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Cardiovascular disease prevention in primary care

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Since the publication of the National Service Framework for coronary heart disease, there has been a move towards primary disease prevention with a greater focus on an individual's absolute risk.

Meta-analysis and systematic reviews of the evidence for primary prevention are incomplete and the current guidelines and policy have led to considerable confusion in clinical practice. There is an increased use of risk assessment tools but no effective method of reviewing current activity with the limited integration into the existing Quality Outcome Framework.

There is an inadequate evidence for some of the risk factors used to identify individuals at risk, the risk calculators used to quantify the degree of risk and the methods of communicating risk to patients are largely unproven or completely missing.

There is a need for a co-ordinated vascular disease prevention programme which can be applied at the individual and at the population level but is also amenable to evaluation.

Keywords: communication/CVD risk assessment/management and surveillance

Introduction

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Diseases of the heart and circulatory system [cardiovascular disease (CVD)] continue to be the main cause of mortality and morbidity in the UK with just under 233 000 deaths (38% of deaths) recorded in 2003.[1]

The introduction of the new General Medical Services (nGMS) contract has been an important development in the management of chronic diseases, such as CVD.[2] The Quality and Outcomes Framework (QOF) of the nGMS specifies targets for blood pressure, serum cholesterol levels and smoking cessation advice for patients with diabetes, established CVD and hypertension (the latter excludes cholesterol target). By setting audit standards, the QOF may lead to better

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outcomes in those with established disease as well as beginning to address the recommendations made in the National Service Framework (NSF) for coronary heart disease (CHD), which advised general practitioners and primary care teams to 'identify all people at significant risk of CVD but who have not developed symptoms and offer them appropriate advice and treatment to reduce their risks'.[3]

Risk assessment, communication, surveillance and management are four fundamental steps in the primary and secondary prevention of CVD and is exemplified by the World Health Organization (WHO) diagrammatic explanation for implementing risk prevention (Fig. 1)[4]. For CVD risk management program to be successful, action needs to take place in all four domains but the decision making process is not clearly defined. The following article will highlight the current deficiencies in clinical practice as well as policy and consider examples of possible solutions in developing an integrated cardiovascular risk management program.

Risk assessment

It has been suggested that 75% of cases of CHDs can be predicted by established risk factors such as physical inactivity, tobacco use and inappropriate diet (as expressed through elevated blood pressure,

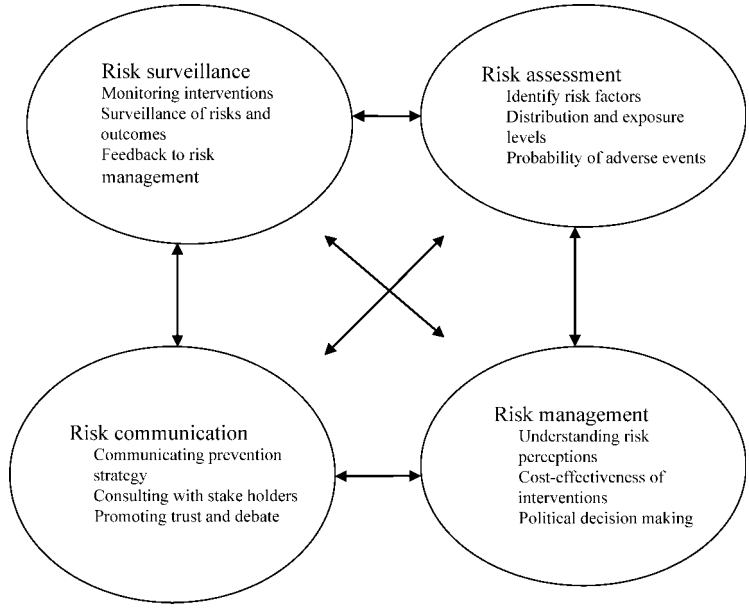

Fig. 1 Implementing risk prevention.[4]

overweight and unfavourable lipid levels) and this increases to over 85% if diabetes is added.[5]

Although there have been a call to focus attention 'from knowing one's blood pressure and cholesterol concentrations to knowing one's absolute cardiovascular risk and its determinants' current guidelines continue to highlight thresholds for diagnosis and treatment.[6]

For example, hypertension has been defined as the blood pressure level above which there would be substantial (or clinically significant) benefits from lowering blood pressure[7] and is currently defined as blood pressure >140 mmHg (systolic) and/or >90 mmHg (diastolic). There are differences in current guidelines in recommendations made by the National Institute of Clinical Excellence (NICE), Joint British Societies' Guidelines (JBS2) and the current QOF audit standards for optimum target blood pressure for those with pre-existing chronic kidney disease (CKD), diabetes, hypertension and CVD risk score $\geq 20\%$ (Fig. 2).[8–10]

