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## Accepted Manuscript

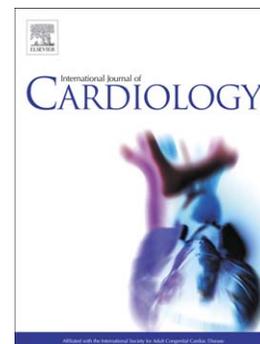
Lack of control of hypertension in primary cardiovascular disease prevention in Europe: Results from the EURIKA study

Claudio Borghi, Florence Tubach, Guy De Backer, Jean Dallongeville, Eliseo Guallar, Jesús Medina, Joep Perk, Carine Roy, José R. Banegas, Fernando Rodriguez-Artalejo, Julian P. Halcox

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# Lack of control of hypertension in primary cardiovascular disease

## prevention in Europe: results from the EURIKA study

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**Background:** The prevalence of and factors associated with uncontrolled hypertension and apparent resistant hypertension were assessed in the European Study on Cardiovascular Risk Prevention and Management in Usual Daily Practice (EURIKA; NCT00882336).

**Methods:** EURIKA was a cross-sectional observational study including patients being treated for the primary prevention of cardiovascular disease in 12 European countries. Patients were assessed if they were being treated for hypertension (N = 5220). Blood pressure control was defined according to European guidelines, with sensitivity analysis taking account of patients' age and diabetes status. Associated factors were assessed using multivariate analysis.

**Results:** In the primary analysis, a total of 2691 patients (51.6%) had uncontrolled hypertension. Factors significantly associated with an increased risk of having uncontrolled hypertension included female sex (odds ratio [OR]: 2.29; 95% confidence interval [CI]: 1.93–2.73), body mass index (BMI; OR per kg/m<sup>2</sup>: 1.03; 95% CI: 1.01–1.04), and geographic location. A total of 749 patients (14.3%) had apparent resistant hypertension. Factors significantly associated with an increased risk of having apparent resistant hypertension included BMI (OR per kg/m<sup>2</sup>: 1.06; 95% CI: 1.04–1.08), diabetes (OR: 1.28; 95% CI: 1.06–1.53), use of statins (OR: 1.36; 95% CI: 1.15–1.62), serum uric acid levels (OR: 1.16; 95% CI: 1.09–1.23), and geographic location. Similar results were seen in sensitivity analyses.

**Conclusions:** Over 50% of patients treated for hypertension continued to have uncontrolled blood pressure, and 14.3% had apparent resistant hypertension. Positive associations were seen with other cardiovascular risk factors.

**Keywords:** Hypertension; cardiovascular disease; observational study; primary prevention; risk factor.

**Abbreviations:** ACE, angiotensin-converting enzyme; BMI, body mass index; CI, confidence interval; CVD, cardiovascular disease; DBP, diastolic blood pressure; ESC, European Society of Cardiology; ESH, European Society of Hypertension; EURIKA, European Study on Cardiovascular Risk Prevention and Management in Usual Daily Practice; HbA<sub>1c</sub>, glycated haemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; OR, odds ratio; SCORE, Systematic Coronary Risk Evaluation; SBP, systolic blood pressure; SD, standard deviation.

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# 1. Introduction

Despite recent reductions in rates of mortality from cardiovascular disease (CVD) throughout Europe, CVD remains responsible for approximately 47% of all deaths across the continent each year [1]. Primary and secondary prevention of CVD, therefore, remains of great importance. Principal risk factors for having a first cardiovascular event include age, sex, smoking, arterial hypertension, dyslipidaemia, diabetes, obesity, and physical inactivity [2]. Control of modifiable risk factors remains poor: the most recent European CVD statistics report that the prevalence of elevated blood pressure in adults aged 25 years or over ranges between 33.6% (Israel) and 48.3% (Ukraine), whereas the prevalence of dyslipidaemia in the same population ranges between 24.0% (Tajikistan) and 69.8% (Iceland) [1].

