Valvular Guidelines: The Past, the Present, the Future

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Northwestern University Feinberg School of Medicine
Bluhm Cardiovascular Institute
Northwestern Memorial Hospital
Editor-in-Chief, JAMA Cardiology

No Relationships to Disclose
**PRACTICE GUIDELINE**

**2008 Focused Update Incorporated Into the ACC/AHA 2006 Guidelines for the Management of Patients With Valvular Heart Disease**

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1998 Guidelines for the Management of Patients With Valvular Heart Disease)

*Endorsed by the Society of Cardiac Anesthesiologists, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons*

<table>
<thead>
<tr>
<th>2006 Writing Committee Members</th>
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<tbody>
<tr>
<td>Robert O. Bonow, MD, MACC, FAHA</td>
<td>Chair</td>
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<td>Blase A. Carabello, MD, FACC, FAHA</td>
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<tr>
<td>Kama Chatterjee, MB, FACC</td>
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<td>Antonio C. de Leon, Jr, MD, FACC, FAHA</td>
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<td>David P. Faxon, MD, FACC, FAHA</td>
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<td>Bruce W. Lytle, MD, FACC</td>
<td></td>
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<td>Rick A. Nishimura, MD, FACC, FAHA</td>
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<td>Patrick T. O’Gara, MD, FACC, FAHA</td>
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<td>Robert A. O’Rourke, MD, MACC, FAHA</td>
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<tr>
<td>Catherine M. Otto, MD, FACC, FAHA</td>
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<td>Pravin M. Shah, MD, MACC, FAHA</td>
<td></td>
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<td>Jack S. Shanewise, MD*</td>
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</tbody>
</table>

www.acc.org
www.americanheart.org
The evidence base is limited by an inadequate number of randomized clinical trials.
Hence, virtually all of the recommendations are based on expert consensus (Level C)
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 Practice Guidelines

Developed in Collaboration With the American Association for Thoracic Surgery, American Society of Echocardiography, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons

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Robert A. Guyton, MD, FACC†
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Carlos E. Ruiz, MD, PhD, FACC†
Nikolaos J. Skabas, MD, FASE†
Paul Sorajja, MD, FACC, FAHA#
Thoralf M. Sandi III, MD**††
James D. Thomas, MD, FASE, FACC, FAHA††

*Writing committee members are required to recuse themselves from voting on sections in which their specific relationships with industry and other entities may apply or Appendix 1 for reversal information. IACC/ AHA representatives: [ACC/AHA Task Force on Performance Measures liaison, ACC/AHA Task Force on Practice Guidelines liaison, Society of Cardiovascular Anesthesiologists representative, Society for Cardiovascular Angiography and Interventions representative, American Association for Thoracic Surgery representative, Society of Thoracic Surgeons representative, American Society of Echocardiography representative.

ESC/EACTS GUIDELINES
Management of valvular heart

Jean-Eudes Ducrocq (Chairperson) (France)*, Ottavio Alfieri (Italy), Manuel J. Antunes (Portugal), Gonzalo Barón-Esquivias (Spain), Helmut Baumgartner (Germany), Michael Andrew Borger (Germany), Thierry P. Carrel (Switzerland), Michele De Bonis (Italy), Arturo Evangelista (Spain), Volkmar Falk (Switzerland), Bernard Jung (France), Patrizio Lancellotti (Belgium), Luc Pierard (Belgium), Susanna Price (UK), Hans-Joachim Schäfers (Germany), Gerhard Schuler (Germany), Janina Stepinska (Poland), Karl Swedberg (Sweden), Johanna Takkenberg (The Netherlands), Ulrich Otto Von Oppell (UK), Stephan Windecker (Switzerland), Jose Luis Zamorano (Spain), Marian Zembala (Poland)

www.esc.org
www.americanheart.org
www.acc.org
# Stages of Valvular Heart Disease

<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Risk of valve disease (BAV, MVP, RF, CHF)</td>
</tr>
<tr>
<td>B</td>
<td>Mild - moderate asymptomatic disease</td>
</tr>
</tbody>
</table>
| C     | Severe valve disease but asymptomatic  
C1: Normal LV function  
C2: Depressed LV function |
| D     | Severe, symptomatic valve disease |
Mitral regurgitation

Degenerative MR: primary valve disease
Functional MR: primary myocardial disease
Mitral regurgitation

Degenerative MR: primary valve disease

Functional MR: primary myocardial disease
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

MR Severity:
RV = 68 ml
RF = 60%
ERO = 0.48 cm²
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

