Mechanical Support and Heart Transplant in End-Stage Paediatric Heart Failure

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FN MOTOL

ČESKÁ KARDIOLOGICKÁ SPOLEČNOST

Decompensated paediatric heart failure

Structural heart disease

Causal treatment (surgery, cath)

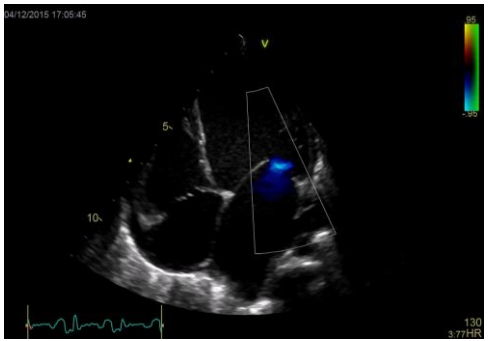
Medical treatment

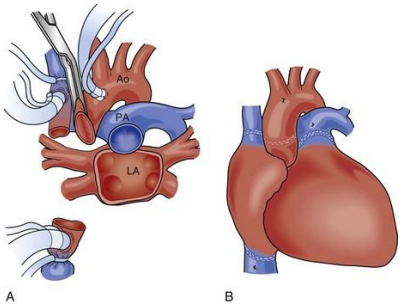
Compensation

End-stage heart failure

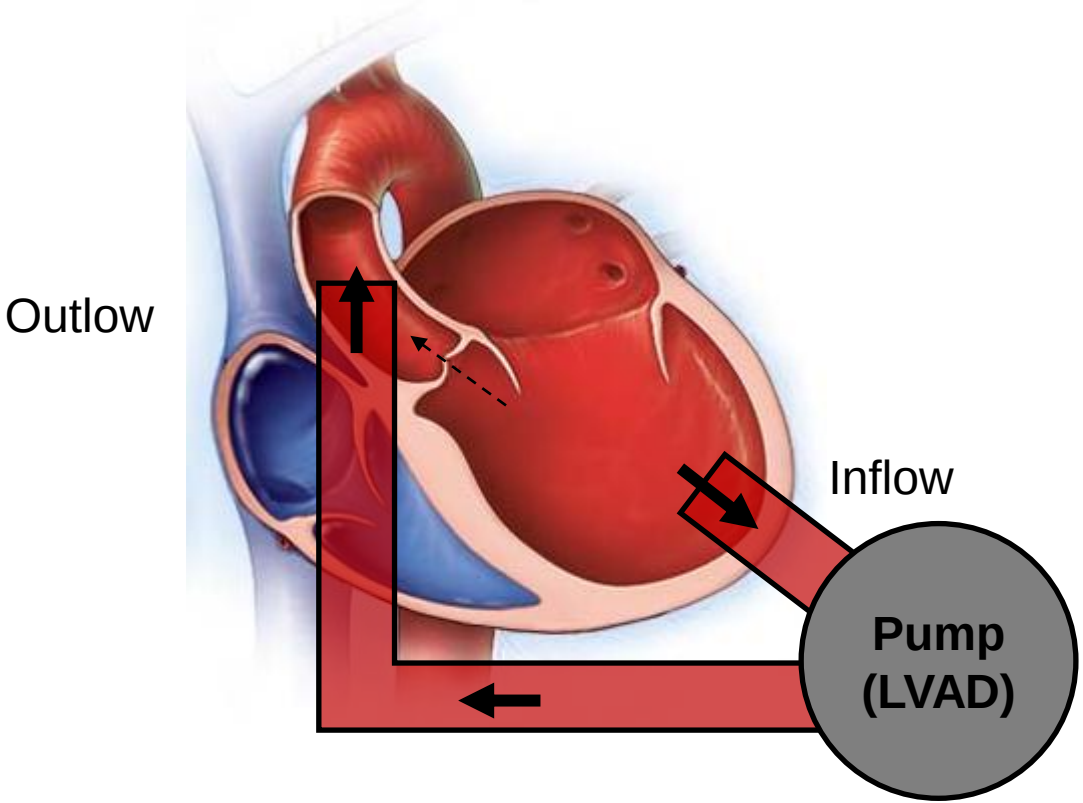
Mechanical support

Heart transplantation





Peadiatric Mechanical Circulatory Support
Durable Ventricular Assist Devices (VADs)



