I have no relevant financial conflicts of interest. I will not discuss off label or unapproved usage.

A careful history will lead to the diagnosis 80% of the time.

"Medicine is the science of uncertainty and the art of probability."

Sir William Osler

Causes of Chest Pain in Primary Care Setting

- Knowing the pretest probability of different causes of chest pain.
Overview

- Chest pain accounts for 6 million annual visits to the EDs in the United States
- Chest pain is the second most common ED complaint
- Patients with chest pain present with a wide spectrum of signs and symptoms
- It is up to the clinician to recognize the life-threatening causes of chest pain

Agenda

- Determine which patients require emergency transfer
- Which tools to use to screen for ACS and other potential causes of chest pain
- How to proceed when initial evaluation and testing do not point to a clear diagnosis

Primary Care Challenges

- Low risk population
  --- limit excess resource utilization
  --- avoid missed diagnoses
- Time-limited care
  --- cannot usually observe over several hours
- No immediate cardiac stress test
- No immediate cardiac enzymes

Premise

- Most patients seeking treatment for chest pain don’t have life-threatening cardiac illness (8 million ED visits for chest pain, 13% have ACS. Amsterdam EA, Circulation. 2010;122)
- In PCP office, less than 1.5% have unstable disease. Nilsson S, Br J Gen Pract. 2003
- Challenge is to appropriately evaluate and manage those who are at low risk of ACS, at same time identifying and arranging prompt transfer or referral for the minority of patients who are at high cardiac risk

CHEST PAIN

Conditions range from:

- Benign and self-limited; chest wall pain
- Serious; anxiety disorder to Life-threatening; unstable angina, aortic dissection, pulmonary embolism

GOAL: accurate identification of life-threatening and serious causes of chest pain accomplished without overtesting and overtreating patients with less serious causes

Start with the ABCs

- Airway, breathing, circulation
- Any potentially unstable patient should be immediately transferred for emergency care
**URGENT Referral**
- Pain on minimal exertion
- Pain at rest (may be at night)
- Angina which appears to be progressing rapidly

**Stable Patient**
- If no signs of respiratory distress and stable vital signs.....unlikely acutely unstable. Can be further evaluated in office

---

**CHEST PAIN**
- How can the clinical examination be used to guide evaluation of patients presenting with chest pain in the primary care setting???
- Location of pain often does not correlate with source
- Severity of pain does not correlate with life threatening potential

---

**Cardiovascular Causes**
- Ischemic syndromes
  - ACS
  - Stable angina
  - Coronary vasospasm
- Nonischemic syndromes
  - Aortic dissection
  - Pericarditis
  - Myocarditis
  - Stress induced cardiomyopathy

---

**Diagnostic Considerations**
- Chest Wall Pain (including costochondritis)
- GERD
- Panic Disorder and Anxiety State
- Less common but important
- Pericarditis
- Pneumonia
- Pulmonary Embolism
- Acute Thoracic Aortic Dissection
PQRST

Characteristic of Pain

P  Palliative Factors/Provocative Factors
What makes the pain better?

Q  Quality
Describe the Pain

R  Radiation/Region
Where is the pain? What are of the body is affected?

S  Severity
How does the pain compare with other pain you have experienced?

T  Temporal Factors
Does the intensity of the pain change with time?

Assessment of Patient

- Clinical History: nature of pain, precipitants, stability of symptoms, Risk factors including co-morbidities, Exercise component, current medications (include OTC, supplements, illicit)
- Examination; BP, pulse, presence or absence of murmurs (especially aortic stenosis), PVD/carotid bruits

“Typical” chest pain have higher risk of ACS

Is it ACS? These chest pain features help narrow the diagnosis

High likelihood of ACS
- Chest pain radiating to one or both arms
- Chest pain associated with exertion, nausea, vomiting, or diaphoresis
- Chest pain described as pressure or “worse than previous angina or similar to a previous MI”

Low likelihood of ACS
- Stable, pleuritic, or positional chest pain
- Pain in an inflammatory location
- Pain not associated with exertion
- Pain is reproduceable with palpation

ACS, acute coronary syndrome; MI, myocardial infarction.

