Review Article

Managing Acute Chest Pain

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Abstract

Acute chest pain is a common and potentially life-threatening symptom that requires prompt evaluation and management. It can be caused by a wide range of conditions, from benign musculoskeletal issues to serious cardiac events. Effective management of acute chest pain involves a systematic approach that prioritizes the identification and treatment of life-threatening causes while also considering the possibility of non-cardiac etiologies. This guideline provides a comprehensive overview of the evaluation and management of acute chest pain.

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Introduction

Acute chest pain is a symptom that demands immediate attention due to life threatening complications. It sometimes is helpful to consider the different etiologies of pain. Visceral pain usually presents with a vague distribution pattern meaning that the patient is unlikely to localize the pain to a specific spot. When asking patients to point with one finger where they feel the pain, they will often move their hand around a larger area. Common descriptors of visceral pain are dull, deep, pressure, and squeezing. Visceral pain also refers to other locations as a result of the nerves coursing through somatic nerve fibers as they reach the spinal cord. Ischemic heart pain, for example, may refer to the left or right shoulder, jaw, or left arm. Symptoms like nausea and vomiting may also be a sign of visceral pain. Diaphragmatic irritation may refer to the shoulders as well.[1]

Somatic pain is more specific than visceral pain and patients are able to pin point the pain to a specific spot. It is less likely to refer to other parts of body and it is described as sharp stabbing or poking pain. Timely and accurate evaluation and management are critical to improving patient outcomes and minimizing complications.

- Initial Assessment
- Immediate Action

Call for Help: If a patient presents with acute chest pain, initiate emergency medical management. Delays can lead to adverse outcomes.

Patient Evaluation: Assess the patient's vital signs, including heart rate, blood pressure, respiratory rate, and oxygen saturation if possible. Administer oxygen if the patient is hypoxic.[2]

Provide Comfort: Offer reassurance to the patient and maintain a calm environment.

History Taking

PQRST Assessment

- P: Precipitating factors (What were they doing when the pain started?)
- Q: Quality of pain (e.g., sharp, dull, crushing)
- R: Radiation of pain (Does it radiate to other areas?)
- S: Severity of pain (on a scale of 1-10)
- T: Timing (Onset, duration, changes over time)

Associated Symptoms: Ask about associated symptoms such as shortness of breath, nausea, diaphoresis, palpitations, fever, cough, dyspepsia, edema, calf pain or swelling, recent illness.

Medical History: Evaluate for any of the following risk factors:3

- ACS risks: prior myocardial infarction(MI), family history of cardiac disease, smoking, hypertension (HTN), hyperlipidemia (HLD), and diabetes
- Pulmonary embolism (PE) risks: prior deep venous thrombosis (DVT) or PE, hormone use (including oral birth control), recent surgery, cancer, or periods of non-ambulation
- Recent gastrointestinal (GI) procedures like scopes
- Drug abuse (cocaine and methamphetamines)

Carefully review the patient's medical history for cardiac history, coagulopathies, and kidney disease. Ask about family history, especially cardiac, and ask about social histories like drug use and tobacco use.

Once you have thoroughly ruled out life-threatening causes, move on to other possibilities. Pneumonia should be considered in patients with a productive cough and/or recent upper respiratory infection (URI). Gastro-esophageal reflux disease (GERD) is a common cause of chest pain so ask about any reflux symptoms. New exercise routines or recent trauma may help support a musculoskeletal cause.[4]

Medications: Determine if the patient is taking any medications, especially anticoagulants or antiplatelet agents.

Allergies: Document any known allergies to medications.

Physical Examination

General: Assess the patient's general appearance, skin color, and overall distress level. Take full set of vitals, including blood pressure measurements in both arms.

Cardiovascular: Evaluate for signs of heart failure, such as elevated jugular venous pressure, crackles in the lungs, and peripheral edema. Auscultate the heart for murmurs or additional sounds.

Respiratory: Listen for lung sounds and assess for signs of respiratory distress.

Abdominal: Examine the abdomen for tenderness or masses that might mimic chest pain.

Neurological: Assess the patient's level of consciousness and neurologic status.

Extremities: Check for signs of peripheral artery disease or deep vein thrombosis.

Skin: Look for the presence of lesions (shingles)

Differential Diagnosis

Acute chest pain can be caused by a variety of conditions,

In evaluating for chest pain, the provider should always consider life-threatening causes of chest pain. These are listed below with approximate percent occurrence in patients presenting to the emergency department with chest pain based on a study by Fruerfaard et al.

