

<b>SUMMARY</b>	<b>DECISION SUPPORT</b>	<b>PATIENT EDUCATION/SELF MANAGEMENT</b>
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## GOALS-EVALUATION OF CHEST PAIN BY PHONE OR AT THE INSTITUTION

- ◇ Appropriately identify and refer patients when Acute Coronary Syndrome (ACS) or other life-threatening emergencies suspected
- ◇ Identify and manage patients with non-life threatening causes of chest pain
- ◇ Appropriately document clinical decision-making whether evaluating patient by phone or onsite
- ◇ Coordinate with cardiologist to appropriately evaluate, and manage patients with recurrent chest pain.

**Contents**

- Diagnostic Criteria/Evaluation ..... 1
- Treatment Options/Monitoring/Likelihood ACS..... 2
- Evaluation of Undiagnosed Acute Chest Pain..... 3
- Follow-up of CP Patient (TTA/ED/Hosp)..... 4
- Medications ..... 5
- ACC/AHA Clinical Decision making ..... 6
- Differential Diagnosis
  - Chest Pain Descriptors ..... 7
  - Alternative Diagnoses/Noncardiac CP ..... 8
  - Esophageal/Musculoskeletal ..... 9
- DDx life-threatening causes of chest pain ..... 10
- Important EKG changes ..... 11
- Noninvasive risk stratification ..... 12
- Patient Information.....13

## DIAGNOSTIC CRITERIA/EVALUATION

- History (description of CP, cardiac risk factors, prior cardiac hx), Brief PE, 12 lead EKG to be addressed with each patient with chest pain whether taking call from home or on-site evaluation.
- *No single feature of a patient's history, risk factors, exam or EKG can rule out or rule in ACS*

<b>ASSESS CHEST PAIN</b>	Quality, location, radiation, duration, provoking or relieving factors or associated symptoms (See p.7)
<b>ASSESS CARDIAC RISK FACTORS</b>	<b>Traditional:</b> DM, hyperlipidemia, HTN, Smoking, male, age >40 years, family history of premature CHD <b>Nontraditional:</b> Obesity, sympathomimetic drug use, coronary artery spasm, estrogen or Birth Control Pill use, collagen vascular disease, cardiomyopathy, H/O chest radiation, sickle cell, chronic kidney disease, rheumatoid arthritis/inflammatory arthritides
<b>PRIOR CARDIAC HX</b>	History of ischemic heart disease and any previous treatment or investigations of chest pain
<b>PHYSICAL EXAM</b>	Vital signs including oxygen saturation, cardiac (murmur, rubs, edema), pulmonary (rhonchi, rales, wheezes): per nursing report if not on-site evaluation
<b>EKG</b>	A normal EKG markedly reduces the probability that chest pain is due to acute myocardial infarction, but it does not exclude a serious cardiac etiology (particularly unstable angina).
<b>ACS MEDICAL DECISION MAKING</b>	<ul style="list-style-type: none"> <li>• No <i>one</i> chest pain descriptor, history or exam element, or EKG finding can rule in or rule out ACS.</li> <li>• Use medical decision making/clinical judgment when evaluating a patient.</li> <li>• Tools exist to assist in risk-stratifying patients, see pgs 2 and 6</li> <li>• Document your medical decision-making including working diagnosis (if available) in the Assessment/ Plan both when evaluating patient onsite or by phone</li> </ul>
<b>RULE OUT NON-ACS LIFE THREATENING CAUSES OF CHEST PAIN* (SEE PG 10)</b>	<p>Consider serious non-ACS causes especially if co-morbidities and risk factors for disease are present</p> <ul style="list-style-type: none"> <li>• Consider aortic dissection if sudden onset ripping/tearing pain</li> <li>• Consider pulmonary embolus or pneumothorax with sudden onset pain and dyspnea</li> <li>• Consider pericarditis/pericardial tamponade if pleuritic or positional anterior pain</li> <li>• Consider esophageal rupture if recent vomiting or EGD or concomitant respiratory and GI symptoms</li> </ul> <ul style="list-style-type: none"> <li>◇ Prompt (Code 3) transport to ED if above diagnoses suspected based on history and RN evaluation, especially if vital signs abnormal</li> <li>◇ Consider CXR in addition to EKG and PCP physical exam (document heart sounds and breath sounds) if clinical suspicion lower for above life-threatening conditions, but no alternative diagnosis established.</li> </ul>

\*"Identifying Chest Pain Emergencies in the Primary Care Setting" in Primary Care Winters and Katzen 33(2006) 625-642

## SUMMARY

## DECISION SUPPORT

## PATIENT EDUCATION/SELF MANAGEMENT

## TREATMENT OPTIONS/MONITORING

## If ACS suspected:

- Call for immediate code 3 transport to higher level of care\*
- Start patient on oxygen (generally 2L by nasal cannula), give 325 mg of ASA (chewed) if no contraindication
- Establish IV access
- SL NTG (0.3 or 0.4 mg).
  - ◊ Watch for signs of hypotension. If not hypotensive may repeat if patient can tolerate doses.
  - ◊ Relief of chest pain with NTG is **not specific for angina**; a similar response may be seen w/ GI problems
    - Conversely a GI "cocktail" **does not** reliably differentiate between ACS and GI etiologies, which may coexist
- Prepare pertinent records for transport including ECG's, cardiology notes, procedure reports, and recent PC progress notes
- Monitor patients VS every 10 minutes prior to transfer. 12-lead EKG every 15-30 minutes while awaiting transfer.
- Cardiac monitor if available. Have AED and emergency response bag available.

