

Patient Knowledge and Awareness of Hypertension Is Suboptimal: Results From a Large Health Maintenance Organization

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Patient knowledge and awareness of hypertension are important factors in achieving blood pressure control. To examine hypertensive patients' knowledge of their condition, the authors randomly surveyed 2500 hypertension patients from a large health maintenance organization; questionnaires were supplemented with clinic blood pressure measurements. Approximately 72% of the subjects completed surveys. Of patients with uncontrolled hypertension (systolic blood pressure [SBP] ≥ 140 mm Hg and/or diastolic blood pressure [DBP] ≥ 90 mm Hg), only 20.2% labeled their blood pressure as "high" and 38.4% as "borderline high." Forty percent of respondents couldn't recall their most recent clinic-based SBP and DBP values. Overall, 71.7% and 61% were unable to report a target SBP or DBP, respectively, or identify elevated targets based on the sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI) criteria. Most patients perceived DBP to be a more important risk factor than SBP. Hypertensive patients' awareness of blood pressure targets and current

hypertension control status, particularly with respect to SBP, is suboptimal. The authors' findings support the need to improve patient education for better management of hypertension. (J Clin Hypertens. 2003;5:254-260)

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The importance of blood pressure (BP) control in preventing cardiovascular disease and stroke is well established. However, estimates suggest that fewer than 30% of hypertensive patients in the United States are controlled based on the sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI) criteria.¹

Patient knowledge and awareness of BP play important roles in the ability to successfully control hypertension.²⁻⁵ A previous study showed an association between hypertension knowledge and compliance in hypertensive patients.⁶ Recently, lack of knowledge of target systolic BP (SBP) levels was shown to be an independent predictor of poor BP control.⁷ While many studies have evaluated patient awareness of hypertension,⁸⁻¹³ critical elements of BP knowledge have not been adequately assessed, especially with regard to the systolic component of BP.

Historically, diagnosis of hypertension has been based on elevated diastolic BP (DBP), while SBP was relatively ignored.¹⁴ However, it has been shown that SBP is the more important component of arterial pressure in predicting cardiovascular disease and stroke.^{15,16} Further, research from the Framingham Heart Study¹⁴ and the Third National Health and Nutrition Examination Survey (NHANES III)^{17,18} has found that poor BP control is largely a result of elevated SBP. Improved control of SBP is of crucial importance in an aging population because SBP continually

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rises with increasing age, in contrast to DBP, which begins to decline in the sixth decade of life.¹ Thus, the high prevalence of hypertension among seniors is primarily due to elevated SBP. In light of this mounting evidence for changing the focus from DBP, the National High Blood Pressure Education Program¹⁹ has recommended that SBP be the principle measure for diagnosing and managing hypertension. These findings suggest the added importance of patient knowledge of the risks and management of elevated SBP as well as DBP in controlling hypertension.

To investigate current patient knowledge and awareness of hypertension, we conducted a survey of hypertensive patients in a large group model health maintenance organization (HMO). The current study was designed to assess several aspects of patient knowledge and awareness of hypertension, with respect to both the systolic and diastolic component of BP. First, we sought to assess general knowledge of hypertension-related terminology and risks. Second, we wanted to evaluate patient knowledge of target SBP and DBP levels and current hypertensive status, as measured against clinic BP recordings. Finally, we wished to study patient perspectives on the importance of SBP compared with DBP as a risk factor in the development of subsequent cardiovascular and renal conditions.

METHODS

Study Population

The sample for this study consisted of 2500 randomly selected members of the Kaiser Permanente Medical Care Program, Northern California region, who had made a hypertension-related visit to a Kaiser Permanente facility during the 3 months before the survey. Subjects who had no known language barriers and were not declared ineligible by their personal physician due to dementia or poor health were able to participate. The Kaiser Foundation Research Institute's institutional review board approved the protocol for this study.

Data Collection

In November, 2000, an eight-page questionnaire with cover letter and prepaid return envelope was mailed to patients' homes. The survey packet was re-sent to non-respondents 4 weeks later. A random sample of nonrespondents was contacted to complete the survey by telephone interview to increase the response rate. All respondents were informed in advance that they would be paid \$10 for participation in the survey. Subjects who returned incomplete questionnaires with missing information for key study questions were contacted by phone to obtain responses for unanswered items.

Once the questionnaire was received, the clinic-based SBP and DBP reading from the most recent hypertension-related visit before the questionnaire completion date was abstracted from the patient's medical chart and/or from an electronic medical record. Both of these sources of clinic-recorded BP data were used to ensure 100% capture of the SBP and DBP readings at hypertension-related visits.