Peadiatric Durable Ventricular Assist Devices (VADs)

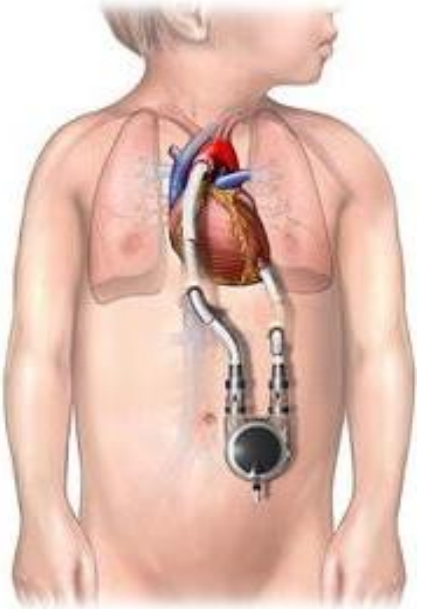
Heartmate 3

~ 20 kg

Heartware

~ 15 kg

Berlin Heart Excor



Intracorporeal – fully implantable
Continuous flow

Paracorporeal
Pulsatile flow

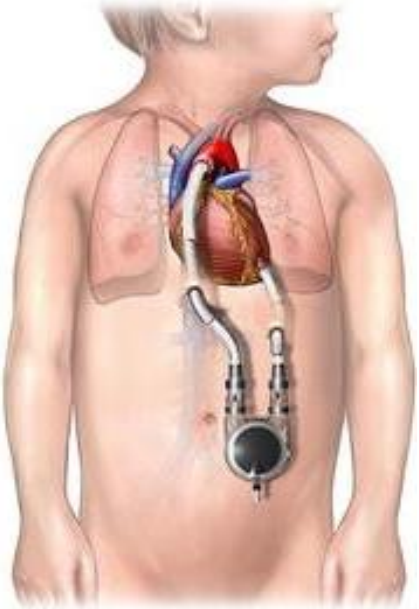
Peadiatric Durable Ventricular Assist Devices (VADs)

Heartmate 3

~ 20 kg

Heartwar

Berlin Heart Excor



~ 15 kg

Intracorporeal – fully implantable
Continuous flow

Paracorporeal
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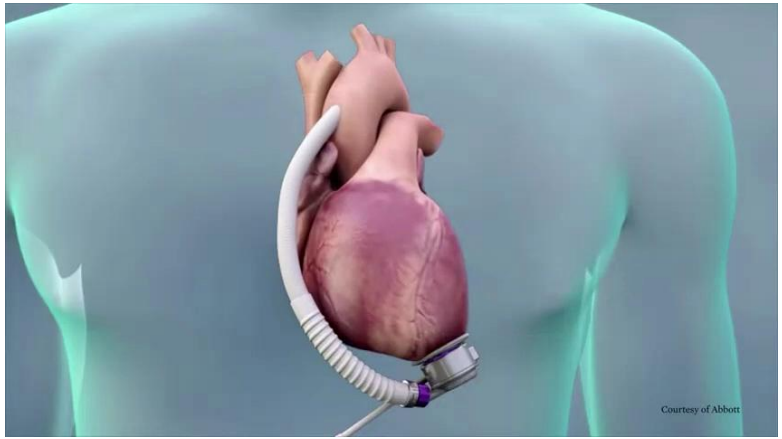
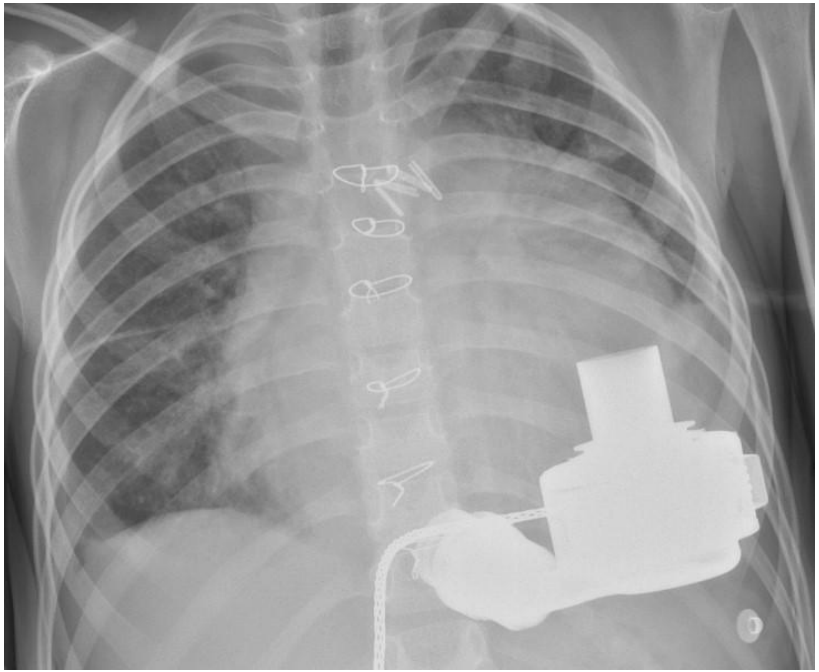
Peadiatric Durable VADs – Heartmate 3

