Inadequate Control of Hypertension in US Adults With Cardiovascular Disease Comorbidities in 2003-2004

Nathan D. Wong, PhD; Victor A. Lopez, BS; Gilbert L'Italien, PhD; Roland Chen, MD; Sue Ellen J. Kline, PhD; Stanley S. Franklin, MD

Background: Cardiovascular risks associated with hypertension (HTN) and the importance of its control are well established; however, the prevalence and adequacy of its treatment and control in persons with cardiovascular comorbidities (CVCs) are uncertain.

Methods: To examine the prevalence, treatment, and control of HTN among US adults with and without CVCs, we analyzed data from adults at least 18 years of age (n=4646, N [projected sample size]=192.4 million) in the National Health and Nutrition Examination Survey 2003-2004, a nationally representative cross-sectional survey of the noninstitutionalized civilian US population. Prevalence, treatment, and control rates of HTN in patients with CVCs vs those without, including coronary artery disease, congestive heart failure, stroke, chronic kidney disease, peripheral artery disease, and diabetes mellitus, and distance to blood pressure goal in those whose HTN was not controlled were the main outcomes.

Results: The overall prevalence rate of HTN was 31.4% (n=1671, N=60.5 million), ranging from 23.1% in those without CVCs to 51.8% to 81.8% in those with CVCs (P<.01). Despite HTN treatment rates for diabetes mellitus, stroke, heart failure, and coronary artery disease that are higher (83.4%-89.3%) than the rates of those without these conditions (66.5%) (P<.01), control rates for treatment remained poor (23.2%-49.3%) (P=.001 to P=.048). Isolated systolic HTN was the most common hypertensive subtype in those with CVCs (≥63.5%) with systolic blood pressure averaging at least 20 mm Hg from goal.

Conclusions: Nearly three-fourths of adults with CVCs have HTN. Poor control rates of systolic HTN remain a principal problem that further compromises their already high cardiovascular disease risk.

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Blood pressure (BP) control worldwide and in the United States continues to be suboptimal. Recent estimates indicate little change in the prevalence of hypertension (HTN), and, although there seem to be some recent improvements in treatment and control rates, HTN in many persons remains inadequately controlled. Control is worse in non-Hispanic black and Hispanic persons than in non-Hispanic white persons, and among older vs young persons (eg, ages ≥70 years vs 18-40 years) despite treatment.1,2

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Methods

Survey

In the National Health and Nutrition Examination Survey (NHANES) 2003-2004,3 we identified adults (those ≥18 years, N [projected sample size]=192.4 million; 51.1% were female) with complete and valid data on BP measures. The NHANES is a cross-sectional health survey conducted by the Centers for Disease Control and Prevention. The

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survey includes self-reported demographic and socioeconomic information as well as medical examination data, including laboratory test findings, and physiological measurements administered by trained medical personnel.

DEFINITIONS

Hypertension was defined as a systolic BP of at least 140 mm Hg or diastolic BP of at least 90 mm Hg or (≥130 mm Hg systolic BP or ≥80 mm Hg diastolic BP in persons with DM or CKD) or self-reported use of medication for lowering BP. Blood pressure was measured using a mercury sphygmomanometer and taking the mean of up to 4 readings. Mean diastolic BP measures of at least 50 mm Hg were required for inclusion. Treatment was defined by self-report. Isolated systolic HTN was defined as systolic BP of at least 140 mm Hg but diastolic BP lower than 90 mm Hg, and isolated diastolic HTN was defined as a systolic BP lower than 140 mm Hg with a diastolic BP of at least 90 mm Hg.

