Research

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Missed opportunities in prevention of cardiovascular disease in primary care:

a cross-sectional study

Abstract

Background
Screening cardiovascular disease (CVD) risk is an important part of CVD prevention. The success of screening is dependent on the rigour with which treatments are subsequently prescribed.

Aim
To establish the extent to which treatment conforms to guidelines.

Design and setting
Cross-sectional study of anonymised patient records from 19 general practices in the UK.

Method
Data relating to patient characteristics, including CVD risk factors, risk score and prescribed medication were extracted. CVD risk (thus eligibility for cholesterol and blood pressure-lowering treatment) was calculated using the Framingham equation. Guideline adherence was defined with descriptive statistics and comparisons by age, sex and disease were made using χ^2 tests.

Results
Of the 34 975 patients (aged 40–74 years) included in this study, 2550 (7%) patients had existing CVD and 12 349 (35%) had a calculable CVD risk or were on treatment. CVD risk was formally assessed in 8390 (24%) patients. Approximately 7929 (64%) patients eligible for primary prevention therapy were being treated appropriately for their CVD risk. Guideline adherence was higher in younger patients (6284 [69%] aged 40–64 years versus 1645 [50%] aged 65–74 years, $P<0.001$) and in females (4334 [69%] females versus 3595 [59%] males, $P<0.001$). There was no difference in guideline adherence between patients where CVD risk had been recorded and those where CVD was calculable. Guideline adherence in patients with existing CVD was highest in patients with ischaemic heart disease (866 [ischaemic heart disease], 52%, versus 288 [stroke], 46%, versus 276 [other CVD], 39%; $P<0.001$).

Conclusion
There is scope for improvement in assessment and treatment for prevention of CVD in clinical practice. Increasing the uptake of evidence-based treatments would improve the cost-effectiveness of CVD risk screening programmes.

Keywords
antihypertensive agents; primary health care; primary prevention; risk; secondary prevention; statins.

INTRODUCTION

Cardiovascular disease (CVD) is a leading cause of mortality and accounts for more than one-fifth of all deaths worldwide.[1] Blood pressure, smoking status, and serum cholesterol concentration are the most important modifiable risk factors for CVD, and more deaths are attributable to these than any other major disease risk factors.[2] Accordingly, national and international guidelines on the management of CVD now include significant promotion of CVD prevention through pharmacological control of blood pressure and lipid levels plus encouragement of behavioural change and lifestyle modification.[3–9]

Despite these guidelines, previous studies have identified under-treatment of patients for CVD prevention in specific at-risk groups.[10–15] In the UK, an attempt has been made to address missed opportunities in CVD prevention by introducing a programme of 'vascular health checks' for all patients aged 40–74 years with no previous history of CVD.[16,17] A recent Cochrane review of general health checks suggested that there is no existing evidence to support their implementation or indicate that such a programme might be effective at reducing cardiovascular morbidity or total mortality.[18,19] However, the applicability of these findings to current practice in general is limited because no contemporary studies examining health checks in combination with present-day CVD prevention interventions were available and, indeed, the vascular check programme was instigated following a modelling exercise that suggested benefit with screening and treatment.[20] This limitation highlights how the impact of health check and/or screening programmes is dependent on the rigour with which preventive treatments are used in patients identified as being at risk. The study therefore examined a contemporary primary care dataset to explore the extent to which current pharmacotherapy practice conforms to national clinical guidelines for primary and secondary prevention in the UK. Although the study acknowledges the importance of lifestyle modification in prevention of CVD, it examined drug treatment as a measure of guideline adherence.

