use, Bratislava (n = 13)



Pediatric HTx - Bratislava 1998-2024 (n = 22)



PedHTx - Population factor

81 high-income countries* → only 32 PedHTx programs

Population of 2-7 million

- 10 pediatric HTx programs

Country	Population in Millions	pHtx 2021	pHTx 2022	pHTx PMP 2022
Denmark	5,8	2	2	0,2
Finland	5,6	5	6	1,1
Norway	5,5	3	1	0,2
Slovakia	5,5	1	2	0,4
Ireland	5	1	0	0
New Zealand	4,9	1	0	0
Panama	4,4	0	1	0,2
Croatia	4,1	1	5	1,2
Uruguay	3,5	0	2	0,6
Slovenia	2,1	1	1	0,5

Population < 2 million – Ø PedHTx

- part of international organizations
- Eurotransplant
  - Luxemburg → Belgium
- Scanditransplant
  - Iceland → Sweden
  - Estonia → Finland

**World Bank, 2023*

EDQM Volume 28 2023 NEWSLETTER TRANSPLANT

Age / size factor
Children under 25 kg on WL

- Longer waiting times & Higher WL mortality

Wait List Mortality and Time to Pediatric Heart Transplant by UNOS Status, Blood Type, and Weight

UNOS Status	Blood Type	Recipient Weight	Wait List Mortality	Median Time to HT (days) [p25, p75]
1A	O	≤ 25 kg	19.7%	108 [51, non-est.*]
1A	Non-O	≤ 25 kg	21.4%	80 [39, non-est.*]
1A	O	> 25 kg	6.7%	47 [16, 109]
1A	Non-O	> 25 kg	6.3%	24 [7, 64]
1B	O	Any	1.6%	337 [147, non-est.*]
1B	Non-O	Any	1.6%	153 [62, 451]

- Most challenging group to bridge (Paracorporeal VAD only)
- Other strategies most in demand

Am J Transplant. 2022 March ; 22(3): 833–842.

Jakub, 18 kg, dCMP, blood type 0

- on BH LVAD since 1/2024
- no heart offer in 15 months

Courtesy of family

Potentially regenerative strategies

- VAD as bridge to recovery by mechanical unloading
- Reversible pulmonary artery banding by VVI interactions
- Restrictive atrial communication creation by left heart decongestion
- ....HTx may still be „Plan B“ for most of these patients

Myocardial recovery in children supported with a durable ventricular assist device–a systematic review

Sofie Rohde[a,*], Theo M. M. H. de By[b], Ad J.J.C. Bogers [a] and Martin Schweiger [c]

European Journal of Cardio-Thoracic Surgery 2023, 64(2).

