Workload implications of implementing national guidelines for hypertension

KAREN ROWLAND YEO, WILFRED W YEO

Abstract

We examined the workload implications of the National Service Framework for Coronary Heart Disease and the 1999 British Hypertension Society guidelines for the management of hypertension in clinical practice. The 1998 Health Survey for England was used to estimate the proportion of the English population aged 35 to 74 years that may require antihypertensive therapy. Of 8,154 subjects with blood pressure measurements, 400 (4.9%; 95% CI 4.4 to 5.4%) with cardiovascular disease were taking antihypertensive drugs and a further 100 (1.2%; 1.0 to 1.5%) were at treatment thresholds for secondary prevention of cardiovascular disease. There were 848 (10.4%; 9.7 to 11.1%) subjects free of cardiovascular disease on antihypertensive therapy and an additional 1,083 (13.3%; 12.5 to 14.0%) were identified for treatment. We estimate that 29.8% (28.8 to 30.8%) of the English population aged 35 to 74 years were candidates for antihypertensive therapy, of which 15.3% (14.5 to 16.1%) were already being treated but only 5.4% (4.9 to 5.9%) had their blood pressure controlled. An additional 14.5% of the English population will need antihypertensive therapy and an extra 9.9 % will need to have their treatment intensified to attain the blood pressure targets set by the British Hypertension Society guidelines.

Key words: hypertension, cardiovascular disease, guidelines.

Br J Cardiol 2002;**9**:524–30

Introduction

Hypertension remains a key modifiable risk factor for coronary heart disease and stroke in the United Kingdom.[1] Prevention of cardiovascular disease by management and treatment of high blood pressure was the focus of guidelines published by the British Hypertension Society in 1999,[2] and a priority of the Joint British Societies recommendations.[3] The National Service Framework for Coronary Heart Disease[4] introduced by the Government last year as the 'blueprint for tackling heart disease' endorses the evidence-based report of the third working party of the British Hypertension Society,[5] which discusses the importance of treating hypertension in diabetic patients, the elderly, those with isolated systolic hypertension, and those with high cardiovascular risk. Explicit optimal blood pressure targets for hypertension treatment based on trial data were also defined.[5]

We have applied the British Hypertension Society guidelines to data from the Health Survey for England in 1998[6] to examine the workload implications of hypertension management for clinical practice. Specifically, we aimed to estimate the proportion of adults in the UK population targeted by the National Service Framework for Coronary Heart Disease who may require treatment for hypertension, and also the proportion of subjects on treatment who may require more intensive management to attain blood pressure targets set by the British Hypertension Society.[2]

