Valvular Heart Disease

Suraj Achar, MD, FAAFP

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Learning Objectives

1. Identify the diagnostic criteria for the array of valvular disorders.
2. Recognize the prevalence of subsets of valvular disease among different patient populations.
3. Select appropriate and cost-effective diagnostic tests and imaging studies.
4. Determine when outpatient management of valvular heart disease is appropriate and when hospitalization and referral are necessary.
5. Incorporate into practice recommendations from recent clinical trials and practice guidelines.

Audience Engagement System

Step 1
Step 2
Step 3
Agenda
1. Understand how to diagnose
   - Criteria
   - Select appropriate and cost-effective diagnostic tests and imaging studies
2. Management
   - Outpatient management vs hospitalization and referral
3. Incorporate into practice recommendations from recent clinical trials and practice guidelines
   - Antimicrobial prophylaxis for IE
4. Management of special populations
   - Elderly
   - Pregnant patients
   - CVD-9 Patients
   - Pts from developing nations
   - Athletes

Epidemiology
- 2.5% of pts
  - (will increase as US population ages)
- 2013~50,000 deaths (2/3 aortic)
- 50,000 heart valve surgeries in the US each year

Key Questions
- Is Valvular disease severe
  - Symptomatic?
- Symptoms related to valvular disease?
- What is life expectancy and expected quality of life
- Do the benefits of the intervention (vs spontaneous outcome) outweigh its risks
- What are the patient's wishes?
- Are resources available locally?

Location
- Aorta
  - R 2nd intercostal/sternal
- Pulmonary
  - L 2nd IC/sternal
- Tricuspid
  - L 4th/5th/sternal B
- Mitral V
  - L 5th IC/Midclavicular

Phonocardiograms
- Blaufuss (website)
  - Auscultation: S/S varies
    - Age of physician and hearing?
    - Equipment?
    - Hand held ultrasound?
  - Aortic stenosis
    - Soft S2 (aortic and pulmonary valve)
  - MVP
    - Click?
  - MVR
    - Pansystolic murmur don't hear s1/s2
    - S3--> dilated ventricle, low pitched right after s2
    - S4--> blood hitting stiff ventricle, just before s1

AES POLL QUESTION
When is the cardiac exam harder?
1. Male observer attempting to auscultate mitral valve in female
2. Palpating apical impulse on male
3. Auscultating in two positions
4. Auscultating aortic stenosis
Indications for TT Echo
1. Loud unexplained systolic murmur
2. Murmur, a single second heart sound,
3. A history of a bicuspid aortic valve, or symptoms
4. Murmur that might be caused by aortic stenosis.
5. All of the above

Key Test: Echocardiogram
- Trained observers?
  - Not me!
- Any Murmur unless no suspicion of valve disease
- Key findings
  - Valve area
  - Mean pressure gradient
  - Maximum flow velocity

Aortic Stenosis: Risks
- Etiology (3)
  - Rheumatic Fever (mostly developing world)
  - AS
  - Calcific Disease (myofibroblasts --> osteoblasts)
    - Bicuspid Valve
    - Calcified
- Risk Factors: Same as CVD
  - Age
    - Each 10-year increase in age was associated with a twofold increased risk. Severe isolated AS is a disease of the elderly.
  - Risk factor for sclerosis (precursor)
    - 30% >65
    - 48% >85
  - Male gender
    - Twofold excess risk.
  - Current cigarette smoking
    - 35 percent increase in risk.
  - A history of hypertension
    - 20 percent increase in risk.

Pathology and Symptoms: AS
- Long Asymptomatic phase
- Symptoms start slowly
  - Diastolic Dysfunction
  - Laterally displaced apex
  - S4 (blood hits a stiff ventricle)
- Outflow obstruction --> LVH
  - SAD (syncope/Anxiety/Dyspnea)

Signs of Outflow obstruction: AS
- Low pulse pressure (Sys/Dias)
- Pulses Tardus
  - Blood is slowly coming out (carotid)
  - Pressure Gradient
    - LV generates higher pressures than what is transmitted to the aorta.
    - The pressure gradient, caused by aortic stenosis, is represented by the green shaded area.
  - S1 nl, S2 soft

