

# The primary prevention of atherosclerosis in general practice\*

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**SUMMARY.** The prevention of atherosclerosis, especially ischaemic heart disease, in general practice is important. The evidence for and against the various risk factors is reviewed, and the rationale for screening and health education is examined. I conclude that health education and screening for risk factors are likely to be more successful in decreasing morbidity and mortality than treating established disease.

There are arguments for and against screening and health education and about the effectiveness of various schemes. Much of the routine work of health education and screening can be carried out by suitably trained health visitors, practice nurses, or community nurses.

### Introduction

**A**THEROSCLEROSIS, principally comprising ischaemic heart disease and cerebrovascular disease, is an important cause of death in this country.

The Registrar General (1975) showed that 31 per cent of all male deaths and 24 per cent of all female deaths were due to hypertensive or ischaemic heart disease. In the same year cerebrovascular disease was responsible for 10.5 per cent of male and 17.0 per cent of all female deaths. Similar figures are found when days lost from work due to certified incapacity and hospital bed occupancy are considered.

### Aims

My aims are first, to review briefly the evidence for and against the various risk factors in the pathogenesis of atherosclerosis with particular reference to ischaemic heart disease; and secondly, to examine medical and public attitudes to the concept of screening and health

education for the prevention of atherosclerosis and subsequent implications for the various ways in which screening and health education can be carried out. Special attention will be given to the use of ancillary workers such as health visitors and community and practice nurses.

### Risk factors

#### *Cigarette smoking*

Among the extensive literature on the cause of ischaemic heart disease (IHD) in particular, there is almost universal agreement that cigarette smoking is an important factor (Kannel, 1976). In a population study from Göteborg, Sweden, Tibblin (1967) showed that of a group of 50-year-old men who had developed IHD, fewer than ten per cent were non-smokers compared with 40 per cent of healthy men. Although (as with all risk factors) a definite causal relationship cannot be shown, there is no doubt about the close relationship of cigarette smoking and IHD.

There is not such a striking relationship between cigarette smoking and cerebrovascular disease. However, Menotti and Puddu (1971) have reviewed evidence to that date and conclude, especially with thrombotic cerebrovascular disease, that smoking is a significant risk factor. There is universal agreement about the relationship between cigarette smoking and peripheral vascular disease.

#### *Hypertension*

Much controversy surrounds the definition of hypertension, be it systolic or diastolic, phase 4 or phase 5. However, for the purpose of estimating the risk of developing IHD, risk is simply proportional to the blood pressure level (Dawber and Kannel, 1972). The Veterans' Administration Study (1967 and 1970) has demonstrated the favourable effect of antihypertensive agents in cerebrovascular disease.

#### *Hyperlipoproteinaemia*

There has probably been more discussion about the

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place of hyperlipoproteinaemia in the atherosclerotic process than any other risk factor. The publication of the joint report by the Royal College of Physicians of London and the British Cardiac Society (1976) recommending for the whole community a reduction in the amount of saturated fats and partial substitution of polyunsaturated fats has produced some criticism. However, there are now reports from 18 international committees giving similar advice (Turner, R. W. D. 1977; personal communication).

Studies such as those of Kannel (1971) have shown that random blood cholesterol levels are proportional to the risk of coronary heart disease. More recent analysis of the Framingham results (Gordon *et al.*, 1977) has shown that total cholesterol is much less accurate in predicting those patients who will develop IHD than a measurement of high density lipoproteins (HDLs) or alpha cholesterol, and low density lipoproteins (LDLs) or beta cholesterol. HDLs protect against IHD and high levels are beneficial, whereas LDLs predict risk; in other words, the higher the levels the greater the risk of developing IHD. Comparable results have now been published from the Tromsø Heart Study (Miller *et al.*, 1977), and yet further supportive evidence has come from New Zealand (Stanhope *et al.*, 1977). These results imply that a more complex biochemical screening approach may be necessary.