Swap CJ, e.al., JAMA, 2005;294:2623–2629

Typical vs. Atypical Chest Pain

Typical
- Characterized as discomfort/pressure rather than pain
- Time duration >2 mins
- Provoked by activity/exercise
- Radiation (i.e., arms, jaw)
- Does not change with respiration/position
- Associated with diaphoresis/nausea
- Relieved by rest/nitroglycerin

Atypical
- Pain that can be localized with one finger
- Constant pain lasting for days
- Fleeting pains lasting for a few seconds
- Pain reproduced by movement/palpation

Typical vs. Atypical Chest Pain

<table>
<thead>
<tr>
<th>Description of pain</th>
<th>Positive Likelihood ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe — tightness or pressure in the chest</td>
<td>4.7 (1.9—10)</td>
</tr>
<tr>
<td>Severe — tightness or pressure in the chest associated with diaphoresis</td>
<td>2.5 (1.2—5.2)</td>
</tr>
<tr>
<td>Anxious or irritable</td>
<td>2.0 (1.2—3.3)</td>
</tr>
<tr>
<td>Associated with diaphoresis</td>
<td>3.0 (1.9—4.6)</td>
</tr>
<tr>
<td>Associated with nausea or vomiting</td>
<td>3.0 (1.7—4.6)</td>
</tr>
<tr>
<td>Associated with diaphoresis or anxiety or nausea</td>
<td>3.0 (1.7—4.6)</td>
</tr>
<tr>
<td>Associated with diaphoresis or anxiety or nausea or vomiting</td>
<td>3.0 (1.7—4.6)</td>
</tr>
<tr>
<td>Associated with diaphoresis or anxiety or nausea or vomiting or both</td>
<td>3.0 (1.7—4.6)</td>
</tr>
</tbody>
</table>

History

- Location
- Quality
- Duration
- Aggravating or alleviating factors
- Risk factors (increase probability of CAD)
- Presence of any may increase suspicion for cardiac cause, absence of factors does not eliminate need for diagnostic evaluation

Point Score for likelihood of CAD cause: Marburg Heart Score

Same study, 773 patient data used to develop score, then used on 672 patients

Classified as low, moderate and high risk of CAD as cause of pain (less than 1%, 12%, 63% respectively)

MHS less than or equal to 2, very unlikely to have CAD
MHS greater than 3 very sensitive for CAD but poor predictive value of CAD

ECG findings for predicting Acute MI

- New ST segment elevation greater than 1 mm (Likelihood ratio (LR) = 6-54
- New LBBB LR = 6.3
- Q wave LR = 3.9
- Hyperacute T wave LR = 3.1
A 33 yo man complains of sharp chest pain at the mid left sternal border, came on during running.
Stopped running because of the pain. Was SOB, had tingling in hands and feet.
Pain worse with deep breath. Has had pain for two days.
PE: BP 120/60, P60 R 16. Pulses strong and equal. 1/6 ejection murmur at LUSB
Discrete tenderness at site of pain.

### Causes of chest pain in patients who seek care in a primary care office

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage of patients with diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal conditions (including costochondritis)</td>
<td>29%-36%</td>
</tr>
<tr>
<td>Nonspecific chest pain</td>
<td>11%-16%</td>
</tr>
<tr>
<td>Gastrointestinal disease</td>
<td>10%-19%</td>
</tr>
<tr>
<td>Stable CAD</td>
<td>8%-10%</td>
</tr>
<tr>
<td>Psychosocial or psychiatric disease</td>
<td>8%-17%</td>
</tr>
<tr>
<td>Pulmonary disease (pneumonia, pneumothorax, lung cancer)</td>
<td>5%-20%</td>
</tr>
<tr>
<td>Other cardiovascular disease (pulmonary embolus, heart failure)</td>
<td>3.5%-5%</td>
</tr>
<tr>
<td>Unstable CAD</td>
<td>1.5%</td>
</tr>
<tr>
<td>CAD, coronary artery disease.</td>
<td></td>
</tr>
</tbody>
</table>

### Typical vs. Atypical Chest Pain

**Typical**
- Characterized as discomfort/pressure rather than pain
- Time duration >2 mins
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- Radiation (i.e. arms, jaw)
- Does not change with respiration/position
- Associated with diaphoresis/nausea
- Relieved by rest/nitroglycerin

