Chest pain, arrhythmias, and syncope – Oh My!

Karen Ream, PA-C, MBA
Assistant Professor, School of Medicine
Division of Cardiology, University of Colorado

Disclosures

None ☹

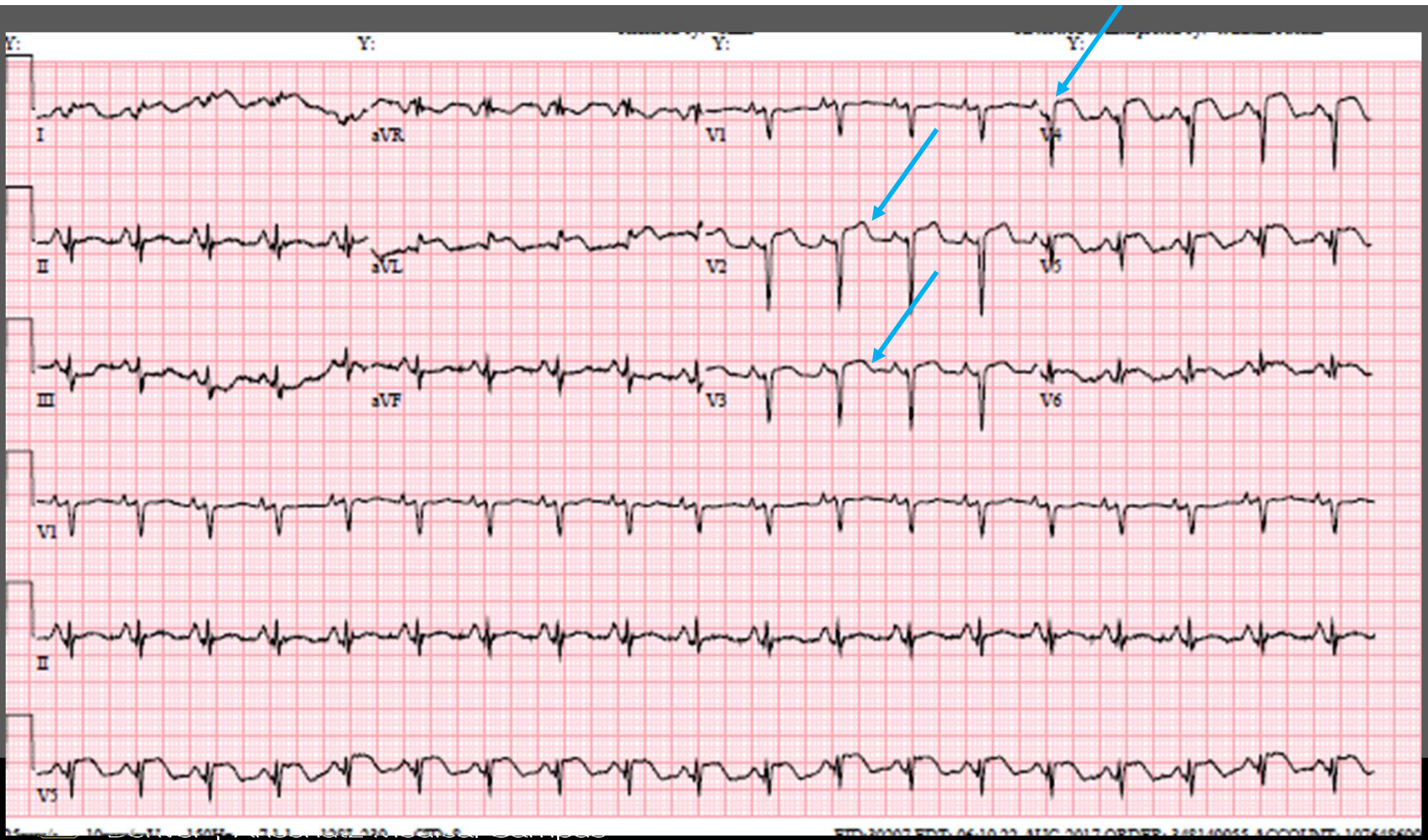
Objectives

- Identify common causes of chest pain in hospitalized patients
- Differentiate between common arrhythmias seen in hospitalized patients
- Explain components needed for a complete syncope work up

Case 1

60 M hx of CAD with PCI in 2015, HTN who is POD1 from L BKA. Tells RN he's having chest heaviness. The pain is 6/10 and started while he was in bed. It felt just like his previous chest pain.

RN finds you to share the good news. What do you do FIRST?


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II
V5

Case 1 – Now what?

1. Call cardiology consult
2. Start heparin gtt?
3. MONA

Heparin Contraindications?

Absolute

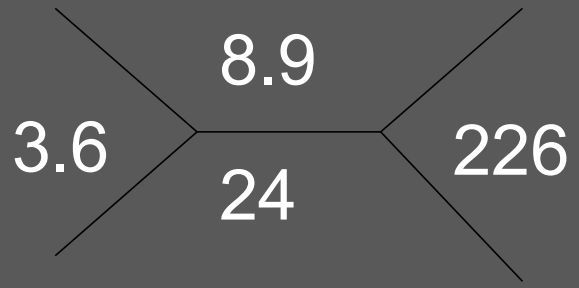
- Active bleeding
- History of heparin-induced thrombocytopenia
- Severe thrombocytopenia

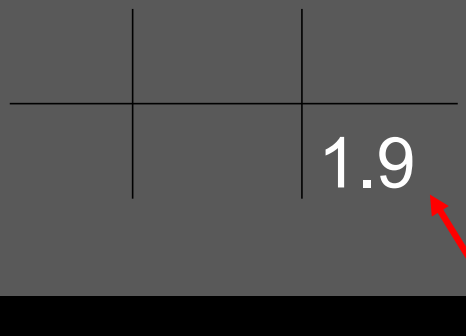
Relative

- Surgical limitations?
- Prior bleeding

Case 1 – Now what?

1. Call cardiology consult
2. Start heparin gtt
3. MONA
4. Activate cath lab?

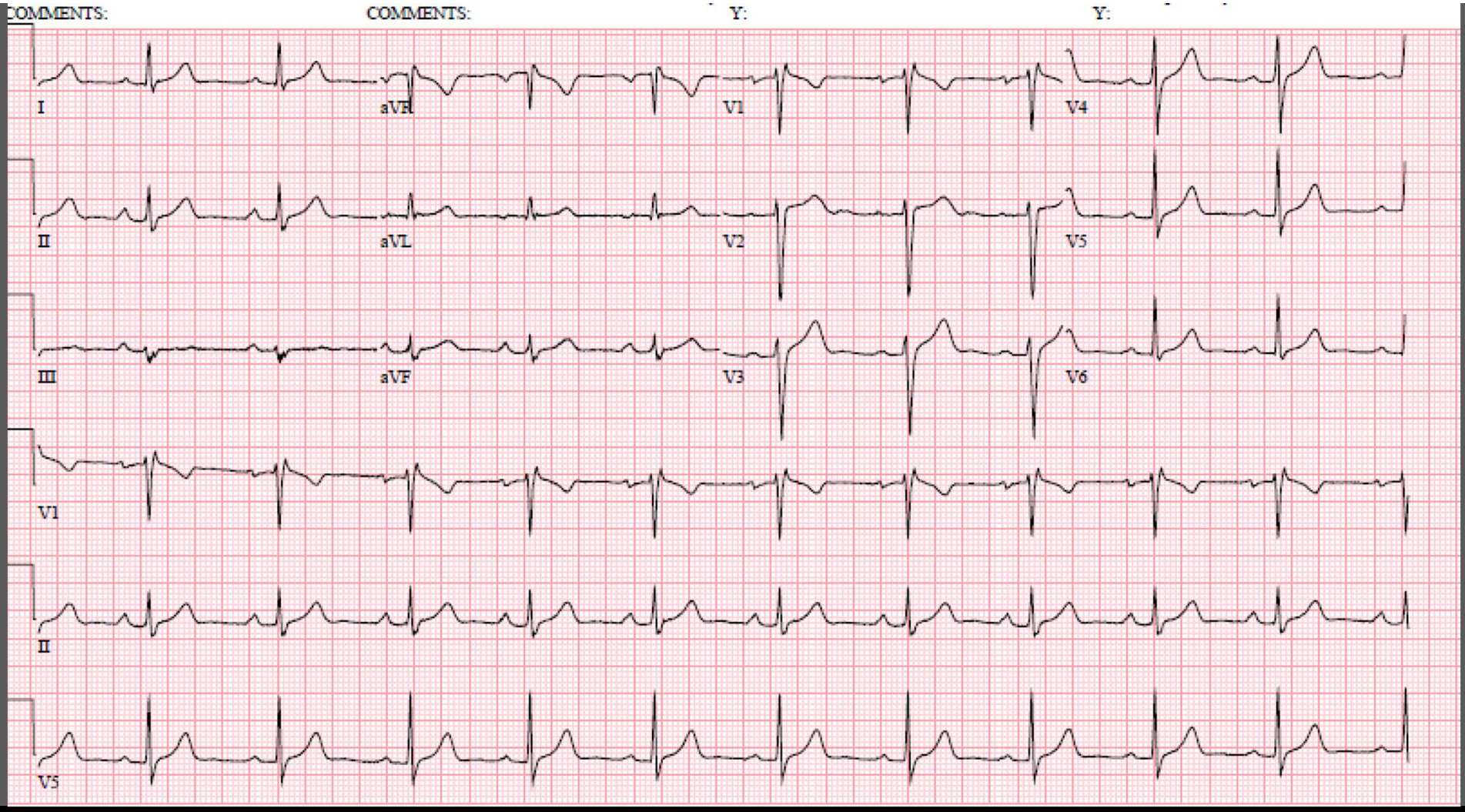




Case 2

- 78 AAM hx of 3v CAD medically managed, HTN, DM, multiple myeloma. He's admitted for complications of chemotherapy. He reports chest pain while walking with PT. The pain subsides once he sits down. This feels like his usual chest pain.
- Home meds: ASA, atenolol 100, atorvastatin 40, imdur 60, Insulin, chemotherapy agents

- Your floor nurse is a rockstar and got an EKG.


COMMENTS:
COMMENTS:
Y:
Y:
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II
V5

Case 2

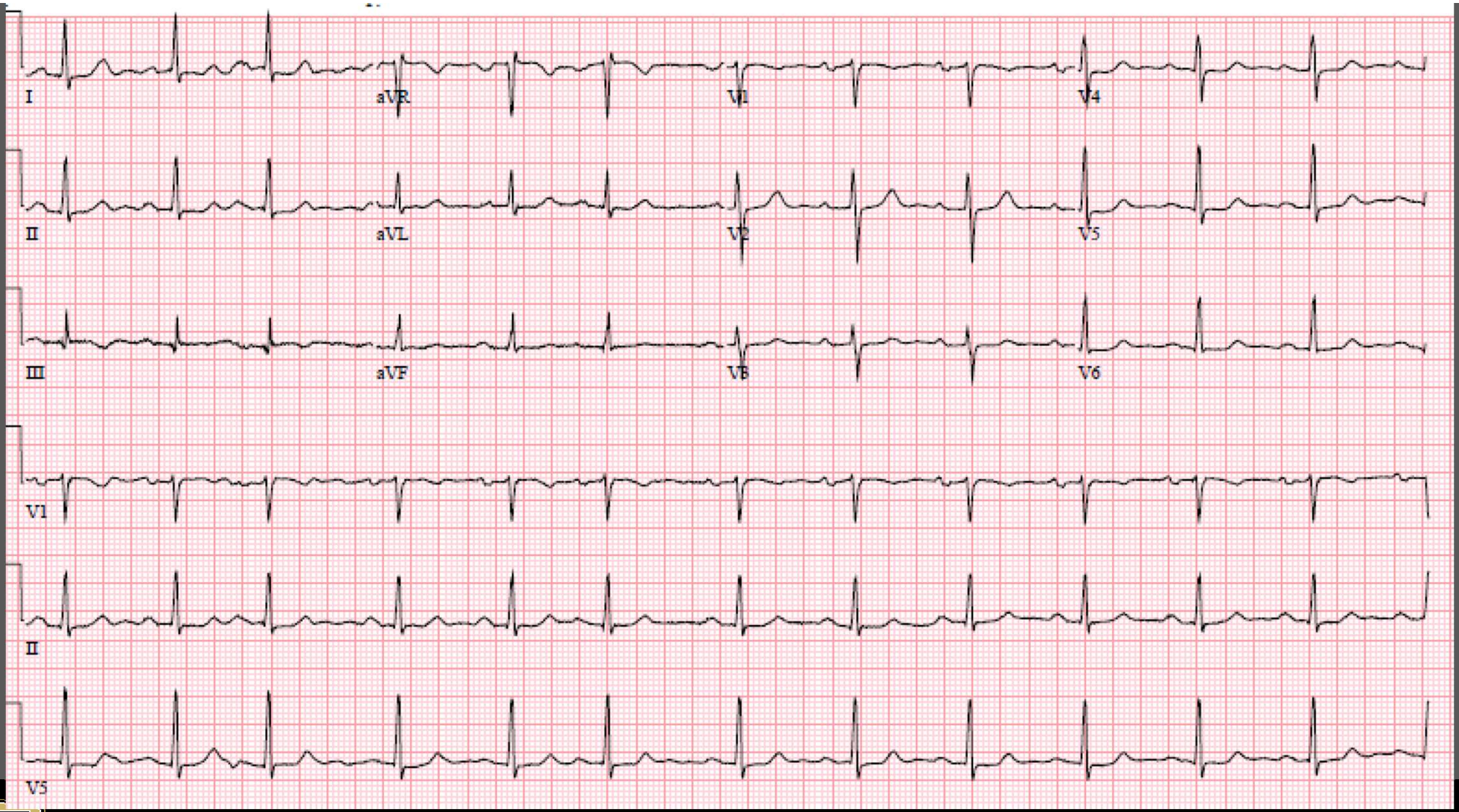
- Stable angina = Angina is a symptom of myocardial ischemia that is recognized clinically by its character, its location and its relation to provocative stimuli. Angina is stable when it is not a new symptom and when there is no deterioration in frequency, severity or duration of episodes.

- Unstable angina = New (within 24 hours) onset angina or abrupt deterioration in previously stable angina, often with prolonged episodes of rest pain.

https://www.ncbi.nlm.nih.gov/books/NBK83610/

Case 3

- 72 F hx of metastatic ovarian cancer, well controlled HTN. Admitted from the ED with sepsis of unclear source. Patient has AMS so history is limited. Family reports she had been doing well at home with no complaints prior to this morning.
- Home meds: Lisinopril 20 mg qd
- hsTrop I: 168 (F nl <16, M <20)


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II
V5

Fourth Universal Definition of MI

Troponin

> 99th percentile of normal

"Rise and fall"

