NHS
National Institute for Health and Clinical Excellence

Quick reference guide

Issue date: March 2010

Chest pain of recent onset

Assessment and diagnosis of recent onset chest pain or discomfort of suspected cardiac origin

This guideline partially updates NICE technology appraisal guidance 73

NICE clinical guideline 95
Developed by the National Clinical Guideline Centre for Acute and Chronic Conditions

About this booklet

This is a quick reference guide that summarises the recommendations NICE has made to the NHS in 'Chest pain of recent onset: assessment and diagnosis of recent onset chest pain or discomfort of suspected cardiac origin' (NICE clinical guideline 95).

This guidance updates and replaces recommendation 1.1 of NICE technology appraisal guidance 73 (2003).

Who should read this booklet?

This quick reference guide is for healthcare professionals and other staff who care for people with chest pain of recent onset.

Who wrote the guideline?

The guideline was developed by the National Clinical Guideline Centre for Acute and Chronic Conditions, which is based at the Royal College of Physicians. The Centre worked with a group of healthcare professionals (including consultants, GPs and nurses), patients and carers, and technical staff, who reviewed the evidence and drafted the recommendations. The recommendations were finalised after public consultation.

For more information on how NICE clinical guidelines are developed, go to www.nice.org.uk

Where can I get more information about the guideline?

The NICE website has the recommendations in full, reviews of the evidence they are based on, a summary of the guideline for patients and carers, and tools to support implementation (see inside back cover for more details).

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NICE clinical guidelines are recommendations about the treatment and care of people with specific diseases and conditions in the NHS in England and Wales.

This guidance represents the view of NICE, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summary of product characteristics of any drugs they are considering.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

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Introduction

Fast and accurate diagnosis of chest pain or discomfort caused by stable angina or an acute coronary syndrome (that is, myocardial infarction or unstable angina) is essential so that treatment can be offered quickly. This guideline covers the assessment and investigation of people with recent suspected cardiac chest pain or discomfort.

There are two separate diagnostic pathways in this guide. One is for people with acute chest pain that is suspected to be caused by an acute coronary syndrome, and the other is for people with intermittent stable chest pain suspected to be stable angina.

In this guide chest pain is used to mean both chest pain and discomfort.

Person-centred care

Treatment and care should take into account the person's individual needs and preferences. Good communication is essential, supported by evidence-based information, to allow the person to reach informed decisions about their care. Follow advice on seeking consent from the Department of Health or Welsh Assembly Government if needed. If the person agrees, families and carers should have the opportunity to be involved in decisions about treatment and care.

Discuss any concerns the person (or their family, carer or advocate) may have. Correct any misinformation. Clearly explain in everyday language:

- the possible causes of symptoms
- about proposed investigations, including their risks, benefits and limitations
- the results of any investigations.

Key to terms

ACS: acute coronary syndrome
CAD: coronary artery disease
CT: computed tomography
ECG: electrocardiogram
GTN: glyceryl trinitrate
LBBB: left bundle branch block
MI: myocardial infarction
MPS with SPECT: myocardial perfusion scintigraphy with single photon emission computed tomography
MR: magnetic resonance
NSTEMI: non-ST-segment-elevation myocardial infarction
SpO_2: oxygen saturation by pulse oximetry
STEMI: ST-segment-elevation myocardial infarction

Key priorities for implementation

Presentation with acute chest pain

- Take a resting 12-lead electrocardiogram (ECG) as soon as possible. When people are referred, send the results to hospital before they arrive if possible. Recording and sending the ECG should not delay transfer to hospital.
- Do not exclude an acute coronary syndrome (ACS) when people have a normal resting 12-lead ECG.
- Do not routinely administer oxygen, but monitor oxygen saturation using pulse oximetry as soon as possible, ideally before hospital admission. Only offer supplemental oxygen to:
  - people with oxygen saturation (SpO_2) of less than 94% who are not at risk of hypercapnic respiratory failure, aiming for SpO_2 of 94–98%
  - people with chronic obstructive pulmonary disease who are at risk of hypercapnic respiratory failure, to achieve a target SpO_2 of 88–92% until blood gas analysis is available.
- Do not assess symptoms of an ACS differently in ethnic groups. There are no major differences in symptoms of an ACS among different ethnic groups.

Presentation with stable chest pain

- Diagnose stable angina based on one of the following:
  - clinical assessment alone **or**
  - clinical assessment plus diagnostic testing (that is, anatomical testing for obstructive coronary artery disease [CAD] and/or functional testing for myocardial ischaemia).
- If people have features of typical angina based on clinical assessment and their estimated likelihood of CAD is greater than 90% (see table 1), further diagnostic investigation is unnecessary. Manage as angina.

continued

- Unless clinical suspicion is raised based on other aspects of the history and risk factors, exclude a diagnosis of stable angina if the pain is non-anginal (see recommendation 1.3.3.1[1]). Other features which make a diagnosis of stable angina unlikely are when the chest pain is:
  - continuous or very prolonged **and/or**
  - unrelated to activity **and/or**
  - brought on by breathing in **and/or**
  - associated with symptoms such as dizziness, palpitations, tingling or difficulty swallowing.

