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MI: secondary prevention

Secondary prevention in primary and secondary care for patients following a myocardial infarction

This guideline replaces NICE inherited guideline A

NICE clinical guideline 48

Secondary prevention in primary and secondary care for patients following a myocardial infarction

Ordering information

You can download the following documents from www.nice.org.uk/CG048

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

For printed copies of the quick reference guide or ‘Understanding NICE guidance’, phone the NHS Response Line on 0870 1555 455 and quote:

- N1251 (quick reference guide)
- N1252 (‘Understanding NICE guidance’).

This guidance is written in the following context

This guidance represents the view of the Institute, 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. The guidance does not, however, 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.

National Institute for Health and Clinical Excellence

MidCity Place
71 High Holborn
London
WC1V 6NA

www.nice.org.uk

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Introduction

In the UK, about 838,000 men and 394,000 women have had a myocardial infarction (MI) at some point in their lives. This guideline contains recommendations on secondary prevention for patients in primary and secondary care after an MI. It replaces the existing NICE guideline 'Prophylaxis for patients who have experienced a myocardial infarction' (NICE inherited guideline A, April 2001) for use in the NHS in England and Wales. This guideline is based on the best available evidence of clinical and cost effectiveness.

This guideline will support the implementation of the 'Coronary heart disease national service framework (NSF)'. The statements in the 'Coronary heart disease NSF' reflected the evidence that was used at the time it was published. This guideline updates the NSF with regard to post-MI secondary prevention.

Patient-centred care

This guideline offers best practice advice on secondary prevention in primary and secondary care for patients after a myocardial infarction (MI).

Treatment and care should take into account patients' individual needs and preferences. After an MI, patients should have the opportunity to make informed decisions about their care and treatment, in partnership with their healthcare professionals. If patients do not have the capacity to make decisions, healthcare professionals should follow the Department of Health guidelines – 'Reference guide to consent for examination or treatment' (2001) (available from www.dh.gov.uk). Since April 2007 healthcare professionals need to follow a code of practice accompanying the Mental Capacity Act (summary available from www.dca.gov.uk/menincap/bill-summary.htm).

Good communication between healthcare professionals and patients is essential. It should be supported by evidence-based written information tailored to the patient's needs. Treatment and care, and the information patients are given about it, should be culturally appropriate. It should also be accessible to people with additional needs such as physical, sensory or learning disabilities, and to people who do not speak or read English.

Families and carers should have the opportunity to be involved in decisions about the patient's care and treatment, if the patient agrees to this.

Families and carers should also be given the information and support they need.

Key priorities for implementation

A number of key priority recommendations have been identified for implementation and these are listed below.

- After an acute myocardial infarction (MI), confirmation of the diagnosis of acute MI and results of investigations, future management plans and advice on secondary prevention should be part of every discharge summary.
- Patients should be advised to undertake regular physical activity sufficient to increase exercise capacity.
- Patients should be advised to be physically active for 20–30 minutes a day to the point of slight breathlessness. Patients who are not achieving this should be advised to increase their activity in a gradual, step-by-step way, aiming to increase their exercise capacity. They should start at a level that is comfortable, and increase the duration and intensity of activity as they gain fitness.
- All patients who smoke should be advised to quit and be offered assistance from a smoking cessation service in line with 'Brief interventions and referral for smoking cessation in primary care and other settings' (NICE public health intervention guidance 1).
- Patients should be advised to eat a Mediterranean-style diet (more bread, fruit, vegetables and fish; less meat; and replace butter and cheese with products based on vegetable and plant oils).
- Cardiac rehabilitation should be equally accessible and relevant to all patients after an MI, particularly people from groups that are less likely to access this service. These include people from black and minority ethnic groups, older people, people from lower socioeconomic groups, women, people from rural communities and people with mental and physical health comorbidities.

- All patients who have had an acute MI should be offered treatment with a combination of the following drugs:
 - ACE (angiotensin-converting enzyme) inhibitor
 - aspirin
 - beta-blocker
 - statin.
- For patients who have had an acute MI and who have symptoms and/or signs of heart failure and left ventricular systolic dysfunction, treatment with an aldosterone antagonist licensed for post-MI treatment should be initiated within 3–14 days of the MI, preferably after ACE inhibitor therapy.
- Treatment with clopidogrel in combination with low-dose aspirin should be continued for 12 months after the most recent acute episode of non-ST-segment-elevation acute coronary syndrome. Thereafter, standard care, including treatment with low-dose aspirin alone, is recommended unless there are other indications to continue dual antiplatelet therapy.
- After an ST-segment-elevation MI, patients treated with a combination of aspirin and clopidogrel during the first 24 hours after the MI should continue this treatment for at least 4 weeks. Thereafter, standard treatment including low-dose aspirin should be given, unless there are other indications to continue dual antiplatelet therapy.
- All patients should be offered a cardiological assessment to consider whether coronary revascularisation is appropriate. This should take into account comorbidity.

1 Guidance

The following guidance is based on the best available evidence. The full guideline (www.nice.org.uk/CG048fullguideline) gives details of the methods and the evidence used to develop the guidance (see section 5 for details).