Recently, we conducted the European Study on Cardiovascular Risk Prevention and Management in Usual Daily Practice (EURIKA; ClinicalTrials.gov identifier: NCT00882336), a study of the management of cardiovascular risk factors in primary care in 12 European countries [3]. Included patients were aged 50 years or over and had at least one risk factor for CVD but no history of cardiovascular events. As part of this study, we have previously reported that control of blood pressure among patients with hypertension in Europe is approximately 38.8%, whereas control of blood serum cholesterol levels among patients with dyslipidaemia is approximately 43.3% [4]. In the present paper, we describe in detail the prevalence of uncontrolled hypertension and of apparent resistant hypertension among patients being treated for hypertension in the EURIKA population. Factors associated with uncontrolled hypertension and with apparent resistant hypertension were also assessed.

## 2. Methods

### 2.1 Study design and participants

EURIKA was carried out in 12 European countries (Austria, Belgium, France, Germany, Greece, Norway, Russia, Spain, Sweden, Switzerland, Turkey, and the UK) [4]. Data collection started in May 2009 and ended in January 2010, with a 3-month data collection period for each country. The study protocol was approved by the appropriate clinical research ethics committees in each participating country, and all patients provided signed informed consent.

The methods for the study have been reported in detail elsewhere [3]. Briefly, the study sample was selected in a two-stage process that involved the random selection of both physicians and their patients [3, 5]. In the first stage, primary care practitioners and specialists involved in CVD prevention (including cardiologists, endocrinologists, and internal medicine specialists) were randomly selected to be invited to participate using the OneKey database (Cegecim Dendrite, Boulogne-Billancourt, France) [6]. In total, 809 physicians (approximately 60 per country) agreed to participate in EURIKA, 64% of whom were primary care practitioners [5]. In the second stage, participating physicians sequentially invited patients who met the selection criteria (aged 50 years or older, free of CVD but having at least one major cardiovascular risk factor [dyslipidaemia, hypertension, smoking, diabetes mellitus, or obesity]) [4]. Approximately 600 patients were included per country, with a final population size of 7641. For the present analysis, included patients were those who were receiving an antihypertensive medication and for whom blood pressure measurements were included in the database (N = 5220).

## **2.2 Assessment of CVD risk factors**

Demographic information and other details of participating patients were gathered from medical records and patient interviews. For each patient, a physical examination was conducted, blood pressure was measured, and a 12-h fasting blood sample was collected within 1 day of the initial outpatient consultation [3]. Blood pressure was determined in standardised conditions, using calibrated mercury sphygmomanometers or validated automated devices, and appropriate-size cuffs [2, 3, 7]. The mean of three readings was used for analyses.

Blood sample analysis was carried out at a central laboratory (Bio Analytical Research Corporation, Ghent, Belgium), with the exception of samples from patients in Russia (approximately 5% of the total patient population), for whom laboratory analysis was carried out locally. High-density lipoprotein cholesterol (HDL-C) concentration was measured by a modified enzymatic method, total cholesterol concentration by the CHOD-PAP method, and triglyceride concentration by the GPO-PAP method (all using the Roche Modular P chemistry analyser; Roche Diagnostics, Indianapolis, IN, USA). Low-density lipoprotein cholesterol (LDL-C) concentration was calculated by the Friedewald formula [8]. Ten-year CVD-related mortality risk for each patient was estimated using the Systematic Coronary Risk Evaluation (SCORE) algorithms for high-risk and low-risk countries, as appropriate [9].

## **2.3 Control of hypertension**

In the primary analysis of uncontrolled hypertension, control of blood pressure was defined in all patients as systolic blood pressure (SBP) <140 mmHg and diastolic blood pressure (DBP) <90 mmHg, in line with the 2007 European Society of Hypertension (ESH)/European Society of Cardiology (ESC) guidelines in place at the time the study was carried out [10]. In a sensitivity analysis, this definition was altered to consider patients' age and diabetes status,

in line with the 2007 ESH/ ESC guidelines [7]. In this sensitivity analysis, control of blood pressure was defined as SBP <150 mmHg and DBP <90 mmHg for patients aged 80 years or over regardless of diabetes status, SBP <140 mmHg and DBP <85 mmHg for patients aged under 80 years with diabetes, and SBP <140 mmHg and DBP <90 mmHg for all other patients. Apparent resistant hypertension was defined as having uncontrolled hypertension (primary and sensitivity analysis definitions as given above) despite being treated with at least three antihypertensive drugs including a diuretic, or having controlled hypertension while being treated with four or more antihypertensive drugs [7].