  Consider causes of chest pain other than angina (such as gastrointestinal or musculoskeletal pain).
- In people without confirmed CAD, in whom stable angina cannot be diagnosed or excluded based on clinical assessment alone, estimate the likelihood of CAD (see table 1). Take the clinical assessment and the resting 12-lead ECG into account when making the estimate. Arrange further diagnostic testing as follows:
  - If the estimated likelihood of CAD is 61–90%, offer invasive coronary angiography as the first-line diagnostic investigation if appropriate (see recommendations 1.3.4.4 and 1.3.4.5[1]).
  - If the estimated likelihood of CAD is 30–60%, offer functional imaging as the first-line diagnostic investigation (see recommendation 1.3.4.6[1]).
  - If the estimated likelihood of CAD is 10–29%, offer CT calcium scoring as the first-line diagnostic investigation (see recommendation 1.3.4.7[1]).
- Do not use exercise ECG to diagnose or exclude stable angina for people without known CAD.

Table 1 Percentage of people estimated to have coronary artery disease according to typicality of symptoms, age, sex and risk factors[2]

Age (years)	Non-anginal chest pain				Atypical angina				Typical angina			
	Men		Women		Men		Women		Men		Women	
	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi
35	3	35	1	19	8	59	2	39	30	88	10	78
45	9	47	2	22	21	70	5	43	51	92	20	79
55	23	59	4	25	45	79	10	47	80	95	38	82
65	49	69	9	29	71	86	20	51	93	97	56	84

For men older than 70 with atypical or typical symptoms, assume an estimate > 90%.
For women older than 70, assume an estimate of 61–90% EXCEPT women at high risk AND with typical symptoms where a risk of > 90% should be assumed.

Values are per cent of people at each mid-decade age with significant coronary artery disease (CAD).
Hi = High risk = diabetes, smoking and hyperlipidaemia (total cholesterol > 6.47 mmol/litre).
Lo = Low risk = none of these three.
The shaded area represents people with symptoms of non-anginal chest pain, who would not be investigated for stable angina routinely.
Note: These results are likely to overestimate CAD in primary care populations.
If there are resting ECG ST-T changes or Q waves, the likelihood of CAD is higher in each cell of the table.

[1] See the full guideline and the NICE guideline at www.nice.org.uk/guidance/CG95
[2] Adapted from Pryor DB, Shaw L, McCants CB et al. (1993) Value of the history and physical in identifying patients at increased risk for coronary artery disease. Annals of Internal Medicine 118 (2): 81–90.

People presenting with acute chest pain

Check for a suspected ACS

- Check immediately if chest pain is current, or when the last episode was, particularly if in the last 12 hours.
- Check if the chest pain may be cardiac. Consider:
  - history of the pain
  - any cardiovascular risk factors
  - history of ischaemic heart disease and any previous treatment
  - previous investigations for chest pain.
- Check if any of the following symptoms of ischaemia are present. These may indicate an ACS:
  - Pain in the chest and/or other areas (for example, the arms, back or jaw) lasting longer than 15 minutes.
  - Chest pain with nausea and vomiting, marked sweating or breathlessness (or a combination of these), or with haemodynamic instability.
  - New onset chest pain, or abrupt deterioration in stable angina, with recurrent pain occurring frequently with little or no exertion and often lasting longer than 15 minutes.
- Central chest pain may not be the main symptom.
- Do not use response to glyceryl trinitrate (GTN) to make a diagnosis of ACS.
- Do not assess symptoms of an ACS differently in men and women or among different ethnic groups.
- Advise people about seeking medical help if they have further chest pain.
- If the chest pain is non-cardiac, explain this to the person and refer for further investigation if appropriate.
- If the chest pain is suspected to be an ACS follow the pathway on the next page.

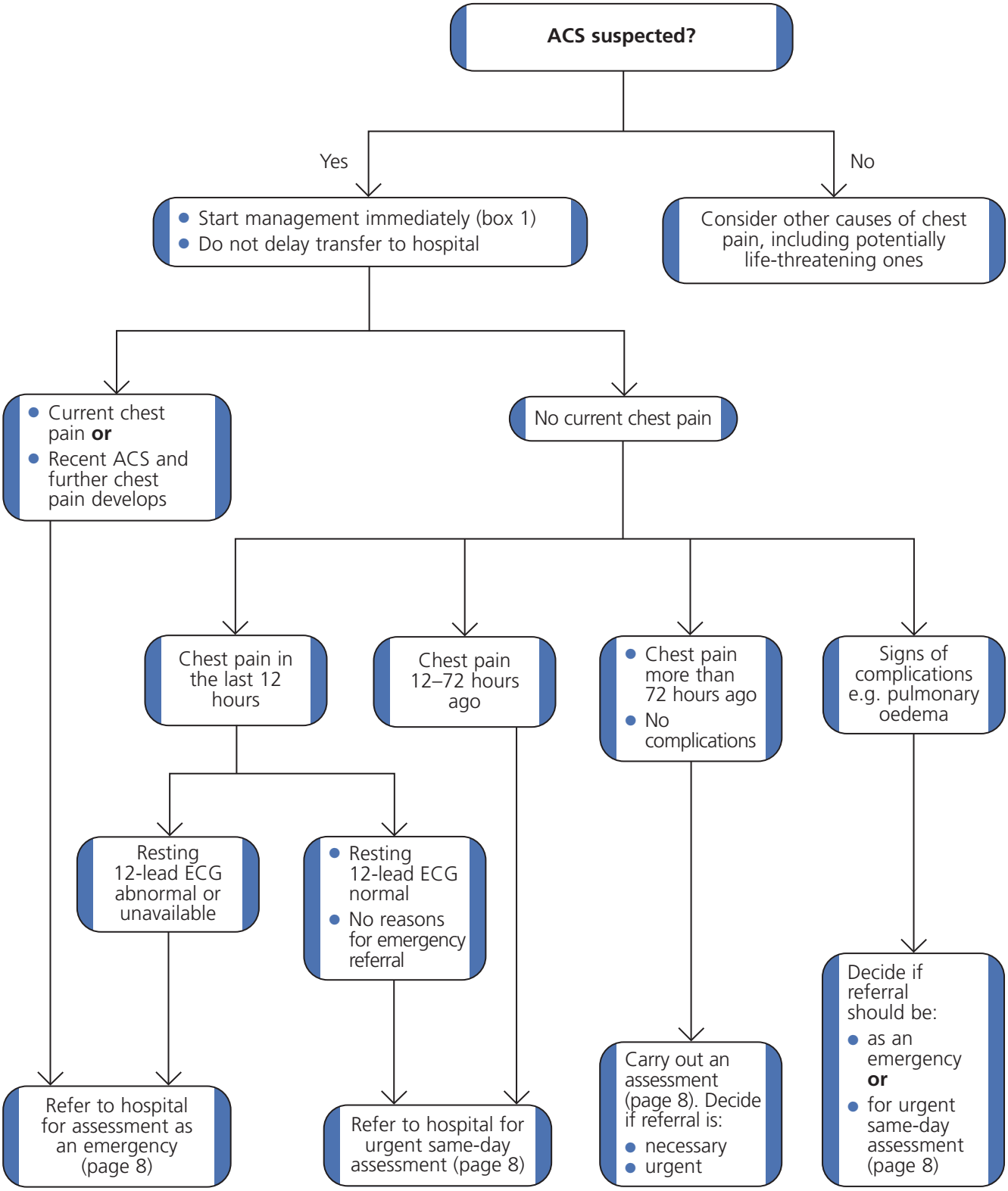
Box 1 Immediate management of a suspected ACS

