8th Annual Richard P. Lewis Memorial Lecture

Aortic Stenosis:
Fifty Years of Progress

Robert O. Bonow, MD, MS, MACC
Northwestern University Feinberg School of Medicine
Bluhm Cardiovascular Institute
Northwestern Memorial Hospital
Editor-in-Chief, JAMA Cardiology

No Relationships to Disclose
Richard P. Lewis, MD, MACC
Aortic Stenosis

By John Ross, Jr., M.D. and Eugene Braunwald, M.D.

The advent of corrective operations for various forms of heart disease has placed increasing emphasis upon the need for accurate information concerning the natural history of patients with potentially correctible lesions. An understanding of the natural course assumes particular importance in the case of aortic stenosis because of the significant incidence of sudden death associated with this disease and the grave prognosis that appears to accompany the onset of certain symptoms, patients with isolated valvular aortic stenosis of rheumatic etiology and patients without a history of rheumatic fever who have isolated calcific aortic stenosis; many of the latter patients are now considered to have developed calcification and stenosis of a congenitally bicuspid valve.¹ The review will focus primarily on the prognostic significance of three major symptoms—angina pectoris, syncope, and symptoms related to left ventricular failure.

¹ From the Cardiology Branch, National Heart Institute, Bethesda, Maryland.

Supplement V to Circulation, Vol. XXXVII and XXXVIII, July 1968
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From the Cardiology Branch, National Heart Institute, Bethesda, Maryland.

Supplement V to Circulation, Vol. XXXVII.
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Supplement V to Circulation, Vol. 33(V)
Comparison of Outcome of Asymptomatic to Symptomatic Patients Older Than 20 Years of Age with Valvular Aortic Stenosis

THOMAS A. KELLY, DONALD L. KAISER, 

Kelly et al, Am J Cardiol 1988;61:123-130
To operate or not on elderly patients with aortic stenosis: the decision and its consequences

B J Bouma, R B A van den Brink, J H P van der Meulen, H A Verheul, E C Cheriex, H P M Hamer, E Dekker, K I Lie, J G P Tijsen

Evaluation of Patients With Severe Symptomatic Aortic Stenosis Who Do Not Undergo Aortic Valve Replacement

The Potential Role of Subjectively Overestimated Operative Risk

David S. Bach, MD; Derrick Siao, MD; Steven E. Girard, MD, PhD; Claire Duvernoy, MD; Benjamin D. McCallister, Jr, MD; Sarah K. Gualano, MD

Bach et al, Circ Cardiovasc Qual Outcomes 2009;2:533-539
Indications for AVR

• Symptomatic patients with severe AS

...if it is likely that the symptoms are cardiac in origin
Aortic Stenosis

Indications for AVR

- Symptomatic patients with severe AS
- Asymptomatic patients with severe AS

... are asymptomatic patients with severe AS really asymptomatic?
Aortic Stenosis

Indications for AVR

Exercise test results:
• Symptoms
• Hypotension

How are **symptoms** determined?
• Everyone has symptoms on stress test
• Are the symptoms cardiac in origin?
• What level of exercise?

How is **hypotension** defined?
• Less than 20 mmHg increase (?)
Aortic Stenosis

Indications for AVR

*Exercise test results:*

- Symptoms  
  - class I
- Hypotension  
  - class IIa

What is the outcome of *asymptomatic* patients with AS?

...when they are *really* asymptomatic?
Comparison of Outcome of Asymptomatic to Symptomatic Patients Older Than 20 Years of Age with Valvular Aortic Stenosis

THOMAS A. KELLY, DONALD L. KAISER,

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THOMAS A. KELLY, DONALD L. KAISER,

Kelly et al, Am J Cardiol 1988;61:123-130
Unoperated Patients With Severe Aortic Stenosis

*David S. Bach, MD, FACC
Nina Cimino
G. Michael Deeb, MD, FACC

Journal of the American College of Cardiology
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Published by Elsevier Inc.

