Aortic Stenosis

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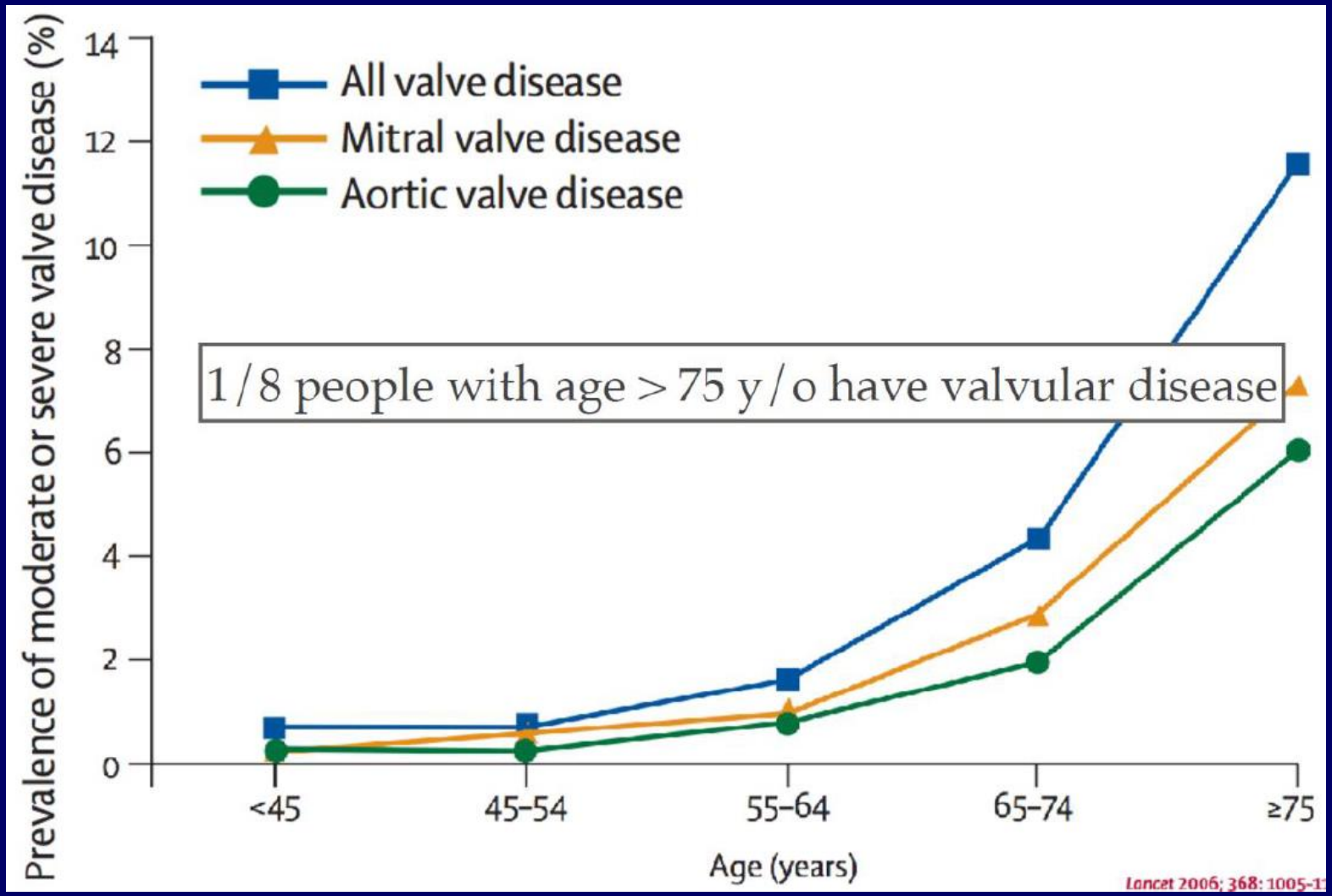
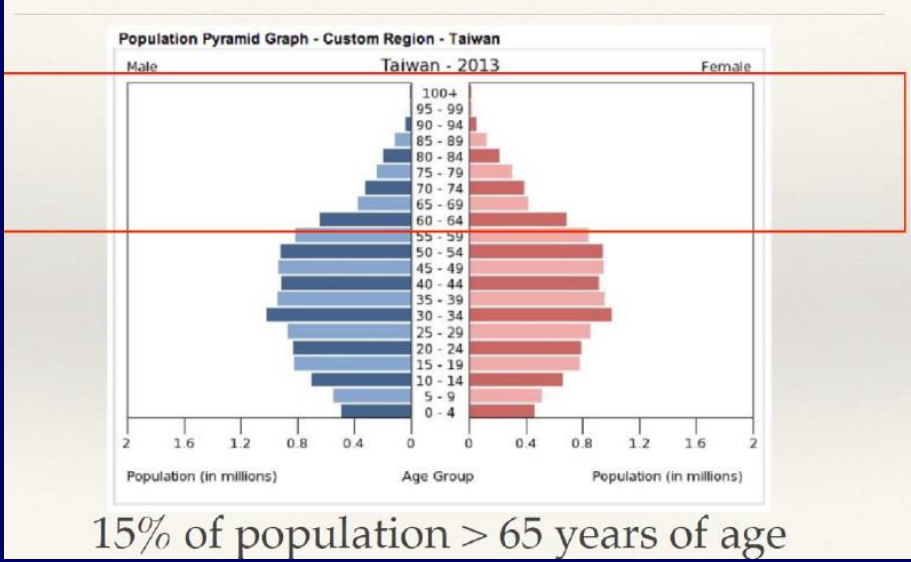
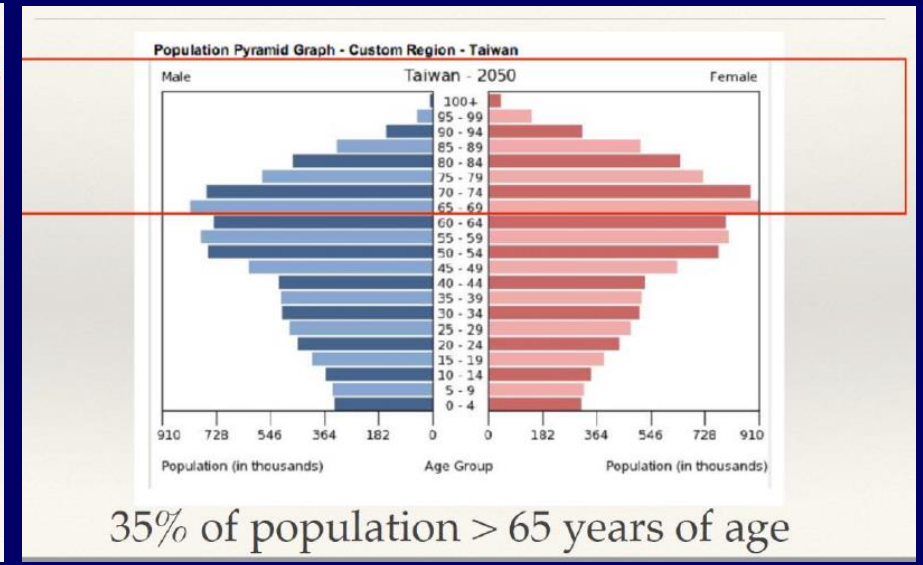
HK Core Cardiology Certificate Course 2019


All valve disease
Mitral valve disease
Aortic valve disease
1/8 people with age > 75 y/o have valvular disease
Prevalence of moderate or severe valve disease (%)
0
2
4
6
8
10
12
14
<45
45–54
55–64
65–74
≥75
Age (years)
Lancet 2006; 368: 1005-1

Change of Population Pyramid in Taiwan



15% of population > 65 years of age

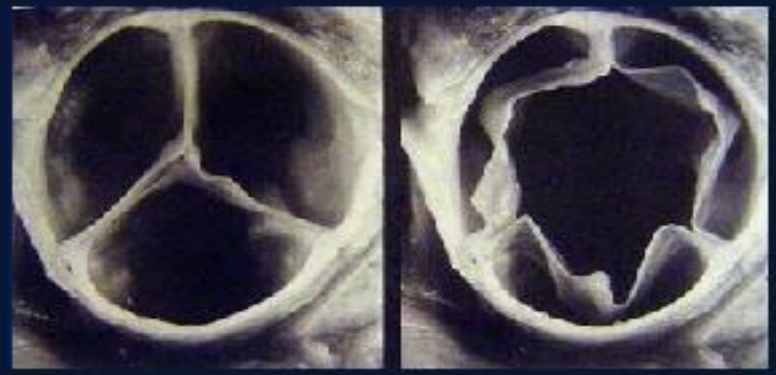


35% of population > 65 years of age

Introduction

- Aortic Stenosis - common valvular heart disease in the elderly
- 4.6% in adults ≧75 years of age
- Once symptomatic, average survival 2-3 years with high risk of sudden death
- TAVI (Transcatheter Aortic Valve Implantation) or TAVR (Transcatheter AV Replacement) has emerged as a viable alternative in inoperable or high risk elderly patients with symptomatic AS
- ~5% immediate complications
- 30-day mortality of ~5%
- Reduces all-cause mortality by 27% at 3 years

Aortic Stenosis Pathology



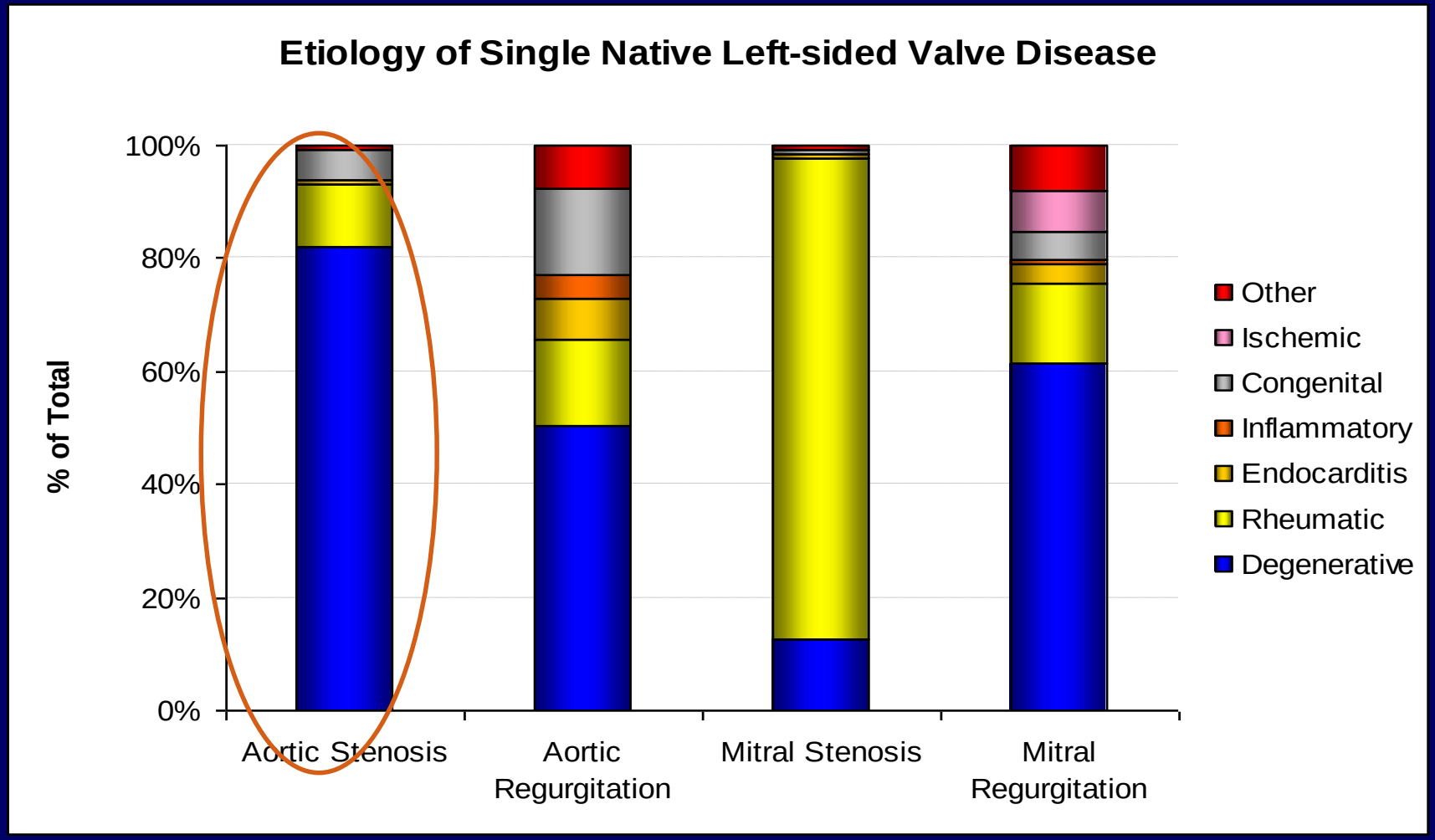
Normal

Degenerative calcified

Bicuspid

Rheumatic

Etiology



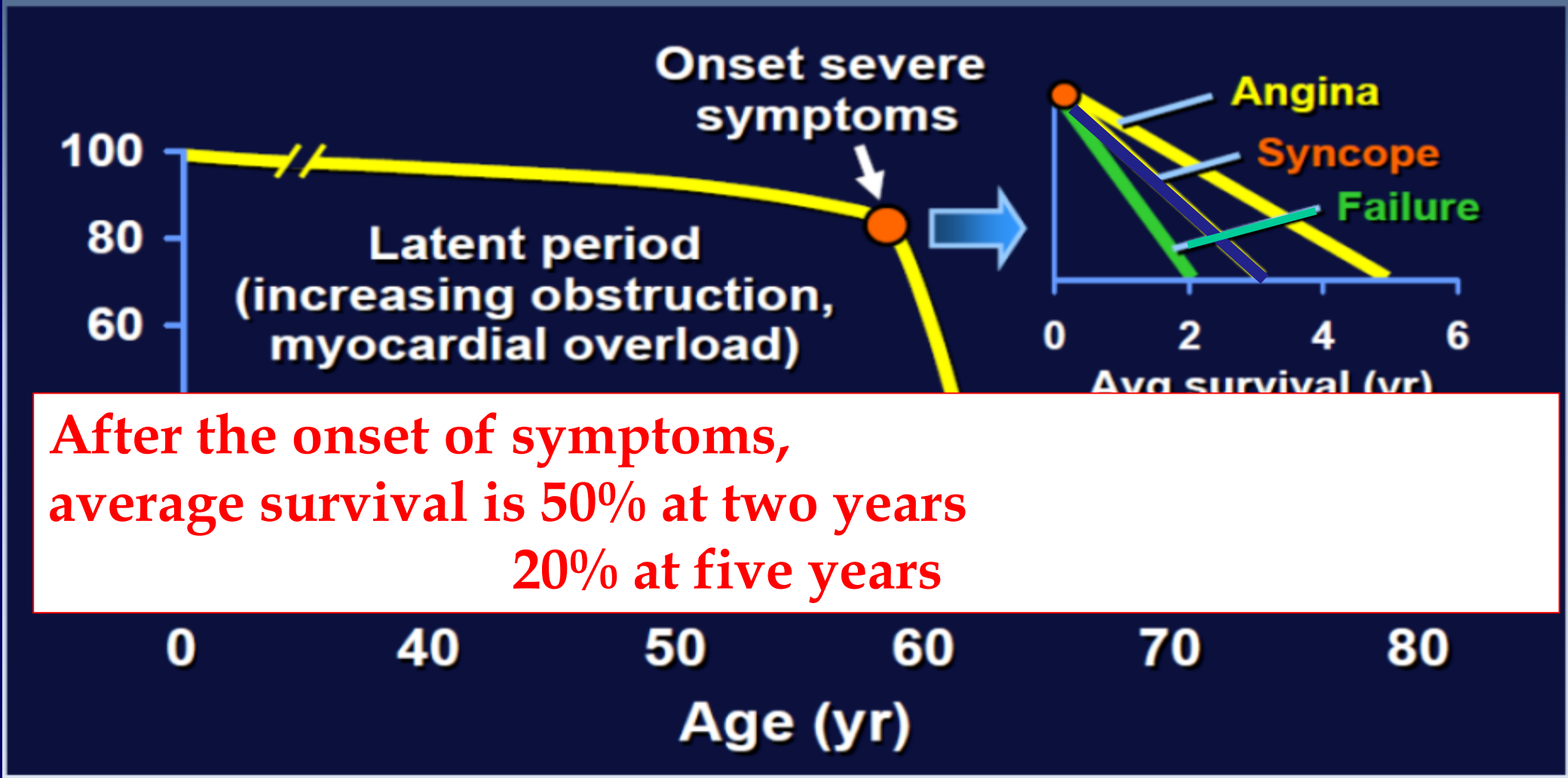
Messika-Zeitoun D.. *Eur Heart J* 2003;24:1244-1253.