In the order appropriate to the circumstances, offer:

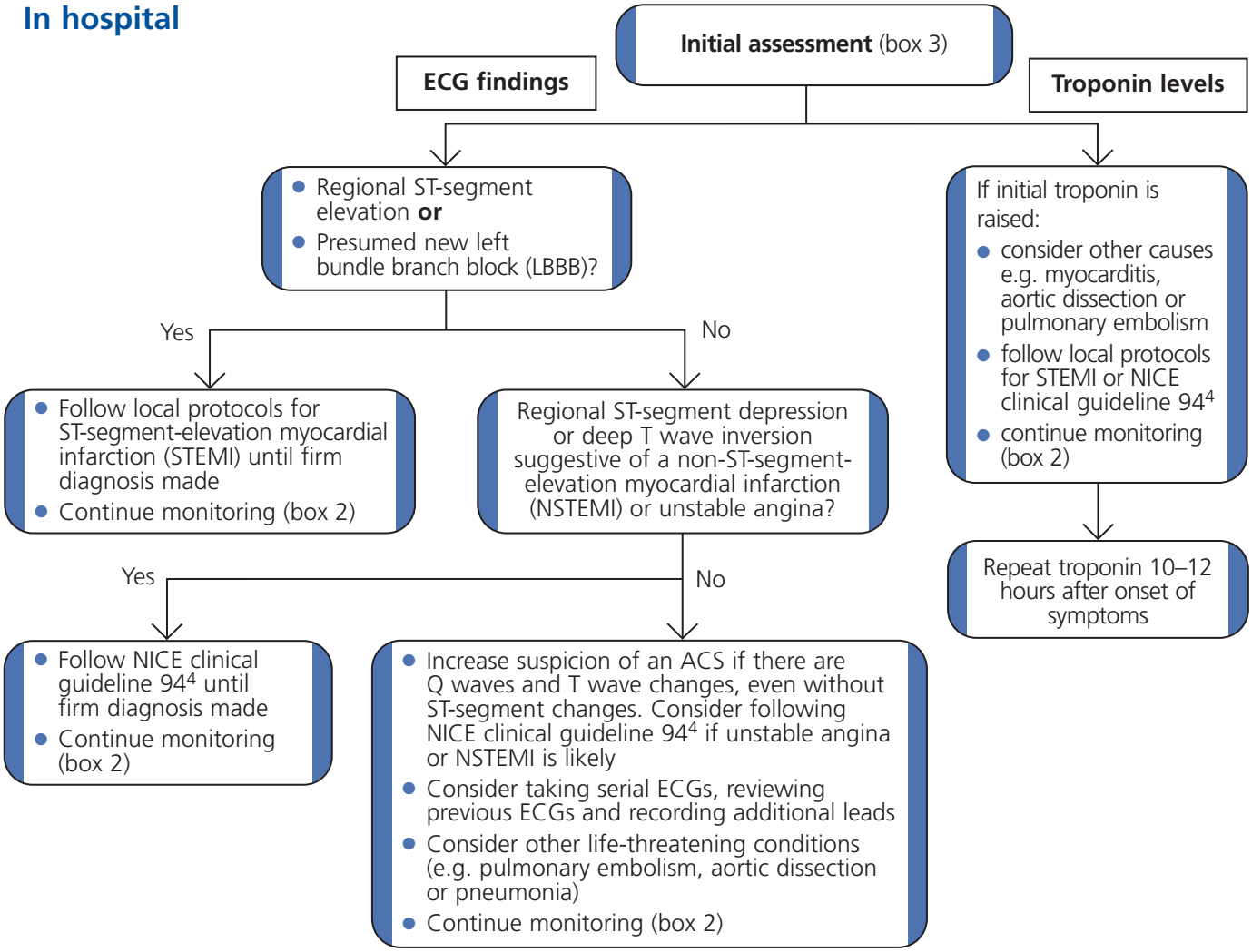
- pain relief (GTN and/or an intravenous opioid)
- a single loading dose of 300 mg aspirin unless the person is allergic. Send a written record with the person if given before arriving at hospital. Only offer other antiplatelet agents[3] in hospital
- a resting 12-lead ECG. Send to the hospital before the person arrives if possible
- other therapeutic interventions[3] as necessary
- pulse oximetry, ideally before hospital admission. Offer oxygen:
  - if oxygen saturation (SpO_2) is less than 94% with no risk of hypercapnic respiratory failure. Aim for SpO_2 of 94–98%
  - to people with chronic obstructive pulmonary disease who are at risk of hypercapnic respiratory failure. Aim for SpO_2 of 88–92% until blood gas analysis is available
- monitoring (box 2).

