Chest Pain Evaluation: Red herring or the real deal?

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Learning Objectives

Upon conclusion of this lecture, the participant will be able to:

1. Describe cardiac vs. non-cardiac chest pain
2. Discuss risk stratification for patients with suspected cardiac chest pain
3. Understand appropriate and optimal testing for both cardiac and non-cardiac etiologies of chest pain
4. Describe the treatment of common causes of chest pain

Cardiac Chest Pain

Myocardial ischemia
- ACS
- Stable angina

Aortic dissection

Pericarditis

Myocarditis

Pericardial tamponade

Heart failure

Arrhythmia

Mr. N

68-year-old male with HTN, HLD, GERD, and ongoing tobacco abuse presents to the ED with substernal chest pain.

He describes the pain as “tightness and pressure”, which began two hours ago while sitting at his desk. The pain lasted an hour and radiated to his left shoulder and arm. He is currently pain-free.

Mr. N

On exam:

- BP 145/87 (R) 141/85 (L), HR 74, RR 16, O_2 99% RA
- General → WDWN. NAD. A&Ox3.
- Heart → RRR without MRG.
- Lungs → CTA B/L.
- Abdomen → +BS. Soft. ND. NT.
- Extremities → Peripheral pulses 2+ B/L. No pedal edema B/L.

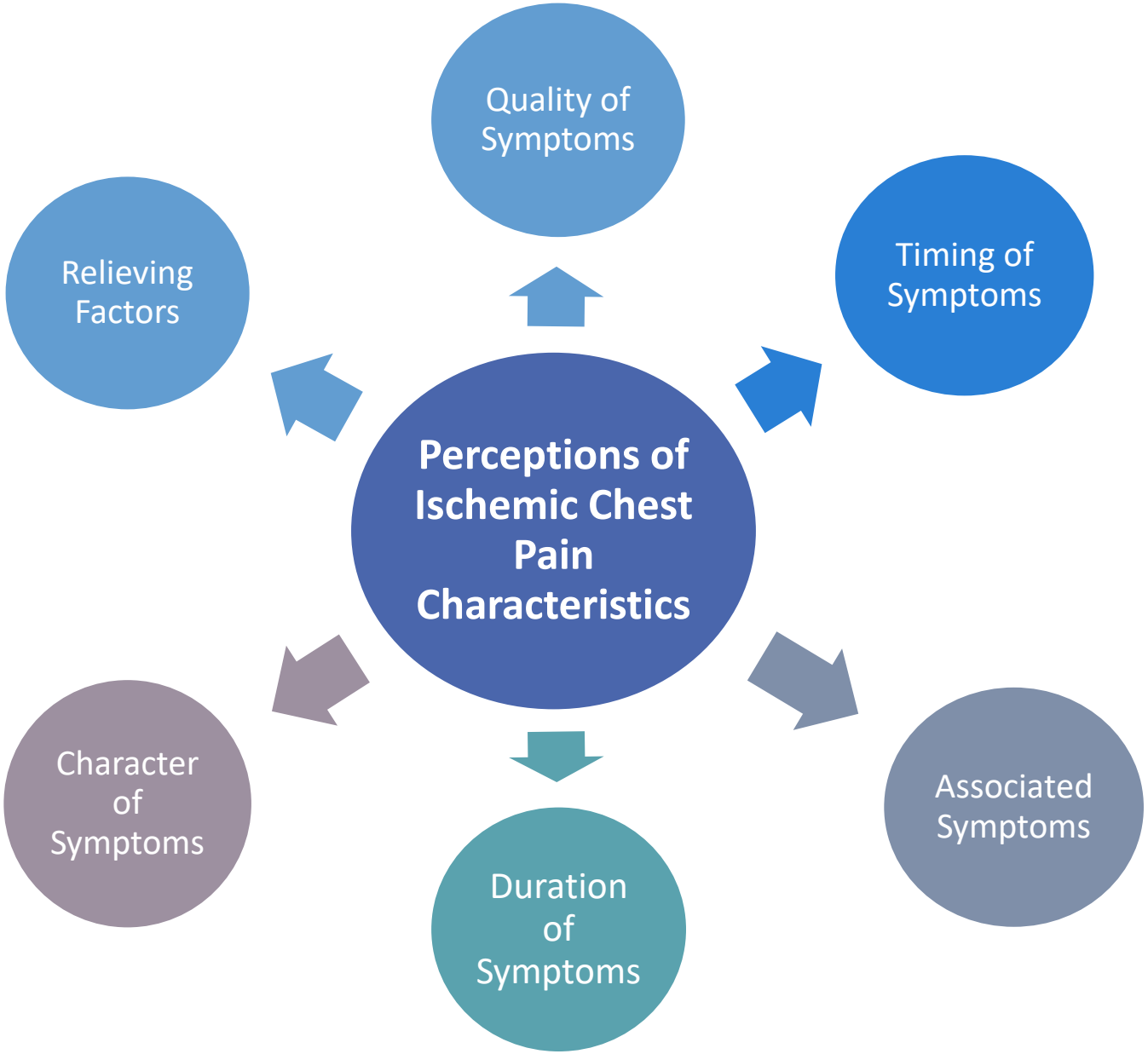
What is your differential diagnosis?

Chest Pain

Common presenting compliant in all settings

- More than **8% of** ED visits each year as a result of acute CP
  - Less than 10% of these have ACS
- Approximately 1%- 20% of primary care present with chest pain
  - 2-4% of patients presenting to primary care will have ACS
- Despite recognized protocols, significate variation in management exists
  - Variation in admissions rates 54-96% of patients with CP.

Source: Slankamenac 2019, Dundas 2022, Smulowitz et al 2017


Quality of Symptoms
Timing of Symptoms
Relieving Factors
Perceptions of Ischemic Chest Pain Characteristics
Character of Symptoms
Associated Symptoms
Duration of Symptoms

Features With Increased Probability of MI

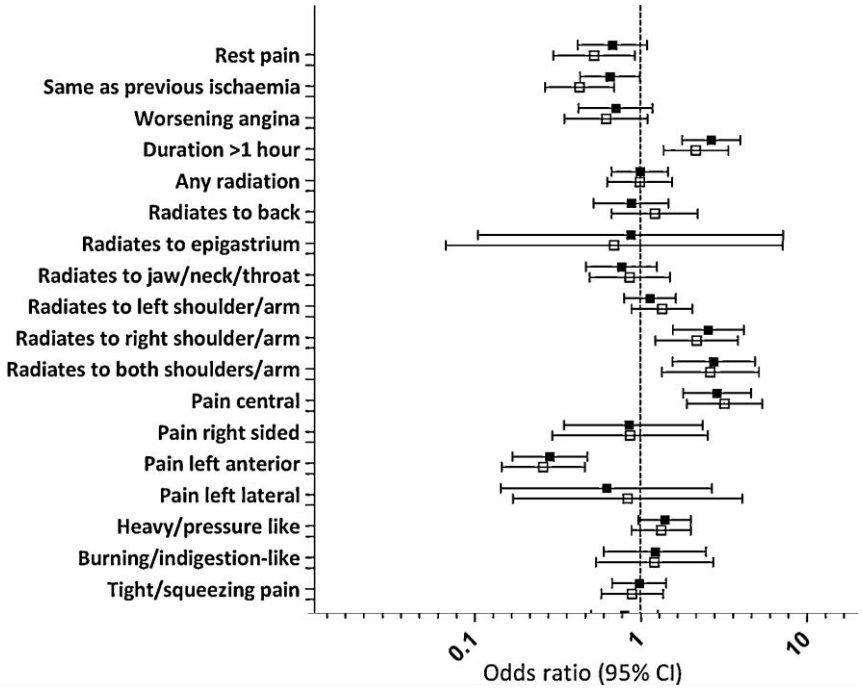
Table 2. Value of Specific Components of the Chest Pain History for the Diagnosis of Acute Myocardial Infarction (AMI)

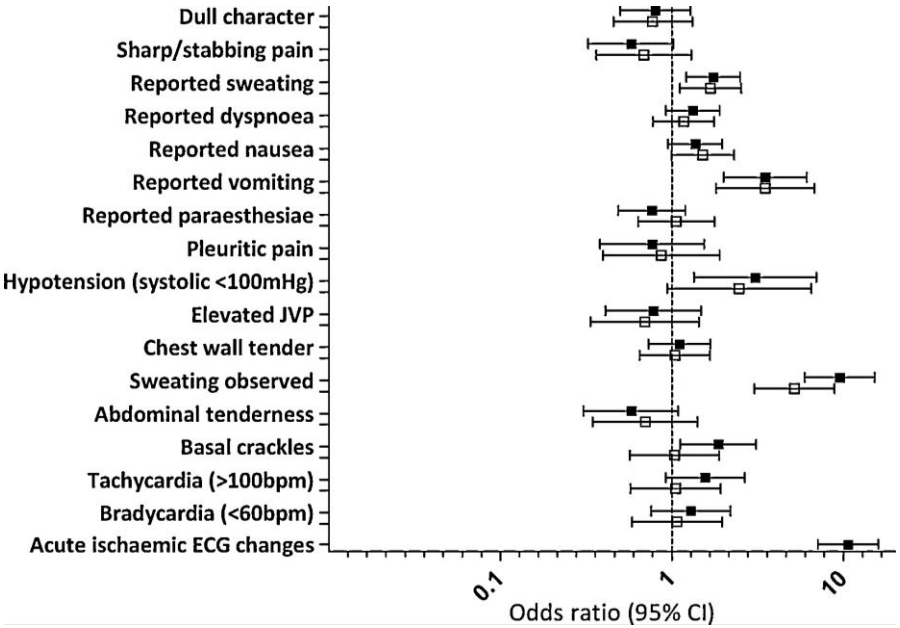
Pain Descriptor	Reference	No. of Patients	Positive Likelihood Ratio (95% CI)
Increased likelihood of AMI			
Radiation to right arm or shoulder	29	770	4.7 (1.9-12)
Radiation to both arms or shoulders	14	893	4.1 (2.5-6.5)
Associated with exertion	14	893	2.4 (1.5-3.8)
Radiation to left arm	24	278	2.3 (1.7-3.1)
Associated with diaphoresis	24	8426	2.0 (1.9-2.2)
Associated with nausea or vomiting	24	970	1.9 (1.7-2.3)
Worse than previous angina or similar to previous MI	29	7734	1.8 (1.6-2.0)
Described as pressure	29	11 504	1.3 (1.2-1.5)
Decreased likelihood of AMI			
Described as pleuritic	29	8822	0.2 (0.1-0.3)
Described as positional	29	8330	0.3 (0.2-0.5)
Described as sharp	29	1088	0.3 (0.2-0.5)
Reproducible with palpation	29	8822	0.3 (0.2-0.4)
Inframammary location	31	903	0.8 (0.7-0.9)
Not associated with exertion	14	893	0.8 (0.6-0.9)

Abbreviations: AMI, acute myocardial infarction; CI, confidence interval.

