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Secondary prevention clinics for coronary heart disease: four year follow up of a randomised controlled trial in primary care

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Abstract

Objectives To evaluate the effects of nurse led clinics in primary care on secondary prevention, total mortality, and coronary event rates after four years.

Design Follow up of a randomised controlled trial by postal questionnaires and review of case notes and national datasets.

Setting Stratified, random sample of 19 general practices in north east Scotland.

Participants 1343 patients (673 intervention and 670 control) under 80 years with a working diagnosis of coronary heart disease but without terminal illness or dementia and not housebound.

Intervention Nurse led secondary prevention clinics promoted medical and lifestyle components of secondary prevention and offered regular follow up for one year.

Main outcome measures Components of secondary prevention (aspirin, blood pressure management, lipid management, healthy diet, exercise, non-smoking), total mortality, and coronary events (non-fatal myocardial infarctions and coronary deaths).

Results Mean follow up was at 4.7 years. Significant improvements were shown in the intervention group in all components of secondary prevention except smoking at one year, and these were sustained after four years except for exercise. The control group, most of whom attended clinics after the initial year, caught up before final follow up, and differences between groups were no longer significant. At 4.7 years, 100 patients in the intervention group and 128 in the control group had died: cumulative death rates were 14.5% and 18.9%, respectively ($P=0.038$). 100 coronary events occurred in the intervention group and 125 in the control group: cumulative event rates were 14.2% and 18.2%, respectively ($P=0.052$). Adjusting for age, sex, general practice, and baseline secondary prevention, proportional hazard ratios were 0.75 for all deaths (95% confidence intervals 0.58 to 0.98; $P=0.036$) and 0.76 for coronary events (0.58 to 1.00; $P=0.049$).

Conclusions Nurse led secondary prevention improved medical and lifestyle components of secondary prevention and this seemed to lead to significantly fewer total deaths and probably fewer

coronary events. Secondary prevention clinics should be started sooner rather than later.

Introduction

People with pre-existing coronary heart disease are at particularly high risk of coronary events and death, but effective secondary prevention can reduce this risk. Effective secondary prevention includes pharmaceutical interventions (for example, antiplatelet agents, statins, β blockers, angiotensin converting enzyme inhibitors) and interventions to change behaviour and modify lifestyle (smoking cessation, regular exercise, and healthy diets).¹ Most people with coronary disease are cared for in primary care, and general practitioners have been encouraged to target them for secondary prevention.² This has proved difficult, however, and surveys of baseline provision consistently show that secondary prevention is suboptimal.³⁻⁴

A recent systematic review of randomised trials concluded that programmes for disease management improved processes of care, reduced admissions to hospital, and enhanced quality of life.⁵ No impact on survival or coronary event rates was detected however, probably because the median follow up of studies in the review was too short (one year). Evidence is now needed from longer term follow up studies on whether improvements in processes of care translate into reduced coronary event rates and mortality.

We found that nurse led secondary prevention clinics in primary care improved medical and lifestyle components of secondary prevention (except smoking) and health related quality of life at one year.^{6,7} In this follow up study, we aimed to evaluate whether these improvements were sustained after four years and to assess effects on total mortality and coronary event rates.

Methods

Participants

We recruited 1343 randomly selected patients with a working diagnosis of coronary heart disease, but without terminal illness or dementia and not housebound, from 19 randomly selected general practices in north east Scotland. Participants were randomised to intervention or control groups.^{6,7}

Number (percentage) of participants with appropriate secondary prevention at baseline, one year, and four years