Definition of BP Classifications

Self-reported and clinic-based BP readings were classified according to JNC VI guidelines. Patients were considered uncontrolled (or to have "elevated BP") if their SBP was ≥ 140 mm Hg and/or their DBP was ≥ 90 mm Hg.

Analysis

All analyses were performed using PC-SAS version 8.0 (SAS Institute, Cary, NC). Chi-square was used to test whether respondent characteristics were significantly associated with the outcomes (e.g., having high BP or self-labeling of BP as high). Multiple logistic regression models were used to examine whether variables that were statistically significant in bivariate analyses remained significant after controlling for potential confounders.

RESULTS

Final Study Sample

A total of 1762 subjects completed the questionnaire by mail ($n=1280$) or phone ($n=482$); there was an overall response rate of 71.5% after excluding ineligible (deceased, noncurrent members, non-English speaking) and/or unreachable (no current address). A recent clinic-recorded SBP was available for 1753 (99.5%) of respondents and clinic-recorded DBP for 1755 (99.6%).

Characteristics of Respondent Sample

Table I shows the characteristics of the final sample used for the analysis. Nearly 9% of the sample was diagnosed with hypertension less than 1 year before the survey, while more than one half had been diagnosed more than 5 years before. The sample was nearly 57% female and 59% white, with a mean age of 64 years (SD, 10.4). Approximately two thirds of the sample was educated beyond high school level. However, educational attainment varied significantly by age and race/ethnicity. Those aged 35–64 years were significantly ($p<0.0001$) more likely than those aged ≥ 65 years to have at least some post-high school education (77% vs. 56.7%) and to be college graduates (36.0% vs. 21.5%). By race/ethnic group, Asian/Pacific Islanders were the most highly educated group (74.8%

at least some post-high school, including 43.7% college graduates) compared with whites (67.4% post-high school, including 28.6% college graduates), African Americans (64.4% post-high school, including 20.8% college graduates), and Latinos (40.8% post-high school, including 12.8% college graduates).

BP was uncontrolled in nearly two thirds (64.7%) of patients. A total of 57.6% had an SBP \geq 140 mm Hg and 25.1% had a DBP \geq 90 mm Hg (Table I). Rates of elevated SBP and DBP did not significantly differ by race/ethnicity, education, or sex. However, approximately 70% of patients aged \geq 65 years were un-

controlled based on elevated SBP alone compared with 50.7% of those aged 35–64 years ($\chi^2=44.4$; $p<0.0001$).

Knowledge of Hypertension Terminology

Participants were asked to identify the meaning of the terms “hypertension,” “systolic blood pressure,” and “diastolic blood pressure.” The majority (76.1%) correctly identified the term hypertension as meaning “high blood pressure.” Four percent thought the term meant both “high blood pressure” and “high level of stress,” and 12.5% thought the term only meant “high level of stress.” A slightly lower percentage (67.8%) correctly identified SBP and DBP as indicating the top and bottom numbers, respectively, of a blood pressure reading. However, when given the option of answering questions that allowed use of the terms “systolic and diastolic blood pressures” or “top and bottom numbers,” 44.4% chose responses containing the terms “top” or “bottom” numbers rather than SBP or DBP. When referring to hypertension in general, the survey questionnaire always used the term “high blood pressure.”

Knowledge of Hypertension as a Factor That Increased Risk for Developing Other Diseases

Patients were highly aware that hypertension increased the risk of developing stroke (92.6%) and heart attack (86.8%), but less were aware that it increased the risk of heart failure (54.6%) and kidney disease (41.2%). Hypertensive patients aged \geq 65 years were significantly less likely than those $<$ 65 years to indicate an increased risk of heart failure (50.6% vs. 59.4%; $\chi^2=13.7$; $p<0.001$) and kidney disease (35.1% vs. 48.4%; $\chi^2=31.6$; $p<0.0001$), with no observed age difference regarding heart attack or stroke risk. Latinos and Asians were significantly less likely than whites and African Americans to believe that hypertension increased risk of stroke (89.6% and 87.3% vs. 93.7% and 94.0%, respectively; $\chi^2=14.7$; $p<0.002$). African Americans were significantly more likely than whites, Latinos, or Asians to indicate that hypertension increased risk of kidney disease (51.9% vs. 39.4%, 35.2%, and 38.3%, respectively; $\chi^2=17.6$; $p<0.001$).

Perceived Importance of SBP and DBP as Important Risk Factors for Developing Other Diseases

Approximately 57% of the sample felt that SBP and DBP were equally important risk factors for developing these diseases. DBP was more frequently indicated as a more important or equally important risk factor as compared with SBP (79.0% vs. 67.3%; $\chi^2=54.5$; $p<0.0001$). This perception that DBP was more important was true across all race/ethnic groups.

