Medicina (Kaunas) 2011;47(4):586-92

Blood Pressure Control in Treated Hypertensive Patients in Daily Practice of Latvian Family Physicians

Inga Stukena[1], Daiva Asta Apanavičienė[2], Guntis Bahs[1], Andrejs Kalvelis[1], Vilnis Dzerve[3], Baiba Ansmite[4], Oskars Kalejs[1, 5], Aivars Lejnieks[1, 4]

[1]Department of Internal Medicine, Riga Stradins University, Latvia, [2]Sanofi-Aventis Lietuva, Vilnius, Lithuania, [3]Research Institute of Cardiology, University of Latvia, Riga, Latvia, [4]Department of Internal Medicine, Riga Eastern Clinical University Hospital, Latvia, [5]Department of Internal Medicine, P. Stradins University Hospital, Riga, Latvia

***Key words**: arterial hypertension; blood pressure control; antihypertensive drugs.*

***Summary.** Background and Objective. The aim of this study was to evaluate blood pressure (BP) control level in treated hypertensive patients in Latvia and to compare their characteristics according to the adequacy of BP control.*

Materials and Methods. Family physicians collected information on demographic and clinical characteristics, and current antihypertensive treatment of 455 18–80-year-old patients with essential arterial hypertension treated for 1 or more years. Target BP was defined as values of <140/90 mm Hg for patients with low or moderate cardiovascular risk and <135/85–125/75 mm Hg for patients with high or very high risk. BP was measured in the office setting after a 5-minute rest in a sitting position using a calibrated aneroid sphygmomanometer.

Results. Nearly half of patients (46.2%) attained their target BP. The proportion of patients with effective BP control was higher in the group of low and moderate added cardiovascular risk than in the high and very high added cardiovascular risk group (61.7% vs. 34.4%, P<0.0001). The majority of patients were given two-drug (26.2%) or three-drug (31.6%) combined antihypertensive therapy. Current pharmacological treatment was similar in the patients who attained target BP and in those who did not. Overall, physicians did not modify antihypertensive treatment in 37.9% of patients; such a recommendation was more common among patients with controlled BP. Very few patients (7.4%) who did not attain target BP did not receive recommendations to modify antihypertensive treatment.

Conclusions. The rate of effective BP control was less than 50% and was even worse (34.4%) in patients with high or very high added cardiovascular risk in the present sample of treated hypertensive patients.

Introduction

Using the currently recommended criteria for the diagnosis of arterial hypertension (AH) (mean systolic blood pressure [SBP] of ⩾140 mm Hg or mean diastolic blood pressure [DBP] of ⩾90 mm Hg or use of antihypertensive medication), the overall prevalence of hypertension in adults in the United States in 1999–2000 was 27% for men and 30% for women (1). National surveys indicate that the prevalence of hypertension in many countries is as high or higher as identified in the United States. Recent estimates suggest that approximately 1 billion adults have hypertension, with the highest prevalence being noted in Eastern Europe and the Latin American/Caribbean region (2). The prevalence of hypertension is 41.8% and 40.5% in Latvian urban and rural populations, respectively (3).

The Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure has recognized AH as a major risk factor for cardiovascular (CV) diseases (1). Persistent high BP increases the risk of coronary heart disease, stroke, peripheral artery disease, and heart failure (4). Clinical trials have demonstrated that a reduction in SBP by 5 mm Hg can reduce stroke mortality by 14%, coronary heart disease mortality by 9%, and overall mortality by 7%. Antihypertensive therapy has also been associated with a mean 35% to 40% reduction in stroke incidence, a 20% to 25% reduction in myocardial infarction, and a greater than 50% reduction in heart failure (5).

