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Non traumatic Chest pain in ED; Approach and Management

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Definition

- Chest pain complaints are of common occurrence in medical practice. Chest pain frightens the patient and puts the physician on the alert, as it is often a symptom of a serious disease.

Cont…

- Chest pain accounts ~10% of all presentations
- 10-15% are serious conditions
- About 10-12% cardiac
- About 2-3% other serious causes (PE, dissection)
- Need safe ways to accurately identify serious causes
- However, up to 30% of serious chest pain outcomes are non cardiac

Degree of pain

- Although chest pain is a subjective symptom, it does have various degrees of intensity. We suggested the following classification of pain:
  - 0 degree - no pain
  - 1st degree - mild pain; patients are calm; pain may be identified only during physical examination, is short-lasting and transient
  - 2nd degree - moderate pain that is recurrent in nature, with long intervals between episodes; patients appear to be restless
  - 3rd degree - sharp, extremely severe, intractable pain; patients appear to be very restless, unable to find a comfortable position, and scream

BASIC NOTIONS Practical recommendations

- In patients complaining of chest pain, diagnosis of Ischemic Heart Diseases should be considered and ruled out first.
- Medical history plays a major part in diagnosis.
- Mitral valve prolapse is a common and underrecognized cause of chest pain.
- Echocardiography is the most appropriate diagnostic technique.
- Pain related to esophagospasm may be as severe as that in myocardial infarction.
- Like angina, esophagospasm-related pain is relieved by nitrates.
- Intervertebral disc hernia (Th2-Th9) is a very rare cause of chest pain.
- In patients with suddenly occurring severe dyspnea, diagnosis of myocardial infarction or pulmonary embolism should be considered, even when there is no pain.

Main causes of errors

- Ignorance of IHD epidemiology.
- Inability to diagnose spinal osteochondrosis and osteoarthrosis, particularly those of the lower cervical spine.
- Over-diagnosis of neurosis in patients with combination of anxiety, fear and acute chest pain.
- Mistaken opinion that any chest pain radiating along the medial surface of the left arm is caused by angina pectoris.
- Ignorance of the fact that 20% of cases of pulmonary embolism and myocardial infarction are asymptomatic or atypical, especially in elderly patients as well as those with alcoholism and diabetes mellitus.
- Mental disorders and simulation
- Psychogenic pain is usually stinging and prolonged (several days), has indeterminate location, and may be severe.
  - It is usually accompanied by palpitations, dyspnea, tremor, agitation, or anxiety.
  - Pain occurs during emotional stress, anxiety and depression.

Common causes of chest pain

Cardiovascular:

- ischemia (AMI or Angina)
- pericarditis (irritation of pericardium)
- thoracic aortic dissection

Respiratory:

- PE (pulmonary embolism)
- pneumothorax
- pneumonia
- pleural irritation
- hyperventilation

Cont…

Gastrointestinal:

- cholecystitis(gall bladder/gallstones)
- pancreatitis
- hiatal hernia (part of stomach pushes through diaphragm)
- esophageal disease/GERD
- peptic ulcers
- dyspepsia (indigestion)