MR Severity:

RV = 68 ml
RF = 60%
ERO = 0.48 cm²

Severe MR:

> 60 ml
> 50%
> 0.4 cm²
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients

class I
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients  
- Asymptomatic patients
  - LV systolic dysfunction

class I
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
- LV systolic dysfunction

LVEF <60%

class I

class I
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction

LVEF <60%
LVSD >40mm
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
  - LV systolic dysfunction
- Asymptomatic patients
  - Pulmonary hypertension

class I

class I

class IIa
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension

PASP >50 mmHg at rest
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation

class I

class I

class IIa

class IIa
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - Normal LV function, repair feasible?

class I

class I

class I

class IIa
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients (class I)
- Asymptomatic patients
  - LV systolic dysfunction (class I)
  - Pulmonary hypertension (class I)
  - Atrial fibrillation (class IIa)
  - Normal LV function, repair feasible? (class IIa)

MV repair to improve survival?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - Normal LV function, repair feasible?

MV repair to improve survival?
What is the natural history?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - Normal LV function, repair

Asymptomatic severe degenerative MR:

- 66% come to surgery in 5 years because of symptoms, LV dysfunction, pulmonary hypertension or AF
- Long-term postoperative survival is worse if surgery is performed after patients become symptomatic
Surgery for Acquired Cardiovascular Disease

Late outcomes of mitral valve repair for floppy valves: Implications for asymptomatic patients

Tirone E. David, MD
Joan Ivanov, PhD
Susan Armstrong, MSc
Harry Rakowski, MD

J Thorac Cardiovasc Surg 2003;125:1143-1152
Surgery for Acquired Cardiovascular Disease

Late outcomes and Implications for Patients

Tirone E. David, MD
Joan Ivanov, PhD
Susan Armstrong, MS
Harry Rakowski, MD

Mitral Regurgitation
Survival After Mitral Valve Surgery

Survival (percent)

Time (years)

Expected

n=488

64%

p<0.001

David et al, J Thorac Cardiovasc Surg 2003;126:1143-1152
Surgery for Acquired Cardiovascular Disease

Late outcomes, implications for therapy

Tirone E. David, MD
Joan Ivanov, PhD
Susan Armstrong, MS
Harry Rakowski, MD

Mitral Regurgitation
Survival After Mitral Valve Surgery

FC I-II 81%
FC III-IV 58%
n=488
p<0.001

Survival (percent)

Time (years)

David et al, J Thorac Cardiovasc Surg 2003;126:1143-1152
Mitral regurgitation

Indications for MV repair for asymptomatic degenerative MR:

- Chronic severe MR
- Preserved LV function
- Experienced surgical center
- Likelihood of durable repair without residual MR > 95%

Class Ila
Mitral regurgitation

Indications for MV repair for asymptomatic degenerative MR:

- Chronic severe MR
- Preserved LV function
- Experienced surgical center
- Likelihood of durable repair without residual MR > 95%

- Preserved LV function
- Likelihood of durable repair and low risk for surgery, and
- LA dilatation >60 ml/m2
  -- or --
  Exercise PAP >60 mmHg
Mitral regurgitation

Indications for MV repair for asymptomatic degenerative MR:

- Chronic severe MR
- Preserved LV function
- Experienced surgical center
- Likelihood of durable repair without residual MR > 95%.

- Repair better than mitral valve replacement
- Patients should be referred to centers experienced in repair

class Ila

class I
Mitral regurgitation

Indications for transcatheter MV repair for severe degenerative MR:

- Chronic severe MR
- Severely symptomatic
- Prohibited surgical risk
- Reasonable life expectancy

class IIb
Mitral regurgitation

Primary MR: primary valve disease

Secondary MR: primary myocardial disease
Mitral regurgitation

Primary MR: primary valve disease

Secondary MR: primary myocardial disease

- Diagnostic dilemmas
- Therapeutic dilemmas
Imprecision in grading severity of secondary MR

Defining “Severe” Secondary Mitral Regurgitation

Emphasizing an Integrated Approach

Paul A. Grayburn, MD, Blase Carabello, MD, Judy Hung, MD, Linda D. Gillam, MD, David Liang, MD, Michael J. Mack, MD, Patrick M. McCarthy, MD, D. Craig Miller, MD, Alfredo Trento, MD, Robert J. Siegel, MD

J Am Coll Cardiol 2014;54:2792-2801

What is “severe” secondary MR?
Ischemic Mitral Regurgitation
Long-Term Outcome and Prognostic Implications With Quantitative Doppler Assessment