## **2.4 Statistical methods**

Data are presented as mean and standard deviation for continuous variables, and as frequency and percentage for categorical variables. Comparisons between groups were performed using Student's t-tests for normally distributed continuous variables, Mann-Whitney U-tests for continuous variables that were not normally distributed, and  $\chi^2$  or Fisher's exact tests for categorical variables, as appropriate

Factors associated with uncontrolled hypertension were assessed in the subpopulation of patients receiving one or two antihypertensive medications, using univariate and subsequently multivariate logistic regression models and using both the primary and sensitivity analysis definitions of blood pressure control. Variables included in the multivariate analyses were country, age, sex, body mass index (BMI), diabetes status, tobacco use, LDL-C levels, frequency of healthcare visits, use of statins, serum uric acid level, and overall cardiovascular risk calculated according to SCORE. A stepwise selection model was used to keep only those variables statistically significantly associated at the 5% significance level in the final model. Factors associated with apparent resistant hypertension

were assessed using the same methods in the overall population. Statistical analyses were carried out using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA).

### **3. Results**

#### **3.1 Patient characteristics and factors associated with uncontrolled hypertension**

Of the 7641 patients included in EURIKA, 5220 were treated for hypertension and had blood pressure measurements available in the database, and were therefore included in the analysis. The mean age was 64.5 years, and 47.9% were men (Table 1). A total of 29.3% had diabetes, and the mean BMI was 29.6 kg/m<sup>2</sup>.

In the primary analysis, 2691 patients (51.6%) had uncontrolled hypertension (Fig. 1). In the sensitivity analysis, using different definitions of blood pressure control according to patients' age and diabetes status, the number of patients with uncontrolled hypertension increased slightly to 2721 (52.1%) (Fig. 1). In the primary analysis, the prevalence of uncontrolled hypertension varied according to country, ranging from 38.6% in Greece to 59.7% in Turkey (Supplementary Table 1). A similar between-country range was observed in the sensitivity analysis (40.5–60.7%) (Supplementary Table 2). In both the primary and sensitivity analyses, the characteristics of patients with controlled and uncontrolled hypertension were broadly similar (Table 1, Supplementary Table 3). Patients with uncontrolled hypertension had greater numbers of metabolic syndrome markers and a higher overall cardiovascular risk according to SCORE. The most commonly used antihypertensive drugs, either alone or in combination, were diuretics, followed by angiotensin II receptor blockers, angiotensin-converting enzyme inhibitors, beta-blocking agents, and calcium channel blockers. In the primary analysis, a total of 2012 patients (74.8%) with uncontrolled hypertension were receiving only one or two antihypertensive medications. In the sensitivity

analysis, the proportion of patients with uncontrolled hypertension receiving only one or two antihypertensive medications was 74.4%.

To investigate factors associated with uncontrolled hypertension, multivariate analysis was carried out comparing patients with and without uncontrolled hypertension who were receiving only one or two antihypertensive medications. In the primary analysis, patients from Spain and Switzerland were found to be statistically significantly more likely to have uncontrolled hypertension than patients in the UK (Fig. 2). Female sex and BMI were found to be significantly positively associated with having uncontrolled hypertension. Conversely, age, being a current or former smoker, or receiving a statin were found to be significantly negatively associated with having uncontrolled hypertension. Higher overall 10-year risk of cardiovascular mortality calculated according to SCORE was also significantly associated with uncontrolled hypertension. Similar factors were found to be associated with uncontrolled hypertension in the sensitivity analysis; in addition to those factors listed above, being from Belgium, relative to the UK, and having diabetes were both associated with having uncontrolled hypertension (Supplementary Fig. 1).

### **3.2 Factors associated with apparent resistant hypertension**

Of the total patient population, 749 (14.3%) had apparent resistant hypertension in the primary analysis at the time the study was carried out (Fig. 1, Table 1). In the sensitivity analysis, the proportion was similar, with 764 patients having resistant hypertension (14.6%). The characteristics of patients with and without apparent resistant hypertension in the primary and sensitivity analyses are shown in Table 1 and Supplementary Table 3, respectively. In the primary analysis, the prevalence of apparent resistant hypertension varied according to country, ranging from 9.9% in France to 25.5% in Germany (Supplementary Table 1). A similar range was seen in the sensitivity analysis (Supplementary Table 2). Diabetes was

more prevalent in the population of patients with apparent resistant hypertension compared with patients without apparent resistant hypertension (39.4% vs. 27.6%).

