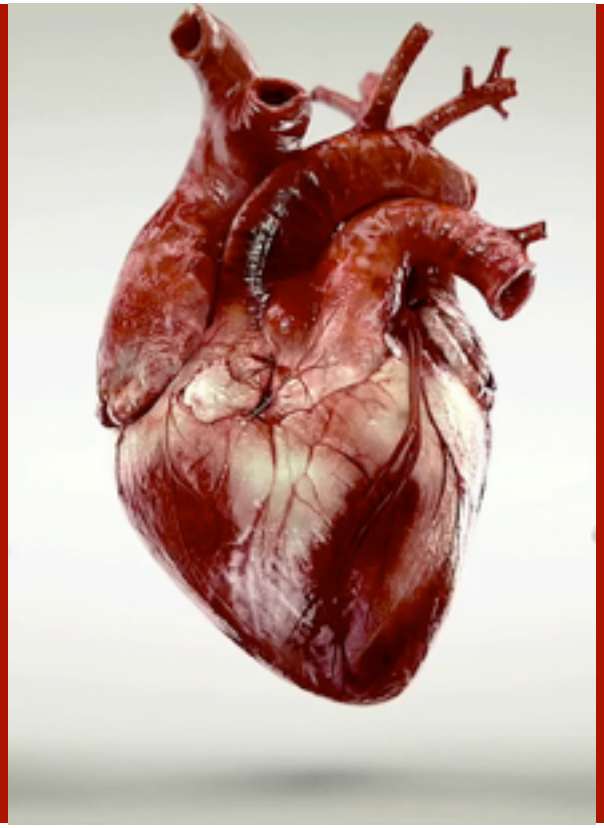


ACS RISK & TREATMENT

BAYLOR Health Care System

ALI FARZAD, M.D.

Baylor University Medical Center - Dallas, TX

March 27th, 2015


BAYLOR
EMERGENCY

#1 - 65 YOM NSTEMI Transfer

"Sounds Fine, Stable"

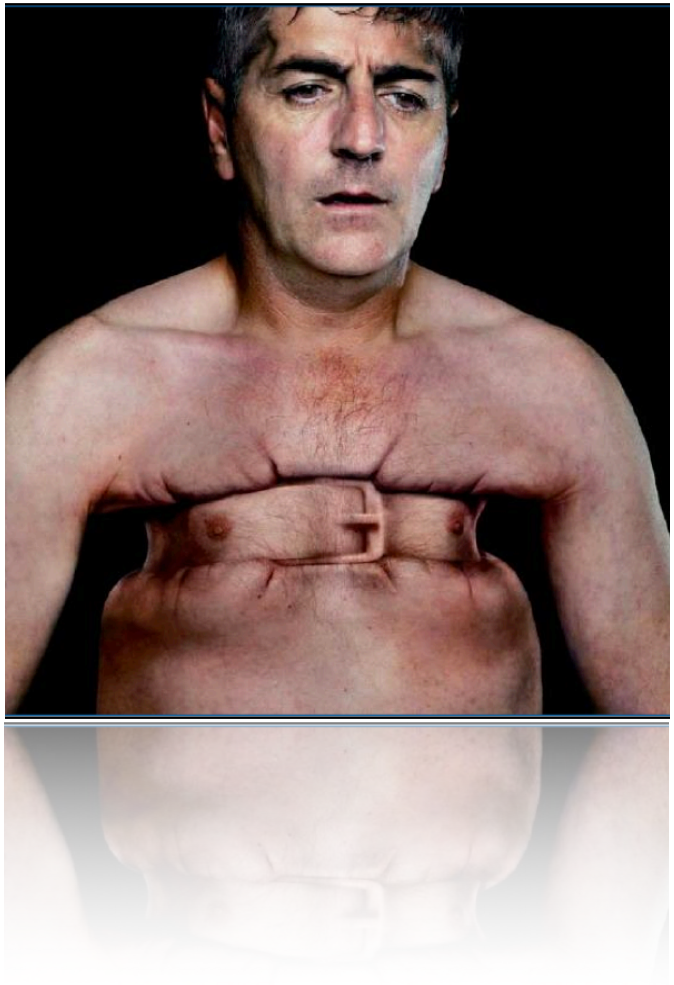
"Shouldn't be trouble"

BP = 140/80, HR = 115

1st Troponin 0.2

ECG "Nonspecific"

Still has mild pain



#1 - 65 YOM in Cardiac Arrest

UNRESPONSIVE

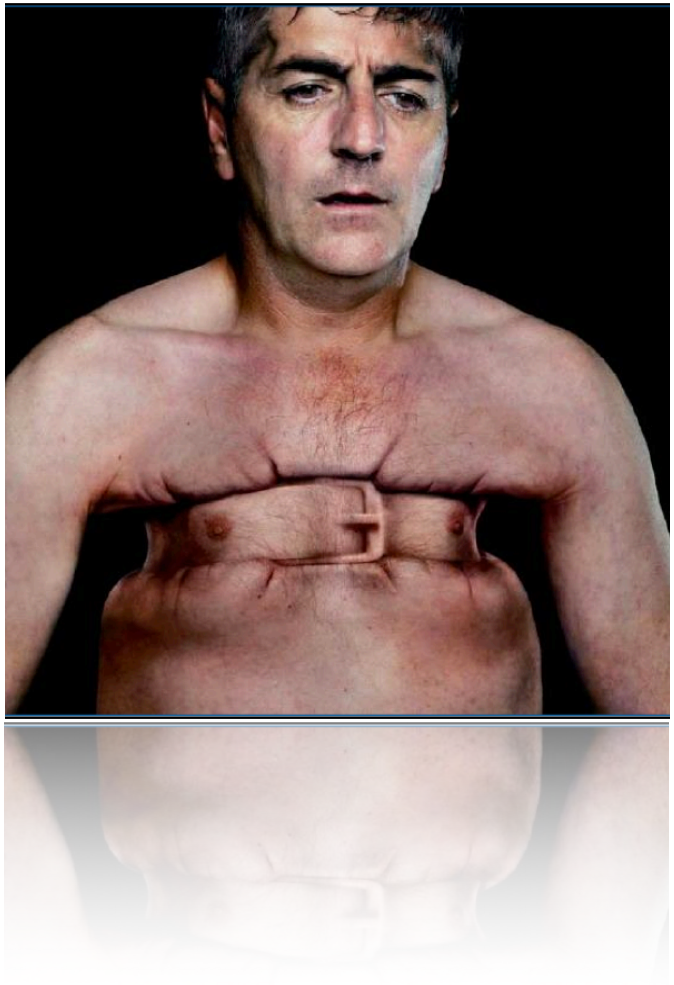
SEIZURE like shaking

Ventricular Fibrillation

High Quality CPR

Early Defibrillation

ROSC



#2 - 43 YOF with CP x 3 days

PMx HTN, DM, HLD,

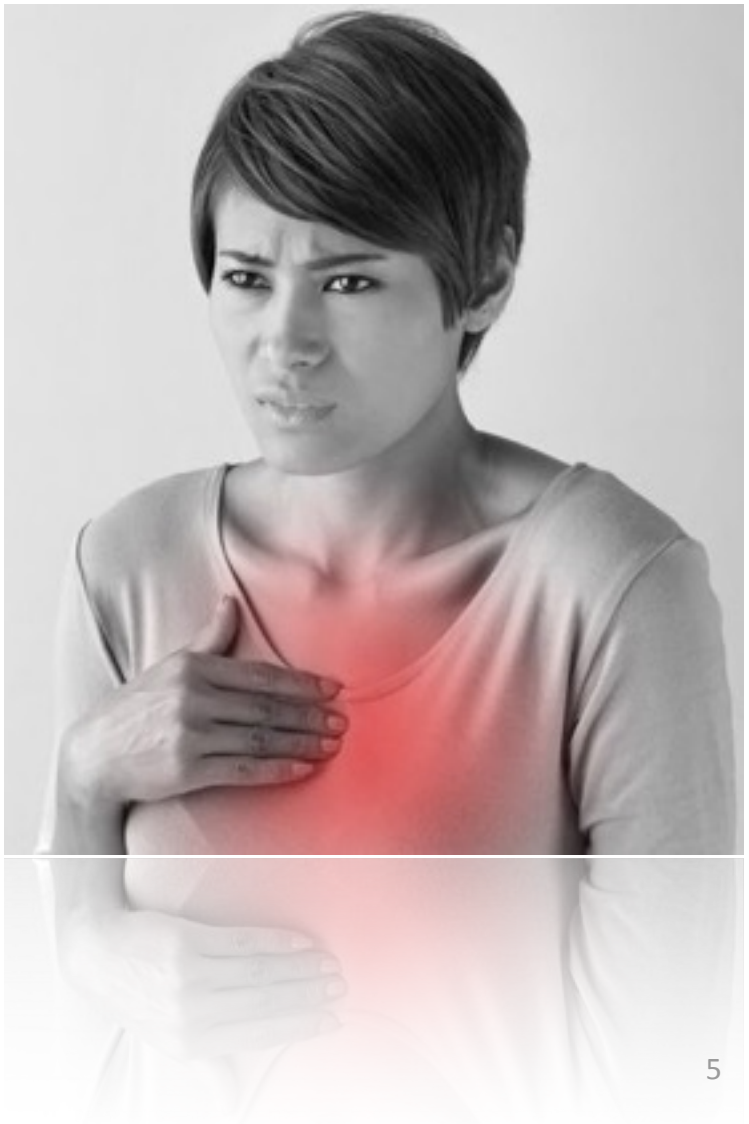
Anxiety - "It's my heart"

RR= 30, Otherwise NL

Hyperventilating

Reproducible, Sharp, Pleuritic, Positional

NL ECG, NL Troponin



#3 - 55 YOM with Exertional CP x 2 hours

PMx HTN, DM, CAD

"Feels like my last MI"

