

Pediatric Heart Transplant: What, Why, When, and How

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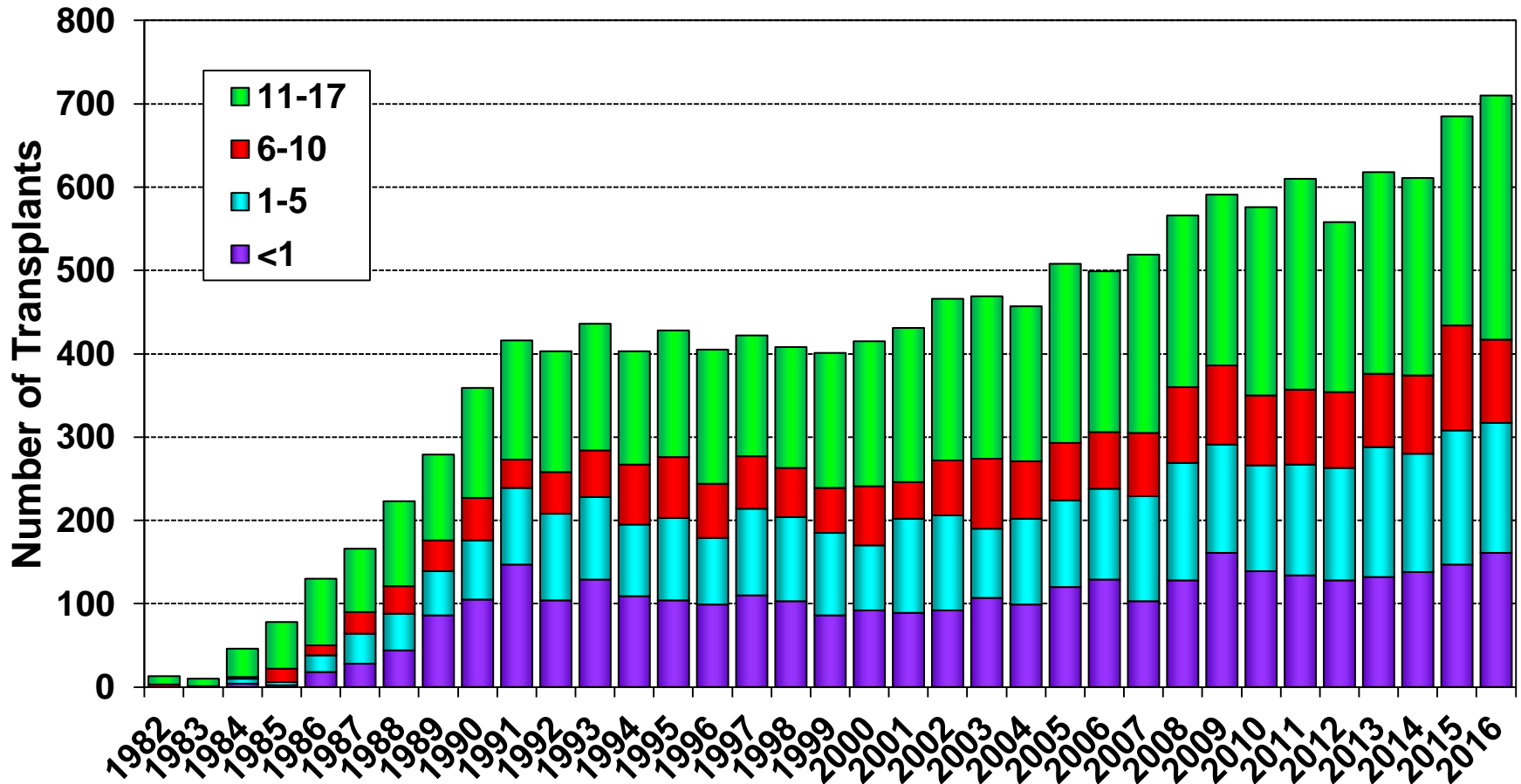
What is a pediatric heart transplant?

- Physical translocation of a human heart to another human
 - Reserved for end-stage, advanced heart failure
- Christiaan Barnard successfully performed the first human heart transplant in 1967 in South Africa
- Dr. Norman Shumway performed the first human heart transplant in the US (Stanford) in 1968
- The 1st successful pediatric heart transplant in the US was performed in 1984 (Columbia)
- The 1st pediatric heart transplant in Atlanta in July 1988



Pediatric Heart Transplants

Recipient Age (in Years) Distribution by Year of Transplant

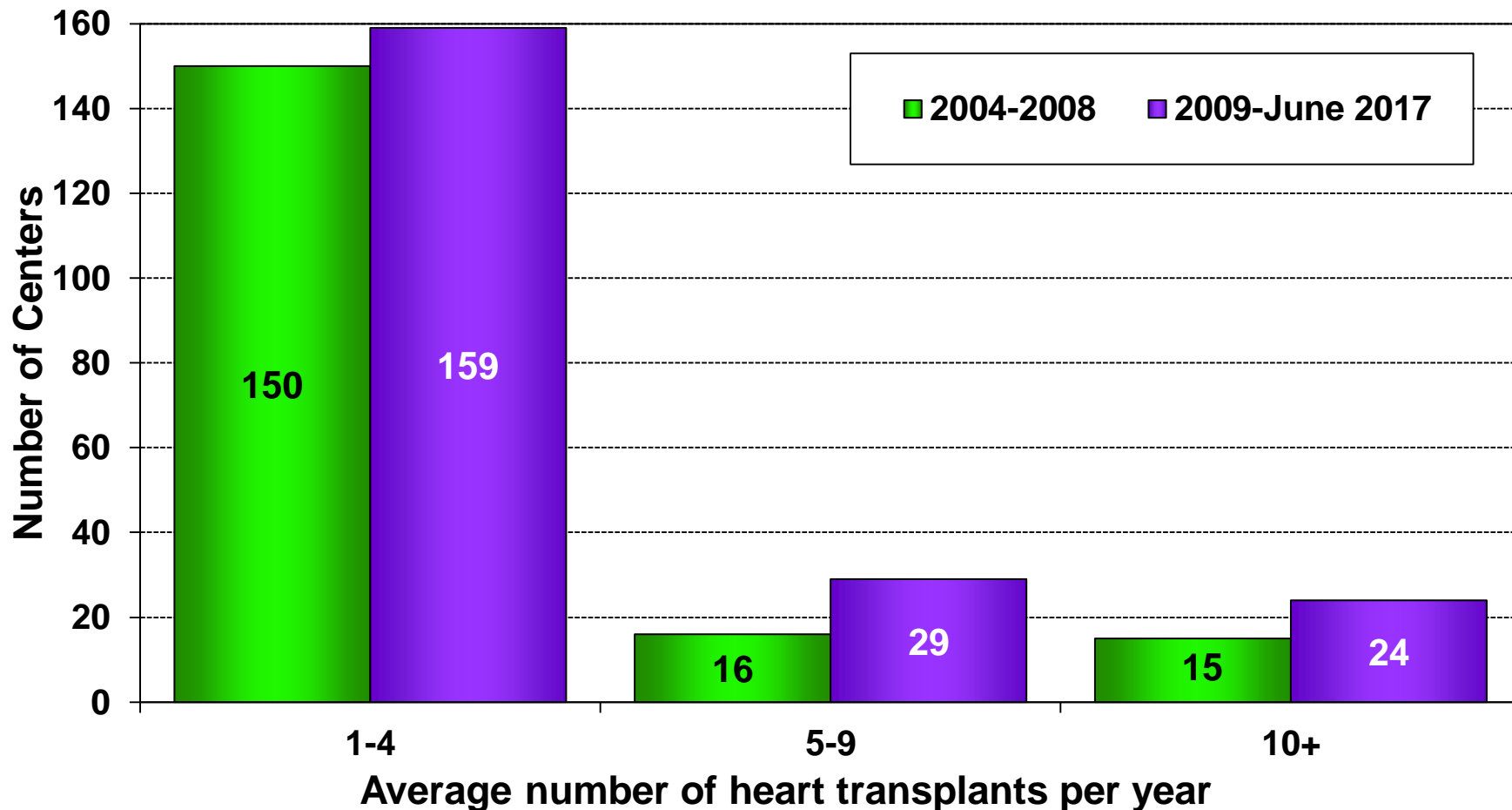


NOTE: This figure includes only the heart transplants that are reported to the ISHLT Transplant Registry. As such, this should not be construed as evidence that the number of hearts transplanted worldwide has increased and/or decreased in recent years.

Pediatric Heart Transplants

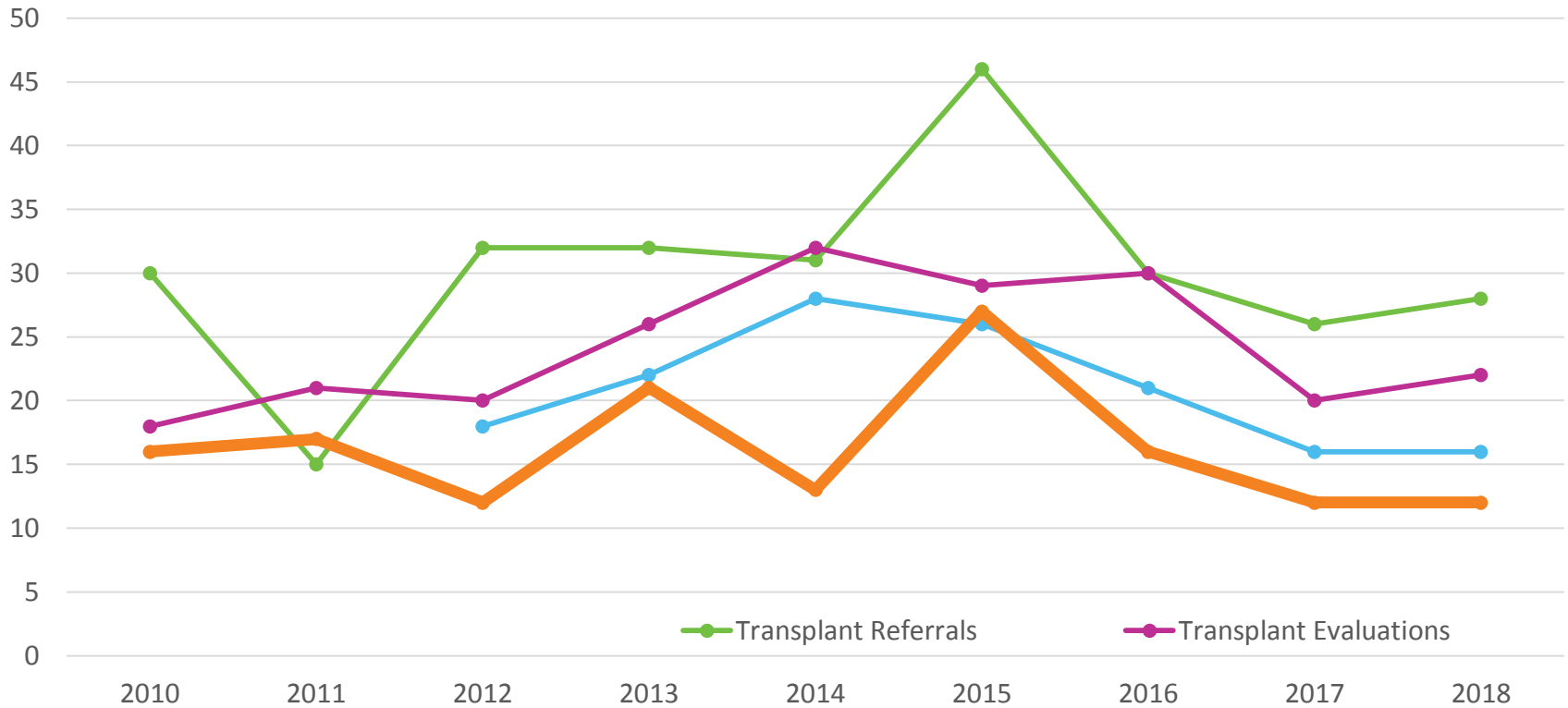
Number of Centers by Center Volume

(Transplants: January 2004 – June 2017)





