The contemporary epidemiology of heart failure shows it is a common clinical problem, at least for the elderly and very elderly, and largely a consequence of coronary artery disease and hypertension. Patients presenting for the first time with clinical heart failure have a median age of 76 years, and for many life expectancy is poor. A quarter die within three months, over a third by one year, and nearly one in two patients are dead by two years. Most deaths within the first three months occur during initial hospitalisation, and this depressing case fatality is despite appropriate use of modern medical and other therapies. So in contrast to clinical trials of pharmacological treatments in selected patients with heart failure, survival in unselected patients from the general population is, for the most part, much poorer. Although heart failure is the final common pathway for many and diverse cardiac pathologies, the most common is coronary artery disease. At this stage of the disease's clinical course the benefits of coronary artery interventions, both medical and mechanical, are necessarily limited by the extent of myocardial damage which explains much of the early case fatality. Therefore, preventing or postponing the development of heart failure caused by coronary artery disease is a more appropriate strategy, by addressing the determinants of atherosclerosis and its complications.

**EPIDEMIOLOGY OF CLINICAL HEART FAILURE**

The London heart failure studies have described the contemporary incidence, aetiology, and survival of patients with heart failure in the population. The first epidemiological study was in Hillingdon in northwest London, where 220 incident cases of heart failure were identified from a population of 151,000 over a 20 month period. Incident cases were identified through general practitioners agreeing to refer all suspected cases of new heart failure to a rapid access heart failure clinic held at Hillingdon Hospital. Patients who were acutely ill were sent directly to the accident and emergency department in the usual way and identified by daily surveillance of all hospital admissions by a research nurse. In addition, general practitioners were asked to inform the study team of any patient in whom the diagnosis of heart failure had been made for the first time elsewhere—for example, while the patient was on holiday. One hundred and eighty (82%) cases were identified from surveillance of admissions to the local hospital and the remaining 40 (18%) from 157 referrals to the rapid access clinic. An audit of case ascertainment was performed by identifying all new prescriptions for diuretic drugs during the study period in a random sample of 10 practices. Of all suspected cases of heart failure identified in this way, 90% had been assessed by the study team either in the rapid access clinic or following acute admission to hospital.

The crude incidence rate was 1.3 cases per 1000 population per year for those aged 25 years or over. Incidence increased from 0.02 cases per 1000 population per year in those aged 25–34 years to 11.6 in those aged 85 years and over (fig 1). The median age of presentation was 76 years (73 years in men and 78 years in women) and 47% of male cases and 64% of female cases were aged 75 years or older. Incidence was higher in males than females (age adjusted incidence ratio 1.75, 95% confidence interval (CI) 1.34 to 2.29), and there was no statistical evidence that the incidence ratio changed across the age groups. Although the incidence rate was higher in men, the number of cases of heart failure in men and women was similar (118 men and 102 women) because there are more women in the elderly population.

The diagnosis of heart failure was made by a panel of three cardiologists, based on a majority decision of whether the case definition had been met, and the aetiology. To meet the case definition, as recommended by the working group on heart failure of the European Society of Cardiology, patients had to have appropriate symptoms (shortness of breath, fatigue, fluid
reduction or any combination of these symptoms) with clinical
signs of fluid retention (pulmonary or peripheral) in the
presence of an underlying abnormality of cardiac structure or
function. If an element of doubt remained the beneficial
response to treatment for heart failure (for example, a brisk
diuresis accompanied by substantial improvement in breath-
lessness) was taken to confirm the diagnosis. An underlying
abnormality of cardiac structure or function was necessary to
confirm the case as heart failure, but echocardiographic
abnormalities were not sufficient in themselves to diagnose
heart failure; patients had to satisfy the full case definition.
The panel's decisions on case definition had a good reproduc-
ibility, as did the allocation of aetiology.

