Differential diagnosis of chest pain

A planned approach to avoid potential pitfalls

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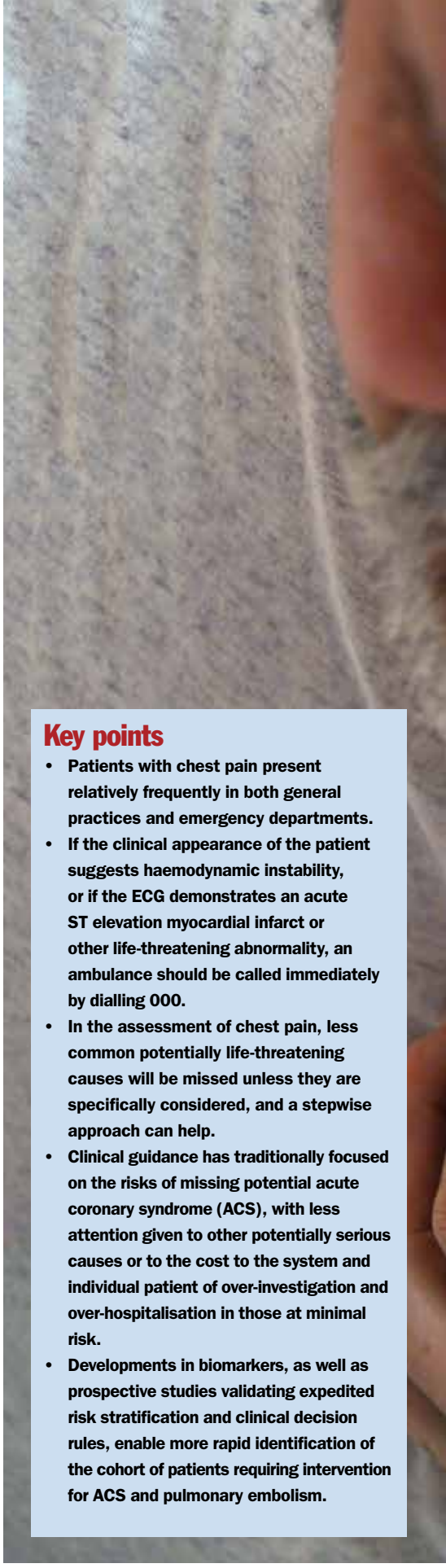
A planned approach to the assessment of patients with chest pain presenting in general practice or the emergency department is required to avoid the pitfalls in diagnosing this common presentation. The challenge is to rapidly differentiate between benign and life-threatening causes of chest pain, and to quickly identify patients who require immediate intervention while avoiding over-investigation and unnecessary hospitalisation for those who do not.



Key points

- **Patients with chest pain present relatively frequently in both general practices and emergency departments.**
- **If the clinical appearance of the patient suggests haemodynamic instability, or if the ECG demonstrates an acute ST elevation myocardial infarct or other life-threatening abnormality, an ambulance should be called immediately by dialling 000.**
- **In the assessment of chest pain, less common potentially life-threatening causes will be missed unless they are specifically considered, and a stepwise approach can help.**
- **Clinical guidance has traditionally focused on the risks of missing potential acute coronary syndrome (ACS), with less attention given to other potentially serious causes or to the cost to the system and individual patient of over-investigation and over-hospitalisation in those at minimal risk.**
- **Developments in biomarkers, as well as prospective studies validating expedited risk stratification and clinical decision rules, enable more rapid identification of the cohort of patients requiring intervention for ACS and pulmonary embolism.**

Chest pain is a relatively common presentation in both general practices and emergency departments, comprising approximately 1% and 6% of patients' presentations, respectively.[1,2] The clinical case mix differs significantly between these two areas of practice, with gastrointestinal disorders, musculoskeletal problems and psychopathology being much more common causes of chest pain in patients presenting in general practice, whereas serious cardiovascular and lung disorders are far more common in those presenting with chest pain in emergency departments.[3] The challenge for physicians is to rapidly differentiate between benign and life-threatening causes of chest pain, and to quickly identify those patients who require immediate intervention.