¾ likely to suggest AS
1. A slow rate of rise in the carotid pulse
2. Mid to late peak intensity of the murmur
3. Reduced intensity of the second heart sound
4. M best heard R 2nd space
**Severity of Aortic Stenosis**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Mean Gradient (mmHg)</th>
<th>Aortic Valve area (cm²)</th>
<th>Jet Velocity VMax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>&lt;25</td>
<td>&gt;1.5</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>25-40</td>
<td>1.0-1.5</td>
<td>&gt;4m/sec</td>
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<tr>
<td>Severe</td>
<td>&gt;40</td>
<td>&lt;1.0</td>
<td></td>
</tr>
<tr>
<td>Very Severe</td>
<td>&gt;70</td>
<td>&lt;0.6</td>
<td></td>
</tr>
</tbody>
</table>

**If symptoms and echo are discordant?**

- Wide variability of outflow obstruction that leads to symptoms
  - exertion level
  - fitness
- Alternate reasons for symptoms
  - Dyspnea → lung disease or fitness?
  - Ankle edema → venous stasis, OA
  - Chest/shoulder pain → MSK/GERD?

**Advanced Testing: AS**

- Cardiac Cath
  - Evaluates angiography or discordancy between the clinical evaluation vs echo
- CMR (4D MRI)
  - Late gadolinium enhancement (LGE) → independent predictor of mortality
  - Midwall fibrosis (hazard ratio 5.35; 95% CI 1.16-24.56)
- Multidetector CT
  - ↑ calcification = echo determination of stenosis severity & clinical outcomes.
  - Also can exclude CAD in low risk patient

**AES POLL QUESTION**

What is true about Aortic Valve disease?

1. Beta blockers have been shown to reduce mortality in severe Aortic Valve disease
2. Transthoracic echocardiography is indicated once every 6 months in moderate AS
3. Watchful waiting is indicated in most patients with symptomatic AS
4. Aortic valve replacement is the only treatment that improves mortality in patients with symptomatic severe aortic stenosis.
5. Animal valve tissues universally produce a loud diastolic click

**Complications of AS**

- AF
  - 5-6% M/M
  - 30% Severe AS
- Endocarditis (0.27%/year Gerson et al. Circulation 1993)
  - Can happen especially with bicuspid valves
  - no antibiotic prophylaxis (2007)
- Sudden Death (problem in symptomatic pts)
  - 1%/year in asymptomatic
  - 20-31% annual incidence (symptomatic)

**Management**

- Asymptomatic
  - Manage CAD → Statins (ACC)
  - No benefit except for CVD
  - Avoid Furosemide (dehydration)
  - Echo Monitoring
  - Moderate 1-2 year
  - Severe 6 months
- Severe AS & symptoms (SAD)
  - Refer to multidisciplinary heart team
  - Percutaneous valve implantation → temporary
  - Surgery (replace not repair)
    - TAVI (minimally invasive, more common in Europe)
      - High surgical risk
      - NEJM (intermediate OK)
      - Phx like this
      - Centers of excellence
      - Outpatient facilities?
    - Replacement SAVR
20y/o Indigenous Australian F with Palpitations, Med Conversations (Australian podcast)

- Palpitations
  - On and off for 6 months
  - Associated lightheadedness, and DOE 6 months
  - Walks her dog every day
  - Chronic exercise intolerance
  -erness in her, not the dog that has shortened the walks because of DOE
  - Worse over the past 2 months
- Illness as a child
  - High fever
  - Chorea

Case: Exam and Testing

- Whole stable
- ECG by nurse
- Lungs clear, no JVP
- Displaced apex beat
- No thrill
- Loud pansystolic murmur
  - Mitral radiating to axilla

Severe MR on Echo
- Got a Mitral Valve repair

Mitral Regurgitation:

- Primary: Issues with valve itself
  - Mitral valve disease
  - Myxomatous degeneration
  - MVP (most common valve conditions)
  - Mitral regurgitation on echo
  - Severe MR on echo
  - Got a Mitral Valve repair

Secondary
  - CAD --> damaged papillary muscles
  - Right heart failure

- Connective tissue of leaflets are weakened --> myxomatous degeneration
- EDS/Marfans --> thoracic skeletal abnormalities
- Results in larger valve leaflet and elongation of cordae tendineae which allows rupture and fold into the atrium