Swap et al, 2005; Ferry et al 2019; Mahajan et al, 2019

Features With Increased Probability of MI





Not all Chest Pain is the Same

Women
- "Atypical" can be a mischaracterization
  - 2019 study of ~2000 women found "typical" chest pain is more commonly reported (77% vs 59%)- Women with typical MI systems have greater positive predictive value

Black
- 32% higher mortality than white patients
- Symptoms less likely to be recognized and more likely to have delay in treatment
- Less likely to undergo coronary angiography than white patients
- Patients with diabetes significantly worse MACE then white patients

Hispanic Non-Black
- Less likely to undergo coronary angiography than white patients
- CVD mortality similar to white patients

"Non-white individuals continue to receive less guideline-concordant care and experience higher rates of MACE" Simon and Ho- 2020

Elderly
- Over 60% of the MIs and >80% of the MACE
- More likely to have atypical symptoms and delay in treatment than nonelderly patients

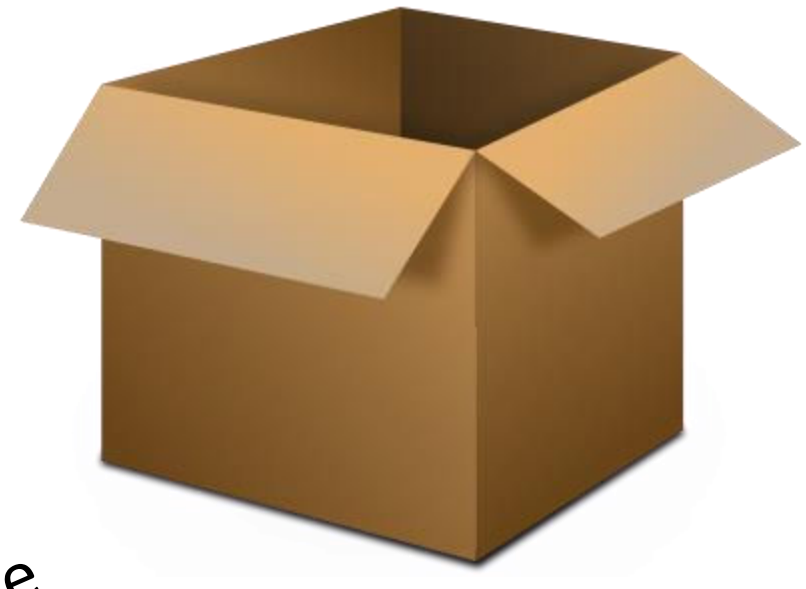
Differential Diagnosis

	Critical	*Less Critical*
Cardiac	*ACS, aortic dissection*	*Pericarditis, myocarditis*
Pulmonary	*PE, pneumothorax*	*Pneumonia, pleurisy, pleural effusion*
Gastrointestinal	*Esophageal rupture, perforated ulcer*	*GERD, esophageal spasm, esophagitis, PUD, cholecystitis*
Musculoskeletal	-	*Costrochondritis, rib fracture, cervical stenosis*
Dermatologic	-	*Herpes zoster*
Psychiatric	-	*Anxiety, panic attack*

Thinking Outside the Box…

Acute chest syndrome (sickle cell anemia)

Trauma



Referred pain

Precordial catch syndrome

Substance abuse

Malignancy

Herpes zoster

Diagnostic Approach

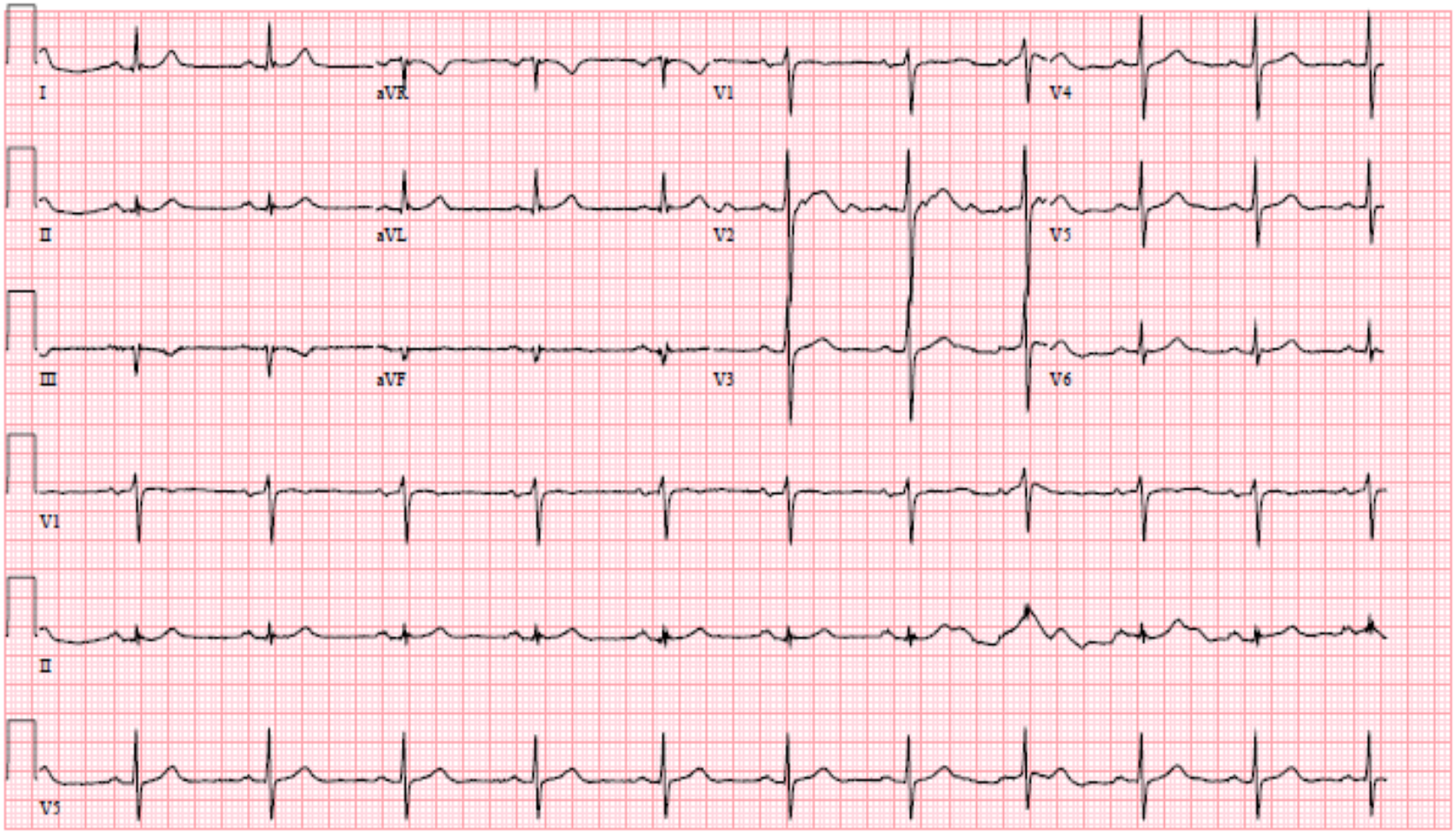
Step 1: Rule out critical conditions

- ACS → urgent ECG!
- Aortic dissection
- PE

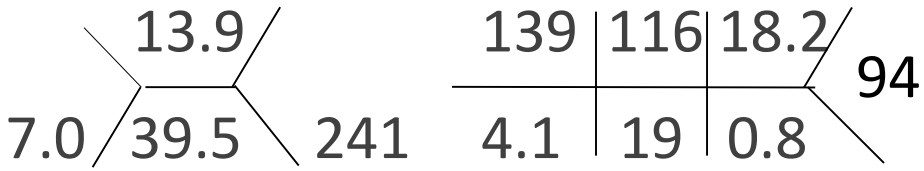
Step 2: Risk stratify patients for cardiac etiology

Step 3: Evaluate for less critical conditions

Mr. N



Mr. N's Labs



	Mr. Sullivan	Reference Range
High Sensitivity Troponin	<0.010	<0.010

- ECG, CXR, and one set of cardiac enzymes are normal.
- What do you do next?

