Acute management of myocardial infarction with ST-segment elevation: summary of NICE guidance

Serena Carville,1 Martin Harker,1 Robert Henderson,2 Huon Gray,3 on behalf of the Guideline Development Group

The incidence of myocardial infarction has been declining in the UK over the past 25 years,1 2 but it varies between regions and still averages more than 600 hospitalised cases of ST-segment elevation myocardial infarction (STEMI) per million people each year.1 3 The case fatality rates after myocardial infarction have also fallen, which has been attributed to improved access to effective treatments.3 The over-riding priority in the management of STEMI is to restore coronary perfusion rapidly and effectively, thereby limiting the extent of damage to myocardium and reducing the likelihood of death or future heart failure. Coronary reperfusion can be achieved by fibrinolysis (with agents such as reteplase and tenecteplase) or by mechanical reopening of the occluded artery by angioplasty and stent insertion (primary percutaneous coronary intervention). This article summarises the most recent recommendations from the National Institute for Health and Care Excellence (NICE) on the delivery of effective and timely coronary reperfusion treatment for people with STEMI.6

Recommendations

NICE recommendations are based on systematic reviews of best available evidence and explicit consideration of cost effectiveness. When minimal evidence is available, recommendations are based on the guideline development group’s experience and opinion of what constitutes good practice. Evidence levels for the recommendations are in the full version of this article on bmj.com.

Assess eligibility for coronary perfusion therapy

- Immediately assess eligibility (irrespective of age, ethnicity, or sex) for coronary reperfusion (either primary percutaneous coronary intervention (PCI) or fibrinolysis) in people with acute STEMI.
- Do not use level of consciousness after cardiac arrest caused by suspected acute STEMI to determine whether a person is eligible for coronary angiography (with follow-on primary PCI if indicated).

Treatment options

- Deliver coronary reperfusion therapy (either primary PCI or fibrinolysis) as quickly as possible for eligible people with acute STEMI.
- Offer coronary angiography, with follow-on primary PCI if indicated, as the preferred coronary reperfusion strategy for people with acute STEMI if:
  - Presentation is within 12 hours of onset of symptoms and
  - Primary PCI can be delivered within 120 minutes of the time when fibrinolysis could have been given.
- Offer fibrinolysis to people with acute STEMI presenting within 12 hours of onset of symptoms if primary PCI cannot be delivered within 120 minutes of the time when fibrinolysis could have been given.
- Offer medical therapy, as per NICE clinical guidelines for chest pain of recent onset1 and for secondary prevention after myocardial infarction,4 to people with acute STEMI who are ineligible for reperfusion therapy (such as those presenting too late to benefit from reperfusion therapy, those with comorbidity or bleeding risk that make reperfusion therapy inappropriate, or those who undergo coronary arteriography but are found not to require primary PCI).
- Consider coronary angiography, with follow-on primary PCI if indicated, for people with acute STEMI presenting more than 12 hours after symptom onset and with evidence of continuing myocardial ischaemia.
- Do not routinely offer glycoprotein IIb/IIIa inhibitors or fibrinolytic drugs before arrival at the catheter laboratory to people with acute STEMI for whom primary PCI is planned.
- Offer coronary angiography, with follow-on primary PCI if indicated, to people with acute STEMI and cardiogenic shock who present within 12 hours of the onset of symptoms of STEMI.
- Consider thrombus aspiration during primary PCI for people with acute STEMI.
- Consider radial (in preference to femoral) arterial access for people undergoing coronary angiography (with follow-on primary PCI if indicated).
- When commissioning primary PCI services for people with acute STEMI, be aware that outcomes are strongly related to how quickly primary PCI is delivered, and that they can be influenced by the number of procedures carried out by the primary PCI centre.