VAD explantation due to myocardial recovery - SR

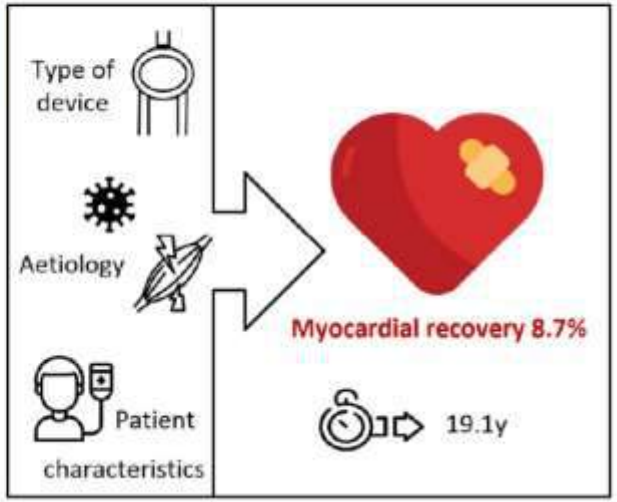
Core findings

Paediatric patients (<18y) on ventricular assist device

8.7% myocardial recovery

Various ages, aetiologies, and device types

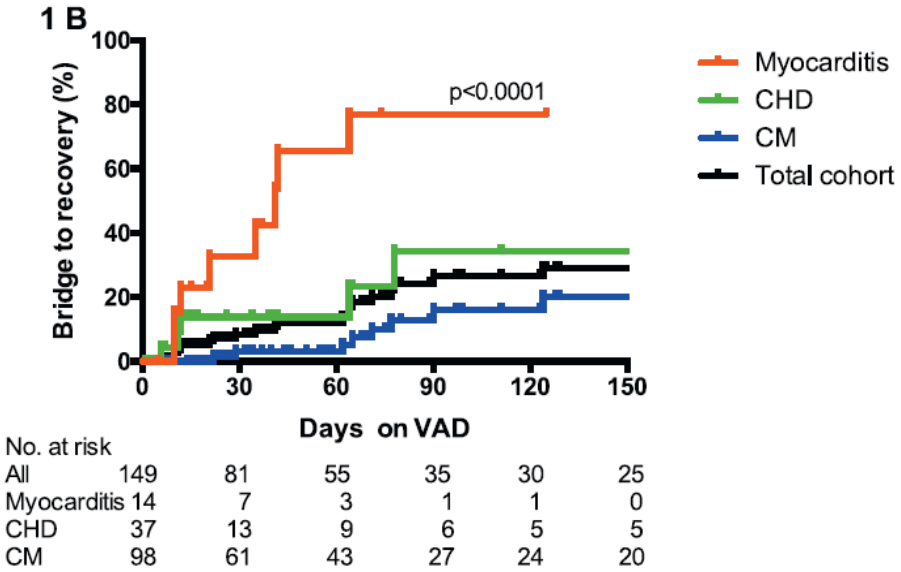