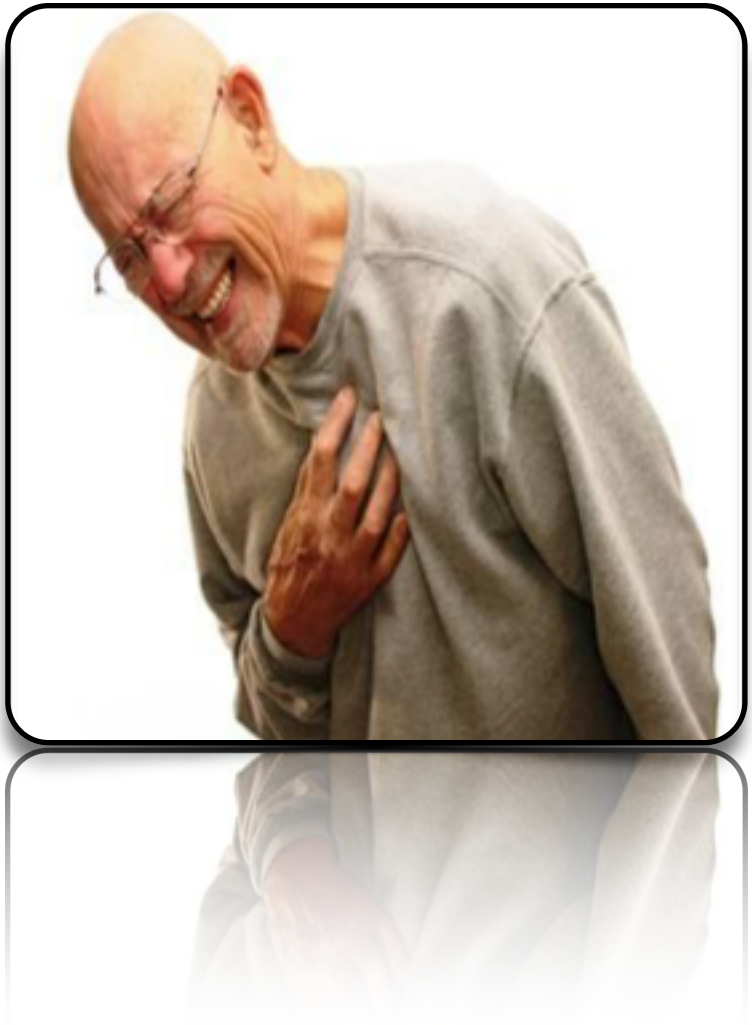
BP = 150/95, HR = 105

Diaphoretic, Vomiting

Radiating to R arm

ECG shows Anterior STD

Troponin Pending



#4 - 55 YOM with CP x 2 hours

PMx HLD, Angina

CP + DOE

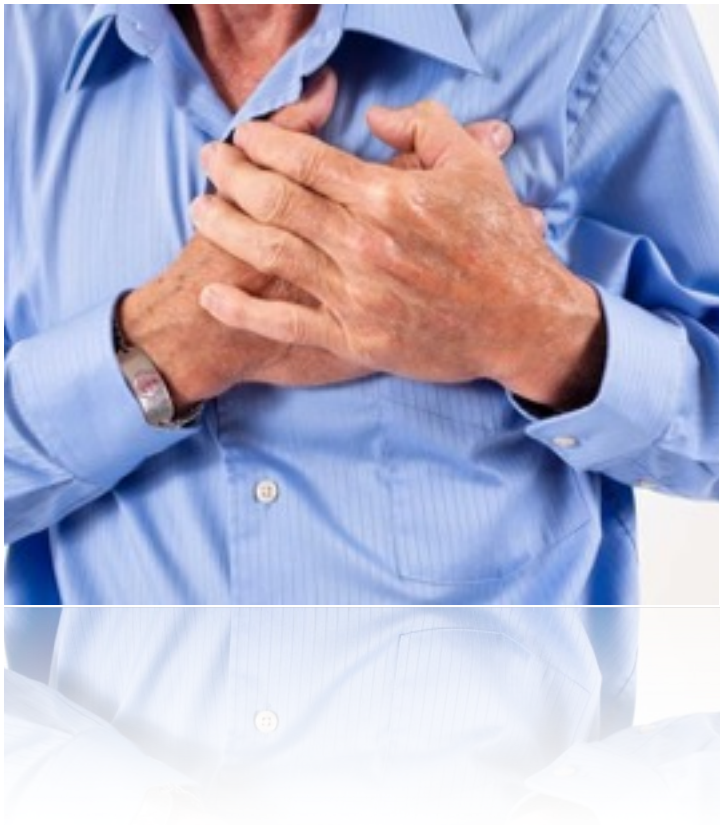
BP = 110/75, HR = 85

Good Story for UA

Normal Physical Exam

Normal ECG

Normal Troponin



ACS is a SPECTRUM

UA, NSTEMI, STEMI, HD/Electrical Instability/CS

Thrombus

Thromboembolism

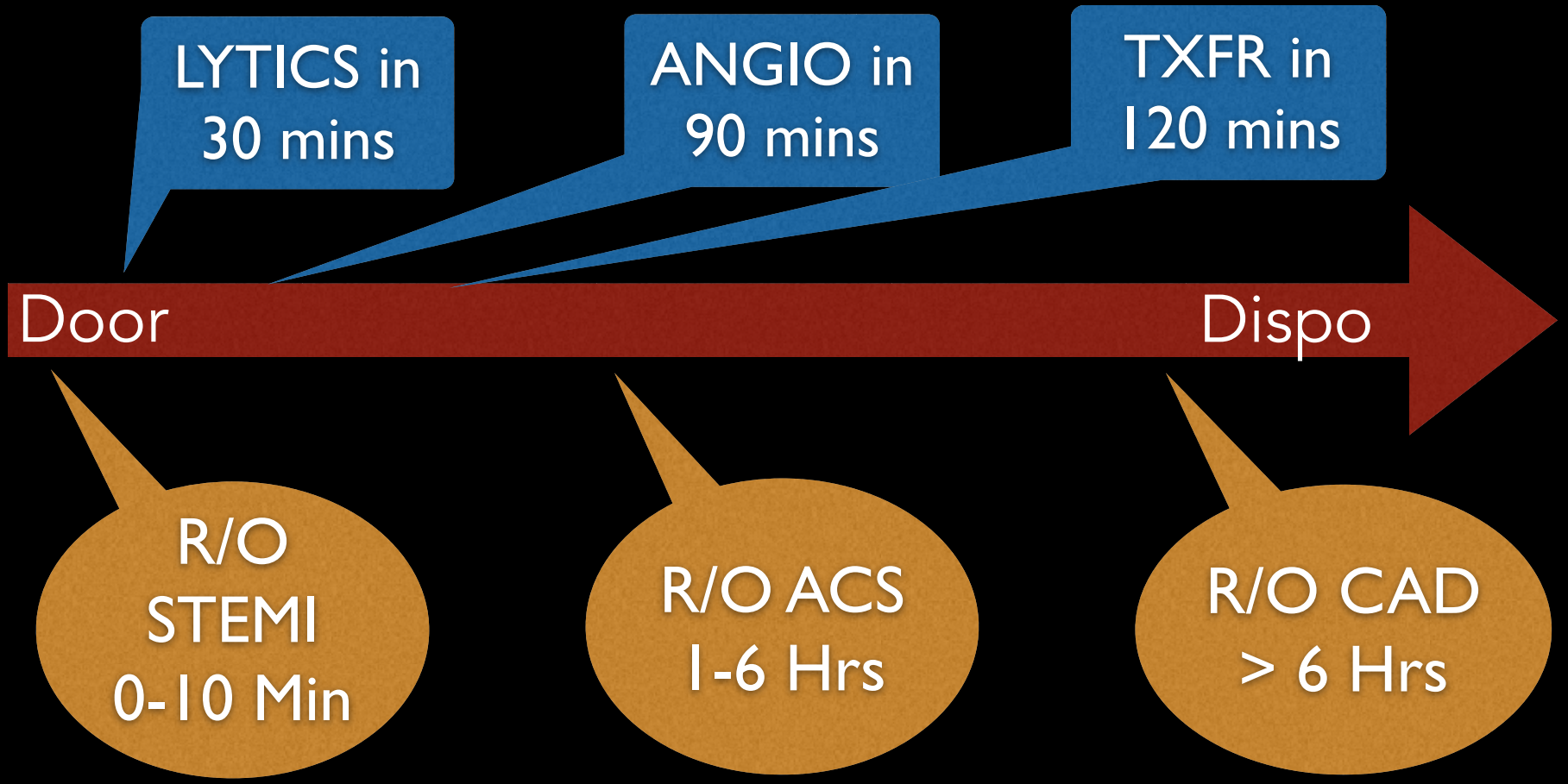
Spasm/dynamic obstruction

Inflammation

Coronary dissection

ETC…

ACS in the ED



GOALS: Tx Pain, Avoid MACE, Medical Tx, Reperfusion

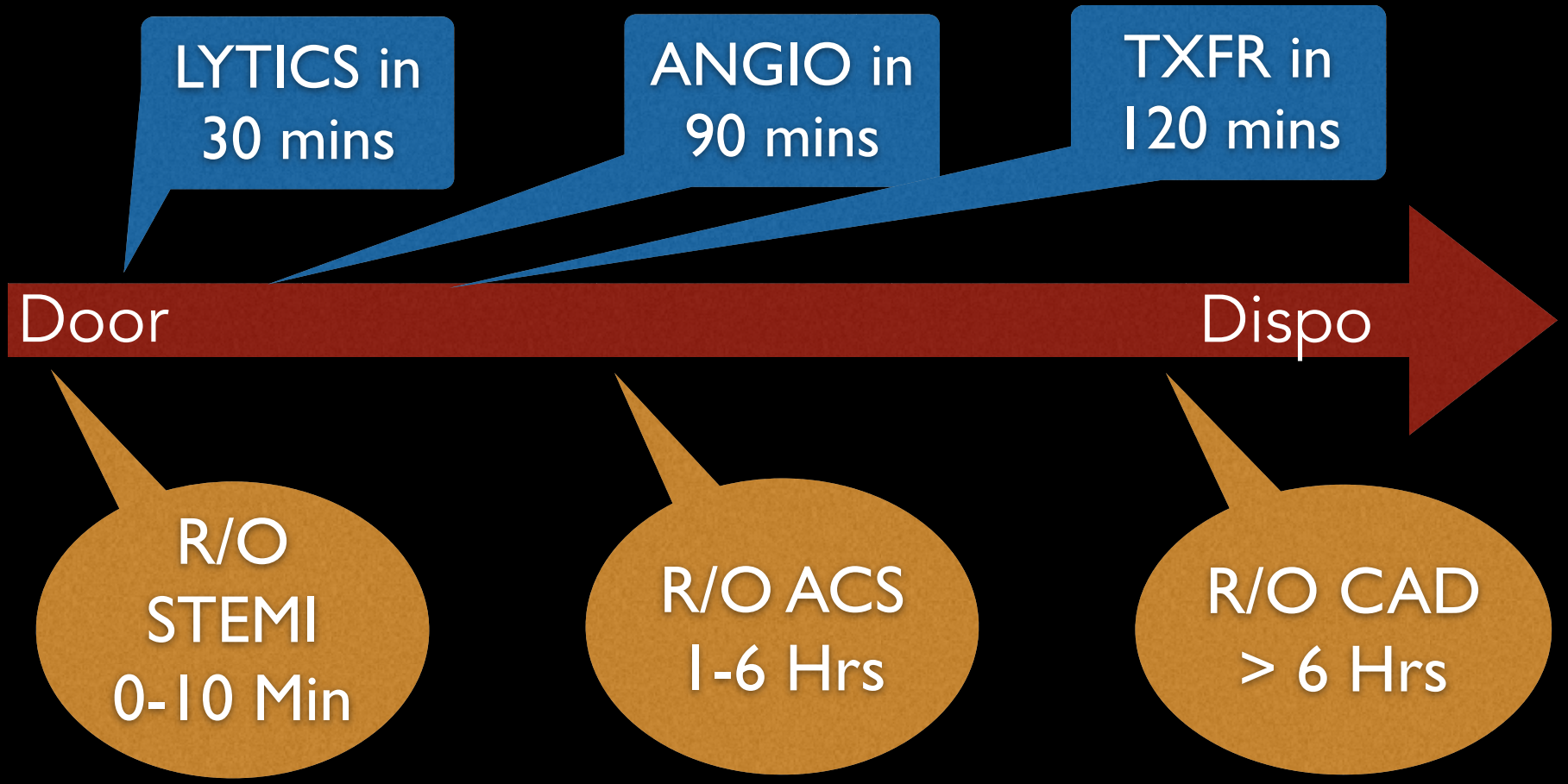
OBJECTIVE

Discuss & Review ED Risk Stratification & Treatment of ACS

GOAL

Review evidence that will help you take care of patients with ACS!

ACS in the ED



GOALS: Tx Pain, Avoid MACE, Medical Tx, Reperfusion

Risk Stratification Tools

ECG

HISTORY

Risk Factors & Scores

Biomarkers

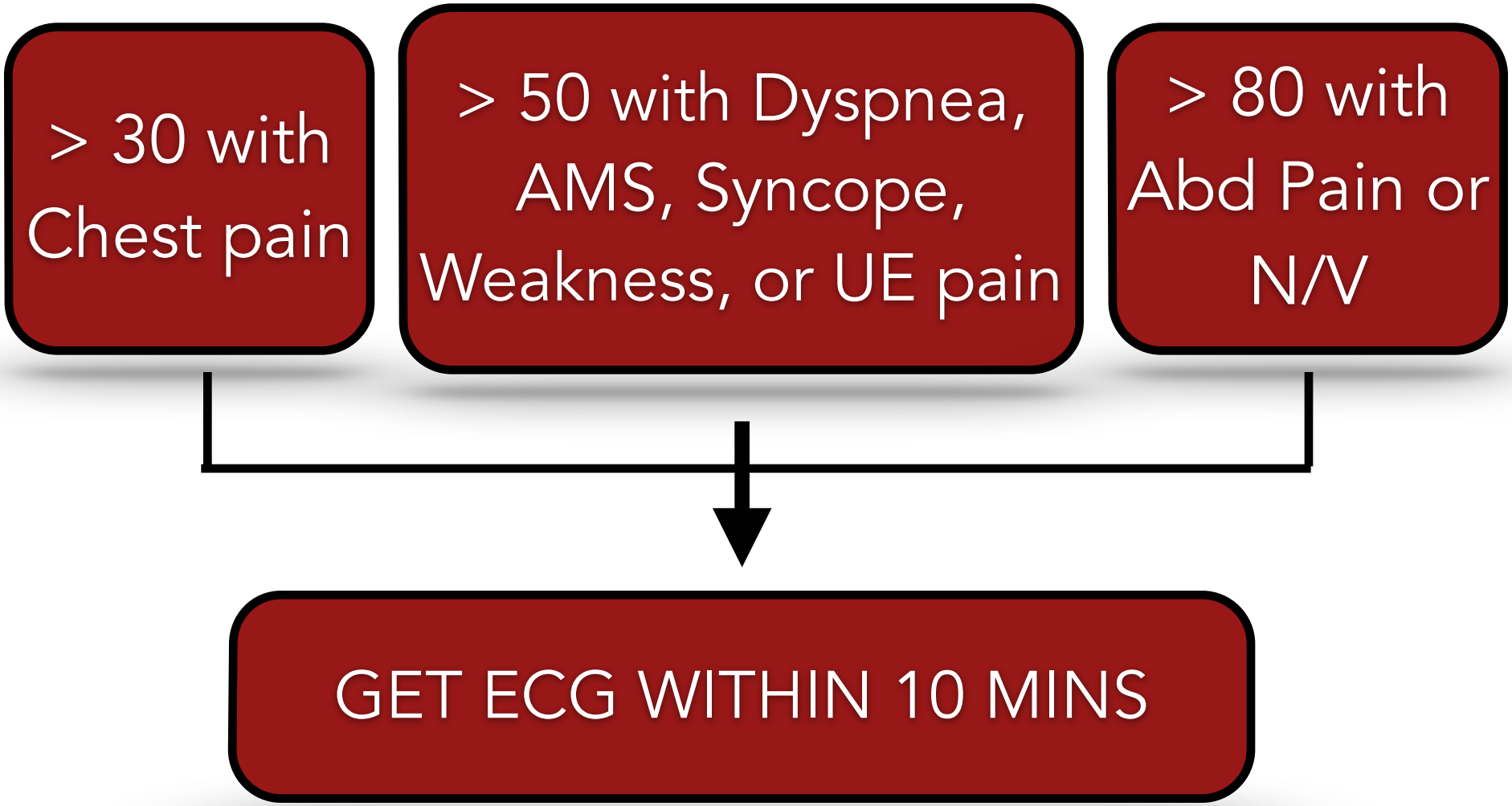
ECG

Glickman et al. American Heart Journal. 2012

Reviewed > 3.5 million cases to ID patients who need an immediate ECG to identify STEMI