Δ 20%

Need both of these

AND

for all types of MI

Clinical

Symptoms

Ischemic ECG changes

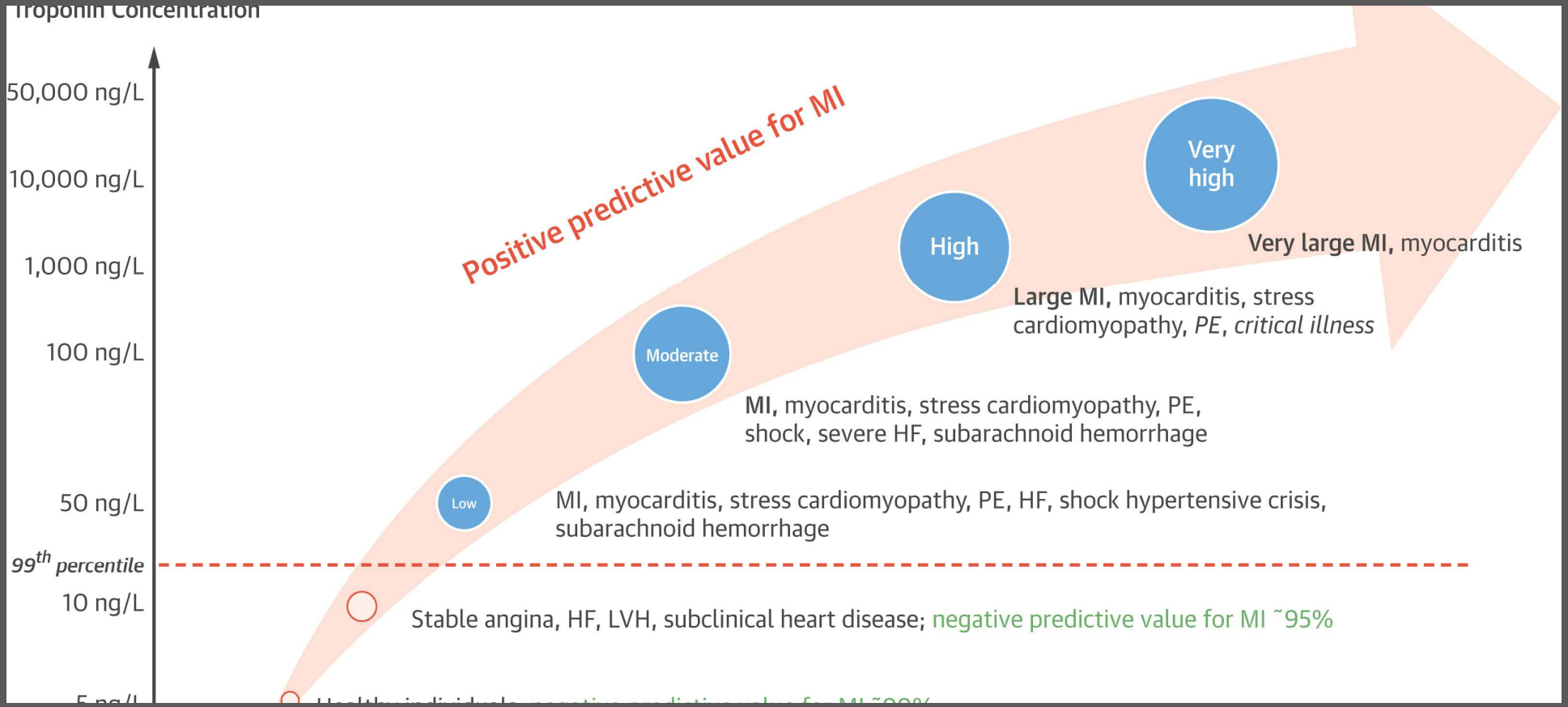
Ischemic imaging changes

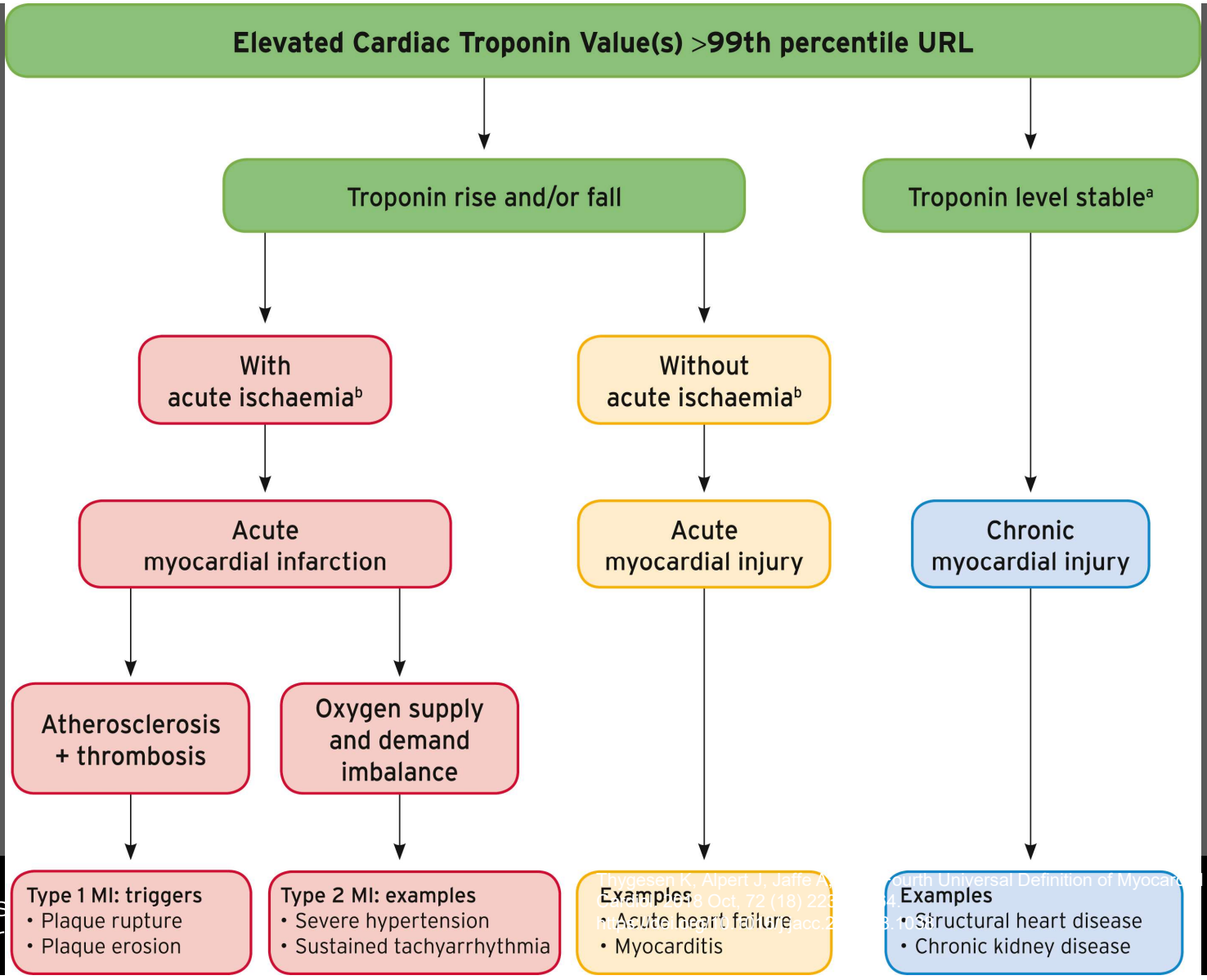
New wall motion abnormality

New perfusion defect

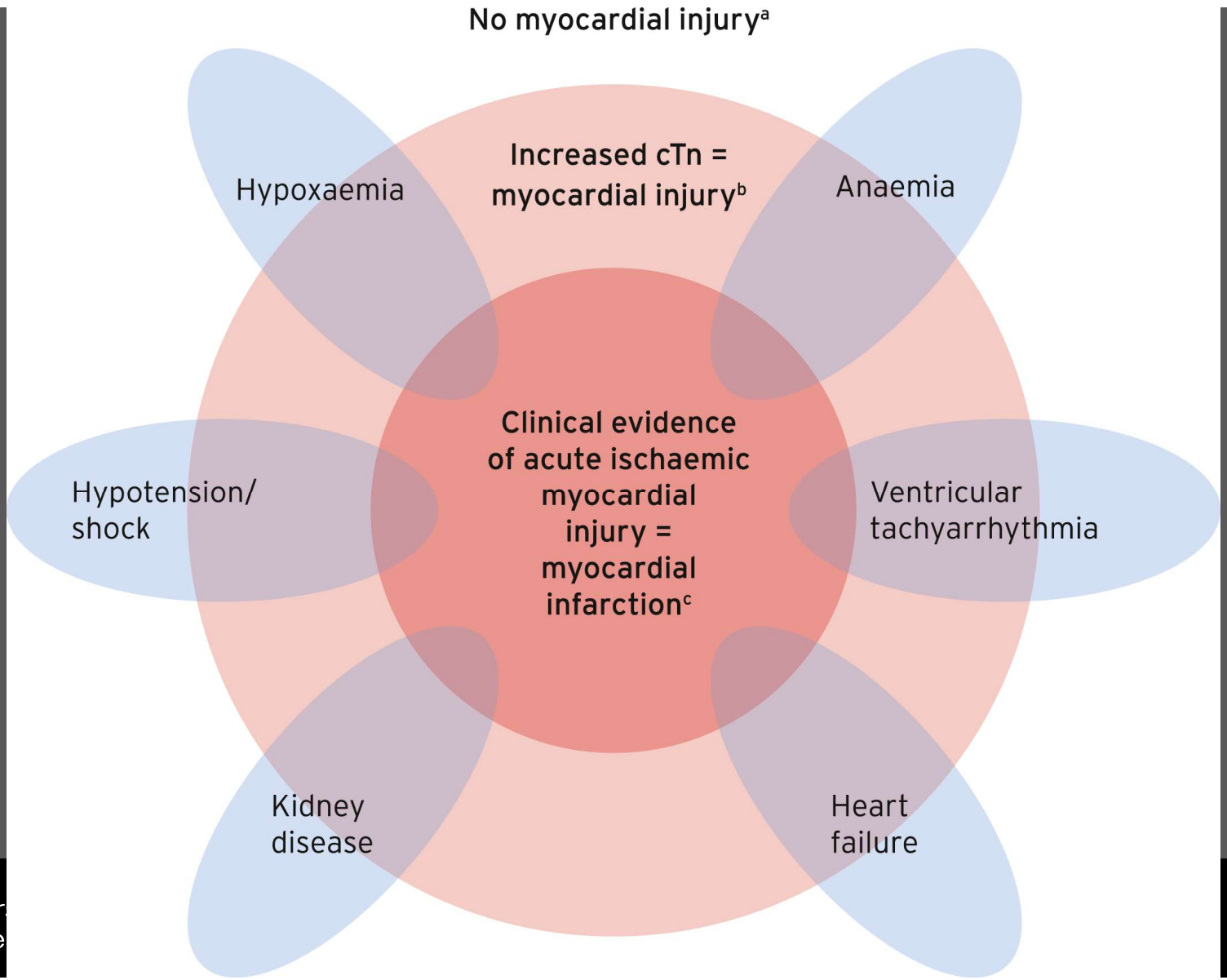
Intracoronary thrombus

Need one of these

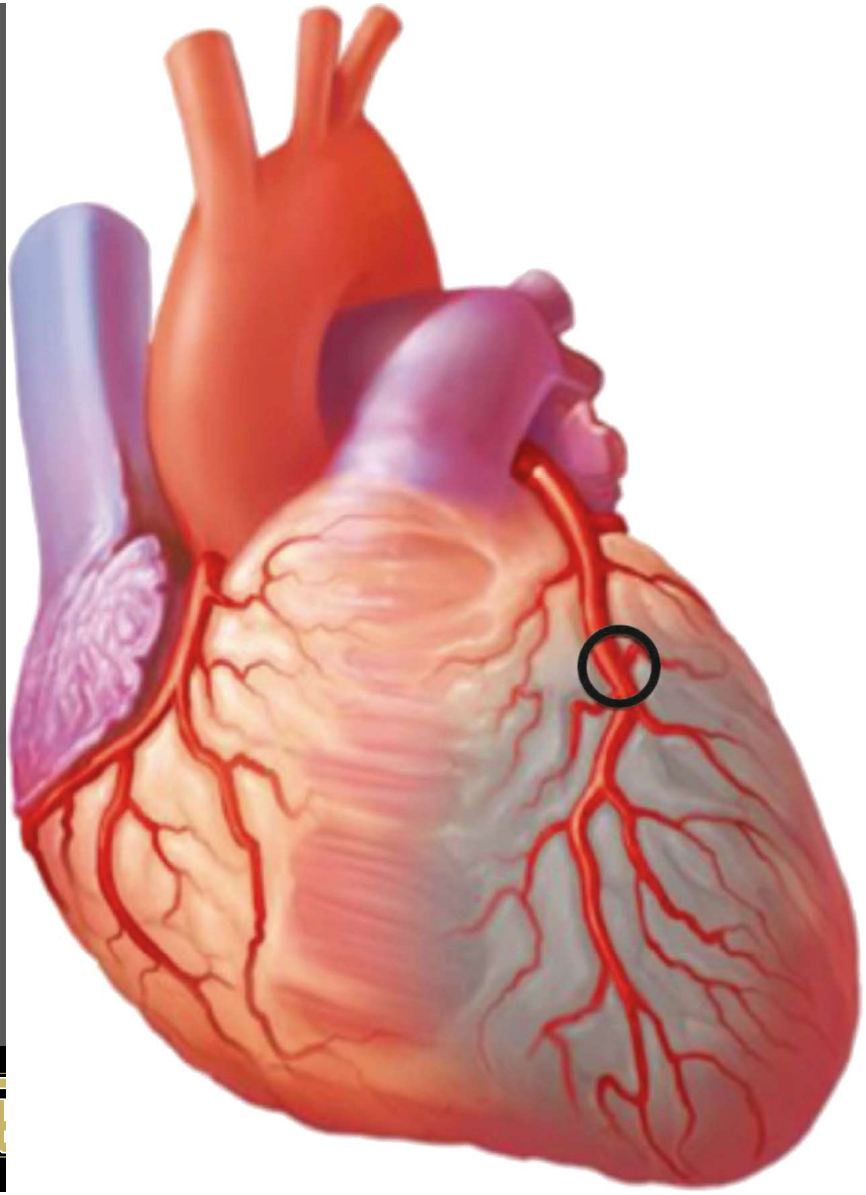

Troponin Concentration
50,000 ng/L
10,000 ng/L
1,000 ng/L
100 ng/L
50 ng/L
99th percentile
10 ng/L
Positive predictive value for MI
Very high
High
Moderate
Low
Very large MI, myocarditis
Large MI, myocarditis, stress cardiomyopathy, PE, critical illness
MI, myocarditis, stress cardiomyopathy, PE, shock, severe HF, subarachnoid hemorrhage
MI, myocarditis, stress cardiomyopathy, PE, HF, shock hypertensive crisis, subarachnoid hemorrhage
Stable angina, HF, LVH, subclinical heart disease; negative predictive value for MI ~95%



Thygesen K, Alpert J, Jaffe A, ... Fourth Universal Definition of Myocardial Infarction (2018). J Am Coll Cardiol. 2018 Oct; 72 (18) 2231-64. https://doi.org/10.1016/j.jacc.2018.08.1038



Thygesen K, Alpert J, Jaffe A, et al. Fourth Universal Definition of Myocardial Infarction (2018). J Am Coll Cardiol. 2018 Oct, 72 (18) 2231–2264. https://doi.org/10.1016/j.jacc.2018.08.1038



Thygesen K, Alpert J, Jaffe A, et al. Fourth Universal Definition of Myocardial Infarction (2018). J Am Coll Cardiol. 2018 Oct, 72 (18) 2231–2264. https://doi.org/10.1016/j.jacc.2018.08.1038

Plaque rupture/erosion with occlusive thrombus

Plaque rupture/erosion with non-occlusive thrombus

Case 4

- 54 F hx of CAD with T2DM, HTN, HLD, previous smoker. Presents with significant fatigue with heartburn and nausea that started about 2 hours ago. She has never felt this before.