METHOD

Data collection
A cross-sectional retrospective study of primary care medical records was conducted. Anonymised data were obtained from the electronic health records of all patients aged between 40 and 74 years registered at 19 general practices across the West Midlands area of the UK. The practices were purposefully selected from a sample of 973 within the West Midlands Strategic Health Authority and represented the local variation in practice sizes and levels of socioeconomic deprivation (estimated

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How this fits in

Pharmacotherapy for blood pressure and cholesterol lowering is highly effective at reducing cardiovascular risk, and evidence-based guidelines recommend use of these drugs in people at high risk of cardiovascular events. Underuse of cardiovascular disease prevention medication is common in healthcare systems across Europe and North America. This study demonstrates that in the UK, 36–53% of patients with known or calculable cardiovascular disease risk are not being treated according to national guidelines. The cost-effectiveness of vascular health checks would be improved if uptake of evidence-based treatments was increased.

using the Indices of Multiple Deprivation score for each practice area). Relevant data were extracted using MIQUEST software developed by NHS Connecting for Health, Crown Copyright, London, UK.

All data queries were run between 17 October 2008 and 6 October 2009. Extracted data included demographic information, cardiovascular risk factor details, records of formal cardiovascular risk assessment, and prescribed medication (blood pressure or cholesterol-lowering therapy). The presence of cardiovascular risk factor details were defined as the most recent value for blood pressure/cholesterol in the 5 years prior to the query date recorded in a value field alongside a read code for blood pressure or cholesterol. Both total and high-density lipoprotein serum cholesterol concentrations were extracted. All cholesterol and blood pressure-lowering medication prescribed within the 90 days prior to the query date were extracted.

Definition of cardiovascular risk status
All patients with existing CVD (myocardial infarction, peripheral vascular disease, heart failure, ischaemic heart disease [IHD], stroke, and transient ischaemic attack [TIA]) were identified and considered to be at high risk of a secondary cardiovascular event.

Where patients had recorded risk factor information, CVD risk was estimated using the Framingham equation, which uses age, sex, blood pressure, total/high-density lipoprotein cholesterol ratio, smoking status, and existence of diabetes and/or left ventricular hypertrophy to estimate a patient's 10-year risk of developing a future

cardiovascular event.[21] This risk calculator was recommended by the National Institute for Health and Care Excellence (NICE) at the time of data collection,[22] although it is now recognised that other risk calculators such as QRISK2[23] may be more appropriate for use in UK populations.[4] In accordance with NICE guidelines of the time, CVD risk scores were adjusted by a factor of 1.4 or 1.5, respectively, for patients of South Asian origin or with a family history of premature cardiovascular events.[22]

The present analysis focused on patients on treatment or with sufficient information in their medical records to calculate a CVD risk score using the Framingham equation.[21] This enabled identification of all possible missed opportunities in CVD prevention, rather than just those where the GP had assessed risk by performing a formal CVD risk assessment. To establish if there were any differences between patients with a recorded risk score and those with a calculable risk score, a sensitivity analysis was conducted to compare guideline adherence in both populations.

Where cardiovascular risk could not be calculated from existing risk factor information, individuals were classified as having unknown CVD risk, unless they were already receiving some form of prevention therapy, in which case they were assumed to have been identified as being at high risk previously. No attempt was made to impute missing data.

Definition of eligibility for and receipt of appropriate treatment
Patients on treatment or with a calculable CVD risk but without existing CVD were considered eligible for primary prevention therapy. Optimal treatment was defined in accordance with NICE guidelines and is summarised in Table 1. All patients with existing CVD were considered to be eligible for secondary preventive treatment. NICE guidelines[3–4] recommend that these patients receive statin therapy and have blood pressure controlled to a target of 140/90mmHg (Table 1). It is acknowledged that some patients may have declined treatment, been contraindicated for therapy or have stopped taking medication having been prescribed it in the past. It is also possible that in some cases, the GP may have chosen to recommend lifestyle modification rather than pharmacotherapy. While these scenarios do not equate to 'non-guideline adherence', it was not possible to separate these in the analysis from those for whom risk had been identified but not appropriately addressed.

