Saint Luke's
MID AMERICA HEART INSTITUTE

Severe Aortic Stenosis and TAVR: An Update for 2016

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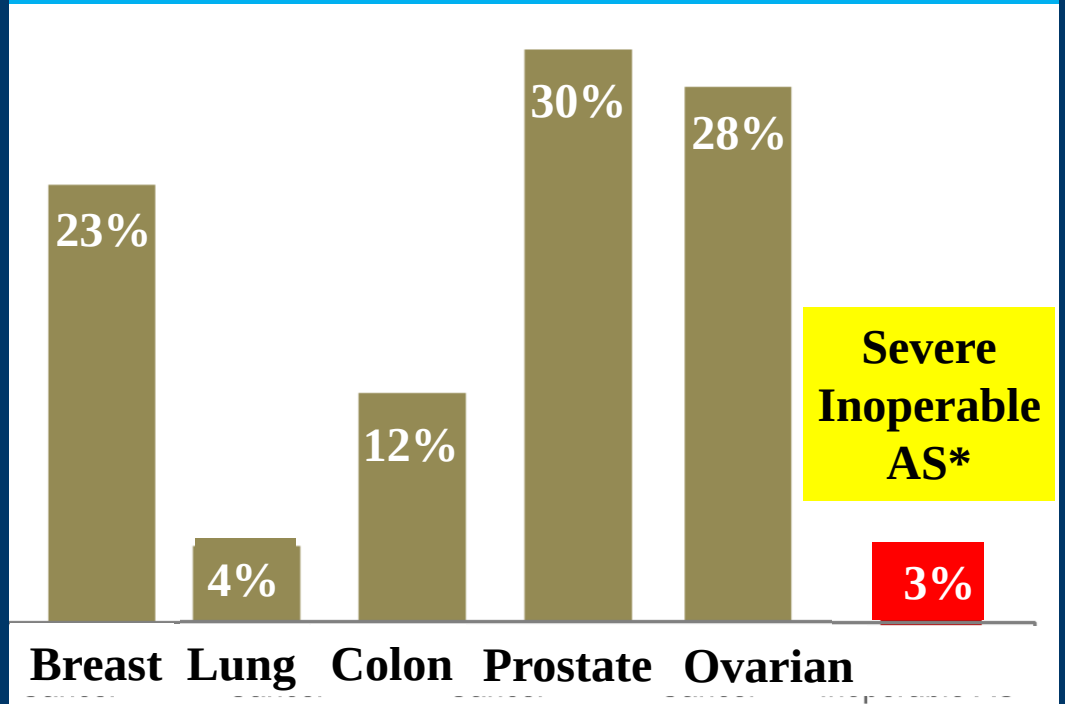
Disclosures

Medtronic - speaker
Edwards -TAVR education

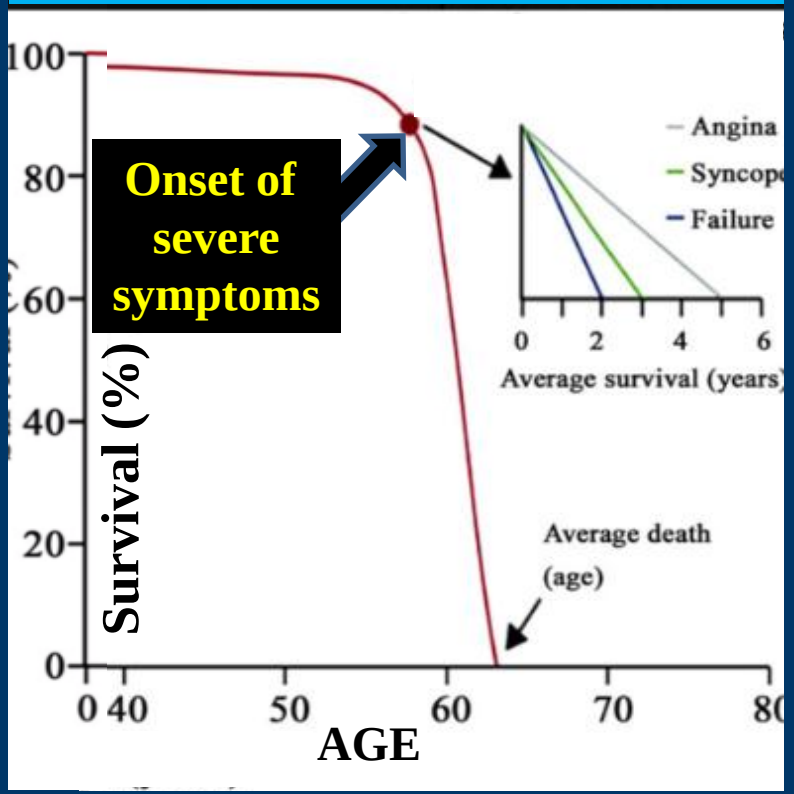
Symptomatic Severe Aortic Stenosis

5-year Survival: Metastatic Cancer



. Data on file, Edwards Lifesciences LLC. Analysis courtesy of Murat Tuczu, MD, Cleveland Clinic

Percent Survival

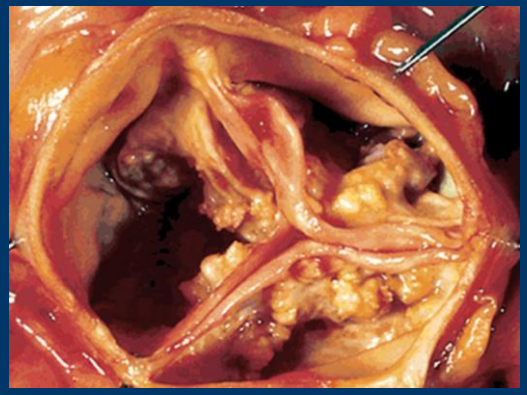


is a lethal disease

Braunwald. Circulation 1968.

Severe AS in the old days …

Angina
Syncope
Heart failure

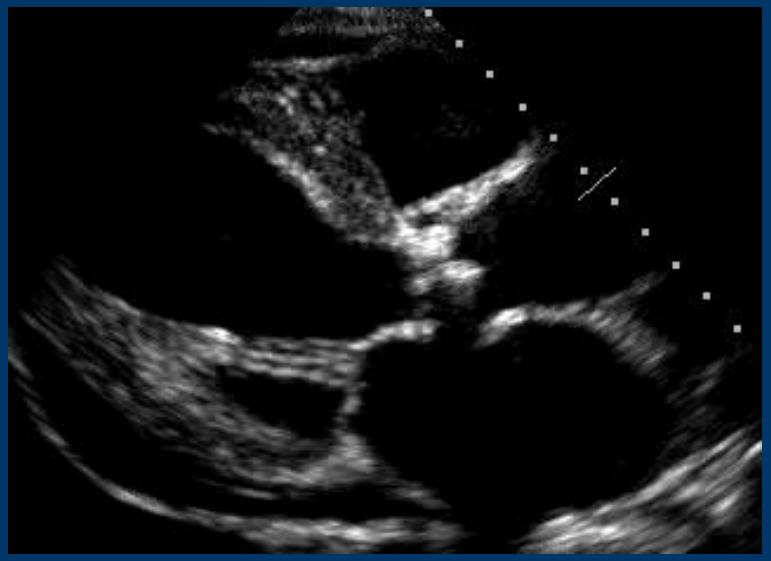


Peak vel >4 m/s
Grad >40 mmHg
Area <1.0 cm^2

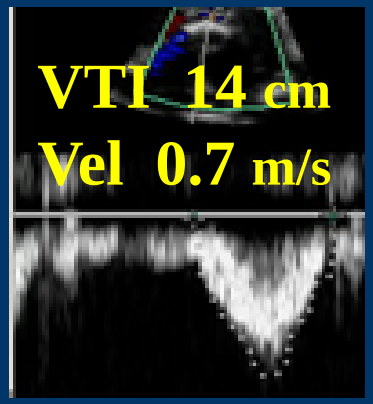
50% referral → **CT Surgeon** → **40%** → **AVR**

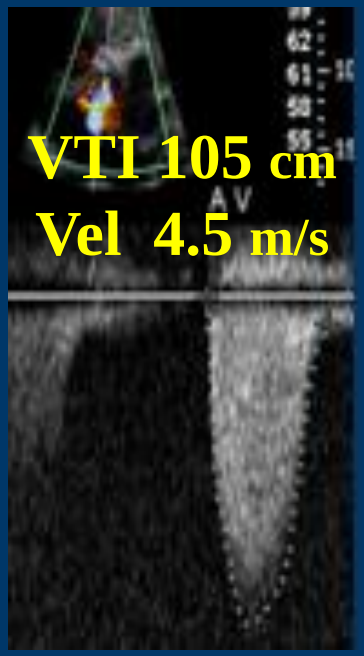
Classic symptoms are late manifestations.
Initial sx: DOE or ↓exercise tolerance.

Unusual Case - Easy Decision



80 year old farmer with HF, syncope and angina.





Mean gradient - 43 mmHg
AV Area - 0.4 cm^2

Management of Aortic Stenosis

Asymptomatic **pts with AS have outcomes similar to age-matched adults. But progression with symptoms is common.**

AVR is based largely on the presence or absence of *symptoms* attributed to severe AS and not on absolute valve area or gradient. (*EF 30% HF I or III*)

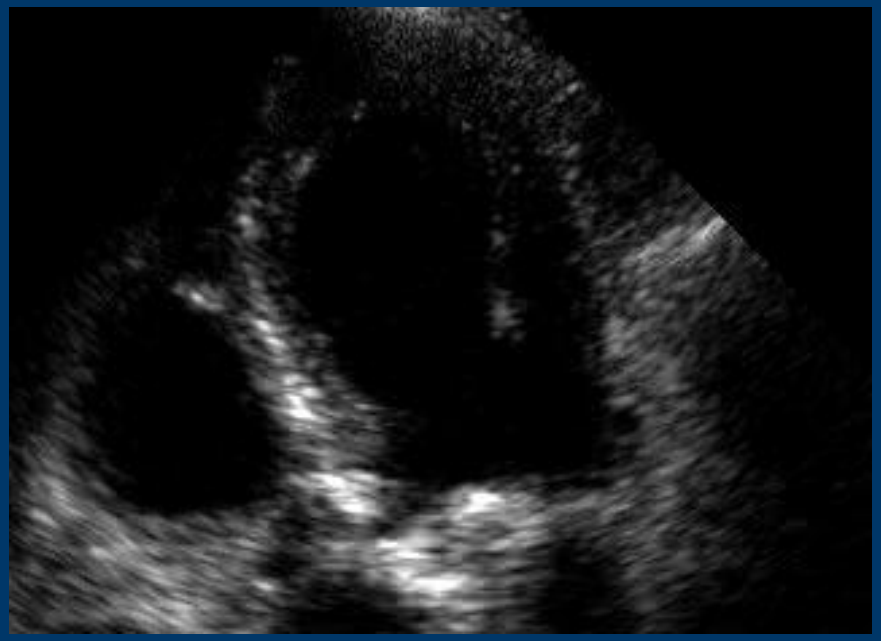
Symptoms may be subtle like reduced exercise tolerance or dyspnea on exertion. Pts may reduce activity to below symptoms threshold. Risk of sudden death is high once any symptoms develop – even mild ones.

Exercise testing in asymptomatic severe AS is safe and underutilized. May help to unmask symptoms!

Bonow. ACC/AHA Valvular Heart Disease Guidelines. JACC 2008:52:e1-142

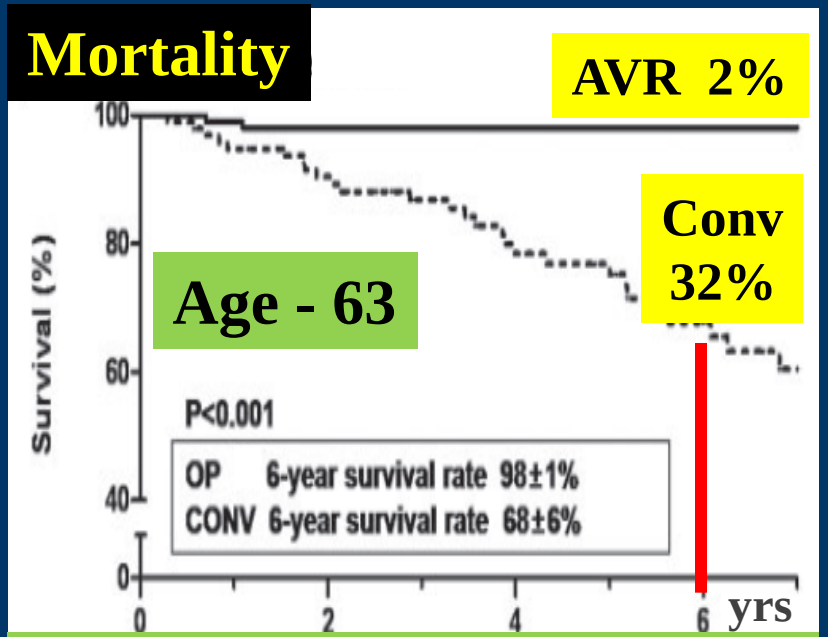
Walks 2 miles/day - no symptoms!

75 yr old wants a 2nd opinion



Peak velocity – 5.5 m/s
Mean gradient - 75 mmHg
AV Area - 0.5 cm^2

197 pts, No sx, valve <0.75 cm^2 plus vel >4.5 m/s or >50mmHg
(Excluded pts with CAD, EF <50%, significant AI or MR, age >85)



Conv group, velocity >5 m/s was an indep marker for mortality

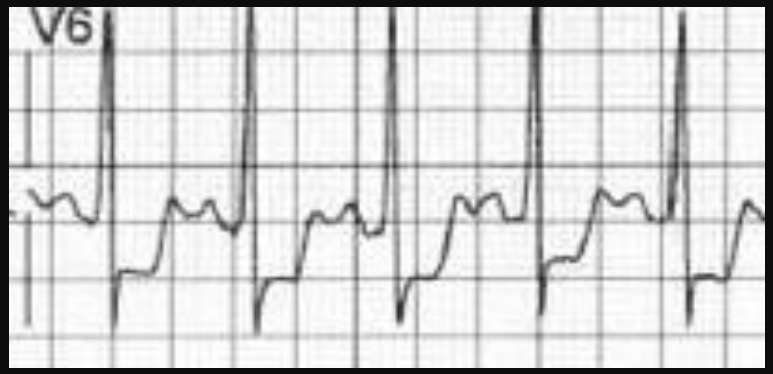
Kang. Circulation 2010;121:1502-9

Is it Aortic Stenosis or Age?

75 male – followed in clinic for severe AS. He may be "slowing some" although attributes it to his age. Denies CP, dyspnea, or syncope. Continues to work out twice a week for at >1 hour on each occasion – jogging, rapid walking, cycles with a high tension and lifts weights. No symptoms.