1.1 *Lifestyle changes after a myocardial infarction (MI)*

1.1.1 Changing dietary regimen

- 1.1.1.1 Patients should be advised not to take supplements containing beta-carotene, and should not be advised to take antioxidant supplements (vitamin E and/or C) or folic acid to reduce cardiovascular risk.
- 1.1.1.2 Patients should be advised to consume at least 7 g of omega 3 fatty acids per week from two to four portions of oily fish.
- 1.1.1.3 For patients who have had an MI within 3 months and who are not achieving 7 g of omega 3 fatty acids per week, consider providing at least 1 g daily of omega-3-acid ethyl esters treatment licensed for secondary prevention post MI for up to 4 years.
- 1.1.1.4 Initiation of omega-3-acid ethyl esters supplements is not routinely recommended for patients who have had an MI more than 3 months earlier.
- 1.1.1.5 Patients should be advised to eat a Mediterranean-style diet (more bread, fruit, vegetables and fish; less meat; and replace butter and cheese with products based on vegetable and plant oils).

1.1.2 Delivery of dietary advice

- 1.1.2.1 Patients should be given consistent dietary advice, tailored to their needs.
- 1.1.2.2 Patients should be offered an individual consultation to discuss diet, including their current eating habits, and advice on improving their diet.

1.1.2.3 Patients should be given healthy eating advice that can be extended to the whole family.

1.1.3 Alcohol consumption

1.1.3.1 Patients who drink alcohol should be advised to keep weekly consumption within safe limits (no more than 21 units of alcohol per week for men, or 14 units per week for women) and to avoid binge drinking (more than 3 alcoholic drinks in 1–2 hours).

1.1.4 Regular physical activity

1.1.4.1 Patients should be advised to undertake regular physical activity sufficient to increase exercise capacity.

1.1.4.2 Patients should be advised to be physically active for 20–30 minutes a day to the point of slight breathlessness. Patients who are not achieving this should be advised to increase their activity in a gradual, step-by-step way, aiming to increase their exercise capacity. They should start at a level that is comfortable, and increase the duration and intensity of activity as they gain fitness.

1.1.4.3 Advice on physical activity should involve a discussion about current and past activity levels and preferences. The benefit of exercise may be enhanced by tailored advice from a suitably qualified professional.

1.1.5 Smoking cessation

1.1.5.1 All patients who smoke should be advised to quit and be offered assistance from a smoking cessation service in line with 'Brief interventions and referral for smoking cessation in primary care and other settings' (NICE public health intervention guidance 1).

1.1.5.2 All patients who smoke and who have expressed a desire to quit should be offered support and advice, and referral to an intensive support service (for example, the NHS Stop Smoking Services) in

line with 'Brief interventions and referral for smoking cessation in primary care and other settings' (NICE public health intervention guidance 1). If a patient is unable or unwilling to accept a referral they should be offered pharmacotherapy in line with the recommendations in 'Nicotine replacement therapy (NRT) and bupropion for smoking cessation' (NICE technology appraisal guidance 39).

1.1.6 Weight management

1.1.6.1 After an MI, all patients who are overweight or obese should be offered advice and support to achieve and maintain a healthy weight in line with 'Obesity: the prevention, identification, assessment and management of overweight and obesity in adults and children' (NICE clinical guideline 43).

1.2 *Cardiac rehabilitation after an acute MI*

1.2.1 Comprehensive cardiac rehabilitation

1.2.1.1 All patients (regardless of their age) should be given advice about and offered a cardiac rehabilitation programme with an exercise component.

1.2.1.2 Cardiac rehabilitation programmes should provide a range of options, and patients should be encouraged to attend all those appropriate to their clinical needs. Patients should not be excluded from the entire programme if they choose not to attend certain components.

1.2.1.3 If a patient has cardiac or other clinical conditions that may worsen during exercise, these should be treated if possible before the patient is offered the exercise component of cardiac rehabilitation. For some patients, the exercise component may be adapted by an appropriately qualified healthcare professional.

1.2.1.4 Patients with left ventricular dysfunction who are stable can safely be offered the exercise component of cardiac rehabilitation.

1.2.2 Patient engagement

1.2.2.1 Cardiac rehabilitation should be equally accessible and relevant to all patients after an MI, particularly people from groups that are less likely to access this service. These include people from black and minority ethnic groups, older people, people from lower socioeconomic groups, women, people from rural communities and people with mental and physical health comorbidities.

1.2.2.2 Healthcare professionals should take into account patients' wider health and social needs, which may involve identifying and addressing economic, welfare rights, housing or social support issues. This may be a particular issue for patients in more deprived circumstances, and rehabilitation services should assess the likely scale of these needs when planning how their services meet the needs of the local population.

1.2.2.3 Cardiac rehabilitation programmes should be culturally sensitive. Employing bilingual peer educators or cardiac rehabilitation assistants who reflect the diversity of the local population should be considered.

1.2.2.4 Cardiac rehabilitation programmes should include an exercise component designed to meet the needs of older patients or patients with significant comorbidity. Any transport problems should be addressed.

