

# Critical Left Ventricular Outflow Tract Obstruction (LVOTO)

Fall Work Weekend  
Nov. 2013

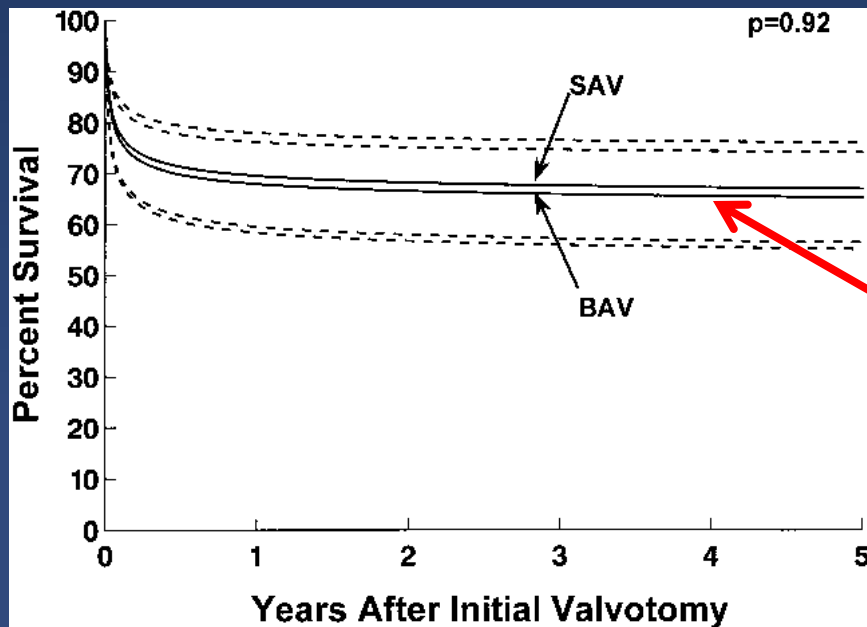
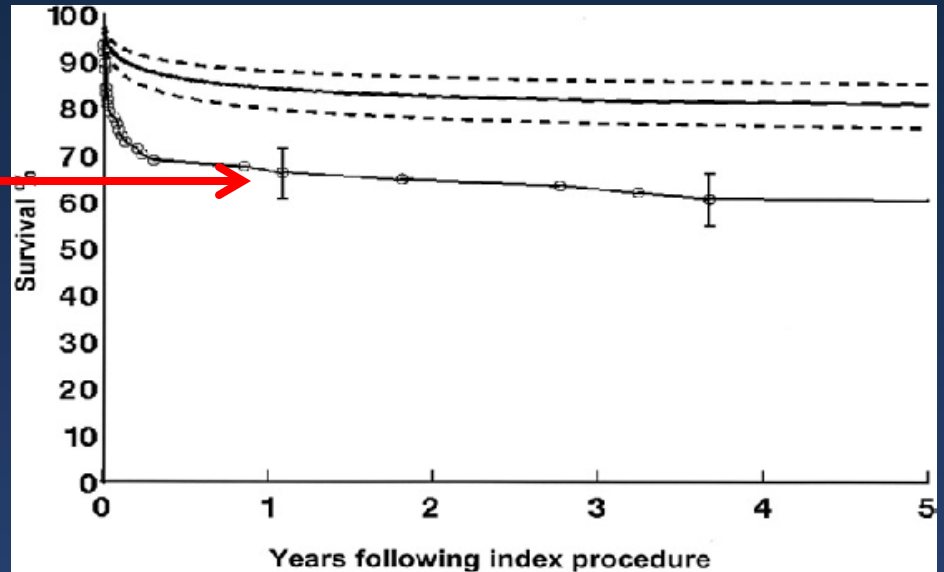


# Work Weekend Objectives

- General overview of cohort
- Generate feasible research question based on current data – Early question
- Develop long term questions of interest
- Focused chart review and data entry
  - Indication for initial Hybrid procedure

# Previous CHSS Work

**Discordant managed  
BVR patients**



**Survival SAV vs. BAV**

Hickey et al., McCrindle et al., Ashburn et al.

# Original Cohort Objectives

- Assess emerging management strategies
- Identify risk factors predictive of late outcomes
- Readjust the CHSS calculator

# Entry Criteria

- 2005- Present
  - Age < 30 days at admission to CHSS institution
  - AV & VA concordance
  - Ductal dependent systemic circulation
  - Excludes patients with AVSD

# General Profile

	<b>N</b>	<b>% Total</b>
<b>Enrollment</b>	<b>675</b>	<b>100</b>
<b>Initial procedure</b>	<b>665</b>	<b>99%</b>
<b>Total deaths</b>	<b>214</b>	<b>32%</b>
<b>Deaths after intervention</b>	<b>204</b>	<b>30%</b>
<b>Deaths prior to intervention</b>	<b>10</b>	<b>1%</b>