Low-density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald equation (LDL-C=total cholesterol – HDL-C – [1/5] triglycerides) (where HDL-C indicates high-density lipoprotein cholesterol), if the triglyceride level was less than 400 mg/dL. Dyslipidemia was defined as a fasting (≥8 hours) LDL-C level of at least 160 mg/dL or 1 or no risk factors, at least 130 mg/dL with 2 or more risk factors, or at least 100 mg/dL in persons with DM or CVD. Risk factors for this purpose included HTN, age older than 45 years for men or older than 55 years for women, DM, smoking, or an HDL-C level of less than 40 mg/dL (no appropriate variables for premature family history of CAD in NHANES were available for analysis). To convert HDL-C and LDL-C to millimoles per liter, multiply by 0.0259; to convert triglycerides to millimoles per liter, multiply by 0.0113.

The MetS was defined by the presence of 3 or more of the following: (1) a waist circumference greater than 102 cm for men and greater than 88 cm for women, (2) a triglyceride level of at least 150 mg/dL if fasting, (3) an HDL-C level lower than 40 mg/dL for men or lower than 50 mg/dL for women, (4) BP of at least 130/85 mm Hg receiving or antihypertensive medications, and (5) a fasting glucose level of at least 100 mg/dL but lower than 126 mg/dL according to modified National Cholesterol Education Program criteria. Diabetes mellitus was defined as a fasting glucose level of at least 126 mg/dL or a non-fasting glucose level of at least 200 mg/dL, receiving treatment with oral hypoglycemic medication or insulin, or with self-reported DM. Chronic kidney disease was defined as having a creatinine clearance of less than 60 mL/min/1.73 m², which is equivalent to stages 3, 4, and 5. Creatinine clearance was approximated using the Cockcroft and Gault formulas:

\[
\text{Creatinine Clearance} = \left( \frac{140 - \text{Age (Years)}}{72 \times \text{Serum Creatinine (Milligrams per Deciliter)}} \right) \times \text{Weight (Kilograms)} / (\text{Multiply Entire Quantity by 0.85 for Women}).
\]

To convert serum glucose to millimoles per liter, multiply by 0.0555; to convert serum creatinine to milliliters per second per meters squared, multiply by 0.0167; to convert serum creatinine to micromoles per liter, multiply by 88.4. Stroke, CHF, and CAD were identified by using a self-reported questionnaire, and peripheral arterial disease (PAD) was defined as having an ankle-brachial index value of less than 0.9 (ankle-brachial index measures were available for participants 40 years or older and were not performed in those with bilateral amputation). No information on intermittent claudication was available. Detailed specimen and data collection are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual.

Control of BP was defined as BP lower than 140 mm Hg systolic and less than 90 mm Hg diastolic (a secondary goal examined BP <130 mm Hg systolic and <80 mm Hg diastolic in persons with DM or CKD). For persons with MetS, a standard goal of BP lower than 140/90 mm Hg was indicated, and a secondary goal of BP lower than 130/85 mm Hg based on the cutoff point for BP in defining MetS is also defined. Distance from the goal was calculated as the mean difference between systolic and diastolic BP goals and the actual BP recorded.

STATISTICAL ANALYSIS

The prevalence, treatment, and control (among those treated) of persons with HTN were identified. Treatment and control rates were defined in those 18 years or older with HTN (n=1671, N=60.5 million; 49.7% were women). The percentages of subjects with HTN, receiving treatment, and with controlled HTN among those treated to the goal as described in the previous subsection, “Definitions,” were analyzed by sex, age group (<40, 40-49, 50-59, 60-69, or ≥70 years), ethnicity (black, Hispanic, or non-Hispanic white), and disease group according to the presence of DYS, MetS, DM, CKD, stroke, CHF, PAD, and CAD (or absence of all these conditions, hereinafter, no-disease group). Disease groups were defined not to be mutually exclusive (eg, persons with CAD, stroke, CHD, or PAD might also have 1 or more of the other conditions, as is the case with the exception of MetS; those with MetS were defined in this study to be separate from those with DM (which may or may not include MetS). The mean values and mean distance from the goal were assessed by disease group, as described in the “Definitions” subsection. In addition, among those untreated with uncontrolled HTN (n=456), the prevalence of isolated systolic HTN was determined.

