**Abstract**—White coat hypertension is considered to be a benign condition that does not require antihypertensive treatment. Ambulatory blood pressure (ABP) was measured in 284 participants in the Hypertension in the Very Elderly Trial (HYVET), a double-blind randomized trial of indapamide sustained release 1.5 mg±perindopril 2 to 4 mg versus matching placebo in hypertensive subjects (systolic blood pressure 160–199 mm Hg) aged >80 years. ABP recordings (DiaSys Integra II) were obtained in 112 participants at baseline and 186 after an average follow-up of 13 months. At baseline, clinic blood pressure (CBP) exceeded the morning ABP by 32/10 mm Hg. Fifty percent of participants fulfilled the established criteria for white coat hypertension. The highest ABP readings were in the morning (average 140/80 mm Hg), the average nighttime pressure was at 124/72 mm Hg, and the average 24-hour blood pressure was 133/77 mm Hg. During follow-up, the systolic/diastolic blood pressure placebo-active differences averaged 6/5 mm Hg for morning ABP, 8/5 mm Hg for 24-hour ABP, and 13/5 mm Hg for CBP. The lowering of blood pressure over 24 hours supports the reduction in blood pressure with indapamide sustained release±perindopril as the explanation for the reduction in total mortality and cardiovascular events observed in the main HYVET study. Because we estimate that 50% had white coat hypertension in the main study, this condition may benefit from treatment in the very elderly. *(Hypertension. 2013;61:89-94.)*  ● Online Data Supplement

**Key Words:** hypertension ■ elderly ■ white coat hypertension ■ ambulatory blood pressure ■ indapamide ■ perindopril ■ National Institute for Health and Clinical Excellence (NICE) guidelines

Accurate measurement of blood pressure (BP) is an essential feature of any trial aiming to determine the relationship between BP reduction and outcome. BP control was the source of a controversy surrounding the results of the Heart Outcomes Prevention Evaluation (HOPE) trial, which claimed additional benefits from the use of an angiotensin-converting enzyme inhibitor (ramipril) versus placebo, because the between-group difference in clinic BP (CBP) was only 3/2 mm Hg.¹ The beneficial effect was estimated to be 3 times that expected for this small difference in BP;² however, the possibility of a greater difference in BP was suggested by a small substudy of HOPE that measured ambulatory BP (ABP) and found a between-group difference of 10/4 mm Hg.³

ABP does not exactly mirror CBP, even if a fixed correction factor is used and the timing of the CBP measurement during the day is taken into account, for example, by comparing morning ABP values with morning CBP. The difference between CBP and ABP also depends on the degree of the alarm response induced in the office and varies from person to person, method of measurement, and the observer. This office or alarm response tends to increase with age⁴,⁵ and decrease with the familiarity with the measurement. Furthermore, the machine used to measure ABP or CBP may over- or underestimate BP. When CBP is above normal and ABP is judged to be normal, then white coat hypertension (WCH) is said to be present. Importantly, it has long been considered desirable to avoid pharmaceutical treatment in those with WCH, because it has been suggested that active treatment does not lower ABP in this condition and also does not reduce cardiovascular events.⁶

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From the Department of Medicine, Imperial College London, London, United Kingdom (C.J.B., N.B., R.P., R.L.A.); Brighton and Sussex Medical School, Brighton, United Kingdom (C.J.B., C.R.); Department of Cardiology, University of Leuven, Leuven, Belgium (J.A.S., R.H.F.); Centre for Epidemiological Studies and Clinical Trials, Ruijin Hospital, Shanghai Institute of Hypertension, China (J.-G.W.); Strada Narciselor, Fagaras, Romania (M.C.); Spitalul Judetean Cluj, Clinica Medica 2, Cluj, Romania (D.D.); Oulu City Hospital and Institute of Health Sciences (Geriatrics), Oulu University, Oulu, Finland (R.L.A.); School of Computing, Engineering and Mathematics, University of Brighton, Brighton, United Kingdom (E.C.); Department of Cardiology, Medical University of Sofia, Sofia, Bulgaria (V.G.).