Multivariate analysis was carried out comparing patients with and without apparent resistant hypertension. In the primary analysis, patients from France, Spain, and Switzerland were statistically significantly less likely to have apparent resistant hypertension than patients from the UK, whereas patients from Germany were more likely to have apparent resistant hypertension than patients from the UK (Fig. 3). BMI, diabetes, use of statins, and serum uric acid levels were significantly positively associated with apparent resistant hypertension, whereas being a current smoker was significantly negatively associated with apparent resistant hypertension. Similarly to uncontrolled hypertension, higher overall cardiovascular risk according to SCORE was significantly associated with apparent resistant hypertension. Similar factors were found to be associated with apparent resistant hypertension in the sensitivity analysis, but statistical significance was lost for the difference between patients from France, Spain, and Switzerland relative to patients from the UK (Supplementary Fig. 2).

#### **4. Discussion**

Here, we have analysed factors associated with uncontrolled hypertension and with apparent resistant hypertension in a European population of patients being treated for hypertension, using data from the large, international EURIKA study. Two definitions of control of blood pressure were used: in the primary analysis, SBP <140 mmHg and DBP <90 mmHg for all patients according to the 2007 ESH/ESC guidelines in place at the time the study was carried out [10], and in the sensitivity analysis an altered definition taking account of patients' age and diabetes status, according to the 2013 ESH/ESC guidelines [7]. To our knowledge, this is the first time such an analysis has been carried out using the 2013 guidelines.

Similar results were seen for both the primary and sensitivity analyses of uncontrolled hypertension: in both, over 50% of patients treated for hypertension continued to have uncontrolled blood pressure at the time the survey was carried out. These results are particularly relevant in light of the recent findings from the Systolic Blood Pressure Intervention Trial (SPRINT), showing that intensive treatment of hypertension to a target of SBP <120 mmHg results in better clinical outcomes than treatment to a target of SBP <140 mmHg, in high-risk hypertensive patients without diabetes [11]. Considerable variability was seen between different countries, with the prevalence of uncontrolled hypertension ranging from approximately 40% to approximately 60%. This indicates that in some regions treatment of patients with hypertension could be improved in order to achieve performance in line with other European countries. Almost 75% of patients with uncontrolled hypertension were receiving only one or two antihypertensive drugs; if tolerated there is the potential to intensify their therapy in order to increase the chance of bringing their blood pressure down to target levels. In patients receiving multiple antihypertensive medications, poor control of hypertension supports the possibility of improvements in drug combination choices and in the doses of medications used.

In the multivariate analysis of uncontrolled hypertension in patients receiving one or two antihypertensive medications, age, being a current or former smoker, and receiving a statin were found to be negatively associated with uncontrolled hypertension, whereas female sex, BMI, and SCORE were found to be positively associated with uncontrolled hypertension, with the addition of diabetes in the sensitivity analysis. These findings are partially in line with risk factors for the development of hypertension identified in the general population, which include obesity and diabetes [7]. The association with SCORE is expected, as hypertension contributes to overall cardiovascular risk. However, some findings were unexpected. Counterintuitive associations, including the negative associations of age,

smoking, and statin treatment with uncontrolled hypertension, are unlikely to be clinically relevant and could result from confounding by indication. For example, the negative association between age and uncontrolled hypertension could be because more aggressive treatment of hypertension is used in older patients. The presence of the associated factors identified here, and other cardiovascular risk factors, should be considered by physicians when making a decision about the intensity of treatment to be prescribed to individual patients with elevated blood pressure, and treatment of all cardiovascular risk factors will reduce overall cardiovascular risk.