Cross-tabulation procedures, performed with SUDAAN statistical software (version 9.0.1; Research Triangle Park, North Carolina), were used for population-weighted percentages. The χ² test of proportions was used to compare prevalence across sex, age, ethnicity, and disease groups. SAS statistical software (version 9.1.3; SAS Institute, Cary, North Carolina) and SUDAAN software were used for analysis and computation of weighted estimates for projection to the population of the United States. The α probability level for statistical analyses was set at .05. All percentages presented reflect the population-weighted estimates.

RESULTS

HTN PREVALENCE, TREATMENT, AND CONTROL BY AGE, SEX, AND RACE

A total of 4646 (N=192.4 million) NHANES participants met study entry criteria for complete BP measurements, and of these individuals, a total of 1671 (N=60.5 million) were identified as having HTN. The overall prevalence of HTN was 31.4% (32.2% in men and 30.5% in women) (Table 1). The prevalence of HTN increased dramatically with age (P<.01 across age groups) and was greatest in black participants (37.4%) (P<.01). When examining treatment and control, 68.5% of those with HTN were being treated, and 52.9% of those treated had their HTN in control. Women had similar treatment rates (69.9%) as men (67.2%); control rates tended to be higher in men (56.5%) than in women (49.4%). Treatment rates also increased with age (P<.01 across age groups). However, control among those treated decreased with age.
(74.0% in those aged 18-40 years and 33.3% in those ≥70 years) \((P < .01)\). Both treatment and control rates were similar across race (Table 1).

**PREVALENCE, TREATMENT, AND CONTROL OF HTN WITH CARDIOVASCULAR COMORBIDITIES**

The prevalence of HTN in the no-disease group was 23.1% (Table 2), with HTN treated in 66.5% and controlled in 64.6%. Among persons with DYS, the prevalence rate of HTN was 51.8% \((P < .01)\) compared with the no-disease group, the treatment rate was 68.0%, but the control rate was only 49.3% \((P < .05)\) compared with the no-disease group. For MetS, the prevalence rate of HTN was 61.5% \((P < .01)\) when compared with the no-disease group, the treatment rate was 70.9%, and the control rate was only 63.7% (based on BP <140/90 mm Hg) but 46.7% if based on BP lower than 130/85 mm Hg \((P < .01)\) compared with the no-disease group. The prevalence rate of HTN in those with DM was 76.8%; CKD, 81.8%; stroke, 69.5%; CHF, 71.4%; PAD, 73.7%; CAD, 73.0%; and in those with 2 or more CVD conditions, 76.9% \((P < .01)\) compared with the no-disease group). The HTN treatment rate in persons with DM was 84.0%; CKD, 65.9%; stroke, 89.0%; CHF, 83.4%; PAD, 73.4%; CAD, 89.3%; and in those with 2 or more CVD conditions, 82.5% \((P < .01)\) compared with the no-disease group, except for those with CKD and PAD). The control rates for HTN were low (DM, 61.2%; CKD, 42.2%; stroke, 34.9%; CHF, 48.8%; PAD, 46.7%; and CAD, 50.3%) \((P < .01)\) for CKD and stroke and \(P < .05\) for PAD compared with the no-disease group). For DM and CKD, control based on a goal of BP lower than 130/80 mm Hg was even lower at 35.3% and 23.2%, respectively \((P < .01)\) compared with the no-disease group).

**DISTANCE TO BP GOAL**

We examined distance from goal and mean values for systolic and diastolic BP in persons receiving treatment who were not at goal (Table 3). For systolic BP, persons with no disease were closer to goal \((14.1 \text{ mm Hg})\) than those with CKD \((P < .001)\), stroke \((P = .02)\), CHF \((P = .007)\), PAD \((P = .009)\), and CAD \((P = .02)\), with the mean of each being 20 mm Hg or greater from goal. The mean diastolic BP was within 10 mm Hg of goal for all conditions.