- Home meds: ASA, atorvastatin 40

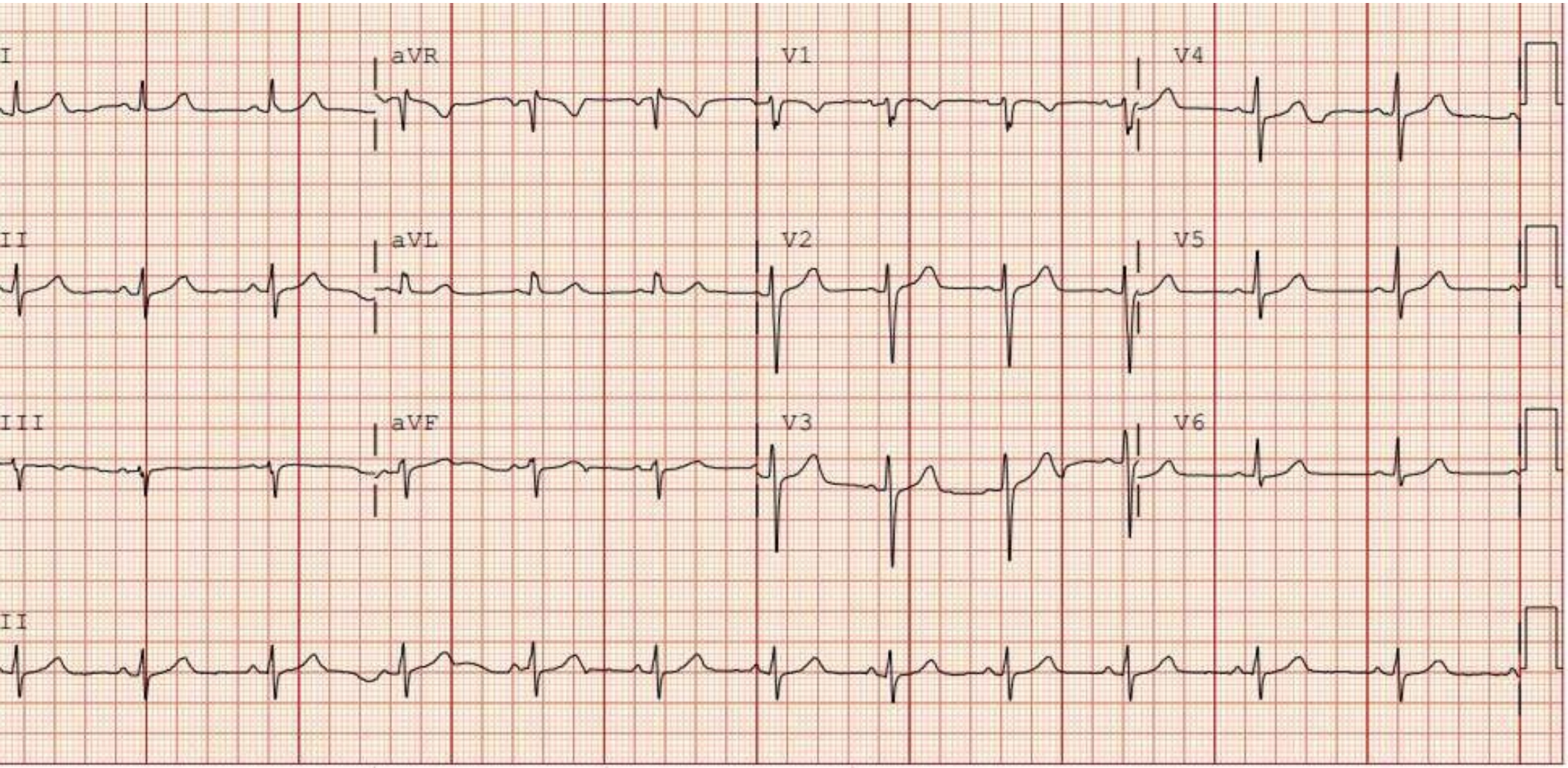
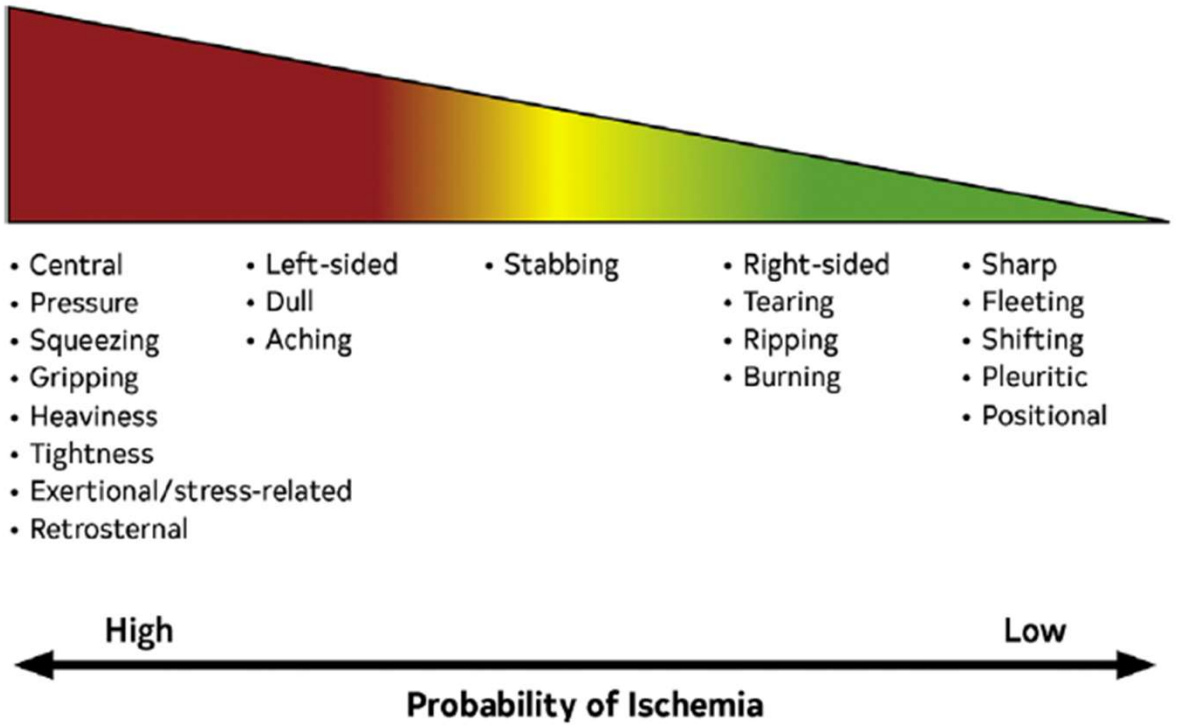

I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II

FIGURE 2 Index of Suspicion That Chest "Pain" Is Ischemic in Origin on the Basis of Commonly Used Descriptors



Gulati M, Levy PD, Mukherjee D, Amsterdam E, Bhatt DL, Birtcher KK, Blankstein R, Boyd J, Bullock-Palmer RP, Conejo T, Diercks DB, Gentile F, Greenwood JP, Hess EP, Hollenberg SM, Jaber WA, Jneid H, Joglar JA, Morrow DA, O'Connor RE, Ross MA, Shaw LJ. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR guideline for the evaluation and diagnosis of chest pain: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. J Am Coll Cardiol. 2021

Other considerations

- Female and DM – DOE or heartburn not resolved with antacids
- Associated sx: nausea, vomiting, diaphoresis
- "felt like the last time"

Risk Factors

- Tobacco use
- Hypertension
- Hyperlipidemia
- Diabetes
- Family history of CAD <65 years (assuming patient is <65)
- ESRD
- HIV
- Autoimmune disease

Evaluation Options

- Treadmill stress
- Coronary CTA
- Stress echo
  - Exercise
  - Dobutamine
- Nuclear stress
  - Exercise
  - Regadenoson/adenosine
  - Dobutamine
- PET
- MRI

Gulati M, Levy PD, Mukherjee D, Amsterdam E, Bhatt DL, Birtcher KK, Blankstein R, Boyd J, Bullock-Palmer RP, Conejo T, Diercks DB, Gentile F, Greenwood JP, Hess EP, Hollenberg SM, Jaber WA, Jneid H, Joglar JA, Morrow DA, O'Connor RE, Ross MA, Shaw LJ. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR guideline for the evaluation and diagnosis of chest pain: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. J Am Coll Cardiol. 2021

Treadmill Stress

- Quick, noninvasive
- Able to ambulate well?
- Baseline EKG abnormalities?
- Betablocker use?
- High rate of false positives, women especially

Coronary CTA

- Quick and informative
- Renal function acceptable?
- HR <75
- Age <60 preferred
- Not helpful if prior PCI
- NOT a functional test – may have buildup that doesn't limit blood flow

Stress echocardiogram

- No radiation
- Identify areas with wall motion abnormalities
- Agile and able to ambulate well?
- Betablocker use?

Nuclear Stress Test

- Long and lots of radiation
- Functional test for ischemia
- Which method best?
- Betablocker?
- NO caffeine x 24 hours

Regadenoson

- Reactive airway dz/wheezing
- Seizure disorder – use adenosine
- PE
- >1st degree heart block

Stress Tests

- Exercise whenever possible
- Don't order it expecting it to be normal – if you are that sure it will be why get it?

Case 5

64 M farmer from rural KS and no known PMH presents with syncope. Was working on his tractor and just went down. Doesn't remember much and this is the first time it has ever happened. Was told he had a murmur a long time ago.

- BP 136/82 P 65 RR 18
- Exam notable for 4/6 systolic ejection murmur that radiates into carotids

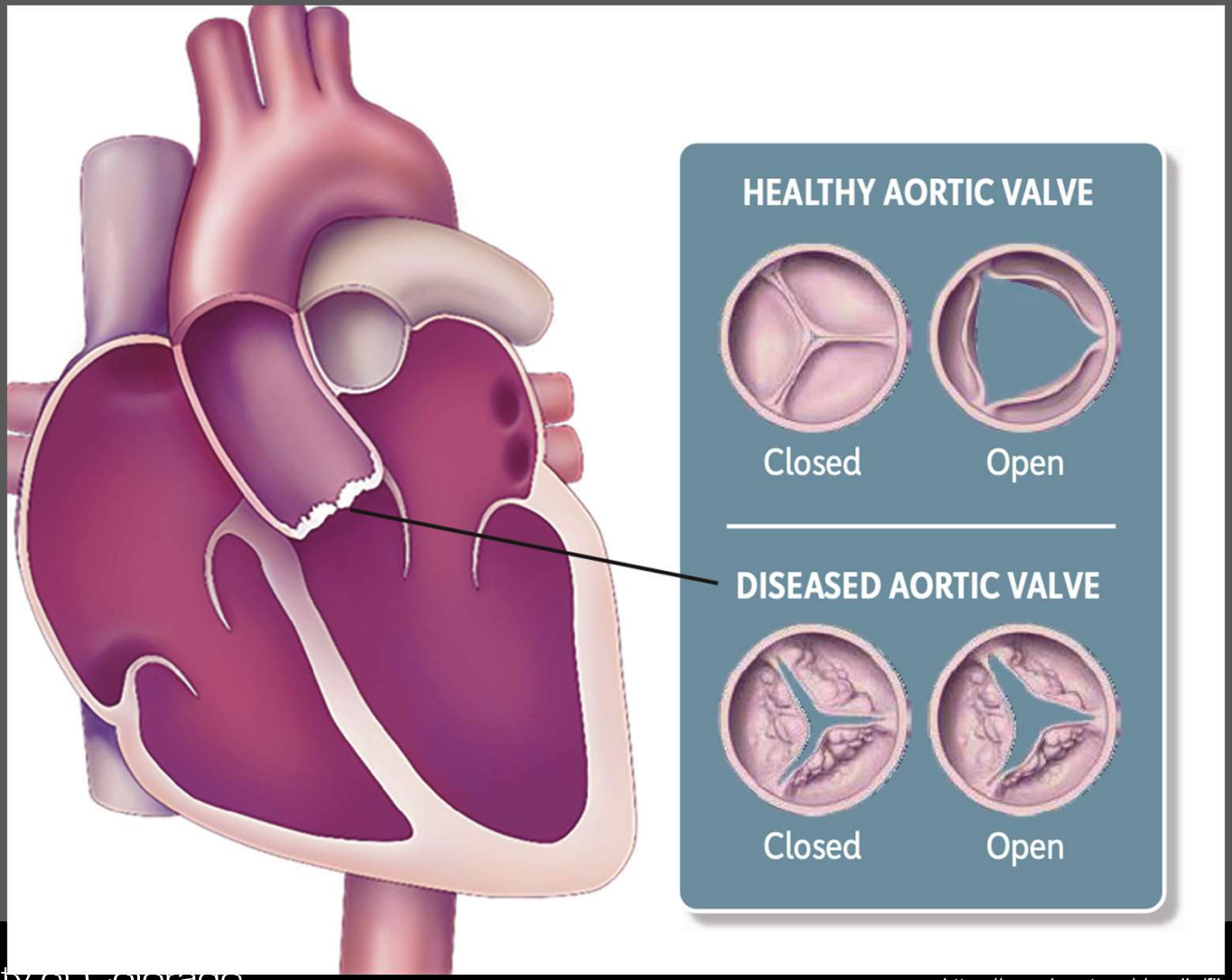
Case 5

- Further questioning he reports some mild chest heaviness and dizziness while working lately which he attributes to dehydration

- Echo: nl LV and RV function, bicuspid aortic valve with mean gradient 54 mmHg and peak velocity 4.7 m/s

Severe Aortic Stenosis

- ~5% of people >65 yo affected
- 50% will die within 2 years of symptoms without intervention
- Symptoms
  - Angina
  - Exertional dyspnea
  - Volume overload/HF
  - Syncope/near syncope



https://www.heart.org/-/media/files/health-topics/answers-by-heart/what-is-aortic-valve-stenosis.pdf?la=en&hash=55E6F9790E47DC3F27A7135D7AE79FB0

Severe Aortic Stenosis

- Criteria for intervention
  - Symptomatic
  - Asymptomatic with LVEF <50%
- SAVR vs TAVR
- Timing of intervention

Case 6

54 F presents to ED with chest pain and is found to have a blood pressure of 180/94. No headache, lightheadedness, dizziness, vision changes. Does get some dyspnea with exertion.

- BP 180/94 P 92 RR 13
- Exam notable for very loud (5/6) murmur heard in the aortic position

Transthoracic echocardiogram

- TTE shows hyperdynamic LV with LVOT gradient of 120 mmHg at rest.

HOCM Treatment

- Goal heart rate low 50s-40s
- CCB +/- BB
- Maintain adequate hydration
- Avoid afterload reduction!

Case 7

23 M presents to ED with chest pain that is worse when he lays down. Recently had COVID19 but symptoms resolved. Hard to take a deep breath due to the discomfort.

- BP 116/78 P 56 RR 15
- HsTrop I normal to slightly elevated
- TTE +/- pericardial effusion
- Rub on exam??

Pericarditis Treatment

- NSAIDs
- Colchicine
- Very rare steroids

- Prolonged treatment course, especially if sx recur

Case 8

84 M PMH significant for metastatic melanoma on nivolumab (checkpoint inhibitor) who presented with acute dyspnea.

- BNP 126 (nl <100)
- hsTrop I 47 (nl <20)

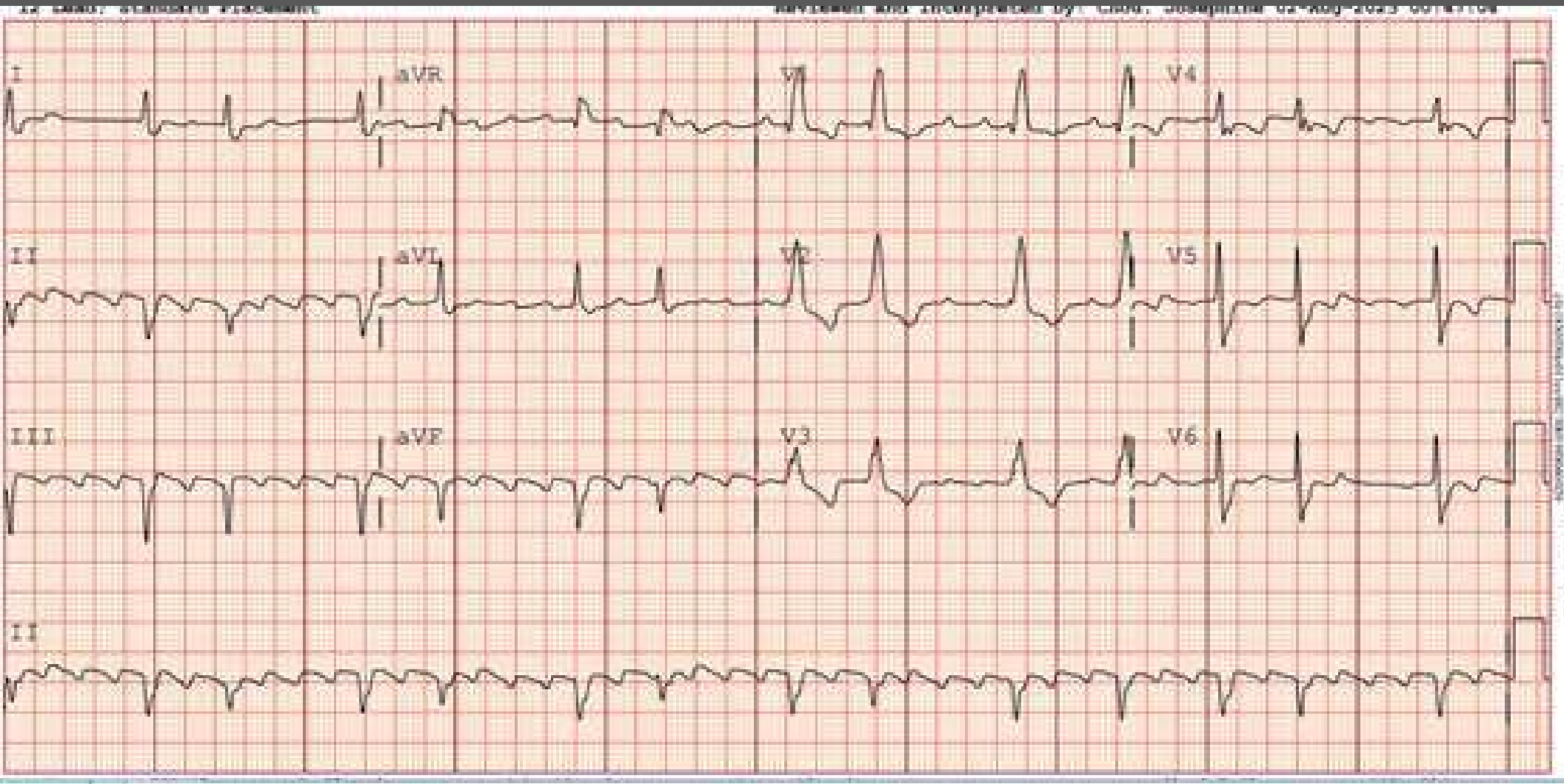
Myopericarditis

- 1. Findings consistent with an inflammatory process with increased interstitial space and myocardial edema coupled with late gadolinium enhancement of the mid myocardium and visceral parietal pericardium suggesting active inflammation of myopericarditis
- 2. Normal left ventricular size and systolic function, LVEF 63%. However, there is evidence of left ventricular hypertrophy and increased left ventricular mass suggesting a hypertrophic cardiomyopathy which does not appear obstructive
- 3. Normal RV size and systolic function, RVEF 61%
- 4. Small pericardial effusion and tiny left pleural effusion
- 5. At least moderate mitral valve regurgitation.