Aortic stenosis severity

Indicator	Mild	Moderate	Severe
Jet Velocity *(m/s)*	< 3.0	3.0 – 4.0	> 4.0
Mean Gradient *(mmHg)*	< 25	25 – 40	> 40
Valve Area *(cm^2)*	> 1.5	1.0 – 1.5	< 1.0
Valve Area Index *(cm^2/m^2)*	–	–	< 0.6

Bonow RO. ACC/AHA 2006 Guidelines for the Management of Patients with Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association on Practice Guidelines. *Circulation* 2006;114:e84-e231.

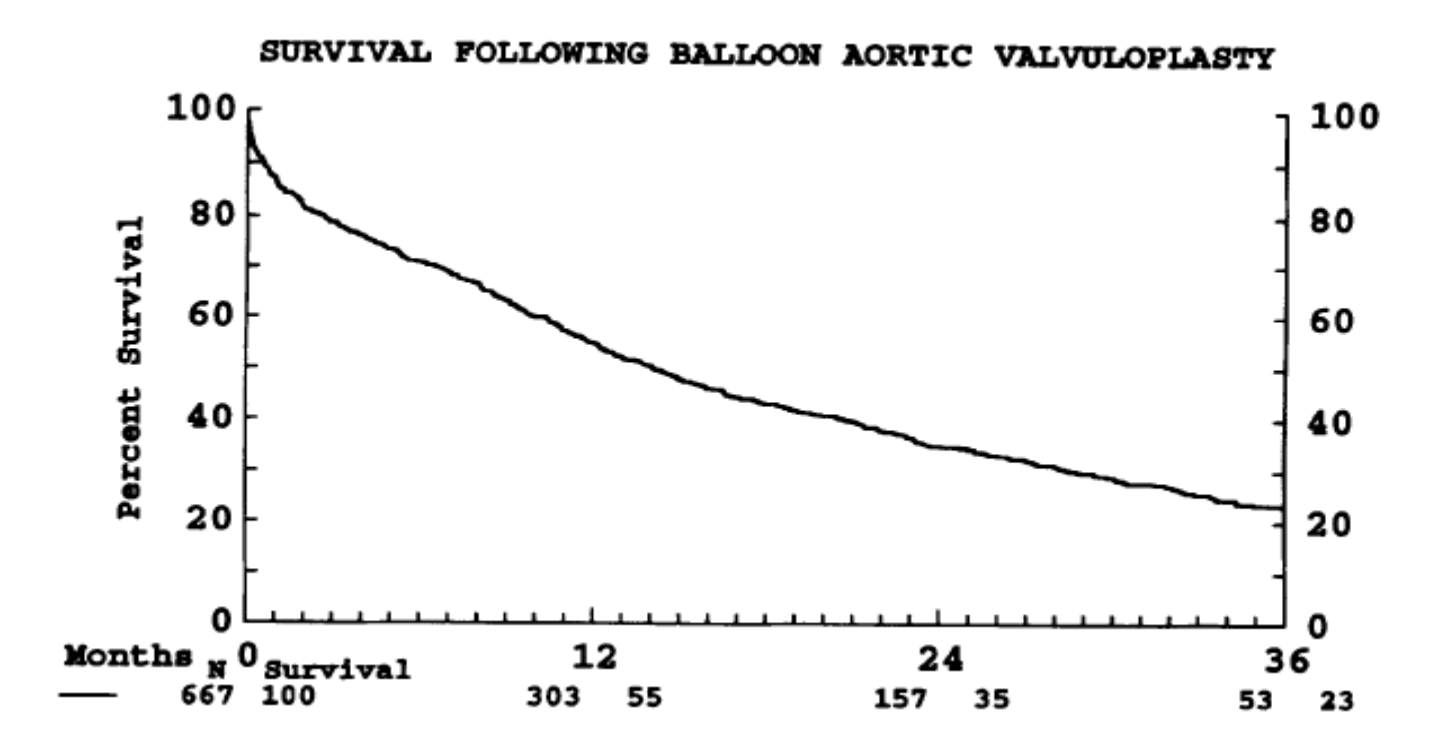
Natural History – Aortic Stenosis



After the onset of symptoms,
average survival is 50% at two years
20% at five years

Ross J Jr. and Braunwald E: Circ 38 (Suppl 5)61,1968

Balloon Aortic Valvuloplasty

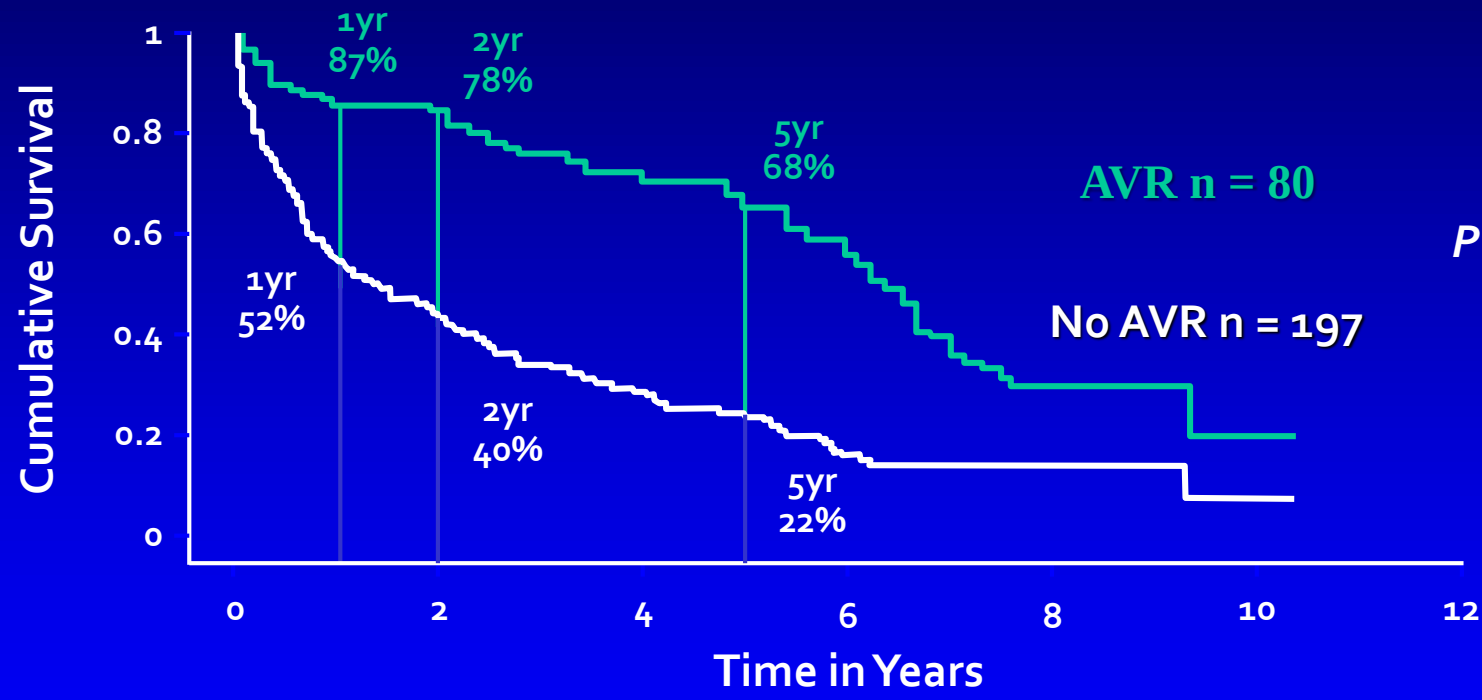


- *Overall survival was 55% at 1 year, 35% at 2 years, and 23% at 3 years, with the majority of deaths (70%) classified as cardiac*
- *Rehospitalization was common (64%), although 61% of survivors at 2 years reported improved symptoms.*

Circulation. 1994;89:642-650.

Severe AS Patients Not Undergoing AVR Have a Shorter Life Expectancy Than Those Receiving AVR

Survival of patients with severe AS with and without AVR



P < 0.0001

Number at risk												
	80	63	54	41	33	26	16	8	4	3	2	AVR group
	197	97	67	48	37	29	17	9	6	4	1	No AVR group

1. Varadarajan P, Kapoor N, Bansal RC, Pai RG. Survival in elderly patients with severe aortic stenosis is dramatically improved by aortic valve replacement: results from a cohort of 277 patients aged ≥ 80 years. *Euro J Cardiothorac Surg*. 2006;30:722-727.

ESC guidelines: Class I indications for SAVR

- Patients with severe AS and symptoms
- Patients with severe AS undergoing cardiac surgery
- Asymptomatic patients with severe AS and systolic left ventricular dysfunction
- Asymptomatic patients with severe AS showing symptoms on exercise

Vahanian A. *Eur Heart J* 2007;28:230-268.

European Heart Journal (2003) **24**, 1231–1243

ELSEVIER

EUROPEAN SOCIETY OF CARDIOLOGY

A prospective survey of patients with valvular heart disease in Europe: The Euro Heart Survey on Valvular Heart Disease

32% of patients with severe
heart valve disease is not operated

Transcatheter Aortic Valve Implantation/Replacement (TAVI/TAVR)

(導管主動脈瓣植入術)

1st TAVI done in 2002

CoreValve® Transcatheter Procedure

Balloon catheter threaded through sheath and into heart

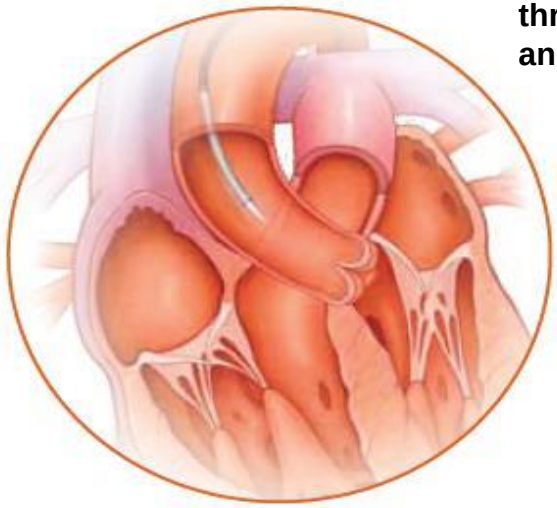


Figure 1

CoreValve placed into position over the diseased aortic valve

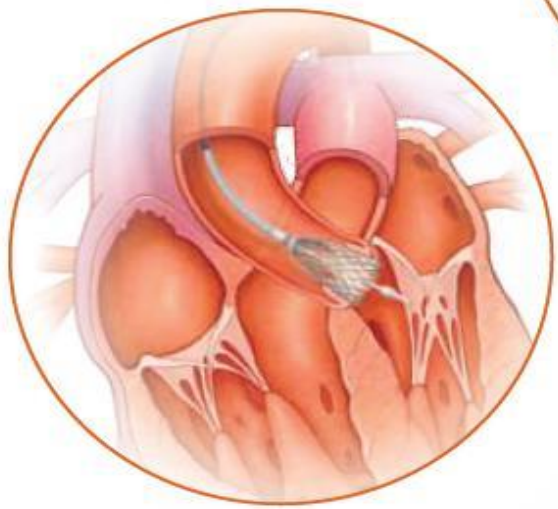


Figure 2

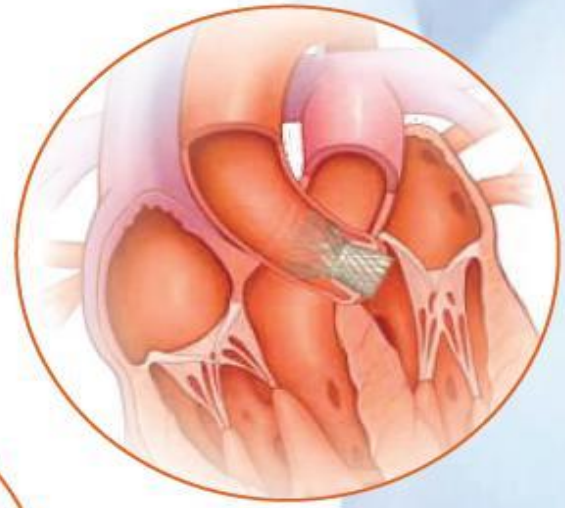


Figure 3

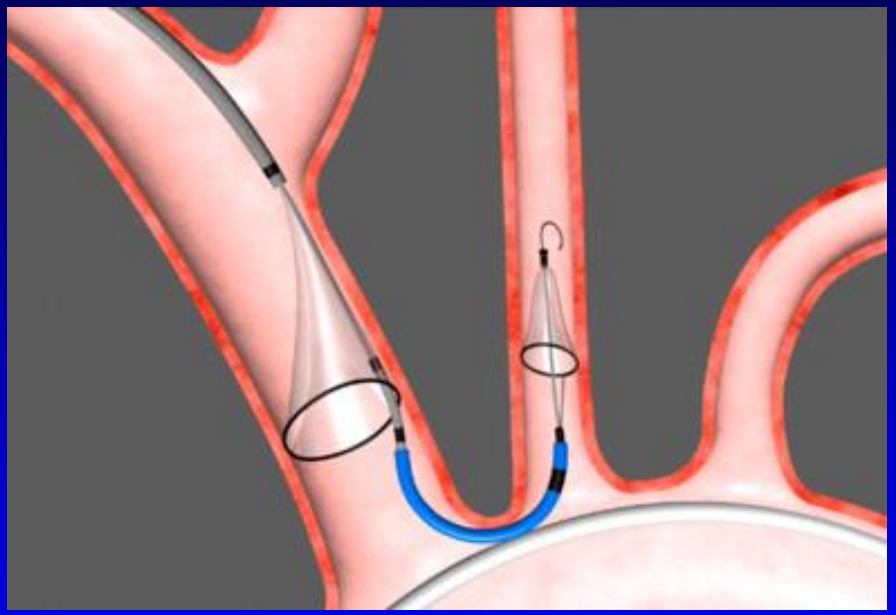
CoreValve in place, procedure completed

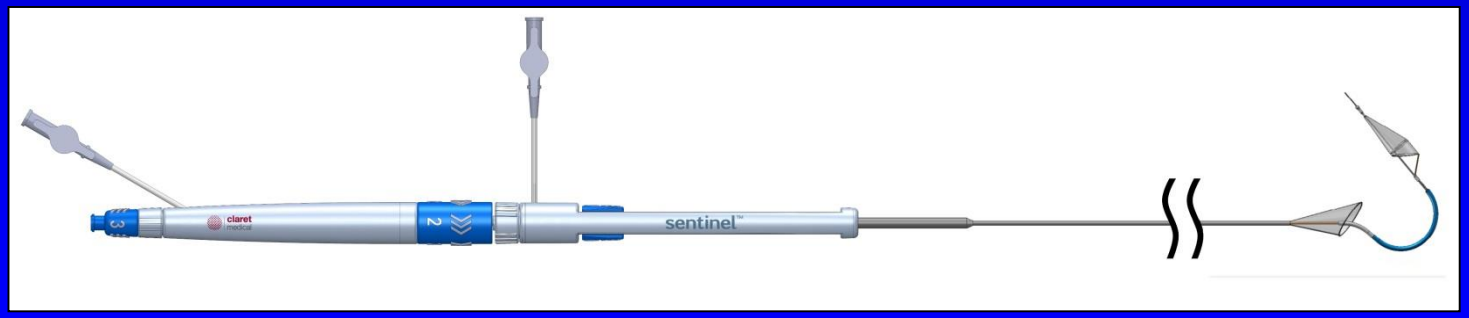
Experimental Device in the United States and Limited by Federal Law to Investigational Use.

Acute Complications of TAVI

- Early Mortality
- Vascular complication
- Para-valvular leakage
- Pacemaker
- Stroke

Claret Sentinel Cerebral Protection Device
First use of the device in Asia Pacific (27.9.2016)





Claret Sentinel Cerebral Protection Device
First use of the device in Asia Pacific (27.9.2016)

New Achilles Heel of TAVI

- Early Mortality
- Vascular complication
- Para-valvular leakage
- Pacemaker
- Stroke

- Access to future coronary intervention
- Thrombosis
- Durability
- Bicuspid AV

Current Guideline for TAVI

Class I:

- Heart Team Required
- On-Site Cardiac Surgery
- Patients Not Suitable for AVR (PARTNER B / CoreValve US Extreme Risk)

Class IIa:

- High-Risk Operable as an Alternative to Surgery
- Determined by Heart Team and Case-Based Discussion (PARTNER A / CoreValve US High-Risk)

Evolution of Therapy for AS in the Elderly

How would you treat an 82 year old diabetic female with aortic stenosis?