**HYPERTENSIVE SUBTYPES IN UNCONTROLLED HTN**

Among the subset of participants with uncontrolled and untreated HTN (n = 456), isolated systolic HTN (ISH) was the most predominant form of untreated HTN, present in 57.0% of those with HTN overall. Not surprisingly, there was a dramatic increase in ISH prevalence among those with certain comorbidities: those with DYS (68.8%), DM (86.8%), CKD (95.2%), CHF (78.5%), and PAD (80.4%) had a significantly higher prevalence of ISH \((P < .05\) to \(P < .01)\) than those with no disease (41.9%). The prevalence of ISH in those with MetS (51.5%), CAD (67.6%), or stroke (63.5%) did not differ substantially from those with no disease. The overall prevalence of isolated diastolic HTN among participants with uncontrolled and untreated HTN was 23.1%; however, it was substantially lower in those with most CVD comorbidities (<10% in those with CHF, PAD, and CAD and 12.2% in those with DM). The prevalence of isolated diastolic HTN was 17.8% in those with DYS, 28.2% in those with MetS, and 22% in those free of any CVD comorbidity.

**COMMENT**

Our study has demonstrated that, whereas the overall prevalence of HTN remains close to one-third of the US adult population, HTN is present in close to three-fourths of those with cardiovascular disease comorbidities including CAD, stroke, DM, CKD, and PAD. In contrast, the prevalence rate of HTN was only 18% in those without these comorbidities. Moreover, despite treatment rates of 75% or greater in many cases, the HTN of only one-third to one-half of such persons is controlled to goal levels for BP. Moreover, given recently released recommendations to reduce the BP goal to less than 130/80 mm Hg for persons with CAD and other high-risk conditions, our HTN control rates would be even lower and...
a greater distance from the goal for these persons if the new criteria are applied.9,10

These high-risk persons with low rates of HTN control represent an urgent need for intensified efforts to achieve BP control. Despite receiving treatment, many have systolic BP that is still 20 mm Hg or greater above goal, clearly justifying Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) recommendations2 for prescribing these patients dual therapy to start with. Isolated systolic HTN remained the predominant hypertensive subtype, being present in two-thirds of those with CAD or stroke and in 78.5% or more of those with DM, CKD, CHF, and PAD, which provided further evidence that the notion that systolic HTN need not be treated if diastolic BP is lower than 90 mm Hg is mistaken.

Compared with earlier reports of HTN prevalence among US persons with DM in 1988-1994 and 1999-2000,11 our prevalence rate of 76.8% in 2003-2004 shows a significant 15% increase, reducing the estimated population of persons with DM from 17.7 million to 15.3 million. Among persons with DM, the prevalence of HTN remained the predominant hypertensive subtype, being present in nearly three-fourths of those receiving treatment, but the BP of only 50.3% was controlled to goal, with those not at goal having systolic BP that was 22 mm Hg or greater above goal. Despite our high treatment rate in persons with CHF (83.4%), less than half attained goal levels of BP, and systolic BP averaged 22 mm Hg or greater above goal.

Among persons with CAD with HTN, although 1 report12 shows a high rate of treatment (93%), the systolic BP of only 40% of such persons was in control compared with the diastolic BP in control for 81%. In our study, we noted that 89.3% of participants were receiving treatment, but the BP of only 50.3% was controlled to goal, with those not at goal having systolic BP that was a mean of 21 mm Hg above goal.

In those with CHF, we noted a prevalence rate of 71.4% for HTN, comparable with the 70% to 76% prevalence rates recently reported by the large Acute Decompensated Heart Failure National Registry.16 However, the Framingham Heart Study17 reported that HTN antedated the development of CHF in 91% of subjects during a mean follow-up period of 14.1 years. The lower prevalence figures for antecedent HTN in cross-sectional studies probably represent in part a process of “reverse causation” by which the onset of severe CHF is frequently associated with pump failure and, thus, a late fall in BP to normotensive levels. Despite our high treatment rate in persons with CHF (83.4%), less than half attained goal levels of BP, and systolic BP averaged 22 mm Hg from goal in those whose BP was not controlled.