**Atypical**
- Pain that can be localized with one finger **YES**
- Constant pain lasting for days **YES**
- Fleeting pains lasting for a few seconds
- Pain reproduced by movement/palpation **YES**

### Costochondritis
Inflammation of the costal cartilage between the sternum and ribs.
Musculoskeletal Pain

- Costo-chondritis, Tietze syndrome, costosternal syndrome
- Study: 1212 consecutive patients older than 35yo presenting to PCP practice with CP
- Followed for 6 months for final dx determination

Bosner S, et.al., Fam Pract 2010; 27(4): 363-369

Costochondritis Causes

- Injury: A blow to the chest
- Physical strain; heavy lifting, physical exercise, severe coughing, repetitive motions
- Arthritis; osteoarthritis, RA, ankylosing spondylitis
- Joint infection; viruses, bacteria/fungi such as TB, syphilis, aspergillosis
- Tumors; non-cancerous and cancerous
- High correlation with anxiety

Verdon F, et.al, BMC Fam Pract 2007

Musculoskeletal Pain: study findings

Age and sex NOT USEFUL in predicting MSK pain
Best predictors:
- Absence of cough
- Stinging/sharp pain
- Pain reproducible on palpation/deep breath
- Localized muscle tension

More components, more likely MSK
2 components; 77% positive predictive value
None or one; 82% negative predictive value


Anxiety and Costochondritis

- Many people are more concerned about the pain and its inherent possibility of cardiac cause than are intolerant of the pain due to its quality and severity
MSK Pain Treatment

- NSAID
- Identify repetitive motion/cause
- Physical therapy where appropriate
- REASSURANCE

GERD

- Burning, retrosternal pain, acid regurgitation, sour or bitter taste in mouth
- Chronic cough, chronic laryngitis an asthma possible
- No useful physical examination maneuvers
- No established test to rule in or out
- One week trial of PPI is modestly sensitive and specific for GERD


Acid suppression therapy test

- 2005 meta-analysis of 6 studies
- PPI symptoms suppression; sensitivity and specificity for GERD 80% and 74% respectively
- One study, relief of chest pain with omeprazole 40mg/d for 14 days more sensitive than endoscopy, manometry or 24-hr pH monitoring in diagnosing GERD
- Another study found noncardiac CP with normal endoscopy, relief with lansoprazole 30mg/d for 4 weeks dx of endoscopy negative GERD

Wang WH, Arch Intern Med 2005

GERD

Appropriate to try a high-dose course of PPI to evaluate GERD as the cause of chest pain for patients who:

- do not initially describe typical reflux symptoms (heart burn, chronic regurg., chronic cough, or sore, burning throat)
- have no history of surgery in the upper GI tract, esophagus or thorax, and
- have no signs of or symptoms that indicate they have a serious or malignant disease (weight loss, anemia, or dysphagia)

Pandak WM, et al., J Clin Gastroent 2002
Jose, 62 y.o. male presents for 9am appt. He reports chest pain last night, awakened him from sleep. Severe pressure in middle to left side of chest started at 3 am lasting 20 minutes. He felt sweaty during the pain. He didn't want to bother anyone so he rested and pain eased. He reports that it was very painful and he wants to get it checked out. He is currently not in pain, though he feels tired
He is a smoker for 40 yrs, ½ pack per day. No previous cardiac history
Do you suspect cardiac source? ACS?
You don’t have ECG machine. Should you refer him to cardiologist? Hospital?
Maureen is a 70 yo female, reports experiencing chest pain 10 days ago while she was out walking. Her chest and left shoulder felt tight. She stopped walking and rested and the pain eased. She did not seek medical attention at the time, thinking it was a muscle cramp. She has Stage 1 HTN on ace-I and calcium channel blocker. Started on Statin 6 months ago.

Do you suspect stable angina? Do you send to hospital? Refer to cardiology? How urgently?

