—Report on Experiments and Clinical Cases—

Changes in Blood-pressure Control among Patients with Hypertension from 2008 through 2011: Surveys of Actual Clinical Practice

Nobuo Hatori, Hiroyuki Sakai, Kazuyoshi Sato, Kazuhiko Mitani, Masayuki Miyajima, Shouhei Yuasa, Shingo Kuboshima, Keiichi Kajiwara and Masaaki Miyakawa
Kanagawa Physicians Association

Abstract

We performed cross-sectional surveys to investigate changes in clinical practices regarding blood-pressure control in patients with hypertension from 2008 through 2011. Questionnaires regarding the care of patients with hypertension were mailed to members of the Kanagawa Physicians Association in Kanagawa Prefecture, Japan. Data were obtained on 675 patients in 2008, 332 in 2009, and 1,076 in 2011. The mean systolic blood pressure (BP) was significantly lower in 2011 than in 2008 (132.2±11.9 mm Hg versus 134.6±10.6 mm Hg). The office-measured target BP, according to the 2009 guidelines of the Japanese Society of Hypertension for the management of patients with hypertension, was achieved in 53.9% of patients in 2008, 55.1% in 2009, and 57.1% in 2011. In nonelderly patients (younger than 65 years), the achievement rate was significantly greater in 2011 (41.2%) than in 2008 (23.6%). This analysis showed that the factor most significantly associated with a decrease in office-measured BP was treatment with a larger number and higher doses of antihypertensive agents. To investigate changes in clinical practices according to the guidelines, further follow-up surveys are necessary.
(J Nippon Med Sch 2014; 81: 258–263)

Key words: blood pressure, physicians, guidelines

Introduction

Elevated blood pressure (BP) is a common risk factors of both stroke and heart disease. Accordingly, numerous studies and clinical trials have been performed to develop treatments to prevent hypertension and to clarify the factors associated with increased BP levels. Because decreasing BP is markedly effective in decreasing risk, several treatment guidelines have been established for patients with hypertension. The Japanese Society of Hypertension (JSH) first published guidelines for the management of hypertension in 2000 (JSH 2000) and published revisions in 2004 and 2009. The aim of the present study was to investigate changes in clinical practices regarding BP control in patients with hypertension according to JSH 2009 guidelines in Kanagawa Prefecture.

Correspondence to Nobuo Hatori, MD, Kobayashi Hospital, 1-14-18 Sakaecho, Odawara, Kanagawa 250-0011, Japan
E-mail: hatnobu@pa2.so-net.ne.jp
Journal Website (http://www.nms.ac.jp/jnms/)
Patients and Methods

Data and Subjects
The present studies were performed in Kanagawa Prefecture, Japan, from October 16 to 31, 2008, and in October 1 to 31, 2009 and 2011. The survey was based on our previous study, which has been described in detail. A questionnaire was mailed each year to approximately 1,400 members of the Kanagawa Physicians Association. The questionnaire contained questions on the following: patient’s age, sex, body-mass index, concomitant disorders (diabetes mellitus [DM], history of myocardial infarction [MI], stroke, and chronic kidney disease [CKD]), alcohol consumption, current smoking habits, office-measured systolic and diastolic BPs, home BP monitoring, and types of antihypertensive agents and their doses. To avoid selection bias, patients were selected as follows: if the final number of the patient’s identification number or telephone number matched the final number of the patient’s consultation date, he or she was enrolled in the study. To enable analysis of doses, the doses of all antihypertensive drugs were adjusted to standard doses that were in accordance with Japanese clinical practice. For example, the standard dose of valsartan is 80 mg, which was counted as 1.0 point.

Data Analysis
We divided patients into 4 groups according to JSH 2009 guidelines: 1) patients with DM, CKD, a history of MI, or CVD; and 4) nonelderly patients (younger than 65 years) without DM, CKD, a history of MI, or CVD. Within these groups, we analyzed in which patients office-measured BP targets were and were not achieved, according to JSH 2009 guidelines.

Statistical Analysis
All data were entered into a computer and analyzed with the software program IBM SPSS Statistics 21.0 (IBM Inc., Armonk, NY, USA). Means and standard deviations were calculated for continuous variables and proportions were calculated for categorical variables. One-way analysis of variance was used for comparison among the 3 groups. If differences were found to be significant, further analysis was done with the Bonferroni test for multiple pair-wise comparisons. The chi-square test was used for comparisons between categorical variables. If differences were significant, further analysis was done using the chi-square test with a Bonferroni correction for multiple pair-wise comparisons. A p value of less than 0.05 was considered significant.