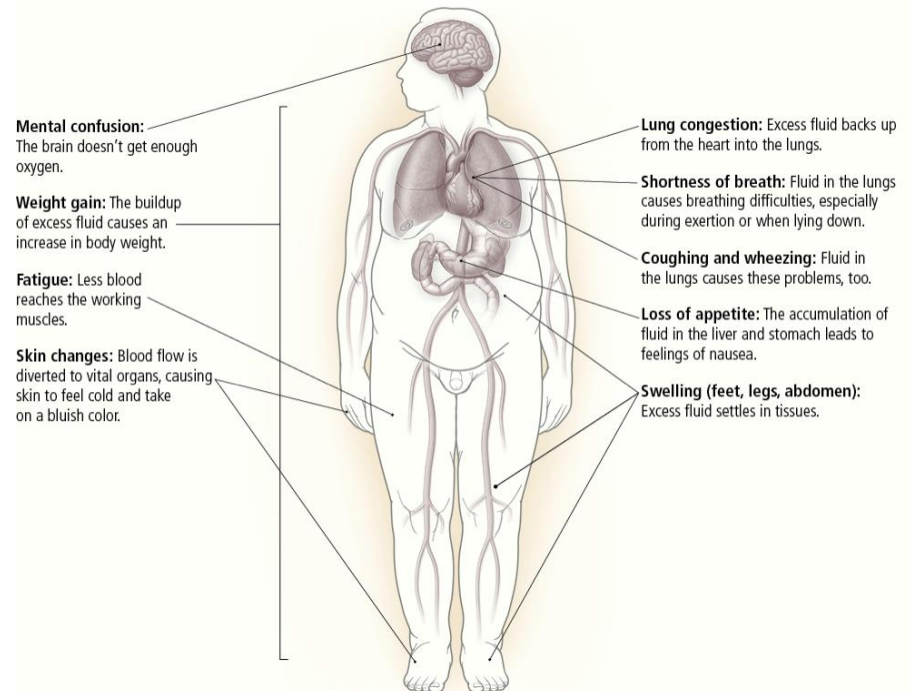
CHOA Transplant Numbers



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Transplant Referrals	30	15	32	32	31	46	30	26	28
Transplant Evaluations	18	21	20	26	32	29	30	21	22
Transplant Listings			18	22	28	26	21	16	16
Transplants	16	17	12	21	13	27	16	12	12

What is Heart Failure?

- Heart Failure: structural or functional cardiac disorder resulting in inadequate perfusion and/or collection of fluid resulting in organ dysfunction - *“Heart doesn't squeeze and/or relax normally”*
- Congenital and Non-congenital heart disease
- Feeding difficulties
- Difficulty breathing / coughing
- Fatigue / Exercise Intolerance
- Abnormal heart rhythms
- Swelling
- Electrolyte abnormalities
- Abnormalities of the liver and kidneys



Causes of Heart Failure

Structural Heart Disease

- Left-to-right shunt
- Valvar regurgitation
- Pressure overload
- Single ventricle

Other

- Arrhythmia
- Ischemic
- Inflammatory
- Infiltrative
- Toxic

Cardiomyopathy

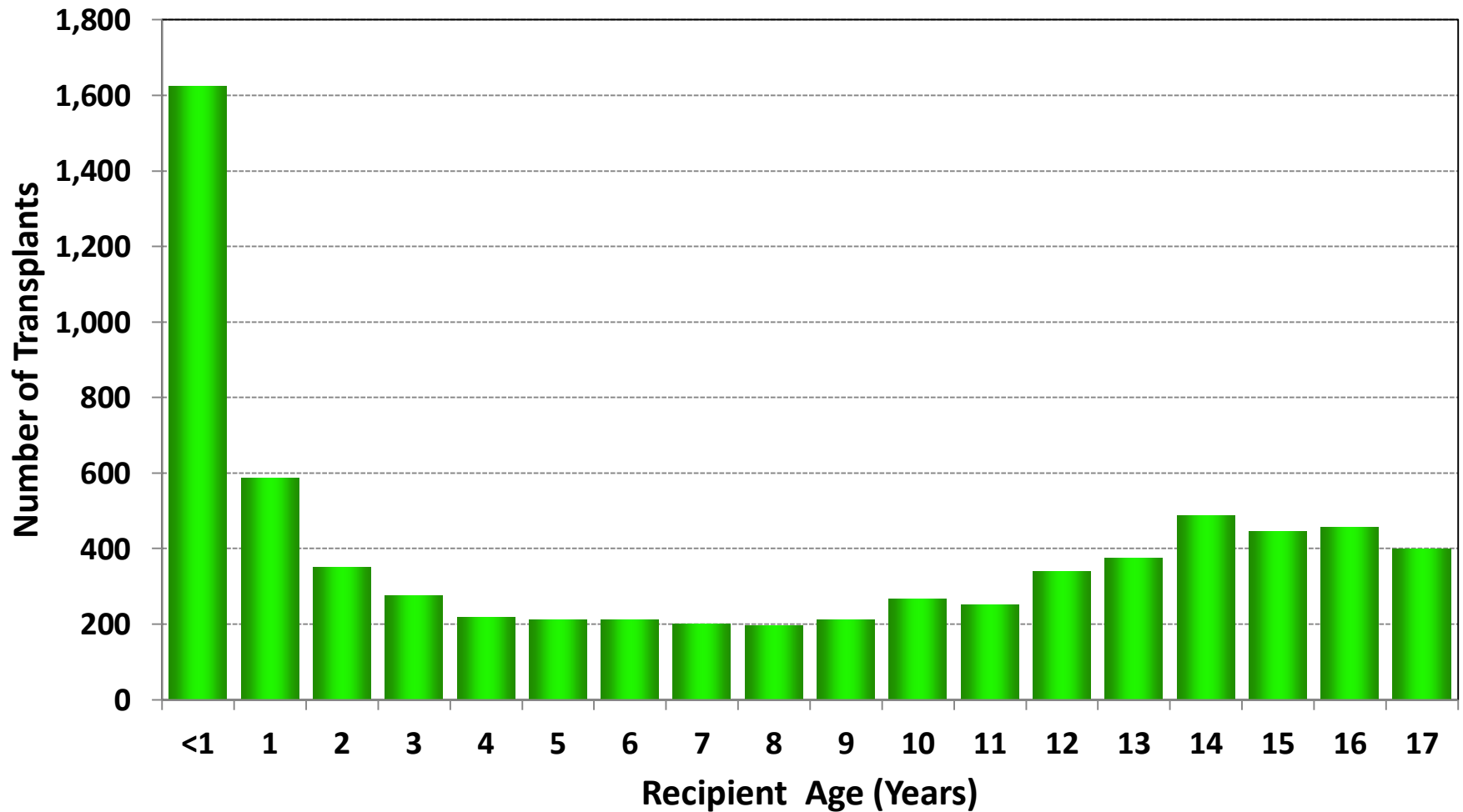
- Dilated
- Hypertrophic
- Restrictive
- Arrhythmogenic
- Noncompaction
- Metabolic/Genetic

When does someone need a heart transplant?

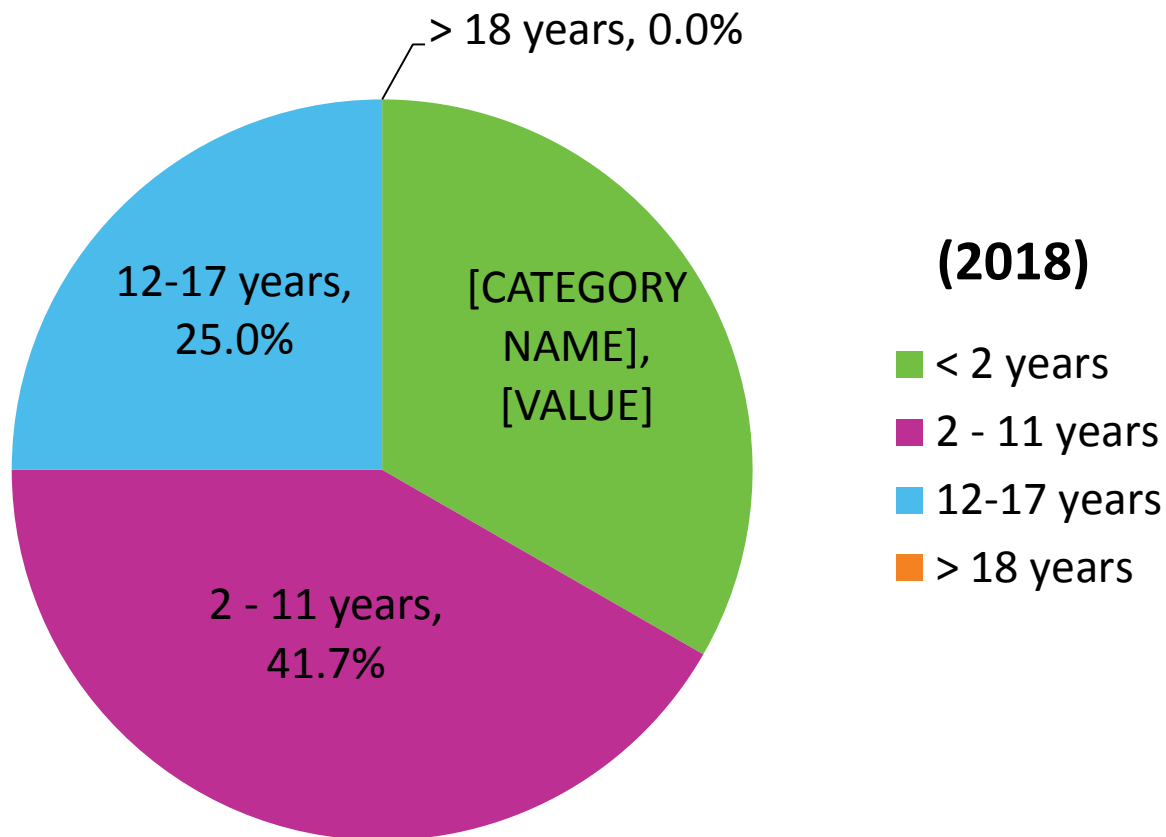
- Inoperable complex congenital heart disease
- Congenital heart disease that has failed surgical management
- Symptomatic heart failure (structural heart disease / cardiomyopathy)
- Significant, uncontrollable rhythm abnormalities
- Heart disease that is causing potentially irreversible damage to other organs (e.g. liver or lungs)