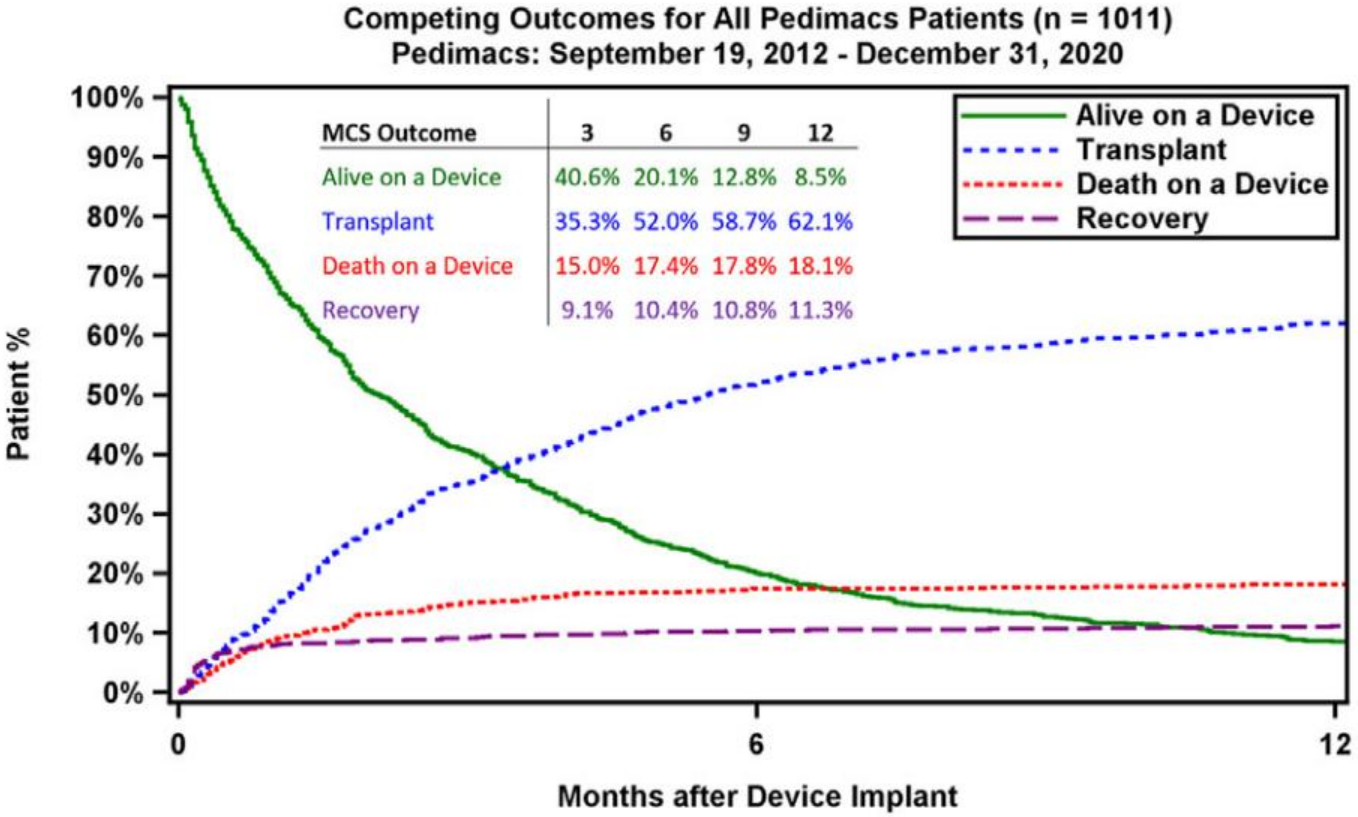




19 kg BSA 0,80 m^2

