Intensive cardiovascular risk factor intervention in a rural practice: a glimmer of hope?

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SUMMARY

Background. *Large trials of primary care-based health promotion to modify coronary heart disease risks have shown only modest benefits. Could more intensive intervention, with doctors sharing with practice nurses in health promotion, produce better health outcomes in the context of the small family practice? How cost-effective might these interventions be?*

Aim. *To assess the cost-effectiveness of an intensive programme of coronary heart disease (CHD) risk factor modification in a rural general practice in which doctors had a major input.*

Method. *A longitudinal study of changes in risk factors in a group of adult patients identified as having one or more major CHD risk factor and monitored for one to seven years. Patients were recruited from and followed up in health promotion clinics, routine practice nurse appointments, or routine doctors' surgeries. All received the practice's routine interventions to modify risk, and changes in risk factors were recorded. Time spent by members of the primary health care team on CHD health promotion was recorded over a two-year period.*

Results. *From a practice list of 2040, 760 patients with one or more CHD risk factors were identified and followed up over a mean of 3.61 years (range six months to seven years). Significant improvements in each of the risk factors occurred, except in body mass index (BMI). Mean Dundee risk scores fell from 7.4 to 5.7 (by 23.3%). The annual cost to the practice (including doctor/nurse/secretarial time plus sundry practice expenses and laboratory costs, but excluding drug costs) was £6000. Cost per coronary death prevented was calculated as approximately £10 000.*

Conclusion. *The results show an effect on risk factors broadly similar but slightly greater in magnitude than that achieved in the OXCHECK and British Family Heart studies of nurse-delivered risk factor intervention in primary care. The results suggest that more intensive effort in lifestyle modification and health promotion, with more active involvement of doctors, could produce significant additional benefit. The cost-effectiveness of this approach compares favourably with many other accepted measures in coronary heart disease prevention.*

Keywords: coronary risk factors; intervention trials; health promotion; rural general practice.

Introduction

SEVERAL studies have cast doubt on the effectiveness of primary prevention of coronary heart disease (CHD) in general practice. The OXCHECK[1,2] and Family Heart[3] studies were designed to evaluate the effect of nurse-conducted health promotion. Another smaller, uncontrolled study from a rural Welsh general practice also examined nurse-conducted intervention,[4] while the Swedish CELL study reported on the effect of 'intensive' versus 'usual' lifestyle advice.[5] The effect of health checks and feedback, of varying intensity, in Glasgow work sites was described by Hanlon *et al*,[6] while Cupples and McKnight[7] described the outcome of health visitor intervention from Belfast practices. The results of each of these studies were disappointing in terms of risk factor reduction (Table 1). They relied mainly on nurse or trained counsellor intervention. In this small rural practice, screening of our patients for CHD risk factors, both opportunistically and by active recall, has been occurring for 12 years. The doctors are actively involved and share the health promotion work with practice nurses. The authors' hypothesis was that the very intensive approach would be a more effective model of health promotion than had been considered before. This longitudinal study set out to test this hypothesis and to examine the cost-effectiveness of intensive risk factor intervention.

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Method

Subjects

Adult patients aged less than 75 years with one or more cardiovascular risk factors were included. They were identified through opportunistic or active case finding, by the doctors or the practice nurses, over a period of seven years.

Risk factors

Risk factors were defined as a random blood cholesterol level >6.5 mmol/l, sustained hypertension (systolic blood pressure >159 mmHg, diastolic blood pressure >99 mmHg), body mass index (BMI) >29.9, existing CHD or having undergone coronary artery bypass graft (CABG) or angioplasty, smoking, diabetes mellitus, stroke, peripheral vascular disease, and a family history of CHD at <60 years of age or of familial hypercholesterolaemia.

Patients were seen in health promotion clinics or at routine practice nurse appointments or routine doctors' surgeries. They received the practice's standard interventions for lifestyle modification. Doctors assessed and initiated treatment for identified hypertensive and hyperlipidaemic patients, with management according to standard guidelines.[8–10] Monitoring of these patients was shared between doctors and nurses, with free referral and consultation in both directions. Patients who failed to achieve appropriate lifestyle modification after a planned series of appointments with the practice nurses were asked to see one of the doctors with a particular interest in motivational counselling. Patients requiring help were able to choose between consultations and follow up with the doctor, the nurse, or both, or to join an appropriate group for smoking cessation or weight control. The two practice nurses had received training in motivational counselling, based on the Prochaska and DiClemente[11,12] model, and in the running of health promotion groups from the local health authority's health promotion department.