**435 (65%) have had at least one subsequent procedure**

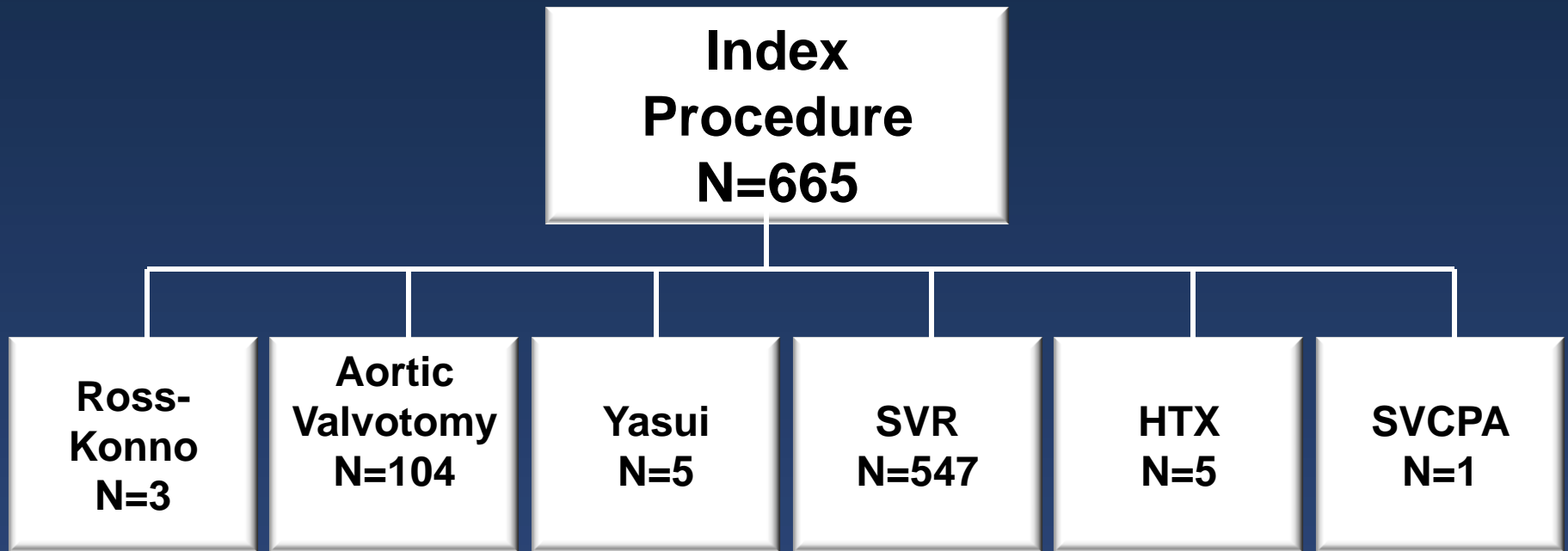
# Morphology Based on Baseline Echo

<b>Baseline echo morphology N=658</b>				
<b>Echos*</b>	<b>Yes</b>	<b>% yes</b>	<b>No</b>	<b>%No</b>
<b>Hypoplastic Left Ventricle **</b>	<b>512</b>	<b>78%</b>	<b>101</b>	
<b>Aortic Valve Stenosis</b>	<b>164</b>	<b>25%</b>	<b>404</b>	
<b>Aortic Valve Hypoplasia</b>	<b>66</b>	<b>10%</b>	<b>592</b>	
<b>Aortic Valve Atresia</b>	<b>314</b>	<b>48%</b>	<b>344</b>	
<b>Mitral Valve Stenosis</b>	<b>113</b>	<b>17%</b>	<b>70</b>	
<b>Mitral Valve Hypoplasia</b>	<b>196</b>	<b>30%</b>	<b>70</b>	
<b>Mitral Valve Atresia</b>	<b>222</b>	<b>34%</b>	<b>70</b>	
<b>Aortic Coarctation</b>	<b>182</b>	<b>28%</b>	<b>415</b>	
<b>Hypoplastic Aortic Arch</b>	<b>497</b>	<b>76%</b>	<b>100</b>	
<b>Interrupted Aortic Arch</b>	<b>15</b>	<b>2%</b>	<b>588</b>	

**\*17 patients w/out baseline echo**

**\*\*135 (21%) with severe/atretic LV**

# Index Procedure



**Deaths prior to intervention=10**



# Surgical Description

Code	Description	N
SANO	Stage 1 Pallation- Norwood-RV-PA shunt	
MBT	Stage 1 Pallation- Norwood-Systemic to PA shunt	
HYBR	Stage 1 Palliation- Hybrid	
HYBNR	Hybrid to Norwood Cross-over	
SVCPA	Stage 2 SVC-PA Anastomosis	
HYBSV	Stage 2-Hybrid Single V	
SVBVCO	Single V to Biventricular Cross Over	
FONTAN	Stage 3 Fontan	
HTX	Heart Transplant	
SVALV	Outflow tract and Arch Repairs	
YASUI	Yasui	
AVR	Aortic Valve replacement	

**AORTIC VALVOTOMY  
N=104**

**CATH  
N=73**

**SVALV  
N=31**

<b>SANO</b> 2	<b>MBT</b> 3	<b>SVALV</b> 4	<b>HYBR</b> 8	<b>HTX</b> 5	<b>AVR</b> 13	<b>ANFS</b> 34	<b>DIED</b> 4	<b>SVALV</b> 1	<b>MBT</b> 2	<b>HTX</b> 1	<b>AVR</b> 2	<b>ANFS</b> 21	<b>DIED</b> 4
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<b>DIED</b> 1	<b>ANFS</b> 1	<b>SVCPA</b> 1	<b>DIED</b> 1	<b>ANFS</b> 1	<b>ANFS</b> 3	<b>AVR</b> 1	<b>SVCPA</b> 1	<b>HYBSV</b> 4	<b>DIED</b> 2	<b>HTX</b> 1	<b>DIED</b> 1	<b>ANFS</b> 4	<b>DIED</b> 5	<b>ANFS</b> 8	<b>ANFS</b> 1	<b>DIED</b> 1	<b>ANFS</b> 1	<b>ANFS</b> 1	<b>AVR</b> 2	<b>ANFS</b> 1
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<b>FONT</b> 1	<b>ANFS</b> 1	<b>ANFS</b> 1	<b>HYBV</b> 1	<b>ANFS</b> 2	<b>FONT</b> 1	<b>ANFS</b> 1
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<b>DIED</b> 1	<b>ANFS</b> 1
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<b>ANFS</b> 1
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**Dead = 20 (3%)**