Also of interest is the high proportion of patients with greater numbers of metabolic syndrome markers among patients with uncontrolled hypertension relative to patients with controlled hypertension. Although this variable was not included in the multivariate analysis owing to collinearity, in univariate analysis the association was found to be statistically significant when comparing patients with fewer than three metabolic syndrome markers with those with three or more metabolic syndrome markers (data not shown;  $p = 0.001$ ). Several previous studies, including the Tromsø and Brisighella Heart Studies [12, 13], have shown an association between hypertension and elevated serum lipid levels. Pathophysiological mechanisms for this association, including overexpression of angiotensin II type 1 receptors and up-regulation of angiotensin II production as a result of elevated serum lipid levels or hyperinsulinemia, have been suggested [14-20]. Although our multivariate analysis failed to demonstrate an association between uncontrolled hypertension and LDL-C levels, it is nevertheless important to manage all cardiovascular risk factors in patients in whom hypertension is associated with abnormalities in metabolic profile and lipid levels.

A total of 14.3% of the EURIKA population being treated for hypertension were found to have apparent resistant hypertension at the time of the study (14.6% in the sensitivity

analysis), with proportions among the countries ranging from 9.9% to 25.5%. These patients may be at particularly high risk of cardiovascular and renal events [7, 21-24]. Previous studies have shown that resistant hypertension is associated with younger age, male sex, duration of hypertension, obesity, kidney and cardiac damage, and overall cardiovascular risk profile [22, 25]. In line with this, factors we found to be positively associated with apparent resistant hypertension included diabetes, BMI, and serum uric acid levels. The clinical relevance of other findings is less clear: counterintuitively, we found that current smokers were less likely to have apparent resistant hypertension than people who had never smoked. Potentially, this is due to lifestyle modification in the group of patients with apparent resistant hypertension. We also found that apparent resistant hypertension was more likely in some European countries than in others, and was positively associated with the use of statins. The association with the use of statins may be indicative of more intensive treatment of cardiovascular risk factors generally among patients with apparent resistant hypertension, and the differing likelihood of uncontrolled or apparent resistant hypertension in some countries versus others may reflect country-specific differences in lifestyle factors and treatment practices that could not be accounted for in the multivariate analysis.

A particular strength of our study was that it included a large sample of patients from 12 different countries, tested according to standardised procedures. As patients were randomly chosen to participate (acceptance rate: 62.1%), the study population is representative of the general population in each country.

#### **4.1 Study limitations**

Limitations of our study include the fact that the data-collection period for each country was only 3 months, so it is possible that frequent healthcare service users were overrepresented in the study cohort. This may bias the patient population towards the inclusion of less healthy

patients. The nature of the cross-sectional study does not allow apparent resistant hypertension to be distinguished from clinical resistant hypertension. It is also difficult to distinguish factors that have a causative association with uncontrolled hypertension or apparent resistant hypertension from those associated with suboptimal therapeutic approaches to the disease. Finally, despite the large numbers of included patients and the identification of factors significantly associated with uncontrolled hypertension and with apparent resistant hypertension in multivariate analysis, the numeric differences in the distribution of associated factors between patients with or without uncontrolled hypertension or apparent resistant hypertension were often small.

## **4.2 Conclusion**

We conclude that, in a large proportion of patients being treated for hypertension, blood pressure remains poorly controlled. There is also a high prevalence of apparent resistant hypertension. Intensification or change of treatment in such patients is necessary in order to reduce their overall cardiovascular risk. More effective control of other factors associated with poor blood pressure control will also contribute to reducing total cardiovascular risk.

## **Disclosures**

Claudio Borghi has received speaker and consulting fees from Menarini, Servier, Takeda, and MSD; Florence Tubach and Eliseo Guallar have received research funding from AstraZeneca; Jean Dallongeville and Julian P. Halcox have received speaker and consulting fees from AstraZeneca; Jesús Medina is an employee of AstraZeneca. The other authors declare that they have no competing interests.

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**Fig. 1.** Proportion of patients with uncontrolled hypertension and apparent resistant hypertension in the primary and sensitivity analyses.

**Fig. 2.** Multivariate analysis of factors associated with uncontrolled hypertension (primary analysis).

<sup>a</sup>Relative to the UK; <sup>b</sup>per year; <sup>c</sup>female, relative to male; <sup>d</sup>per kg/m<sup>2</sup>; <sup>e</sup>relative to never; <sup>f</sup>relative to non-use; <sup>g</sup>relative to low (<2%).