	Baseline No (%)	One year		Four years	
		No (%)	Adjusted odds ratio* (95% CI)	No (%)	Adjusted odds ratio* (95% CI)
Aspirin management:					
Intervention	457/660 (69.2)	466/575 (81.0)	3.22 (2.15 to 4.80)	396/486 (81.5)	1.02 (0.71 to 1.47)
Control	413/659 (62.7)	373/562 (66.4)	1	348/446 (78.0)	1
Blood pressure management:					
Intervention	585/673 (87.0)	572/593 (96.5)	5.32 (3.01 to 9.41)	530/564 (94.0)	1.48 (0.91 to 2.42)
Control	583/670 (87.0)	510/580 (88.0)	1	492/534 (92.1)	1
Lipid management:					
Intervention	78/673 (11.6)	244/593 (41.1)	3.19 (2.39 to 4.26)	325/564 (57.6)	1.22 (0.93 to 1.58)
Control	90/670 (13.4)	125/580 (21.6)	1	284/534 (53.2)	1
Moderate exercise:					
Intervention	241/663 (36.3)	247/587 (42.1)	1.67 (1.23 to 2.26)	171/494 (34.6)	1.26 (0.88 to 1.81)
Control	204/664 (30.7)	177/568 (31.2)	1	128/455 (28.1)	1
Low fat diet:					
Intervention	287/597 (48.1)	271/480 (56.5)	1.47 (1.10 to 1.96)	308/464 (66.4)	0.74 (0.53 to 1.02)
Control	299/616 (48.5)	226/465 (48.6)	1	301/440 (68.4)	1
Non-smoking:					
Intervention	545/668 (81.6)	483/584 (82.7)	0.78 (0.47 to 1.28)	422/491 (86.0)	0.73 (0.40 to 1.34)
Control	543/666 (81.5)	481/568 (84.7)	1	398/454 (87.7)	1

*Adjusted for age, sex, baseline performance and general practice.

Participants in the intervention group were invited to attend secondary prevention clinics at their general practice, during which their symptoms and treatment were reviewed, use of aspirin promoted, blood pressure and lipid management reviewed, lifestyle factors assessed, and, if appropriate, behavioural change negotiated. Participants in the control group received usual care. After one year, we collected data on uptake of secondary prevention and participants' health. We fed back the findings to participating general practices, the staff of which decided their own policies on running clinics.

After four years we traced the original participants through their general practices or, for those who had moved within Scotland, through health board records. For those who had left Scotland, follow up ceased when their general practice case notes were transferred out of the country.

Outcome measures

The main outcomes were use of secondary prevention, total mortality, and coronary event rates. Criteria used to define appropriate secondary prevention were aspirin taken (or contraindicated by allergy or peptic ulceration), blood pressure managed according to guidelines of the British Hypertension Society, lipids managed according to local guidelines for lipid management in general practices in Grampian region, moderate physical activity (index of physical activity > 4), low fat diet (dietary instrument for nutrition education score < 30), and not currently smoking.⁸⁻¹¹

We obtained data on dates and causes of deaths from the Information and Statistics Division for the NHS in Scotland. We collected data on non-fatal myocardial infarctions during review of general practice case notes and from hospital morbidity records. We ceased follow up of deaths and coronary events the date data were collected from the general practice case notes.

Statistical analysis

We analysed binary data on secondary prevention with logistic regression to adjust for age, sex, general practice, and baseline performance. For total mortality

and coronary event data, we constructed Kaplan-Meier survival curves and analysed these with the log rank test. We used Cox regression to adjust for age, general practice, sex, and uptake of secondary prevention at baseline. The main analysis was by intention to treat.

Results

Mean follow up was 4.7 years. Of the 1343 original participants, 228 died, 16 had left Scotland, and one participant's new general practitioner refused follow up. Overall we excluded 42 participants from the postal questionnaire because of dementia or terminal illness. The questionnaire was completed by 961 of the remaining 1056 participants (91.0%). Intervention and control groups were well matched for age, sex, and practice characteristics at baseline and follow up (see [bmj.com](#)).

During the first year of the study, 551 of 673 (81.9%) participants in the intervention group attended a secondary prevention clinic at least once. By final follow up, 16 of the 19 general practices were running secondary prevention clinics.

Secondary prevention

Significant improvements were shown in the intervention group in all components of secondary prevention except smoking at one year (table). At four years these improvements were sustained except for exercise. Differences with the control group were significant for all components except smoking at one year, but by four years the performance of the control group had improved and differences were no longer significant. Longer exposure to clinics was associated with improved secondary prevention for aspirin use, blood pressure and lipid management, and exercise; diet and smoking status did not vary with length of exposure (see [bmj.com](#)).