Despite advances in understanding of the pathophysiology of hypertension, a wide range of effective antihypertensive drugs, and evidence-based national and international guidelines for the management of hypertension, BP control is still far from optimal in many countries. The results of epidemiologic studies revealed that even in the countries with advanced

Correspondence to A. Lejnieks, 10 Gertrudes Blv, 2008 Jurmala, Latvia. E-mail: lejnieks@latnet.lv

economy, only half of all hypertensive patients were treated and only 15% to 20% were controlled to target BP level (6). The reasons for inadequate BP control are complex and arise from a combination of factors related to poor patient adherence to therapy and the way that physicians treat hypertension (noncompliance with the current guidelines, avoidance of combined therapy and nonpharmacologic measures) (7–10).

The main objective of this study was to evaluate BP control level in treated hypertensive patients in Latvia. We also aimed to compare the patients with controlled and uncontrolled BP in terms of their clinical characteristics, prescribed medications, and recommendations for further treatment.

Materials and Methods

The protocol of the study was reviewed and approved by the Latvian Independent Ethics Committee for the Investigation of Drugs and Pharmaceutical Products. The study was conducted in accordance with the recommendations adopted by the 18th World Medical Assembly (Helsinki, 1964) and all applicable amendments.

This was a cross-sectional study. In order to ensure that the data reflect BP control of patients living in urban as well as rural areas, randomly selected family physicians throughout Latvia were asked to participate in the study. A total of 73 family physicians agreed to take part in the study. The regions covered included Aizkraukle, Bauska, Cesis, Daugavpils, Dobele, Jelgava, Kuldiga, Lapmezciems, Liepaja, Limbazi, Ludza, Ogre, Rezekne, Riga, Skrunda, Saldus, Talsi, Tukums, Valmiera, and Ventspils. Every physician had to include at least 6 patients. Every third patient with the diagnosis of hypertension who visited the family physicians on a working day for any reason was asked to take part in the study. In case this patient did not meet the inclusion criteria or refused to participate, the next patient was offered to take part.

A total of 455 patients were recruited between March 2009 and June 2009. The subjects included in the study were 18–80 years old who had a diagnosis of essential AH and had been treated with antihypertensive drugs for at least 1 year. All the patients provided written informed consent. The following exclusion criteria were applied: known secondary hypertension, pregnancy, required hospitalization, and factors that may influence the accuracy of BP measurements (i.e., fever, alcohol or drug addiction, anxiety, restlessness, etc.).

For each patient, the family physician registered the following data into a standardized case report form during a single visit: age, gender, weight, height, waist circumference, duration of AH, concomitant diseases and risk factors, previous antihypertensive treatment, BP, and heart rate. Demographic and medical data were retrieved from patients' files, while anthropometric parameters (height, weight, and waist circumference) and blood pressure were measured during the study visit. Height (cm) and weight (kg) was measured with indoor clothing and without shoes. BMI was defined as measured weight in kilograms divided by squared height in meters. The waist circumference (cm) was measured at the level of the umbilicus with the participant standing and breathing normally. BP was measured in a seated position after a 5-minute rest using a calibrated mechanical aneroid sphygmomanometer (manufacturer Rudolf Riester GmbH, model Big Ben®). Two measurements were performed. If results of SBP and/or DBP differed by 10 mm Hg or more, the third BP measurement was performed. The mean of 2 or 3 readings was recorded into a case report form. Heart rate (heartbeats per 1 minute) was also measured in a seated position after a 5-minute rest.

Family physicians indicated patients' target BP according their CV risk and assessed if target BP (<140/90 mm Hg in low and moderate added CV risk or <135/85–125/75 mm Hg in high and very high risk) was achieved. Stratification of CV risk was performed according to the criteria by the ESH/ESC guidelines for the management of arterial hypertension (11) and the Latvian guidelines for hypertension management (12). The stratification was based on records in patients' files about risk factors:

- Age >55 years for men and >65 years for women;
- Regular smoking;
- Dyslipidemia (total cholesterol >5.0 mmol/L [190 mg/dL] or low-density lipoprotein cholesterol >3.0 mmol/L [15 mg/dL] or high-density lipoprotein cholesterol <1.0 mmol/L [40 mg/dL] for men and <1.2 mmol/L [46 mg/dL] for women or triglycerides >1.7 mmol/L [150 mg/dL]);
- Fasting glucose 5.6–6.9 mmol/L (102–125 mg/dL);
- Abnormal glucose tolerance test;
- Abdominal obesity (waist circumference ⩾102 cm for men and ⩾88 cm for women);
- Family history of premature CV disease (first-degree relatives with the onset of cardiovascular disease at age <55 years for men and <65 years for women);
- Diagnoses of subclinical target organ damages (electrocardiographic or echocardiographic left ventricular hypertrophy, carotid wall thickening or plaque, carotid-femoral pulse wave velocity >12 m/s, ankle/brachial BP index <0.9, slight increase in plasma creatinine (115–133 mmol/L [1.3–1.5 mg/dL] for men and 107–124 mmol/L [1.2–1.4 mg/dL] for women), low estimated glomerular filtration rate (<60 mL/[min · 1.73 m^2]) or creatinine clearance (<60 mL/min), micro-

albuminuria (24-hour urine albumin >30 mg equivalent to >20 μg/min in a morning urine sample or >22 mg/g creatinine for men and >31 mg/g for women in a random urine sample or ⩾20 mg/L using a urine test strip);
- Concomitant diseases (diabetes, ischemic stroke, cerebral hemorrhage, transient ischemic attack, myocardial infarction, angina, coronary revascularization, heart failure, diabetic nephropathy, renal impairment [serum creatinine >133 mmol/L for men or >124 mmol/L for women], proteinuria [>300 mg/24 h], peripheral artery disease, and advanced retinopathy).

The cluster of 3 of the 5 risk factors (abdominal obesity, altered fasting plasma glucose, BP ⩾130/85 mm Hg, low high-density lipoprotein cholesterol level, and high triglyceride level as defined above) indicates the presence of the metabolic syndrome.

According to the above referred guidelines (11, 12), the low added CV risk group comprised patients with the following: 1) normal BP (DBP/SBP, 80–84/120–129 mm Hg) or high normal BP (DBP/SBP, 85–89/130–139 mm Hg) plus 1–2 risk factors; or 2) grade 1 hypertension (DBP/SBP, 90–99/140–159 mm Hg) alone. The moderate added CV risk group comprised patients with the following: 1) normal BP plus ⩾3 risk factors or the metabolic syndrome or subclinical organ damage or diabetes; or 2) grade 1 hypertension plus 1–2 risk factors; or 3) grade 2 hypertension (DBP/SBP, 100–109/160–179 mm Hg) with or without 1–2 risk factors. The high added CV risk group included patients with the following: 1) high normal BP or grade 1–2 hypertension plus ⩾3 risk factors or the metabolic syndrome or subclinical organ damage or diabetes; or 2) grade 3 hypertension (DBP/SBP, ⩾110/⩾180 mm Hg) alone. The very high added CV risk group consisted of patients with the following: 1) established CV or renal disease; or 2) grade 3 hypertension plus 1–3 risk factors or the metabolic syndrome or subclinical organ damage or diabetes.

The main parameter to be evaluated was BP control. BP was considered as controlled if the target BP was achieved according to the assessment of the family physicians and as uncontrolled if the target BP was not achieved.

The descriptive statistics was applied for data analysis. The χ^2 test or Fisher exact test was used to assess the difference between categorical data. The Student *t* test was applied to test the difference between continuous normally distributed data or the Wilcoxon signed rank test if the data were not normally distributed. Statistical tests were interpreted at the 5% significance level (two-tailed). Following initial descriptive statistics, multiple logistic regression analysis was used to identify variables that predicted the likelihood of reaching target BP. A forward stepwise procedure was used for the addition of individual variables to build the model. Differences were considered statistically significant in the final model with a *P* value of <0.05. Statistical software SAS 9.1.2 was used for statistical data analysis.