\*Alternate (Code 2) transfer of patient to a specific facility is sometimes indicated in cases such as:

- Patients who present with findings consistent with an established diagnoses (such as stable coronary heart disease) who have a relationship with outside hospital/cardiologists and whose cardiologist requests specific facility
- Discussion with accepting Emergency Department physician or cardiologist reveals anticipated care is best provided at a specific facility.
- Patients whose symptoms have resolved though index of suspicion remains increased for unstable angina/ACS

## Institution Support

- Maintain 24-7 urgent-emergent cardiology consultation contact information in TTA
- Provide scanning capability in TTA . Scanned EKGs can be sent via email to CCHCS employees with CCHCS email addresses. Encryption should be used when available,
- Provide faxing capability in TTA. Patient information including EKGs can be sent to non-CCHCS consultants via fax if no protected health information is contained in the records sent. Patient care documents can also be scanned and sent to non-CCHCS consultants if the email is encrypted and no protected health information is contained in the documents sent.
- Provide access to prior EKGs in the TTA, limited to the minimum necessary information and those with a need to know

## ACS more likely when:

- \* Primary symptom is pain/discomfort in chest
- \* Current pain similar to prior documented angina
- \* Patient has Coronary Heart Disease or equivalent:
  - H/O myocardial infarction, known CHD, AAA
  - Cerebrovascular or peripheral vascular disease
  - Diabetes or chronic renal disease
- \* Transient mitral regurgitation or hypotension or diaphoresis or pulmonary edema (rales)
- \* New (or presumably new) ST deviation ( $\geq 1$  mm)
  - Either depression or elevation
- \* New T wave inversion in multiple precordial leads
- \* New left bundle branch block treated as ST elevation

## ACS less likely when:

- \* Primary or sole location in the mid or lower abdominal region
- \* Any discomfort localized with one finger
- \* Any discomfort reproduced by movement or palpation
- \* Constant pain lasting for days
- \* Fleeting pains lasting for a few seconds or less
- \* Pain radiating into lower extremities or above the mandible
- \* Under Age 40
- \* No known Coronary Heart Disease or no equivalent:
  - No H/O myocardial infarction, known CHD, AAA
  - No cerebrovascular or peripheral vascular disease
  - No diabetes or chronic renal disease
- \* Pain not worsened during exercise
- \* Patient assumes pain is not cardiogenic
- \* Normal EKG

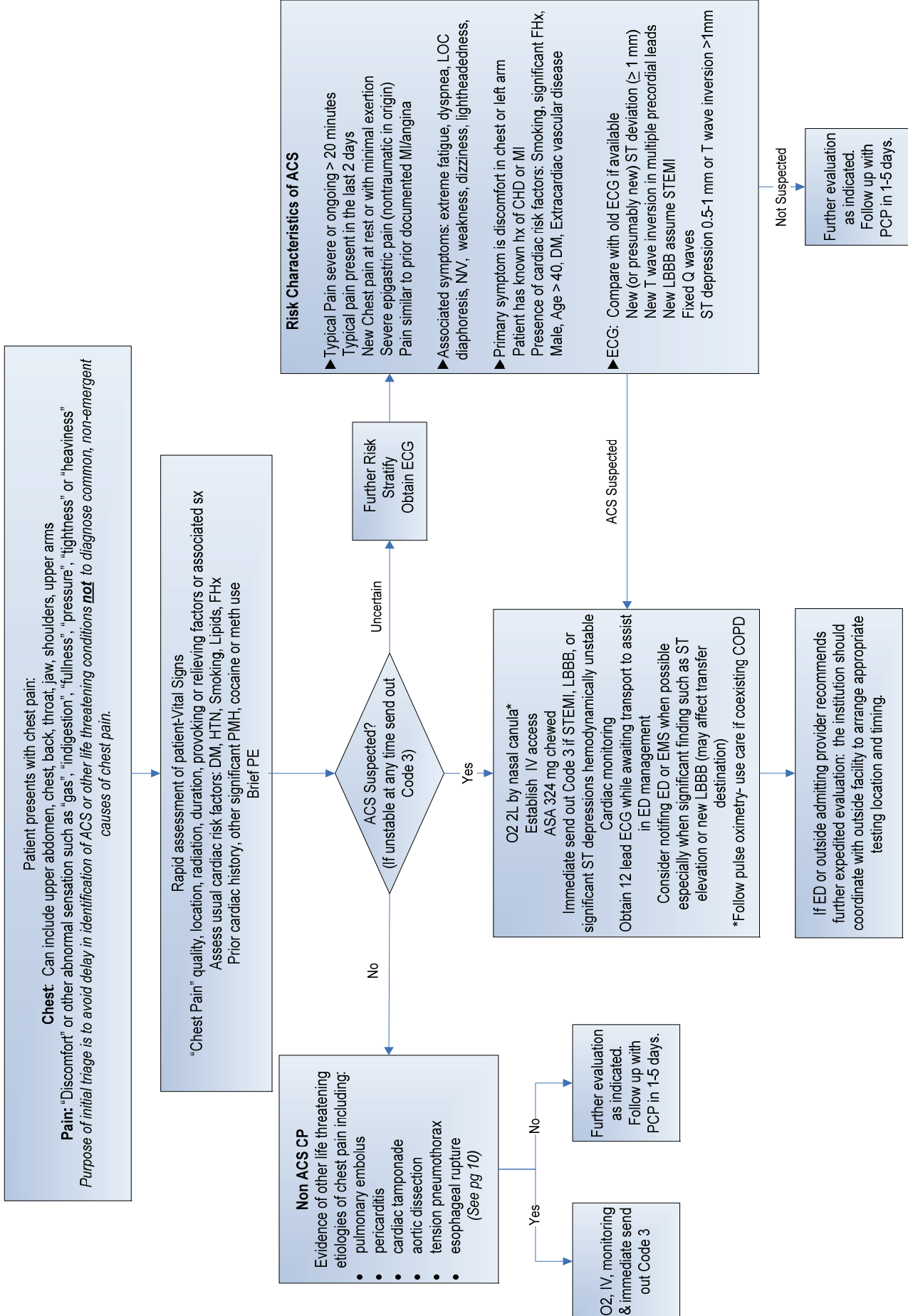
\*\*"Identifying Chest Pain Emergencies in the Primary Care Setting" in Primary Care Winters and Katzen 33(2006) 625-642