A structured approach to the assessment and evaluation of a patient with chest pain will assist in identifying the small cohort of higher-risk patients who need rapid intervention or further diagnostic work up to prevent missing a potentially fatal condition, while avoiding over-investigation and unnecessary hospitalisation for those who do not.

Immediately life-threatening nontraumatic causes of chest pain include acute coronary syndrome (ACS) with or without associated acute ST-segment elevation on the ECG, thoracic aortic dissection, pulmonary embolism and oesophageal rupture (discussed in more detail below).

If the general appearance of the patient suggests an immediate life-threatening situation – for example, the patient looks sweaty, pale or grey, confused, anxious or distressed or is feeling lightheaded – rapid intervention to stabilise and treat will be required (see flowchart). In relatively stable

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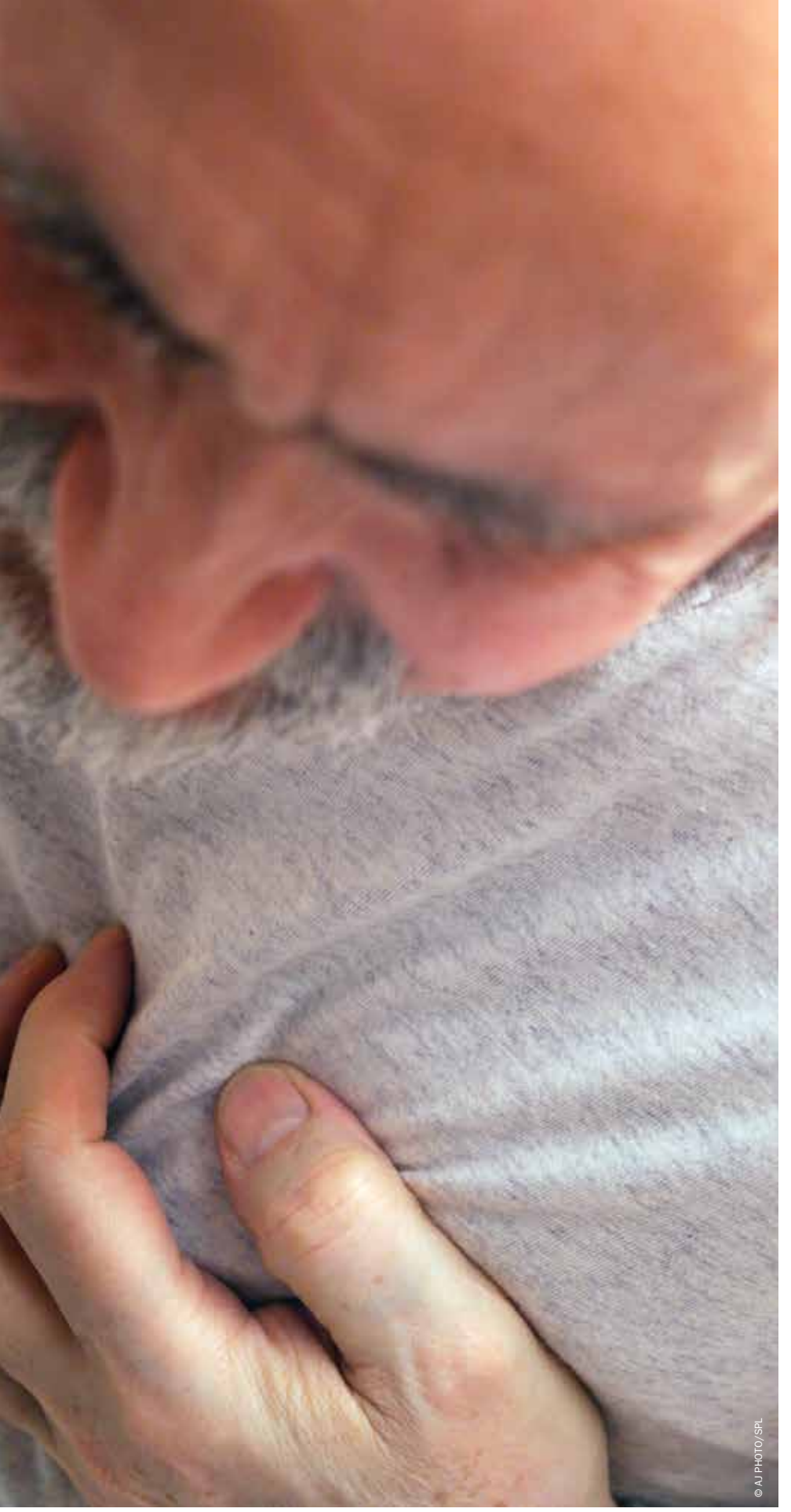
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patients, a history of the pain and associated symptoms, presence of risk factors for underlying disease and assessment of the ECG guides initial decision-making.