#### *Physical activity*

Kannel and colleagues (1971) have shown that physical activity appears to protect against the development of IHD. The amount of exercise needed to give protection, however, was less than that required to produce physical fitness. Professor Morris and co-workers (1973) in a study of male civil servants have shown that habitual vigorous exercise protects against the development of IHD. Blackburn (1976) has criticized much of the work which attempts to examine the effect of exercise on IHD protection, pointing out the design difficulties. However, as there are so many obvious advantages in regular moderate exercise, advice in this direction can be given without hesitation.

#### *Overweight*

Excess weight is associated with an increased incidence of IHD, thrombotic cerebrovascular disease, and congestive heart failure (Gordon and Kannel, 1973). However, the association is weakest for IHD, especially in women. There was no association with peripheral vascular disease.

There is as yet no clear evidence that the overweight person, who is free of other risk factors, is still at increased risk (Stamler and Epstein, 1972). The undesirability of being overweight from a general medical standpoint, however, is undisputed.

#### *Family history*

There is evidence not only of an increased risk of IHD in close relatives of people who develop IHD before the age of 50 (Epstein, 1967), but also in spouses (Kannel,

1976). Genetic influences, such as in the hyperlipoproteinaemias (Fredrickson *et al.*, 1967) are relatively uncommon, and it appears that environmental factors probably play an important part.

#### *Personality, stress, and behaviour*

Friedman and Rosenman (1959) have described "coronary-prone" individuals who have a particular behaviour pattern (Type A). Personality seems to be more important than stress.

#### *Diabetes mellitus*

The Framingham Study (Kannel, 1976) has demonstrated that regardless of blood pressure or lipid levels, the risk of IHD is further increased in those with impaired glucose tolerance. However, is diabetes mellitus an independent IHD factor? Studies from the Dupont survey (Pell and D'Alonzo, 1970) suggest that clinical diabetes mellitus is an independent risk factor. The debate about chemical diabetes mellitus is not yet settled.

#### *Hyperuricaemia*

This is often associated with other risk factors such as hypertension, hyperglycaemia, and overweight, and its affect as an individual factor appears to be small.

#### *Relative importance and additive action of risk factors*

Stamler (1974) reviewing the literature concludes that the major risk factors are hypertension, cigarette-smoking, and hypercholesterolaemia. Using data from the Framingham Study, Professor Rose has demonstrated the additive effect of risk factors (Blackburn, 1976).

It is easy to overlook the patient with only marginal increases in all major risk factors. From an evaluation of the Framingham data, Kannel (1976) has reported that with knowledge of the major risk factors it is possible to define the ten per cent of the asymptomatic population in whom 25 per cent of ischaemic heart disease, 40 per cent of peripheral vascular disease, and 50 per cent of cerebrovascular disease and congestive cardiac failure will develop. Werko (1974) has shown that correcting only one risk factor will have little overall effect and that a multifactorial approach to the problem seems necessary.

#### **Screening for risk factors and health education**

##### *Rationale for screening*

The risk of developing manifestations of atherosclerosis can be predicted in many individuals. Atherosclerosis has an incubation period of many years, and by the time clinical evidence is forthcoming there is usually advanced arterial damage. Efforts have been made to cut down the delay time from onset of symptoms of myocardial infarction to the arrival of trained staff (Black and Brown, 1973). The main effect of this

campaign, however, was to convert sudden deaths in the community to hospital mortalities. Inevitably there will be some advantage from this approach, but the impact on the problem as a whole will be very small. Thus, there are compelling reasons why our efforts should be directed towards prevention rather than cure, and therefore screening and health education must largely replace traditional management (Turner and Ball, 1973).

#### *Arguments for and against screening and health education*

Although most workers in this field report that there appears to be no increase in neurosis in patients screened and given preventive advice, Mayou (1973) has stressed that we must examine this possibility carefully. Meade and colleagues (1974) are doubtful whether IHD can be prevented by the introduction of screening based on present knowledge. They suggest that public acceptability of measures advocated is all too often taken for granted and that to control all risk factors needs "a revolution in life styles which people appear unwilling to attempt". They also make the point that if present recommendations for the prevention of IHD are shown to be wrong, it will make "acceptance for more effective measures difficult to gain later on".