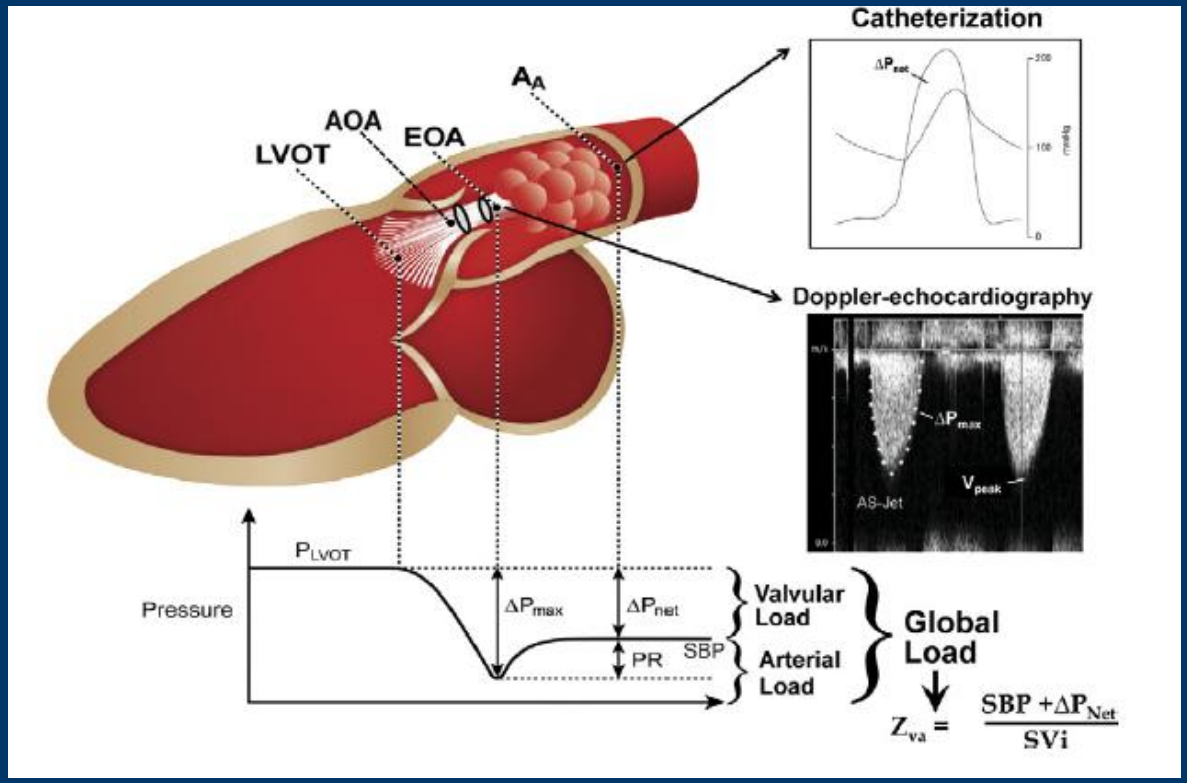
Treadmill - 7 METS. Stops due to leg weakness, fatigue.

BP at rest - 167/62. BP with exercise - 130/60.



AS: Complex "systemic" disease

1. Hypertension which adds to total afterload.
2. CAD which can impact ventricular function.



Pibarot and Dumesnil (review). JACC 2012;60:169-80

In 2016, it looks like this …

Age > 80+
Tired / fatigue
Heart failure (?)
COPD / Renal

High gradient AS

Low flow, low gradient

Paradoxical low-flow

- Treadmill stress (IIa)
- Dobutamine echo (IIa)
  if EF <50%, AVA <1.0,
  and <4m/s or <40 mmHg

TAVR Clinic

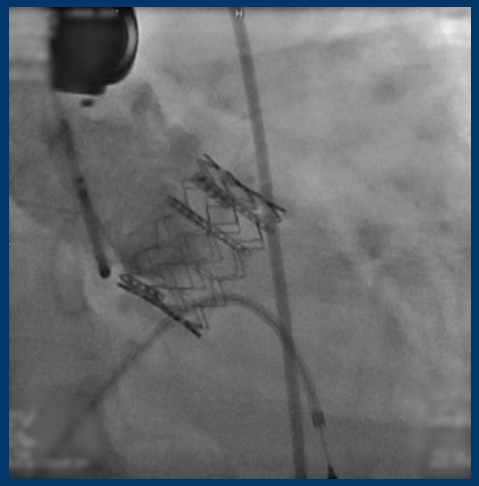
Truly symptomatic severe AS or futility

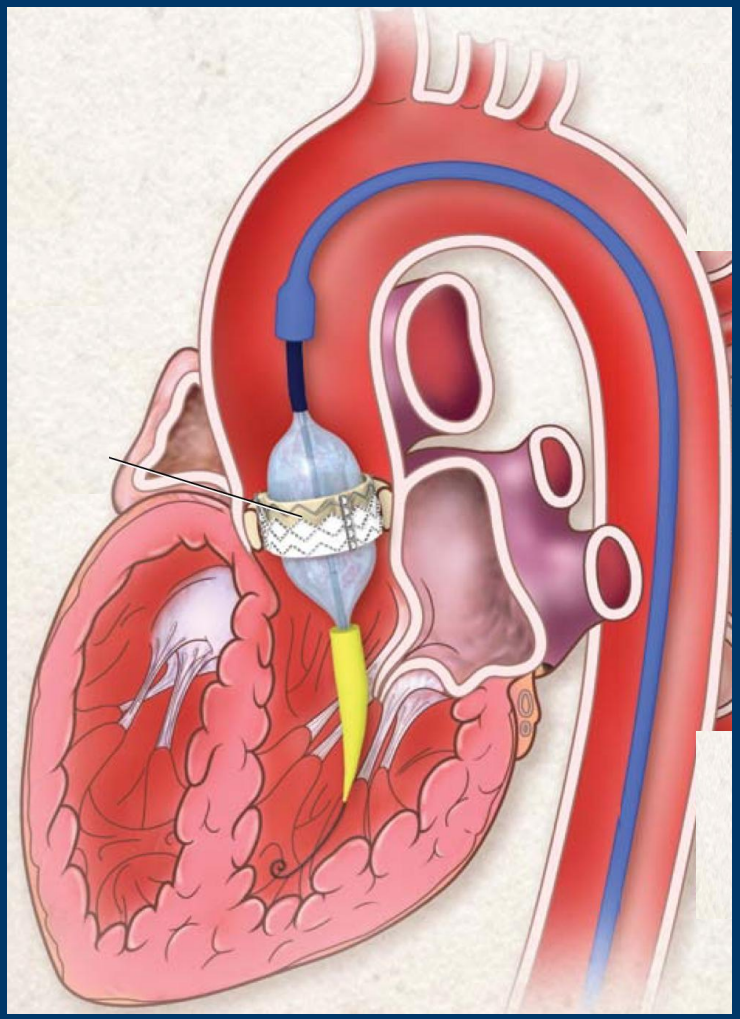
SAVR ± ?

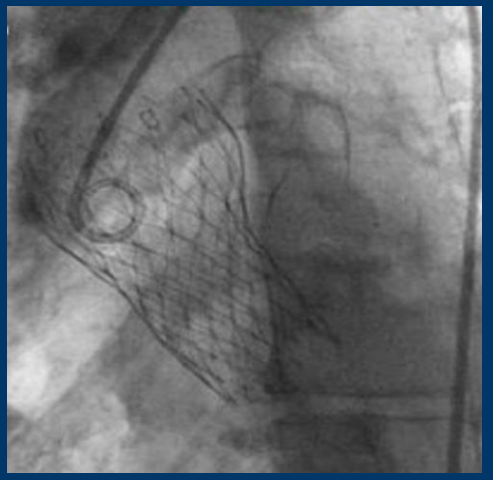
TAVR

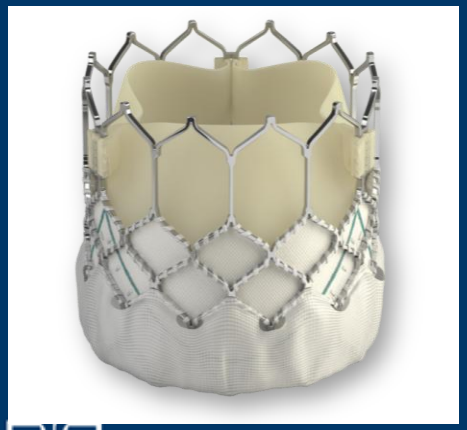
Trial TAVR

Transcatheter Aortic Valve Replacement

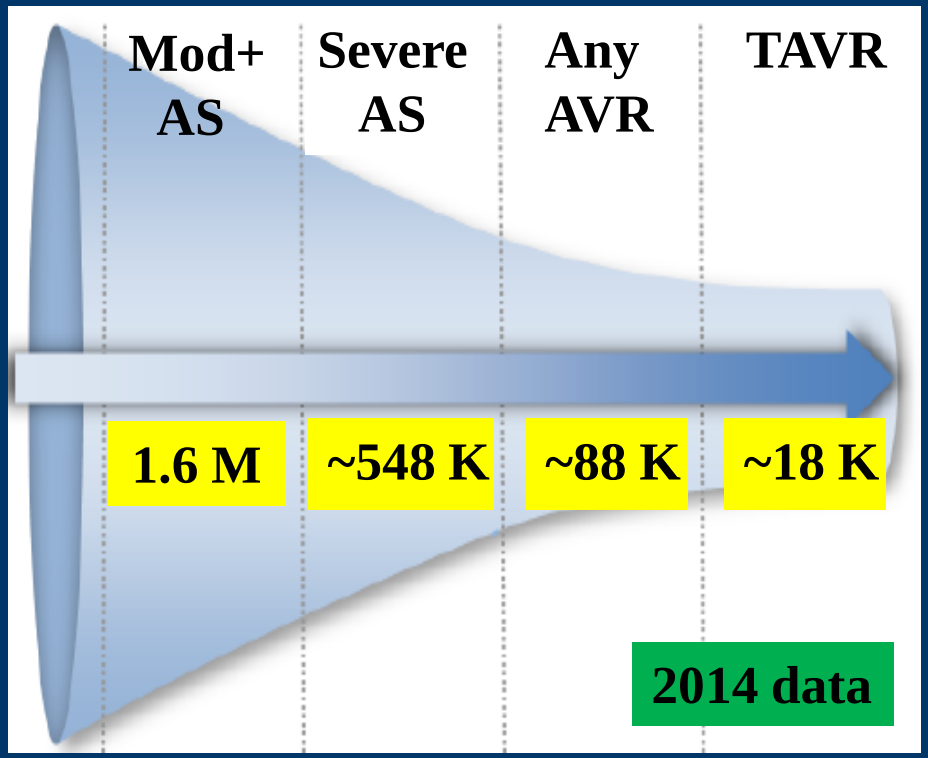


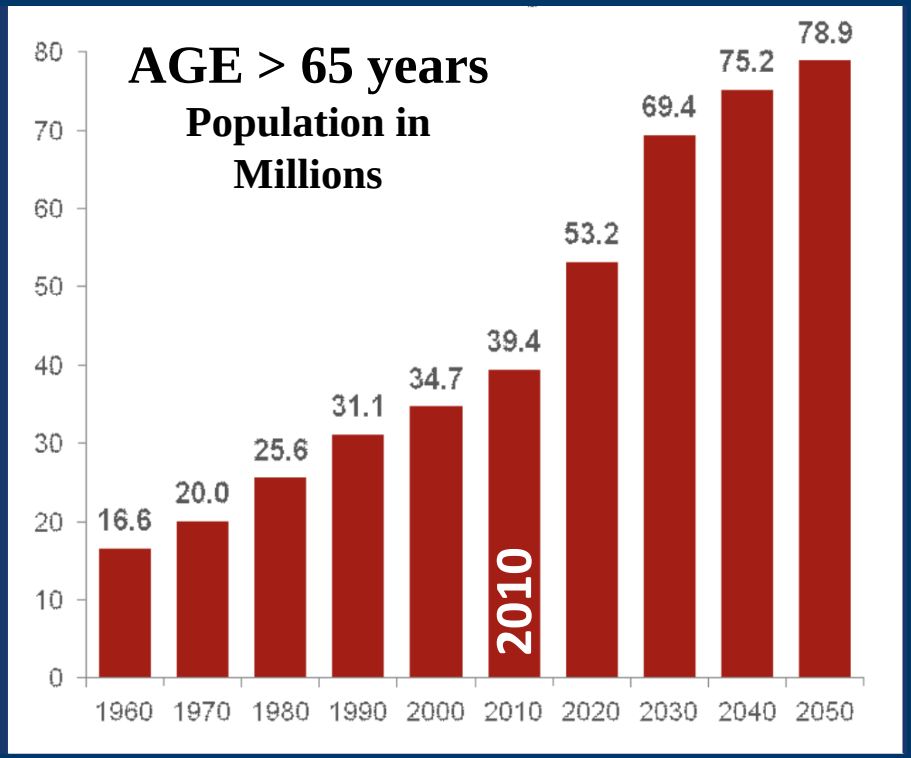






Demographic Trends



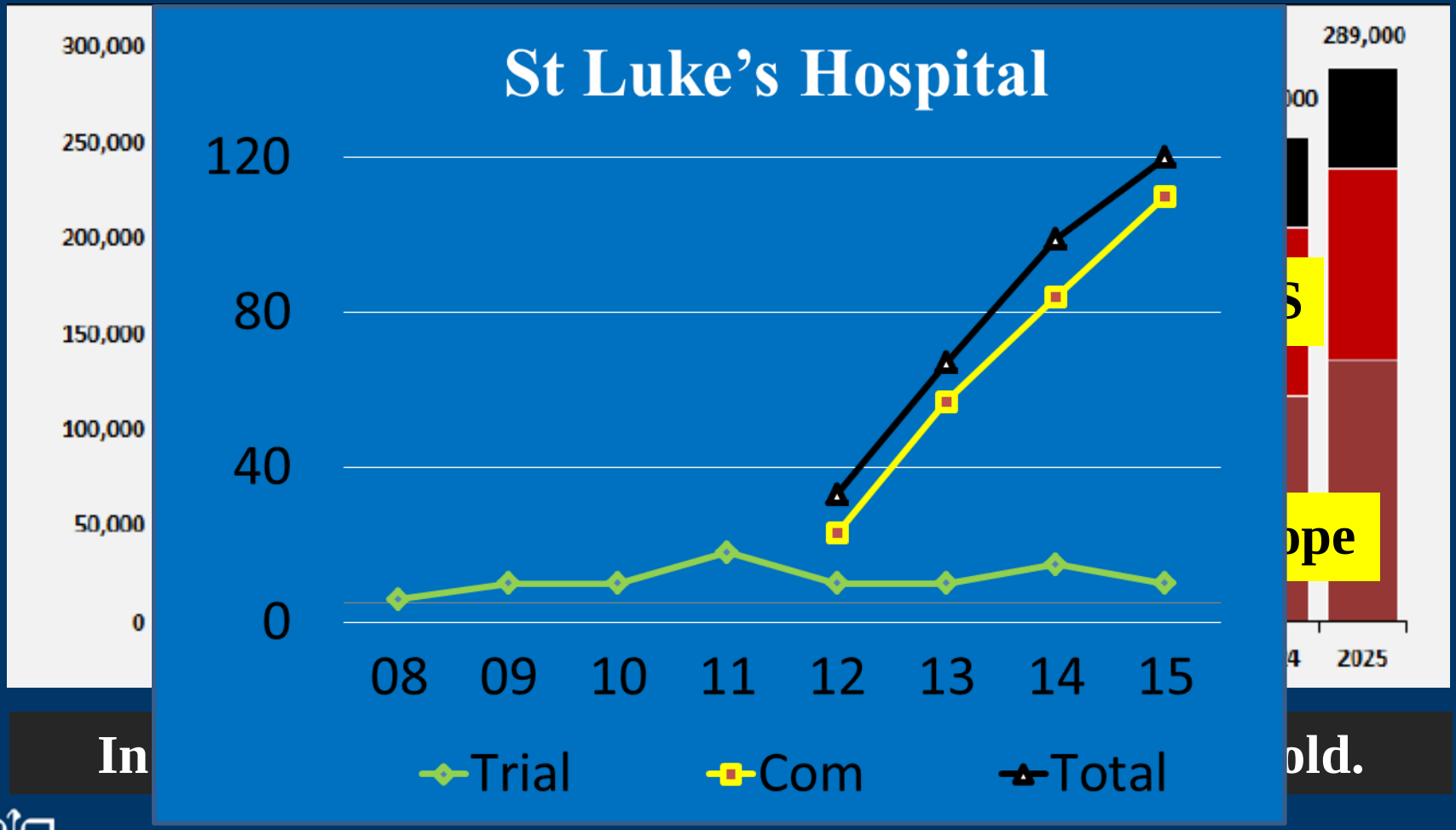


Nearly 3% of subjects >75 years have critical aortic stenosis.