2001

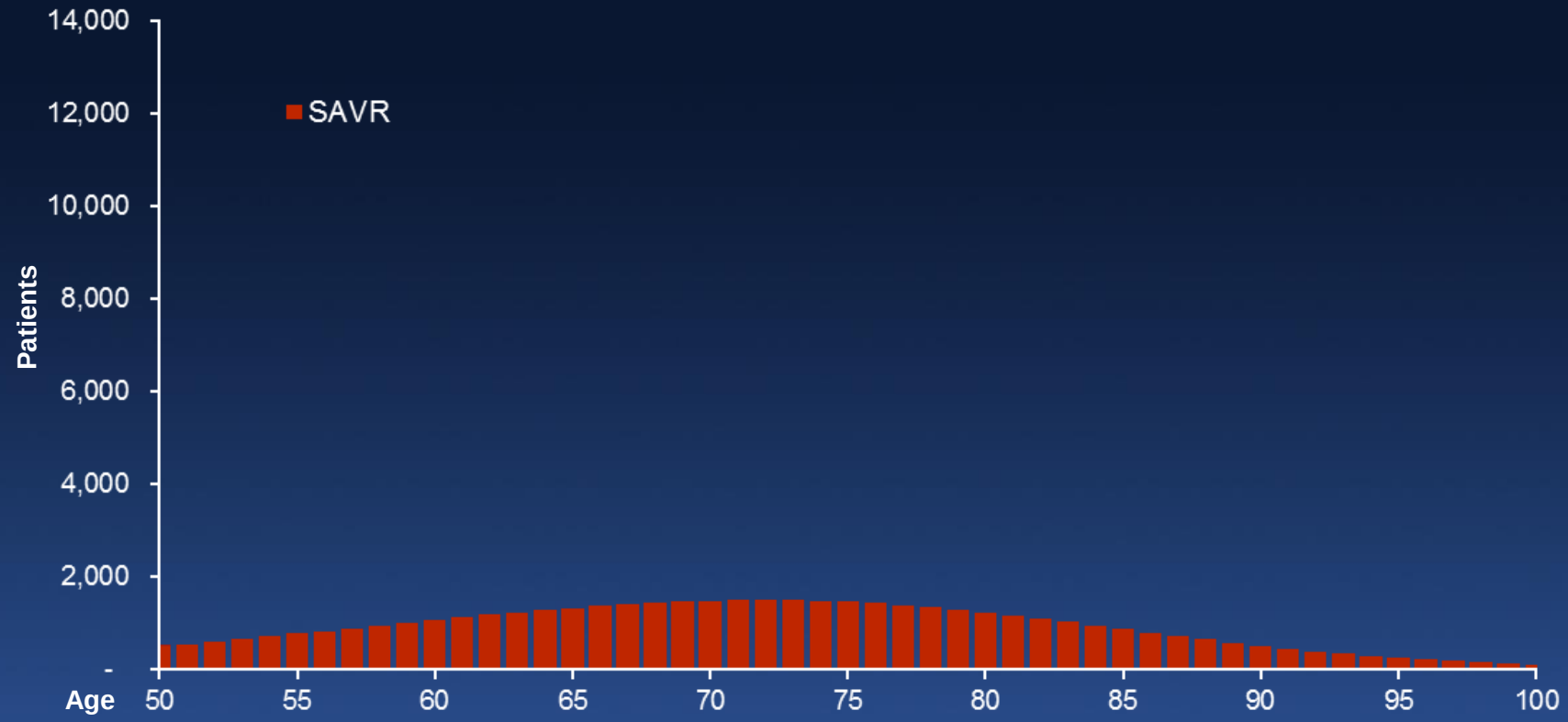
- Surgical AVR (30% of patients were refused in the Euroheart Survery)
- Balloon Valvuloplasty
- Medical treatment

2018

- Surgical AVR OR
- Transcatheter Aortic Valve implantation
- Medical treatment

Historically, Our Understanding of Aortic Stenosis was Based on Surgical Experience

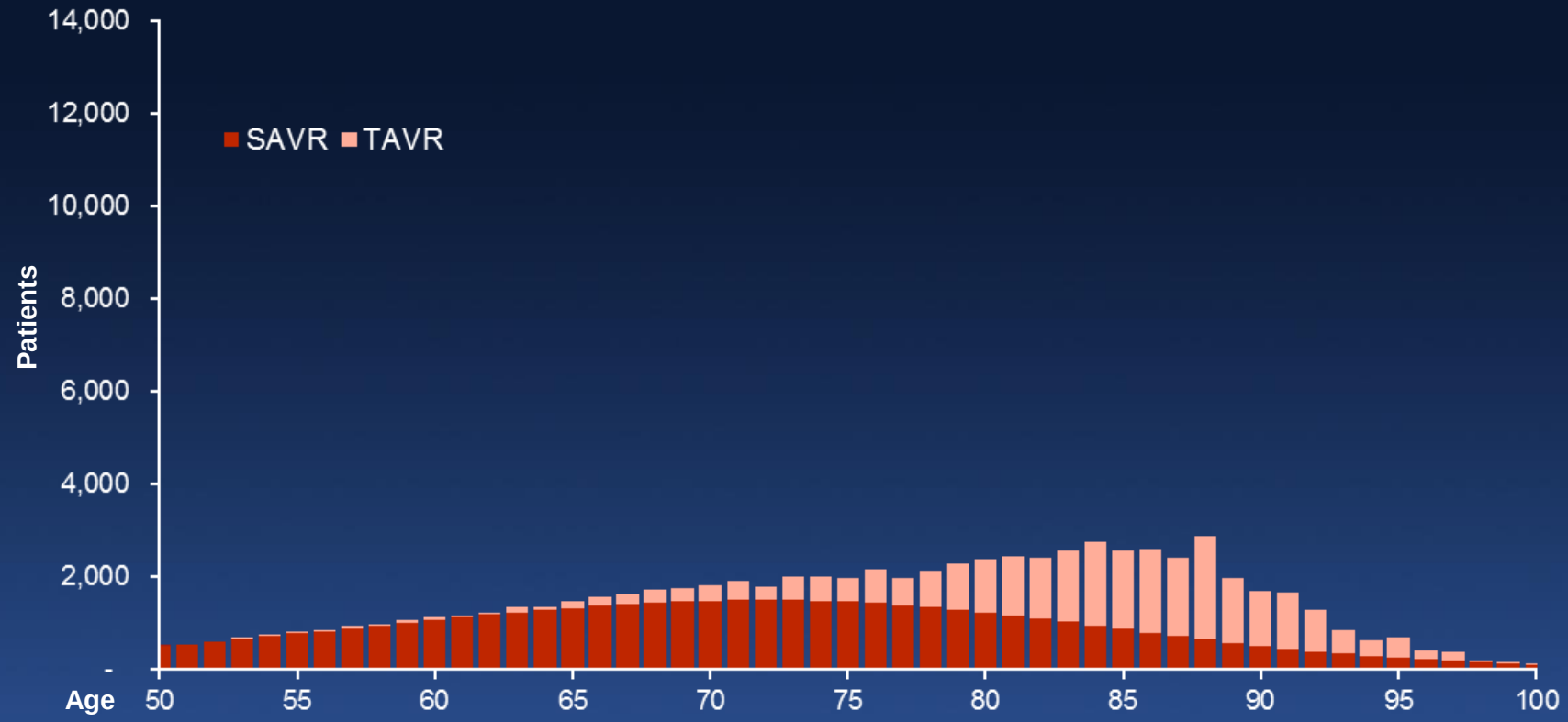
2015 Severe Symptomatic AS Patients in the U.S.[1]



(1) Nkomo 2006, Iivanainen 1996, Aronow 1991, Bach 2007, Freed 2010, Iung 2007, Pellikka 2005, Brown 2008, Thourani 2015,

The TAVR Experience Has Changed Our Understanding of Aortic Stenosis

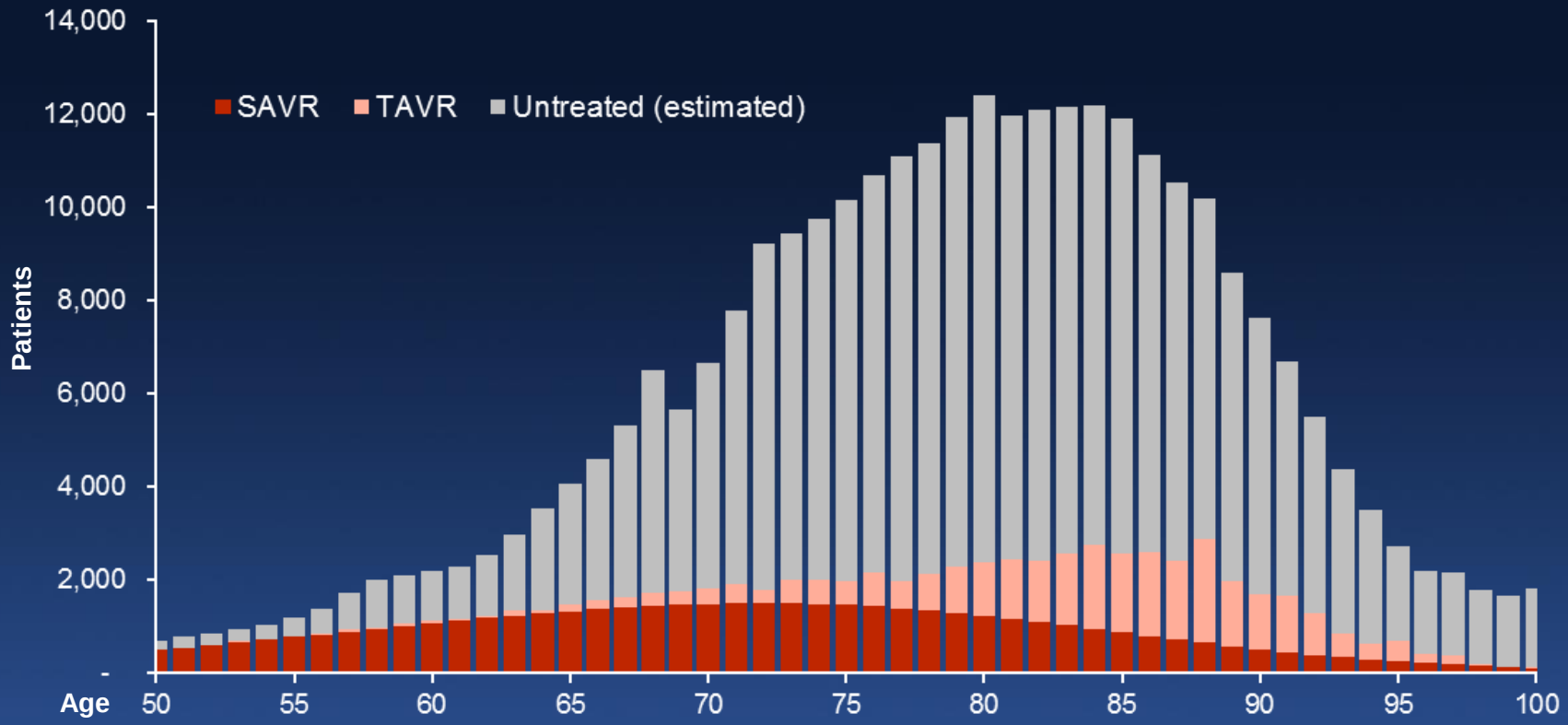
2015 Severe Symptomatic AS Patients in the U.S.[1]



(1) Nkomo 2006, Iivanainen 1996, Aronow 1991, Bach 2007, Freed 2010, Iung 2007, Pellikka 2005, Brown 2008, Thourani 2015,

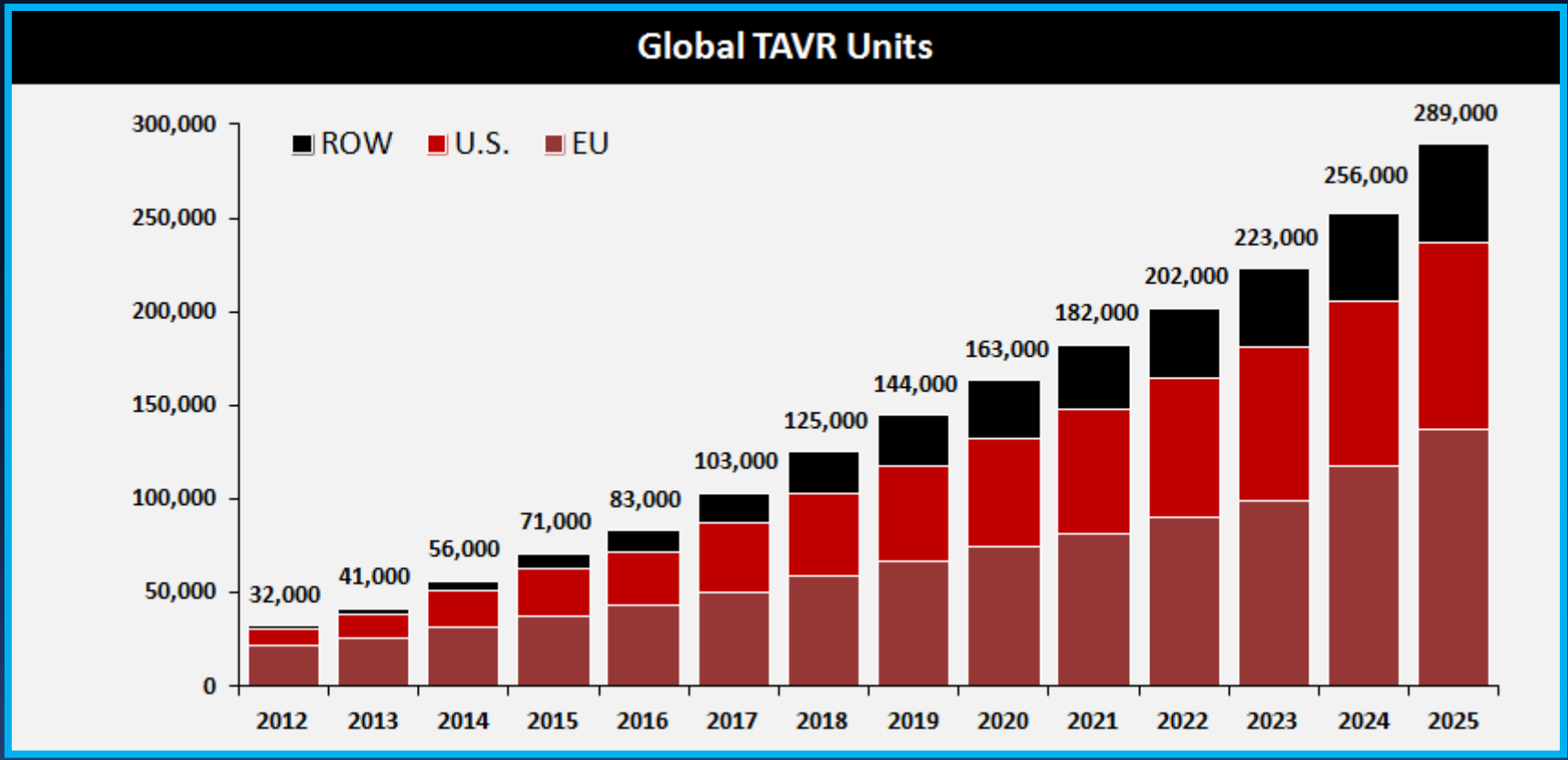
A Large Population of Severe Symptomatic AS Patients Remain Undiagnosed and Untreated

2015 Severe Symptomatic AS Patients in the U.S.[1]



(1) Nkomo 2006, Iivanainen 1996, Aronow 1991, Bach 2007, Freed 2010, Iung 2007, Pellikka 2005, Brown 2008, Thourani 2015,