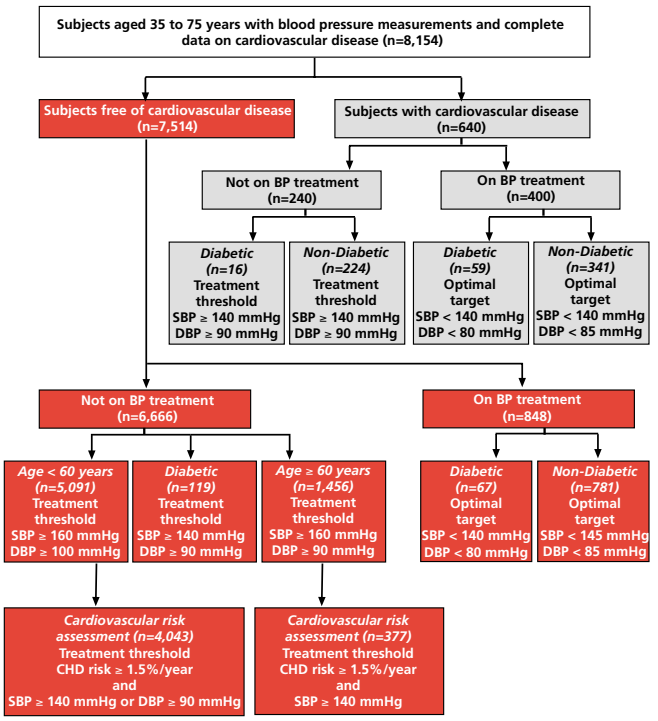
Methods

Methodology relating to the 1998 Health Survey for England has been described previously.[7] In the Health Survey, 19,654 subjects were interviewed. Our analysis was restricted to the 8,154 subjects with a valid blood pressure measurement aged 35 to 74 years – the target population of the National Service Framework for Coronary Heart Disease.[4] Blood pressure was measured by a Dinamap 8,100 monitor using an appropriate cuff size. Three blood pressure measurements were taken, and results were based on the mean of the second and third readings. Subjects were assumed to be on treatment for hypertension if they reported that they were taking blood-pressure lowering medication prescribed by their doctor.

Guidelines issued by the British Hypertension Society[2] recommend antihypertensive therapy in uncomplicated patients with sustained systolic blood pressure $\geq$ 160 mmHg or diastolic blood pressure $\geq$ 100 mmHg. For those with target organ damage, cardiovascular disease, diabetes or a 10-year coronary heart disease risk $\geq$ 15%, treatment thresholds are systolic blood pressure $\geq$ 140 mmHg or diastolic blood pressure $\geq$ 90 mmHg. In elderly patients ($\geq$ 60 years) the treatment thresholds are systolic blood pressure $\geq$ 160 mmHg or diastolic blood pressure $\geq$ 90 mmHg. These guidelines were applied systematically to the 8,154 subjects to identify those likely to be recommended for treatment of hypertension for secondary and primary pre-

Clinical Pharmacology and Therapeutics, Division of Clinical Sciences (S), Floor L, University of Sheffield, Royal Hallamshire Hospital, Sheffield, S10 2JF.
Karen Rowland Yeo, Lecturer
Wilfred W Yeo, Senior Lecturer and Consultant Physician
Correspondence to: Dr K Rowland Yeo
(email: k.r.yeo@sheffield.ac.uk)

Figure 1. Sequential route of data analysis for the 1998 Health Survey for England using the British Hypertension Society guidelines to estimate proportions of the population that may require antihypertensive therapy for secondary prevention (grey route) or primary prevention (red route) of cardiovascular disease

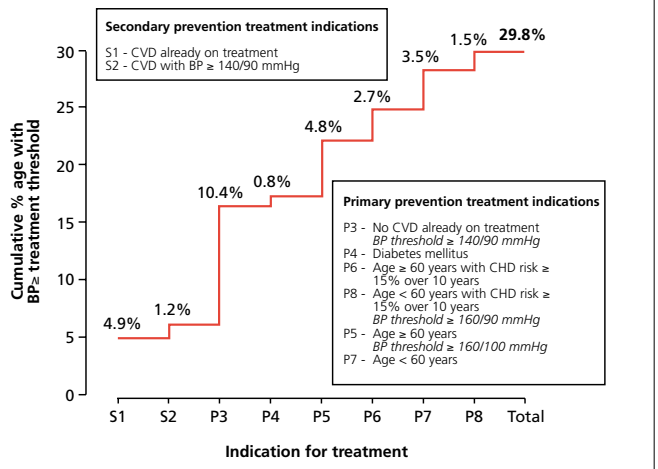


Key: BP = blood pressure; SBP = systolic blood pressure; DBP = diastolic blood pressure

Table 1. Baseline characteristics (mean ± SD) and risk factors or history of cardiovascular disease [n (%)] for all subjects aged 35 to 74 years in the Health Survey for England 1998 with blood pressure measurements

