Hyperlipidaemia in general practice: three year follow up of an opportunistic screening project

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SUMMARY. As part of the national lipid screening project 927 people with a plasma cholesterol level greater than 6.5 mM were detected by screening 4006 men and women aged 25–59 years. Three years later 801 of the 878 patients eligible for a follow-up study (91%) had been followed up at least once. The median number of follow-up visits was two. The bulk of the workload fell on the nursing staff. The mean decrease in cholesterol level was 8–14% in those receiving dietary advice only, 15–25% in those receiving additional drug treatment and 12% for all patients. A proportion of this decrease must be attributable to regression to the mean, loss to follow up when patients were doing well, and the patients' knowledge of their follow-up date. Data on a group of patients not attending for regular follow up suggest that regression to the mean could account for up to 7% of the cholesterol reduction observed. Screening for hyperlipidaemia in general practice is feasible when the necessary infrastructure is provided, but even with a fairly conservative protocol 3% of those screened received drug treatment.

Introduction

REDUCTION in plasma cholesterol levels, particularly low density lipoprotein cholesterol, is known to reduce the risk of coronary heart disease in those with high cholesterol levels,[1,2] and it is believed that some benefit will occur at lower levels. Approximately half the deaths from coronary heart disease in the UK among people aged 25–59 years occur in the 75% of the population with a plasma cholesterol level of less than 6.5 mM,[3,4] and a strategy to reduce plasma cholesterol levels in the whole population is essential. This strategy must include changes in food production as well as health education. Although the extent of mean cholesterol reduction in community based programmes in the United States of America[5] and elsewhere has been less than 5% this seems encouraging and worthwhile. However, in the UK and other similar countries appreciable numbers of people would still have high plasma cholesterol levels. An individual strategy to identify and treat those at high risk is therefore required to complement a population strategy.[6]

The feasibility of such an individual strategy based in general practice was assessed by an audit of the management of patients with a plasma cholesterol level greater than 6.5 mM identified by screening in the Oxford arm of the national lipid screening project. The patients were followed up to assess their response to management. They remained under the care of the general practitioner, although the follow up was carried out primarily by practice nurses coordinated by a 'nurse facilitator' who liaised between the practices and the hospital lipid clinic.

Method

As part of the national lipid screening project 4006 people aged 25–59 years were screened in 1985–86 in nine Oxford general practices.[3] After patients had fasted overnight a venous blood sample was taken and placed in ethylenediaminetetraacetic acid (EDTA). Total cholesterol, cholesterol in lipoprotein subfractions and triglyceride concentrations were measured enzymatically in one laboratory.[7-9] Nine hundred and twenty seven participants had a plasma cholesterol concentration greater than 6.5 mM. Seven of the nine practices participated in this follow-up study and 878 patients were eligible for follow up.

At the beginning of the screening project in Oxford a meeting was held in all practices, and a protocol for managing hyperlipidaemia was explained. The protocol was based on the policy statement of the European Atherosclerosis Society,[10] although several aspects were simplified. The recommended management was based primarily upon dietary modification, weight reduction and other lifestyle changes, with drug treatment reserved for those who failed to respond adequately. Responsibility for follow up was vested primarily in the practice nurse, who was expected to give the initial advice and to ask patients to return within three months for a repeat blood test if their total cholesterol level was above 6.5 mM. The nurse was advised that if the cholesterol level at the repeat test had fallen to 6.5 mM or less, this could be regarded as satisfactory. Although a further test was desirable after 12–18 months, no further intervention was necessary. If the cholesterol level remained above 6.5 mM, further advice or referral to the general practitioner was suggested. Full details are given in Appendix 1.

The coordinating nurse (B M) visited each practice regularly (at least fortnightly), and was available for consultation on the management of individual patients. The practice nurse completed a record card for each visit and later added the laboratory results. Occasionally, she completed a record card when a patient saw the general practitioner if she was aware of the visit. After two years, patients who had an initial cholesterol level greater than 6.5 mM but no record of follow up were identified. They were sent a letter requesting them to attend the surgery for follow up. Those not responding were sent a follow-up letter and then telephoned (if possible) with a request to attend the surgery.

At the end of the three year follow-up period, all 28 general practitioners and seven practice nurses completed a questionnaire on the workload and the benefits of identifying and following up patients with hyperlipidaemia.

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The data were analysed on the university mainframe computer using the SPSS-X package, and statistical significance assessed by the paired *t*-test (as the differences between means were approximately normally distributed).