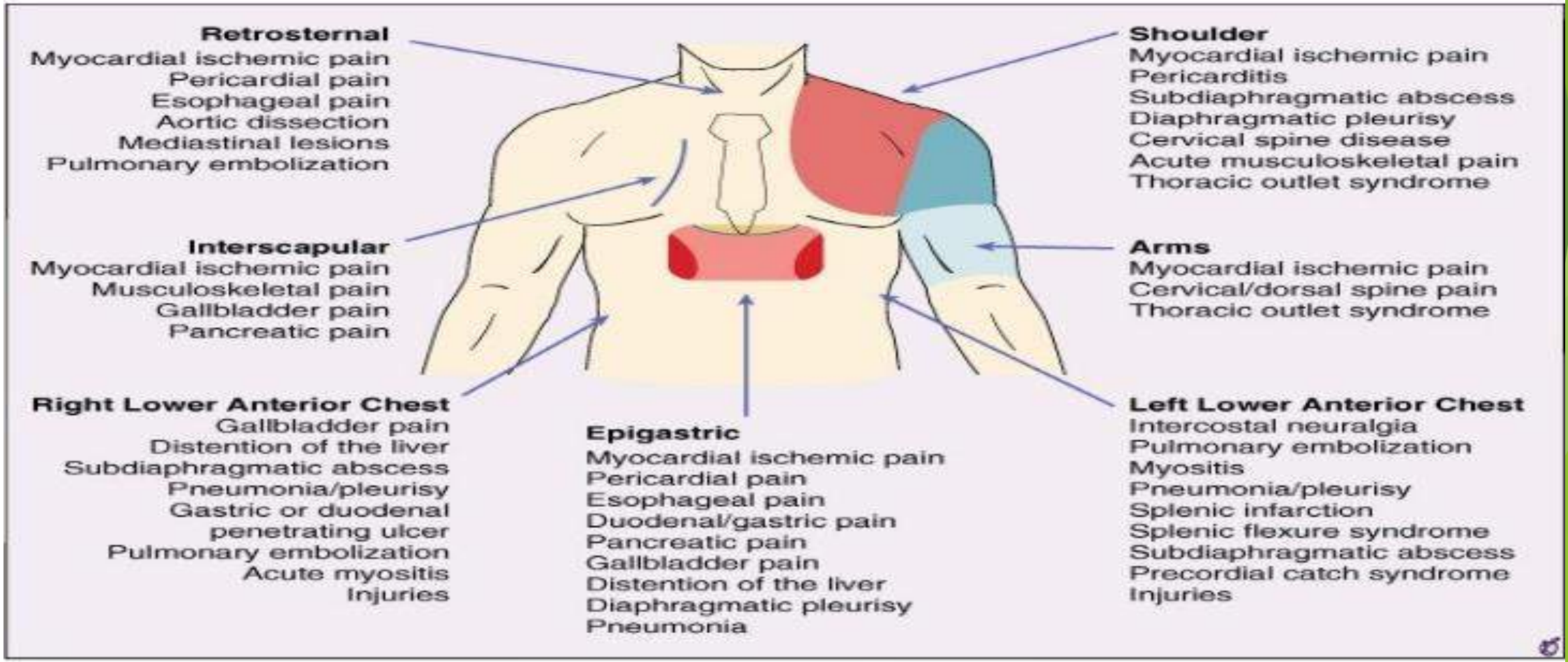
Musculoskeletal:

- Chest wall syndrome (inflamed chest wall)
- costochondritis(inflamed rib cartilage)
- herpes zoster (shingles)
- chest wall trauma
- chest wall tumors

Non cardiac chest pain

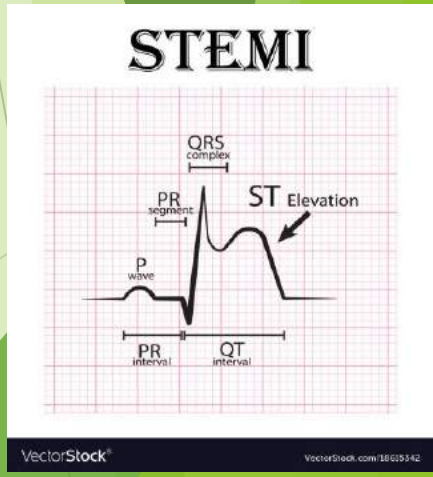
- **Pulmonary**
  - Pneumonia
  - Pleuritis
  - Pneumothorax
  - Pulmonary Embolism
  - Tumor
- **Gastrointestinal**
  - GERD
  - Esophageal spasm
  - Mallory-Weiss Tear
  - Peptic Ulcer disease
  - Biliary/Gallbladder Disease
  - Pancreatitis
- **Musculoskeletal**
  - Costochondritis
  - Cervical Disk Disease
  - Rib Fracture
  - Intercostal Muscle Cramp
- **Other**
  - Herpes Zoster
  - Disorders of the Breast
  - Splenic Infarct
  - Panic Attacks/Anxiety Disorder
  - Fibromyalgia

Chest pain is difficult to interpret



Laboratory and other diagnostic studies

- In most cases, ECG at rest, chest X-ray, and blood enzyme activity testing provides sufficient information for making diagnosis.
- ECG at rest is the most informative procedure for diagnosing acute ischemia and myocardial infarction. **It should be remembered that ECG might show no changes during the first minutes following the onset of MI-related pain attack.**
- **Diagnostic criteria for acute myocardial infarction:**
- ST elevation >= 1 mm in 2 or more contiguous limb or precordial leads
- Left bundle branch block, not known to be old