Coronary artery disease was considered the primary
aetiology if the patient had a documented history of myocar-
dial infarction (acute or in the past): unstable angina pectoris;
a history of stable angina supported by evidence of reversible
myocardial ischaemia; or coronary artery disease confirmed at
coronary angiography. Hypertension was considered to be the
aetiology if there was a history of hypertension from the gen-
eral practice records or sustained hypertension (blood
pressure > 160/95 mm Hg) during hospital admission, and
there was no documented history of myocardial infarction or
angina or evidence of other cardiac pathology. The presence
and severity of underlying valvular heart disease was assessed
from the history, clinical examination, and echocardiographic
findings. The presence of cardiac arrhythmias were noted and
the temporal relation of these to the development of heart
failure ascertained.

The majority of cases were moderately or severely sympto-
matic (New York Heart Association functional class III and IV)
and a past history of cardiovascular disease was common.
Almost three quarters reported smoking at some time in their
lives. The physical examination, chest radiography, and
echocardiographic features were as expected in patients with
heart failure. Sixty per cent were in sinus rhythm and almost
a quarter had ECG evidence of previous infarction (pathologi-
Q wave).

The single most common aetiology was coronary heart dis-
ase (CHD) (36%), and this co-existed with a history of
hypertension in about half of these cases. Just under half of all
heart failure cases had a history of hypertension (44%), but
hypertension was considered the primary aetiology in only
about a third of these cases; hypertension was therefore the
primary aetiology in about 15% of all cases. Valvar heart
disease was an uncommon cause of heart failure (7%). The
remaining cases were allocated to a variety of other causes
including alcohol, cor pulmonale, hypertrophic cardiomypa-
thy, and restrictive cardiomyopathy. In 34% of cases no
aetiology could be allocated on the basis of the clinical infor-
mation, principally non-invasive investigations, available at
the time of panel review.

To further quantify the contribution of coronary artery dis-
ase to heart failure a second population study, the Bromley
heart failure study, systematically undertook coronary angi-
ography and myocardial perfusion imaging in incident cases of
heart failure. A total of 332 cases with new heart failure were
identified over 15 months from a population of 292 000 in
southeast London. The methodology of case ascertainment
and assessment for the diagnosis of heart failure and its aeti-
ology was the same as the Hillingdon study. In particular,
coronary artery disease was identified as the primary aetiology,
in the absence of angiographic data, using the same criterion as
Hillingdon. The presence and severity of coronary artery
disease was then further defined by performing coronary
angiography in patients under 75 years. The age cut of 75 years
for this investigation was determined by ethical considera-
tions, including the potential benefit to the patient of informa-
tion gained. This cut-off was close to the upper age at
which revascularisation would normally be considered, while
being as near to the median age of cases (76 years) as possible.

One hundred and thirty six were under 75 years of age and
angiography was undertaken in 99 (73%). Angiograms were
reported visually twice; at the time of angiography and on a
separate occasion by a cardiologist, specialising in interven-
tional cardiology and blinded to clinical information. Ana-
tomically significant coronary artery disease was defined as a
luminal stenosis ≥ 50% in one or more epicardial arteries.
Functional significance was assessed by combining the
anatomical data with information from the clinical assess-
ment and non-invasive investigations, including myocardial
perfusion imaging. Wherever possible cases with significant
coronary artery disease underwent myocardial perfusion scin-
tigraphy. Single photon emission tomography was performed
with technetium. Another panel of three cardiologists
reviewed the cases to allocate a final aetiology. In order for
cases with anatomically significant coronary artery disease to
be assigned to this aetiology, further evidence that the disease
was related to the left ventricular dysfunction in the form of
regional wall motion abnormalities, myocardial perfusion
abnormalities or ischaemic valvar dysfunction was needed.