1.2.2.5 Healthcare professionals should ask patients whether they would prefer single-sex classes or mixed classes.

1.2.2.6 Healthcare professionals should establish patients' health beliefs and level of health literacy before offering appropriate lifestyle advice.

1.2.2.7 Healthcare professionals, including senior medical staff involved in providing care for patients after an MI, should actively promote cardiac rehabilitation.

1.2.2.8 Reminders such as:

- telephone calls
- telephone calls in combination with direct contact from a healthcare professional
- motivational letters

should be used to improve uptake of cardiac rehabilitation.

1.2.3 Health education and information

1.2.3.1 Comprehensive cardiac rehabilitation programmes should include health education and stress management components.

1.2.3.2 A home based programme validated for patients who have had an MI (such as ‘The Edinburgh heart manual’; see www.cardiacrehabilitation.org.uk/heart_manual/heartmanual.htm) that incorporates education, exercise and stress management components with follow-ups by a trained facilitator may be used to provide comprehensive cardiac rehabilitation.

1.2.3.3 Most patients who have had an MI can return to work. Any advice should take into account the physical and psychological status of the patient, the nature of the work and the work environment.

1.2.3.4 Healthcare professionals should be up to date with the latest Driver and Vehicle Licensing Agency guidelines. Regular updates are published on the agency’s website (www.dvla.gov.uk).

1.2.3.5 After an MI without complications, patients can usually travel by air within 2–3 weeks. Patients who have had a complicated MI need expert individual advice.

- 1.2.3.6 Patients who hold a pilot's licence should seek advice from the Civil Aviation Authority.
- 1.2.3.7 Most patients can return to normal activities of daily living. Any advice about the timing of this should take into account the patient's physical and psychological status, as well as the type of activity planned.
- 1.2.3.8 An estimate of the physical demand of a particular activity, and a comparison between activities, can be made using tables of metabolic equivalents (METS) of different activities (for further information please refer to www.cdc.gov/nccdphp/dnpa/physical/measuring/met.htm). Patients should also be advised how to use a perceived exertion scale to help monitor physiological demand. Patients who have had a complicated MI may need expert advice.
- 1.2.3.9 Advice on competitive sport may need expert assessment of function and risk, and is dependent on what sport is being discussed and the level of competitiveness.

1.2.4 Psychological and social support

- 1.2.4.1 Stress management should be offered in the context of comprehensive cardiac rehabilitation.
- 1.2.4.2 Complex psychological interventions such as cognitive behavioural therapy should not be offered routinely.
- 1.2.4.3 There should be provision to involve partners or carers in the cardiac rehabilitation programme if the patient wishes.
- 1.2.4.4 For recommendations on the management of patients with clinical anxiety and/or depression, refer to 'Anxiety' (NICE clinical guideline 22) and 'Depression' (NICE clinical guideline 23).

1.2.5 Sexual activity

- 1.2.5.1 Patients should be reassured that after recovery from an MI, sexual activity presents no greater risk of triggering a subsequent MI than if they had never had an MI.
- 1.2.5.2 Patients who have made an uncomplicated recovery after their MI can resume sexual activity when they feel comfortable to do so, usually after about 4 weeks.
- 1.2.5.3 The subject of sexual activity should be raised with patients within the context of cardiac rehabilitation and aftercare.
- 1.2.5.4 When treating erectile dysfunction, treatment with a PDE5 (phosphodiesterase type 5) inhibitor may be considered in patients who had an MI more than 6 months earlier and who are now stable.
- 1.2.5.5 PDE5 inhibitors must be avoided in patients treated with nitrates and/or nicorandil because this can lead to dangerously low blood pressure.

1.3 Drug therapy after an MI

Drug therapy is an important part of the treatment that should be offered for secondary prevention after MI. This section makes specific recommendations about which drugs should be offered. However, interventions that are specific to the early phase of acute MI are not included. The majority of drugs are intended as long-term therapy, and it is clearly stated if any drugs should be routinely discontinued after an interval.

1.3.1 Overall drug therapy recommendation

- 1.3.1.1 All patients who have had an acute MI should be offered treatment with a combination of the following drugs:
- ACE (angiotensin-converting enzyme) inhibitor
 - aspirin
 - beta-blocker
 - statin.

1.3.2 ACE inhibitors

- 1.3.2.1 Early after presenting with an acute MI, all patients should be offered an ACE inhibitor.
- 1.3.2.2 ACE inhibitor therapy should be initiated at the appropriate dose and titrated upwards at short intervals (for example every 1 to 2 weeks) until the maximum tolerated or target dose is reached.
- 1.3.2.3 Assessment of left ventricular function is recommended in all patients who have had an MI.
- 1.3.2.4 After an MI, all patients with preserved left ventricular function or with left ventricular systolic dysfunction should continue treatment with an ACE inhibitor indefinitely, whether or not they have symptoms of heart failure.
- 1.3.2.5 Routine prescription of angiotensin receptor blockers (ARBs) after an acute MI is not recommended.
- 1.3.2.6 For patients after an acute MI who have had to discontinue an ACE inhibitor because of intolerance (for example because of cough) or allergy, an ARB should be substituted.
- 1.3.2.7 Combined treatment with an ACE inhibitor and an ARB is not recommended for routine use in patients early after an acute MI with heart failure and/or left ventricular systolic dysfunction.
- 1.3.2.8 In patients with a proven MI in the past (more than 1 year ago) and with heart failure and left ventricular systolic dysfunction, ACE inhibitor and ARB treatment should be in line with 'Chronic heart failure' (NICE clinical guideline 5).
- 1.3.2.9 In patients with a proven MI in the past and with left ventricular systolic dysfunction, who are asymptomatic, ACE inhibitor treatment should be offered and the dose titrated upwards, as tolerated, to the effective clinical dose for patients with heart failure and left ventricular systolic dysfunction.