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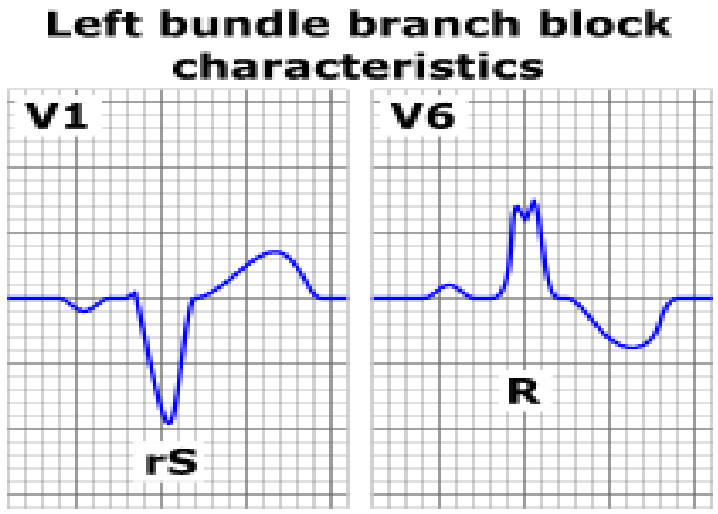
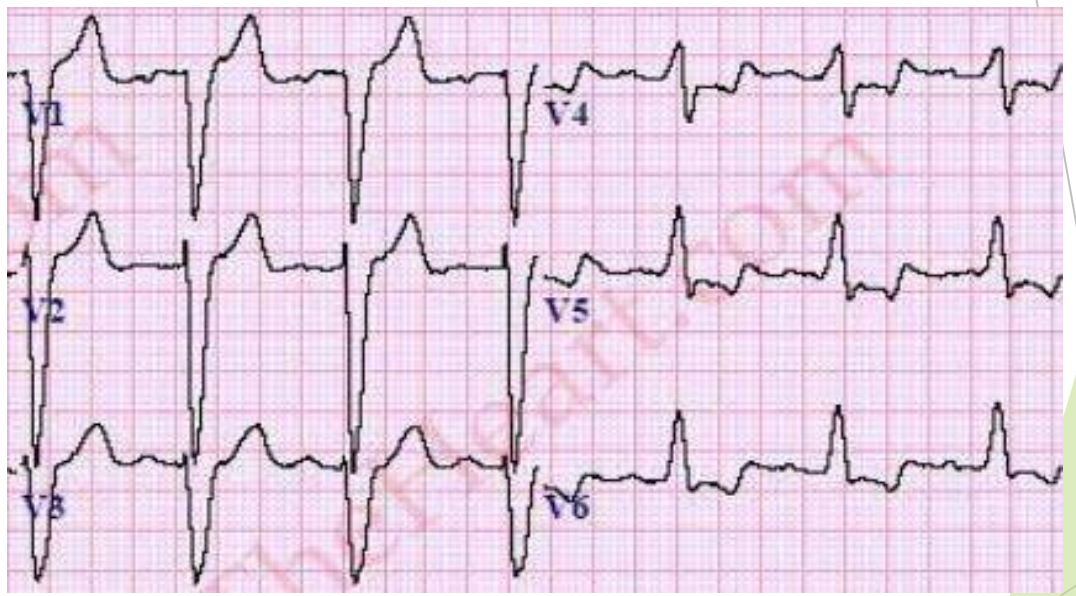
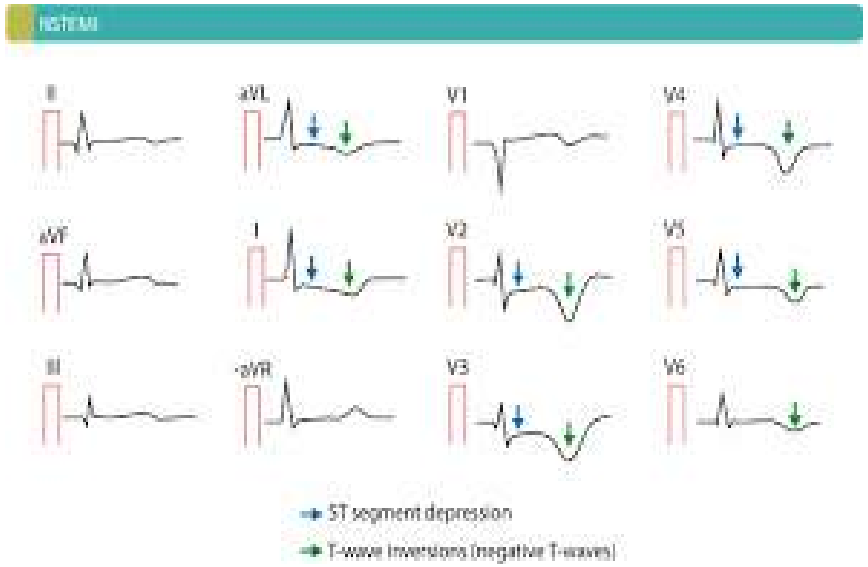

