Recent developments in secondary prevention and cardiac rehabilitation after acute myocardial infarction

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Primary care has a key role in improving the health of patients who have had a myocardial infarction

Acute myocardial infarction remains a common cause of death worldwide. Despite decreases in mortality from coronary heart disease in most developed countries, mortality is increasing in most eastern European countries and developing countries.¹ In the United Kingdom 1.2 million people are estimated to have survived heart attacks, yet few survivors are offered comprehensive cardiac rehabilitation.² Effective implementation of secondary prevention is a great challenge,^{w1} and lack of implementation has been described as a collective failure of medical practice, as clear evidence shows that several interventions could reduce the risk of recurrent disease and death.³

Primary care's challenge is to make this happen. Two recent initiatives will change the face of secondary prevention in British primary care:

- The national service framework for coronary heart disease advocates the use of disease registers in primary care to provide long term follow up of patients with coronary heart disease and sets standards and milestones for secondary prevention^{w2}
- The imminent general medical services contract includes funding to encourage primary care teams to implement evidence based care.^{w3}

Growing evidence shows suboptimal application of secondary prevention, and examples show how evidence based practice can be applied in primary care to improve the quality of care for patients with coronary heart disease.³⁻⁶ The number of patients in each practice, the benefits of continuity and the high frequency of comorbidity, and psychosocial problems have increased the role of the generalist. This puts primary care in the vanguard of saving lives.⁷ This review thus focuses on topics related to primary care.

Sources and selection criteria

We searched Medline for relevant reviews related to secondary prevention (after acute myocardial infarction) and papers published in the past three years; we also canvassed specialist and generalist colleagues. Recent large trials have included acute myocardial infarction with other cardiovascular diseases, as they share common risk factors⁸⁻¹⁰; this review reflects this trend. We adopted the Scottish Intercollegiate Guidelines Network's definition of secondary prevention, which encompasses "identification and modification of risk

Summary points

Effective implementation of secondary prevention and cardiac rehabilitation after acute myocardial infarction remains suboptimal

Coprescribing of antiplatelet drugs, statins, angiotensin converting enzyme inhibitors, and β blockers should be considered in all patients after myocardial infarction

Structured care for chronic cardiac disease management can improve the recording of risk factors

Nurse led clinics for secondary prevention of coronary heart disease may improve clinical outcomes

Exercise based cardiac rehabilitation after myocardial infarction has been shown to reduce all cause mortality

Depression is common after myocardial infarction; the associated increased mortality seems to be refractory to psychological or drug treatment

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factors by the introduction of lifestyle measures and pharmacological therapy and cardiac rehabilitation."^{w4}

Drugs and secondary prevention

Large randomised trials have confirmed the benefits of the four main prophylactic drug groups (box 1). Their routine use in secondary prevention is recommended in national guidelines^{w4 w5}; several recent trials have contributed new evidence for their use.

Antiplatelet drugs

A recent meta-analysis supported the long term use of low dose aspirin (75-150 mg daily) in secondary prevention: higher doses (500-1500 mg daily) are no

P+ Additional references and a second patient's perspective are on bmj.com

Box 1: Four main prophylactic drug groups for secondary prevention of coronary heart disease

- Antiplatelet drugs
- β blockers
- Statins
- Angiotensin converting enzyme inhibitors

more effective and are associated with gastrotoxicity.¹¹ Clopidogrel 75 mg daily is an effective but expensive alternative in patients with a genuine allergy or proved gastric intolerance to aspirin.^{11 12} Addition of clopidogrel to aspirin for up to nine months in patients with acute coronary syndromes (myocardial infarction without ST segment elevation) can prevent additional cardiovascular events or non-fatal myocardial infarction but carries a higher risk of bleeding (3.7% v 2.7%; relative risk 1.38, 95% confidence interval 1.13 to 1.67).^{w6} Aspirin and clopidogrel should not be coprescribed routinely until the results of ongoing trials on their combined use are available (box 2).

Angiotensin converting enzyme inhibitors

Angiotensin converting enzyme inhibitors after acute myocardial infarction have been recommended in patients with signs of heart failure or confirmed left ventricular dysfunction.¹³ Two recent trials, however, reported reductions in cardiovascular death and events (myocardial infarction and stroke) and provide strong evidence for treating all patients after myocardial infarction with an angiotensin converting enzyme inhibitor regardless of left ventricular function (provided no contraindications exist).^{8 9} This view is endorsed by a recent editorial and is included in national guidelines.^{w5 w7} In a study in which 52% of participants were survivors of myocardial infarction, rates of readmission for heart failure were also reduced in patients who took ramipril.⁹ Angiotensin II antagonists have been advocated when patients are intolerant of angiotensin converting enzyme inhibitors (box 3).

