DCD and NRP in Pediatrics

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Duke Heart

Duke Children's

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- No relevant financial relationships
- May include discussion of off-label use of FDA approved drugs/devices or investigational devices

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- Published RCT comparing DCD vs. DBD in adults
- Demonstrates comparable survival rates

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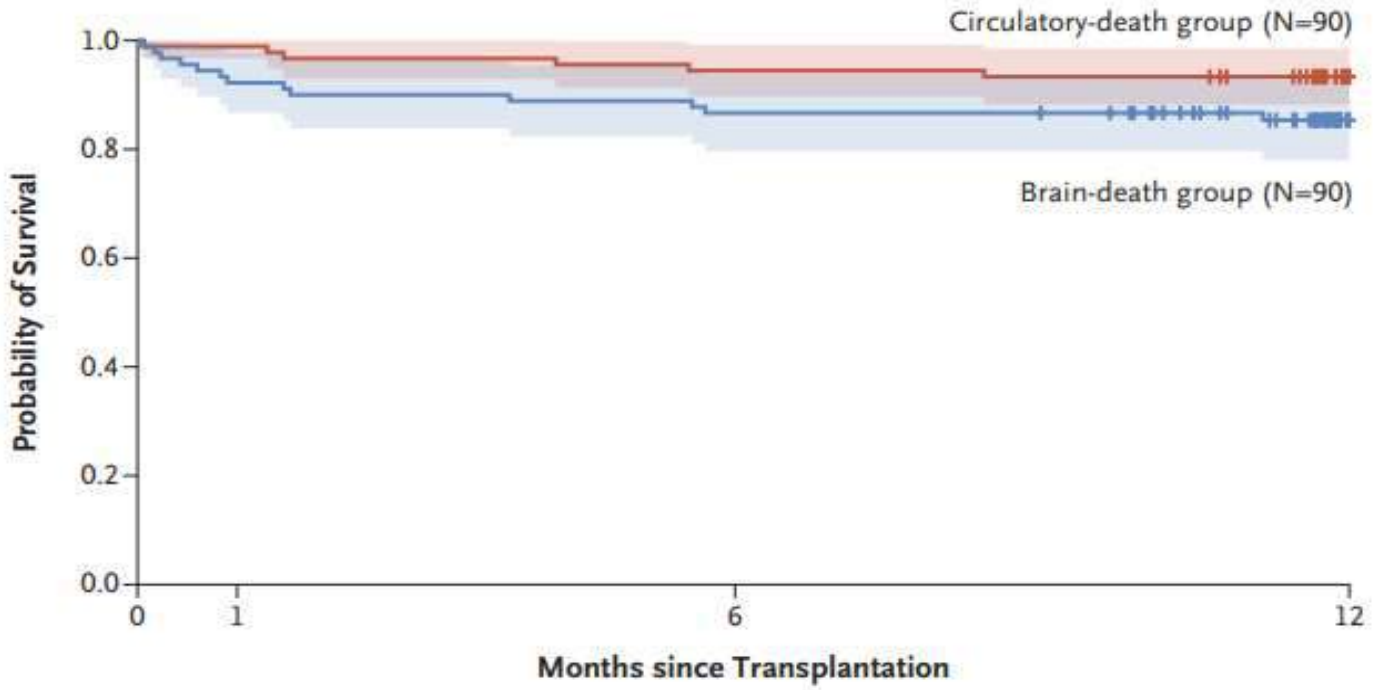
Transplantation Outcomes with Donor Hearts after Circulatory Death

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



Duke Heart

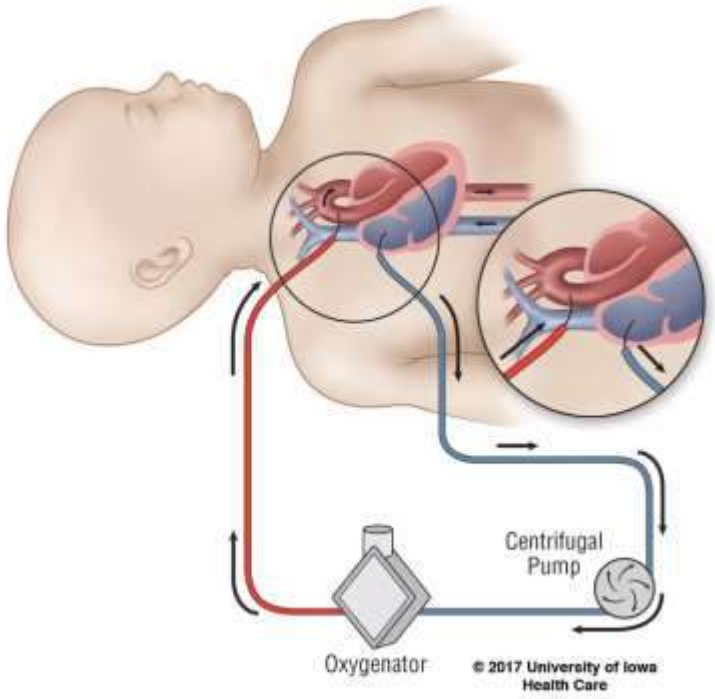
Duke performs first U.S. pediatric heart transplant using new method