Left bundle branch block characteristics
V1
V6
rS
R

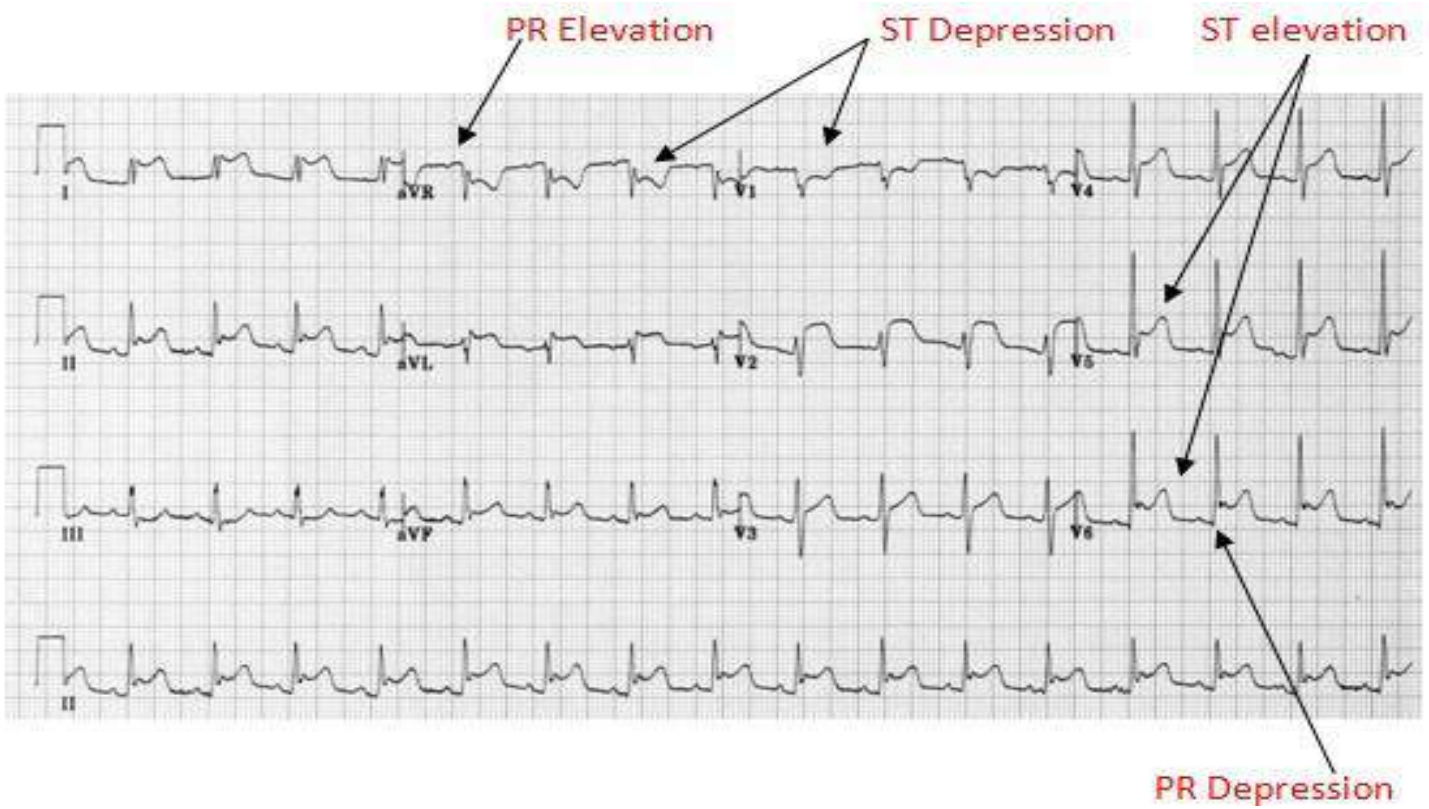

V1
V4
V2
V5
V3
V6

Cont…

- ECG findings useful for establishing the likelihood of coronary artery disease:
- ✓ T segment depression >=1mm
- ✓ Inverted T-waves >=1 mm in two or more contiguous leads