Survival (percent)

Asymptomatic
Symptomatic

p=0.01

Natural History of Asymptomatic AS

- Average hospital mortality: 8.8%
  - Low volume centers: 13.0%
  - High volume centers: 6.0%

Medicare data

Event-Free Survival (%)

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>Vmax &lt; 3.0 m/s</th>
<th>Vmax 3.0 - 4.0 m/s</th>
<th>Vmax &gt; 4.0 m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>1</td>
<td>80</td>
<td>80</td>
<td>80</td>
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<td>2</td>
<td>60</td>
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<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
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Natural History of Severe Asymptomatic AS

Natural History of Severe Asymptomatic AS

Natural History of Severe Asymptomatic AS

Average hospital mortality: 8.8%
- Low volume centers: 13.0%
- High volume centers: 6.0%

Medicare data

Event-Free Survival (%)

Time (years)

$V_{\text{max}} > 4.0 \text{ m/s}$


Pellikka et al. *Circulation* 2005;111:3290-2395
Natural History of Severe Asymptomatic AS

Vmax > 4.0 m/s

Pellikka et al. Circulation 2005;111:3290-2395
Stewart et al. Eur Heart J 2010;31:2216-2222
Natural History of Severe Asymptomatic AS

Average hospital mortality: 8.8%
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Vmax > 4.0 m/s

Pellikka et al. Circulation 2005;111:3290-2395
Stewart et al. Eur Heart J 2010;31:2216-2222
Lancellotti et al. JAMA Cardiol 2018;3:1070-1080
Natural History of Severe Asymptomatic AS

Vmax > 4.0 m/s

Natural History of Severe Asymptomatic AS

- Average hospital mortality: 8.8%
- Low volume centers: 13.0%
- High volume centers: 6.0%

Medicare data

- 96 events:
  - 90 surgical indication
  - 6 cardiac deaths [1 SCD]
- 79 patients underwent AVR
  - 6 deaths in 3 mo postopx

What is the risk of death while waiting for symptoms to trigger AVR?

Rosenhek et al. Circulation 2010;121:151-156
Average hospital mortality: 8.8%

- Low volume centers: 13.0%
- High volume centers: 6.0%

Natural History of Severe Asymptomatic AS

Average hospital mortality: 8.8%

• Low volume centers: 13.0%
• High volume centers: 6.0%

Medicare data

Survival (%)

Time (years)

Conservative (n=291)
AVR (n=291)

31% of patients who developed symptoms did not have AVR

17 deaths

Vmax: 4.6 m/s
Mean Δ: 52 mmHg
AVA: 0.7 sq cm

Severe AS:
>4.0 m/s
>40 mmHg
<1.0 sq cm
Aortic Stenosis

84 year old man with severe AS

- Watchful waiting? *
- More data (more testing)?
- Aortic valve replacement?
- Enroll him in a clinical trial?

*Wait until he develops symptoms in 5-6 years and then recommend TAVR?
“Primary atherosclerosis of the valve may sometimes occur without previous rheumatic valvulitis.”
1.12 million individuals in Ontario
Age >65
Median follow-up 13 years
20,995 developed aortic stenosis
Association Between Cardiovascular Risk Factors and Aortic Stenosis

The CANHEART Aortic Stenosis Study

Andrew T. Yan, MD, Maria Koh, MSc, Kelvin K. Chan, MD, MSc, Helen Guo, MSc, David A. Alter, MD, PhD, Peter C. Austin, PhD, Jack V. Tu, MD, PhD, Harindra C. Wijeysundera, MD, PhD, Dennis T. Ko, MD, MSc

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Adjusted HR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>1.71 (1.66-1.76)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.49 (1.44-1.54)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>1.17 (1.14-1.21)</td>
<td>&lt;0.001</td>
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Assessment of Valvular Calcification and Inflammation by Positron Emission Tomography in Patients With Aortic Stenosis

Marc Richard Dweck, MD; Charlotte Jones, BSc; Nikhil V. Joshi, MD; Alison M. Fletcher, PhD; Hamish Richardson, BSc; Audrey White; Mark Marsden, BSc; Renzo Pessotto, MD; John C. Clark, DSc; William A. Wallace, PhD; Donald M. Salter, MD; Graham McKillop, MD; Edwin J.R. van Beek, PhD; Nicholas A. Boon, MD; James H.F. Rudd, PhD; David E. Newby, DSc