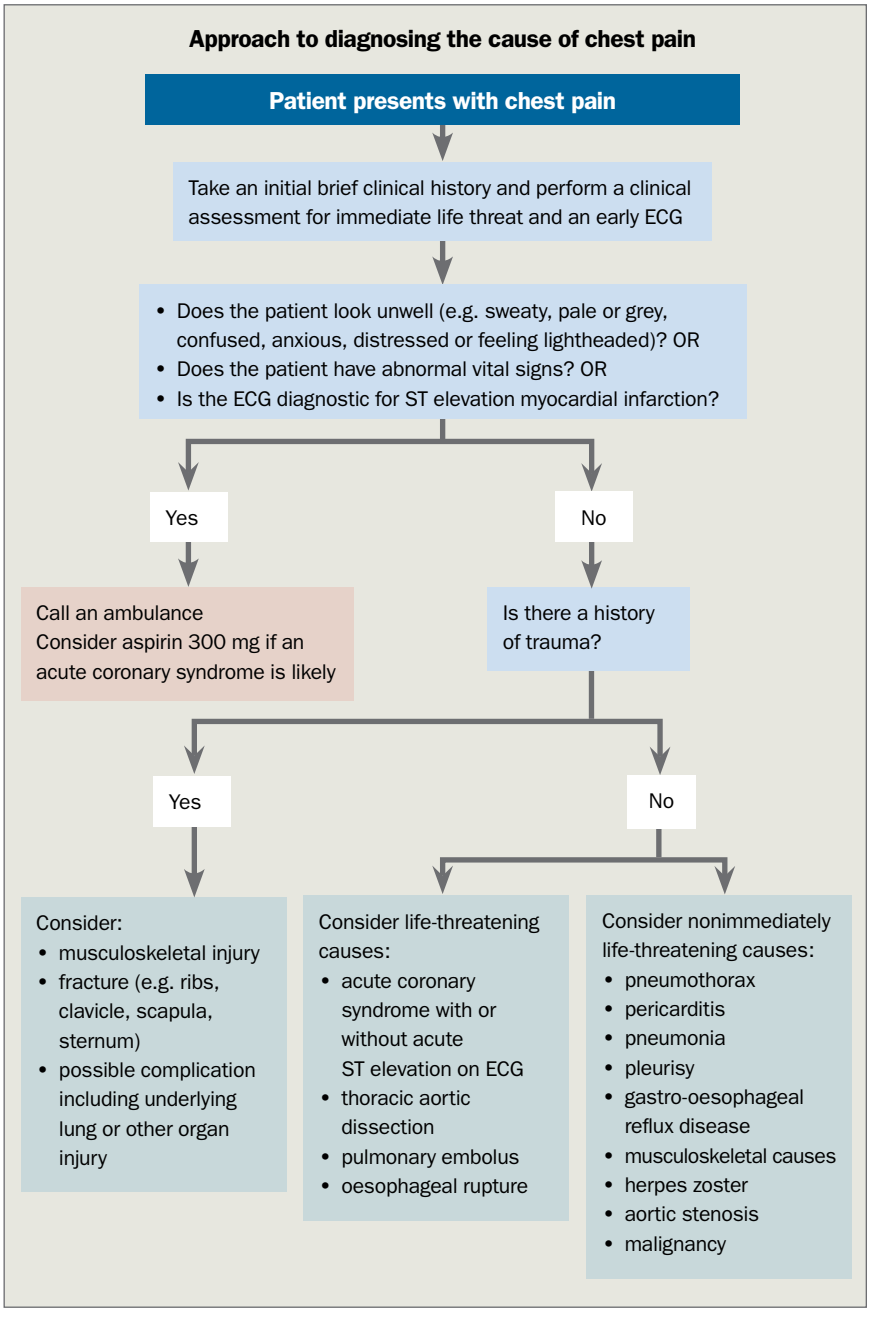
Life-threatening causes of chest pain

Cardiac chest pain

Although classic ACS pain is described as a 'pressure', cardiac pain can also be described as 'burning' or 'indigestion-like', and pain radiating to one or both shoulders or produced by exertion is more strongly associated with ischaemic pain. Unhelpfully for the clinician at the bedside, the character of the pain, the radiation of the pain and the number of risk factors a patient has does not affect the probability of having an ACS to any significant extent. Grouping symptoms together as 'typical' or 'atypical' is not helpful either, as patients with atypical symptoms are no less likely to have an ACS than those with typical symptoms. In summary, clinician gestalt alone cannot be used to 'rule in' or 'rule out' ACS.[4,5]

The stepwise approach to the patient with possible ACS has been well described and includes clinical risk stratification, 12-lead ECG performed immediately to exclude ST-segment elevation and, if nondiagnostic, a period of observation, electrocardiography and serial biomarker evaluation.[6,7] More recently, studies have described the current guideline-based process of assessing the patient with non-ST-segment elevation who is at intermediate risk of ACS as lengthy and resource intensive.[8] It is therefore recommended that strategies to shorten or safely reduce the need for objective cardiac testing in these patients are required. Rapid rule out pathways using clinical assessment, rule-based scoring and highly sensitive troponin assays are being investigated and will greatly streamline the approach to the investigation and management of possible cardiac chest pain in the emergency department when universally implemented.[8]

In summary, the approach to the patient with possible cardiac chest pain includes a clinical assessment, an ECG and measurement of troponin levels according to evidence-based chest pain prediction rules.