ECG

- Low sensitivity for coronary ischemia
- Only 50% with proven MI have positive initial ECG
- Up to 76% of ACS – normal or nonspecific initial ECG

Types of Angina

Chronic stable angina, also called classic or effort angina

Unstable angina, also called pre-infarction or crescendo angina

Vasospastic angina, also called Prinzmetal or variant angina
**Stable Angina**

Stable angina is:
- Pain or constricting discomfort, often in the front of the chest caused by restriction of blood flow and oxygen to the heart muscle
- Brought on by physical exertion or emotional stress
- A chronic medical condition associated with incidence of acute coronary events and increased mortality

Management aims to:
- Stop or minimize symptoms
- Improve quality of life and long-term morbidity and mortality

**Unstable Angina**

Unstable angina:
- Chest symptoms occur with increased frequency and are precipitated by progressively less effort
- The symptoms are not often relieved with rest or NTG
- Requires hospital admission and more aggressive therapy to prevent death and progression to myocardial infarction

**Key Predictors of MI in outpatient setting**

- Age older than 60
- Male sex
- Pressure-like pain
- Pain radiating to arm, shoulder, neck or jaw
- If none: less than 1% risk of acute MI

**Point Score for likelihood of CAD cause: Marburg Heart Score**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age older than 60</td>
<td>5</td>
</tr>
<tr>
<td>Male sex</td>
<td>3</td>
</tr>
<tr>
<td>Pressure-like pain</td>
<td>2</td>
</tr>
<tr>
<td>Pain radiating to arm, shoulder, neck or jaw</td>
<td>1</td>
</tr>
</tbody>
</table>

MHS less than or equal to 2, very unlikely to have CAD
MHS greater than 3, very sensitive for CAD but poor predictive value of CAD

**Algorithm integrating clinical decision rules and ECG findings**

Jose, 62 y.o. male presents for 9am appt. He reports chest pain last night, awakened him from sleep. Severe pressure in middle to left side of chest started at 3 am lasting 20 minutes. He felt sweaty during the pain. He didn’t want to bother anyone so he rested and pain eased. He reports that it was very painful and he wants to get it checked out. He is currently not in pain, though he feels tired.

He is a smoker for 40 yrs., ½ pack per day. No previous cardiac history

Do you suspect cardiac source? ACS?
You don’t have ECG machine. Should you refer him to cardiologist? Hospital?

UNSTABLE ANGINA...ADMIT
Maureen is a 70 yo female, reports experiencing chest pain 10 days ago while she was out walking. Her chest and left shoulder felt tight. She stopped walking and rested and the pain eased. She did not seek medical attention at the time, thinking it was a muscle cramp. She has Stage 1 HTN on ace-I and calcium channel blocker. Started on Statin 6 months ago.

Do you suspect stable angina? Do you send to hospital? Refer to cardiology? How urgently?

Stable angina; Refer urgently to cardiologist.

What to do when diagnosis remains unclear?

Types of Stress Tests

- If patient can exercise AND ECG is interpretable...... REGULAR STRESS TEST
- If the patient cannot exercise, OR ECG is uninterpretable, proceed to:
  - Imaging stress test
  - Uninterpretable ECG: ST or T wave abnormality on rest ECG
  - Ventricular paced beats
  - Borderline: LVH and RBBB
  - Stress Echo: if good images obtainable based on tech quality and body habitus
  - Exercise nuclear stress: body habitus, pre-existing significant CAD
  - Pharmacologic stress: LBBB, Ventricular Pacemaker, HTN

True Diagnosis: "Gold Standard"

<table>
<thead>
<tr>
<th>Disease present</th>
<th>Disease absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>Positive predictive value = a / (a + b)</td>
<td>Negative predictive value = d / (c + d)</td>
</tr>
<tr>
<td>Positive likelihood ratio = a / (a + c)</td>
<td>Negative likelihood ratio = c / (a + c)</td>
</tr>
</tbody>
</table>

Sensitivity = a / (a + c)  Specificity = d / (b + d)

Pros and Cons of Echo and Nuclear

- Echo:
  - No radiation
  - No need for expensive equipment
  - More info than just ischemia, such as pulmonary pressure change and valve abnormality
  - Easier to get pre-authorization
  - Reader dependent?
- Nuclear scan:
  - Objective, less reader dependent?
  - Fewer false positives in females
  - Radiation
  - Expensive equipment
Types of stress tests commonly available

**Regular**
- exercise stress
- pharmacologic

**Stress echo**
- exercise stress
- dobutamine

**Stress nuclear**
- exercise stress
- dobutamine
- vasodilator

---

**PERICARDITIS**

- Sharp, stabbing chest pain is a common symptom of pericarditis.