September 9, 2021 | By Sarah Avery

DURHAM, N.C. – Surgeons at Duke University Hospital successfully performed a "donation after circulatory death" (DCD) heart transplant in a pediatric patient, demonstrating the potential expansion of eligible donor hearts for children with heart failure.

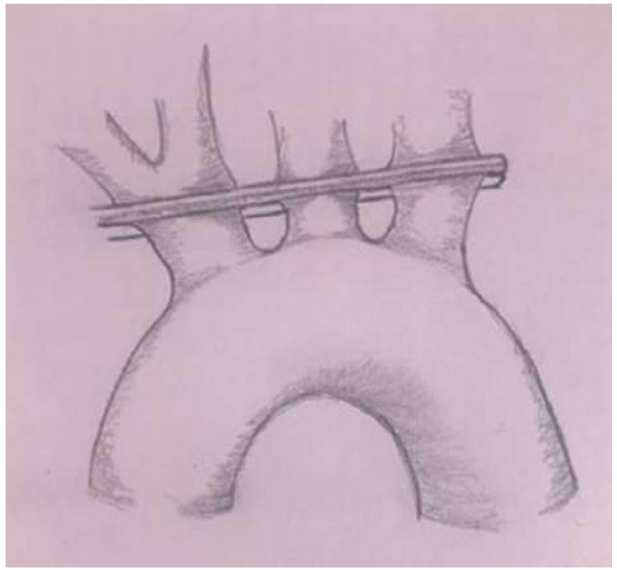
The transplant occurred Aug. 31 and is the first pediatric patient in the U.S. to undergo a DCD transplant using the organ preservation technology developed by Transmedics. A small

Normothermic Regional Perfusion (NRP) for Heart Procurements



Initiation of cardiopulmonary bypass, **following exclusion of the head vessels**, to reanimate and assess the heart *in-situ*

Good option for pediatric hearts too small for OCS device



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How?

Full CPB

Limited to in-house donors or transportation of donor to accepting center

Mobile Open CPB

Use cardiotomy reservoir for cardiac decompression and cardiotomy suction with mobile pump

Mobile Closed CPB

Standard closed-system mobile circuit with manifold access and venting for volume manipulation

Donation after circulatory death heart transplantation using normothermic regional perfusion: The NYU Protocol

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ORIGINAL CLINICAL SCIENCE

Early US experience with cardiac donation after circulatory death (DCD) using normothermic regional perfusion