Results

A total of 455 patients with essential AH were enrolled into the study. There were 137 men (30.1%) and 318 women (69.9%) among the study participants. The mean age of the patients was 62.6 years (SD, 9.7; range, 33 to 80 years). The mean duration of hypertension in the study population was 11.1 years (SD, 8.2).

One hundred ninety-six patients (43.1%) were classified as having low or moderate added risk, while 259 patients (56.9%) were considered as having high or very high added risk. The proportion of men with high or very high added risk was higher than that of women (67.2% and 52.5%, respectively; $P<0.05$).

Nearly half (46.2%) of the study patients attained their target BP according to the assessment of family physicians. The proportion of patients with effectively controlled BP was almost 2-fold greater in the group of low or moderate risk in comparison with the group of high or very high added risk (61.7% vs. 34.4%, $P<0.0001$). BP was controlled (<140/90 mm Hg) in 161 patients (35.4%) as assessed by BP measurements performed during the study visit. The mean BP was similar among patients with different added CV risk (143.2±19.6/85.9±9.9 mm Hg and 144.1±18.5/86.3±10.1 mm Hg in patients with low or moderate risk and high or very high risk, respectively).

In total, 317 patients (69.7%) had at least one concomitant disease. The most frequent comorbid conditions were heart failure, coronary heart disease, and diabetes, each present in more than 30% of patients. The proportion of patients without any concomitant disease in the group of controlled BP was higher than that in the group of uncontrolled BP (35.7% vs. 25.7%). A total of 439 patients (96.3%) had at least one risk factor, with abdominal obesity and dyslipidemia being most prevalent. Among the patients with uncontrolled BP, there were more patients with multiple risk factors (89.4% vs. 80.0%, $P<0.05$). This group had more patients with metabolic syndrome, dyslipidemia, or abdominal obesity (Table 1).

The results of the final multivariate analysis showed 3 significant predictors of reaching the target BP. Compared with the patients classified as having high or very high added risk, those with low or moderate added risk had a greater chance of reaching targeted BP (odds ratio [OR], 2.42; 95%

Table 1. Clinical Characteristics of Patients With Controlled or Uncontrolled Blood Pressure

Characteristic	Patients Who Reached Target BP (n=210)	Patients Who Did Not Reach Target BP (n=245)
Age, mean (SD), years	62.6 (9.4)	62.6 (9.9)
Age ⩾65 years	91 (43.3)	107 (43.7)
Systolic blood pressure, mean (SD), mm Hg	130.4 (9.6)	155.1 (17.7)*
Diastolic blood pressure, mean (SD), mm Hg	80.5 (5.9)	90.9 (10.4)*
Low and moderate added CV risk	121 (57.6)	75 (30.6)*
High and very high added CV risk	89 (42.4)	170 (69.4)*
No concomitant diseases	75 (35.7)	63 (25.7)*
Concomitant diseases:		
Diabetes mellitus	58 (27.6)	91 (37.1)*
Diabetic nephropathy	15 (7.1)	25 (10.2)
Coronary heart disease	88 (41.9)	95 (38.8)
Peripheral artery disease	17 (8.1)	17 (6.9)
Heart failure	80 (38.1)	107 (43.7)
Atrial fibrillation	21 (10.0)	25 (10.2)
History of myocardial revascularization	12 (5.7)	20 (8.2)
Myocardial infarction	19 (9.1)	37 (15.1)
Ischemic stroke	10 (7.8)	19 (7.8)
More than 1 risk factor	168 (80.0)	219 (89.4)*
Risk factors		
Microalbuminuria	52 (24.8)	72 (29.4)
Metabolic syndrome	64 (30.5)	112 (45.7)*
Dyslipidemia	121 (57.6)	175 (71.4)*
Abdominal obesity	152 (72.4)	199 (81.2)*
Smoking	25 (11.9)	42 (17.1)
Other risk factors	18 (8.6)	23 (9.4)

Values are number (percentage) unless otherwise indicated. BP, blood pressure; CV, cardiovascular.
*$P<0.05$.

confidence interval [CI], 1.73 to 3.39). Lower odds of reaching target BP were associated with the diagnosis of the metabolic syndrome (OR, 0.67; 95% CI, 0.45 to 0.99) or dyslipidemia (OR, 0.59; 95% CI, 0.42 to 0.82).