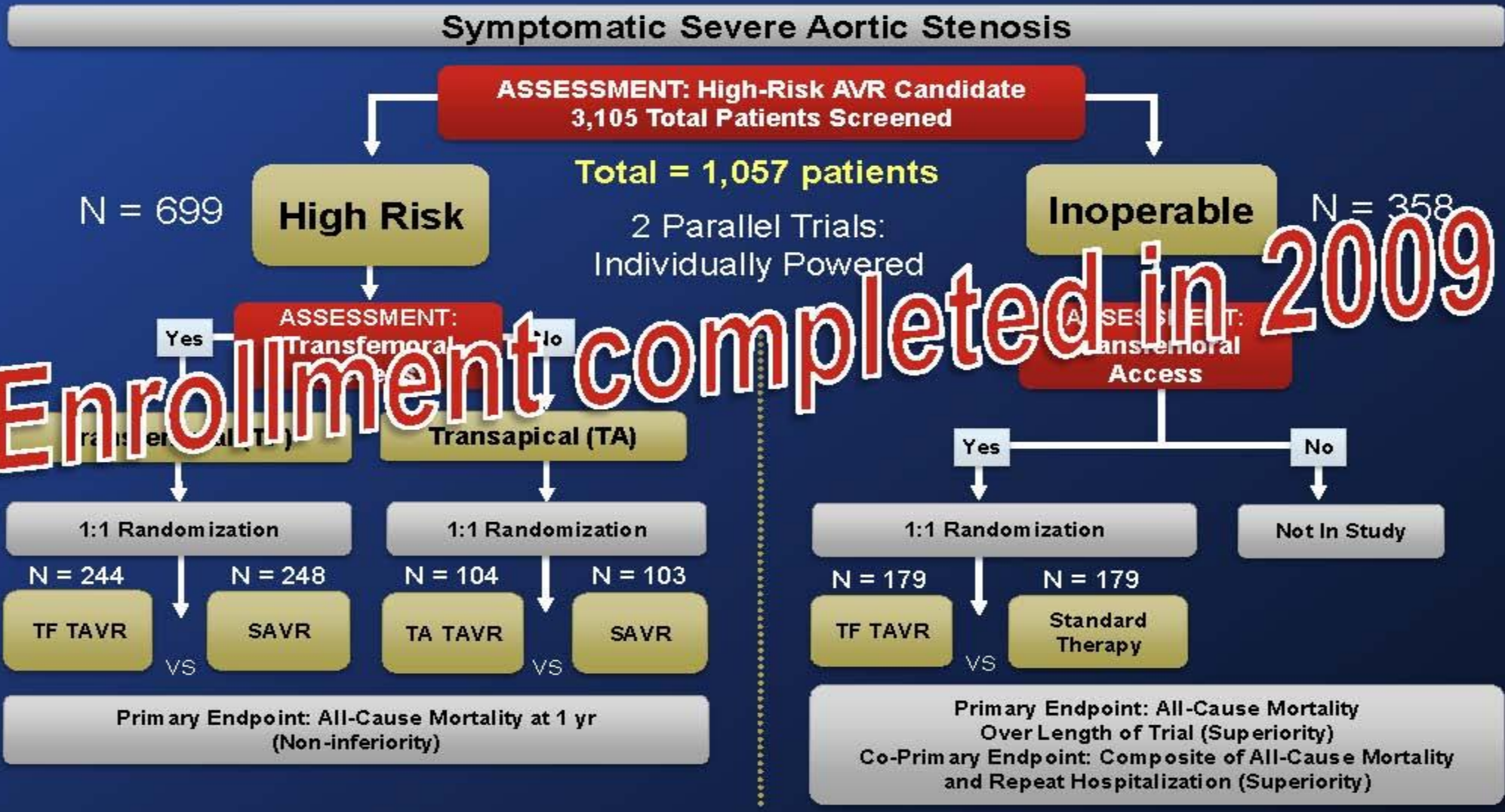
Estimated Global TAVR Growth



SOURCE: Credit Suisse TAVI Comment –January 8, 2015. ASP assumption for 2024 and 2025 based on analyst model. Revenue split assumption in 2025 is 45% U.S., 35% EU, 10% Japan, 10% ROW

In the next 10 years, TAVR growth will increase X4!

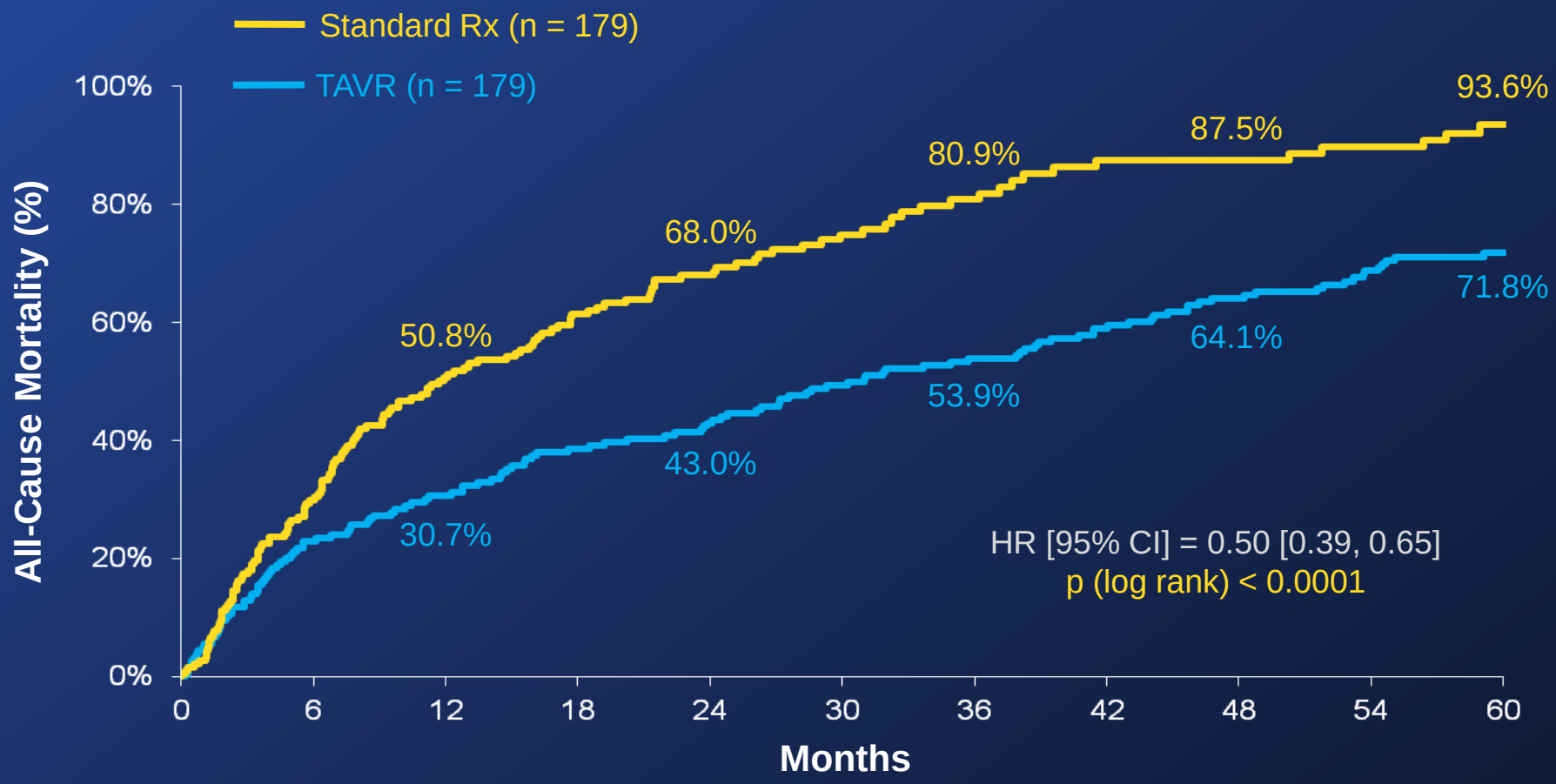
PARTNER Study Design



Enrollment completed in 2009

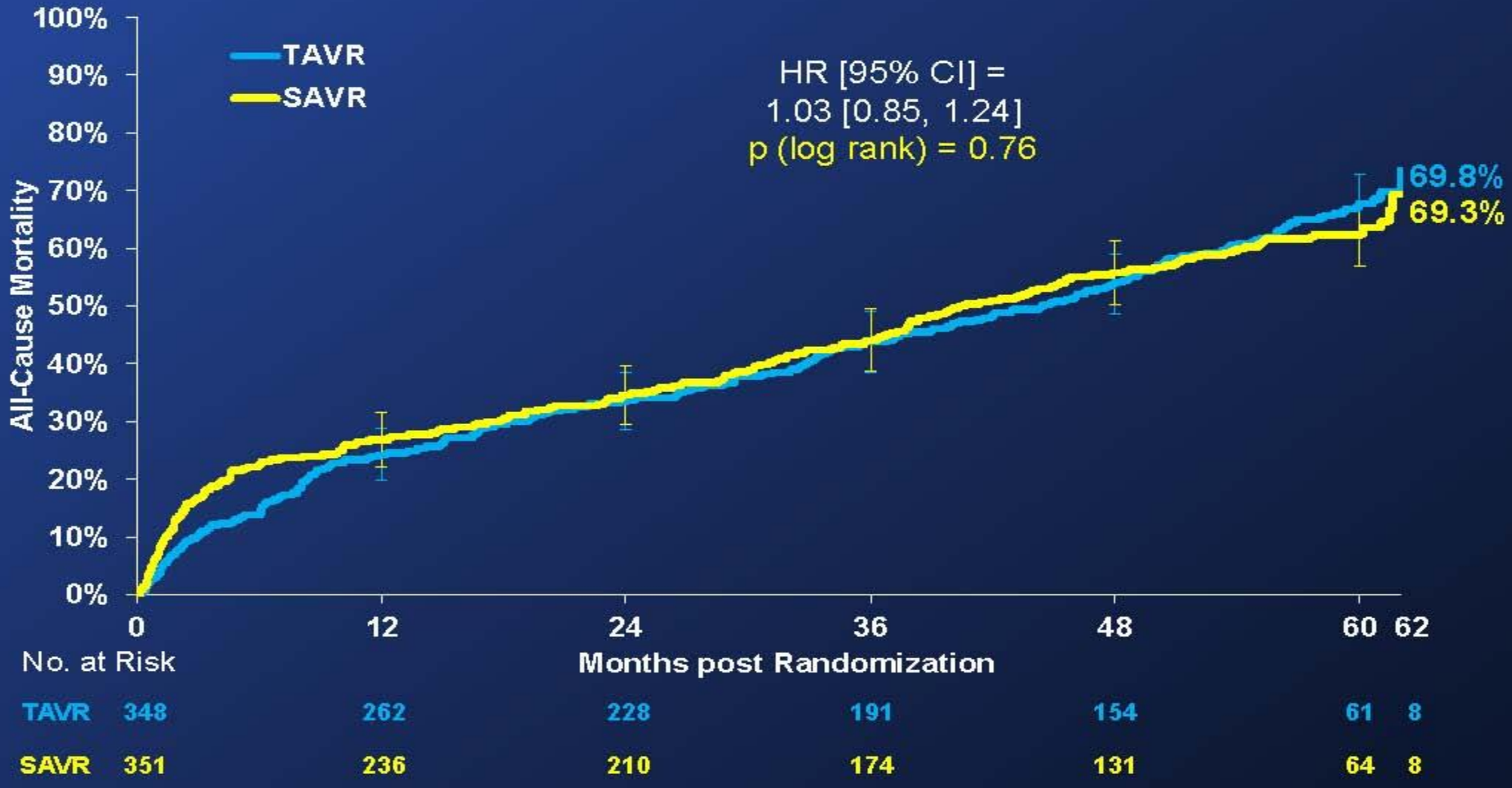
All-Cause Mortality (ITT)

Crossover Patients Censored at Crossover



** In an age and gender matched US population without comorbidities, the mortality at 5 years is 40.5%.*

All-Cause Mortality (ITT)
Pooled Approaches



Pivotal Trial Design

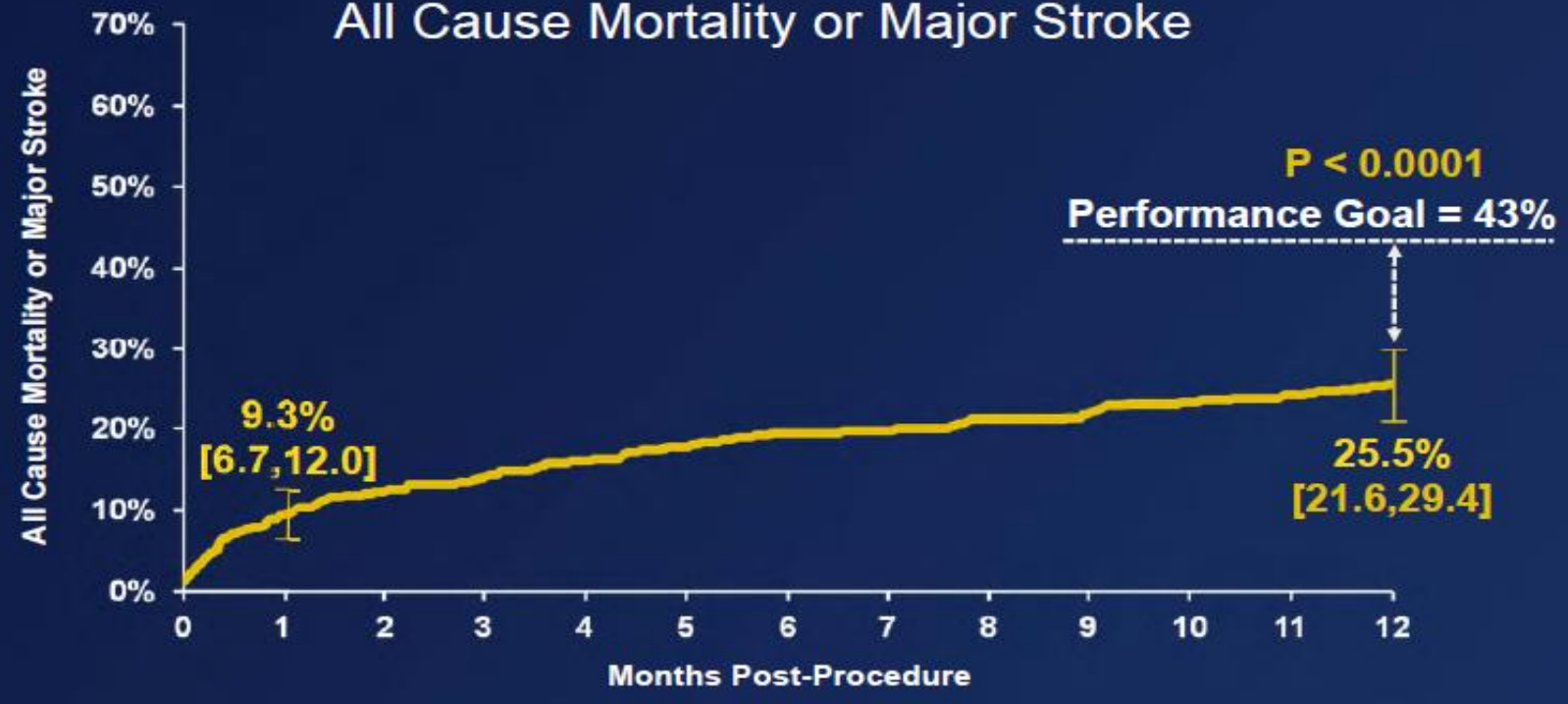
Enrollment completed in 2012

* Randomization stratified by intended access site

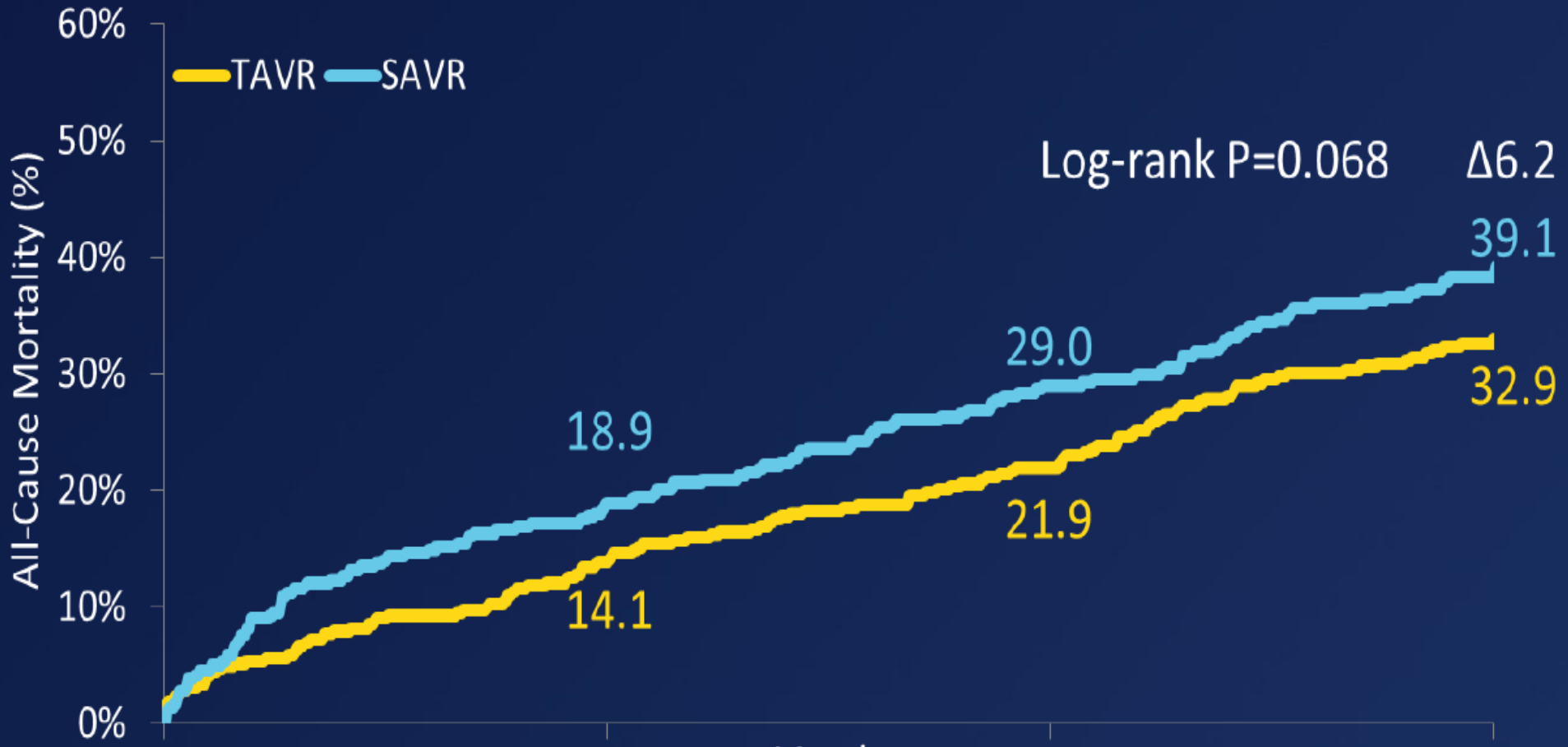
1-Year All-cause Mortality
CoreValve US Pivotal Trial