Maximum follow up 19.1 years



Bridge to recovery in children on ventricular assist devices—protocol, predictors of recovery, and long-term follow-up

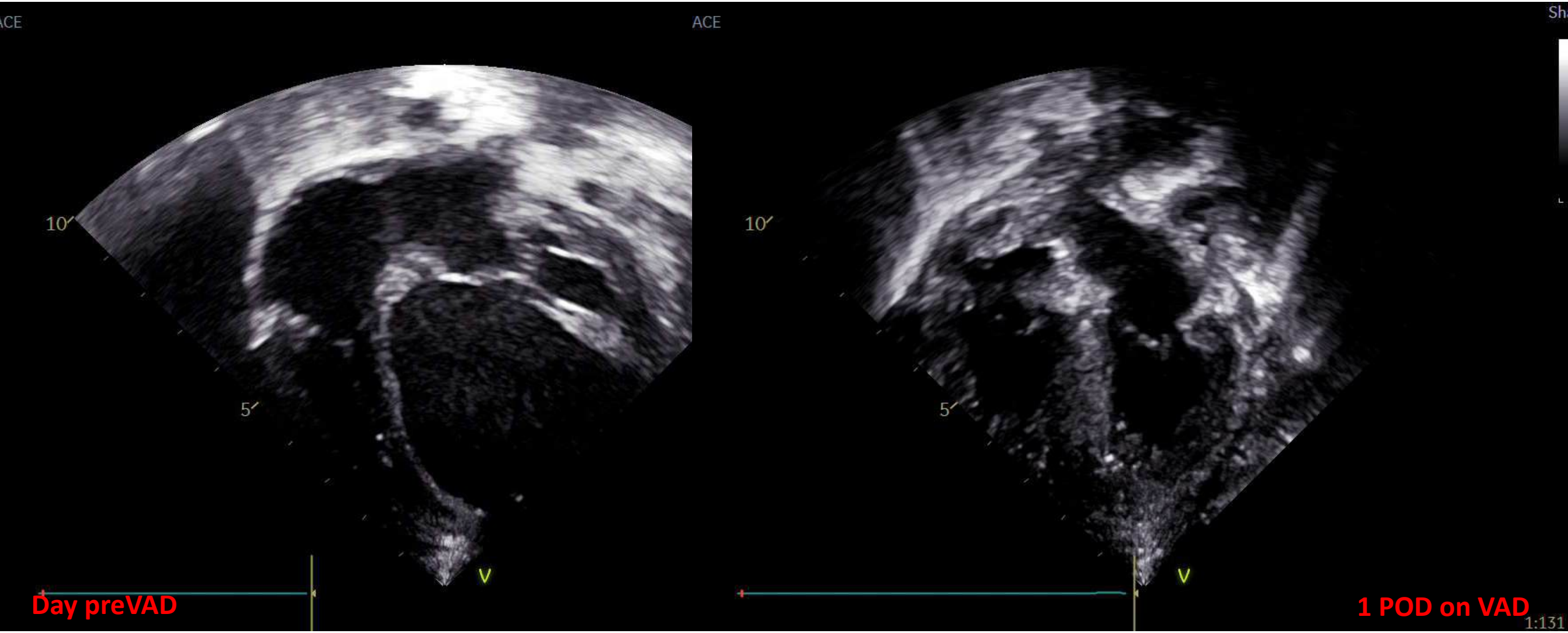
Oliver Miera, MD,[a] Matthias Germann[a] My Y. Cho[b] Joachim Photiadis, MD,[b]