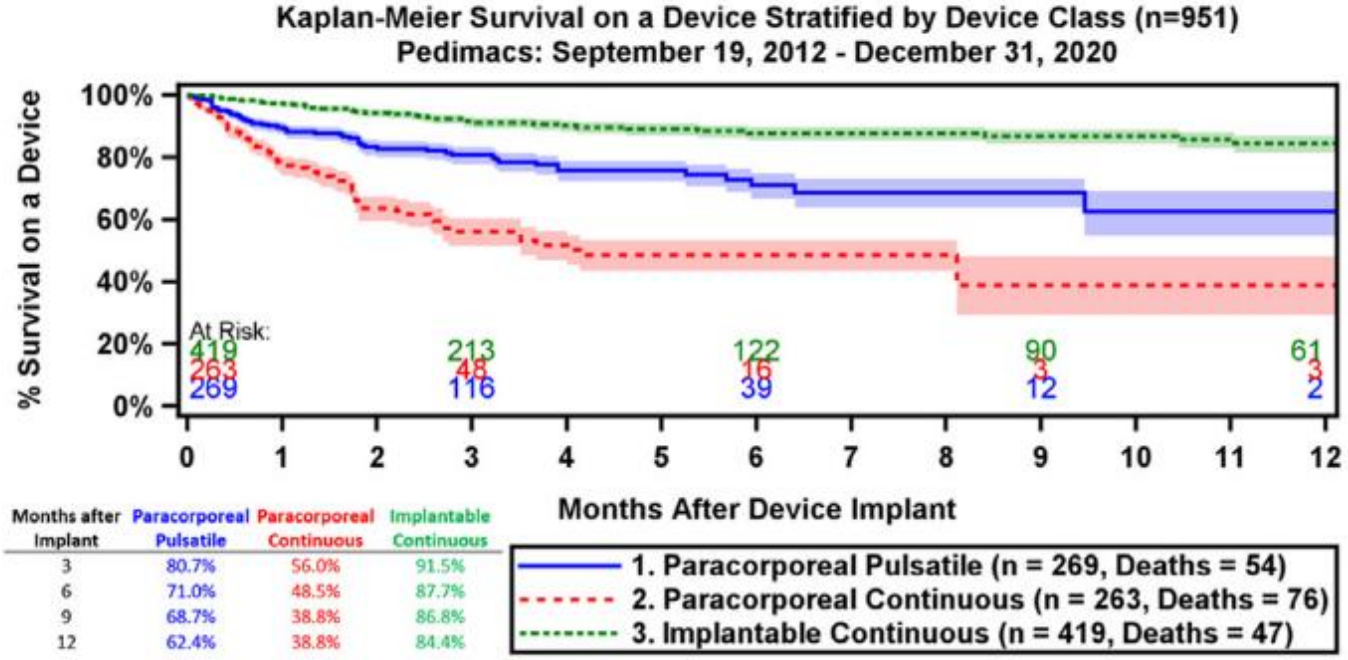
Peadiatric Durable VADs – Berlin Heart Excor