Primary Endpoint

CoreValve US Clinical Trials



All-Cause Mortality



Transcatheter or Surgical Aortic Valve Replacement in Intermediate Risk Patients with Aortic Stenosis:

Final Results from the PARTNER 2A Trial

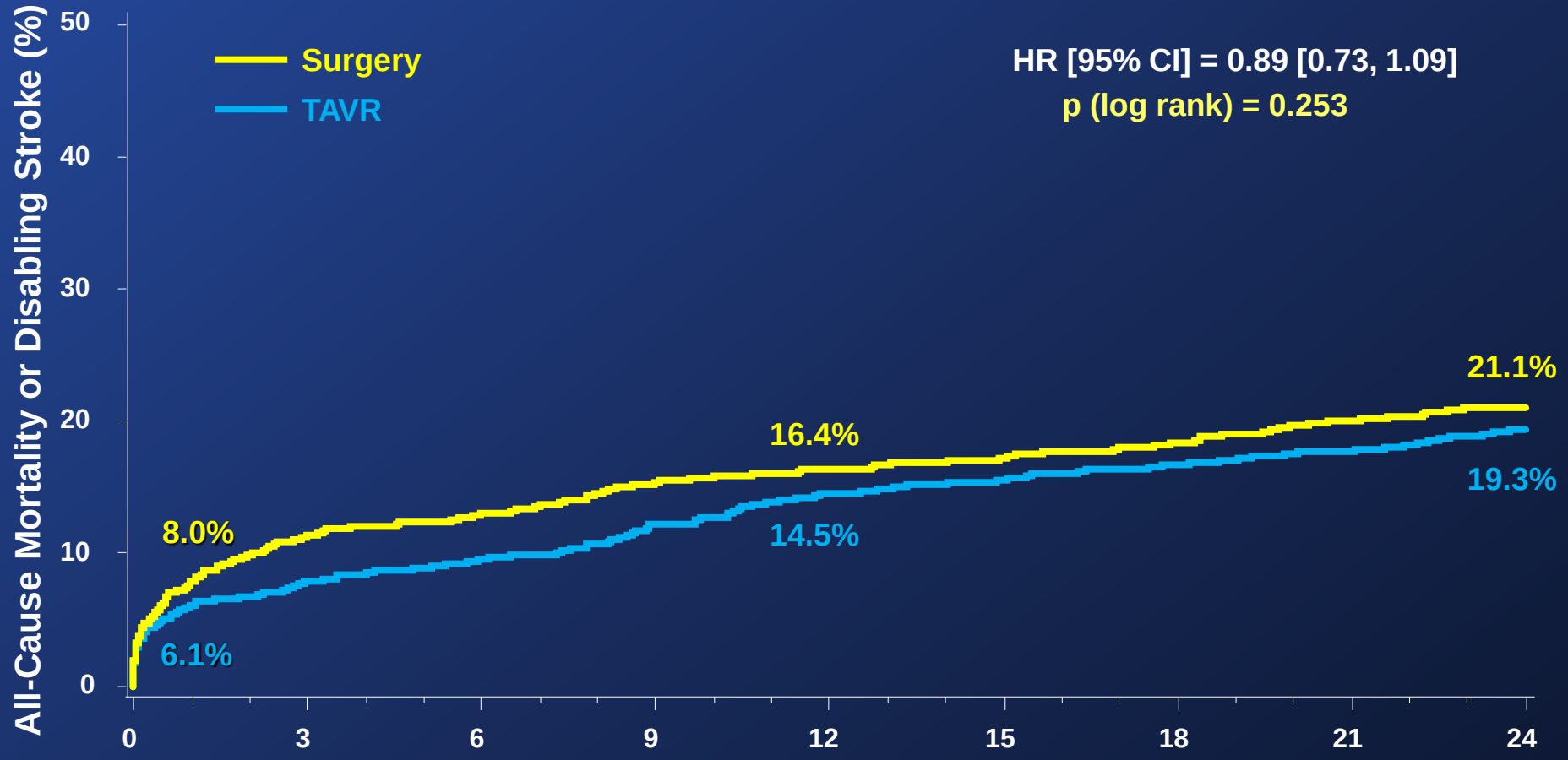
Craig R. Smith, MD
on behalf of the PARTNER Trial Investigators

ACC 2016 | Chicago | April 2, 2016

THE PARTNER II TRIAL

Primary Endpoint (ITT)
All-Cause Mortality or Disabling Stroke

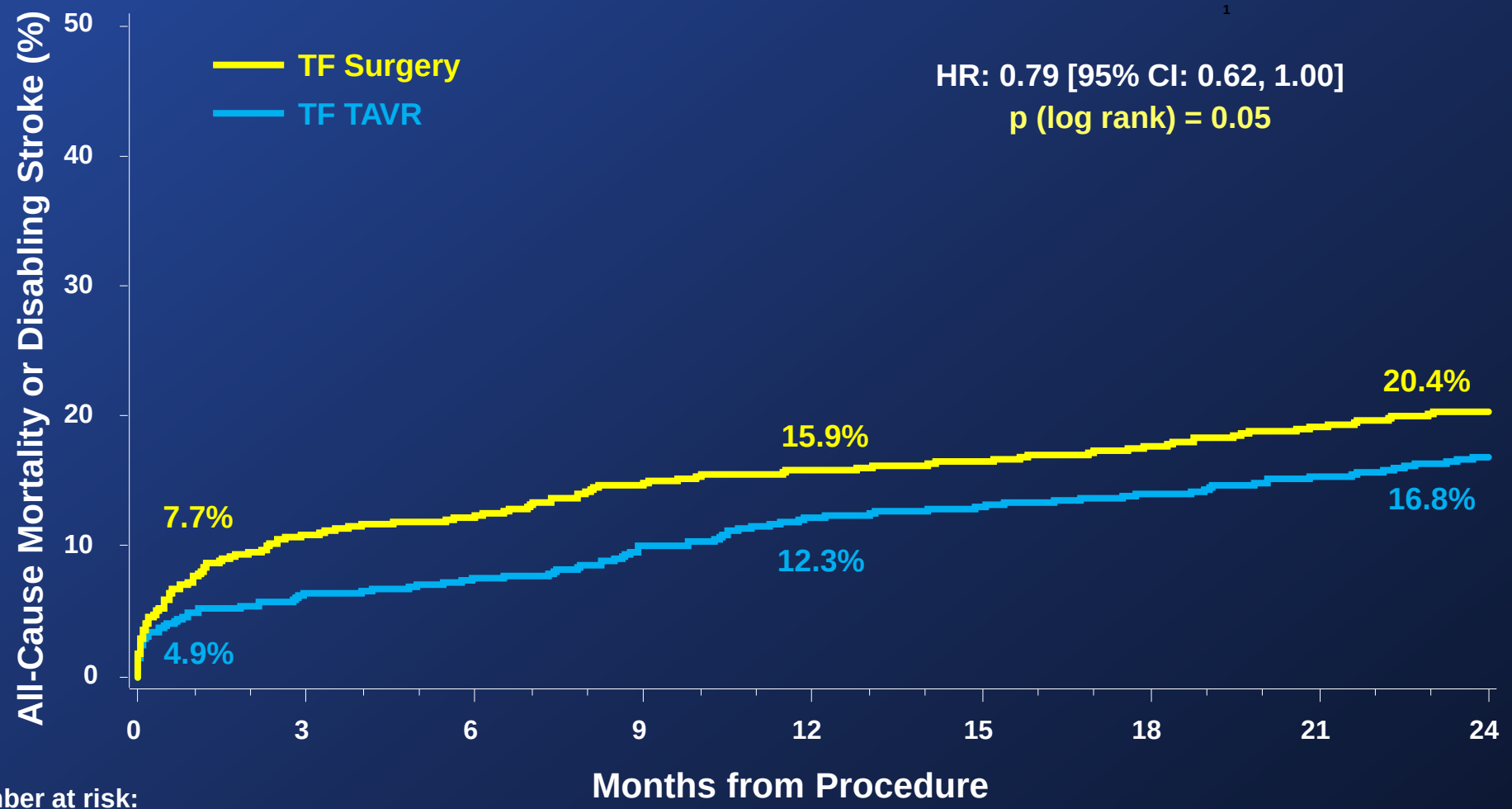
THE PARTNER II TRIAL



Number at risk:									
Surgery	1021	838	812	783	770	747	735	717	695
TAVR	1011	918	901	870	842	825	811	801	774

TF Primary Endpoint (ITT)
All-cause Mortality or Disabling Stroke

THE PARTNER II TRIAL



Number at risk:									
TF Surgery	775	643	628	604	595	577	569	557	538
TF TAVR	775	718	709	685	663	652	644	634	612

The PARTNER 2A Trial
Conclusions (1)

THE PARTNER II TRIAL

In intermediate-risk patients with symptomatic severe aortic stenosis, results from the PARTNER 2A trial demonstrated that...

- TAVR using SAPIEN XT and surgery were similar (non-inferior) for the primary endpoint (all-cause mortality or disabling stroke) at 2 years.
- In the transfemoral subgroup (76% of patients), TAVR using SAPIEN XT significantly reduced all-cause mortality or disabling stroke vs. surgery (ITT: p = 0.05, AT: p = 0.04).

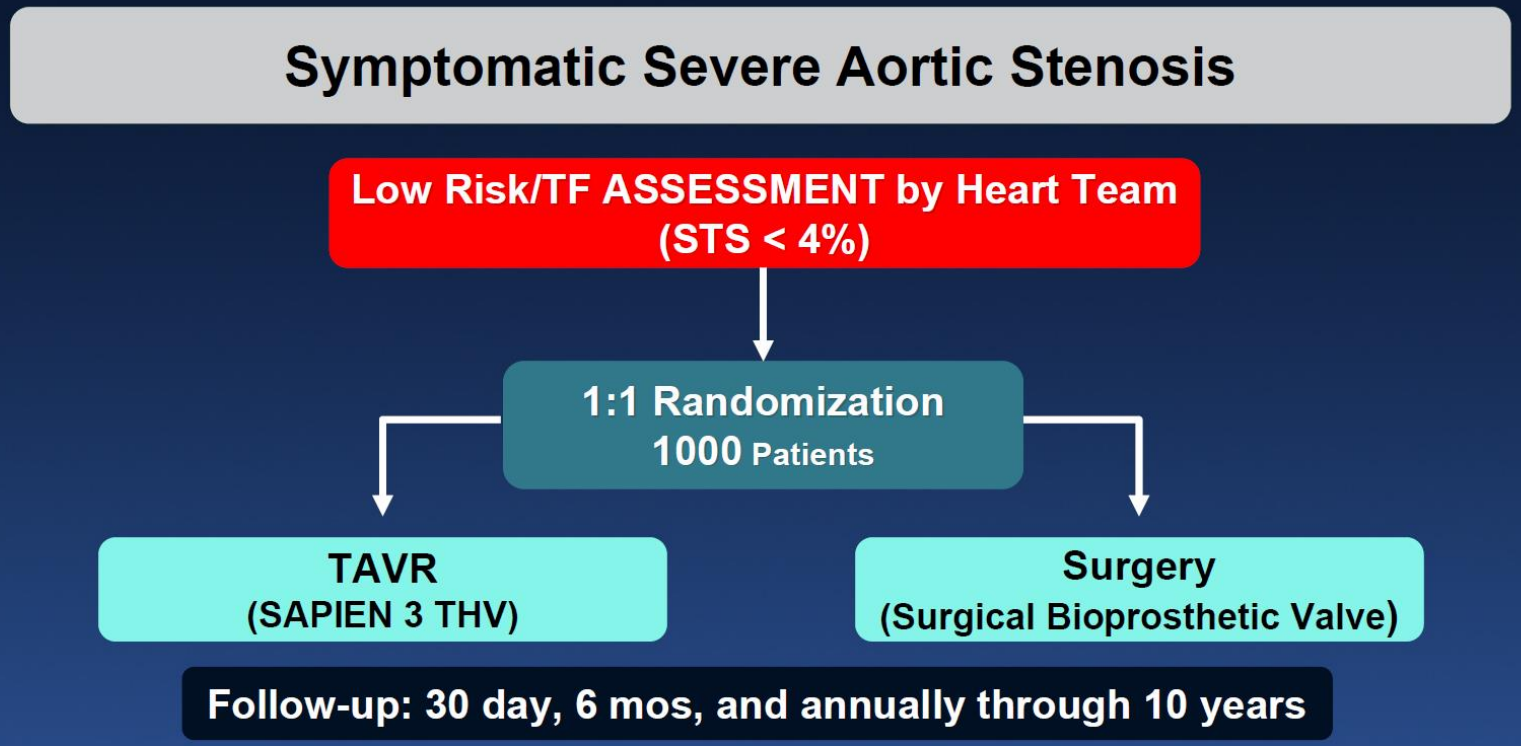
THE PARTNER 3 TRIAL

PARTNER 3

Transcatheter or Surgical Aortic Valve Replacement in Low Risk Patients with Aortic Stenosis

Martin B. Leon, MD &
Michael J. Mack, MD
on behalf of the PARTNER 3 Trial Investigators

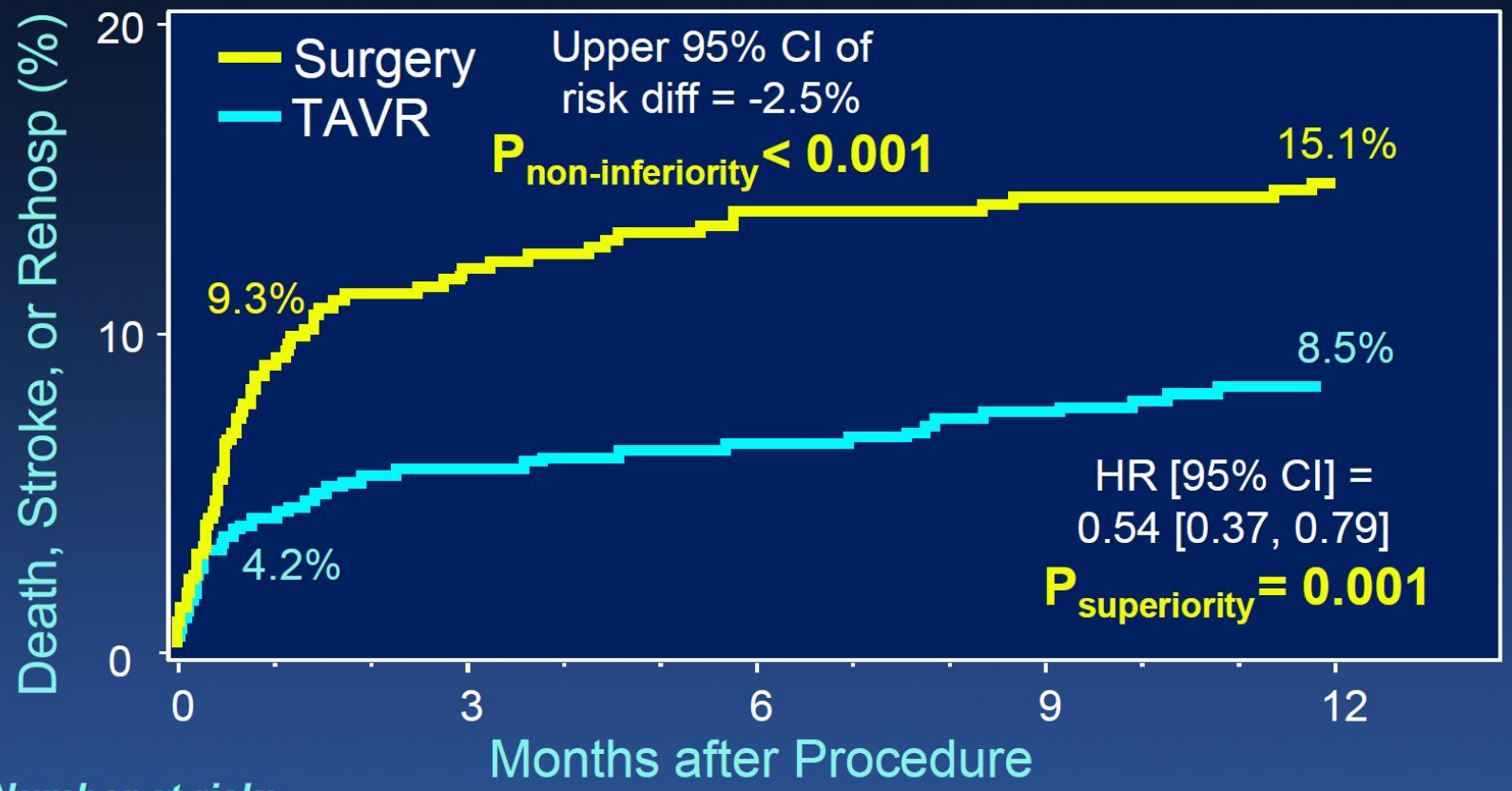
PARTNER 3 Study Design



PRIMARY ENDPOINT:
Composite of all-cause mortality, stroke, or CV re-hospitalization
at 1 year post-procedure