J Heart Lung Transplant 2018;37:1459–1466

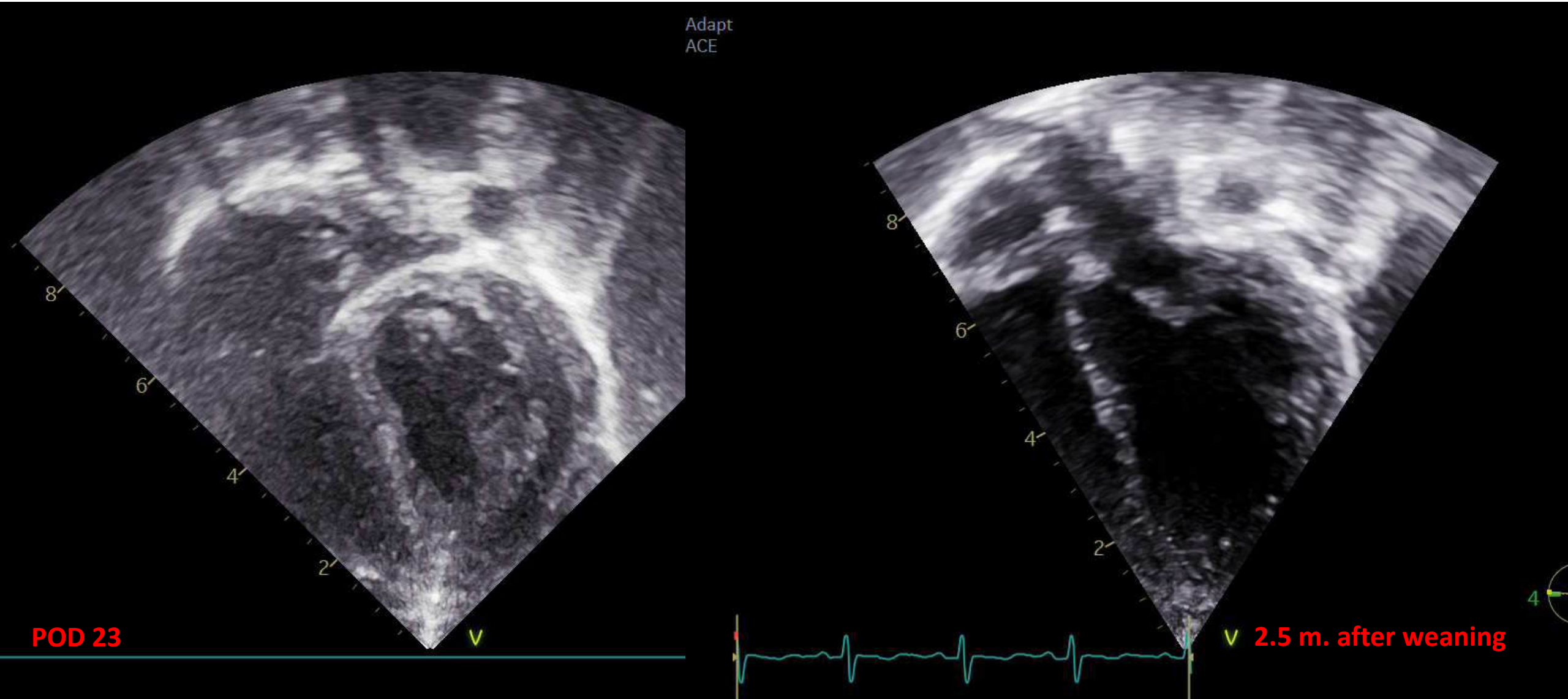


- dCMP 7% recovery (6/85 pts.)
- children < 2 y. – 28% recovery

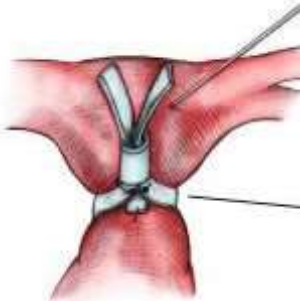
6 months old infant, dCMP, no myocarditis (MRI, biopsy)



Successful weaning on POD 23



Pulmonary artery banding in dilative cardiomyopathy of young children: review and protocol based on the current knowledge



Dietmar Schranz[1], Sabine Recla[1], Ivan Malcic[2], Gunter Kerst[3], Nathalie Mini[4], Hakan Akintuerk[1]