Francesco Grigioni, MD; Maurice Enriquez-Sarano, MD; Kenton J. Zehr, MD; Kent R. Bailey, PhD; A. Jamil Tajik, MD

Circulation. 2001;103:1759-1764

Survival After MI

Survival (percent)

Time (years)

Grigioni et al. Circulation 2001;103:1759-1764
Independent prognostic value of functional mitral regurgitation in patients with heart failure. A quantitative analysis of 1256 patients with ischaemic and non-ischaemic dilated cardiomyopathy

Andrea Rossi,1 Frank L Dini,2 Mariantonietta Cicoira,1 Silvia Stefano Ghio,5 Maurice Enriquez-Sarano

Heart 2011;97:1675-1680

Rossi et al. Heart 2011;97:1675-1680
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Heart 2011;97:1675–1680
Valvular Heart Disease

Influence of Mitral Regurgitation Repair on Survival in the Surgical Treatment for Ischemic Heart Failure Trial

Marek A. Deja, Paul A. Grayburn, Benjamin Sun, Vivek Rao, Lilin She, Michal Krejca, Anil R. Jain, Yeow Leng Chua, Richard Daly, Michele Senni, Krzysztof Mokrzycki, Lorenzo Menicanti, Jae K. Oh, Robert Michler, Krzysztof Wróbel, Andre Lamy, Eric J. Velazquez, Kerry L. Lee and Robert H. Jones

Circulation. 2012;125:2639-2648

Ischemic Cardiomyopathy

Mortality (percent)

- No MR: 30%
- Mild MR: 47%
- Mod-Severe MR: 55%

p<0.001

Time (years)
Valvular Heart Disease

Influence of Mitral Regurgitation Repair on Survival in the Surgical Treatment for Ischemic Heart Failure Trial

Marek A. Deja, Paul A. Grayburn, Benjamin Sun, Vivek Rao, Lilin She, Michal Krejea, Anil R. Jain, Yeow Leng Chua, Richard Daly, Michele Senni, Krzysztof Mokrzycki, Lorenzo Menicanti, Jae K. Oh, Robert Michler, Krzysztof Wróbel, Andre Lamy, Eric J. Velazquez, Kerry L. Lee and Robert H. Jones

Circulation. 2012;125:2639-2648

Ischemic Cardiomyopathy

Deja et al. Circulation 2012;125:2639-2648
### Prevalence of MR in Patients with LV Dysfunction

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<th>Journal/Sources</th>
<th>N</th>
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<td>Yiu et al</td>
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<td>128</td>
<td>63%</td>
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<td>N Engl J Med 2004</td>
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*Patients with moderate to severe MR*
Secondary mitral regurgitation:
...a marker of a sicker LV
- or -
...a contributor to a sicker LV?
Secondary mitral regurgitation: ...a marker of a sicker LV - or - ...a therapeutic target?

Therapies that produce beneficial reverse remodeling also reduce severity of functional MR
Secondary mitral regurgitation

Guideline-directed medical therapy for heart failure, including CRT

class I
Secondary mitral regurgitation

Guideline-directed medical therapy for heart failure, including CRT

Indications for mitral valve surgery:
- Patients with severe MR undergoing CABG or AVR

class I

class IIa
Secondary mitral regurgitation

Guideline-directed medical therapy for heart failure, including CRT

Indications for mitral valve surgery:

- Patients with severe MR undergoing CABG or AVR
- Severe MR, persistent symptoms despite optimal medical therapy, including CRT

class I

class IIa

class IIb
Indications for mitral valve surgery:

- Severe MR, persistent symptoms despite optimal medical therapy, including CRT (class IIb)
- Patients with severe MR undergoing CABG or AVR (class IIa)
- Severe MR, persistent symptoms despite optimal medical therapy, including CRT (class IIb)
- Patients with moderate MR undergoing CABG or AVR (class IIb)

Guideline-directed medical therapy for heart failure, including CRT (class I)
Baseline

Optimized Medical Therapy and Biventricular Pacing
Correction of Mitral Regurgitation in Nonresponders to Cardiac Resynchronization Therapy by MitraClip Improves Symptoms and Promotes Reverse Remodeling

Angelo Auricchio, MD, PtID,† Wolfgang Schillinger, MD,‡ Sven Meyer, MD,‡ Francesco Maisano, MD,§ Rainer Hoffmann, MD,¶ Gian Paolo Ussia, MD,¶ Giovanni B. Pedrazzini, MD,† Jan van der Heyden, MD,# Simona Fratini, MD, PtID,++ Catherine Klersy, MD, MSc,†† Jan Komtebedde, DVM,* Olaf Franzen, MD,‡ on behalf of the PERMIT-CARE Investigators