## SUMMARY

## DECISION SUPPORT

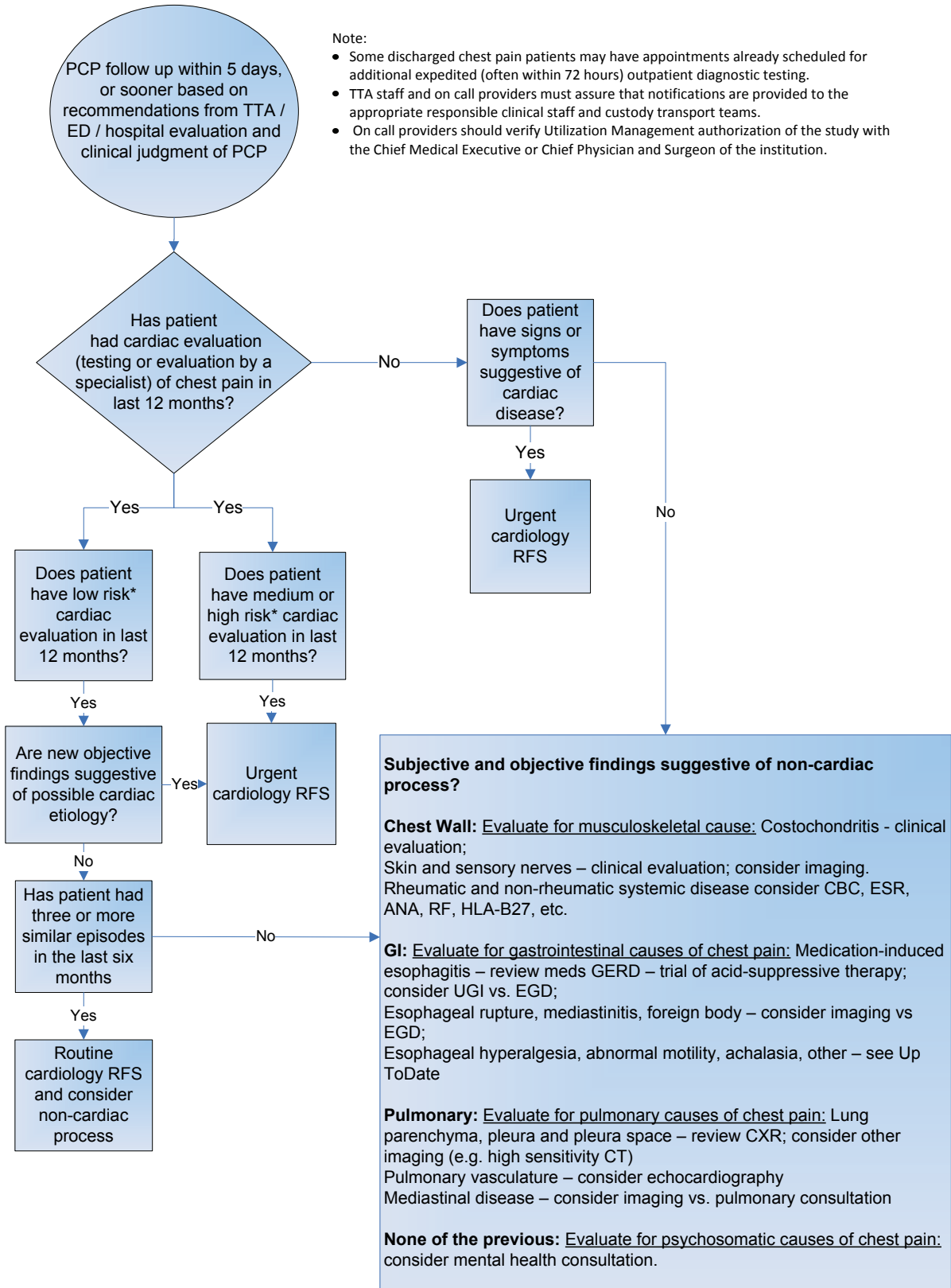
## PATIENT EDUCATION/SELF MANAGEMENT

### Evaluation of Undiagnosed Acute Chest Pain



Adapted from: Anderson, J, Adams, C, Antman, E, et al. ACC/AHA 2007 guidelines for the management of patients with unstable angina/non-ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines Adapted from: National Heart Attack Alert Program. Emergency Department: rapid identification and treatment of patients with acute myocardial infarction. Bethesda, MD: US Department of Health and Human Services. US Public Health Service. National Institutes of Health. National Heart, Lung and Blood Institute, September 1993. NIH Publication No. 93-3278 (23).