All patients took antihypertensive drugs for at least 1 year. Diuretics, angiotensin-converting enzyme (ACE) inhibitors, and beta-adrenergic blockers were the most frequent antihypertensive agents; these drugs were used by 305 (67.0%), 300 (65.9%), and 262 patients (57.6%), respectively. Nearly half of the study patients took dihydropyridine (DHP) calcium channel blockers (43.3%). A quarter of patients were treated with angiotensin II receptor antagonists (25.5%). Non-DHP calcium channel blockers, imidazoline receptor blockers, alpha-adrenergic blockers, and other antihypertensive drugs were less common.

Very few patients were administered antihypertensive monotherapy (n=42, 9.2%). One hundred nineteen (26.2%) patients were taking 2 drugs; 144 patients (31.6%), 3 drugs; 110 patients (24.2%), 4 drugs; and 32 patients (7.0%), 5 drugs. Among those who received 3 drugs, the most common combination was DHP calcium channel blocker plus ACE inhibitor plus beta-adrenergic blocker (n=53, 11.7%). The most prevalent combination of 2 antihypertensive drugs was ACE inhibitor plus beta-adrenergic blocker (n=120, 26.4%).

Current pharmacologic management of hypertension was similar in the patients who attained their target BP and those who did not attained their target BP, except the patients with uncontrolled BP who were treated with DHP calcium channel blockers more frequently.

Overall, on the day of study visit, family physicians did not change treatment for 173 patients (38.0%); this decision was more common among patients with controlled BP. For the remaining patients, pharmacological treatment was changed. The majority of patients (N=214, 47.0%) were advised a single treatment correction. Sixty-one patients (13.4%) were offered to change 2 treatment recommendations, while 7 patients (1.5%) were offered 3 changes in their current treatment. An addition of a drug from another class, an increase in a single drug dose, and change of drug class were the more frequent decisions (Table 2).

Discussion

This study discloses the BP control among patients receiving pharmacologic antihypertensive

Table 2. Current Antihypertensive Treatment and Recommendations for Further Treatment in Patients With Controlled or Uncontrolled Blood Pressure

Antihypertensive Treatment and Further Treatment Recommendations	Patients Who Reached Target BP (n=210)	Patients Who Did Not Reach Target BP (n=245)
Current antihypertensive treatment		
Treatment with ⩾ 2 antihypertensive drugs	189 (90.0)	224 (91.4)
Antihypertensive drugs		
Diuretics	143 (68.1)	162 (66.1)
ACE inhibitors	130 (61.9)	170 (69.4)
Beta-adrenergic blockers	117 (55.7)	145 (59.2)
Calcium channel blockers (DHP)	75 (35.7)	122 (49.8)*
Angiotensin II receptor antagonists	53 (25.2)	63 (25.7)
Calcium channel blockers (non-DHP)	33 (15.7)	34 (13.9)
Other antihypertensive drugs	19 (9.1)	29 (11.8)
Imidazoline receptor blockers	11 (5.2)	25 (10.2)
Alpha-adrenergic blockers	12 (5.7)	18 (7.4)
Recommendations for further treatment		
No treatment changes	155 (73.8)	18 (7.4)*
Increase in a dose of one drug	9 (4.3)	55 (22.4)*
Increase in doses of two or more drugs	3 (1.4)	33 (13.5)*
Change to another drug of the same class	0 (0)	13 (5.3)
Change to the drug of another class	10 (4.8)	51 (20.8)*
Addition of a drug of another class	12 (5.7)	113 (46.1)*
Other recommendations	31 (14.8)	27 (11.0)

Values are number (percentage). BP, blood pressure; ACE, angiotensin-converting enzyme; DHP, dihydropyridine.
*$P<0.05$.