Similarly, at the simplest level diabetes is defined as persistent raised glucose level. However, the level classified as 'raised' has changed over the years. In 1997, the American Diabetes Association (ADA) approved lowering of the fasting plasma glucose (FPG) concentration from 7.8 to 7.0 mmol/L for diagnosing type 2 diabetes as this is associated with an increase of microvascular disease (eye disease, renal disease and neuropathy) equivalent to the increase that occurs with the 2 h FPG of 11.1 mmol/L (oral glucose tolerance test).[11] Macrovascular disease (stroke, heart disease, hypertension and peripheral vascular disease) begins early and 50% of patients with type 2 diabetes have evidence of macrovascular disease at the time of diagnosis.[12] More recently, the International Diabetes Federation (IDF) has suggested lowering the FPG cut point for impaired fasting glucose (IFG) from 6.1 to 5.6 mmol/L to improve the predictive power of CVD.[13]

While there is evidence that lowering blood sugar improves microvascular complications, there is very little evidence that improved glycaemic control (lowering blood sugar) reduces cardiovascular risk.[14]

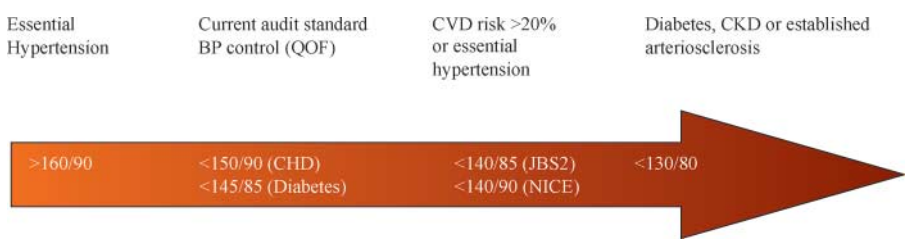

Fig. 2 Thresholds for diagnosis and management of hypertension (mmHg).

However, strategies that focus on reduction of other metabolic abnormalities associated with diabetes (such as insulin resistance, hypertension and dyslipidaemia) have been shown to reduce cardiovascular risk.[15,16]

A major risk factor for the increasing prevalence of diabetes is obesity. Obesity is not only a major risk factor for hypertension, hyperlipidaemia and diabetes, but also an independent risk factor for CHD. However, Body mass index (BMI) as a measure of obesity fails as a cardiovascular risk factor for a number of reasons. Firstly, in a meta-analysis of 40 studies, including 250,152 patients with established CHD, outcomes for cardiovascular and total mortality were better for overweight and mildly obese groups compared with normal BMI patients.[17] The most likely explanation is that BMI cannot discriminate between visceral fat and lean body mass. Body fat distribution is an important predictor of the health risk of obesity in those individuals with predominance of central obesity, and the INTERHEART study found that abdominal obesity (as measured by waist to hip ratio) was a much more significant risk factor for myocardial infarction than BMI.[18] To replace one proxy measure (BMI) which requires two separate measurements and a calculation with another (waist to hip ratio) would not be practical and the merits of using waist circumference need to be explored further.

Secondly, current CVD risk assessment scores such as those based on Framingham do not take obesity or impaired glucose regulation (impaired glucose tolerance or IFG) into account, whereas evidence from lifestyle intervention studies would suggest those affected by these factors would benefit most from therapeutic input.[19] Targeting those with the high BMI for risk assessment would mean that other concomitant risk factors would have to be present for the defined threshold for treatment with statins is breached. Future reassessment of risk then would not be altered by any change in level of obesity unless the other risk factors changed, therefore communicating the potential benefits of weight loss will require integration with methods of behaviour change.

Thirdly, the recent revisions to the QOF for 2006/7 contract includes a new clinical indicator for obesity were practices are obliged to produce a register of patients over 15 years of age who are clinically obese (BMI > 30).[10] This indicator would be of greater use once the practice has a BMI record for all patients on their register over the age of 15 (the denominator) as opposed to only those with a BMI >30 (numerator[†]). Finally, the reasons for seeking medical help for obesity

[†]The denominator is the total number of patients in the sample and the numerator is the total number of patients for whom the item was present in the medical record.

are not necessarily centred on medical reasoning and are likely to be related to social pressures and most current initiatives to combat obesity and overweight are outside the NHS.