Results

Feasibility

Of the 878 eligible patients with an initial cholesterol level greater than 6.5 mM, 801 (91%) had been followed up at least once at the end of three years (417 men and 384 women). Only 77 patients were lost to follow up: 38 had moved, four had died and 35 refused to take part in the study (mostly owing to illness or social problems). The median number of follow-up visits was two; 36% of patients were followed up once, 39% twice, and 25% on three or more occasions. Five per cent of all patients, and 10% of those with an initial cholesterol level greater than 8.0 mM were seen on five or more occasions. The number of attendances was almost identical in men and women (820 versus 793).

When completing the questionnaire, all seven practice nurses were enthusiastic, commenting that the project represented a considerable workload but was worth the effort. The 28 general practitioners were less unanimous. There was marked variation in the amount of extra work reported. One doctor said he had noticed no difference in his workload and four said they had been overwhelmed. If a consensus existed, it was that the project had represented considerable extra work for the practice but perhaps added only one or two extra consultations each week for the individual doctor. All doctors agreed that the project had improved their understanding and ability to manage hyperlipidaemia: at the end of the study 17 felt confident, nine felt their management had improved, and only two still felt 'muddled' over certain issues. Thirteen doctors said they would volunteer to repeat the exercise, seven that they might, seven that they would not and one expressed no opinion. The primary reason given for not wishing to continue with screening was the extent of the task and the lack of financial support for what was seen as an open-ended commitment.

Outcome

The effect of setting a target cholesterol level of 6.5 mM meant that patients were not always followed up after they had achieved a level of 6.5 mM or less, and follow-up intervals were not uniform. In the first two years 61% and 57%, respectively, of the patients lost to follow up had a total cholesterol level of 6.5 mM or less when last checked. This tendency to discontinue follow up when patients are doing well may be good clinical practice, but it can lead to an overestimation of success in cholesterol lowering. To avoid this bias, the data are presented according to the interval between the first screening consultation and the latest follow-up visit. Table 1 shows the overall change of plasma cholesterol, high density lipoprotein cholesterol and triglyceride levels according to the length of follow up. The fall in cholesterol level was greater in those patients followed up for shorter periods, but the effect was not marked. The fall in mean total cholesterol level was 13.7% in those followed up for less than six months compared with 10.8% in those followed up for more than 18 months, with an overall reduction in all patients of 12.0%. Identical trends were observed when the data were examined in men and women and by age groups. In the 328 patients followed up for over a year who were also seen within six months, most of the reduction in cholesterol level was achieved in the first six months (10.2% reduction at six months, 12.4% at final follow up). Generally the cholesterol reduction achieved was sustained for the whole follow-up period.

Table 2 shows the change in plasma cholesterol level according to the initial level. Patients with the highest initial cholesterol levels showed the greatest mean reduction in cholesterol levels. More than four out of five patients with initial cholesterol levels of 8.0 mM or more had decreased their levels by at least 5% at final follow up. In those patients followed up on more than one occasion, the maximum lowering in cholesterol level was again achieved early on. In the group with an initial cholesterol level of 6.6–7.9 mM ($n=262$), the mean level fell from an initial value of 7.1 mM to 6.5 mM after six months and was 6.4 mM at one year. In those with initial levels of 8.0 mM or greater (mean 8.6 mM, $n=66$) the values of six and 12 months were 7.5 mM and 7.1 mM, respectively. In all groups shown on Table 2, at least 67% of patients reduced their cholesterol levels by at least 5%. Once again the data were very similar for men and women and for patients of different ages.

Table 3 shows the effect of different methods of treatment on plasma cholesterol, high density lipoprotein cholesterol and triglycerides levels. The fall in mean total cholesterol level in patients receiving drug treatment was between 15% and 25%. In patients receiving bezafibrate or gemfibrozil the mean triglyceride level fell to about half the initial level. Follow up for less than six months usually meant that the patient's cholesterol level had fallen below 6.5 mM with dietary changes only and the patient was excluded from further follow up in accordance with the study design. Nobody followed up for less than six months received drug treatment. Overall 114 patients were treated with drugs, representing 3% of the population initially screened. The higher initial triglyceride levels in the fibrate-treated group reflects the selection of drug treatment according to plasma triglyceride levels (Appendix 1).