The final aetiology in the 136 cases < 75 years of age was
based on all non-invasive and invasive data available and is
shown in fig 2. Coronary artery disease was considered to be
the primary aetiology in 71 (52%) of the cases. In three of
these cases coronary artery disease was felt to be contributing
to the aetiology, but was not the sole aetiology. Twelve (17%)
of these 71 cases were assigned coronary artery disease as the
aetiology in the absence of angiographic data. Either they died
during the course of acute myocardial infarction associated
with heart failure (10 cases) or declined angiography but
developed heart failure during an acute myocardial infarction
as evidenced by chest pain, ECG changes, and raised
creatine kinase (two cases). Seventeen (13%) out of 136
cases presented with heart failure with no identifiable
aetiology and normal or anatomically non-significant coron-
ary artery disease at angiography. In 13 (9.6%) of the 136
cases angiographic data were not available (five died, one declined,
and seven had other medical conditions making angiography
clinically inappropriate), and no aetiology could be identified
on available non-invasive data. These cases remained classi-
fied as undetermined.

A comparison of the initial non-invasive panel aetiology
and subsequent angiography/perfusion scan results in 99/136
cases with angiograms showed evidence of significant coron-
ary artery disease in other panel attributed aetiologies (table
1). When the non-invasive panel diagnosed coronary artery

Figure 2  Final aetiology of heart failure in 136 cases aged less
than 75 years using angiographic and myocardial perfusion
data (where available). AF, atrial fibrillation; CAD, coronary artery
disease. Reproduced from Fox et al., with permission.
disease this was subsequently confirmed at angiography in the vast majority (95%) of cases. For other aetiologies significant coronary artery disease was found in just over half. For those in whom the non-invasive panel could not define an aetiology, significant coronary artery disease was found in over a third. So in total two thirds of the cases of heart failure under 75 years with angiographic data had evidence of significant coronary artery disease.

There were 21 cases who had not at the time of initial non-invasive panel assessment undergone angiography and they were assigned to hypertension, alcohol or atrial fibrillation. Fifteen (71%) subsequently underwent angiography and in seven (47%) important coronary artery disease was present. This included three out of five cases thought to be caused by hypertension. In the group of 40 out of 136 cases in whom the panel were unable to allocate an aetiology before angiography, 27 (68%) underwent catheterisation. Angiography demonstrated important coronary disease in 10 (37%) of these 27 cases. Overall the additional information from coronary angiography altered the initial panel aetiology of 18 cases.

For coronary artery disease to be defined as the aetiology of a patient’s heart failure requires angiographic evidence of atherosclerotic disease and independent evidence that this disease is responsible for the myocardial dysfunction. Coronary angiography is the definitive investigation for coronary anatomy and was therefore considered essential to this epidemiological study. The functional importance of the coronary disease also needed to be determined. While no investigation can differentiate ischaemic myocardium from other forms of dysfunctional myocardium with absolute certainty, a more complete picture can be obtained by combining clinical, echocardiographic, and anatomical findings with myocardial perfusion imaging. In this study angiographic and other data confirmed that 71 (52%) (95% CI 43% to 61%) of the 136 cases of heart failure under 75 years were caused by coronary artery disease. It is likely that the 23 cases with non-invasively assigned aetiologies, other than coronary artery disease, and who did not subsequently undergo angiography, also had important coronary artery disease. Therefore, the proportion of all cases caused by coronary artery disease is likely to be higher than 52%. Assuming the proportion of important coronary artery disease in these cases is the same as in those who did undergo angiography, this would raise the overall proportion with aetiologically important coronary disease under 75 years to 59%.

The finding of coronary artery disease has potential treatment implications, beyond angiotensin converting enzyme (ACE) inhibitors, β blockers, and spironolactone, in terms of other treatments which can modify the underlying disease process and also revascularisation of an ischaemic myocardium. Coronary secondary prevention measures, such as aspirin and lipid lowering therapy, could prevent another coronary event and thus further deterioration in left ventricular function. Such treatments could be initiated if judged appropriate for an individual patient having taken account of comorbidity and other factors. A post hoc analysis of the 4S trial has reported that simvastatin is associated with a lower incidence of heart failure in coronary patients, reflecting a lower frequency of further myocardial ischaemic insults. However, in patients presenting for the first time with heart failure caused by coronary artery disease the potential reduction in risk of recurrent or progressive heart failure and death from a comprehensive multifactorial risk factor intervention programme has yet to be quantified in a randomised controlled trial. Nor is there any trial evidence to support revascularisation in the context of hibernating myocardium in heart failure.