- About 6500 STEMI cases
- **22% of STEMI's did not present to ED with CP!**
- Major Predictors of need for Emergency ECG:
  - **> 30 YO with CP**
  - **> 50 YO with AMS, SOB, Syncope, Weakness, UE pain**
  - **> 80 YO with Abdominal Pain or N/V**

Prioritization Rule for Rapid ECG



STEMI Definition

Syndrome of Ischemic Sx + STE + marker of necrosis

ECG Criteria:

» New STE > 1mm at J-point relative to TP-segment in 2 cont. leads

- <u>V2/V3</u>
  - > 2.5 mm in Men < 40
  - > 2.0 mm in Men > 40
  - > 1.5 mm in Women

O'Gara et al. ACCF/AHA STEMI Guidelines. JACC. 2013

55 YOM with Exertional CP x 2 hours, STEMI?

PMx HTN, DM, CAD

"Feels like my last MI"

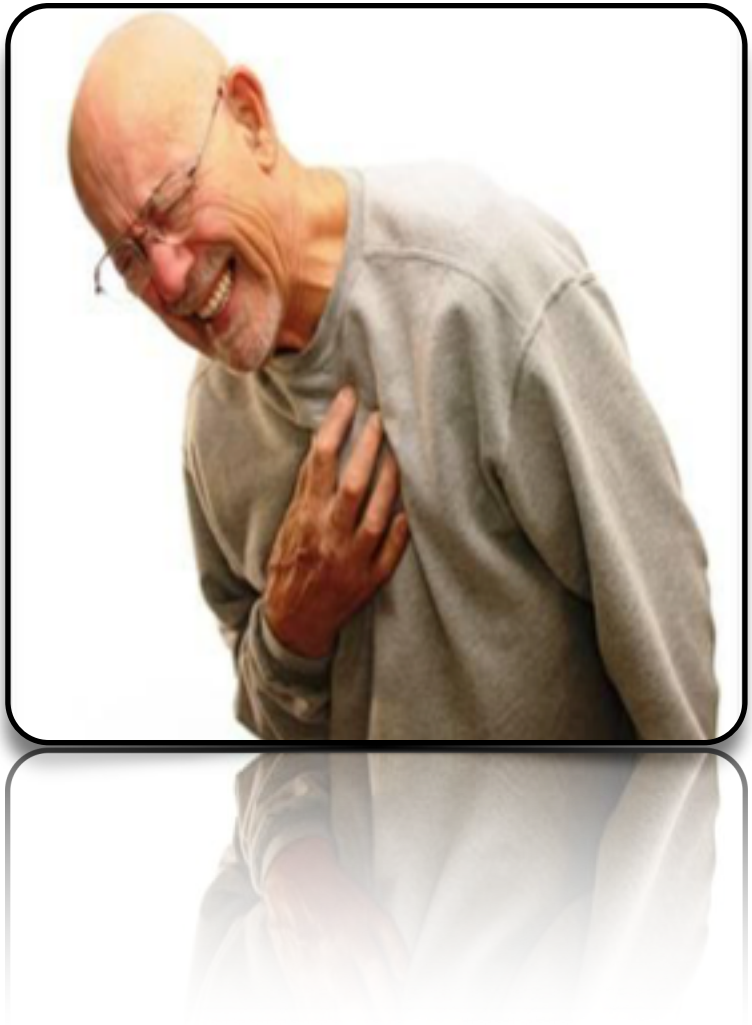
BP = 150/95, HR = 105

Diaphoretic, Vomiting

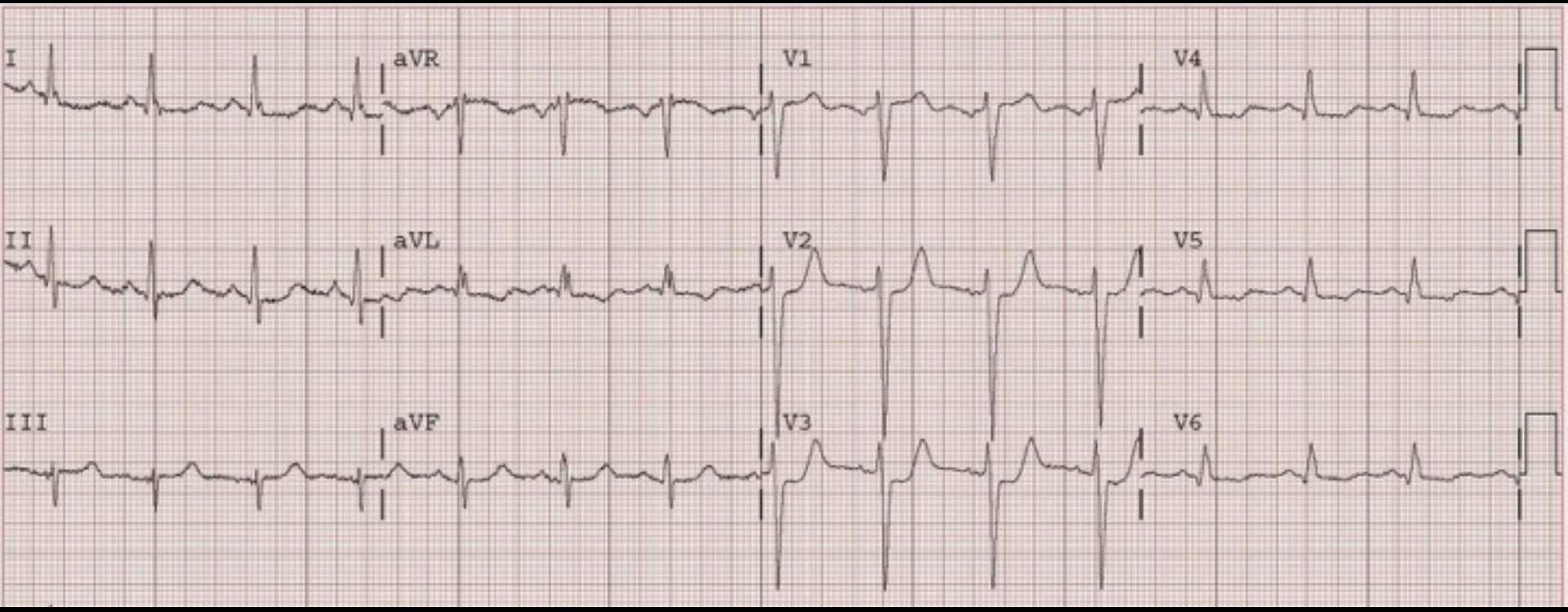
Radiating to R arm

ECG shows Anterior STD

Troponin Pending



STEMI without STE?



STEMI Equivalents

ISOLATED POSTERIOR MI

STD in anterior leads

STE in aVR

+ STD diffusely = LMCA, Prox LAD, MVD, or Global Ischemia

EARLY CHANGES

Hyperacute T waves & reciprocal changes may occur before STE

New LBBB no longer STEMI equivalent

O'Gara et al. ACCF/AHA STEMI Guidelines. JACC. 2013

ECG Pearls

~1/3 of pts. with MI may have no CP!

Door to ECG time < 10 minutes!

Not 100%. 1-6% of MIs have normal ECG

Serial ECGs q 15 -30 mins
in symptomatic patients
with nondiagnotic ECGs

ECG Pearls

Consider STEMI equivalents!

Watch for Hyperacute T-waves

Watch for Early Reciprocal Changes (aVL)

ST-D?

Look at aVR & Posterior leads before signing “NO STEMI”