Total mortality

After a mean follow up of 4.7 years, cumulative death rates were 14.5% for the intervention group and 18.9% for the control group ($P=0.038$) (figure), and the relative risk for total mortality was 0.78 (95%

confidence interval 0.61 to 0.99). After adjustment for age, general practice, sex, and baseline secondary prevention, the proportional hazard ratio was 0.75 (0.58 to 0.98; P=0.036).

Coronary death or non-fatal myocardial infarction

The cumulative event rate for coronary deaths or non-fatal myocardial infarctions in the intervention group was 14.2% compared with 18.2% in the control group. The proportional hazard ratio for coronary events was 0.76 (0.58 to 1.00; P=0.049) after adjustment for age, general practice, sex, and baseline secondary prevention.

Discussion

Nurse led secondary prevention clinics can improve secondary prevention within one year. In our study this translated into reduced mortality and reduced coronary event rates in the medium term. However, several factors need to be taken into consideration when interpreting our study.

The randomised trial on which our study is based was well conducted but had two main limitations: a relatively short follow up of one year and outcomes based on processes of care and risk factors.¹²⁻¹⁴ Our follow up study has remedied these limitations by extending follow up to more than four years and by evaluating effects on coronary events and mortality. The study was conducted with random samples of general practices and patients, few participants were lost to follow up, and response rates were good so findings should be generalisable at least locally.^{6 7} The main limitation of the study concerns crossover of participants from control to intervention and vice versa. Most patients in the control group attended at least one secondary prevention clinic after the original trial year. Our main analysis by intention to treat takes the most conservative approach and would be expected to reduce differences between groups. Indeed, at four years, uptake of secondary prevention in the control group had largely caught up with the intervention group. We conducted a secondary analysis of duration

What is already known on this topic

Several effective interventions exist for the secondary prevention of coronary heart disease, but implementing them in practice has proved difficult

Secondary prevention programmes for coronary heart disease have improved short term outcomes such as processes of care and quality of life

What this study adds

Short term improvements in uptake of secondary prevention produced by nurse led clinics are maintained in the longer term

Improved medical and lifestyle components of secondary prevention produced by nurse led clinics seem to lead to fewer total deaths and coronary events

of exposure to clinics in which longer exposure to clinics was associated with better secondary prevention for the three medical components of secondary prevention and improved exercise (see bmj.com). This finding is, however, observational. The differences could have been biased by the healthy attender effect, although we found no association between length of exposure to clinics and healthy diet or smoking habits. Caution is needed in interpreting our findings on mortality and coronary events because of the study's low power to detect differences in these outcomes and the borderline P values. However, this long term follow up was preplanned at the outset of the trial, and we collected and analysed data at a single preselected time point, which reduces the likelihood that our findings are due solely to chance.

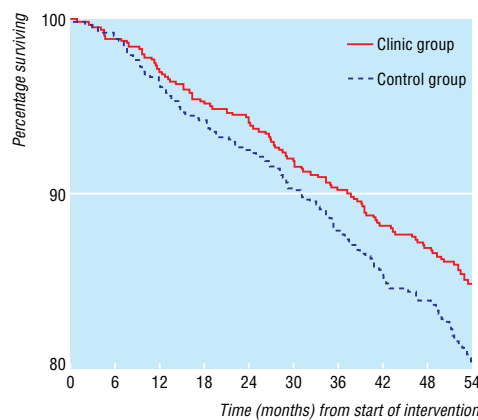
The benefits we found to total mortality and coronary events are consistent with projections we made prospectively based on the effects on secondary prevention after one year.¹⁵ They occurred despite improved secondary prevention in the control group after the original intervention year—although the survival curves seem to diverge over the four years, this visual impression should be treated with caution because of the study's low power. With this caveat, our findings are consistent with the expectation that benefits from secondary prevention continue to accrue over the medium term and show the value of attending clinics sooner rather than later.