Recipient Age Distribution

January 2004 – June 2016

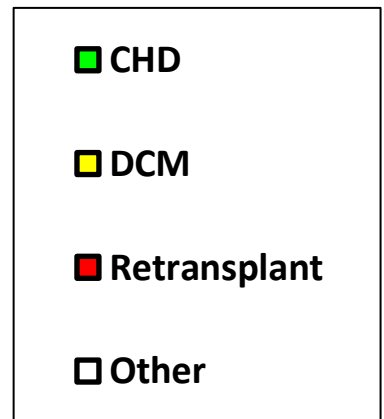
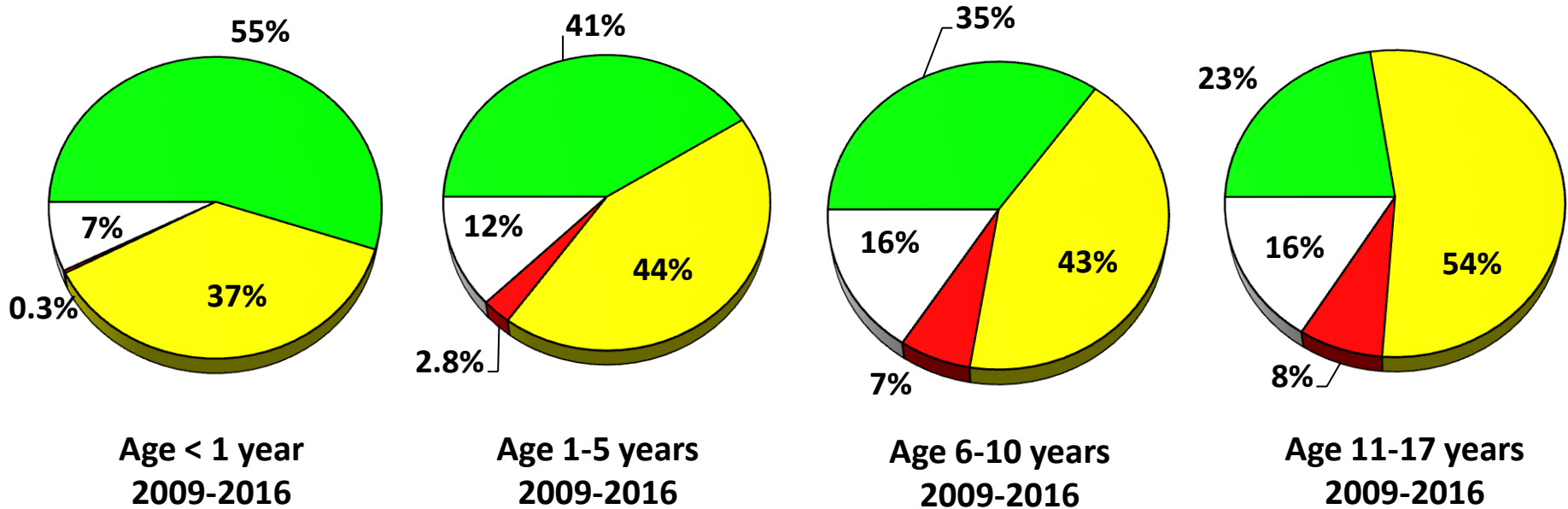


CHOA Transplant Information (By Age)



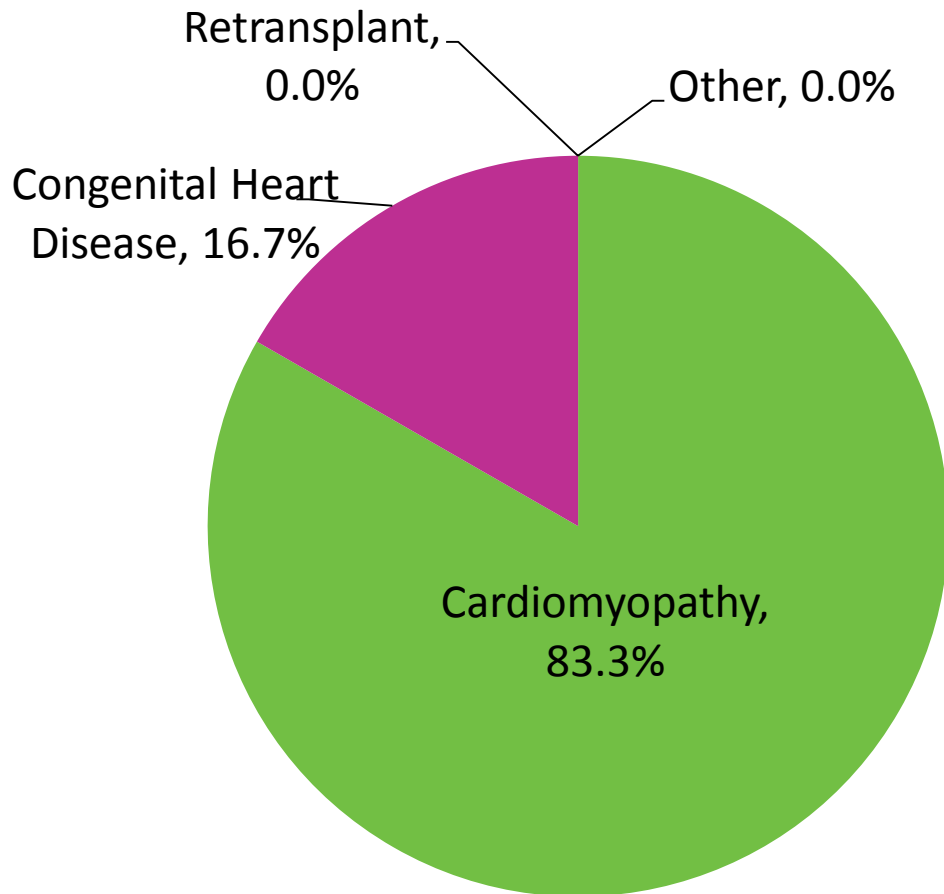
Scientific Registry of Transplant Recipients (SRTR) Program-Specific Report. July 2019

Pediatric Heart Transplants Recipient Diagnosis



CHOA Transplant Information

Primary Disease

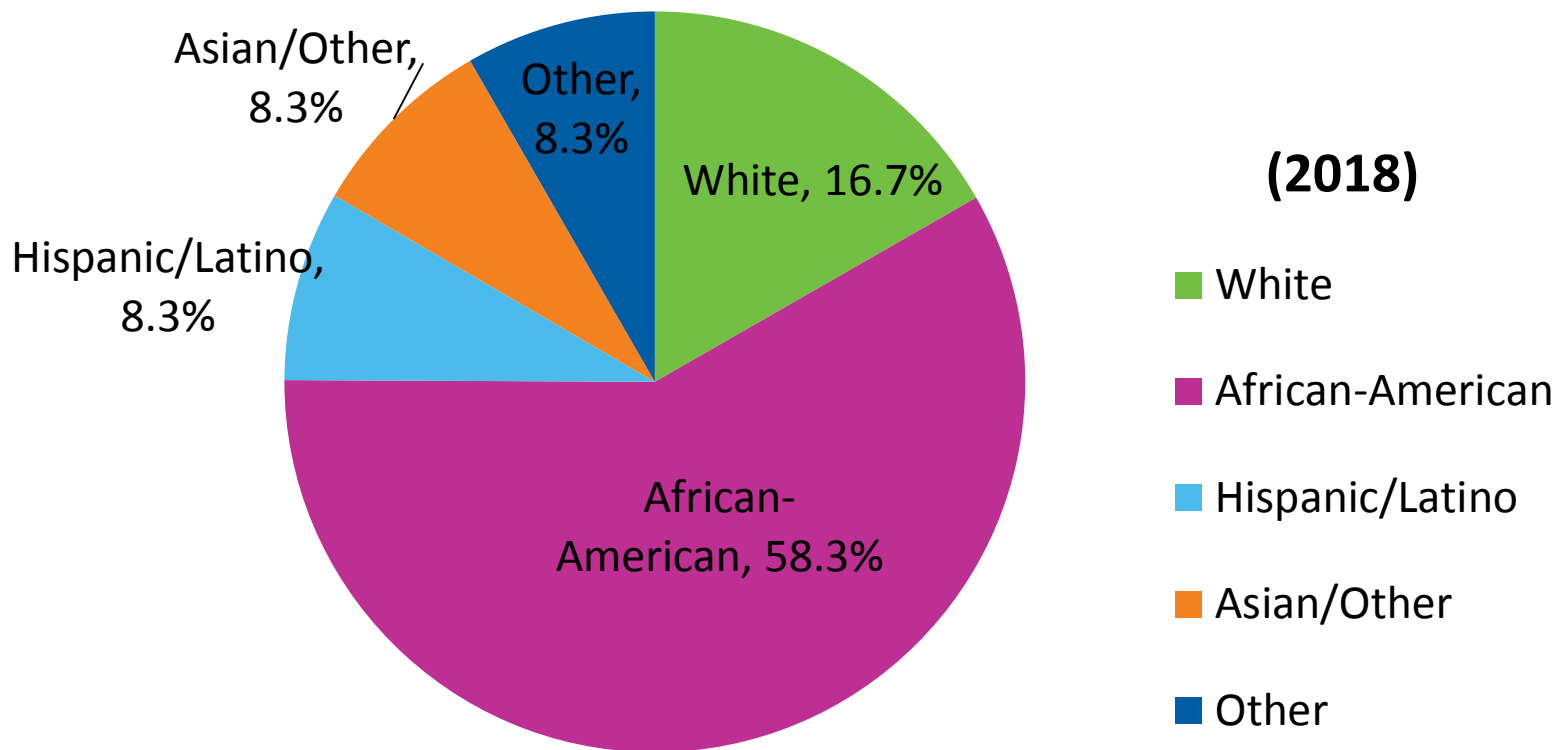


(2018)