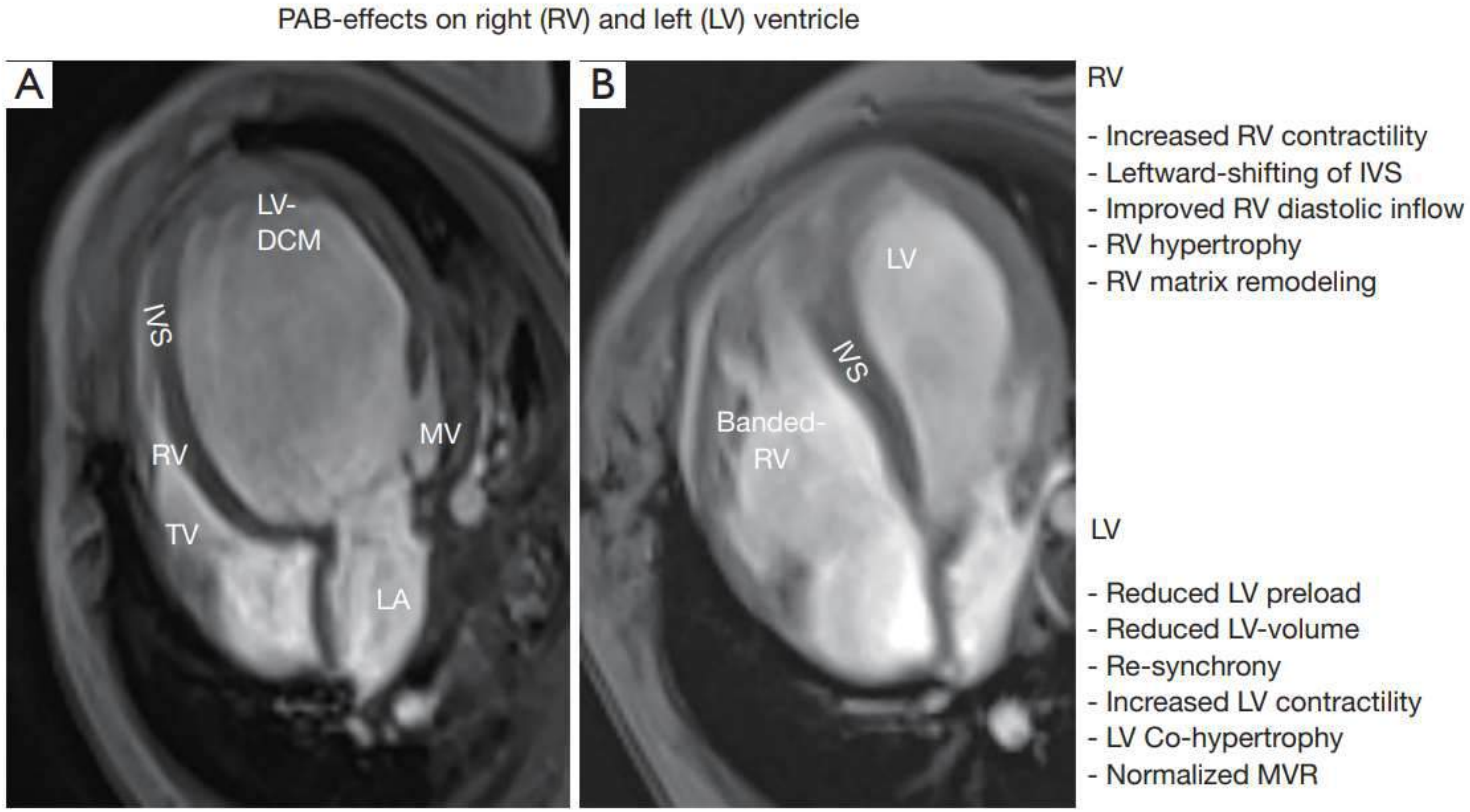
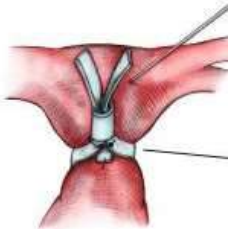
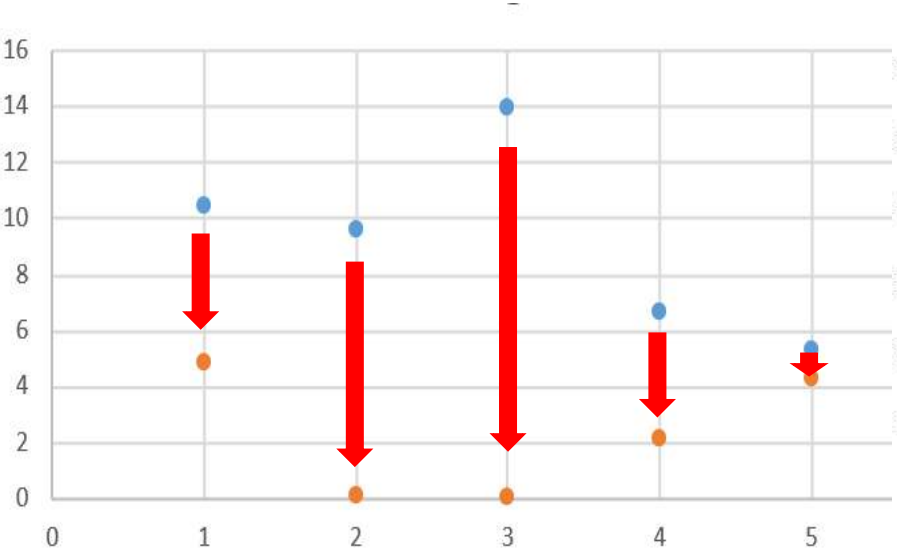


Figure 1 Summarizes the pulmonary artery banding (PAB) effects on the right (RV) and left ventricle (LV). (A) Depicts the magnet resonance imaging (MRI) in four-chamber view of an infant with left ventricular dilated cardiomyopathy (LV-DCM); (B) shows functional regeneration of the LV based on the PAB induced ventriculo-ventricular interaction (VVI); the MRI was performed before the PAB induced RV hypertension was unloaded by transcatheter balloon dilation. IVS, interventricular septum; LA, left atrium; MV, mitral valve; TV, tricuspid valve.