Table 1. Summary of possible treatment strategies and how they relate to current NICE guidelines

Population	Treatment	Blood pressure control mmHg	10-year CVD risk[a]	Treated in accordance with guidelines?	Why?
Primary prevention	On statin	>140/90	>20% risk	No	Should be on an antihypertensive
			<20% risk	No	Should be on an antihypertensive
			Risk not recorded	No	Should be on an antihypertensive
		<140/90	>20% risk	Yes	BP below threshold for treatment and on a statin for high risk
			<20% risk	Yes	BP below threshold for treatment and on a statin (assumed have been at high risk previously)
			Risk not recorded	Yes	BP below threshold for treatment and on a statin (assumed have been at high risk previously)
	On antihypertensive	>140/90	>20% risk	No	Should be on a statin and an additional antihypertensive
			<20% risk	No	Should be on an additional antihypertensive
			Risk not recorded	No	Should be on an additional antihypertensive and assessed for risk
		<140/90	>20% risk	No	Should be on a statin
			<20% risk	Not clear	Low risk could be due to the use of treated BP in risk calculation
			Risk not recorded	Not clear	Should have risk assessed
	On both statin and antihypertensive	>140/90	>20% risk	No	Should be on an additional antihypertensive
			<20% risk	No	Should be on an additional antihypertensive
			Risk not recorded	No	Should be on an additional antihypertensive
		<140/90	>20% risk	Yes	BP controlled and on a statin for high risk
			<20% risk	Yes	BP controlled and on a statin (must have been at high risk previously)
			Risk not recorded	Yes	BP controlled and on a statin (must have been at high risk previously)
	Neither statin nor antihypertensive	>140/90	>20% risk	No	Should be on a statin and an antihypertensive
		>160/100	<20% risk	No	Should be on an antihypertensive
		<140/90	>20% risk	No	Should be on a statin
		<160/100	<20% risk	Yes	BP below threshold for treatment and low risk so statin not indicated
Secondary prevention	On statin	>140/90	>20% risk	No	Should be on an antihypertensive
		<140/90	>20% risk	Yes	BP controlled and on a statin for high risk
	On antihypertensive	>140/90	>20% risk	No	Should be on a statin and additional antihypertensive
		<140/90	>20% risk	No	Should be on a statin
	On both statin and antihypertensive	>140/90	>20% risk	No	Should be on an additional antihypertensive
		<140/90	>20% risk	Yes	BP controlled and on a statin for high risk
	Neither statin nor antihypertensive	>140/90	>20% risk	No	Should be on a statin and an antihypertensive
		<140/90	>20% risk	No	Should be on a statin

BP = blood pressure. [a]Risk defined as a 10-year Framingham risk score (high risk >20%),[21] as calculated by the authors from available risk factor information in patient medical records.

Analysis

Descriptive statistics were used to define the proportion of patients within each risk group who were being treated in accordance with NICE guidelines. χ^2 tests were used to compare adherence to guidelines by age, sex, disease, and in patients with recorded or calculable risk scores. All data are presented as means ± standard deviation and proportions of the total, primary or secondary prevention populations (unless otherwise stated). All analyses were carried out using SPSS software (version 21).

RESULTS

Population characteristics

Of the 90 516 patients registered at participating practices, 34 975 patients were aged 40–74 years and were included in this analysis. CVD risk was known or calculable in 43% (14 899 patients): 12 349 (35%) patients had a calculable risk or were on treatment (primary prevention population), 2550 (7%) patients had existing CVD (secondary prevention population), and 20 076 (57%) patients had an unknown risk of CVD and therefore would be eligible for vascular screening (Figure 1). Cardiovascular risk factor and disease status in the total, primary, and secondary prevention populations are shown in Table 2. A formal cardiovascular risk assessment had been conducted and recorded in the medical notes of 8390 (24%) patients within the preceding 5 years.