Problems with the Framingham risk score

Risk scoring methods enable clinicians to combine patient risk factor information and calculate the risk of a cardiovascular event within a specified time period. There are number of risk scoring methods (over a hundred) which have been proposed for primary prevention strategies and most use the established risk factors (age, gender, blood pressure, lipids and smoking status). A previous review in this journal reviewed some of the various risk charts and calculators available for risk assessment.[20] The CHD NSF recommended using computerized versions 'as they generate more precise risk estimates and allows more risk factors to be taken into account than do paper-based risk charts'.[3]

The original Framingham-based risk scores used quite a different endpoint (CHD death, or non-fatal MI, or sub-clinical MI, or stable or unstable angina) compared to the NSF for CHD which advocated treating absolute risk of major CHD event (CHD death or non fatal MI).[3] The different endpoint makes a substantial difference to the estimated level of absolute risk (defined as the probability of developing CHD over a given time period). Initially, the NHS was tasked to offer treatment to those whose risk of a cardiac event (their 'CHD risk') is greater than 30% over ten years.[3] However, more recently, the NICE guidance on statins for the prevention of cardiovascular events recommended that statins be used 'where the risk of an individual developing CVD within 10 years is estimated to be 20% CVD risk or greater'.[21]

Clinical systems in general practice such as EMIS[‡] have an integrated version of Framingham risk score with READ codes for recording actual/estimated 10/5 year risk of CHD event and more recently CVD risk estimates. It is not essential for all of the risk factors to be recorded for clinical system software to calculate an 'Estimated' risk score, and the difference between an 'Estimated' risk score versus 'Actual' risk score may not be appreciated by all clinicians in primary care and not all clinicians understand the difference between an 'Actual' versus 'Estimated' versus 'Adjusted' risk score and how this is worked out by the computer let alone how they should try and explain this to the patient. Current evidence suggests that most general practitioners (GPs)

[‡]Egton Medical Information Systems (EMIS) is the largest supplier (~55%) of clinical administration software to medical practices throughout the UK in 2006.

are using an 'Estimated' risk score because of poor data recording of risk factors,[22] although this may have changed significantly since the introduction of the QOF.

An 'Adjusted' risk score can be calculated for those individuals considered at higher risk than the population such as minority ethnic populations, those with impaired fasting or impaired glucose tolerance and those with a family history of premature CHD where the 'Actual' risk is multiplied score by 1.5 according to the most recent guidelines.[8] This, however, is an arbitrary boost of risk and does not take into account the heterogeneity of CVD risk within these groups. Further modification of the Framingham risk equation has led to the creation of another risk calculator, ETHRISK,[23] which adjusts for ethnic groups (Indian, Pakistani, Bangladeshi, Chinese, Black Caribbean, Black African, Irish and general population) by recalibrating the Framingham risk score.

The Framingham risk score also underestimates risk in other population subgroups such as the most economically disadvantaged. The Scottish Intercollegiate Guideline Network (SIGN) has developed a cardiovascular risk score which includes social deprivation and family history (The ASSIGN score), which is derived from outcomes in Scottish heart health extended cohort (SHHEC) follow-up study.[24] Early results suggest that the score is slightly better than Framingham risk score with more people with social deprivation and family history classified as at risk. However, deprivation is not highly portable over communities or over time as a determinant. There is also uncertainty around how ethnicity and deprivation can be added to the equation without resulting in 'double counting' of risk for some minority ethnic groups who live in deprived areas.

An important consequence of using any system for identifying those at risk in a clinical setting is the remarkable difference in the patient population group identified. This applies not only to charts and tools used to identify patients at risk of diabetes, metabolic syndrome but also when different versions of the Framingham risk scores are uesd.[25] Review of the various Framingham risk tools also suggests considerable difference in predicted versus observed outcomes when applied to different population groups.[26]

Risk communication

Although some research has looked specifically at the issues of risk communication related to coronary heart, much can be learnt from issues of risk communication in other areas. The psychometric approach has indicated that factors such as whether the risk is

perceived as involuntary, whether it will affect large number of people or is seen to be unnatural are likely to be important determinants of public responses, and partly explain lay and expert beliefs about risk.[27] A strong predictor of a patients' readiness for medical treatment and preventive behaviour is their perceived vulnerability to disease,[28,29] however people's perceptions of risk are often inaccurate and influenced by dramatic or sensational causes with heavy media coverage (social amplification of risk).[30]