However, even if the multifactorial hypothesis for the pathogenesis of IHD is proved to be wrong, advice about smoking, exercise, and moderate diet can only be beneficial to the general health of the population. Screening for hypertension is of undoubted value and the detection of glycosuria may, at the least, prevent the presentation of hyperglycaemic crisis. Thus, the only questionable factor is screening for hypercholesterolaemia.

Kannel (1976) sounding a cautionary note, maintains that screening may be "counter-productive to the subject's sense of security, insurance eligibility; his job and recreational preference may be affected". On the other hand he may be "falsely reassured of perpetual immunity". Obviously the influence of medical staff on the future lives of patients must be considered and this is where a personal approach by a physician, health visitor, or nurse who knows the patient or his family is likely to result in more realistic advice and action for the individual. It is when there is a blind rush to screen everyone quickly that problems such as those detailed by Kannel (1976), and Meade and colleagues (1974), become evident. As an example of a conservative approach Rankin and colleagues (1976) are screening an average of only two men per week but, as they point out, this will produce a hundred contacts in a year, and possibly affect about 300 to 400 people (if families are included).

#### *Acceptability and effectiveness of screening and health education*

If we argue that screening and health education are worthwhile, we should consider the evidence for

acceptability and effectiveness. Rankin and colleagues (1976) have studied the feasibility of screening for IHD factors in general practice. Although in a predominantly middle-class practice area only 57 per cent (106) of men aged between 35 and 44 accepted an invitation to be examined for IHD risk factors. In the Framingham Study 68 per cent of the population contacted elected to participate. Non-respondents have had a persistently greater mortality (Gordon *et al.*, 1959). Fifty-three per cent (89) were seen a second time at six or twelve-month intervals. At this second examination 33 out of 44 obese patients had managed to lose weight, 41 patients out of 89 had increased the amount of exercise they took, but only seven out of 38 cigarette smokers had stopped smoking completely and seven had cut down. Cholesterol levels fell an average of 39 mg/100 ml (1.0 mmol/l) in the 29 men with an initial plasma cholesterol greater than 250 mg/100 ml (6.47 mmol/l). Predictably smaller falls were observed in those men with initially lower levels. These results are encouraging and confirm the work of Evans and colleagues (1972) who have shown that hyperlipoproteinaemia can be reduced by a fat restricted diet. The general conclusion from the paper by Rankin and co-workers must be, however, that acceptance rates for screening and subsequent favourable changes in risk factors after health education are only variably successful.

There have been several papers investigating the effectiveness of antismoking advice. Thus Burt and colleagues (1974) gave detailed firm advice to 125 survivors of acute myocardial infarction advising them to give up smoking. Sixty-three per cent were persuaded to give up, as opposed to 27.5 per cent of a control group of 85 patients. At follow-up 11.4 per cent had restarted smoking.

Unfortunately the evidence from large-scale industrial screening projects such as the Heart Disease Prevention Project suggests that favourable changes in risk factors after counselling are minimal (Rose, 1977; personal communication).

Even in high risk groups where written and verbal advice was given, only about five per cent had stopped smoking completely at follow-up and 20 per cent had cut down tobacco consumption. Similarly cholesterol levels had fallen only eight to ten per cent and there was no effect on weight. Perhaps these disappointing results are partly explained by the mass approach to the problem. The medical profession's efforts to reduce cigarette smoking tend to be frustrated by the economic and political strength of the tobacco industry (Mackie, 1976). Despite this, a recent 45-second advertisement on television produced 60,000 requests for antismoking literature. Changing public attitudes by means of health education is immensely difficult. As Lynn (1972) points out, the medical profession has a poor record when it comes to influencing changes in public attitudes, and this is illustrated by looking at the small number of health service individuals who 'live as they preach', the only major exception being doctors.