### SURVIVAL OF CLINICAL HEART FAILURE PATIENTS

In the Hillingdon heart failure study the 220 incident cases of heart failure have been followed up for mortality.

- **Date of death and certified cause of death** were identified by flagging each patient’s record at the National Health Service central registry using their NHS number. Since the initial report on survival based on 90 deaths over a mean follow up of 16 months (range 6–26 months) this cohort of 220 patients has now been followed up for 42 months and there have been 126 deaths. Figure 3 shows the survival curve for this cohort. Survival was 81% at one month, 75% at three months, 70% at six months, 62% at 12 months, 53% at 24 months, and 54% at 36 months. The majority of these deaths were related to cardiovascular disease. The standardised mortality ratio for cardiovascular deaths within this cohort was 18.1 at 12 months, representing an 18-fold increase (95% CI 15 to 23).

![Figure 3](http://heart.bmj.com/)

**Figure 3** Survival of 552 incident cases of heart failure, from the London heart failure studies (with 95% confidence intervals). Modified from Cowie et al.7
PREVENTION OF CORONARY HEART DISEASE

The Joint British Societies (British Cardiac Society, British Hypertension Society, British Hyperlipidaemia Association, and British Diabetes Association) defined priorities and strategies for CHD prevention in clinical practice together with lifestyle, risk factor, and therapeutic targets. The National Service Framework for CHD adopted these priorities and endorsed the risk factor targets for blood pressure and blood lipids, and the appropriate use of prophylactic drug treatments such as aspirin, β blockers, ACE inhibitors, and statins.

The priorities for CHD prevention in clinical practice are:

- patients with established CHD
- patients with other major atherosclerotic disease
- patients with hypertension, dyslipidaemia, diabetes mellitus, family history of premature CHD, or a combination of these risk factors, which puts them at high risk of developing CHD or other atherosclerotic disease; patients with diabetes mellitus are at particularly high risk of CHD.

Patients with symptomatic coronary disease are the top priority because they have declared themselves to medical services, and are at high risk of recurrent disease and heart failure. For these atherosclerotic disease patients every effort should be made to achieve the lifestyle, risk factor, and therapeutic targets shown in table 2. The care of coronary patients should embrace all aspects of cardiac prevention and rehabilitation. For some patients the initial presentation with an acute myocardial infarction results in heart failure, and for others progressive myocardial ischaemic insults eventually result in heart failure together with other contributing factors such as hypertension. Blood pressure is a risk factor for coronary artery disease, and an independent risk factor for heart failure as well. For some patients with an acute infarction the extent of myocardial damage may be so great that progressive heart failure is inevitable, and the extent to which drug therapies and other treatments can modify these patients subsequent clinical course is limited.

Yet for most patients presenting with symptomatic coronary disease exertional angina is the most common clinical manifestation, not myocardial infarction, and these patients usually have well preserved ventricular function. So addressing lifestyle and risk factors may, in the medium term, reduce the risk of progressing to myocardial infarction and thus heart failure. Specifically, the use of antithrombotic, antihypertensive, and lipid modification medications will favourably modify the clinical course of the coronary artery disease and protect the myocardium. For those patients who have a myocardial infarction complicated by left ventricular dysfunction, but no clinical heart failure, an ACE inhibitor reduces the incidence of progressing to severe heart failure. In a post hoc analysis of the SAVE trial a β blocker in asymptomatic coronary patients with left ventricular dysfunction also showed a reduced risk of progression to severe heart failure. Similarly in coronary and other high risk patients with preserved ventricular function, an ACE inhibitor also reduces incident heart failure. For lipid lowering therapy the use of a statin in coronary patients (myocardial infarction and angina pectoris) without heart failure, in a post hoc analysis of 4S, also reduced the risk of developing heart failure. Other lipid lowering trials have not reported on the incidence of heart failure but in both CARE and LIPID the risk of myocardial infarction was reduced and thus a reduction in subsequent risk of progressing to heart failure would be expected. Achieving the blood pressure target of < 140/85 mm Hg (and < 130/80 mm Hg in patients with diabetes) will further limit the contribution of blood pressure to the development of heart failure, both in patients with established CHD of atherosclerotic individuals at high risk.