The interpretation of numeric risk is subject to a broad range of biases when relative risk, absolute risk or number-needed-to-treat values are used. Risk communication around screening for Down's Syndrome by midwifes and obstetricians has been routine for many years yet continues to be poorly understood by professionals and patients when using probabilistic screening information (frequencies and percentages).[31] There is evidence that graphic representations of risk are perceived as easier to understand than percentages which are currently relied upon by clinical systems to communicate risk.[32,33]

The main driver up to now appears to have been changing professional behaviour but where is the evidence patient behaviour can be influenced to a similar extent and what is the evidence that lifestyle interventions works in primary care? Behaviour assessment tools such as the Fagerstrom test for nicotine dependency[34] or motivational assessment tools such as the Prochaska scales[35] are not in routine use in primary care (NICE are due to publish guidelines on behaviour change in October 2007). A number of randomized controlled trials (RCTs) have shown that favourable changes can be made by individuals in their lifestyles to reduce cardiovascular risk using behavioural techniques.[36,37]

Risk assessment and management can involve a number of professionals within primary care and the process of communication can be easily forgotten. A patient may have their risk factors, such as blood pressure, recorded without any communication as to the reasons why this is being done and yet the act of doing so, can be regarded by some patients as receiving 'good service'. It is even possible to carry out 'routine blood tests' without offering an explanation as to why they are being done or what the blood tests are for. It is then not difficult to imagine a situation where a health care assistant may record risk factors, a nurse may calculate the CVD risk using an appropriate calculator and a GP may then prescribe the appropriate treatment without ever involving the patient in the decision-making process. The aim should be to create a system were decision support is patient centred and focused towards simple representations of risk which can help professionals and patients move from innumeracy to insight.[33]

Risk surveillance

Monitoring is required to ensure that those at risk are being risk assessed using appropriate risk factors and are offered appropriate treatment but also to assess the potential impact on resources (financial and workload). For CVD risk assessment to be effectively evaluated certain audit measures need to be in place at the practice level, at the level of the primary care organization and/or Strategic Health Authority. In order to identify the appropriate population to target and structure workload, the practice needs to know not only demographic data of its population such as age and ethnicity but also prevalence of risk factors such as obesity and smoking. The primary care organization needs to be aware of practice level variation of risk factors and facilitate access to prevention strategies in areas of greater need to tackle health inequalities. Strategy for population activities, such as smoking, healthy eating and physical activity would need to be co-ordinated at the Strategic Health Authority level or nationally.

There may be resistance within the medical profession to undertake work which is perceived to be outside the current contract as this may have direct effect on their ability to deliver set targets. Although CVD risk assessment may form part of any future QOF, it is important the audit measures used to judge outcomes are selected carefully. Setting rigid standards can potentially lead to exposure to higher doses of medication without additional benefit. The overall benefit to the individual patient of reducing their cholesterol from 5.3 to less than 5.1 from an initial value of 6.8, for example, are unlikely to be significant and unlikely to be communicated in a way which will be understood by the individual. This is a significant risk in an era when primary care professionals are encouraged to pursue QOF points and 'treat to target'.

Risk management

The recent addition to guidance on prevention of CVD in clinical practice with the publication of the Joint British Societies (JBS2) guidelines have progressed the debate,[8] but as yet there has been limited national guidance from the department of health. However, creating guidelines for who should be risk assessed, which risk factors should be recorded and which blood tests should be ordered are likely to be lost among the numerous similar guidelines health professionals receive on a frequent basis unless they are integrated with electronic records and available at the time of decision-making.[38]

Some of the difficulties and uncertainties around which risk factors to use for risk assessment have already been discussed. In terms of investigations, a series of reviews using a systematic method[39] for collating answers have looked at the top hundred popular diagnostic questions in primary care. The group reviewing these questions are from a range of professional associations and clinical authors with an aim to develop these 'into prompts, reminders and alerts to help doctors and nurses while they are treating patients'.[40] Some of these, such as how often should cholesterol/lipids be tested are pertinent when assessing a patient's coronary risk.[40] Integration into current clinical systems and automatic provision of decision support such as these as part of clinicians' current workflow is a challenge which needs to be met by the new information and technology infrastructure.

The challenge of identifying those at high risk has produced a number of methods although their effectiveness as yet has not been established. The four main strategies include (Fig. 3):

- The self assessment risk strategy,
- The record-based risk management strategy,
- The population-based risk management strategy, and
- The sporadic risk assessment and management.

