Effectiveness of health checks conducted by nurses in primary care: final results of the OXCHECK study

Imperial Cancer Research Fund OXCHECK Study Group

See pp 1105, 1109 and editorial by Toon

University of Oxford, Department of Public Health and Primary Care, Gibson Building, Radcliffe Infirmary, Oxford OX2 6HE
Members of the OXCHECK Study Group are:

University Department of Public Health and Primary Care
A Coulter, G Fowler, A Fuller, L Jones, T Lancaster, M Lawrence, D Mant, J Muir, A Neil, C O'Neil, L Roe, N Rusted, T Schofield, C Silagy, M Thorogood, P Yudkin, S Ziebland

Chemical Pathology Department, Luton and Dunstable District General Hospital
D Freedman, M Oggelsby, S Joyce, Y Sweetman

Department of Biological Sciences, Sheffield Hallam University
R F Smith

Participating general practitioners
P Bradley, R Brown, S Choudhury, M Clarke, J Crarer, N Curt, D Denis-Smith, H Francis, P Maddock, J Marsden, D Marshall, S Martin, H McGill, A Mitchell, O O'Toole, M Roberts, C Royall, A Sander, J Stanton, H Swallow, C Sykes, J Tabert, S Talbot, D Tant, M Waldron, P Williams

Participating practice nurses
I Allen, S Brown, P Clark, J Draper, P Gazeley, S Lilley, K Mustoe, J Steele, J Szumski, M Tyrrell, K Tiernan, J Vanderwall, S Vella, A White, K Warren, A White, P Wolsey, L Young

Report prepared by J Muir, T Lancaster, L Jones, P Yudkin

Correspondence to: Dr Muir.

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Abstract

***Objective*—To determine the effectiveness of health checks, performed by nurses in primary care, in reducing risk factors for cardiovascular disease and cancer.**

***Design*—Randomised controlled trial.**

***Setting*—Five urban general practices in Bedfordshire.**

***Subjects*—2205 men and women who were randomly allocated a first health check in 1989-90 and a re-examination in 1992-3 (the intervention group); 1916 men and women who were randomly allocated an initial health check in 1992-3 (the control group). All subjects were aged 35-64 at recruitment in 1989.**

***Main outcome measures*—Serum total cholesterol concentration, blood pressure, body mass index, and smoking prevalence (with biochemical validation of cessation); self reported dietary, exercise, and alcohol habits.**

***Results*—Mean serum total cholesterol was 3·1% lower in the intervention group than controls (difference 0·19 mmol/l (95% confidence interval 0·12 to 0·26)); in women it was 4·5% lower ($P<0\cdot0001$) and in men 1·6% ($P<0\cdot05$), a significant difference between the sexes ($P<0\cdot01$). Self reported saturated fat intake was also significantly lower in the intervention group. Systolic and diastolic blood pressures and body mass index were respectively 1·9%, 1·9%, and 1·4% lower in the intervention group ($P<0\cdot005$ in all cases). There was a 3·9% (2·4 to 5·3) difference in the percentage of subjects with a cholesterol concentration $\geqslant 8$ mmol/l, but no significant differences in the number with diastolic blood pressure $\geqslant 100$ mm Hg or body mass index $\geqslant 30$ kg/m². There was no significant difference between the two groups in prevalence of smoking or excessive alcohol use. Annual rechecks were no more effective than a single recheck at three years, but health checks led to a significant increase in visits to the nurse according to patients' degree of cardiovascular risk.**

***Conclusions*—The benefits of health checks were sustained over three years. The main effects were to promote dietary change and reduce cholesterol concentrations; small differences in blood pressure may have been attributable to accommodation to measurement. The benefits of systematic health promotion in primary care are real, but must be weighed against the costs in relation to other priorities.**

Introduction

In 1994 we reported the effectiveness of general practice based, nurse run health checks after one year of follow up in the randomised controlled OXCHECK (Oxford and collaborators health check) trial.[1] The main differences between the intervention and control groups were in serum total cholesterol concentration (2·3%), systolic blood pressure (2·5%), and diastolic blood pressure (2·4%). No significant differences in smoking prevalence or body mass index were detected. The Family Heart Study Group reported concurrently that a similar randomised intervention aimed at families led to a 16% difference at one year in the total coronary risk score (Dundee risk score[2]).[3]

