Chest pain

- Cardiac chest pain

- Most likely to present without cardiac chest pain

- Best initial test
  - What are you looking for on EKG?
  - What are you looking for on troponins?
  - Reinfarction?

- Medications

- 1. Substernal 2. Worsened with exertion and relieved by rest 3. Relieved by nitroglycerin
- Diabetics and females
- EKG (outpatient), troponins (ER)
  - STE (>2mm), new LBBB
  - Troponins-increasing >0.04, 3x
  - Troponin for reinfarction-myoglobin
- Morphine, O2, Nitrates, Aspirin, BB, ACEi, Statin, Heparin (MONA BASH)
Localization
CAD

- Risk factors
- So, if the troponins are negative and the EKG is normal-what is the next best step?
- Who cannot be stressed?
- What chemical stress would you avoid in an asthmatic?
- What are you looking for on nuclear imaging?

- DM (#1), HTN, HLD, Age>45M, >55F, smoking
- Stress them
- LBBB, LVH, Pacer, Digoxin
- Dipyridamole (other options are adenosine, dobutamine with echo)
- Reversible defects-if a defect is present at rest and under stress, it cannot be salvaged through an intervention. However, if there is a defect that is only present during stress, an intervention can salvage it.
Intervention options

- PCI timeline?
- When can you use thrombolytics?
  - Time limit?
  - Contraindication to thrombolytics?
- What can you stent?
- When do you need to call CT surgery?

- Door to balloon in 90 minutes
- Question has to go out of the way to tell you they are in the boonies
  - <30 minutes if no PCI or PCI >2 hours away
  - Intracranial hemorrhage
  - Recent ischemic stroke (6 mo)
  - Surgery past 2 weeks
  - BP >185/110
- Stent >70%
- CT for CABG if
  - L main
  - >3 vessels
  - >2 vessels in DM
Discharge medications and complications

- What meds are you sending them home on?
  - How long for the clopidogrel?
  - What BB?
  - What statins and what is the goal?
- MCC death post MI

- Short acting nitrates, ASA (+ clopidogrel if stenting), BB, ACEi, Statin
  - 6 months if DES, 1 month bare metal
  - Metoprolol, bisoprolol, carvedilol
  - High intensity (atorvastatin, rosuvastatin; goal <70)
- Arrhythmia
Post MI Complications

- RCA occlusion-leads
  - Initial treatment
  - Severe pulmonary edema and new holosystolic murmur 3-5 days post MI

- LAD occlusion-leads
  - New onset chest pain, shock, distant heart sounds

- LAD or RCA-new holosystolic murmur, step up in O2 level from RA to RV

- HR <60 post MI
- Re-infarction?
- Pleuritic CP weeks later?
- Persistent STE?

- LAD or RCA-new holosystolic murmur, step up in O2 level from RA to RV

- II, III, aVF
  - Fluids-nitro will not help because the issue is preload
  - Papillary muscle rupture, leads to new MR murmur

- V1, V2, V3, V4
  - Free wall rupture, leads to a new tamponade presentation

- Interventricular septum rupture, leads to VSD murmur
- Bradycardia post MI
- Myoglobin
- Dressler-give NSAIDS
- Aneurysm
### MI

<table>
<thead>
<tr>
<th>Lead</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Lateral</td>
<td>aVR</td>
</tr>
<tr>
<td>II Inferior</td>
<td>aVL Lateral</td>
</tr>
<tr>
<td>III Inferior</td>
<td>aVF Inferior</td>
</tr>
<tr>
<td>V1 Septal</td>
<td>V2 Septal</td>
</tr>
<tr>
<td>V4 Anterior</td>
<td>V5 Lateral</td>
</tr>
<tr>
<td>V3 Anterior</td>
<td>V6 Lateral</td>
</tr>
</tbody>
</table>