Box 2: Key ongoing research studies

- Study of additional reductions in cholesterol and homocysteine (SEARCH): Study of patients after myocardial infarction randomised to receive 20 or 80 mg simvastatin daily, folic acid plus vitamin B-12, or placebo. Primary outcome measures—total coronary heart disease events, including non-fatal myocardial infarction and coronary revascularisation
- Euro action: Project involving eight European countries that aims to show the effectiveness of multidisciplinary lifestyle measures in patients with coronary heart disease and their families (www.escardio.org/euroaction)
- Second Chinese cardiac study (CCS-2) to determine whether addition of oral clopidogrel to aspirin after suspected acute myocardial infarction can produce greater reductions in risk of major vascular events. *J Cardiovasc Risk* 2000;7:435-41
- Jolly K, Lip GYH, Sandercock J, Greenfield SM, Raftery JP, Mant J, et al. Home-based versus hospital-based cardiac rehabilitation after myocardial infarction or revascularisation: design and rationale of the Birmingham rehabilitation uptake maximisation study (BRUM): a randomised controlled trial. *BMC Cardiovasc Disord* 2003;3:10
- Home versus hospital based cardiac rehabilitation following myocardial infarction: a randomised trial to compare clinical outcomes and cost: Principal investigator: H M Dalal, Royal Cornwall Hospital, Truro, TR1 3LJ (hmdalal@doctors.net.uk)

Nurse led secondary prevention clinics in primary care are effective in improving outcomes

Statins

Since the first landmark trial showed that statins decrease the risk of coronary events and total mortality in patients after myocardial infarction,^{w10} these drugs have become the cornerstone of preventive therapy. Their benefits apply to women and to patients aged over 65 years, who had been under-represented in clinical trials.¹⁴ A recent large randomised trial with simvastatin showed that the benefits of statins apply irrespective of sex, age, or initial cholesterol concentrations.¹⁰ Thresholds for cholesterol lowering in secondary prevention have reduced with each successive secondary prevention study. Current British guidelines and the national service framework recommend treatment when total cholesterol concentrations are ≥ 5 mmol/L.^{w2 w11} Updated guidelines (due in 2004) are likely to recommend that survivors of myocardial infarction should be prescribed a statin irrespective of initial cholesterol concentrations. However, non-adherence to statin treatment may be a bigger problem than previously thought, with 60% non-adherence reported among elderly patients two years after an acute coronary event.¹⁵

Recent evidence has highlighted ageism in the prescribing of statins in primary care: patients aged 55-64 years with ischaemic heart disease were more likely to receive them than those aged 65-74 years or 75-84 years (odds ratios 0.63 and 0.15).^{w12} This may be because of a perceived lack of evidence for use of statins in older patients or other factors, such as general practitioners' attitudes.^{w13} However, the influence of these factors may change after the findings from the heart protection study, which included 5806 patients aged over 70 years and showed beneficial effects in this age group.¹⁰

Box 3: Comparison of angiotensin converting enzyme inhibitors and angiotensin II antagonists

- Two recent trials that compared losartan or valsartan with captopril in patients after myocardial infarction complicated by heart failure (left ventricular dysfunction) showed that angiotensin II antagonists were as effective as angiotensin converting enzyme inhibitors.^{w8 w9}
- Although losartan was better tolerated than angiotensin converting enzyme inhibitors, it resulted in significantly more cardiovascular deaths ($n = 420$, 15.3%) than did captopril ($n = 363$, 13.3%) (relative risk 1.17 (1.01 to 1.34))

Evidence for structured systematic care in secondary prevention of coronary heart disease. Adapted from Begg 2003^{w18}

