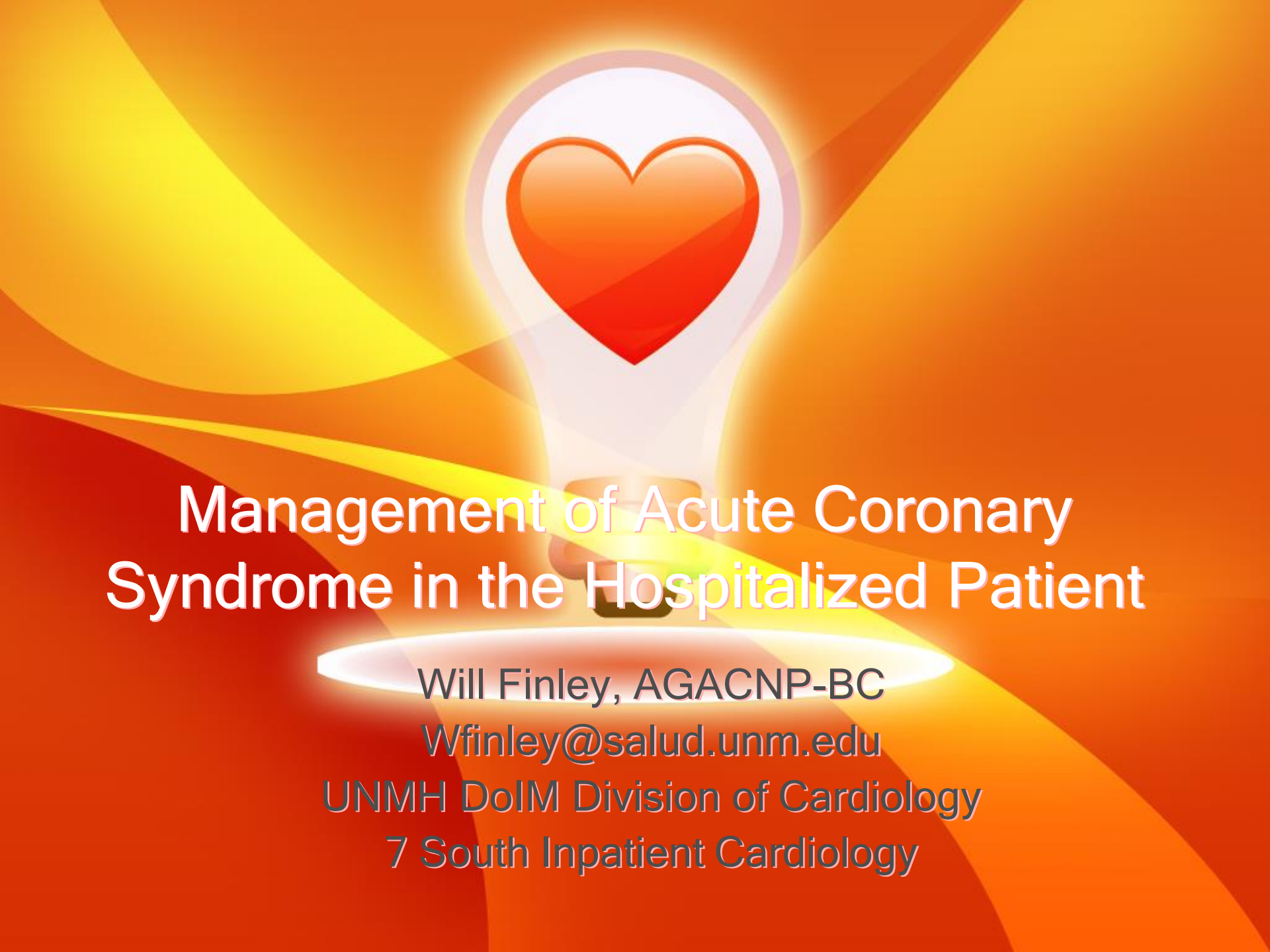

Management of Acute Coronary Syndrome in the Hospitalized Patient

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Disclosures

- I have no relevant relationships with commercial interests to disclose

Objectives

- Define ACS
- Identify the initial therapies of ACS
- Rapidly identify clinical situations that need intervention
- Recognize complications of ACS
- Inform appropriate D/C and follow-up

Diagnosis of Angina

- **Typical angina**—All three of the following:
  - Substernal chest discomfort >1min
  - Onset with exertion or emotional stress
  - Relief with rest or nitroglycerin
- Atypical angina
  - 2 of the above criteria
- Noncardiac chest pain
  - 1 of the above criteria