![Heart Diagram](https://example.com/heart-diagram.png)
EKGs

• EKGs are measuring vectors based on particular lead placement
  • Heart should depolarize from R to L and top to bottom
    • Natural conduction system is the most efficient conduction system
      • If you have the current depolarizing but in a direction that the system isn’t made for-timing of a particular segment is going to be off
        • Wide QRS-WPW, LBBB, RBBB
  • Net current towards something gives an upward deflection, away gives a downward deflection
EKGs

- **PR**
  - Glimpse of SA to AV conduction
  - Shortened (<.2) in WPW because the Bundle of Kent depolarizes before the conduction from SA to AV occurs
  - Prolonged (> .2) in AV Blocks

- **QRS**
  - If the heart cannot use that conduction pathway because there is a block or current is going the wrong direction, it will take > .12s
    - RBBB, LBBB, pacemaker, WPW
Electrolytes on EKGs

Hyperkalemia-peaked t wave

Treatment?

1. Calcium gluconate-stabilize cardiac membrane
2. Kayexalate-poop out the potassium
3. Insulin and glucose (do not just give insulin because you will make the patient hypoglycemic)

As an aside, most questions involve hyperkalemia in context of crush or burn victims
Electrolytes on EKGs

Hypocalcemia prolonged QT

Hypercalcemia-shortened QT

Treatment?
If severe >14 treat with NS hydration, calcitonin, and pamidronate or another bisphosphonate for maintenance
Electrolytes on EKGs

Hyperkalaemia:
- Flattened T wave
- U wave
- ST depression

Hypokalaemia:
- Peaked T wave
- Widened QRS
- Loss of P wave

Hypercalcemia:
- Normal

Hypocalcemia:
First degree AV block—just long PR intervals

Second degree Type I-PR lengthens then drops a beat
3rd degree-no association
-Lyme and Lupus
-Cannon a-waves on PE

2nd degree type II-randomly dropped beats
Atrial Fibrillation

• EKG?
• Risk factors for development of atrial fibrillation?
• Management?
• What will you check in a patient with new onset Afib?
• Considered acute vs chronic?

• Irregularly irregular-no p waves and irregular RR intervals
• AE from HTN or CAD
• Rate or rhythm control (more common rate), and anti-coagulation
• MCC is hyperthyroidism so check TSH/T4
• <48 hours is acute and does not require anticoagulation before shocking
To Anticoagulate or Not

- CHA2DS2-VASc - What scores for what?
  - C?
  - H?
  - A?
  - D?
  - S?
  - V?
  - A?
  - Sc?

- >2 NOAC or OAC, <2 ASA or nothing
  - CHF
  - HTN
  - Age >75
  - DM
  - Stroke
  - Vascular (PAD, MI)
  - Age 65-74
  - Sex (Female)
Atrial flutter

• Consistent electrical circuit
• Sawtooth appearance
• Consistent RR interval
• Treat with OAC, rate or rhythm control
Multifocal Atrial Tachycardia

High yield association-lung disease
(COPD)
Electrical alternans in cardiac tamponade
Distant heart sounds, JVD, hypotension (Becks Triad)
Pulsus paradoxus (fall in BP>10 w/ inspiration)
- EKG?
- What is causing it?
- Drugs to avoid?
- Tx?

- WPW
- Accessory pathway through Bundle of Kent
- Avoid adenosine, beta blockers, CCB, and digoxin (ABCD-essentially all drugs that slow conduction through AV node because increases chance of vfib)
- Tx with procainamide
SVT-come in with palpitations and sweating
Tx? Carotid massage first, then try meds

VTach
VFib

Torsades
Tx? Mg
Associations-medications (ondansetron, anti-psych, FQN)
ACLS

- Unstable-hypotension, change in consciousness, chest pain?
- Symptomatic bradycardia tx?
- Shockable rhythms?
- Medications in VFib and pVT?