Trial	Intervention	Relevant outcomes
Grampian secondary prevention clinics ^{w19 w20}	Nurse led secondary prevention clinics in general practice for patients with coronary heart disease	Short term improvements in secondary prevention can be maintained in the longer term Therapeutic prevention and lifestyle change can lead to fewer total deaths and coronary events
Belfast ^{w21}	Personalised health promotion by health visitors in patients with angina	Ongoing intervention is desirable to maintain immediate benefits in respect of exercise and prophylactic drug taking
Southampton heart integrated care project ^{w22}	Specialist liaison nurse led programme to coordinate and support follow up care in general practice after diagnosis of coronary heart disease	Effective in promoting follow up in general practice
POST ^{w23}	Postal prompts to patients with acute coronary syndrome to encourage review in general practice	Postal prompts can help improve recording of cardiovascular risk factors and provision of lifestyle advice
ASSIST ^{w23}	Benefits of audit summary feedback to primary healthcare team, assistance with setting up disease register, and systematic recall to nurse run clinic or general practitioners	Setting up a register of patient with coronary heart disease increases follow up and assessment of patients at risk Follow up by nurses may be more effective than follow up by doctors
Systematic review of randomised trials of programmes for secondary prevention of coronary heart disease ^{w24}	Assessment of multidisciplinary disease management programmes	Comprehensive disease management programmes can have a positive impact on the process of care in terms of risk factor management and prescribing of vascular protective drugs. They also reduce hospital admissions and enhance quality of life

β blockers

β blockers reduce the risk of death, non-fatal recurrent myocardial infarction, and sudden cardiac death and are recommended in national guidelines.^{w4 w5} Two studies confirmed that use of β blockers remains suboptimal (22% and 63%).^{3 4} Anecdotally, primary care doctors report that the incidence of adverse events and side effects is higher than reported in trials. A recent major systematic review, however, showed no significant increased risk of depression and only small increases in the risks of fatigue and sexual dysfunction in patients who took β blockers.¹⁶

The contraindication of β blockers in patients with asthma or chronic obstructive pulmonary disease was questioned in a recent Cochrane review,^{w14} which concluded that they do not produce adverse respiratory effects during short term treatment in patients with mild to moderate airway disease. The proved benefits of β blockers in patients with heart failure, hypertension, and arrhythmias means that they should not be withheld. A study of 46 000 survivors of myocardial infarction with asthma and chronic obstructive pulmonary disease reported a 40% reduction in total mortality in patients treated with β blockers and benefits for patients aged over 80 years and those with heart failure.^{w15}

An earlier review reported that β blockers should be used with caution in patients with severe peripheral arterial disease but have little effect on the peripheral circulation in those with less severe forms of the disease.^{w16} This view was shared by a recent clinical review.^{w17}

Organisation of care

Recent trials have provided evidence for the effectiveness of structured care in secondary prevention of coronary heart disease (table).^{w18} Although a validated register of patients who survive acute myocardial infarction is the bedrock of any structured care system in primary care,¹⁷ good communication between hospital and primary care, with multidisciplinary working, is a common theme in successful schemes.⁶ Nurse led clinics for secondary prevention of coronary heart disease may produce improved clinical outcomes.

Cardiac rehabilitation

The overall aims of cardiac rehabilitation are to optimise patients' functioning, enhance quality of life, and minimise the risk of recurrent cardiac events (box 4). Reviews of cardiac rehabilitation describe two types of cardiac rehabilitation—"exercise only" and "comprehensive cardiac rehabilitation" (see additional educational resources).

Comprehensive rehabilitation programmes include exercise training, behavioural changes, education, and psychological support.^{w27} Long term maintenance of physical activity and lifestyle changes should be coupled with structured follow up to tackle secondary prevention risk factors (table). In some settings, this may include drugs to optimise risk factors such as hypertension, diabetes, and hyperlipidaemia. Overlap thus exists between the aims of cardiac rehabilitation programmes and secondary prevention clinics.

A recent Cochrane review confirmed a 27% reduction in all cause mortality (random effects model odds ratio 0.73 (0.54 to 0.98)) with exercise based cardiac rehabilitation (box 5).^{w25} Participation in cardiac rehabilitation, however, has remained poor in the United States (10-20%) and the United Kingdom

Box 4: Number needed to treat (NNT)

An updated Canadian review of cardiac rehabilitation endorsed the findings of the Cochrane review and reported a relative risk reduction in all cause mortality of 24% (95% confidence interval 4% to 27%).^{w25 w26} This translates to a number needed to treat of 66 (35 to 273) over a mean of 28 months' follow up. The same review quoted number needed to treat for other accepted drug interventions after myocardial infarction, such as statin treatment (11-56), β blocker treatment (84), and antiplatelet treatment (306). Care needs to be exercised in direct comparisons of numbers needed to treat, as many recent studies have included participants from non-comparable patient populations. Comprehensive cardiac rehabilitation that includes long term preventive drugs is a complex intervention, and attribution of benefits to each component by using numbers needed to treat may not be wholly appropriate.