_Circulation._ 2012;125:76-86
Assessment of Valvular Calcification and Inflammation by Positron Emission Tomography in Patients With Aortic Stenosis

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Valvular $^{18}$F-Fluoride and $^{18}$F-Fluorodeoxyglucose Uptake Predict Disease Progression and Clinical Outcome in Patients With Aortic Stenosis

$^{18}$F-Fluoride is a positron emitting radiotracer that preferentially localizes in newly forming vascular microcalcification. We examined the resolution of computed tomography (CT) and $^{18}$F-Fluorodeoxyglucose ($^{18}$F-FDG) uptake for predicting aortic valve calcium progression and clinical outcomes in aortic stenosis patients. We performed a retrospective analysis of 99 patients with aortic stenosis who had undergone $^{18}$F-Fluoride and $^{18}$F-FDG imaging at baseline and 2 years. Disease progression was assessed using CT and echocardiography. The primary clinical outcome endpoint was a composite of cardiovascular death and aortic valve replacement. Ninety-nine patients (81%) were followed for repeat cardiovascular imaging at the median of 2.6 years (interquartile range 1.8 to 3.6 years). Ninety-nine patients (81%) underwent repeat CT calcium scoring (available). Aortic valve calcium score increased by 5 to 226 AU/year, with a median increase of 67 AU/year. After a median of 2.6 years, 72 patients had uneventful follow-up, whereas 7 experi-
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Diseased segment tissue: background ratio, based upon averaging the mean standard uptake values in the 2 adjacent valve slices with the highest signal, corrected for blood-pool activity. Disease progression was assessed at 1 and 2 years using CT aortic valve calcium scoring and echocardiography. The primary clinical outcome endpoint was a composite of cardiovascular death and aortic valve replacement.

Ninety-nine participants (81%) returned for repeat imaging.
Elevated Expression of Lipoprotein-Associated Phospholipase A2 in Calcific Aortic Valve Disease

Implications for Valve Mineralization

Ablajan Mahmut, MD, MSc,* Marie-Chloé Boulanger, PhD,* Diala El Hussein, MSc,* Dominique Fournier, MSc,* Rihab Bouchareb, PhD,* Jean-Pierre Després, PhD,* Philippe Pibarot, PhD,*† Yohan Bossé, PhD,*† Patrick Mathieu, MD* 

Quebec City, Quebec, Canada

J Am Coll Cardiol 2014;63:460–9
Genetic Associations with Valvular Calcification and Aortic Stenosis

George Thanassoulis, M.D., Catherine Y. Campbell, M.D., David S. Owens, M.D., J. Gustav Smith, M.D., Ph.D., Albert V. Smith, Ph.D., Gina M. Pelosi, Ph.D., Kathleen F. Kerr, Ph.D., Sonali Pechlivanis, Ph.D., Matthew J. Budoff, M.D., Tamara B. Harris, M.D., Rajeev Malhotra, M.D., Kevin D. O'Brien, M.D., Pia R. Kastrup, M.D., Ph.D., Børge G. Nordestgaard, M.D., D.M.Sc., Anne Tybjaerg-Hansen, M.D., D.M.Sc., Matthew A. Allison, M.D., M.P.H., Thor Aspelund, Ph.D., Michael H. Criqui, M.D., M.P.H., Susan R. Heckbert, M.D., Ph.D., Shih-Jen Hwang, Ph.D., Yongmei Liu, Ph.D., Marketa Sjögren, Ph.D., Jesper van der Pals, M.D., Ph.D., Hagen Kälsch, M.D., Thomas W. Mühliesen, Ph.D., Markus M. Nöthen, M.D., L. Adrienne Cupples, Ph.D., Muriel Caslake, Ph.D., Emanuele Di Angelantonio, M.D., Ph.D., John Danesh, F.R.C.P., Jerome I. Rotter, M.D., Sigurdur Sigurdsson, M.Sc., Quenna Wong, M.S., Raimund Erbel, M.D., Sekar Kathiresan, M.D., Olle Melander, M.D., Ph.D., Vilmundur Gudnason, M.D., Ph.D., Christopher J. O'Donnell, M.D., M.P.H., and Wendy S. Post, M.D., for the CHARGE Extracoronary Calcium Working Group
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Oxidized Phospholipids, Lipoprotein(a), and Progression of Calcific Aortic Valve Stenosis