## Follow up of TTA / ER / Hospital Evaluation of Chest Pain



\*See page 12 for details

## SUMMARY

## DECISION SUPPORT

## PATIENT EDUCATION/SELF MANAGEMENT

## MEDICATIONS:

MEDICATION/ THERAPY	ADULT DOSAGE	INDICATIONS/PRECAUTIONS															
<b>ASPIRIN</b>	160 mg to 325 mg tablet taken as soon as possible and then daily <b>(chewing preferable to swallowing)</b> <ul style="list-style-type: none"> <li>• May use rectal suppository for patients who cannot take orally</li> <li>• Give within minutes of arrival.</li> <li>• Higher doses (1000 mg) interfere with prostacyclin production and may limit positive benefits.</li> </ul>	<ul style="list-style-type: none"> <li>• Administer to all patients with suspected ACS unless contraindicated</li> <li>• Blocks formation of thromboxane A<sub>2</sub>, which causes platelets to aggregate, arteries to constrict. This reduces overall AMI mortality, reinfarction, nonfatal stroke.</li> <li>• Any person with symptoms (<i>pressure, heavy weight, squeezing, crushing</i>) suggestive of ischemic pain.</li> <li>• Use with caution in patients with active ulcer disease.</li> <li>• Contraindicated in patients with known hypersensitivity to aspirin.</li> </ul>															
<b>NITROGLYCERIN</b>	Sublingual Route  1 tablet (0.3 to 0.4 mg); repeat every 5 minutes.	<ul style="list-style-type: none"> <li>• Initial anti-anginal for suspected ischemic pain.</li> <li>• Hypertensive urgency with ACS.</li> </ul> <p>Precautions:</p> <ul style="list-style-type: none"> <li>• With evidence of AMI, limit systolic blood pressure to drop 10% if patient is normotensive, 30% drop if hypertensive, and avoid drop below 90 mm Hg.</li> <li>• Patient should sit or lie down with receiving this medication.</li> </ul> <p>Contraindications:</p> <ul style="list-style-type: none"> <li>• Hypotension</li> <li>• Concomitant phosphodiesterase inhibitor use</li> <li>• Severe bradycardia or severe tachycardia</li> <li>• RV infarction</li> </ul>															
<b>OXYGEN</b>  Delivered from portable tanks or installed, wall-mounted sources through delivery devices.	<table border="1"> <thead> <tr> <th>Device</th> <th>Flow Rate</th> <th>O<sub>2</sub> (%)</th> </tr> </thead> <tbody> <tr> <td>Nasal prongs</td> <td>1-6 L/min</td> <td>24-44</td> </tr> <tr> <td>Venturi mask</td> <td>4-8 L/min</td> <td>24-40</td> </tr> <tr> <td>Partial rebreather mask</td> <td>6-10 L/min</td> <td>35-60</td> </tr> <tr> <td>Bag-mask</td> <td>15 L/min</td> <td>up to 100</td> </tr> </tbody> </table>	Device	Flow Rate	O <sub>2</sub> (%)	Nasal prongs	1-6 L/min	24-44	Venturi mask	4-8 L/min	24-40	Partial rebreather mask	6-10 L/min	35-60	Bag-mask	15 L/min	up to 100	<ul style="list-style-type: none"> <li>• Any suspected cardiopulmonary emergency, especially (but not limited to) complaints of shortness of breath and suspected ischemic chest pain.</li> <li>• <b>Note:</b> Pulse oximetry provides a useful method of titrating oxygen administration to maintain physiologic oxygen saturation (see precautions).</li> </ul> <p>Precautions:</p> <ul style="list-style-type: none"> <li>• Observe closely when using with pulmonary patients known dependent on hypoxic respiratory drive (rare).</li> </ul> <p>Pulse oximetry inaccurate in low cardiac output states or with vasoconstriction.</p>
Device	Flow Rate	O <sub>2</sub> (%)															
Nasal prongs	1-6 L/min	24-44															
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Bag-mask	15 L/min	up to 100															
<b>MORPHINE</b>	IV Infusion  2 to 4 mg IV (over 1 to 5 minutes) every 5 to 30 minutes.	<ul style="list-style-type: none"> <li>• Chest pain with ACS unresponsive to nitrates</li> <li>• Acute cardiogenic pulmonary edema (if blood pressure is adequate).</li> </ul> <p>Precautions:</p> <ul style="list-style-type: none"> <li>• Administer slowly and titrate to effect.</li> <li>• May compromise respiration; therefore, use with caution in the compromised respiratory state of acute pulmonary edema.</li> <li>• Causes hypotension in volume-depleted patients.</li> <li>• Reverse, if needed, with naloxone (0.4 to 2 mg IV).</li> </ul>															

SUMMARY	DECISION SUPPORT		PATIENT EDUCATION/SELF MANAGEMENT	
<b>AMERICAN COLLEGE OF CARDIOLOGY/AMERICAN HEART ASSOCIATION GUIDELINES: LIKELIHOOD THAT SIGNS AND SYMPTOMS REPRESENT AN ACUTE CORONARY SYNDROME SECONDARY TO CORONARY HEART DISEASE</b>				
<b>High Likelihood ACS</b>	<b>Intermediate Likelihood ACS</b>		<b>Low Likelihood ACS</b>	
Any of the following features	Absence of high likelihood features and any of the following		Absence of intermediate likelihood features but may have	
<b>HISTORY</b>				
Chest or left arm pain or discomfort as chief symptom reproducing prior documented angina	Chest or left arm pain or discomfort as chief symptom		Absence of any of the intermediate likelihood features	
Known history of CHD including MI	Age > 70 years			
	Male sex			
	Diabetes mellitus			
<b>EXAMINATION</b>				
Transient mitral regurgitation, hypotension, diaphoresis, pulmonary edema, or rales	Extracardiac vascular disease		Chest discomfort reproduced by palpation	
<b>EKG</b>				
New or presumably new transient ST segment deviation ( $\geq 0.05\text{mV}$ ) or T wave inversion ( $\geq 0.2\text{mV}$ ) with symptoms New LBBB is ST elevation equivalent	Fixed Q waves		Normal EKG or T wave flattening or inversion in leads with dominant R waves	
	Abnormal ST segments or T waves not documented to be new			
Classification Unstable Angina, Up To Date 2011				
<b>Clinical Decision Rule for Identifying Patients with Chest Pain Caused by CHD</b>				
<b>Variable</b>			<b>Points</b>	
Age 55 years or older in men; 65 years or older in women			1	
Known CHD or cerebrovascular disease			1	
Pain not reproducible by palpation			1	
Pain worse during exercise			1	
Patient assumes pain is cardiogenic			1	
<b>Total Points:</b>				
<b>Points</b>	<b>Patients with CHD</b>	<b>Patients without CHD</b>	<b>Likelihood ratio</b>	<b>Predictive value</b>
0 to 1	3	542	0.0	0.6
2 or 3	91	659	0.9	12.1
4 or 5	94	56	11.2	62.7
Bösner S, Haasenritter J, Becker A, et al. Ruling out coronary artery disease in primary care: development and validation of a simple prediction rule. <i>CMAJ</i> . 2010;182(12):1295-1300.				

Mayo Clinic Proceedings March 2010;85(3):284-299 "The basic clinical tools of history, physical examination, and electrocardiography are currently widely acknowledged to allow early identification of low-risk patients who have less than 5% probability of acute coronary syndrome."