There is no doubt that person-to-person contact is the most effective way of communication, but even so the average person can retain very few facts after a consultation (Epstein, 1967). The ability to retain information from posters is also poor. These points have great practical significance because in a screening/education programme for the prevention of IHD, multiple facts must be assimilated by those participating. Ways must therefore be found of obtaining maximum retention of information presented. Home visits made by health visitors are noticeably more successful *after* the results of screening have been made available (Rankin *et al.*, 1976). There are, therefore, many queries about the effectiveness of screening and health education programmes, and a further consideration is: who should carry out screening and education?

#### *An interdisciplinary approach to screening and health education*

Kark and colleagues (1976) in Jerusalem have described a community-orientated screening programme for hypertension, atherosclerotic diseases, and diabetes. Although excellent, this comprehensive screening/education programme is probably too elaborate for the average general practitioner to implement. Reduced to its bare essentials, screening for the major risk factors contributing to IHD and other forms of atherosclerosis could include:

1. A simple questionnaire about family history, smoking and eating habits and exercise.
2. Measuring weight, height and blood pressure.
3. Simple urinalysis.
4. Taking a venous blood sample for cholesterol estimations.

Any competent health visitor, community nurse, or practice nurse can perform these tasks after a short period of training. Rankin and colleagues (1976) have clearly demonstrated the practicality of using a health visitor in general practice to undertake many of the tasks detailed above.

Rankin (personal communication) recently extended the scope of activity of the health visitor to include the whole of the initial screening consultation. Follow-up examinations in patients who have been identified as having one or more major risk factors are then carried out by the general practitioner but, once again, delegation is possible.

#### *The use of community nurses, health visitors and practice nurses*

Most general practices have variable attachments of community nurses, practice nurses, and health visitors, with each group having diverse workloads and motivation. It is essential, therefore, that there is a flexible approach to the instigation of a screening/health education programme. It is also likely that in any one practice there can be a sharing of responsibilities

between the various groups. If we accept that the nursing staff are to be largely responsible for screening and health education, what are the economic and organizational consequences?

#### *Organization of screening and health education*

*Numbers of staff.* Most general practitioners are worried that the initiation of screening programmes will need extra staff. Obviously if mass screening is contemplated this will be necessary, but a more practical approach is to aim for a small number of patients to be screened each week. In most cases it should be possible to assimilate this small extra workload without difficulty. Also this would avoid an appreciable increase in secretarial and reception workload.

*Training.* In the first instance training of nurses or health visitors would be undertaken by general practitioners: this trained group could in turn teach subsequent nurses or health visitors, either individually or in groups. As a time-saving manoeuvre and, where local interest is high, teaching in groups is ideal.

*Organization of subject contact.* There are three approaches to screening for IHD. First, using an age-sex register patients can be contacted directly by letter or telephone. Secondly, screening facilities can be advertised, with individuals attending of their own volition, and thirdly, patients presenting for other reasons can be screened.

Having considered the general aspects of screening and health education, it may be useful to show how they can be combined with already existing specialized clinics, especially with respect to health education.

#### *Integration with existing groups in the surgery*

*Antenatal clinics.* Diet and smoking habits are two major risk factors which can be modified in this highly motivated patient group. If a woman can be persuaded to give up smoking while pregnant, there is a fair chance she will not restart after delivery and may influence her husband and children not to smoke. Similarly, dietary advice is likely to be carried through pregnancy and beyond.

*Well-baby clinics.* The most important influences at these clinics are likely to be dietary, apart from encouragement and advice regarding breast-feeding.

*Well-woman clinics.* The usual breast, blood pressure, urine, and cervical cytology screening can be extended to include screening for risk factors. This is also an excellent opportunity for health education.

*Middle-age clinics.* Similar considerations to those already listed apply to this group.