treatment. According to the evaluation of family physicians, less than half (46.2%) of patients achieved the recommended BP targets (<140/90 mm Hg in case of low and moderate risk or <135/85–125/75 mm Hg in high and very high risk). The rate of BP control was higher among patients with low or moderate added risk (61.7%) in comparison with patients with high or very high risk (34.4%). According to the results of BP measurements performed during the study visit, 35.4% of patients had a BP of <140/90 mm Hg. These results were confirmed by multivariate analysis. The patients with low or moderate added risk had almost a 2.5-fold greater chance of reaching target BP as compared with those with high or very high added risk (OR, 2.42; 95% CI, 1.73 to 3.39).

Epidemiologic studies carried out in the United States, Canada, and Europe have shown that BP control is inadequate despite pharmacological treatment. In different countries, the percentage of treated hypertensive patients who achieved the recommended BP targets of <140/90 mm Hg was shown to range from 8.3% to 42% (13–23). The rate of hypertension control that was observed in our study population was similar to that observed in another recent Lithuanian study with a similar design. In that study, 45.4% of treated hypertensive patients achieved target BP levels, and the rate of BP control was significantly higher in a group of low and moderate added CV risk than in high and very high added risk group (62.9% vs. 26.3%) (24). In contrast, available published studies from Latvia reported much lower BP control rate (6.4%–17.6%) (3, 25). The actual reason for such significant differences between countries in BP control rates is not clear, but most likely it is related to methodological differences used in the studies.

A high proportion (90.8%) of patients treated with two or more antihypertensive drugs in the study population shows that Latvian family physicians follow the current national and international guidelines. The widespread use of combined treatment may at least partially explain the relatively high rate of BP control in the study population. However, despite the fact that almost all patients with high or very high added CV risk received combined antihypertensive treatment (91.4%), only one-third of them achieved the target BP. One of the reasons may be the more stringent target BP for patients with high or very high risk (<135/85–125/75 mm Hg). According to the published data from other countries, 30%–60% of hypertensive patients receive monotherapy (15–21, 23, 26, 27). BP control rate in patients receiving monotherapy in Latvia was very low and ranged from 3.8% in patients receiving diuretics to 12.5% in those treated with beta-blockers (3). No information about the proportion of patients receiving monotherapy was provided in this

article. Monotherapy even at maximal doses effectively controls BP in less than 50% of hypertensive patients (28); thus, combination therapy is needed for the majority of hypertensive patients. Combination therapy is more effective, and guidelines for the management of hypertension declare the combinations of low dose antihypertensive drugs as a first-choice treatment in patients with high or very high added CV risk (12, 29).

Physicians usually consider the patient nonadherence to pharmacologic and nonpharmacologic treatment as the main barrier to successful hypertension management (6). Information about patient adherence within the framework of this study was not collected; however, other authors reported that only half of Latvian patients (48% in city and 49.7% in village) regularly take prescribed antihypertensive drugs (25).

While interpreting the reasons for relatively high BP control rate found in this study, the possibility of selection bias cannot be excluded, i.e., physicians might be more inclined to enroll patients with better-controlled BP. In order to minimize the selection bias, every third hypertensive patient who visited the family physicians on a working day for any reason was asked to take part in the study.

The comparison of patients' characteristics revealed that diabetes, metabolic syndrome, dyslipidemia, and abdominal obesity were more frequent among patients with uncontrolled BP. Multivariate logistic regression analysis showed that patients with the metabolic syndrome or dyslipidemia had lower odds of attaining BP target.

As expected, patients with uncontrolled BP were more often recommended to correct the pharmacologic antihypertensive treatment. The most popular decisions were an addition of a drug from another class, an increase in a single drug dose, and change of drug class. Very few patients (7.4%) who did not achieve the target BP were not recommended any treatment recommendations.