Risk factor status was recorded on the practice computer system by both nurses and doctors. Dundee risk scores were calcu-

Table 1. Results of CHD health promotion trials compared.

Trial	Intervention	Smoking	Cholesterol	Blood pressure (systolic/diastolic)	BMI	Risk score	Comment
OXCHECK (1995)[1,2]	Nurse-led intensive	⇨	⇩3.1%	⇩1.9/1.9%	⇨	–	(at three years) Randomized controlled trial (RCT) in five practices
British Family Heart study (1994)[3]	Nurse-led intensive	⇩4%	⇩1.8%	⇩5.2/3.6%	⇩1.4%	⇩12%	(at one year) RCT in 26 practices
Gibbins *et al* (1993)[4]	Nurse-led	⇩8%	⇧3.5%	⇧1.3/0%	⇧1.6%	–	One small practice; 3.9 years' mean follow up; non-controlled
Cupples and McKnight (1994)[7]	Health visitors; four months of visits	⇨	⇨	⇨/⇨	⇨	–	Belfast practices; two-year follow up; angina patients; RCT
Hanlon *et al* (1995)[6]	Nurse/ counsellors; non-practice based	⇨	⇩2.2%	⇨/⇨	⇨	–	RCT; work site checks and intervention; five-month follow up
Lindholm *et al* (1995)[5]	Nurse and doctor; intensive versus usual advice	⇨	⇩2.1%	⇨/⇨	⇨	Framingham ⇩0.068	RCT; 32 health centres; 18-month follow up; three or more risk factors including high cholesterol level
Roberts *et al* (1996) (this study)	Nurse and doctor; intensive	⇩19.3%	⇩6.8%	⇩4.3/4.8%	⇩0.42%	⇩23%	Non-controlled; small practice; mean 3.6 years' follow up

⇧ = increased; ⇩ = decreased; ⇨ = unchanged/no significant change.

lated using the Tunstall-Pedoe coronary risk disk.[13] The score was used both to determine patient motivation/education and to prioritize the intensity of intervention and follow up. Patients with scores of more than 16 (or rank 10) were referred to or discussed with a doctor.

Results

A total of 760 patients were studied for a mean follow-up period of 3.61 years. Paired observations were obtained for all initial smokers (400), for blood pressure (490), for cholesterol level (248), and for BMI (316) (Table 2). Significant reductions were achieved for all risk factors except BMI. Smoking prevalence decreased by 19.25%, mean systolic and diastolic blood pressure decreased by 6.4 and 4.0 mmHg, and mean random cholesterol decreased by 0.55 mmol l^{-1} (7.8%). The overall decrease in Dundee risk score was 23.3%. The total cost to the practice excluding drugs (only six patients were receiving lipid-lowering drugs during the study) was £6000 annually (Table 3). The number of patients that had to be treated[14] to prevent one coronary death was 1280 at a calculated cost of £10 103. (Table 4).

Discussion

The study by Gibbins *et al*[4] suggested that those patients followed up more frequently achieved a better result in terms of cholesterol reduction than those seen less frequently; a hint that more intensive intervention might bring better results. It has been suggested that lifestyle advice may be heeded more when delivered by a doctor than by the practice nurse. This study commenced before the publication of the disappointing OXCHECK and Family Heart study results and the ensuing pessimistic discussion questioning the validity of continuing this type of health promotion.

Our hypothesis and hope was that, given the high level of GP input and the context of a small family practice in which most patients are known personally to the doctors, our efforts would be more effective.

Our small study was, of necessity, uncontrolled and based on a small sample. Follow up was incomplete because of non-compliance or death, or because patients moved away from the area. There were large differences in the numbers of paired observations of risk factors. Patients with more severe abnormalities or suffering from several risk factors were more likely to be recalled and followed up. Such patients were also more likely to have paired cholesterol measurements and, hence, high risk scores. Because the practice had a long-standing special interest in smoking cessation, the follow up of smokers was almost complete (99%). Smokers who had not been reviewed for other reasons were recalled by telephone and letter. Non-attending obese patients lacking other major risk factors were not actively recalled. The non-compliers might well represent a 'difficult group' who are less amenable to lifestyle change, and their inclusion in the study might be expected to reduce the apparent improvements in risk factors. There are also many possible confounding variables. Smoking prevalence, diet, and exercise habits may have changed in the community as a result of factors unrelated to our health promotion. Each of these factors has been the subject of national and local health promotion initiatives during our study period. However, evidence suggests that the preva-

Table 2. Principal results.