Norwood  
N=440

SANO  
N=217

MBT  
223

SVCPA 152  
YASUI 4  
HYBV 1  
HTX 3  
FONT 1  
ANFS 17  
DIED 39

SVCPA 143  
SVAL 1  
HTX 6  
FONT 1  
ANFS 9  
DIED 63

SVCPA 1  
SVAL 1  
HTX 9  
FONT 78  
DIED 11  
ANFS 52  
ANFS 4  
ANFS 1  
ANFS 2  
ANFS 2

HYBV 1  
HTX 2  
FONT 70  
DIED 18  
ANFS 52  
ANFS 1  
DIED 2  
ANFS 2  
ANFS 2

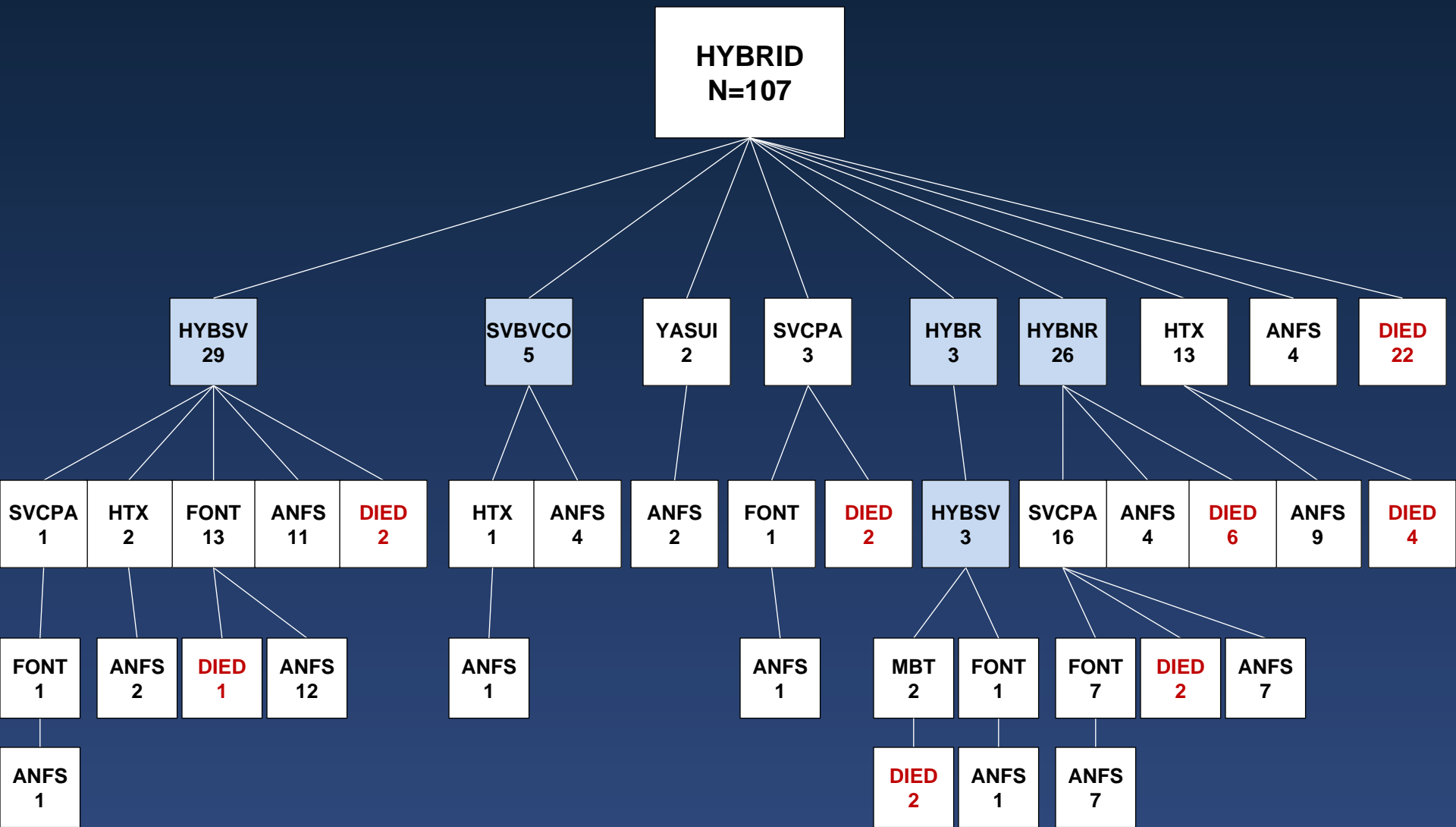
FONT 1  
FONT 1  
DIED 1  
ANFS 8  
DIED 6  
ANFS 71  
HTX 1

ANFS 1  
ANFS 2  
DIED 1  
ANFS 67

ANFS 1  
ANFS 1

ANFS 1

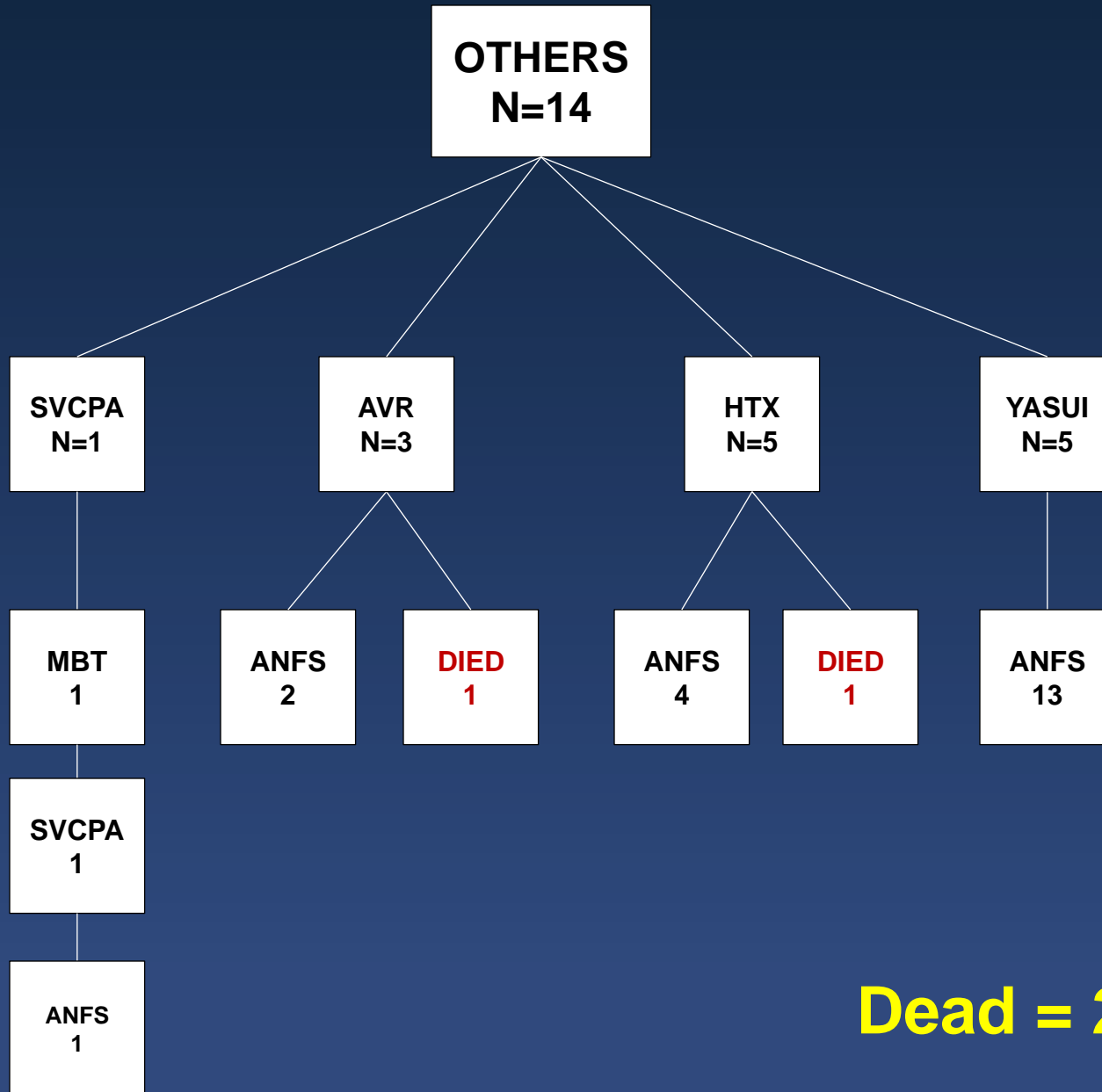
**MBT Dead = 84 (12%)**  
**SANO Dead = 57 (8%)**