Adherence to guidelines for primary prevention

Approximately 7929 (64%) patients in the primary prevention group were receiving appropriate treatment for their CVD risk in accordance with NICE guidelines (Figure 2). Adherence to treatment guidelines was higher in younger patients (6284 [69%] aged 40–64 years versus 1645 [50%] aged 65–74 years, P<0.001) and in females (4334 [69%] females versus 3595 [59%] males, P<0.001).

A total of 4699 patients were eligible for statin therapy, of whom 3777 (80%) were prescribed medication. Statin prescription was more common in younger patients (2399 [83% of those eligible] aged 40–64 years versus 1378 [76% of those eligible] aged 65–74 years, P<0.001) and in females (1782 females [92% of those eligible] versus 1995 males [72% of those eligible], P<0.001).

Of those eligible for antihypertensive medication (7234), 6213 (86%) patients received treatment. However, only 8191 (66%) patients in total had controlled blood pressure. As with statin prescription, blood pressure control was better in younger individuals (6424 [71%] aged 40–64 years versus 1767 [54%] aged 65–74 years, P<0.001) and in females (4373 [69%] females versus 3818 [63%] males, P<0.001).

There was no difference in guideline adherence between patients where a cardiovascular risk score was recorded

Figure 1. Treatment and risk stratification for primary and secondary prevention of cardiovascular disease (CVD) in a typical primary care population aged 40–74 years. TIA = transient ischaemic attack. [a]Disease groups within the secondary prevention cohort are not mutually exclusive. [b]High CVD risk defined as a 10-year Framingham risk score of >20%,[21] as calculated by the authors from available risk factor information in patient medical records. All percentages represent proportions of the total population.
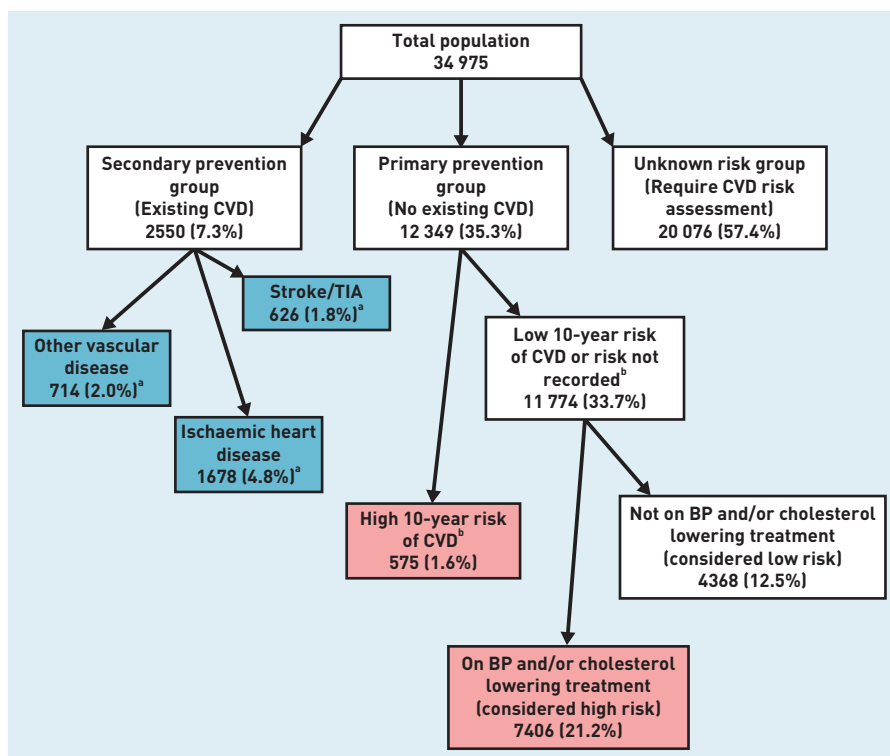
Table 2. Cardiovascular risk factor and disease status in total, primary and secondary prevention populations