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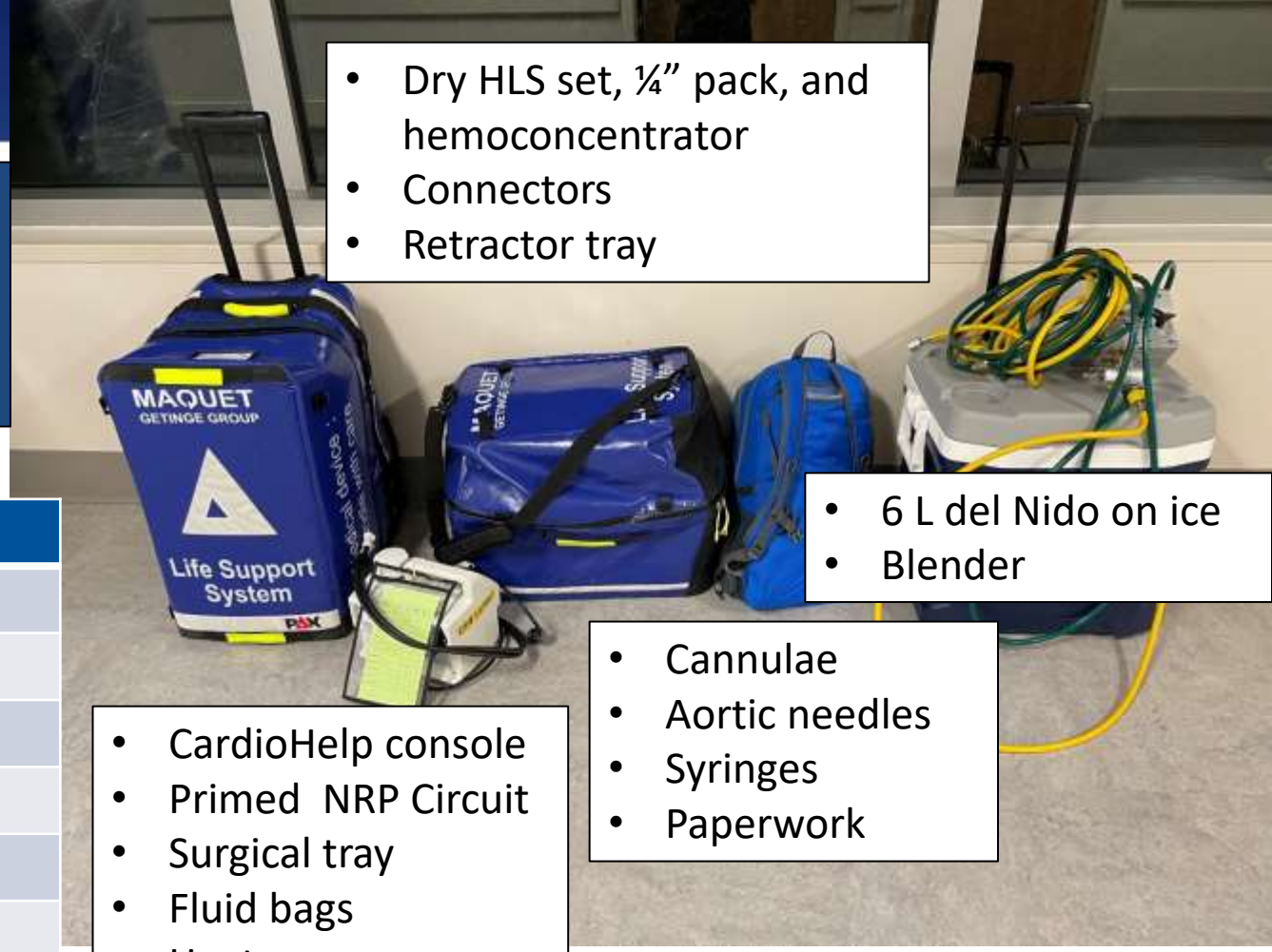
Duke Children's

PEDIATRIC & CONGENITAL HEART CENTER

NRP CCP, LP arrives ~2h prior to departure:

- Order and pick up NRP Drug Bag
- Build new circuit
- Gather and review all supplies/equipment

Drug Bag	
Albumin 25%	1
Solumedrol 500 mg	1
Mannitol 12.5 g	1
Calcium Gluconate 1g	3
Sodium Bicarb 50 mEq	6
Cefazolin 1g	1
Ciprofloxacin 200mg (bag)	1
Phenylephrine syringes	4
Heparin 10,000 unit/10ml	3
Plasmalyte A/Normosol R 1L	3
Rocuronium 50 mg	4
Del Nido Cardioplegia 1L	6