- DC conversion
- Atropine and pacemaker
- VFib and pulseless VTach
- Alternating epinephrine and amiodarone between CPR
Congestive Heart Failure

- Forms of CHF
- Best initial test
- Most accurate test
  - When would you actually use this?
- Medications-special note of decreased mortality
- Medications for acute decompensation
- Salt and fluid recommendations
- Indications for implantable defibrillator

- Diastolic dysfunction (preserved EF >50%), systolic dysfunction (reduced EF <40% in setting of ischemic heart disease and HTN)
- Transthoracic echo, if first presentation of CHF-EKG is indicated to ensure decompensation is not a result of ischemia/infarction
- MUGA
  - Pre-chemotherapy for a cardiotoxic agent (ex. doxorubicin)
- ACEi, BB (carvedilol, bisoprolol, metoprolol), spironolactone (NYHF III, IV), (diuretics, digoxin do not decrease mortality but it improves symptoms and decreases admissions)
- Lasix, Morphine, Nitrates, O2, Positional relief (LMNOP)
- <2L fluid, <2g salt
- EF <35% and NYHF III, IV
Congestive Heart Failure

Diastolic heart failure
- Aorta
- Thick, stiff heart muscle
- Right ventricle

Systolic heart failure
- Thin, weak heart muscle
- Left ventricle

Pleural effusion

Cephalization of vessels

Kerley B lines

Increased cardiothoracic ratio
Cor pulmonale

- Common causes are COPD, ILD, OSA.
- Present with dyspnea on exertion.
- Exam shows increased JVP, peripheral edema, loud S2, right sided heave, and pulsatile liver from congestion.
Pericarditis

- EKG in pericarditis
- Best initial treatment
  - Uremia
- Role of colchicine
- MCC
  - Others
- Diffuse STE (concave) and PR depression
- NSAIDS
  - Indication for hemodialysis
- Decreases recurrences
- Viral
  - MC other etiology in practice
  - questions-Lupus, RA
Pericarditis

- Calcifications on imaging, pulsus paradoxus, pericardial knock, and Kussmaul’s sign

- Constrictive pericarditis
  - Can occur in setting of viral pericarditis, cardiac surgery, or radiation therapy
Endocarditis

- Best initial test
- Best initial treatment
- IVDU-MC valve
  - What would the murmur sound like?
- MC valve for HACEK and Strep pneumo
  - What would the murmur sound like?
  - Treatment if HACEK
- What do you do if you find strep bovis?
- Who gets penicillin ppx in oral procedures?

- Blood culture (x3-do before imaging), TTE, TEE
- Vancomycin and gentamicin
- Tricuspid
  - Holosystolic murmur, increases with inspiration
- Mitral valve
  - Holosystolic murmur
  - Ceftriaxone
- Colonoscopy
- Prosthetic valve, previous history of endocarditis, cardiac transplant, unrepaired cyanotic heart defect
Cardiomyopathy

- Different forms of cardiomyopathy
- Causes of dilated cardiomyopathy
  - Medications that decrease mortality
- Causes of hypertrophic cardiomyopathy
  - Meds to avoid
  - Tx

- Dilated, hypertrophic, hypertrophic obstructive, restrictive
- Myocardial infarction, alcohol, postviral, radiation/doxorubicin, Chagas
  - ACEi/ARBs, BB, and spironolactone
- MCC HTN
  - Avoid increase in HR and decrease in LV chamber size (ACEi, ARB)
  - Tx with BB, diuretics
Cardiomyopathy

- Causes of hypertrophic obstructive cardiomyopathy
  - Tx

- Causes of restrictive cardiomyopathy
  - Pt with CHF, LVH and proteinuria; no HTN; waxy skin, anemia, big tongue
  - EKG
  - Echo

- AD sarcomere mutation
  - Ablation of septum, defibrillators; BB, CCB

- Sarcoidosis, amyloidosis, hemochromatosis, fibrosis, scleroderma
  - Amyloidosis
  - Low voltage
  - Speckling
Murmurs