Results
Data were collected on 692 patients in 2008, 348 in 2009, and 1,079 in 2011. Seventeen, 16, and 3 patients in each year were excluded owing to insufficient patient characteristics and office-measured BP. Thus, data on 675 patients in 2008, 332 in 2009, and 1,076 in 2011 were included in this study (Fig. 1).
Table 1  Characteristics of hypertensive patients

<table>
<thead>
<tr>
<th>Years</th>
<th>2008</th>
<th>2009</th>
<th>2011</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>675</td>
<td>332</td>
<td>1,076</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>70.1 ± 10.6</td>
<td>69.4 ± 10.0</td>
<td>68.8 ± 11.2</td>
<td>ns</td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>301/374</td>
<td>150/182</td>
<td>538/538</td>
<td>ns</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>24.1 ± 3.7</td>
<td>24.3 ± 3.7</td>
<td>24.4 ± 4.2</td>
<td>ns</td>
</tr>
<tr>
<td>Current smokers</td>
<td>98 (14.5%)</td>
<td>36 (10.8%)</td>
<td>206 (19.1%)</td>
<td>p&lt;0.0001 #1, #2</td>
</tr>
<tr>
<td>Current drinkers</td>
<td>164 (24.3%)</td>
<td>71 (21.4%)</td>
<td>355 (33%)</td>
<td>p&lt;0.0001 #3, #4</td>
</tr>
<tr>
<td>Concomitant diseases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVD</td>
<td>57 (8.4%)</td>
<td>23 (6.9%)</td>
<td>43 (4%)</td>
<td>p&lt;0.0001 #5</td>
</tr>
<tr>
<td>DM</td>
<td>144 (21.3%)</td>
<td>90 (27.1%)</td>
<td>218 (20.3%)</td>
<td>p=0.029 #6</td>
</tr>
<tr>
<td>CKD</td>
<td>35 (5.2%)</td>
<td>13 (3.9%)</td>
<td>49 (4.6%)</td>
<td>ns</td>
</tr>
<tr>
<td>history of MI</td>
<td>8 (1.2%)</td>
<td>7 (2.1%)</td>
<td>23 (2.1%)</td>
<td>ns</td>
</tr>
<tr>
<td>Patients measured BP at home</td>
<td>353 (52.2%)</td>
<td>169 (50.9%)</td>
<td>615 (57.1%)</td>
<td>p=0.047</td>
</tr>
</tbody>
</table>

Abbreviations: CVD, cerebrovascular disease; DM, diabetes mellitus; CKD, chronic kidney disease; MI, myocardial infarction; #1, p=0.015 in 2008 vs. 2011; #2, p<0.0001 in 2009 vs. 2011; #3, p<0.0001 in 2008 vs. 2011; #4, p<0.0001 in 2009 vs. 2011; #5, p<0.0001 in 2008 vs. 2011; #6, p=0.01 in 2009 vs. 2011.

Table 2  Achievement ratio of target office BP according to JSH 2009 guidelines

<table>
<thead>
<tr>
<th>Category</th>
<th>Years</th>
<th>2008</th>
<th>2009</th>
<th>2011</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with DM, CKD, or history of MI (SBP&lt;130 mmHg and DBP&lt;80 mmHg)</td>
<td>29.7% (44/148)</td>
<td>32.2% (29/90)</td>
<td>35.3% (99/279)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Patients with CVD (SBP&lt;140 mmHg and DBP&lt;90 mmHg)</td>
<td>75.4% (43/57)</td>
<td>69.9% (16/23)</td>
<td>60.5% (26/43)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Elderly patients (SBP&lt;140 mmHg and DBP&lt;90 mmHg)</td>
<td>72% (247/343)</td>
<td>72.2% (117/162)</td>
<td>78% (380/487)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Nonelderly patients (SBP&lt;130 mmHg and DBP&lt;85 mmHg)</td>
<td>23.6% (30/127)</td>
<td>36.6% (21/57)</td>
<td>41.2% (110/267)</td>
<td>p=0.003 #</td>
<td></td>
</tr>
<tr>
<td>Office BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>134.6 ± 10.6</td>
<td>133.9 ± 9.9</td>
<td>132.2 ± 11.9</td>
<td>p&lt;0.0001 #</td>
<td></td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>76.2 ± 8.3</td>
<td>75.6 ± 8.2</td>
<td>75.6 ± 8.7</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Overall controlled ratio</td>
<td>53.9% (364/675)</td>
<td>55.1% (183/332)</td>
<td>57.1% (615/1,076)</td>
<td>ns</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: JSH, the Japanese Society of Hypertension guidelines for the management of hypertension 2009; BP, blood pressure; SBP, systolic blood pressure; DBP, diastolic blood pressure; DM, diabetes mellitus; CKD, chronic kidney disease; MI, myocardial infarction; #, 2008 vs. 2011 with a p<0.0001