Patients should be transported to hospital via an ambulance if an ACS is suspected, as the most important initial requirement is proximity to a defibrillator, and aspirin (300 mg) orally should be given immediately unless already taken or contraindicated. An ECG taken en route to the hospital and transmitted to a medical facility with warning of the incoming patient in whom there is a high suspicion of an ACS, particularly an ST-segment elevation myocardial infarction or if the patient's condition is unstable, enables streamlined reception and definitive care. Increasingly, prehospital bypass to bring selected patients straight to the cardiac catheter laboratory, and protocols for prehospital thrombolysis where indicated, are in place, so the key challenge for the primary physician is to consider ACS as a possibility from the outset.

Thoracic aortic dissection

The incidence of thoracic aortic dissection (TAD) is thought to be increasing as the population ages, peaking between 50 and 70 years of age. Risk factors for TAD include hypertension, cocaine and other amphetamine-type stimulant use, advanced age, male sex, pregnancy, connective tissue disorders, bicuspid aortic valve, weight lifting and Turner syndrome.

The diagnosis of TAD must be specifically considered because TAD is uncommon and the diagnosis is often difficult to make. Asking about the classic TAD symptoms of severe 'tearing' or 'ripping' pain of sudden onset radiating through to the upper back and examining for upper extremity blood pressure differences (although this is found in many patients without TAD), neurological deficits, new aortic incompetence murmur and widened mediastinum, as well as other classic findings on the chest x-ray, will assist with making the diagnosis. Nonspecific ECG changes are common. Although CT imaging, transoesophageal echocardiography and MRI are all helpful in diagnosing TAD, in practice CT is the diagnostic test of choice because of its accessibility and high sensitivity. Bedside ultrasound is helpful to detect possible cardiac tamponade and other complications.