• If it is a text question-go to the description of the murmur and start eliminating (Megri’s Method)
  • Systolic
    • ASS (Aortic stenosis, pulmonic stenosis, tricuspid regurg, mitral regurg)
  • Diastolic
    • Aortic regurg, pulmonic regurg, tricuspid stenosis, mitral stenosis
  • Holosystolic
    • VSD, tricuspid and mitral regurg

• If you get in trouble-try to think about the murmur relative to the cardiac cycle
  • Murmurs-think of as feed forward issues or backflow issues
    • Feed forward-from valves that should be open but are not good at opening because they are stenosed
    • Backflow-valves that should be closed that are allowing backflow
    • Systole-open A/P, closed M/T
    • Diastole-open M/T, closed A/P
Murmurs

• Best initial test?
• What kind of murmurs are we concerned about?

• Echo
• Grade III or more, diastolic, pansystolic, radiating, or symptomatic
Aortic stenosis

- Pathophysiology of AS
- Presentation
- Murmur

- Senile calcifications (MC>70), bicuspid aortic valve (association with Turner’s), late manifestation rheumatic heart
- Syncope, CHF, angina
- Systolic murmur, radiates to carotids
MVP

• Murmur?
• Pathology?
• Treatment?
• Repercussions?

• Late systolic with click
• Myxomatous degeneration
• Treatment only indicated if symptomatic with heart palpitations, treat with BB
• Predisposes to IE (Strep Viridans-only damaged valves)
Aortic regurgitation/dissection

- Widened pulse pressure and diastolic murmur?
- Patient experience of AR?
- Associations?
- Pain radiating to the back, pressure >20 between arms, new onset aortic regurgitation?
- Most specific and sensitive?

- Aortic Regurgitation
- Aware of heart beat due to LV enlargement
- Connective tissue diseases, syphilis, ankylosing spondylitis
- Aortic dissection
- TEE
Mitral regurgitation

- Murmur and radiation
- Cause?
- In setting of IE or MI?
- P wave abnormalities in EKG?
- Manifestations of LAE?

- Holosystolic, radiation to axilla
- Can be manifestation of RF, MVP is the most common cause of MR in developed countries
- Chordae in IE, papillary muscle rupture
- Looks like m
- Predisposes to A. Fib, splays carina on XR, can cause hoarseness and dysphagia
Coarctation of the aorta

- Underdeveloped lower extremity with brachial-femoral pulse delay
  - EKG?
  - CXR?
  - High yield association-genetics?

- Coarctation of the aorta
  - LVH
  - 3 sign with rib notching
  - Turner syndrome
Dysfunction in HOCM?
Murmur?
EKG?
Treatment?

Diastolic then systolic due to fibrous replacement of sarcomeres
Mitral regurg
Septal Q waves
CCB or BB
# Maneuvers on Murmurs

<table>
<thead>
<tr>
<th></th>
<th>Venous Return / Preload</th>
<th>Afterload</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increase (Leg raise / Squat)</td>
<td>Decrease (Valsalva / Standing)</td>
<td>Increase (Handgrip)</td>
</tr>
<tr>
<td>MS, AS</td>
<td>↑</td>
<td>↓</td>
<td>↓(AS)</td>
</tr>
<tr>
<td>MR, AR</td>
<td>↑</td>
<td>↓</td>
<td>↑</td>
</tr>
<tr>
<td>VSD</td>
<td>↑</td>
<td>↓</td>
<td>↑</td>
</tr>
<tr>
<td>HOCM</td>
<td>↓</td>
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<td>↓</td>
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<tr>
<td>MVP</td>
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</tr>
</tbody>
</table>
Murmur buzzwords

- Holosystolic (MR, VSD, TR)
- Early systolic (AS, PS, HOCOM)
- Mid systolic (MVP, ASD)
- Diastolic (MS, TS, AR, PR)

- Murmur with Click-MVP
- Radiates to the Axilla-MR
- Opening snap-MS
- Hyperdynamic circulation or signs-AR
Cardiotoxicity

- Best indication for MUGA to determine EF before starting cardiotoxic medications
- MC cause in questions: doxorubicin