**Dead = 41 (6%)**

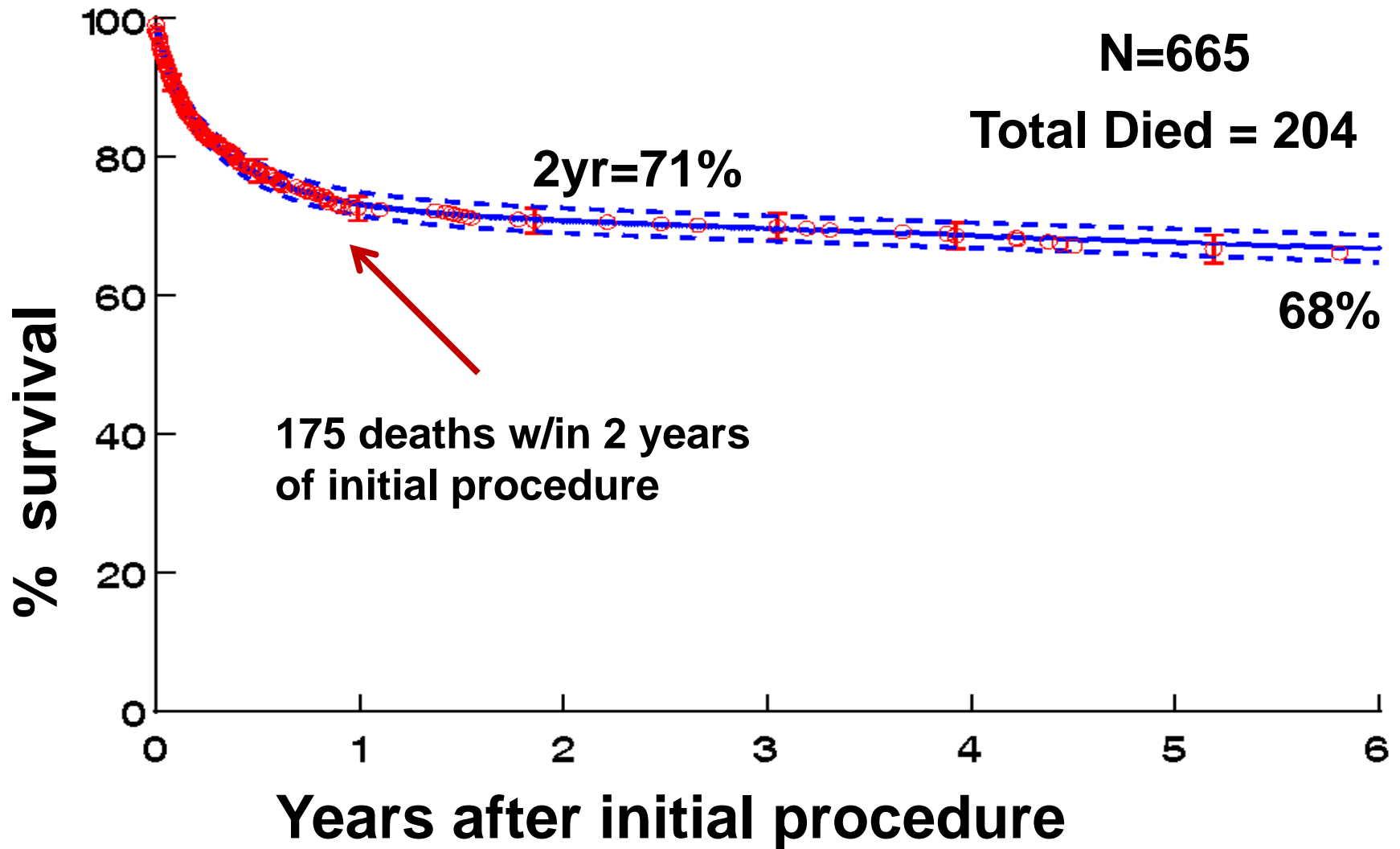
# Initial Hybrid Procedure

- N=107
  - 37 = Bilateral PA band alone
  - 67 = Ductal stent + Bilateral PA band
  - 3 = Ductal stent alone
- 5 SVBVC, 2 Yasui
- 26 with subsequent Norwood procedure
  - 10 RV-PA shunts
  - 8 MBT shunts
  - 8 Unknown