Comparisons of Patient Characteristics

Comparisons of patient characteristics in the 3 years are shown in Table 1. There were no significant differences in age, sex ratio, or body-mass index among the 3 years. The percentages of current smokers and drinkers were significantly greater in 2011 than in 2008 and 2009. The prevalence of CVD in 2011 was 4%, which was lower than that in 2008 (8.4%). The prevalence of DM was significantly greater in 2009 (27.1%) than in 2011 (20.3%). The percentage of patients who measured BP at home was significantly different on intergroup comparison but was not significant on pair-wise comparisons.

Achievement Rate of Target Office-measured BP According to JSH 2009 Guidelines

The rates of control of office-measured BP in each of the 4 groups according to the JSH 2009 guidelines are shown in Table 2. There were no significant differences among the years in any of the 4 groups, except for the nonelderly patients. In nonelderly patients, the rate of control of office-measured BP in 2011 was 41.2% of patients (110 of 267 patients), which was significantly higher than that in 2008 (23.6%, 30 of 127 patients). The overall rate of control
of office-measured BP in each of the 3 years was greater than 50%, but the rate did not differ significantly among the years. The mean office-measured systolic BP was significantly less in 2011 (132.2±11.9 mmHg) than in 2008 (134.6±10.6 mmHg).

**Antihypertensive Agents**

The agents prescribed at the highest rates were CCBs in the each year. The mean number of antihypertensive agents used per patient was significantly greater in 2011 than in 2008 or 2009 (Table 3). The scores adjusted to standard doses were also higher in 2011 than in 2008. The rates of use of calcium channel blockers (CCBs) and the scores of their doses were significantly greater in 2011 than in 2008. Angiotensin II receptor blockers (ARBs) were also used more frequently in 2011 than in 2008. Although the scores of alpha-blockers were higher in 2011 than in 2008, the scores of diuretics were lower in 2011 than in 2008.

**Discussion**

The total rates of achievement of target office-measured BPs, according to each of the 4 categories of the JSH 2009 guidelines, increased from 53.9% in 2008 to 55.1% in 2009 and 57.1% in 2011. However, those changes did not reach to a statistical significance.

In each year of this study in Kanagawa Prefecture, the agents prescribed at the highest rates were CCBs. This finding can be explained by the fact that CCBs are first-line antihypertensive medications in Japan. The tendency to favor CCBs may be related to the high incidence of CVD in Japan. ARBs were the second most frequently prescribed drugs and were prescribed more often than angiotensin-converting enzyme inhibitors (ACEIs). These results are consistent with those of other studies in Japan. Prescription rates of ARBs gradually increased year by year to nearly match those of CCBs.

The JSH 2009 guidelines suggest that ACEIs or ARBs should be chosen as the first-line hypertensive drug in high-risk patients and that diuretics and beta-blockers can be added later. ACEIs have been shown to improve cardiovascular outcomes, thus, ARBs are thought to have the same effects as ACEIs. The ARBs are believed to not only reduce BP but also to directly inhibit organ damage and, consequently, to prevent the occurrence of diseases. Furthermore, ARBs were also prescribed as a substitute for ACEIs if the side effect of dry cough develop. Therefore, physicians have
preferentially prescribed ARBs in Japan. In the present study, ARBs were prescribed in 2011 for 74.7% of patients.