Cardiac Enzymes

Test	Onset	Peak	Duration
CK (Isomers)	3-12 hours	18-24 hours	36-48 hours
Troponin T	3-12 hours	18-24 hours	Up to 10 days
Troponin High Sensitivity	2-3 hours	12- 48 hours	4-10 days

High-Sensitivity Troponin T (hs-cTnT)

5th generation

High-sensitivity assays for hs-cTnT can detect levels as low as 5ng/L.

hs-cTnT ≠ the current Troponin T

- The values should not be compared.
- hs-cTnT can detect lower levels.
- Shorter time intervals between repeat values
  - Possible intervals: 0, 2, and 6 hours

High-sensitivity troponin has greater early sensitivity and negative predictive value compared with conventional troponin

How to Interpret the Values (ng/L)

Whole numbers not decimals

Normal or elevated - not negative or positive

99th% upper limit normal

- Male: 15 ng/L
- Female: 10 ng/L

Deltas from Time 0	
2h Δ	≤3 = unchanged 4-9 = intermediate ≥10 = Changing
6h Δ	≥12+ = Changing

High-Sensitivity Troponin T (hs-cTnT)

What about the value of a single test?

In ED

- Initial results of <5 ng/l does as a clinical predictor does have some value in low- risk patients
  - Generally, not relied upon

In primary care

- Study in the Netherlands found reduction on non-ACS patient referral by about 7% using point of care hs-TnT
  - Generally, not relied upon in the US

Sandoval 2019; Kip, 2017

Risk Stratification

ED/Hospital

- Heart Score
- Timi

Outpatient

- Marburg Heart Score
- INTERCHEST

TIMI Risk Score

Variables

- Age ≥65 years
- ≥ three risk factors for CHD
- Prior coronary stenosis of ≥50 percent
- ST segment deviation on admission ECG
- ≥ two anginal episodes in prior 24 hours
- ↑ serum cardiac biomarkers
- Aspirin use in prior seven days

TIMI Risk Score

↑ TIMI risk score =
↑ numbers of events at 14 days

All-cause mortality, new or recurrent MI, or severe recurrent ischemia requiring revascularization

Score	Risk %
0-1	4.7
2	8.3
3	13.2
4	19.9
5	26.2
6-7	40.9

HEART Score

- Useful to evaluate undifferentiated chest pain in the ED

	0 points	1 point	2 points
History	Incompatible with ACS	Potentially compatible with ACS	Strongly suggestive of ACS
ECG	Normal	Nonspecific repolarization abnormalities	ST depression or transient ST elevation
Age	<45	45-65	>65
Risk Factors	None	1-2 Risk Factors	3 Risk Factors or known CAD
Troponin Levels	Normal	1-3x upper limit of normal	>3x upper limit of normal

HEART Score

Predicts 6 week risk of major adverse cardiac event (MACE)

- Risk of missed ACS <1%

Score	Risk	Recommendation
0-3	Low Risk	Outpatient follow up
4-6	Moderate Risk	Admission to hospital
7	High Risk	Admission to hospital

Back to Mr. N

HEART score = **6**

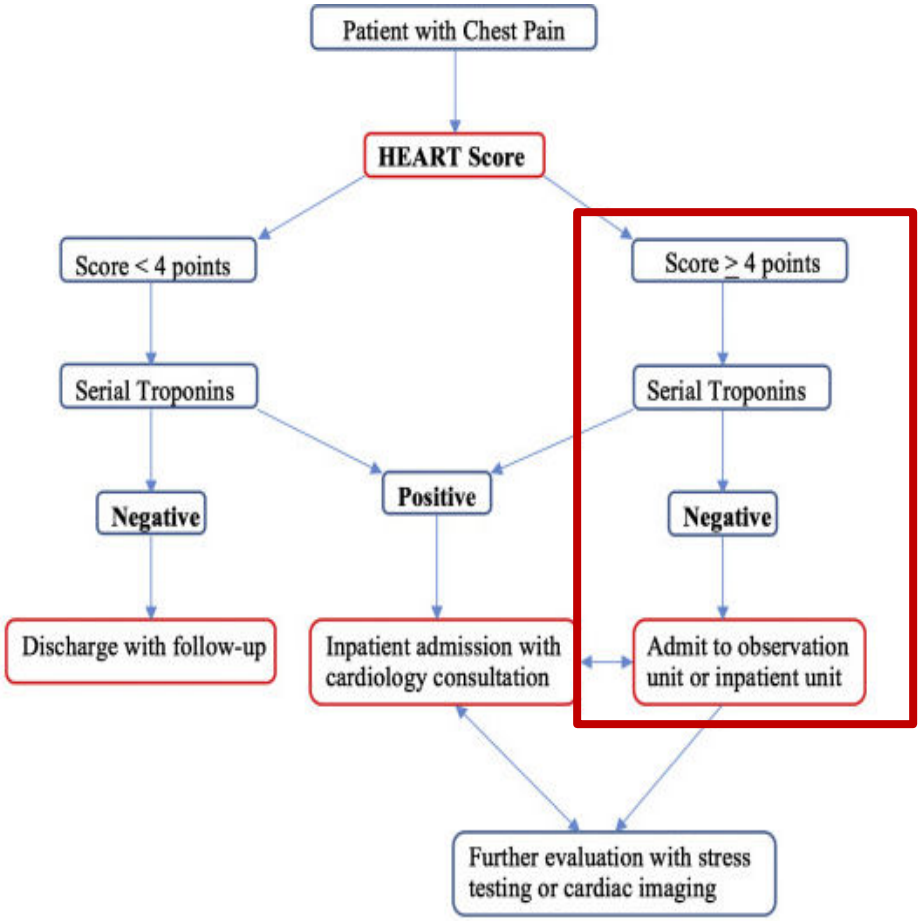
- History: potentially compatible with ACS **(1)**
- ECG: nonspecific repolarization abnormalities **(1)**
- Age: >65 **(2)**
- Risk Factors: at least three risk factors **(2)**

HEART Pathway

Combines the HEART score and serial cardiac troponins

Low risk score < 4

High Risk score ≥ 4



Marburg Heart Score

Developed for outpatient use

One systematic review found that the Marburg was better than clinical judgement alone

Components (one point each)

- Sex/age
- Known CAD
- Pain with exercise
- Pain not elicited with palpation
- Patient assumes pain is cardiac

Prevalence of CAD as cause of chest pain given overall population risk of:

Score	Likelihood ratio	2%	10%	20%
0 to 1 point	0.04	0.1	0.4	0.9
2 to 3 points	0.92	1.8	9.3	18.8
4 to 5 points	11.2	18.6	55.5	73.7

INTERCHEST Rule

Developed for outpatient use

Components

◦ Pain reproduced by palpation	-1
◦ Men>55 or women >65	+1
◦ Physician initially suspected a serious condition	+1
◦ Chest pressure	+1
◦ Chest pain with effort	+1
◦ History of CAD	+1

Risk	
-1 to 0	0.3%
1-2	6.9%
3+	64%

Mr. N

You admit Mr. N for observation, and he is given ASA. He is monitored on cardiac telemetry overnight and has no recurrent chest pain.

A stress test is planned for the following morning…

Inpatient Stress Testing

Exercise or pharmacologic stress ↑ myocardial oxygen demand and reveals an inadequate oxygen supply (hypoperfusion) in diseased coronary arteries

Mixed data inpatient vs. outpatient

? low risk patients

Poor outpatient compliance

Modalities of Stress Testing

Exercise ECG: simple, widely available, low cost

- Many limitations, but may be appropriate initial test in some

Stress Echocardiography: localizes ischemia, provides structural information, fast results

- Limited utility with resting RWMA's

Stress Radionuclide Myocardial Perfusion Imaging (rMPI):

- Can quantify involved myocardium and assess viability, good for known CAD
- More expensive, radiation exposure, longer interpretation times; limited utility with balanced ischemia (3-vessel disease)

Modalities of Stress Testing

Which test should I perform?

Factors:

- Institution ability to perform specific test
- Resting ECG
- Patients body habitus
- Exercise capacity
- History of prior revascularization
- Comorbidities (e.g. Asthma, heart failure, valvular disease)
- Radiation exposure

Coronary CT Angiography

Low to intermediate risk patients with normal ECG and negative troponins who have potential ACS

- **Sensitivity = 94%, Specificity = 83%**

  *for focal lesions of >70% stenosis when compared with invasive coronary angiography

Potential benefits: reduce unneeded testing, decrease LOS/cost

"Other than troponin and ECG no need for additional work-up within 2 years of a negative CCTA"- Musey

Risks: Radiation

Last thoughts on ED Evaluation

Guidelines for reasonable and appropriate care in the emergency department (GRACE): Recurrent, low-risk chest pain in the emergency department

Paul I. Musey Jr. MD, MSc, Fernanda Bellolio MD, MS, Suneel Upadhye MD, MSc,

Volume 28, Issue 7
July 2021
Pages 718-744

Recommendation 1: In adult patients with recurrent, low-risk chest pain, for greater than 3 h duration we suggest a single, high-sensitivity troponin below a validated threshold to reasonably exclude ACS within 30 days. (Conditional, For) [Low level of evidence].

Recommendation 2: In adult patients with recurrent, low-risk chest pain, and a normal stress test within the previous 12 months, we do not recommend repeat routine stress testing as a means to decrease rates of MACE at 30 days. (Conditional, Against) [Low level of evidence].

Recommendation 3: In adult patients with recurrent, low-risk chest pain, there is insufficient evidence to recommend hospitalization (either standard inpatient admission or observation stay) versus discharge as a strategy to mitigate major adverse cardiac events within 30 days. (No evidence, Either).

Recommendation 4: In adult patients with recurrent, low-risk chest pain and non-obstructive (<50% stenosis) CAD on prior angiography within 5 years, we suggest referral for expedited outpatient testing as warranted rather than admission for inpatient evaluation. (Conditional, For) [Low level of evidence].