Am Heart J 2012;163:477-85. US Census Bureau 2010

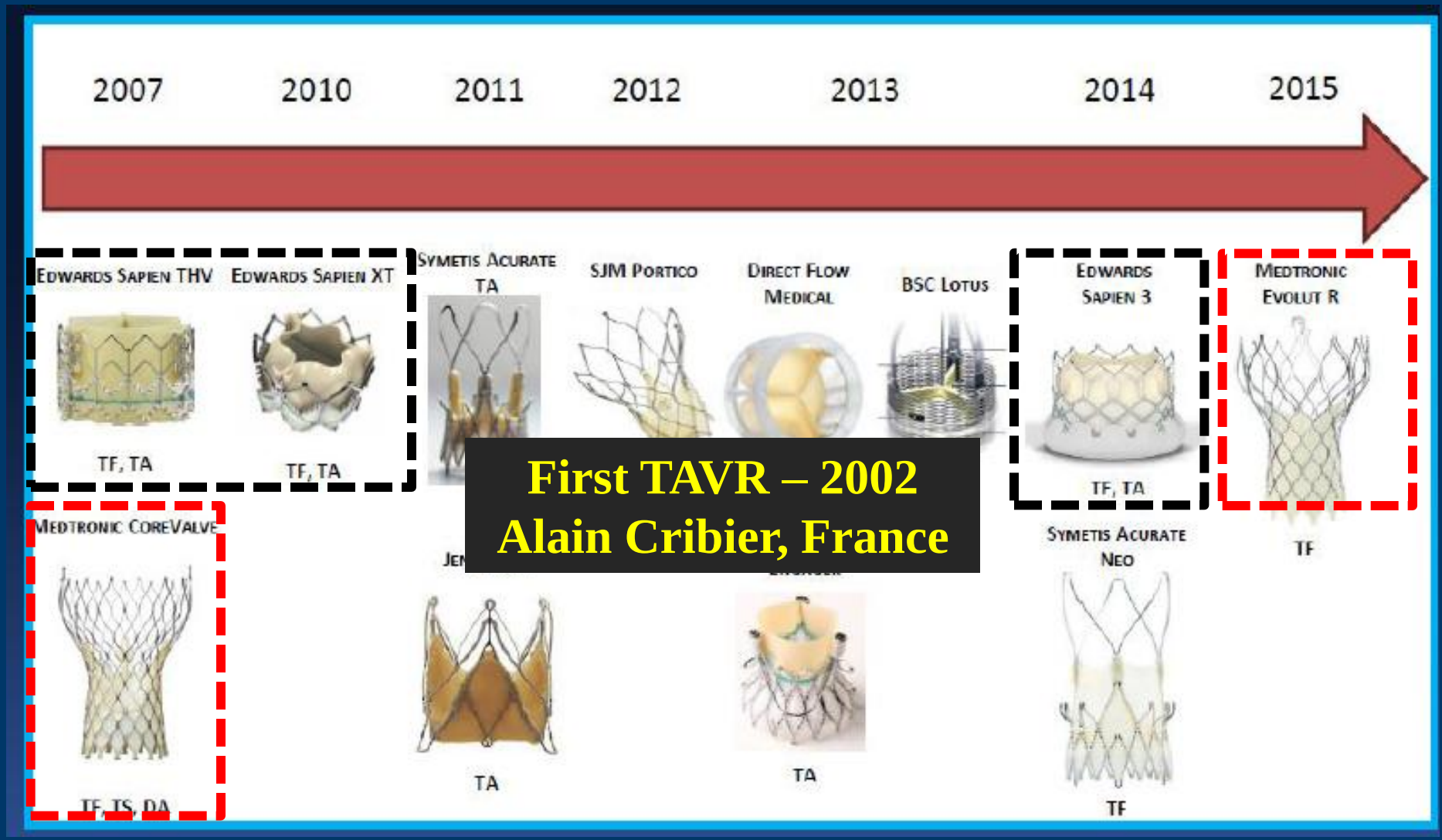
TVT 2015: Freed 2010; Bach. Unoperated pts with severe AS. J Heart Valve Dis May 2011

Estimated Global TAVR Growth

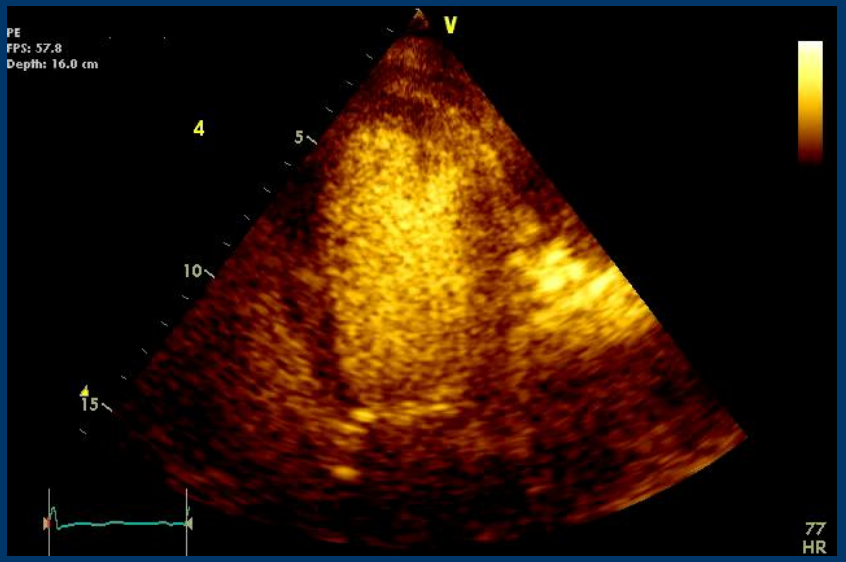


Lancet 2015;385:2439-41. TVT 2015 – Source: Credit Suisse TAVI Comment 1/8/15

CE-Approved TAVR Systems



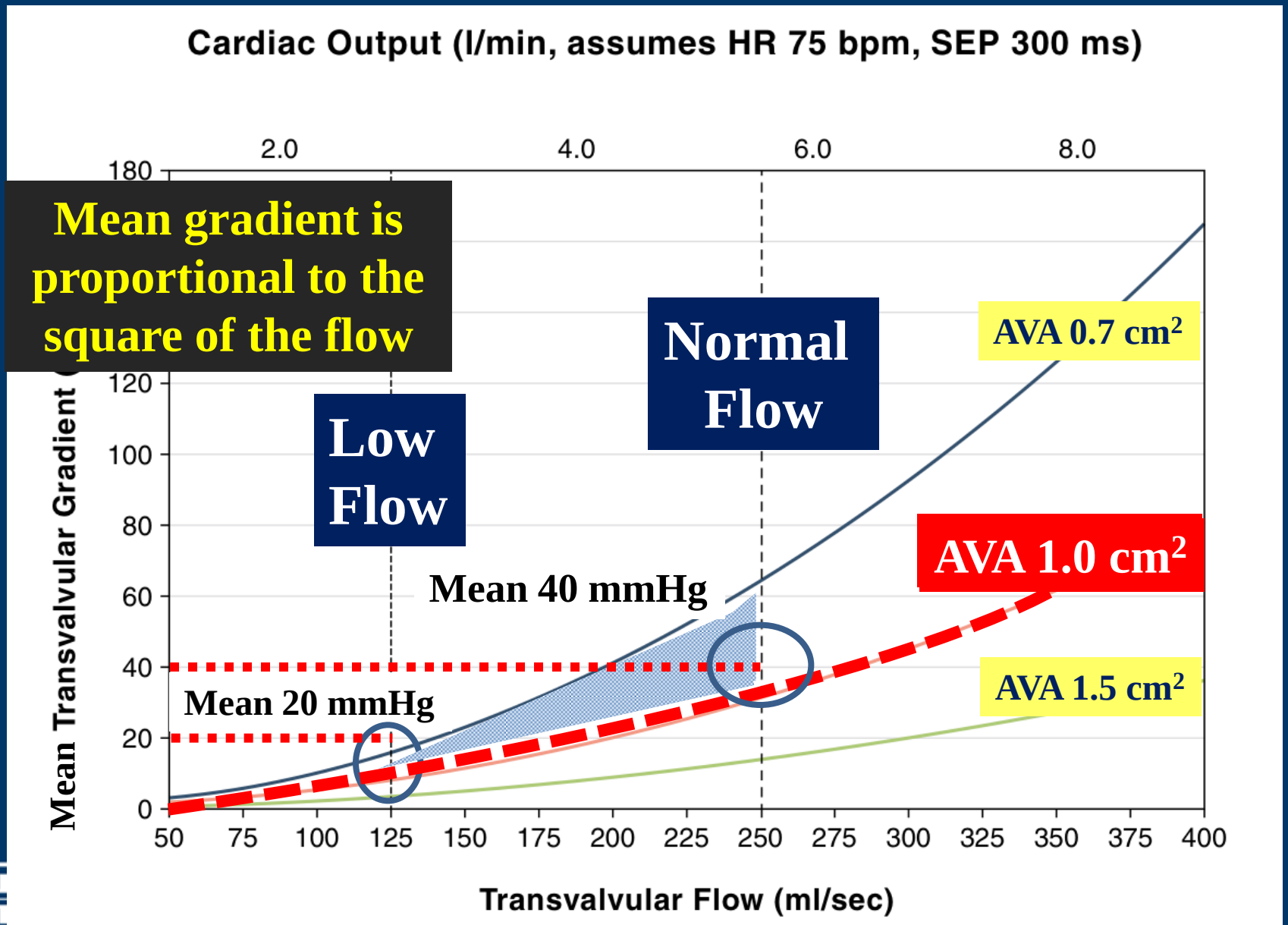
Low-Flow/Low-Gradient AS (↓EF)



LVOT	Ao V
17 cm	62 cm
0.8 m/s	3.0 m/s
	23 mmHg

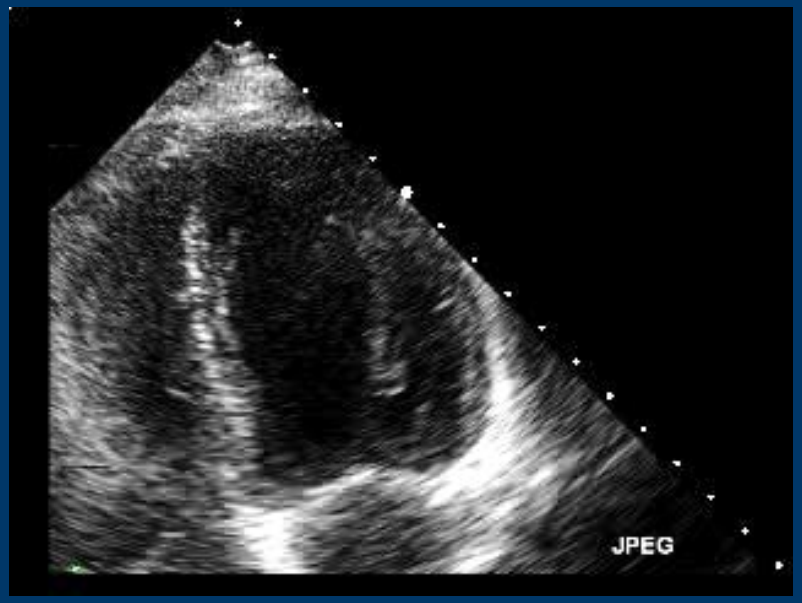
AV Area - 0.9 cm^2

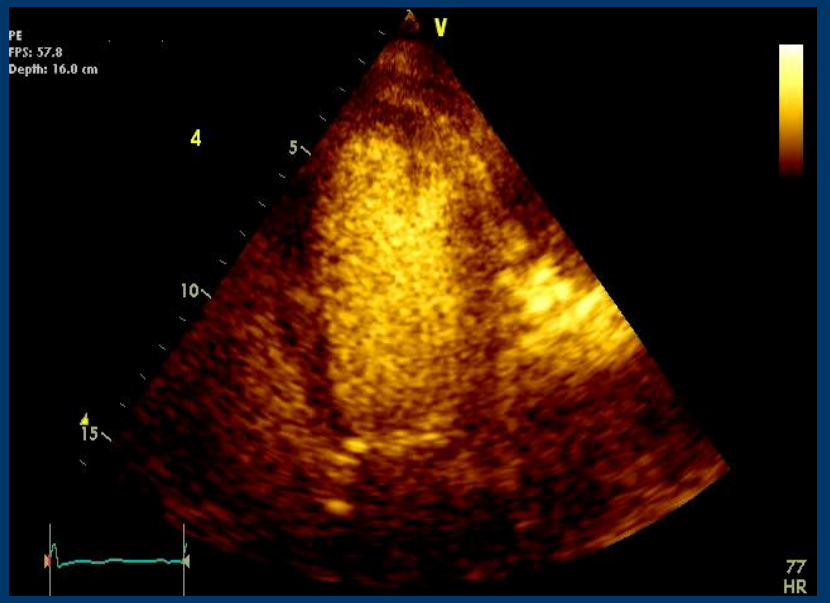
April 2012



JACCi 2013:6:184-95

Low-Flow/Low-Gradient AS (↓EF)





LVOT	Ao V
28 cm	98 cm
1.0 m/s	3.8 m/s
	38 mmHg

Sept 2011

LVOT	Ao V
17 cm	62 cm
0.8 m/s	3.0 m/s
	23 mmHg

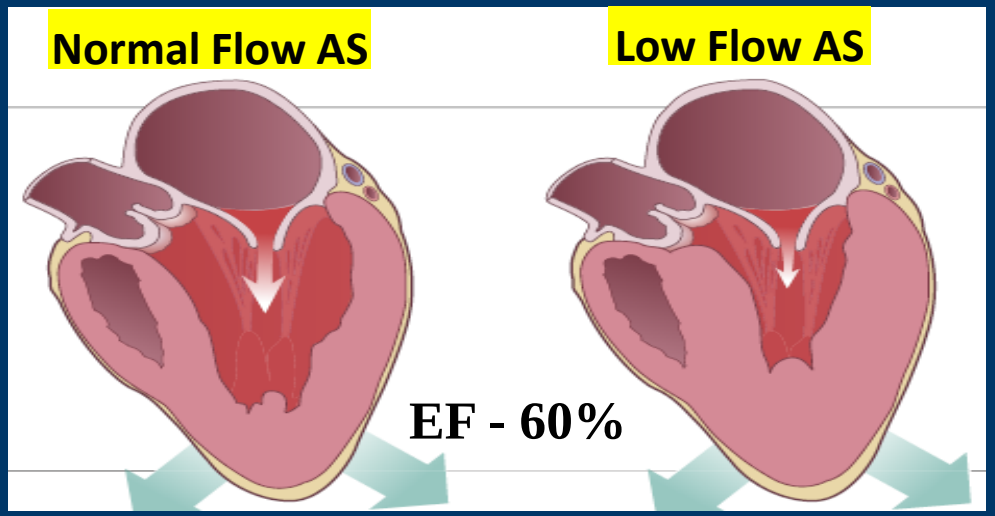
April 2012

AV Area - 0.9 cm^2

Paradoxical low-flow severe AS

Chronic exposure to high afterload may eventually lead to intrinsic impairment of myocardial function.

Myocardial function and stroke volume are reduced despite a normal LVEF.