THE PARTNER 3 TRIAL

Primary Endpoint

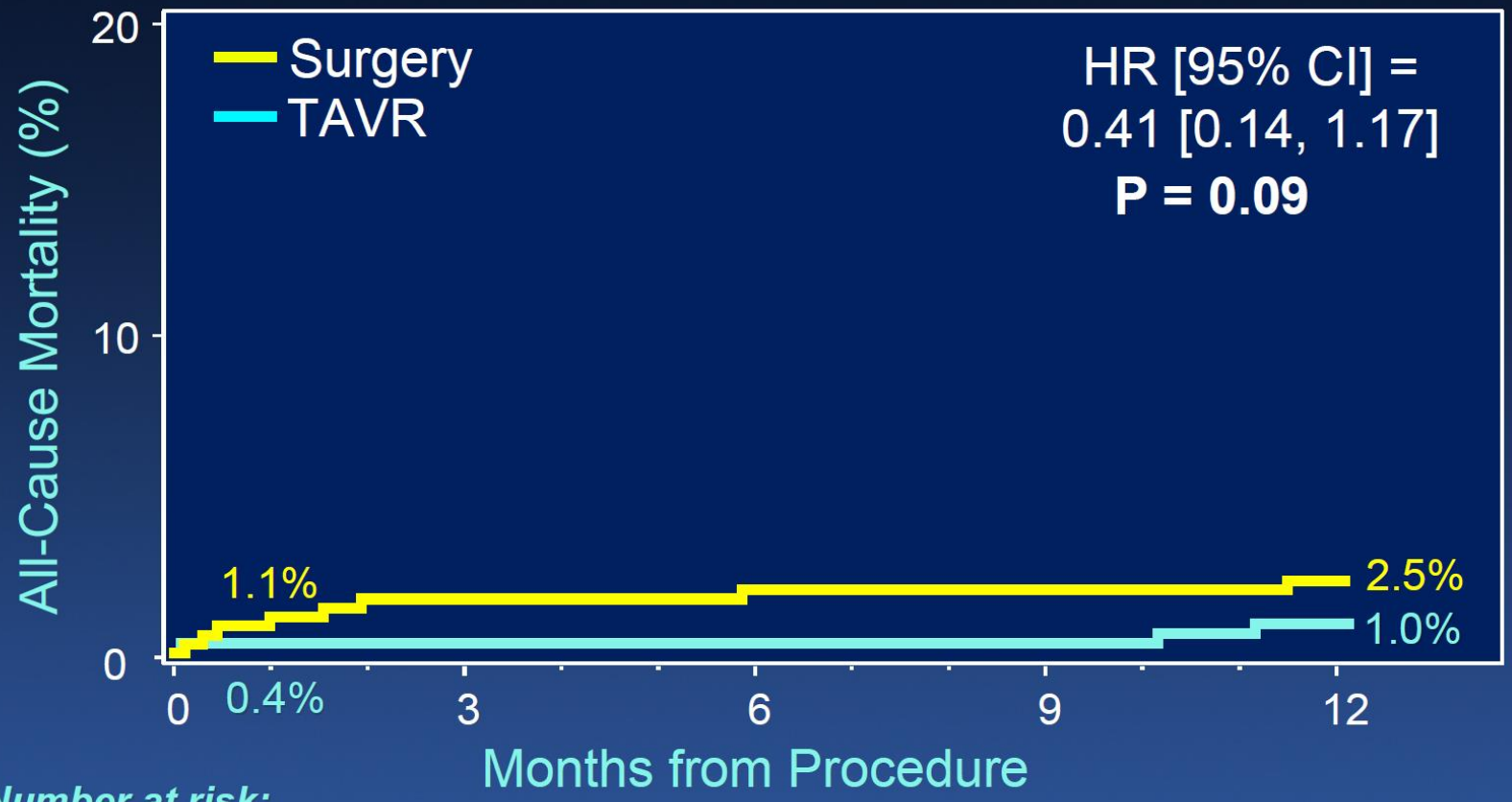


Number at risk:

Surgery	**454**	**408**	**390**	**381**	**377**	**374**
TAVR	**496**	**475**	**467**	**462**	**456**	**451**

THE PARTNER 3 TRIAL

All-Cause Mortality



Number at risk:

Surgery	**454**	**445**	**438**	**433**	**431**	**427**
TAVR	**496**	**494**	**494**	**493**	**492**	**488**

Evolut™ Low Risk Trial

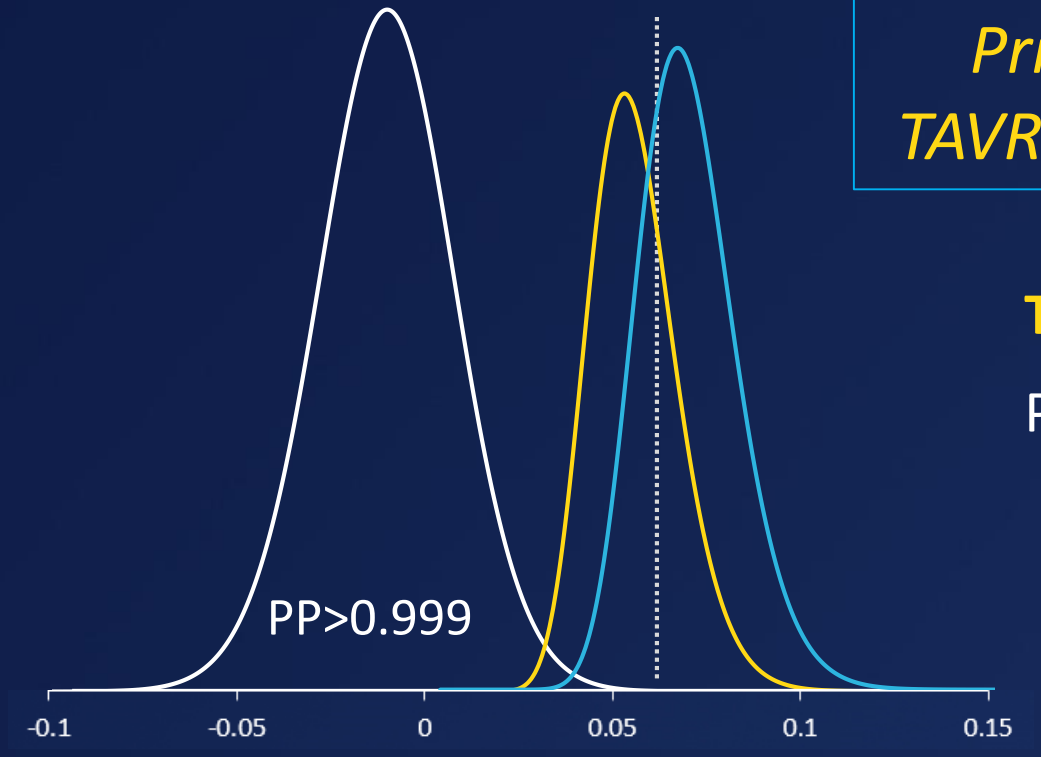
Primary Results From the Evolut Low Risk Trial

Michael J. Reardon, MD, FACC
Houston Methodist DeBakey Heart & Vascular Institute, Houston, TX
For the Evolut Low Risk Trial Investigators

Primary Endpoint

All-Cause Mortality or Disabling Stroke at 2 Years

Evolut™ Low Risk Trial



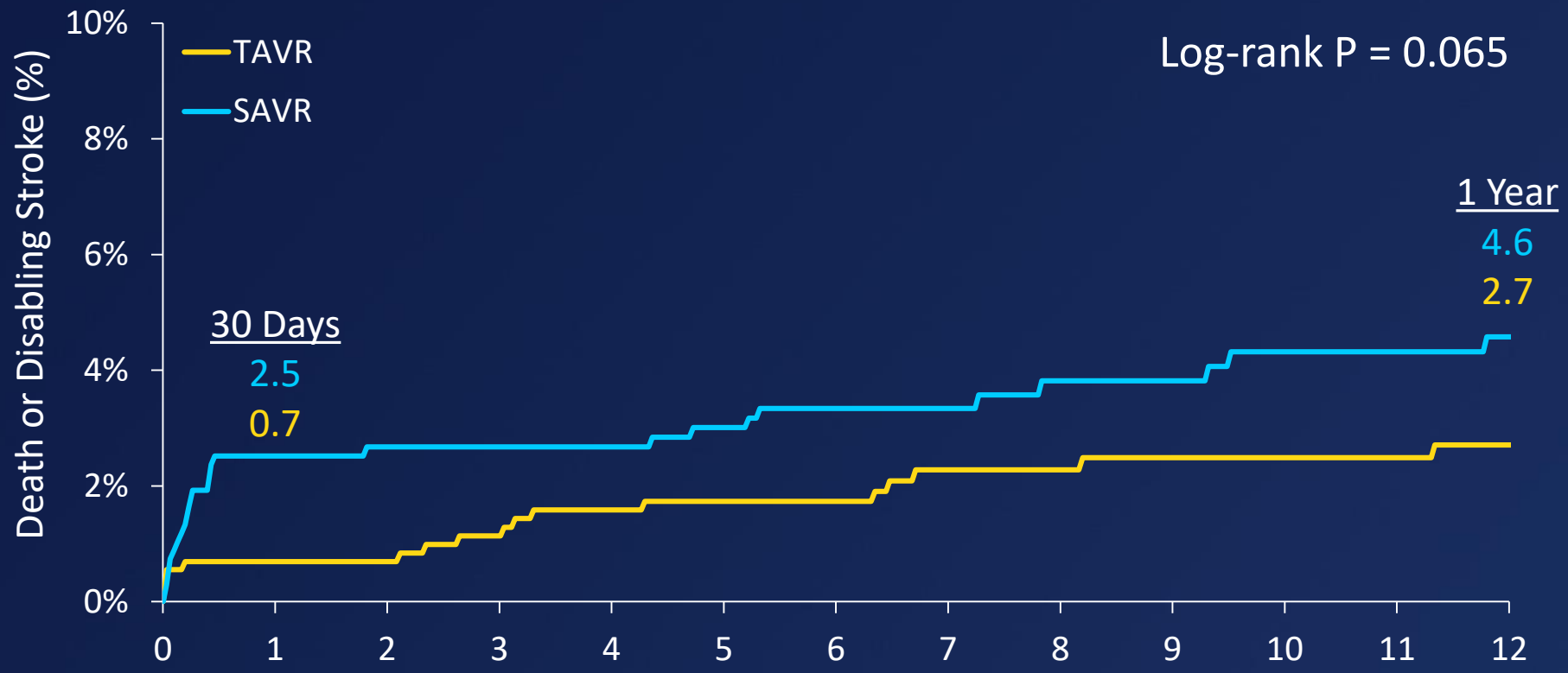
Primary Endpoint Met
TAVR is noninferior to SAVR

TAVR 5.3% **SAVR 6.7%**

Posterior probability of noninferiority > 0.999

TAVR –SAVR difference = -1.4% (95% BCI; -4.9, 2.1)