People at high multifactorial risk, without clinically overt CHD or other major atherosclerotic disease, can be identified...
### Table 2  Joint British Societies recommendations on lifestyle, risk factor, and therapeutic targets in patients with established coronary heart disease (CHD), or other atherosclerotic disease, and healthy individuals at high multifactorial risk. Reproduced from the summary of the Joint British recommendations on prevention of coronary heart disease in clinical practice,* with permission of the BMJ Publishing Group

<table>
<thead>
<tr>
<th>Lifestyle targets for all patients</th>
<th>People without overt CHD or atherosclerotic disease at high risk (absolute CHD risk ≥ 15% over 10 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop smoking, make healthier food choices, increase aerobic exercise, and moderate alcohol consumption</td>
<td>Healthy individuals with</td>
</tr>
<tr>
<td>Body mass index ≤ 25 kg/m² is desirable, with no central obesity</td>
<td>• Systolic blood pressure ≥ 160 mm Hg or diastolic blood pressure ≥ 100 mm Hg: lifestyle advice and drug treatment if blood pressure is sustained at these levels on repeat measurements regardless of absolute CHD risk</td>
</tr>
<tr>
<td></td>
<td>• Systolic blood pressure 140–159 mm Hg or diastolic blood pressure 90–99 mm Hg: CHD risk ≥ 15% or target organ damage: lifestyle advice and drug treatment if blood pressure is sustained at these levels on repeat measurements</td>
</tr>
<tr>
<td></td>
<td>• Systolic blood pressure &lt; 140 mm Hg and diastolic blood pressure &lt; 90 mm Hg: Lifestyle advice and reassess annual repeat measurements</td>
</tr>
<tr>
<td>Blood pressure &lt; 140 mm Hg systolic and &lt; 85 mm Hg diastolic</td>
<td>Healthy individuals with</td>
</tr>
<tr>
<td>Total cholesterol &lt; 5.0 mmol/l (LDL cholesterol &lt; 3.0 mmol/l)</td>
<td>• Familial hypercholesterolaemia or other inherited dyslipidaemia: lifestyle advice and drug treatment</td>
</tr>
<tr>
<td>• All patients to have blood pressure reduced to consistently &lt; 140/85 mm Hg</td>
<td>• Total cholesterol ≥ 5.0 mmol/l: CHD risk ≥ 15%: lifestyle advice and drug treatment* if cholesterol sustained on repeat measurements</td>
</tr>
<tr>
<td></td>
<td>• If CHD risk &lt; 15%: lifestyle advice, reassess annually if risk is close to 15%</td>
</tr>
<tr>
<td></td>
<td>• If CHD risk &lt; 15% and no target organ damage: lifestyle advice and drug treatment if blood pressure is sustained at these levels on repeat measurements</td>
</tr>
<tr>
<td></td>
<td>• If CHD risk &lt; 15% and no target organ damage: if blood pressure is sustained at these levels on repeat measurements</td>
</tr>
<tr>
<td></td>
<td>• Total cholesterol &lt; 5.0 mmol/l (LDL cholesterol &lt; 3.0 mmol/l)</td>
</tr>
<tr>
<td>Blood pressure &lt; 130 mm Hg systolic and &lt; 80 mm Hg diastolic (&lt; 125 mm Hg systolic and &lt; 75 mm Hg diastolic when there is proteinuria)</td>
<td>Healthy individuals with</td>
</tr>
<tr>
<td>Total cholesterol &lt; 5.0 mmol/l (LDL cholesterol &lt; 3.0 mmol/l)</td>
<td>Optimal glycaemic control: HbA₁c &lt; 7%</td>
</tr>
<tr>
<td>Patients with diabetes mellitus</td>
<td>• Aspirin (75 mg daily) in individuals aged &gt; 50 years whose hypertension, if present, is controlled</td>
</tr>
<tr>
<td>• Aspirin for all patients</td>
<td>• β Blockers at doses prescribed in clinical trials after myocardial infarction, particularly in high risk coronary patients and for at least 3 years</td>
</tr>
<tr>
<td>• β Blockers at doses prescribed in clinical trials after myocardial infarction, particularly in high risk coronary patients and for at least 3 years</td>
<td>• Cholesterol lowering agents (statins) at doses prescribed in clinical trials</td>
</tr>
<tr>
<td>• ACE inhibitors at doses prescribed in clinical trials for patients with symptoms or signs of heart failure at time of myocardial infarction, or in those with persistent left ventricular systolic dysfunction (EF &lt; 40%)</td>
<td>• Anticoagulants for patients at risk of systemic embolisation with large anterior infarctions, severe heart failure, left ventricular aneurysm, or paroxysmal tachyarrhythmias</td>
</tr>
<tr>
<td></td>
<td>• Cardioprotective drug treatment</td>
</tr>
<tr>
<td>Screening of first degree relatives</td>
<td>• Aspirin (75 mg daily) in individuals aged &gt; 50 years whose hypertension, if present, is controlled</td>
</tr>
<tr>
<td>• Screening of first degree relatives (principally siblings and offspring aged 18 years or older) of patients</td>
<td>• If resources do not permit drug treatment at 15% then 30% is the minimum acceptable</td>
</tr>
<tr>
<td></td>
<td>• Screen close relatives if familial hypercholesterolaemia or other inherited dyslipidaemia is suspected and in the context of familial dyslipidaemias is essential</td>
</tr>
</tbody>
</table>