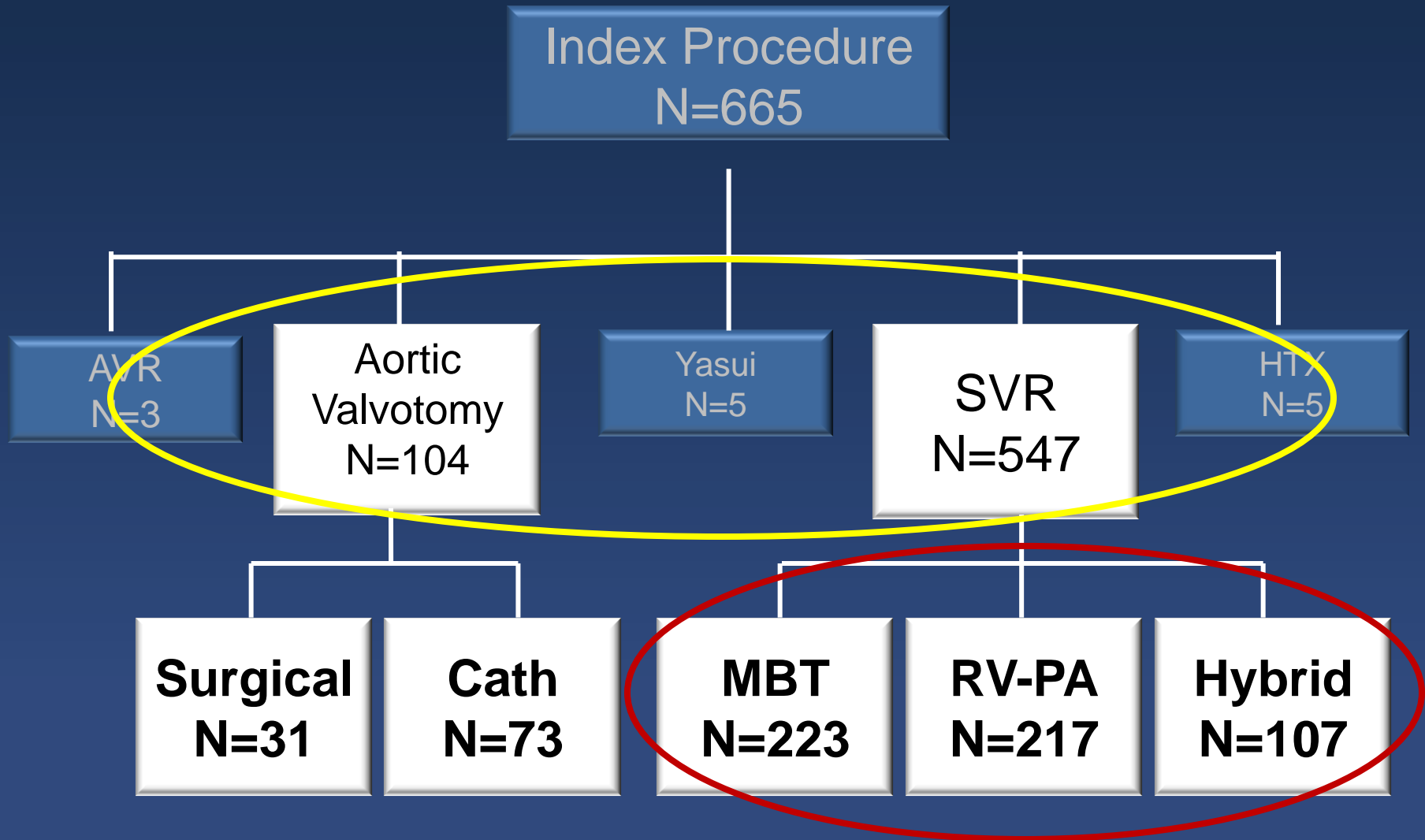


**Dead = 2 (%)**

# Survival After Initial Procedure

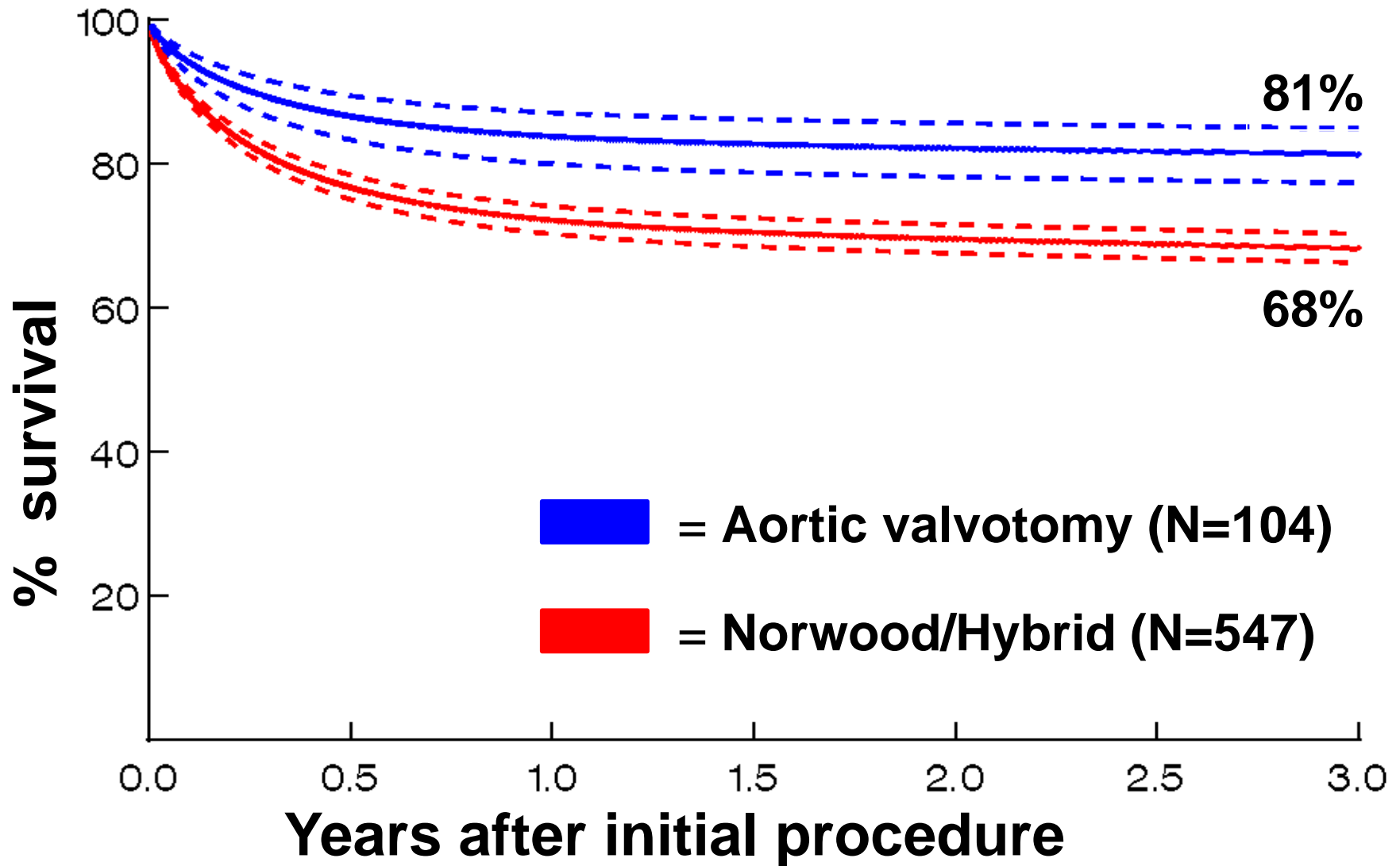


# Unadjusted Comparison: Based on Index Procedure

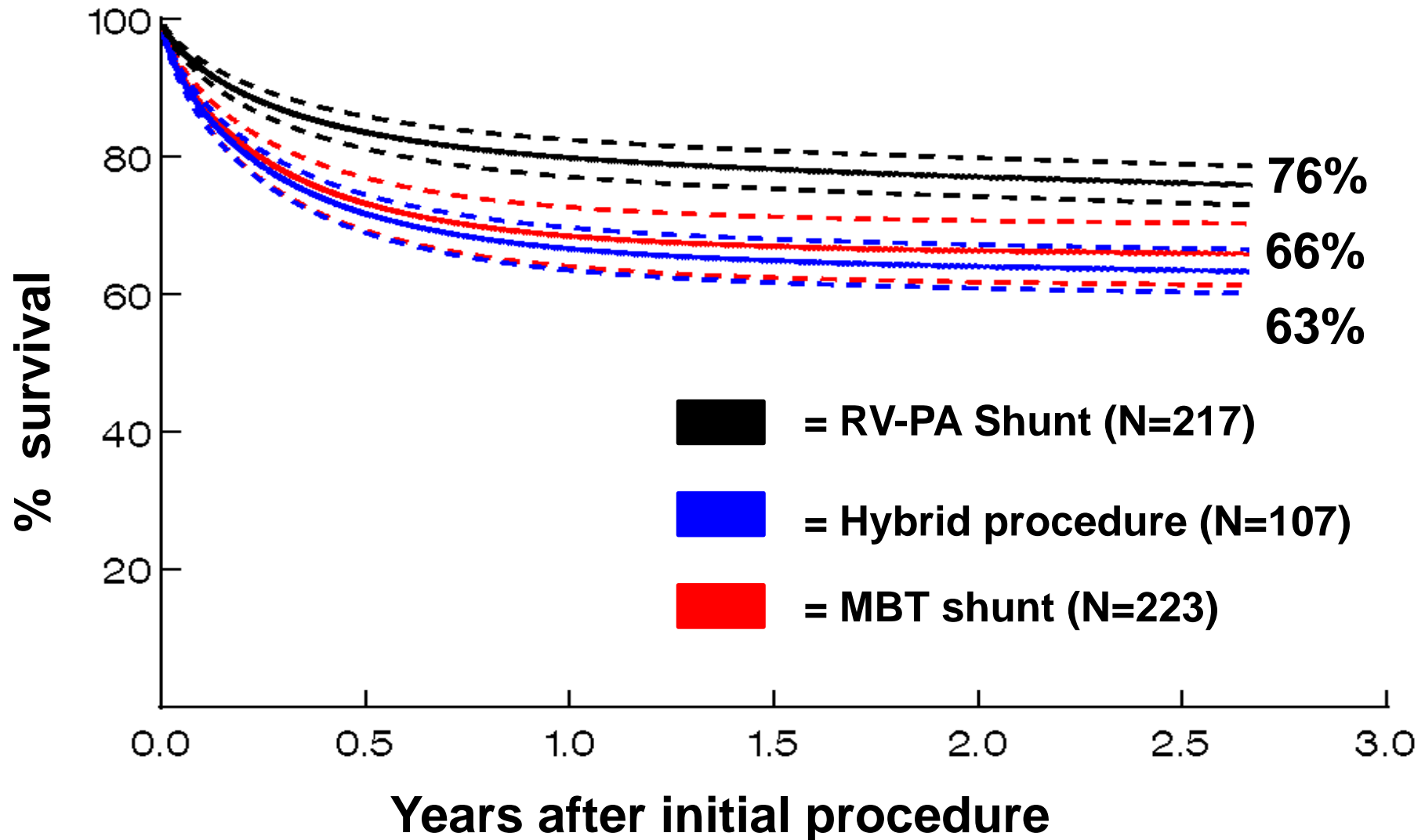




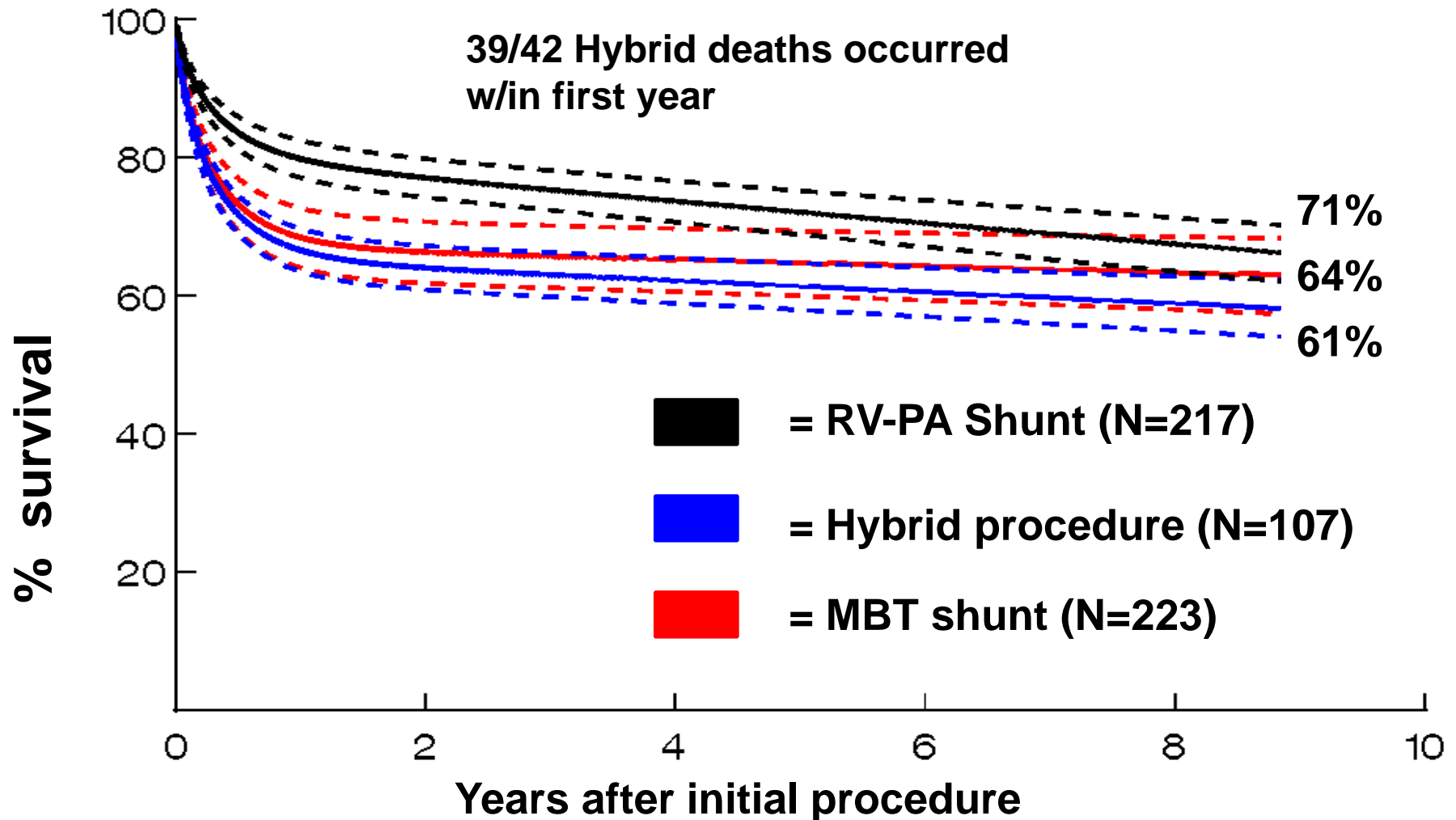
# Survival: Aortic Valvotomy vs. SVR



# Survival after SVR: 3 years



# Survival after SVR: 6 years



# Moving Forward

- Define succinct research question
  - Baseline data entry is complete (demographic, 1<sup>st</sup>, 2<sup>nd</sup> procedures, baseline echo)
- Allocate resources for focused data entry
- Chart Review: Indications for Hybrid
  - Norwood Alternative
  - 1V-2V decision deferral
  - Salvage
  - Pre-transplant palliation