Romain Capoulade, PhD,* Kwan L. Chan, MD,† Calvin Yeang, MD, PhD,‡ Patrick Mathieu, MD,* Yohan Bossé, PhD,* Jean G. Dumesnil, MD,* James W. Tam, MD,§ Koon K. Teo, MBBCn, PhD,|| Ablajan Mahmut, MD, MSc,* Xiaohong Yang, BSc,‡ Joseph L. Witztum, MD,¶ Benoit J. Arsenault, PhD,* Jean-Pierre Després, PhD,* Philippe Pibarot, DVM, PhD,* Sotirios Tsimikas, MD||
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**Novel biomarkers**

*hsTroponin I*
Chin et al, *Eur Heart J* 2014;35:2312-2321

*GDF15, soluble ST2, NTproBNP*
Lindman et al, *Heart* 2015;101:1382-1388

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**B-Type Natriuretic Peptide Clinical Activation in Aortic Stenosis**
Impact on Long-Term Survival

Marie-Annick Clavel, DVM, PrtD, Joseph Malouf, MD, Hector I. Michanela, MD, Rakesh M. Suri, MD, DPhiIII, AH, Maurice Enriquez-Sarano, MD
Rochester, Minnesota

*J Am Coll Cardiol* 2014;63:2016-2025

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**Asymptomatic AS with Normal EF**

- **BNP ratio**
  - <1.0
  - 1.0-1.9
  - 2.0-2.9
  - ≥3.0

- **Survival (percent)**
  - 83%
  - 66%
  - 53%
  - 33%

- **n=562**

- **p<0.001**

- **Time (years)**
  - 0
  - 1
  - 2
  - 3
  - 4
  - 5

---

Clavel et al, *J Am Coll Cardiol* 2014;63:2016-2025
Midwall Fibrosis Is an Independent Predictor of Mortality in Patients With Aortic Stenosis

Marc R. Dweck, MD,† Sanjiv Joshi, MD,* Timothy Murigu, BSc,* Francisco Alpendurada, MD,* Andrew Jabbour, MD,* Giovanni Melina, MD,* Winston Banya, MSc,* Ankur Gulati, MD,† Isabelle Roussin, MD,* Sadaf Raza,* Nishant A. Prasad,* Rick Wage, BSc,* Cesare Quarto, MD,* Emiliano Angeloni, MD,* Simone Refice, MD,* Mary Sheppard, MD,* Stuart A. Cook, MD, PhD,* Philip J. Kilner, MD, PhD,‡ Dudley J. Pennell, MD,*‡ David E. Newby, MD, DSc,† Raad H. Mohiaddin, MD,*‡ John Pepper, MD,*‡ Sanjay K. Prasad, MD,*‡

London and Edinburgh, United Kingdom

J Am Coll Cardiol 2011;58:1271–9
Myocardial Fibrosis and Cardiac Decompensation in Aortic Stenosis

Calvin W.L. Chin, MD, Russell J. Everett, MD, Jacek Kwicinski, MD, Alex T. Vesey, MD, PnD, Emily Yeung, Gavin Esson, William Jenkins, MD, Maria Koo, Saeed Mirsadraee, MD, Audrey C. White, Alan G. Japp, MD, PnD, Sanjay K. Prasad, MD, Scott Semple, PnD, David E. Newby, MD, PnD, Marc R. Dweck, MD, PnD

Normal myocardium
Extracellular expansion
Replacement fibrosis

• ECV = 12.7 mL/m²
• ECV = 26.1 mL/m²
• ECV = 30.8 mL/m²
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Sanjay K. Prasad, MD, d Scott Semple, PhD, d David E. Newby, MD, PhD, d Marc R. Dweck, MD, PhD d

Aortic Peak Velocity

<table>
<thead>
<tr>
<th>Condition</th>
<th>Aortic Peak Velocity (m/s)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal myocardium</td>
<td>4.2 ± 0.5</td>
<td>0.001</td>
</tr>
<tr>
<td>Extracellular expansion</td>
<td>5.1 ± 0.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Replacement fibrosis</td>
<td>6.0 ± 0.9</td>
<td>0.001</td>
</tr>
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p<0.001
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![Diagrams showing normal myocardium, extracellular expansion, and replacement fibrosis with corresponding E/e' ratio.](image)
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Natural Log (hs-troponin I)
Association of Left Ventricular Global Longitudinal Strain With Asymptomatic Severe Aortic Stenosis
Natural Course and Prognostic Value