Characteristic	Total population, n (%)	Primary prevention population,[a] n (%)	Secondary prevention population,[b] n (%)
Total patients	34 975	12 349	2550
Sex (% female)	16 990 (49)	6295 (51)	894 (35)
Age (mean ± standard deviation)	54 ± 10	57 ± 9	63 ± 8
South Asian ethnicity[c]	1899 (12)	974 (14)	195 (10)
Family history of cardiovascular disease	4213 (12)	1888 (15)	473 (19)
Diabetes	2598 (7)	1827 (15)	599 (24)
Left ventricular hypertrophy	77 (0)	44 (0)	26 (1)
Chronic kidney disease	1302 (4)	742 (6)	402 (16)
Blood pressure measured	30 151 (86)	12 312 (100)	2527 (99)
Cholesterol measured	10 339 (30)	9022 (73)	1176 (46)
Formal cardiovascular risk assessment recorded in medical records	8390 (24)	5558 (45)	911 (36)
Myocardial infarction	733 (2)	n/a	733 (29)
Peripheral vascular disease	487 (1)	n/a	487 (19)
Heart failure	253 (1)	n/a	253 (10)
Ischaemic heart disease	1678 (5)	n/a	1678 (66)
Stroke	331 (1)	n/a	331 (13)
Transient ischaemic attack	295 (1)	n/a	295 (12)

n/a = not applicable. [a]Primary prevention population defined as patients with available risk factor information in medical records or a prescription for primary prevention medication. [b]Secondary prevention population defined as patients with existing cardiovascular disease (myocardial infarction, peripheral vascular disease, heart failure, ischaemic heart disease, stroke or transient ischaemic attack). Percentage of total patients in each group. [c]Percentage of patients in whom ethnicity was recorded.

in the medical notes (and/or medication was already prescribed) (n = 11 530) and in patients where it was calculable from risk factor information recorded in the medical notes (and/or medication was already prescribed) (n = 12 349) (guideline adherence in 7422 with recorded risk [64%] versus 7929 with calculable risk [64%], P = 0.792). Similarly, age and sex differences in guideline adherence were not affected by the use of recorded risk scores instead of calculated risk scores to define the eligible population (data available from authors).

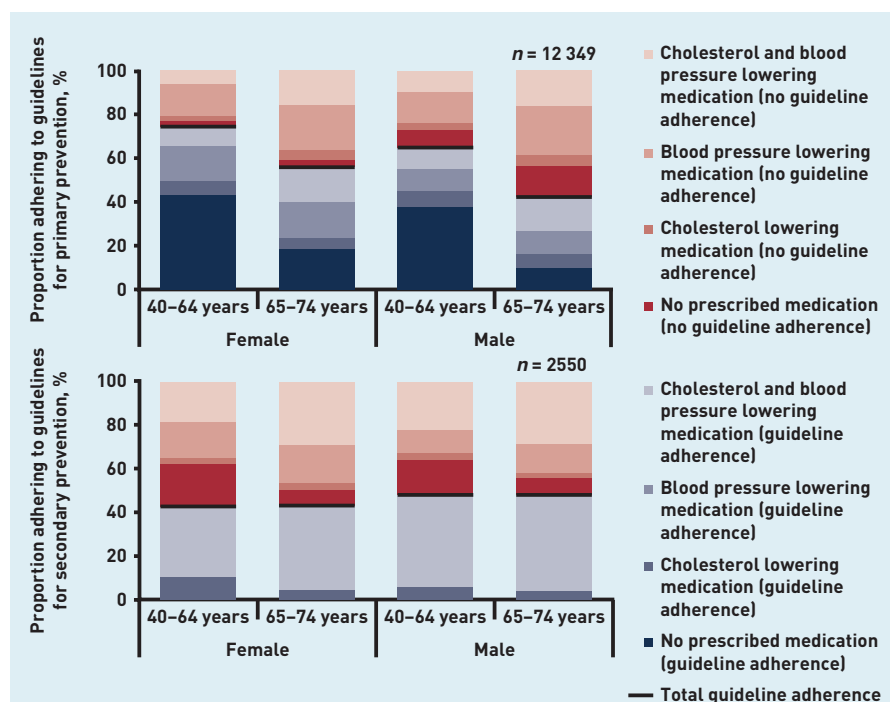### Adherence to guidelines for secondary prevention