- 1.3.2.10 In patients with a proven MI in the past without heart failure and with preserved left ventricular function, ACE inhibitor treatment should be offered and the dose titrated upwards, as tolerated, to the effective clinical dose.
- 1.3.2.11 In patients with a proven MI in the past with left ventricular systolic dysfunction, who are asymptomatic and who have had to discontinue an ACE inhibitor because of intolerance (for example because of cough) or allergy, an ARB should be substituted.
- 1.3.2.12 Renal function, serum electrolytes and blood pressure should be measured before starting an ACE inhibitor or ARB and again within 1 or 2 weeks of starting treatment. Patients should be monitored as appropriate as the dose is titrated upwards, until the maximum tolerated or target dose is reached, and then at least annually. More frequent monitoring may be needed in patients who are at increased risk of deterioration in renal function. Patients with chronic heart failure should be monitored in line with 'Chronic heart failure' (NICE clinical guideline 5).

1.3.3 Antiplatelet therapy

- 1.3.3.1 Aspirin should be offered to all patients after an MI, and should be continued indefinitely.
- 1.3.3.2 Clopidogrel should not be offered as first-line monotherapy after an MI.
- 1.3.3.3 Clopidogrel, in combination with low-dose aspirin, is recommended for use in the management of non-ST-segment-elevation acute coronary syndrome in people who are at moderate to high risk of MI or death.¹

¹ The recommendations 1.3.3.3, 1.3.3.4 and the text preceding the footnote number in recommendation 1.3.3.5 are all from 'Clopidogrel in the treatment of non-ST-segment-elevation acute coronary syndrome' (NICE technology appraisal guidance 80). They have been incorporated into this guideline in line with NICE procedures for developing clinical guidelines.

- 1.3.3.4 People at moderate to high risk of MI or death, presenting with non-ST-segment-elevation acute coronary syndrome can be determined by clinical signs and symptoms, accompanied by one or both of the following:
- the results of clinical investigations, such as new ECG changes (other than persistent ST segment elevation) indicating ongoing myocardial ischaemia, particularly dynamic or unstable patterns
 - the presence of raised blood levels of markers of cardiac cell damage such as troponin.¹
- 1.3.3.5 Treatment with clopidogrel in combination with low-dose aspirin should be continued for 12 months after the most recent acute episode of non-ST-segment-elevation acute coronary syndrome. Thereafter, standard care, including treatment with low-dose aspirin alone, is recommended¹ unless there are other indications to continue dual antiplatelet therapy.
- 1.3.3.6 After an ST-segment-elevation MI, patients treated with a combination of aspirin and clopidogrel during the first 24 hours after the MI should continue this treatment for at least 4 weeks. Thereafter, standard treatment including low-dose aspirin should be given, unless there are other indications to continue dual antiplatelet therapy.
- 1.3.3.7 If the patient has not been treated with a combination of aspirin and clopidogrel during the acute phase of an MI, this combination should not routinely be initiated.
- 1.3.3.8 The combination of aspirin and clopidogrel is not recommended for routine use for any longer than 12 months after the acute phase of MI, unless there are other indications to continue dual antiplatelet therapy, and the combination is usually recommended for a shorter duration after an ST-segment-elevation MI.

- 1.3.3.9 For patients with aspirin hypersensitivity, clopidogrel monotherapy should be considered as an alternative treatment.
- 1.3.3.10 In patients with a history of dyspepsia, treatment with a proton pump inhibitor and low-dose aspirin should be considered in line with 'Dyspepsia' (NICE clinical guideline 17).
- 1.3.3.11 After appropriate treatment, patients with a history of aspirin-induced ulcer bleeding whose ulcers have healed and who are negative for *Helicobacter pylori* should be considered for treatment with a full-dose proton pump inhibitor and low-dose aspirin. Refer to 'Dyspepsia' (NICE clinical guideline 17).