## SUMMARY

## DECISION SUPPORT

## PATIENT EDUCATION/SELF MANAGEMENT

## DIFFERENTIAL DIAGNOSIS OF CHEST PAIN

## Chest Pain Descriptors

<b>QUALITY</b>	Cardiac pain: May be reported as discomfort rather than pain. Terms often used squeezing, tightness, pressure, constriction, strangling, burning, heart burn, fullness in the chest, band-like sensation, knot in the center of the chest, lump in throat, ache, heavy weight on chest (elephant sitting on chest), like a bra too tight.
<b>LOCATION RADIATION</b>	Cardiac pain often diffuse discomfort that may be difficult to localize. Can radiate to upper abdomen (epigastric), shoulders, either or <i>both</i> arms (upper and forearm), wrist, fingers, neck and throat, lower jaw and teeth and rarely to the back (specifically the interscapular region).
<b>DURATION</b>	Angina generally lasts for 2-5 minutes, not a fleeting discomfort that lasts only for a few seconds or less than a minute. It generally does not last for 20 to 30 minutes, unless the patient is experiencing ACS, especially MI.
<b>PROVOKING/RELIEVING FACTORS</b>	Cardiac pain can be provoked by physical activity, cold, emotional stress, sexual intercourse, meals, or lying down. Patients should be questioned about cocaine use (risk of a MI ↑24x in the 60 minutes after cocaine use). Cardiac pain often relieved by rest. Other etiologies: <ul style="list-style-type: none"> <li>• Discomfort that reliably occurs with eating is suggestive of upper gastrointestinal disease.</li> <li>• Pain made worse by swallowing is likely of esophageal origin.</li> <li>• Body position or movement, or deep breathing, may exacerbate chest pain of musculoskeletal origin.</li> <li>• Pleuritic chest pain is worsened by respiration and may be exacerbated when lying down.</li> <li>• The pain of pericarditis typically improves with sitting up and leaning forward.</li> </ul>
<b>SPECIAL CONSIDERATIONS</b>	<ul style="list-style-type: none"> <li>• Women may present more frequently than men with atypical chest pain and symptoms.</li> <li>• Diabetic patients may have atypical presentations due to autonomic dysfunction.</li> <li>• Chronic kidney disease patients often have multiple risk factors for cardiovascular disease.</li> <li>• Elderly patients may have atypical symptoms such as generalized weakness, stroke, syncope, or a change in mental status.</li> <li>• Maintain objectivity: studies indicate patients who present in "histrionic" fashion are far less likely to be suspected of cardiac disease and are frequently misdiagnosed.</li> <li>• Patients with new or presumably new left bundle branch block should be treated similarly to those with ST-segment elevation.</li> <li>• Avoid over-reliance on an alternative diagnosis. In patients evaluated for chest pain, it was shown that those with a "clear-cut" alternative noncardiac diagnosis had a 4 % rate of ACS at 30 days.</li> <li>• Certain populations also have increased risk for missed ACS. Four populations that are more likely to be discharged (from the emergency department) with ACS include: Women &lt;55 years old, nonwhite patients, dyspnea as the primary complaint, and patients with a normal EKG.</li> </ul>

## Noncardiac chest pain

In two systematic reviews, the following characteristics were found to be more typical of **nonischemic** chest discomfort (however, some patients with ACS present with atypical types of chest pain):

- Pleuritic pain, sharp or knife-like pain related to respiratory movements or cough
- Primary or sole location in the mid or lower abdominal region
- Any discomfort localized with one finger
- Any discomfort reproduced by movement or palpation
- Constant pain lasting for days
- Fleeting pains lasting for a few seconds or less
- Pain radiating into the lower extremities or above the mandible

## DIFFERENTIAL DIAGNOSIS OF CHEST PAIN

### Alternative diagnoses to cardiac ischemia for patients with chest pain

NON-ISCHEMIC CARDIOVASCULAR	PULMONARY	GASTROINTESTINAL
<ul style="list-style-type: none"> <li>• Aortic dissection</li> <li>• Myocarditis</li> <li>• Pericarditis</li> </ul>	<ul style="list-style-type: none"> <li>• Pleuritis</li> <li>• Pneumonia</li> <li>• Pulmonary embolus</li> <li>• Tension pneumothorax</li> </ul>	<ul style="list-style-type: none"> <li>• Biliary cholangitis                             <ul style="list-style-type: none"> <li>◦ Cholecystitis</li> <li>◦ Choledocholithiasis</li> <li>◦ Colic</li> </ul> </li> </ul>
CHEST WALL	PSYCHIATRIC	<ul style="list-style-type: none"> <li>• Esophageal                             <ul style="list-style-type: none"> <li>◦ Esophagitis</li> <li>◦ Spasm</li> <li>◦ Reflux Rupture</li> </ul> </li> <li>• Pancreatitis</li> <li>• Peptic ulcer disease                             <ul style="list-style-type: none"> <li>◦ Nonperforating</li> <li>◦ Perforating</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Cervical disc disease</li> <li>• Costochondritis</li> <li>• Fibromyalgia</li> <li>• Herpes zoster (before the rash)</li> <li>• Neuropathic pain</li> <li>• Rib fracture</li> <li>• Sternoclavicular arthritis</li> </ul>	<ul style="list-style-type: none"> <li>• Affective disorders (eg, depression)</li> <li>• Anxiety disorders                             <ul style="list-style-type: none"> <li>◦ Hyperventilation</li> <li>◦ Panic disorder</li> <li>◦ Primary anxiety</li> </ul> </li> <li>• Somatiform disorders                             <ul style="list-style-type: none"> <li>◦ Thought disorders (eg, fixed delusions)</li> </ul> </li> </ul>	

### Characteristics of major noncardiac causes of chest pain

CONDITION	DURATION OF PAIN	CHARACTER OF PAIN
<b>Gastroesophageal reflux</b>	5 to 60 min	Visceral, substernal, worse with recumbency, no radiation, relief with food, antacids
<b>Esophageal spasm</b>	5 to 60 min	Visceral, spontaneous, substernal, associated with cold liquids, relief with nitroglycerin
<b>Peptic ulcer</b>	Hours	Visceral, burning, epigastric, relief with food, antacids, normal EKG
<b>Biliary disease</b>	Hours	Visceral, epigastric, interscapular colic, occurs after meals
<b>Cervical disc</b>	Variable	Superficial, positional, arm, neck
<b>Musculoskeletal</b>	Variable	Superficial, positional, worse with movement, local tenderness
<b>Hyperventilation</b>	2 to 3 min	Visceral, substernal, tachypneic, anxious
<b>Thyroiditis</b>	Persistent	Aggravated by swallowing, neck, throat tenderness

Pathophysiology and clinical presentation of ischemic chest pain: Philip J. Podrid, MD, Author, UTD version 19.1: January 2011