Diagnosis of Unstable Angina

- Patients *with known* history typical angina
    - Increased in severity or duration
    - Has onset at rest (or at a low level of exertion)
    - Unrelieved by the amount of nitroglycerin or rest that had previously relieved the pain
- Patients *not known* to have typical angina
    - First episode with usual activity or at rest within the previous two weeks
    - Prolonged pain at rest
- Clinical findings
    - non-occlusive thrombus
    - non specific ECG, normal cardiac enzymes

NSTEMI vs. STEMI
(at least 2 of the following findings)

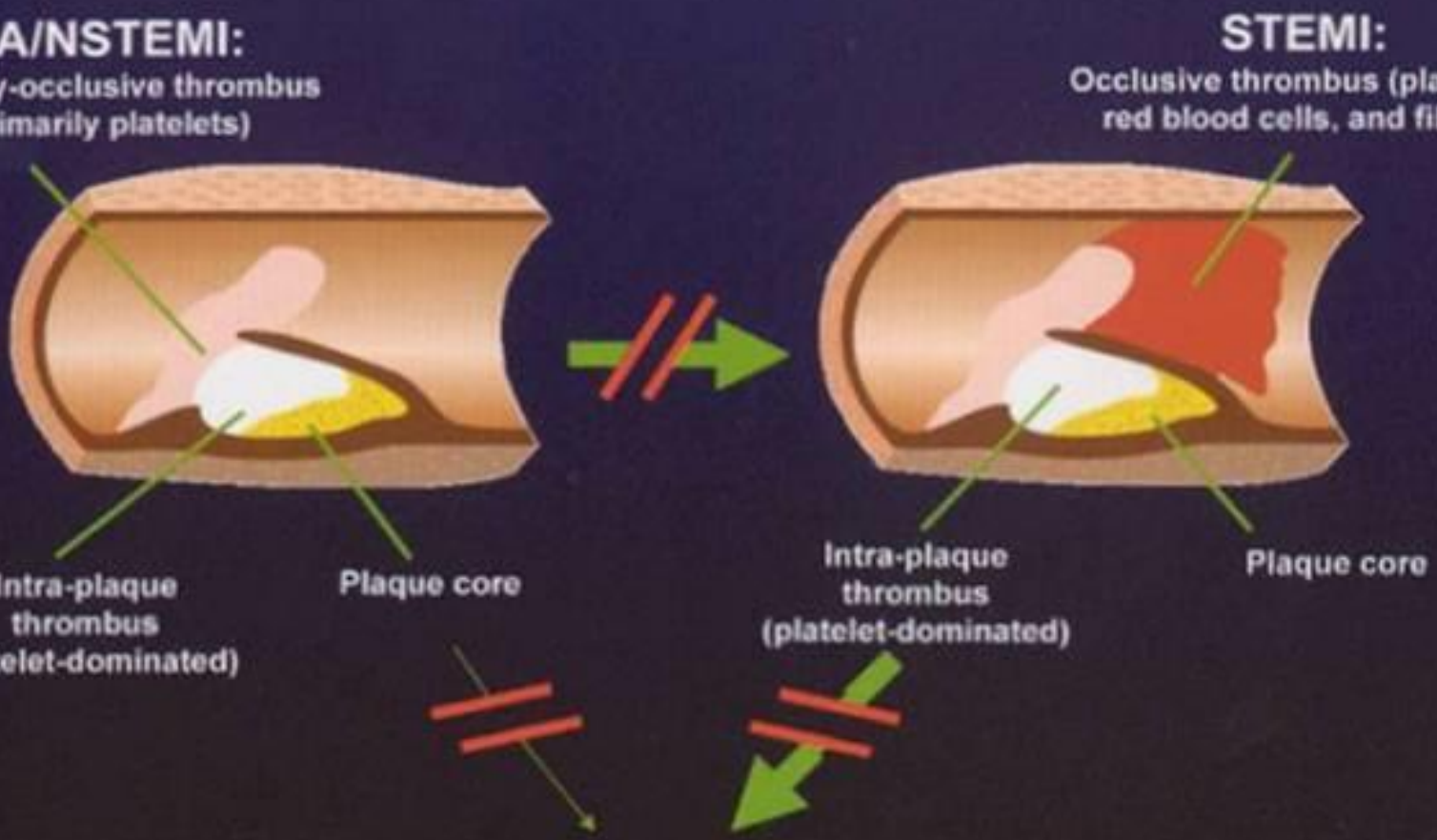
NSTEMI:

- Usually partial thrombus/plaque
- Occlusion that is sufficient to cause tissue damage & mild myocardial necrosis
- ST depression +/-
- T wave inversion on ECG
- Elevated cardiac enzymes

STEMI:

- Usually complete thrombus occlusion
- ST elevations 2mm in precordial and/or 1mm in limb leads on ECG or new LBBB
- Elevated cardiac enzymes
- More severe symptoms

Structure of Thrombus Following Plaque Disruption



UA = Unstable Angina
NSTEMI = Non-ST-segment Elevation Myocardial Infarction
STEMI = ST-segment Elevation Myocardial Infarction

White HD. *Am J Cardiol* 1997;80 (4A):2B-10B.