Severe low-gradient AS

JACC Img 2009;2:400-2

Pibarot and Dumesnil. JACC 2012;60:169-80

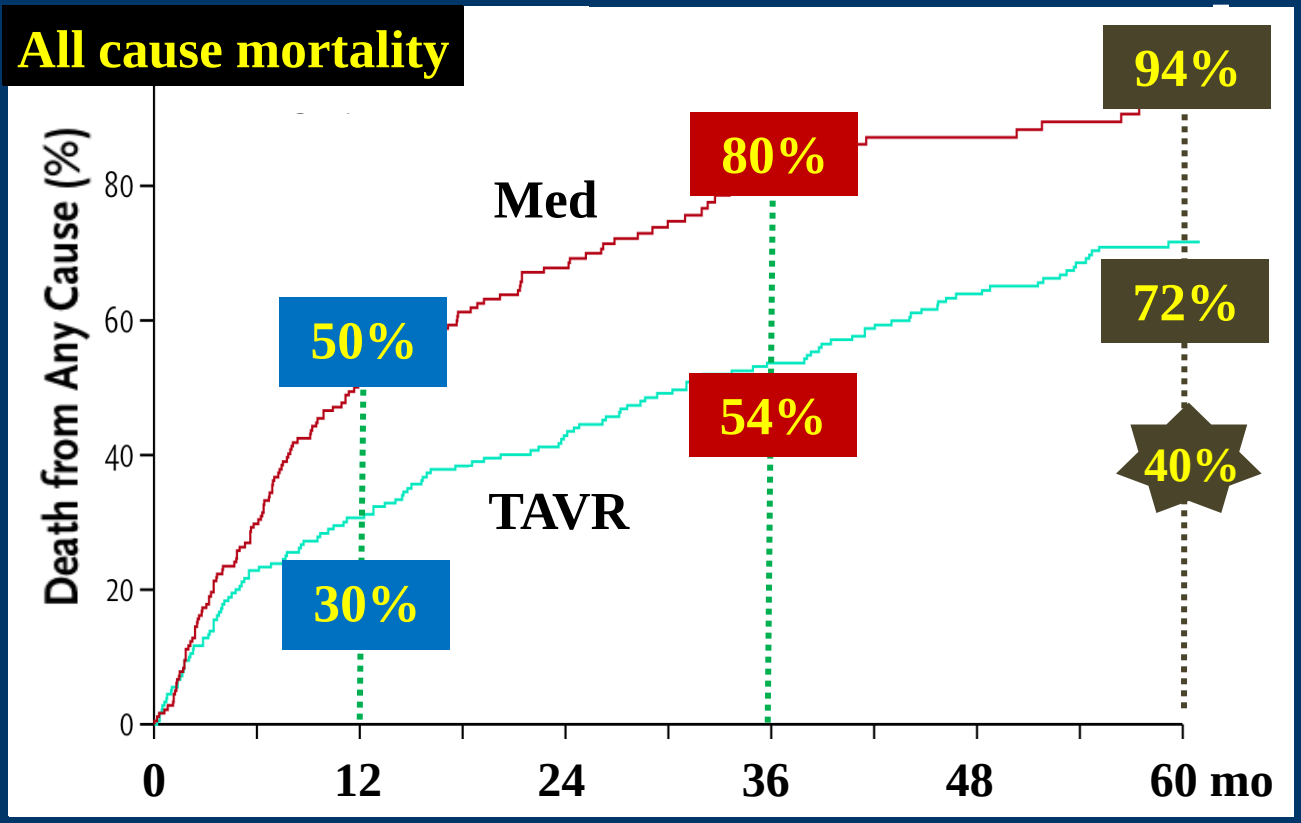
Predicting the Future

	Low	Intermediate	High Risk	Inoperable
STS PROM	**<4% and**	**4 to 8% or**	**>8% or**	**major morbidity or death >50% at 1 year**
Frailty Index	**None and**	**1 index - mild or**	**≥2 indices mod-severe**	
Feed, bath, dress, transfer, toilet, urinary continence, walk independently				
Major organs compromised	**None and**	**1 organ system or**	**≤ 2 organ systems or**	**3 organ systems or**
Low EF, diastolic or RV dysfx, pulm HTN, CKD stage 3-5, FEV1 <50%, dementia, CVA, albumin <3.0, active malignancy, liver dz / cirrhosis.				
Anatomy	**None**	**Possible**	**Possible**	**Severe**
Trach, porcelain aorta, chest deformity, grafts against chest wall, radiation				

ACC/AHA Guidelines . *Circulation*. 2014;129.

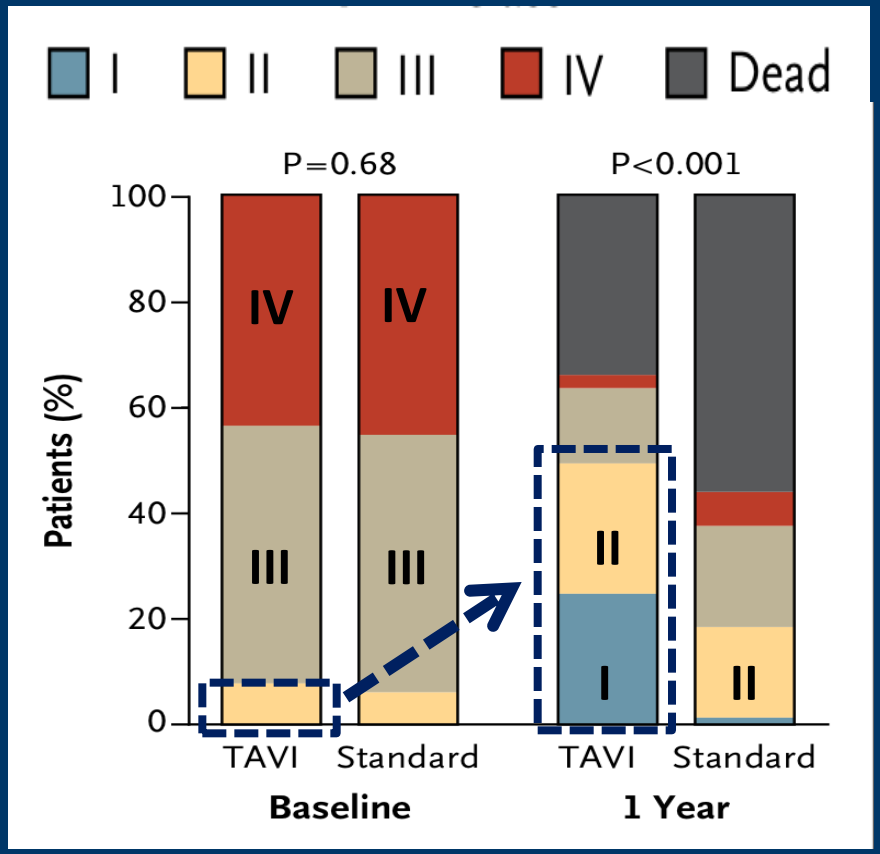
PARTNER IB - Inoperable

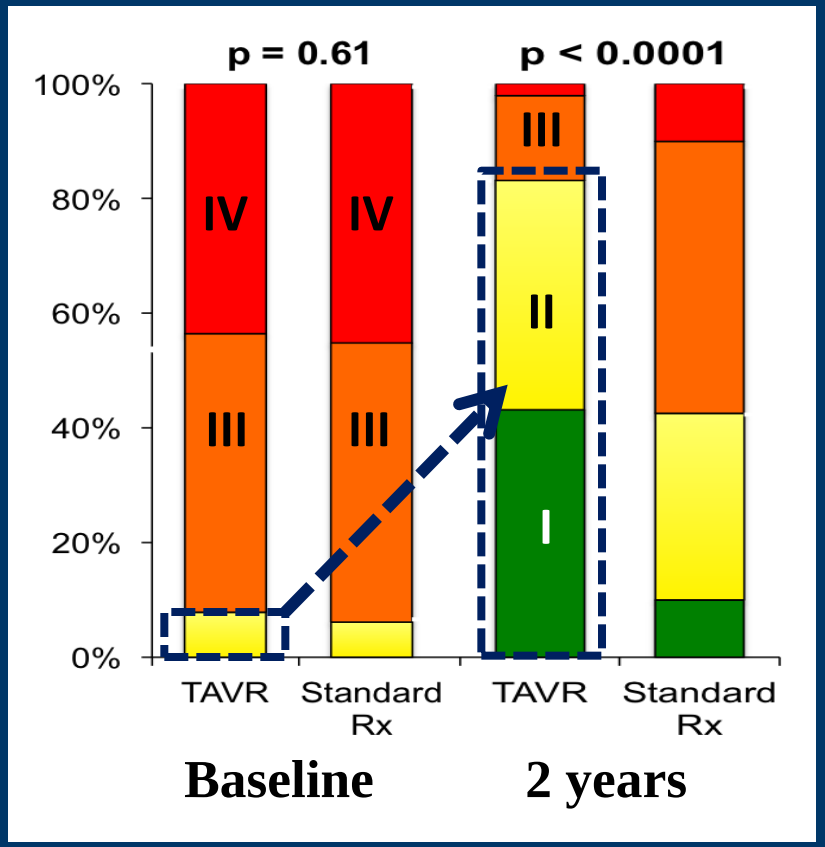
N - 358. Edwards 23mm or 26mm bioprosthetic valve
Age 83, male 45%, HF III-IV 92%, AVA 0.6 cm2, EF 52%



Lancet 2015;385:2485-91 NEJM 2010;363:1597-1607

PARTNER IB - HF Status

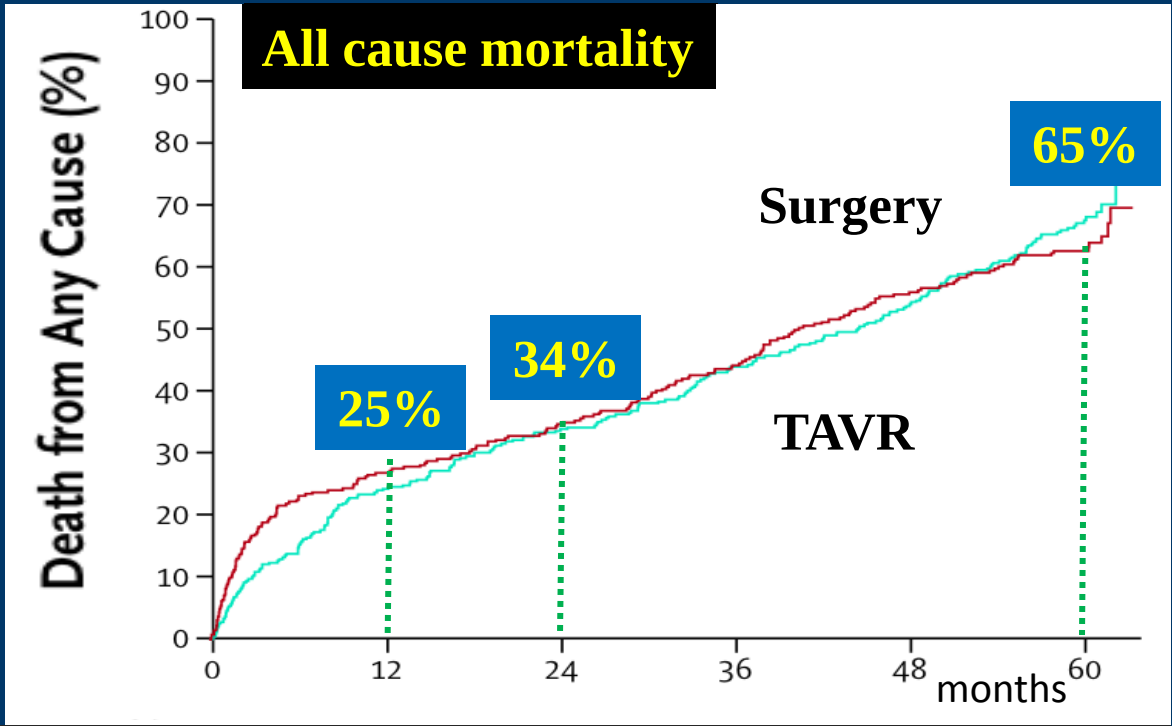




NEJM 2010;363:1597-1607 NEJM 2012;366:1696-1704

PARTNER IA - High Risk

N - 699. Randomized to TAVR (TF or TA) or SAVR
Age 84, male 58%, HF III-IV 94%, EF 53%, Prior CABG 41%