## SUMMARY

## DECISION SUPPORT

## PATIENT EDUCATION/SELF MANAGEMENT

Features found more frequently in patients with esophageal chest pain	Important features of the history in musculoskeletal chest pain
Pain provoked by swallowing	Features suggestive of musculoskeletal cause
Pain provoked by postural changes	Insidious onset
Pain palliated by antacids	Recent repetitive unaccustomed activity (trunk and arms)
An inconsistent relationship to exercise	Pain may be localized or diffuse
Substernal chest pain that does not radiate	Positional component
Frequent episodes of spontaneous pain	Persistent and prolonged (lasting hours-days)
Nocturnal pain	Features suggestive of associated condition
Severe onset of pain, continuing as a background ache for several hours	Neck, thoracic, or shoulder pain (pain referred to chest)
Pain associated with heartburn and regurgitation of acid into the mouth	Chronic low back pain, young patient (ankylosing spondylitis)
	Ocular inflammation (ankylosing spondylitis or related disease)
	Diffuse musculoskeletal pain/sleep disturbance (fibromyalgia)
	Peripheral joint pain and swelling (rheumatoid arthritis)
	Skin lesions (acne, psoriasis, psoriatic arthritis)

*Data from Davies, HA, Jones, DB, Rhodes, J, Newcombe, RG, J Clin Gastroenterology 1985; 7:477.*

### Characteristics of isolated musculoskeletal chest pain syndromes

DISORDER	CLINICAL MANIFESTATIONS
<b>Costosternal syndromes (costochondritis)</b>	Multiple areas of tenderness that reproduce the described pain, usually in the upper costal cartilages at the costochondral or costosternal junctions; there is no swelling.
<b>Tietze's syndrome</b>	Painful, nonsuppurative localized swelling of the costosternal, sternoclavicular, or costochondral joints, most often involving one joint in the area of the second and third ribs; rare, primarily affects young adults.
<b>Sternalis syndrome</b>	Localized tenderness over the body of the sternum or overlying sternalis muscle; palpation often causes radiation of pain bilaterally.
<b>Xiphoidalgia</b>	Localized discomfort over the sternum at the xiphoid process.
<b>Spontaneous sternoclavicular subluxation</b>	Most often occurs in the dominant side, associated with moderate to heavy repetitive tasks; almost exclusively occurs in middle-aged women.
<b>Lower rib pain syndromes</b>	Pain in the lower chest or upper abdomen with a tender spot on the costal margin; pain can be reproduced by pressing on the spot.
<b>Posterior chest wall syndromes</b>	May be caused by herniated thoracic disc, leading to band-like chest pain that may have a unilateral dermatomal distribution. Also induced by costovertebral joint dysfunction; tenderness over the affected area, worse with coughing or deep breathing.

Pathophysiology and clinical presentation of ischemic chest pain: Philip J. Podrid, MD, Author, UTD version 19.1: January 2011