Chest pain suggestive of ischemia

Immediate assessment within **10 Minutes**

History & Physical

- Establish diagnosis
- Read ECG
- Identify complications
- Assess for reperfusion

Emergent care

- Cardiac monitoring
- Oxygen
- IV access
- If STEMI activate STEMI pager

Initial labs and tests

- 12 lead ECG
- Obtain initial cardiac enzymes
- Electrolytes, cbc lipids, bun/cr, glucose, coags
- CXR
- Echo (eval EF and wall motion abnormailites)

ECG assessment

ST Elevation or new LBBB
STEMI

ST Depression or dynamic
T wave inversions
NSTEMI

Non-specific ECG
Unstable Angina

Cardiac Markers

Enzyme	Normal	Rise	Peak	Return to normal
CK	30-210 u/L	3-6 h	24 h	3-4 days
CK-MB	<8 ng/ml	4 h	18-24 h	2-3 days
CK-MB R	< 3.5			
Myoglobin	<100 ng/ml	2 h	6-7 h	24 h
Troponin I	<0.1 ng/ml	4-6 h	10-24 h	4 days
Troponin T	<0.5 ng/ml	4-6 h	10-24 h	10 days

Initial Treatment Protocol

Initial Treatment Protocol

Nitroglycerin (class I, level B)

- Analgesia–titrate infusion to keep patient pain free
- Dilates coronary vessels–increase blood flow
- Reduces systemic vascular resistance and preload
- Careful with recent ED meds, hypotension, bradycardia, tachycardia, RV infarction

Aspirin (325mg chewed & swallowed) (class I, level A)

- Irreversible inhibition of platelet aggregation
- Stabilize plaque and arrest thrombus
- Reduce mortality in patients with STEMI
- Careful with active PUD, hypersensitivity, bleeding disorders

(ACCF/AHA Guidelines, 2012)

Initial Treatment Protcol

Beta-Blockers (class I, level A)

- 14% reduction in mortality risk at 7 days at 23% long term mortality reduction in STEMI
- Approximate 13% reduction in risk of progression to MI in patients with threatening or evolving MI symptoms
- Be aware of contraindications (CHF, Heart block, Hypotension)
- EF>40% Metop tartrate PO BID
- EF≤ 40% Metop XL qday or Coreg PO BID
  - *never IV

ACE-Inhibitors / ARB (class I, level A)

- Start in first 24 hours
- ARB as substitute for patients unable to use ACE-I

(ACCF/AHA Guidelines, 2012)

Initial Treatment Protocol

Statin therapy

- Assists in plaque stabilization
- Reduces lipid profile
- Atorvastatin 80mg (PROVE IT-TIMI 22 and MIRACL trials)
- Consider Pravastatin if LFT's are elevated

Aldosterone Antagonist (Spironolactone)

- EF≤ 40% with s/s of HF and/or DM
  * Patient is without significant renal dysfunction or hyperkalemia
  * Must tolerate ACEi/ARB first

(ACCF/AHA Guidelines, 2012)

Initial Treatment Protocol

Heparin (class I, level C to class IIa, level C)

- LMWH or UFH (max 5000u bolus, 1000u/hr)
  - Indirect inhibitor of thrombin
  - 24-48 hours of treatment
  - Used in combo with aspirin and/or other platelet inhibitors