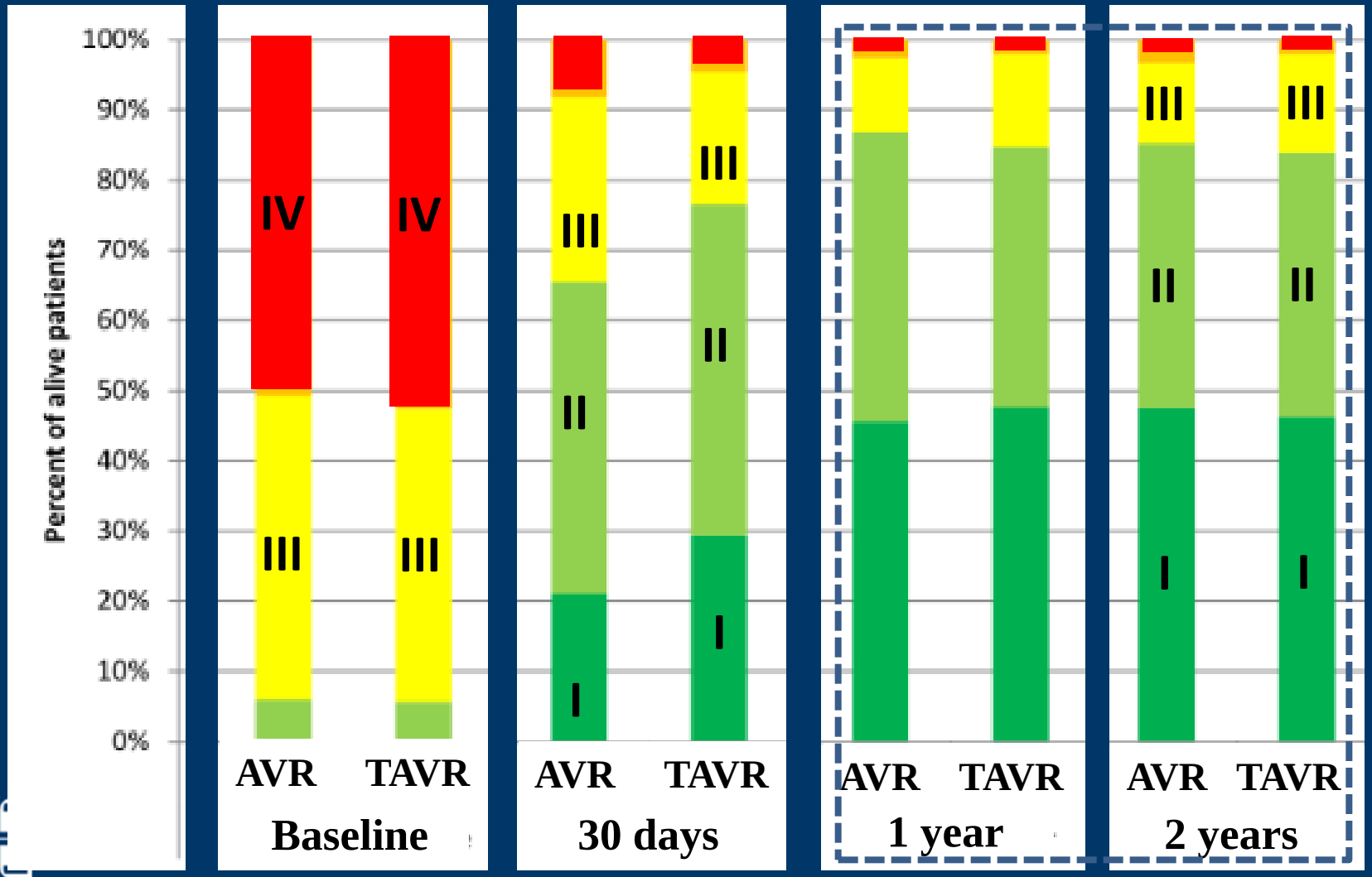


TAVR (Sapien 23, 26) is non-inferior to SAVR

FDA approved - Sept 2012

NEJM 2011; 364:2187-98 Lancet 2015;385:2477-84

PARTNER IA – HF Class

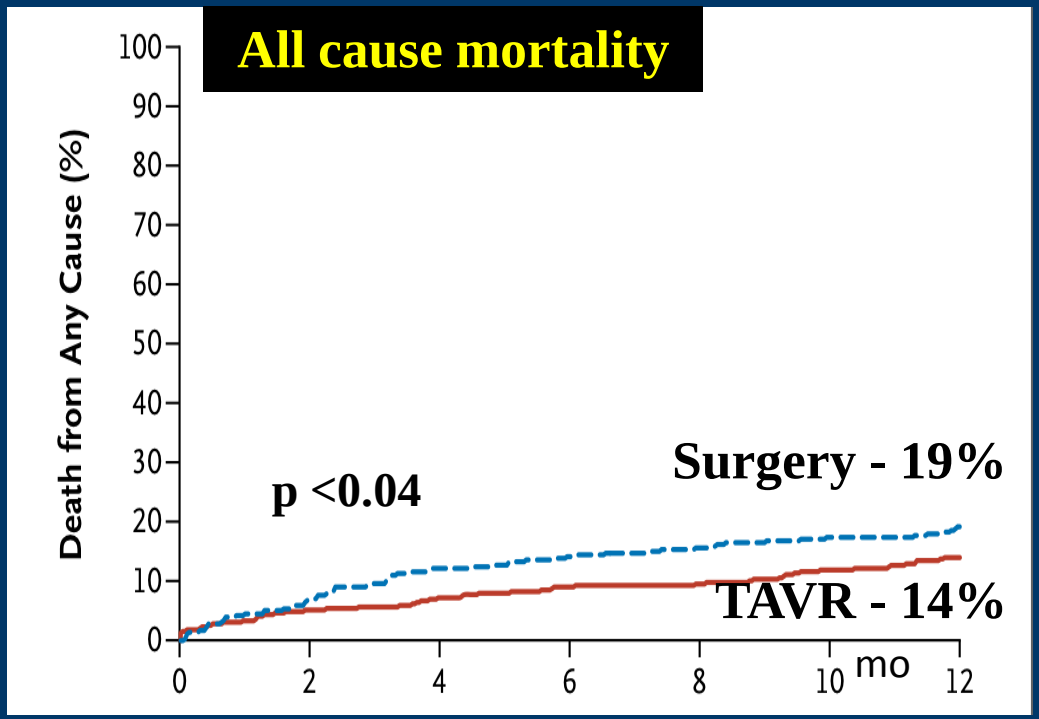


CoreValve - High surgical risk

Self-expanding system.

N - 747. Randomized to TAVR (TF or TA) or SAVR

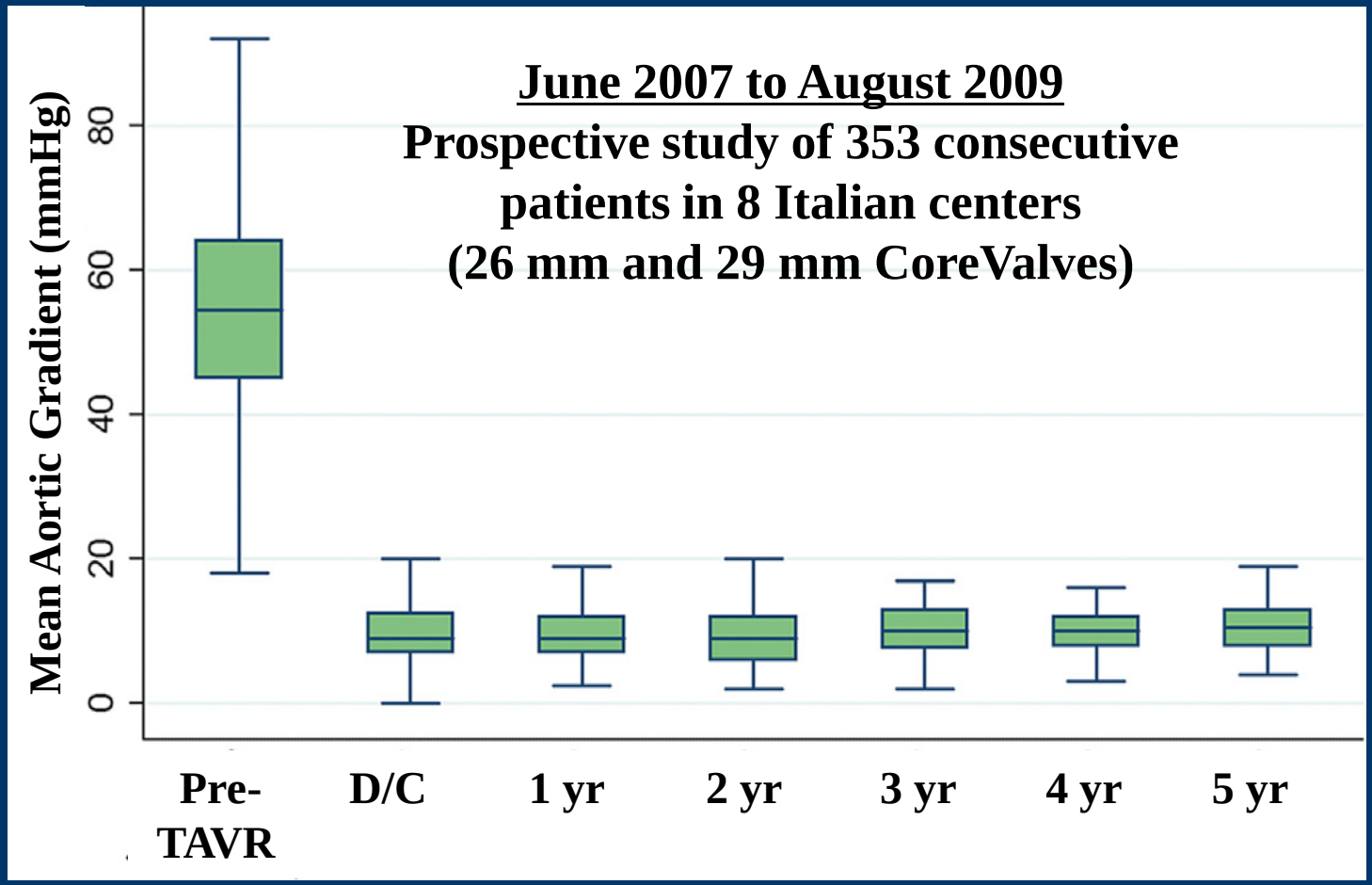
Age 83, male 53%, HF III-IV 86%, Prior CABG 30%, DM 40%



NEJM 2014;370:1790-8.

5-Year Prosthesis Performance

3rd generation 18-F CoreValve device



JACC Intervention 2015;8;1084-91

30 day Outcomes

Trial	N	STS	Death	CVA	≥2+ AR	Vasc Injury	Pacer
Partner IB	179	11.2	5.0	6.7	11.8	16.2	3.4
Partner 1A	348	11.8	3.4	4.7	12.2	11.0	3.8
Partner IIB	284	10.3	3.5	4.3	24.0	9.6	6.4
SAPIEN 3	150	7.4	5.3	2.7	3.5	5.3	13.3
SAPIEN 3 TF	96	7.5	2.1	1.0	3.5	4.2	12.5

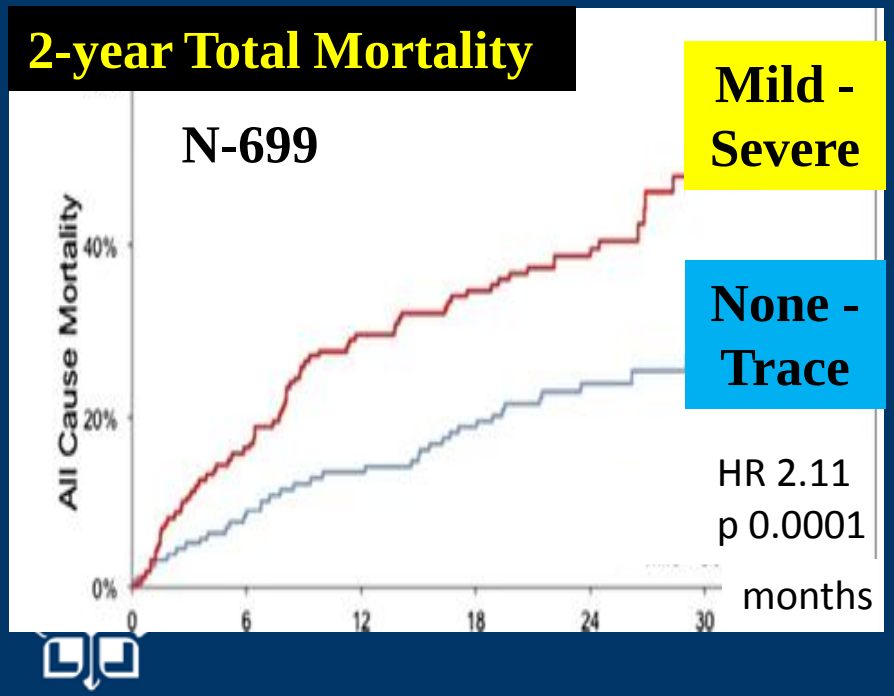
Core - Extreme	**489**	**10.3**	**8.4**	**4.0**	**15.3**	**5.9**	**21.6**
Core - Pivotal	390	7.3	3.3	4.9	10.0	5.3	19.8
Evolut R	60	7.0	0	0	3.4	8.3	11.7

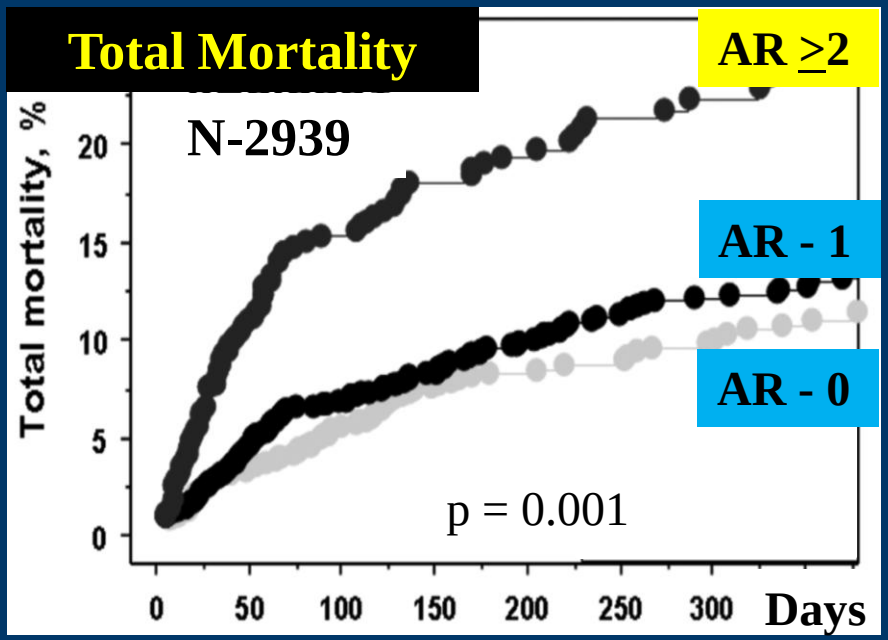
Euro PCR 2015. **JACC 2014;64;2244-5**

Impact of Aortic Regurgitation

Predictors: calcification, valve malposition within annulus, undersized valve, CoreValve vs Sapien (21% vs 13%)*

Outcomes: AI > 2+ is an independent predictor of short- and long-term mortality. The mechanism is still unclear.



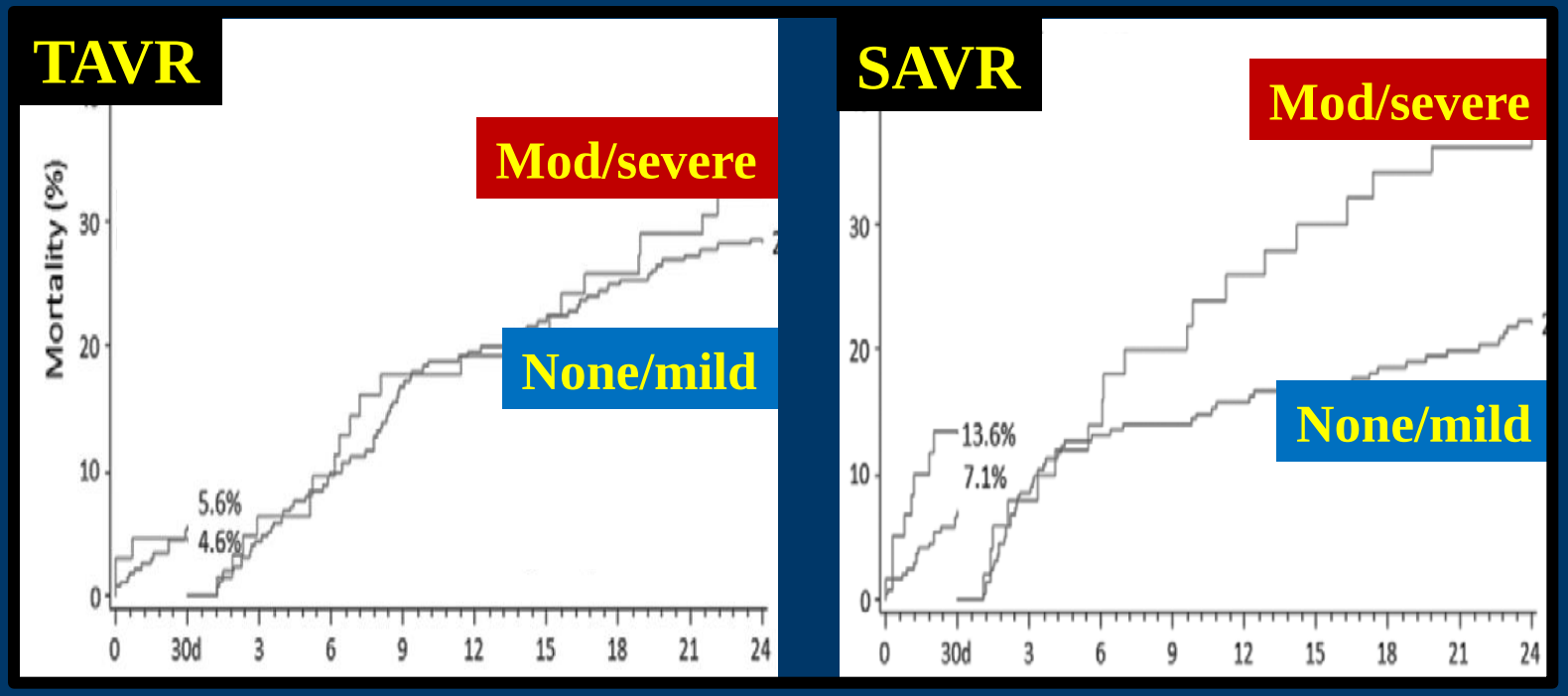


Partner IA. JACC 2013;61:1125-36

*France 2 Registry. CIRC 2014; 129:1415-1427

Role of Mitral Regurgitation

PARTNER 1A (high risk): ~ 20% pts had mod or severe MR



Moderate or severe MR was associated with a higher 2 year mortality with SAVR but not with TAVR.

