



# Chest Pain

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## Introduction

*Patient 1 : Joe*

*Joe a 50 year old male presents to the ED by ambulance complaining the first time ever of severe chest pain that just started while running on the treadmill. He immediately called 911. Vitals: BP = 140/90, P = 80, RR = 24, T = 98.3F, O2 sat = 98%.*

*Patient 2: Mary*

*Mary a 69 year-old female presents to the emergency department via triage complaining of worsening shortness of breath, chest and epigastric pain x 24 hrs. She has nausea/vomiting, weakness, and fatigue. She “feels terrible.” Vitals: BP = 140/90, P = 80, RR = 24, T = 98.3F, O2 sat = 98%.*

Chest pain is one of the most high risk chief complaints you will see in any setting. However, accurately diagnosing the etiology of acute chest pain in the emergency department is very difficult because neither the quality nor intensity of the pain is specific to any particular organ. Furthermore, presentations vary significantly even amongst the most common life-threatening diseases. The potential for a life threatening processes always exists even if there are normal initial vital signs or atypical features. In almost every case of undifferentiated chest pain the experienced clinicians will at least initially consider the top three common causes of morbidity and mortality: ACS, pulmonary embolism, and aortic dissection. In many cases, the experienced clinician will also consider and prepare for potential several other less common life-threatening conditions: tension pneumothorax, esophageal rupture, and pericarditis with potential cardiac tamponade.

### Objectives

Upon completion of this self-study module, you should be able to:

- Describe the initial actions taken for high risk patients with chest pain.
- List critical diagnoses for chest pain and key features.
- Recognize that “Classic” symptoms may or may not be present

### Initial Actions

As you're walking toward his room, what actions should you perform upon arriving?

- If arrest– call a code: initiate CAB / multi-disciplinary help
- Determine “Sick vs “Not Sick” clinical gestalt
- Assesses primary survey: ABC's and vital signs (Stable vs unstable).

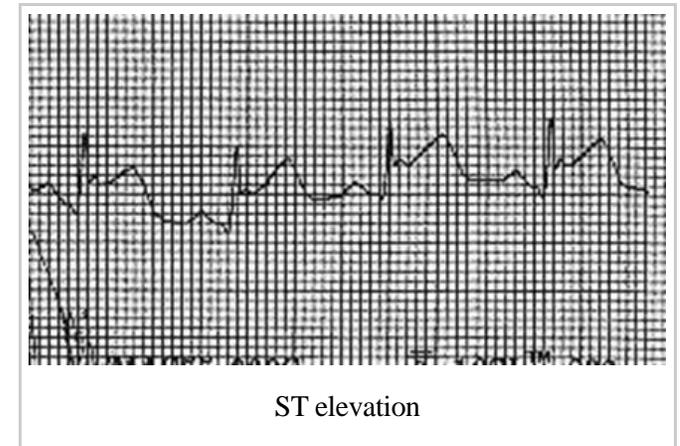
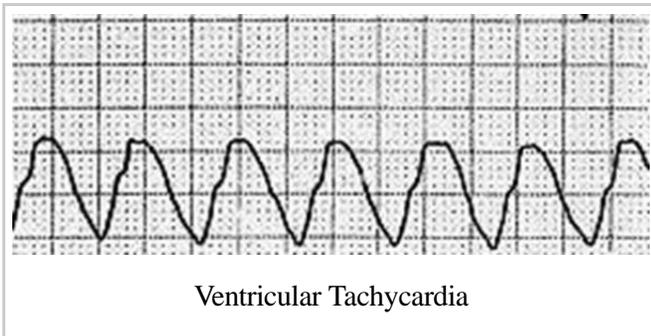
Primary Survey: ABC's + Vitals

If not in arrest, assessment of all high risk patients with chest pain should always begin with getting an initial impression then assessing the airway, breathing and circulation paired with vital signs. Simultaneously, the entire team begins initiating treatment: IV / O-2 / monitor. Initially, prepare for the worst. Chest pain is a team sport. Consider even placing a set of defibrillator/cardioversion pads on those patients who appear “Sick.”

Should you have a patient who presents with or develops acute distress, your diagnosis and treatment needs to occur simultaneously with resuscitating the patient. Chest pain patients with ACS may present in acute pulmonary edema from cardiogenic shock and need immediate airway support. Some patients with one of these critical illness may quickly become hypotensive with overt shock needing IVF and/or pressors. At any point, a patient may go into an arrhythmia and require emergent cardioversion or defibrillation. Rapid specific interventions are critical!