Lugano, Switzerland; Göttingen, Hamburg, and Aachen, Germany; Milan, Catania, L’Aquila, and Pavia, Italy; and Nieuwveen, the Netherlands

J Am Coll Cardiol 2011;58:2183–9
Secondary mitral regurgitation

Indications for transcatheter MV repair for severe secondary MR:

- Severe secondary MR
- Severely symptomatic
- Prohibited or high surgical risk
- Reasonable life expectancy

Class IIb
# Prevalence of MR in Patients with LV Dysfunction

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*Patients with moderate to severe MR*
Burden of valvular heart diseases: a population-based study

Nkomo et al, Lancet 2006;368:1005-1011

Moderate-Severe Mitral Valve Disease

<table>
<thead>
<tr>
<th>Age</th>
<th>ARIC, CHS, CARDIA (n=11,911)</th>
<th>Olmstead County (n=16,501)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;45</td>
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<tr>
<td>45-54</td>
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<tr>
<td>55-64</td>
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<tr>
<td>65-74</td>
<td>9.6</td>
<td>7.3</td>
</tr>
<tr>
<td>≥75</td>
<td>7.3</td>
<td>2.0</td>
</tr>
</tbody>
</table>

28,412 subjects
Burden of valvular heart diseases: a population-based study

Vuyisile T Nkomo, Julius M Gardin

Moderate-Severe Aortic Valve Disease

28,412 subjects

ARIC, CHS, CARDIA (n=11,911)
Olmstead County (n=16,501)

Nkomo et al, Lancet 2006;368:1005-1011
Aortic Stenosis

- Rheumatic AS
- Congenital AS
- Calcific AS

from Bonow and Braunwald, Valvular Heart Disease
*Braunwald's Heart Disease*, 7th ed, 2004
Aortic Stenosis

Rheumatic AS

Congenital AS

Calcific AS

<table>
<thead>
<tr>
<th>Age &gt;60</th>
<th>All patients</th>
<th>47%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>51%</td>
</tr>
</tbody>
</table>

Roberts and Ko, *Circulation* 2005;111:920-925

from Bonow and Braunwald, Valvular Heart Disease
*Braunwald’s Heart Disease*, 7th ed, 2004
Aortic Stenosis

Rheumatic AS

Congenital AS

Calcific AS

Age >80

All patients 28%

Men 32%

Roberts and Ko, Circulation 2005;111:920-925

from Bonow and Braunwald, Valvular Heart Disease
Braunwald’s Heart Disease, 7th ed, 2004
Aortic-Valve Stenosis — From Patients at Risk to Severe Valve Obstruction

Catherine M. Otto, M.D., and Bernard Prendergast, D.M.

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, Volts. XXXVII and XXXVIII, July 1968.
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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 aortic stenosis because of the incidence of sudden death as disease and the grave progress to accompany the onset of 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.

[Graph showing the percentage survival over age, with a peak at 40 years and a steep decline after 60 years.]

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

Supplement V to Circulation, Vol. XXXVII.
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 this assumes particular importance in 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 disease and the grave prognosis to accompany the onset of symptoms.

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

Supplement 5 to Circulation, Vol. XXXVI.
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 Schwartz, MD; and Jeffrey J. Popma, MD

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

Aortic Stenosis
Survival of Symptomatic Patients
Indications for AVR

• Symptomatic patients with severe AS

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

*Management challenges:*

- The asymptomatic patient with severe AS
- Low-flow, low gradient severe AS
- Indications for TAVR
Aortic Stenosis

Management challenges:

• The asymptomatic patient with severe AS
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Aortic Stenosis

Management challenges:

• The asymptomatic patient with severe AS
• Low-flow, low gradient severe AS

Are asymptomatic patients with severe AS *really* asymptomatic?
Aortic stenosis

Indications for valve replacement

**Exercise test results:**

- Symptoms
  - **class I**
- Hypotension
  - **class IIa**

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 valve replacement

Exercise test results:

- Symptoms  
  - class I

- Hypotension  
  - class IIa

Should *asymptomatic* patients with severe AS undergo AVR?  
...when they are *really* asymptomatic?
Vmax: 4.6 m/s
Mean Δ: 52 mmHg
AVA: 0.7 sq cm

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

84 year old man with severe AS

• Watchful waiting? *
• More data (more testing)?
• Aortic valve replacement?