Table I. Characteristics of Final Hypertension Patient Study Sample (N=1762)

	PERCENT (%)	N
Clinic BP reading		
SBP \geq 140 mm Hg	57.6	1010
DBP \geq 90 mm Hg	25.1	440
Overall BP (SBP \geq 140 and/or DBP \geq 90 mm Hg)	64.7	1135
Sex and age		
Men, 35–44 years	1.8	31
Women, 35–44 years	2.6	46
Men, 45–64 years	19.9	351
Women, 45–64 years	21.6	381
Men, \geq 65 years	21.7	382
Women, \geq 65 years	32.4	571
Race/ethnicity		
White, non-Hispanic	59.1	1041
African American/black	16.2	285
Latino	7.1	125
Asian/Pacific Islander	14.5	255
Other	3.2	56
Education level		
<High school graduate	12.0	212
High school graduate/GED	22.1	388
Some post-high school education/training	37.8	664
College graduate	28.1	495
Time since hypertension was diagnosed		
<1 year	8.8	155
1–2 years	16.1	282
3–5 years	16.3	287
>5 years	54.9	964
Don't recall	3.9	68
Date of clinic BP data vs. questionnaire completion		
\leq 60 days before	51.5	904
61–120 days before	34.5	605
121–180 days before	9.5	167
>180 days before	4.5	79

BP=blood pressure; SBP/DBP=systolic/diastolic BP; GED=General Education Development Testing Service

Knowledge of "Target" BP

While most patients (79%) reported that their doctor had told them target SBP and DBP levels, 25.1% of those who indicated being told could not recall either target. Of those who did report a target BP, 53.3% reported a target SBP ≥ 140 mm Hg and 34.3% a target DBP ≥ 90 mm Hg. Taken together, this means that most patients did not know what their target SBP level (71.7%) or DBP level (61%) should be in relation to JNC VI guidelines. When we examined knowledge of target BPs among those with elevated clinic SBP or DBP levels, we found that nearly 39% could not report a target SBP or DBP, and an additional 34.3% and 24.3%, respectively, recalled an SBP or DBP level that was elevated based on JNC VI criteria.

Ability to Recall SBP and DBP Values From Most Recent Hypertension-Related Clinic Visit

Approximately 60% of respondents reported an SBP and DBP from their most recent hypertension-related visit with their primary care clinician or other BP specialist. Of these, 60% had reported BP values that fell into the same JNC VI classification as their clinic-recorded values. Overall, approximately 50% of patients either could not recall their most recent clinic-based SBP and DBP values (38.5% and 40.1%, respectively) or recalled values that placed them in a lower JNC VI classification than their clinic-based values indicated (10.7% and 10.9%, respectively). About 57% of those who could not recall their most recent SBP reading had an SBP ≥ 140 mm Hg while 23.5% of those who did not know their last DBP level had an elevated DBP clinic reading.

Correct Labeling of High BP Values as "High"

The Figure shows the percentages of respondents with elevated clinic-recorded SBP and DBP levels who correspondingly labeled their BP values as "high." Slightly more than one half of those with an elevated SBP or DBP correctly labeled these values as "too high." The question about BP control status provided more detailed categories of "high," "borderline high," "borderline," or "OK." Only 20.2% of patients who had SBP ≥ 140 mm Hg and/or a DBP level ≥ 90 mm Hg correctly labeled their BP as "high," with 38.4% labeling it as "borderline high" or "borderline." Patients with both elevated SBP and DBP were significantly more likely than those with just a high SBP or DBP to label their BP as "high" rather than "borderline high," "borderline," or "OK" (28.2% vs. 17.1% and 16.5%, respectively; $\chi^2=17.4$; $p<0.001$). More than one third (36.8%) of these patients labeled their overall BP as "OK"

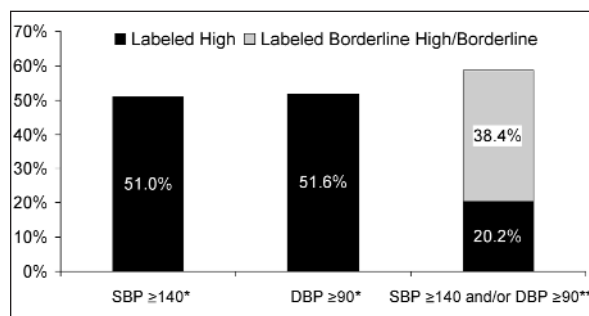


Figure. Percentages with clinic-recorded systolic blood pressure (SBP), diastolic BP (DBP), and BP in the JNC VI high range who correctly labeled these BPs as high. *If your BP is too high, which number(s) or BP type(s) are too high? **Do you think your BP is high, borderline high, borderline, or OK?