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Correspondence to Chakravarthi Rajkumar, Academic Department of Geriatrics, Brighton and Sussex Medical School, Audrey Emerton Bldg, Royal Sussex County Hospital, Eastern Rd, Brighton BN2 5BE, United Kingdom. E-mail c.rajkumar@bsms.ac.uk

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In this article, we describe an analysis of the Hypertension in the Very Elderly Trial (HYVET) ABP substudy in which ABP was measured at baseline and on treatment in subgroups of patients in both the active treatment and placebo arms. The between-group difference in BP was determined in the subgroup, and the comparison of ABP and CBP data was also used to determine the extent of WCH in HYVET participants.

Methods

The protocol for ABP monitoring in HYVET has been published elsewhere, as has the protocol for the main study (registered trial number NCT00122811) and the main results. Participants were eligible for the trial if they were aged >80 years and had an average systolic CBP of 160 to 199 mmHg after at least a 2-month placebo run-in and an average standing systolic CBP of ≥140 mmHg. At the start of the trial, the participants had to have a diastolic CBP of 90 to 109 mmHg, although this criterion was later relaxed to allow the inclusion of subjects with isolated systolic hypertension and diastolic CBP <90 mmHg. Treatment was started with indapamide sustained release (SR) 1.5 mg daily or matching placebo, to which could be added perindopril 2 or 4 mg daily (or matching placebo) to achieve a goal of systolic CBP <150 mmHg and diastolic CBP <80 mmHg.

It was planned to recruit 609 patients into the ABP substudy with data both at baseline and during the double-blind phase of the trial. Unfortunately, this was not achieved, though 284 were recruited. Of these, 36 were excluded for the following reasons: 11 recorded <60% of possible ambulatory readings; 3 were studied while no longer on trial medication; and 1 was excluded because of uncontrolled atrial tachycardia. For baseline measurements, 7 were excluded because they were studied within 7 days of starting placebo run-in and were previously on antihypertensive treatment; and 14 were studied after inclusion of subjects with isolated systolic hypertension and diastolic CBP <90 mmHg. Treatment was started with indapamide sustained release (SR) 1.5 mg daily or matching placebo, to which could be added perindopril 2 or 4 mg daily (or matching placebo) to achieve a goal of systolic CBP <150 mmHg and diastolic CBP <80 mmHg.

Results

The baseline characteristics of the patients in the ABP substudy were similar to those of the whole HYVET trial (Table 1). The overall CBP and baseline ABP results are presented in Table 2 for both systolic and diastolic pressure. At baseline, the average 24-hour ABP reading was 133/77 mmHg and the average ABP night-time reading was low at 124/72 mmHg. The difference between CBP and daytime (8:00 AM to 8:00 PM) ABP averaged 36 mmHg (range −13 to +73 mmHg) systolic and 12 mmHg (range −31 to +35 mmHg) diastolic. Almost all (97%) of patients had systolic CBP greater than daytime ABP (Figure A) and 80% had diastolic CBP greater than daytime ABP (Figure B). When CBP was compared with morning (8:00 AM to 12:00 noon) ABP, the average difference was 32 mmHg (range −33 to +80 mmHg) systolic and 10 mmHg (range −35 to +41 mmHg) diastolic. Ninety percent of patients had systolic CBP greater than morning ABP, and 76% had diastolic CBP greater than morning ABP. WCH at baseline was present in 36 (50%; 95% CI, 40%–60%) participants based on daytime ABP and in 43 (38%; 95% CI, 29%–48%) participants based on morning ABP. There were too few events in the HYVET ABP substudy to determine mortality and morbidity in the 2 treatment groups according to ABP level.

Table 3 gives the ABP results according to treatment arm, active treatment (indapamide SR–based) or placebo, with recordings after an average of 13 months on treatment or placebo. The placebo-active treatment difference in daytime ABP was 8 mmHg systolic and 6 mmHg diastolic, and the treatment difference in morning ABP was 6 mmHg systolic and 5 mmHg diastolic. The 24-hour ABP difference averaged 8/5 mmHg.