[3] Follow 'Unstable angina and NSTEMI' (NICE clinical guideline 94) or local protocols for ST-segment-elevation myocardial infarction (STEMI).

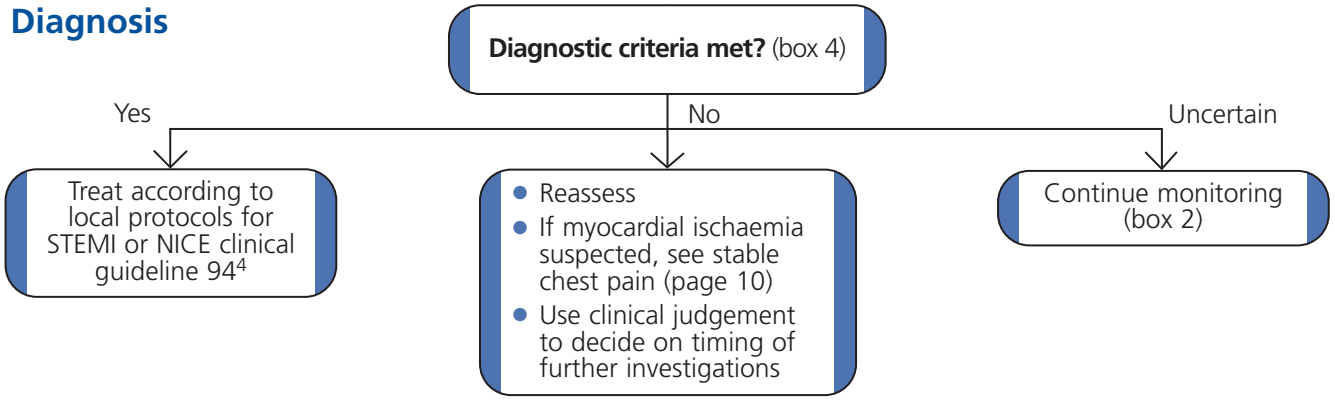
Referral to hospital



In hospital



Diagnosis



- Consider a chest X-ray to help exclude complications of an ACS (e.g. pulmonary oedema) or other diagnoses (e.g. pneumothorax or pneumonia).
- Only consider early chest computed tomography (CT) to rule out other diagnoses (e.g. pulmonary embolism or aortic dissection), not to diagnose an ACS.
- Manage risk factors for cardiovascular disease[5] if an ACS has been excluded.

[4] 'Unstable angina and NSTEMI' (NICE clinical guideline 94).
[5] Follow appropriate guidance, e.g. 'Hypertension' (NICE clinical guideline 34) or 'Lipid modification' (NICE clinical guideline 67).

Box 2 Monitor until diagnosis

- Include:
  - exacerbations of pain and/or other symptoms
  - pulse and blood pressure
  - heart rhythm
  - oxygen saturation by pulse oximetry
  - repeated resting 12-lead ECGs
  - checking pain relief is effective.
- Decide how often this should be done.

Box 3 Initial assessment

Clinical history (unless STEMI is confirmed from the resting 12-lead ECG)

- Record:
  - the characteristics of the pain
  - associated symptoms
  - history of cardiovascular disease
  - any cardiovascular risk factors
  - details of investigations or treatments for similar symptoms of chest pain.

Physical examination

- Check:
  - haemodynamic status
  - for signs of complications (e.g. pulmonary oedema, cardiogenic shock)
  - for signs of non-coronary causes of acute chest pain (e.g. aortic dissection).

ECG

- Take a resting 12-lead ECG.
- Do not exclude an ACS if the resting 12-lead ECG is normal.
- Obtain a review of ECGs by a healthcare professional qualified to interpret them as well as any automated interpretation.

Biochemical markers

- Take blood for troponin I or T.
- When interpreting troponin, take into account the clinical presentation, time from onset of symptoms and the resting 12-lead ECG findings.
- Do not use:
  - natriuretic peptides or high sensitivity C-reactive protein to diagnose an ACS
  - biochemical markers of myocardial ischaemia (such as ischaemia-modified albumin).

Box 4 Diagnostic criteria for myocardial infarction[6]

Detection of rise and/or fall of cardiac biomarkers (preferably troponin) with at least one value above the 99th percentile of the upper reference limit, together with evidence of myocardial ischaemia with at least one of the following:

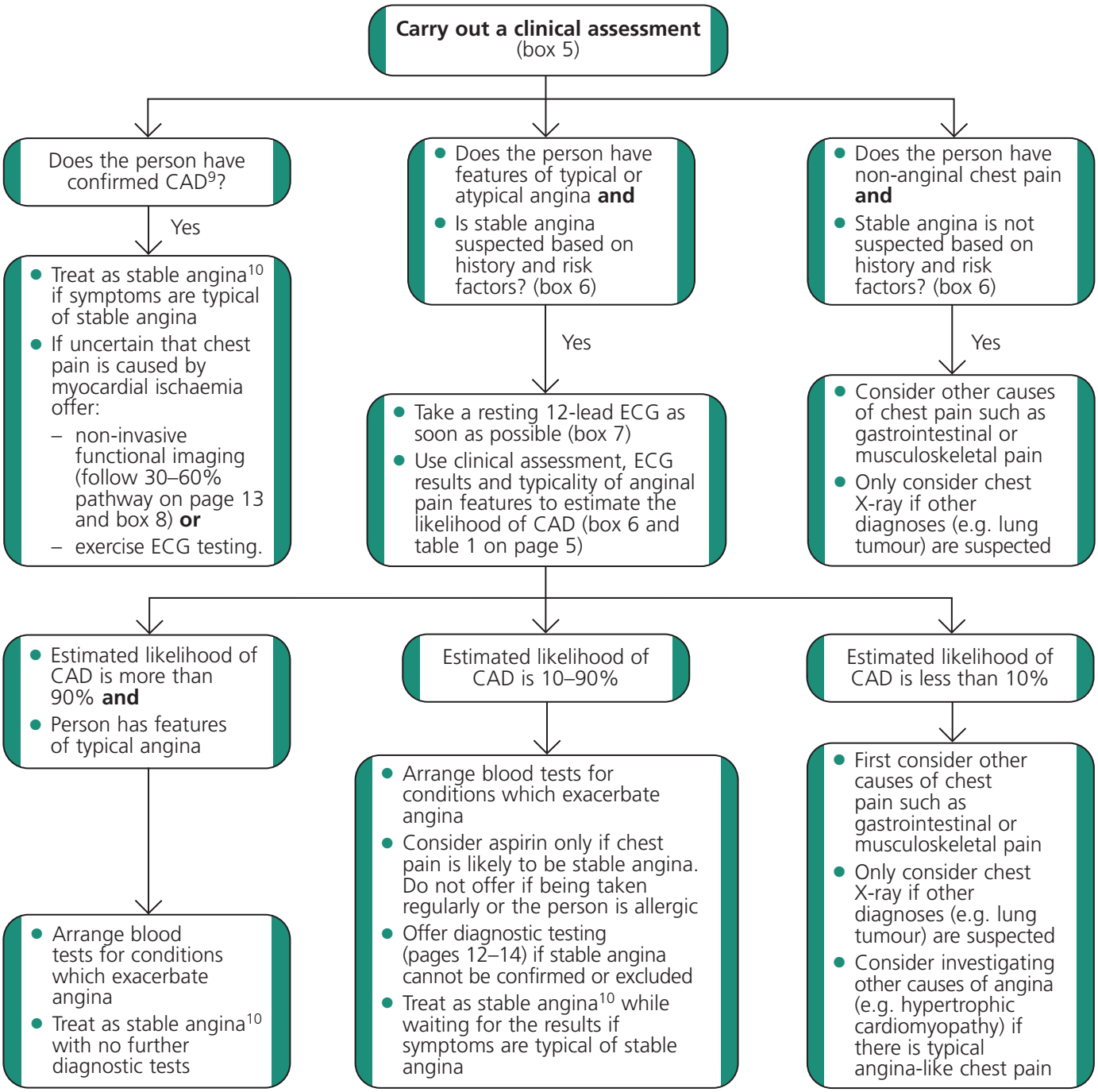
- symptoms of ischaemia (see page 6)
- ECG changes indicative of new ischaemia (new ST-T changes or new LBBB)
- development of pathological Q wave changes in the ECG
- imaging evidence of new loss of viable myocardium or new regional wall motion abnormality[7].

[6] Thygesen K, Alpert JS, White HD et al. on behalf of the joint ESC/ACCF/AHA/WHF Task Force for the redefinition of myocardial infarction (2007). Universal definition of myocardial infarction. Journal of the American College of Cardiology 50: 2173–95.

[7] The Guideline Development Group (GDG) did not review the evidence for the use of imaging evidence of new loss of viable myocardium or new regional wall motion abnormality in the diagnosis of myocardial infarction (MI), but recognised that it was included as a criterion in the universal definition of MI. The GDG recognised that it could be used, but would not be done routinely when there were symptoms of ischaemia and ECG changes.

People presenting with stable chest pain

- Angina can be diagnosed based on clinical assessment alone or clinical assessment plus diagnostic testing.
- Manage risk factors for cardiovascular disease[8] if chest pain is not stable angina.



[8] Follow appropriate guidance, e.g. 'Hypertension' (NICE clinical guideline 34) or 'Lipid modification' (NICE clinical guideline 67).
[9] Previous MI, revascularisation, previous coronary angiography.
[10] Follow local guidelines. NICE is developing a clinical guideline on stable angina. Publication is expected in July 2011.

Box 5 Clinical assessment

Clinical history

- Record:
  - age and sex
  - pain characteristics, factors provoking and relieving the pain
  - associated symptoms
  - history of cardiovascular disease
  - cardiovascular risk factors.

Physical examination

- Identify cardiovascular risk factors.
- Look for signs of other cardiovascular disease.
- Exclude:
  - non-coronary causes of angina (e.g. severe aortic stenosis, cardiomyopathy)
  - other causes of chest pain.

Box 6 Features of stable angina

- Anginal pain is:
- constricting discomfort in the front of the chest, neck, shoulders, jaw or arms
- precipitated by physical exertion
- relieved by rest or GTN in about 5 minutes.
- People with typical angina have all the above anginal pain features, people with atypical angina have two of the features and people with non-anginal chest pain have one or none of the features.
- Do not define typical and atypical features of anginal and non-anginal chest pain differently in men and women or among ethnic groups.
- Factors making stable angina more likely:
- increasing age
- whether the person is male
- cardiovascular risk factors
- a history of established CAD (e.g. previous MI, coronary revascularisation).
- Stable angina is unlikely if the pain is:
- continuous or very prolonged **and/or**
- unrelated to activity **and/or**
- brought on by breathing in **and/or**
- associated with dizziness, palpitations, tingling or difficulty swallowing.