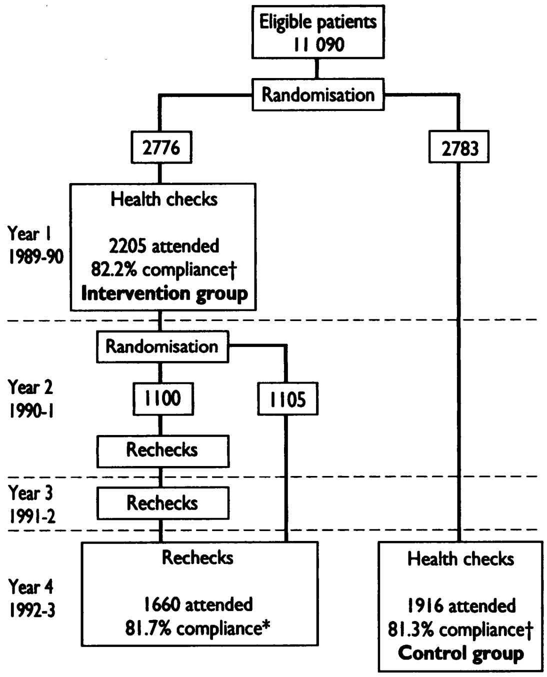
These reports provoked extensive, and sometimes passionate, debate about the benefits and costs of systematic health promotion through primary care.[4-6] The 1990 contract offered general practitioners financial rewards for providing health checks, which were often performed by nurses. In 1992 the new health promotion package shifted the emphasis to opportunistic intervention, but it continued to encourage primary care teams to perform screening, record data on lifestyle, and offer intervention to their adult patients aged 16-74. Substantial resources are diverted from other areas of general practice to reward this activity, which is seen as central to achieving government targets for reducing heart disease and cancer incidence.[7] These public health benefits can be realised only if effects of primary care health promotion are sustained over time, but the extent to which this occurs is uncertain.[5] We addressed this issue.

Subjects and methods

The study was performed in five general practices in Luton and Dunstable. This area was chosen for its mixed urban and suburban setting, range of heavy and light industry, and varied demographic profile. It had the additional advantage that there was no facilitator in post encouraging practices to perform health checks. All five practices in Luton with over 10 000 patients were approached. Three agreed to take part, and two further practices, with lists of about 7500 were recruited, one of which was in Dunstable.

Potential participants were identified from the Bedfordshire Family Practitioner Committee's register in the autumn of 1988. The 17 965 men and women aged 35-64 who were identified were sent a health and lifestyle questionnaire. A total of 11 090 (80·3% after adjusting for inaccuracies of registration[8]) returned the questionnaire, and they were randomly allocated in 1988 to health checks during one of the four years from 1989 to 1993. Invitation to health checks was by post, by telephone, and opportunistically during surgery visits. Considerable effort was invested to attain a target attendance rate of 80% of those who had been randomly allocated to each group.[9]

Our principal analysis is of the effects of the intervention after three years of follow up; figure 1 shows the groups compared. The intervention group consisted of the 2205 participants who attended their first health check in 1989-90 (year 1 of the study) and were scheduled for re-examination in 1992-3 (year 4 of the study). They were compared with 1916 controls who attended their first health check in 1992-3 (year 4).



* Denominator is all patients attending a first health check who were subsequently randomly allocated annual rechecks or a single recheck minus those who left the practice area before receiving the final recheck.
† Denominator is all patients randomly allocated to a first health check minus those who left the practice area before receiving it.

FIG 1—*Design of OXCHECK trial showing composition of intervention and control groups at three year follow up. A total of 5531 patients randomly allocated health checks in years 2 and 3 are excluded from this analysis*

The 2205 participants allocated to a first health check in year 1 of the study were further randomly allocated annual re-examinations (1100) or a single return visit at three years (1105). We were thus able to examine the effect of annual rechecks. We also examined the effects of intervention in 2080 participants who had their first health check in the second year of the study, 1990-1, and were re-examined in 1992-3, two years after the intervention. The results in this group were consistent with those seen at three years, and the data are therefore not shown (available on request to JM).

Practice nurses performed health checks according to a standard protocol, which included completing a medical history, lifestyle questionnaire, and structured dietary assessment.[10] They measured height, weight (on Seca scales), and blood pressure (with the Hawksley random zero sphygmomanometer) and drew blood for determination of serum cholesterol concentration. Details of the laboratory methods have been previously reported.[1] Patients were offered follow up according to a structured protocol for each risk factor. Initial health checks took 45-60 minutes, and follow up visits 10-20 minutes. Nurses were instructed in the importance of identifying and following up patients with multiple risk factors and in the use of a patient centred communication model.[11] They attended a two day induction course, an annual study day, and a monthly evening training session with the medical and nursing coordinators to maintain and develop their knowledge and skills. In some practices nurses in post combined health checks with other work, while in others nurses were employed specifically to perform health checks. Over the course of the study each practice required roughly 50 hours a week of a nurse's time.

Results are presented both for those who attended for re-examination and for all patients scheduled to attend on the assumption that non-attenders showed no change from their initial visit or last recheck (analysis by intention to treat). This assumption is generally conservative, except in the case of cholesterol concentration and blood pressure, which rise with age. The effect of this assumption was modelled by adjusting the means for those with missing values at recheck for age related changes. The effects were negligible (a 0·01 mmol/l difference in cholesterol concentration in women only), and unadjusted values were therefore used in subsequent analysis. Subjects classed as smokers at the initial health check were considered to be non-smokers at follow up only if their report of having given up smoking was confirmed by measurement of serum cotinine concentration.