Discussion

The results of the main HYVET study demonstrated that active BP lowering with indapamide±perindopril was associated with a 21% reduction in total mortality, a 30% reduction in stroke, and a 34% reduction in any cardiovascular event. These results applied to trial participants over 80 years of age with an untreated systolic CBP of 160 to 199 mmHg and a CBP difference of 15/6 mmHg between the placebo and actively treated groups after 2 years. The ABP side study found a similar difference in CBP between the groups of 17/7 mmHg at 13 months with a placebo-active difference in 24-hour ABP of 8/5 mmHg.

The ABP side study suggests that between 40% and 60% of eligible participants in the main study may have had WCH. If WCH does not require treatment it would be surprising that the benefits of treatment were so great. Definitions of systolic hypertension based on daytime ABP range from >135 to >140 mmHg with night-time ABP >120 mmHg and an average standing systolic of 124 mmHg, and because we found an average baseline daytime systolic ABP of 136 mmHg and an average night-time systolic of 124 mmHg, about half of HYVET participants would be judged to have hypertension on ABP criteria. However, it has long been recognized that the CBP-ABP difference increases with age, so that ABP falls with age relative to CBP, leading to our finding that the very elderly have hypertension as determined by CBP but not necessarily when assessed by ambulatory blood pressure monitoring. With the widening gap between CBP and ABP with advancing age, the 2 arbitrary definitions of hypertension diverge, and it is unlikely that the present definition of WCH is appropriate over 80 years of age. Indeed, it is recognized that the prevalence of WCH increases with age, and the possibility remains that many with this condition would benefit from treatment. A recent database analysis reported a 28.6% prevalence of WCH in subjects with isolated systolic hypertension and an average of 60 years of age. In untreated subjects, those with WCH and subjects with a normal BP were at a similar risk (P=0.29). However, the authors commented “our subgroup analysis suggests that men and diabetics with untreated White-Coat Hypertension are at increased risk.” One potential subgroup will be the very elderly, and ABP may be considerably lowered by active treatment in those with WCH. We suggest that WCH may need active treatment in the
Table 1. Baseline Characteristics of Participants Taking Part in the ABP Substudy Versus Those of the Main HYVET Population