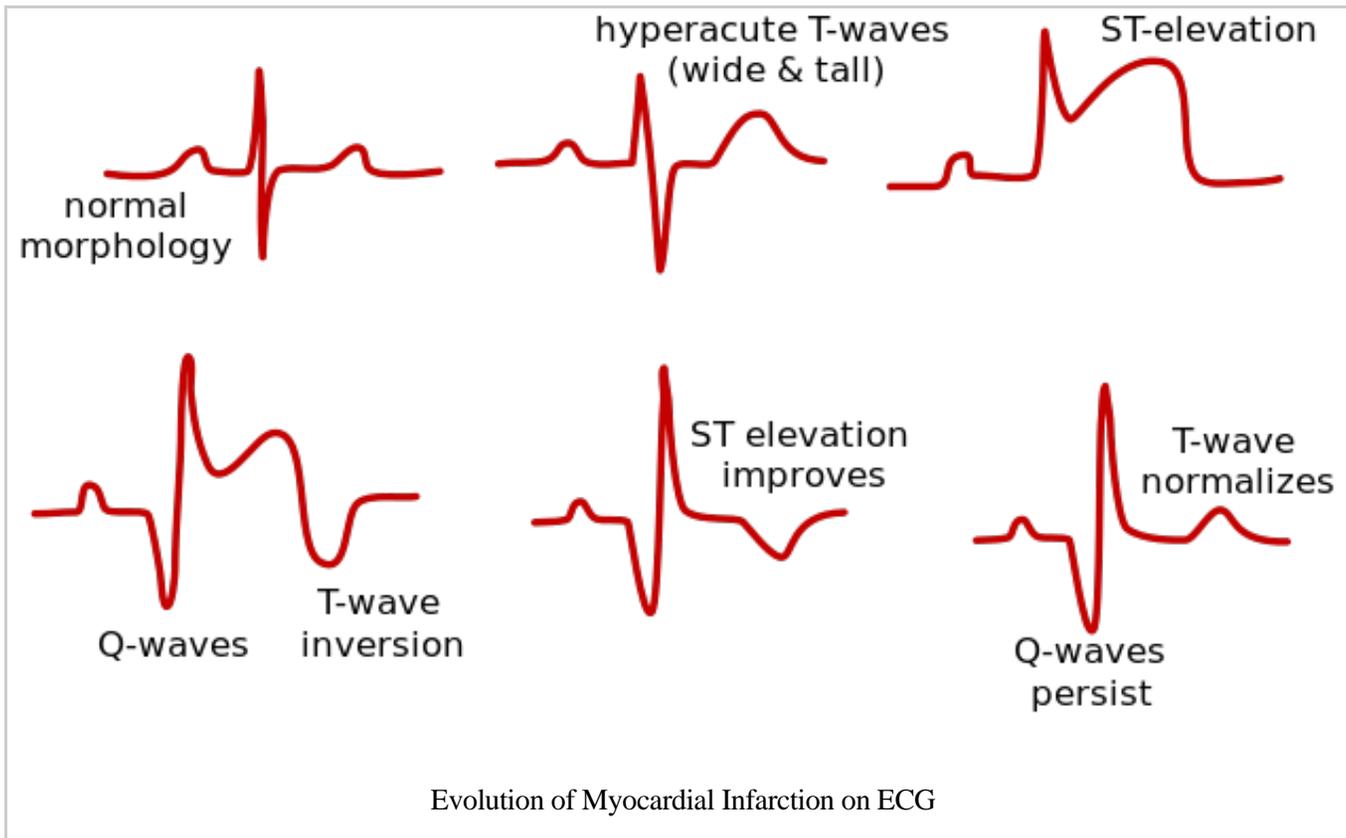
Airway	Breathing	Circulation
<ul style="list-style-type: none"> <li>• Jaw thrust /chin lift</li> <li>• Nasopharyngeal airway</li> <li>• Oral Airway</li> <li>• Laryngeal Mask Airway</li> <li>• Endotracheal tube</li> </ul>	<ul style="list-style-type: none"> <li>• Oxygen</li> <li>• Needle Decompression</li> <li>• Medications (70kg adult)               <ul style="list-style-type: none"> <li>• Nitroglycerin</li> <li>• Furosemide 20-80mg iv</li> </ul> </li> <li>• BiPAP</li> <li>• BVM: Bag Valve Mask</li> <li>• Ventilator</li> </ul>	<ul style="list-style-type: none"> <li>• IVF : 20-30 ml/kg of normal saline</li> <li>• BP Control</li> <li>• Anti-arrhythmics (70kg adult)               <ul style="list-style-type: none"> <li>• Amiodarone 300mg -150mg iv</li> <li>• Adenosine 6mg -12mg fast ivp</li> </ul> </li> <li>• Cardioversion (70kg adult)               <ul style="list-style-type: none"> <li>• 50-100 J (biphasic )</li> </ul> </li> <li>• Defibrillation (70kg adult)               <ul style="list-style-type: none"> <li>• 200 J (biphasic )</li> </ul> </li> <li>• Pressors</li> </ul>

## The EKG



High risk patient with undifferentiated chest pain should receive an EKG within 5-10 minutes of arriving to the emergency department. The attending physician and you need to look at that EKG as soon as it's done. It can yield a wealth of information. Not only may it show a ST-elevation MI or an arrhythmia, but it may suggest another concerning diagnosis. For example, PE may present with tachycardia and S-1, Q-3, T-3 or show electrical alternans suggesting impending tamponade.