- Prevalence
  - 0.6% - 2%
  - (less common than previously thought) - Although still most common cause of MR
  - 60% F

- Associations
  - Other valve disorders (40-50% tricuspid, 10-15% AV)
  - MVP syndrome with dizziness, anxiety, palpitations (not more common with MVP)


MVP

- Definition
  - Mitral valve prolapse

- Etiology
  - Connective tissue of leaflets are weakened

- Myxomatous degeneration
  - EDS/Marfans
  - Thoracic skeletal abnormalities
  - Results in larger valve leaflet and elongation of cordae tendineae which allows rupture and fold into the atrium

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MR

- LVH --> LA enlargement
- LVH can lead to MR
- MR can lead to LVH (dilating a hole and dirt falls back, get tired)
- Usually asymptomatic

- Usual Symptoms (far down the line)
  - Fatigue
  - DOE
  - Palpitations --> AF
  - S1: absent or soft (mitral not closing well)
- S3 (only with very severe)
- Murmur
  - Grade 1-3 benign
  - Very loud grade 3
  - 4 (palpable thrill)
  - Offsets of systole (can't appreciate s1 and s2)

BP and JVP (nl)
- (unless severe)
- Palpation
  - Apex hyperdynamic and laterally displaced
  - Diffuseness (volume overload)
  - In systole-cave to large cough

MR: Exam

- S1: absent or soft (mitral not closing well)
- S3 (only with very severe)
- Murmur
  - Grade 1-3 benign
  - Very loud grade 3
  - 4 (palpable thrill)
  - Offsets of systole (can't appreciate s1 and s2)
Testing

- Stress testing
  - Severe but asymptomatic
  - Dyspnea during low METS → symptomatic
- BNP (research?)
  - Independently predict mortality
- Cardiac Cath
  - Risk of CVA
- Cardiac MRI
  - Late gad enhancement predictor of mortality
- CT
  - Degree of calcifications correlates with echo and clinical outcomes

ECG/Echo → MV

- ECG (LAD)
  - P Waves (M shaped) → left atrial distension → AF
- Lead 2
  - R wave in lead II > 0.8
- V1
  - Biphasic P wave
  - Ratio of negative portion to peak > 0.2

- Echo
  - Mitral_flora
  - (probably → not as much as science)
  - Hard to see mitral valve back of heart
  - TEE possible to see?

Mitral Valve Regurgitation

- Tolerated for years
  - Annually echo
  - Symptoms of heart failure are indications for surgery
  - Repair is the best option
    - Best time is a week before AF
    - Only if symptomatic
    - No need for anticoagulation
    - No mortality in hospitalization
    - Of note most of repair patients were younger

Mitral Stenosis

- Predominately a disease of young
- Pathology
  - RHD
  - Congenital
  - Calcifications (like in AS)
  - Degeneration
  - Autoimmune
  - Myxoma
    - Most common cardiac tumor
    - Often left atrium
    - Obstruction of MV > MR
    - Embolic
      - May have weight loss, fever, CRP

RHD on autopsy → thickened mitral valve, thickened chordae tendineae, hypertrophied left ventricular wall

MS

- JVP (hyperacute A waves)
- Systolic murmur (apex)
- Opening snap and S1 decreased
- RHF
- Pleural fluid
- Predispose
  - Infection
  - Thromboembolism (dilated atrium & stasis)

MS

- Generally conservative
  - ↓ Work of heart
    - Beta Blockers/diuretics/Calcium Channel Blockers
  - Warfarin
    - at risk of Thromboembolism
  - Surgical options
    - Preferred options → repair
      - Percutaneous mitral balloon
      - Mitral valve leaflet→ catheter left atrium into femoral vein
    - MVR

Mitrail Valve Stenosis (Narrow Valve)

Mitral Valve Stenosis

Mitrail Valve Regurgitation

Bicuspid Aortic Valve

Mitrail Valve Regurgitation

Bicuspid Aortic Valve

Mitrail Valve Regurgitation

Bicuspid Aortic Valve

Mitrail Valve Regurgitation

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Mitrail Valve Regurgitation

Bicuspid Aortic Valve

Mitrail Valve Regurgitation

Bicuspid Aortic Valve

Mitrail Valve Regurgitation
Tricuspid Regurgitation

- Common
  - Framingham Heart Study:
    - 74% of men & 86% >70 years
  - >moderate =⇡Mortality
- Etiology
  - RVH 2nd to LHF or Pulm Htn
  - Inferior infarct, Cor Pulm
- Management
  - Mostly non-surgical
  - Diuretics
  - Surgery if doing left sided valve surgery
  - Repair over replacement, dangerous

Severe tricuspid regurgitation: Dilated vena cava inferior, no diameter variations during respiration.