<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>ABP Participants With Measurements at Baseline (n=112)</th>
<th>ABP Participants With Measurements on Treatment (n=186)</th>
<th>All ABP Participants (n=248)</th>
<th>All HYVET Participants (n=3845)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>82.9±2.6</td>
<td>83.7±3.6</td>
<td>83.4±3.4</td>
<td>83.5±3.2</td>
</tr>
<tr>
<td>Female</td>
<td>72 (64.9%)</td>
<td>124 (66.0%)</td>
<td>162 (65.3%)</td>
<td>2327 (60.5%)</td>
</tr>
<tr>
<td>Disease characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sitting SBP, mm Hg</td>
<td>172.0±8.0</td>
<td>175.3±9.7</td>
<td>174.2±9.2</td>
<td>173.0±8.5</td>
</tr>
<tr>
<td>Sitting DBP, mm Hg</td>
<td>90.0±9.5</td>
<td>91.3±8.9</td>
<td>90.9±9.4</td>
<td>90.8±8.5</td>
</tr>
<tr>
<td>Standing SBP, mm Hg</td>
<td>168.3±9.9</td>
<td>171.0±11.5</td>
<td>169.8±11.0</td>
<td>167.9±11.0</td>
</tr>
<tr>
<td>Standing DBP, mm Hg</td>
<td>89.5±9.8</td>
<td>90.5±10.0</td>
<td>89.8±10.2</td>
<td>88.7±9.3</td>
</tr>
<tr>
<td>Heart rate, bpm</td>
<td>71.6±9.3</td>
<td>73.5±9.8</td>
<td>73.4±9.6</td>
<td>74.5±9.3</td>
</tr>
<tr>
<td>Isolated systolic hypertension</td>
<td>43 (38.7%)</td>
<td>62 (33.0%)</td>
<td>84 (33.9%)</td>
<td>1248 (32.5%)</td>
</tr>
<tr>
<td>Orthostatic hypotension*</td>
<td>5 (4.5%)</td>
<td>18 (9.6%)</td>
<td>21 (8.5%)</td>
<td>321 (8.4%)</td>
</tr>
<tr>
<td>Cardiovascular history</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>12 (10.8%)</td>
<td>21 (11.2%)</td>
<td>29 (11.7%)</td>
<td>452 (11.8%)</td>
</tr>
<tr>
<td>Stroke</td>
<td>4 (3.6%)</td>
<td>13 (6.9%)</td>
<td>15 (6.0%)</td>
<td>261 (6.8%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>104 (93.7%)</td>
<td>153 (81.4%)</td>
<td>207 (83.5%)</td>
<td>3455 (89.9%)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>6 (5.4%)</td>
<td>8 (4.3%)</td>
<td>12 (4.8%)</td>
<td>121 (3.1%)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>3 (2.7%)</td>
<td>1 (0.5%)</td>
<td>4 (1.6%)</td>
<td>111 (2.9%)</td>
</tr>
<tr>
<td>Antihypertensive treatment</td>
<td>84 (75.7%)</td>
<td>123 (65.4%)</td>
<td>171 (69.0%)</td>
<td>2486 (64.7%)</td>
</tr>
<tr>
<td>Cardiovascular risk factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>11 (9.9%)</td>
<td>16 (8.5%)</td>
<td>20 (8.1%)</td>
<td>263 (6.8%)</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>25.4±3.5</td>
<td>25.0±3.6</td>
<td>25.1±3.6</td>
<td>24.7±3.6</td>
</tr>
<tr>
<td>Current smoker</td>
<td>2 (1.8%)</td>
<td>11 (5.9%)</td>
<td>11 (4.4%)</td>
<td>250 (6.5%)</td>
</tr>
<tr>
<td>Alcohol drinkers</td>
<td>27 (24%)</td>
<td>45 (24%)</td>
<td>55 (22%)</td>
<td>681 (18%)</td>
</tr>
<tr>
<td>Biochemistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hematocrit (%)</td>
<td>40.7±5.3</td>
<td>39.6±5.4</td>
<td>39.9±5.3</td>
<td>39.9±4.7</td>
</tr>
<tr>
<td>Potassium, mmol/L</td>
<td>4.3±0.4</td>
<td>4.4±0.4</td>
<td>4.4±0.4</td>
<td>4.3±0.4</td>
</tr>
<tr>
<td>Sodium, μmol/L</td>
<td>141.3±4.8</td>
<td>140.3±5.7</td>
<td>140.7±5.5</td>
<td>141.5±4.4</td>
</tr>
<tr>
<td>Urea, mmol/L</td>
<td>6.5±1.8</td>
<td>6.3±2.2</td>
<td>6.3±2.2</td>
<td>6.3±1.8</td>
</tr>
<tr>
<td>Uric acid, μmol/L</td>
<td>318.6±80.4</td>
<td>286.2±89.8</td>
<td>295.6±89.7</td>
<td>279.7±80.3</td>
</tr>
<tr>
<td>Glucose, mmol/L</td>
<td>5.6±1.2</td>
<td>5.5±1.8</td>
<td>5.5±1.7</td>
<td>5.4±1.4</td>
</tr>
<tr>
<td>Serum creatinine, μmol/L</td>
<td>87.6±19.8</td>
<td>84.7±19.5</td>
<td>86.4±19.7</td>
<td>88.9±20.5</td>
</tr>
<tr>
<td>Total cholesterol, mmol/L</td>
<td>5.5±1.2</td>
<td>5.4±1.2</td>
<td>5.4±1.2</td>
<td>5.3±1.1</td>
</tr>
<tr>
<td>HDL cholesterol, mmol/L</td>
<td>1.40±0.40</td>
<td>1.42±0.49</td>
<td>1.41±0.48</td>
<td>1.35±0.37</td>
</tr>
<tr>
<td>Country of residence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>6 (5.4%)</td>
<td>35 (18.6%)</td>
<td>40 (16.1%)</td>
<td>1636 (42.5%)</td>
</tr>
<tr>
<td>China</td>
<td>25 (22.5%)</td>
<td>50 (26.6%)</td>
<td>65 (26.2%)</td>
<td>1526 (39.7%)</td>
</tr>
<tr>
<td>Finland</td>
<td>15 (13.5%)</td>
<td>13 (6.9%)</td>
<td>16 (6.5%)</td>
<td>29 (0.8%)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>5 (4.5%)</td>
<td>4 (2.1%)</td>
<td>5 (2.0%)</td>
<td>18 (0.5%)</td>
</tr>
<tr>
<td>Romania</td>
<td>20 (18.0%)</td>
<td>65 (34.6%)</td>
<td>77 (31.0%)</td>
<td>273 (7.1%)</td>
</tr>
<tr>
<td>Russia</td>
<td>34 (30.6%)</td>
<td>17 (9.0%)</td>
<td>39 (15.7%)</td>
<td>235 (6.1%)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>6 (5.4%)</td>
<td>4 (2.1%)</td>
<td>6 (2.4%)</td>
<td>16 (0.4%)</td>
</tr>
</tbody>
</table>