---

**TABLE 1**

<table>
<thead>
<tr>
<th>Etiology of Pericarditis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute myocardial infarction</td>
</tr>
<tr>
<td>St段gment elevation in many leads, with reperfusion</td>
</tr>
<tr>
<td>Inflammation of the coronary arteries</td>
</tr>
<tr>
<td>Inflammation of the myocardium</td>
</tr>
<tr>
<td>Myocardial ischemia</td>
</tr>
<tr>
<td>Myocardial necrosis</td>
</tr>
<tr>
<td>Myocardial rupture</td>
</tr>
<tr>
<td>Pericardial effusion</td>
</tr>
<tr>
<td>Pericardial friction</td>
</tr>
<tr>
<td>Pericardial constriction</td>
</tr>
</tbody>
</table>

**TABLE 2**

<table>
<thead>
<tr>
<th>Electrocardiographic Differentiation of Pericarditis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute pericarditis</td>
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</tr>
<tr>
<td>Pericardial friction</td>
</tr>
<tr>
<td>Pericardial constriction</td>
</tr>
</tbody>
</table>

**Acute pericarditis**
- ST段gment elevation in many leads, with reperfusion
- Inflammation of the coronary arteries
- Inflammation of the myocardium
- Myocardial ischemia
- Myocardial necrosis
- Myocardial rupture
- Pericardial effusion
- Pericardial friction
- Pericardial constriction

**Acute myocardial infarction**
- ST段gment elevation in many leads, with reperfusion
- Inflammation of the coronary arteries
- Inflammation of the myocardium
- Myocardial ischemia
- Myocardial necrosis
- Myocardial rupture
- Pericardial effusion
- Pericardial friction
- Pericardial constriction

**Early repolarization**
- ST段gment elevation in middle and left precordial leads, but may be widespread
- Inflammation of the coronary arteries
- Inflammation of the myocardium
- Myocardial ischemia
- Myocardial necrosis
- Myocardial rupture
- Pericardial effusion
- Pericardial friction
- Pericardial constriction

---

**Goyle 2002**
Case 2

EKG on admission:

- Low sensitivity for coronary ischemia
- Only 50% with proven MI have positive initial ECG
- Up to 76% of ACS – normal or nonspecific initial ECG

Presentation

The typical pericardial pain is described as a retrosternal or precordial sharp pain.

The character of the pain is almost always pleuritic, usually aggravated by inspiration, coughing, and sometimes by swallowing.

The pain usually worsens with recumbence and is relieved by leaning forward.

On occasion the pain may imitate the pain of acute myocardial infarction, as well as pulmonary infarction.

The symptoms of pericardial effusion include dyspnea, orthopnea, fatigue, weakness, and syncope.

Pericarditis

- Diagnostic criteria

Acute pericarditis (at least 2 criteria of 4 should be present):

1. Typical chest pain
2. Pericardial friction rub
3. Suggestive ECG changes (basically widespread ST segment elevation)
4. New or worsening pericardial effusion

Pericarditis Treatment

- Treatment

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose*</th>
<th>Duration of therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>BuPROPion*</td>
<td>400 to 600 mg three times daily</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td>Metoprolol SR</td>
<td>200 mg twice daily</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td>Captopril</td>
<td>12.5 to 50 mg two times daily</td>
<td>1 to 2 months</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>650 to 1000 mg three times daily</td>
<td>1 to 2 weeks</td>
</tr>
<tr>
<td>FurosEMide</td>
<td>12.5 to 50 mg two times daily</td>
<td>1 to 2 months</td>
</tr>
<tr>
<td>For refractory case with a contraindication to NSAID therapy:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propranolol</td>
<td>0.25 to 0.5 mg twice daily</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Captopril</td>
<td>0.5 to 6.6 mg twice daily</td>
<td>3 months</td>
</tr>
</tbody>
</table>

PANIC DISORDER AND ANXIETY
Panic Disorder and Anxiety State

- One in four persons with panic attack will have chest pain and shortness of breath
- Often not recognized leading to more testing, follow-up, cost of care and, often, more anxiety
- Validated brief questionnaires useful