- Cardiomyopathy
- Congenital Heart Disease
- Retransplant
- Other

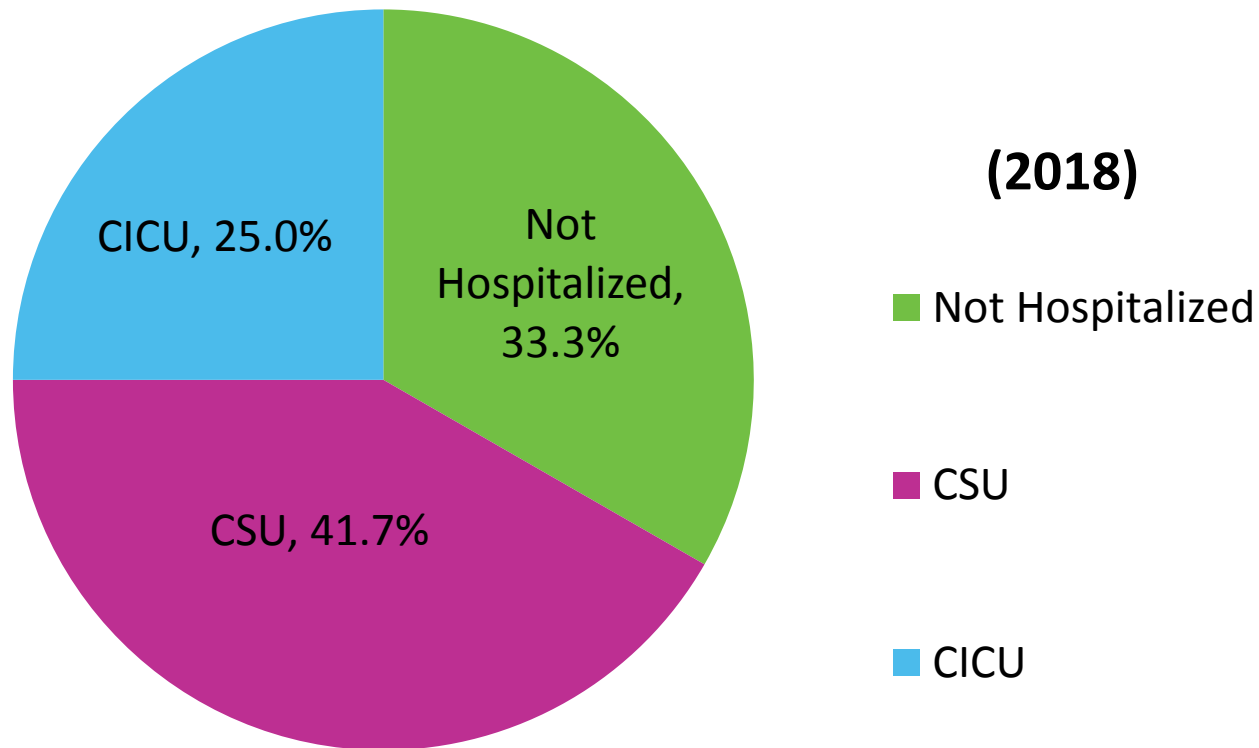
Scientific Registry of Transplant Recipients (SRTR) Program-Specific Report. July 2019

CHOA Transplant Information By Ethnicity



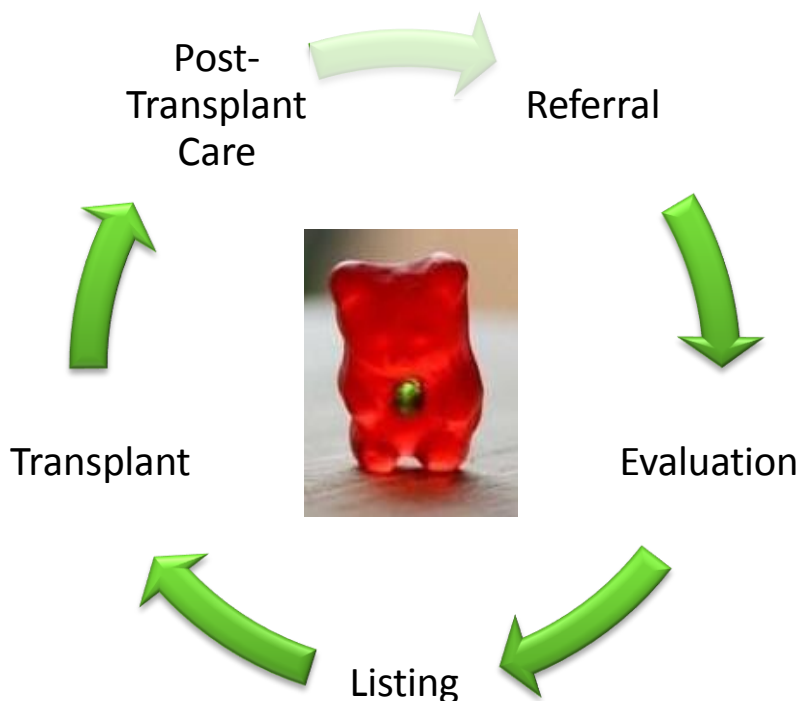
Scientific Registry of Transplant Recipients (SRTR) Program-Specific Report. July 2019

CHOA Transplant Information By Location



Scientific Registry of Transplant Recipients (SRTR) Program-Specific Report. July 2019

Heart Transplant Life Cycle



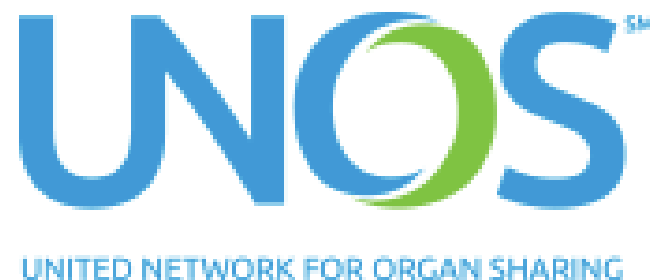
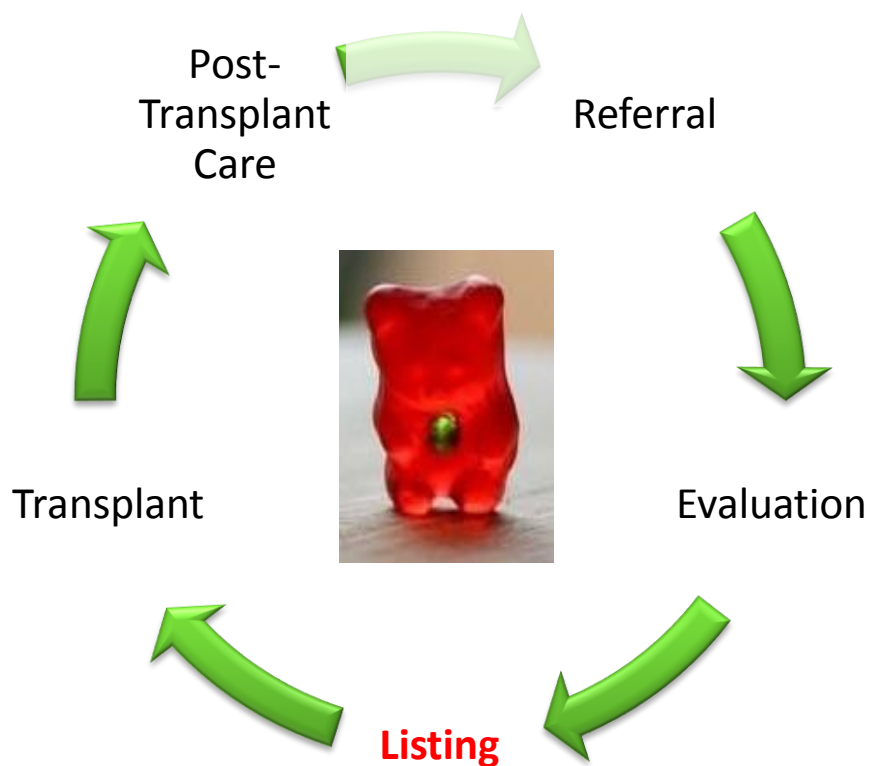
- Confirm Candidate meets indications for transplantation
- Confirm no absolute contraindications for transplant
- Determine relative contraindications/risk factors for transplantation
- Identify ways to optimize pre-transplant care
 - Vaccinations
 - Rehabilitation
 - Nutrition
 - Psychological (swallowing pills)
 - Social support
- Informed consent for evaluation and listing (Education)

Transplant Evaluation Team

- Medical Evaluation
 - Cardiology (MD/NP)
 - CT Surgery
 - Infectious Disease
 - *Medical Genetics*
- Social Work
- Pharmacy
- Psychology
- Financial / Insurance
- Nutrition
- Physical Therapy
- *Palliative Care*



Listing for Transplant



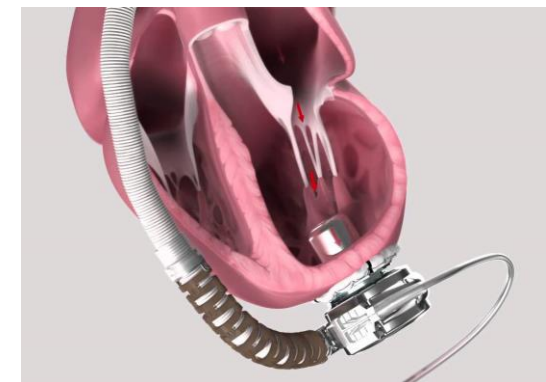
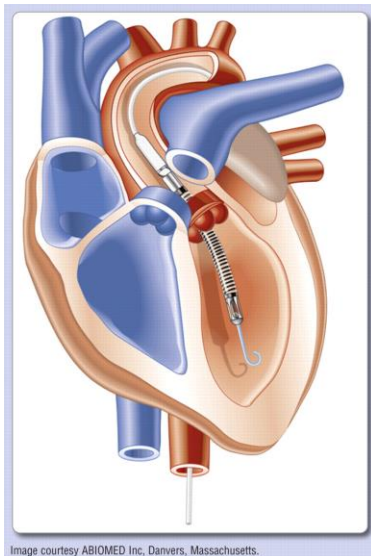
- Pediatric rules differ from adult
- Patient listed prior to their 18th birthday continue to qualify under pediatric guidelines
- Status 1A, 1B, 2, 7