(37.0% of those with high DBP only, 40.7% of those with high SBP only, and 28.2% of those with both high SBP and DBP). Among those aged ≥ 65 years, patients with elevated SBP and normal DBP were significantly more likely than those with elevated DBP alone or elevated SBP and DBP to label their BP as "OK" (44.2% vs. 33.3% and 30.7%, respectively; $\chi^2=8.6$; $p<0.05$).

Table II shows how accuracy of labeling by those with an elevated BP level differed by demographic characteristics. Those aged ≥ 65 years were significantly less likely to correctly label their DBP or overall control status as high compared with those <65 years. African Americans were significantly less likely than whites or Asian/Pacific Islanders to label their SBP as too high; those with a high school education or less were significantly less likely than those with at least some post-high school education to correctly label their SBP as too high.

Multivariate logistic regression models were used to examine the independent significance of the different patient demographics in predicting correct labeling of BP control status. Among those with elevated clinic-recorded BPs, the only significant predictors of correctly labeling BP as high were age and sex, with those <65 years more likely to be correct than those ≥ 65 years ($p<0.05$) and women less likely to be correct than men ($p<0.05$).

Among those with elevated clinic-SBP readings, having at least some post-high school education ($p<0.01$) or a college degree ($p<0.01$) vs. high school or less were positively associated with correct labeling of SBP as too high, while African American vs. white race/ethnicity was negatively associated with correct labeling ($p<0.001$). Among those with elevated clinic DBP, having a college degree vs. high school or less was positively associated with correct labeling of DBP as high ($p<0.01$), while being aged ≥ 65 years vs. <65

Table II. Correct Labeling of SBP, DBP, and Overall BP as “High” by Respondents With Clinic-Recorded BP Values in the JNC VI “High” Range

	CORRECTLY LABELED VALUE AS “TOO HIGH” [†]		CORRECTLY LABELED VALUE AS “HIGH” ^{††}
	SBP ≥140 mm Hg % (BASE N)	DBP ≥90 mm Hg % (BASE N)	OVERALL BP (SBP ≥140 AND/OR DBP ≥90 mm Hg) % (BASE N)
Sex			
Male	50.5 (420)	50.2 (211)	17.4 (476)
Female	51.1 (589)	52.6 (230)	22.0 (651)
Age			
35–64	49.3 (446)	61.7 (256)	23.5 (516)
≥65	52.0 (563)	37.3 (185)***	17.2 (611)**
Race/Ethnicity			
White	54.5 (602)	52.3 (258)	18.4 (680)
African American/black	38.0 (171)	54.7 (75)	23.2 (185)
Latino	42.3 (71)	34.5 (29)	19.2 (78)
Asian/Pacific Islanders	53.4 (131)**	51.5 (68)	24.0 (146)
Education			
≤High school graduate	43.2 (347)	40.2 (137)	19.9 (381)
Some post-high school	54.2 (384)	53.0 (181)	19.1 (434)
College graduate	56.2 (276)**	62.3 (122)**	21.6 (310)

BP=blood pressure; SBP/DBP=systolic/diastolic BP; [†]For SBP and DBP, correct labeling if the relevant BP(s) were indicated in response to the question, “If your blood pressure is too high, check which number(s) or blood pressure type(s) are too high.” ^{††}For overall BP, correct labeling if BP was labeled as high in response to the question, “Do you think your blood pressure is high, borderline high, borderline, or OK?”
Significant by χ^2 test at $p<0.05$; **at $p<0.01$; ***at $p<0.001$

years ($p<0.0001$) and Latino vs. white ($p<0.05$) were negatively associated with correct labeling.

DISCUSSION

The results of this survey suggest that hypertensive patients’ knowledge of basic terminology used to communicate about hypertension and awareness of hypertension as a risk factor for stroke and myocardial infarction is relatively good. Approximately two thirds of hypertensive patients surveyed correctly identified SBP and DBP as the top and bottom numbers, respectively, of a BP reading. However, patients seem to feel more comfortable using the terms “top” and “bottom” numbers rather than SBP and DBP. Most patients also are aware that hypertension is an important risk factor for developing stroke and heart attack, although fewer are aware of the increased risk of heart failure and kidney disease. More patients indicated that DBP was a more important or equally important factor for the development of subsequent disease than SBP, even though the current evidence is that SBP is more important.