*If resources do not permit drug treatment at 15% then 30% is the minimum acceptable.

ACE, angiotensin converting enzyme; EF, ejection fraction; HbA₁c, glycated haemoglobin; LDL, low density lipoprotein.
from the Joint British Societies’ coronary risk prediction chart. As absolute risk of CHD (non-fatal myocardial infarction and coronary death) increases, so lifestyle intervention should be intensified. Introducing drug treatment for raised blood pressure or lipid concentrations should be strongly determined by the absolute risk of developing disease. An absolute risk of CHD ≥ 15% (equivalent to a cardiovascular risk of 20%) over 10 years is considered to be sufficiently high to justify drug treatment. For all high risk patients every effort should be made to achieve the lifestyle, risk factor, and therapeutic targets given in the table.

A meta-analysis of blood pressure lowering trials shows that antihypertensive therapy in the healthy population reduces the incidence of heart failure by 52%. This finding is reinforced by the HOPE trial which included patients at high risk, but without symptomatic atherosclerotic disease and no left ventricular dysfunction. HOPE reported a 23% reduction in the incidence of heart failure. In the prevention arm of the SOLVD trial both an ACE inhibitor and a β blocker (post hoc analysis) resulted in a lower risk of the combined end point of heart failure and death. While the primary prevention lipid lowering trials have not reported the incidence of heart failure, the reduction in myocardial infarction in both WOSCOPS and AFCAPS/TEXCAPS is again likely to reduce the subsequent risk of heart failure.

AUDITS OF PREVENTIVE CARDIOLOGY PRACTICE

Unfortunately, national audits of lifestyle, risk factor, and therapeutic management of coronary patients in the UK, such as ASPIRE and EUROASPIRE, consistently show a majority of patients are still not achieving the blood pressure and cholesterol targets, despite an increase in use of prophylactic drug treatments. In the second EUROASPIRE survey, which included six centres in the UK, 8181 medical records were reviewed and 5556 patients (adjusted response rate of 76%) interviewed from 47 centres in selected geographical areas in 15 countries. Consecutive patients < 70 years were identified retrospectively with the following diagnoses: coronary artery bypass graft, percutaneous transluminal coronary angioplasty, acute myocardial infarction, and myocardial ischaemia. Data collection was based on a review of medical records and then on interview and risk assessment at least six months after hospital admission.