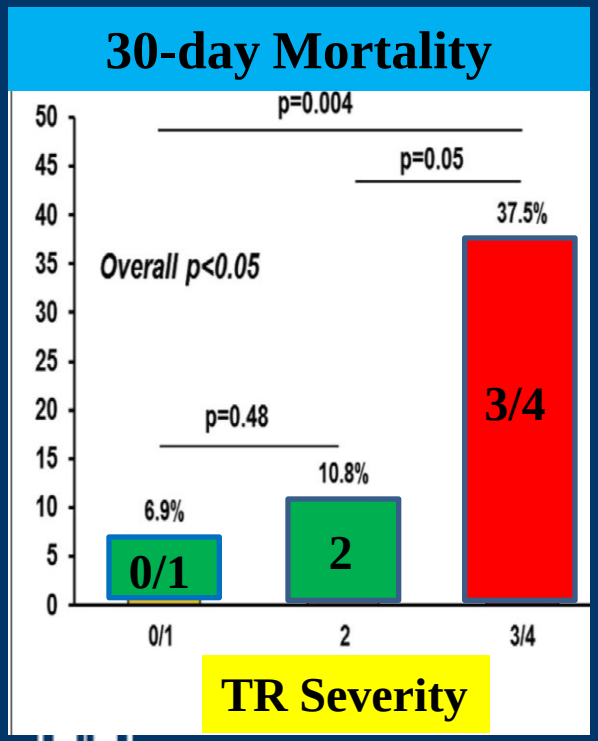
TAVR/SAVR: HF symptoms improved regardless of MR

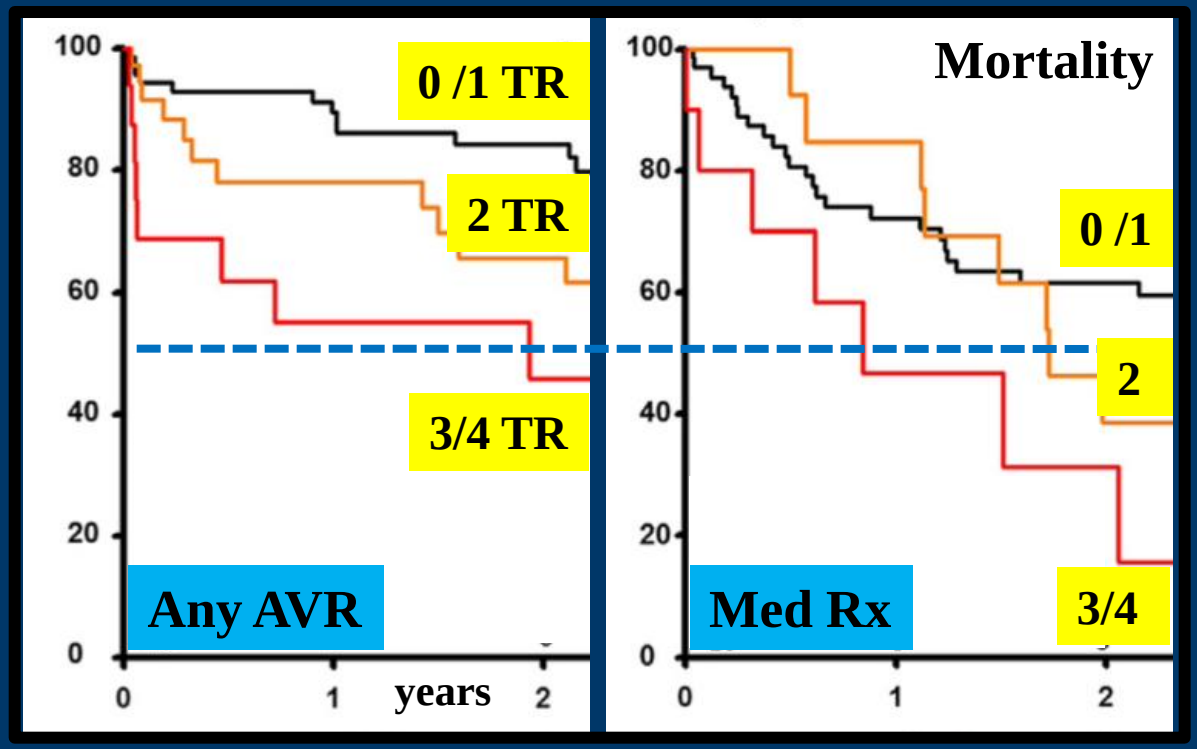
Barbanti. Circ 2013;128:2776-84

Tricuspid Regurgitation

Mortality in Low Flow, Low Gradient, Low EF AS

TOPAS study: 220 pts, age 73, HF III-IV 50%
60% underwent AVR (80% surg - 20% TAVR)



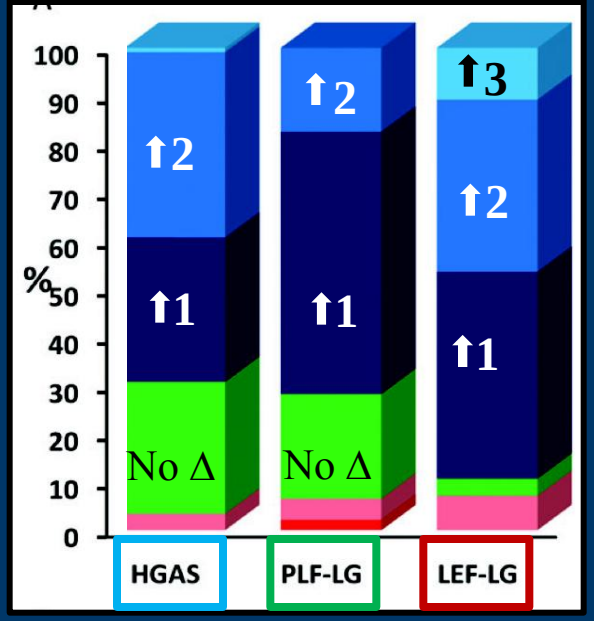


JACC Intervention 2015;8:588-96

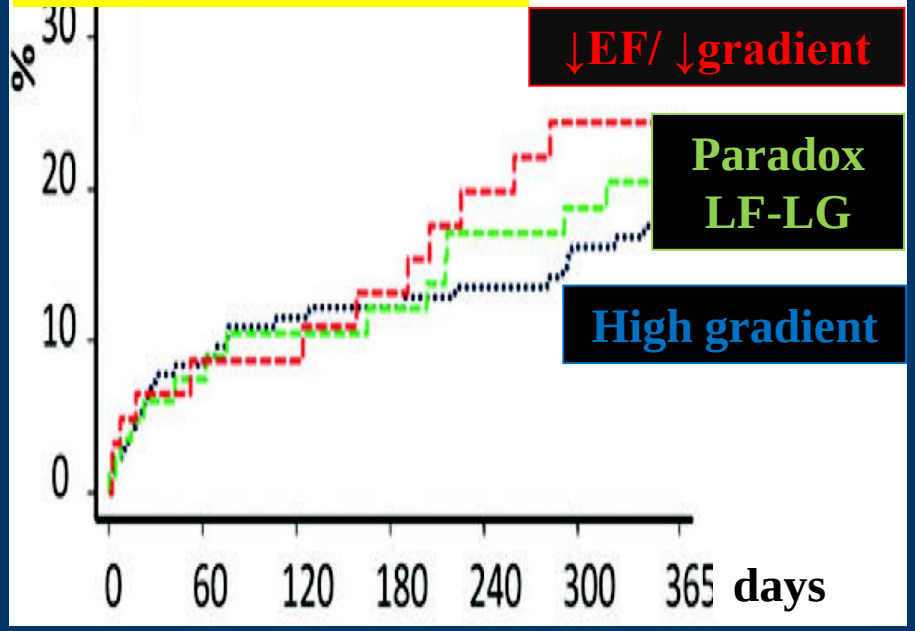
TAVR - low flow, low gradient

Retrospective analysis of 385 pts with inoperative or high risk symptomatic severe aortic stenosis.

Change in HF status



All-Cause Mortality

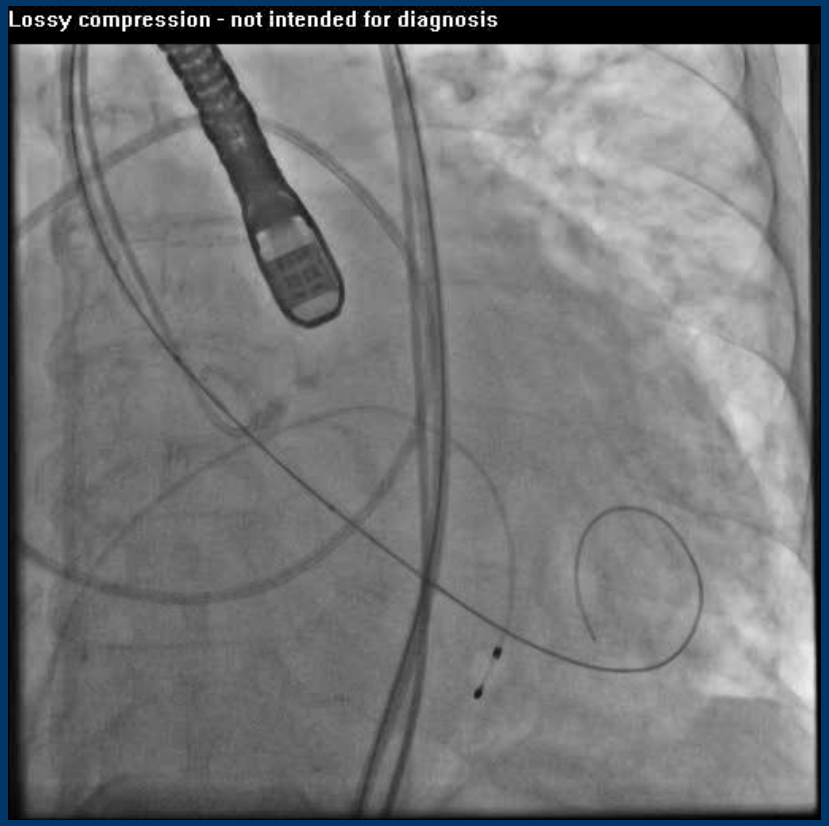


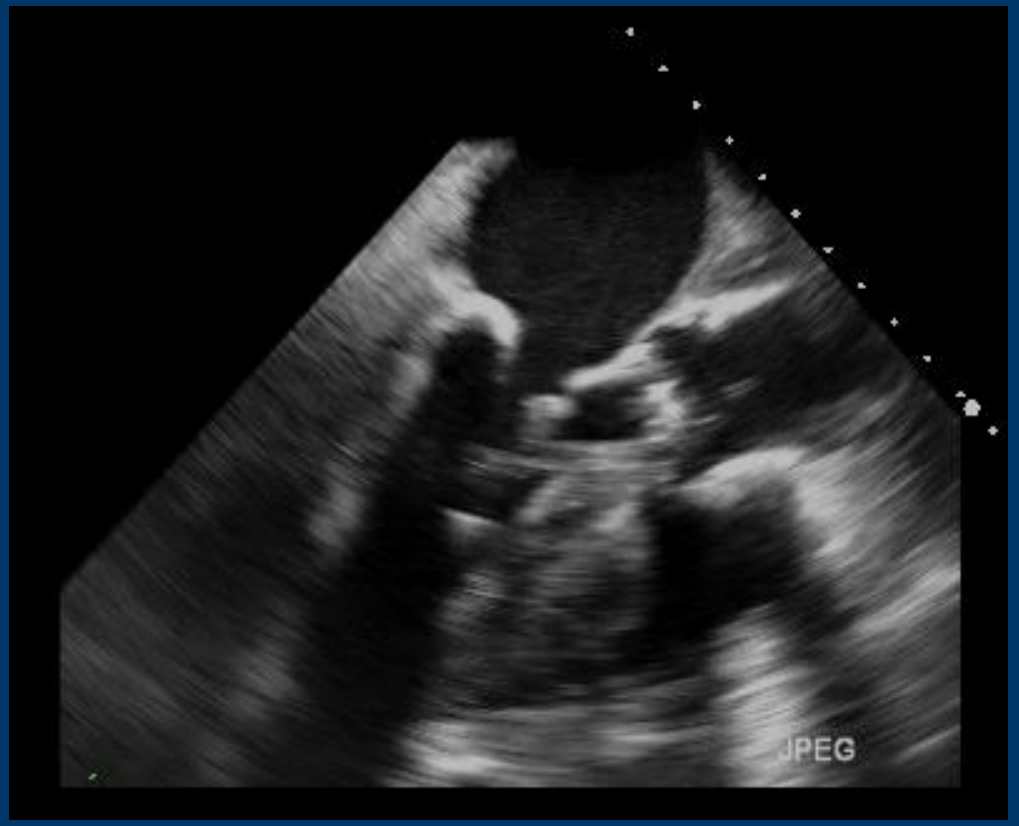
EF	mmHg
29%	25
60%	31
57%	56

Low EF-LG AS pts had more CAD, MI, MR. More likely to die of CV causes. Paradoxical LFLG pts - same benefit as HG . Typically 80 yr, ♀, HTN, CAD.