Waitlist Factors

- Status, Blood Type, Size, Time

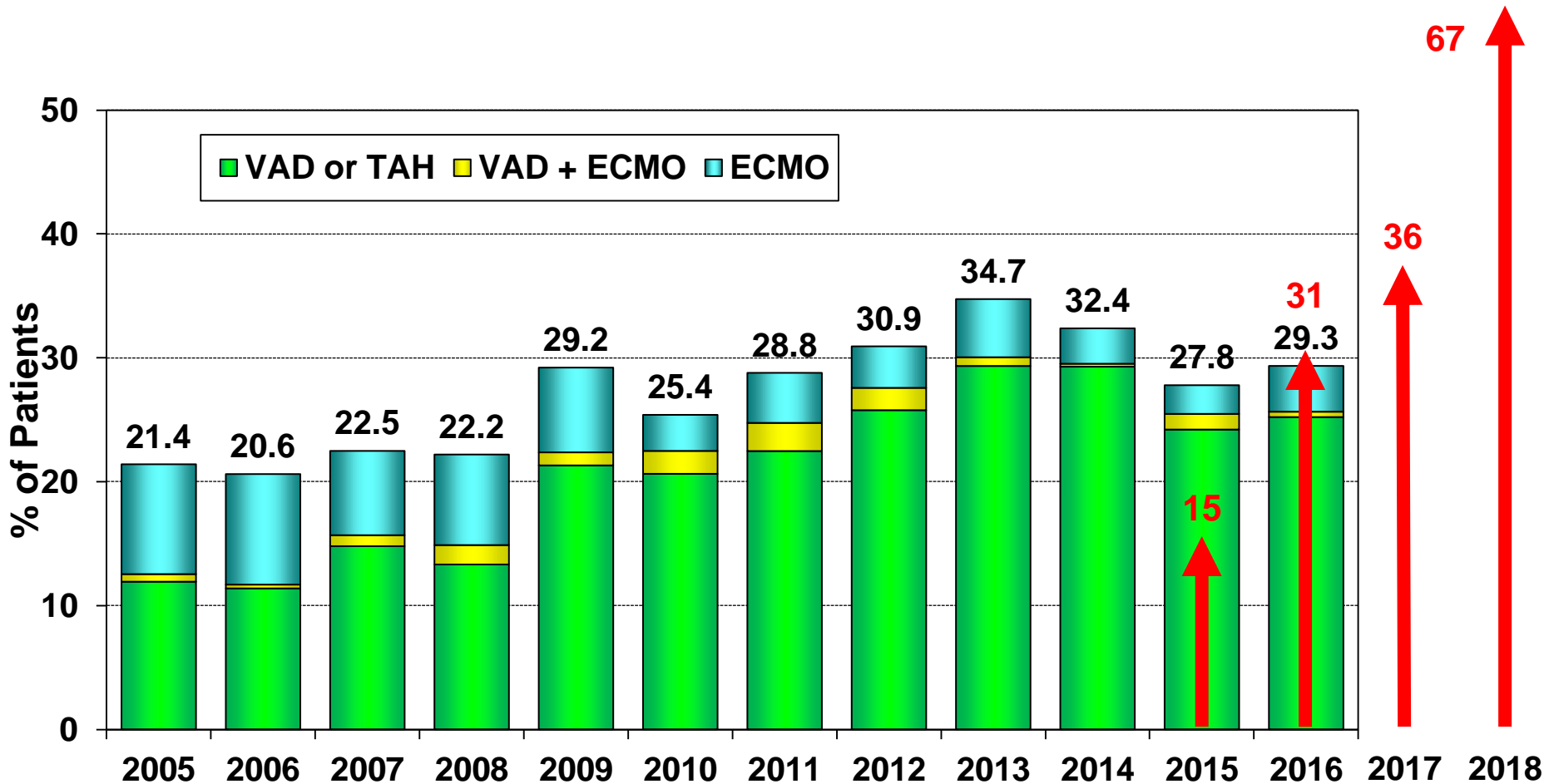
Current Ventricular Assist Device (VAD) Platforms

- Berlin EXCOR
- Thoratec® CentriMag® and PediMag®
- Abiomed Impella®
- Medtronic Heartware HVAD
- Jarvik 2015 (PumpKIN)



Pediatric Heart Transplants

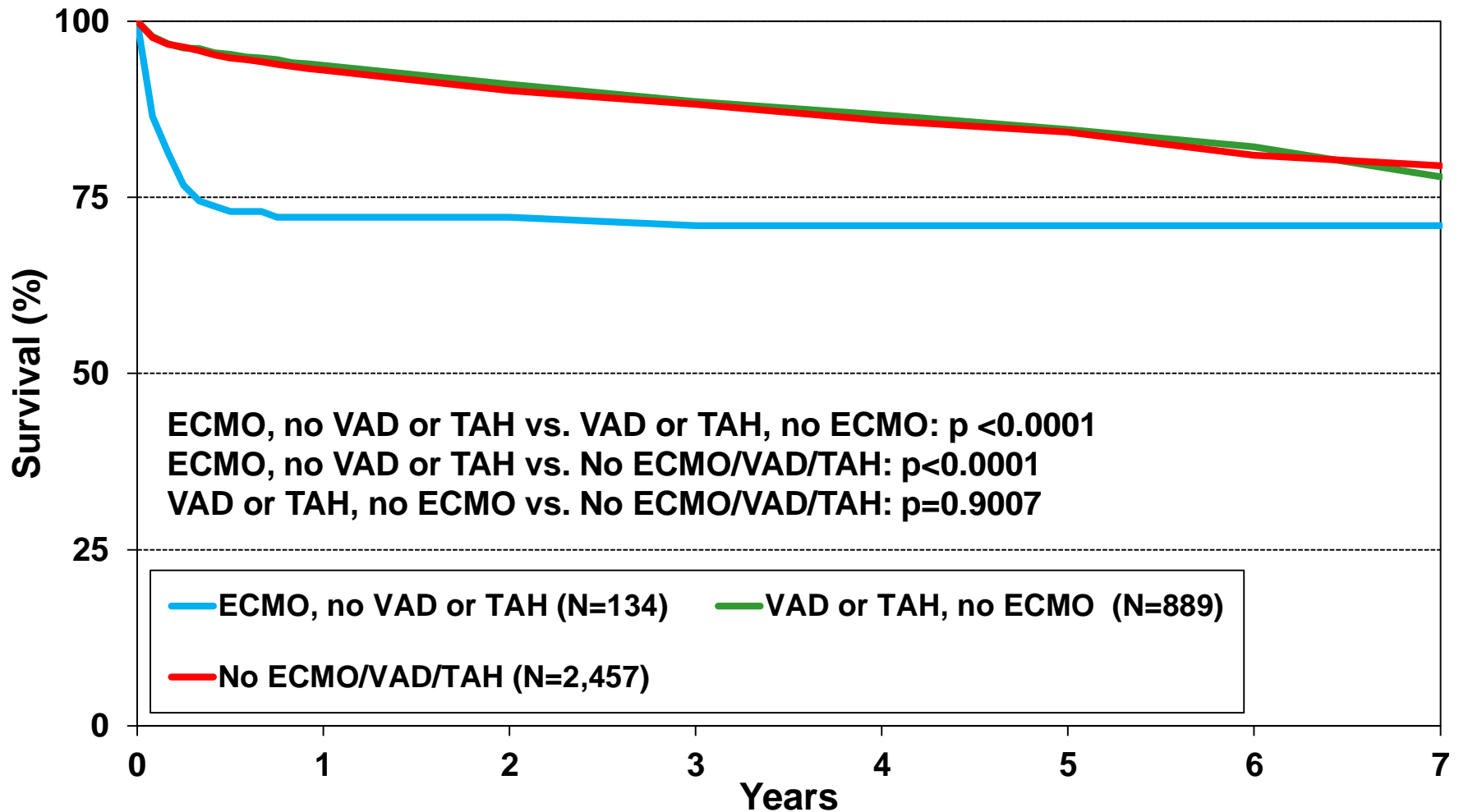
**% of Patients Bridged with Mechanical Circulatory Support*
by Year (Transplants: January 2005 – December 2016)**



