Academic Half Day: Endocarditis

Facilitator Guide

1:00-1:05 Theory Burst
1:05-2:25 Cases
2:25-2:30 Questions for the expert

Educational Objectives (at the end of this AHD you will be able to…)

- Compare and contrast different populations at risk for Endocarditis
- Recognize patients who require surgical intervention for Endocarditis
- Assemble a plan for a patient with endocarditis
- Initiate appropriate prophylaxis for a patient at increased risk of endocarditis

Case 1: Mr. Stephan Bovis is a 48-year-old male with h/o IVDU presents with "passing out". He reports he was just watching TV when he lost consciousness. He denies any symptoms prior to episode and has never happened before. He reports mild SOB for last week. SOB present at all times but worse with exertion. Also has noticed 3 weeks of increased fatigue, intermittent fevers, and chills. He currently uses IV heroin daily, binge drinks ETOH and smokes 1 ppd. No other PMH, PSH, and no meds.

Physical Exam:
Vitals: T 101, BP 95/45, HR 105, RR 20, 98% RA
Gen: Diaphoretic, mild discomfort
HEENT: PERRL, normal conjunctivae, MMM, multiple dental caries
CV: Tachycardic, regular rhythm, nl S1/S2, no murmur appreciated, no JVD, no edema
Resp: CTAB
Abd: Soft, NT/ND, +BS
Skin: Track marks present with no surrounding erythema or warmth

1. **What is syncope and how might this patient have syncopized? Why are you worried about endocarditis? What else is on your differential diagnosis?**
    - Syncope = transient global cerebral hypoperfusion
        - Types: reflex, orthostatic, cardiogenic
            - Reflex: no prodrome
            - Orthostats: non-orthostatic
            - Cardiogenic: IVDU with a fever… Hmmm
        - Cardiogenic
            - Structural:
                - Valvular
                    - Typically AS if syncopal presentation
                    - Valves with IE:
                    - AR or MR (usually doesn't cause syncope)
                    - TR, assoc with IVDU (usually doesn't cause syncope)
            - Arrhythmia
                - In IE, we worry about Heart block (intrinsic or as complication of endocarditis with myocardial abscess)
        - DDx: Other etiology of Transient Loss of Consciousness?
            - Neurogenic
                - TIA/Stroke (arterial occlusion)

        - Intracranial hemorrhage (abscess, mycotic aneurysm)
        - Seizure (abscess as seizure focus)
    - Note: FYI cerebral complications are most severe and most common extra-cardiac complications (17-20% of patients).

- Shortness of breath – possibly due to a complication of endocarditis
    - Heart failure 2/2 valvulopathy
    - Septic pulmonary emboli

Why should we worry about IE in this patient?

- Fevers (86%-96% of cases)
- Constitutional symptoms- chills, fatigue (non-specific but point towards systemic symptoms from his infection)
- At risk population (IVDU)

Point: Worried about endocarditis with possible complications of endocarditis causing the presentation. The presentation for acute IE is indistinguishable from general causes of sepsis, however; with the subacute illness and risk factors present, it must be considered.

Note: They were asked to review the modified Duke criteria for prep so please do not have them regurgitate this but it can be used for general discussion.

2. **Why does IVDU create risk for endocarditis? What other patients are at risk for endocarditis?**
    - Point: At risk when valve tissue is damage or replaced
        - Endothelial damage: repeated IV injections of solid particles, turbulent blood flow
        - Chronic inflammation: chronic rheumatic heart disease, degenerative valvular lesions Prosthetic valves or materials
        - Other: Age >60, Male Sex, Chronic HD, IV catheter, indwelling cardiac device, oral hygiene or dental pathology

- With IVDU the risk for endocarditis is not just due to the potential bacteria being introduced from injecting (that's the bacteremia risk), there is also damage to the valve.

3. **What else would you look for on physical exam?**

Please discuss this in general. Do not need to hit every single point. Percentages listed in case you get asked but do not worry about these details for learners otherwise

General: Presenting with syncope, may want to check orthostats (negative in this case)

HEENT:
- Dentition- poor dentition increases risk of endocarditis 2/2 oral flora, IVDUs often lick needles though so even with good dentition still at risk
- Conjunctival hemorrhage (5%)
- *Roth's spots (2%) – exudative, edematous hemorrhagic lesions of retina with pale centers. Usually related to subacute bacterial endocarditis, but also leukemia, DM, hypertensive retinopathy

CV:
- New regurgitant murmur (48%)
- Worsening of prior regurgitant murmur (20%)