Cost effectiveness ratios for selected medical interventions are highlighted in a Canadian review.^{w26} Cardiac rehabilitation compared reasonably favourably with lipid lowering for secondary prevention (US\$4950-15 000 (£2673-9000) per life year gained in 1995-6 v US\$9630 (£5200) in 1996).

Box 5: A patient's perspective

My experience of care after my heart attack was like being led through a fog by someone who knew the way. My first reaction was disbelief—there must be a mistake. I seemed as well as ever. The professionalism of the staff taking their work very seriously made the truth sink in. I had to do what I was told. I suddenly felt very fragile and feared a repeat attack. Slowly I was reassured by the care of the hospital staff. It was not going to happen again. I was eager for more information. How did I come to be in this situation? What was going to happen to me? I needed to know.

After the first few days, you are not in the front line of care and medication becomes routine and predictable. In a way, you miss the attention and need to be reassured that care is continuing, albeit at a lower profile. There is a lot to learn to care for yourself. The rehabilitation nurse reassures you that your feelings of vulnerability are not unusual. There is a psychological aspect to recovering from a heart attack. At first you feel you'll never be able to do the things you enjoy again. Your family holds you back to shelter you, but this can be frustrating. The rehabilitation nurse reassures you about how much you should be able to do. This advice first received in hospital is worth covering again when you are at home. This continuity and the link between hospital and home definitely helps.

50 year old farmer, Cornwall

(14-23%).^{2 w28} Over the past decade, provision of rehabilitation services has increased steadily in the United Kingdom, from less than 100 programmes in 1989 to 300 in 1997.^{w4} Historically, group based rehabilitation

classes have been held in hospitals and have focused on exercise training, with variable multidisciplinary input on education, lifestyle advice, drugs, and risk factors. Some programmes also offer psychological support. Emerging evidence supports the safety and effectiveness of rehabilitation in other settings such as community centres and homes.^{18 19 w29 w30}

Home based cardiac rehabilitation programmes are increasingly popular and can increase uptake in rural areas where access to centre based classes can be difficult.⁶ Services near patients or home based programmes could increase participation by women, elderly people, and ethnic minorities, which is low with hospital based rehabilitation.¹⁹ Increasingly, patients prefer a choice of rehabilitation. The clinical and health economic outcomes of home based rehabilitation compared with hospital based rehabilitation are yet to be determined (box 2).

Psychosocial interventions**Smoking cessation**

Although observational studies have estimated that mortality and subsequent cardiac events are reduced by 50% when patients with coronary heart disease stop smoking, the timing of benefits and amount of risk reduction have been debated. A recent systematic review of 20 high quality prospective cohort studies suggested that stopping smoking in patients with coronary heart disease (acute myocardial infarction and angina) reduced total all cause mortality (relative risk 0.64 (0.58 to 0.71)).²⁰

Smoking cessation clearly is a priority for all patients with coronary heart disease, including elderly patients.^{w31} The challenge for primary care practitioners is how to achieve lifestyle changes, particularly smoking cessation. Nicotine replacement seems to be safe for patients with coronary heart disease.^{w32}

Psychological problems

Depression is common after myocardial infarction: 15-20% of patients have major depression, and a similar proportion have minor depression.^{w33} This may be missed in primary care, and several commentators have suggested screening for depression.²¹

Depression and perception of lack of social support after myocardial infarction are associated with increased mortality, although the precise mechanism remains uncertain. A recent study of 2481 patients with coronary heart disease showed enhanced recovery after cognitive behaviour therapy or antidepressants (sertraline), as patients were less depressed and felt less isolated, but event free survival after 29 months' follow up did not increase.²²

Implementation

Implementation of the evidence is far from universal in primary and secondary care, as exemplified by variability in prescribing of statins in primary care and door to needle times in secondary care. This has been termed the "implementation gap."