ABP indicates ambulatory blood pressure; HYVET, Hypertension in the Very Elderly Trial; SBP, systolic blood pressure; DBP, diastolic blood pressure; BMI, body mass index; HDL, high-density lipoprotein. Values are n (%) or mean±SD. Not all countries in the HYVET study took part in the ABP side project.

*Orthostatic hypotension is defined as a fall in pressure on standing from sitting of ≥20 mm Hg systolic or ≥10 mm Hg diastolic.
very elderly or the definition of WCH needs to be changed for this age group. However, a randomized trial specifically in subjects with WCH is needed to inform this debate. We must bear in mind that systolic pressure drives the prediction of morbidity and mortality in the elderly, and also that other measures, such as home BP measurements, may prove successful in detecting WCH.\textsuperscript{23–25}

It is also not widely recognized that an elderly group with an average night-time systolic CBP of 124 mm Hg would have such dramatic benefits from BP lowering, but this is true in the main trial.\textsuperscript{3} In addition, a low average night-time pressure corresponding to a systolic CBP $\geq 160$ mm Hg has been recorded in younger elderly subjects in the Systolic Hypertension–Europe (SYST-EUR) trial, namely 134 mm Hg.\textsuperscript{21} In this trial, it was concluded that the benefit of antihypertensive therapy is less evident when daytime systolic ABP is $\leq 160$ mm Hg,\textsuperscript{6} but it cannot be excluded that treatment of WCH would also be beneficial in the younger elderly.

The treatment effect on 24-hour ABP of 8/5 mm Hg confirms the 24-hour BP-lowering efficacy of indapamide SR 1.5 mg $\pm$ perindopril 2 to 4 mg daily. ABP treatment differences usually agree well with the result from clinic measures, and treatment was effective when measured by both methods.\textsuperscript{30–33} The difference between the groups was 8/4 mm Hg for night-time ABP and even higher in the 52 participants with ABP measurements at baseline and during follow-up (online-only Data Supplement). Over 65 years of age, night-time ABP is a better predictor of cardiovascular events than the CBP and other measures of ABP.\textsuperscript{29,30} Burr et al\textsuperscript{3} studied a population of average age 73 years (range 65–92 years) and average night-time systolic BP of 133 mm Hg, and found a hazard ratio for cardiovascular mortality of 1.18 for every 10 mm Hg increase in night-time systolic ABP unadjusted for CBP. Thus, untreated, our participants on placebo with an excess of 8 mm Hg night-time systolic pressure over the actively treated group would have been expected to have an excess of 14.4\% in cardiovascular mortality compared with actively treated subjects. An excess of 23\% was observed for cardiovascular mortality in the HYVET trial placebo group (unadjusted for CBP),\textsuperscript{9} indicating a fair agreement with that expected. The predictions of Burr et al\textsuperscript{18} for an increase in cardiovascular mortality of 1.09 for every 5 mm Hg increase in night-time diastolic BP (1.08 for 24-hour diastolic BP) would suggest an excess of 7.2\% in cardiovascular mortality in the placebo group (arising from the placebo-active difference of 4 mm Hg), which is much lower than that actually observed.\textsuperscript{9} However, the actual difference in ambulatory diastolic pressure may be greater (Table S4), and other trials in the elderly, such as the European Working Party on High Blood Pressure in the Elderly (EWPHE)\textsuperscript{31} and SYST-EUR,\textsuperscript{23} have also reported that excess mortality is driven by systolic rather than diastolic BP. Moreover, the HYVET study recruited only older participants with systolic CBP 160 to 199 mm Hg untreated, whereas Burr et al\textsuperscript{3} included a wide range of ages (65–92 years) and systolic CBPs (mean±SD, 172±26.8 mm Hg).