Recommendation 5: In adult patients with recurrent, low-risk chest pain and no occlusive CAD (0% stenosis) on prior angiography within 5 years, we recommend referral for expedited outpatient testing as warranted rather than admission for inpatient evaluation. (Conditional, For) [Low level of evidence].

Recommendation 6: In adult patients with recurrent, low-risk chest pain and prior CCTA within the past 2 years with no coronary stenosis, we suggest no further diagnostic testing other than a single, high-sensitivity troponin below a validated threshold to exclude ACS within that 2-year time frame. (Conditional, For) [Moderate level of evidence].

Recommendation 7: In adult patients with recurrent, low-risk chest pain, we suggest the use of depression and anxiety screening tools as these might have an effect on healthcare use and return ED visits. (Conditional, Either) [Very low level of evidence].

Recommendation 8: In adult patients with recurrent, low-risk chest pain, we suggest referral for anxiety or depression management, as this might have an impact on healthcare use and return ED visits. (Conditional/Either) [Low level of evidence].

Musey et al, 2021

Last thoughts on Office Evaluation

Acute Chest Pain in Adults: Outpatient Evaluation

JOHN R. MCCONAGHY, MD, MALVIKA SHARMA, MD, AND HITEN PATEL, MD

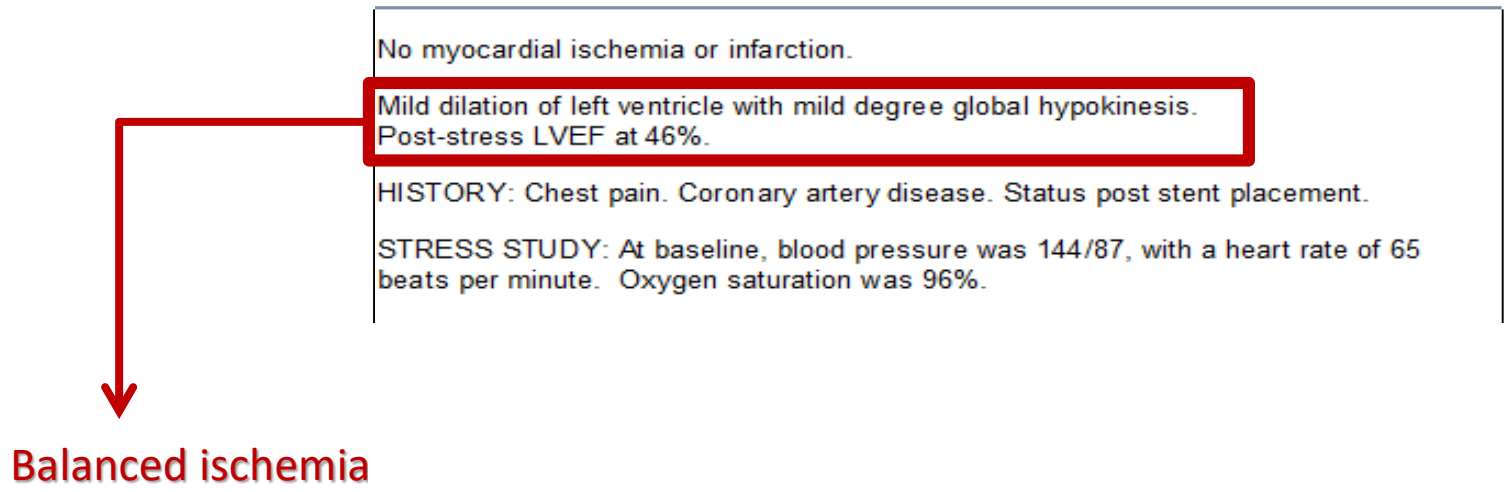
AMERICAN FAMILY PHYSICIAN

Am Fam Physician. 2020;102(12):721-727

Clinical recommendation	Evidence rating	Comments
When patients present to the primary care office with chest pain, physicians should consider age, sex, and type of chest pain to predict the likelihood that it is acute coronary syndrome caused by coronary artery disease.[15]	B	Large prospective cohort study
Physicians should consider using a validated clinical decision rule such as the INTERCHEST rule or the Marburg Heart Score to stratify risk in patients with chest pain.[17–20]	B	Smaller clinical trials of validated decision rules
Twelve-lead electrocardiography should be performed on all patients in whom cardiac ischemia is suspected. The presence of ST segment changes, new-onset left bundle branch block, presence of Q waves, and new T-wave inversion increases the likelihood of acute coronary syndrome and acute myocardial infarction; these patients should be referred immediately to the emergency department.[21,22]	C	Clinical reviews and consensus expert opinion
Patients who have chest pain with a low to intermediate probability of coronary artery disease not requiring immediate referral to the emergency department should be evaluated for coronary artery disease with exercise stress testing, coronary computed tomography angiography, or cardiac magnetic resonance imaging.[23–27]	B	Unblinded randomized controlled trials and clinical reviews
Patients with localized musculoskeletal pain that is reproducible by palpation or pain reproducible by palpation of the parasternal costochondral joints likely have chest wall pain or costochondritis.[29,30]	C	Clinical reviews and consensus expert opinion
Gastroesophageal reflux disease should be considered in patients with burning retrosternal pain, acid regurgitation, and a sour or bitter taste in the mouth.[31,32]	C	Clinical review and observational studies
Panic disorder and anxiety states often cause chest pain and shortness of breath; physicians should consider using a single validated screening question to confirm the diagnosis.[35]	B	Validation of a clinical prediction rule

Back to Mr. N

He underwent stress myocardial perfusion imaging.
Per his RN, he tolerated the procedure well. He is anxious to discharge .



ACS Treatment

- MONA is no more…

ACS Treatment

Step 1: Immediate therapy for ACS

- **OXYGEN**
  - Used for respiratory distress, oxygen saturation <90%
    - "Hyperoxia" has been shown to have a direct vasoconstrictor effect on coronary arteries
- **ASPIRIN**
  - 162-325mg for all patients suspected of ACS
- **NITRATES**
  - Screen for contra-indications (Phosphodiesterase- 5 inhibitors, R Ventricle MI)
  - Only use for patients with active pain
  - IV Nitroglycerin for persistent ischemic pain, HF, or HTN
- **ANALGESICS**
  - **Morphine** used only when other anti-anginals at maximum dose are not relieving CP
  - **NSAIDS** should be discontinued/not initiated because of risk of MACE

ACS Treatment

Step 2: Therapy for ACS

- **<u>P2Y12 INHIBITORS</u>**
  - **Clopidogrel** 300-600mg loading dose
  - **Ticagrelor** 180mg loading dose
  - ***Prasugrel** 60mg loading dose
- Load at time of presentation vs. PCI (risk vs. benefit)
  - Does your patient potentially need CABG?

ACS Treatment

Step 2: Therapy for ACS

- **PARENTERAL ANTICOAGULATION THERAPY:**
  - **Unfractionated Heparin (UFH):** continued for 48 hours or until PCI performed
  - **Enoxaparin (LMWH):** for duration of hospitalization or until PCI performed
  - **Fondaparinux (Factor Xa inhibitor):** for duration of hospitalization or until PCI performed
    - Not used as sole anticoagulant
  - **Bivalirudin (Direct thrombin inhibitor):** 0.10 mg/kg loading with 0.25 mg/kg per hour until PCI
    - Similar outcomes to UFH, but less cost effective

ACS Treatment

Step 3: Decide on a treatment strategy

- **STEMI**: FMC to device time expected to be ≤90 minutes
- **NSTE-ACS**: Ischemia guided vs. early invasive strategy

Ischemia-guided vs. Early Invasive Strategy

Ischemia-guided Strategy

- Only calls for an invasive evaluation if:
  - patient fails medical therapy (refractory angina)
  - objective evidence of ischemia (dynamic ECG changes, perfusion defect)
  - clinical indicators of very high prognostic risk (e.g. high TIMI or GRACE scores)

Early Invasive Strategy (within 24 hours)

- Triages patients to an invasive diagnostic evaluation (i.e. coronary angiogram)
  - Generally a high-risk patient, or with high-risk features (e.g. + troponin)

Irrespective of strategy chosen, a patient receives optimal anti-ischemic and anti-thrombotic medical therapy

ACS Treatment

Step 4: Institute routine medical therapy

- **Beta Blockers**: within 24 hours unless contraindicated
- **Statins:** high intensity, regardless of baseline LDL-C
- **ACE/ARB**: LVEF<40%, HTN, DM, stable CKD
- **Aldosterone Antagonist**: if already on therapeutic ACE, BB, and have an LVEF<40%
- **Calcium Channel Blockers**: no benefit; consider only if recurring ischemia, or BB and nitrates are contraindicated or maximized

Mrs. P

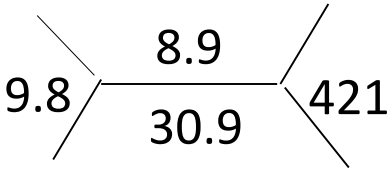
48-year-old female with asthma, microcytic anemia secondary to menorrhagia which was due to uterine fibroids who presents to the ED with dyspnea on exertion for 4 weeks. She developed right shoulder and chest pain over the last 4 days.