While patient knowledge about basic hypertension concepts appears to be good, knowledge about personal BP control status is suboptimal. More than one half the patients either could not recall

their most recent clinic-based SBP and DBP values or recalled values that placed them in a lower than actual JNC VI classification. More than 60% were not aware of appropriate SBP and DBP targets to aim for. Additionally, many patients with elevated clinic-based BPs were not aware that their BP values were too high based on JNC VI criteria. Approximately one half of all subjects with elevated SBPs and DBPs were not aware that these BP values were too high. Since only approximately 20% of patients with an elevated BP labeled their BP as “high” vs. 38% as “borderline high” or “borderline,” we presume that the majority of those who correctly indicated that their SBP or DBP was “too high” actually believe that these BPs are “borderline high.” African Americans with an elevated SBP appear to be significantly less aware that their SBP is high than hypertensive patients of other races/ethnicities. Also, patients aged ≥65 years, considered hypertensive due to high isolated SBP, were significantly less likely to label their overall BP as high when compared with patients with elevated DBP or both high SBP and high DBP. This suggests that patients are not being adequately informed by clinicians about their BP control status under the newer guidelines, especially with regard to SBP.

The impact of awareness level and value of education programs on compliance and BP control in hypertensive patients has been demonstrated in a number of recent studies. A survey⁷ of hypertensive patients in three disparate clinical sites complemented with clinic BP measurements showed that lack of knowledge of target SBP goal was an independent predictor of poor BP control. An education program that focused, in part, on "knowing high BP" led to improved compliance and significant reductions in both SBP and DBP.²⁰ Patients who were aware that increased BP reduced life span had a higher level of compliance with checkups and medication use.⁶ These findings suggest the importance of hypertension knowledge and awareness in improving BP control and ultimately long-term outcomes.

Furthermore, the importance of provider hypertension knowledge and the method by which it is communicated in educating patients should not be discounted. A recent survey by Hyman et al.²¹ suggests that physicians may be a bottleneck in improving patient BP knowledge and awareness. In this survey,²¹ 41% of physicians that responded had not heard of, or were unfamiliar with JNC guidelines. Additionally, 43% of the providers would not treat SBP unless it was >160 mm Hg, 33% would not treat DBP unless it was >95 mm Hg, and many providers surveyed felt that less aggressive therapy is warranted in older hypertension patients. The study also found that community physicians give greater preference to DBP than SBP when managing hypertension.²¹ Furthermore, although more than 70% of patients reported that providers had described target BP levels, the majority still could not recall an appropriate goal, based on JNC VI criteria.

There are some limitations to the generalizability of our study results to all hypertensive patients. First, despite aggressive follow-up, we only obtained responses from 71% of the eligible sample of patients. The subgroup of the final sample who completed the survey only after a more intensive follow-up were significantly more likely to be nonwhite, less educated, and incorrect in their understanding of hypertension terminology, suggesting we may be overestimating the ability to understand hypertension terminology. However, there were no significant differences between original and prompted responders regarding awareness of target and actual BP values and perceptions of BP control status, suggesting that our results on awareness of BP goals and control status provide reasonable estimates. Second, the patients who participated in this survey all had access to prepaid outpatient care through a large group model HMO that distributes guidelines to all clinicians regarding hypertension control and has excellent patient education resources for chronic disease

management and risk factor modification. Patients being seen by physicians in solo or small group practices may not be exposed to as much hypertension education as our patients. A study reported many years ago²² indicated that patients who had access to up-to-date patient information experienced a better outcome than patients in other practices who did not. Finally, while our sample had good diversity with regard to race/ethnicity, education, and age, the sample size precluded our ability to examine in more detail the BP-related knowledge and awareness of African Americans, Latinos, and Asians of different age groups and educational attainment.

CONCLUSIONS

The predominance of hypertension-related disease outcomes in the nation underscores the need for aggressive BP control. While our study found that patients were generally aware of basic concepts related to hypertension, their knowledge of personal BP goals and current status of control were suboptimal. Given evidence that suggests the importance of education and hypertension knowledge in increasing patient compliance and BP control, this study points out potential areas for improvement in health care delivery. Culturally-appropriate messages need to be delivered to patients and their families about the importance of knowing one's target and actual SBP and DBP levels, as well as having an accurate appraisal of control status, both in the public health domain and the clinical setting. Additionally, the results of our study suggest that particular emphasis needs to be put on increasing clinician and patient awareness of the importance of controlling SBP as well as DBP. Future studies should examine patient-provider communication and behavior with regard to hypertension management.*

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* A helpful patient education booklet, *High Blood Pressure: What You Should Know About It and What You Can Do to Help Your Doctor Treat It* (2002) can be downloaded from the following website: <http://www.hypertensionfoundation.org/>