Case 9

72 M with hx of CAD, HTN, HLD, DM, and OSA. Admitted with osteomyelitis of the R foot. Telemetry notifies you that his heart rate has jumped up to 155 bpm and has been sustained for at least 10 minutes.

- Patient resting comfortably without any cp, pressure, tightness or palps. Feels no different than when you rounded on him earlier

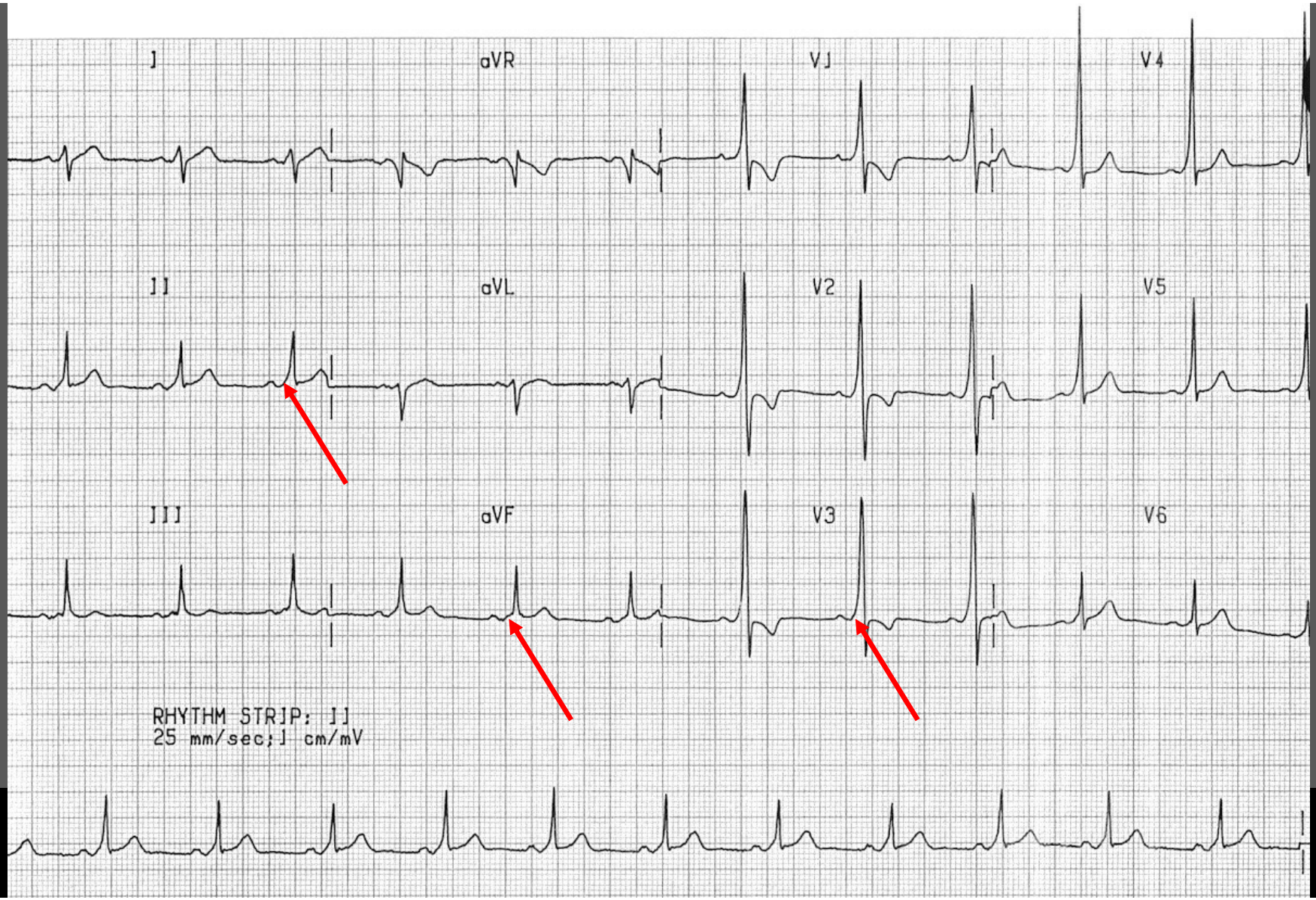

I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II

Atrial Flutter

- Rates ~150, typically steady (look at graphic trends)
- Very challenging to rate control
- Usually need DCCV +/- ablation

Case 10

25 yo M comes to ED after developing palpitations and feeling extremely tired while playing basketball. He was found to be in SVT. Since he knew exactly when it started the ED completed DCCV and he is NSR. He is now admitted to your service with an abnormal ECG and concern for recurrence.

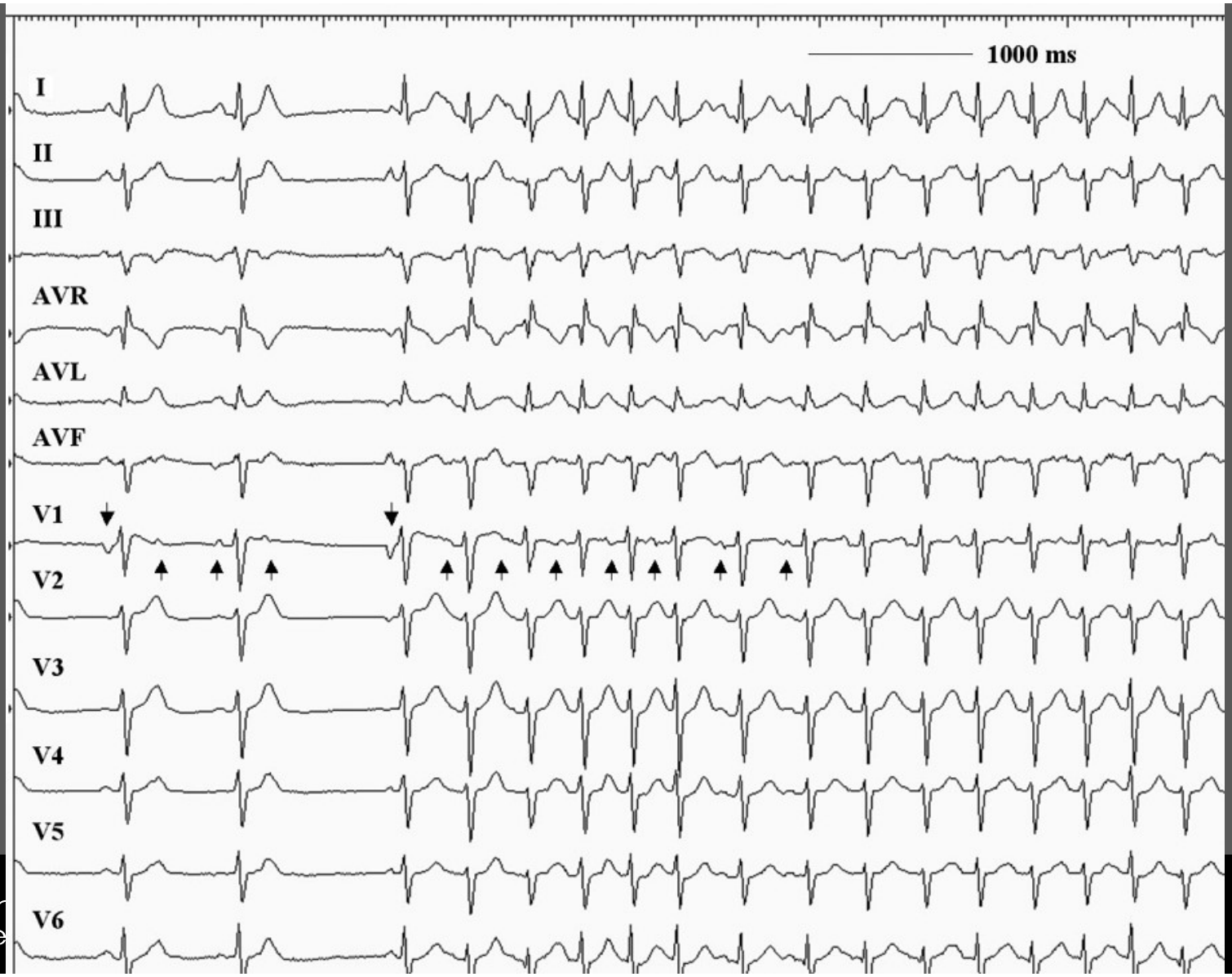

I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
RHYTHM STRIP: II
25 mm/sec; 1 cm/mV

Wolff-Parkinson-White Syndrome

- Accessory pathway with pathopneumonic Delta waves
- Can present at chest pain or arrhythmias
- Typically much younger
- Require EP consultation for ablation

Case 11

36 yo F with no significant PMH admit for uncomplicated delivery of her first child. She feels some palpitations and alerts the RN who notes that her heart rate is jumping up to 165. ECG comes back NSR so you place her on tele.


1000 ms
I
II
III
AVR
AVL
AVF
V1
V2
V3
V4
V5
V6

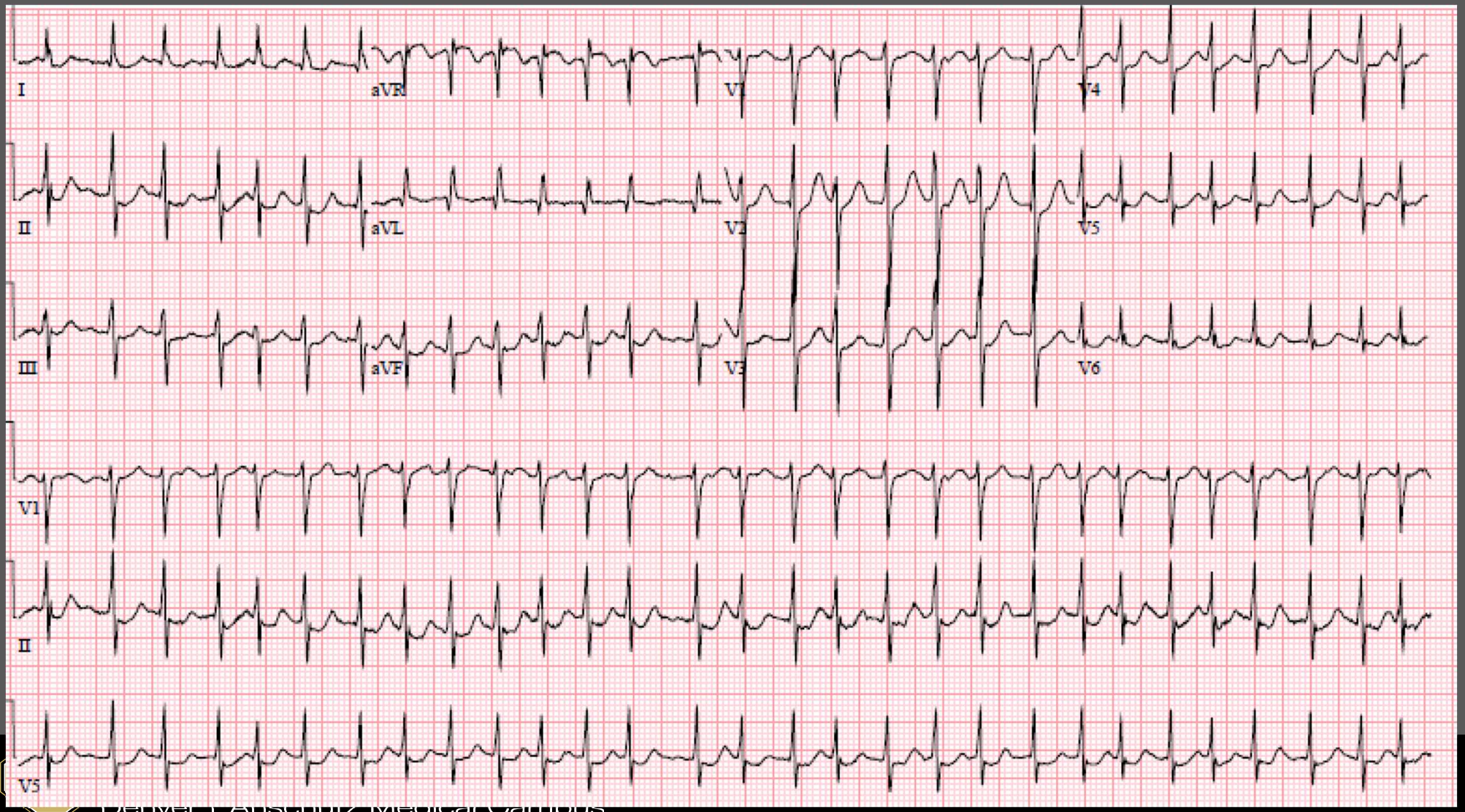
Atrial Tachycardia

- Very rapid onset/spike (look at graphic trend)
- Not dangerous or concerning
- Often longstanding

Case 12

73 F hx of HTN, CAD, CML s/p DCT. Admit with sepsis and recently transferred to MICU for escalation of care. 3 hours post transfer went into afib with RVR.

- BP: 74/42
- P: 147
- R: 36
- O2: 86%


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II
V5

Case 12

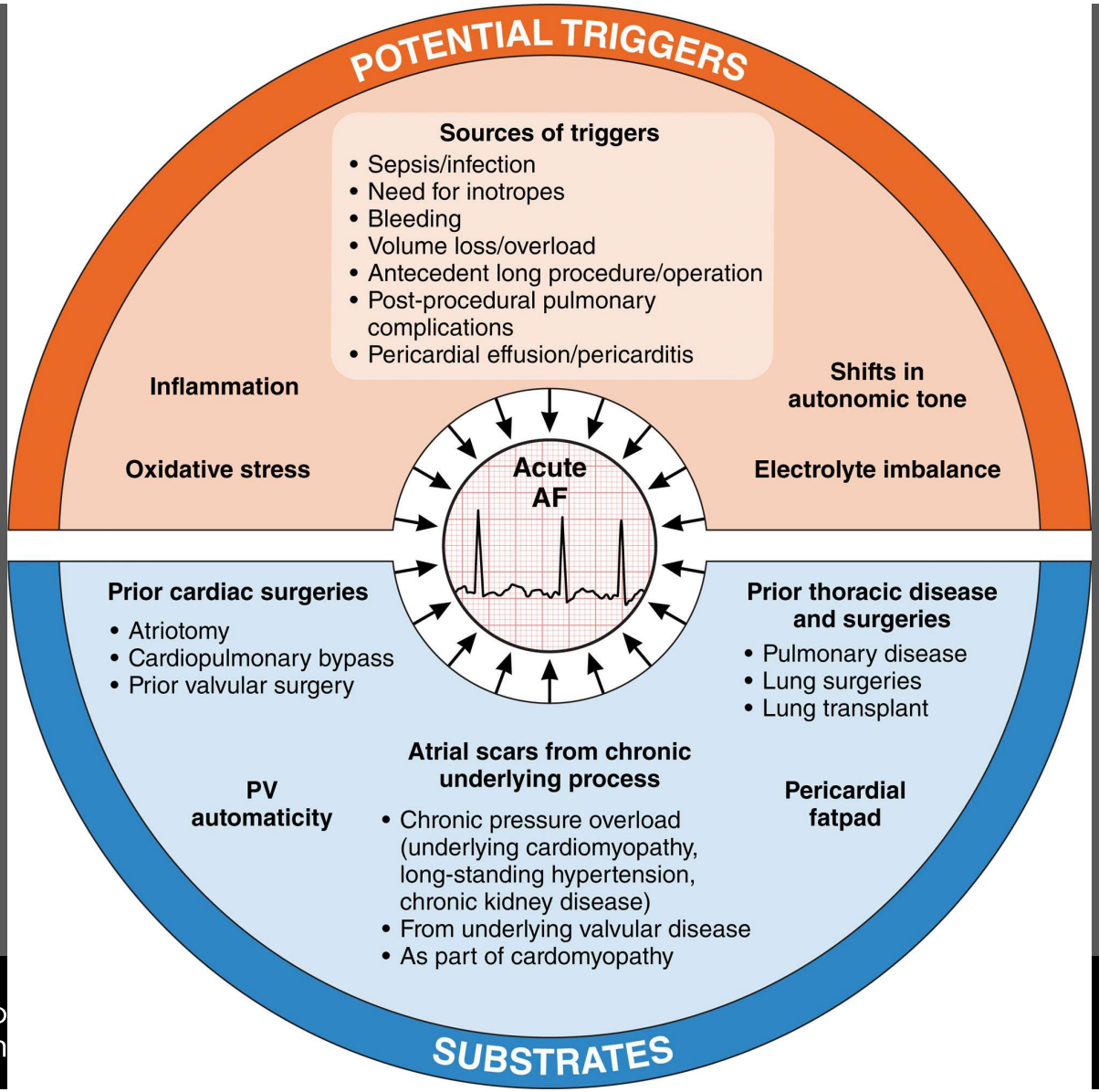
- What was the BP on the floor prior to afib?
  - If low: ride it out
  - If normal: consider DCCV for hemodynamic instability

TABLE 4 Definitions of AF: A Simplified Scheme

Term	Definition
Paroxysmal AF	• AF that terminates spontaneously or with intervention within 7 d of onset. • Episodes may recur with variable frequency.
Persistent AF	• Continuous AF that is sustained >7 d.
Long-standing persistent AF	• Continuous AF >12 mo in duration.
Permanent AF	• The term "permanent AF" is used when the patient and clinician make a joint decision to stop further attempts to restore and/or maintain sinus rhythm. • Acceptance of AF represents a therapeutic attitude on the part of the patient and clinician rather than an inherent pathophysiological attribute of AF. • Acceptance of AF may change as symptoms, efficacy of therapeutic interventions, and patient and clinician preferences evolve.
Nonvalvular AF	• AF in the absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve, or mitral valve repair.