For people treated with fibrinolysis

- Offer an electrocardiogram 60–90 minutes after administration of fibrinolytic therapy. For those who have residual ST segment elevation suggesting failed coronary reperfusion:
  - Offer immediate coronary angiography, with follow-on PCI if indicated.
  - Do not repeat fibrinolytic therapy.
- If a person has recurrent myocardial ischaemia after fibrinolysis, seek immediate specialist cardiological advice and, if appropriate, offer coronary angiography, with follow-on PCI if indicated.
10-MINUTE CONSULTATION

Atrial fibrillation

Alastair Bradley,1 Paul Sheridan2

A 67 year old woman presents with recent onset of “palpitations,” lethargy, and shortness of breath, usually related to exercise. She experiences a fluttering in her chest and has hypertension and type 2 diabetes.

What you should cover
Atrial fibrillation is the commonest cardiac arrhythmia, increasing in frequency with age. It causes various symptoms including palpitations, lethargy, shortness of breath, and chest pain and increases the risk of stroke sixfold.1 It can be intermittent (paroxysmal) or continuous (persistent (>7 days to 1 year), longstanding persistent (>1 year), or permanent). Controlling symptoms is important, but reducing stroke risk is paramount.

Consider:
- Are the palpitations caused by atrial fibrillation?
- Do you need to refer the patient to hospital?
- Treatment to control the heart rate and improve symptoms.
- Stroke risk and stroke prevention strategies.

Box 1: Causes of atrial fibrillation
Valvular heart disease, especially mitral stenosis
Congestive heart failure
Alcohol ingestion
Thyrotoxicosis
Hypertension and ischaemic heart disease
Lung problems such as pneumonia, pulmonary embolus, tumour
No apparent cause

Patient anxiety over symptoms and taking oral anticoagulants.

What you should do
Initial assessment
- Check the apical heart beat for the irregularly irregular rhythm of atrial fibrillation.
- Record ventricular rate, blood pressure, and heart sounds. Haemodynamically unstable patients require urgent admission.

Atrial fibrillation

1Academic Unit of Primary Medical Care, Northern General Hospital, Sheffield S5 7AU, UK.
2Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Sheffield
Correspondence to: A Bradley a.bradley@sheffield.ac.uk
Cite this as: BMJ 2013;346:f3719
doi: 10.1136/bmj.f3719
This is part of a series of occasional articles on common problems in primary care. The BMJ welcomes contributions from GPs.
Atrial fibrillation secondary to a corrected cause.

8.5
6
12

No anticoagulation recommended

Oral anticoagulation therapy

• Ask about chest pain and shortness of breath.
• Ask about vascular events such as stroke, transient ischaemic attack, and peripheral emboli.
• Exclude and document other potential causes of symptoms: anaemia, myocardial infarction, pneumonia, and pulmonary embolus.
• Identify predisposing factors for atrial fibrillation and correct treatable causes (see box 1).

Stroke risk assessment

• Annual risk of stroke can be calculated with CHADS₂.²
• Low risk patients who do not require any prophylaxis can be identified with the CHA₂DS₂-VASc index.³
• Calculate the CHADS₂ score from the presence of risk factors (table 1) then identify the annual stroke risk from the resultant score (table 2).
• Recommendations for treatment depend on the patient’s CHADS₂ score (table 2).
• The risk of bleeding with oral anticoagulants (HAS-BLED)⁴ is increased by certain modifiable conditions (table 3): a score of ≥3 does not preclude anticoagulation but indicates greater caution in starting treatment and more regular review.

Investigations

• Confirm the diagnosis by 12 lead electrocardiography and to exclude abnormalities such as a short PR interval.