* Wait until he develops symptoms in 5-6 years and then recommend TAVR?
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%

Vmax > 4.0 m/s
Natural History of Severe Asymptomatic AS

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

Pellikka et al. *Circulation* 2005;111:3290-3295
Stewart et al. *Eur Heart J* 2010;31:2216-2222
Natural History of Severe Asymptomatic AS

Natural History of Severe Asymptomatic AS

Rosenhek et al. Circulation 2010;121:151-156
Aortic Stenosis

Management challenges:

• The asymptomatic patient with severe AS
• Low-flow, low gradient severe AS

Indications for TAVR

What is the risk of death while waiting for symptoms to trigger AVR?
Natural History of Severe Asymptomatic AS

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

Natural History of Severe Asymptomatic AS

Kang et al. Circulation 2010;121:1502-1509
Natural History of Severe Asymptomatic AS

Survival (%)

Time (years)

Kang et al. Circulation 2010;121:1502-1509
Nistri et al. Am J Cardiol 2012;109;718-723
Average hospital mortality: 8.8%
- Low volume centers: 13.0%
- High volume centers: 6.0%

Medicare data

Natural History of Severe Asymptomatic AS

Kang et al. Circulation 2010;121:1502-1509
Nistri et al. Am J Cardiol 2012;109;718-723
Taniguchi et al. J Am Coll Cardiol 2105;66:2827-2838
Natural History of Severe Asymptomatic AS

![Graph showing survival (%) over time (years)]

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

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*Taniguchi et al. J Am Coll Cardiol 2105;66:2827-2838*
Natural History of Severe Asymptomatic AS

Asymptomatic Aortic Stenosis

Indications for valve replacement:

- Very severe AS: $\text{Vmax} \geq 5 \text{ m/s}$

(class IIa)
Asymptomatic Aortic Stenosis

Indications for valve replacement:

- Class IIa
  - Very severe AS: Vmax ≥ 5 m/s

- Class IIb
  - Rapid progression and low surgical risk
Asymptomatic Aortic Stenosis

Indications for valve replacement:

- Very severe AS: $V_{\text{max}} \geq 5 \text{ m/s}$
  - class IIa

- Rapid progression and low surgical risk
  - class IIb

- Very severe AS: $V_{\text{max}} > 5.5 \text{ m/s}$
  - class IIa
Asymptomatic Aortic Stenosis

Indications for valve replacement:

- **Very severe AS:** $V_{\text{max}} \geq 5 \text{ m/s}$
  - class IIa

- **Rapid progression and low surgical risk**
  - class IIb

- **Very severe AS:** $V_{\text{max}} > 5.5 \text{ m/s}$
  - class IIa

- **Severe valve calcification and rate of progression $\geq 0.3 \text{ m/s/year}$**
  - class IIa
Asymptomatic Aortic Stenosis

Indications for valve replacement:

- Very severe AS: \( V_{\text{max}} \geq 5 \) m/s  
  - class IIa

- Rapid progression and low surgical risk  
  - class IIb

- Very severe AS: \( V_{\text{max}} > 5.5 \) m/s  
  - class IIa

- Severe valve calcification and rate of progression \( \geq 0.3 \) m/s / year  
  - class IIa

- Markedly elevated BNP  
- Increase in gradient with exercise >20 mmHg  
- Excessive LVH  
  - class IIb
Indications for valve replacement:

The ACC/AHA and ESC/EACTS guidelines have lowered the threshold for surgery in asymptomatic patients with AS

- Severity of AS
- Severity of calcification
- Left ventricular function
- Exercise response
Asymptomatic Aortic Stenosis

Indications for valve replacement:

The ACC/AHA and ESC/EACTS guidelines have lowered the threshold for surgery in asymptomatic patients with AS

- Severity of AS
- Severity of calcification
- Left ventricular function
- Exercise response
- BNP?
B-Type Natriuretic Peptide Clinical Activation in Aortic Stenosis
Impact on Long-Term Survival

Marie-Annick Clavel, DVM, PhD, Joseph Malouf, MD, Hector I. Michelsen, MD, Rakesh M. Suri, MD, DPhD, Ali N. Zoghbi, MD, Mauricio Enriquez-Sarano, MD

Rochester, Minnesota

J Am Coll Cardiol 2014;63:2016-2025

Asymptomatic AS with Normal EF

Survival (percent)

Time (years)

n=562

p<0.001

Clavel et al, J Am Coll Cardiol 2014;63:2016-2025
Aortic stenosis

Management challenges:

• The asymptomatic patient with severe AS
• Low-flow, low gradient severe AS
• Indications for TAVR
Low Gradient Aortic Stenosis

LV Dysfunction

- Treat hypertension
- Catheterization
- Valve calcification
- Advanced imaging
- Clinical skills

Normal LV Function

Diastole

Systole

Dobutamine: Echocardiography or Catheterization

from Pibarot and Dumesnil, *J Am Coll Cardiol* 2012:60:1845-1853
Low Flow, Low Gradient Aortic Stenosis

Indications for valve replacement:

**Reduced EF:**
- Dobutamine study showing:
  - $V_{max} > 4$ m/s or
  - Mean $\Delta > 40$ mmHg or
  - $AVA \leq 1$ sq cm

- With contractile reserve

**class IIa**
Low Flow, Low Gradient Aortic Stenosis

Indications for valve replacement:

**Reduced EF:**
- Dobutamine study showing:
  - $V_{\text{max}} > 4 \text{ m/s}$ or
  - Mean $\Delta > 40 \text{ mmHg}$ or
  - $\text{AVA} \leq 1 \text{ sq cm}$

**Normal EF:**
- Only if clinical, anatomic and hemodynamic data support severe AS

**Reduced EF:**
- With contractile reserve
**Low Flow, Low Gradient Aortic Stenosis**

Indications for valve replacement:

<table>
<thead>
<tr>
<th>Reduced EF:</th>
<th>Normal EF:</th>
</tr>
</thead>
</table>
| Dobutamine study showing:  
  - Vmax >4 m/s or  
  - Mean Δ >40 mmHg or  
  - AVA ≤1 sq cm | Only if clinical, anatomic and hemodynamic data support severe AS |
| Normal EF: | Reduced EF: |
| Only if clinical, anatomic and hemodynamic data support severe AS | With contractile reserve |
| Normal EF: | Reduced EF: |
| Only after thorough confirmation of severe AS | class Ila |
| class Ila | class Ila |
| class Ila | class Ila |

**Reduced EF:**
- Dobutamine study showing:
  - Vmax >4 m/s or
  - Mean Δ >40 mmHg or
  - AVA ≤1 sq cm

**Normal EF:**
- Only if clinical, anatomic and hemodynamic data support severe AS

**Reduced EF:**
- With contractile reserve

**Normal EF:**
- Only after thorough confirmation of severe AS
Aortic stenosis

Management challenges:

• The asymptomatic patient with severe AS
• Low-flow, low gradient severe AS
• Indications for TAVR
Indications for TAVR vs surgical AVR:

- Evaluation by a Heart Team

class I
Indications for TAVR vs surgical AVR:

- Evaluation by a Heart Team  
  class I

- Surgical AVR for patients at low or intermediate risk  
  class I
Indications for TAVR vs surgical AVR:

- Evaluation by a Heart Team
- Surgical AVR for patients at low or intermediate risk
- TAVR for patients with prohibitive surgical risk and life expectancy >12 months

class I
Intervention for Severe AS

Indications for TAVR vs surgical AVR:

- Evaluation by a Heart Team
  - class I

Surgical AVR for patients at low or intermediate risk
  - class I

TAVR as alternative?

TAVR for patients with prohibitive surgical risk and life expectancy >12 months
  - class I

TAVR alternative for patients at high surgical risk
  - class IIa

TAVR as alternative?
Valvular heart disease 1

Management strategies and future challenges for aortic valve disease

Robert O Bonow, Martin B Leon, Darshan Doshi, Neil Moat

Lancet 2016; 387: 1312–23
TAVR Now

• TAVR has been truly transformative
• Surgical AVR remains 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 or intermediate surgical risk
• The threshold for TAVR is declining in clinical trials, registries and clinical practice
• All patients want this
• Determining when to withhold TAVR is difficult
TAVR in the Future

- Guidelines will need to adapt to the rapidly evolving TAVR evidence base

  TAVR in intermediate and low risk surgical patients

- Availability of TAVR is likely to inform new indications for valve replacement
  - Moderate AS in primary cardiomyopathy
  - Asymptomatic severe AS?

- Judgment of the Heart Team remains essential in patient selection for TAVR

- Appropriate use criteria and performance measures are needed to define quality
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. An obstructive lesion of this sort presents a problem for the surgeon. The aneurysm has not been met, and one point of view 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

...it’s not simple any more
Valvular heart disease: Have the guidelines filled the gap?