PERICARDITIS



Radiodiagnostic procedures

- Chest X-ray
- Esogo-gastro-duodenoscopy and Biopsy
- Radiography of cervical and thoracic spine
- Heart Ultrasound
- Chest CT Scan Angiography
- CT coronary angiography
- MRI

Cont…

- Total blood count and clinical chemistry panel At the primary health care level: Total blood count (hemoglobin, leukocyte count, ESR) and determination of C-reactive protein.
- At the specialty level: Myocardial infarction is accompanied by destruction of cardiac myocytes and release of intracellular enzymes into the bloodstream.Valuable diagnostic markers include:
- Troponin T (troponin concentration rapidly increases following myocardial injury [within 4-6 hours] and remains elevated for at least one week).
- Due to the high sensitivity, this test could also be positive in decompensated heart failure, myocarditis, myocardial hypoperfusion
- CPK, SGOT, LDH are indicated

Characteristics of Chest Pain in Various Conditions

- A. IHD In angina pectoris and myocardial infarction, the pain is usually pressing, located retrosternally, and radiating to the lower jaw, neck, back (between blade-bones), epigastrium, and along the medial surfaces of the arms. Radiation to the left arm is observed much more frequently, than to the right one. The pain may be initially located in the arm or epigastrium, rather than retrosternally.
- Factors that precipitate, worsen, or relieve the pain should be identified to allow differentiating angina pectoris from cardiodynia caused by spinal disease.
- In patients complaining of retrosternal pain that does not correlate to physical exertion and occurs in recumbent position and body bending, esophageal spasm and reflux esophagitis should be ruled out. Most like angina pectoris, pain caused by esophageal disease may radiate to the left arm.

Angina pectoris

- Angina pectoris affects 2-3% of people at the age of 25-64. In exertional angina without surgery, ten-year survival is 30%.
- Clinical presentation In angina pectoris, pain is usually pressing, located retrosternally, and radiating to the arms, lower jaw, neck, or back; it is often accompanied by dyspnea.
- Pain occurs during physical or emotional stress, in the cold air, or post-prandially, and disappears at rest (within several minutes) or after taking nitroglycerin. Physical examination between episodes reveals few or no abnormalities.
- Angina pectoris should be differentiated from the pain caused by mitral valve prolapse and esophageal spasm.
- In exertional angina, pain typically lasts 3-5 minutes and passes after taking nitroglycerin. Pain episodes caused by unstable angina are more prolonged and severe. In such cases, relying on clinical manifestations may lead to misdiagnosing myocardial infarction. However, unlike MI, no specific ECG changes or changes in enzymatic activity may be detected.
- The onset of angina episodes is associated not only with exertion, but with paroxysmal arrhythmias (arrhythmia paroxisms) as well, with pain occurring and disappearing concurrently with arrhythmia.

Cont…

- **Emergency care of angina episode:**
- Nitroglycerin, 300-600mg sublingually.
- **Other treatments:**
- isosorbide dinitrate, 5 mg sublingually every 5 minutes (up to 3 doses), or
- nitroglycerin dosed spray, 1-2 puffs (up to 3 puffs) within 15 minutes, or
- when nitrate intolerance is present, nifedipine 5 mg sublingually or to be chewed.

Cont…

- **Angina of effort (high tolerance to physical exertion):**
- Aspirin, 150 mg orally once a day.
- Nitroglycerin to relieve pain (sublingual tablets or dosed spray).
- In some instances, beta-adrenergic blockers, nitrate ointments or patches.
- **Angina of effort (moderate to low tolerance to physical exertion):**
- • Aspirin, 150 mg orally once a day.
- • Nitroglycerin to relieve pain (sublingual tablets or dosed spray).

Cont…

- Add beta-adrenergic blockers or calcium channel blockers, as well as one of the following drugs:
- isosorbide dinitrate, 10 mg orally 3 times a day, or
- isosorbide mononitrate, 60 mg orally once a day.

Unstable angina

- Hospitalization is indicated.
- Hospitalized patients should be administered intravenous nitroglycerin. Then coronary angiography is performed and decision is made as to whether balloon coronary angioplasty or coronary bypass surgery is indicated.
- The above treatment scheme used in exertional angina may be supplemented by calcium antagonists:
  - nifedipine, 20 mg orally 2-3 times a day (drug of choice), or
  - verapamil, 40-160 mg orally 2-3 times a day, or
  - diltiazem, 30-90 mg orally 4 times a day, or
  - amlodipine, 2.5-10 mg orally once a day.
- Any case of angina requires cardiology referral!