AF indicates atrial fibrillation.

January C, Wann L, Alpert J, et al. 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation. J Am Coll Cardiol. 2014 Dec, 64 (21) e1–e76. https://doi.org/10.1016/j.jacc.2014.03.022



Chyou JY, Barkoudah E, Dukes JW, Goldstein LB, Joglar JA, Lee AM, Lubitz SA, Marill KA, Sneed KB, Streur MM, Wong GC, Gopinathannair R; on behalf of the American Heart Association Acute Cardiac Care and General Cardiology Committee, Electrocardiography and Arrhythmias Committee, and Clinical Pharmacology Committee of the Council on Clinical Cardiology; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; Council on Cardiovascular and Stroke Nursing; and Stroke Council. Atrial fibrillation occurring during acute hospitalization: a scientific statement from the American Heart Association. *Circulation*. 2023;147:e676–e698. doi: 10.1161/CIR.0000000000001133

Symptoms of atrial fibrillation

- Palpitations
- Chest pain
- Fatigue
- Shortness of breath
- NOTHING

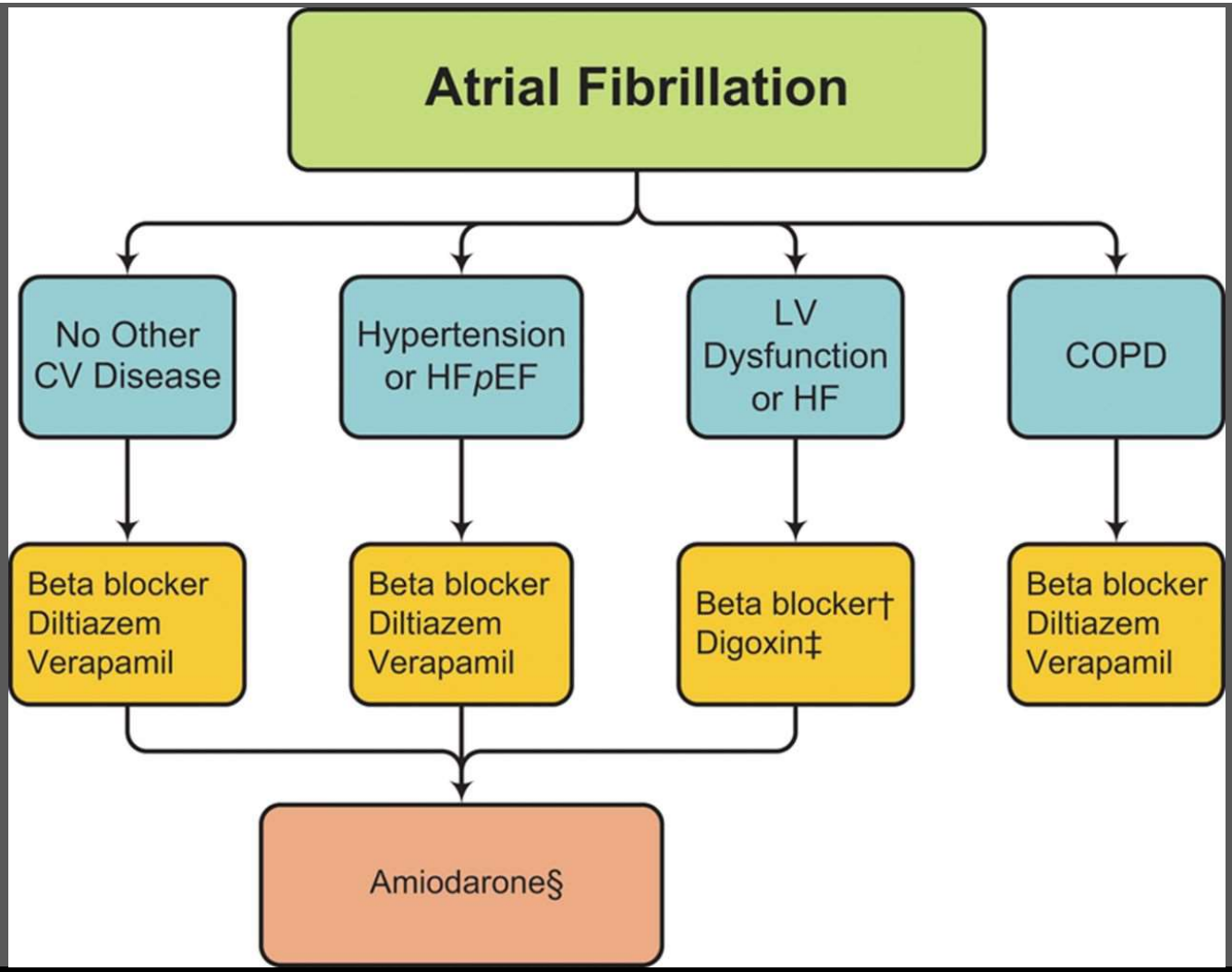
Acute Management

Rate Control
- Asymptomatic
- Hemodynamically stable
- Other medical issues

Beta block vs CCB

Rhythm Control
- Symptomatic
- Hemodynamically unstable
- Optimized

Cardioversion vs
Anti-arrhythmic



January C, Wann L, Alpert J, et al. 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation. J Am Coll Cardiol. 2014 Dec, 64 (21) e1–e76. https://doi.org/10.1016/j.jacc.2014.03.022

Risk factors		
C	Congestive Heart Failure	+1 point
H	Hypertension	+1 point
A_2	Age ≥75	+2 point
D	Diabetes	+1 point
S_2	Stroke/TIA History	+2 point
V	Vascular Disease	+1 point
A	Age 65-74	+1 point
S	Sex (Female)	+1 point

Stroke risk per year	
SCORE	% RATE PER YEAR
0	0%
1	1.3%
2	2.2%
3	3.2%
4	4.0%
5	6.7%
6	9.8%
7	9.6%
8	6.7%
9	15.2%

Reference: European Heart Rhythm Association. Guidelines for the management of atrial fibrillation: the Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). *Eur Heart J*. 2010;31(19):2369-2429.

Treating Arrhythmias

- DON'T PANIC
- Look for reversable causes
  - Bleeding
  - Electrolyte abnormalities
  - Volume issues
  - Held meds?
- Treat if hemodynamically unstable or very symptomatic

Case 13

45 yo F with no PMH but family history of heart failure presents with new onset swelling in her legs and ankles over the past 2 months. When thinks about it has been more tired over the past 6 months. Denies chest pain, pressure or discomfort.

- BP 112/68 P 93 R 15 O2 98% on RA

Transthoracic Echocardiogram

LV is normal in size and thickness with moderately reduced systolic function. EF is 34.3 %. There is a component of global hypokinesis that is more pronounced hypokinesis in the left anterior descending artery distribution (anterior wall, apex, anteroseptum, and distal inferior wall).

There is dense sludge and possibly early thrombus formation see in the left ventricular apex.

The right ventricle is not well visualized. The chamber appears borderline dilated with grossly normal function.

Estimation of RVSP not possible due to incomplete tricuspid regurgitation envelope.

There is no evidence of a pericardial effusion.

Right pleural effusion versus ascites.

New Onset HF

<u>All Patients</u>

- Ischemic evaluation
- Labs
  - CBC
  - CMP
  - TSH
  - BNP or pro-NT BNP

<u>Select patients</u>

- Labs
  - HIV
  - SPEP, UPEP
  - Iron Studies
- Cardiac MRI

Loop Diuretics

- Improves symptoms, does not reduce morbidity or mortality
- No superiority in dose response exists amount the IV loop diuretics when administered at equivalent doses
- Can add thiazide (e.g. metolazone PO) if ineffective response

- Oral bioavailability differs:

bumetanide 1 mg PO = torsemide 20 mg PO = furosemide 40 mg PO

Loop Diuretics

Drug	Bioavailability	Cash Price* (max dose)	Considerations
Furosemide	10-100%	$4	20-40 mg daily
Bumetanide	80-90%	$30-60	10-20 mg daily
Torsemide	80-100%	$10-20	160 mg BID
Ethacrynic Acid	100%	>$200	used for real sulfa-allergic patients

New Onset HF

GDMT

- Evidence based bb (metoprolol succinate, carvedilol, bisoprolol)
- ACEi/ARB/ARNI
- MRA
- SGLT2i

New Onset HF

Other options

- Digoxin
- Hydralazine/Isosorbide dinitrate
- Ivabradine

Case 14

78 yo M presents after passing out. He woke up in the middle of the night to go to the bathroom and next thing he knew he was on the ground. No chest pain or palpitations. No shortness of breath.

- BP 136/68 P 80 R 14 O2 98% on RA

Syncope

Work up

- ECG/telemetry
- Orthostatic vitals
- Echocardiogram
- Home cardiac monitoring

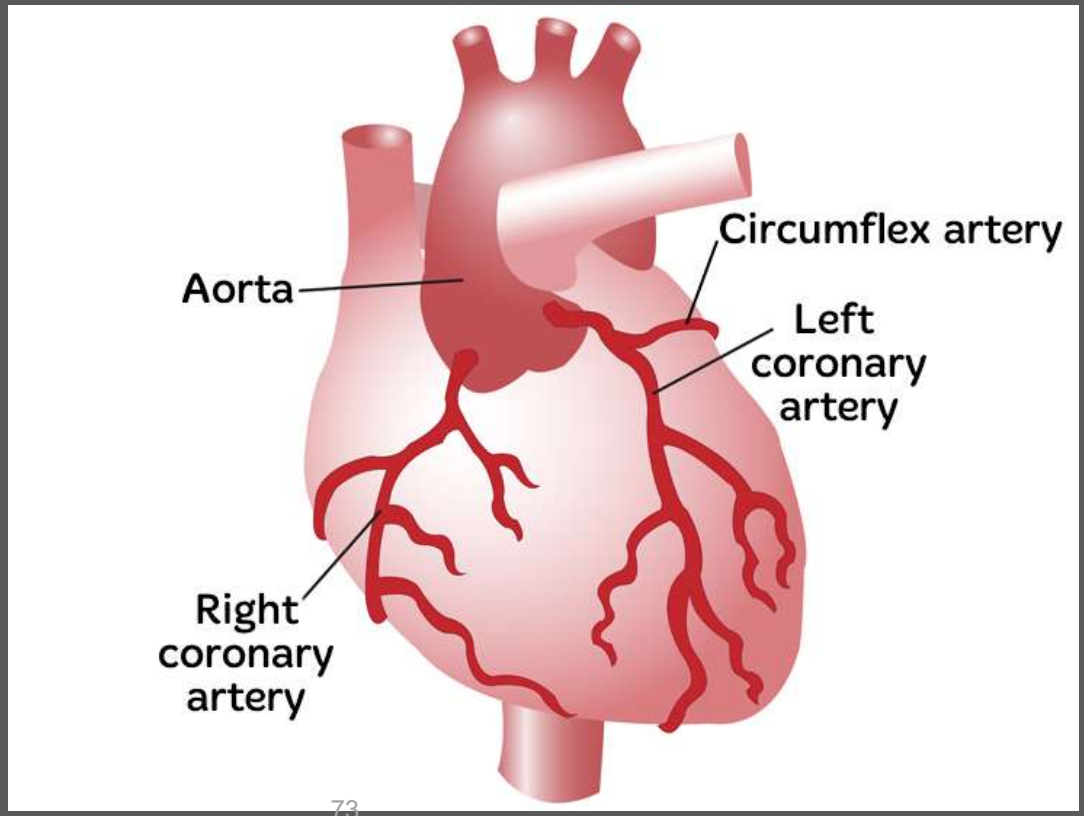
Take Home Points

1. There are many different causes of chest pain, keep the differential broad
2. Always treat the patient not the numbers
3. Consider if the patient can/should be anticoagulated as most cardiac procedures involve heparin or AC
4. Be sure to rule out all of the concerning causes of syncope first

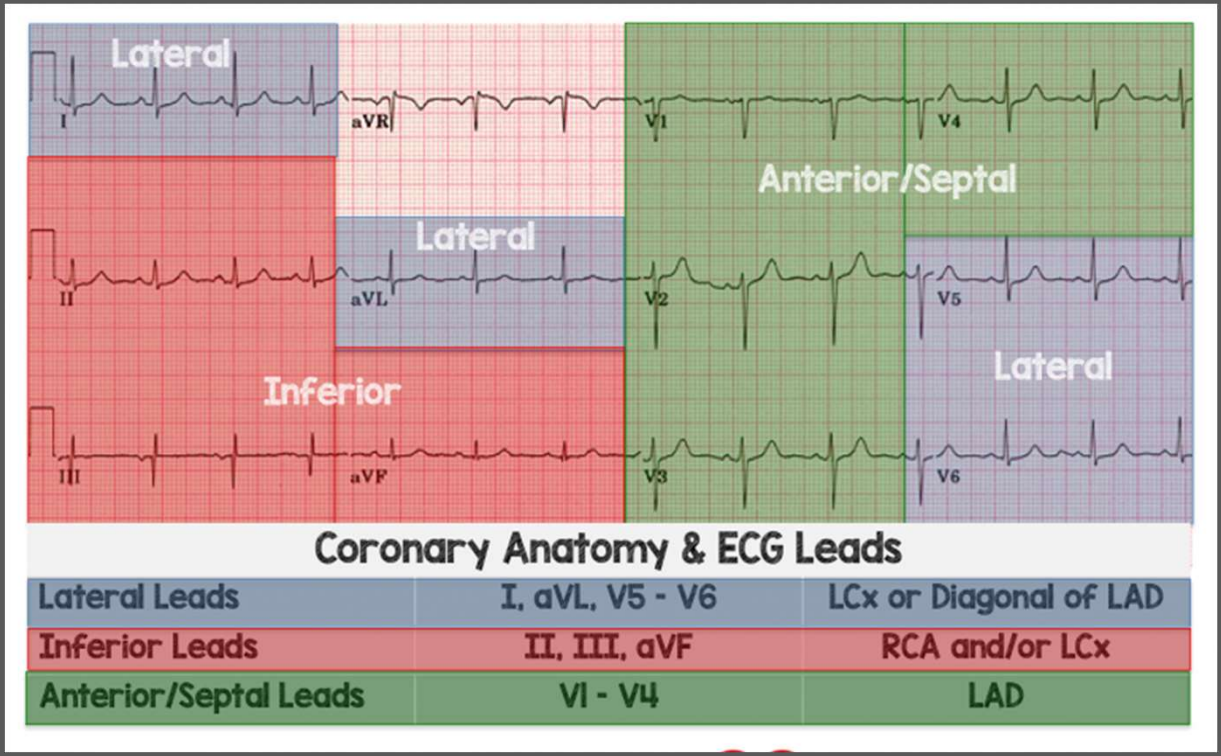
Questions??

Karen.ream@cuanschutz.edu
Karen.ream@uchealth.org

Review


Aorta
Circumflex artery
Left coronary artery
Right coronary artery

Review



Coronary Anatomy & ECG Leads

Lateral Leads	I, aVL, V5 - V6	LCx or Diagonal of LAD
Inferior Leads	II, III, aVF	RCA and/or LCx
Anterior/Septal Leads	V1 - V4	LAD

Definitions

- Cath: coronary angiogram
- PTCA/POBA: balloon angioplasty
- PCI: percutaneous coronary intervention
- DES: drug eluting stent
- BMS: bare metal stent
- CABG: coronary artery bypass grafting
- Angina vs ischemia

Case #2

- You are seeing a 47 yo male with no PMH except for tobacco use who is 3 weeks post MI. He is feeling well without chest pain or shortness of breath. He is very nervous about having another heart attack and has A LOT of questions related to exercise and sexual activity.