We thank staff at all the general practices who participated in the study, especially the health visitors, practice nurses, and district nurses who ran the clinics. Participating general practices were Aboyne Medical Practice, Ardach Practice, Dr Crowley, Danestone Medical Practice, Elmbank Group, Dr Grieve and Partners, Kemnay Medical Practice, Kincoth Medical Practice, King Street Medical Practice, The Laich Medical Practice, Dr Mobbs and Partners, Drs Mackie and Kay, Old Machar Medical Practice, Rubislaw Medical Group, Seafield Medical Practice, Skene Medical Practice, Spa-Well Medical Group, Turriff Medical Practice, and Victoria Street Medical Group.

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Nos at risk:	0	6	12	18	24	30	36	42	48	54
Intervention group	670	649	628	602	577	377				
Control group	667	643	617	587	559	382				

Kaplan-Meier survival plot for total mortality

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Was it something you ate?

My patient was 52 and in her menopause. She weighed a steady eight and a half stone (54 kg) for her five feet three inches (1.6 m) height and was fit because she taught aerobics. She told me that she had suffered from "resistant high blood pressure" for two years. It varied, she said, between 219/119 mm Hg and 140/75 mm Hg. Her electrocardiographic and cholesterol results were normal, and her general practitioner had at first prescribed a diuretic, which had worked for a year, after which her blood pressure began to seesaw between 139/70 mm Hg and 196/80 mm Hg.

She was then prescribed β blockers, which made her dizzy and "spaced out," but which had reduced her blood pressure to 130/50 mm Hg. As she could not tolerate these, she was prescribed α blockers, but, by the second batch, she was experiencing sleepless nights, abdominal pain, and more headaches than usual. (She had had mild to moderate migraine since she was 14.) She also had a congenital leaking aortic valve, which had not caused her any problems.

Her general practitioner then prescribed an angiotensin converting enzyme inhibitor, but this made her insomnia worse and caused extreme exhaustion. She tolerated this drug for only two weeks before discontinuing, with her doctor's consent. Her blood pressure resumed its former erratic pattern. Her doctor was concerned, and it was agreed that she should try homoeopathy if she wished to.

I took her history at some length and, not having found much of homoeopathic significance, asked her what she ate on an average day. For her lunch she had fruit and natural yoghurt, some nuts, and her favourite treat, two small (20 g) bars of an unnamed liquorice sweetmeat.

"Every day?" I asked.

"Yes, mostly," and she smiled apologetically.

"Sometimes I have three, but not often. It is my only sin: I don't smoke and only take an occasional drink and am very sparing with the salt. I have done this for years."

I did not prescribe any homoeopathic remedy but asked her if she would stop eating the liquorice for three weeks and then have her blood pressure measured on three alternate days. She agreed, and when she returned she told me that it had been 121/78 mm Hg on average and was now (one month

later) 126/82 mm Hg and steady. She felt much better and was sleeping well. She was taking no drugs, and her doctor was pleased.

The sweet bars contained liquorice extract and other common confectionery ingredients in unspecified amounts. Liquorice contains glycyrrhizic acid, which may be an exogenous cause of a hypermineralocorticoid state. This is characterised by hypertension and hypokalaemia. I am not aware if she was investigated for the latter condition, but the marked and disabling fatigue she suffered from at the time I saw her may be indicative that this was the problem.

This potential adverse effect of the extract of the root of *Glycyrrhiza glabra* is well documented in the literature and should be more widely appreciated. It may exert this effect even at low doses in chewing gum flavoured with liquorice.¹

Medical practitioners may not appreciate that most complementary therapeutic consultations are not informed by NHS case notes or test results. One must make do with what is available, and I have learnt, to my cost, that it saves a lot of time if you ask a patient what he or she had for lunch early on in the interview.

The patient continues well without needing any drugs, and her energy for aerobic exercise is restored in full.

Geraldine Lindley *homoeopath, Bath*

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We welcome articles of up to 600 words on topics such as *A memorable patient, A paper that changed my practice, My most unfortunate mistake*, or any other piece conveying instruction, pathos, or humour. If possible the article should be supplied on a disk. Permission is needed from the patient or a relative if an identifiable patient is referred to. We also welcome contributions for "Endpieces," consisting of quotations of up to 80 words (but most are considerably shorter) from any source, ancient or modern, which have appealed to the reader.