Box 7 Resting 12-lead ECG testing

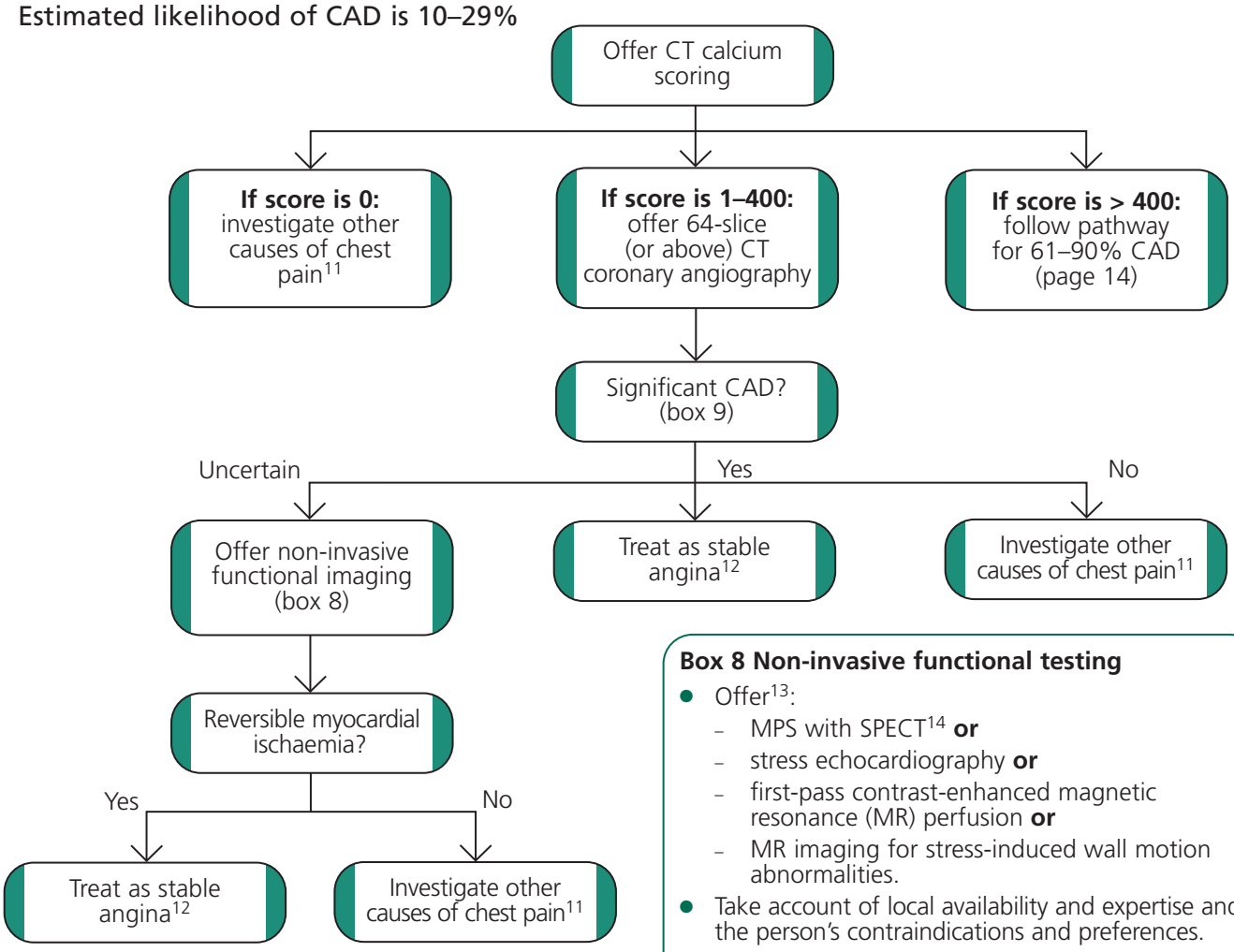
- Do not rule out stable angina based on a normal ECG.
- Consider ECG changes with people's clinical history and risk factors. Changes consistent with CAD which may indicate ischaemia or previous infarction include:
  - pathological Q waves in particular
  - LBBB
  - ST-segment and T wave abnormalities (e.g. flattening or inversion).

  Results may not be conclusive.

Diagnostic testing when the estimated likelihood of CAD is 10–90%

- Take into account the person's:
  - preferences and comorbidities
  - risk from radiation exposure.
- Include the typicality of anginal pain and the estimated likelihood of CAD in all requests for tests and in the person's notes.