Paediatric VADs – 12-month Outcomes



Rossano et al 2021

Paediatric VADs – 12-month Outcomes



Months after Implant	Paracorporeal Pulsatile	Paracorporeal Continuous	Implantable Continuous
3	80.7%	56.0%	91.5%
6	71.0%	48.5%	87.7%
9	68.7%	38.8%	86.8%
12	62.4%	38.8%	84.4%

Shaded areas indicate 70% confidence limits
p (log-rank) = <.0001
Event: Death (censored at transplant or cessation of support)
Patients are not censored at device switch

Rossano et al 2021

Paediatric Heart Transplantation in the Czech Republic

Institute for Clinical and Experimental Medicine (IKEM)

- since 1988 (adolescents close to adulthood)

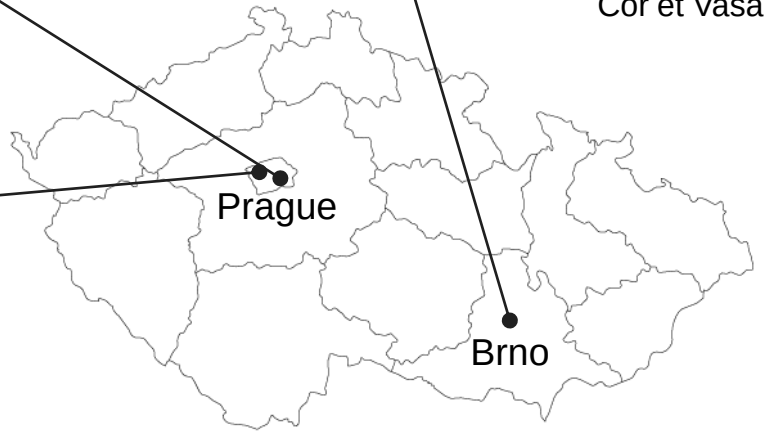
Centre of Cardiovascular Surgery and Transplantation, Brno

- since 1995 (26 patients until 2013)
- average age 11.2 yrs (2.4 – 17.5 yrs)
- indications: 90% cardiomyopathies