- Acute coronary syndrome (ACS), 31%
- Pulmonary embolism (PE), 2%
- Pneumothorax (PTX), unreported
- Pericardial tamponade, unreported (pericarditis 4%)
- Aortic dissection, 1%
- Esophageal perforation, unreported

Other common causes of chest pain with approximate percent occurrence in patients presenting to the

emergency department with chest pain include:

- Gastrointestinal reflux disease, 30%
- Musculoskeletal causes, 28%
- Pneumonia/pleuritis, 2%
- Herpes zoster 0.5%

Diagnostic Evaluation

The diagnostic workup for acute chest pain aims to identify the underlying cause and assess the patient's risk. Key investigations include[5]

Electrocardiogram (ECG): Obtain a 12-lead ECG as soon as possible, preferably within 10 minutes of EMS arrival. Only a small number of patients presenting with acute chest pain to the ED show a typical STEMI ECG pattern. The majority have either a completely normal ECG (40–60%) or atypical non-ischaemic ECG changes.[4-8] If the ECG is normal or non-diagnostic, the ECG should be repeated after a 10-minute interval, especially if chest pain recurs. The use of additional posterior chest wall leads (V7–V9) should be considered if there is high clinical suspicion of posterior wall MI.

Cardiac Biomarkers: The introduction of high-sensitivity cardiac troponin (hs-cTn) assays allowing the detection and quantification of minute degrees of myocardial injury has led to the development of new decision algorithms that enable a more accurate and rapid rule-in and rule-out of acute coronary syndromes (ACSs).[3] Measure cardiac troponin levels at presentation and after 3-6 hours. Elevated troponin indicates myocardial injury. In patients presenting with suspected non ST-segment elevation ACS it is recommended to use the 0/3 hour ESC algorithm.[9-13]
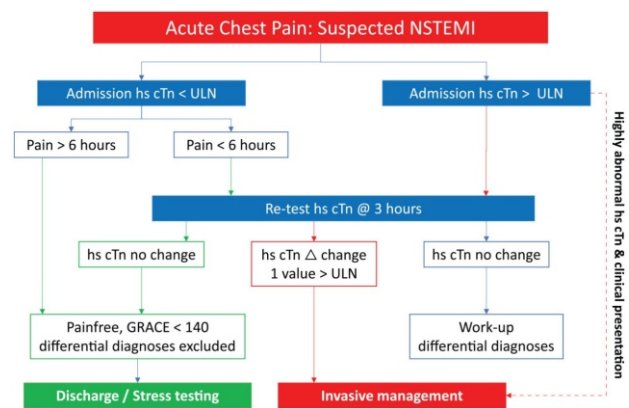
Chest X-ray: The chest X-ray is often performed in the evaluation of patients attending the ED. In one large study a quarter of such patients showed significant findings: cardiomegaly, pneumonia and pulmonary oedema. When there is a high clinical suspicion of acute life-threatening conditions other than ACS (pericardial effusion, acute aortic dissection, PE, pneumothorax or pneumonia) chest X-ray is indicated and should be

available, preferably within 30 minutes.

Coronary Computed Tomography Angiography (CCTA): A selective use of CCTA may be considered in the 20% of chest pain patients in whom the diagnosis of NSTE-ACS cannot be reliably ruled out or ruled in by the ECG and hs-cTn diagnostic algorithms.

CTA of the aorta plays a central role in the diagnosis, risk stratification and management of acute aortic syndromes. In most patients with suspected acute aortic dissection, CTA is the preferred initial imaging modality.[14] Pulmonary CTA allows the detection of PE and adequate visualization of the pulmonary arteries down to at least the segmental level. The high accuracy of CTA in the diagnosis of PE and acute aortic dissection and the utility of CCTA in excluding coronary artery disease have led to the development of a triple rule-out scan protocol allowing the simultaneous assessment of all three causes of acute chest pain with a single scan.

Echocardiography: Echocardiography should be routinely available in the ED, and performed by a trained staff member. It is not required where a non-cardiac diagnosis is obvious or in whom the probability of an acute cardiovascular cause is considered very low. Consider transthoracic echocardiography to assess cardiac function and detect structural abnormalities.

Other Tests: Arterial blood gases (ABGs), D-dimer, Ultrasound chest and other tests may be indicated based on clinical suspicion.

Risk Stratification

After initial evaluation and diagnostic tests, risk stratification is essential to guide further management. The efficacy of a scoring system can be estimated by its capacity to identify patients at a significantly low risk of developing major adverse cardiovascular events (MACE) or mortality during the follow-up period. Classically, the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry of Acute Coronary Events (GRACE) criteria have been implemented for the purpose of risk computation in such cases.[15]

One recently introduced tool is the Symptoms, history of Vascular disease, ECG, Age, and Troponin I (SVEAT) score, which comprises the following parameters: patient's symptoms and history of vascular disease, ECG findings, individual's age, and plasma troponin I concentration. In contrast to its counterparts, Heart score, the initial evidence pinpoints a significantly greater degree of effectiveness for the SVEAT score especially in low to intermediate risk patients.[16]

Calculating the SVEAT score in acute-onset chest pain

MI: Myocardial Infarction; PCI: Percutaneous Coronary Intervention; SVEAT: Symptoms, history of Vascular disease, ECG, Age, and Troponin I

Parameters	Clinical Presentation	Score
Symptoms	Typical Unstable angina	3
	Stable angina	1
	Non-cardiac chest pain	-2
Vascular Disease	Recent MI	2
	CABG grafting>5 years	2
	Previous h/o coronary events	1
	Previous revascularization procedures	2
ECG changes	New ischemic ST/T changes	3
	ST depression of unknown duration	2
	ST changes with LVH, conduction delay	1
	Old Q waves	1
	No ST/T changes	0
	Normal ECG in the presence of severe chest pain	-2
Age	>75	2
	50-75	1
	30-49	0
	<30	-2
Troponin I	0.7 or higher	5
	>0.12 but <0.7	2
	>0.04 but <0.12	1
	Normal	0

Immediate Management

Oxygen: Administer oxygen to maintain oxygen saturation above 94%.