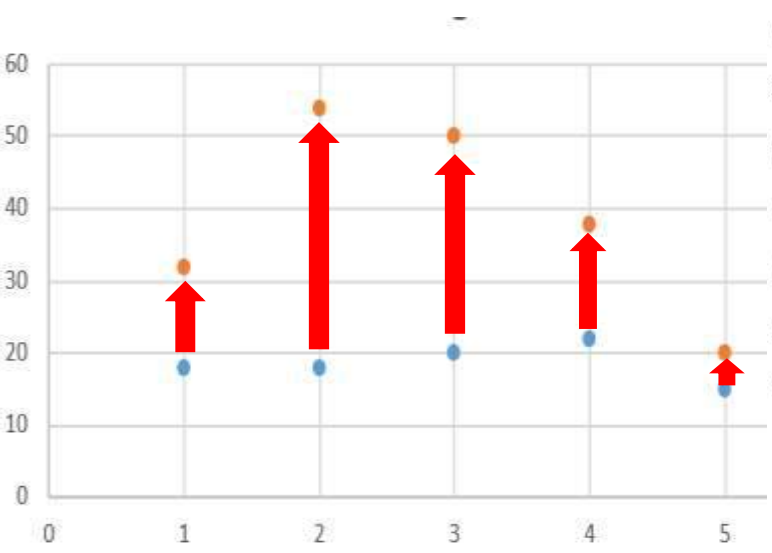
Reversible BAP for dilated CMP in infants
(Bratislava experience 2022-2025)



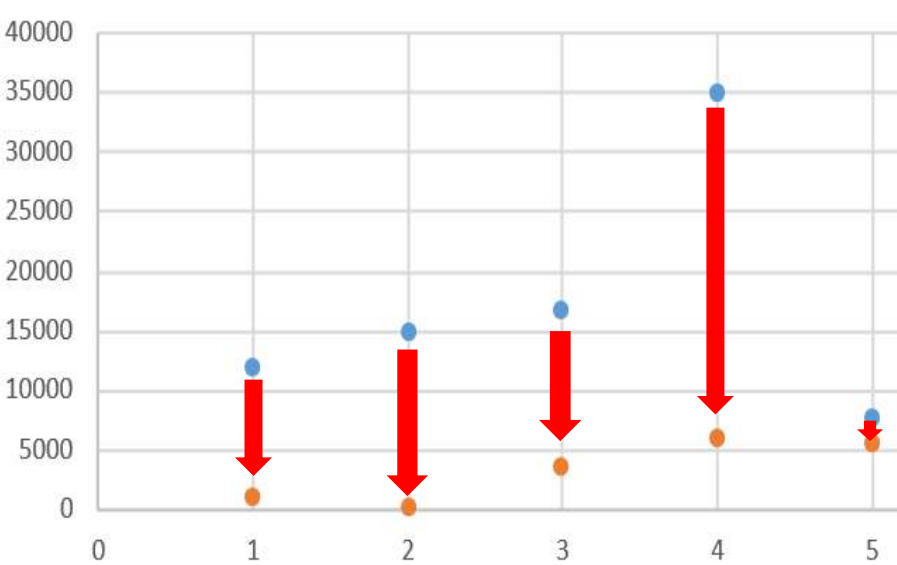
- **5 infants** (no signs of myocarditis on MRI)
- ~ 6 months (2.5-11); ~ 6.2 kg (3.5-8.1)
- CICU pre-rBAP ~21 days (7-52), postop. hosp. stay ~ 49 days (24-97)
- follow-up 14 months (1-31), FC I or II