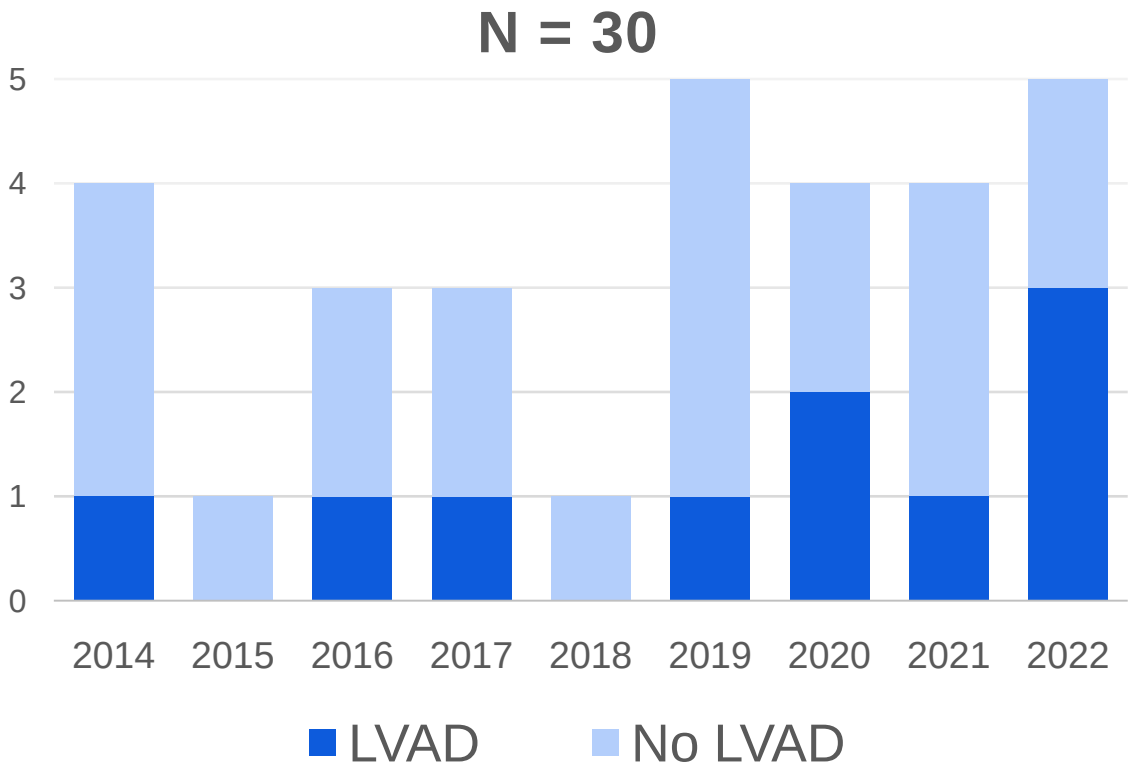
M. Ošmerová et al
Cor et Vasa 2013

Children's Heart Centre Motol

- first patient transplanted in 2000
- organised programme started in 2013
- protocol adapted from Great Ormond Street Hospital and Children's Hospital of Philadelphia
- collaboration with IKEM



Children‘s Heart Centre – Transplant Programme 2014 - 2022

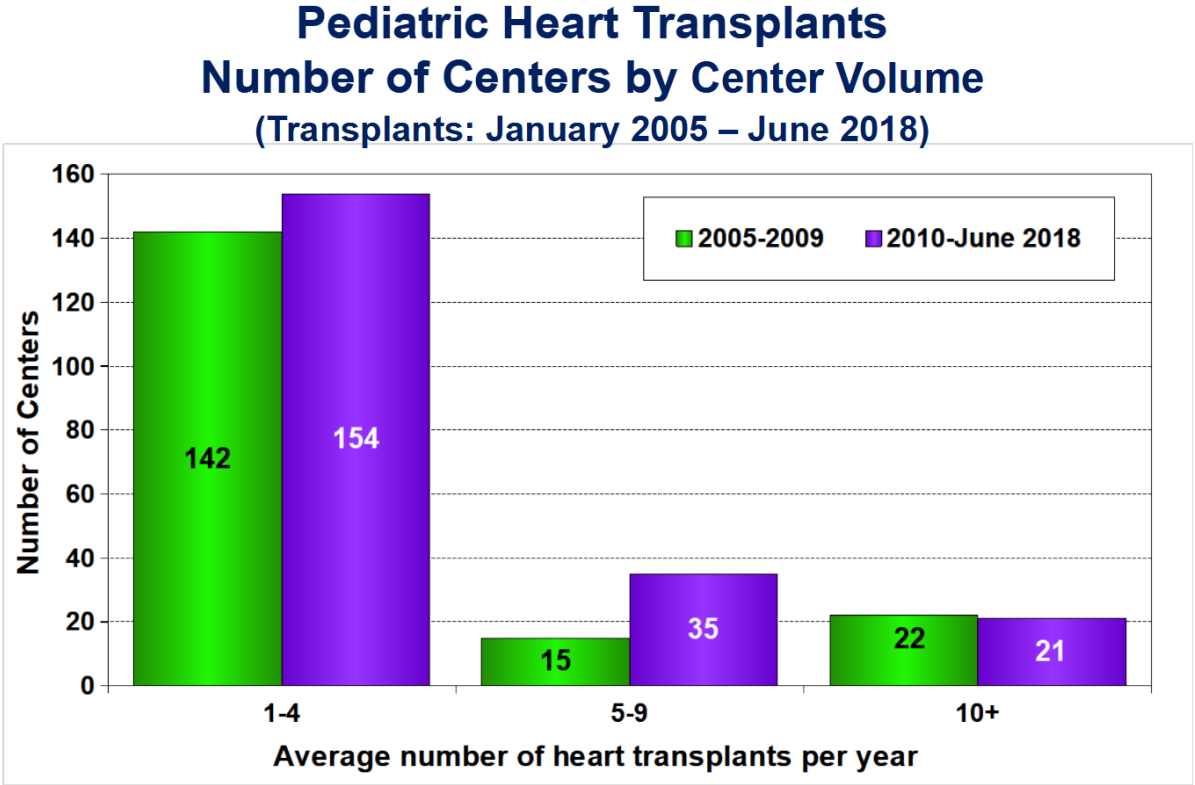


LVAD (N = 10)
median duration 97.5 days:

Berlin Heart Excor N = 3
Heartware N = 4
Heartmate 3 N = 3

Re-transplantation N = 1

ISHLT Registry – Centre Volumes



ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
2019
JHLT. 2019 Oct; 38(10): 1015-1066

Children‘s Heart Centre – Transplant Programme 2014 – 2022
Basic Demography (N = 30)

Gender:	Female N = 14, male N = 16	
Diagnosis:	Cardiomyopathy (CMP) N = 15	(dilated N = 11)
	Complex congenital heart disease (CHD) N = 15	(univentricular N = 10)
Waiting list time:	84 days (IQR 42 – 228)	
Age at HTx:	10.2 years (IQR 2.5 – 14.4)	
Weight at HTx:	26.3 kg (IQR 10.2 – 43.4)	

Children‘s Heart Centre – Transplant Programme 2014 – 2022
Surgery (N = 30)

	CMP (N = 15)	**CHD (N = 15)**	**p-value**
Previous surgeries (excluding LVAD)	0 (IQR 0 – 1)	4 (IQR 2 – 5)	**<0.0001**
HTx from LVAD	8 (53%)	2 (13%)	0.05
Total HTx surgery time (min)	**300** (IQR 240 – 360)	**480** (IQR 420 – 570)	**<0.0001**
Cardiopulmonary bypass time (min)	**145** (126 – 178)	**259** (175 – 312)	**<0.0001**
Graft ischemic time (min)	125 (IQR 90 – 158)	136 (IQR 117 – 175)	0.27

Children‘s Heart Centre – Transplant Programme 2014 – 2022
Postoperative Course (N = 30)

Early mortality: 1 patient (3%)

	CMP (N = 15)	**CHD (N = 15)**	**p-value**
ECMO or RVAD after HTx	0	3 (20%)	0.22
Delayed sternal closure	**2** (13%)	**9** (60%)	**<0.01**
Renal replacement therapy	**1** (7%)	**6** (40%)	0.08
ICU stay (days)	**8** (IQR 7 – 13)	**12** (IQR 10 – 28)	**0.01**
Hospital stay (days)	20 (IQR 17 – 25)	24 (IQR 18 – 44)	0.18

Tricuspid valve plasty N = 1, Repeated haemoptysis N = 1

Children‘s Heart Centre – Transplant Programme 2014 – 2022
Follow-up (N = 29)

No late mortality during median follow-up 3.1 years (IQR 0.9 – 5.7)

8 patients transitioned to IKEM at 18-19 years of age

Late complications		**Treatment**
Cellular rejection ≥ 2R	N = 6	Pulses of corticosteroids, 1x re-transplantation
Significant antibody-mediated rejection	N = 2	Immunoadsorption, IVIG, rituximab, bortezomib
Coronary allograft vasculopathy	N = 1	Re-transplantation
Post-transplant lymphoproliferation	N = 2	Monoclonal antibodies

Summary

- Paediatric end-stage heart failure is rare
- Heart transplant is an established treatment of end-stage heart failure
- Durable VADs enable certain patients to reach transplant
  - Fully implantable devices still not available for the low age/weight group

- **Children‘s Heart Centre:**
  - Excellent midterm results of the transplant programme
    - 97 % survival, 1 death, 2 re-HTx
  - CMP and CHD equally represented, univentricular hearts accounting for 1/3 of the cohort
  - Increasing experience with paediatric VADs (1/3 of the cohort)
  - Rejection surveillance and treatment challenging (~1/3 of the cohort)