The notes of 1100 patients in the intervention group with a raised blood pressure (≥160 mm Hg systolic or ≥90 mm Hg diastolic) or cholesterol concentration (≥8·0 mmol/l) identified at the health check were audited at the end of the study to determine how many patients were prescribed pharmaceutical treatment after the checks. In addition, the notes of 1000 consecutive patients attending for a health check were audited to ascertain the annual rates of consultation with doctors and nurses in the year before and after a first health check.

Confidence intervals were calculated with the confidence interval analysis program.[12] The means of continuous variables were compared between the two groups and the significance of differences was assessed by the *t* test. The χ^2 test was used to test the significance of differences in proportions. Minor inconsistencies in the tables reflect rounding or missing values for some variables. The study was approved by the Central Oxford Ethics Committee.

Results

As previously reported, the groups randomly allocated at baseline to a health check during each year of the trial did not differ significantly in the distribution of age or social class.

Table I shows the mean differences in total cholesterol concentration, blood pressure, and body mass index between the intervention and control groups for attenders at re-examination and for all patients scheduled to attend after three years of follow up. The true effect of health checks in this trial is likely to lie between the two estimates, but we present the intention to treat analysis as the principal outcome of the trial.

Cholesterol concentration, blood pressure, and body mass index differed significantly. Mean total cholesterol concentration was 3·1% lower in the intervention than in the control group ($P<0·0001$); in women it was 4·5% lower ($P<0·0001$) and in men 1·6% ($P<0·05$). This difference between the sexes was significant (difference 0·18 mmol/l (95% confidence interval 0·04 to 0·32), $P<0·01$). The mean systolic and diastolic blood pressures and body mass index were lower in the intervention group by 1·9% ($P<0·0001$), 1·9% ($P<0·0001$), and 1·4% ($P<0·005$) respectively. When the analysis was restricted to those who reattended, the differences for systolic and diastolic blood pressure and body mass index were the same but the differences in mean cholesterol concentration increased to 4·0% (women 5·2%, men 2·6%).

Table II shows differences in the proportions of patients in five high risk groups: smokers, those who were overweight, those with raised diastolic blood pressure or total cholesterol concentration, and those who drank alcohol excessively. The main significant difference was in the proportion with a high cholesterol concentration. Although the prevalence of smoking was lower in those attending a recheck, there was no significant difference in the intention to treat analysis. Figure 2 shows the frequency distribution of cholesterol concentrations in the intervention and control groups at three years. The curve for the intervention group lies to the left of that for the controls, indicating benefit from intervention at all serum cholesterol concentrations, though with greater effect at the upper end of the distribution.

TABLE I—*Total cholesterol concentrations, blood pressures, and body mass indices in control group and after three years of intervention. Values are means (SD)*

		Intervention group		Difference from control (95% confidence interval)	
	Control group	Attenders only	All participants	Attenders only	All participants*
		Men and women			
No of participants	1916	1660	2205		
Total cholesterol (mmol/l)	6·18 (1·17)	5·93 (1·06)	5·99 (1·10)	0·25 (0·18 to 0·33)	0·19 (0·12 to 0·26)
Blood pressure (mm Hg):					
Systolic	129·0 (20·4)	126·8 (19·6)	126·5 (19·3)	2·2 (0·9 to 3·5)	2·5 (1·3 to 3·7)
Diastolic	77·2 (11·7)	75·7 (11·5)	75·7 (11·6)	1·5 (0·7 to 2·3)	1·5 (0·8 to 2·2)
Body mass index (kg/m²)	26·26 (4·31)	25·89 (4·14)	25·88 (4·21)	0·37 (0·09 to 0·65)	0·38 (0·12 to 0·64)
		Men			
No of participants	885	738	987		
Total cholesterol (mmol/l)	6·09 (1·07)	5·93 (1·02)	5·99 (1·06)	0·16 (0·06 to 0·26)	0·10 (0·00 to 0·20)
Blood pressure (mm Hg):					
Systolic	131·2 (20·2)	128·8 (19·0)	128·7 (18·3)	2·4 (0·5 to 4·3)	2·5 (0·7 to 4·3)
Diastolic	78·6 (11·9)	77·1 (11·5)	77·4 (11·5)	1·5 (0·4 to 2·7)	1·2 (0·1 to 2·3)
Body mass index (kg/m²)	26·33 (3·50)	25·88 (3·39)	25·89 (3·44)	0·45 (0·11 to 0·79)	0·45 (0·12 to 0·76)
		Women			
No of participants	1031	922	1218		
Total cholesterol (mmol/l)	6·26 (1·25)	5·93 (1·10)	5·98 (1·13)	0·33 (0·22 to 0·44)	0·28 (0·18 to 0·38)
Blood pressure (mm Hg):					
Systolic	127·0 (20·5)	125·3 (20·0)	124·7 (19·9)	1·7 (−0·1 to 3·5)	2·3 (0·6 to 4·0)
Diastolic	76·0 (11·4)	74·6 (11·3)	74·3 (11·5)	1·4 (0·4 to 2·4)	1·7 (0·7 tp 2·7)
Body mass index (kg/m²)	26·20 (4·90)	25·90 (4·65)	25·86 (4·74)	0·30 (−0·13 to 0·73)	0·34 (−0·06 to 0·74)

*Last value from health check or recheck for non-attenders.