Adherence to guidelines for secondary prevention was observed in 1185 (47%) patients eligible for treatment (Figure 2). Guideline adherence was higher in patients with IHD than in those with stroke/TIA or other CVD (866 patients with IHD [52%] versus 288 patients with stroke/TIA [46%] versus 276 patients with other CVD [39%], P<0.001). There were no observed age or sex differences in adherence to guidelines in patients with IHD or stroke/TIA. However, in those with other CVD (heart failure or peripheral vascular disease), older patients (106 [34%] aged 40–64 years versus 170 [42%] aged 65–74 years, P = 0.043) and males (78 [32%] females versus 198 [42%] males, P = 0.014) were more likely to be treated in accordance with secondary prevention guidelines.

A total of 1882 patients (74%) were prescribed statin therapy for secondary prevention. Statin prescription was higher in patients with IHD (1354 patients with IHD [81%] versus 458 patients with stroke/TIA [73%] versus 453 patients with other CVD [63%], P<0.001). Almost all patients with IHD eligible for antihypertensive therapy were receiving treatment (1473 [95%]). Antihypertensive prescription in eligible patients with stroke/TIA or other CVD was also high, but significantly lower than those with IHD (433 patients with stroke/TIA [89%] versus 539 patients with other CVD [89%], versus 1473 patients with IHD [95%], P<0.001).

Despite a high proportion of patients receiving antihypertensive prescription, only 1577 patients (62%) had controlled blood pressure and this was consistent across disease groups (1044 patients with IHD [62%] versus 398 patients with stroke/TIA

Figure 2. Adherence to pharmacological guidelines for primary and secondary prevention of cardiovascular disease in patients on medication or with known risk, by age and sex (n = 14 899)

[64%] versus 433 patients with other CVD [61%], *P* = 0.539).

DISCUSSION

Summary

This study examined adherence to national guidelines for pharmacological primary and secondary prevention of CVD in patients aged 40–74 years attending general practice in the UK. Ten-year cardiovascular risk was known (or calculable) in nearly half of all patients (14 899 [43%]) and approximately two-thirds of these were receiving optimal treatment in accordance with national guidelines.[3,22]

Blood pressure was uncontrolled in over one-third of patients and this was the primary cause of guideline 'non-adherence', although it is possible that some patients were not prescribed further medication because of contraindications to therapy, refusal of treatment or because they were already receiving the maximal number of recommended drugs for hypertension. The study's data suggest that existing prescribing practice is sufficient to ensure that the original projections of cost-effectiveness for the new vascular screening programme are realised.[20] However, missed opportunities in

Table 3. Adherence to treatment guidelines and blood pressure control in previous studies compared with the present study

Country	Year	Study population	Population sampling	Number of patients	Guideline lipid-lowering therapy prescription,[a] %	Guideline antihypertensive prescription,[a] %	Controlled blood pressure
Belgium[10]	2010	High risk[b]	Selected sample from multiple centres	11 069	80	68	13
Italy[11]	2006	High risk[b]	Random sample from multiple centres	3120	56	70	28
Italy[12]	2010	High risk[b]	Random sample from multiple centres	5731	–	67	–
Switzerland[13]	2010	High risk[b]	Entire population from study area	23 892	71	77	62
[c]Europe[14]	2010	Primary prevention	Patients attending study clinic	4366	50	86	29
Canada[15]	2012	High risk[b]	Entire population from study area	4931	–	94	50
UK: present study	2014	Primary prevention	Entire population from study area	12 349	80	88	56
UK: present study	2014	Secondary prevention	Entire population from study area	2550	74	91	62