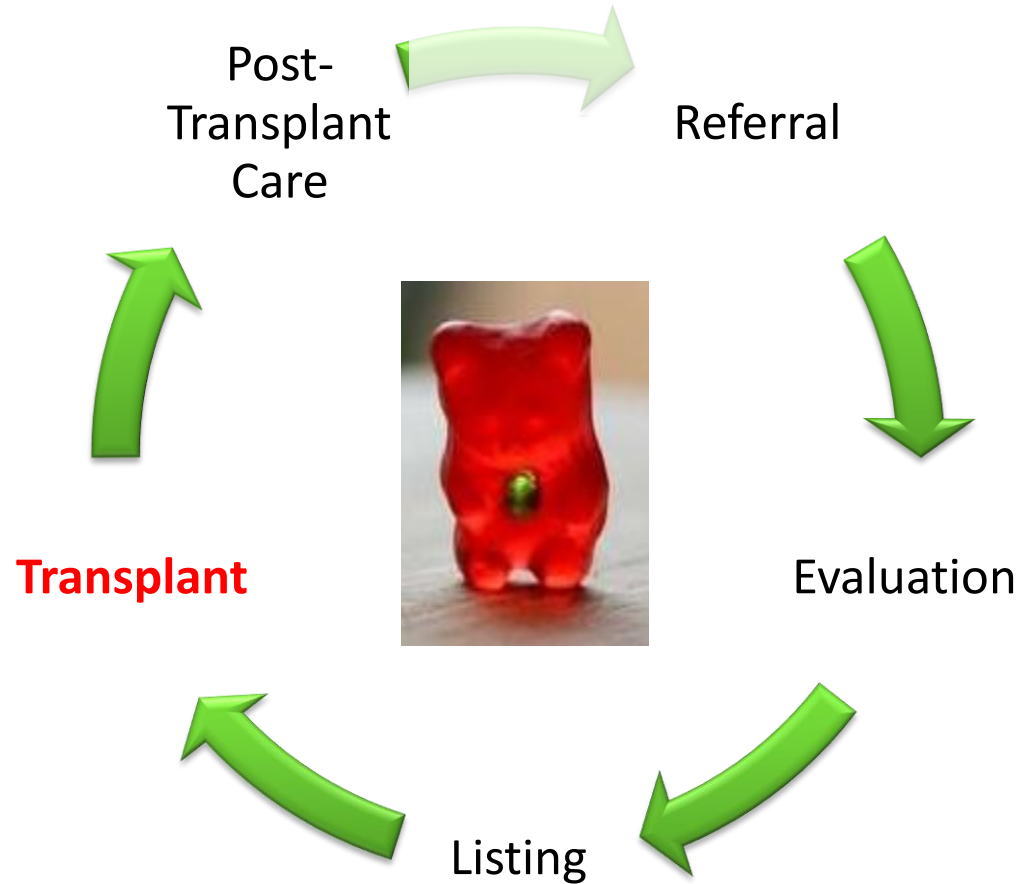
* LVAD, RVAD, TAH, ECMO

Pediatric Heart Transplants

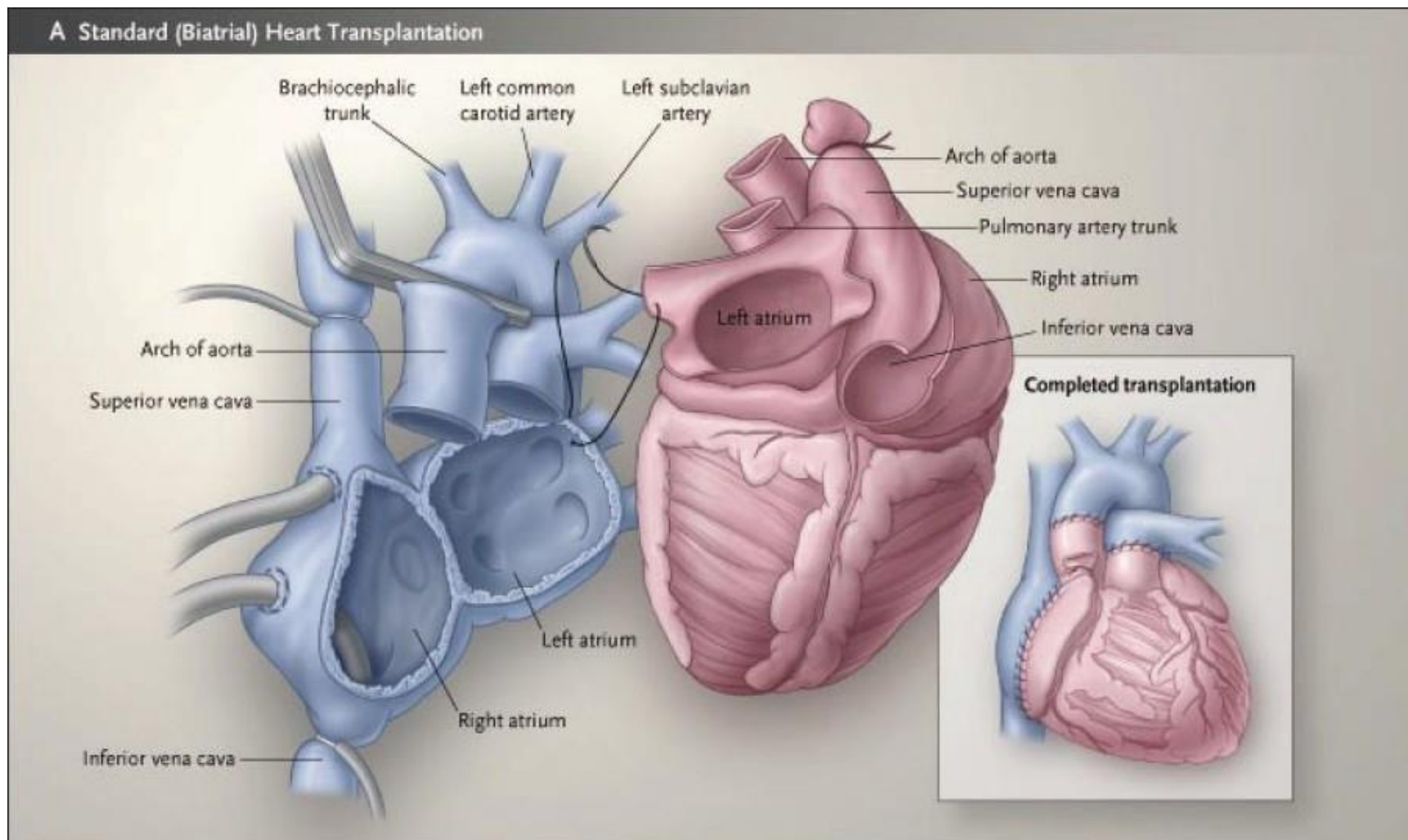
Kaplan-Meier Survival by Mechanical Circulatory Support Usage* (Transplants: January 2009 – June 2016)



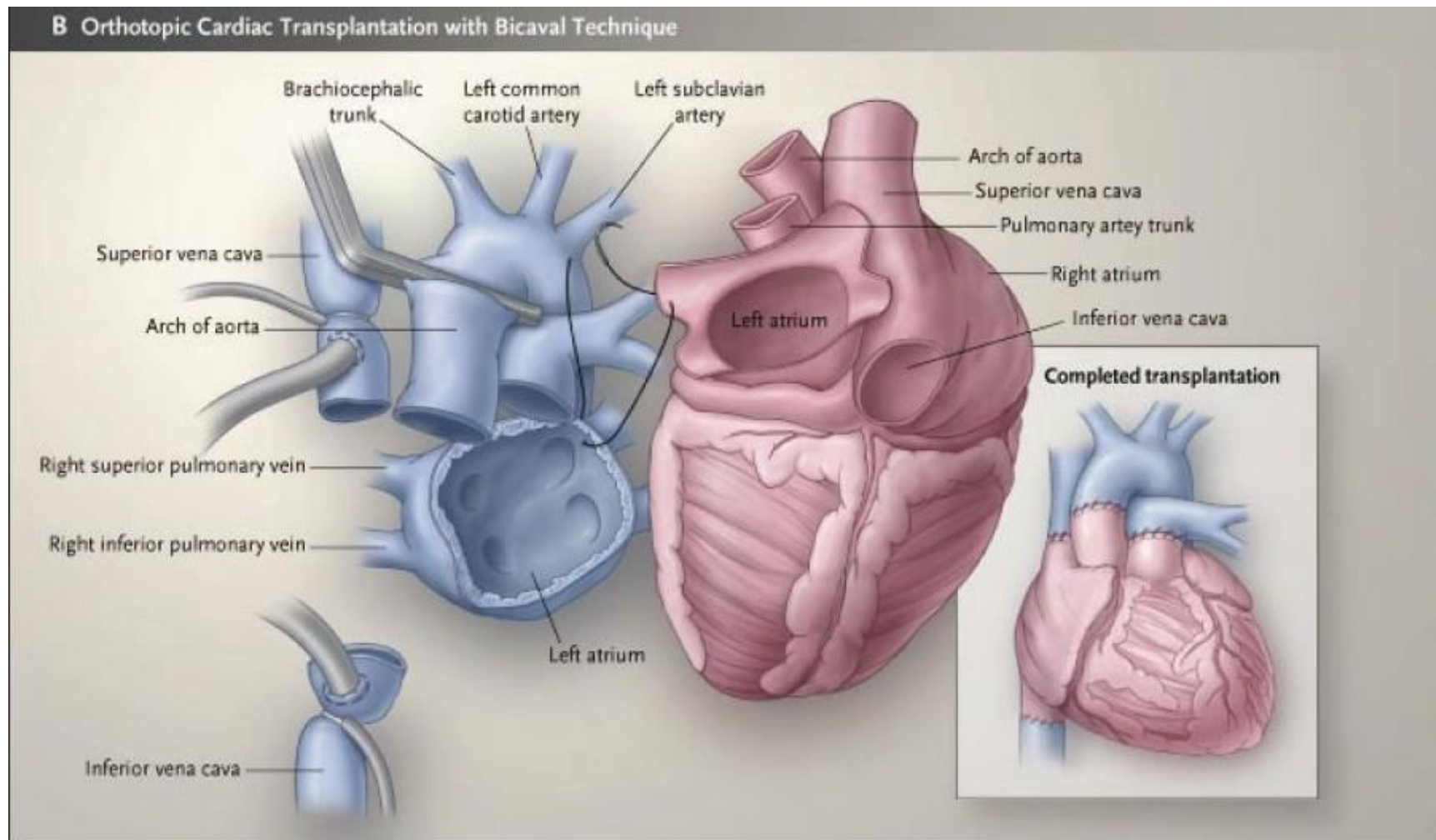
Time of Transplant



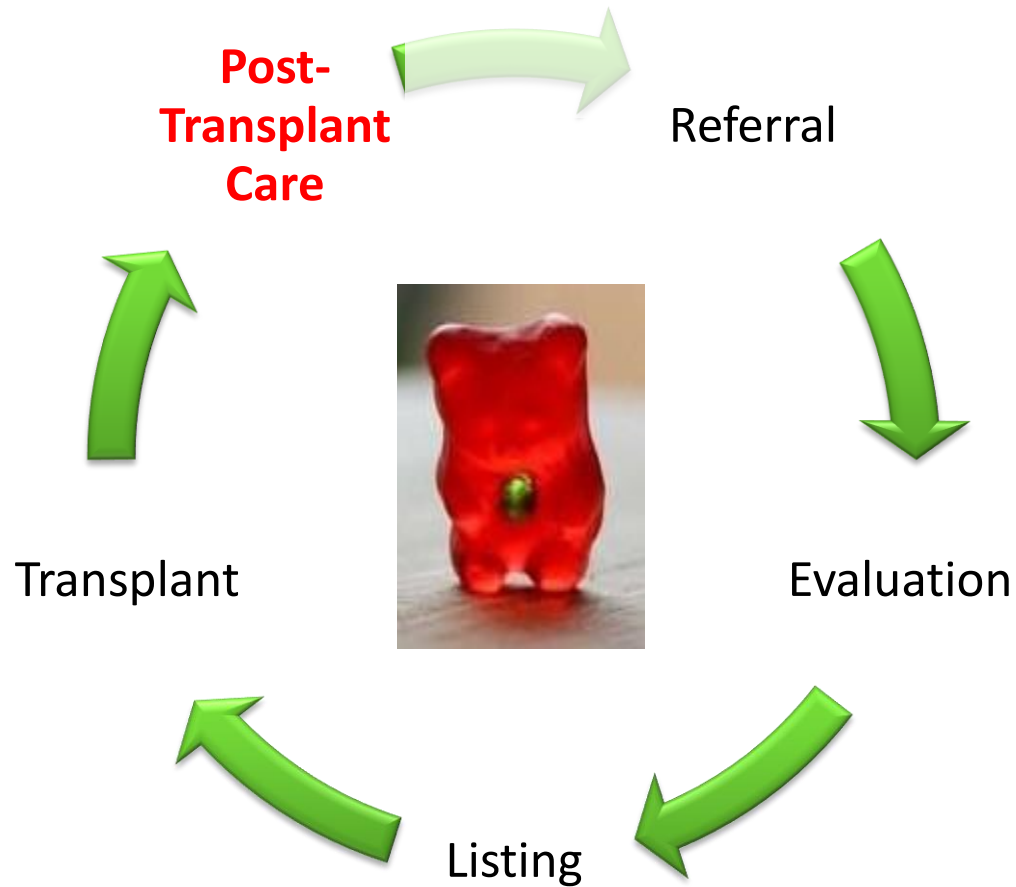
Biatrial Anastomosis



Bicaval Anastomosis



Post-Transplant Care



Post-Transplant Schedule (> 12 mo)

Post-transplant graft surveillance and follow-up schedule for children **>12 months** of age at the time of transplant (may vary if necessary to meet individual needs):

Week 1- ECHO visit

Week 2 – endomyocardial biopsy, RHC

Week 3 - ECHO visit

Week 4 - endomyocardial biopsy, RHC

Week 6 - ECHO visit

Week 8 - endomyocardial biopsy, RHC

Months 3, 4 & 5 – ECHO visit

Month 6 – endomyocardial biopsy, RHC

Months 8 & 10 - ECHO visit

Month 12 – endomyocardial biopsy,
echocardiogram, RHC, LHC

1-3 years- endomyocardial biopsy, RHC every 6 months; ECHO visit every 3 months; LHC annually

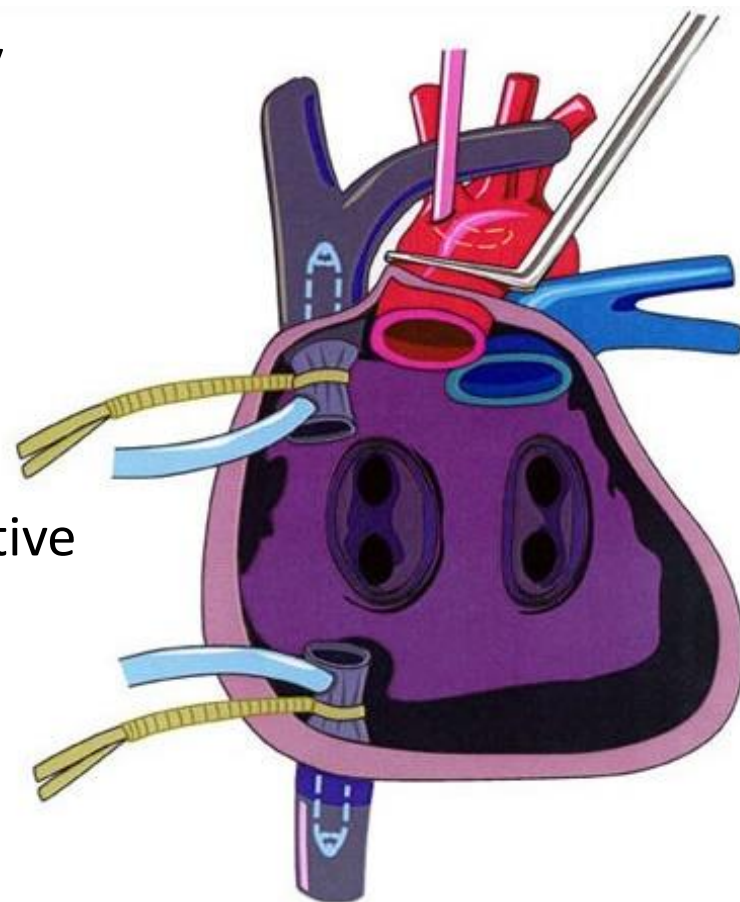
>3 years- endomyocardial biopsy, RHC every 6 months; May have annual biopsy (RHC, LHC) with an echocardiogram every 4 months if ...