### Table 1 | CHADS₂ and CHA₂DS₂-VASc scores for calculating annual risk of stroke¹²

<table>
<thead>
<tr>
<th>Item</th>
<th>CHADS₂ score</th>
<th>CHA₂DS₂-VASc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥75 years</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Stroke, transient ischaemic attack, or thromboembolism</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Vascular disease (myocardial infarction, peripheral arterial disease)</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Age 65-74 years</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Sex (female)</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Maximum score</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

### Table 2 | Annual stroke risks calculated with CHADS₂ and CHA₂DS₂-VASc scores, and associated treatment recommendations¹²

<table>
<thead>
<tr>
<th>CHADS₂ Score</th>
<th>NNT for warfarin*</th>
<th>Annual stroke risk (%)</th>
<th>CHA₂DS₂-VASc Score</th>
<th>Annual stroke risk (%)</th>
<th>Treatment recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>77</td>
<td>1.9</td>
<td>0</td>
<td>0</td>
<td>No anticoagulation recommended</td>
</tr>
<tr>
<td>1</td>
<td>53</td>
<td>2.8</td>
<td>1</td>
<td>1.3</td>
<td>No treatment or oral anticoagulation therapy (oral anticoagulation preferred)</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>4.0</td>
<td>2</td>
<td>2.2</td>
<td>Oral anticoagulation therapy recommended</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>5.9</td>
<td>3</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>17</td>
<td>8.5</td>
<td>4</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>12.5</td>
<td>5</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>18.2</td>
<td>6</td>
<td>9.8</td>
<td></td>
</tr>
</tbody>
</table>

Note: Aspirin is recognised by Quality and Outcomes Framework and NICE guidelines but is no longer a recommended treatment for thromboprophylaxis in patients with atrial fibrillation.⁵

### USEFUL READING

- Consider 24 hour electrocardiography, or event or loop recording, if paroxysmal atrial fibrillation is suspected.
- Blood tests (full blood count, urea and electrolytes test, liver function tests, thyroid function tests, clotting screen, fasting blood sugar (or HbA₁c), and cholesterol levels).
- Echocardiography is useful to assess left ventricular function or a suspected valvular defect.

Management

**When to refer to cardiologist (or cardiac rhythm management specialist if available)**

- Urgently if the patient has new onset atrial fibrillation (<48 hours) or there is haemodynamic instability.
- When the patient has paroxysmal atrial fibrillation for consideration of preventive medication.
- When there is difficulty achieving adequate rate control.
- If there is coexistent heart disease such as coronary or valvular heart disease.
- For consideration of cardioversion if:
  - Symptoms remain despite adequate rate control
  - Relatively young age (no definitive guideline but generally <60 years old)
  - Atrial fibrillation related heart failure
  - Atrial fibrillation secondary to a corrected cause.

Rate control

- Start immediately.
- Initially aim for lenient rate control with a resting apical heart rate <100-110 beats/min, but more stringent control may be required if symptoms remain (resting apical rate 80 beats/min).⁵
- Start bisoprolol 2.5 mg (1.25 mg in elderly patients) and titrate upwards in increments of 1.25 mg every 1-2 weeks until target heart rate is achieved or until maximum tolerated dose (not more than 10 mg daily). β blockers are contraindicated in acute heart failure, severe obstructive airways disease, asthma, and severe peripheral arterial disease. Symptoms of hypoglycaemia may be masked in diabetic patients.
- If β blockers are not tolerated or contraindicated, alternatives include diltiazem (slow release, starting at 90 mg twice daily, increasing to 120 mg twice daily if heart rate remains uncontrolled) and verapamil (starting at 40 mg three times daily, titrating...
upwards in increments of 40 mg every 1-2 weeks and converting to a long acting preparation once heart rate is controlled. Both must be avoided in patients with impaired left ventricular function or already taking β blockers.

- Digoxin is an alternative for elderly sedentary patients (>80 years old). Start at 62.5 μg daily and titrate upwards in increments of 62.5 μg every 1-2 weeks; the usual maintenance dose is 62.5-250 μg daily. Check urea and electrolytes before starting, after a dose change, and then annually. Monitor digoxin level at least 1 week after a dose change; subsequently only if toxicity is suspected.