Myocardial infarction

- In myocardial infarction, pain lasts 15-20 minutes and does not respond to nitroglycerin. Paleness, clammy sweat, nausea, vomiting, and hypertension may be seen. Painless forms of myocardial infarction are developed mostly in patients with diabetes mellitus, in the elderly, as well as in recurrent myocardial infarction.
- In case of suspected myocardial infarction, specialized emergency care should be provided, with subsequent cardiology referral.

B. Aortic dissection

- Aortic dissection is characterized by sudden occurrence of very severe retrosternal pain. Pain radiates to the back, abdomen, and legs. Diagnostic sign of importance is unequal pulse at carotid, radial, and femoral arteries. **Aortic dissection is often complicated by occlusion of coronary and renal arteries, aortic insufficiency, and cardiac tamponade**.
- In case of suspected aortic dissection, cardiologist should be called for organizing patient management, and emergency care should be provided.

C. Pulmonary thromboembolism

- Pulmonary thromboembolism is accompanied by retrosternal pain, dyspnea, and syncope. Physical examination does not usually reveal any changes. In severe cases; **hypotension, acute right ventricular failure, and cardiac arrest may develop.** Lesions of the trunk and large branches of pulmonary artery often have fatal outcome. In 10% of cases, pulmonary thromboembolism is complicated by pulmonary infarction, which is manifested by pain worsened during respiration, and the sputting up of blood.
- Diagnosis of pulmonary thromboembolism presents great difficulties when the only sign is **suddenly occurring dyspnea**.

D. Pericarditis

- Pericarditis is manifested by:
- pain worsened by cough and deep breathing, and sometimes related to swallowing;
- continuous squeezing retrosternal pain resembling to angina;
- throbbing pain in the cardiac area and left shoulder.

E. Pneumothorax

- In case of suddenly occurring pain and dyspnea, pneumothorax should be considered, especially in patients with bronchial asthma and emphysema. Pneumothorax may occasionally develop with no underlying lung disease. This is particularly characteristic of young, thin males. Location and intensity of pain vary.
- Worsening of dyspnea and pain is indicative of tension pneumothorax; in this case, emergency pleural puncture is indicated.

F. Pulmonary conditions

- Pleurodynia (pleurisy), caused by inflammation of pleura, often accompanies viral or bacterial respiratory infections. It may also occur in collagen vascular disorders. History suggesting pleurodynia includes acute onset of sharp pain associated with breathing or movement, sometimes accompanied by systemic symptoms of infection. Physical examination may reveal a pleural friction rub. A chest X-Ray should be obtained to exclude pneumonia, pleural effusion, or other intrathoracic processes

G. Gastrointestinal conditions

- Reflux esophagitis is characterized by burning retrosternal or epigastric pain radiating to the lower jaw. Pain occurs or worsens in recumbent position and front bend, especially after a meal; sleep is often disturbed. Pain may be worsened by concomitant esophageal spasm. Esophageal spasm often develops without underlying reflux esophagitis. In this case, pain occurs when eating, especially very hot or very cold food. Pain radiates to the back and passes after taking nitrates. Pain from gallstones can be referred to the lower chest as well as the shoulder. Post-prandial chest discomfort, especially if associated with radiation to the back or abdomen and accompanied by nausea, is suggestive of gallbladder disease.

Musculoskeletal conditions

- H. Spinal diseases Chest pain is frequently caused by osteochondrosis (including hernias of intervertebral discs, especially those of cervical spine) and osteoarthrosis of cervical and thoracic spine. Pain in spinal diseaseis described as dull and gnawing, may be located in any area of the chest, including sternal area, and worsens during strain, movements and deep breathing.