TABLE II—*Numbers (percentages) of patients in high risk categories in control group and after three years of intervention*

		Intervention group		Difference from control (95% confidence interval)	
	Control group	Attenders only	All participants	Attenders only	All participants*
		Men and women			
No of participants	1916	1660	2205		
Smoking†	506 (26·4)	356 (21·4)	552 (25·0)	5·0 (2·2 to 7·8)	1·4 (−1·3 to 4·1)
Alcohol use‡	210 (11·0)	156 (9·4)	229 (10·4)	1·6 (−0·42 to 0·04)	0·6 (−1·3 to 2·5)
Total cholesterol ≥8 mmol/l	148 (7·8)	49 (3·1)	82 (3·9)	4·7 (3·2 to 6·2)	3·9 (2·4 to 5·3)
Diastolic pressure ≥100 mm Hg	86 (4·5)	53 (3·3)	73 (3·4)	1·2 (−0·1 to 2·5)	1·1 (−0·1 to 2·3)
Body mass index ≥30 kg/m²	304 (15·9)	220 (13·5)	310 (14·3)	2·4 (0·0 to 4·7)	1·6 (−0·6 to 3·8)
		Men			
No of participants	885	738	987		
Smoking†	270 (30·5)	190 (25·7)	296 (30·0)	4·8 (0·4 to 9·1)	0·5 (−3·7 to 4·7)
Alcohol use‡	155 (17·5)	112 (15·2)	164 (16·6)	2·3 (−1·3 to 5·9)	0·9 (−2·5 to 4·3)
Total cholesterol ≥8 mmol/l	56 (6·4)	19 (2·7)	34 (3·6)	3·7 (1·7 to 5·7)	2·8 (0·8 to 4·8)
Diastolic pressure ≥100 mm Hg	49 (5·5)	28 (3·9)	39 (4·0)	1·6 (−0·4 to 3·7)	1·5 (−0·4 to 3·5)
Body mass index ≥30 kg/m²	114 (12·9)	73 (10·1)	103 (10·6)	2·8 (−0·3 to 5·9)	2·3 (−0·6 to 5·2)
		Women			
No of participants	1031	922	1218		
Smoking†	236 (22·9)	166 (18·0)	256 (21·0)	4·9 (1·3 to 8·5)	1·9 (−1·6 to 5·3)
Alcohol use‡	55 (5·3)	44 (4·8)	65 (5·3)	0·6 (−1·4 to 2·5)	0·0 (−1·9 to 1·9)
Total cholesterol ≥8 mmol/l	92 (9·0)	30 (3·4)	48 (4·1)	5·6 (3·4 to 7·7)	4·8 (2·7 to 6·9)
Diastolic pressure ≥100 mm Hg	37 (3·6)	25 (2·8)	34 (2·9)	0·8 (−0·8 to 2·4)	0·7 (−0·7 to 2·2)
Body mass index ≥30 kg/m²	190 (18·4)	147 (16·3)	207 (17·3)	2·2 (−1·2 to 5·6)	1·2 (−2·0 to 4·4)

*Last value from health check or recheck used for non-attenders.
†Smoking any form of tobacco at least daily.
‡Reported weekly intake of >21 units for men and >14 units for women.

The prescribing audit showed that 28 out of 90 (30%) participants with a cholesterol concentration ≥8 mmol/l at the first health check were prescribed cholesterol lowering drugs. Of 215 patients with either a systolic blood pressure ≥160 mm Hg or a diastolic ≥90 mm Hg, 48 (22%) had been taking hypotensive drugs and 23 (11%) received such treatment after the health checks.

Table III shows the differences between intervention and control groups in reported diet and exercise. The proportion of patients reporting taking vigorous exercise less than once a month was significantly lower in the intervention group (difference 3·3% (0·5 to 6·1)). After intervention there was a 8·7% (6·0 to 11·4) difference in the proportions who used mainly butter or hard margarine and a 7·5% (4·8 to 10·3) difference in the proportion who drank mainly full cream milk.

We further examined the 2205 subjects who received their first health check in year 1 and compared the values at the final health check between 1100 randomly allocated to return for annual rechecks and 1105 randomly allocated to return for a recheck only at three years. Values in the two groups were similar. Mean differences were: cholesterol −0·03 (−0·12 to 0·06) mmol/l, systolic blood pressure 0·2 (−1·4 to 1·8) mm Hg, diastolic blood pressure 0·0 (−1·0 to 1·0) mm Hg, and body mass index 0·29 (−0·06 to 0·64) kg/m². The difference in the proportion smoking was 1% (−2·6% to 4·6%).