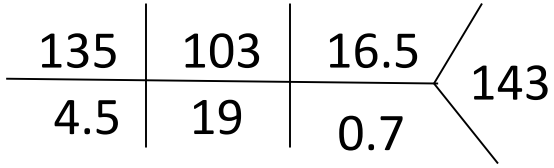
Mrs. P

Vitals:

- T 36.5 C; HR 117 bpm; BP 150/94 mmHg; RR 24 br/min; SpO2 95% RA

Labs:



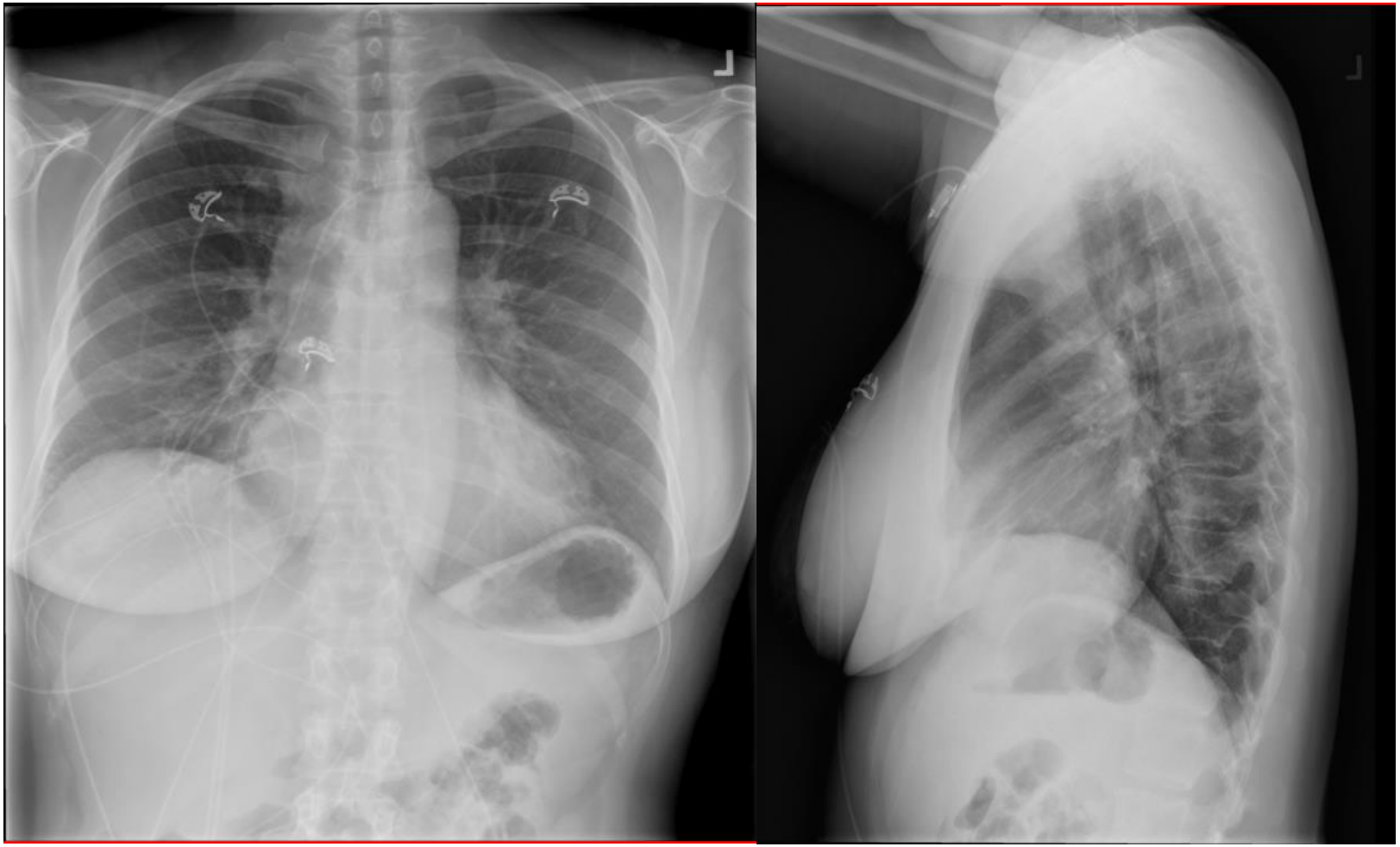


hs-cTnT: 5 ng/L (female ≤ 10 ng/mL)

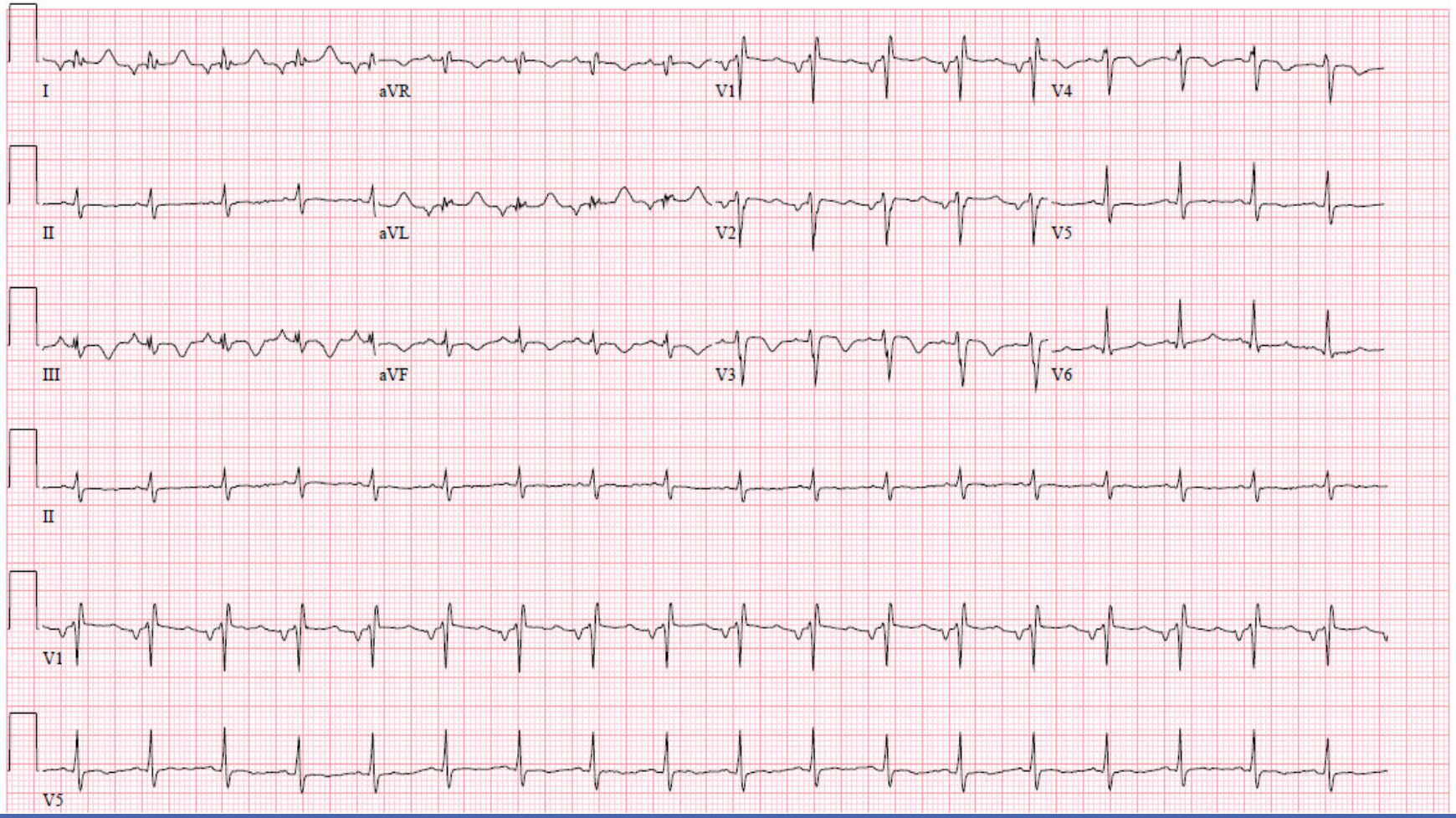
NT-Pro BNP: 6,204 pg/mL (<248 pg/mL)

D-Dimer: 5,924 ng/mL (< 500 ng/mL*)

Ms. P Chest X-ray



Admission ECG (no priors)



D-Dimer

D-dimer is used as a marker of activation of the coagulation and fibrinolytic systems and indirectly as a marker of thrombotic activity

Causes: VTE, infection, DIC, malignancy, CHF, renal failure, afib, hematologic disease, trauma, age, surgery, pregnancy, smoking

Pro: Low cost

Cons: Poor specificity -> resulting in false positives in low risk patients

(Modified) Wells Score for PE

Criteria	Scoring
Clinical symptoms of DVT	3.0
Other diagnosis less likely than PE	3.0
HR >100	1.5
Immobilization ≥3 days or surgery in the previous 4 weeks	1.5
Previous DVT/PE	1.5
Hemoptysis	1.0
Malignancy	1.0

Wells Criteria	Score
High	>6.0
Moderate	2.0 to 6.0
Low	<2.0

Modified Wells Criteria	Score
PE likely	>4.0
PE unlikely	≤4.0

Geneva Score

Risk Factors, symptoms and signs (revised)

- Age 65 +1
- Previous DVT or PE +3
- Surgery or fracture within one month +2
- Active malignancy +2
- Unilateral lower limb pain +3
- Hemoptysis +2
- HR 75 -94 +3
- HR>94 +5
- Deep pain on palpation of one leg or edema +4