O'Sullivan. Europ Heart J 2013;34:3437-50

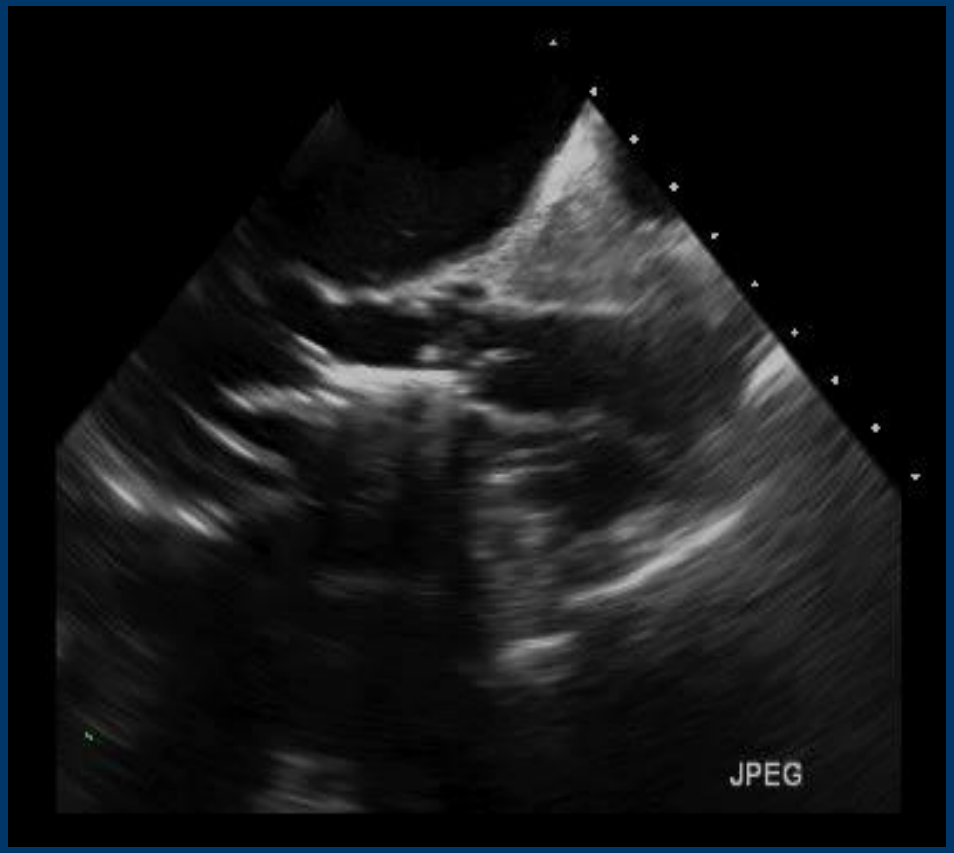
Balloon Aortic Valvaloplasty



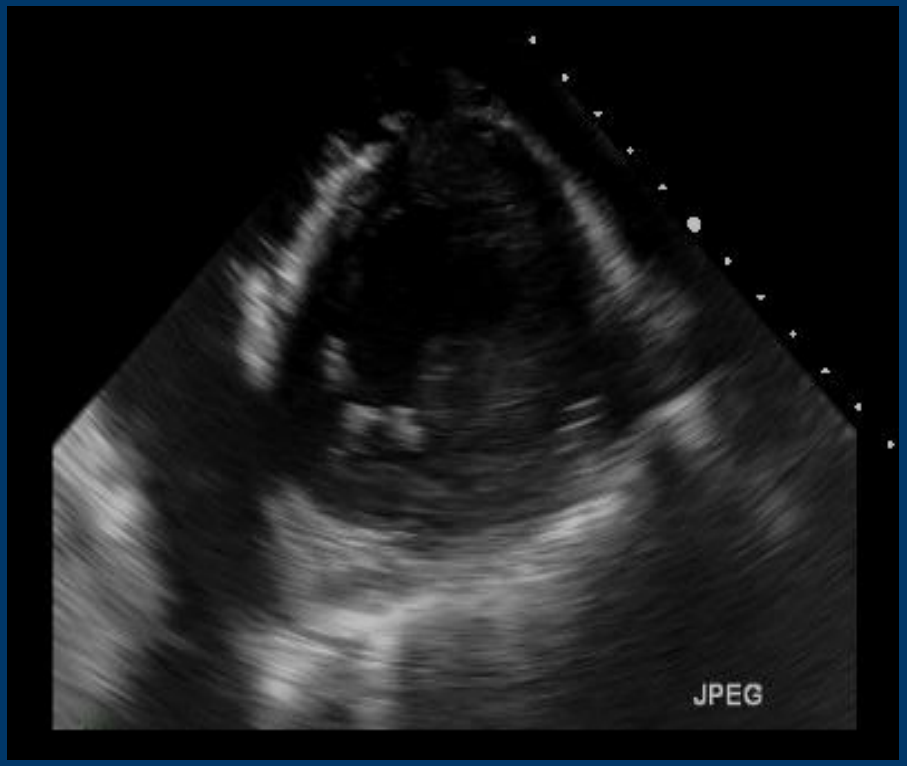


CoreValve Deployment

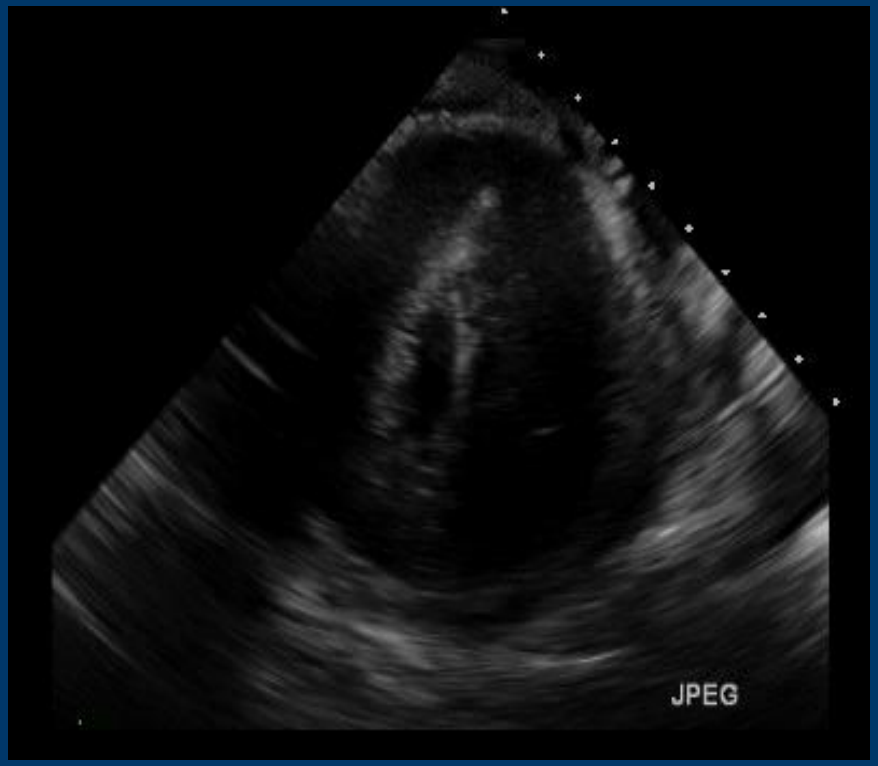
Edwards Valve Deployment



LV Function During TAVR

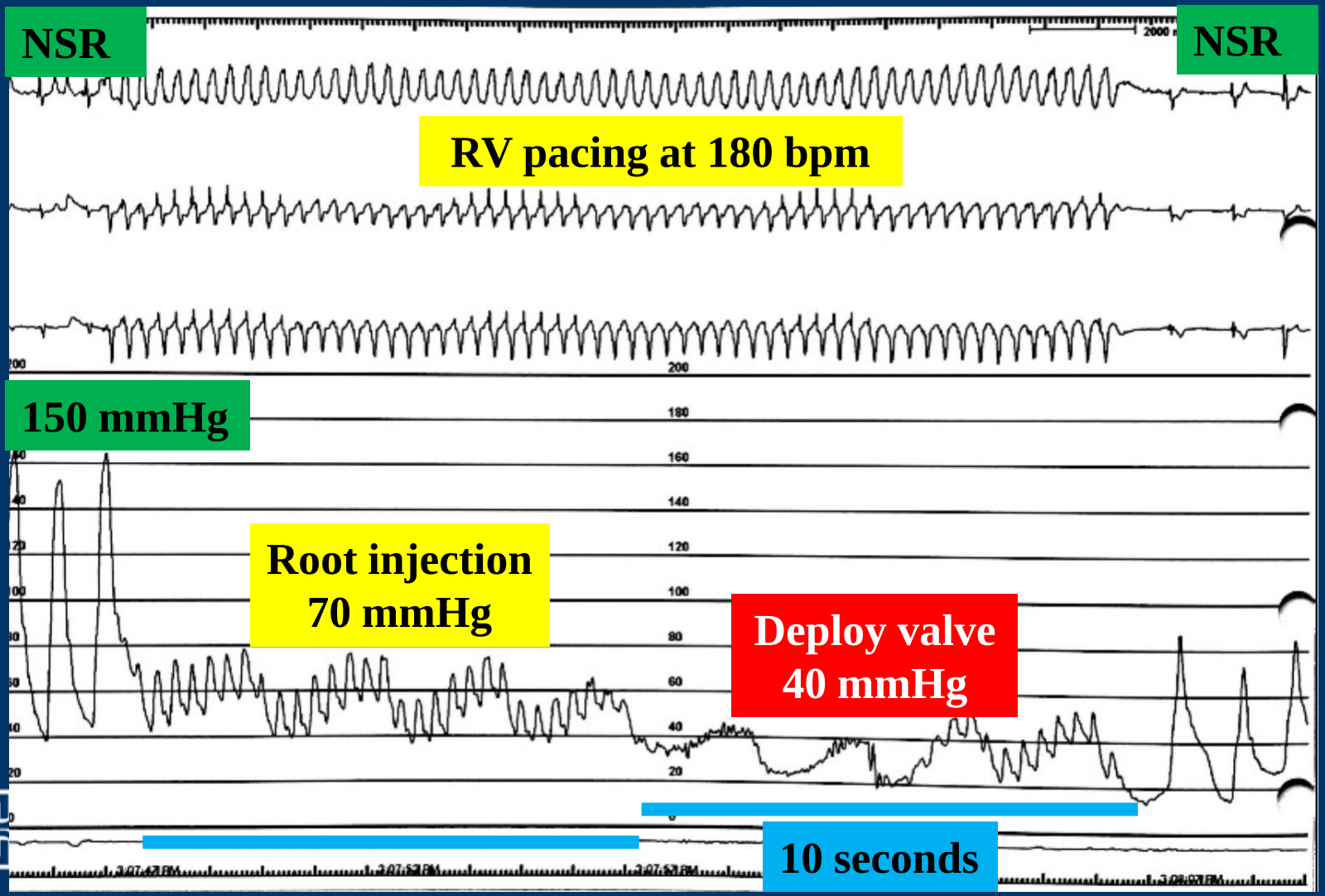


Baseline



Rapid RV Pacing

Rapid Pacing for TAVR



PARTNER IA at 5 Years

Balloon-expandable valves versus SAVR

For pts with no or trace paravalvular regurgitation, 5 year mortality reduction for TF-TAVR compared to SAVR was ~16% (45% vs. 61%), emphasizing the need to eliminate paravalvular regurgitation post-procedure.

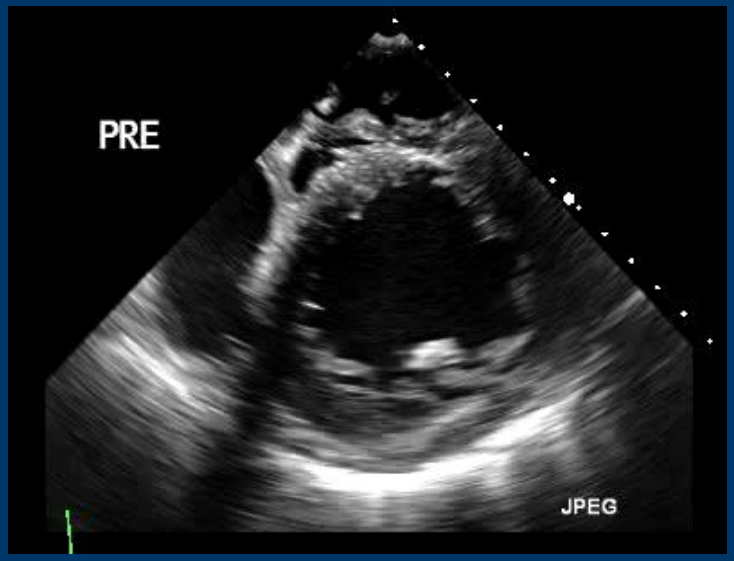
Better outcomes with TAVR: women, those with smaller annular size and low-flow, low gradient AS.

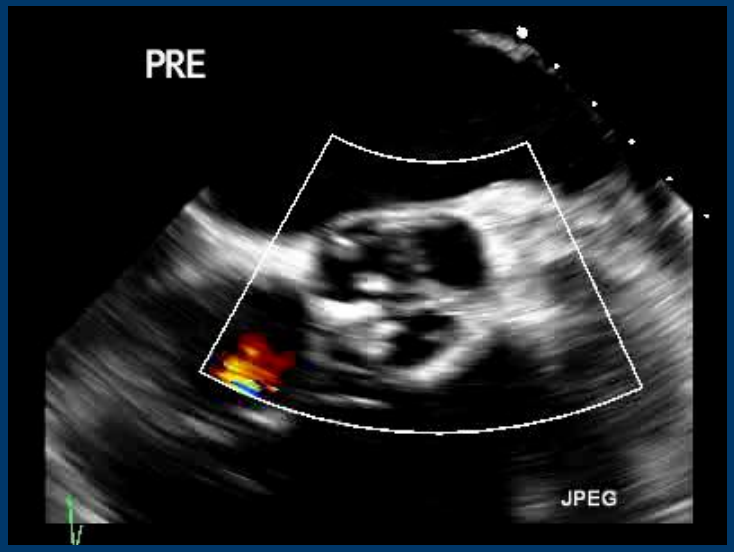
Waksman and Pichard. JACC 2015;66:122-4.

Typical TAVR Patient

84 year old with class IV HF, EF 20%, valve area - 0.5 cm^2 mean gradient - 50 mmHg

Few months later, presents for TAVR: EF 15%, gradient 27 mmHg





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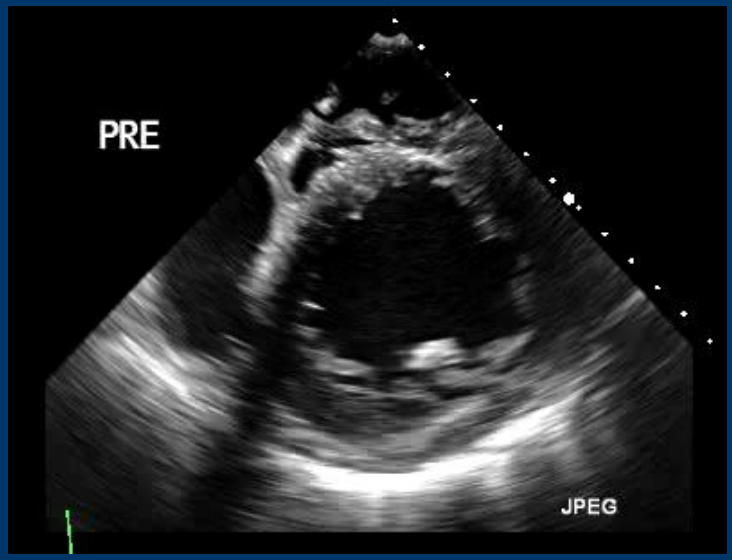
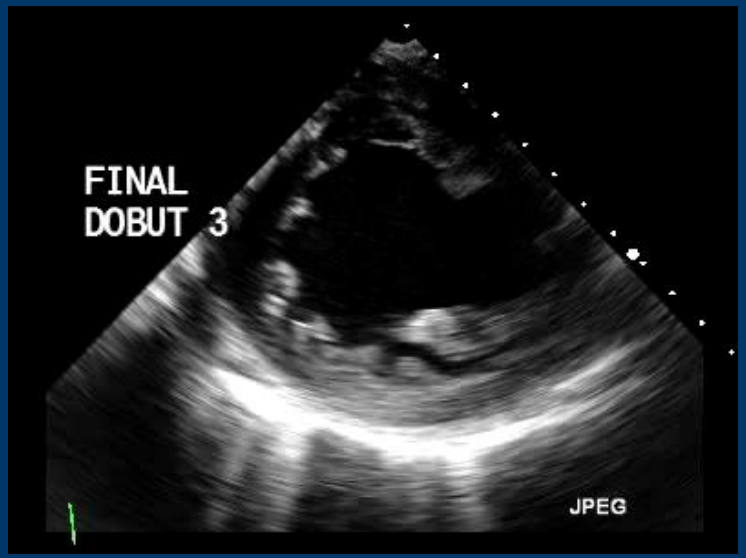


Cardiac output doubled and diastolic dysfunction improved.