55 YOM with CP x 2 hours - UA?

PMx HLD, Angina, DM

CP + DOE

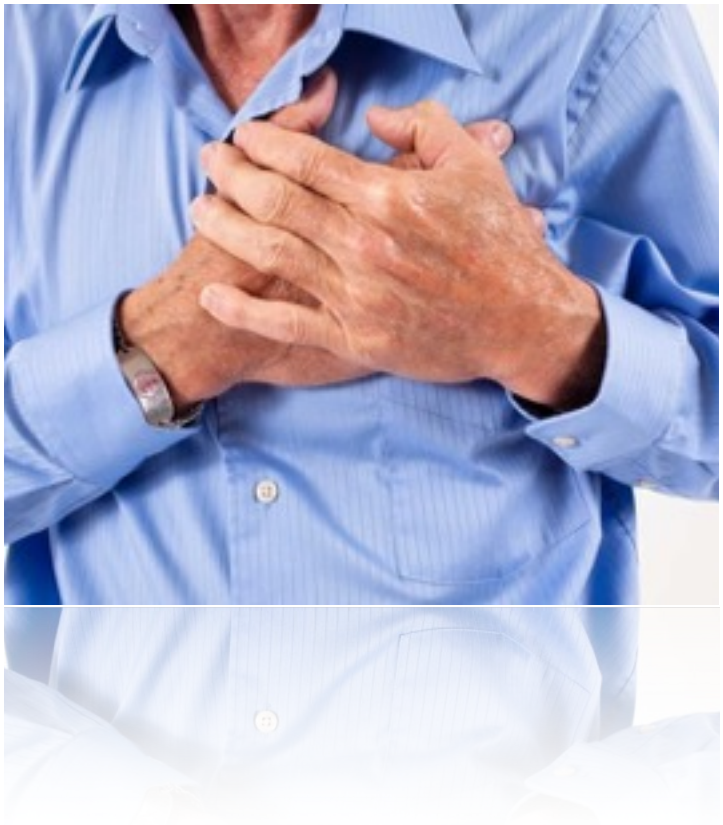
BP = 110/75, HR = 85

Good Story for ACS

Normal Physical Exam

Normal ECG

Normal Troponin



NSTE ACS Definition

Syndrome of Ischemic Sx without STE

NSTEMI

Elevated Biomarkers

ECG may be normal

UA

Normal Biomarkers

ECG may be normal

~ 70 % of ACS presentations

Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

Risk Stratification Tools

ECG

HISTORY

Risk Factors & Scores

Biomarkers

History of Presenting Illness

Onset

Location

Duration & Intensity

Character

Alleviating /Aggravating Factors

Associated Symptoms

Radiation

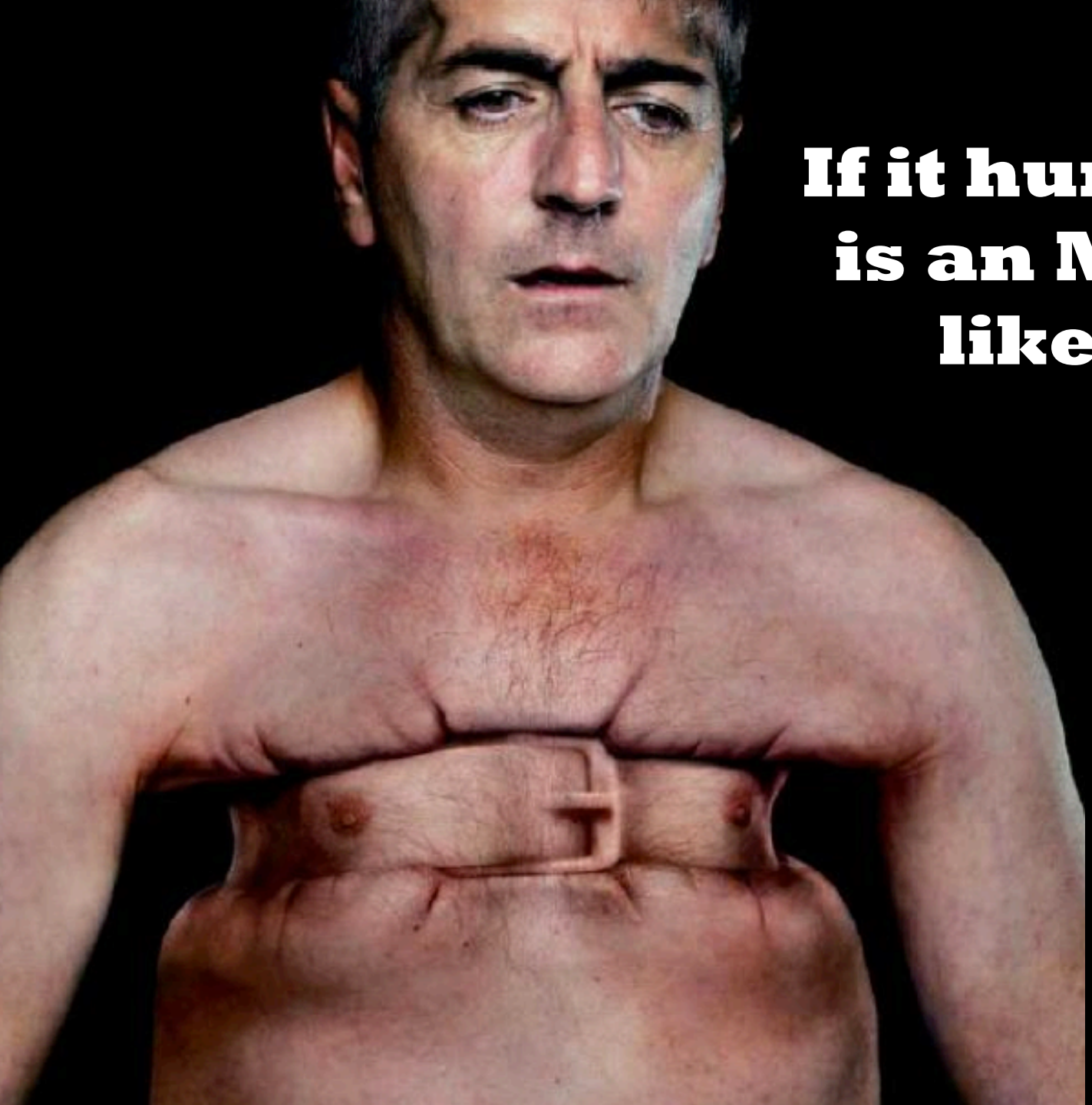
Value of HPI in ACS

SOME

likelihood of ACS/AMI & help r/o other Dx

NONE

patients that can be safely discharged!



If it hurts ALOT, is an MI more likely???

Does SEVERITY matter?

Edwards et al. Annals of Emergency Medicine. 2011

Relationship between pain severity and outcomes in patients presenting with potential ACS.

- ~ 3300 ED patients with CP
- Compared pain scores > 8 with others
- No significant differences
- **Severity was not related to likelihood of AMI or MACE at 30 days**

Does SEVERITY matter?

Body et al. European Journal of Emergency Medicine. 2014

Chest pain: if it hurts a lot, is heart attack more likely?

- ~ 455 patients, 17% with AMI
- AMI patients has marginally higher pain scores (8 vs 7, p=0.03) than those without
- However severity of pain had poor diagnostic accuracy (area under ROC curve = 0.58) and did not correlate with troponin
- **Pain score has limited diagnostic value for AMI**

Clinical Features

Panju et al. Rational Clinical Exam. JAMA. 1998

Literature review from 1980-1991, looking for clinical features that change probability of AMI

- **AMI more likely with**
  - Radiation to both arms (LR = 7.1)
  - Radiation to R shoulder (LR = 2.9)
- **AMI less likely with**
  - Sharp/Stabbing Pain (LR = 0.3)
  - Pleuritic Pain (LR = 0.2)
  - Positional Pain (LR = 0.3)
  - Reproducible Pain (LR = 0.3)

Clinical Features

Swap et al. Value and limitations of CP History. JAMA.2005

Literature search from 1970-2005

- **ACS more likely with**
  - Radiation to R or both arms (LR ~ 4.5)
  - Diaphoresis (LR = 2.0)
  - Exertional CP (LR = 2.4)
- **ACS less likely with**
  - Sharp/Stabbing Pain (LR = 0.3)
  - Pleuritic Pain (LR = 0.2)
  - Positional Pain (LR = 0.3)
  - Reproducible Pain (LR = 0.3)

Clinical Features

Goodacre et al. Academic Emergency Medicine. 2002

Are clinical features useful in diagnosis of acute undifferentiated chest pain.

- ~ 890 stable CP patients with non-diagnostic ECG
- **ACS more likely with**
  - Radiation to R or both arms (LR ~ 4.1)
  - Exertional CP (LR = 2.4)
- **ACS less likely with**
  - Chest wall tenderness (LR = 0.3)

Clinical Features

Body et al. Value of Symptoms & Signs. Resuscitation. 2012.

~ 800 ED patients with CP. 19% had MI.

- Adjusted for age, sex and ECG changes.
- **ACS more likely with**
  - Observed sweating (OR = 5.2)
  - Vomiting (OR = 3.5)
  - Radiation to R arm or both arms (OR ~ 2.4)
- **ACS less likely with**
  - L anterior chest pain (OR = 0.25)
  - "like previous MI" (OR = 0.42)

INCREASED
likelihood of ACS/AMI

1. EXERTIONAL CP
2. RADIATION
3. DIAPHORESIS
4. VOMITING

DECREASED
likelihood of ACS/AMI

1. PLEURITIC CP
2. POSITIONAL CP
3. SHARP/STABBING
4. REPRODUCIBLE

43 YOF with CP x 3 days - Low Risk?

PMx HTN, DM, HLD,

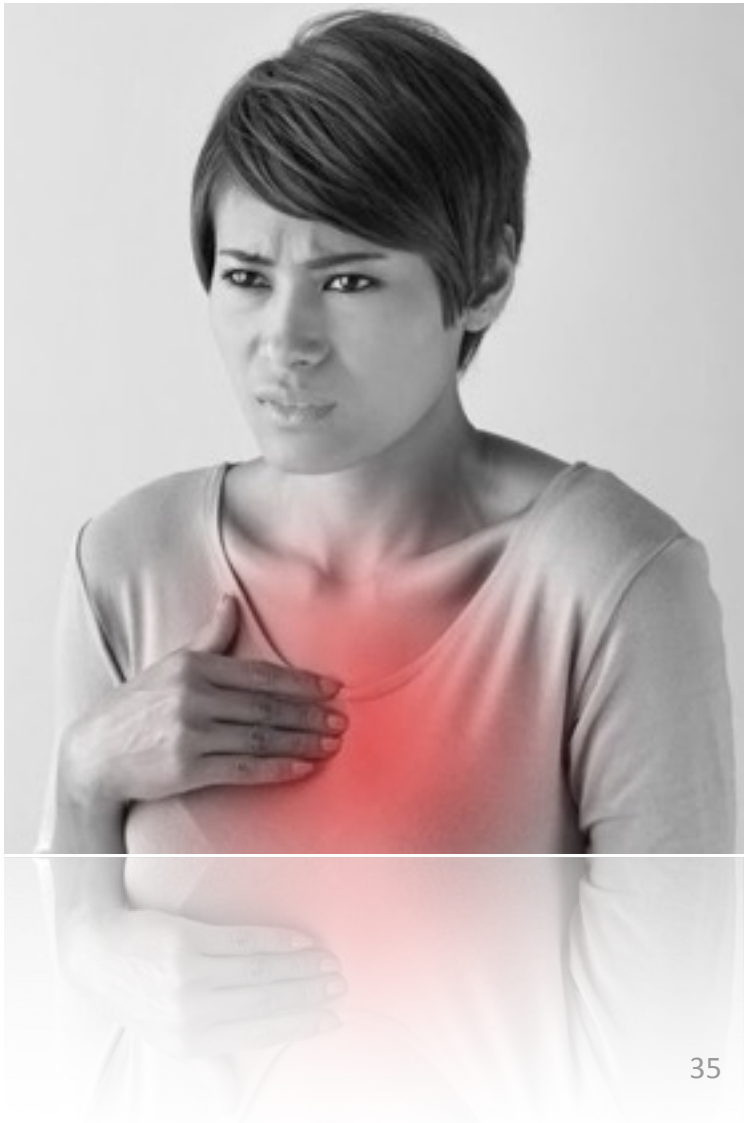
Anxiety - "It's my heart"

RR= 30, Otherwise NL

Hyperventilating

Reproducible, Sharp, Pleuritic, Positional

NL ECG, NL Troponin



You don't think it's an MI???

What about my Risk Factors?

Do Risk Factors Matter?

Jayes et al. Journal of Clinical Epidemiology. 1992.

Do coronary risk factors predict acute ischemia in the ED?

- Prospectively collected data on ~ 1740 ED patients worked up for ACS
- No change in risk for Women
- DM and FHx has very small increase in risk for Men
- **Concluded that classic RFs convey minimal risk for acute cardiac ischemia**

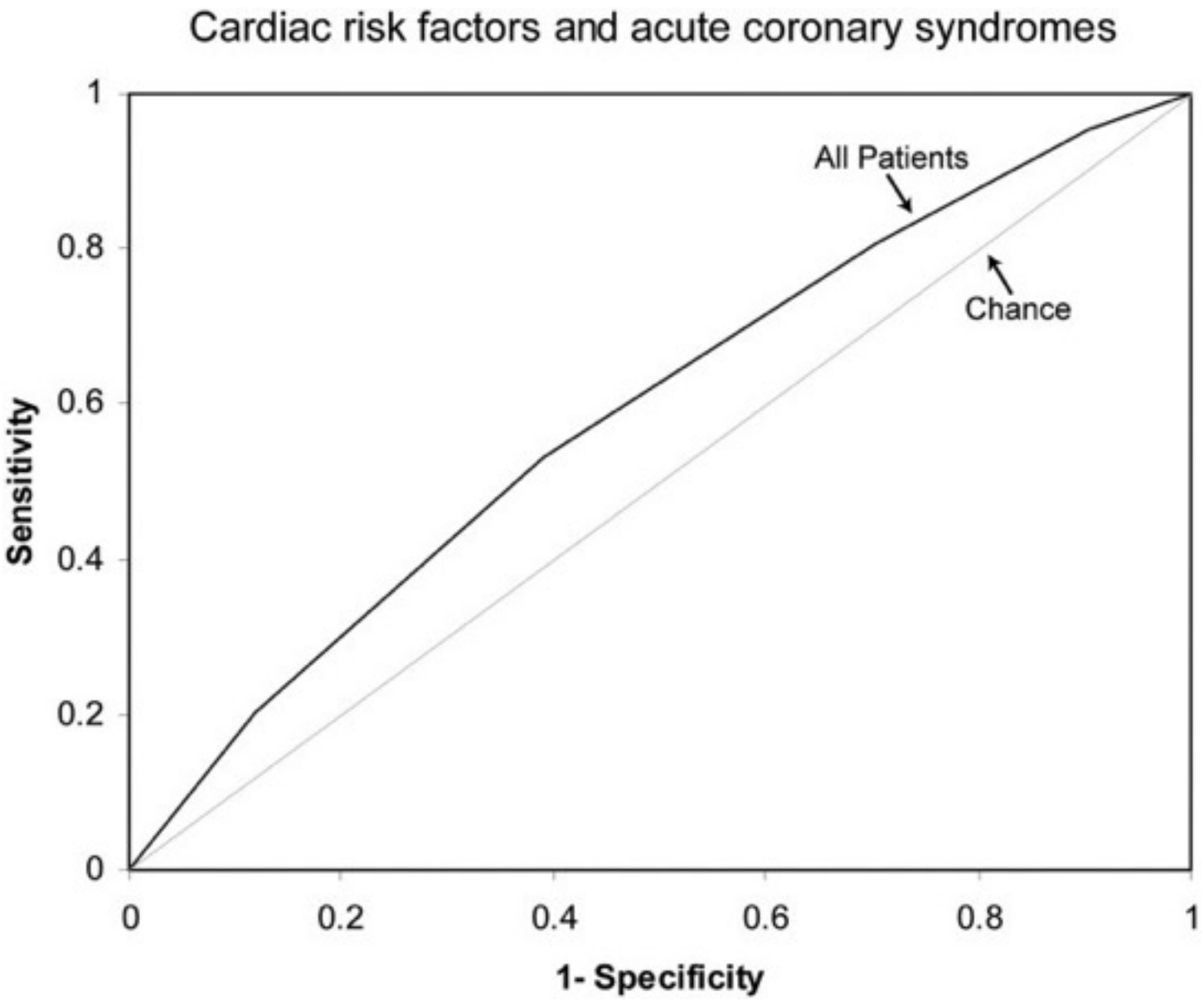
Do Risk Factors Matter?

Han et al. Annals of Emergency Medicine. 2007.