Conclusions

In the present sample of treated hypertensive patients, the rate of blood pressure control was less than 50% and was even worse in patients with high or very high added CV risk (34.4%). Since the overwhelming majority of patients with uncontrolled blood pressure received the combination therapy and most of them were recommended some treatment modifications, other unidentified reasons in this study may interfere with the management of hypertension especially among high-risk patients.

Acknowledgments

EVA LV investigators: M. Āboliņš, E. Adijane, T. Aizstrauta, H. Akmentiņš, A. Babule, L. Baranovska, I. Beļēviča, R. Berga, M. Bosko, M. Bremmere, L. Bubenko, V. Butule, A. Čukurs, I. Dalbina, L. Demidova, N. Gailīte, N. Gizatullina, L. Grīga, I. Grīnhofa, S. Gulbe, D. Harasimjuka, L. Hoha, I. Jakubaite, D. Kaķis, S. Kaktina, D. Ķērpe, A. Klauberga, A. Kondratoviča, I. Korvina-Piotrovska, T. Kramčia, L. Krūmija, L. Kudule, I. Kukute, I. Lācīte, G. Laimiņa, R. Lapsa, S. Lapsa-Ārenta, R. Lipska, A. Lucenko, J. Mārtinsons, A. Mihailova, V. Opelte, S. Pilskalne, V. Podniece, N. Portnaja, J. Prohorova, A. Pūpols, M. Putra, O. Rodionova, N. Rogoza, V. Rone, D. Roska-Levina, I. Rudko, S. Saldniece, D. Saulīte, E. Seržante, M. Spasova, Z. Stepko, I. Streņģe, I. Šime, R. Šopo, L. Teršukova, L. Titova, O. Ulmane, L. Ustinoviča, T. Valucka, K. Vernere, I. Zaderņuka, N. Zaharenkova, V. Zariņa, Z. Zauere, A. Zirne, J. Žuka.

Statement of Conflict of Interest

The study was financially supported by the Sanofi-Aventis Latvia Ltd.

References

1. Hajjar I, Kotchen TA. Trends in prevalence, awareness, treatment, and control of hypertension in the United States, 1988-2000. JAMA 2003;290:199-206.
2. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. Lancet 2005;365:217-23.
3. Dzerve V, Lejnieks A. Hypertension in Latvia – epidemiology and management. Blood Press 2005;14(Suppl 2):29-32.
4. Kannel WB. Blood pressure as a cardiovascular risk factor: prevention and treatment. JAMA 1996;275:1571–6.
5. Andros V. Uncontrolled blood pressure in a treated, high-risk managed care population. Am J Manag Care 2005;11(Suppl 7):S215-9.
6. Lindholm LH. The problem of uncontrolled hypertension. J Hum Hypertens 2002;16 Suppl 3:S3-8.
7. Sanson-Fisher RW, Clover K. Compliance in the treatment of hypertension. A need for action. Am J Hypertens 1995; 8:82S-8S.
8. Oliveira SA, Lapuerta P, McCarthy D, L'Italien GJ, Berlowitz DR, Asch SM. Physician-related barriers to the effective management of uncontrolled hypertension. Arch Intern Med 2002;162:413-20.
9. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. JAMA 1999;282:1458-65.
10. Nelson MR, Reid CM, Krum H, McNeil JJ. Factors influencing family physician adherence to hypertension treatment guideline recommendations on the initiation of pharmacotherapy. Am J Cardiovasc Drugs 2003;3:437-41.
11. Mancia G, De Backer G, Dominiczak A, Cifkova R, Fagard R, Germano G, et al. 2007 Guidelines for the management of arterial hypertension: the task force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). J Hypertens 2007;25:1105-87.
12. Racionālas farmakoterapijas rekomendācijas zāļu iegādes kopensācijas sistēmas ietvaros. (Rational recommendations of hypertension pharmacotherapy within framework of drug purchase compensation system.) Zāļu cenu valsts aģentūra; 2005.