BMI, body mass index; CI, confidence interval; OR, odds ratio; SCORE, Systematic Coronary Risk Evaluation.

**Fig. 3.** Multivariate analysis of factors associated with apparent resistant hypertension (primary analysis).

<sup>a</sup>Relative to the UK; <sup>b</sup>per kg/m<sup>2</sup>; <sup>c</sup>relative to non-diabetes; <sup>d</sup>relative to never; <sup>e</sup>per mg/dL; <sup>f</sup>relative to more than once a month; <sup>g</sup>relative to non-use; <sup>h</sup>relative to low (<2%).

BMI, body mass index; CI, confidence interval; OR, odds ratio; SCORE, Systematic Coronary Risk Evaluation.

**Table 1**

Patient characteristics, drug treatments, and hypertensive status (primary analysis).

	Overall (N = 5220)	Uncontrolled hypertension (n = 2691)	Controlled hypertension (n = 2529)	Apparent resist hypertension (n = 749)
Age, years, mean (SD)	64.5 (9.0)	64.6 (8.9)	64.4 (9.1)	65.9 (8.9)
Sex				
Male	2498 (47.9)	1299 (48.3)	1199 (47.4)	378 (50.5)
Female	2722 (52.1)	1392 (51.7)	1330 (52.6)	371 (49.5)
Smoking status				
Never	2916 (55.9)	1502 (55.8)	1414 (55.9)	432 (57.7)
Current	847 (16.2)	419 (15.6)	428 (16.9)	95 (12.7)
Former	1399 (26.8)	735 (27.3)	664 (26.3)	214 (28.6)
Unknown	58 (1.1)	35 (1.3)	23 (0.9)	8 (1.1)
Diabetes	1530 (29.3)	774 (28.8)	756 (29.9)	295 (39.4)
BMI, kg/m <sup>2</sup> , mean (SD)	29.6 (5.5)	29.8 (5.6)	29.3 (5.4)	31.3 (6.3)

SBP, mmHg, mean (SD)	138.3 (16.3)	149.8 (13.5)	126.0 (8.0)	146.5 (17.2)
DBP, mmHg, mean (SD)	82.0 (10.0)	87.1 (9.8)	76.6 (6.9)	84.4 (11.7)
Lipid levels, mmol/L, mean (SD)				
Total cholesterol	5.4 (1.1)	5.5 (1.1)	5.3 (1.1)	5.2 (1.1)
LDL-C	3.1 (1.0)	3.2 (1.0)	3.0 (0.9)	3.0 (0.9)
HDL-C	1.4 (0.4)	1.4 (0.4)	1.4 (0.4)	1.4 (0.4)
Triglycerides	1.8 (1.3)	1.9 (1.3)	1.8 (1.3)	2.0 (1.3)
HbA <sub>1c</sub> , %, mean (SD)	6.2 (2.3)	6.3 (2.9)	6.1 (1.4)	6.4 (2.9)
Number of metabolic syndrome markers <sup>a</sup>				
1	339 (6.5)	164 (6.1)	175 (6.9)	26 (3.5)
2	1600 (30.7)	771 (28.7)	829 (32.8)	174 (23.2)
3	1543 (29.6)	806 (30.0)	737 (29.1)	246 (32.8)
4	1028 (19.7)	556 (20.7)	472 (18.7)	170 (22.7)
5	469 (8.9)	249 (9.3)	220 (8.7)	98 (13.1)

Unknown	241 (4.6)	145 (5.4)	96 (3.8)	35 (4.7)
SCORE risk <sup>b</sup>				
Low (<2%)	1138 (21.8)	393 (14.6)	745 (29.5)	107 (14.3)
Intermediate (2–5%)	1594 (30.5)	727 (27.0)	867 (34.3)	193 (25.8)
High (≥5%)	2374 (45.5)	1500 (55.7)	874 (34.6)	431 (57.5)
Unknown	114 (2.2)	71 (2.6)	43 (1.7)	18 (2.4)
Lipid-lowering treatment				
None	2880 (55.2)	1584 (58.9)	1296 (51.2)	363 (48.5)
Statins alone	2064 (39.5)	970 (36.0)	1094 (43.3)	338 (45.1)
Statins with other treatment	119 (2.3)	54 (2.0)	65 (2.6)	27 (3.6)
Other treatment without statins	157 (3.0)	83 (3.1)	74 (2.9)	21 (2.8)
Use of antihypertensive medications				
Diuretics	2390 (45.8)	1224 (45.5)	1166 (46.1)	744 (99.3)

