Chest pain

After injuries, chest pain is the second most common reason for adults to present to the emergency department (ED) in the United States. Chest pain also leads to nearly 4 million outpatient visits annually in the United States. Chest pain remains a diagnostic challenge in the ED and outpatient setting and requires thorough clinical evaluation. Although the cause of chest pain is often noncardiac, coronary artery disease (CAD) remains the leading cause of death for men and women, accounting for >365 000 deaths annually. Distinguishing between **serious and benign causes of chest pain** is imperative. Of all ED patients with chest pain, only 5.1% will have an acute coronary syndrome (ACS), and more than half will ultimately be found to have a noncardiac cause. Chest pain remains the most common symptom of CAD.

Presentation

Chest 'pain' is clearly a subjective phenomenon and may be described by patients in a variety of different ways. Whether the patient describes 'pain', 'discomfort' or in the case of John Smith, **'heaviness'**, there are some key features that must be elicited from the history. It is important when eliciting the history to use the patient's own description of their symptom.

Site and radiation

Pain secondary to myocardial ischemia is typically located in the **center of the chest**. It may radiate to the **neck**, **jaw, to either shoulder** and the **medial aspect of the left arm**. Occasionally, it may be experienced only at the sites of radiation or in the back. The patients may also report their primary discomfort at a location other than the chest, including the shoulder, arm, neck, back, upper abdomen, or jaw. Despite individual variability, the discomfort induced by myocardial ischemia is often characteristic and therefore central to the diagnosis.

Alternate diagnoses: The pain of myocarditis or pericarditis is also felt in the center of the chest, but can also be to the left of the sternum. It can radiate to the trapezial ridge. The severe pain of aortic dissection is typically central with radiation through to the back. Central chest pain may also occur with esophageal disease or disease of the thoracic aorta. Pain that is very localized (point with one finger) is unlikely to be ischemia.

Characteristics

Although the term chest pain is used in clinical practice, patients often report pressure, tightness, squeezing, heaviness, or burning. Thus, the pain of myocardial ischemia is typically **dull, aching, constricting, choking** or **'heavy'**. **Patients often emphasize that it is a discomfort rather than a pain.** We recommend using the term 'chest discomfort'. Angina occurs during (not after) exertion (John has a history of **exertional angina**) and is promptly relieved (in less than 5 minutes) by rest. It may also be precipitated or exacerbated by emotion but tends to occur more readily during exertion, after a large meal or in a cold wind. In crescendo or unstable angina or with infarction, similar pain may occur **at rest as is the case with this patient or be precipitated by minimal exertion**.

Alternate diagnoses: Pleuritis, a sharp or 'catching' chest pain aggravated by **deep breathing or coughing**, is often indicative of respiratory pathology, particularly pulmonary infection or infarction due to pulmonary embolus. However, the pain associated with pericarditis is also described as 'sharp' and can worsen during **inspiration, coughing or lying flat** due to

associated inflammation of the pleura. Pain associated with pericarditis typically **varies in intensity with movement and the phase of respiration**. Sudden onset of **ripping or tearing chest pain** radiating to the back suggests acute aortic dissection. Patients with reversible airways obstruction, such as asthma, may also describe exertional chest tightness that is relieved by rest. This may be difficult to distinguish from myocardial ischemia.

Onset and Timing

Onset: The pain associated with myocardial infarction (MI) typically takes several minutes or even longer to develop to its maximal intensity; similarly, angina builds up gradually in proportion to the intensity of exertion. John reports the discomfort **rising to maximal intensity over several minutes**. The chest discomfort has been constant although the intensity had diminished.

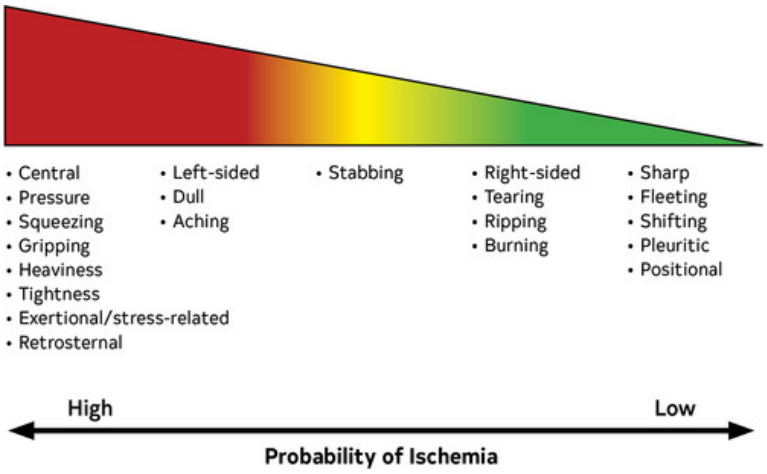
Timing: Chest pain should be considered ***acute*** when it is new onset or involves a change in pattern, intensity, or duration compared with previous episodes in a patient with recurrent symptoms. John has **acute onset (2 hours) of chest discomfort occurring at rest**.