- Bradycardia 2/2 heart block

Abd/Renal:
- *Hematuria 2/2 glomerulonephritis (26%)
- Splenomegaly (11%)

MSK:
- Septic joints – warm, erythematous painful joints; effusions
- Signs of abscesses – pinpoint spinal tenderness, psoas sign

Skin:
- Janeway lesions (5%) – non-painful erythematous macular or nodular lesions on hands and feet (reflect microabscesses, vascular phenomena)
-*Osler's nodes (3%) – painful (**O**uch **O**sler), red, violaceous raised lesions on pads of fingers and toes (reflect vascular occlusion by microthrombi that cause immune-mediated vasculitis)
- Splinter hemorrhages (8%)

Neuro:
- Signs of abscesses/septic emboli – focal neurologic findings, mental status changes, seizures

*Immunological phenomena uncommon in acute IE, more characteristic of the more insidious subacute form of untreated IE. Also, right-sided IE usually does not cause peripheral emboli and immunological phenomena.

4. **You are admitting this patient to general medicine service. What work-up do you do?**
Ask the learners specifics about why and how they would order things. Ask to consider the close & distant anatomical complications!

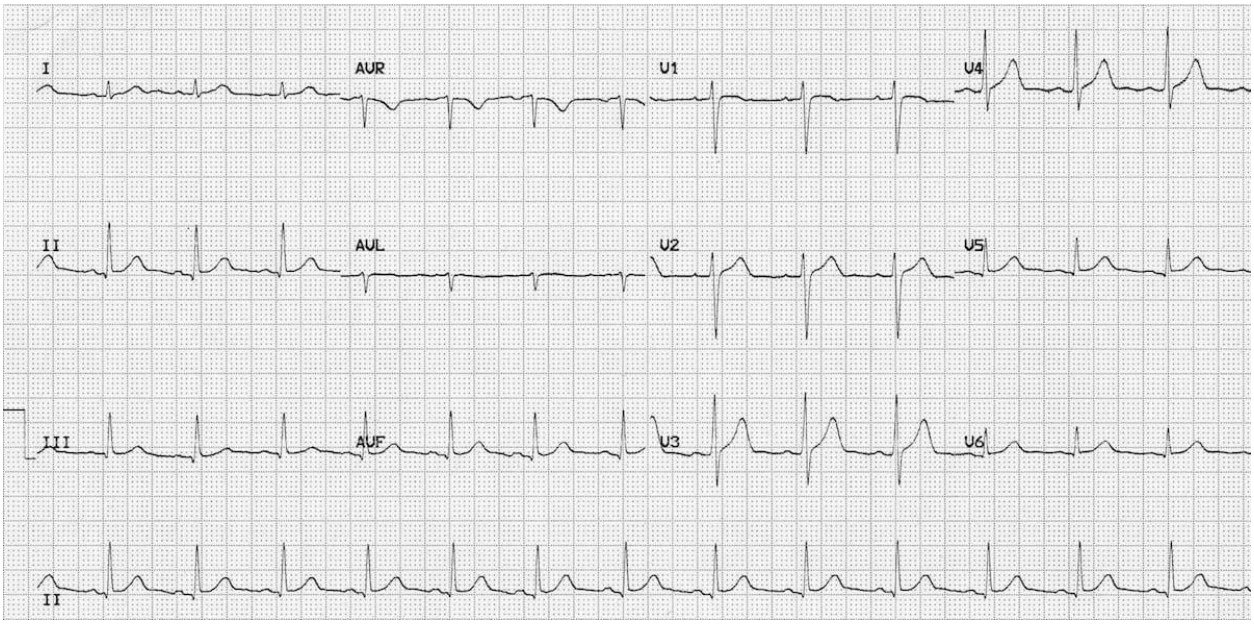
- EKG – evaluate for syncope (QT prolongation, LAD/LVH in HOCM, Brugada, WPW, MI, etc), heart block (perhaps from a septal muscle abscess; surgery indications later) & PR prolongation (suggests peri-valvular abscess)
- Blood Cultures
    - Guideline: Before starting abx at least 3 sets of BCx obtained from different venipuncture sites should be obtained, with the first and last samples drawn at least 1 hour apart. Class I, Level A.
    - Point: Multiple BCx across time, documents persistent bacteremia.