In the absence of a control group, it is important to note the results of the 26 patients who attended for follow up after two letters and a telephone call as these are the patients who are least

Table 1. Mean cholesterol, high density lipoprotein (HDL) cholesterol and triglyceride levels at initial screening and final follow up according to time between first screening consultation and the latest follow-up visit.

Final follow up at:		Mean cholesterol level (mM)			Mean HDL cholesterol level (mM)				Mean triglyceride level (mM)			
	n[a]	Initial	Final	% change (95% CI)	*n*	Initial	Final	% change (95% CI)	*n*	Initial	Final	% change (95% CI)
<6 months	136	7.3	6.3	*−13.7 (−11.5, −15.9)*	127	1.5	1.4	*−6.7*[b] *(−2.6, −10.6)*	135	1.8	1.5	*−16.7 (−8.4, −24.9)*
6–18 months	286	7.5	6.5	*−13.3 (−11.5, −15.2)*	262	1.5	1.4	*−6.7 (−3.2, −10.2)*	276	2.0	1.6	*−20.0 (−13.5, −26.5)*
19+ months	378	7.4	6.6	*−10.8 (−9.3, −12.4)*	330	1.5	1.4	*−6.7 (−3.4, −9.4)*	335	1.9	1.6	*−15.8 (−9.7, −21.8)*

[a]Data missing for one patient. All changes in mean are significant at $P<0.01$, except [b]$P<0.02$.
n = number of patients. CI = confidence interval.

Table 2. Change in mean cholesterol level, and percentage change in cholesterol level, between initial screening and final follow up according to initial cholesterol level.

Initial cholesterol level (mM)	*n*	Mean cholesterol level (mM)		% change (95% CI)	% of patients with change in cholesterol level	
		Initial	Final		<5% decrease	5+% decrease
Final follow up at <6 months						
6.6–7.9	113	7.1	6.2	−12.7 (−10.6, −15.2)	24.8	75.2
8.0+	23	8.6	7.1	−17.4 (−12.1, −23.2)	8.6	91.2
Final follow up at 6–18 months						
6.6–7.9	221	7.1	6.3	−11.3 (−9.9, −13.5)	28.5	71.5
8.0+	65	8.9	7.1	−20.2 (−16.4, −24.8)	18.4	81.4
Final follow up at 19+ months						
6.6–7.9	312	7.1	6.5	−8.5 (−7.3, −10.4)	32.7	67.3
8.0	66	8.6	7.1	−17.4 (−14.2, −22.2)	19.7	80.3

All changes in means are significant at $P<0.01$.
n = number of patients. CI = confidence interval.

Table 3. Mean cholesterol, high density lipoprotein (HDL) cholesterol and triglyceride levels at initial screening and final follow up according to treatment group.

Method of treatment	*n*	Mean cholesterol level (mM)		% change (95% CI)	*n*	Mean HDL cholesterol level (mM)		% change (95% CI)	*n*	Mean triglyceride level (mM)		% change (95% CI)
		Initial	Final			Initial	Final			Initial	Final	
Final follow-up at <6 months												
Diet only	136	7.3	6.3	−13.7*** (−11.6, −16.0)	127	1.5	1.4	−6.7* (−1.1, −9.2)	135	1.8	1.5	−16.7*** (−8.2, −24.8)
Final follow-up at 6–18 months												
Diet	249	7.4	6.5	−12.2*** (−10.8, −14.3)	228	1.5	1.4	−6.7*** (−6.0, −13.4)	240	2.0	1.6	−20.0*** (−9.5, −23.0)
Diet + fibrate[a]	21	8.3	6.5	−21.7*** (−14.2, −29.2)	18	1.3	1.2	−7.7 (+5.5, −16.0)	20	3.3	1.6	−51.5*** (−32.9, −65.7)
Diet + cholestyramine	16	8.8	6.6	−25.0*** (−13.2, −36.5)	16	1.6	1.4	−12.5 (+1.9, −27.3)	16	1.7	1.7	0.0 (+13.1, −15.1)
Final follow-up at 19+ months												
Diet	301	7.2	6.6	−8.3*** (−7.5, −10.7)	262	1.5	1.4	−6.7*** (−5.1, −11.2)	265	1.8	1.6	−11.1* (−1.2, −13.6)
Diet + fibrate[a]	36	8.1	6.5	−19.8*** (−14.2, −24.9)	32	1.4	1.6	+14.3** (+23.6, +6.4)	33	2.7	1.5	−44.4*** (−22.3, −66.8)
Diet + cholestyramine	41	8.0	6.8	−15.0*** (−8.6, −19.4)	36	1.6	1.6	0.0 (+3.8, −7.3)	37	1.8	1.7	−5.6 (+11.4, −20.2)

*$P<0.05$, **$P<0.01$, ***$P<0.001$.
n = number of patients. CI = confidence interval. [a]Bezafibrate or gemfibrozil.

likely to have altered their behaviour. Their initial mean cholesterol level was 7.1 mM and their final level 6.6 mM. This fall of 7.0% (95% confidence interval 5.7–8.2%) probably represents the maximum magnitude of change in a non-compliant or control group.

