

A comparison of the 2017 American College of Cardiology/American Heart Association blood pressure guideline and the 2017 American Diabetes Association diabetes and hypertension position statement for US adults with diabetes.

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## ABSTRACT

**Objective:** To determine the concordance in the prevalence of hypertension and pharmacological antihypertensive treatment recommendations for US adults with diabetes using definitions from the 2017 American College of Cardiology/American Heart Association (ACC/AHA) blood pressure (BP) guideline and the 2017 American Diabetes Association (ADA) diabetes and hypertension position statement.

**Research Design and Methods:** We analyzed data for US adults with diabetes in the US National Health and Nutrition Examination Survey, 2011-2016 (n=2,266). Diabetes was defined by treatment with glucose-lowering medication, glycosylated hemoglobin  $\geq 6.5\%$ , fasting serum glucose  $\geq 126$  mg/dL or non-fasting serum glucose  $\geq 200$  mg/dL. BP was measured three times and antihypertensive medication use was self-reported.

**Results:** The prevalence (95%CI) of hypertension among US adults with diabetes was 77.1% (73.9%, 80.0%) and 66.3% (63.4%, 69.1%) according to the ACC/AHA and ADA definitions, respectively. Also, 22.9% (20.0%, 26.1%) did not have hypertension according to either definition and the concordance in hypertension status was 89.2% (87.2%, 91.0%). Among US adults with diabetes not taking antihypertensive medication, 52.8% (47.7%, 57.8%) were not recommended antihypertensive medication initiation by either the ACC/AHA or the ADA documents and 22.4% (19.2%, 25.9%) were recommended initiation by both documents (overall concordance: 75.2%; 95%CI: 70.4%, 79.4%). Among those taking antihypertensive medication, 45.3% (41.3%, 49.4%) and 50.4% (46.5%, 54.2%) had BP above the goal in neither and both documents, respectively (overall concordance: 95.7%; 95%CI: 93.4%, 97.2%).

**Conclusions:** A high percentage of US adults with diabetes are provided identical antihypertensive treatment recommendations by the ACC/AHA BP guideline and the ADA diabetes and hypertension position statement.

Hypertension is one of the most common co-morbidities among adults with diabetes. Prior studies have estimated the prevalence of hypertension to be twice as high among adults with diabetes compared to age-matched controls without diabetes.(1; 2) Among adults with diabetes, the presence of hypertension has been associated with a two times higher risk for cardiovascular disease (CVD) events and mortality.(3; 4)

The 2017 American College of Cardiology (ACC)/American Heart Association (AHA) Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure (BP) in Adults provides a comprehensive set of recommendations for the diagnosis and treatment of hypertension among adults, including those with diabetes.(5) This guideline defines hypertension in adults, including those with diabetes, as an average systolic blood pressure (SBP)  $\geq 130$  mm Hg or diastolic blood pressure (DBP)  $\geq 80$  mm Hg (**Table 1**). According to this guideline, pharmacological antihypertensive treatment should be initiated in adults with diabetes if they have an average SBP  $\geq 130$  mm Hg or DBP  $\geq 80$  mm Hg, and the treatment goal is SBP  $<130$  mm Hg and DBP  $< 80$  mm Hg.(5)

The American Diabetes Association (ADA) published a position statement on diabetes and hypertension in 2017 that recommends different BP levels for defining hypertension (SBP  $\geq 140$  mm Hg or DBP  $\geq 90$  mm Hg) and initiating pharmacological antihypertensive treatment (SBP  $\geq 140$  mm Hg or DBP  $\geq 90$  mm Hg).(6) The ADA position statement recommends that BP goals should be individualized based on patient priorities and clinician judgement. Treatment goals for those taking antihypertensive medication are

SBP < 140 mm Hg and DBP < 90 mm Hg with SBP < 130 mm Hg and DBP < 80 mm Hg to be considered for those with high CVD risk as long as it can be achieved without undo treatment burden.

The purpose of the current study was to estimate the impact of differences in the definition of hypertension and recommendations for pharmacological antihypertensive treatment initiation and intensification of therapy in US adults with diabetes, according to the ACC/AHA guideline and ADA diabetes and hypertension position statement.(5; 6) To accomplish these goals, we analyzed data from the US National Health and Nutrition Examination Survey (NHANES).

## **RESEARCH DESIGN AND METHODS**

NHANES was designed and conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention.(7) Since 1999, it has been conducted in two-year cycles, which can be combined in statistical analyses to provide more stable prevalence estimates. For the current analysis, we pooled data from the 2011-2012, 2013-2014, and 2015-2016 NHANES cycles. For each NHANES cycle, participants were identified through stratified, multistage probability sampling of the non-institutionalized US population. Among the 16,381 adults aged 20 years or older who completed the study interview and examination, we included 2,651 participants with diabetes (defined below) in our analyses. We excluded 177 participants who did not have three SBP and DBP measurements obtained during their study examination, 3 participants missing information on self-reported antihypertensive medication use and

205 participants who were missing data needed to calculate 10-year predicted atherosclerotic CVD (ASCVD) risk using the Pooled Cohort risk equations.(4) After applying these exclusion criteria, we had a final sample size of 2,266 participants with diabetes. The protocols for each NHANES cycle were approved by the National Center for Health Statistics of the Centers for Disease Control and Prevention Institutional Review Board and all participants provided written informed consent. Our analysis of the publically available NHANES data was considered exempt research by the University of Alabama at Birmingham Institutional Review Board.