In spite of the promotion of hypertension management guidelines and the development of effective antihypertensive drugs, target BPs are rarely achieved. In particular, rates of achieving BP goals are low among nonelderly patients without DM or CKD and among patients with DM or CKD or a history of MI. In the present study, the rate of achieving target BPs in these patients improved from 23.6% in 2008 to 36.6% in 2009 and 41.2% in 2011. A possible explanation for this improvement was that the rate of ARB use was greater by patients who achieved target BPs than by patients with uncontrolled hypertension in 2011 (data not shown).

In the present study office-measured systolic BPs decreased significantly from 2008 to 2011. The stroke mortality rate in Japan decreased from 1961 to 1990. This decrease coincided closely with a decrease in the BP of the Japanese population. In other studies, high percentage of patients required 3 or more antihypertensive agents to achieve the specified BP targets. Although other factors, such as poor patient compliance, high drug costs, adverse effects of drugs, and the presence of resistant hypertension, may contribute to poor BP control, the present results suggest that more aggressive antihypertensive treatment is necessary for adequate BP control.

An earlier study emphasized the necessity of improving physicians’ awareness of the management of hypertension according to treatment guidelines and the importance of a healthy lifestyle in maintaining good BP levels. To achieve this awareness, it is important to provide feedback to physicians regarding the current status of BP control among patients with hypertension using the results of this kind of study, year after year.

Our study had several limitations. First, this was a cross-sectional analysis. Second, the new JSH 2014 guidelines are going to be spread and further follow-up survey data are thus necessary.

Acknowledgement: We wish to thank all physicians of the Kanagawa Physicians Association who participated in the studies of 2008, 2009, and 2011.

Conflict of Interest: The authors declare no conflict of interest.

References

of resistant hypertension determined by self-
measured blood pressure at home and office blood
pressure measurements: the J-HOME study. J
Hypertens 2006; 24: 1737–1743.
Characteristics of antihypertensive medication
and change of prescription over 1 year of follow up in
Japan: Fukushima Research of Hypertension
16. Effect of enalapril on survival in patients with
reduced left ventricular ejection fractions and
congestive heart failure. The SOLVD Investigators.
17. Pfeffer MA, Braunwald E, Moye LA, et al: Effect of
captopril on mortality and morbidity in patients with
left ventricular dysfunction after myocardial
infarction. Results of the survival and ventricular
enlargement trial. The SAVE Investigators. N Engl J
18. Schmieder RE, Schlaich MP, Klingbeil AU, Martus P:
Update on reversal of left ventricular hypertrophy in
essential hypertension (a meta-analysis of all
randomized double-blind studies until December
1996). Nephrology, dialysis, transplantation: official
publication of the European Dialysis and Transplant
Association - European Renal Association 1998; 13:
564–569.
19. Cohn JN: Improving outcomes in congestive heart
failure: Val-HeFT.Valsartan in Heart Failure Trial.
20. Pitt B, Poole-Wilson PA, Segal R et al: Effect of
losartan compared with captopril on mortality in
patients with symptomatic heart failure: randomised
trial—the Losartan Heart Failure Survival Study
Patterns of persistence with antihypertensive
medications in newly diagnosed hypertensive
patients in Italy: a retrospective cohort study in
22. Spranger CB, Rics AJ, Berge CA, Radford NB,
Victor RG: Identifying gaps between guidelines and
clinical practice in the evaluation and treatment of
patients with hypertension. The American Journal of
Status toward Goal Blood Pressure Levels and
Healthy Lifestyles among Japanese Hypertensive
Patients; Cross-sectional Survey Results from
Fukushima Research of Hypertension (FRESH).
24. Yokokawa H, Goto A, Sanada H, Watanabe T,
Yasumura S: Longitudinal community-based
assessment of blood pressure control among
Japanese hypertensive patients: Fukushima research
of hypertension (FRESH). J Clin Hypertens
(Greenwich) 2010; 12: 166–173.
25. Tight blood pressure control and risk of
cardiovascular and microvascular complications in
type 2 diabetes: UKPDS 38. UK Prospective
26. Berlowitz DR, Ash AS, Hickey EC, Glickman M,
Friedman R, Kader B: Hypertension management in
patients with diabetes: the need for more aggressive
27. Miller NH, Hill M, Kottke T, Ockene IS: The
multilevel compliance challenge: recommendations
for a call to action. A statement for healthcare
organizational factors in poor blood pressure control
in patients with type 2 diabetes: the QuED Study
Group—quality of care and outcomes in type 2

(Received, January 10, 2014)
( Accepted, February 20, 2014)