E. Mara Vollena, MD; Tadafumi Sugimoto, MD; Mylène Shen, MSc; Lionel Tastet, MSc, MSc; Arnold C. T. Ng, MD, PhD; Rachid Abou, MD; Nina Ajmone Marsan, MD, PhD; Bart Mertens, MD; Raluca Dulgheru, MD; Patrizio Lancellotti, MD, PhD; Marie-Annick Clavel, DVM, PhD; Philippe Genereux, MD; Martin B. Leon, MD; Victoria Delgado, MD, PhD; Jeroen J. Bax, MD, MSc

*JAMA Cardiol.* 2018;3:839-847
Vmax: 3.2 m/s
Mean Δ: 32 mmHg
AVA: 0.8 sq cm

Low gradient AS
from Pibarot and Dumesnil, J Am Coll Cardiol 2012:60:1845-1853

Diastole

Low Flow
Low Gradient
LV Dysfunction

Dobutamine:
Echocardiography
or
Catheterization

Systole

Difficult patient management
... but physiology understandable
Diastole

Low Flow
Low Gradient
Normal LV Function

Systole

• Treat hypertension
• Cardiac catheterization

from Pibarot and Dumesnill, J Am Coll Cardiol 2012:60:1845-1853
Inconsistent grading of aortic valve stenosis by current guidelines: haemodynamic studies in patients with apparently normal left ventricular function

Jan Minners, Martin Allgeier, Christa Gohlke-Baerwolf, Rolf-Peter Kienzle, Franz-Josef Neumann, Nikolaus Jander

Heart 2010;96:1463–1468
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*Heart* 2010; 96: 1463–1468

![Diagram showing the relationship between aortic valve area and mean pressure gradient, with shaded areas indicating not severe AS and severe AS.](image)
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Heart 2010;96:1463–1468
Poor Long-Term Survival in Patients With Moderate Aortic Stenosis

Geoff Strange, PhD, Simon Stewart, PhD, Gregory M. Scalia, MBBS (Hons), MMSc, Jim Codde, PhD, David Playford, MBBS,

J Am Coll Cardiol 2019;74:1851-1863

\[ N = 241,301 \]
\[ \text{Mean age 62} \]
\[ \text{Median f/u 3.3 years} \]
This scenario can be under-diagnosed ... and over-diagnosed

- Treat hypertension
- Cardiac catheterization
- Valve calcification
- Advanced imaging
- **Clinical skillset**
Low-Gradient Aortic Valve Stenosis
Myocardial Fibrosis and Its Influence on Function and Outcome

Sebastian Hermann, MD,*† Stefan Störk, MD, PhD,*† Markus Niemann, MD,*† Volkmar Lange, MD,§ Jörg M. Strotmann, MD,* Stefan Frantz, MD,*† Meinrad Beer, MD,*† Stefan Gattenlöchner, MD,*† Wolfram Voelker, MD,*† Georg Ertl, MD,*† Frank Weidemann, MD†

Würzburg, Germany

J Am Coll Cardiol 2011;58:402-12
Unveiling transthyretin cardiac amyloidosis and its predictors among severe aortic stenosis post aortic valve replacement

Adam Castaño¹,²*, David L. Narotzky¹, Rachelle Morgenstern², Albert DeMaria³, Tamim Nazi³, Torsten Vahl³, Isaac Toub⁴, Rebecca Hahn³, Sabahat Bokhari²

European Heart Journal (2017) 38, 2879-2887
Patients with ATTR-amyloidosis:
- Greater wall thickness
- Greater LV mass
- Lower stroke volume index
- Greater diastolic dysfunction
- Lower ejection fraction
- More abnormal global longitudinal strain
The Diagnostic and Prognostic Value of Echocardiographic Strain

Arushi Singh, MD; Woo Bin Voss, MD; Robert W. Lentz, MD; James D. Thomas, MD; Nausheen Akhter, MD