- Physical Exam: VSS, no significant findings

Cardiac Rehab

- Lower risk of disease related mortality, readmission following MI
- Only 20% of eligible patients receive services
- APP's can't refer
  - S.1986 Increasing Access to Quality Cardiac Rehabilitation Care Act of 2021
- Effective January 1, 2024 APP's can supervise
  - S.1986 introduced 6/9/2021 to accelerate to January 1, 2022

Case #3

- 63 yo F presents complaining of arm pain. She has a hx of CAD, HTN, HLD and was just discharged from the hospital 2 days ago after receiving a stent to the RCA. The pain is throbbing and constant, no change with exertion
- Exam:
  - VSS, afebrile, RRR, no MRG, CTAB
  - R forearm ecchymotic, edematous and warm, TTP
  - Distal sensation intact, FROM of fingers, hand and wrist

Access Site Complications

Access Site Complications

- Fever
- Hot to touch
- Surrounding erythema
- Streaking

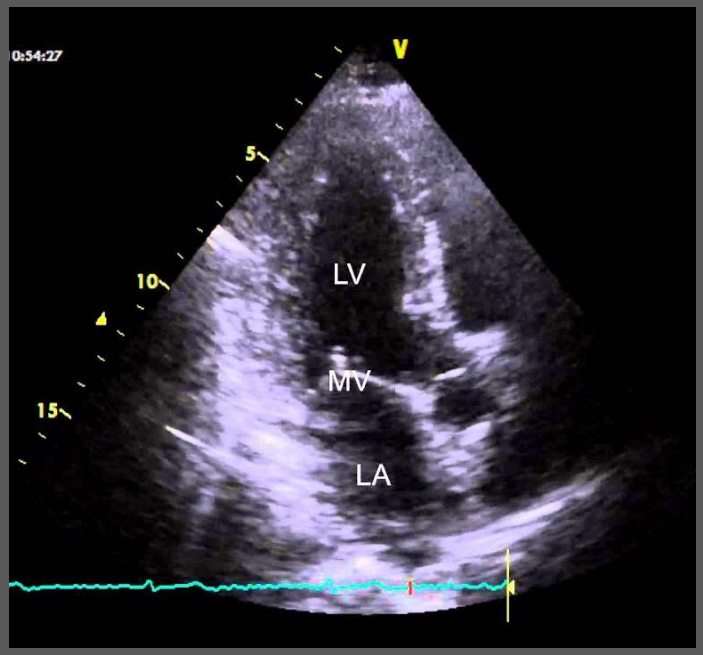
Case #4

- 62 yo M who is one week post large anterior MI. He initially felt better when he went home but then 3 days ago started noticing more fatigue and shortness of breath. He has had some lightheadedness and mild swelling in his legs.

Physical Exam

- BP 80/50, HR 92, R 26, O2 92% on RA, afebrile
- Breath Sounds
- Heart Sounds 
- 2+ DP, PT, and radial pulses
- 1+ pitting edema in bilateral ankles to mid shin

Post mi care



Acute mitral regurgitation

- Most improve with reperfusion and medical therapy
- Degree of murmur DOES NOT equal severity
- Papillary muscle rupture (within 2-7 days) is most common

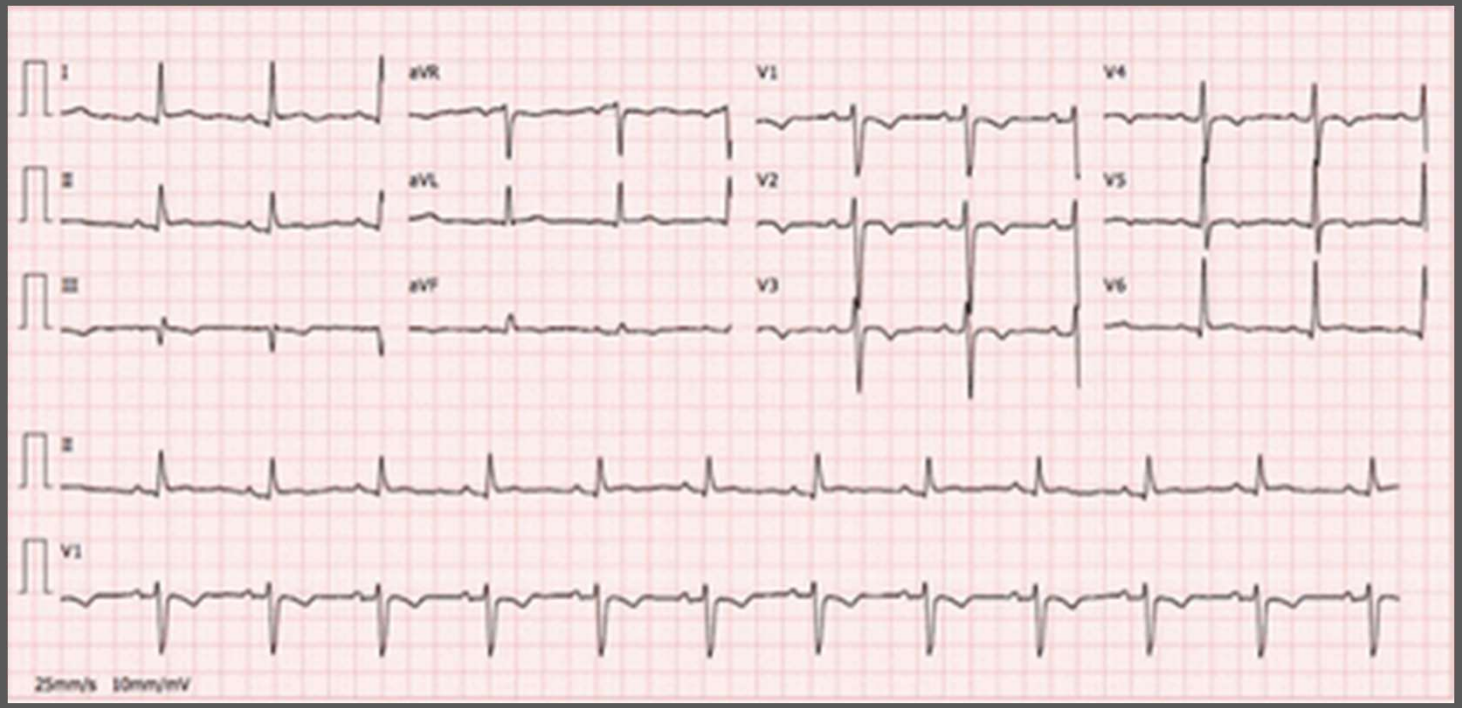
- Urgent echocardiogram and cardiology appointment
- If appears unstable send to ED

Case #5

- A 72 yo F with hx of DM, HTN, hypothyroid presents to your clinic for hospital follow up. She was admitted for an NSTEMI and found to have left main disease and underwent CABG. She was discharged 2 weeks ago and has started to notice more chest pain that feels similar to her prior symptoms. The pain is worse at night. She is also feeling really run down and feverish while having some night sweats.

Physical Exam

- BP 124/72, P 78, R 18, 97% on RA, T 38.3
- WNWD female who appears younger than stated age in NAD
- Breath sounds
- Heart sounds


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
V1
25mm/s 10mm/mV

Dressler's Syndrome/Post MI Syndrome

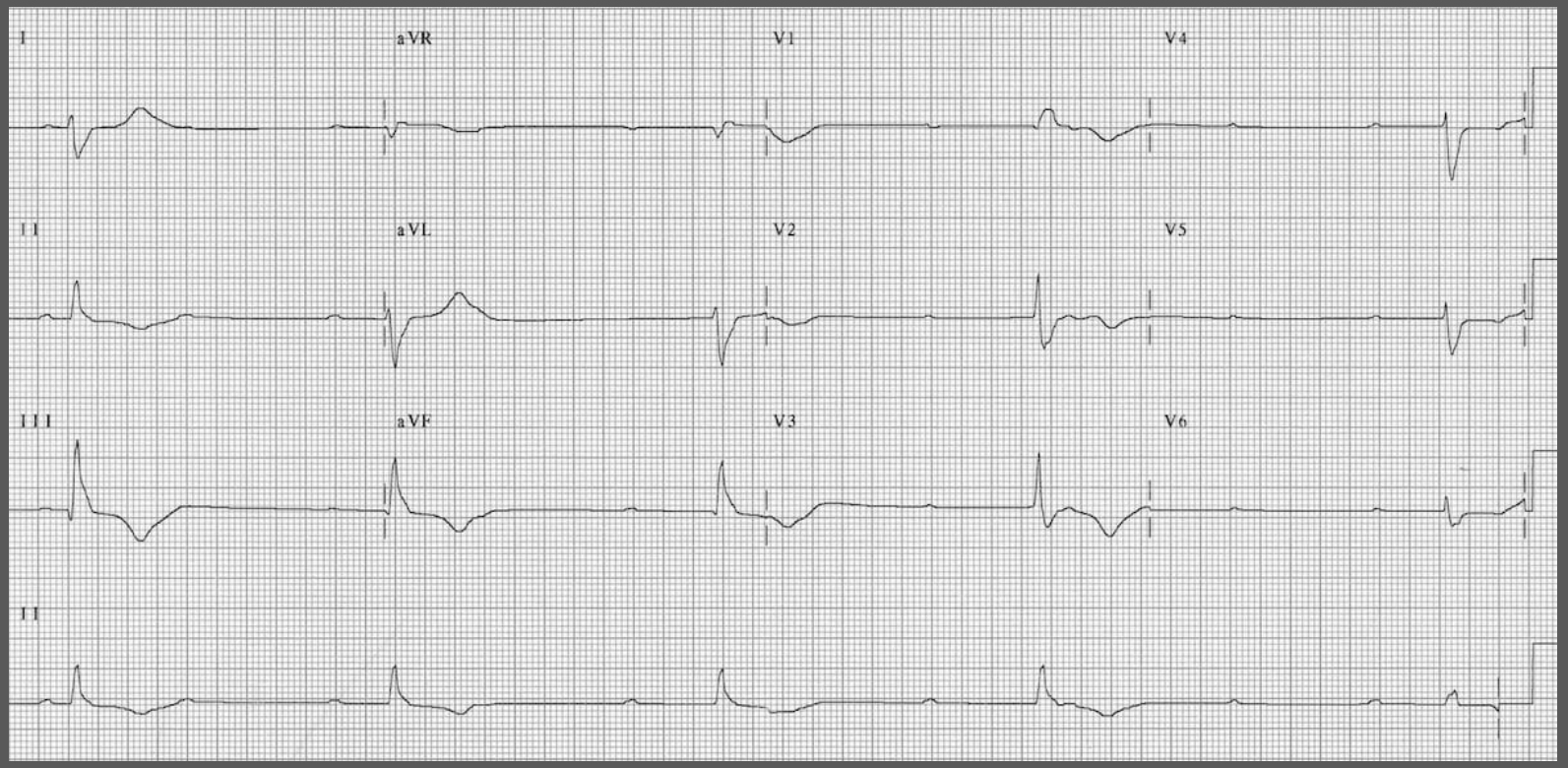
- Pericarditis
- Leukocytosis or inflammatory markers
- Fever
- ECG changes
- Rub
- +/- pericardial effusion
- Treatment – NSAIDS, colchicine, steroids

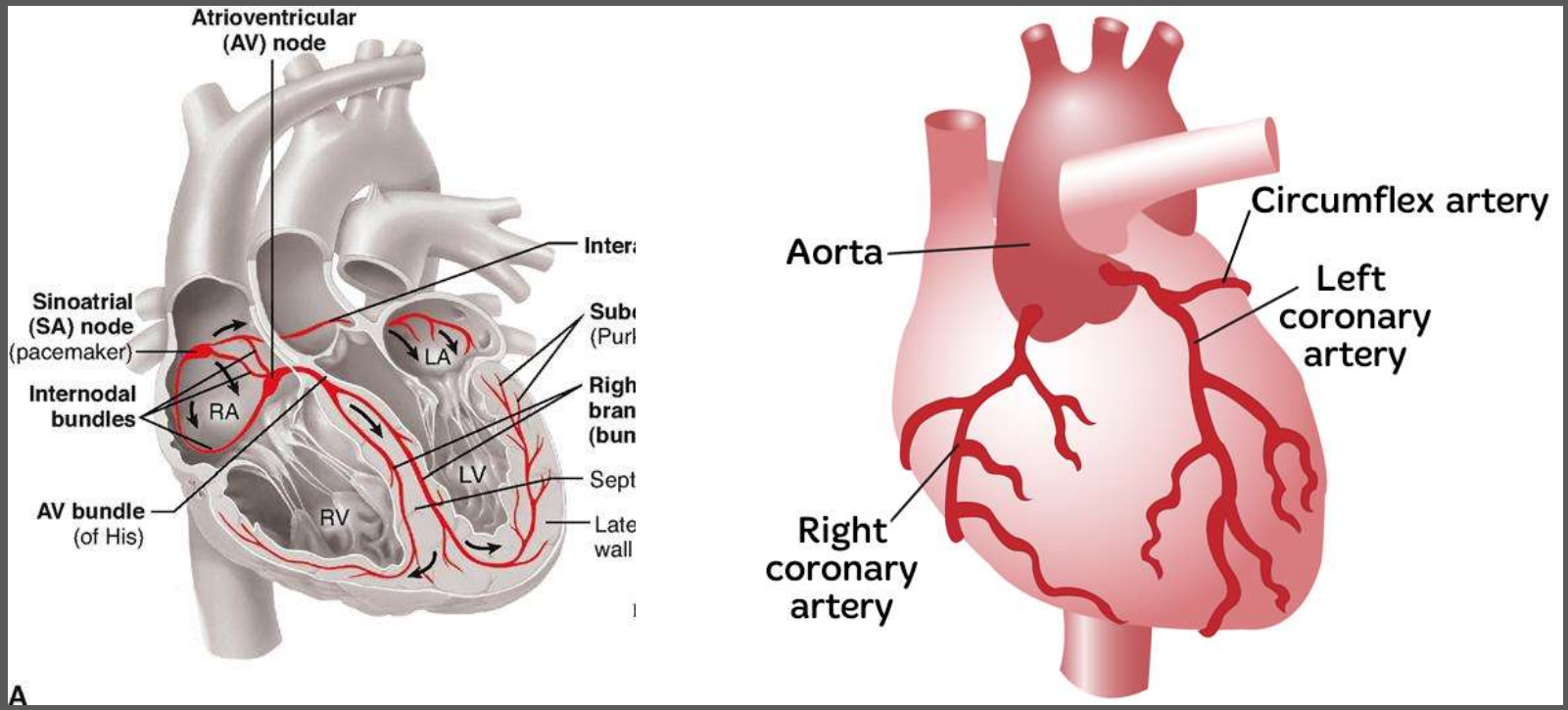
Case #6

- 82 yo male with no significant PMH comes in to establish care complaining of feeling really tired. It started two days ago when he had “the flu.” He denies any chest pain or discomfort. His breathing feels fine, but he admittedly hasn’t done a whole lot over the past few days.

Physical Exam

- BP 110/82, P 40, R 18, T 36.3, 96% on RA
- Elderly male who appears fatigued
- Lungs: CTA
- Heart: regular, slow, no murmur appreciated
- 1+ radial pulses B/L, unable to palpate DP or PT pulses


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II

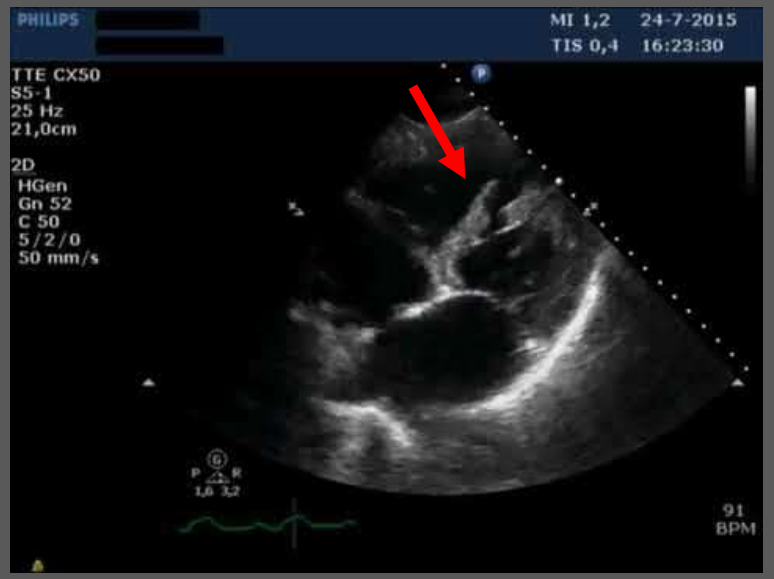

Atrioventricular
(AV) node
Sinoatrial
(SA) node
(pacemaker)
Internodal
bundles
AV bundle
(of His)
RA
LA
LV
RV
A
Aorta
Circumflex artery
Left
coronary
artery
Right
coronary
artery

Electrical Complications

- Inferior MI – typically transient
  - Can last hours to days
    - *Sinus bradycardia is most common (40%)*
    - *Mobitz I*
    - *Complete Heart Block (CHB)*
- Anterior MI – less common
  - More symptomatic
  - High mortality rate

Other Complications

- Acute VSD
  - typically 3-5 days post MI (24h – 2 wk poss)
  - Most common after large anterior MI (LAD territory)



Other Complications

- LV wall rupture – 50% within first 5 days and 90% within 2 weeks
  - <1% occurrence but accounts from >7% of deaths
  - Risk Factors: Anterior location, >70, female
  - BB help prevent
  - Sx – profound RHF and shock to PEA and death
- Pericardial effusion +/- tamponade 2/2 rupture

Cardiac free wall rupture post myocardial infarction.