Self assessment is limited currently to simple paper based self assessment tools such as the Finnish diabetes risk score (FINDRISC)[41] used to identify those at risk of diabetes to more complicated tools available on the internet and examples include various versions of the Framingham risk score. The Diabetes PHD (Personal Health Decisions) is a new web-based risk assessment tool available on the ADA website that allows greater interaction with visual explanation of the effect of changing risk factor values.[42] Like a number of other computer programmes available

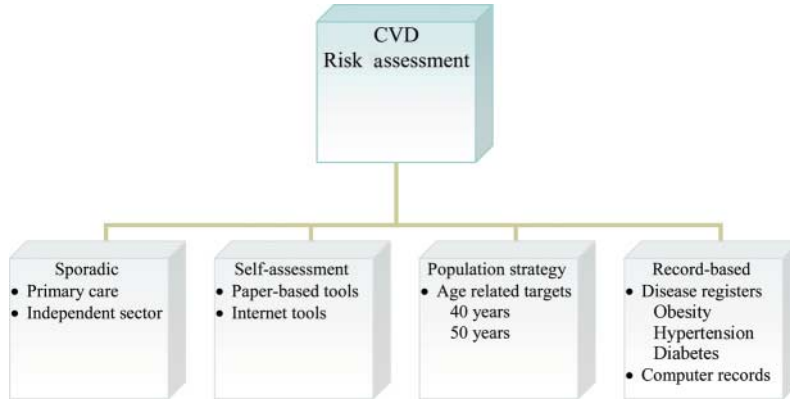

Fig. 3 CVD risk assessment strategies.

to health professionals, it permits patients to view in graphic form the effects of changing individual risk factors and understand the possible benefits through treatment or behaviour change in reducing the risk CVD but also diabetes. There is considerable overlap between the more simple diabetes risk scoring systems such as FINDRISC (which require simple measurements such as waist circumference, height and weight but notably does not take smoking status into account) and disease register based strategy, as the risk group identified tend to be those who are overweight and/or hypertensive.

There a number of examples of how record based risk management strategies can be put into practice. The possibility of using electronic alert messages as a way of prompting GPs and nurses to carry out risk assessment and change clinical behaviour is currently being evaluated through a RCT (the e-Nudge trial).[43] Such electronic 'pop up' messages are already in use for QOF indicators to remind GPs and nurses to collect missing data necessary for meeting QOF targets, and theoretically this does not have any additional resource implications. Another method used an additional specialist nurse to target patients for further risk assessment having initially identified those at risk by using existing clinical data and imputed missing data (such as average population cholesterol levels) to calculate a Framingham risk score.[44] Some primary care organizations have used funding from the Investing in Primary Care Scheme in place since 2001 to incentivise practises to carry out risk assessment in certain groups (patients with diabetes, hypertension and obesity for example) to locally agreed targets as part of their Local Delivery Plans.

Sporadic risk assessment can take place either in primary care or in the community by pharmacy and supermarket chains. Recent advertising campaign by various methods including television by Lloyds Pharmacy claims that one in four people have diabetes without knowing it (the so-called missing million). They are offering 'free diabetes test' and claimed to have tested over 850 000 since launching their free service in 2003.[45] Similar schemes have been run for individuals to check their blood pressure in pharmacies and supermarkets. This continues to promote the value of individual risk factors as being important and similar pattern of health promotion is likely to occur when cholesterol tests become widely available over the counter. This approach runs the risk of giving false reassurance when single risk factors are assessed for an individual.

Population-based risk assessment as part of a co-ordinated vascular disease control programme which would integrate the strategies outlined above is currently being evaluated by the National Screening Committee,[46] with a view to creating standard operating procedures for risk assessment and management, and may fit well with the 2006 White Paper 'Our health, our care, our say' aims to introduce a 'life

checks', with one being offered at the age of 50 by 2008/9.[47] Inviting all individuals for risk assessment at certain memorable landmarks such as their 50th birthday allows a structured approach which can than be expanded to other age groups once the infrastructure to cope with the workload has developed. The White Paper also recommends 'information prescriptions for all with long-term health or social care needs by 2008' and these are currently being piloted across a number of sites in England.[47] Providing access to accurate 'self help' information as well as local initiatives such as access to borough council run exercise-on-prescription schemes for example as part of any integrated information system meets the criteria for provision of decision support at time and location of decision-making.[38]

If information prescriptions become the first line treatment then this would provide an opportunity to revaluate any changes in risk scores through lifestyle changes prior to commencement of drug therapy.