Table 2. Prevalence, Treatment, and Control of HTN in United States by Disease Group (NHANES 2003-2004)²

<table>
<thead>
<tr>
<th>Disease Group (n, N)</th>
<th>Mean Age, y</th>
<th>Prevalence, %</th>
<th>Mean BP Value Among Those With HTN, SBP/DBP, mm Hg</th>
<th>Those Receiving Treatment for HTN, %</th>
<th>Those Receiving Treatment for, and Controlled for, HTN, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>No disease (441, 25.2M)</td>
<td>53.5</td>
<td>23.1</td>
<td>138.2/79.5</td>
<td>66.5</td>
<td>64.6</td>
</tr>
<tr>
<td>DYS (778, 29.9M)</td>
<td>59.3</td>
<td>51.8b</td>
<td>140.1/76.8</td>
<td>68.0</td>
<td>49.3e</td>
</tr>
<tr>
<td>MetS without DM (718, 31.4M)</td>
<td>54.8</td>
<td>61.5b</td>
<td>135.6/77.9</td>
<td>70.9</td>
<td>63.7b/46.7b</td>
</tr>
<tr>
<td>DM (458, 14.6M)</td>
<td>60.5</td>
<td>76.8b</td>
<td>136.3/71.7b</td>
<td>84.0b</td>
<td>61.2b/35.3b</td>
</tr>
<tr>
<td>CKD (445, 11.5M)</td>
<td>76.1</td>
<td>81.8b</td>
<td>147.4b/84.2b</td>
<td>65.9</td>
<td>42.2b/32.2b</td>
</tr>
<tr>
<td>Stroke (155, 4.7M)</td>
<td>65.9</td>
<td>69.5b</td>
<td>141.3/72.8b</td>
<td>89.0b</td>
<td>34.9b</td>
</tr>
<tr>
<td>CHF (285, 9.2M)</td>
<td>68.2</td>
<td>71.4b</td>
<td>138.0/72.0b</td>
<td>83.4b</td>
<td>48.8</td>
</tr>
<tr>
<td>PAD (190, 5.0M)</td>
<td>69.3</td>
<td>73.7b</td>
<td>142.1/68.7b</td>
<td>73.4</td>
<td>46.7i</td>
</tr>
<tr>
<td>CAD (284, 9.4M)</td>
<td>67.2</td>
<td>73.0b</td>
<td>137.1/70.8b</td>
<td>89.3b</td>
<td>50.3</td>
</tr>
<tr>
<td>CVD ≥ 2 (347, 76.9M)</td>
<td>71.3</td>
<td>76.8b</td>
<td>142.4/70.0b</td>
<td>82.5b</td>
<td>51.8b/39.0b</td>
</tr>
</tbody>
</table>

Abbreviations: BP, blood pressure; CAD, coronary artery disease; CHF, congestive heart failure; CKD, chronic kidney disease; CVD, cardiovascular disease; DYS, dyslipidemia; HTN, hypertension; M, million; MetS, the metabolic syndrome; n, sample size (unweighted); N, sample-projected population size (all percentages are based on weighted population N sizes); NHANES, National Health and Nutrition Examination Survey; SBP, systolic blood pressure.²

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(23.3%) (based on a BP target of <130/80 mm Hg). It has been previously noted\(^\text{10,19}\) that HTN is present in more than 80% of persons with CKD, and in 1 recent Italian multicenter study,\(^\text{30}\) only 12% of participants reached the target goal of BP lower than 130/80 mm Hg. The inability to recognize advanced renal disease by means of the serum creatinine level alone and the failure to determine the creatinine clearance from one of several equations that are available may partially explain why the treatment and control rates were so low in persons with stage 3 CKD. This was supported by our findings that 89.6% of our subjects with CKD had creatinine clearances in the stage 3 CKD range (30-59 mL/min/1.73 m\(^2\)) in conjunction with upper reference range or borderline elevations in serum creatinine; only 10% of subjects had more advanced renal failure (higher than stage 3).