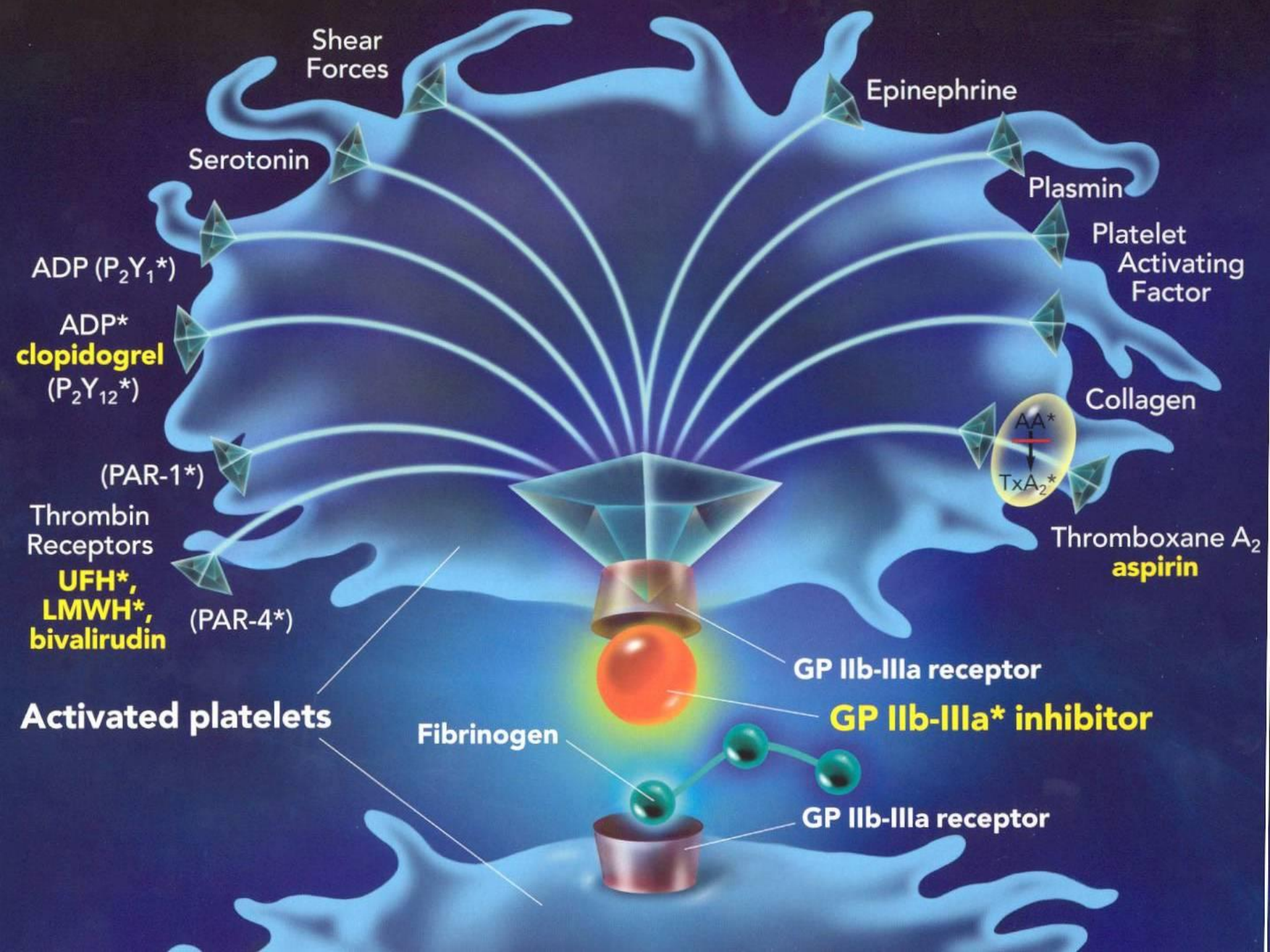
P2Y12 inhibitors: clopidogrel/ticagrelor/prasugrel

- Inhibition of platelet aggregation
- Duration depends on BMS vs DES vs no PCI

(ACCF/AHA Guidelines, 2012)

Initial treatment P2Y12 cont

- Clopidogrel
  - 600mg/300mg PO load
  - 75mg PO qday
- Ticagrelor
  - 180mg PO load
  - 90mg PO BID
- Prasugrel
  - 60mg PO load
  - 10mg PO qday


Shear Forces
Epinephrine
Serotonin
Plasmin
Platelet Activating Factor
ADP (P_2Y_1*)
ADP*
clopidogrel
(P_2Y_{12}*)
Collagen
AA*
TxA_2*
(PAR-1*)
Thrombin Receptors
UFH*, LMWH*, bivalirudin
(PAR-4*)
Thromboxane A_2
aspirin
GP IIb-IIIa receptor
GP IIb-IIIa* inhibitor
Activated platelets
Fibrinogen
GP IIb-IIIa receptor

Risk Stratification for USA and NSTEMI

- TIMI risk score
  - Age ≥65 years
  - Elevated serum cardiac biomarkers
  - Presence of ST segment deviation on admission ECG
  - Presence of at least three risk factors for CAD
  - Prior coronary stenosis of ≥50 percent
  - At least two anginal episodes in prior 24 hours
  - Use of aspirin in prior seven days
- 0-2 low risk= Stress test
- 5-7 high risk= Cath