- a) no previous rejection episodes (defined as 2R or 3R between post-op years 1-3) or
- b) has been at least 3 years from cellular rejection episode.

- ❖ Patient may be seen for an additional visit weekly for the first two weeks following hospital discharge for physical exam, review of medications, and lab work.
- ❖ The following will be performed at all post-transplant visits: review of medications, physical exam, laboratory tests, echocardiogram, review of postoperative care and additional diagnostics if indicated.

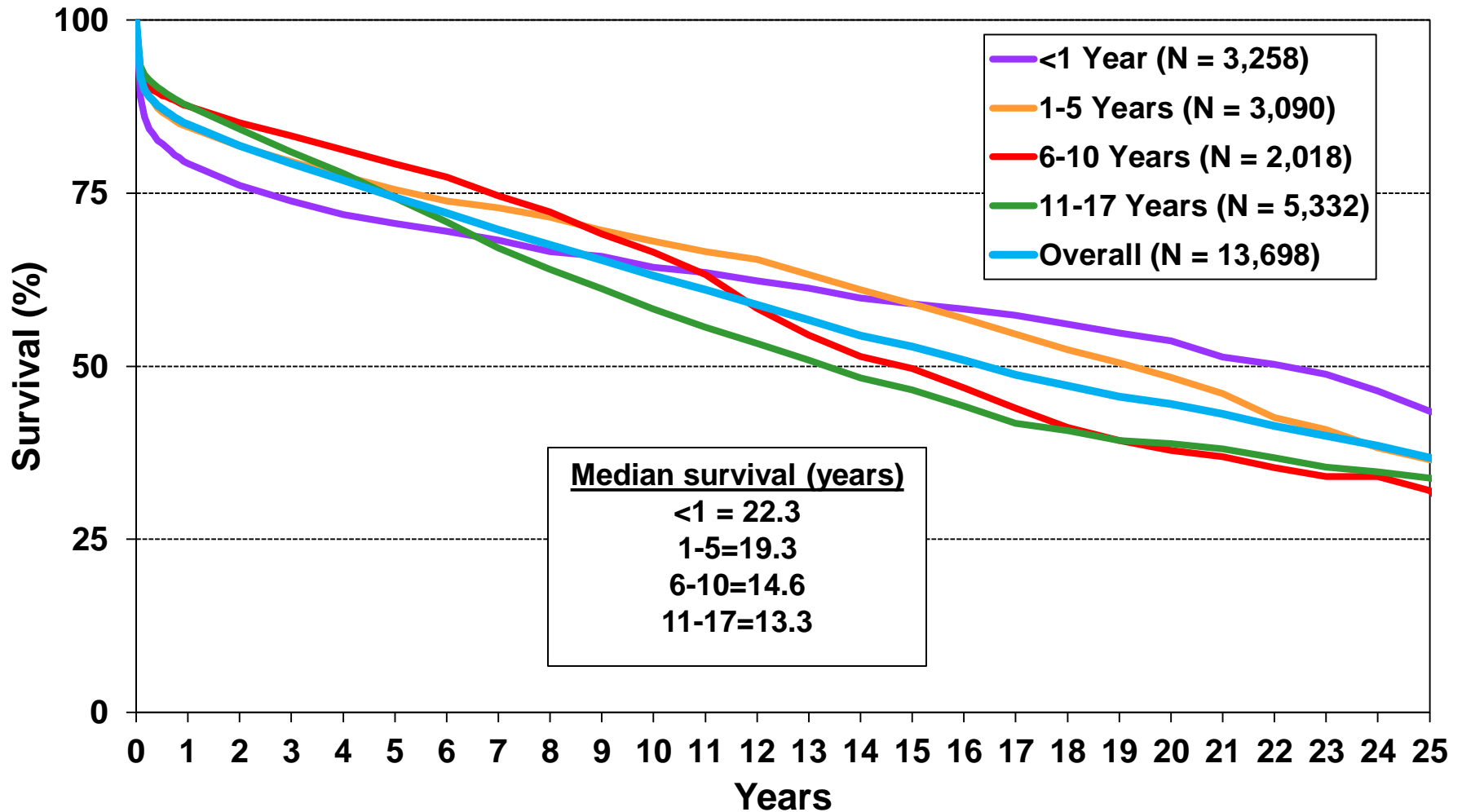
Life with a Heart Transplant

- Immunosuppression
 - 2-3 medications, once or twice daily
 - Regular blood work to monitor immunosuppression
- Complications
 - Infections
 - Cancers:
 - Post-transplant lymphoproliferative disease (PTLD)
 - Rejection
 - Cellular, Antibody-mediation,
 - Coronary allograft vasculopathy
 - Graft Failure

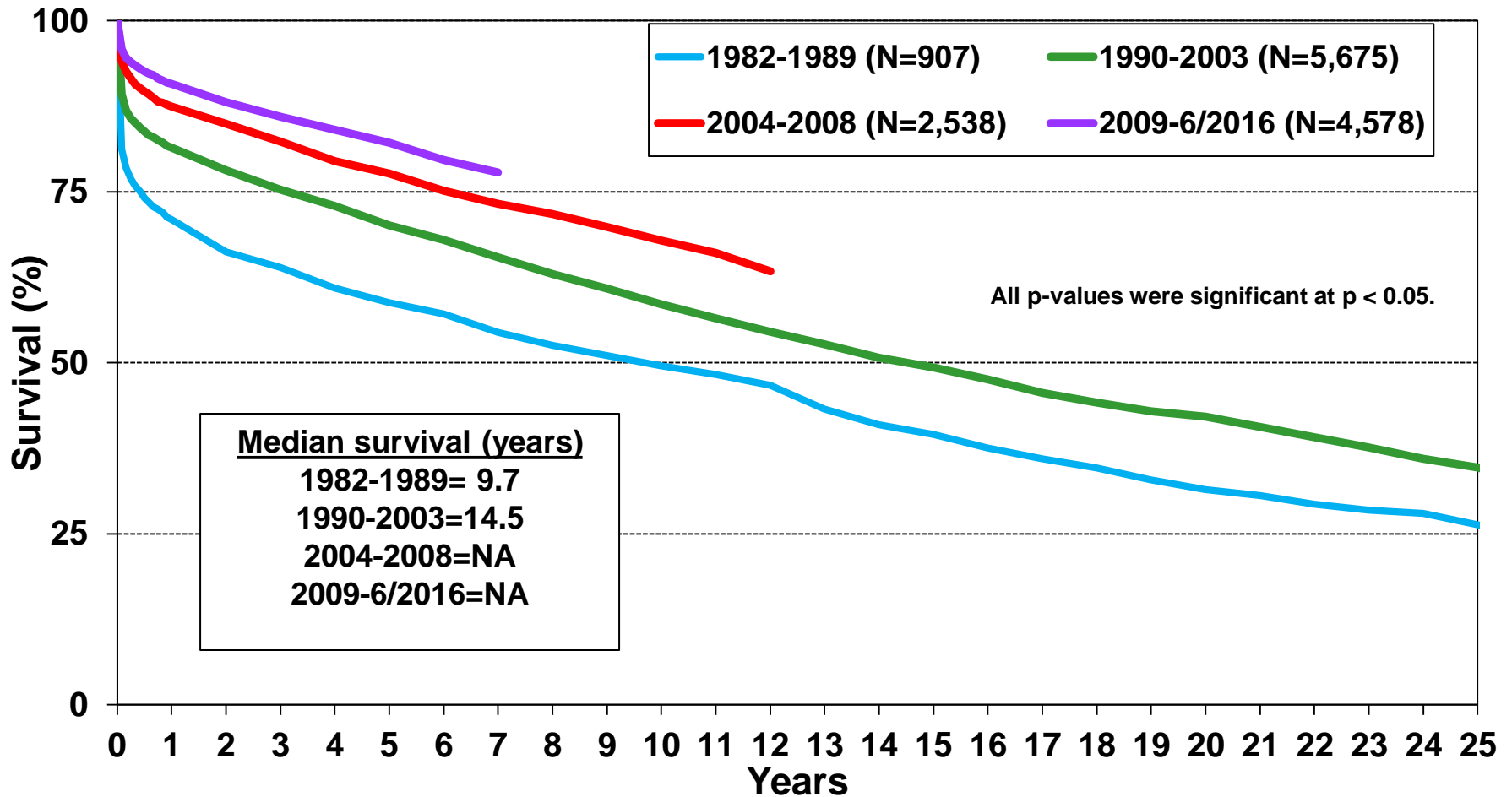


Pediatric Heart Transplants

Kaplan-Meier Survival (Transplants: January 1982 – June 2016)