Post hoc analysis of registry data for 17K ED visits for suspected ACS

- 8 % had ACS
- Presence of Risk Factors Documented
  - HTN, HLD, DM, Tobacco, FHx
- In those < 40 YO
  - Absence of RF's had LR: 0.17
  - 4+ RF had LR: 7.4
- In those > 40 YO
  - **RF burden has limited clinical value**

Han et al. Annals of Emergency Medicine. 2007.



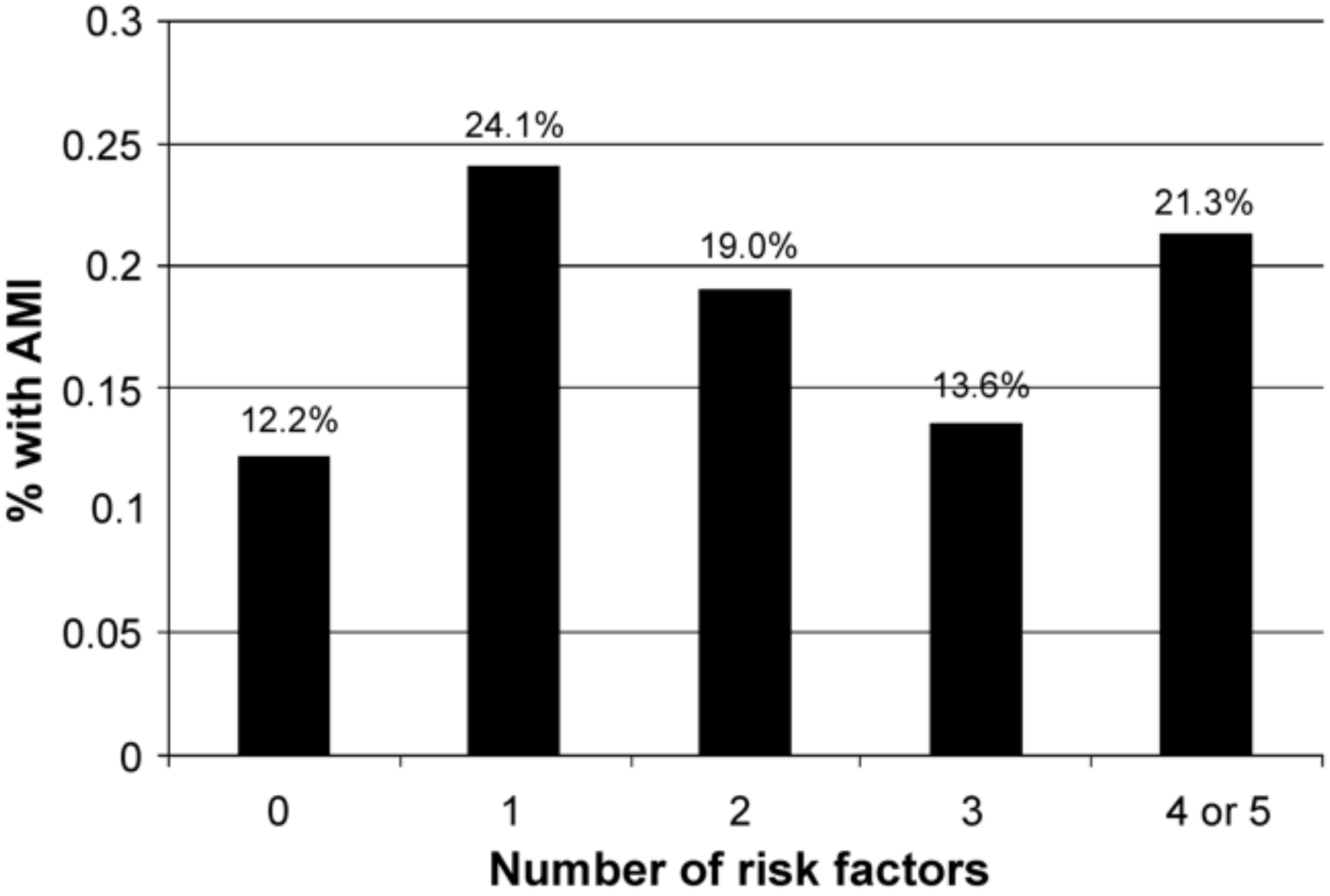
Do Risk Factors Matter?

Body et al. Do Risk Factors Help Dx AMI. Resuscitation. 2008.

~ 800 patients with suspected cardiac CP

- 18.6 % had AMI, all followed for 6 months
- Presence of Risk Factors Documented
  - HTN, HLD, DM, Tobacco, FHx
- No trend towards increasing incidence of AMI with increasing number of risk factors
- Useful in predicting prognosis in CAD
- **NOT USEFUL in Dx or Exclusion of AMI**

Body et al. Value of Symptoms & Signs. Resuscitation. 2008.



HPI Pearls

SEVERITY & CHARACTER of pain is not related to likelihood of AMI!

Risk Factors are NOT useful in Diagnosis or Exclusion of AMI!

History alone can help, but CAN'T rule out AMI!

So how do we define MI?

Evidence of necrosis in clinical setting consistent with MI

Detection of rise and/or fall of biomarkers (cTn) with at lease one value above the 99th percentile URL & at least one of the following:

- Symptoms of Ischemia
- New significant ST-T changes or new LBBB
- Q waves
- Imaging evidence of new wall motion abnormality
- Identification of intracoronary thrombus

Thygesen et al. 3rd Universal Definition of MI. JACC. 2012.

Risk Stratification Tools

ECG

HISTORY

Risk Factors & Scores

Biomarkers

Do we still need CK-MB?

Troponin has become standard

Correlates with prognosis

Incorporated into definition of MI

Removed CK-MB from lab panel at large academic center

- Looked for discrepancies between TN and CK-MB
- Only 17/6444 cases were discrepant
- **Of all 17, no patients were diagnosed with ACS**
- **Removal saved $47,000 in one year!**

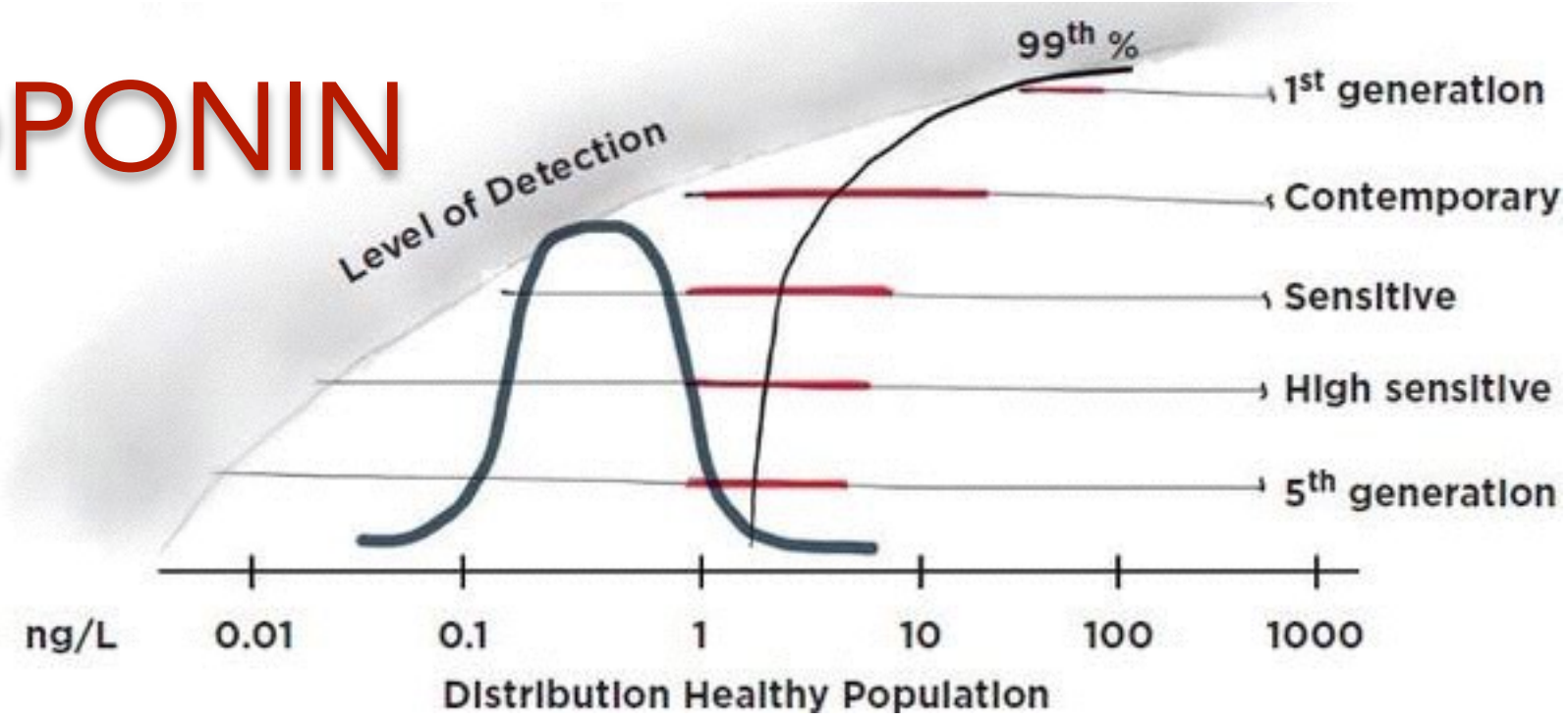
Le et al. Impact of removing CK-MB. Am J Emerg Med 2015.

Types of Acute MI

1 = Spontaneous	Related to ischemia from primary coronary event (plaque rupture, erosion, dissection)
2 = Demand/Supply Imbalance	Secondary to O2 supply/demand imbalance (Spasm, anemia, hypotension, arrhythmia)
3 = Sudden Death	Unexpected cardiac death, suggestive of MI, before labs sent
4A = PCI 4B=Stent Thrombosis	Associated with procedure or stent thrombosis on angiography or autopsy
5 = CABG	Associated with CABG

Thygesen et al. 3rd Universal Definition of MI. JACC. 2012.

TROPONIN



Lower Limit of Detection (LOD) - lowest concentration that can be reported. Values not reportable below this limit.

99th percentile upper reference limit (URL)- value which will be undetectable in 99% of the reference population for a given assay. Serves as decision level for diagnosis of AMI

Coefficient of Variation (CV) - Ratio of SD to the mean, primary measure of precision, indicates proportion of detected variability that is due to the assay itself. Lower values = greater precision and increased reliability of results

TROPONIN

Conventional	Limit of Detection = 99th% URL Poor precision CV=10-20%
4th Gen & Contemporary	Optimal precision (CV <10%) at 99th% URL
High Sensitivity	CV < 10% at 99th% URL. Measurable above LOD in 50% of population
Ultrasensitive	CV < 10% at 99th% URL. Measurable above LOD in 95% of population

Sherwood et al. High-sensitivity Troponin Assays. JAHA. 2014.

Conventional vs. HS-TROPONIN

Evaluated 17 Studies (N=8644)

- **Improved Sensitivity (88 & 93% vs 74 & 90%) & NPV at cost of Specificity & PPV**
- Identifies more patients who died or had MI at follow up
- + hs-TN, - c-TN = Increased risk of death or MI at follow up

Lipinski et al. TN Meta-Analysis. American Heart Journal. 2015.

HIGH-SENSITIVITY TROPONIN

Better NPV at cost of Specificity & PPV

Detectable in 90-180 minutes

Repeat at 3 hours reasonable

Deltas have better diagnostic value

Absolute changes in values > Relative change

Sherwood et al. High-sensitivity Troponin Assays. JAHA. 2014.

DDx of Troponin Elevation

Heart Failure	**Renal Failure**
Pulmonary Embolism	**CVA / Subarachnoid Hemorrhage**
Aortic Dissection	**COPD & Pulmonary Hypertension**
Aortic Valve Disease	**Infiltrative Diseases**
Hypertension	**Ablation, Pacing, Defibrillation**
Hypertrophic Cardiomyopathy	**Drugs/Toxins**
Dysrhythmias	**Burns**
Takotsubo Cardiomyopathy	**Extreme Exercise or Exertion**
Rhabdomyolysis	**Sepsis**
Cardiac Contusion	**Respiratory Failure**
Myocarditis	**List goes on…**

Newly et al. ACC Consensus Document on TN. JACC. 2012.

Biomarker Pearls

CK-MBs can be removed from routine ED lab panel without harming patients and can save $

hs-TN's have improved Sensitivity and NPV at the cost of Specificity and PPV!

Critical to interpret biomarkers in clinical context of the patient!