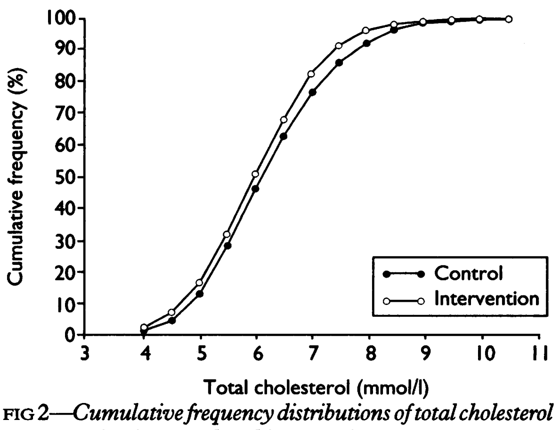


FIG 2—*Cumulative frequency distributions of total cholesterol concentration in control and intervention groups*

TABLE III—*Reported diet and exercise in control group and after three years of intervention. Values are numbers (percentages) of patients unless stated otherwise*

	Control group	Intervention group		Difference from control (95% confidence interval)	
		Attenders only	All participants	Attenders only	All participants
		Men and women			
No of participants	1916	1660	2205		
Exercise <once per month	1354 (70·9)	1094 (66·5)	1478 (67·6)	4·5 (1·4 to 7·5)	3·3 (0·5 to 6·1)
Use full cream milk	587 (30·6)	300 (18·5)	501 (23·1)	12·1 (9·4 to 15·0)	7·5 (4·8 to 10·3)
Use butter or hard margarine	587 (30·7)	303 (18·3)	483 (21·9)	12·4 (9·6 to 15·2)	8·7 (6·0 to 11·4)
		Men			
No of participants	885	738	987		
Exercise <once per month	635 (71·8)	479 (65·4)	648 (66·2)	6·4 (1·9 to 10·9)	5·6 (1·5 to 9·8)
Use full cream milk	312 (35·3)	162 (22·4)	260 (26·7)	12·8 (8·5 to 17·2)	8·5 (4·3 to 12·7)
Use butter or hard margarine	286 (32·3)	141 (19·1)	232 (23·5)	13·2 (9·0 to 17·4)	8·8 (4·8 to 12·9)
		Women			
No of participants	1031	922	1218		
Exercise <once per month	719 (70·1)	615 (67·3)	830 (68·8)	2·9 (−1·3 to 7·0)	1·4 (−2·5 to 5·2)
Use full cream milk	275 (26·7)	138 (15·3)	241 (20·1)	11·4 (7·8 to 15·0)	6·6 (3·1 to 10·1)
Use butter or hard margarine	301 (29·2)	162 (17·6)	251 (20·7)	11·6 (7·9 to 15·3)	8·6 (5·0 to 12·2)

Audit of the notes of 1000 patients attending for a health check showed that visits to the general practitioner did not increase in the year after an initial health check, but there were significant increases in visits to the nurse. In the first year after the health check, patients with none of four identified risk factors (raised cholesterol concentration, raised blood pressure, obesity, and smoking) had a mean number of 0·6 (0·4 to 0·8) visits to the nurse. For patients with one, two, and three or more risk factors the figures were respectively 1·3 (1·2 to 1·4), 1·6 (1·4 to 1·8), and 2·5 (2·1 to 2·9). In contrast, the mean number of visits in the year before the first health check was 0·3 (0·2 to 0·4) and did not differ according to number of risk factors. Women were twice as likely to visit the nurse as were men.

Discussion

To assess the effects over time of an intervention which included both screening and treatment presented several methodological problems. To collect data on a control group at baseline risked obscuring the benefits of health checks because of the similarity between measurement and intervention. We therefore randomly allocated patients to a health check in one of four successive years. This allowed us to compare those returning for rechecks after three years with a control group attending at the same time for their first health check, the control group thus having a low probability of contamination by previous contact with the study. The main concern with this design was the potential bias introduced by non-attendance for follow up in the intervention group. By analysing on intention to treat, we made a generally conservative assumption about the direction of this bias. Some of the non-attenders may, however, have changed their behaviours as a result of the health checks, particularly when the reason for non-attendance was because of having moved out of the area. Thus, our analysis may underestimate the impact of the health checks.

Any programme subjected to evaluation in general practice should be of high quality and generalisable. The nurses who provided the intervention were trained in the identification and modification of risk factors and in the use of a communication model that emphasised the importance of identifying and responding to the patients' concerns about their health, negotiating change according to patients' priorities, and reinforcing change through supportive follow up. Analysis of over 100 audiotapes of the checks with the nurses in this study met these standards in a high proportion of cases (T Schofield, personal communication). Our audit of subsequent visits showed that nurses were also effective in stratifying risk and adjusting the intensity of follow up accordingly. Our reported results should therefore be seen in the context of high quality clinical performance by the nurses.

SMOKING

The lack of effectiveness of health checks in promoting stopping smoking confirms the disappointing findings from our one year follow up.[1] Perhaps this is not surprising. Studies showing an increase in stopping smoking after brief advice in primary care were performed over a decade ago.[13,14] As the prevalence of smoking has fallen, the proportion of smokers who can relinquish the habit with information and support alone has almost certainly fallen. Pharmacological treatments of proved efficacy now exist to supplement approaches based on behavioural and counselling models.[15] Making effective use of this array of methods for treating addictive behaviour may not be compatible with achieving the multiple tasks of a general health check.