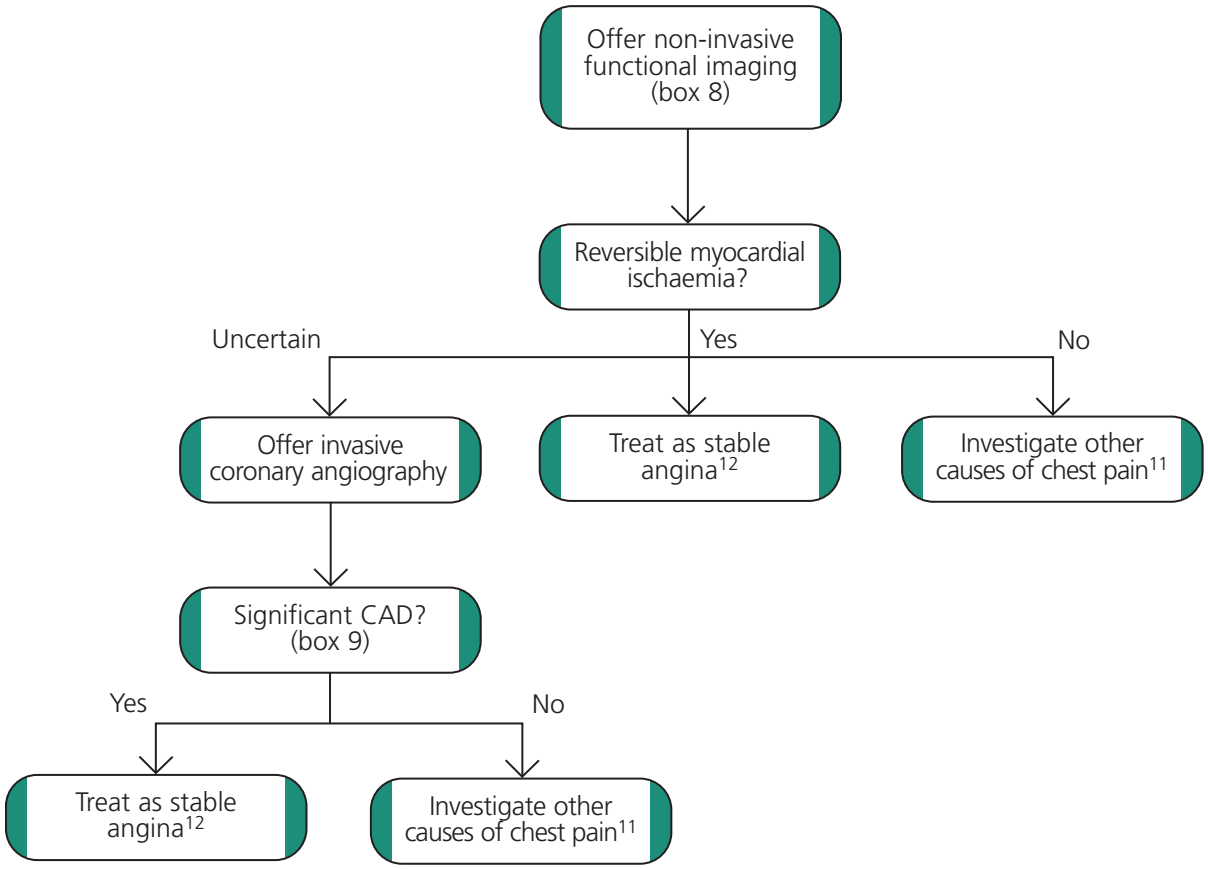
Estimated likelihood of CAD is 10–29%



Box 8 Non-invasive functional testing

- Offer[13]:
  - MPS with SPECT[14] **or**
  - stress echocardiography **or**
  - first-pass contrast-enhanced magnetic resonance (MR) perfusion **or**
  - MR imaging for stress-induced wall motion abnormalities.
- Take account of local availability and expertise and the person's contraindications and preferences.
- Use adenosine, dipyridamole or dobutamine as stress agents for MPS with SPECT.
- Use adenosine or dipyridamole for first-pass contrast-enhanced MR perfusion.
- Use exercise or dobutamine for stress echocardiography or MR imaging for stress-induced wall motion abnormalities.
- Do not use:
  - MR coronary angiography for diagnosing stable angina
  - exercise ECG to diagnose or exclude stable angina in people without known CAD.

Estimated likelihood of CAD is 30–60%



Box 9 Coronary artery disease

Significant CAD on invasive coronary angiography is ≥ 70% diameter stenosis of at least one major epicardial artery segment or ≥ 50% diameter stenosis in the left main coronary artery.

Factors intensifying ischaemia

Such factors allow less severe lesions (e.g. ≥ 50%) to produce angina:

- reduced oxygen delivery: anaemia, coronary spasm
- increased oxygen demand: tachycardia, left ventricular hypertrophy
- large mass of ischaemic myocardium: proximally located lesions
- longer lesion length.