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## DECISION SUPPORT

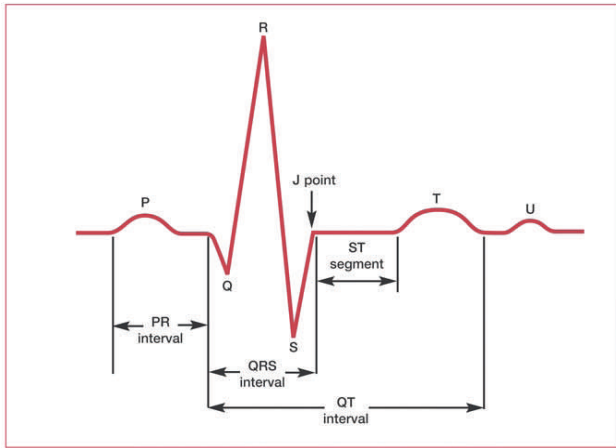
## PATIENT EDUCATION/SELF MANAGEMENT

## DIFFERENTIATION OF LIFE-THREATENING CAUSES OF CHEST PAIN

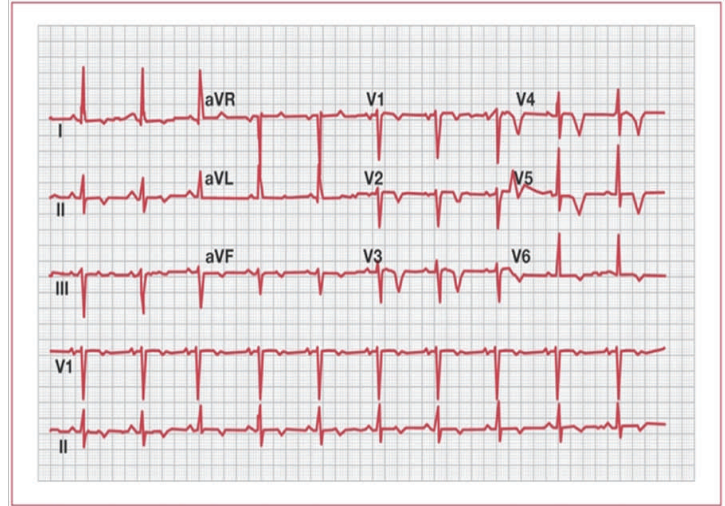
Diagnosis	Historical features	Examination findings	Electrocardiogram	Chest X-ray	Additional important information
<b>Acute coronary syndrome</b>	<ul style="list-style-type: none"> <li>Substernal/left sided chest pressure or tightness is common</li> <li>Onset is gradual</li> <li>Pain radiating to shoulders or pain with exertion increases relative risk</li> <li>"Atypical" symptoms (eg, dyspnea, weakness) more common in elderly, women, diabetics</li> <li>Elderly can present with dyspnea, weakness, syncope, or altered mental state alone</li> </ul>	<ul style="list-style-type: none"> <li>Nonspecific</li> <li>May detect signs of HF</li> </ul>	<ul style="list-style-type: none"> <li>ST segment elevations, Q waves, new left bundle branch block are evidence of AMI</li> <li>Single EKG is not sensitive for ACS</li> <li>Prominent R waves with ST segment depressions in V<sup>1</sup> and V<sup>2</sup> strongly suggests posterior AMI</li> </ul>	<ul style="list-style-type: none"> <li>Nonspecific</li> <li>May show evidence of HF</li> </ul>	<ul style="list-style-type: none"> <li>Assume symptoms of ACS within days or a few weeks of PCI or CABG is from an occluded artery or graft</li> </ul>
<b>Aortic dissection</b>	<ul style="list-style-type: none"> <li>Sudden onset of sharp, tearing, or ripping pain</li> <li>Maximal severity at onset</li> <li>Most often begins in chest, can begin in back</li> <li>Can mimic: stroke, ACS, mesenteric ischemia, kidney stone</li> </ul>	<ul style="list-style-type: none"> <li>Absent pulse in upper extremity or carotid pulse is suggestive</li> <li>Discrepancy in systolic BP &gt;20 mmHg between R and L arm is suggestive</li> <li>Up to 30 percent with neurologic findings</li> <li>Findings vary with arteries affected</li> </ul>	<ul style="list-style-type: none"> <li>Ischemic changes in 15 percent</li> <li>Nonspecific ST and T changes in 30 percent</li> </ul>	<ul style="list-style-type: none"> <li>Wide mediastinum or loss of normal aortic knob contour is common (up to 76 percent)</li> <li>10 percent have normal CXR</li> </ul>	<ul style="list-style-type: none"> <li>Can mimic many diseases depending on branch arteries involved (eg, AMI, stroke)</li> </ul>
<b>Pulmonary embolism</b>	<ul style="list-style-type: none"> <li>Many possible presentations, including pleuritic pain and painless dyspnea</li> <li>Often sudden onset</li> <li>Dyspnea often dominant</li> </ul>	<ul style="list-style-type: none"> <li>No finding is sensitive or specific</li> <li>Extremity exam generally normal</li> <li>Lung exam generally nonspecific; focal wheezing may be present; tachypnea is common</li> </ul>	<ul style="list-style-type: none"> <li>Usually abnormal but nonspecific</li> <li>Signs of right heart strain suggestive (eg, RAD, RBBB, RAE)</li> </ul>	<ul style="list-style-type: none"> <li>Great majority are normal</li> <li>May show atelectasis, ▲ hemidiaphragm, pleural effusion</li> </ul>	
<b>Tension pneumothorax</b>	<ul style="list-style-type: none"> <li>Often sudden onset</li> <li>Initial pain often sharp and pleuritic</li> <li>Dyspnea often dominant</li> </ul>	<ul style="list-style-type: none"> <li>Ipsilateral diminished or absent breath sounds</li> <li>Subcutaneous emphysema is uncommon</li> </ul>		<ul style="list-style-type: none"> <li>Demonstrates air in pleural space</li> </ul>	
<b>Pericardial tamponade</b>	<ul style="list-style-type: none"> <li>Pain from pericarditis is most often sharp anterior chest pain made worse by inspiration or lying supine, leaning forward; relieved by sitting forward</li> <li>Dyspnea is common</li> </ul>	<ul style="list-style-type: none"> <li>Severe tamponade creates obstructive shock, and causes jugular venous distension, pulsus paradoxus</li> <li>Pericardial effusion can cause friction rub</li> </ul>	<ul style="list-style-type: none"> <li>Decreased voltage and electrical alternans can appear with significant effusions</li> <li>Diffuse PR segment depressions and/or ST elevations can appear with acute pericarditis</li> </ul>	<ul style="list-style-type: none"> <li>May reveal enlarged heart</li> </ul>	<ul style="list-style-type: none"> <li>Pericardial effusion/pericarditis is seen often in renal failure or dialysis patients</li> </ul>
<b>Mediastinitis (esophageal rupture)</b>	<ul style="list-style-type: none"> <li>Forceful vomiting often precedes esophageal rupture</li> <li>Recent upper endoscopy or instrumentation increases risk of perforation</li> <li>Odontogenic infection is possible cause</li> <li>Coexistent respiratory and gastrointestinal complaints may occur</li> </ul>	<ul style="list-style-type: none"> <li>Ill-appearing; shock, fever</li> <li>May hear (Hamman's) crunch over mediastinum</li> </ul>		<ul style="list-style-type: none"> <li>Large majority have some abnormality; pneumomediastinum, pleural effusion, pneumothorax</li> </ul>	

DMS: altered mental status; ACS: acute coronary syndrome; AMI: acute myocardial infarction; BP: blood pressure; CABG: coronary artery bypass graft; CK-MB: creatine kinase-MB; CSR: chest x-ray; EKG: electrocardiogram; HF: heart failure; PCI: percutaneous coronary intervention; PE: pulmonary embolism; RAD: right axis deviation; RAE: right atrial enlargement; RBBB: right bundle branch block.

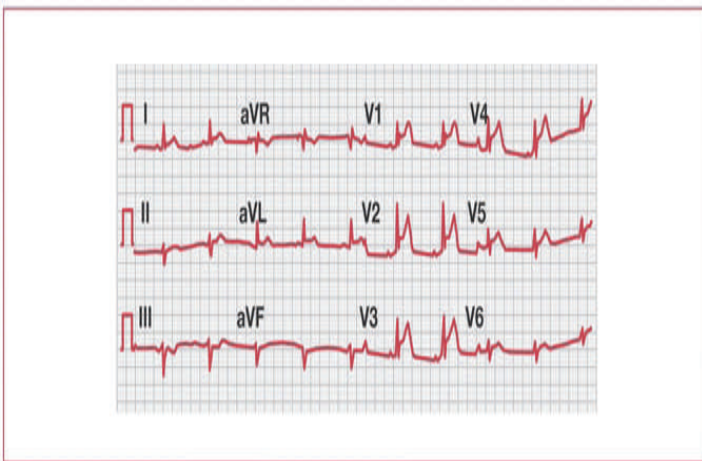
## Important EKG Changes



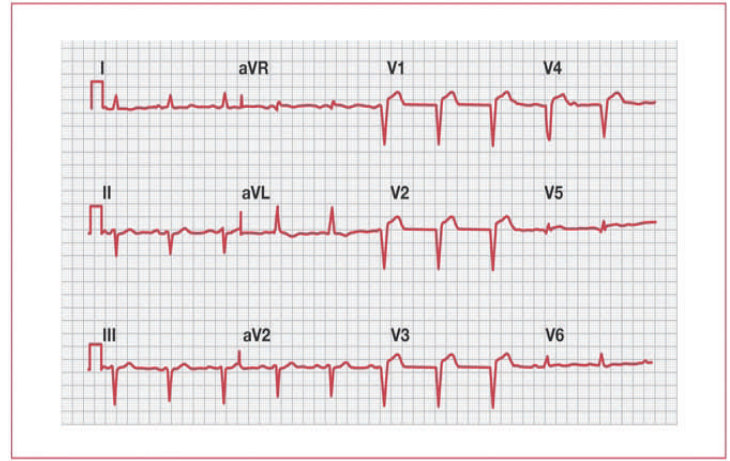
Features of EKG changes that increase probability of ACS in patients with CP: New ST segment elevation, q waves, conduction defect, ST segment depression or T wave inversion