[a]*Medication prescriptions in those eligible for treatment (according to relevant guidelines).* [b]*Existing cardiovascular disease or high risk because of existence of diabetes, chronic kidney disease or >20% cardiovascular risk score.* [c]*Belgium (n = 106), Bulgaria (n = 327), Croatia (n = 398), Finland (n = 518), Germany (n = 206), Italy (n = 548), Latvia (n = 321), Poland (n = 394), Romania (n = 485), Slovenia (n = 163), Spain (n = 519), UK (n = 381).*

cardiovascular disease prevention remain. These findings suggest that the full potential for vascular screening programmes will not be realised unless better use is made of existing risk factor information and greater adherence to the national guidelines for treatment is achieved.

Strengths and limitations
This study used routine data from the West Midlands, UK, and included all registered patients aged between 40 and 74 years in a large cohort of practices which were representative of the local area.[24] The quality of these data is likely to be high since the introduction of the Quality and Outcomes Framework (QOF) has significantly improved the accuracy of recording of risk factor and chronic disease diagnoses in UK primary care.[25] Blood pressure control was assessed on the basis of the most recent recorded clinic readings; it is not possible to know whether these readings represented isolated clinic readings or an average of multiple measurements.

Risk factor information extracted in the present study was not collected via the recently introduced vascular screening programme.[16,17] Thus, it is possible that those included in the primary prevention population may have been sicker than those in the general population because risk factors are usually only measured where there is a clinical suspicion of risk. Despite this, the included population was considered comparable with the national population aged between 35 and 74 years, in terms of mean age (55 years [present study] versus 55 years [national]),[26] sex (females, 49%) [present study] versus 49% [national]),[26] prevalence of stroke and IHD (6% [present study] versus 6% [national]),[27] diabetes (7% [present study] versus 7% [national]),[27] untreated hypertension (16% [present study] versus 16% [national])[27] and mortality (1.7 to 20.4 per 1000 population [West Midlands] versus 1.5 to 20.5 per 1000 population [national]).[28] These data are advantageous over those from the *Health Survey for England*[27] because the entire population from the study area was sampled, therefore removing any bias from differential response rates.

In the comparison of patient treatment with guideline recommendations, it was not possible to account for comorbidities and co-prescription, GP judgement of individual cases (including where patients were already receiving multiple medications or could not tolerate any further prescriptions), or individual patient choice which may have affected prescribing.[29] The apparent better

performance of younger patients in the analysis may be because younger people are more likely to be low risk and therefore not need treatment. Furthermore, while the study acknowledges the importance of behavioural change, this study focused only on drug treatment as a measure of guideline adherence.

The study did not take into account diabetes as an independent risk factor for CVD (although the Framingham equation does include adjustment for patients with diabetes).[21] Thus a minority of low-risk patients may have been classified as high risk in general practice because of a risk score calculated by the UK Prospective Diabetes Study (UKPDS) risk engine,[30] which was not used in the present investigation.

The Framingham equations are claimed to overestimate risk, resulting in misclassification of individuals.[31] However, such comparisons have been undertaken using databases which themselves fail to capture approximately the same proportion of cardiac events as Framingham is said to overestimate by.[32] Furthermore, this tool was recommended for use in clinical practice by NICE at the time of data collection,[22] and therefore was deemed appropriate for use in this study. The present study used data preceding the introduction of the vascular screening programme in the UK and so it is only reflective of prescribing practice in the absence of routine cardiovascular risk assessments. It is possible that since the introduction of vascular screening, prescribing practice may have changed, and this is worthy of further study.