Evidence produced after introduction of the national service framework confirmed the disappointing level of implementation of secondary prevention, most notably effective prescribing of statins, in British

Additional educational resources**Websites for health professionals**

Clinical Evidence (www.clinicalevidence.org)—sections on acute myocardial infarction and secondary prevention of ischaemic events provide a comprehensive review of all major evidence based interventions

Scottish Intercollegiate Guidelines Network (www.sign.ac.uk)—guideline no 41: secondary prevention of CHD following myocardial infarction; guideline no 57: cardiac rehabilitation

National Institute for Clinical Excellence (www.nice.org.uk)—clinical guideline A: prophylaxis for patients who have experienced a myocardial infarction (April 2001)

British Heart Foundation (www.bhf.org.uk)—statistics on coronary heart disease

National Service Framework for Coronary Heart Disease (www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/CoronaryHeartDisease/fs/en)

New general medical services contract (www.bma.org.uk/ap.nsf/Content/_Hub+GPC+contract)

Cardiac rehabilitation. *Effective Health Care Bulletin* 1998; 4(4). (www.york.ac.uk/inst/crd/ehc44.pdf)

Brown A, Taylor R, Noorani H, Stone J, Skidmore B. *Exercise-based cardiac rehabilitation programs for coronary artery disease: a systematic clinical and economic review*. Ottawa: Canadian Coordinating Office for Health Technology Assessment, 2003 (www.ccohta.ca)

Recent papers of interest

Van der Elst ME, Buurma H, Bouvy ML, de Boer A. Drug therapy for prevention of recurrent myocardial infarction. *Ann Pharmacother* 2003;37:1465-77 (comprehensive tables that list key randomised controlled trials and meta-analyses that give relative risk values for secondary prevention drug interventions and all cause mortality)

Boersma E, Mercado N, Poldermans D, Gardien M, Vos J, Limoons ML. Acute myocardial infarction. *Lancet* 2003;361:847-58

Ades PA. Cardiac rehabilitation and secondary prevention of coronary heart disease. *N Engl J Med* 2001;345:892-902

British Cardiac Society, British Hyperlipidaemia Association, British Hypertension Society, endorsed by the British Diabetic Association. Joint British recommendations on prevention of coronary heart disease in clinical practice. *Heart* 1998;80(suppl 2):S1-29

primary care and elsewhere.^{3 4 w34 w35} Lack of time, cost, and patient compliance are cited as underpinning the implementation gap across Europe.^{w34} Recent decreases in mortality in patients with coronary heart disease bear witness to better secondary prevention,^{w35} and other initiatives, such as the national primary care collaborative, show that treatment with statins is increasing in primary care.^{w36}

Summerskill and Pope explored this further in a qualitative study of general practitioners' attitudes to secondary prevention and implementation.²³ Themes emerged around the difficulties of prioritising secondary preventive measures within 10 minute consultations, especially for patients with comorbid disorders. General practitioners reported responding to immediate social or psychological needs rather than tackling longer term prevention and were more likely to implement interventions in consultations dedicated to reviews of coronary heart disease. Other studies showed that although general practitioners do not doubt the credibility of the evidence, they may find it difficult to apply in individual patients and are concerned about the resource implications of prescribing statins and monitoring patients who take them.^{w37 w38} Implementation is perhaps not as mechanistic as it first seems. Workload and costs can be barriers to implementing national guidelines.^{w2 w39}

The future

General practice seems to be responding to new evidence with increasing vigour. The revised definition of myocardial infarction diagnosed by troponin estimation, however, will probably result in increased reporting of myocardial infarction and further increased workloads in primary and secondary care.²⁴ The two sectors need to collaborate and communicate effectively to reduce treatment gaps and build on established models of integrated care with proved effectiveness. The impact of the national service framework, the new general medical services contract for general practitioners, and other initiatives (such as the national primary care collaborative) should improve quality of care after myocardial infarction for patients in the United Kingdom.

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Sources of information for patients

Hearts for Life (www.heartsforlife.co.uk)—provides patient friendly information on heart attacks, angina, heart failure, and prevention

British Heart Foundation (www.bhf.org.uk)—printable information on heart attack and cardiac rehabilitation, with links to other sites

DIPEX (www.dipex.org)—website about people's experiences of health and illness; the site links video, audio, and written interviews with evidence based information, patients' questions and answers, and links to other resources; information for patients who have had heart attacks will be available from August 2004

BBC Health (www.bbc.co.uk/health)—specific section on how to recover after a heart attack (www.bbc.co.uk/health/features/heart_attack_recovery.shtml)

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