2014 ACC/AHA: Guidelines

Severe AS
>4 m/s or 40 mmHg

Symptoms

AVR Class I

No Symptoms

EF <50%

V >5 m/s

Abnl ETT

AVR Class IIa

Symptomatic but
3-4 m/s or 20-40 mmHg

EF <50% then DSE: AVA <1cm^2 or V >4m/s

If EF >50% AVA <1cm^2, *and* AS likely cause of sx*

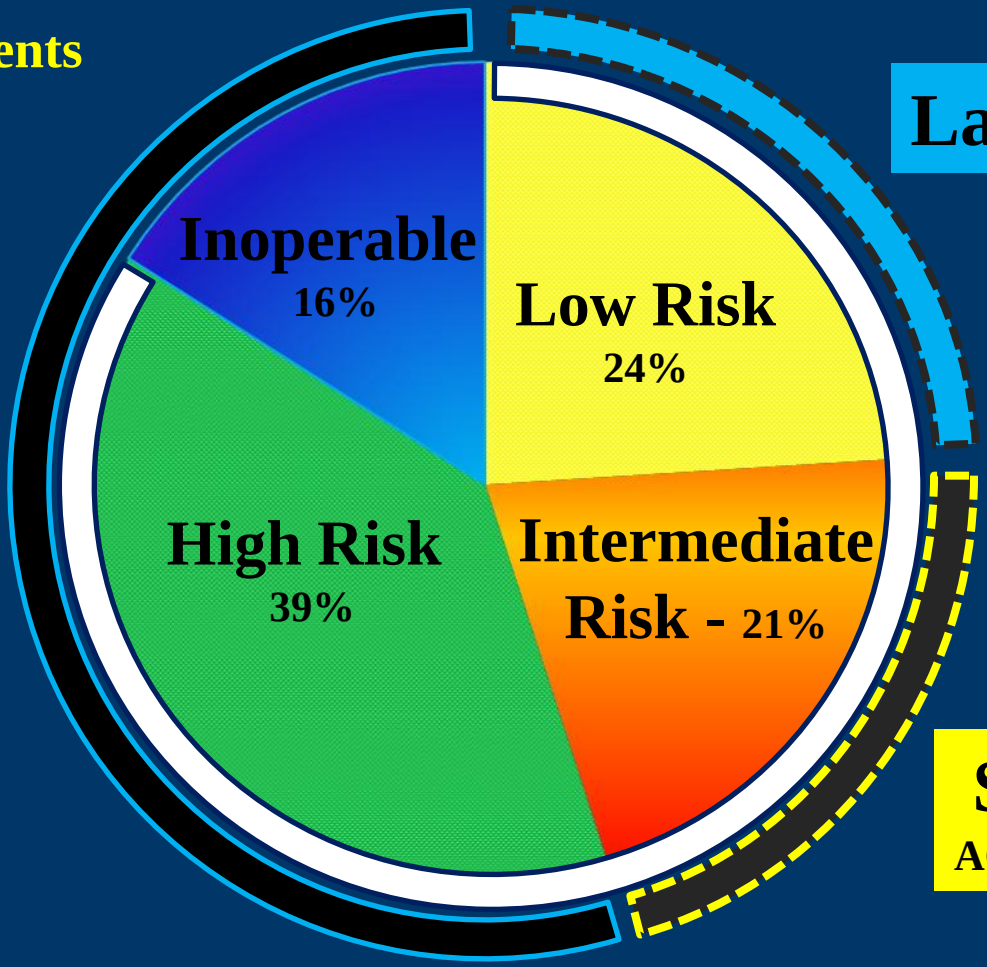
AVR Class IIa

*** SBP <140**
Calcified AV!

ACC/AHA Valvular Heart Disease Guidelines. JACC 2014;63:e57-185

Symptomatic Severe AS

170,000 patients



Late 2016

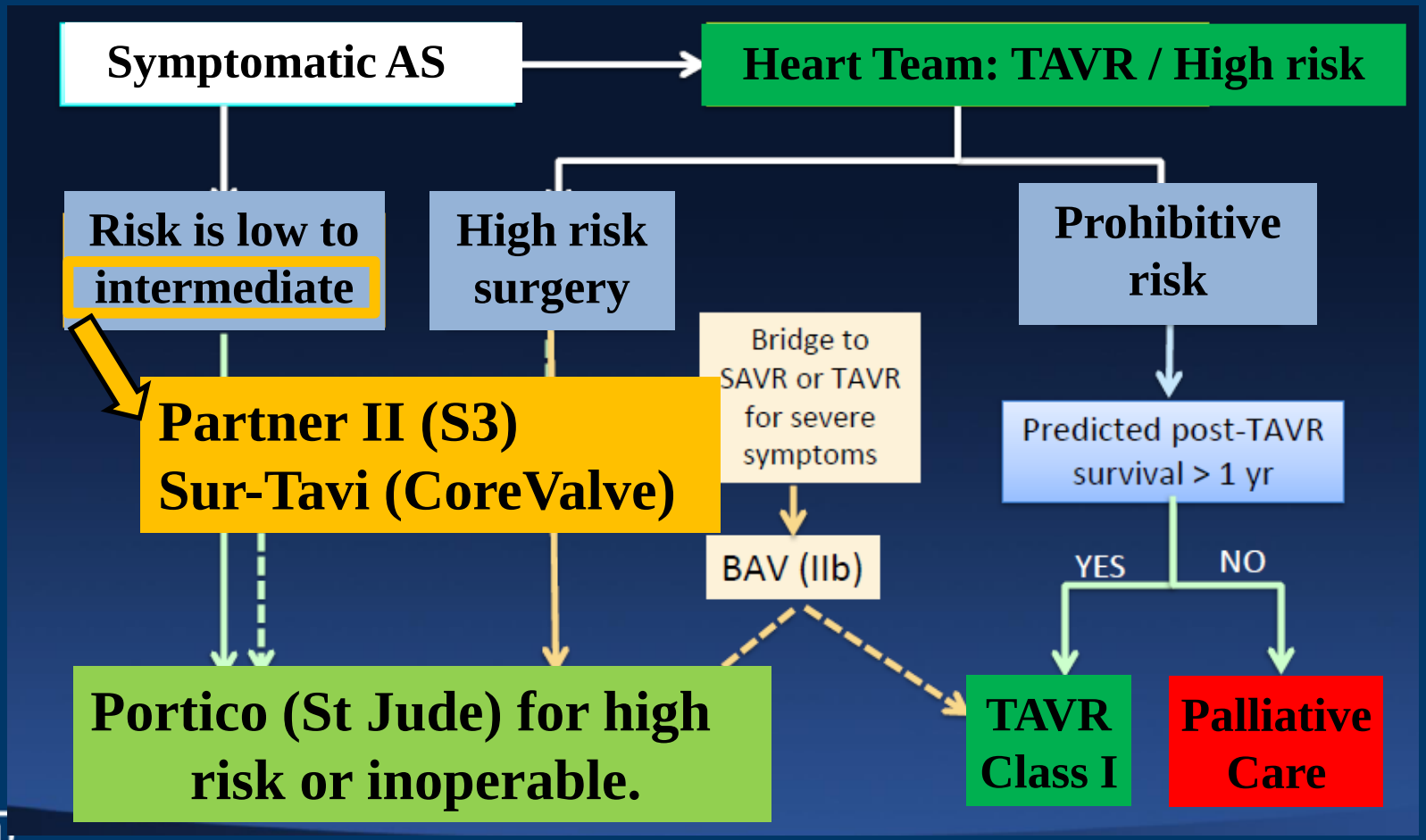
TAVR

SAVR

Sapien S3
ACC - March 2016

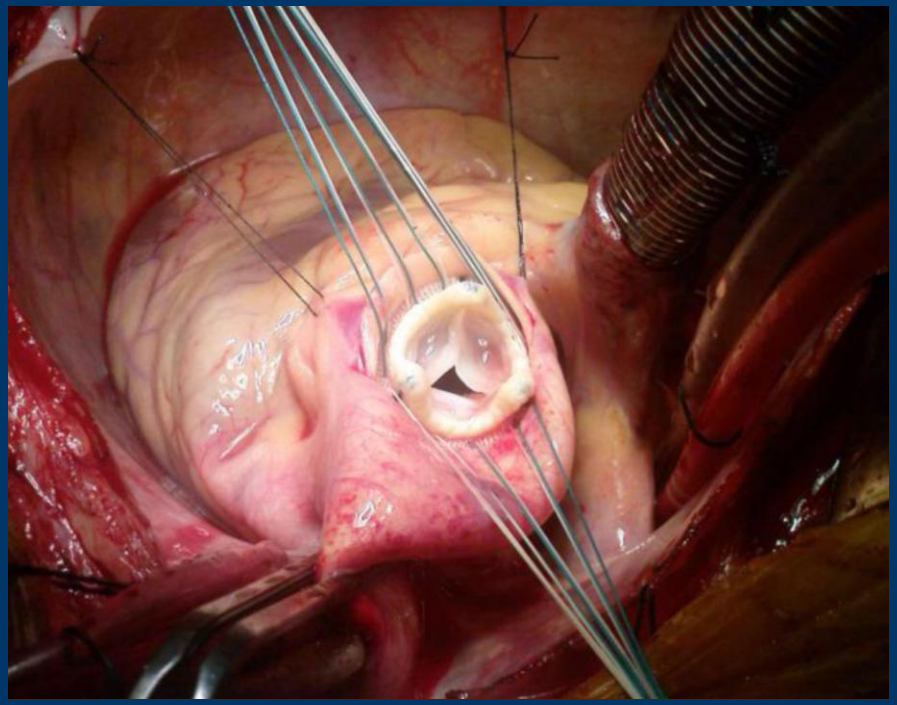
1. STS Adult Cardiac Database - 2010 Harvest, Isolated AVR. 2. *JACC*. 2007;50(20):2018-19. 3. *Europ Heart J*. 2003;24:1231-43. 4. *Circ*. 2005;111:3290-5. 5. *J of Heart Valve Dz*. 2006;15:312-321. 6. *Lancet*. 2006;368:1005-11. 7. *JACC*. 1993;21(5):1220-25. 8. *JAMA* 2013;310(19):2069-2077. 9. Medtronic data

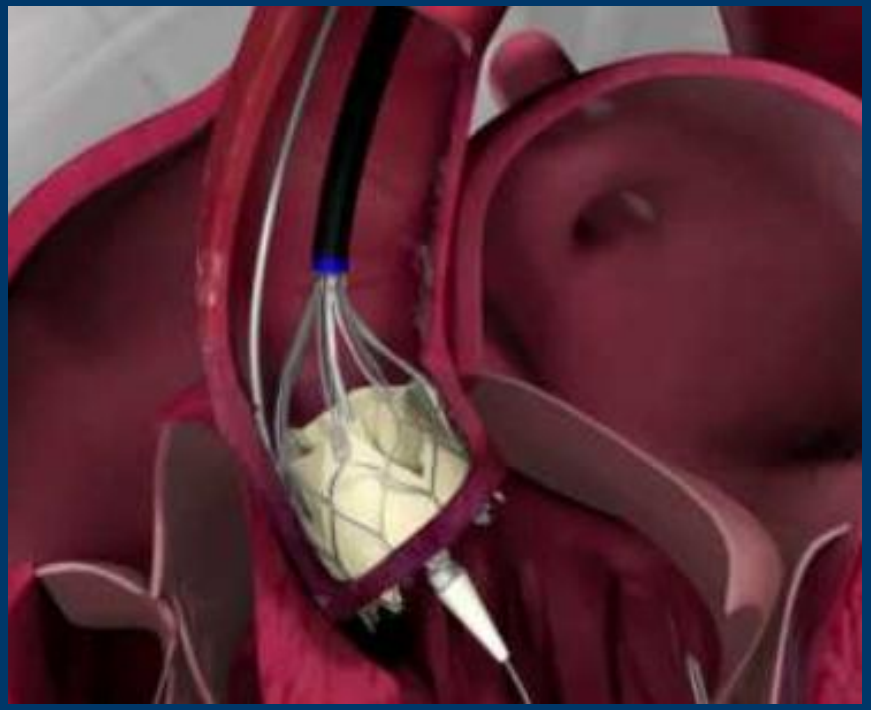
2014 ACC/AHA: Which Valve?



ACC/AHA Valvular Heart Disease Guidelines. JACC 2014;63:e57-185

TAVR - Game Changer!





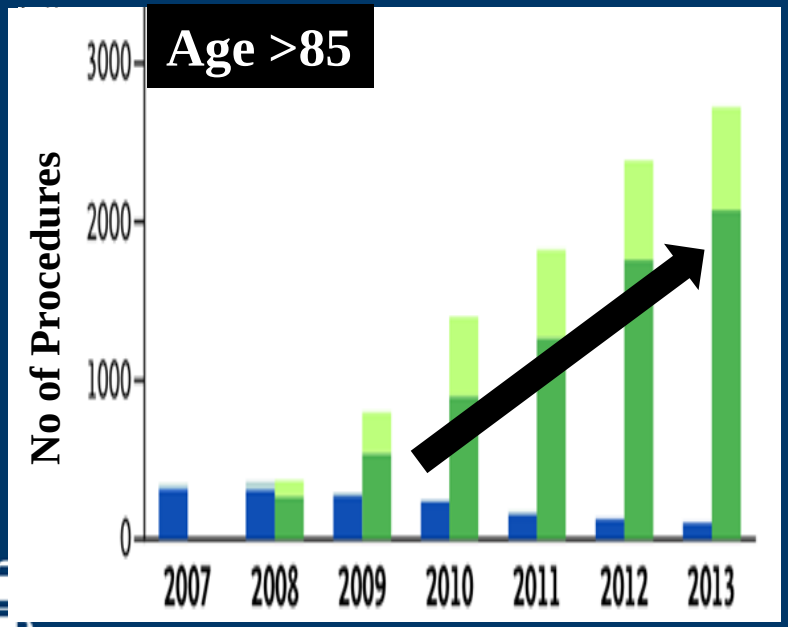
Trans-femoral TAVR should be considered as the first-line therapy for high risk patients with severe aortic stenosis.

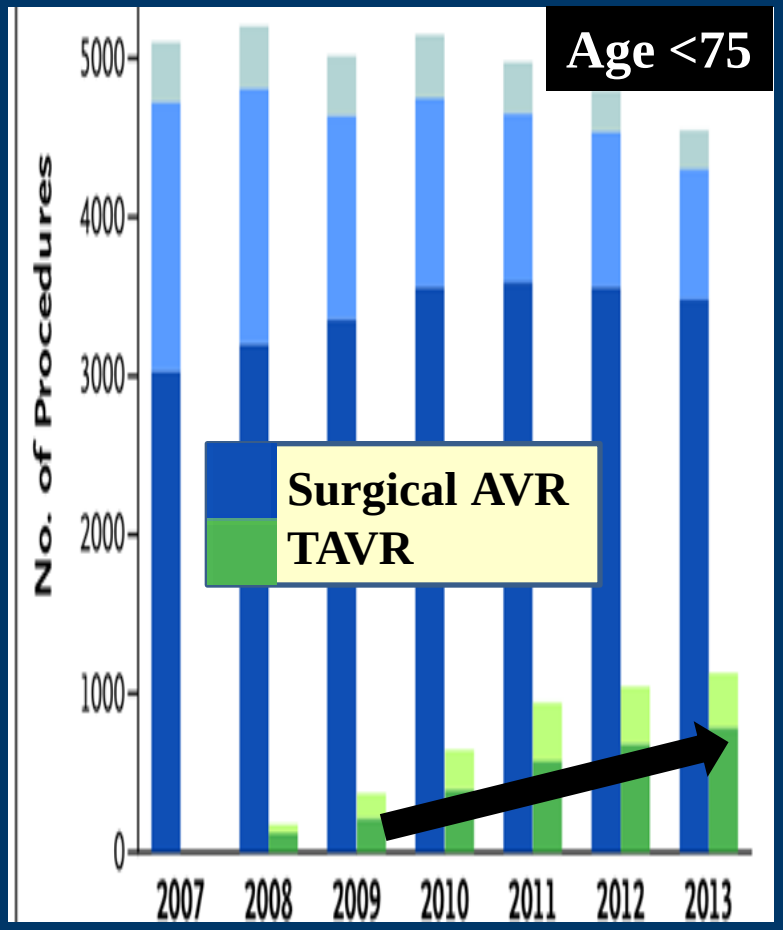
Waksman and Pichard. JACC 2015;66:122-4.

TAVR and Clinical Practice

In Germany

Year	Surg	TAVR
2007	8622	144
2013	7048	9147





NEJM 2016;373:2438-47

Aortic Stenosis in 2016