Interestingly, results from an international database\textsuperscript{10} suggest that daytime pressure is a better predictor of cardiac events than night-time pressure, the latter being more important for stroke events. Stroke events far outweighed cardiac events in this study. However, others have suggested that night-time ABP is also a better predictor of cardiac events.\textsuperscript{32}

Untreated morning ABP averaged 140/80 mm Hg, daytime pressure 136/78 mm Hg, and night-time pressure

\begin{table}[htb]
\centering
\caption{CBP and ABP at Baseline: Mean (SD) and Range} 
\begin{tabular}{lrr}
\hline
Blood Pressure & Mean (SD) & Range \\
\hline
Systolic sitting CBP & 172 (8) & 159–197 \\
Systolic standing CBP & 168 (10) & 149–197 \\
Baseline morning ABP (8:00 am–12:00 noon) & 140 (20) & 101–201 \\
Baseline daytime ABP (8:00 am–8:00 pm) & 136 (16) & 105–174 \\
Baseline night-time ABP (10:00 pm–6:00 am) & 124 (20) & 90–217 \\
Baseline 24-h ABP & 133 (15) & 104–187 \\
Difference between CBP sitting and ABP morning & 32 (21) & –33 to 80 \\
Difference between CBP sitting and ABP daytime & 36 (16) & –13 to 73 \\
\hline
Diastolic sitting CBP & 90 (10) & 60–105 \\
Diastolic standing CBP & 90 (10) & 61–108 \\
Baseline morning ABP (8:00 am–12:00 noon) & 80 (13) & 51–116 \\
Baseline daytime ABP (8:00 am–8:00 pm) & 78 (10) & 56–111 \\
Baseline night-time ABP (10:00 pm–6:00 am) & 72 (13) & 45–134 \\
Baseline 24-h ABP & 77 (10) & 55–109 \\
Difference between CBP sitting and ABP morning & 10 (15) & –35 to 41 \\
Difference between CBP sitting and ABP daytime & 12 (13) & –31 to 35 \\
\hline
\end{tabular}
\end{table}
124/72 mmHg. This gradient agrees fairly well with the results of other studies.33

The limitations of this ABP substudy in HYVET include the small number of participants studied and the failure to consistently provide follow-up readings.

There were only 52 subjects with both baseline and follow-up visits, and these participants may not have been representative of those in the main trial. Their data are presented in the online-only Data Supplement. Nevertheless, the estimate of the placebo-active treatment 24-hour BP difference for the whole subgroup at follow-up (8/5 mmHg) was in line with the clinic difference for the whole of the subgroup (17/7 mmHg). The characteristics of the participants studied were similar to those in the trial as a whole, and the results showed the expected and consistent differences among morning, afternoon, and night-time measurements. Another limitation is that the number of participants was too low to differentiate results for indapamide alone or in combination with the 2 doses of perindopril (35% of participants on active treatment in the substudy were on combined treatment).

One strength of the study was the use of the Diasys Integra II, which also provided the compliance measures of Q wave (ECG)–Korotkoff diastolic. The results of these measurements are expected to give more complete information on the effects of indapamide SR±perindopril. In the present communication, we confined the results to morning, afternoon, daytime, nighttime, and 24-hour measures of ABP. Too few subjects were included in the substudy to attempt to assess the predictive value of ABP over and above CBP.