Among persons with stroke, even though 89.0% were being treated for their HTN, only 34.9% of those receiving therapy had their BP controlled to lower than 140/90 mm Hg. The therapeutic consequences of these findings are that in stroke survivors there is at least a 1 in 6 chance of experiencing another stroke within 5 years.\(^\text{21}\) Furthermore, second strokes have a greater chance of leading to fatal outcomes or considerable disability, including dementia. However, the Perindopril Protection Against Recurrent Stroke Study\(^\text{22}\) showed that in persons who had sustained a stroke, recurrent strokes were reduced by 28% in association with a reduced BP of 9/4 mm Hg secondary to combination therapy that included an angiotensin-converting enzyme inhibitor and a diuretic compared with placebo treatment. Indeed, the lowest risk for recurrent stroke occurred in persons who achieved a follow-up BP of approximately 115/75 mm Hg,\(^\text{23}\) which supports the case for lower treatment goals, as have been recently recommended.\(^\text{10}\)

Participants with PAD in the present study had a high prevalence of HTN (73.7%), a mean systolic BP of 23.0 mm Hg above goal, and a control rate among those receiving treatment of only 47%. The Framingham Heart Study,\(^\text{24}\) showed a strong association between baseline BP and the 26-year incidence of intermittent claudication. Moreover, HTN in persons with severe PAD is frequently predictive of renal artery disease and renovascular HTN, which may be more resistant to control by antihypertensive therapy.\(^\text{25}\) Furthermore, persons with PAD have a high incidence of comorbidities that may include smoking, DM, CHD, and CKD;\(^\text{26-28}\); in severe cases, there is a 15-fold increase in CVD risk that requires multiple drug therapy for HTN, DYS, and hyperglycemia.

Our study has several strengths and limitations. Our large NHANES 2003-2004 cohort, which is largely representative of the US population, allows us to generalize our findings to the US population. The standardized procedures for measurement of BP and medical history information are also important strengths. The age-related increase in HTN in those with MetS, DM, and CVD events explains some, but not all, of our findings. There are numerous sociodemographic, cultural, and other factors beyond the scope of this study to consider that may have affected treatment and control rates. Treatment was based on self-reported anti-HTN therapy to retain consistency with other reports from NHANES\(^\text{1-29}\) and did not include any dietary regimens or supplements that subjects may have been prescribed to lower their BP. Although it is possible that some persons with comorbidities such as CAD or DM were prescribed other medications (eg, \(\beta\)-blockers or angiotensin-converting enzyme inhibitors or angiotensin receptor blockers) for their condition even if they did not have HTN, such persons were not identified as hypertensive because their BP did not fit the criterion for defining HTN and they did not report taking medication to lower BP. Most important, this was a cross-sectional study; therefore, the control of HTN may be confounded by other factors that determined the choice of antihypertensive agents over an extended duration of time.

Our study has documented, among a recently surveyed population of US adults, that HTN is present in

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### Table 3. Mean Values for BP in Those Receiving Treatment But Not at Goal With HTN