#1 - 65 YO NSTEMI ARREST

"Sounds fine, STABLE"

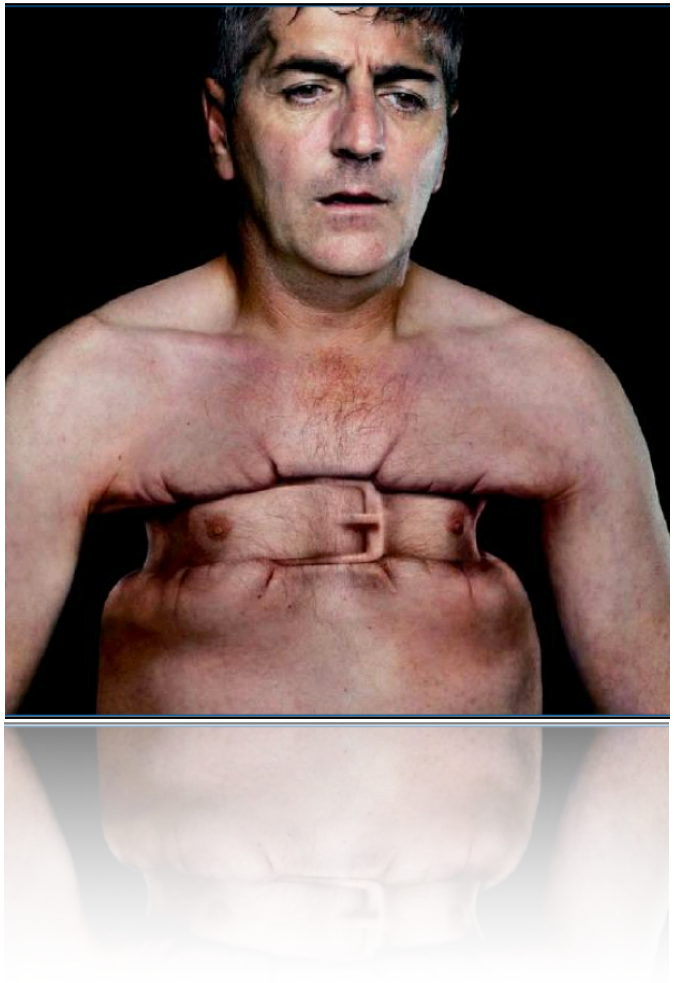
"Shouldn't be trouble"

V FIB ARREST

1st Troponin 0.2

ECG "Nonspecific"

Still has mild pain



Value of Post Arrest ECG

Zanuttini et al. Resuscitation. 2013

Post Arrest ECG is a poor detector of acute culprit lesions

Do not rely on seeing STE

Urgent/Immediate Invasive strategy for NSTE-ACS that develop HD or electrical instability (I, LOE A)

NSTE ACS Risk Stratification

Must stratify risk for future cardiovascular events

Ischemia Guided vs. Invasive strategy (early or delayed angio)

- **Urgent/Immediate Invasive (2 hours)**
  - Refractory ischemia despite aggressive medical tx (I,A)
  - HD instability / Sustained VT or VF (I,A)
  - Evolving Acute Heart Failure
  - New or worsening MR
- **A GRACE > 140, or > 4 TIMI & HEART > 7have been shown to benefit from invasive strategies**

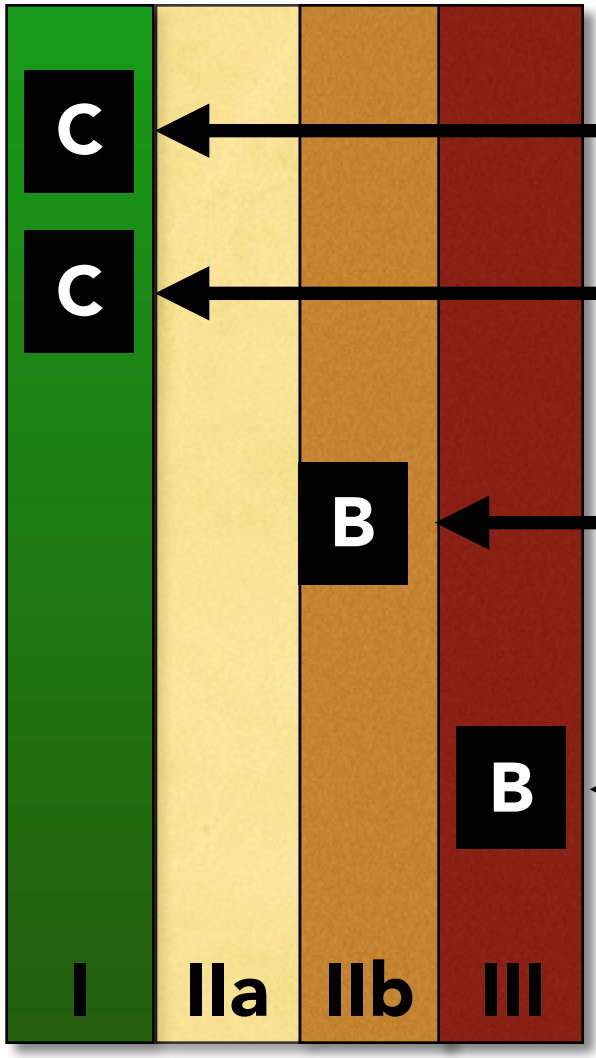
Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

NSTE ACS Risk Stratification

- **Early Invasive (within 24h)**
  - "Initially stabilized" but have elevated risk for clinical events
  - GRACE > 140
  - New STD
- **Delayed Invasive (25-72 h)**
  - PCI within 6 months
  - Prior CABG
  - GRACE 109-140, TIMI score ≥ 2, HEART ≥ 4
  - Reduced LVEF < 40%
- **Ischemia Guided**
  - Low risk score - TIMI (0 or 1), GRACE < 109
  - Normal TNs

Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

ACS in the ED



AVOID Hyperoxia, O2 for hypoxia

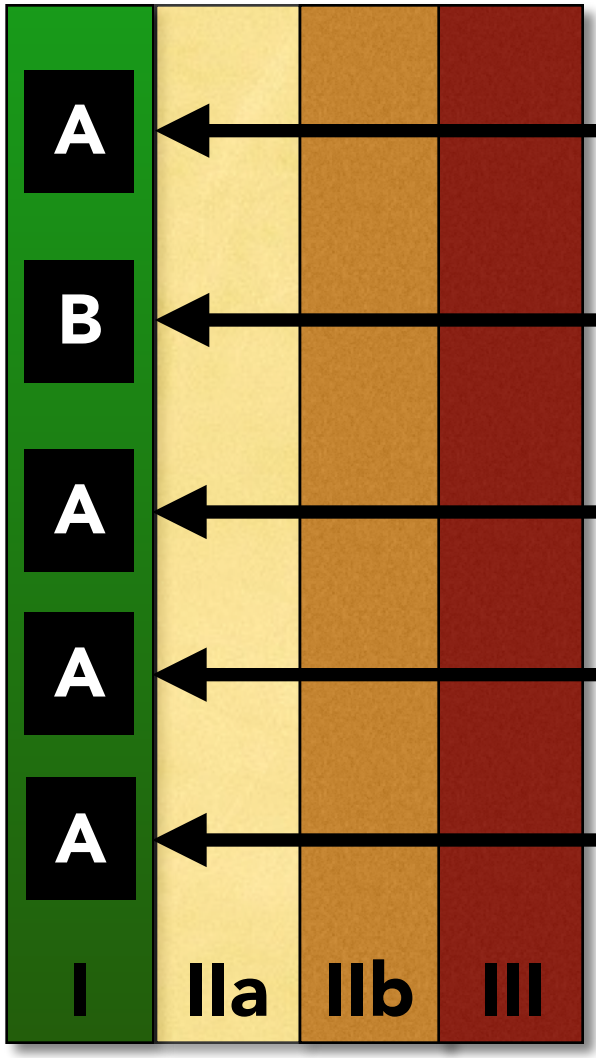
NTG: SL q 5 mins x 3 doses then IV

Morphine: Refractory pain, downgraded for worse outcome and increased mortality

NSAIDS: Avoid/Discontinue, Increases MACE

Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

ACS in the first 24 hours!



Beta Blockers: PO if no CI's. Harmful in shock!

CCB's: When BB's contraindicated

Statins: In absence of CI's

ACE-Inhibitors: HTN, DM, LVF<40%

ARB's:When intolerant to ACE-I

Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

NSTE ACS Ischemia Guided Tx

ASA IMMEDIATELY

Antianginal Tx

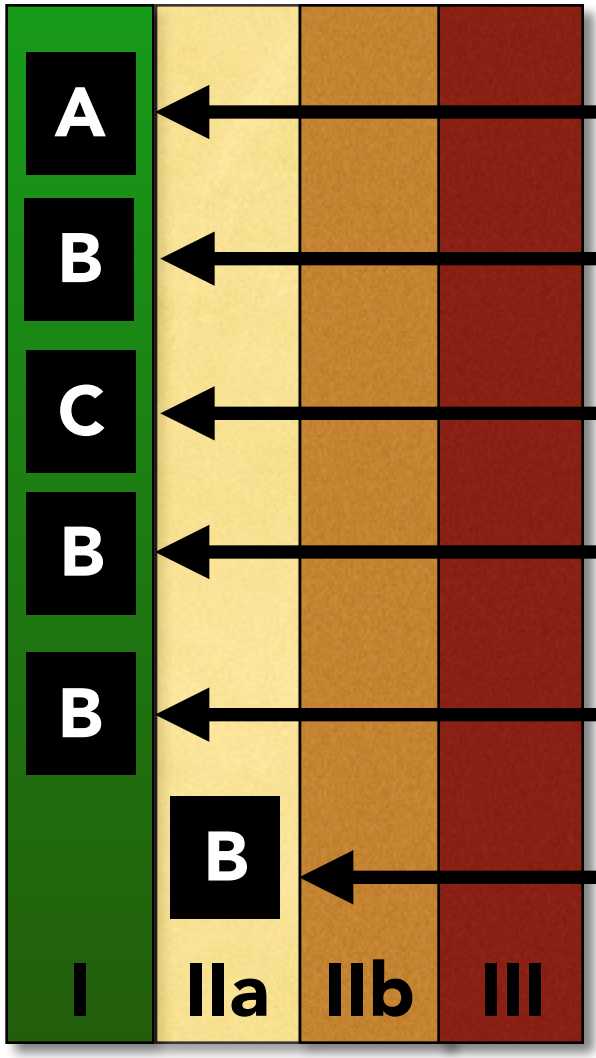
BBs orally within 24 hours

No timeframe given for:

P2Y12 Inhibitors, statins, or anticoagulants

Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

Antiplatelets: Invasive NSTE ACS



Aspirin: 162-325 AT PRESENTATION

Clopidogrel: If can't tolerate ASA

Alternatively: **Prasugrel or Ticagrelor**

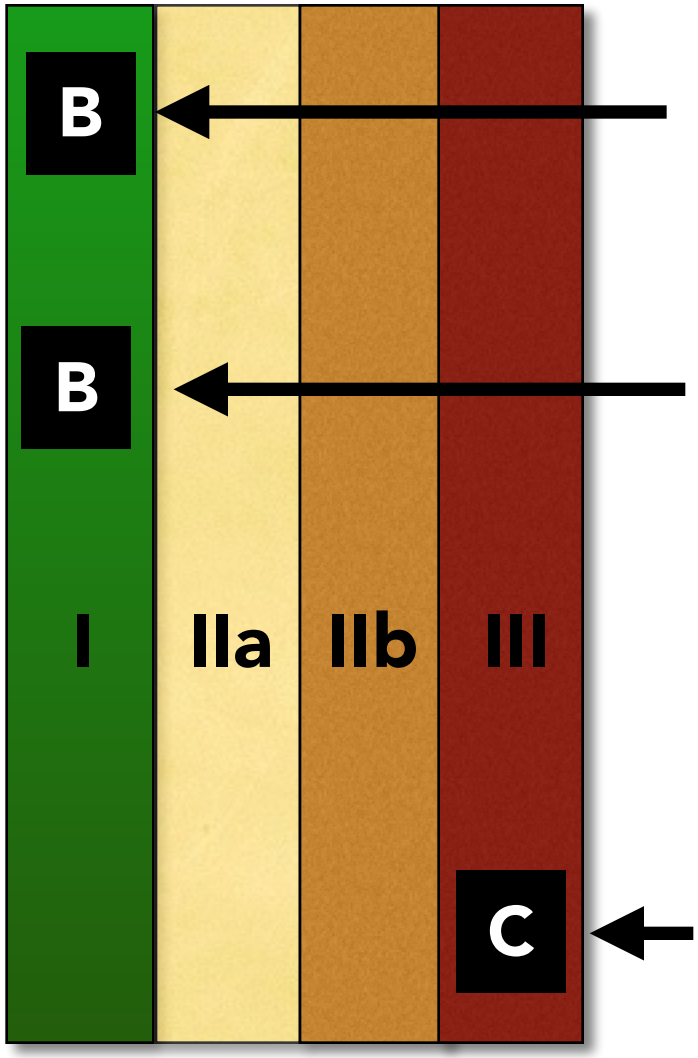
Dual Antiplatelet if > Mod Risk

Before PCI: Clopidogrel or Ticagrelor

Ticagrelor > Clopidogrel

Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

Antiplatelet Therapy in STEMI



Aspirin: 162-325 AT PRESENTATION

Loading Dose of a P2Y12 Receptor Inhibitor should be given

BEFORE OR AT PCI

Clopidogrel: 600

Ticagrelor: 180

Prasugrel: 60

Prasugrel: Avoid if >75, <60 kg or prior TIA/CVA

O'Gara et al. ACCF/AHA STEMI Guidelines. JACC. 2013

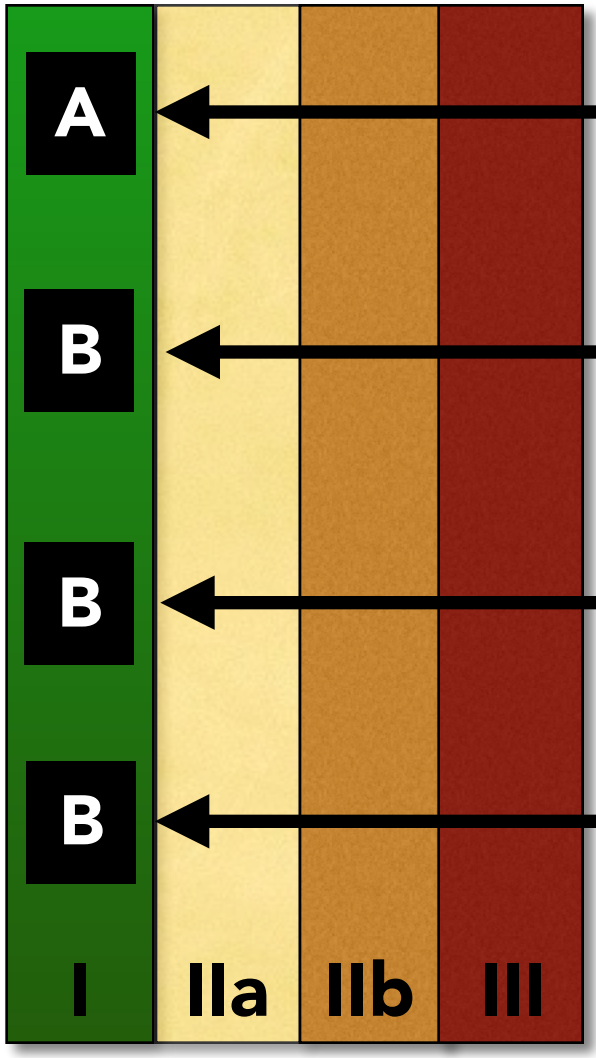
Antiplatelet Pearls

USE DAPT for your High Risk Patients (STEMI & NSTE ACS)

IV GPI's are potent & have higher bleeding risk than PO P2Y12 inhibitors

Follow institutional protocol and discuss individual tx with consultants

Anticoagulants: Invasive NSTE ACS



Enoxaparin: During hospitalization or until PCI.

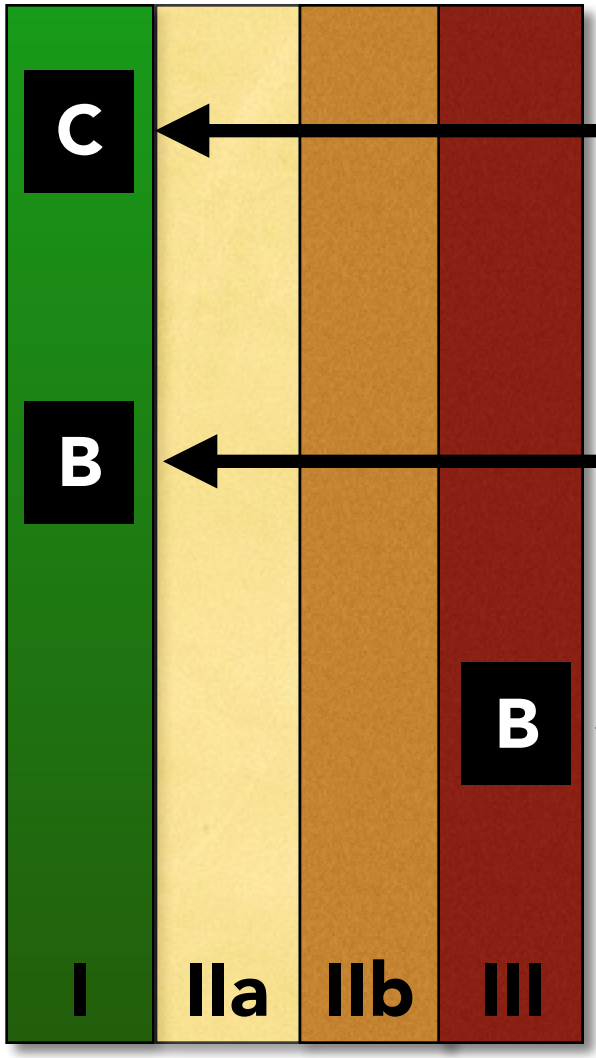
UFH: Use if angio or CABG likely in first 24 hours

Bivialrudin: Until PCI is performed

Fondaparinux: During hospitalization or until PCI. Need additional AC with PCI

Amsterdam et al. AHA/ACC NSTEMI Guideline. JACC. 2014

Anticoaguant Therapy in STEMI



UFH: Use instead of LMWH, dose dependant on GPI use

Bivalirudin: Until PCI is performed

Fondaparinux: Not recommended as sole anticoagulant for Primary PCI

O'Gara et al. ACCF/AHA STEMI Guidelines. JACC. 2013

Anticoagulant Pearls

ONE SIZE DOES NOT FIT ALL!

Preference for one strategy over another is ELUSIVE on a global basis

Seek PROSPECTIVE agreement amongst all stakeholders of ACS care!

Risk Stratification Tools

ECG

HISTORY

Risk Factors & Scores

Biomarkers

GRACE

Estimated admission - 6 month mortality/MI in ACS

Variables

- Age
- Killip Class
- BP
- HR
- ST-deviation
- Cardiac Arrest
- Creatinine
- Elevated Biomarkers

Fox et al. British Medical Journal. 2006

GRACE

Prospectively validated (N > 20K) to stratify risk in patients diagnosed with ACS (**known STEMI or NSTEMI**) to estimate mortality

Like TIMI, not designed to assess which patients' symptoms are due to ACS

Elbarouni et al. American Heart Journal. 2009

HEART Score for MACE

HISTORY	Highly (2), Moderately (1), or Slightly Suspicion (0)?
ECG	Significant ST-D (2), Nonspecific (1), or Normal (0)?
AGE	≥ 65 (2), 45-65 (1), or ≤ 45 (0)
RISK FACTORS	≥ 3 RF's or Hx CAD (2), 1-2 RF's (1), No known (0)
TROPONIN	≥ 3 X's normal limit (2), 1-3 X's normal (1), Nl limit (0)

Backus et al. Neth Heart J. 2008.

HEART Score for MACE

~120 patients, Outcome was MACE at 6 wks
16 had MI, 20 Revascularized, 2 died

- 0-3: 2.5% risk of MACE - Low Risk, Discharged
- 4-6: 20.3% risk of MACE - High Risk, Admitted
- ≥7: 72.7% risk of MACE - High Risk, Early Invasive Strategies

Backus et al. Neth Heart J. 2008.

HEART Score for MACE

~2400 patients, from 10 hospitals

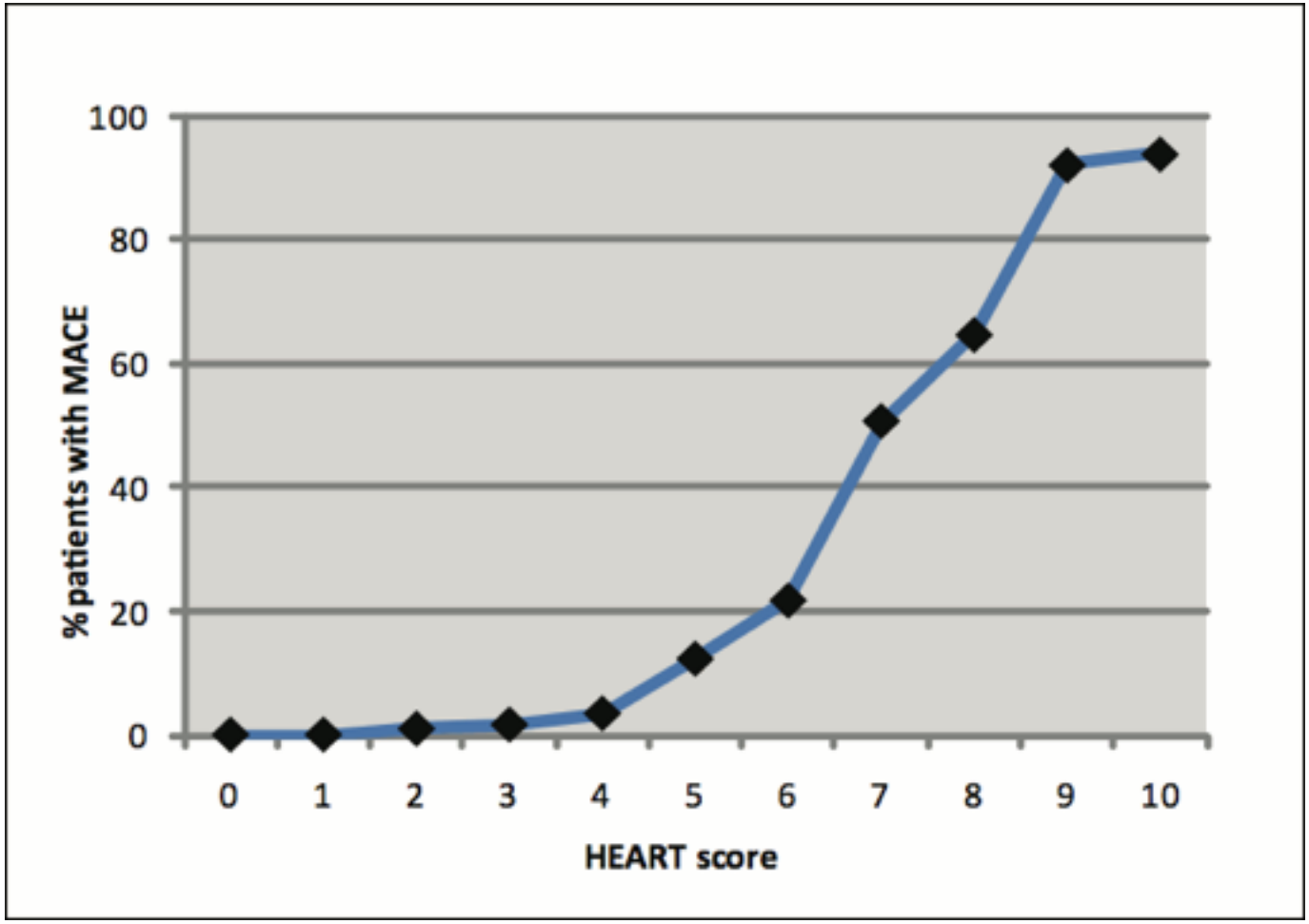
Applied TIMI, GRACE and HEART. Looked at MACE at 6 wks

- 0-3: 36.4 % of patients, had 1.7% Risk
- 4-6: 16.6% Risk
- ≥7: 50.1% Risk
- C-statistic of HEART (0.83) > TIMI (0.75) > GRACE (0.70)

Performed better than TIMI and GRACE and provided quick and reliable predictor of outcomes in ED CP!

Backus et al. Prospective Validation. Int J of Cardiology. 2013.

HEART: Discriminative Power



Backus et al. Prospective Validation. Int J of Cardiology. 2013.

HEART Score Pearls

Quick, Reliable, made by EPs for the ED!

Looks for who will Have MACE at 6 wks

High NPV for MACE at 6 weeks exceeding 98%, performed better than TIMI & Grace

LOW RISK CP

Guideline adherent care is

Inefficient & Expensive!

Lots of stress tests and hospitalization, few with ACS, harm from false +'s

Can we SAFELY identify patients that can be discharged without provocative tests?