Recording of risk factor history and management in hospital notes was incomplete, particularly for discharge documents. Only a minority (27%) had their weight recorded and less than half had a blood pressure measurement (49.6%) or cholesterol measurement (42.4%) in the discharge document. In the UK the figures were 12%, 30.9%, and 16.8%, respectively. At follow up interview (median time 1.4 years after hospital discharge) the risk factor profile was as follows (UK results for comparison in brackets): 21% (18%) of patients were smoking cigarettes, 31% (38%) were obese, 50% (52%) had raised blood pressure (systolic blood pressure ≥ 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg), 58% (54%) had raised serum total cholesterol (total cholesterol ≥ 5 mmol/l), and 20% (24%) had a medical history of diabetes. Glucose control in these diabetic patients was poor, with 80% having plasma glucose > 6.0 mmol/l and 72% > 7 mmol/l. The use of prophylactic drug treatments at interview was as follows: aspirin or other antiplatelet drugs 86% (81%), β blockers 63% (44%), ACE inhibitors 38% (28%), and lipid lowering drugs 61% (69%).

In terms of therapeutic control only 49% of patients on blood pressure lowering medication had reached the European Societies’ goal of < 140/90 mm Hg. The proportion was identical in the UK. Overall the majority (87%) of patients were on one or more blood pressure lowering medications, not necessarily initiated as antihypertensive therapy. The majority of patients were also on lipid lowering medication (61%); 50.6% on such medication, principally a statin, had achieved the cholesterol goal of < 5.0 mmol/l. In the UK the figure was 54.3%.

So a majority of coronary patients are not achieving the lifestyle, risk factor, and therapeutic targets either in the UK or elsewhere. In comparison with the first EUROASPIRE survey adverse lifestyle trends are apparent. There is an increase in the proportion of younger (< 50 years) patients achieving the blood pressure, and a substantial increase in the prevalence of obesity in all countries. There was virtually no change in the proportion of patients achieving the blood pressure target between surveys despite an increased use of antihypertensive medication in the form of β blockers and ACE inhibitors. The increased prevalence of obesity may be contributing to this failure to improve the proportion of patients achieving the blood pressure target. Although there is a real increase in the proportion of patients achieving the cholesterol target this still leaves a majority yet to do so. This improvement in lipid management reflects a substantial increase in prescriptions for lipid lowering medications, particularly the statins. The prevalence of undetected diabetes in the second survey is also a matter of concern, as this metabolic syndrome is associated with a particularly high risk of further coronary disease. Self-reported diabetes was found in 19.6% of patients and this increased to 38% of all patients when those with a fasting glucose > 7.0 mmol/l were added. Obesity was much more common in those with known diabetes compared to those coronary patients without diabetes, and fewer diabetic patients had achieved the minimum European blood pressure target of < 140/90 mm Hg. However, a majority of patients with diabetes had achieved the cholesterol target.

When a patient presents with coronary disease, particularly premature disease, the opportunity to extend preventive activities to the family as a whole is presented. Cardiovascular screening of all first degree relatives of patients with premature CHD (men < 55 years and women < 65 years) is recommended. In EUROASPIRE II there was a family history of CHD at any age in 54.8% of cases, and premature CHD (men < 55 years and women < 65 years) in 28.8% of cases. The figures for the UK were 53.8% and 30.8% respectively. Yet in the EUROASPIRE II survey 29% (16%) of patients with a family history of first degree relatives (siblings and offspring) had not been screened for cardiovascular risk factors—a missed opportunity for primary prevention of coronary disease and heart failure.