Discussion

The initial screening project[3] demonstrated that screening for hyperlipidaemia on an opportunistic basis is feasible with the support of a trained nurse facilitator, and was consistent with the findings achieved by the Oxford heart attack and stroke project.[11] As some 90% of people attend their general practitioner within a five year period,[12] it is quite possible that an entire practice could be screened opportunistically if organization and enthusiasm could be maintained. This follow-up audit goes further and suggests that a reasonable degree of follow up can also be achieved. The majority of patients were followed up at least once, and most achieved a substantial reduction in plasma cholesterol level.

In the absence of a control group several factors must be taken

into account when interpreting the overall reduction in cholesterol level. First, some allowance must be made for regression to the mean. On the basis of the change in the 26 patients who required repeated attempts to persuade them to reattend, this regression to the mean could account for up to 7% of the 12% reduction seen. It is unlikely to exceed this, and may well be less if some of this group were partially compliant. Secondly, patients were not followed up when they responded to management, and some may have subsequently relapsed. Thirdly, patients knew their follow-up date, and could have modified their diets just before the appointment. Nevertheless, despite these reservations, the reductions in cholesterol levels are striking.

It is agreed that the UK needs a population strategy aimed at decreasing the overall prevalence of hyperlipidaemia by general dietary and lifestyle changes. It would be aimed as much at the social and political environment as at the individual, aiming to create a society in which individual change may occur. An individual strategy provides individual health education and treatment in a general practice setting, and would be complementary to the population strategy. The success of an individual strategy will depend to a considerable extent upon the provision of an infrastructure of support for participating general practices.

Our strong impression is that a coordinator is needed. Although the results reported here are from seven practices receiving little formal support except for initial guidance on an appropriate follow-up and treatment protocol, the key role of the nurse coordinator must not be underestimated. In west Oxfordshire, the coordinating nurse provided liaison with the lipid clinic, visited each practice at least fortnightly, tried to ensure follow up was arranged when necessary and was available for consultation on the management of individual patients. Although we can provide no supporting data, it is the opinion of all the collaborators that without her support follow up would have been much less complete, and several practices would have withdrawn. If identification and management of hyperlipidaemia in general practice is to become a service reality rather than an isolated event linked to research projects, the role of the nurse facilitator must be consolidated for the efficient running of this and other prevention programmes.

Some source of expert advice is also needed. In normal practice, most patients could be managed by the general practitioner up to and including the institution of drug therapy. Only unresponsive cases or cases where doubt about diagnosis or treatment exists would need to be referred. Nevertheless, special expertise or a referral centre is still needed in any district proposing to undertake screening, and this project involved support from a long established lipid clinic. The involvement of a dietitian is also essential, primarily to train and advise the nurse facilitator and the primary health care staff, but also to help the most difficult patients and those at highest risk.

The availability of cholesterol measurements should be considered. It seems likely that knowing the cholesterol level would increase the impact of the initial dietary advice given to those with high levels and reduce the impact in those with low levels, and this area needs investigation. Portable dry chemistry machines are now available which give an immediate measurement of cholesterol levels. The fact that the total cholesterol level is relatively unaffected by meals and that most clinical decisions can be made on the basis of this result simplify both the screening and follow-up procedure. However, special attention must be paid to training operators of these machines and to maintaining a policy of adequate quality control.

The issue of long-term follow up was not addressed in this study. Once control of lipid levels has been achieved in those with cholesterol levels above 6.5 mM, patients will probably need to be followed up every 12 to 18 months. For those with cholesterol levels below this, five-yearly follow up could be considered. This will generate a considerable practice workload and there will be a need for a register and information system to generate call and recall lists. Consequently, detailed proposals for the provision of a computerized information system and for reimbursement of preventive work in general practice must be reviewed. A Department of Health standing medical advisory committee working party is considering the issue of cholesterol screening. The continuing negotiations over the 1987 white paper on primary care,[13] and the repercussions from the 1989 white paper, *Working for patients,*[14] have major implications for such activities.