	Men (n=3,797)	Women (n=4,357)	Total (n=8,154)
Age (years)	52.3 ± 11.2	52.2 ± 11.2	52.3 ± 11.2
Systolic blood pressure (mmHg)	138 ± 18	134 ± 20	136 ± 19
Diastolic blood pressure (mmHg)	80 ± 12	74 ± 12	77 ± 12
Serum total cholesterol (mmol/L)	5.7 ± 1.1	5.8 ± 1.1	5.7 ± 1.1
High density lipoprotein cholesterol (mmol/L)	1.3 ± 0.4	1.6 ± 0.5	1.4 ± 0.4
Smokers (%)	952 (25.1)	1,121 (25.7)	2,073 (25.4)
Diabetes (%)	148 (3.9)	113 (2.6)	261 (3.2)
Angina (%)	248 (6.5)	163 (3.7)	411 (5.0)
Myocardial infarction (%)	190 (5.0)	81 (1.9)	271 (3.3)
Stroke (%)	91 (2.4)	79 (1.8)	170 (2.1)
Cardiovascular disease (%)	384 (10.1)	256 (5.9)	640 (7.9)

Figure 2. Percentage of men and women aged 35 to 74 years in the English population who may require treatment for hypertension for secondary or primary prevention of cardiovascular disease



Key: BP = blood pressure; CVD = cardiovascular disease; CHD = coronary heart disease

vention of cardiovascular disease (figure 1). The Framingham equation was used to estimate 10-year CHD event risk[8] in subjects free of cardiovascular disease. This required the following parameters: age, sex, systolic blood pressure, smoking habit, diabetes status, total cholesterol, high density lipoprotein (HDL) cholesterol and left ventricular hypertrophy (assumed to be absent in all individuals).

In subjects already taking antihypertensive therapy, we used optimal targets recommended by the British Hypertension Society to determine the proportion of subjects with controlled blood pressure (figure 1). We also determined the number of subjects taking each class of antihypertensive drug and those on combination therapy.

Results

Mean baseline characteristics of the 8,154 subjects aged 35 to 74 years with blood pressure measurements are shown in table 1. Of these, 400 subjects (4.9%; 95% CI 4.4 to 5.4%) with a history of cardiovascular disease were already taking antihypertensive therapy and an additional 100 (1.2%; 1.0 to 1.5%) were identified as candidates for treatment for secondary prevention (figure 2; table 2). There were 848 (10.4%; 9.7 to 11.1%) subjects free of cardiovascular disease who were already on blood pressure treatment and an additional 1,083 (13.3%; 12.5 to 14.0%) required treatment for primary prevention (figure 2; table 2). Of the 8,154 subjects aged 35 to 74 years, 29.8% (28.8 to 30.8%) were identified as candidates for antihypertensive therapy, 15.3% (14.5 to 16.1%) were being treated and only 5.4% (4.9 to 5.9%) were taking medications that controlled their hypertension. About one third of subjects on treatment were taking two or more drugs (table 3).

Among the 640 subjects with a history of cardiovascular dis-

Table 2. Percentage (number) of participants already on antihypertensive therapy and those at treatment intervention levels

	Men		Women		Total	
	Age 35–59 (n=2,649)	Age 60–74 (n=1,148)	Age 35–59 (n=3,083)	Age 60–74 (n=1,274)	Age 35–59 (n=5,732)	Age 60–74 (n=2,422)
Secondary prevention						
Subjects already on treatment (n=400)						
Diabetic	0.3 (8)	2.7 (31)	0.2 (5)	1.2 (15)	0.2 (13)	1.9 (46)
Non-diabetic	2.2 (57)	12.6 (145)	1.0 (30)	8.6 (109)	1.5 (87)	10.5 (254)
Subjects not on treatment (n=240)						
Diabetic	0.2 (4)	0.2 (2)	0 (0)	0.2 (3)	0.1 (4)	0.2 (5)
Non-diabetic	0.8 (21)	3.0 (34)	0.4 (12)	1.9 (24)	0.6 (33)	2.4 (58)
Primary prevention						
Subjects already on treatment (n=848)						
Diabetic	0.5 (13)	1.6 (18)	0.3 (9)	2.1 (27)	0.4 (22)	1.9 (45)
Non-diabetic	5.3 (139)	15.0 (172)	6.4 (197)	21.4 (273)	5.9 (336)	18.4 (445)
Subjects not on treatment (n=6,666)						
Diabetic	0.5 (14)	1.8 (21)	0.3 (10)	1.4 (18)	0.4 (24)	1.6 (39)
Non-diabetic						
Age ≥ 60, SBP ≥ 160 mmHg		12.0 (138)		13.3 (169)		12.7 (307)
Age ≥ 60, DBP ≥ 90 mmHg		6.0 (69)		1.3 (17)		3.6 (86)
Age ≥ 60, CHD risk ≥15%/10 years, SBP > 140 mmHg		12.3 (141)		6.3 (80)		9.1 (221)
Age < 60, SBP ≥ 160 mmHg	4.9 (130)		3.7 (115)		4.3 (245)	
Age < 60, DBP ≥ 100 mmHg	1.0 (27)		0.4 (13)		0.7 (40)	
Age < 60, CHD risk ≥ 15%/10 years, SBP > 140 mmHg	3.6 (95)		0.6 (18)		2.0 (113)	
Age < 60, CHD risk ≥15%/10 years, DBP > 90 mmHg	0.3 (8)		0 (0)		0.1 (8)	