### Perspectives

The increasing divergence between CBP and ABP in the very elderly, in the presence of marked benefits from treatment based on indapamide SR±perindopril, indicates that WCH may not be a benign condition in the elderly, and that it would be very dangerous to limit the definition of systolic hypertension to a 24-hour systolic ABP of >135 mmHg or even 130 mmHg.15 Our data suggest that a systolic 24-hour ABP of ≥125 mmHg may require treatment when the subject is >80 years of age. This goes against the recent National Institute for Health and Clinical Excellence guideline agrees with the meta-analyses of studies in younger subjects with an average age of 56 to 63 years, where WCH had a hazard rate compared with normotension of only 1.12 (95% CI, 0.84–1.50).35 1.17 (0.87–1.57),22 and 1.22 (0.96–1.53)36 for cardiovascular events.34

The National Institute for Health and Clinical Excellence guidelines may be correct for younger subjects but may not be for those aged >80 years. A randomized trial is required to further this debate. It must also be remembered that participants with a standing systolic CBP of <140 mmHg were excluded from the trial. Thus, when WCH was accompanied by severe orthostatic hypertension or impaired baroreflexes they were excluded from the HYVET trial, and this group may not benefit from active treatment.

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The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

### Disclosures

None.

### References


Novelty and Significance

What Is New?
• The study, which is a substudy of a large double-blind, randomized, placebo-controlled trial, has shown that white coat hypertension may require treatment in the very elderly population. The lower age limit for recruitment in the main Hypertension in the Very Elderly Trial (HYVET) was 80 years. Patients were enrolled and managed in this trial based on clinic blood pressure.

What Is Relevant?
• Because this substudy now shows that white coat hypertension in the very elderly may require treatment, it will have significant verifications.

Summary
This study shows that white coat hypertension is common in the >80-year-old patient and this may require treatment. This should be included in national guidelines for treatment of hypertension in the very elderly.
Does White Coat Hypertension Require Treatment Over Age 80?: Results of the Hypertension in the Very Elderly Trial Ambulatory Blood Pressure Side Project
Christopher J. Bulpitt, Nigel Beckett, Ruth Peters, Jan A. Staessen, Ji-Guang Wang, Marius Comsa, Robert H. Fagard, Dan Dumitrascu, Vesselka Gergova, Riitta L. Antikainen, Elizabeth Cheek and Chakravarthi Rajkumar

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DOES WHITE COAT HYPERTENSION REQUIRE TREATMENT OVER AGE 80? RESULTS OF THE HYPERTENSION IN THE VERY ELDERLY TRIAL AMBULATORY BLOOD PRESSURE SIDE PROJECT.

DOES WHITE COAT HYPERTENSION REQUIRE TREATMENT?

Christopher J. Bulpitt, M.D., Nigel Beckett, M.B.ChB FRCP., Ruth Peters, Ph.D., Jan A. Staessen, M.D., Ph.D., Ji-Guang Wang, Ph.D., Marius Comsa, M.D., Robert H. Fagard, M.D., Ph.D., Dan Dumitrascu, M.D., Vesselka Gergova, M.D., Riitta L. Antikainen, M.D., Ph.D., Elizabeth Cheek, M.Sc, Chakravarthi Rajkumar, M.D., Ph.D.

Affiliations:
1. Imperial College London, London, UK
2. Brighton and Sussex Medical School, Brighton, UK
3. University of Leuven, Leuven, Belgium
4. Centre for Epidemiological Studies and Clinical Trials, Ruijin Hospital, Shanghai Institute of Hypertension, China
5. Str Narciselor, Bl. A, Sc D, Ap 3; 2300, Fagaras, Romania, mcomsa@email.com
6. Spitalul Judetean Cluj, Clinica Medicala 2, Cluj, Romania
7. Oulu City Hospital and Institute of Health Sciences (Geriatrics), Oulu University, Oulu, Finland
8. University of Brighton, Brighton, UK.
Author for correspondence: Professor C. Rajkumar, Academic Department of Geriatrics, Brighton and Sussex Medical School, Audrey Emerton Building, Royal Sussex County Hospital, Eastern Road, Brighton, BN2 5BE, UK, Telephone 01273 523360, Fax 01273 523066, Email c.rajkumar@bsms.ac.uk.
Table S1 gives the corresponding results for the 52 participants where WCH status was known at baseline and on-treatment ABP results were available. In those with WCH, ABP tended to rise if given a placebo and to be maintained if given active treatment, to give a 24 hour ABP placebo-active treatment effect of 21/10 mm Hg. In those with sustained BP, ABP tended to be maintained on placebo treatment and to fall on active treatment to give a placebo-active treatment effect of 15/6 mm Hg.