Invasive therapy option UA/NSTEMI (High Risk)

For high risk ACS (class I, level A)

- Coronary angiography and revascularization within 24 hours after presentation
- PCI with DES or no intervention:
  - ASA 81mg PO qday
  - P2Y12 inhibitor **1Year min**
  - ACEi/ARB
  - High intensity Statin (Atorvastatin 80mg)
  - Beta Blocker (Dependent on EF)
  - EF>40% Metop tartrate BID
  - EF≤ 40% Metop XL qday or Coreg BID

(ACCF/AHA Guidelines, 2012)

Invasive therapy option UA/NSTEMI (High Risk)

- Coronary angiography and revascularization within 24 hr of symptoms
- PCI with BMS:
  - ASA 81mg PO qday
  - Plavix 75mg PO qday for **1 month min/ pref 1year**
  - ACEi/ARB
  - High intensity Statin (Atorvastatin 80mg)
  - Beta Blocker (Dependent on EF)
  - EF>40% Metop tartrate PO BID
  - EF≤ 40% Metop XL qday or Coreg PO BID

(ACCF/AHA Guidelines, 2012)

Additional Pearls During Admission

- Unstable Angina=24hrs
- NSTEMI= 48hrs
- STEMI= 72hrs
- Daily EKG's
- Trend Troponins until down trending occurs
  - Depends on duration of injury, may be elevated>10days
- Out patient Cardiac Rehab appointment Adhoc
- Cardiology clinic appointment 2 weeks post D/C

Possible Complications

- Cardiogenic Shock: Tachy, Low BP, Pulmonary edema
- LV free wall rupture: 3-5days post Lcx, s/s of tamponade
- Papillary muscle rupture: PDA→ Murmur on exam with Pulmonary edema→ need Echo and surgery
- VSD: Murmur→Echo and surgery
- LV aneurysm: Found on Echo→ if thrombus noted needs warfarin
- Arrhythmias: VT or HB→ Tele and keep K>4 and Mag >2

Case Study I

Case Study I

- “Mr Jones” (Mr. J) is a 60-year-old man, presents to the ED with complaints of exertional chest pain for the past 4 days that occurs on his AM walk to work from parking lot.
- Each episode lasts approx 5 mins, chest & jaw pain. Chest pain is “heavy, deep with a burning “like heartburn”
- Each episode resolved without intervention other than rest, and was not associated with any other symptoms.

Case Study I

- On the evening of his admission, his angina returns while watching TV, he is diaphoretic, SOB
- He reports increasing dyspnea on exertion and fatigue over the past 6 months
- Denies h/o orthopnea, LE edema, CAD

Case Study I

Pertinent PMH:

- HTN
- Diabetes
- Current smoker – 40 pack yr
- No ETOH
- Healthcare administrator
- Does not see MD regularly or check BG at home

Medications:

- Metformin 500mg bid
- Lisinopril 20mg PO qd

Case Study I

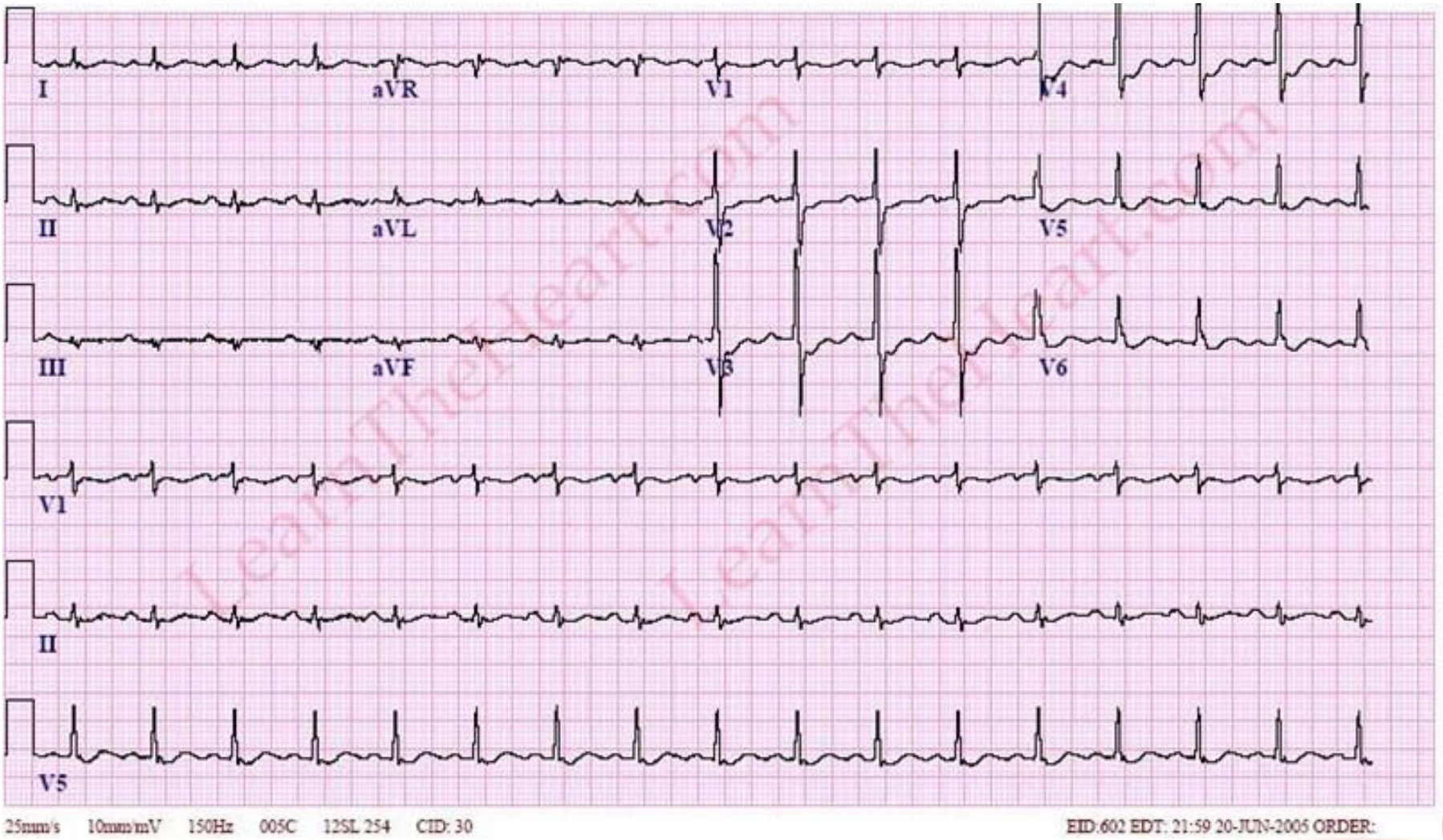
Physical exam:

- Normal S_1 and S_2
- BP154/94
- HR 92, regular
- Slightly diaphoretic
- Chest pain "pressure in center of chest" 4/10

Labs:

- CBC:
  - WBC 7, PCV 41, plt 213
- BMP:
  - Na 138, K+4.2 Cl 104 Glucose 213, Cr 1.2, BUN 26
- CXR without acute findings
- Cardiac enzymes
  - CK-MB ratio 10,
  - Troponin-I: 4.5
- HgbA1c: 10

Case Study I EKG



Case Study I Diagnosis

Based on assessment and clinical findings, Mr. J's diagnosis is:

A. Unstable Angina

B. STEMI

C. NSTEMI

Case Study I Diagnosis

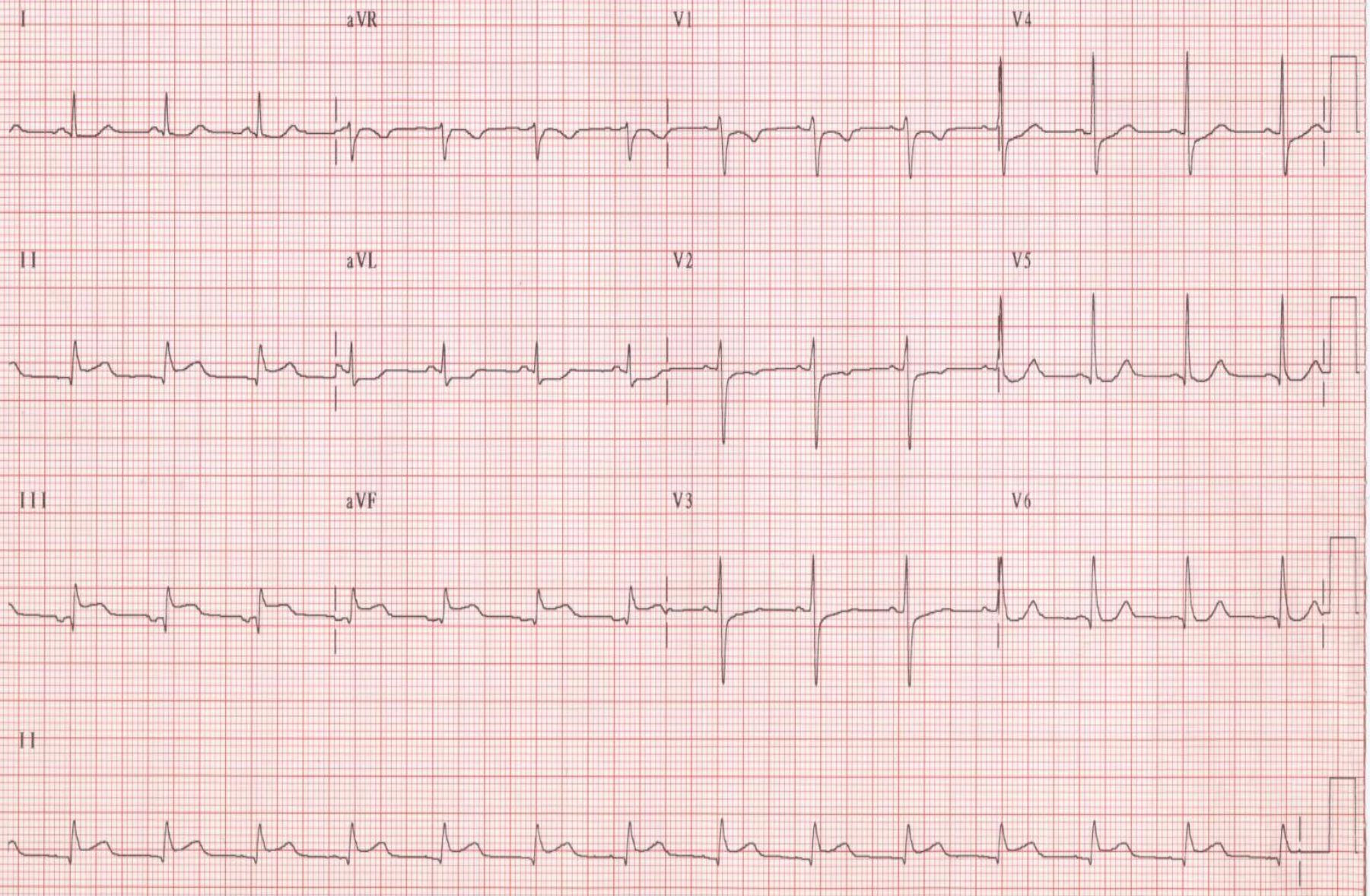
A. Unstable Angina

B. STEMI

C. NSTEMI

Case study II

- Mrs. Kay is a 85 y/o F admitted for recent fall and right femur fx
- She is now complaining of back and chest pain
- BMP WNL
- VS stable
- Troponin is 33
- ECG is obtained immediately



LOC 00000-0000 Speed:25 mm/sec Limb:10 mm/mV Chest:10 mm/mV F 60∿ 0.5-100 Hz W HP7 00380

Case Study II Diagnosis

Based on assessment and clinical findings, Mrs. K's diagnosis is:

A. Unstable Angina

B. STEMI

C. NSTEMI

Case Study II Diagnosis

A. Unstable Angina

B. STEMI

C. NSTEMI

STEMI

Reperfusion !!

- PCI
  - FMC to balloon goal <90 minutes
- Open heart surgery (CABG)
- 2 or more diseased vessels
  - Blockages not amenable to PCI
  - Ex: Lima to LAD

Case Study II Treatment

Mrs. Kay received a DES to the pRCA and then had an echocardiogram done that showed an EF of 30%

Case Study II Treatment

Based on the previous slides information, which beta blocker should Mrs. Kay NOT be prescribed?

A. Metoprolol Succinate

B. Carvedilol (Coreg)

C. Metoprolol Tartrate

Answer

A. Metoprolol Succinate

B. Carvedilol (Coreg

C. Metoprolol Tartrate

* EF <40%= Coreg or Metoprolol Succinate/XL

STEMI Goals

- Relief of pain
- Assess HD status
- Beta blockade (ischemia & anti-arrhythmic)

Medication Checklist after ACS (LEAPFROG)

- Antiplatelet agent
  - Aspirin* and Plavix
- Lipid lowering agent
  - Statin*
- Antihypertensive/Anti-remodeling agent
  - Beta blocker*
  - ACE-I*/ARB
  - Spironolactone (as appropriate for EF≤ 40% with HF and or DM)