Key: SBP = systolic blood pressure; DBP = diastolic blood pressure; CHD = coronary heart disease

Table 3. Percentage (number) of subjects taking antihypertensive drugs and combination therapy for secondary and primary prevention

	Secondary prevention				Primary prevention				Total	
	Diabetic (n=59)		Non-diabetic (n=341)		Diabetic (n=67)		Non-diabetic (n=781)		(n=1,248)	
Diuretics	39.0	(23)	34.9	(119)	34.3	(23)	46.5	(363)	42.3	(528)
Beta blockers	20.3	(12)	43.1	(147)	13.4	(9)	36.4	(284)	36.2	(452)
ACE inhibitors	50.8	(30)	30.8	(105)	58.2	(39)	22.8	(178)	28.2	(352)
CCB	47.5	(28)	41.3	(141)	35.8	(24)	24.1	(188)	30.5	(381)
Other	10.2	(6)	2.3	(8)	4.5	(3)	6.1	(48)	5.2	(65)
≥ 5 drugs	0	(0)	0	(0)	0	(0)	0.3	(2)	0.2	(2)
≥ 4 drugs	0	(0)	0.9	(3)	1.5	(1)	0.4	(3)	0.6	(7)
≥ 3 drugs	10.2	(6)	6.7	(23)	6.0	(4)	4.7	(37)	5.6	(70)
≥ 2 drugs	47.5	(28)	36.4	(124)	29.9	(20)	24.2	(189)	28.9	(361)
1 drug	42.4	(25)	56.0	(191)	62.7	(42)	70.4	(550)	64.7	(808)

Key: ACE = angiotensin-converting enzyme; CCB = calcium channel blockers

ease, 59 of the 75 diabetics (78.7%) and 341 of the 565 non-diabetics (60.4%) were taking treatment for hypertension, and a further nine diabetics (12.0%) and 91 non-diabetics (16.1%) were at treatment threshold levels. Only 45.8% of diabetics and 44.9% of non-diabetics on treatment had blood pressure readings at optimal targets. Among subjects free of cardiovascular disease, 67 of the 186 diabetics (36.0%) and 781 of the 7,328 non-diabetics (10.7%) were taking antihypertensive therapy, and an additional 63 diabetics (33.7%) and 1,020 non-diabetics (13.9%) required treatment. Of subjects on blood-pressure lowering drugs, only 17.9% and 32.1% of diabetics and non-diabetics respectively were controlled. The use of different classes of drugs for treating hypertension in diabetic and non-diabetic subjects is described in table 3.