**Stroke risk reduction**

- Start as soon as possible after diagnosis.
- Aspirin is no longer considered an appropriate treatment despite being a Quality and Outcomes Framework target.
- Low risk patients (see table 2) require no treatment.
- Higher risk patients are recommended oral anticoagulants, which can be started in primary care.
- Falls and risk of falls are not contraindications to oral anticoagulants, but investigation of falls is important before starting treatment.
- Warfarin within the target international normalised ratio (2.0-3.0) reduces stroke risk by 68% across all age ranges.
- Newer agents (dabigatran, rivaroxaban, and apixaban) are at least as effective as warfarin and do not require blood monitoring. Compared with warfarin, they reduce the risk of intracranial haemorrhage by nearly 50%, but slightly increase the risk of gastrointestinal haemorrhage. The effects of warfarin can be reversed with administration of vitamin K, but there is no known antidote to the newer agents if bleeding occurs.

- These newer agents are recommended by the National Institute for Health and Care Excellence (NICE) for patients with non-valvular atrial fibrillation (NICE) for patients with non-valvular atrial fibrillation and at least one other risk factor—such as congestive heart failure, hypertension, age ≥75 years, diabetes, or prior stroke or transient ischaemic attack.

---

**Table 3 | HAS-BLED scoring system to identify patients at increased risk of haemorrhage and to identify modifiable risk factors**

<table>
<thead>
<tr>
<th>Clinical characteristic</th>
<th>Score</th>
<th>Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>1</td>
<td>Systolic blood pressure ≥160 mm Hg</td>
</tr>
<tr>
<td>Abnormal renal and liver function (1 point each)</td>
<td>1 or 2</td>
<td>Chronic dialysis; renal transplantation; serum creatinine ≥200 mmol/L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chronic hepatic disease; bilirubin 2+ or 3+ normal with ALT, AST, or alkaline phosphatase 3+ normal</td>
</tr>
<tr>
<td>Stroke</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td>1</td>
<td>History of bleeding or anaemia</td>
</tr>
<tr>
<td>Labile INR (on warfarin)</td>
<td>1</td>
<td>Time in therapeutic range &lt;60%</td>
</tr>
<tr>
<td>Elderly</td>
<td></td>
<td>≥65 years old</td>
</tr>
<tr>
<td>Drugs and alcohol</td>
<td>1 or 2</td>
<td>Concomitant aspirin or NSAID use; ≥8 units/week alcohol</td>
</tr>
<tr>
<td>Maximum score</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

**Competing interests:** AB has received educational grants from Bayer Healthcare, Boehringer Ingleheim, and Pfizer for the development of a decision aid for patients with non-valvular atrial fibrillation.

**Provenance and peer review:** Not commissioned; externally peer reviewed.

<table>
<thead>
<tr>
<th>Reference</th>
</tr>
</thead>
</table>

Accepted: 01 March 2013

**ANSWERS TO ENDGAMES, p 38** For long answers go to the Education channel on bmj.com

**STATISTICAL QUESTION**

Multiple regression

Statements a and b are true, whereas c and d are false.

**PICTURE QUIZ** An unusual death in the community

1 The histological section shows widespread granulomatous inflammation within the submucosa and muscularis propria of the bowel. A Langerhans giant cell can also be seen.

2 The most common causes are Crohn’s disease, reaction to foreign materials, intestinal perforation, sarcoidosis, and infection such as tuberculosis.

3 Special stains on the tissue sections should be performed, including Ziehl-Neelsen staining to detect acid fast bacilli and Grocott staining to detect fungi. Samples of fresh tissue may be submitted for culture for confirmation, resistance determination, molecular typing, and archiving if permission exists.

4 1a: peritonitis, 1b: small bowel perforation, and 1c: disseminated tuberculosis.

5 If a new diagnosis of tuberculosis is made at autopsy, the local consultant in communicable disease control must be informed and contact tracing should be initiated. Occupational health advice should be sought if mortuary personnel have been exposed.