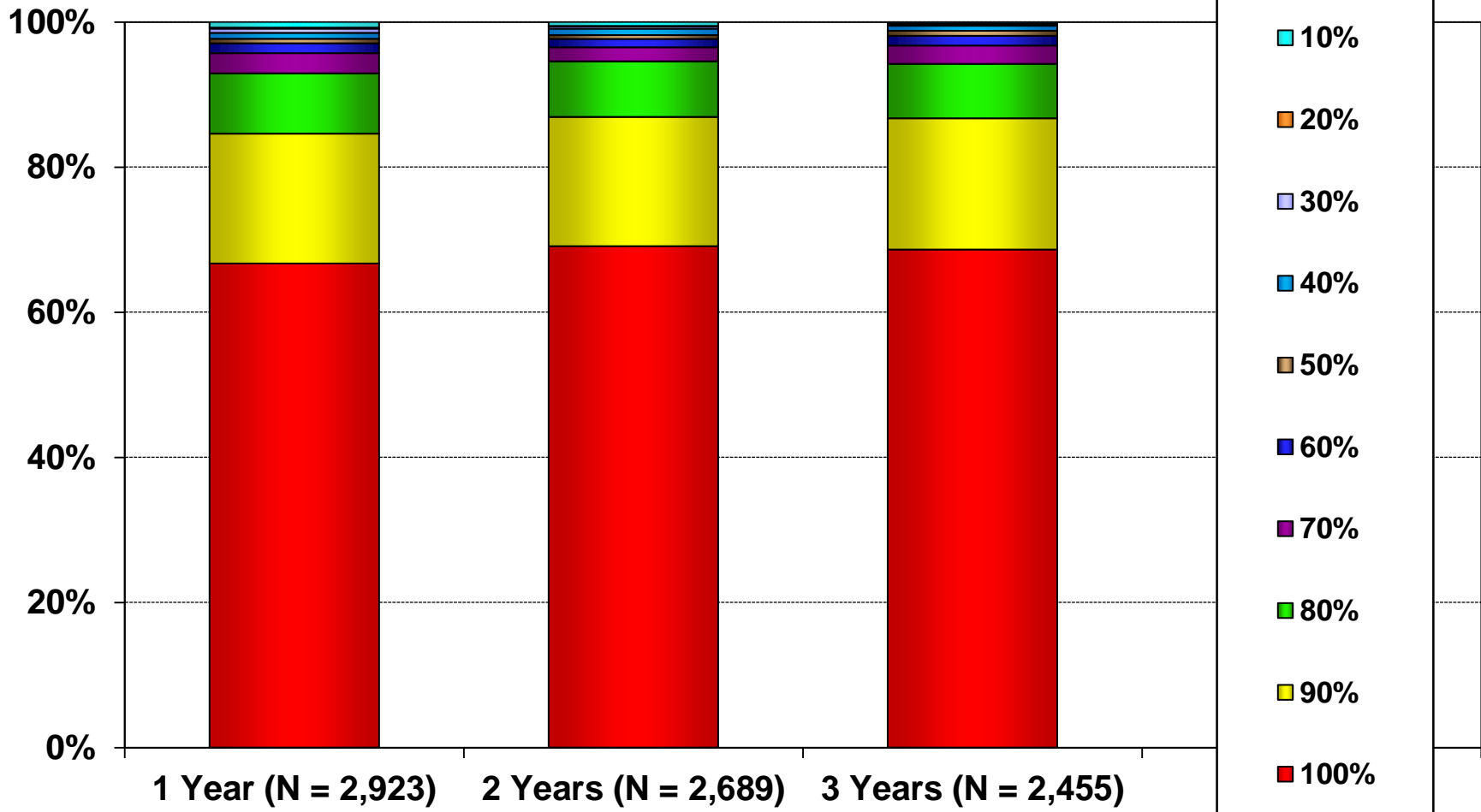
Pediatric Heart Transplants Kaplan-Meier Survival by Era (Transplants: January 1982 – June 2016)



Pediatric Heart Transplants

Functional Status of Surviving Recipients

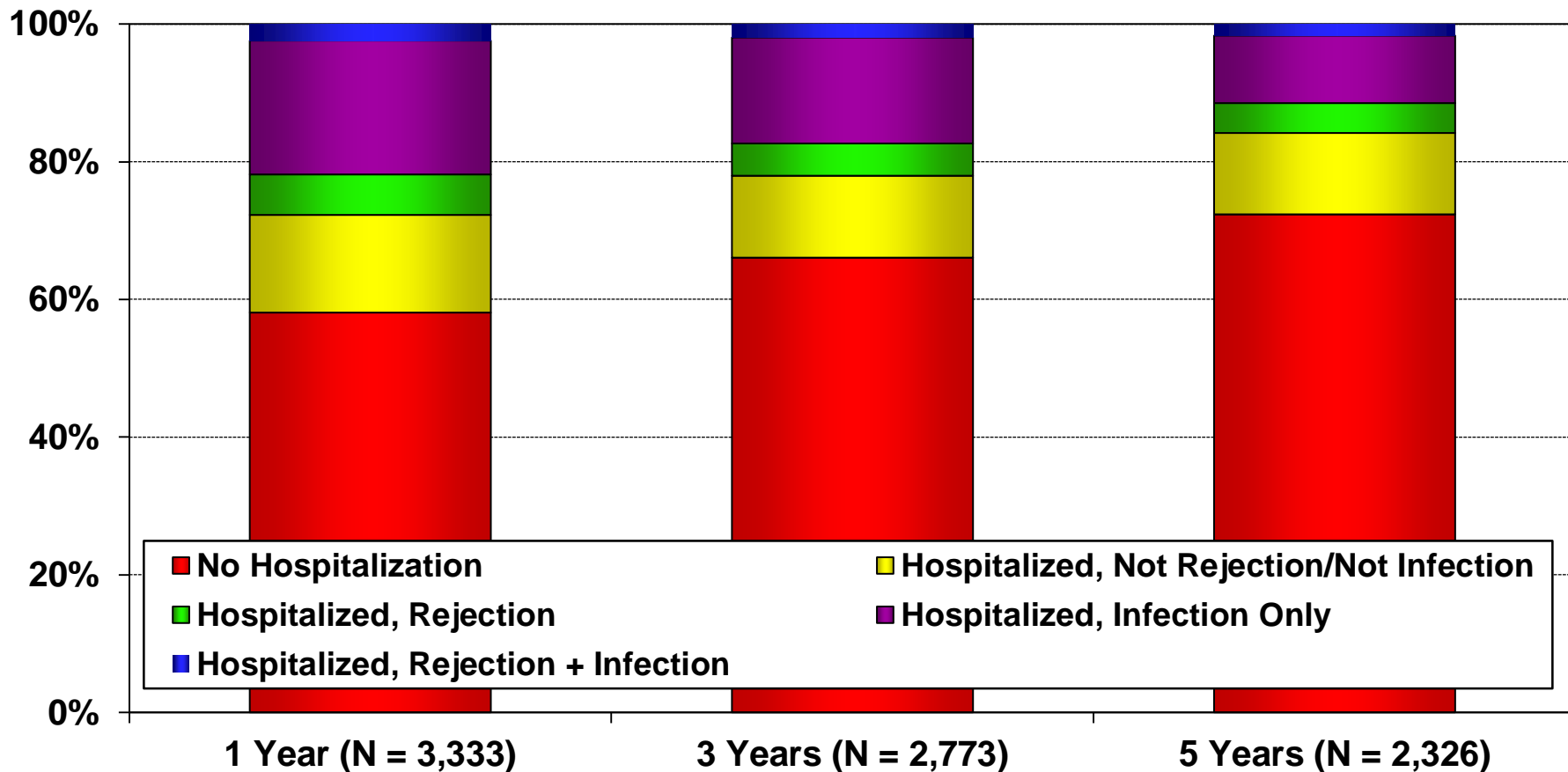
(Follow-ups: January 2009 – June 2017)



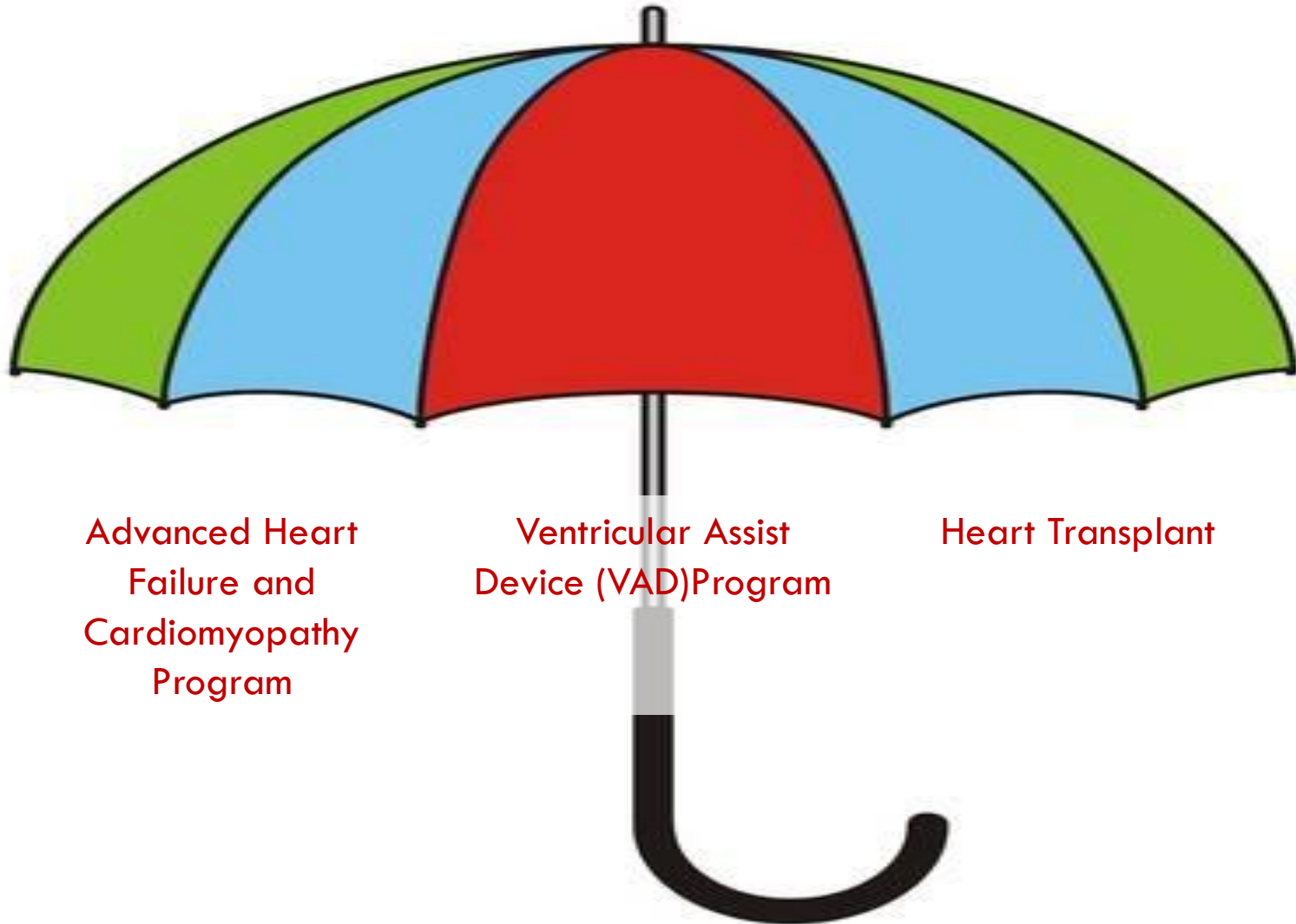
Pediatric Heart Transplants

Rehospitalization Post-transplant of Surviving Recipients

(Follow-ups: January 2009 – June 2017)



Advanced Cardiac Therapies Program



Advanced Heart
Failure and
Cardiomyopathy
Program

Ventricular Assist
Device (VAD) Program

Heart Transplant