- Dry HLS set, ¼" pack, and hemoconcentrator
- Connectors
- Retractor tray

- 6 L del Nido on ice
- Blender

- Cannulae
- Aortic needles
- Syringes
- Paperwork

- CardioHelp console
- Primed NRP Circuit
- Surgical tray
- Fluid bags
- Heater

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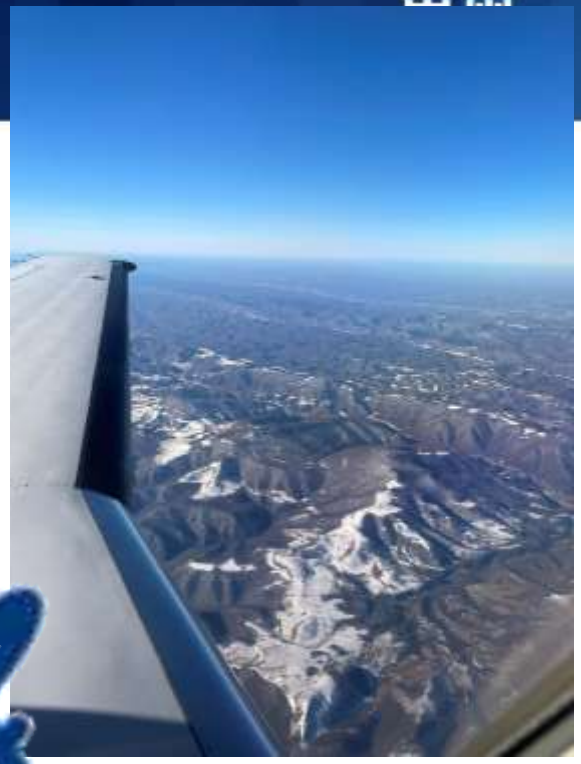

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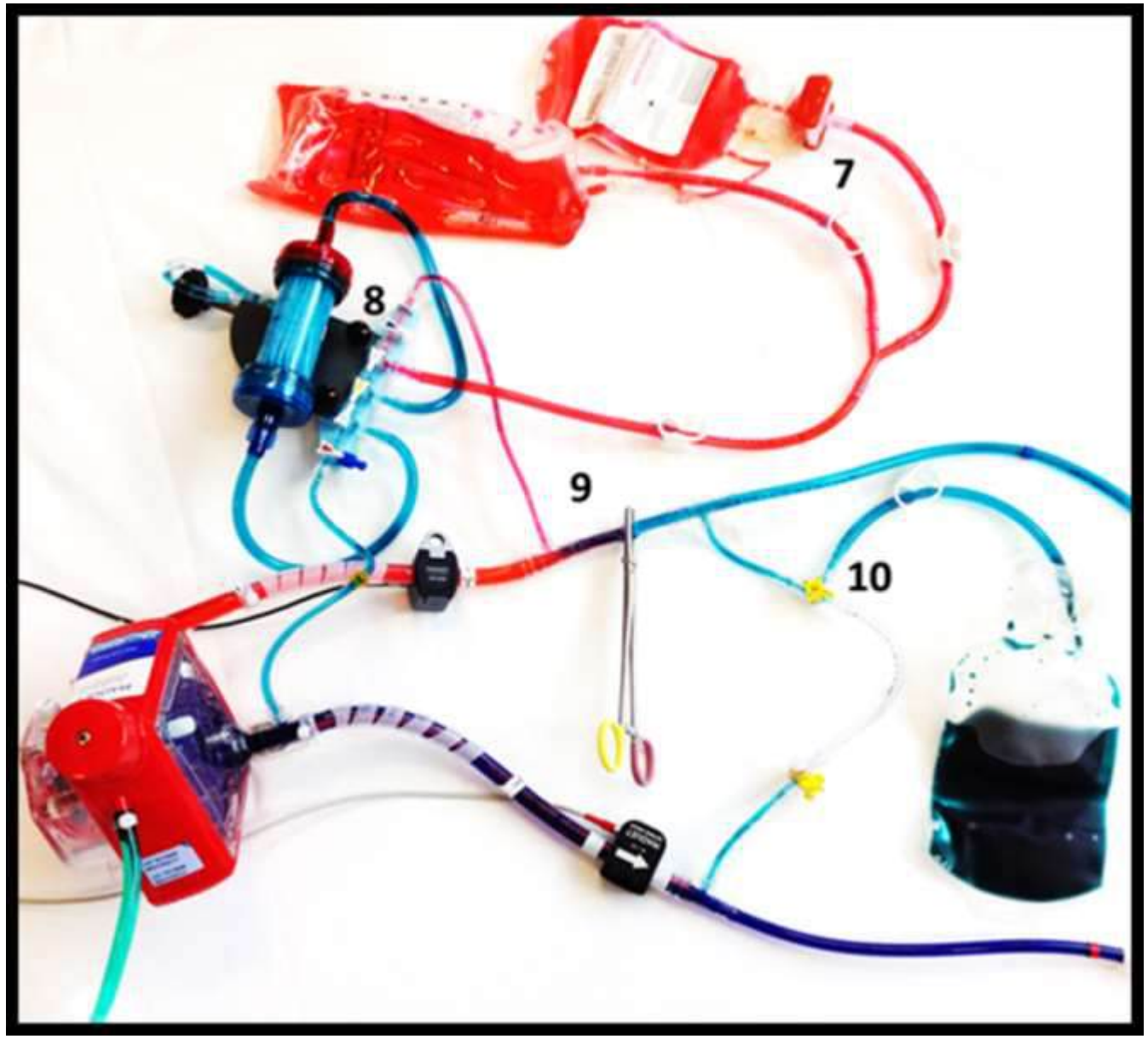
Circuit Preparation- Blood Priming