  Note: If learners bring it up you can look at modified Duke Criteria to see how this relates.
- Echocardiogram – Transthoracic
    - Guideline: TTE should be performed in all cases of suspected IE. Class I, Level B. *Not everyone needs a TEE as TTE may be positive. Some individuals are considered higher risk and will also need a TEE. Additionally, patients with high risk transthoracic echo features should also undergo TEE.* ***We will be discussing more details about high initial patient risk and high risk echo features later.***
    - Point: Always start with TTE. If high initial patient risk, still get TTE but get TEE ASAP after.
- Evaluate for other potential sources of infection and/or complications
    - CXR, UA

5. **What organisms are you concerned about? What empiric antibiotics would you start?**
    - Organisms:
        - IVDU: Staph aureus (MRSA or MSSA), Coag neg Staph, β-hemolytic Strep, Aerobic Gram Neg Bacilli (including Pseudomonas)
        - Poor dentition: Viridian Group Strep, Streptococci, HACEK organisms
        - Enterococcus
    - Antibiotics:
        - Need to cover Staph/Strep including potential methicillin-resistance organisms -> Vancomycin
        - Cover gram negative bacilli including pseudomonas and HACEK species -> pip/tazo or Cefepime

Note: no clear recommendations for empiric antibiotics for endocarditis as should be thinking about individual risk factors and previous cultures. So above are reasonable options

Case Continued:
CXR was normal. UA was negative for blood, RBCs, WBCs, LE and nitrites. ECG below. It's the next morning and you are seeing your patient on pre-rounds. In the quiet of the 7W bed you now notice a murmur (see QR code for audio link). The patient has just come back from TTE but the results aren't up yet.



Murmur (Heard at 3rd left ICS which increases with isometric hand grip):

6. **How does this change your plan?**
   - The patient now should get a TEE regardless of the findings on TTE as they are considered high initial patient risk.

   Follow-up question: Who is considered high initial patient risk?
   Answer: prosthetic valves, many congenital heart conditions, prior endocarditis, new murmur, heart failure, and stigmata of endocarditis.

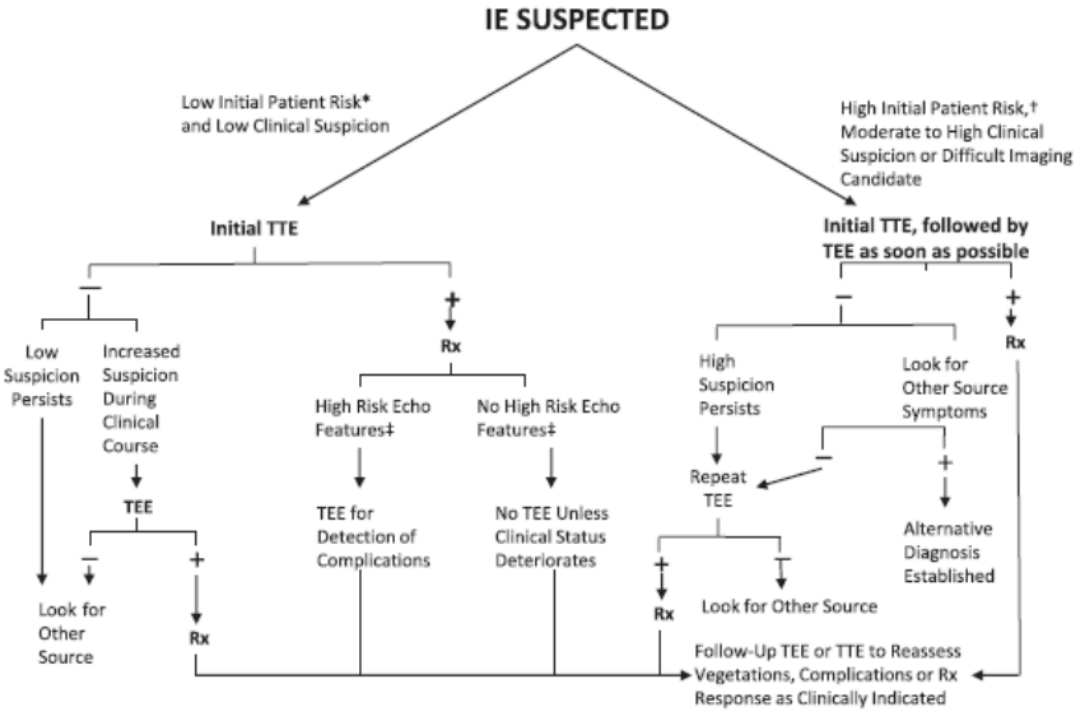
   Point: Patients with high initial risk should still get TTE first, but should also undergo TEE as soon as possible afterward.