CHEST PAIN & ACS

~ 8-10 Million visits in US alone

> 50% get "full" workup

$ 10-13 Billion Annual Cost

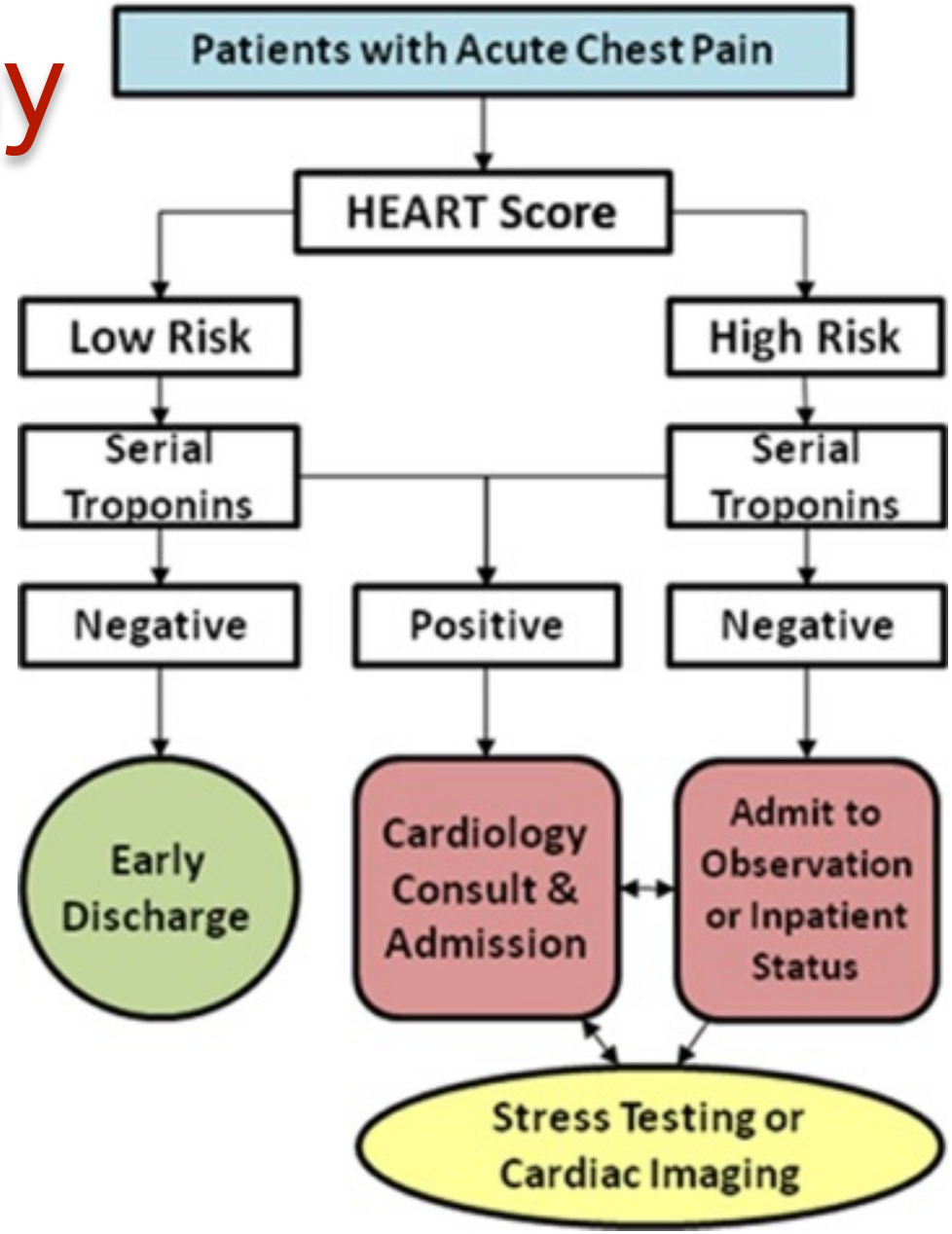
< 10 % Diagnosed with ACS

Mahler et al. Circulation: Cardiovascular Quality and Outcomes. 2015.

HEART Pathway

HEART Score +
0 & 3 hr TN

Limitations
Size
Single Center
Non-adherence



Mahler et al. Circulation: Cardiovascular Quality and Outcomes. 2015.

HEART Pathway RCT

282 ED CP patients without STEMI randomized to HEART Protocol vs Usual Care (AHA guideline)

- –Primary Outcome: Cardiac Testing (stress tests or angiography)
- –Secondary Outcomes: LOS, early DC, MACE at 30 days
- –16 % had MI and 6 % had MACE

Mahler et al. Circulation: Cardiovascular Quality and Outcomes. 2015.

HEART Pathway RCT

- **Decreased stress testing by 12 %** (69% vs 57%, p=0.048)
- **Decreased LOS by 12 hours** (10 vs. 22 hours, p=0.013)
- **Increased Early Discharges by 21%** (39% vs 18%, p <0.001)

No patients discharged early (71% of Low Risk Pts.) had MACE at 30 days!

Mahler et al. Circulation: Cardiovascular Quality and Outcomes. 2015.

HEART Pathway RCT

Decision Aid not a substitute for clinical judgement

- Non-adherence to pathway in 29% (19/66) of low risk patients and 13% of high risk patients
- None of the low risk patients had MACE at 30 days
- **Perfect adherence would have increased early DC rate to 47%**

Mahler et al. Circulation: Cardiovascular Quality and Outcomes. 2015.

HEART Pathway Pearls

REDUCES Utilization
(stress tests, hospitalization, LOS)

Doubled ED rate of early discharge
~ 40%, & reduced LOS by 1/2 a day!

No Missed MACE

How well do we Communicate Risk?

Newman et al. Annals of Emergency Medicine. 2015

Surveyed patients & their physicians (N=425 pairs)

- Low risk cohort - <2% risk of Death/MI in 30 days
- **Communication was POOR**
- Discussion of risks and reasons for admission in ONLY ~2/3
- Agreement on risk only 36% of the time
- Patients: Home vs Admission Risks = 80% vs 10%
- Physicians: Home vs Admission Risks = 15% vs 10%
- **BOTH OVERESTIMATED RISK of ADVERSE EVENTS**
- **"Collective statistical illiteracy"**

What's Next?

Prepared for: _____

1 Your Chest Pain Diagnosis

Our initial evaluation has NOT shown any evidence of a heart attack. This conclusion is based on a blood test (to look for troponins — enzymes that are released when the heart muscle is damaged) and an electrocardiogram (to check that your heart is getting enough oxygen and blood). Over the next five hours, two additional blood tests (troponins) will be taken to definitively rule out a heart attack.

However, even if these tests do confirm our diagnosis, your chest pain may indicate possible warning signs of a FUTURE heart attack.

2 Further Tests

A STRESS TEST EVALUATION may more precisely determine if your heart is functioning correctly by viewing blood flow to your heart while at rest and under stress.

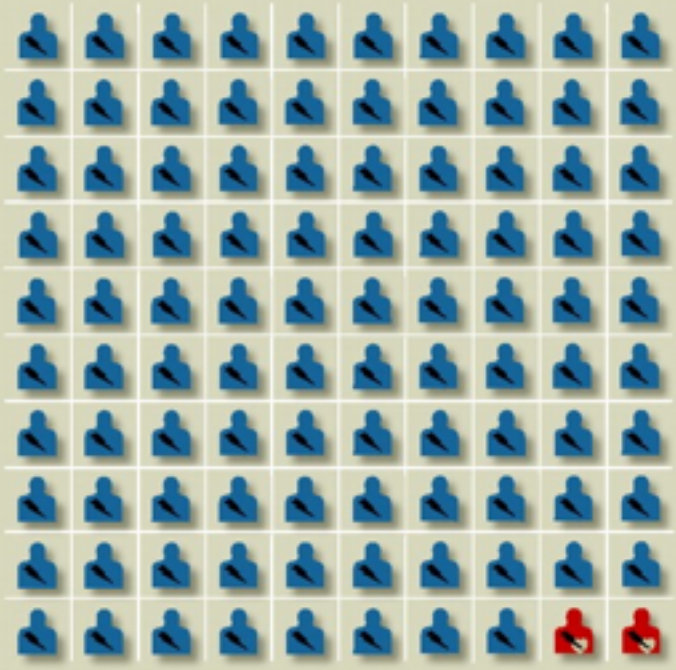
Examining your risk will help you to determine whether you would like to have a stress test now or would like assistance in making a clinic appointment.[1]

3 Your Personal Risk Evaluation

Your risk of having a heart attack or of having a pre-heart attack diagnosis within the next 45 days can be determined by comparing you to people with similar factors[2] who also came to the Emergency Department with chest pain.

Of every
100
people with factors like yours who came to the emergency department with chest pain...

2
had a heart attack or a pre-heart attack diagnosis within 45 days of their emergency department visit,
98
did not.



4 Would You Like to Have a Stress Test Now or Make an Appointment?

- ❑ **I would like to be admitted to the observation unit to have an urgent cardiac stress test.** I realize that this could add to the cost of my evaluation and lengthen my emergency stay.
- ❑ **I would like to be seen by a Mayo Clinic heart doctor within 24-72 hours** and would like assistance in scheduling this appointment.
- ❑ **I would like to schedule an appointment on my own** to consult with my primary care physician.
- ❑ **I would like my emergency department doctor to make this decision for me.**

[1] Stress test options include nuclear stress testing, ultrasound stress testing, and exercise ECG (electrocardiogram) stress testing. Nuclear stress testing includes exposure to radiation which has been shown to be related to increased cancer risk over a lifetime. Your doctor can help you explore which option may be best for you.

[2]
- Age
- Gender
- Race
- If chest pain is made worse when manual pressure is applied to the chest area
- If there is a history of coronary artery disease
- If the chest pain causes perspiration
- Findings on electrocardiograms (electronic tracings of the heart)
- Initial cardiac troponin T result

Shared Decision Making!

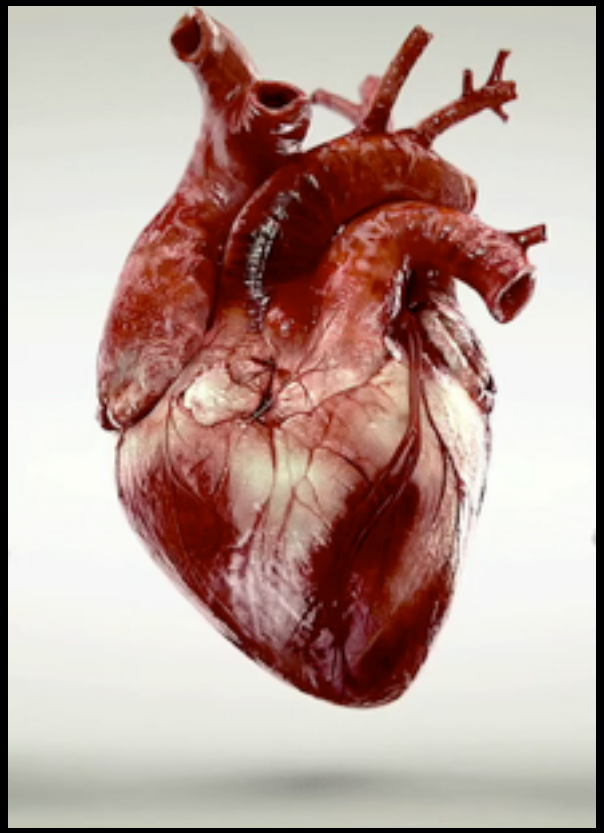
Hess et al. Circulation: Cardiovascular Quality & Outcomes. 2012

Prospective RCT (N = 204)

Randomized to Decision Aid vs Usual Care & followed for 30 days

Primary outcome: Patient knowledge by survey

- Used a 100 person pictograph of Pretest Probability
- Options: Observation & Stress Test vs. OP follow up in 24-72 hrs
- Decision Aid:
  - **More knowledgeable**
  - **More engaged & involved**
  - **Decided to be observed LESS (58% vs 77%)**
  - **No MACE in either group**



Let's Summarize

ECG Pearls

~1/3 of pts. with MI may have no CP!

Door to ECG time < 10 minutes!

Not 100%. 1-6% of MIs have normal ECG

Serial ECGs q 15 -30 mins
in symptomatic patients
with nondiagnotic ECGs

ECG Pearls

Consider STEMI equivalents!

Watch for Hyperacute T-waves

Watch for Early Reciprocal Changes (aVL)

ST-D?

Look at aVR & Posterior leads before signing “NO STEMI”

ACS HPI Pearls

SEVERITY & CHARACTER of pain is not related to likelihood of AMI!

Risk Factors are NOT useful in Diagnosis or Exclusion of AMI!

History alone can help, but CAN'T rule out AMI!

INCREASED
likelihood of ACS/AMI

1. EXERTIONAL CP
2. RADIATION
3. DIAPHORESIS
4. VOMITING

DECREASED
likelihood of ACS/AMI

1. PLEURITIC CP
2. POSITIONAL CP
3. SHARP/STABBING
4. REPRODUCIBLE

Biomarker Pearls

CK-MBs can be removed from routine ED lab panel without harming patients and can save $

hs-TN's have improved Sensitivity and NPV at the cost of Specificity and PPV!

Critical to interpret biomarkers in clinical context of the patient!

The Final Pearls

Guideline adherent care is inefficient & $$$

HEART score is quick & reliable with high NPV

Even more sensitive when combined in a pathway with 2 tropinins

Has potential to ↓ resource utilization and ↑ early discharge without sig. adverse outcomes

THANK YOU!

@alifarzadmd