*JAMA Cardiol.* 2019;4:580-588
Aortic Valve Replacement
Hospital Mortality

Medicare 1999-2011

30 Day AVR Mortality (percent)

Year

1999 2001 2003 2005 2007 2009 2011

0 2 4 6 8 10

N=24,900 N=33,441

7.6% 4.2%

Barreto-Filho et al, JAMA 2013;210:2078-2085
Aortic Valve Replacement
Hospital Mortality

30 Day AVR Mortality (percent)

Year

Age ≥85
5.8%

Age 75-84
5.9%

Age 65-74
3.3%

Medicare 1999-2011

Barreto-Filho et al, JAMA 2013;210:2078-2085
Key Knowledge Gaps

1. The symptomatic patient
2. The asymptomatic patient
3. Mechanisms of inflammation and calcification?
4. Role of biomarkers?
5. Valve area / gradient / flow?
6. Ventricular-vascular coupling?
7. Evolution of TAVR to lower-risk patients?
Aortic Valve Replacement

Evolution of TAVR

- Prohibitive surgical risk
- High surgical risk
- Intermediate surgical risk
- Low surgical risk
Transcatheter Aortic-Valve Replacement with a Self-Expanding Valve in Low-Risk Patients

Jeffrey J. Popma, M.D., G. Michael Deeb, M.D., Steven J. Yakubov, M.D., Mubashir Mumtaz, M.D., Hemal Gada, M.D., Daniel O’Hair, M.D., Tanvir Bajwa, M.D., John C. Heiser, M.D., William Merhi, D.O., Neal S. Kleiman, M.D., Judah Askew, M.D., Paul Sorajja, M.D., Joshua Rovin, M.D., Stanley J. Chetcuti, M.D., David H. Adams, M.D., Paul S. Teirstein, M.D., George L. Zorn III, M.D., John K. Forrest, M.D., Didier Tchétché, M.D., Jon Resar, M.D., Antony Walton, M.D., Nicolo Piazza, M.D., Ph.D., Basel Ramlawi, M.D., Newell Robinson, M.D., George Petrossian, M.D., Thomas G. Gleason, M.D., Jae K. Oh, M.D., Michael J. Boulware, Ph.D., Hongyan Qiao, Ph.D., Andrew S. Mugglin, Ph.D., and Michael J. Reardon, M.D., for the Evolut Low Risk Trial Investigators*

Mean age: 74 years
Mean STS score: 1.9
Low degree of comorbidities
## Low Risk TAVR Trials

<table>
<thead>
<tr>
<th></th>
<th>PARTNER 3</th>
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<tbody>
<tr>
<td></td>
<td>TAVR</td>
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<td>Age (years)</td>
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<td>Prior MI</td>
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<tr>
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<td>31.4%</td>
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<td><strong>AVA (cm²)</strong></td>
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<td><strong>Mean gradient (mmHg)</strong></td>
<td>49.4</td>
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<td><strong>LVEF (%)</strong></td>
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<td>Mortality (1 year)</td>
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<td>Stroke (30 days)</td>
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<td>Atrial fibrillation (30 d)</td>
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<td>New pacemaker (30 d)</td>
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Low Risk TAVR Trials: Missing Pieces

- Durability of transcatheter valves
- Subclinical leaflet thrombosis
• No HALT
• Normal leaflet motion

• HALT
• Normal leaflet motion

• HALT
• Reduced leaflet motion
• Normal gradient

• HALT
• Reduced leaflet motion
• Elevated gradient

Aortic valve gradient

Makkar et al. TCT 2019
Low Risk TAVR Trials: Missing Pieces

- Durability of transcatheter valves
- Subclinical leaflet thrombosis
- Patients with:
  - Bicuspid aortic valves
  - Extensive CAD
  - Aortic aneurysms
  - Associated MR / TR
- Younger patients
- Asymptomatic patients