7. **What if instead of hearing a murmur, the TTE returns with findings of an 11 mm oscillating vegetation on the anterior leaflet of aortic valve? What is your next step?**
   - Obtain a TEE because the patient has high risk echo features.

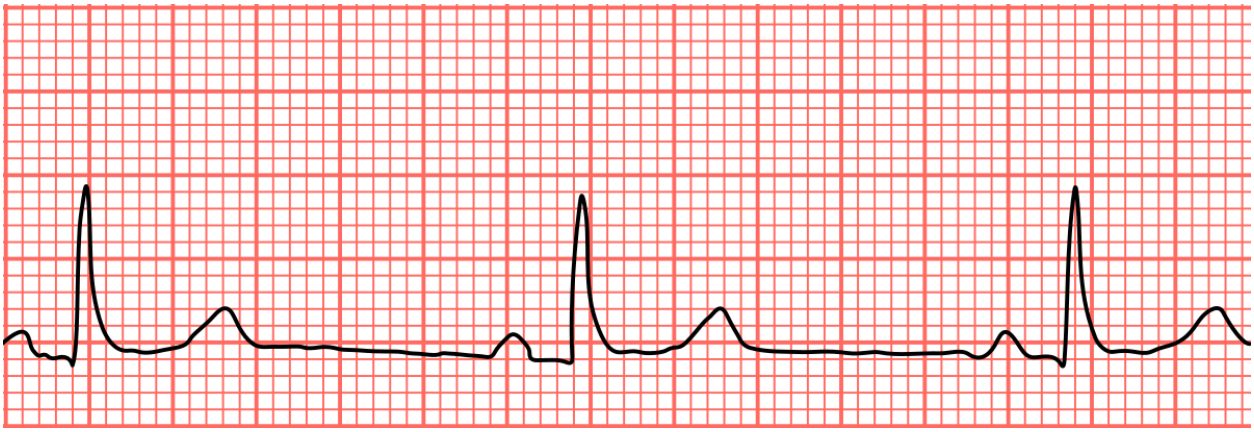
Follow-up question: What are the high risk echo features?
Answer: large vegetations (> 10 mm in diameter), severe valvular insufficiency, abscess cavities or pseudoaneurysms, valvular perforation or dehiscence, and evidence of decompensated heart failure.

Point: Patients with high risk echo features on TTE should also undergo TEE for detection of complications.

Note: Below diagram is here for your reference.



Case Continued: Patient undergoes TEE for the new murmur. TEE shows a 7 mm vegetation on the aortic valve with moderate aortic regurgitation and EF of 55%. Then on hospital day 3 the team gets called because of the finding below seen on telemetry.



8. **What are your next steps?**
    - Obtain a repeat TEE because the patient now has new findings consistent with intracardiac complications.
        - (Repeat TEE: shows vegetation that is 11 mm in size with abscess extending into interventricular septum.)
    - Consult CT surgery

9. **Should this person have surgery? What are the indications for early surgery in left-sided endocarditis?**
    - Yes, indicated due to the heart block. Size of vegetation alone is not a definite indication for surgery, although still high risk echo feature.
    - Learners have a blank version of this table. Work with your team to fill it in.

Indications for early surgical management of native valve infective endocarditis	
Valvular or conduction failure	• Acute heart failure due to valvular regurgitation • Valve leaflet fistula formation • New heart block
Uncontrollable infection	• Paravalvular abscess formation • Infection with difficult-to-treat pathogen (eg, fungi) • Persistent fever or bacteremia despite ≥7 days antibiotics
Embolic complications	• Systemic emboli despite appropriate antibiotics • Left-sided, mobile vegetation >10 mm & prior embolic event

Levels of evidence

- Valve dysfunction with signs/sx of heart failure (Native Valve Endocarditis, Prosthetic VE). Class I, Level B.
- IE complicated by heart block, annular or aortic abscess, or destructive penetrating lesions (NVE, PVE). Class I, Level B.

- Evidence of persistent bacteremia (or fever) lasting > 5-7 days and other sources excluded (NVE, PVE). Class I, Level B.
- Early surgery considered when caused by fungi or resistant organisms (NVE, PVE). Class I, Level B.
- Early surgery reasonable for:
- Recurrent emboli despite appropriate antibiotic therapy >7 days (NVE, PVE). Class IIa, Level B.
- Mobile vegetation > 10 mm and severe valve regurg (NVE). Class IIa, Level B.
- Early surgery may be considered if mobile vegetation > 10 mm (PVE). Class IIb, Level C.