I. Psychogenic pain

- Psychogenic pain is typically located in the cardiac area and usually does not radiate. The pain is prolonged, jabbing or pressing. Although resembling angina, it lasts significantly longer—several hours or even days. Pain occurs during exhaustion and agitation. Concomitant symptoms include dyspnea, weakness, and palpitations. Chest pain caused by anxiety or emotional stress most commonly occurs in healthy young men or women, but it can occur at any age

Initial approach for Chest Pain

- **Airway, Breathing and Circulation (ABC)**
- assessment by
  - Assessment of the airway by able to talk without distress, no obvious upper airway obstruction such tongue swelling, lip swelling, hoarseness, …etc.)
  - Assessment of breathing (listen to the pulmonary sounds (Equal, wet (basal crackles indicate CHF).
  - Assessment of Circulation (listen to heart sounds such as S3,4 gallop rhythm in congestive heart disease and new murmurs: mitral regurgitation murmur in papillary muscle dysfunction.
- Vital signs should be assessed and repeated at regular intervals (for example respiratory distress with low O2 saturation indicate pulmonary edema, ↓BP indicates cardiogenic shock), also unequal BP in both arm or pulse deficient indicate aortic dissection.
- Electrocardiogram (ECG): To interpret ECGs in myocardial ischemia and arrhythmias.

Cont…

- Start with history.
  - What types of questions would you like to ask?
  - Are you having discomfort?
  - How would you describe the discomfort?
  - Where is the discomfort?
  - Does it radiate anywhere?
  - Any aggravating/alleviating factors?
  - Any associated discomfort?

Cont…

- Diaphoresis, nausea, vomiting, cough, fevers
  - Frequency of the discomfort?
  - Time of onset or acute worsening?
  - Has there been any progression?
- History of Cardiopulmonary disease?
- Risk factors for cardiopulmonary disease (Risk factor of coronary disease such as (HTN, Diabetes, High cholesterol, Obesity, Male, Family history, Smoker, Sedentary, Postmenopausal, Previous history of ACS and family History of CAD), Risk factors of Pulmonary embolism).
- Family history of cardiopulmonary disease?

Cont…

- **Start with physical examination**
  - General appearance of patient looks sick or not sick or patient in pain or not in pain.
  - Assessment of the airway by able to talk without distress, no obvious upper airway obstruction such tongue swelling, lip swelling, hoarseness …etc.)
  - Assessment of breathing
  - Assessment of Circulation (listen to heart sounds such as S3,4 gallop rhythm in congestive heart disease and new murmurs: mitral regurgitation murmur in papillary muscle dysfunction
  - Look for swelling in legs (lower limb edema), calf tenderness (deep vein thrombosis).
  - Assess abdomen for tenderness and Pulsating mass

Immediate chest pain management

- Medication
- – to relieve pain and dilate (widen) the blood vessels of the heart to allow the blood to flow more effectively.
- Give morphine and Nitroglycerine

Management for life threatening conditions

- **Emergency treatment of MI**
  - Aspirin should be given immediately: Great benefit, little risk, Give minimum of 182 mg.
  - Rapid decisions on reperfusion: Based on ECG only (PCI vs Fibrinolysis).
  - Antiplatelet options: Heparin (Low Molecular Weight vs unfractionated) clopidogrel.
  - Symptomatic/pain control: GTN Vasodilator, also reduces preload Can be given SL or IV. Give also Morphine for pain control and reduce anxiety and stress.
  - Secondary prevention: B-Blocker, statins and ACE inhibitor

Right bundle branch block

- **Emergency treatment**
- Heparin (Will limit propagation but does not dissolve clot)
  - Unfractionated: 80 u/kg bolus, 18 u/kg/hr.
  - Fractionated (Lovenox): 1 mg/kg SC BID.
- Fibrinolysis
  - Alteplase 50–100 mg infused over 2–6 hrs., (bolus in severe shock)

Cont…

DOSE AND ADMINISTRATION

Agents	Dose and Administration
Alteplase (tPA)*	**90 min infusion**: • 15 mg bolus, then • Infusion 0.75 mg/kg for 30 min (max 50 mg), then 0.5 mg (max 35 mg) over the next 60 min; total dose not to exceed 100 mg; 60 mg administered within first hour, then 20 mg during second and third hour
Reteplase (rPA)	Two 10 unit boluses, each administered over 2 min, 30 min apart
Tenecteplase (TNK)	Single bolus administration over 5 sec; dose based on patient weight (max dose 50 mg): <60 kg: 30 mg; 60-69 kg: 35 mg; 70-79 kg: 40 mg; 80-89 kg: 45 mg; and ≥ 90 kg: 50 mg
Streptokinase	1,500,000 units IV infusion over 30-60 min

*KPSH&RC formulary

Hilleman D E et al. Pharmacotherapy. 2007;27[11]:1558-1570

Management of pulmonary Embolism

- **Thrombolysis**
  - All patients with PE require risk stratification
  - Generally all patients with acute PE with hypotension (<90mmhg)
  - Alteplase (Actylise) 100 mg infusion over 2hrs.
  - Tenectaplase (Metalyse) Rapid infusion