Remember: time is cardiac muscle! Prompt diagnosis and treatment of a myocardial infarction will prevent further heart injury. Use treatment algorithms such as a STEMI protocol to improve care. Note: Serial EKGs in patients with ongoing chest pain improve sensitivity for STEMI.



## Differential Diagnosis

Like all patients with a high risk chief complaint the worst diagnosis should be considered first. Key features are used in a focused history and physical to rapidly differentiate these critical illnesses. You should be able to identify “Classic” presentations rapidly.

The diagnoses you must consider in patients with chest pain include:

1. Acute coronary syndromes
2. Pulmonary Embolus
3. Thoracic aortic dissection

4. Tension Pneumothorax
5. Esophageal Rupture
6. Pericarditis with potential tamponade

Diagnosis	Key Historical features	Key Exam Features
ACS	Chest pain, weakness, nausea, and fatigue	Variable: possible diaphoresis, ill appearance, or rales
PE	Pleuritic chest pain, SOB, risk factors	Tachycardia, clear lungs, unilateral leg swelling
Aortic Dissection	Sudden onset severe ripping pain to back with paresthesia or paralysis	Unequal blood pressures, abnormal pulses, neurologic deficits
Tension Pneumothorax	Sudden onset severe unilateral pleuritic chest pain	Hypotension, unequal breath sounds, tracheal deviation
Esophageal Rupture	Intense SSCP after vomiting or endoscopic procedure	Hamman's crunch (crackle sound heard or felt in time w/ heart beat)
Pericarditis/Tamponade	Pleuritic chest pain and dyspnea	Muffled heart sound, distended neck veins, hypotension

In an elderly patient with multiple co-morbidities even after a detailed secondary survey the differential could still include three or more of the above diagnoses. Evaluating chest pain is not simple. Serial EKGs, serial biomarkers, clinical assessment, imaging and observation may all still needed to further differentiate many patients.

Obviously there are other less acute possible sources for chest pain, such as costochondritis, pleurisy, gastroesophageal reflux or an anxiety attack. However, arrival at a likely non-emergent diagnosis should occur only after evaluation of more serious causes.

#### Clinical Decision Rules

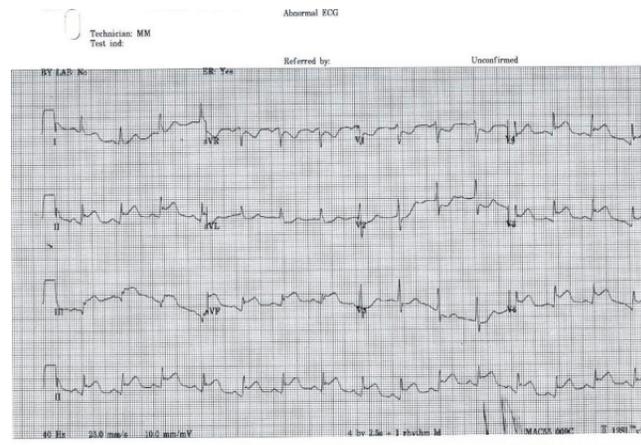
Use of clinical decision rules or CDR's may be used as cognitive checks and in unclear or "Non-classic" cases of "chest pain". In fact, this is may be the majority of patients you will see. Most CDR's are designed to assess pre-test probability or short term morbidity and mortality. Common examples include: the Wells's Scoring System for PE and the TIMI scoring systems for ACS.

It must be remembered that medicine is an applied science and you must understand what each scoring system is assessing. For example, when calculating A TIMI score you are assessing the 14 day risk of all-cause mortality, new or recurrent MI, and ischemia requiring re-vascularization. It does not answer the clinician's most direct question: "Is this particular symptom is a manifestation of the disease (ACS)?"

### *Your Cases: Joe and Mary*

*Initial assessment upon walking into the room is that both patients are “Potentially Sick”, but not in cardiac arrest. You then begin a primary survey: ABC’s and vital signs to determine stable vs unstable. Both patients are awake and talking, and so you ascertain that both patients are maintaining their airway. A quick assessment reveals clear lungs, an adequate work of breathing and normal pulse oximetry. Both patients have a normal blood pressure and an intact radial pulse with adequate perfusion. Primary survey has been assessed and appears intact.*

*The team begins by placing the patients on the cardiac monitor, giving 2 liters of oxygen by nasal cannula and placing an 18 gauge IV. Next, an EKG is obtained. It is possible that the EKG will differentiate these two patients. It is even possible that they will have the exact same process an acute ST elevation MI since both have some “Classic” features of an acute inferior lateral STEMI given their relative age and gender.*



*([https://cdemcurriculum.files.wordpress.com/2015/10/chest\\_pain\\_03.jpg](https://cdemcurriculum.files.wordpress.com/2015/10/chest_pain_03.jpg))*

If the EKG is not diagnostic, a secondary survey focused on the key features of life-threatening chest pain will be needed. Keep a broad differential initially! Try to formulate a systematic differential using a system that you such as CARD Common, Atypical, Rare, Don't Miss. Re-assess ABC's frequently as a patient's status may change at any moment. Use the following sections on the specific disease process to further guide your focused exam, choice of diagnostic testing, and definitive management.