Younger patients without atherosclerosis or a history of hypertension, pregnant women or patients presenting with nonspecific abdominal pain or syncopal symptoms are less likely to have TAD considered in their differential diagnosis, and therefore it can be potentially missed.

Pulmonary embolism

Patients with pulmonary embolism can present across the spectrum of illness from cardiovascular shock to mild and nonspecific symptoms, which are all relatively common symptoms in patients presenting to the emergency department. Patients with pulmonary embolism less frequently present with chest pain than with respiratory symptoms. The most common symptoms of pulmonary embolism include dyspnoea at rest or on exertion, pleuritic chest pain, cough, calf or thigh pain or swelling, or wheezing. As the

history, examination findings, ECG and chest x-ray are not sufficiently sensitive or specific to make the diagnosis of PE, and as anticoagulant therapy itself carries a significant risk, an assessment using evidence-based validated clinical prediction rules (e.g. Wells score) with further testing based on a stepwise approach should be carried out.

Patients with a low risk pretest probability meeting all pulmonary embolism rule-out criteria (PERC) require no further testing. Plasma high sensitivity D-dimer test is only useful to rule out pulmonary embolism in patients identified as low risk who do not meet all the PERC, or those initially assessed as intermediate risk. Patients with elevated age-adjusted D-dimer levels will require imaging, with computed tomographic pulmonary angiography (CTPA) being the preferred study unless it is not available or contraindicated, and then ventilation-perfusion lung scanning should be used. D-dimer testing should not be ordered in high-risk patients because it does not contribute to clinical management.[9]

With advances in technology and detection of smaller and smaller emboli, questions as to our understanding of which small emboli need treatment are being raised.[10]

Oesophageal rupture

Spontaneous full thickness tears through the oesophagus are rare and have significant morbidity and mortality from mediastinitis and sepsis. The diagnosis is often delayed because of a lack of clinical suspicion and consideration of this condition. The classic presentation of spontaneous oesophageal rupture is that of a middle-aged man with a history of dietary overindulgence and overconsumption of alcohol who experiences chest pain and subcutaneous emphysema after recent vomiting or retching. The erect chest x-ray will usually be abnormal, demonstrating pneumothorax, widened mediastinum, pleural effusion and hydropneumothorax more often on the left. Imaging of the oesophagus is required to confirm the diagnosis. Patients with this condition should be regarded as critically ill and require multidisciplinary involvement to decide on the best course of treatment.

Nonimmediately life-threatening causes of chest pain

Gastro-oesophageal reflux disease is a common cause of noncardiac chest pain and may require exclusion of cardiac disease before a definitive diagnosis is made. Other common nonimmediately life-threatening causes of acute chest pain presentations to emergency departments include pericarditis, pneumonia, pleurisy and musculoskeletal causes. Less common presentations include herpes zoster, aortic stenosis and malignancy.

Spontaneous pneumothorax may present as pleuritic or persistent chest pain of sudden onset, and may be nonspecific and not accompanied by other symptoms in an otherwise well patient. Chest x-ray will confirm clinical suspicion, and management will depend on symptoms and comorbidities. Clinical advice to avoid aircraft travel until at least one week after full resolution and to avoid diving permanently (unless surgically treated to prevent recurrence of pneumothorax) should be given.[11]

Nonspecific noncardiac chest pain

Most of the remaining causes of chest pain are benign and are generally not formally diagnosed; however, patients with so-called noncardiac chest pain are two to three times more likely to have anxiety disorders and depression than those with cardiac causes of chest pain. Subclinical anxiety and depression as well as panic disorder occur at high rates in people with noncardiac chest pain. Many successful treatments are aimed at reducing both the chest pain and co-occurring psychological factors.[12]

Screening for panic disorder has been suggested as a useful indicator of anxiety-related symptoms; however, this should not preclude cardiac testing in patients with risk factors for cardiac causes of chest pain.

Summary

A structured approach to the assessment and investigation of chest pain, including history, examination, early ECG and use of validated clinical decision support tools, alongside an inclusive approach to possible diagnoses, are required to avoid the pitfalls in diagnosing the cause of this common presentation. **CT**

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COMPETING INTERESTS: None.