Medication Checklist after ACS (LEAPFROG)

- Pain control
  - Nitogylcerin 0.4mg SL q5min up to 3 doses
    - Nitro gtt if no complete relief SL
  - Morphine 4-8mg IV q 5-15min

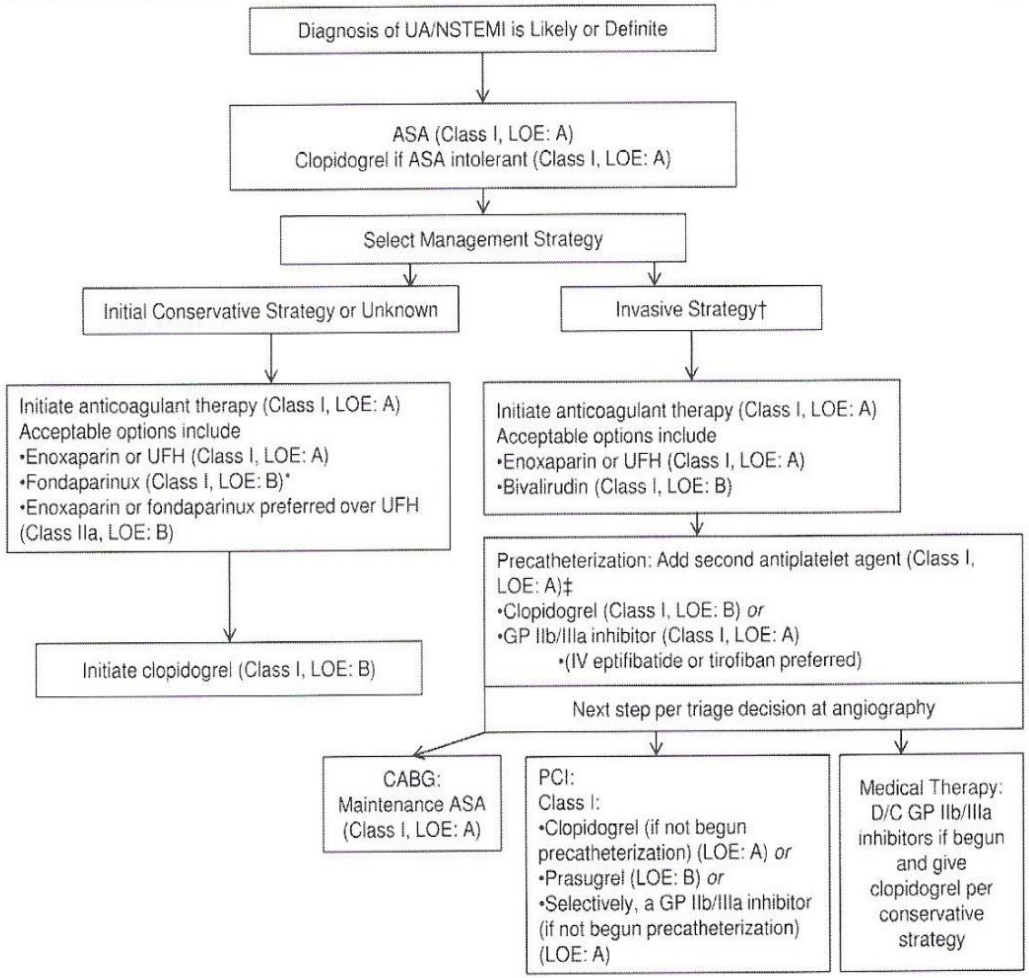
Summary

- ACS includes UA, NSTEMI, and STEMI
- Management guideline focus
  - Immediate assessment/intervention
  - Risk stratification
    - Conservative vs. Invasive therapy for UA/NSTEMI
  - RAPID reperfusion for STEMI
    - PCI
- Aggressive attention to secondary prevention initiatives for ACS patients
  - ASA, Plavix, ACE-I, Beta blocker and Statin
- Appropriate D/C and follow-up

Algorithm (handout)

JACC Vol. 57, No. 19, 2011
May 10, 2011:1920–59

Appendix 6. Flowchart for Class I and Class IIa Recommendations for Initial Management of UA/NSTEMI



THANK YOU!

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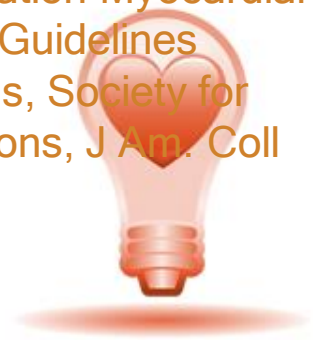

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