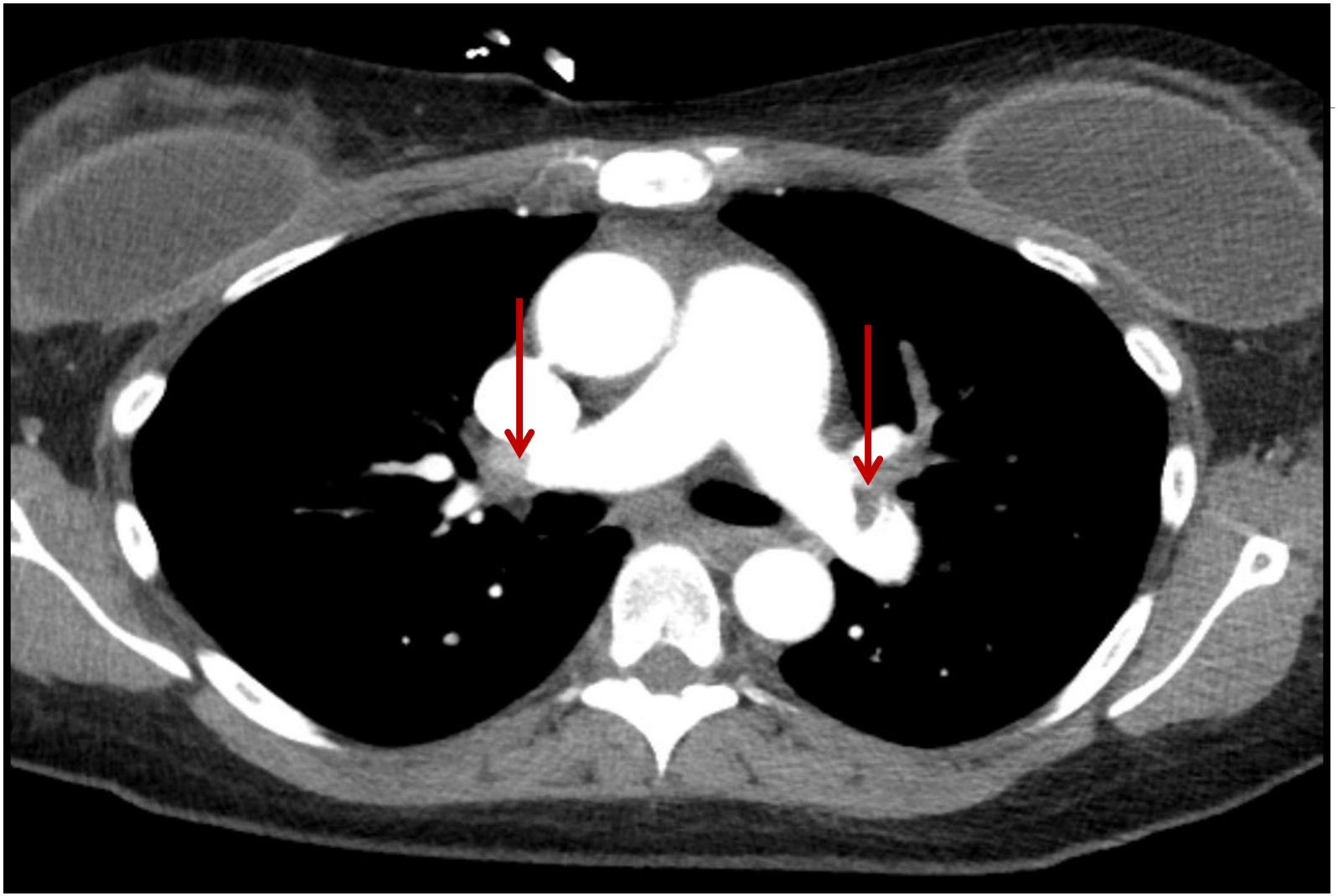
Clinical Probability

Low risk	0-3
Mod risk	4-10
High risk	>11

Two level Score

PE- Unlikely	0-5
PE- Likely	>6

CTPA



PE Treatment

Step 1: If PE suspected, stabilize the patient while definitive diagnostic test is ongoing

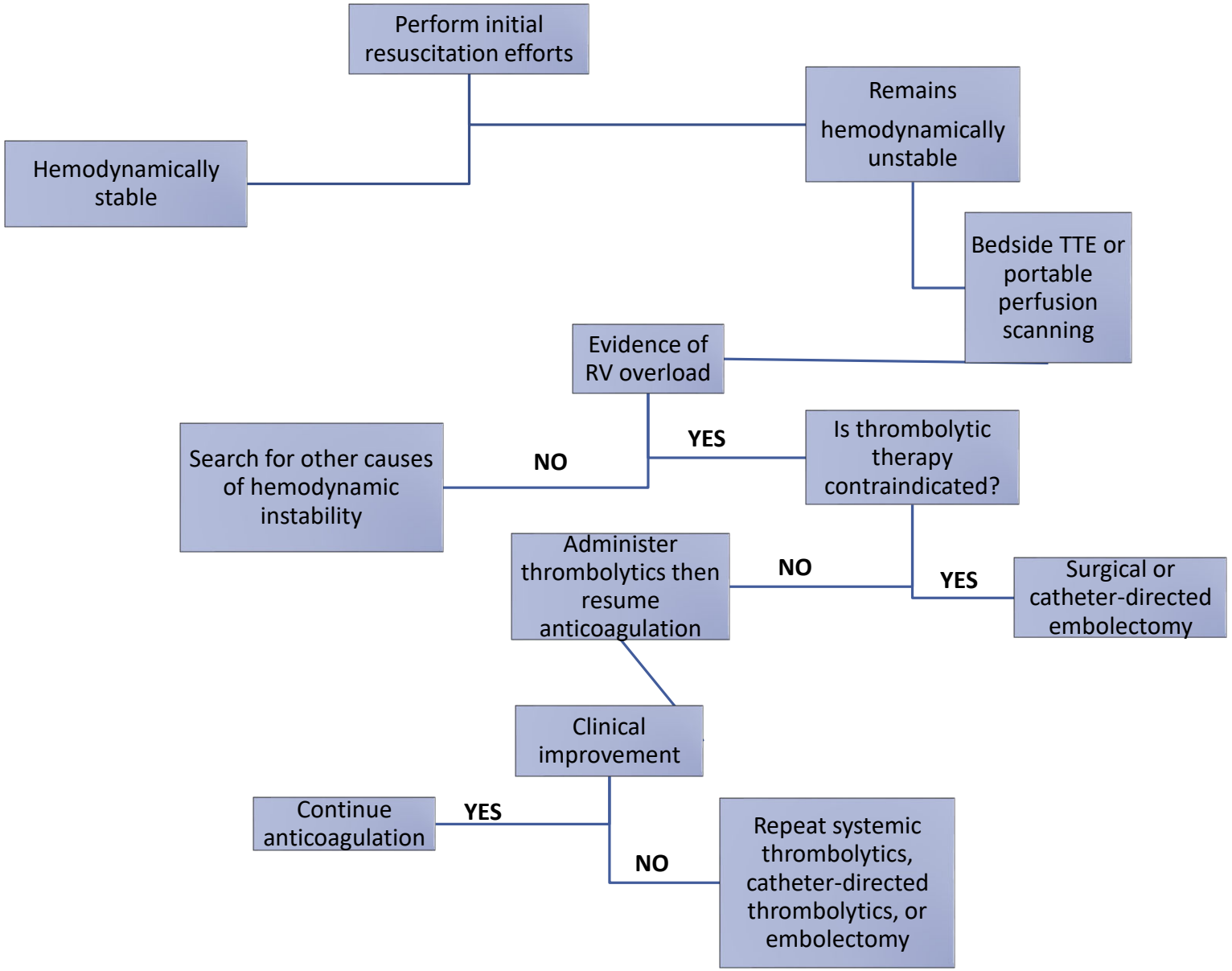
- IV Heparin v. Low Molecular Weight Heparin

Step 2: Risk stratification

- High-risk/massive
- Intermediate-risk/submassive
- Low-risk/small

Hemodynamic instability ("massive PE"): SBP<90 mmHg for >15 minutes, hypotension requiring vasopressors, or clear evidence of shock

Massive PE Treatment



Hemodynamically Stable PE

Treat with anticoagulation unless contraindicated:

- Consider IVC Filter
- Consider risk vs. benefit

Consider **thrombolysis** or **catheter-directed thrombolysis** on a case-by-case basis:

- Severe RV dysfunction
- Extensive DVT
- Presence of severe hypoxemia
- Patients who appear to be decompensating but not yet hypotensive
- Clot in transit (RA or RV clot)

Back to Mrs. P

Transthoracic Echocardiogram:

Final Impressions
1. Findings consistent with cor pulmonale - possibly acute.
2. Moderate right ventricular enlargement with moderate-severe systolic dysfunction (FAC 26%).
3. Estimated right ventricular systolic pressure 93 mmHg (systolic blood pressure 170 mmHg).
4. Tricuspid annulus dilatation with moderate-severe functional tricuspid regurgitation.
5. Severely dilated inferior vena cava with no inspiratory collapse and dilated hepatic veins.

Underwent emergent **catheter-directed thrombolysis**

Mrs. P

At 24 hours → catheter pulled and placed on heparin drip
- COMPLETE resolution of symptoms!

Transitioned to Xarelto upon discharge
- IUD placed for her vaginal bleeding

Mr. S

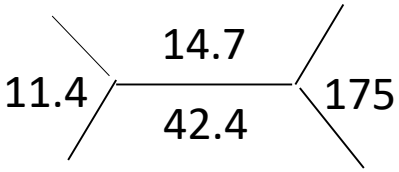
65-year-old male with untreated hypertension presents to the ED with acute onset of dizziness and severe chest pain with radiation to his back, of acute onset while he was in the shower. He also described bilateral 9/10 flank pain and nausea & emesis.