Antimicrobial prophylaxis?

- 10,000-15,000 new cases of IE in US/year
- Prevented?
  - No human study has definitively demonstrated that prophylactic antibiotics prevent endocarditis after dental or other procedures
  - Only observational studies are available, with conflicting evidence of benefit

- 1997–2007 (major revisions)

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

Change in recommendations

- Most cases are just caused by tooth brushing and incidental bacteremia rather than dental GI or GU surgeries
- Prior to 2007
  - Rx moderate risk patients
- > 2007
  - Rx only high risk patients

Prophylaxis high risk: ¾ have a preexisting structural cardiac abnormality

- Prosthetic heart valves, including bioprosthetic and homograft valves
- Prior history of IE
- Unrepaired cyanotic CHD
- Revascularization CHD
- Residual shunts or valve regurgitation
- Repaired CH Defects with catheter based intervention during 1st 6 months
- Valve regurgitation due to a structurally abnormal valve in a transplanted heart

Severe tricuspid regurgitation: Dilated vena cava inferior, no diameter variations during respiration.

Conflicting data?

- No (Case Control study: Dental Rx not a risk factor)
- Yes (Epidemiologic Study: France)
  - 1 in 11,000 for patients with prosthetic valves and no prophylaxis
  - 1 in 54,000 for patients with native valves and no prophylaxis
  - 1 in 150,000 for patients who received prophylaxis
- Estimated risk of endocarditis in adults with predisposing cardiac conditions undergoing dental procedures with or without prophylactic prophylaxis, Clin Infect Dis. 2006

Potential reasons for failure?

- 1997–2007 (major revisions)

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
Pt factors

- Age
  - >50% over 60y/o
- Male Sex
- IVDA
- Poor Dentition
- Hemodialysis
- HIV

Procedures that could pose risk?

- Dental
  - Routine dental cleaning
  - Tooth extraction
  - Drainage of dental abscess
- Respiratory
- Skin/MSK
- Vaginal/Cesarean section?

Respiratory Procedures?

- No direct evidence that bacteremia associated with respiratory tract procedures causes IE.
- Prophylaxis is suggested only for procedures involving incision or biopsy of the respiratory tract mucosa.
  - Tonsillectomy
  - Adenoidectomy
  - Bronchoscopy with biopsy

GI or GU

- 2014 AHA/ACC
  - No routine prophylaxis for gastrointestinal (GI) or genitourinary (GU) procedures, even for patients with high-risk cardiac conditions
  - Antimicrobial therapy with activity against enterococci (amoxicillin or ampicillin) is suggested in patients with high-risk cardiac conditions and ongoing GI or GU tract infection

Vaginal or Cesarean Birth

- No data → not an indication now!
- ACC/AHA
  - Reasonable to consider antibiotic prophylaxis against infective endocarditis before vaginal delivery at the time of membrane rupture in select patients with the highest risk of adverse outcomes
- 2008 guidelines update Circulation

Patients undergoing a surgical procedure for infected skin, skin structure, or musculoskeletal tissue

- Yes-thrombogenic risk
  - Activity against Staphylococci and beta-hemolytic Streptococci.
Dx of IE: (Modified Duke criteria)  
2/1, 1/3, 0/5  

**Major Criteria**  
- Typical Microorganisms  
- At least 2 blood cultures >12 hours apart  
  - Continuous bacteremia  
  - Any time do not need a fever  
  - Note negative cultures do not exclude IE  
- Echo  
  - Vegetation  
  - Abscess  
  - New dehiscence of prosthetic valve  
  - New valvular regurgitation  
  - (increase or change in pre-existing murmur is not sufficient)  