#### *Health education in the community*

*Schools.* In general, health education in schools is grossly neglected. One problem here is the time

commitment and another is the uncertainty over responsibility. Health visitors or practice nurses from a local general practice could be used, but the obvious people to do it would be the recently designated area health education officers and their assistants, working in conjunction with community physicians. However, Mackie (1976) has reported that 20 per cent of area health authorities have not yet appointed a health education officer, and an even higher number have not appointed assistant health education officers. For screening, one useful step would be for every child leaving school to have his or her blood pressure checked.

*Industry.* In collaboration with the industrial medical and nursing services, the factory provides an excellent site for both education and screening.

I have so far purposely stressed the community basis for screening and health education, but obviously hospital-based programmes must also play an important role.

## Discussion

Ischaemic heart disease, cerebrovascular disease, and other manifestations of atherosclerosis undeniably make up one of the most important groups of diseases now afflicting society. Although there is, and will continue to be, controversy about the role of the various risk factors, an increasing body of evidence suggests that smoking, hypertension, hyperlipoproteinaemia, and family history are of prime importance.

By the time these disease entities are clinically obvious, all therapeutic endeavours and changes in habits will, at best, produce only slight improvement in the prognosis. It is therefore imperative that our efforts should be directed increasingly towards the prevention rather than the cure of the atherogenic process. This can be done only by increasing public awareness of the multiple risk factors involved and, in addition, screening communities in an attempt to isolate the groups of individuals who are particularly at risk. In this group considerable efforts should be made to correct risk factors, especially if several are present together.

There are still considerable doubts about not only the desirability but also the effectiveness of screening and health education, and I have attempted to summarize the arguments for and against them. It is, however, clear from reviewing the literature that the ability of the medical and ancillary professions to change habits and attitudes of individuals, even those with established disease, is relatively unsuccessful. Perhaps more of our efforts should be directed to searching for more efficient and effective ways of disseminating information and influencing the public to modify their behaviour. These goals may well be unattainable, except at the expense of personal freedom.

However, the fact that our efforts will be only moderately successful should not discourage us from at least trying to bring about changes by screening for risk

factors and giving health education. In support of this there are already suggestions from the USA that the epidemic of IHD is on the wane; this has been attributed to a greater public awareness of risk factors and considerable changes in public behaviour in respect of smoking, diet, and exercise.

I have also attempted to show that much of the routine screening and health education work can be adequately carried out by suitably trained practice or community nurses or health visitors. Training is not difficult and takes relatively little time. I have explored ways of screening and conclude that for most general practices projected aims should be realistic, with perhaps only two or three people being screened and 'educated' weekly. In this way there is need for only a little reorganization of the practice, as the additional workload is small. Patients to be screened can either be found by using an age-sex register, or contacted when they are seeing the doctor for other reasons.

My own view is that this relatively low key, personal approach is likely to be more acceptable and more effective than mass screening.

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### Reversal of advanced digoxin intoxication with Fab fragments of digoxin-specific antibodies

Purified Fab fragments of ovine digoxin-specific antibodies reversed severe digoxin intoxication in a patient who had taken 22.5 mg of the drug with suicidal intent. Atrioventricular block with extreme bradycardia was temporarily managed by pacing, but progressive, intractable hyperkalaemia (serum potassium of 8.7 mmol per l) with increasing pacing threshold and progressive intraventricular conduction delay was controlled only after infusion of 1,100 mg of Fab. Sinus rhythm returned ten minutes after completion of Fab infusion. Within five hours, the serum potassium concentration fell to 4.0 mmol per l. Free digoxin concentrations in serum fell sharply to undetectable levels, whereas total serum digoxin concentration concomitantly increased twelve fold. Renal excretion of digoxin bound to Fab was documented. Reversal of toxicity was not accompanied by haemodynamic instability, and antibodies to sheep Fab fragments were not detected in the patient's serum after treatment. Thus, purified digoxin-specific Fab fragments are capable of rapid reversal of advanced digoxin toxicity.

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