(a)	Smoking 400 paired observations		n
Initial smokers	400	(52.9%)	756
Smokers at last follow up	323	42.7%	756
Stopped smoking	77	(19.2%)	400

(b)	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)	Total cholesterol (mmol/l)	BMI	Dundee risk scores
No. of paired observations	490	490	248	316	224
Initial mean (SD)	144.8 (25.8)	84.5 (11.3)	7.0 (1.3)	27.1 (4.4)	7.4 (5.6)
Mean at last follow up (SD)	138.4 (20.9)	80.5 (11.3)	6.5 (1.1)	27.0 (4.3)	5.7 (3.6)
Mean reduction (%)	6.4 (4.4)	4.0 (4.7)	0.5 (7.1)	0.1 (0.4)	1.7 (23.0)
95% CI	4.5–8.5	3.0–5.5	0.42–0.68	–0.07 to 0.32	1.2–2.6

Table 3. Time and costs spent in health promotion.

(a)	Time spent on health promotion (hours)
Annual hours (doctor and nurse)	162
Doctor	69
Nurse	93
Secretarial and computer operator time annually	100 (estimated)
Total number of health promotion contacts	1063
Mean duration of each contact	9.2 minutes

(b)	Costs (£)
GP hourly rate (average BMA locum rate 1994)	26.00
G-grade nurse hourly rate (Whitley Council 1994)	10.47
Secretarial/computer operator hourly rate	5.46
Telephone, stationery, postage annually	200.00
Doctors, annually	1791.11
Nursing, annually	975.07
Secretarial, annually	546.00
Laboratory costs, annually	2224.00
Approximate total annual cost	6000.00

Table 4. Risk reduction.

Number needed to treat (NNT)[14]	
Assumed non-intervention coronary mortality	335.8 per 100 000 annually
Relative risk reduction	23.3%
Absolute risk in intervention group	257.7 per 100 000 annually
NNT to prevent a single coronary death	1280
Estimated cost	£10 103 per death prevented

Figures from World Health Organization for coronary heart disease mortality for European standard population for 1989 are used in this calculation for expected non-intervention coronary mortality.[15] The figures are similar if the placebo group mortality from the West of Scotland Coronary Prevention Study is used.[16]

lence of risk factors for CHD is increasing in Cornwall. A survey conducted by the district health authority in 1994 found a 12% increase in smoking prevalence and a 3% increase in obesity in Cornwall since the 1990 county survey.[21] If these worsening figures reflect the trend in this practice area, then our figures would underestimate the effect of our interventions. The lack of a significant change in BMI in our study is consistent with many other findings, confirming that it is very difficult to influence body weight.

Both blood pressure and cholesterol concentration increase with age, although serum cholesterol concentration may plateau after the age of 40 years.[4] Given the mean age of our population of 49 years, this effect is not likely to be significant. Probably the over-riding extraneous influence on serial blood pressure readings is the accommodation effect,[1,2] together with the regression towards the mean phenomenon.

Overall, our results are rather better than those of the British Family Heart study (23% versus 12% Dundee risk score reduction), which, of all the recent studies, is unique in showing a favourable effect on all risk factors (Table 1). The authors of that study concluded that the intensity of their family-centred programme, which involved specially trained, dedicated nurses, far exceeded all but that of the most dedicated practice teams elsewhere. The present study attained a 'near-maximal' effort for the circumstances of a small practice, but still spent overall a mean total of only 46 minutes on CHD health promotion on each of our 760 subjects over the mean follow-up period of 3.6 years. This is about half the duration of the initial assessment interview in the British Family Heart study. In spite of the methodological limitations of this small study, the results are of interest in that the risk factor reduction achieved is of a similar order to, but better than, that of the British Family Heart study. We consider that our results represent the best achievable results in 'real-life' general practice.

The number needed to be treated (NNT) to prevent a single fatal coronary event in our practice, using the interventions described, was 1280 for one year at a cost to the practice of approximately £10 000 (Table 4). The figures for baseline mortality used in this calculation are likely to be underestimates of the risk in our study population and to be a source of bias in the direction of undervaluing our intervention.[15] The NNT for secondary prevention with cholesterol lowering with simvastatin in the 4S study was 15 patients for 10 years to prevent one fatal coronary event with approximate drug costs of £76 800.[22] Thus, the interventions used in the present study compare favourably with other accepted preventive interventions in CHD. This would remain true even if the size of the effect in this study were grossly overestimated.

There are two conclusions. First, our study suggests that this 'small practice' approach may indeed be more effective. Secondly, the approach appears to be considerably more cost-effective than many of the interventions widely accepted and used in primary care (e.g. the drug treatment of hypercholesterolaemia).

We therefore remain enthusiastic and optimistic about the potential for CHD risk factor modification in general practice.

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