Appendix 1. Protocol used for management of hyperlipidaemia in general practice.

1. Recruitment. Practices adopted different methods for recruiting people into the screening programme. Most commonly, a letter was handed to patients attending surgery for other matters. This offered an appointment to see the screening nurse, and briefly described what was involved. Some practices posted this letter to a random sample of their patients. Posters in the waiting area alerted people to the service, and undoubtedly the information was passed by word of mouth.

2. Initial consultation. The initial consultation was performed by nurses and was based on the pattern pioneered by the Oxford heart and stroke project;[6] it involved identification of coronary heart disease risk factors, tetanus immunization and cervical cytology status where appropriate. Counselling was given, with particular emphasis on smoking cessation, weight reduction and exercise. Those with raised blood pressure were managed according to practice protocols.

A fasting blood sample was taken to gain epidemiological evidence of population lipid levels. General dietary advice based on a healthy eating leaflet was given at the initial consultation without the knowledge of the plasma cholesterol level. Subsequent advice and management was based primarily on cholesterol levels.

3. Management of hyperlipidaemia. Most people screened left a stamped addressed envelope for their results. Those with cholesterol levels below 5.5 mM were advised that their levels were satisfactory. Those with levels between 5.5 and 6.5 mM were told that their levels were higher than desirable and were offered simple written dietary advice. In view of the numbers involved, no formal follow up was arranged for these two groups. Those with levels between 6.6 and 7.4 mM were informed by letter that their level was 'higher than is desirable but no cause for concern if you follow the suggestions listed below about diet and other habits'. They were also told by the practice nurse about smoking cessation, and to see their doctor if they were taking the oral contraceptive pill or diuretics. The dietary advice aimed to reduce total fat to around 30% and saturated fat to less than 10% of total energy intake. Increased proportions of unsaturated fats, complex carbohydrates, and more dietary fibre, particularly soluble fibre were advised. When weight reduction was indicated, energy reduction and exercise were advised. A repeat blood test was performed after about 12 weeks. A reduction in cholesterol level to 6.5 mM or less was regarded as satisfactory.

Patients whose cholesterol level remained above 6.5 mM and those with an initial cholesterol level of 7.5 mM or above were managed as follows. Secondary causes of hyperlipidaemia were sought, in particular diabetes, excess alcohol intake, hypothyroidism and drugs (for example oestrogens, steroids, thiazides), and specific treatment for the conditions identified was instituted. A diagnosis of a primary genetic hyperlipidaemia was considered, taking account of a person's fasting lipid profile and age, family history of hyperlipidaemia or early coronary heart disease, and the presence of tendon xanthomas. Up to 1% of the population are in this category and they need vigorous management as they have the highest risk of early heart disease. All these patients had individual dietary advice reinforced on several occasions before drug therapy was considered.

4. Referral to lipid clinic. All those with cholesterol levels above 7.5 mM were initially referred to a lipid clinic in order to estimate the incidence of undiagnosed monogenic familial hyperlipidaemia. As expertise in the practices increased only those with levels over 8.0 mM were referred.

5. Drug treatment. Drug treatment was considered for those whose plasma cholesterol level remained at 7.5 mM or above once secondary hyperlipidaemia was excluded and adequate dietary modification achieved, including weight loss as necessary. Most people with familial hyperlipidaemia received lipid lowering medication. Exceptionally, in patients aged under 35 years, or those with hypertension, diabetes or

a particularly strong family history of early coronary heart disease, treatment was considered for cholesterol levels between 7.0 mM and 7.5 mM.

Those with raised cholesterol levels and triglycerides levels under 2.5 mM were prescribed cholestyramine in gradually increasing dosage to minimize gastrointestinal upset. The usual dose was 16 g per day (four sachets) with a range of 4 to 24 g per day.

A fibrate (bezafibrate or gemfibrozil) was prescribed for those with raised cholesterol levels and triglyceride levels of 2.5 mM or above, for those with hypertriglyceridaemia (triglyceride levels above 5.0 mM), and for those unable to tolerate cholestyramine.

A combination of cholestyramine and a fibrate was sometimes used if the response to a single drug was inadequate.

6. Follow up. Maintenance of follow up was achieved by a manual card index because few routine recall systems existed in the practices.

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