Huffman JC, Prim Care Comp J Clin Psychiatry 2002

3 Item Questionnaire to Assess PD in Patients with Chest Pain

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive sweating</td>
<td>0-2</td>
</tr>
<tr>
<td>Trembling and shaking</td>
<td>0-2</td>
</tr>
<tr>
<td>Dizziness</td>
<td>0-2</td>
</tr>
<tr>
<td>Heart Palpitations</td>
<td>0-2</td>
</tr>
<tr>
<td>Fear of losing control or going insane</td>
<td>0-2</td>
</tr>
<tr>
<td>Fear of dying</td>
<td>0-2</td>
</tr>
<tr>
<td>CHEST PAIN</td>
<td>0-2</td>
</tr>
</tbody>
</table>

Score >5; 55% sensitivity and 86% specificity for PD

Common Panic Attack Symptoms

- Excessive sweating
- Trembling and shaking
- Dizziness
- Heart Palpitations
- Fear of losing control or going insane
- Fear of dying
- CHEST PAIN

Treatment of Panic Disorder

- Antidepressants: SSRIs considered first line therapy. Start lower doses than for depression
- Benzodiazepines: rapid onset of efficacy, abort ongoing attacks. Don’t treat comorbid depression
- Psychotherapy: cognitive-behavioral therapy. As good or better than medications. Requires significant commitment of time and energy

PULMONARY EMBOLISM
Pulmonary Embolism

**TABLE 1.**

<table>
<thead>
<tr>
<th>Clinical Finding</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calf pain and symptoms of DVT</td>
<td>3.0</td>
</tr>
<tr>
<td>Leg swelling or pain with palpation of deep leg veins</td>
<td>3.0</td>
</tr>
<tr>
<td>PE as halo or mass plus more than an alternative diagnosis</td>
<td>3.0</td>
</tr>
<tr>
<td>Heart rate &gt; 100 beats per minute</td>
<td>1.5</td>
</tr>
<tr>
<td>Respiratory rate &gt; 20 breaths per minute</td>
<td>1.5</td>
</tr>
<tr>
<td>Oxygen saturation &lt; 90% or O2 needs</td>
<td>1.5</td>
</tr>
<tr>
<td>% of weight loss in 3 months or weight loss in 2 weeks</td>
<td>1.5</td>
</tr>
<tr>
<td>Previous systematically diagnosed DVT or PE</td>
<td>1.5</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1.0</td>
</tr>
<tr>
<td>Multiple treatment failure that is ongoing within the past 4 weeks, or shaved</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Conclusion:**

Whenever you are stuck, ask for help. Your colleagues are here to help you!

Pneumonia

- Commonly associated with fever, chills, productive cough and pleuritic chest pain.
- Egophony, dullness to percussion of posterior thorax
- Clinical impression useful

Pneumonia

Egophony, dullness to percussion of posterior thorax

Clinical impression useful

Summary

- Chest pain is a very common complaint but has a broad differential
- MSK most common cause in PCP office
- Always try to rule out the life-threatening causes of chest pain
- Use the history, physical exam, labs, EKG and imaging to commit to a diagnosis
- Whenever you are stuck, ask for help. Your colleagues are here to help you!

Conclusion: Early Referral

- People with previous MI, CABG, PCI who develop angina
- People who appear to have evidence of a previous MI or significant abnormality
- People who fail to respond to medical therapy
- People who have ejection systolic murmur suggesting AS
Conclusion: Routine Referral

- Confirm or refute a diagnosis with uncertain or atypical symptoms
- To advise on management of individual, particularly where the person has not responded to treatment or risk factor modification
- Presence of a number of risk factors or strong family history
- Patient preference for referral
- Problems with employment, life insurance, or unacceptable interference with lifestyle
- Significant co-morbidity

Point Score for likelihood of CAD cause: Marburg Heart Score

- Same study, 773 patient data used to develop score, then used on 672 patients
- Classified as low, moderate, and high risk of CAD as cause of pain (less than 1%, 12%, 63% respectively)
- MHS less than or equal to 2, very unlikely to have CAD
- MHS greater than 3 very sensitive for CAD but poor predictive value of CAD

Bosner S, et.al., Fam Pract 2010; 27(4): 363-369

Use Your Resources

- “Curbside consults”: direct or with secure messaging platforms
- Consider probabilities by risk scores and experience
- Use consultants where appropriate, provide cogent information (labs, medication list, ECGs)