K-M All-Cause Mortality or Disabling Stroke at 1 Year

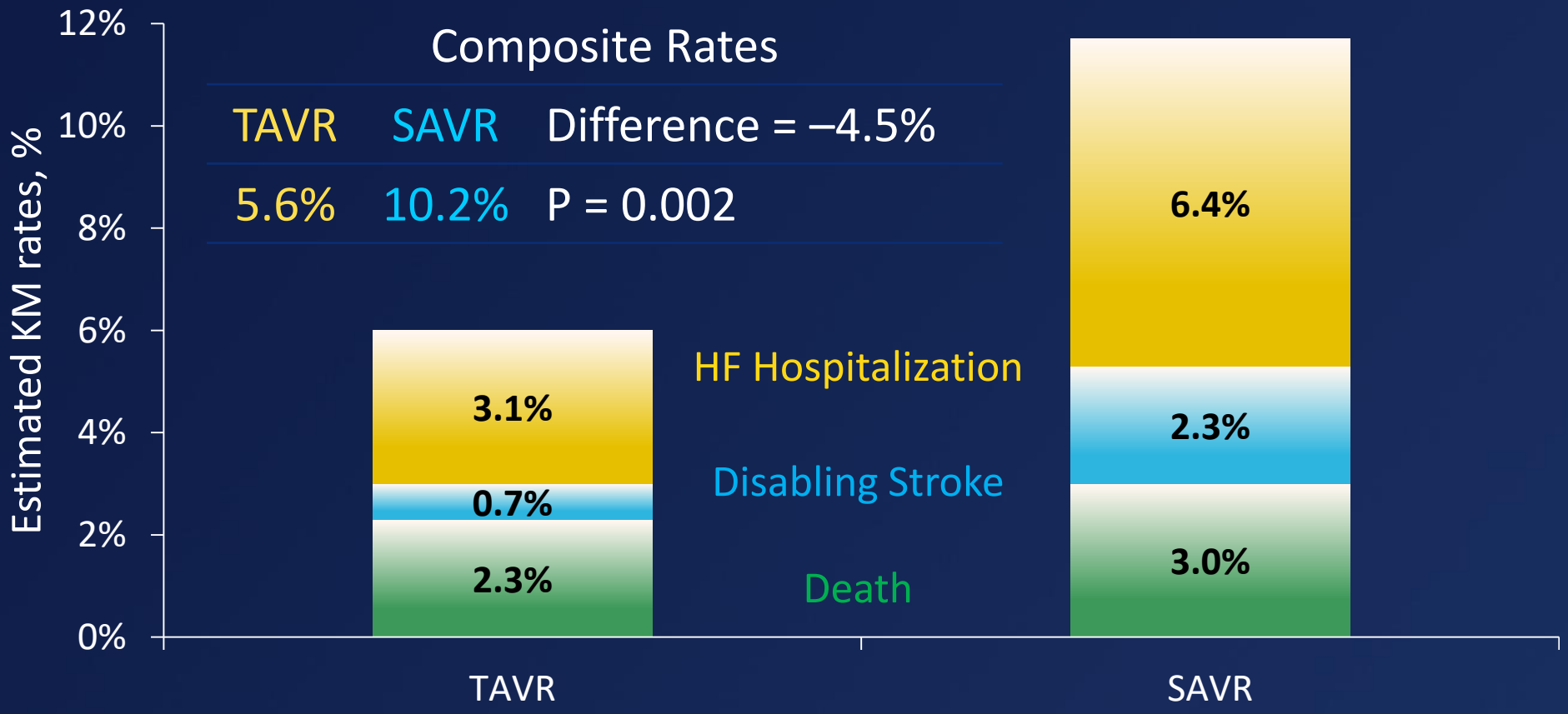


No. at risk					
TAVR	725	718	648	435
SAVR	678	656	576	366

Evolut™ Low Risk Trial

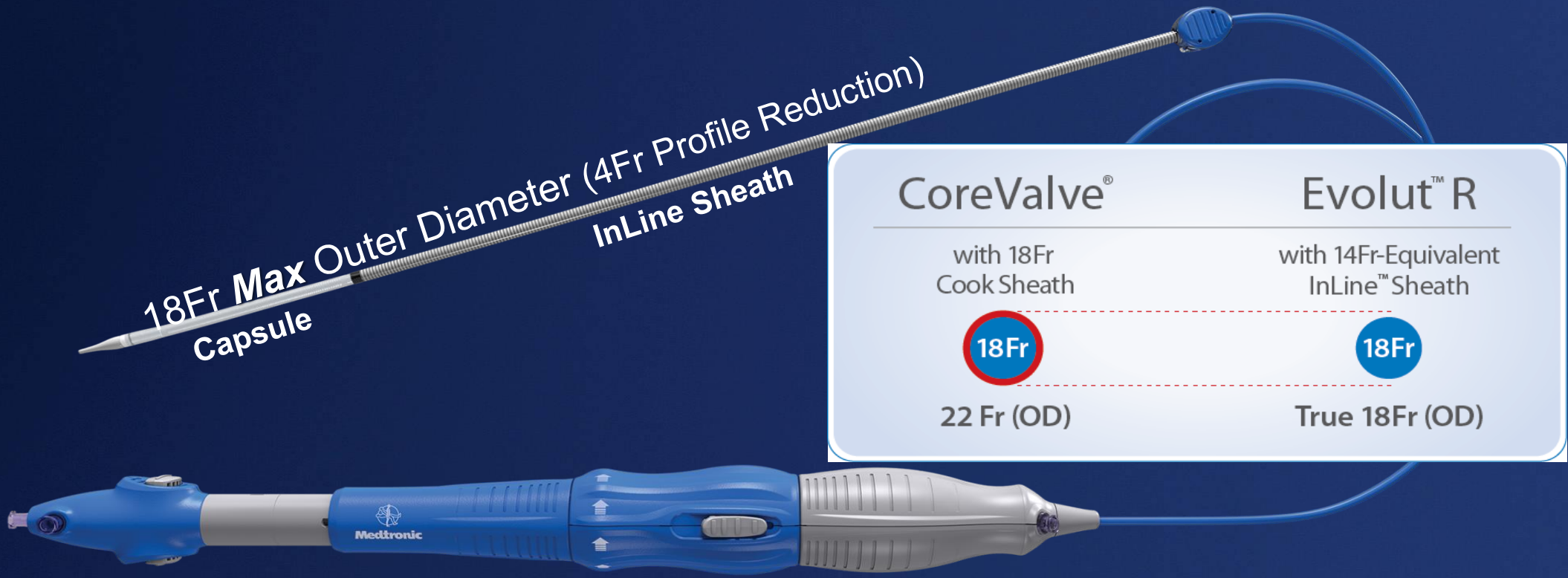
Clinical Implications

Death, Disabling Stroke and Heart Failure Hospitalizations to 1 Year



EnVeo™ R Delivery System

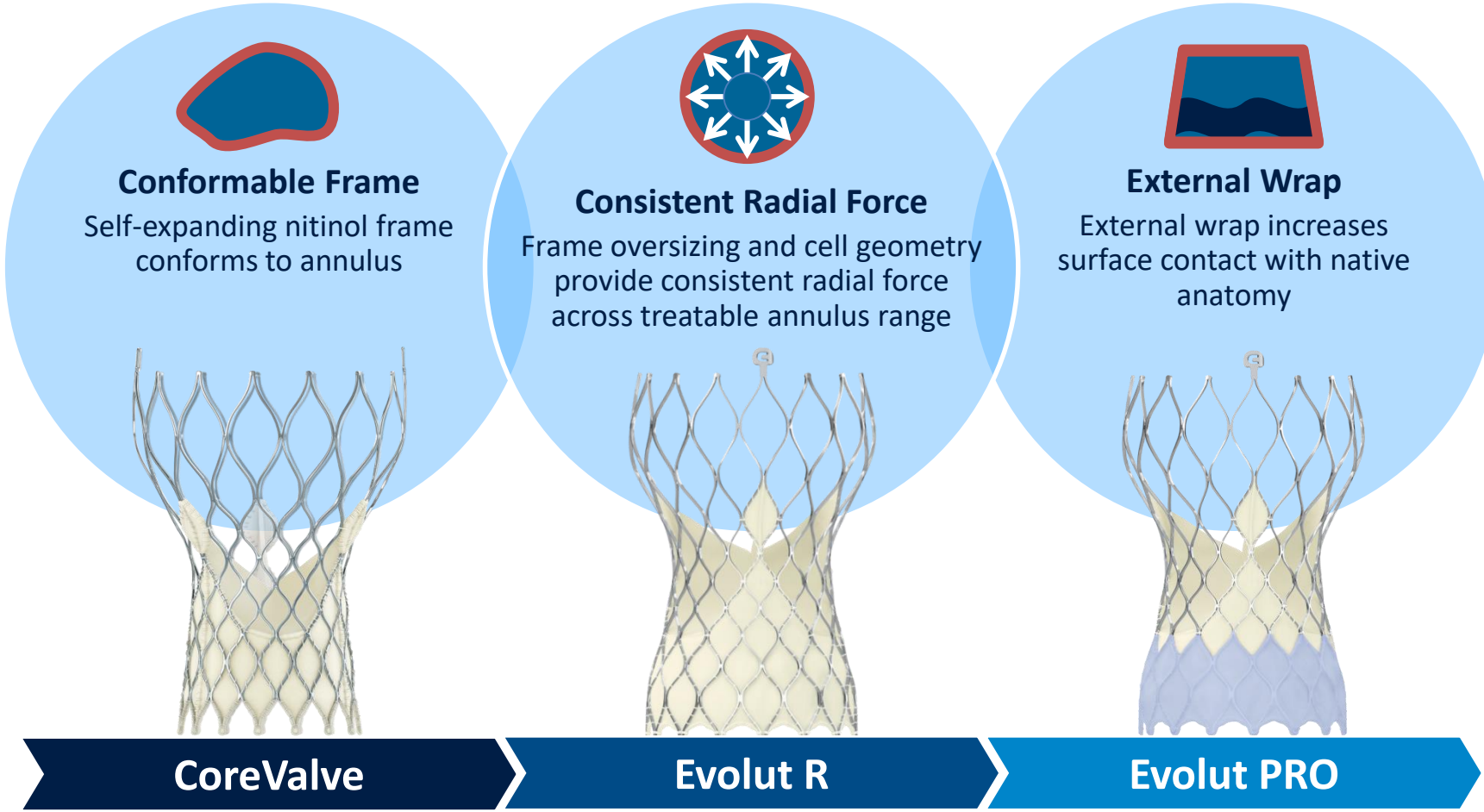
14Fr Equivalent System with EnVeo InLine™ Sheath



CoreValve®	Evolut™ R
with 18Fr Cook Sheath	with 14Fr-Equivalent InLine™ Sheath
18Fr	18Fr
22 Fr (OD)	True 18Fr (OD)

EVOLUT PRO TRANSCATHETER VALVE
ADVANCED SEALING

Building on Proven Design for Advanced Sealing



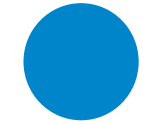
EVOLUT PRO DELIVERY CATHETER SYSTEM
DELIVERY PROFILE COMPARISON

Lowest delivery profile across **all valve sizes** with InLine Sheath

Evolut R 23/26/29 mm TAV		Evolut PRO /Evolut R 34 mm TAV
≥ 5.0 mm	Treatable Access Vessel Diameter	≥ 5.5 mm

18 Fr OD

14 Fr Equivalent



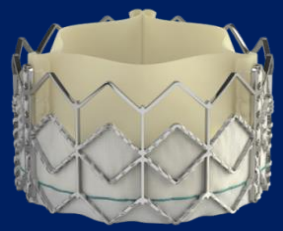
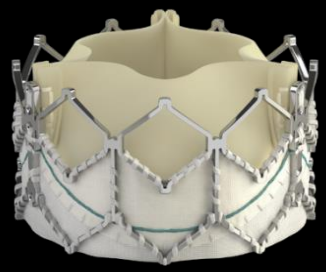
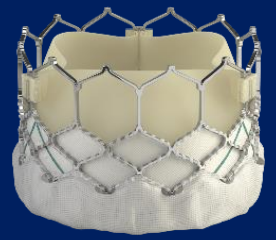
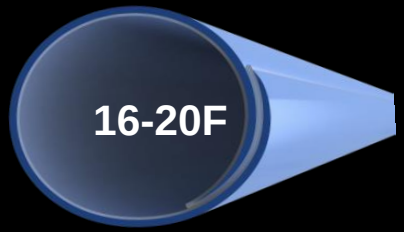
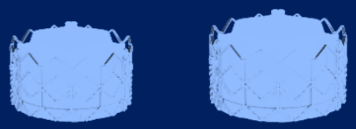
20 Fr OD

16 Fr Equivalent

The Evolut System retains its outer diameter as it enters the vessel and remains at this diameter as it is advanced to the annulus.

PARTNER SAPIEN Platforms
Device Evolution

THE PARTNER II TRIAL

	SAPIEN	SAPIEN XT	SAPIEN 3
Valve Technology			
Sheath Compatibility			
Available Valve Sizes	 23 mm 26 mm	 23mm 26mm 29mm*	 20 mm 23 mm 26 mm 29 mm

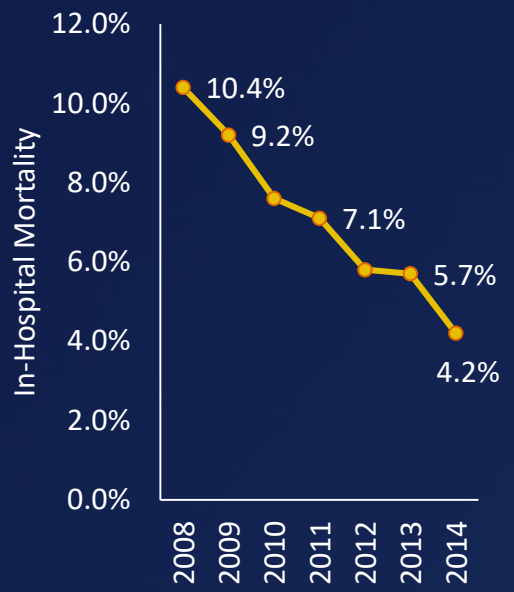
*First Implant Oct 30, 2012

Early Mortality

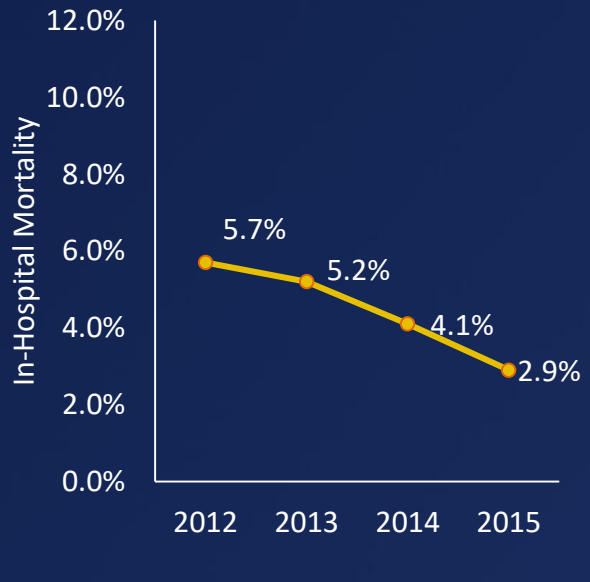
Established TAVR Markets

- Within these established markets, rates of early mortality have steadily decreased with time. 30-day mortality is under 5% in contemporary practice.
- Each geography has also shown declining rates of complications which are known to impact mortality, such as aortic regurgitation, vascular injury, and severe acute complications such as annular rupture.

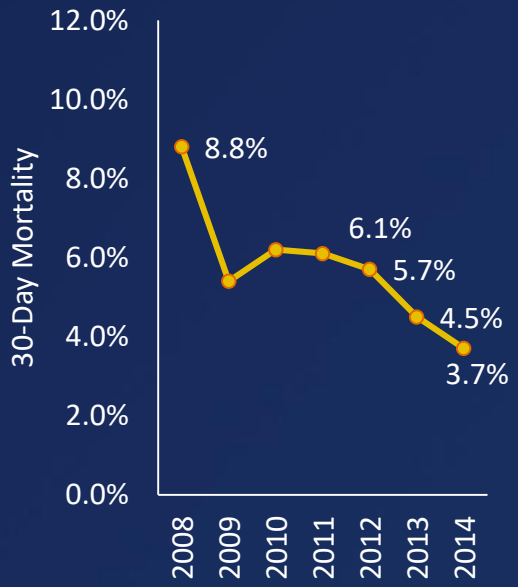
Germany



STS / ACC TVT Registry



UK TAVI Registry

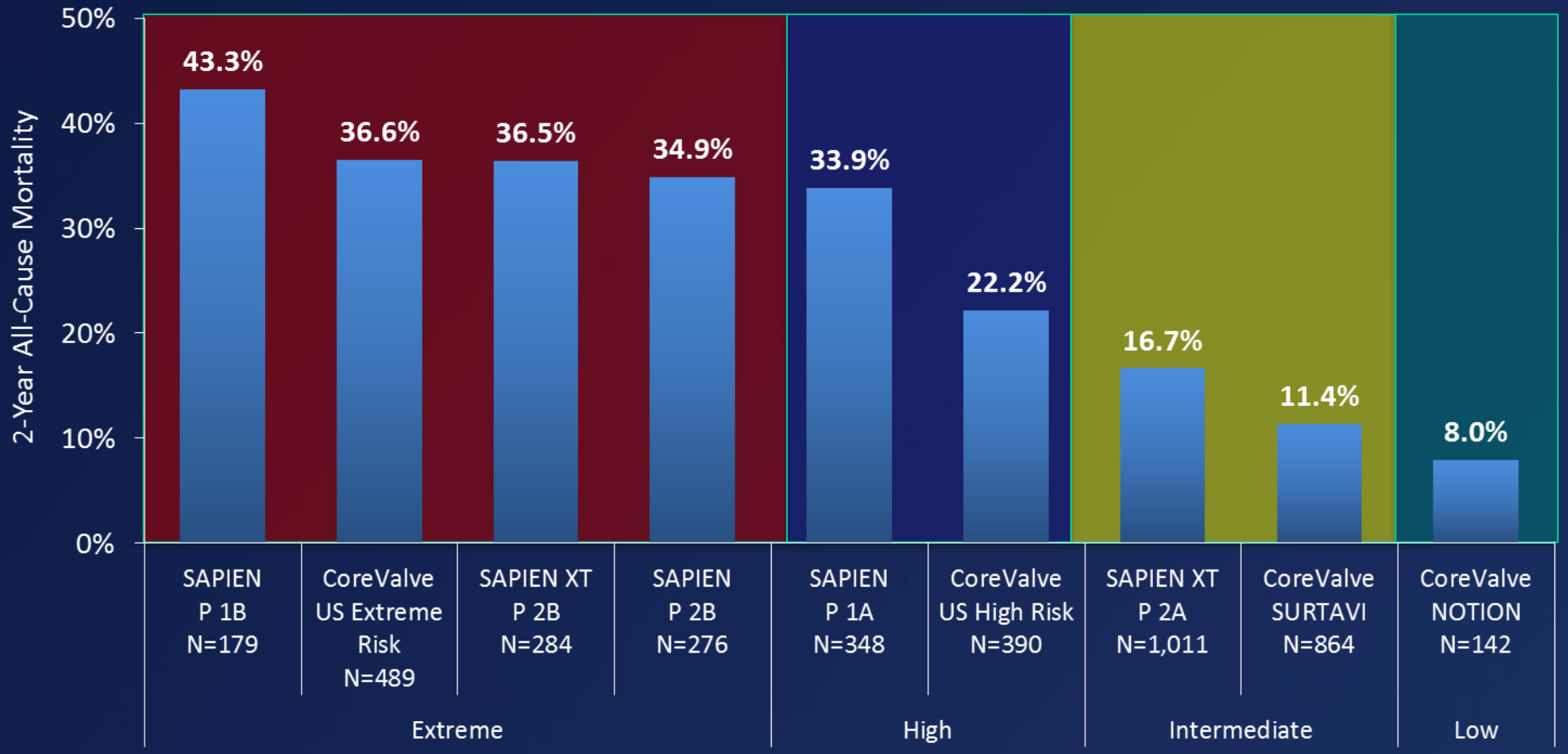


[1]Grover, et al., *J Am Coll Cardiol* 2016; epub; [2]Moat, et al., presented at TCT 2016

2-Year All-Cause Mortality with TAVR

Importance of Patient Clinical Profile

Long-term TAVR outcomes follow the spectrum risk, with better outcomes in patients with better clinical profile at baseline



[1]Leon, et al., *N Engl J Med* 2010;363:1597-1607; [2]Popma, et al., *J Am Coll Cardiol* 2014;63:1972-81; [3]Webb, et al., *J Am Coll Cardiol Intv* 2015;8:1797-806; [4]Smith, et al., *N Engl J Med* 2011;364:2187-98; [5]Adams, et al., *N Engl J Med* 2014;370:1790-8; [6]Leon, et al., *N Engl J Med* 2016;374:1609-20; [7]Reardon, et al. *N Engl J Med* 2017; 376:1321-31; [8]Thyregod, et al., *J Am Coll Cardiol* 2015;65:2184-94

Minimalist TAVI

- Heart Team
- LA/Conscious Sedation
- No TEE, TTE if needed
- No central line
- No temporary pacing wire
- LV pacing through the stiff GW
- R femoral for 14F sheath, L femoral for 5F pigtail
- R radial for Sentinel cerebral embolic protection
- Early ambulation
- Discharge 48-72 hours