Future direction

The focus of primary prevention is currently skewed towards the early detection of disease and targeting those most at risk (for example those with hypertension and diabetes) and this may be the most sensible approach using NHS resources before population strategy is implemented (Fig. 4) and there is some supporting evidence for this approach.[48] Adding

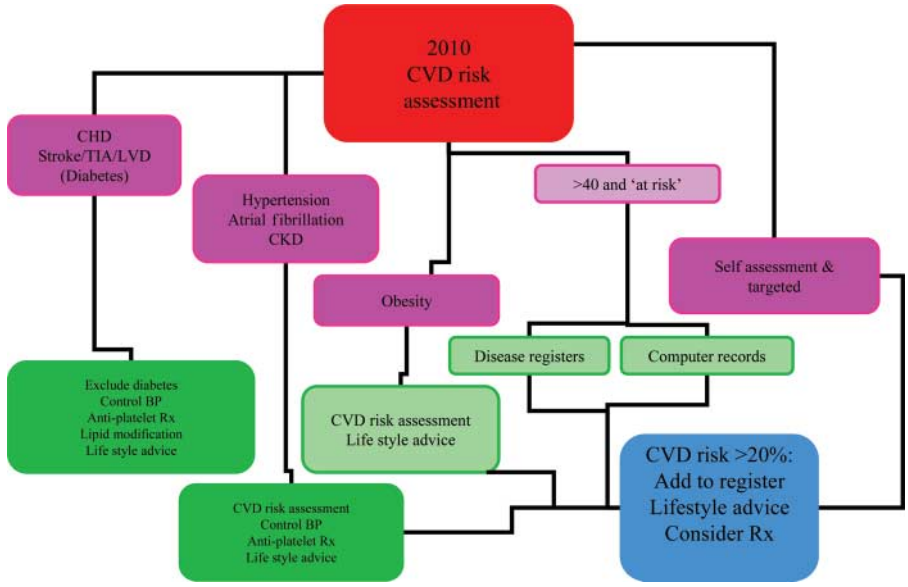

Fig. 4 Structuring secondary prevention and risk assessment for primary prevention by 2010.

other disease registers such as obesity and using age as a selection criteria for actively identifying and risk assessing would broaden the population undergoing assessment but would need a detailed strategy for evaluation to identify any measurable risk reduction and the criteria used to define success: meta-analysis of RCTs data would suggest a reduction in morbidity but not necessarily mortality for both aspirin and statins in primary prevention.[49,50] Integrating self assessment and opportunistic assessment particularly in the independent sector would add to the current focus on 'individuals at risk' strategy (Fig. 4) but is difficult to evaluate and audit. At the population level, new legislation such as banning smoking in enclosed public places, which is due to come into effect in summer 2007, are to be welcomed but it remains to be seen if this will have a significant impact on the deprived communities were smoking prevalence remains high.[51]

The relative importance of risk factors varies in different populations and evidence would suggest that certain risk factor levels are changing in the general population. For example, trends in serum lipid levels among US adults between 1960 and 2002 using data from the National Health Examination Survey (NHES) and Nutrition Examination Surveys (NHANES) have reduced in men and women[52]. There is some evidence this has also occurred in the UK but also some suggestion there may be widening inequality in distribution of risk factors within society with higher levels of smoking and increasing levels of obesity in the most deprived.[53] The importance of the increasing prevalence of diabetes, obesity and physical inactivity will in future play a greater part in accounting for cardiovascular risk.[54] If the changes in smoking prevalence, blood pressure, total cholesterol, diabetes, BMI and physical activity continue to follow recent trends mortality related to CHD will continue to fall. However, a greater reduction in mortality could be achieved by small reduction in population cholesterol levels and blood pressure through primary prevention.[55,56]

The underlying reasons for the increasing prevalence of obesity and diabetes are related to societal behaviour patterns with decreasing physical activity levels and increasing high energy food intake.[57,58] There has been little change in social patterning to suggest these will improve in the near future.

Summary

The introduction of the QOF has resulted in steps towards standardization of secondary prevention of CVD and introduction of some primary prevention measures. The QOF exemplifies the 'high risk'

medical approach to prevention with individual's most at risk targeted for intervention but has largely focused on particular risk factors and does not address overall CVD risk so far. Risk assessment is being carried out by a variety of health professionals within the NHS and the independent sector with a wide variation in policy and practice and currently no effective method of evaluating activity level or impact. The need for a set of guidelines to co-ordinate and integrate activity in a complex environment pressured by a host of other activities is long over due.

Conflict of Interests

GP advisor the National Screening Committee.

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