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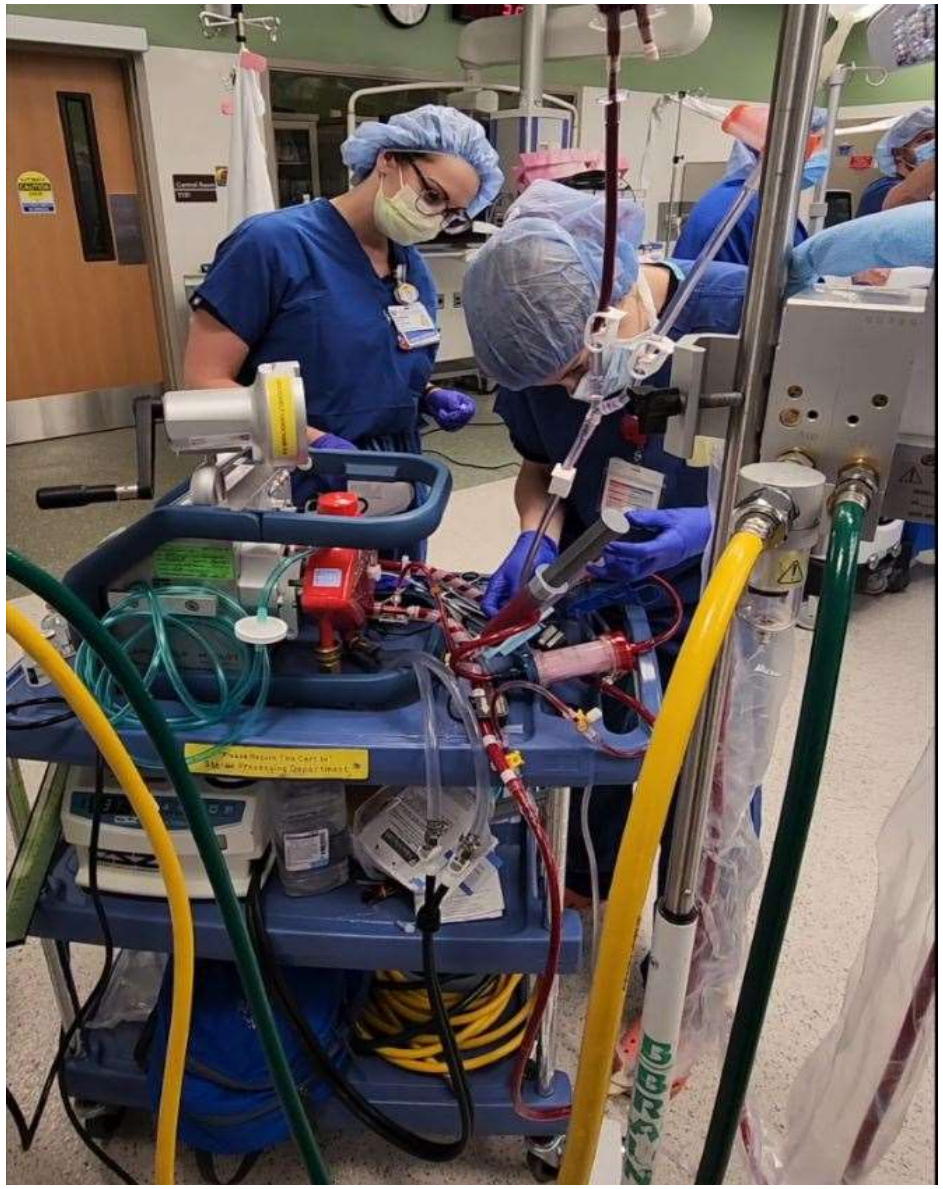
Preparations/Withdrawal/Stand-Off

- Sweep gas and alarms off
- Move circuit to side and drape

- Confirm heparin administered
- Exit room

- Extubation
- Declaration

- Five minute stand off



Cannulation

- Pass up lines
- Perform final circuit checks
- Initiate NRP
- ~100 mL/kg/min
- 1:1 sweep gas: flow ratio
  - ~0.30 FiO2
- Avoid changes in sweep gas or administering calcium/bicarb before obtaining first gas