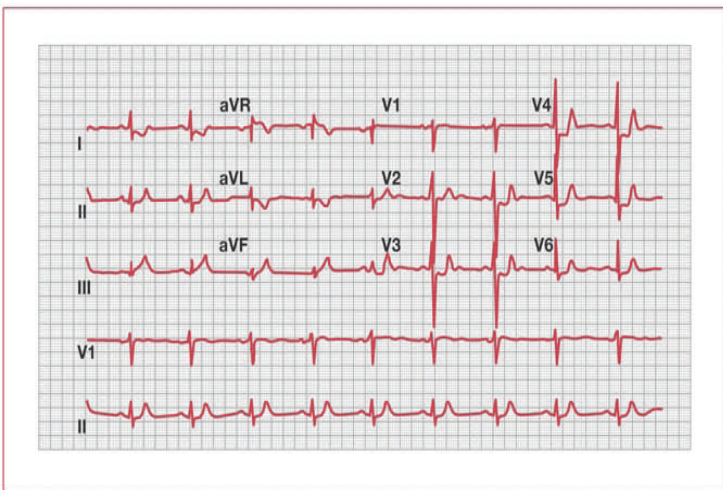
**T wave inversion**



**Anteroseptal MI showing ST elevation**



**Q waves in V1-V4**



**ST segment depression I, V3-V6**



**Left Bundle Branch Block**

## SUMMARY

## DECISION SUPPORT

## PATIENT EDUCATION/SELF MANAGEMENT

## NONINVASIVE RISK STRATIFICATION:

**High risk (greater than 3% annual mortality rate)**

- Severe resting LV dysfunction (LVEF less than 0.35)
- High-risk treadmill score
- Severe exercise LV dysfunction (exercise LVEF less than 0.35)
- Stress-induced large perfusion defect (particularly if anterior)
- Stress-induced multiple perfusion defects of moderate size
- Large, fixed perfusion defect with LV dilation or increased lung uptake (thallium-201)
- Stress-induced moderate perfusion defect with LV dilation or increased lung uptake (thallium-201)
- Echocardiographic wall-motion abnormality (involving more than 2 segments) developing at low dose of dobutamine or at a low heart rate
- Stress echocardiographic evidence of extensive ischemia

**Intermediate risk (1% to 3% annual mortality rate)**

- Mild/moderate resting LV dysfunction (LVEF 0.35 to 0.49)
- Intermediate-risk treadmill score
- Stress-induced moderate perfusion defect without LV dilation or increased lung intake (thallium-201)
- Limited stress echocardiographic ischemia with a wall-motion abnormality only at higher doses of dobutamine involving less than or equal to 2 segments

**Low risk (less than 1% annual mortality rate)**

- Low risk treadmill score
- Normal or small myocardial perfusion defect at rest or with stress\*
- Normal stress echocardiographic wall motion or no change of limited resting wall-motion abnormalities during stress\*

Adapted from: Anderson, J, Adams, C, Antman, E, et al. ACC/AHA 2007 guidelines for the management of patients with unstable angina/non-ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to revise the 2002 Guidelines for the Management of Patients with Unstable Angina/Non-ST-Elevation).

\*Although the published data are limited, patients with these findings will probably not be at low risk in the presence of either a high-risk treadmill score or severe resting LV dysfunction (LVEF)

## CHEST PAIN: WHAT YOU SHOULD KNOW

**Q:** Does all chest pain come from your heart?

**A:** No, Chest pain can come from different parts of your body, including your muscles, bones, digestive tract, lungs, or heart.

- ◆ Chest pain often comes from injuries or strains to the muscles, ribs, and bones in your chest.
  - “Musculoskeletal” pain is more common after a lot of exercise or doing something physical you are not used to doing.
  - Musculoskeletal chest pain is usually in one spot in the chest and hurts more if you move that area.
- ◆ Your lungs can also cause chest pain. Lung or “pulmonary” chest pain can come from inflammation (irritation) of the lungs
  - Often you may have cough, fever or you may be coughing up phlegm (sputum).
- ◆ Your digestive tract (including your esophagus-or food pipe which travels from your mouth to your stomach) can cause chest pain.
  - When chest pain is caused by a lot of acid in your stomach it is called GERD or heartburn.
  - Chest pain from your digestive tract is often felt under your breastbone (sternum) and gets better with antacid medication.
  - If you are short of breath or sweaty from the pain you should contact medical right away even if you think the pain is heartburn.



**Q:** Am I having a heart attack?

**A:** A heart attack occurs when heart muscle dies because of blockage of the blood supply to the heart, usually because of a build-up of cholesterol. Most people think a heart attack is sudden and intense, like a “movie heart attack”. The fact is that many heart attacks start slowly as mild pain or discomfort, and those who experience it may not know what is wrong.

**Warning Signs of a Heart Attack include:**

- Chest pain or discomfort (pressure, squeezing, fullness, or pain in the center of the chest)
- Pain or discomfort in one or both arms, back, neck, jaw, or stomach
- Shortness of breath (often comes with or before chest discomfort)
- Breaking out in a cold sweat, nausea, or light headedness
- **Waiting is dangerous. Minutes matter.** Anyone with heart attack symptoms should not wait more than five minutes to get medical help



**Q:** What if I have a heart attack?

**A:** Most people do not die when they have a heart attack.

**New medications and treatments work well.**

**The faster you get medical help the better chance you will live and will do well.**

### Coronary Heart Disease

Coronary heart disease (CHD) is the name for when your heart muscle does not get enough blood. CHD can give you chest pain. CHD comes from a blockage in the arteries of the heart. (Most often caused by cholesterol related blockages)

You likely have CHD if:

- You have had a heart attack
- You have angina (chest pain that comes from your heart)
- You have had a “balloon” reopen one of your coronary arteries
- You have had coronary bypass surgery