Discussion

In the 52 participants who had both baseline and follow-up ABP measurements, those with WCH had a 24 hour placebo-active blood pressure lowering effect of 21/10 mm Hg and those with sustained BP a difference of 15/6 mm Hg, reinforcing the possibility of a benefit from the active treatment of WCH. The difference between sitting CBP and daytime ABP was higher in the placebo group than in the actively treated group. This was expected as the higher the CBP the greater the potential White Coat effect.
**Table S1.** Ambulatory blood pressure (ABP) results on placebo and active treatment at an average of 13 months. Clinic blood pressure (CBP) is given for nearest date to ABP readings. The 52 participants who had both baseline and a treatment ABP are divided according to whether that had White Coat Hypertension (WCH) at baseline on a sustained BP and whether they received active or placebo treatment. Mean (standard deviation).

<table>
<thead>
<tr>
<th>Blood pressure group</th>
<th>n</th>
<th>CBP sitting</th>
<th>Daytime ABP</th>
<th>Nighttime ABP</th>
<th>24h ABP</th>
<th>CBP sitting</th>
<th>Daytime ABP</th>
<th>Nighttime ABP</th>
<th>24h ABP</th>
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<td><strong>Systolic blood pressure (mm Hg)</strong></td>
<td></td>
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<tr>
<td>WCH Placebo</td>
<td>8</td>
<td>171 (7)</td>
<td>127 (4)</td>
<td>122 (19)</td>
<td>170 (15)</td>
<td>145 (18)</td>
<td>133 (25)</td>
<td>141 (18)</td>
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</tr>
<tr>
<td>WCH Active</td>
<td>17</td>
<td>172 (11)</td>
<td>124 (8)</td>
<td>109 (9)</td>
<td>140 (16)</td>
<td>123 (19)</td>
<td>109 (27)</td>
<td>120 (21)</td>
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<tr>
<td>WCH All</td>
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<td>172 (10)</td>
<td>125 (7)</td>
<td>113 (14)</td>
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<td>148 (12)</td>
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<td>174 (7)</td>
<td>147 (11)</td>
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<td>158 (19)</td>
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<td><strong>Diastolic blood pressure (mm Hg)</strong></td>
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<td>WCH Placebo</td>
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<td>85 (11)</td>
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<td>71 (8)</td>
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<td>69 (8)</td>
<td>75 (10)</td>
<td>71 (13)</td>
<td>63 (13)</td>
<td>69 (13)</td>
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<tr>
<td>WCH All</td>
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<td>72 (9)</td>
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<td>78 (11)</td>
<td>75 (13)</td>
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<tr>
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<td>80 (9)</td>
<td>78 (13)</td>
<td>70 (10)</td>
<td>76 (11)</td>
</tr>
</tbody>
</table>
Appendix


Centres participating in the ABP side project were:

Bulgaria: V. Gergova; Sofia: C. Nachev (diseased); Sofia: V. Stoyanovsky; Sofia.

China: J. Wang; Shanghai: S. Wang; Beijing: GE Yuan; Beijing: W. Zhang; Shanghai:

Finland: H. Litmanen; Kuopio: R. Antikainen; Oulu:

New Zealand: C. Anderson: Auckland;

Romania: M. Comsa; Fagaras: D. Dumitrascu; Cluj: D Jianu; Bucharest:

Russia: S. Nedogoda; Volgograd: Y. Nikitin; Novosibirsk:

United Kingdom: C. Rajkumar; London:

E. Pinto coordinated the ABPM side project and W. Banya was responsible for data monitoring and preliminary analyses.