BLOOD PRESSURE

The significant differences in mean blood pressures between the intervention and control groups are difficult to interpret because the size of the change is compatible with accommodation to measurement (the tendency of blood pressure recordings to yield lower values over time as subjects become used to the procedure).[16] Change in mean blood pressure may be due to screening and drug treatment of previously unidentified or inadequately treated hypertension or to the effects of advice on lifestyle in patients with the full range of blood pressure. The prevalence of moderate to severe hypertension at first attendance was low: only 4·5% of patients in the intervention group had a diastolic blood pressure greater than 100 mm Hg. This may be partly explained by underestimation of blood pressure by the Hawksley random zero sphygmomanometer.[17] It also suggests, however, that when opportunistic screening is already occurring, the yield of patients with undiagnosed or inadequately treated hypertension from systematic screening may be relatively low. The effects on population mean blood pressure of advice on lifestyle offered through a health check seem to be small at best.

DIET, CHOLESTEROL CONCENTRATION, AND WEIGHT

The most encouraging aspect of this trial was the evidence that dietary advice from nurses led to significant differences in self reported dietary and exercise habits and to a modest difference in the mean cholesterol concentrations. These effects were significant in both men and women and were sustained three years after the initial intervention. The frequency distribution curves of cholesterol concentration in figure 2 suggest that health checks had an effect on the diet of many subjects with average cholesterol concentration, in whom the attributable risk of ischaemic heart disease due to cholesterol is highest. That the effects on cholesterol concentration largely reflect dietary change is supported both by the differences in self reported saturated fat intake and by the small number of prescriptions for lipid lowering drugs. Dietary advice also led to a small difference in mean body mass index but failed to reduce the proportion of the population with obesity.

The magnitude of the effect on cholesterol concentration is comparable with the reductions of up to 4·0% reported in an overview of five trials of individualised advice on a reduced fat diet.[18] It is also consistent with our recently completed randomised trial of dietary advice in patients with raised cholesterol concentration (6·0-8·5 mmol/l), which found a mean difference in total cholesterol concentration of 1·5% at six months, after correction for regression to the mean.[19] The benefits of dietary advice are probably not fully reflected by measurements of cholesterol concentration. Reducing fat intake and substituting fruit and vegetables may raise serum concentrations of antioxidant vitamins and other cardioprotective factors, depite having little effect on lipid values.[19] Substantial epidemiological evidence suggests that this could reduce the risk of cancer and cardiovascular disease.[20] Such benefits must, however, remain speculative in the absence of data from clinical trials.

There may be several reasons why the intervention was more successful in changing diet than in effecting other behavioural changes. Modifying the diet, particularly when palatable substitutes exist for foodstuffs high in saturated fat, is probably an easier task than losing weight, curbing alcohol use, or breaking an addiction to smoking. In addition, the effect of advice may have been to validate information about healthy eating received from other sources. Whereas most smokers are aware of the harmful nature of their addiction,[21] confusion about public health messages on nutrition is well documented.[21,22] Advice from nurses may have catalysed changes previously contemplated.[23] Finally, the nurses may have invested greater effort in diet than in other issues as a result of the emphasis on collection of detailed dietary data in the health check protocol. It is unclear whether this represents the most efficient method of delivering dietary advice. Indeed, in another, shorter, randomised trial in general practice dietary advice was no more effective than written information in lowering cholesterol concentration.[19]

EFFECT OF ANNUAL RECHECKS

There was no evidence that annual rechecks after an initial health check were any more effective in modifying risk factors after three years than a single health check. The narrow confidence intervals around the differences between the two groups suggest that no important incremental effect was undetected. Our audit of clinical records shows, however, that health checks generated a significant number of follow up visits in both groups—up to four times more in patients with three or more risk factors. It would therefore be misleading to suggest that all the benefit of intervention can be realised by a single health check.

PUBLIC HEALTH BENEFITS

Caution is required in estimating effects on morbidity and mortality from change in risk factors. It is, however, important to make a judgment about the benefits that might accrue if this programme were widely implemented. Little or no reduction in cancer incidence can be expected from systematic health checks because of their lack of effect on the prevalence of smoking and excessive alcohol use. To calculate the change in incidence of ischaemic heart disease that might result from their application, we used overviews of the effects of reducing cholesterol concentration and blood pressure that correct for the regression dilution bias.[24,25] The long term risk reduction in (combined fatal and non-fatal) myocardial infarction attributable to cholesterol reduction was projected to be 6% in men and 13% in women. The mean difference of 1·5 mm Hg in diastolic blood pressure, if not discounted as an accommodation effect, would add a further 7% reduction in long term risk of myocardial infarction and should also lead to fewer strokes. These estimates are comparable with the overall 12% reduction in risk of myocardial infarction predicted by the Family Heart Study Group on the basis of its one year results.[3] In a population such effects might well be considered worth while. It is, however, important to understand the limitations of such projections, particularly among women, in whom the strength of the association between cholesterol concentration and cardiovascular risk remains contentious.[26]