Pericardial tamponade from left ventricular free wall rupture and hemopericardium.

Other Complications

- Peri-infarction pericarditis
  - 7-10 days, self limiting
  - Avoid NSAIDs, high dose ASA only if needed
  - No evidence for colchicine
  - Less likely to have ECG changes

Possible complications

- Access site complications
- Acute mitral regurgitation
- Dressler's syndrome/Post MI syndrome
- Heart block/bradycardia
- Acute VSD
- LV wall rupture
- Peri-infarction pericarditis

Primary Care Post MI Visit

- History
- Thorough medication reconciliation
- Complete cardiac physical exam
- Check an ECG
- EDUCATION!

2013 ACCF/AHA Guideline for the Management of Heart Failure

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

Developed in Collaboration With the American College of Chest Physicians, Heart Rhythm Society and International Society for Heart and Lung Transplantation

2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure

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

Developed in Collaboration With the American Academy of Family Physicians, American College of Chest Physicians, and International Society for Heart and Lung Transplantation

What percentage of people will die within 5 years of a HF diagnosis?

A.5%

B.15%

C.25%

D.50%

#1 Heart Failure Hospitalizations Are Bad

Common

>1 million annually

Costly

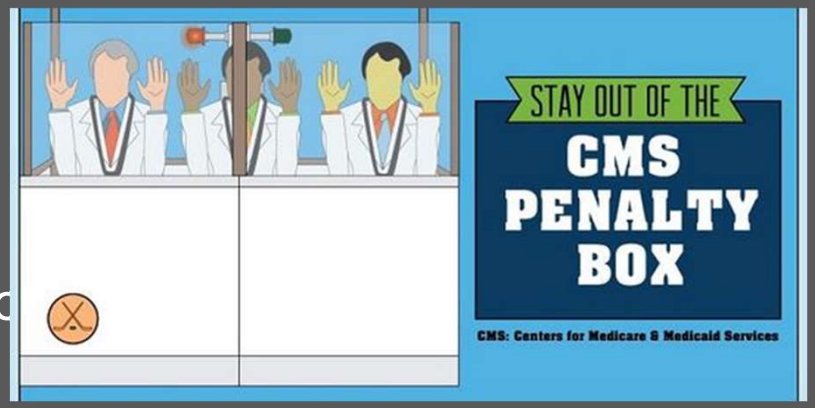
>$1 billion annually

Deadly

10% at 30 days

Hospital Readmission Reduction Program

- Established in 2012
  1. Heart failure
  2. AMI
  3. Pneumonia
- Incentivized hospitals to reduce readmissions
- Maximum Penalties=3%



Definition of Heart Failure

Classification	Ejection Fraction	Description
I. Heart Failure with Reduced Ejection Fraction (HF*r*EF)	<40%	Also referred to as systolic HF. Randomized clinical trials have mainly enrolled patients with HF*r*EF and it is only in these patients that efficacious therapies have been demonstrated to date.
II. Heart Failure with Preserved Ejection Fraction (HF*p*EF)	≥50%	Also referred to as diastolic HF. Several different criteria have been used to further define HF*p*EF. The diagnosis of HF*p*EF is challenging because it is largely one of excluding other potential noncardiac causes of symptoms suggestive of HF. To date, efficacious therapies have not been identified.
a. HF*p*EF, Borderline	41% to 49%	These patients fall into a borderline or intermediate group. Their characteristics, treatment patterns, and outcomes appear similar to those of patient with HF*p*EF.
b. HF*p*EF, Improved	>40%	It has been recognized that a subset of patients with HF*p*EF previously had HF*r*EF. These patients with improvement or recovery in EF may be clinically distinct from those with persistently preserved or reduced EF. Further research is needed to better characterize these patients.

#2 Diagnosis of Heart Failure

- Consider in all patients:
  - TTE
  - 12-lead ECG
  - CBC, CMP, iron studies, TSH
  - CXR
  - Biomarkers: BNP, troponin
- In select patients: CMR, ischemia evaluations

Yancy et al. 2013 ACCF/AHA Guideline for the Management of Heart Failure

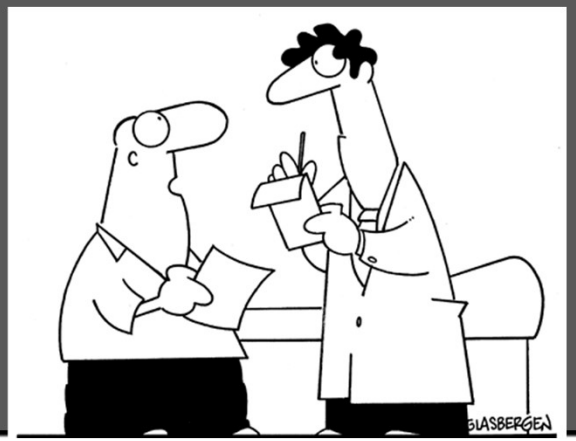
All of the following can increase BNP or NT-proBNP, except:

A. Advancing age
B. COPD
C. Bacterial sepsis
D. Renal failure

Potential Causes of Elevated BNP or NT-ProBNP

Cardiac	Non-Cardiac
Heart failure	Advancing age
Acute coronary syndromes	Anemia
Heart muscle disease, including LVH	Renal failure
Valvular heart disease	Pulmonary: OSA, PNA
Pericardial disease	Pulmonary hypertension
Atrial fibrillation	Critical illness
Myocarditis	Bacterial sepsis
Cardioversion	Severe burns
Cardiac Surgery	

#4 Three Mainstay Meds For HFrEF



"Right now I take a blue pill, a purple pill, an orange pill, a white pill, and a yellow pill. I need you to prescribe a green pill to complete my collection."

What is the only loop diuretic that does not contain sulfa?

A. Bumetanide
B. Furosemide
C. Ethacrynic Acid
D. Torsemide

Diuretic Dosing
=

HCN Channel Blocker

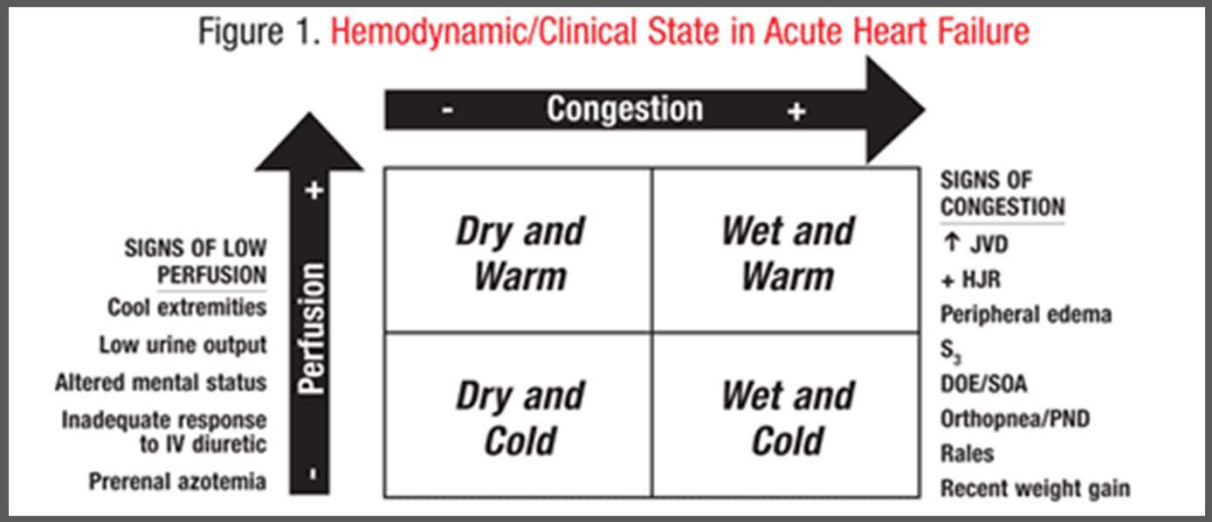
Drug	Initial Daily Dose	Maximum Dose	Trial	Cash Price* (max dose)
Ivabradine	5 mg BID	7.5 mg BID	SHIFT	$450

#7 BB Can Be a Best Friend or Worst Enemy

#7 BB Can Be a Best Friend or Worst Enemy

- In patients with HFrEF experiencing a symptomatic HF exacerbation, it is recommended that optimal medical therapy (including beta blockers) be continued
- Withholding or reducing beta blockers should only be considered if patients have significant volume overload that cannot be managed with IV diuretics or evidence of low cardiac output

Figure 1. Hemodynamic/Clinical State in Acute Heart Failure



#8 Hello from the Other Side: HFpEF Rx

#8 Hello from the Other Side: HFpEF Rx

- BP should be controlled
- Diuretics should be used for relief of symptoms
- Use of BB, ACE-I, and ARBs in patients with HTN is reasonable to control BP
- In appropriate patients, aldosterone antagonists may be considered to decrease hospitalizations

Yancy et al. 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure

#9 Shake Your Groove Thing


"I'm the doctor who brings the cards. I'm a cardiologist."
GET WELL
GLASBERGEN

To Be Elevated Risk or Not To Be

- Low risk procedure = combination of patient characteristics and surgery predict <1% chance of MACE.
  - Ex) Cataract surgery or plastic surgery

Clinical Risk Factors

- Coronary artery disease
  - MI within last 6 months
- History of CVA
- Clinical heart failure or history of heart failure
- Significant valve disease
- High grade heart block
- Age
- Frailty /decreased functional status

Functional Status

- > 4 METS is the goal
  - Flight of stairs
  - Heavy house work
  - Walking at 4 mph
- Duke Activity Status Index

Medscape® www.medscape.com

Scoring the Duke Activity Status Index (in METs)

Can you.....	Score Only for Answers: "Yes, With No Difficulty."	MET Value
1. Take care of yourself, that is, eating, dressing, bathing, and using the toilet?		0.8
2. Walk indoors, such as around your house?		0.5
3. Walk a block or two on level ground?		0.8
4. Climb a flight of stairs or walk up a hill?		1.6
5. Run a short distance?		2.3
6. Do light work around the house like dusting or washing dishes?		0.8
7. Do moderate work around the house like vacuuming, sweeping floors, carrying in groceries?		1.0
8. Do heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?		2.3
9. Do yard work like raking leaves, weeding or pushing a power mower?		1.3
10. Have sexual relations?		1.5
11. Participate in moderate recreational activities, like golf, bowling, dancing, doubles tennis, or throwing baseball or football?		1.7
12. Participate in strenuous sports like swimming, singles tennis, football, basketball or skiing?		2.1

Total Score _____

RCRI

Table 1. Revised Cardiac Risk Index

Lee Variables	
1	High-risk type of surgery
2	Ischemic heart disease (includes any of the following: history of myocardial infarction; history of positive exercise test; current complaint of chest pain that is considered to be secondary to myocardial ischemia; use of nitrate therapy; electrocardiography with pathologic Q waves)
3	Congestive heart failure
4	History of cerebrovascular disease
5	Preoperative treatment with insulin
6	Preoperative serum creatinine > 2.0 mg/dL

No. of Variables	**Risk of Major Postoperative Cardiac Complication**
0	0.4%
1	0.9%
2	7.0%
≥ 3	11.0% High risk

Adapted from reference 19.

Case #1

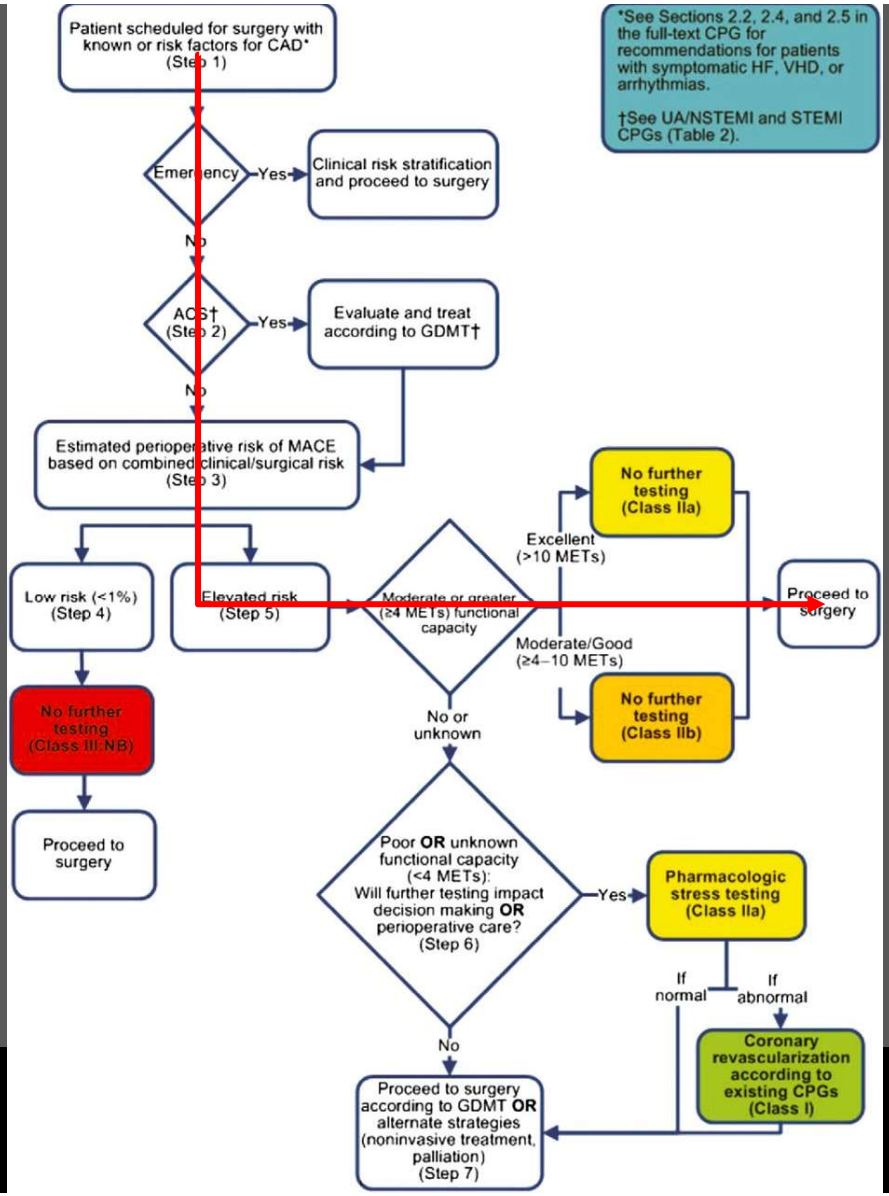
- 73 F hx bladder CA s/p TURBT (07/2016), CAD s/p PCI and stent placement (2008 & 2009), CKD, SLE, RA, HTN, and COPD. Cancer continues to grow so needs to have a complete cystectomy. She walks daily and denies any chest pain or shortness of breath that is different for her. Prior to about a week ago she was doing all of her housework without a problem.