Alternate diagnoses: The pain of aortic dissection (severe and 'tearing'), massive pulmonary embolism (PE) or pneumothorax is usually very sudden in onset. Other causes of chest pain tend to develop more gradually, over hours or even days (e.g. pericarditis). Pain that occurs after, rather than during, exertion is usually musculoskeletal or psychological in origin. Fleeting chest pain lasting 'seconds' is unlikely to be ischemic in nature.

Precipitating and relieving factors

Occurrence of pain at rest or with minimal exertion is typical of acute coronary syndrome. Physical exercise or stress are common triggers for anginal symptoms. John's history of chest pain with exertion is consistent with this.

Alternate diagnoses: Pain that is worse with inspiration (pleuritic) or changes with position is unlikely related with ischemic heart disease. Relief with nitroglycerine is not diagnostic and should not be used as criteria.



Chest pain

Associated features
Common symptoms associated with myocardial ischemia include, but are not limited to, dyspnea, palpitations, diaphoresis, lightheadedness, presyncope or syncope, upper abdominal pain, or heartburn unrelated to meals and nausea or vomiting. The pain of MI, massive PE or aortic dissection is often accompanied by **autonomic disturbance**, including **diaphoresis, nausea (John reports both)** and vomiting. Some patients describe a feeling of impending death. **Dyspnea,** due to pulmonary congestion arising from transient ischemic left ventricular dysfunction, is often a prominent feature of myocardial ischemia.

Alternate diagnoses: Dyspnea may also accompany any of the respiratory causes of chest pain and can be associated with cough, wheeze or other respiratory symptoms. Patients with myocarditis or pericarditis may describe a **prodromal viral illness**. Gastrointestinal disorders, such as gastro-esophageal reflux or peptic ulceration, may present with chest pain that is hard to distinguish from myocardial ischemia; it may even be precipitated by exercise and be relieved by nitrates. However, it is usually possible to elicit a history relating chest pain to supine posture or eating, drinking or esophageal reflux. The pain of gastro-esophageal reflux often radiates to the inter-scapular region and dysphagia may be present. Severe chest pain arising after retching or vomiting, or following esophageal instrumentation, should raise the possibility of **esophageal perforation.**

Risk factors for **atherosclerosis** should be established and include:
- **Hypertension**
- **Hyperlipidemia**
- **Diabetes**
- **Smoking**
- **Positive family history**
- Obesity (BMI > 30)

Look at the Heart Score below:

For the history, the following would be concerning for ACS:
- **Chest pain radiating to one or both arms**
- **Pressure like pain with associated nausea, vomiting, or diaphoresis**
- **Exertional chest pain**
- Chest pain similar to prior MI

For the history, the following would be NON-concerning for ACS:
- Pleuritic or positional chest pain
- Chest pain reproducible with palpation
- Stabbing quality of pain
- Pain localized to an area on chest smaller than a coin

John's history of atherosclerotic disease (claudication) would also give him a 2.
if a patient has a score between 0-3, they are considered low risk can be discharged home safely.
A score between 4-6 is considered moderate risk and should be admitted for further observation

and workup. A score of 7-10 is considered high risk and is recommended to have an early invasive intervention. John would be a '7' without the inclusion of troponin data..

HEART score for chest pain patients

History (Anamnesis)	Highly suspicious	2	
	Moderately suspicious	1	
	Slightly suspicious	0	
ECG	Significant ST-deviation	2	
	Non-specific repolarisation disturbance / LBBB / PM	1	
	Normal	0	
Age	≥ 65 years	2	
	45 – 65 years	1	
	≤ 45 years	0	
Risk factors	≥ 3 risk factors *or* history of atherosclerotic disease	2	
	1 or 2 risk factors	1	
	No risk factors known	0	
Troponin	≥ 3x normal limit	2	
	1-3x normal limit	1	
	≤ normal limit	0	
		Total	

Risk factors for atherosclerotic disease:

Hypercholesterolemia	Cigarette smoking
Hypertension	Positive family history
Diabetes Mellitus	Obesity (BMI>30)