In the healthy population there is even greater scope for more effective risk factor intervention in high risk individuals. In the 1994 health survey for England of 12,116 adults, awareness of hypertension was common among those with a blood pressure ≥ 160/95 mm Hg, or receiving antihypertensive treatment. However, among these hypertensives only 50% were receiving treatment and just 30% had their blood pressure controlled (< 160/95 mm Hg) by a rather more conservative criterion than today’s target of < 140/85 mm Hg. In the same study cardiovascular risk factor management of diabetic patients was evaluated. In 97 diabetic subjects 19%...
were current smokers, 27% were obese and 38% had hypertension by the same definition used above; one third were untreated and less than one half of those on treatment had their blood pressure controlled to <160/95 mm Hg. The current blood pressure target in diabetic patients is <130/80 mm Hg. Of those aged <70 years 29% required lipid lowering therapy because their absolute multifactorial CHD risk was >30% and almost all (94%) were not on treatment. The current threshold for lipid lowering therapy is an absolute CHD risk >15% over 10 years. Finally, more than one quarter of these diabetic patients had poor glycaemic control (glycated Hb >11% or an HbA1c >7.5%). So the potential for more effective risk factor management in primary prevention is also evident, and the challenge is even greater because the risk factor targets for blood pressure are now lower, especially for diabetic patients. Lipid management is now also an integral part of risk factor care, compared to the early 90s, and in contrast to blood pressure management, general practitioners are starting from an even lower baseline of care and therefore have much more work to do. In diabetic patients the traditional focus has been glycaemic control but this is now changing towards a much greater emphasis on other risk factors, especially the control of blood pressure and also lipids.

CONCLUSION

There is considerable potential throughout Europe, including the UK, to raise the standard of preventive cardiology by more effective lifestyle intervention, control of risk factors, and optimum use of prophylactic drug treatments in both patients with atherosclerotic disease and healthy high risk individuals. By achieving the lifestyle and risk factor targets, and through the appropriate use of prophylactic drug treatments, the progression of coronary disease and its complications will be reduced. Specifically the risk of myocardial (re)infarction will be reduced and thus so will the progressive myocardial damage which ultimately leads to clinical heart failure. Only by addressing the causes and consequences of coronary artery disease and its impact on ventricular function will the incidence of heart failure be substantially reduced in the population.

REFERENCES

the argument that specialists are best placed to diagnose and manage heart failure.

**Question:** Your figures on the incidence of heart failure were interesting: 1.3 per thousand patients per year. In primary care we are looking at three patients per GP per year, two of which you say will be diagnosed in a hospital setting anyway. So we are looking at one patient per GP per year detection. I think those figures back up your argument.

**Professor Wood:** I absolutely accept that. I think that once the diagnosis and management plan have been made, then I think there is a need for some form of structured care between the hospital and general practice that will ensure optimal long term management.

**Question:** I like your argument about secondary prevention, and in primary care we are quite good at that. When you say that all patients with heart failure should be seen by specialists because their management is difficult to get right I am happy to accept that. How often in your experience does an echo or the fine tuned assessment of a patient significantly alter your management of a patient? I have a need for echos when I have real difficulty in knowing how much of their breathlessness is due to their heart or how much is due to other causes. There are times when it seems very obvious. By sending them to a specialist I want to know how that is going to change my management?

**Professor Wood:** You may have seen from the data I presented that about one in four of the patients referred to the rapid access heart failure clinics in both Hillingdon and Bromley turned out to have the clinical syndrome of heart failure. That means that about three quarters did not, which isn’t a criticism of our colleagues in primary care, as it is a very difficult diagnosis to make sometimes. We expect GPs to have a low threshold for referring patients with a suspected heart failure. In the hospital service I would suggest that we need to observe patients and make repeated observations on a substantial proportion (which I can’t quantify) before we come to a definitive opinion about the diagnosis of heart failure and its aetiology. Its not always a snap judgement; its not always florid pulmonary oedema in CCU. The spectrum of heart failure can make the diagnosis more complicated and require a little more consideration and a little more time. So how often do we change our minds in the light of a referral from general practice? I think quite a lot in practice.

**Professor Hall:** There is another role too: we talk a great deal about straightforward pharmacological treatments but there may well be other treatments available which will be effective for some of these patients, which they can only get to through further investigations—for example, viability studies or the use of complex pacing.
Preventing clinical heart failure: the rationale and scientific evidence

D A Wood

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Updated information and services can be found at:
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