**Minor Criteria**  
- Predisposition  
  - IVDA or heart condition (prosthetic valve)  
- Fever >38  
- Immunologic phenomena: Glomerulonephritis, Osler nodes, Roth spots, or RF  
- Vascular phenomena  
  - Septic infarcts, ICH, conjunctival hemorrhages, arterial emboli  
- Labs  
  - CBC, leukocytes, ESR  

**Findings of IE**  
- Janeway lesions  
  - 36 year old male with staphylococcus endocarditis  
  - non-tender, small erythematous or haemorrhagic macular or nodular lesions on the palms or soles  
- Osler’s nodes  
  - Osler’s nodes are painful, red, raised lesions found on the hands and feet  
  - Result from immune complexes  
- Roth’s spots  
  - retinal hemorrhages with white or pale centers  

**Trends in Incidence of IE**  
- UK: National Institute for Health and Clinical Excellence (NICE)  
  - recommended to completely stop antibiotic prophylaxis for IE in 2008  
  - Starting in March 2008, the number of hospital discharges coded for IE increased significantly above the projected historical trend  
  - By March 2013, 35 more cases of IE per month were reported  
  - NICE is re-evaluating the program  

**Valvular Disease: At risk groups**  
1. Elderly  
2. Pregnant patients  
3. Those with CVD → Marfans  
4. Those in developing nations  
5. HS & Collegiate athletes  

**Valvular heart disease in elderly adults**  
- Mostly degenerative  
- *p* decreases  
  - ≥80 yr to 0.8 million to 25 million by 2050  
- Prevalence of critical aortic stenosis (AVA<0.8 cm²) and velocity ratio <0.25  
  - 1 to 2 % (75 yrs)  
  - 6 % (85 yrs)
Outcome of surgery in Elderly pts

- Higher perioperative mortality:
  - Friable leaflets
  - Need for CABG
  - Pneumonia

- Once past perioperative period:
  - Older patients have excellent functional recovery and a marked improvement in quality of life similar to that of younger patients

- Which type:
  - Mechanical
    - Thromboembolism and Bleeding
  - Bioprosthetic valves
    - Limited durability

- Valve outlives 80 year olds!

DeBakey Age 97

Modified WHO classification: VHD: risks in pregnancy

- No risk
  - MVP
  - Uncomplicated pulmonic stenosis

- Small risk II
  - Repaired tetralogy of fallot
  - Bicuspid Aortic Valve with Aortic diameter <45mm

- Moderate risk III
  - AA > 45mm
  - Mechanical valve

- Extreme risk IV
  - Severe MS, AS, Aorta >50mm, severe coarctation, LV EF <30%, NYHC III+
  - Significant pulmonary hypertension

Findings of Marfans

- Positive Wrist sign
- Thumb sign
- Pectus excavatum

Micrograph showing pulmonary hypertensive arteriopathy with marked thickening of the tunica intima and tunica media.

Aortic Disease in Marfans

- Aneurysmal Dilatation or Aortic regurgitation
- Poor correlation with ocular and skeletal manifestations
- 50% of children with MFS --> 60-80% of adults
- Thoraacic aneurysm
- Family history of heart disease or MFS mutation
- Need to rule out other causes

- Silent Bicuspid
- Blockage >30mm +/- progressive aortic regurgitation

Micrograph demonstrating degenerative changes in the aortic valve. A common manifestation of Marfan syndrome.

Rheumatic Fever

- Inflammatory disease that can involve the heart, joints, skin, and brain
- 2-4 weeks after a streptococcal throat infection
- Called RF because symptoms mimic other rheumatologic conditions

- Signs and symptoms
  - Fever
  - Multiple painful joints
  - Involuntary muscle movements
  - Occasionally a characteristic non-itchy rash known as erythema marginatum.