Angiotensin II receptor blockers	2111 (40.4)	1049 (39.0)	1062 (42.0)	413 (55.1)
ACE inhibitors	1905 (36.5)	1014 (37.7)	891 (35.2)	349 (46.6)
$\beta$ -adrenergic antagonists	1783 (34.2)	901 (33.5)	882 (34.9)	499 (66.6)
Calcium channel blockers	1558 (29.8)	863 (32.1)	695 (27.5)	501 (66.9)
$\alpha$ -adrenergic antagonists	166 (3.2)	94 (3.5)	72 (2.8)	84 (11.2)
Other anti-adrenergic agents	26 (0.5)	14 (0.5)	12 (0.5)	13 (1.7)
Other	223 (4.3)	130 (4.8)	93 (3.7)	94 (12.6)
Number of antihypertensive drugs used				
1	2032 (38.9)	1036 (38.5)	996 (39.4)	0 (0.0)

2	1895 (36.3)	976 (36.3)	919 (36.3)	0 (0.0)
3	918 (17.6)	468 (17.4)	450 (17.8)	384 (51.3)
4	303 (5.8)	167 (6.2)	136 (5.4)	294 (39.3)
5	59 (1.1)	36 (1.3)	23 (0.9)	58 (7.7)
6	12 (0.2)	7 (0.3)	5 (0.2)	12 (1.6)
7	1 (0.0)	1 (0.0)	0 (0.0)	1 (0.1)

Data are n (%) unless indicated otherwise.

<sup>a</sup>Low HDL-C (<1 mmol/L for men or <1.3 mmol/L for women); high triglycerides ( $\geq 1.7$  mmol/L); high HbA<sub>1c</sub> (dependent on ethnicity); high blood pressure (SBP  $\geq 130$  mmHg and/or DBP  $\geq 85$  mmHg or being treated with a

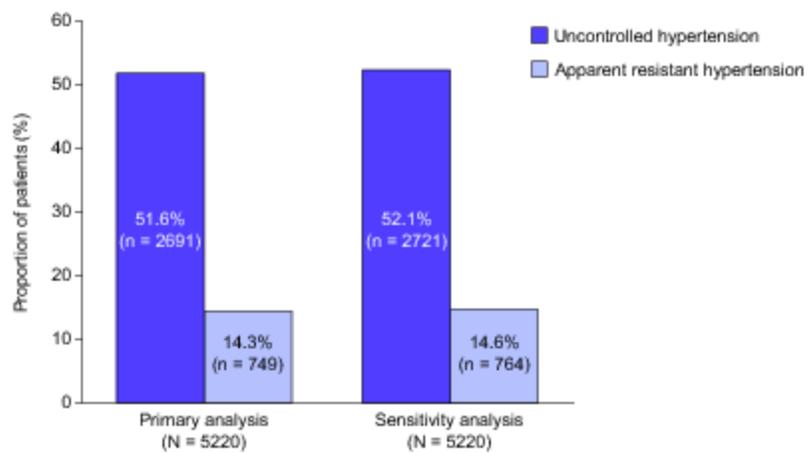
all patients in the analysis were being treated with an antihypertensive drug and therefore had at least one metabolic

<sup>b</sup>10-year risk of mortality due to cardiovascular disease, based on age, sex, smoking status, SBP, and total cholesterol

ACE, angiotensin-converting enzyme; BMI, body mass index; DBP, diastolic blood pressure; HbA<sub>1c</sub>, glycated hemoglobin

lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; SBP, systolic blood pressure; SCORE, Systemic Coronary Risk

SD, standard deviation.