1.3.4 Beta-blockers

- 1.3.4.1 Early after an acute MI, all patients without left ventricular systolic dysfunction or with left ventricular systolic dysfunction (symptomatic or asymptomatic) should be offered treatment with a beta-blocker.
- 1.3.4.2 For patients after an MI with left ventricular systolic dysfunction, who are being offered treatment with a beta-blocker, clinicians may prefer to consider treatment with a beta-blocker licensed for use in heart failure.
- 1.3.4.3 Beta-blockers should be continued indefinitely after an acute MI.
- 1.3.4.4 After a proven MI in the past, all patients with left ventricular systolic dysfunction should be offered treatment with a beta-blocker whether or not they have symptoms, and those with heart failure plus left ventricular systolic dysfunction should be managed in line with 'Chronic heart failure' (NICE clinical guideline 5).
- 1.3.4.5 After a proven MI in the past, patients with preserved left ventricular function who are asymptomatic should not be routinely offered treatment with a beta-blocker, unless they are identified to be at increased risk of further cardiovascular events, or there are other compelling indications for beta-blocker treatment.

1.3.4.6 Beta-blockers should be initiated as soon as possible when the patient is clinically stable and titrated upwards to the maximum tolerated dose.

1.3.5 Vitamin K antagonists

1.3.5.1 For patients who have had an MI, high-intensity warfarin (INR >3) should not be considered as an alternative to aspirin in first-line treatment.

1.3.5.2 For patients who have had an MI and are unable to tolerate either aspirin or clopidogrel, treatment with moderate-intensity warfarin (INR 2–3) should be considered for up to 4 years, and possibly longer.

1.3.5.3 For patients who have had an acute MI, are intolerant to clopidogrel and have a low risk of bleeding, treatment with aspirin and moderate-intensity warfarin (INR 2–3) combined should be considered.

1.3.5.4 For patients already being treated for another indication (mechanical valve, recurrent deep vein thrombosis, atrial fibrillation, left ventricular thrombus), warfarin should be continued. For patients treated with moderate-intensity warfarin (INR 2–3) and who are at low risk of bleeding, the addition of aspirin should be considered.

1.3.5.5 The combination of warfarin and clopidogrel is not routinely recommended.

1.3.6 Calcium channel blockers

1.3.6.1 Calcium channel blockers should not routinely be used to reduce cardiovascular risk after an MI.

1.3.6.2 If beta-blockers are contraindicated or need to be discontinued, diltiazem or verapamil may be considered for secondary prevention

in patients without pulmonary congestion or left ventricular systolic dysfunction.²

- 1.3.6.3 For patients who are stable after an MI, calcium channel blockers may be used to treat hypertension and/or angina. For patients with heart failure, amlodipine should be used, and verapamil, diltiazem and short-acting dihydropyridine agents should be avoided in line with 'Chronic heart failure' (NICE clinical guideline 5).

1.3.7 Potassium channel activators

- 1.3.7.1 Nicorandil is not recommended to reduce cardiovascular risk in patients after an MI.

1.3.8 Aldosterone antagonists in patients with heart failure and left ventricular dysfunction

- 1.3.8.1 For patients who have had an acute MI and who have symptoms and/or signs of heart failure and left ventricular systolic dysfunction, treatment with an aldosterone antagonist licensed for post-MI treatment should be initiated within 3–14 days of the MI, preferably after ACE inhibitor therapy.
- 1.3.8.2 Patients who have recently had an acute MI and have clinical heart failure and left ventricular systolic dysfunction, but who are already being treated with an aldosterone antagonist for a concomitant condition (for example, chronic heart failure), should continue with the aldosterone antagonist or an alternative, licensed for early post-MI treatment.
- 1.3.8.3 For patients who have had a proven MI in the past and heart failure due to left ventricular systolic dysfunction, treatment with an aldosterone antagonist should be in line with 'Chronic heart failure' (NICE clinical guideline 5).

² At the time of publication (May 2007) diltiazem and verapamil did not have UK marketing authorisation for this indication. Informed consent should be obtained and documented.

- 1.3.8.4 Renal function and serum potassium should be monitored before and during treatment with an aldosterone antagonist. If hyperkalaemia is a problem, the dose of the aldosterone antagonist should be halved or the drug stopped.

1.3.9 Statins and other lipid lowering agents

- 1.3.9.1 Statin therapy is recommended for adults with clinical evidence of cardiovascular disease in line with 'Statins for the prevention of cardiovascular events' (NICE technology appraisal guidance 94)³.
- 1.3.9.2 After an MI, all patients should be offered treatment with a statin as soon as possible.
- 1.3.9.3 The decision whether to initiate statin therapy should be made after an informed discussion between the healthcare professional and the individual about the risks and benefits of statin treatment, and taking into account additional factors such as comorbidities and life expectancy.
- 1.3.9.4 Baseline liver enzymes should be measured before initiation of a statin.
- 1.3.9.5 Patients who have raised liver enzymes should not routinely be excluded from statin therapy.
- 1.3.9.6 When the decision has been made to prescribe a statin, it is recommended that therapy should usually be initiated with a drug with a low acquisition cost (taking into account required daily dose and product price per dose).
- 1.3.9.7 Patients who are intolerant of statins should be considered for other lipid lowering agents.

³ The clinical guideline 'Cardiovascular risk assessment: the modification of blood lipids for the primary and secondary prevention of cardiovascular disease' is in development and is expected to be published in January 2008.