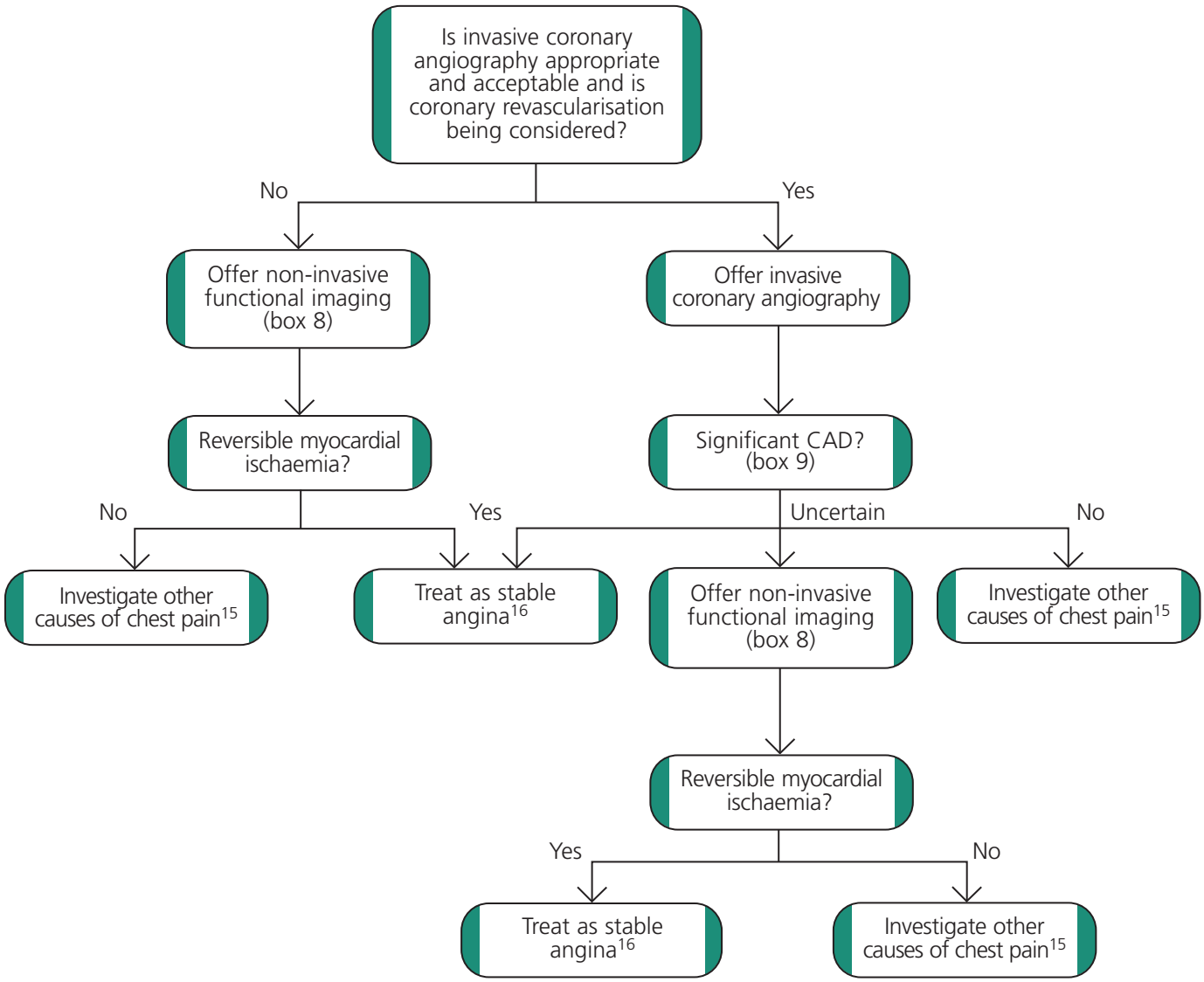
Factors reducing ischaemia

Such factors may make severe lesions (≥ 70%) asymptomatic:

- well-developed collateral supply
- small mass of ischaemic myocardium: distally located lesions, old infarction in the territory of coronary supply.

[11] Consider investigating other causes of angina (e.g. hypertrophic cardiomyopathy or syndrome X) in people with typical angina-like chest pain if investigation excludes flow-limiting disease in the epicardial coronary arteries.
[12] Follow local guidelines. NICE is developing a clinical guideline on stable angina. Publication is expected in July 2011.
[13] This updates and replaces recommendation 1.1 of NICE technology appraisal guidance 73.
[14] Myocardial perfusion scintigraphy with single photon emission computed tomography.

Estimated likelihood of CAD is 61–90%



[15] Consider investigating other causes of angina (e.g. hypertrophic cardiomyopathy or syndrome X) in people with typical angina-like chest pain if investigation excludes flow-limiting disease in the epicardial coronary arteries.
[16] Follow local guidelines. NICE is developing a clinical guideline on stable angina. Publication is expected in July 2011.

Further information

Ordering information

You can download the following documents from www.nice.org.uk/guidance/CG95

- The NICE guideline – all the recommendations.
- A quick reference guide (this document) – a summary of the recommendations for healthcare professionals.
- 'Understanding NICE guidance' – a summary for patients and carers.
- The full guideline – all the recommendations, details of how they were developed, and reviews of the evidence they were based on.

For printed copies of the quick reference guide or 'Understanding NICE guidance', phone NICE publications on 0845 003 7783 or email publications@nice.org.uk and quote:

- N2113 (quick reference guide)
- N2114 ('Understanding NICE guidance').

Implementation tools

NICE has developed tools to help organisations implement this guidance (see www.nice.org.uk/guidance/CG95).

Related NICE guidance

For information about NICE guidance that has been issued or is in development, see www.nice.org.uk

Published

- Unstable angina and NSTEMI. NICE clinical guideline 94 (2010). Available from www.nice.org.uk/guidance/CG94
- Lipid modification. NICE clinical guideline 67 (2008). Available from www.nice.org.uk/guidance/CG67
- MI: secondary prevention. NICE clinical guideline 48 (2007). Available from www.nice.org.uk/guidance/CG48
- Hypertension. NICE clinical guideline 34 (2006). Available from www.nice.org.uk/guidance/CG34
- Statins for the prevention of cardiovascular events. NICE technology appraisal guidance 94 (2006). Available from www.nice.org.uk/guidance/TA94
- Anxiety (amended). NICE clinical guideline 22 (2004; amended 2007). Available from www.nice.org.uk/guidance/CG22
- Dyspepsia (amended). NICE clinical guideline 17 (2004; amended 2005). Available from www.nice.org.uk/guidance/CG17
- Myocardial perfusion scintigraphy for the diagnosis and management of angina and myocardial infarction. NICE technology appraisal guidance 73 (2003). Available from www.nice.org.uk/guidance/TA73

Under development

- The management of stable angina. NICE clinical guideline. Publication expected July 2011.
- Prevention of cardiovascular disease. NICE public health guidance. Publication date to be confirmed.

Updating the guideline

This guideline will be updated as needed, and information about the progress of any update will be available at www.nice.org.uk/guidance/CG95

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