Point: There are some clear indications for surgery but often the decision is a balance of multiple factors and should be a multi-disciplinary decision. In all cases of left-sided, prosthetic valve, device, or complicated endocarditis, consult to cardiac surgeon should be done.

Note: Early surgery is generally considered surgery done during initial hospitalization and before completion of a full course of antibiotics.

10. **What if instead the patient had right-sided endocarditis with septic pulmonary emboli? Is surgery indicated, why or why not?**
    - No, generally you would treat medically and not pursue surgery.
        - Why not? Outcomes are better with right-sided endocarditis. Also, concern for reinfection of prosthetic valve.
    - Follow-up question: Do the emboli matter?
        - Answer: Emboli get tricky with left-sided or right-sided IE. Generally, do not pursue surgery for presence of emboli alone. However, recurrent emboli despite appropriate antibiotic therapy would be a reason to consider surgical intervention.
    - If do intervene surgically, then *valve repair* rather than replacement should be performed when feasible. Class I, Level C.
    - Possible follow-up question: When else would you consider surgical intervention?
        - Answer: right heart failure 2/2 severe tricuspid regurgitation with poor response to medical therapy, sustained infection caused by difficult-to-treat organisms (i.e. fungi, MDRO) or lack of response to appropriate antimicrobial therapy, and tricuspid valve vegetations that are ≥20 mm in diameter and recurrent pulmonary embolism despite antimicrobial therapy.

11. **What if instead the patient already had a prior history of endocarditis with a mechanical AVR on Coumadin and he presented with recurrent endocarditis with the emboli to brain as above? What would you do with his anticoagulation?**

Discuss risk vs benefit of clotting valve vs bleeding around brain emboli

Guideline: Discontinuation of all forms of anticoagulation in patients with mechanical valve IE who have experienced a CNS embolic event for at least 2 weeks is reasonable. Class IIa, Level C (only expert opinion).

Case Continued: Patient undergoes AVR and does well post-operatively. His cultures grew MSSA.

12. **If the patient had prosthetic valve would this change your antibiotics?**

Point: Staph aureus- infected prosthetic valves need combination therapy:
antistaphylococcal beta-lactam OR vancomycin PLUS an aminoglycoside and rifampin

He completes a 6 week course of nafcillin. He is then seen in the Lenox Hill Medicine clinic to establish care with a new PCP. He hasn't seen a dentist in years so you refer him to a dentist who recommends deep cleaning and tooth extraction.

13. **Does the patient need antibiotic prophylaxis? If so, why and with what antibiotic? What are the indications for antibiotic prophylaxis prior to dental procedures?**
    - Yes, due to prior history of endocarditis.
    - Prophylaxis with amoxicillin 2 gm 30-60 min prior to procedure
    - (alternative if allergic: clindamycin, erythromycin, or clarithromycin; cephalexin if rash only)
    - Indications for antibiotic prophylaxis:
        - Prosthetic cardiac valve or prosthetic material used for valve repair
        - Previous infective endocarditis
        - Some congenital heart disease
            - Unrepaired cyanotic CHD
            - Completely repaired CHD with prosthetic material/device during first 6 months after procedure
            - Cardiac transplantation recipients who develop cardiac valvulopathy

QUESTIONS FOR THE EXPERT. IF THERE IS STILL TIME PROCEED TO QUESTIONS BELOW

What is your differential diagnosis for culture negative endocarditis?

- Antibiotics administered before cultures drawn (most common)
- Brucella
- Bartonella
- Coxiella burnetti (Q fever)
- Chlamydia
- Legionella
- Mycoplasma
- Whipples disease (T whipplei)
- Libman Sacks/other autoimmune (rheumatoid, Behcets, etc)
- Malignancy (myxoma, etc)

Which antibiotic would you choose in the following cases?

25 yo IVDU with tricuspid valve endocarditis and right leg weakness. MRI shows small abscess. Blood culture with MSSA.	Nafcillin x 6 weeks
68 yo M presenting with 4-6 weeks of fevers and weight loss. Blood cultures + for *Strep gallolyticus*	Aqueous penicillin OR ceftriaxone x 4 weeks Note: Could also treat with PCN or CTX PLUS gent for 2 weeks * Patient also needs a colonoscopy ASAP
40 yo F with history of fistulizing Crohn's on TPN. Blood cultures with Candida albicans.	Amphotericin B + flucytosine Stat CT surgery consult Likely will require lifelong suppression with an azole