Key messages

- The British Hypertension Society guidelines focus on the importance of treating isolated systolic hypertension and hypertension in diabetic patients, the elderly and patients with high cardiovascular risk. For the first time optimal blood pressure targets based on trial data have been set
- We estimate that about 30% of the English population aged 35 to 74 years require antihypertensive therapy for secondary and primary prevention of cardiovascular disease
- Only half of the adults who may need treatment (15%) were on blood-pressure lowering drugs, with two thirds receiving monotherapy
- In the Health Survey for England 1998 only one third (5%) of patients prescribed antihypertensive drugs achieved the currently recommended blood pressure targets

Discussion

The workload implications of implementing hypertension guidelines in the English population are key to planning and executing the National Service Framework for Coronary Heart Disease. In 1999 the British Hypertension Society published comprehensive guidelines for treatment and optimal targets for blood pressure control.[3] When applied to a large nationally representative sample, we estimate that 29.8% of subjects aged 35 to 74 years require antihypertensive therapy for secondary and primary prevention of cardiovascular disease. Only half (15.3%) of these were taking antihypertensive drugs and about one-third (5.4%) had their blood pressure controlled. Therefore, an additional 14.5% of the population will need to be started on treatment and another 10% will require more intensive drug treatment to attain the optimal blood-pressure targets.[3] The latter is not surprising as two thirds of patients in the Health Survey were on monotherapy for their hypertension, and it follows that the proportion of patients requiring combination therapy of two, three or four drugs will need to increase substantially. It should be noted that thresholds and targets for the use of blood-pressure lowering drugs in the Health Survey were based on earlier hypertension guidelines.[9] Nevertheless the Health Survey data allow us to examine the marginal workload between ordinary medical practice in 1998 and full implementation of current recommendations.[3,4]

Target groups

The focus of the new guidelines was the management of hypertension in diabetic patients, the elderly, those with isolated systolic hypertension, and those with high cardiovascular risk.[5] Epidemiological and outcome studies show that diabetic patients are at high risk of cardiovascular disease and have much to gain from improved management of hypertension.[10] About 76% of diabetic patients aged 35 to 74 years in the Health Survey were identified for treatment, and half were already on antihypertensive drugs. As diabetes occurs in a minority of the population, only an additional 0.8% of the population will require treatment at a threshold of 140/90 mmHg (figure 2). The recommendation to extend treatment to all diabetics at this blood pressure level should have a major impact on morbidity without greatly increasing the workload.

One third of elderly patients aged 60 to 74 years were receiving antihypertensive drugs and an extra 30% were at treatment threshold levels. Evidence for treating the elderly has been available since the early 1990s[11] but physicians have been reluctant to treat for a number of reasons. Among these, is the incorrectly held view that a rise in systolic blood pressure was a normal and harmless consequence of ageing, and that the elderly did not tolerate drug treatment well.

Another aspect of the British Hypertension Society guidelines to consider is the impact of cardiovascular risk assessment on hypertension management. Once patients have been identified for treatment on the basis of 'simple' criteria, such as secondary prevention or blood pressure thresholds, the effect of cardiovascular risk assessment is considerable. An additional 4.2% of the population will be at or above the threshold for treatment of hypertension based on cardiovascular risk.

A possible new development in the secondary prevention of stroke is the lowering of blood pressure irrespective of the baseline level. In the PROGRESS study,[12] combination therapy reduced blood pressure by 12/5 mmHg and stroke risk by 43% with similar benefits in hypertensive and non-hypertensive patients. If the findings of this study were incorporated into guidelines for clinical practice, we estimate that a further 0.2% of the population aged 35 to 74 years with normal blood pressure[13] would require treatment for secondary prevention of stroke.

Study limitations

Some limitations of the study merit discussion. Bias may have been introduced by excluding the 1,436 subjects with no blood pressure readings (men 43.2%, mean age 52.7 years, diabetics 3.6%, smokers 27.7% mean total cholesterol 5.8 mmol/L and mean high density lipoprotein (HDL) cholesterol 1.5 mmol/L). This is unlikely as the characteristics of the subjects are similar to those of the 8,154 included in the analysis (table 1). One of the main limitations is that we assumed that all patients on treatment were correctly diagnosed and prescribed antihypertensive drugs by their own doctors. The low proportion of patients with controlled blood pressure suggests that there were few normotensive patients incorrectly assigned for treatment. Absence of left ventricular hypertrophy was assumed for all patients; this may have underestimated the need for treatment in two ways: by failing to recognise those with target organ damage, and by underestimating coronary heart disease risk in individuals. On the other hand, we may have overestimated the proportion of subjects who require antihypertensive therapy by not considering regression to the mean for blood pressure. However, it should be noted that subjects in the Health Survey were not selected on the

basis of their blood pressure, and the population mean of 136 mmHg for systolic pressure was close to the 140 mmHg treatment threshold used for most patients. Overall these factors will probably balance each other to leave reasonably accurate estimates of the population implications of the British Hypertension Society guidelines.