Streptococcus pyogenes bacteria (Pappenheim stain) the trigger for rheumatic fever.
Rheumatic Heart Disease: Autopsy

- Gross pathology of rheumatic heart disease: aortic stenosis. Aorta has been removed to show thickened, fused aortic valve leaflets and opened coronary arteries from above.
- Which Valvular disease is most common early on in RHD
  1. Aortic Valve stenosis
  2. Aortic Valve regurgitation
  3. Mitral regurgitation
  4. Mitral Stenosis

High risk groups--->RHD

- Children
  - occurs approximately 20 days after strep throat.
  - 3% rate in developing countries
  - 50% recurrence if untreated
- No vaccine
  - (too many serotypes)

Disease of Poverty!--->Deaths from RHD

Deaths from rheumatic heart disease per million persons in 2012

Why has RF declined in the US

- S Pyogenes
  - Beginning of 20th century -- scarlet fever with mortality rates ~ 30%
  - RF significant morbidity until 1950’s
  - More necrotizing fasciitis
  - Reason for serotype change is unknown!

AES POLL QUESTION

Which is the most critical historical finding in a pre-participation exam?

1. Exertional symptoms
2. History of murmur
3. Symptoms of Marfan’s
4. Family history of premature serious cardiac condition or sudden death

Incidence of SCA/D

- 1/80,000 HS
- 1/50,000 College
- AA athletes 1/16,000
- 1/9,000 Male college basketball
  - > 50% Male BB & football
  - Similar rates in Military personnel and firefighters
  - 58-80% occur during exercise
  - Most common cause HCM
  - Detected prevalence is 1/800-1/2,600
  - Autosomal dominant--> screen 1st degree relatives
AES POLL QUESTION

Sensitivity of the history and PE for the detection of cardiac disorders with an elevated risk for SCA/D is:

1. 20%
2. 50%
3. 80%

Harmon KG, Zigman M, Drezner JA. The effectiveness of screening history, physical exam, and ECG to detect potentially lethal cardiac disorders in athletes: A systematic meta-analysis. J Electrocardiol. 2015;48:329-338

Distinguishing characteristics of left ventricular outflow tract obstruction

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>valve area (cm²)</th>
<th>mean gradient (mmHg)</th>
<th>maximum jet velocity (m/s)</th>
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</thead>
<tbody>
<tr>
<td>Valvular effect</td>
<td>decreased</td>
<td>increased</td>
<td></td>
</tr>
<tr>
<td>4th heart sound</td>
<td>severe</td>
<td>common</td>
<td></td>
</tr>
<tr>
<td>Paradoxical splitting</td>
<td>sometimes</td>
<td>common</td>
<td></td>
</tr>
<tr>
<td>Ejection click</td>
<td>most</td>
<td>uncommon</td>
<td></td>
</tr>
<tr>
<td>Valve calcification</td>
<td>Common after 40</td>
<td>no</td>
<td></td>
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<tr>
<td>Valve mass</td>
<td>2nd RIS</td>
<td>MHR US</td>
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<tr>
<td>Dilated Ascending Aorta</td>
<td>Common &gt; 40 y/o</td>
<td>rare</td>
<td></td>
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</table>

Summary

<table>
<thead>
<tr>
<th>AS</th>
<th>MS</th>
<th>TS</th>
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<tbody>
<tr>
<td>Valve area (cm²)</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Mean gradient (mmHg)</td>
<td>&gt;40</td>
<td>&gt;10</td>
</tr>
<tr>
<td>Maximum jet velocity (m/s)</td>
<td>&gt;4.0</td>
<td></td>
</tr>
</tbody>
</table>

Guidelines on the management of valvular heart disease (version 2012): The Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Summary Mitral Valve Diseases

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>SORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms of heart failure secondary to regurgitation should be managed by surgical consultation</td>
<td>B</td>
</tr>
<tr>
<td>Most patients with mitral regurgitation are asymptomatic</td>
<td>B</td>
</tr>
<tr>
<td>Repair favored over replacement for MR and MS?</td>
<td>B</td>
</tr>
</tbody>
</table>

Practice Recommendations: AS

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>SORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimicrobial prophylaxis for endocarditis is not recommended for patients with aortic stenosis unless they have undergone aortic valve repair or have a history of IE</td>
<td>B</td>
</tr>
<tr>
<td>Watchful waiting is recommended for most patients with asymptomatic aortic stenosis</td>
<td>A</td>
</tr>
<tr>
<td>Echocardiography is recommended every 1-2 years in those with moderate aortic stenosis</td>
<td>B</td>
</tr>
</tbody>
</table>

Questions