LVEDD Z

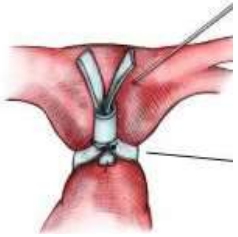


LV EF %

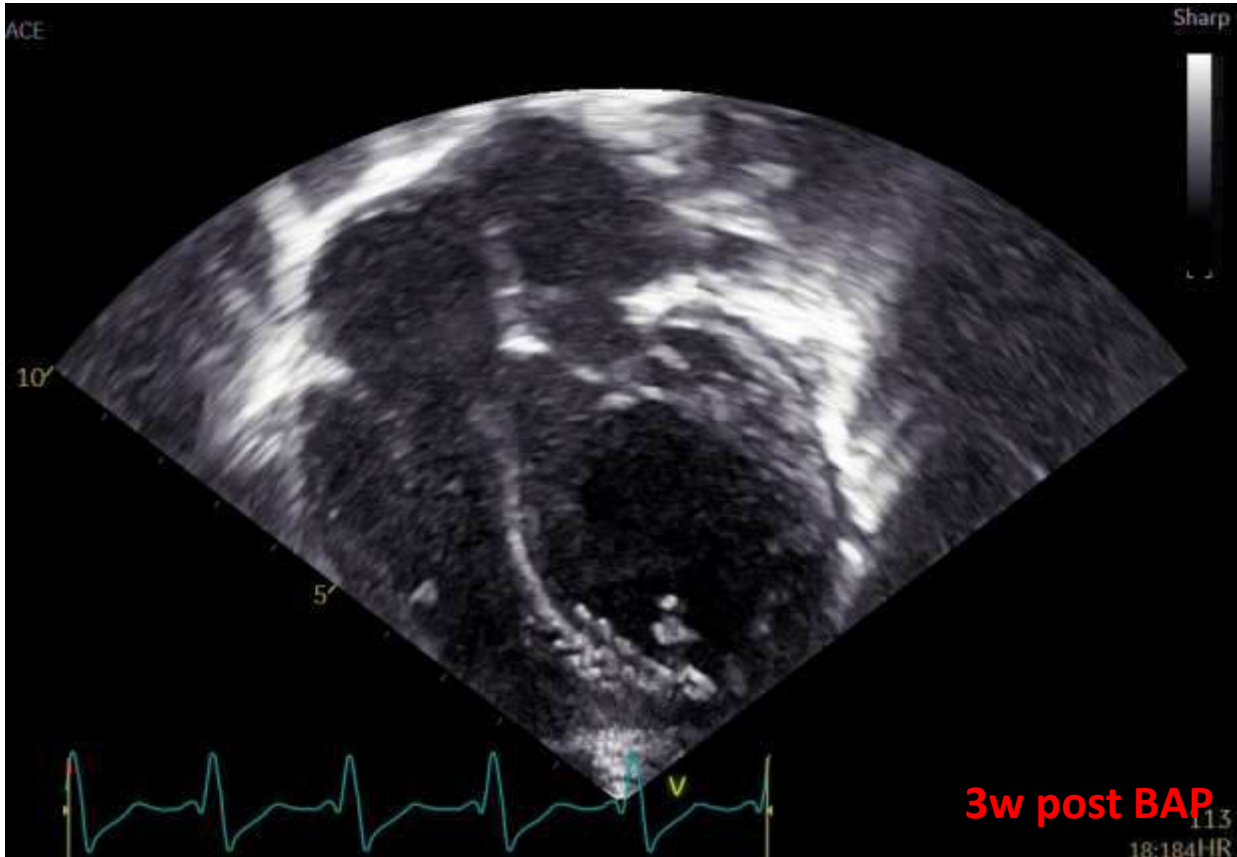


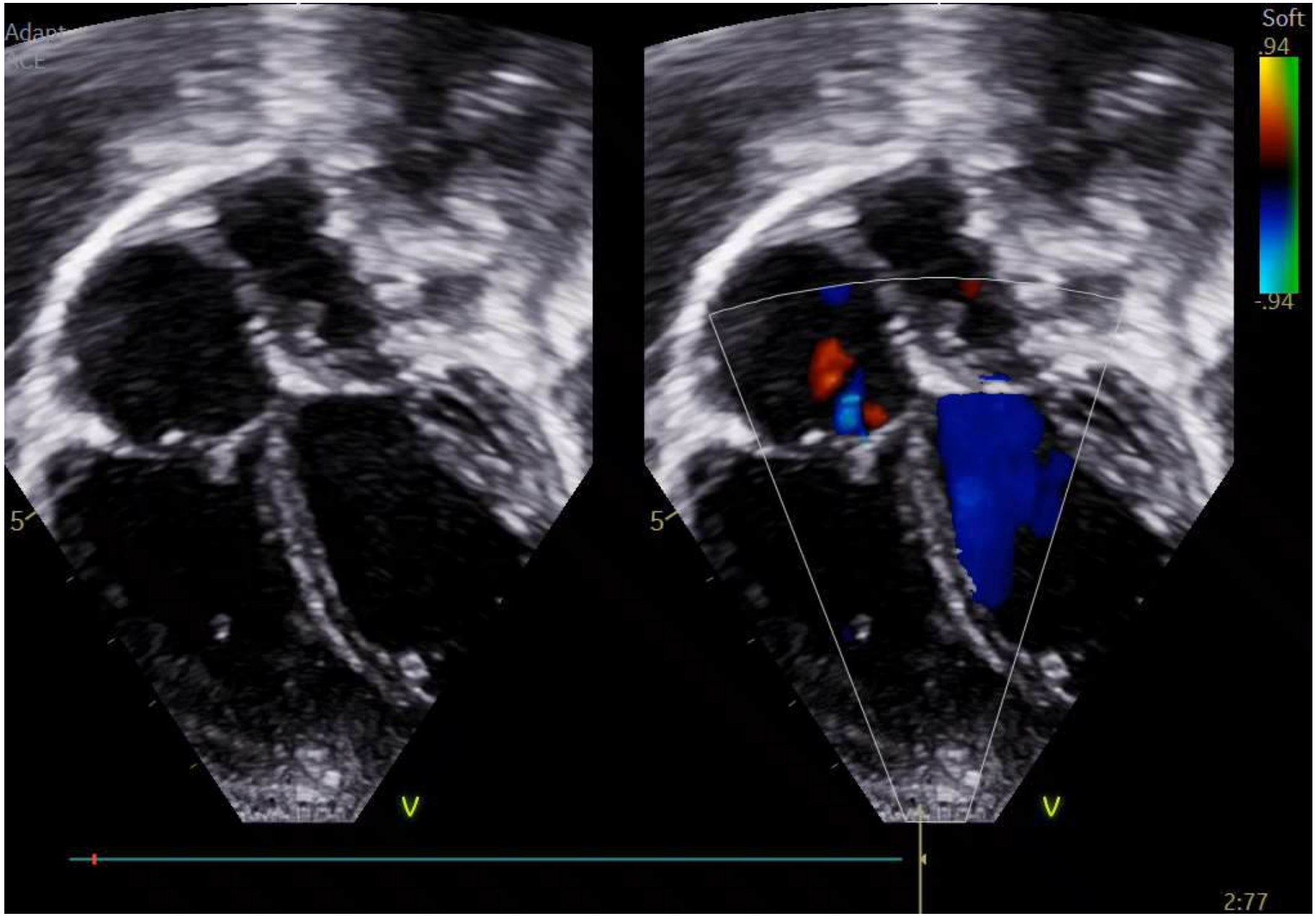
NT proBNP ng/l

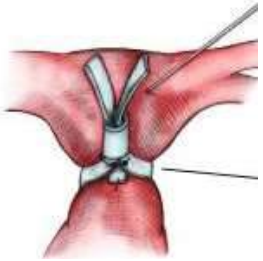
Reversible BAP for dilated CMP



- 5 m. old infant – progressive HF, MRI w/o myocarditis,
- 50 days of intensive care (parental disaproval for VAD/HTx)
- Cath: CVP 6, LAP 21 → RVp low → restrictive ASD creation → rBAP







5 months post BAP – balloon dilation for systemic RVp → 64%

Conclusions – small country perspective
Advanced heart failure /HTx strategies

- Complex programs (PedHTx) – challenging for small countries & ↓vol. centers
- Slovakia experience - cooperation with high-volume programs
  - trends: ↓WL mortality, ↑ HTx activity, ↑ outcomes
- Global health perspective - HTx available to minority of affected children
- Pressing need for alternative therapies → potential for ↓ pts. on WL
- rBAP for dCMP in small children potentially useful, also in countries w/o PedHTx

Czech & Slovak Humanitarian Mission, Mater Hospital, Nairobi, Kenya, 2024

“The place I was born...,
...it's chance not competence“

Song „Colours“
Clara Luzia
Austria