13. Wolf-Maier K, Cooper RS, Kramer H, Banegas JR, Giampaoli S, Joffres MR, et al. Hypertension treatment and control in five European countries, Canada, and the United States. Hypertension 2004;43:10-7.
14. Vitezić D, Burke T, Mrsić-Pelcić J, Mavrić Z, Zaputović L, Zupan G, et al. Characteristics of blood-pressure control in treated hypertensive patients in Croatia. Blood Press Suppl 2005;2:33-41.
15. Grzybowski A, Bellwon J, Gruchała M, Stolarczyk L, Popaszkiewicz J, Sobiczewski W, et al. Effectiveness of hypertension treatment assessed by blood pressure level achieved in primary care setting in Poland. Blood Press 2003;12: 232-8.
16. Avanzini F, Alli C, Colombo P, Corsetti A, Colombo F, Tognoni G. Control of hypertension in Italy: results of the "Study on Antihypertensive Treatment in General Practice (STAP)". Physicians Taking Part in STAP. G Ital Cardiol 1998;28:760-6.
17. Westheim A, Klemetsrud T, Tretli S, Stokke HP, Olsen H. Blood pressure levels in treated hypertensive patients in general practice in Norway. Blood Press 2001;10:37-42.
18. Hedblad B, Nerbrand C, Ekesbo R, Johansson L, Midlöv P, Brunkstedt I, et al. High blood pressure despite treatment: results from a cross-sectional primary healthcare-based study in southern Sweden. Scand J Prim Health Care 2006; 24:224-30.
19. Banegas JR, Segura J, Ruilope LM, Luque M, García-Robles R, Campo C, et al. Blood pressure control and physician management of hypertension in hospital hypertension units in Spain. Hypertension 2004;43:1338-44.
20. Primatesta P, Brookes M, Poulter NR. Improved hypertension management and control: results from the health survey for England 1998. Hypertension 2001;38:827-32.
21. Mallion JM, Genès N, Vaur L, Clerson P, Vaïsse B, Bobrie G, et al. Blood pressure levels, risk factors and antihypertensive treatments: lessons from the SHEAF study. J Hum Hypertens 2001;15:841-8.
22. Mancia G, Bombelli M, Lanzarotti A, Grassi G, Cesana G, Zanchetti A, et al. Systolic vs diastolic blood pressure control in the hypertensive patients of the PAMELA population. Pressioni Arteriose Monitorate E Loro Associazioni. Arch Intern Med 2002;162:582-6.
23. Fagard RH, Van Den Enden M, Leeman M, Warling X. Survey on treatment of hypertension and implementation of World Health Organization/International Society of Hypertension risk stratification in primary care in Belgium. J Hypertens 2002;20:1297-302.
24. Petrulionienė Ž, Apanavičienė D. Study on arterial hypertension control and treatment evaluation in daily practice of family physicians. Medicina (Kaunas) 2010;46(10):657-63.
25. Dzerve V, Britcina N, Pakhomova J, Markovitcha I, Rinkuzs K, Mitjusheva G. Prevalence and control of hypertension in Latvia. J Hum Hypertens 2004;18:587-90.
26. Psaty BM, Manolio TA, Smith NL, Heckbert SR, Gottdiener JS, Burke GL, et al. Time trends in high blood pressure control and the use of antihypertensive medications in older adults: the Cardiovascular Health Study. Arch Intern Med 2002;162:2325-32.
27. Wang YR, Alexander GC, Stafford RS. Outpatient hypertension treatment, treatment intensification, and control in Western Europe and the United States. Arch Intern Med 2007;167:141-7.
28. Prisant LM, Weir MR, Papademetriou V, Weber MA, Adegbile IA, Alemayehu D, et al. Low-dose drug combination therapy: an alternative first-line approach to hypertension treatment. Am Heart J 1995;130:359-66.
29. Mansia G, De Backer G, Dominiczak A, Cifkova R, Fagard R, Germano G, et al. 2007 ESH-ESC Guidelines for the management of arterial hypertension: the task force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). Blood Press 2007;16(3):135-232.

Received 10 December 2010, accepted 31 October 2011