- 1.3.9.8 Routine monitoring of creatine kinase in asymptomatic patients who are being treated with a statin after an MI is not recommended.
- 1.3.9.9 Patients who are being treated with a statin and who develop muscle symptoms (pain, tenderness or weakness) should be advised to seek medical advice so that creatine kinase can be measured.
- 1.3.9.10 The dose of any statin may need to be reduced or stopped if there are issues surrounding the metabolic pathway, food and/or drug interactions and/or concomitant illness.
- 1.3.9.11 Statins should be discontinued in patients who develop peripheral neuropathy that may be attributable to the statin treatment, and further advice from a specialist should be sought.

1.4 *Coronary revascularisation after an MI*

- 1.4.1 All patients should be offered a cardiological assessment to consider whether coronary revascularisation is appropriate. This should take into account comorbidity.

1.5 *Selected patient subgroups*

1.5.1 Patients with hypertension

- 1.5.1.1 Hypertension should be treated to the currently recommended target of 140/90 mmHg or lower given in 'Hypertension' (NICE clinical guideline 34). Patients with relevant comorbidities, for example diabetes or renal disease, should be treated to a lower blood pressure target.

1.5.2 Patients with left ventricular systolic dysfunction

- 1.5.2.1 Patients who have left ventricular systolic dysfunction should be considered for an implantable cardioverter defibrillator in line with 'Implantable cardioverter defibrillators for arrhythmias' (NICE technology appraisal guidance 95).

1.6 *Communication of diagnosis and advice*

1.6.1 After an acute MI, confirmation of the diagnosis of acute MI and results of investigations, future management plans and advice on secondary prevention should be part of every discharge summary.

1.6.2 A copy of the discharge summary should be offered to the patient.

2 *Notes on the scope of the guidance*

NICE guidelines are developed in accordance with a scope that defines what the guideline will and will not cover. The scope of this guideline is available from www.nice.org.uk/page.aspx?o=236895

This guideline is of relevance to those who work in or use the National Health Service (NHS) in England and Wales:

- healthcare professionals who work within the acute and primary healthcare sectors and who have direct contact with patients after an MI
- those with responsibilities for commissioning and planning health services such as primary care trust commissioners and Welsh Assembly Government officers
- public health and trust managers
- patients who have had an MI, their partners, families and other carers.

The guideline does not cover:

- patients who have had a non-spontaneous MI (for example, a periprocedural MI, which may occur after percutaneous coronary intervention)
- patients who have had a non-atherosclerotic-induced MI (which is an MI in patients without underlying coronary artery disease)
- diagnosis of an MI either acutely or retrospectively
- interventions specific to the early phase of the acute MI, such as thrombolysis
- different methods of assessment of cardiac status before possible coronary revascularisation

- symptom control, such as the management of angina.

The guideline also does not cover the additional management of diabetes and glycaemic control in patients who have had an MI, because this is more appropriately placed in the revisions of the diabetes guidelines. Similarly, the additional management of chronic heart failure, which would be more appropriately placed in revisions of the chronic heart failure guideline, is not included.

How this guideline was developed

NICE commissioned the National Collaborating Centre for Primary Care to develop this guideline. The Centre established a Guideline Development Group (see appendix A), which reviewed the evidence and developed the recommendations. An independent Guideline Review Panel oversaw the development of the guideline (see appendix B).

There is more information in the booklet: 'The guideline development process: an overview for stakeholders, the public and the NHS' (third edition, published April 2007), which is available from www.nice.org.uk/guidelinesprocess or by telephoning 0870 1555 455 (quote reference N1233).

3 Implementation

The Healthcare Commission assesses the performance of NHS organisations in meeting core and developmental standards set by the Department of Health in 'Standards for better health', issued in July 2004. Implementation of clinical guidelines forms part of the developmental standard D2. Core standard C5 says that national agreed guidance should be taken into account when NHS organisations are planning and delivering care.

NICE has developed tools to help organisations implement this guidance (listed below). These are available on our website (www.nice.org.uk/CG048).

- Slides highlighting key messages for local discussion.
- Costing tools:

- costing report to estimate the national savings and costs associated with implementation
- costing template to estimate the local costs and savings involved.
- Implementation advice on how to put the guidance into practice and national initiatives which support this locally.
- Audit criteria to monitor local practice.

4 Research recommendations

The Guideline Development Group has made the following recommendations for research, based on its review of evidence, to improve NICE guidance and patient care in the future. The Guideline Development Group's full set of research recommendations is detailed in the full guideline (see section 5).

4.1 *Optimal duration of treatment with the combination of aspirin and clopidogrel*

What is the optimal duration of treatment with the combination of aspirin and clopidogrel, compared with aspirin alone, in patients with ST-segment-elevation MI treated with thrombolysis?

Why this is important

The addition of clopidogrel to other standard treatments, including aspirin and thrombolysis, in patients presenting with ST-segment-elevation MI has been shown to improve coronary patency and clinical outcome. This effect appears to be mediated by preventing reocclusion of the open infarct-related artery rather than by facilitating early reperfusion. The trials examining the effects of the addition of clopidogrel in patients with ST-segment-elevation MI were of short duration (about 4 weeks or less). The trial that reported a clinical benefit from treating patients with non-ST-segment-elevation MI with the combination of aspirin and clopidogrel, compared with aspirin alone, had a follow-up of up to 12 months (mean 9 months). The optimal duration of treatment with the combination of aspirin and clopidogrel in patients with ST-segment-elevation MI is unknown.