**Figure 1**

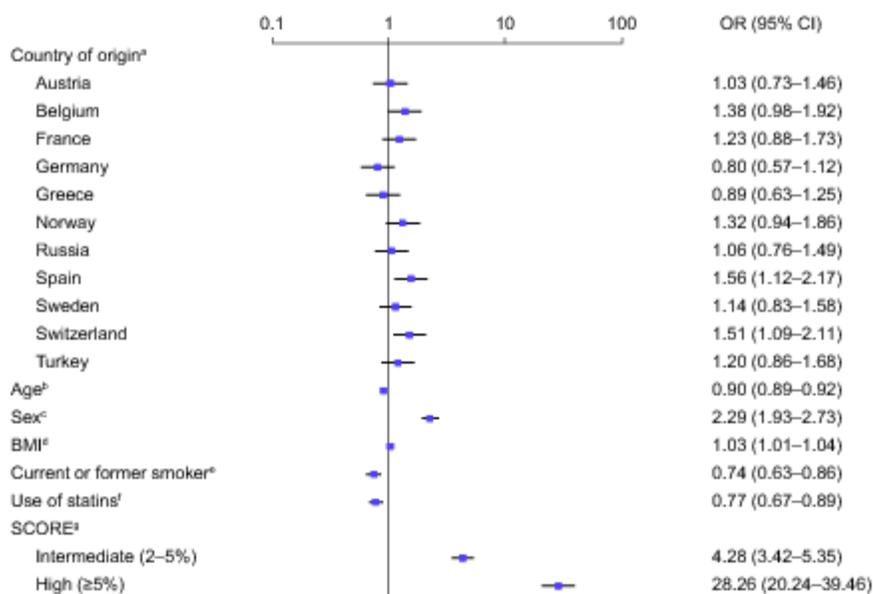


Figure 2

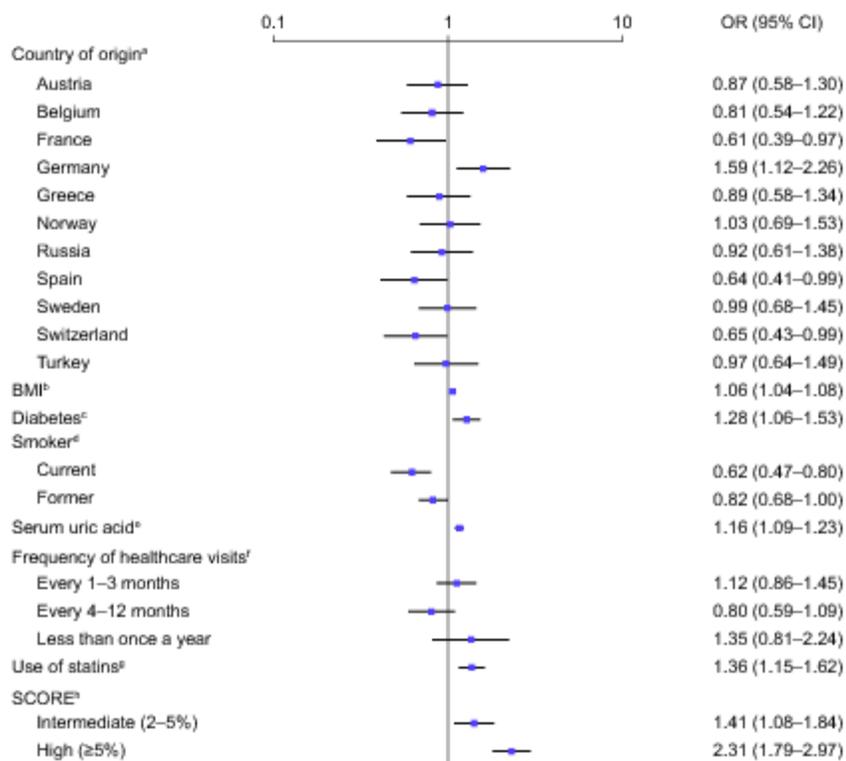


Figure 3

**Highlights**

- EURIKA was a cross-sectional observational study in 12 European countries
- Uncontrolled hypertension was assessed among patients treated for hypertension
- More than half of all treated patients continued to have uncontrolled hypertension
- Approximately 14% had apparent resistant hypertension
- Associations were seen between hypertension and other cardiovascular risk factors