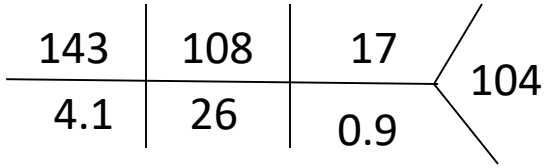
Mr. S

Vitals:

- T 37 C; HR 78; BP 189/99; RR 20 br/min; 96% RA

Labs:

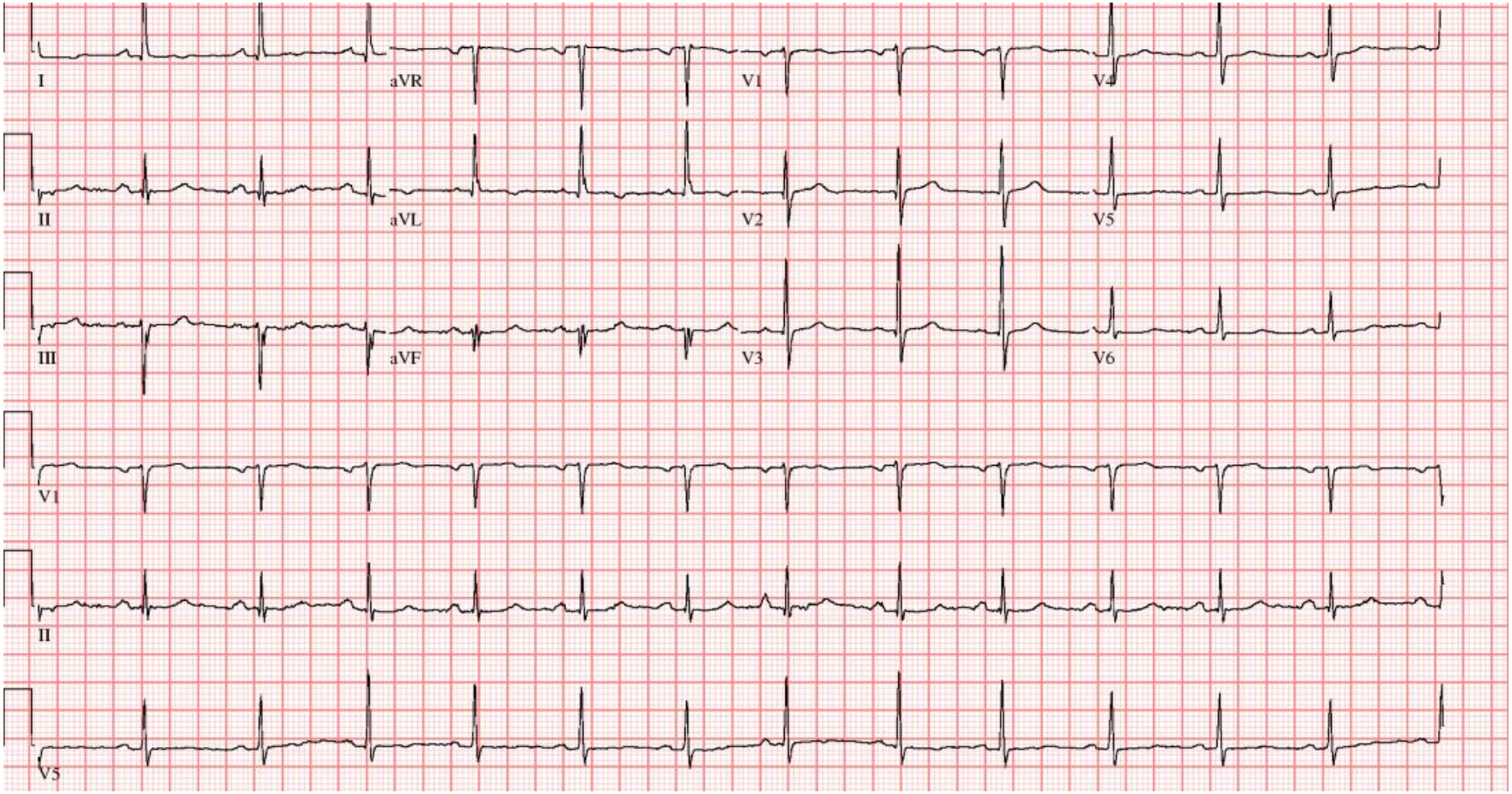




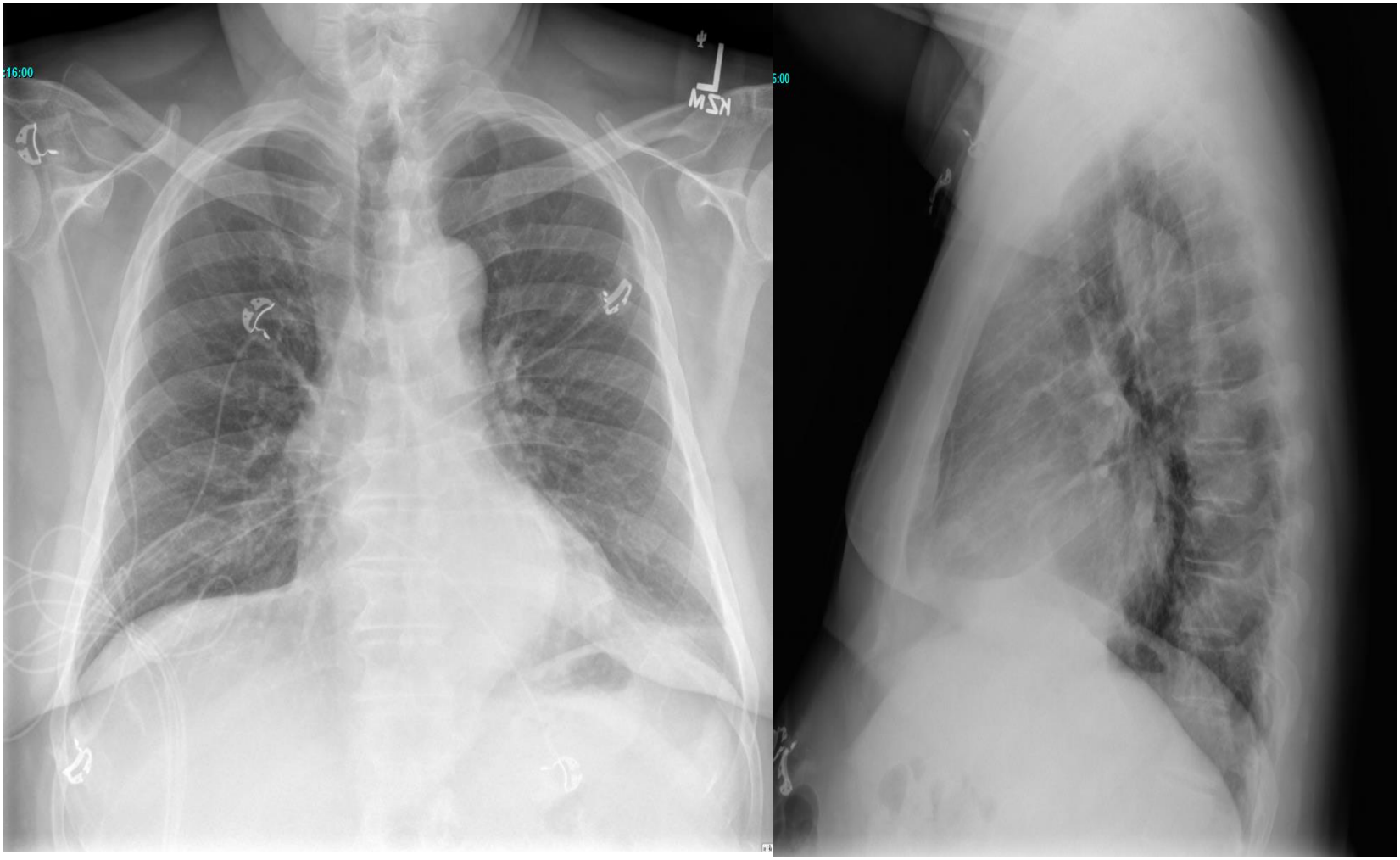
hs-cTnT: 8 ng/L (male ≤ 15 ng/L)

D-dimer: 1,208 ng/mL (< 500 ng/mL*)

Admission ECG



Chest X-Ray



Mr. S

You are called to see the patient in the ED, so you quickly review his records from when he was admitted to the hospital with atypical chest pain 1 month prior…

TTE (one month prior):

Final Impressions
1. Normal left ventricular chamber size. Hyperdynamic left ventricular systolic function.
2. Calculated 2-D monoplane volumetric left ventricular ejection fraction 73 %.
3. Mid left ventricular maximal instantaneous Doppler gradient rest 6 mm Hg; Valsalva 28 mm Hg.
4. Concentric remodeling (increased wall thickness to cavity ratio).
5. Findings consistent with normal left ventricular filling pressure.
6. Mild right ventricular enlargement with normal systolic function.
7. Normal left atrial size.
8. No hemodynamically significant valvular heart disease.
9. Normal inferior vena cava size with normal inspiratory collapse (>50%).
10. Mild ascending aorta dilatation (diameter 41 mm at proximal level).
11. No pericardial effusion.

ECG and CXR are unchanged.