<table>
<thead>
<tr>
<th>Disease Group (n, N)</th>
<th>Systolic BP (mm Hg)(^{a,b})</th>
<th>Diastolic BP (mm Hg)(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No disease (33, 1.4M)</td>
<td>Mean value: 154</td>
<td>93</td>
</tr>
<tr>
<td>Distance from goal: 14.1</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>DYS (162, 5.4M)</td>
<td>Mean value: 154</td>
<td>90(^c)</td>
</tr>
<tr>
<td>Distance from goal: 19.0</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>MetS without DM (143, 5.4M)</td>
<td>Mean value: 154</td>
<td>94</td>
</tr>
<tr>
<td>Distance from goal: (16.1(^d)/23.5(^f))</td>
<td>(4.8(^d)/9.2(^f))</td>
<td></td>
</tr>
<tr>
<td>DM (186, 6.1M)</td>
<td>Mean value: 149(^c)</td>
<td>87(^e)</td>
</tr>
<tr>
<td>Distance from goal: (13.5(^d)/19.1(^e))</td>
<td>(5.6(^d)/7.0(^e))</td>
<td></td>
</tr>
<tr>
<td>CKD (188, 4.8M)</td>
<td>Mean value: 155</td>
<td>87(^e)</td>
</tr>
<tr>
<td>Distance from goal: (17.5(^d)/25.0(^e))</td>
<td>(6.7(^d)/6.8(^e))</td>
<td></td>
</tr>
<tr>
<td>Stroke (68, 1.9M)</td>
<td>Mean value: 155</td>
<td>87(^e)</td>
</tr>
<tr>
<td>Distance from goal: 22.2(^c)</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>CHF (97, 2.8M)</td>
<td>Mean value: 154</td>
<td>89(^e)</td>
</tr>
<tr>
<td>Distance from goal: 21.9(^f)</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>PAD (63, 1.4M)</td>
<td>Mean value: 157</td>
<td>89(^c)</td>
</tr>
<tr>
<td>Distance from goal: 23.0(^e)</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>CAD (102, 3.0M)</td>
<td>Mean value: 155</td>
<td>90</td>
</tr>
<tr>
<td>Distance from goal: 21.2(^c)</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>CVD (\geq 2) (197, 5.5M)</td>
<td>Mean value: 154</td>
<td>88(^e)</td>
</tr>
<tr>
<td>Distance from goal: 22.5(^g)</td>
<td>6.0</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: BP, blood pressure; CAD, coronary artery disease; CHF, congestive heart failure; CKD, chronic kidney disease; CVD, cardiovascular disease; DM (186, 6.1M); DYS, dyslipidemia; HTN, hypertension; M, million; MetS, metabolic syndrome; n, sample size (unweighted); N, sample-projected population size (all percentages are weighted from population N sizes); PAD, peripheral artery disease.

\(^{a}\) Disease groups are not mutually exclusive.

\(^{b}\) The virgule separates the percentage controlled for the primary goal and the percentage controlled for the secondary goal.

\(^{c}\) Based on BP lower than 140/90 mm Hg.

\(^{d}\) Based on BP lower than 130/80 mm Hg.

\(^{e}\) Based on BP lower than 130/85 mm Hg.

\(^{f}\) Based on BP lower than 130/80 mm Hg.

\(^{g}\) Based on BP lower than 130/85 mm Hg.
most of those with DM, CKD, stroke, CAD, CHF, and PAD. Despite high treatment rates compared with those with uncomplicated HTN, these rates are still suboptimal, and control rates, even among those receiving treatment, remain low. Moreover, ISH remains the principal problem, further compromising risk in these persons and suggesting an urgent need for intensified efforts at improved treatment and control.

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Correspondence: Nathan D. Wong, PhD, Heart Disease Prevention Program, Department of Medicine, University of California, C240 Medical Sciences, Irvine, CA 92697 (ndwong@uci.edu).

Author Contributions: Dr Wong had full access to the data in the study and takes responsibility for the integrity of the data and the accuracy of the results. Study concept and design: Wong, L'Italien, Chen, Kline, and Franklin. Acquisition of data: Lopez and Franklin. Analysis and interpretation of data: Wong, Lopez, L'Italien, Chen, and Franklin. Drafting of the manuscript: Wong, Lopez, and Franklin. Critical revision of the manuscript for important intellectual content: Wong, L'Italien, Chen, Kline, and Franklin. Statistical analysis: Wong, Lopez, and Franklin. Obtained funding: Wong, Chen, and Kline. Administrative, technical, and material support: L'Italien, Chen, and Kline. Study supervision: Wong.

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