4.2 *The clinical and cost effectiveness of long-term secondary prevention treatment with ACE inhibitors*

Could a discontinuation trial of ACE inhibitors in patients without left ventricular dysfunction determine the clinical and cost effectiveness of long-term secondary prevention treatment in patients after an MI?

Why this is important

Most trials of secondary prevention drugs after an MI follow patients for a limited period of time, rarely more than 5 years after the event.

In current guidance there is an assumption that the benefit demonstrated in these trials persists indefinitely and therefore, provided they are tolerated, secondary prevention drugs such as beta-blockers, statins, aspirin and ACE inhibitors should be continued long term. Further research is needed to test this assumption. Specific patient groups may not benefit from extended treatment, for example groups based on baseline left ventricular function, the extent of coronary disease and the presence of coronary risk factors. It would be ethically and logistically difficult to study withdrawal of drug therapy using the traditional randomised controlled trial design. Alternative designs, such as large cohort studies, based on routinely collected (or enhanced) data would allow comparison of people stopping treatment with one or more secondary prevention drugs with a cohort continuing their secondary prevention therapy. Close attention would need to be paid to confounders. This question is particularly pertinent for ACE inhibitors and beta-blockers, because it is not clear to what extent patients without significant left ventricular systolic dysfunction benefit from long-term use of these agents after an MI.

4.3 *Spironolactone compared with eplerenone*

What is the clinical and cost effectiveness of treatment with spironolactone compared with eplerenone in patients with heart failure early after an MI?

Why this is important

Heart failure is the major cause of death after the acute phase of MI. We know that eplerenone, in addition to conventional treatments, can reduce mortality from heart failure early after MI (EPHESUS). Spironolactone, another

aldosterone antagonist, is less expensive but is not always well tolerated, particularly in men. We need to know whether spironolactone is as effective as eplerenone in reducing mortality in all grades of heart failure after acute MI.

4.4 *Uptake of and adherence to comprehensive cardiac rehabilitation*

What strategies are effective in improving the uptake of and adherence to comprehensive cardiac rehabilitation in people who have had an MI, including people from under-represented groups such as minority ethnic groups, women, the elderly and those on low incomes or with physical or mental comorbidities?

Why this is important

Participation in cardiac rehabilitation after an MI has been shown to reduce all-cause mortality and cardiovascular mortality when compared with usual care. The 'National service framework for coronary heart disease' states that more than 85% of people discharged from hospital with a primary diagnosis of acute MI or after coronary revascularisation should be offered cardiac rehabilitation. However, less than a third of all patients who have had an MI or coronary revascularisation attend comprehensive cardiac rehabilitation. Uptake is particularly poor among certain groups of people, including minority ethnic groups, women, the elderly and people on low incomes or with physical or mental comorbidities. Studies investigating methods to improve uptake of and adherence to comprehensive cardiac rehabilitation have been small and limited to individual programmes or geographical locations, and have not evaluated interventions specifically for under-represented patient groups. Consequently, the ability of NICE to provide specific recommendations in this area is limited, because the most clinically and cost effective strategies are unknown.

4.5 *Clinical and cost effectiveness of omega-3-acid ethyl esters treatment in all patients after an MI*

What is the clinical and cost effectiveness of omega-3-acid ethyl esters treatment in all patients after an MI?

Why this is important

One trial has shown a benefit of treatment with omega-3-acid ethyl esters in patients within 3 months of an MI. However, other secondary prevention treatment had not been optimised in this trial and the majority of patients had preserved left ventricular function. There is some uncertainty about how much additional benefit patients after acute MI optimally managed for secondary prevention, including those with left ventricular systolic dysfunction, will obtain from the addition of omega-3-acid ethyl esters treatment. There is also a paucity of evidence for the effectiveness of treating patients who have had an MI in the past, at least 3 months earlier. The efficacy of omega-3-acid ethyl esters treatment in patients both early and later after MI deserves further research.

5 Other versions of this guideline

5.1 Full guideline

The full guideline, 'Secondary prevention in primary and secondary care for patients following a myocardial infarction', contains details of the methods and evidence used to develop the guideline. It is published by the National Collaborating Centre for Primary Care, and is available from www.rcgp.org.uk/nccpc/nccpc_home.aspx, our website (www.nice.org.uk/CG048fullguideline) and the National Library for Health (www.nlh.nhs.uk).

5.2 Quick reference guide

A quick reference guide for healthcare professionals is also available from www.nice.org/CG048quickrefguide

For printed copies, phone the NHS Response Line on 0870 1555 455 (quote reference number N1251).

5.3 'Understanding NICE guidance'

Information for patients and carers ('Understanding NICE guidance') is available from www.nice.org.uk/CG048publicinfo

For printed copies, phone the NHS Response Line on 0870 1555 455 (quote reference number N1252).