Durability?
Pacemaker rates?
CLINICAL PRACTICE GUIDELINE: FOCUSED UPDATE

2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Writing Group Members*

Rick A. Nishimura, MD, MACC, FAHA, Co-Chair
Catherine M. Otto, MD, FACC, FAHA, Co-Chair
Robert O. Bonow, MD, MACC, FAHA
Anne A. Carabello, MD, FACC
John P. Erwin III, MD, FACC, FAHA
Lee A. Fleisher, MD, FACC, FAHA
Hard J. Gottdiener, MD, FACC, FAHA, FSCAI
Michael J. Mack, MD, FACC
Christopher J. McLeod, MD, PhD, FACC, FAHA
Patrick T. O’Gara, MD, MACC, FAHA

ESC/EACTS GUIDELINES

2017 ESC/EACTS Guidelines for the management of valvular heart disease

The Task Force for the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Authors/Task Force Members: Helmut Baumgartner* (ESC Chairperson) (Germany), Volkmar Falk† (EACTS Chairperson) (Germany), Jeroen J. Bax (The Netherlands), Michele De Bonis‡ (Italy), Christian Hamm (Germany), Per Johan Holm (Sweden), Bernard Jung (France), Patrizio Lancellotti (Belgium), Emmanuel Lansac† (France), Daniel Rodriguez Muñoz (Spain), Raphael Rosenhek (Austria), Johan Sjögren† (Sweden), Pilar Tornos Mas (Spain), Alec Vahanian (France), Thomas Walther† (Germany), Olaf Wendler† (UK), Stephan Windecker (Switzerland), Jose Luis Zamorano (Spain)
TAVR 2019

- TAVR has been truly transformative
- Surgical AVR has been the standard with proven durability and safety for most patients
- TAVR provides treatment options for patients who previously had no options other than a predictably very poor short term outcome
- TAVR is an alternative to SAVR in patients at high and intermediate surgical risk
- The threshold for TAVR is declining in clinical trials, registries and clinical practice
- Multidisciplinary heart team is essential
- All patients want this
- Determining when to withhold TAVR is difficult

Is TAVR now the standard? ... and now low risk
Aortic stenosis is a simple mechanical fault, which, if severe enough, imposes a heavy burden on the left ventricle and sooner or later overcomes it.

Definition of severe stenosis is one with sufficient hypertrophy of the left ventricle to cause inversion of the T wave of the electrocardiogram in left ventricular surface leads or their isoelectric.
Associations of Long-Term and Early Adult Atherosclerosis Risk Factors With Aortic and Mitral Valve Calcium

George Thanassoulis, MD,*† Joseph M. Massaro, PhD,**†‡ Ricardo Cury, MD,‖ Emily Manders, BS,* Emelia J. Benjamin, MD, ScM,*†‡§‖ Ramachandran S. Vasan, MD,**‖ L. Adrienne Cupple, PhD,*‡‖ Udo Hoffmann, MD, MPH,‖ Christopher J. O'Donnell, MD, MPH,*†‡§ Sekar Kathiresan, MD*‡§

Framingham, Boston, and Cambridge, Massachusetts; and Bethesda, Maryland

J Am Coll Cardiol 2010;55:2491–8

• 1323 subjects in Framingham Offspring Study
• Enrolled between 1971 and 1975
• Mean age at enrollment 34 ± 9 years
• MDCT imaging between 2002 and 2005
• Median 26.9 year follow-up
Associations of Long-Term and Early Adult Atherosclerosis Risk Factors With Aortic and Mitral Valve Calcium

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Atherosclerosis

Prevalence of Aortic Valve Calcium

Framingham Risk Score

Prevalence of AVC (%)

<6
6-19
≥20

0
30
60
90

0;55:2491-8
Associations of Long-Term and Early Adult Atherosclerosis Risk Factors With Aortic and Mitral Valve Calcium

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Elevated Lipoprotein(a) and Risk of Aortic Valve Stenosis in the General Population

Pia R. Kamstrup, MD, Pål D.,† Anne Tybjerg-Hansen, MD, DMSc,‡§||
Børge G. Nordestgaard, MD, DMSc*†§||

Copenhagen, Denmark

rs10455872 carriers

<table>
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<th>Percentile</th>
<th>mg/dL</th>
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<tr>
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<td>7-17</td>
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<td>&gt;95</td>
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Age and Sex Adjusted

Hazard Ratio [95% CI] for AS

p<0.001

Multivariable Adjustment

Hazard Ratio [95% CI] for AS

p<0.001