Case #1

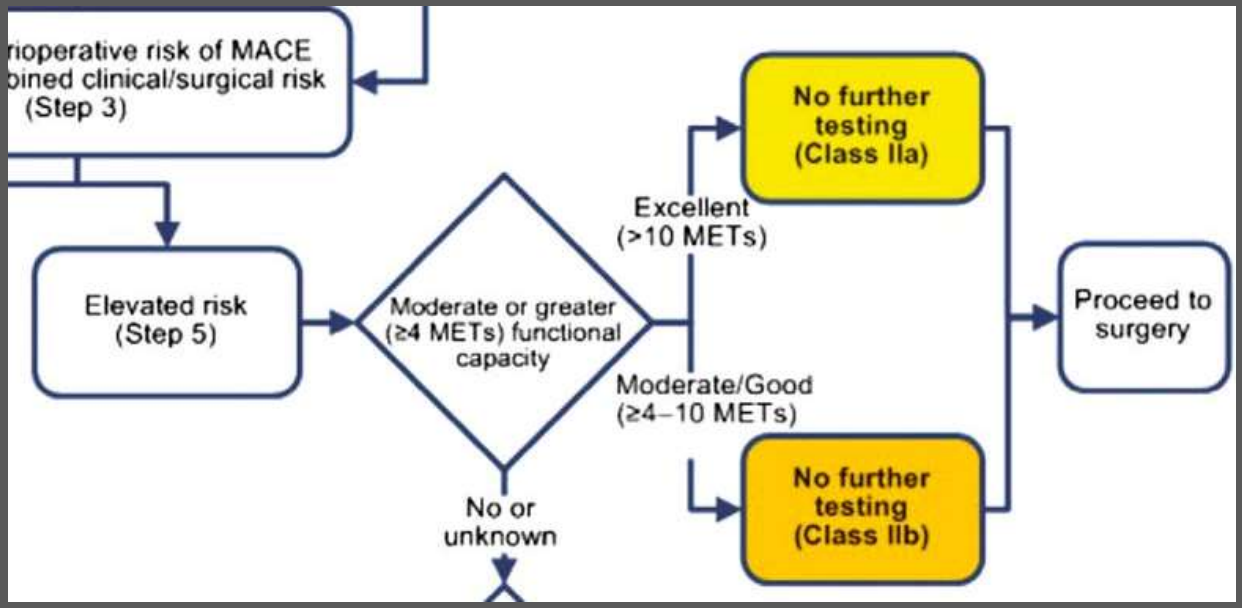
RCRI Risk Factors:

- High risk surgery
- History of CAD
- CKD

= ELEVATED risk



Lee A. Fleisher et al. JACC 2014;64:e77-e137



Lee A. Fleisher et al. JACC 2014;64:e77-e137

Exercise Stress Recommendations

CLASS IIa

1. For patients with elevated risk and excellent (>10 METs) functional capacity, it is reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery. (Level of Evidence: B)

CLASS IIb

1. For patients with elevated risk and unknown functional capacity, it may be reasonable to perform exercise testing to assess for functional capacity if it will change management. (Level of Evidence: B)

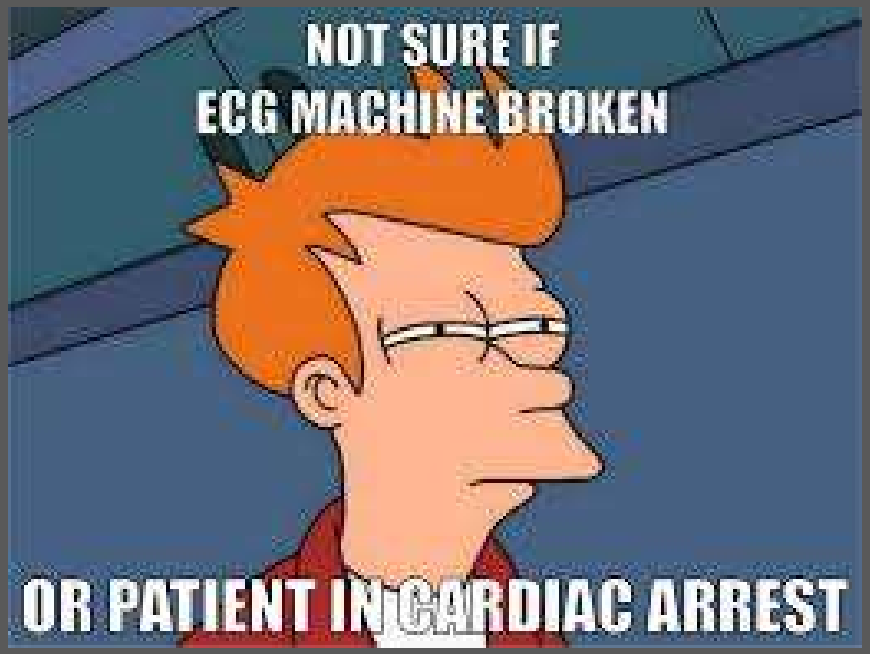
2. For patients with elevated risk and moderate to good (≥ 4 METs to 10 METs) functional capacity, it may be reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery. (Level of Evidence: B)

3. For patients with elevated risk and poor (<4 METs) or unknown functional capacity, it may be reasonable to perform exercise testing with cardiac imaging to assess for myocardial ischemia if it will change management. (Level of Evidence: C)

Coronary angiography

CLASS III: NO BENEFIT

1. It is not recommended that routine coronary revascularization be performed before noncardiac surgery exclusively to reduce perioperative cardiac events. (Level of Evidence: B)


NOT SURE IF
ECG MACHINE BROKEN
OR PATIENT IN CARDIAC ARREST

Case #2

- 74 F hx aortic stenosis, hypertension who presents for pre-operative risk assessment prior to right total knee replacement. She denies any chest pain, dyspnea on exertion, syncope, or near syncopal episodes. She has no history of heart failure symptoms.
- Echo 3/2017: EF 60%, peak velocity 2.5 m/s, mean gradient 23 mmHg.

Valvular Recommendations

Class I

Patients with clinically suspected moderate or greater degrees of valvular stenosis or regurgitation undergo preoperative echocardiography if there has been either:

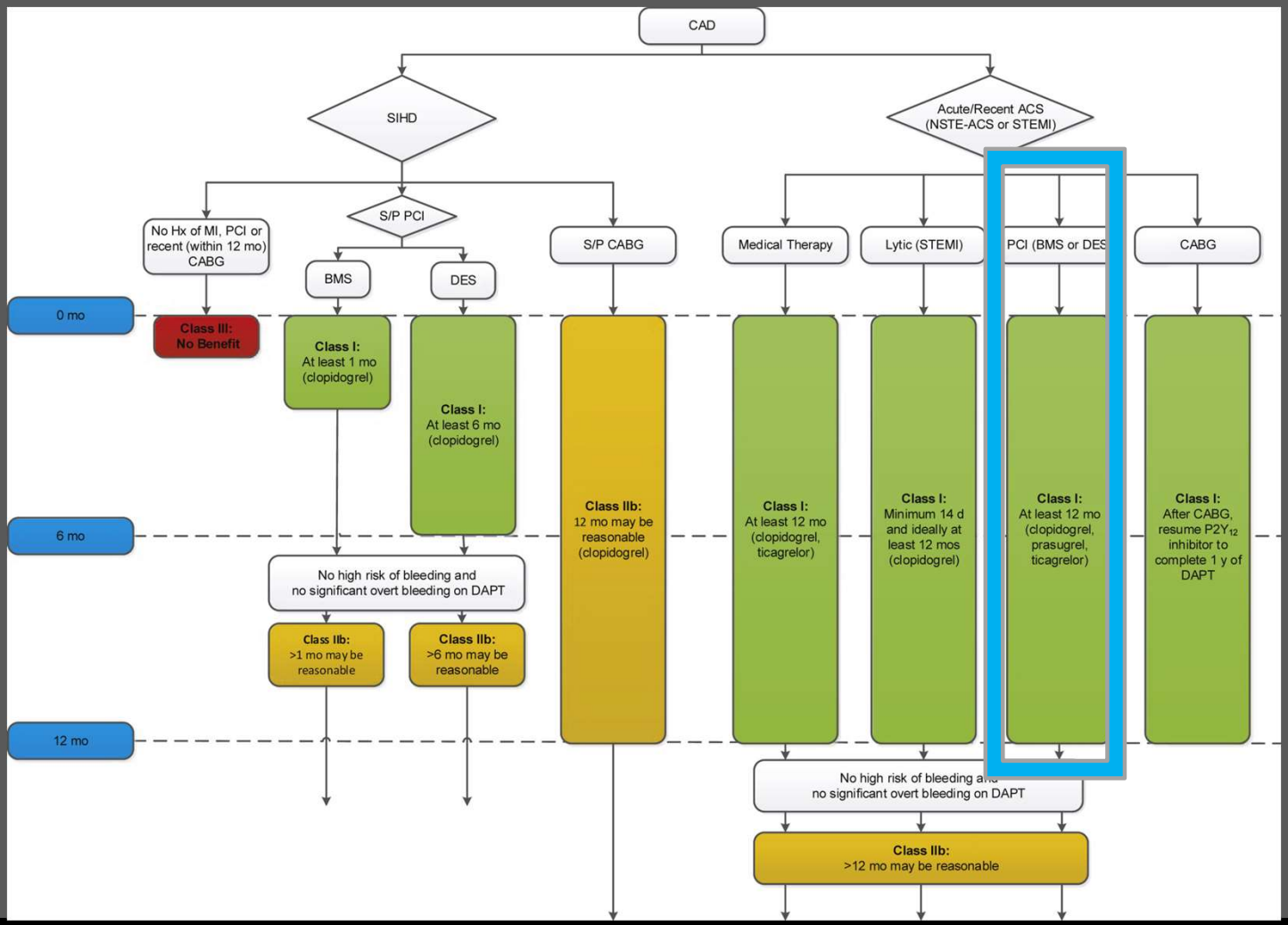
1. no prior echocardiography within 1 year or
2. a significant change in clinical status or physical examination since last evaluation. (Level of Evidence: C)

For adults who meet standard indications for valvular intervention (replacement and repair) on the basis of symptoms and severity of stenosis or regurgitation, valvular intervention before elective noncardiac surgery is effective in reducing perioperative risk. (Level of Evidence: C)

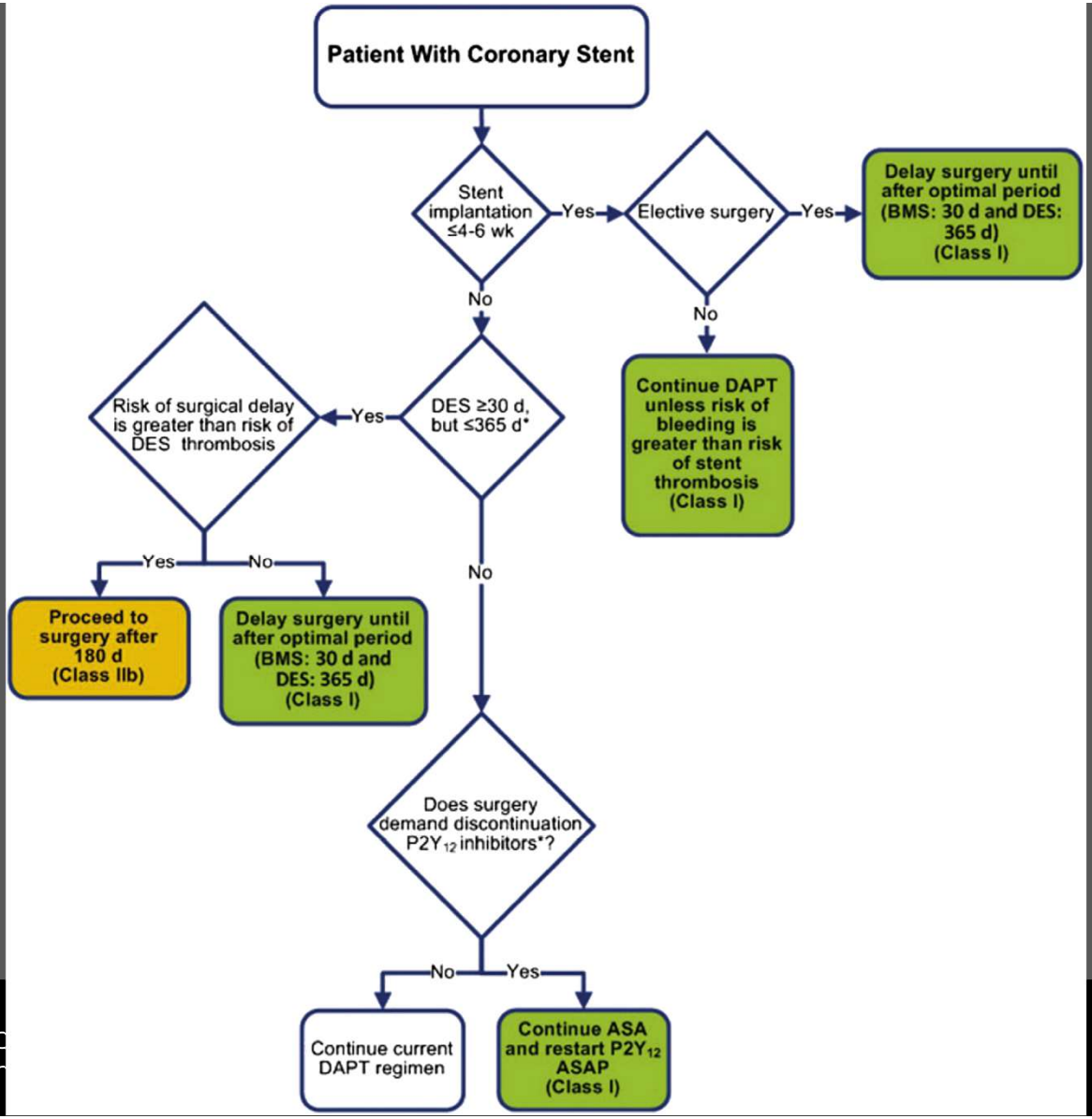
Case #3

- 63 M hx morbid obesity, inferior MI 7 months ago, ISR 5 months ago (held Plavix x 3 days) treated with thrombectomy and balloon angioplasty, presents needing a cholecystectomy for frequent pain from long-standing cholelithiasis. He is currently on ASA 81 mg and prasugrel.

Banerjee, S. Angiolillo, DJ. Boden, WE. Murphy JG. Khalili, H. Hasan, AA. Harringon, RA. Rao SV. Use of Antiplatelet Therapy/DAPT for Post-PCI Patients Undergoing Noncardiac surgery. JACC 2017 69(14):1861-70.



From: **2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines**


Patient With Coronary Stent
Stent implantation ≤4-6 wk
Yes
Elective surgery
Yes
Delay surgery until after optimal period (BMS: 30 d and DES: 365 d) (Class I)
No
Continue DAPT unless risk of bleeding is greater than risk of stent thrombosis (Class I)
No
DES ≥30 d, but ≤365 d*
Yes
Risk of surgical delay is greater than risk of DES thrombosis
Yes
No
Proceed to surgery after 180 d (Class IIb)
Delay surgery until after optimal period (BMS: 30 d and DES: 365 d) (Class I)
No
Does surgery demand discontinuation P2Y12 inhibitors*?
No
Yes
Continue current DAPT regimen
Continue ASA and restart P2Y12 ASAP (Class I)

Elective Surgery Timing Recommendations

CLASS I

1. Delay surgery for 14 days after balloon angioplasty (Level of Evidence: C) and 30 days after BMS implantation. (LOE: B)
2. Delay surgery for 365 days after drug-eluting stent (DES) implantation. (LOE: B)

CLASS IIa

1. In patients in whom surgery is required, a consensus decision among treating clinicians as to the relative risks of surgery and discontinuation or continuation of antiplatelet therapy can be useful. (LOE: C)

CLASS IIb

1. Surgery after DES implantation may be considered after 180 days if the risk of further delay is greater than the expected risks of ischemia and stent thrombosis. (LOE: B)

CLASS III: HARM

1. Surgery should not be performed within 30 days after BMS implantation or within 12 months after DES implantation in patients in whom dual antiplatelet therapy (DAPT) will need to be discontinued. (LOE: B)
2. Surgery should not be performed within 14 days of balloon angioplasty in patients in whom aspirin will need to be discontinued. (LOE: C)


©Marty Bucella
www.martybucella.com
"You're in perfect health, which, I'm afraid, is an early sign of something eventually going wrong."

Case #4

- 62 M hx CAD with MI in 2007 and HTN presents prior to a planned shoulder surgery. He denies any cardiac symptoms, only right shoulder pain from a torn rotator cuff. He walks 3 miles daily and takes all of his medications.

- Meds: ASA, atorvastatin 80, lisinopril 10

Betablocker

- reduce MACE but no effect on surgical risk of death
  - Continue if already on (Class I)
  - Start if significant indication (hx CAD) or ≥ 3 RCRI risk factors (Class IIb)
  - If started, do it more than 1 day prior to surgery (Class IIb)

Statins

- Class I – Continue if currently taking (LOE: B)
- Class IIa – It is reasonable to start prior to vascular surgery (LOE: B)
- Class IIb – Consider in patients with clinical indications undergoing high risk surgery (LOE: C)

Other Medications

- Alpha 2 Agonists – no benefit (Class III)
- ACE inhibitors – Continuation is reasonable (Class IIa, LOE B)
- Calcium channel blockers – Diltiazem with possible cardioprotective effects but no clear recommendation