Aspirin: Give aspirin (chewed or crushed) to all suspected cardiac patients unless contraindicated (e.g., allergy or active bleeding).

Nitroglycerin: Consider sublingual nitroglycerin for suspected angina but use caution in patients with low blood pressure or phosphodiesterase inhibitors within 24 hours.

Nelbuphine: Intravenous injection of nalbuphine slowly as small aliquants if pain is severe.[17-19]

Low-Risk Patients

Medical Therapy: Initiate antiplatelet therapy, 300 mg soluble aspirin (even if patient was already taking low dose aspirin) and 300 mg clopidogrel, pain relief, and other appropriate medications.

Observation: Consider admission for further evaluation or discharge with close follow-up based on clinical judgment. Exercise ECG or non-invasive stress testing has been recommended in low-risk patients as the final confirmatory test before safe discharge from the ED.[20-22]

Intermediate-Risk Patients

Medical Therapy: Same as low-risk patients.

Further Evaluation: Arrange for stress testing or coronary angiography within 24-72 hours.

High-Risk Patients

Immediate Reperfusion: Transfer to a cardiac catheterization lab for percutaneous coronary intervention (PCI) or thrombolytic therapy if PCI is not available. In Pakistan, the only thrombolytic agent that is available widely is streptokinase (SK). Fifteen million iu diluted in 100 ml saline to be infused over one hour. One trained healthcare professional preferably a doctor should remain present on the bedside to detect and treat any complication that might arise.23-25

Hemodynamic Support: Start dobutamine infusion if patient has persistent hypotension with signs of hypoperfusion. Consider mechanical circulatory support (e.g., intra-aortic balloon pump) if necessary and available.

Monitoring: Close monitoring of vital signs, cardiac rhythm, and oxygen saturation is necessary to identify any complications early.

Non-Cardiac Causes

Identify and treat the underlying non-cardiac condition responsible for chest pain (e.g., pulmonary embolism, pneumothorax, or gastrointestinal issues). Musculoskeletal pain can be safely and effectively treated with intravenous ketorolac (or any other non-steroidal anti-inflammatory drug)

Pain Management: Provide adequate pain relief, which may include nitroglycerin, opioids, or nonsteroidal anti-inflammatory drugs (NSAIDs).[19,25]

Discharge: Low-risk patients with stable symptoms and negative cardiac biomarkers may be discharged with appropriate follow-up.

> ➤ Educate patients about their diagnosis and treatment plan.
> ➤ Provide information on lifestyle modifications that can help reduce their risk of future cardiovascular events, such as smoking cessation, diet changes, and exercise.

Admission: Intermediate-risk patients, those requiring further evaluation, or those with persistent symptoms should be admitted for observation and further testing.

Transfer: High-risk patients or those requiring specialized care (e.g., PCI or cardiac surgery) should be transferred to a tertiary care center.

Follow-Up: All patients with acute chest pain, whether discharged or admitted, require close follow-up to monitor their progress and adjust their treatment plan as needed. Stress testing, coronary angiography, or further investigations may be scheduled as appropriate.

Conclusion

Managing acute chest pain is a complex and high-stakes clinical scenario that requires a systematic approach. Timely assessment, risk stratification, and appropriate intervention are crucial for ensuring the best possible outcomes for patients. Healthcare providers should continuously update their knowledge and skills to stay current with the latest guidelines and advancements in the field of acute chest pain management. Effective collaboration among emergency physicians, cardiologists, radiologists, and other healthcare professionals is essential in providing comprehensive care to patients experiencing acute chest pain.

Take home messages

> ➤ Chest pain means more than pain in the chest. Pain, pressure, tightness discomfort in the chest, shoulders, arms, neck, back upper abdomen, or jaw as well as shortness of breath should all be considered anginal equivalents.
> ➤ At the first medical contact, the clinician should look for signs of haemodynamic instability and manifestations of life-threatening conditions.
> ➤ A 12-Lead ECG recording and interpretation is indicated as soon as possible within 10 minutes after the first medical contact.
> ➤ It is recommended to measure cardiac troponins, preferably with high-sensitivity assays and obtain the results within 60 minutes.
> ➤ Early care for acute symptoms should be done for early identification or exclusion of life-threatening causes.
> ➤ Clinically stable patients should be included in decision making.
> ➤ Testing not needed routinely for Low-risk patients.
> ➤ Clinical decision pathways for chest pain in the emergency department and outpatient settings should be used routinely.
> ➤ Always look for accompanying symptoms.
> ➤ Identify patients most likely to benefit from further testing.
> ➤ Term 'Noncardiac' should be used if heart disease is not suspected. "Atypical" is misleading.
> ➤ Structured risk assessment should be used.

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