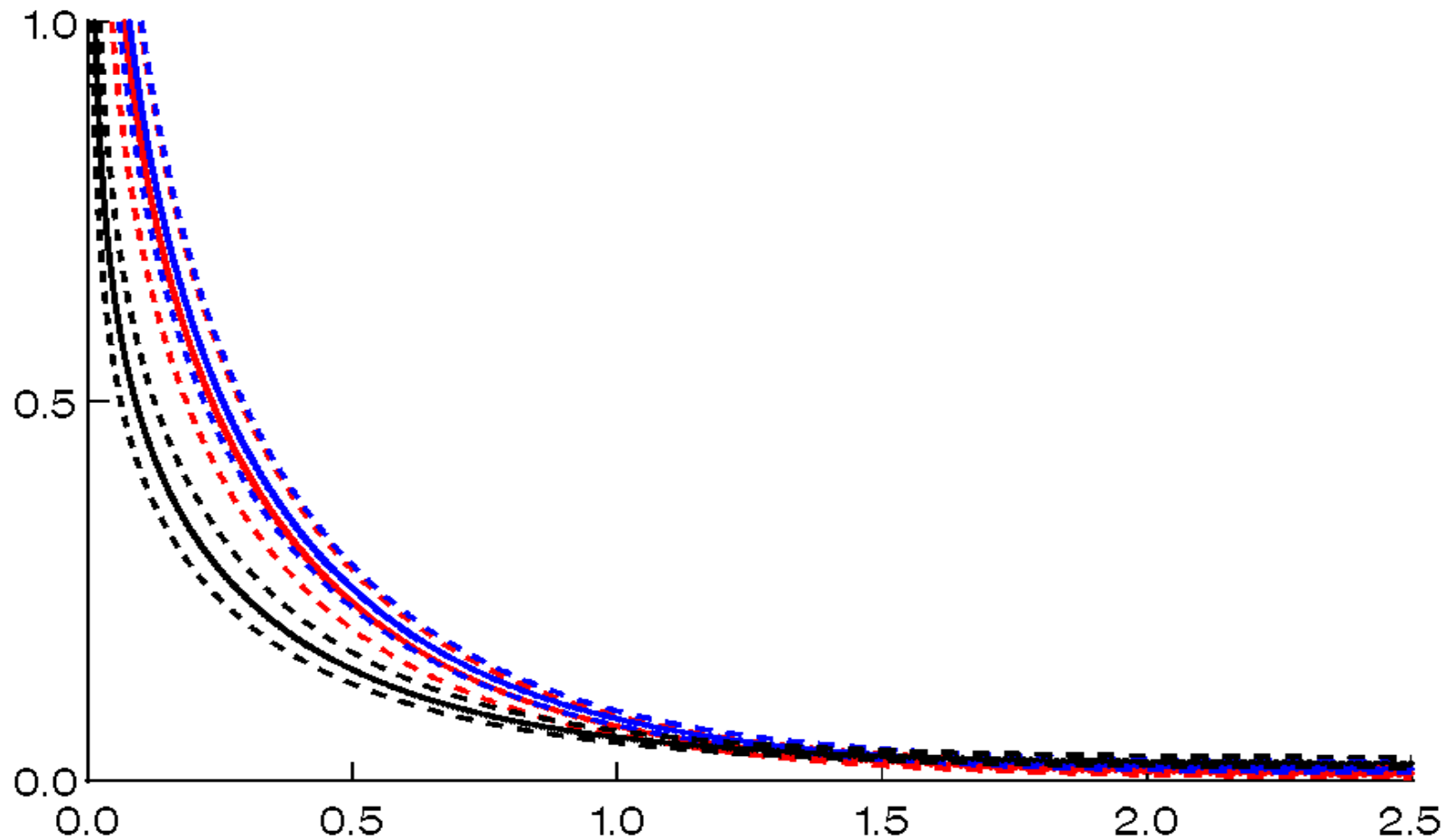




# Potential Questions

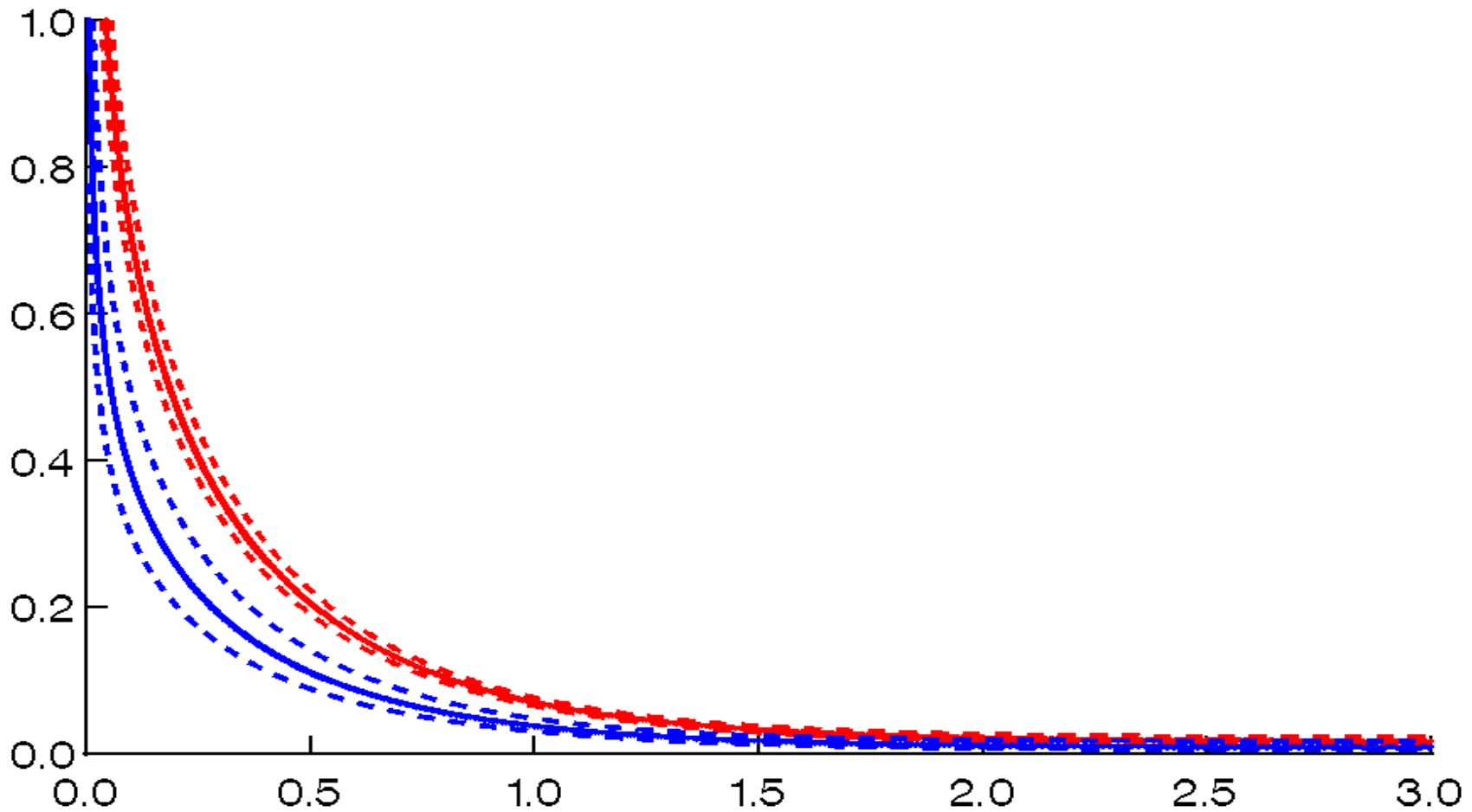
- What are early risk factors for survival after hybrid?
  - What is driving selection of this population?
- What are the differences among 3 subsets of stage I single ventricular repair?
- Should the aortic stenosis calculator be re-evaluated?

# Hazard: Sano, MBT, Hybrid

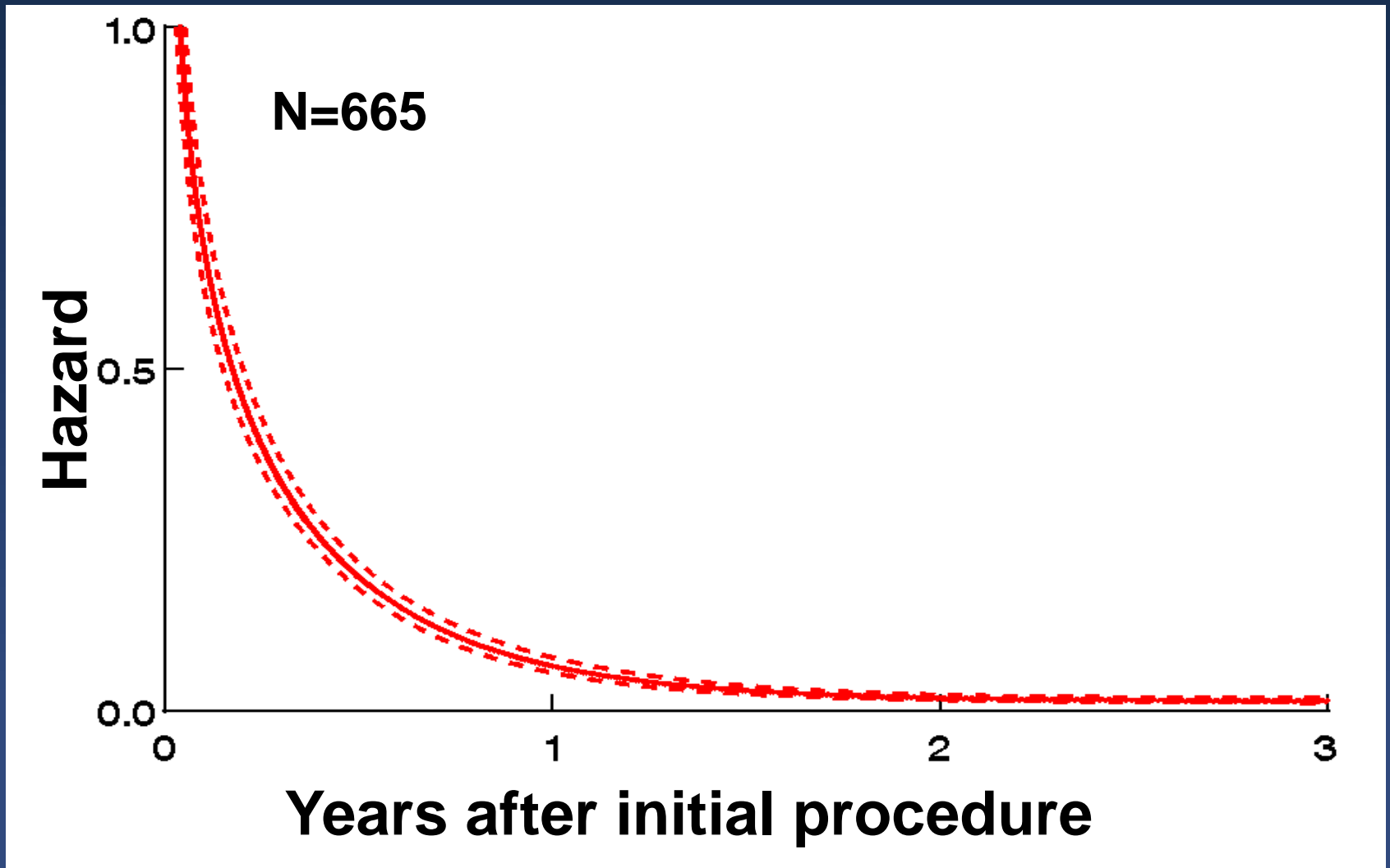




# HAZARD: SVR BVR



# Hazard for death after initial procedure



# Background

- Wide spectrum of morphology
- Evolving surgical techniques
  - New tools at our disposal
- Individualized management strategies not well defined

# Gaps in Knowledge

- Optimal management
  - Single ventricular repair
  - Biventricular repair
- Borderline population
- Late outcomes

# General Profile

- 675 patients
- 665 index procedures
- Initial procedure
  - 82% represent single ventricular repair
  - 15% represent biventricular repair