The benefits of health checks will, moreover, only come to those who attend them. In this trial, subjects were recruited after they had expressed some interest in their health by completing an initial survey questionnaire.[1] Despite this, almost half of nurses' time in the OXCHECK trial was taken up with recruiting patients to health checks. A third of attenders at first health checks had required more than one invitation and a fifth failed to take up the offer even after three invitations. A third of those scheduled for follow up appointments failed to attend them. At best, two thirds of the target population received a health check, and about half attended for both an initial check and the agreed follow up. The effectiveness of the intervention was further attenuated by the poorer attendance rates of those at higher risk.[9] Moreover men, who face a higher absolute risk of cardiovascular disease, showed less change than the women, perhaps because they attended for follow up less frequently. Clearly, health checks cannot be seen as any more than one part of a population strategy for reducing cardiovascular disease.

CONCLUSIONS

The effects of health checks, especially on diet, were sustained after three years. A particular strength of our study is its generalisability. The intervention was provided in a representative general practice setting by nurses who received training that could realistically be offered nationally. Substantial resources were, however, devoted not only to this training but to recruitment, intervention, and follow up. We did not measure the psychological impact of health checks, but there is enough evidence from previous studies to be concerned that they are not without harm to individual patients.[27] The question is therefore not whether health checks work but whether they work enough to justify their costs. Formal cost effectiveness analysis of our data is in progress, but primary health care teams are already well aware of the opportunity costs of systematic health promotion. Few will wish to relinquish all responsibility for prevention in the light of our results. Many, however, may now share the view of Stott *et al* that, "Rewarding general practitioners for population coverage rather than using more sensitive and practical approaches to individuals is unlikely to build on the natural advantages of primary care."[28]

One final lesson from the OXCHECK trial is the difficulty of performing rigorous health services research to inform policy. The study began before

Key messages

- This study shows that health checks by nurses in primary care lead to sustained changes in dietary behaviour and a reduction of about 3% in serum cholesterol concentration; effects on blood pressure are of questionable significance
- There is little effect on smoking or alcohol use, and more targeted approaches to modifying these behaviours may be appropriate
- Systematic implementation of health checks might lead to a reduction in risk of myocardial infarction among those who attend of about 5-15%; men, who are at higher risk, show less change than women
- Health checks consume substantial resources, and their effect is attenuated by non-attendance
- The benefits of health promotion through primary care must be weighed against their costs and in relation to other priorities

offering health checks became part of general practitioners' contractual obligation in 1990. Before the first year results of the trial had been published, this policy had been abandoned and replaced by a strategy whose value was no more certain. If policy makers cannot wait for research it is crucial that they are ready to modify their programmes when evidence becomes available.