Cont…

Tenecteplase dose

Table II. Tenecteplase dosing regimen

Weight (kg)	Dose (mg)	Dose (Units)	Volume (mL)
<60	30	6000	6
≥60 to <70	35	7000	7
≥70 to <80	40	8000	8
≥80 to <90	45	9000	9
≥90	50	10,000	10

Unfractionated heparin therapy

- Most patients should receive LMWH or fondaparinux instead of UFH.
- UFH –where procedures are likely have short half life.
- Initial bolus of 80U/kg or 5000 U followed by infusion of 1300u/h.
- **Low-molecular weight heparin therapy**
  - LMWH-greater bioavailability, subcutaneous administration, longer duration of action. Fixed doses.
  - Can safely be administered in an outpatient setting.
  - i.e: Enoxaparin-LMW (Clexane) 1mg/Kg sc 12hrly

Cont…

- **Fondaparinux-factor Xa inhibitor (Arixtra)**
  - <50kg: 5mg SC once daily
  - 50-100kg: 7.5mg SC once daily
  - >100 kg: 10 mg SC once daily
- **Factor Xa inhibitors**
  - RIVAROXABAN (Xarelto)-factor Xa inhibitor 15mg bd X 3 weeks then 20 mg daily

Cont…

- **Warfarin therapy**
- Should be started same day as anticoagulation therapy.
- Parenteral anticoagulation therapy continued 5 days until INR is 2-3.

Pulmonary embolism in pregnancy

- Risk of thromboembolism increased in pregnancy and 6-12 weeks post partum.
- Investigate as usual including venous dopplers and CT scan.
- **LMWH** treatment of choice.
- **Embolectomy**
- Either catheter embolectomy or surgical embolectomy in massive PE who have contraindications to thrombolysis.
- **Vena Cava Filters**
- If there is an absolute contraindication to anticoagulation.
- Patients who have recurrent events despite adequate anticoagulation.

Contraindications to thrombolysis

Absolute Contraindications.

- Any prior intracerebral haemorrhage
- Known structural cerebrovascular lesion (eg. AVM)
- Known intracranial neoplasm
- Prior ischaemic stroke (w/in 3 months)
- Active internal bleeding (excl. menses)
- Suspected aortic dissection or pericarditis

Relative Contraindications.

- Severe uncontrolled hypertension (>180/100 mmHg)
- Prior ischaemic stroke (>3 months)
- Known intracranial pathology
- Current anticoagulation w/ INR > 2-3
- Known bleeding diathesis
- Recent trauma (past 2 weeks)
- Prolonged CPR > 10mins
- Major surgery <3 weeks
- Non-compressible vascular punctures (eg. Subclavian or IJ lines)
- Recent internal bleeding (2-4 weeks)
- Previous streptokinase therapy
- Pregnancy
- Active peptic ulcer disease

Education of patients and their families

- Education of patients and their families is aimed to provide them with easy-to-understand information to ensure that they have adequate knowledge to be able to prevent diseases that may cause chest pain.
- Prevention topics should be discussed with patients and their family members.
- Prevention is particularly important in case of genetic predisposition to IHD.
- Preventive measures are aimed to eliminate risk factors for IHD:
  - smoking cessation,
  - weight reduction,
  - diet low in animal fats,
  - treatment of hypertension and diabetes mellitus.

Cont…

- Patients should be informed about the effectiveness of early IHD treatment and the need to adhere to physician's recommendations.
- Risk factors for atherosclerosis should be identified.
- Physical exercises program should be recommended, with intensity depending on angina severity.
- In patients subject to significant emotional exertion and prone to social conflicts, psychotherapy should be administered.
- Patients should be educated on how to prevent angina episodes in daily life.
- Very strict limitations are to be avoided, because they may deteriorate patient's quality of life.

Conclusion

- Physician and nurse should remember that:
- Chest pain is often a warning sign of life-threatening conditions, thus physician's alert is indispensable.
- Patient assessment should be done accordingly
- ECG should be done immediately when patient arrive in triage.
- Pain management also is mandatory as quick as possible to maintain patients' comfort (morphine and nitroglycerine are commonly indicated).
- Nurse's actions should be focused on three principal issues:
  - Patient education
  - Family members education
  - Education on self-control

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End

Thank you for your Kind attention