Verbally confirm head vessel exclusion

Goal time from end standoff-on NRP=6-8 minutes

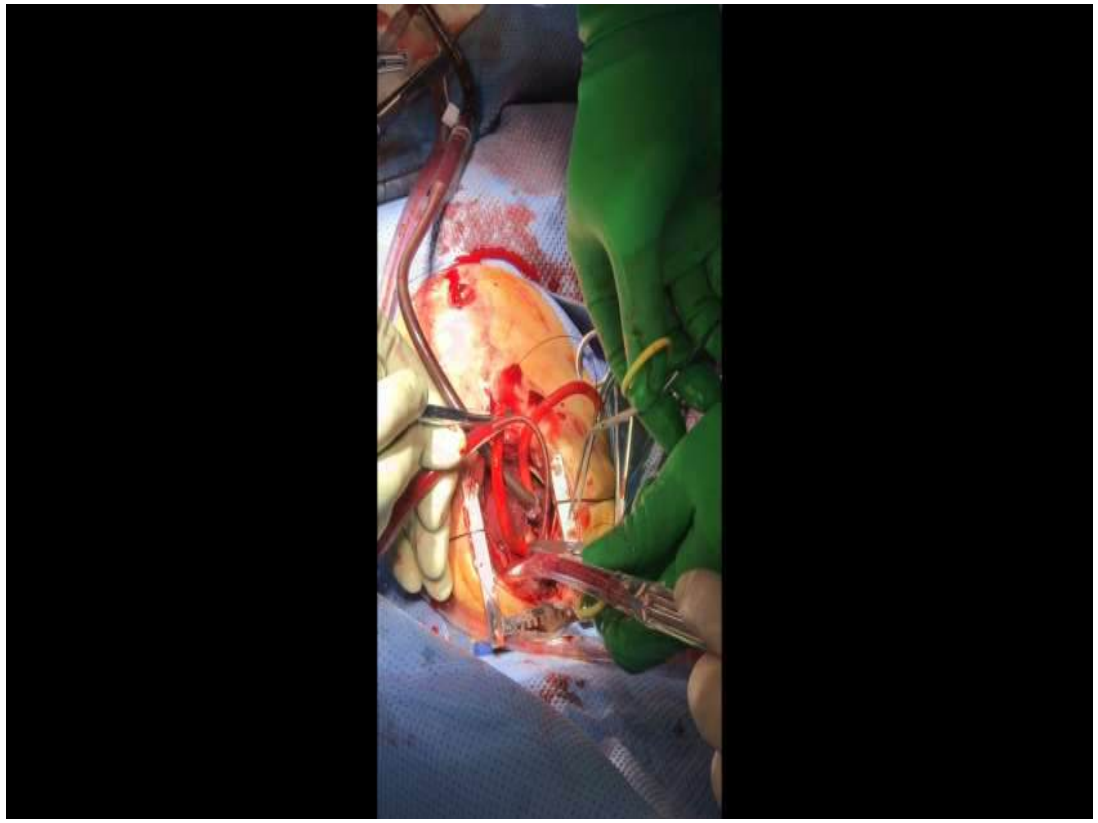
Reanimation and Clamp Trial

- Monitor EKG, MAPs, circuit pressures, signs of venous air entrainment

- Obtain first gas after ~5 minutes reperfusion time and q10min
- Treat with $NaHCO_3$, RBCs, and Ca^{2+}
- Communicate with team regarding volume/filling

- After 30-60min, clamp NRP circuit
- Flow through the bridge to maintain circuit patency
- Keep up with volume and calcium administration via NRP circuit

- Flash cannulas q3 minutes to ensure patency of both
- Administer volume



Cross Clamp, Cardioplegia, Storage

- END NRP TIME
- Cleanup
- Confirm accuracy of all documentation and times with OPO prior to departure
- Assist surgeons with SherpaPak prep

- 30 mL/kg del Nido cardioplegia
  - *Delivered directly with syringes*

Duke Pediatric Mobile NRP Program- By the Numbers

12 NRP Procurements

- 9 successful recoveries/recipients transplanted
- 2 dry runs- Donor did not expire in allotted time
- 1 unsuccessful reanimation- severe LV dysfunction and distension

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Challenges and Future Directions in Pediatric DCD

- Ethical Concerns
- Timing/Complexity
- Simple, ex-vivo reanimation

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For more info, please email Rachel: rachel.gambino@duke.edu

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