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1 Imperial Cancer Research Fund OXCHECK Study Group. Effectiveness of health checks conducted by nurses in primary care: results of the OXCHECK study after one year. *BMJ* 1994;**308**:308-12.
2 Tunstall-Pedoe H. The Dundee coronary risk-disk for management of change in risk factors. *BMJ* 1991;**303**:744-7.
3 Family Heart Study Group. Randomised controlled trial evaluating cardiovascular screening and intervention in general practice: principal results of British family heart study. *BMJ* 1994;**308**:313-20.
4 Mant D. Health checks—time to check out? *Br J Gen Pract* 1994;**44**:51-2.
5 Stott N. Screening for risk in general practice. *BMJ* 1994;**308**:285-6.
6 McCormick J. Health promotion: the ethical dimension. *Lancet* 1994;**344**: 390-1.
7 Secretary of State for Health. *The health of the nation: a strategy for health in England.* London: HMSO, 1992. (Cm 1986.)
8 Imperial Cancer Research Fund OXCHECK Study Group. Prevalence of risk factors for heart disease in OXCHECK trial: implications for screening in primary care. *BMJ* 1991;**302**:1057-60.
9 Thorogood M, Coulter A, Jones L, Yudkin P, Muir J, Mant D. Factors affecting response to an invitation to attend for a health check. *J Epidemiol Community Health* 1993;**47**:224-8.
10 Roe L, Strong C, Whiteside C, Neil A, Mant D. Dietary intervention in primary care: validity of the DINE method for diet assessment. *Fam Pract* 1994;**11**:375-81.
11 Schofield T. Communication. In: Fowler G, Gray M, Anderson P, eds. *Prevention in general practice.* Oxford: Oxford University Press, 1993:60-7.
12 Gardner SB, Winter PD, Gardner MJ. *Confidence interval analysis (CIA).* London: BMJ Publishing Group, 1991.
13 Jamrozik K, Vessey M, Fowler G, Wald N, Parker G, Vunakis HV. Controlled trial of three different anti smoking interventions in general practice. *BMJ* 1984;**288**:1449-503.
14 Russell MH, Wilson C, Taylor C, Baker CD. Effect of general practitioners' advice against smoking. *BMJ* 1979;ii:231-5.
15 Silagy C, Mant D, Fowler G, Lodge M. Meta-analysis on efficacy of nicotine replacement therapies in smoking cessation. *Lancet* 1994;**343**:139-42.
16 Medical Research Council Working Party. MRC trial of treatment of mild hypertension: principal results. *BMJ* 1985;**291**:97-104.
17 Conroy RM, O'Brien E, O'Malley K, Atkins N. Measurement error in the Hawksley random zero sphygmomanometer: what damage has been done and what can we learn? *BMJ* 1993;**306**:1319-22.
18 Ramsay LE, Yeo WW, Jackson PR. Dietary reduction of serum cholesterol concentration: time to think again. *BMJ* 1991;**303**:953-7.
19 Neil HAW, Roe L, Godlee RJP, Moore J, Clark GMG, Brown J, *et al.* Randomised trial of lipid lowering dietary advice in general practice: the effects on serum lipids, lipoproteins, and antioxidants. *BMJ* 1995;**310**: 469-73.
20 Manson JE, Gaziano JM, Jonas MA, Hennekens CH. Antioxidants and cardiovascular disease: a review. *J Am Coll Nutr* 1993;**12**:426-32.
21 Silagy C, Muir J, Coulter A, Thorogood M, Roe L. Cardiovascular risk and attitudes to lifestyle: what do patients think? *BMJ* 1993;**306**:1657-60.
22 Frankel S, Davison C, Smith GD. Lay epidemiology and the rationality of responses to health education. *Br J Gen Pract* 1991;**41**:428-30.
23 Prochaska JO, DiClemente CD. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol* 1983;**51**:390-5.
24 Law MR, Wald NJ, Thompson SG. By how much and how quickly does reduction in serum cholesterol concentration lower risk of ischaemic heart disease? *BMJ* 1994;**308**:367-72.
25 Collins R, Peto R, MacMahon S, Hebert P, Fiebach NH, Eberlein KA, *et al.* Blood pressure, stroke, and coronary heart disease. II. Short-term reductions in blood pressure: overview of randomised drug trials in their epidemiological context. *Lancet* 1990;**335**:827-38.
26 Hulley SB, Walsh JMB, Newman TB. Health policy on blood cholesterol. Time to change direction. *Circulation* 1992;**86**:1026-9.
27 Haynes BR, Sackett DL, Taylor DW, Gibson ES, Johnson A. Increased absenteeism from work after detection and labelling of hypertensive patients. *N Engl J Med* 1978;**299**:741-4.
28 Stott NCH, Kinnersley P, Rollnick S. The limits to health promotion. *BMJ* 1994;**309**:971-2.

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A MEMORABLE PATIENT

An African woman weeps

Theresa was waiting for an operation in an African hospital. But as there were so many patients her operation would have to be postponed for another day, or week, or perhaps months. Such postponements are common and the patients quietly wrap their covering sheets around themselves, pick up their medical records, and make their way back to the wards from the waiting area of the operating theatre. Disappointed as most patients are when this happens they are usually hopeful because to have got this far means that they will ultimately get their operation. But Theresa had lost hope and cried in a way that I had never seen an African woman cry before. As I passed I could see the tears just roll down her cheeks as she sat quietly and waited resigned and dignified. During my several working trips to Africa I had seen and heard many women cry in Africa. When the children die the mothers weep and wail and throw themselves on the floor in a way that is very disturbing but Theresa's tears were of a different kind and I was perplexed and curious.

From her medical history I could work out a large part of her story. She was probably from a remote part of Africa. Married at a young age her pregnancy and labour would have been poorly managed. Many hours of obstructed labour occurred before some form of delivery, most likely of a dead baby, was carried out. By that time the pressure of the baby's head on the mother's pelvis had damaged her bladder so badly that now she leaked urine continuously. Her vesicovaginal fistula needed major surgery. In some ways she was fortunate. She had not died in obstructed labour as so many thousands of women do in Africa. Eventually she had managed, no doubt with many difficulties, to find the means to travel perhaps over 50 km to our hospital where she was now waiting for some chance of a cure.

I called one of the nurses over to translate for me and to find some explanation for her weeping. It seemed that Theresa knew that the next day there was to be a government plan to start charging fees for operations. She was a poor woman without money. She thought that as her operation was to be postponed she had lost hope of a cure. All her previous waiting would be in vain and hence the tears.

Under pressure from the International Monetary Fund and the World Bank many powerless African governments have been forced to introduce cuts in health care and education and charge for treatment. Theresa's tears were the human consequences of these policies. No doubt there are many thousands of people like Theresa in Africa. The poorest of the poor are bearing a burden with their lives for the policies of the banks. The debt repayments, the arms trade, and the international unjust trade policies rob Africa of any economic progress. A new brutal and insidious slavery is being perpetuated.—RAY TOWEY *is a consultant anaesthetist in London*