6 Related NICE guidance

Obesity: the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE clinical guideline 43 (2006). Available from www.nice.org.uk/CG043

Hypertension: management of hypertension in adults in primary care. NICE clinical guideline 34 (2006). Available from www.nice.org.uk/CG034

Depression: management of depression in primary and secondary care. NICE clinical guideline 23 (2007). Available from www.nice.org.uk/CG023

Anxiety: management of anxiety (panic disorder, with or without agoraphobia, and generalised anxiety disorder) in adults in primary, secondary and community care. NICE clinical guideline 22 (2007). Available from www.nice.org.uk/CG022

Dyspepsia: management of dyspepsia in adults in primary care. NICE clinical guideline 17 (2004). Available from www.nice.org.uk/CG017

Diagnosis and management of type 1 diabetes in children, young people and adults. NICE clinical guideline 15 (2004). Available from www.nice.org.uk/CG015

Management of chronic heart failure in adults in primary and secondary care. NICE clinical guideline 5 (2003). Available from www.nice.org.uk/CG005

Type 2 diabetes – management of blood pressure and blood lipids (guideline H) (2002). Available from www.nice.org.uk/guidance/CGH

Brief interventions and referral for smoking cessation in primary care and other settings. NICE public health intervention guidance 1 (2006). Available from www.nice.org.uk/PHI001

Implantable cardioverter defibrillators for arrhythmias. NICE technology appraisal guidance 95 (2006). Available from www.nice.org.uk/TA095

Statins for the prevention of cardiovascular events. NICE technology appraisal guidance 94 (2006). Available from www.nice.org.uk/TA094

Clopidogrel and modified-release dipyridamole in the prevention of occlusive vascular events. NICE technology appraisal guidance 90 (2005). Available from www.nice.org.uk/TA090

Clopidogrel in the treatment of non-ST-segment-elevation acute coronary syndrome. NICE technology appraisal guidance 80 (2004). Available from www.nice.org.uk/TA080

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/TA073

The use of nicotine replacement therapy (NRT) and bupropion for smoking cessation. NICE technology appraisal guidance 39 (2002). Available from www.nice.org.uk/TA039

NICE is developing the following guidance (details available from www.nice.org.uk).

- Cardiovascular risk assessment: the modification of blood lipids for the primary and secondary prevention of cardiovascular disease. NICE clinical guideline (publication expected January 2008).
- Type 2 diabetes – management of blood pressure and blood lipids. NICE clinical guideline (updated publication expected February 2008).
- Familial hypercholesterolaemia: identification and management. NICE clinical guideline (publication expected August 2008).

7 Updating the guideline

NICE clinical guidelines are updated as needed so that recommendations take into account important new information. We check for new evidence 2 and 4 years after publication, to decide whether all or part of the guideline should be updated. If important new evidence is published at other times, we may decide to do a more rapid update of some recommendations.

Appendix A: The Guideline Development Group

Professor Gene Feder (Chairman)

Professor of Primary Care Research and Development, Barts and the London Queen Mary's School of Medicine and Dentistry, London

Dr Keith MacDermott

General Practitioner, York

Dr Rubin Minhas

General Practitioner, Primary Care CHD Lead, Kent

Dr Chris Packham

Director of Public Health, Nottingham City Primary Care Trust

Dr Jane Skinner (Clinical Advisor)

Consultant Community Cardiologist, the Newcastle upon Tyne Hospitals NHS Foundation Trust

Mrs Helen Squires (until April 2006)

Superintendent Physiotherapist, Luton and Dunstable Hospital NHS Trust, Bedfordshire

Mr David Thomson

Patient representative, Buckinghamshire

Professor Adam Timmis

Professor of Clinical Cardiology, Barts and the London Queen Mary's School of Medicine and Dentistry, London

Mr John Walsh

Patient representative, Swindon

Ms Anne White

British Heart Foundation Cardiac Specialist Nurse, Cambridgeshire PCT and Addenbrooke's NHS Trust

Ms Helen Williams

Pharmacy Team Leader for Cardiac Services and London Region CHD
Advisor for Clinical Pharmacy, King's College Hospital, London

***Members of the Guideline Development Group from the
National Collaborating Centre for Primary Care***

Dr Angela Cooper

Senior Health Services Research Fellow

Dr Meeta Kathoria (from May 2006)

Project Manager

Mr Leo Nherera

Health Economist

Gabrielle Shaw (until December 2005)

Project Manager

Ms Nancy Turnbull

Guideline Lead and Chief Executive

Appendix B: The Guideline Review Panel

The Guideline Review Panel is an independent panel that oversees the development of the guideline and takes responsibility for monitoring adherence to NICE guideline development processes. In particular, the panel ensures that stakeholder comments have been adequately considered and responded to. The Panel includes members from the following perspectives: primary care, secondary care, lay, public health and industry.

Professor Mike Drummond (Chair)

Professor of Health Economics, Centre for Health Economics, University of York

Dr Graham Archard

General Medical Practitioner

Ms Karen Cowley

Practice Development Nurse

Mr Barry Stables

Patient/Lay Representative