Data from the 1998 Health Survey for England can serve as an audit standard for those implementing the National Service Framework for Coronary Heart Disease. About 15.3% of the target population aged 35 to 74 were being treated with antihypertensive drugs in 1998 and a further 14.5% may require treatment. Applying the British Hypertension Society guidelines to ordinary medical practice will involve systematic identification of patients and more intensive management to ensure that blood pressure targets are achieved. It follows that more patients will need two-, three- and four-drug treatment, and these changes will, in turn, affect the definition of resistant hypertension and the number of patients requiring more detailed investigation. The cost-benefit analyses of hypertension management will therefore need to be reconsidered.

Acknowledgement

The Health Survey for England 1998 was carried out by the Joint Health Survey Unit of the National Centre for Social Research (formerly SCPR) and the Department of Epidemiology and Public Health at University College London. We thank the depositors and keepers of the data archive for access to the database.

Contributors: KRY and WWY planned and carried out the analyses. Both authors wrote the paper and will act as guarantors of the study.

Conflict of interest

None.

References

1. British Heart Foundation Health Promotion Research Group. *European cardiovascular disease statistics.* London: British Heart Foundation, 2000.
2. Ramsay LE, Williams B, Johnston GD *et al*. British Hypertension Society guidelines for hypertension management 1999: summary. *BMJ* 1999; **319**:630-5.
3. Wood D, Durrington P, Poulter N *et al*. for the British Cardiac Society, British Hyperlipidaemia Association, British Hypertension Society and British Diabetic Association. Joint British recommendations on prevention of coronary heart disease in clinical practice. *Heart* 1998;**80**(suppl 2):S1-S29.
4. Department of Health. *National Service Framework for Coronary Heart Disease*. *Modern standards and service models, 2000*. London: The Stationery Office, 2000.
5. Ramsay LE, Williams B, Johston GD *et al*. Guidelines for management of hypertension: report of the third working party of the British Hypertension Society, 1999. *J Hum Hypertens* 1999;**13**:569-92.
6. Erens B, Primatesta P, eds. *Health survey for England. Cardiovascular disease '98*. *Vol 1*. *Findings*. London: The Stationery Office, 1999.
7. Primatesta P, Poulter NR. Lipid concentrations and the use of lipid-lowering drugs: evidence from a national cross sectional survey. *BMJ* 2000;**321**:1322-5.
8. Anderson KM, Odel PM, Wilson PWF, Kannel WB. Cardiovascular disease risk profiles. *Am Heart J* 1991;**121**:293-8.
9. Sever P, Beevers G, Bulpitt C *et al*. Management guidelines in essential hypertension: report of the second working party of the British Hypertension Society. *BMJ* 1993;**306**:983-7.
10. United Kingdom Prospective Diabetes Study Group. Tight blood pressure control of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *BMJ* 1998;**317**:703-13.
11. SHEP Cooperative Research Group. Prevention of stroke by anithypertensive drug treatment in older persons with isolated systolic hypertension. Final results of the Systolic Hypertension in the Elderly Program (SHEP). *JAMA* 1991;**265**:3255-64.
12. PROGRESS Collaborative Group. Randomised trial of a perindopril-based blood-pressure-lowering regimen among 6105 individuals with previous stroke or ischaemic attack. *Lancet* 2001;**358**:1033-41.
13. Staessen JA, Wang JG. Blood-pressure lowering for the secondary prevention of stroke. *Lancet* 2001;**358**:1026-7.