From This……. To This *(since 2012)*

Comparison of Transfemoral Transcatheter Aortic Valve Replacement Performed in the Catheterization Laboratory (Minimalist Approach) Versus Hybrid Operating Room (Standard Approach)

CME

Outcomes and Cost Analysis

Transfemoral TAVI Devices

Iterative Device Design

For the purposes of this presentation, the devices are categorized in the following way

Foundation Devices

SAPIEN

CoreValve

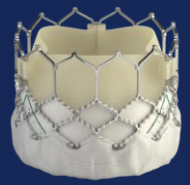
SAPIEN XT

Contemporary Devices

Portico

Direct Flow

Lotus



SAPIEN 3

Evolut R

Symetis ACURATE neo TF

Hong Kong Experience

Dec 2010
Queen Elizabeth Hospital

Nov 2011
Prince of Wales Hospital

June 2013
Union Hospital

May 2011
HK Adventist Hospital

Dec 2012
Queen Mary Hospital

The Hong Kong Experience

First TAVI performed at Queen Elizabeth Hospital on Dec 6th, 2010

Medtronic CoreValve/
Evolut R/Pro - 205

Edwards Sapien XT/3 - 120

St Jude
Portico - 18

Hydra - 6

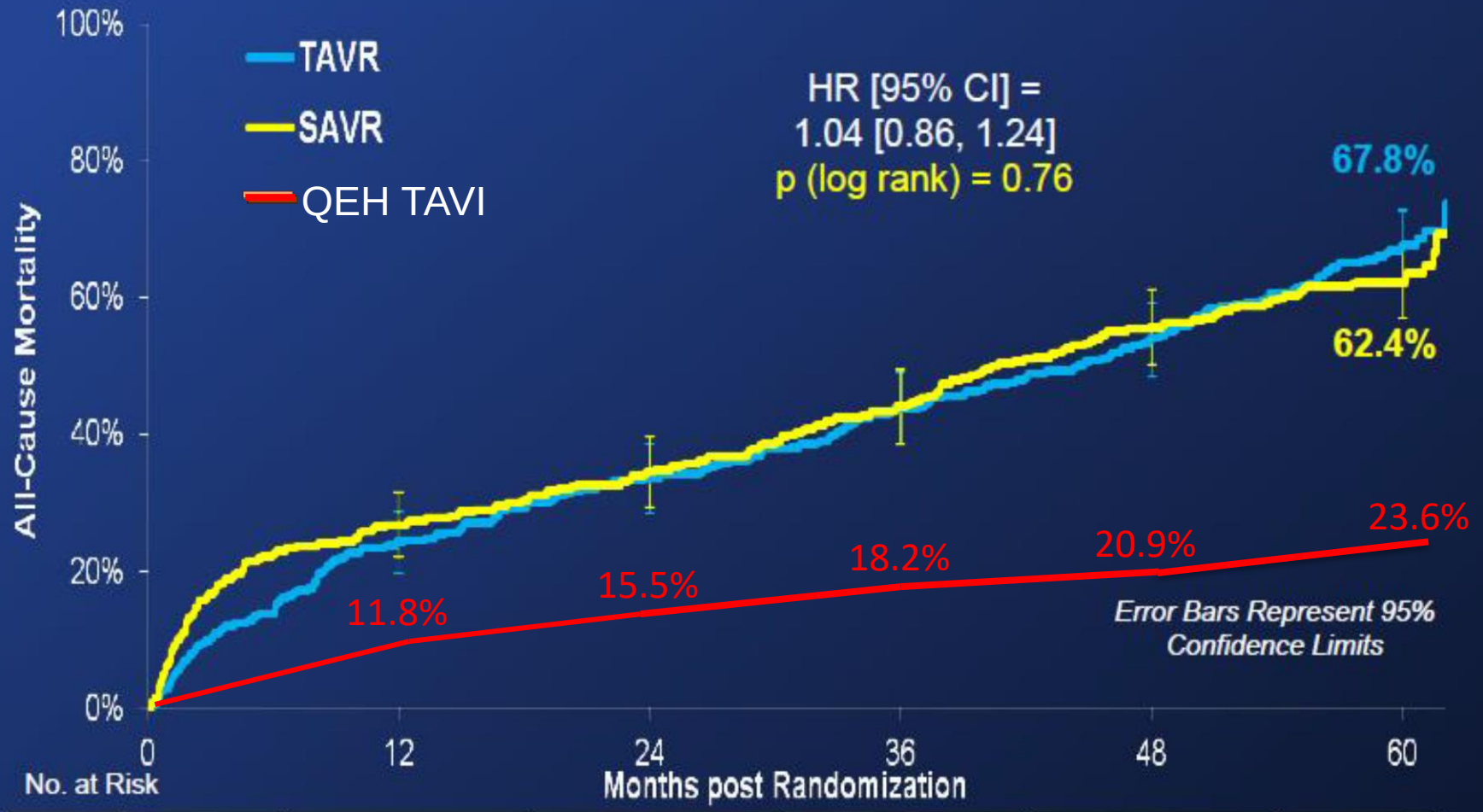
Center	# of Cases
Queen Elizabeth Hospital	119
Prince of Wales Hospital	100
Queen Mary Hospital	106
Hong Kong Adventist Hospital	23
Union Hospital	1
TOTAL	**349**

Up to Mar 2018

All-Cause Mortality (ITT)

All Patients

THE PARTNER TRIAL

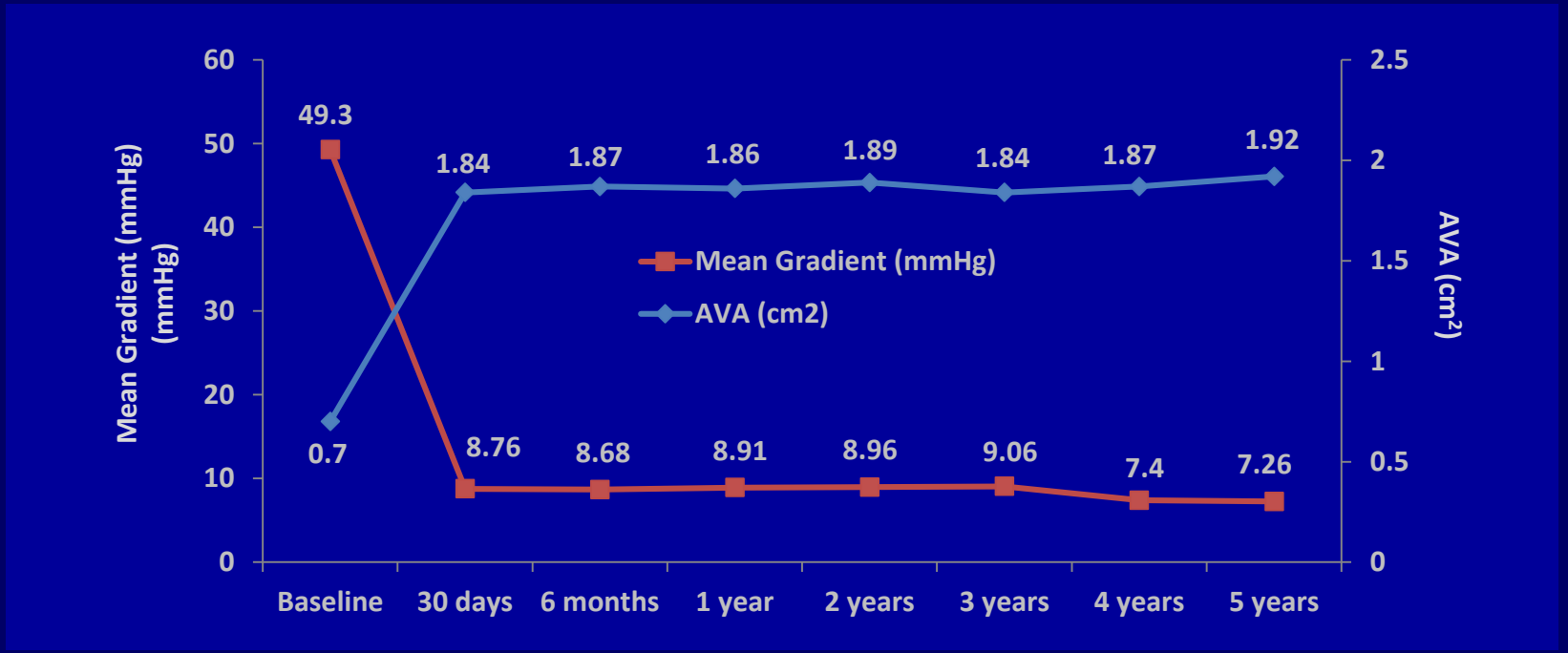


No. at Risk

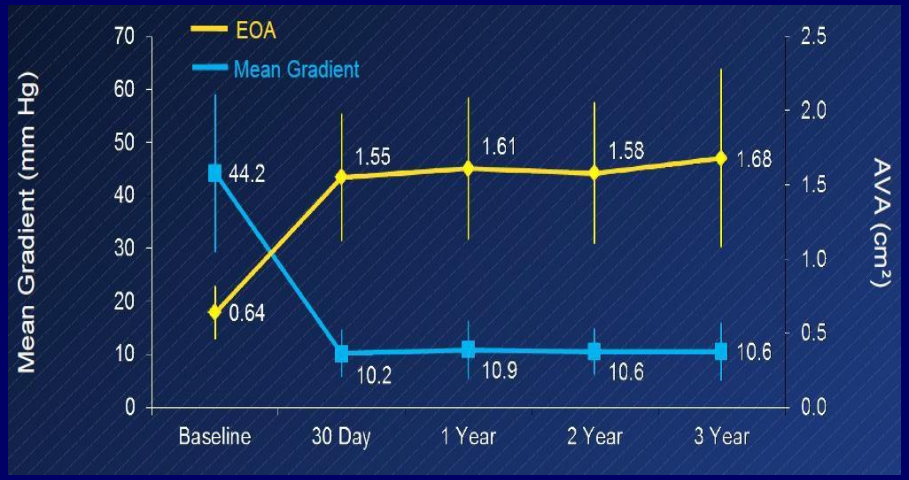
TAVR	348	262	228	191	154	61
SAVR	351	236	210	174	131	64

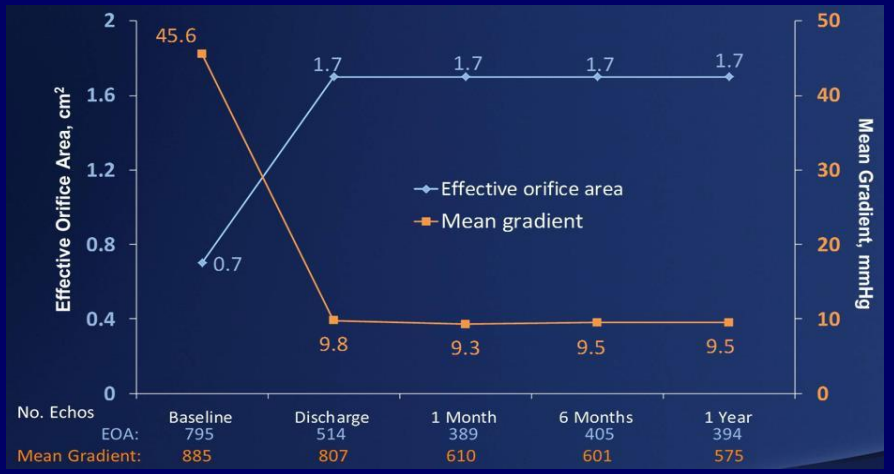
Mean Gradient & Valve Area

QEH Registry



The PARTNER Trial CoreValve ADVANCE Study





TAVR UNLOAD Trial

Study Design

(600 patients, 1:1 Randomized)

TAVR UNLOAD Trial

International Multicenter Randomized

Heart Failure
LVEF < 50%
NYHA ≥ 2
Optimal HF therapy (OHFT)
Moderate AS

R

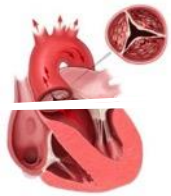
TAVR + OHFT

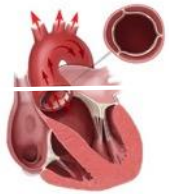
OHFT Alone

Follow-up:
1 month
6 months
1 year

Clinical endpoints
Symptoms
Echo
QoL

Primary Endpoint
Hierarchical occurrence of:
- **All-cause death**
- **Disabling stroke**
- **Hospitalizations for HF, aortic valve disease**
- **Change in KCCQ**





Reduced AFTERLOAD
Improved LV systolic and diastolic function

EARLY TAVR Trial
Study Flow

THE PARTNER 3 TRIAL

Asymptomatic Severe AS and 2D-TTE (PV ≥4m/s or AVA ≤1 cm^2)
Exclusion if patient is symptomatic, EF<50%, concomitant surgical indications, bicuspid valve, or STS >8

Treadmill Stress-Test

Stress-Test Normal

CTA and Angiography
TF- TAVR eligibility

Early-TAVR Randomized Trial

Randomization 1:1
Stratified by STS (<3 vs ≥3)

TF- TAVR

Clinical Surveillance

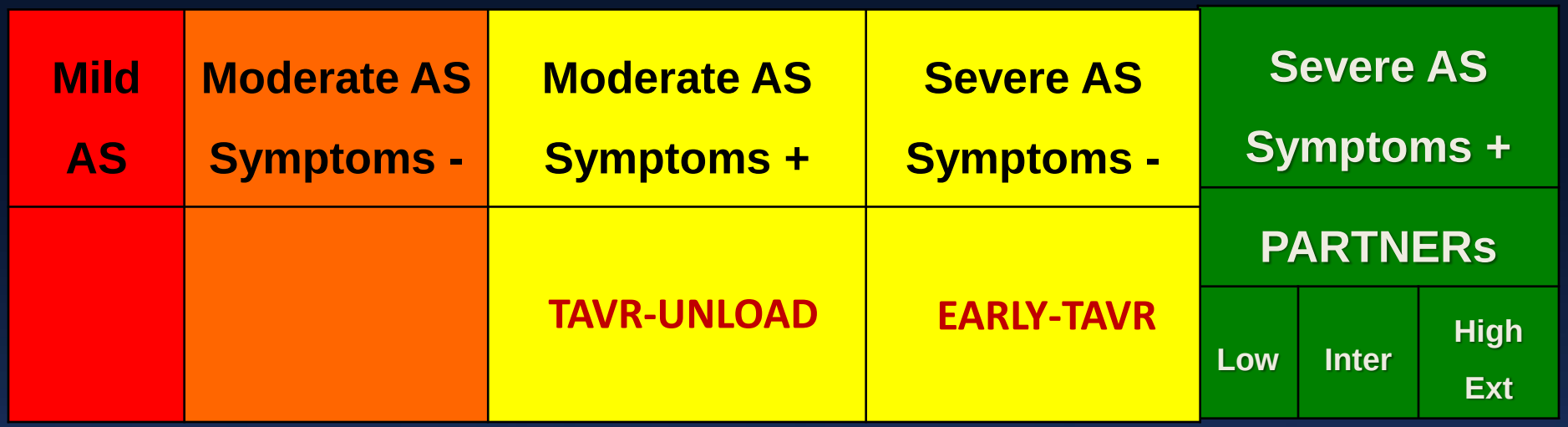
Stress-Test Abnormal

Early TAVR Registry

Primary Endpoint (superiority): 2-year composite of all-cause mortality, all strokes, and repeat hospitalizations (CV)

Aortic Stenosis Redefined:

Functional Classification



≈2020

2012

Courtesy of P. Généreux TVT 2016

Paradigm Shift in the Therapy for AS in the Elderly ?

How would you treat an ~~82~~ 72 year old diabetic female with aortic stenosis?

2014

- Surgical AVR
- Transcatheter Aortic Valve implantation
- Medical treatment

FUTURE

- ***Transcatheter Aortic Valve implantation***
- Surgical AVR
- Medical treatment

What to inform the patients?

- Once symptoms develop for severe AS, early intervention is indicated regardless of age
- Severe AS in cardiogenic shock or for high-risk PCI, perform BAV first
- ≥75 y/o severe AS → go for TAVI irrespective of risk score
- 70-75 y/o severe AS → go for TAVI if there is any of the high risk features, consider other factors as well, e.g. frailty score, cirrhosis, COPD, ESRF
- 60-70 y/o severe AS → go for SAVR with bioprosthesis unless inoperable (porcelain aorta)
- Minimalist TAVI under LA, stay in hospital for 2-3 days
- Immediate complications ~5%
- 30-day mortality <5%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13 - 15 March 2020
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A Complication Case Based Meeting & the First Dedicated Complication Forum in Asia

Mark Your Calendar!

For updates, please visit

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Organized by:

Hong Kong Society of Transcatheter ENdo-cardiovascular Therapeutics (HKSTENT)


Thank you !