Comparison with existing literature
The under-treatment of patients at high risk of CVD observed in the present study is consistent with the findings of other studies conducted in Canada,[15] Belgium,[10] Italy,[11,12] Switzerland,[13] and across Europe[14] (Table 3). The present study is the first conducted in the UK and the first to examine adherence to guidelines for both primary and secondary prevention of CVD in a complete primary care population. The study observed comparable rates of prescription for lipid-lowering therapy (74% [present study] versus 56–80% [existing literature])[10,11,13,14] and antihypertensive medication (91% [present study] versus 67–94% [existing literature]),[10–15] and generally better blood pressure control than previously reported (62% [present study] versus 13–62% [existing literature]).[10,11,13–15]

However, the study demonstrates that there is still scope for significant intensification of treatment in patients with

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known or calculable 10-year CVD risk. Why such treatment intensification does not occur in clinical practice is difficult to establish from the present data alone. It is not clear whether the lack of treatment observed here results from the GP's failure to examine CVD risk using available risk factor information or whether risk is known but concerns about the accuracy of risk calculators,[33] overtreatment,[34] misunderstanding of CVD risk[34,35] or that patients would not understand what risk means[36] act as barriers to guideline adherence. Patients themselves may choose to avoid medication, resulting in 'under-use' of CVD prevention therapy.[29] While some such decisions may be informed, others may be made by default or in the absence of adequate explanation of the concept of CVD risk.[37]

The data support the findings of previous studies that examined the association between age and sex, and prescription of medication for the primary prevention of CVD.[38] In primary prevention, the study showed that younger patients and females are more likely to be prescribed therapy, despite all eligible patients being at high risk of developing CVD by definition. This is interesting and does not suggest that GP prescribing practice is solely based on calculated 10-year CVD risk. Contrary to previous reports,[39–42] however, the study found little difference in secondary prevention associated with age or sex, except in patients with heart failure and peripheral vascular disease, where a higher number of older patients and males were receiving therapy. This may reflect the 74-year age cut-off in this study.

There do not appear to be any other studies that demonstrate the disparity in guideline adherence for secondary prevention of CVD between specific disease types. It is possible that these differences result from the array of different guidelines available for specific disease management[4,7–9] and subsequent confusion regarding the latest guidance.

Implications for clinical practice
Optimisation of treatment in people with known or calculable 10-year CVD risk is as important as identifying new people at risk. The study suggests that there is room for improvement in this area of CVD prevention.

One way of ensuring this happens is to promote regular treatment reviews in all patients with a history of CVD or who are known to be at high risk. In the UK, regular review is encouraged by national guidelines[3,4] and QOF,[43] which offers financial rewards to GPs achieving certain performance-related goals. However, the present study suggests that in the past, this recommendation has not precipitated action in CVD prevention. The latest iteration of the QOF, introduced in April 2013,[43] recommends stricter blood pressure control (targets of 140/90mmHg)[3] and the prescription of lipid-lowering therapy to those at high risk of CVD.[4] The study suggests that there is scope for these indicators to facilitate improvements in CVD prevention in routine clinical practice.

This study found that just over half of patients had an unknown 10-year risk of CVD. They could benefit from the national vascular screening programme currently being implemented in the UK,[16,17] but only if treatment is initiated appropriately after screening. Although the study showed adherence to guidelines for prevention of CVD to be suboptimal, the data do suggest that the benefits of vascular screening modelled in the original cost-effectiveness analysis[20] are likely to be realised if current treatment trends can be marginally improved. This modelling assumed that 80% of the total eligible population screened in the vascular health checks would be prescribed an antihypertensive medication and 85% would receive statin therapy. These assumptions were based on 'expert opinion' but the study's data seem to support them; it was found that for primary prevention, 86% of patients are prescribed antihypertensive medication and 80% are given statins.

Provided that existing prescribing trends in UK clinical practice continue, the vascular health check programme is likely to achieve the predicted benefits modelled by the Department of Health.[20] However, there is still room for improvement in CVD prevention, particularly in patients with existing CVD, known or calculable risk. The inclusion of new CVD indicators in the QOF could lead to optimisation of treatment in these at-risk patients but only if such treatment is accepted by patients and their GPs.

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