ADD-RS

Aortic Dissection Detection Risk Score (ADD-RS):

1. **High risk conditions**: Marfan syndrome or other CT disease, aortic valvular disease, family history/gene mutation, known thoracic aortic aneurysm, previous cardiac surgery or aortic manipulation

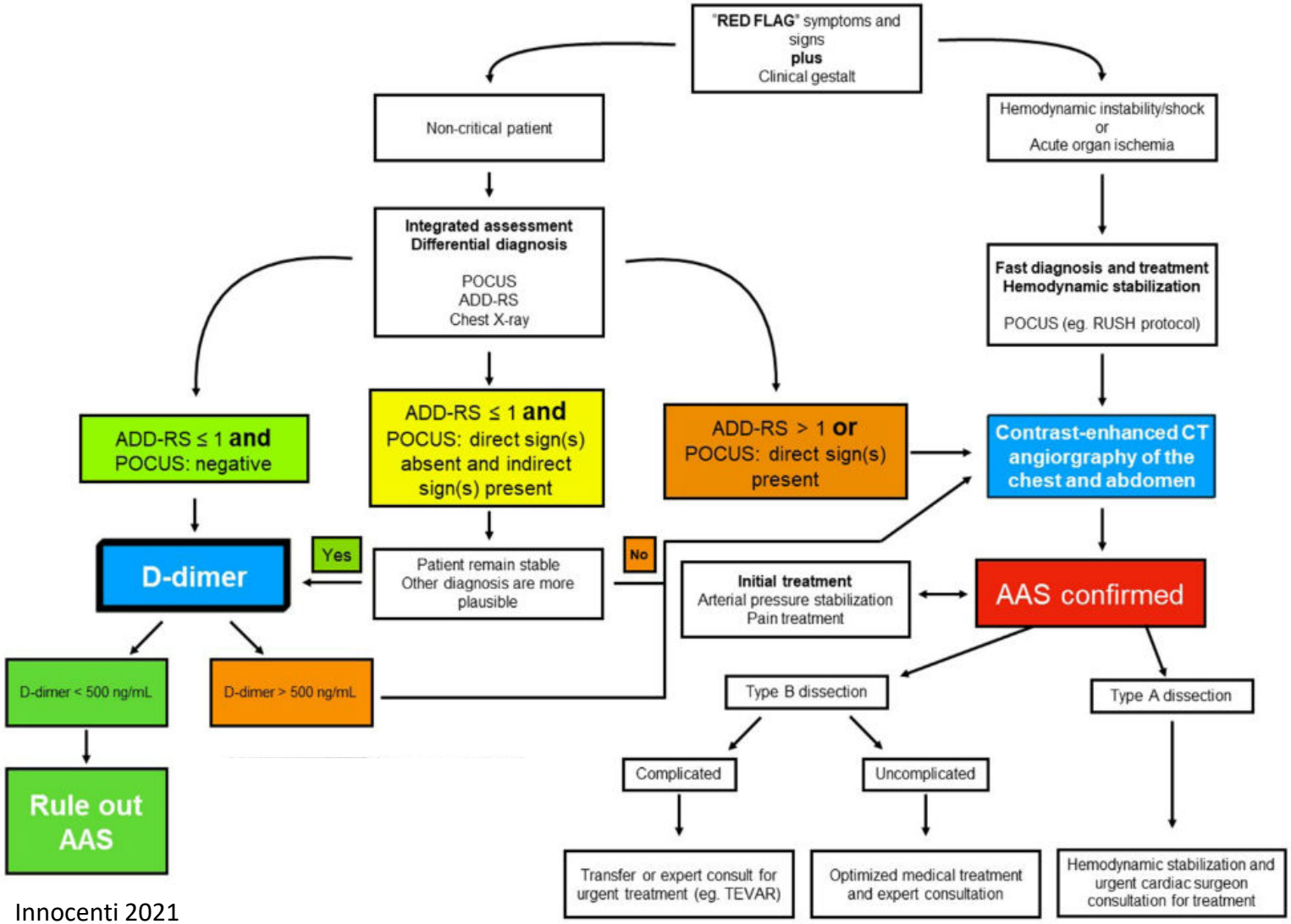
1. **High risk features:** pain in the chest back or abdomen that is abrupt, severe, or a ripping/tearing sensation

1. **High risk PE findings:** pulse deficit, SBP difference, focal neurologic deficit, aortic diastolic murmur, shock

Score 0-3 based on the presence of any positives in each of the categories

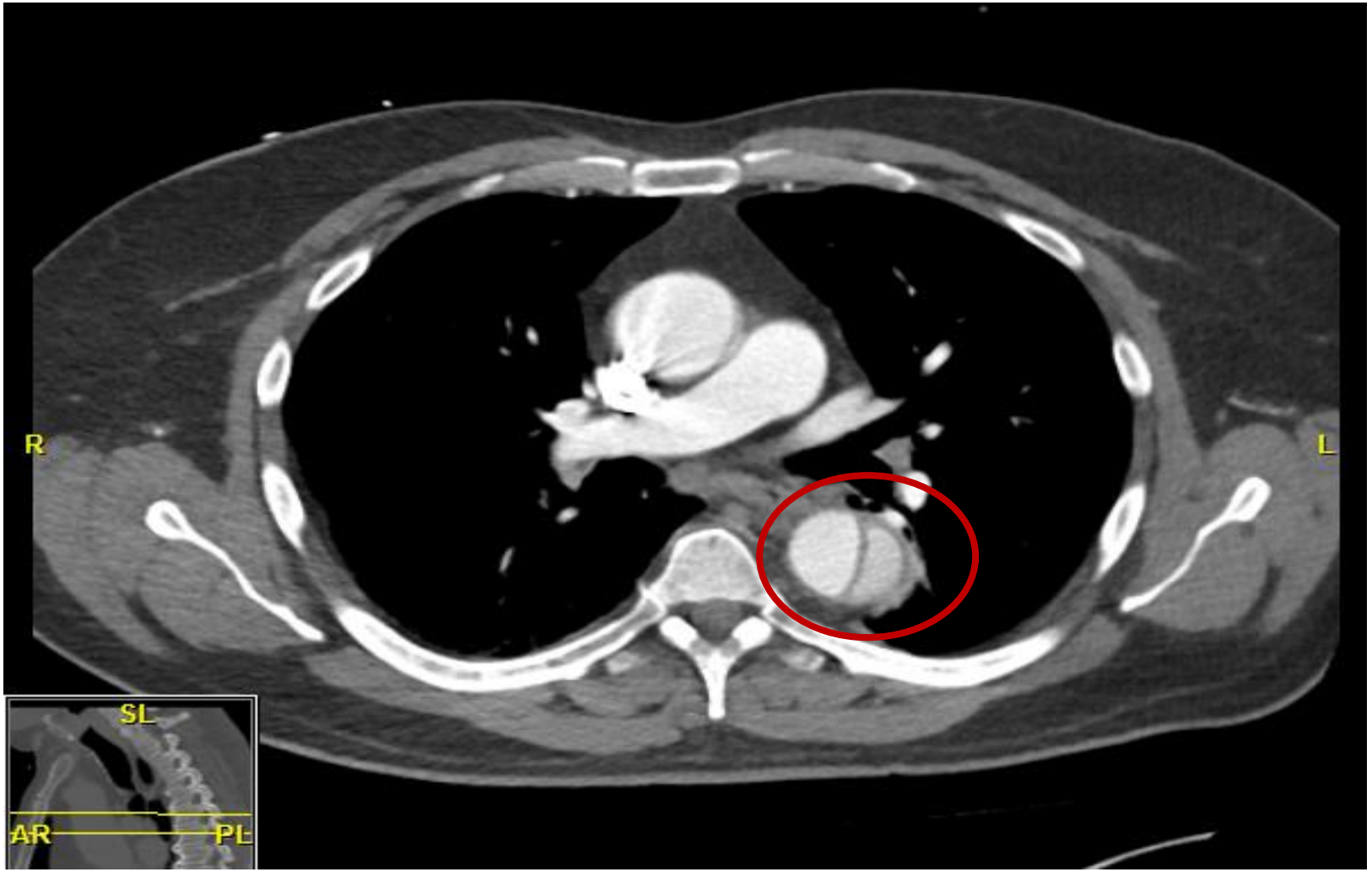
- low risk = 0
- intermediate risk = 1
- high risk = 2-3

ADD-RS with D-dimer



Innocenti 2021

CT Angiography Chest



Mr. S

CT Angio Chest

CONCLUSION:

1. Type B aortic dissection in the mid descending thoracic aorta with slow flow in the false lumen and intramural hematoma extending into the abdominal aorta. Please see dedicated abdominal CT for detailed intra-abdominal findings.

Management of Aortic Dissection

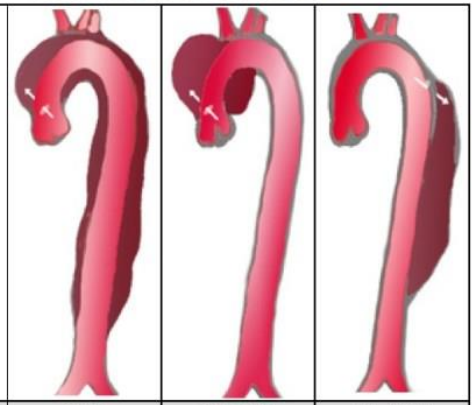
If hypotension or shock:
- IVF bolus +/- vasopressors
- Surgical consultation
- Review/additional imaging studies
  - Severe AR? Cardiac tamponade?

If stable, IV labetalol preferred
- Maintain HR <60, SBP <120 mmHg

Pain control is essential
- IV morphine reduces force of cardiac contraction

Dissections involving the **ascending thoracic aorta** should have urgent operative or interventional management if able

Classification of aortic dissection



Percentage	60%	10–15%	25–30%
Type	DeBakey I	DeBakey II	DeBakey III
	Stanford A (Proximal)		Stanford B (Distal)

Back to Mr. S

Admitted to the ICU, started on esmolol drip + nicardipine drip

Vascular Surgery consult: recommended conservative management and serial imaging studies

Complicated hospital course, eventually discharged hospital day 5 on the following regimen:

- labetalol 400mg TID
- lisinopril 40mg QD
- amlodipine 10mg QD
- chlorthalidone 25mg QD

Take Home Points

It is helpful to differentiate cardiac vs. non-cardiac chest pain.

Keep a wide differential…chest pain does not always mean ACS.

Use risk stratification tools, but despite these tools, your clinical judgement is most important!

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