### **Data collection**

The NHANES data were collected using questionnaires and through a study examination conducted at a mobile clinic. Information on age, sex, race/ethnicity, education, cigarette smoking, use of antihypertensive and glucose lowering medication, and a history of myocardial infarction, coronary heart disease, stroke or heart failure was obtained through self-report. Height and weight were measured during the study visit and used to calculate body mass index (BMI). A blood specimen was collected and used to measure total and HDL cholesterol, serum creatinine, serum glucose and glycated hemoglobin. Estimated glomerular filtration rate (eGFR) was calculated using the Chronic Kidney Disease Epidemiology (CKD-EPI) equation.(8) Using albumin and creatinine measured from a spot urine sample collected during the study visit, we calculated the albumin-to-creatinine ratio (ACR). Chronic kidney disease was defined as an eGFR < 60 ml/min/1.73 m<sup>2</sup> or ACR > 30 mg/g.(9)

### **Blood pressure measurement**

BP was measured three times by a trained physician using a mercury sphygmomanometer, following a standardized protocol. The first measurement was obtained in the seated position after five minutes of quiet rest and the two remaining measurements after 30-second rest intervals between the readings. For each participant, the mean of the three BP measurements was used to estimate SBP and DBP. Quality control included quarterly retraining and certification.

### **Diabetes**

Participants who reported taking oral hypoglycemic agents or insulin were considered to be taking glucose lowering medication. Using blood specimens collected during the NHANES examination, serum glucose was measured by means of a Roche/Hitachi Modular P Chemistry Analyzer or a Roche/Hitachi Cobas C Chemistry Analyzer (Roche Diagnostics, Indianapolis, IN) and glycated hemoglobin was measured using a Tosoh G7 Automated HPLC Analyzer or a Tosoh Automated Analyzer HLC-723G8 (Tosoh Medics, Inc., San Francisco, CA). Diabetes was defined by a fasting serum glucose  $\geq$  126 mg/dL, non-fasting serum glucose  $\geq$  200 mg/dL, hemoglobin A1c  $\geq$  6.5% or the use of glucose lowering medication.(10)

### **Cardiovascular disease (CVD) risk**

History of CVD was defined by self-report of a prior diagnosis of myocardial infarction, coronary heart disease, stroke or heart failure. Among participants without a history of CVD, 10-year ASCVD risk was calculated using the Pooled Cohort risk equations.(4)

Among participants without a history of CVD who were less than 60 years old, 30-year predicted ASCVD risk was calculated using an equation developed in the Framingham Offspring Cohort.(11) In these equations, ASCVD risk includes the risk for nonfatal myocardial infarction or coronary heart disease death or fatal or nonfatal stroke.

### **Definitions of hypertension, recommendations for antihypertensive medication, and blood pressure treatment goals**

The ACC/AHA guideline and ADA position statement recommendations for the definition of hypertension, initiation of antihypertensive medication, and BP goals in adults with diabetes were as described in the introduction and are displayed in **Table 1**. Participants taking antihypertensive medication were considered to have hypertension according to both the ACC/AHA guideline and the ADA position statement. The ADA position statement states that a goal SBP and DBP ( $< 130$  mm Hg and DBP  $< 80$  mm Hg, respectively) may be appropriate for individuals at high CVD risk if they can be achieved without undue treatment burden. High CVD risk was defined as having a history of CVD or a 10-year predicted ASCVD risk  $\geq 10\%$  using the Pooled Cohort risk equations.(5)

### **Statistical methods**

Using NHANES data, extrapolated to the US population, we calculated summary statistics for US adults with diabetes taking and not taking antihypertensive medication, overall and for those with and without high CVD risk, separately. We estimated the percentage and number of US adults with diabetes who had hypertension according to



the ACC/AHA guideline and ADA position statement, separately. Among those not taking antihypertensive medication, we estimated the percentage and number of US adults with diabetes who would be recommended initiation of antihypertensive medication according to the ACC/AHA guideline and ADA position statement, separately. Among those taking antihypertensive medication, we estimated the percentage and number of US adults with diabetes who had BP above the treatment goal according to the ACC/AHA guideline and the ADA position statement. We calculated the percentage of US adults with diabetes who had concordant and discordant definitions of hypertension and recommendations for initiation of antihypertensive medication and with BP above the treatment goal by the ACC/AHA and ADA documents. As the ADA position statement does not explicitly define high CVD risk, we conducted a sensitivity analysis defining high CVD risk as a history of CVD or a 10-year ASCVD risk  $\geq 20\%$ . Using this definition, we calculated the proportion of US adults with diabetes taking antihypertensive medication that had BP above the treatment goal according to the ADA position statement (SBP  $\geq 140$  mm Hg or DBP  $\geq 90$  mm Hg; SBP  $\geq 130$  mm Hg or DBP  $\geq 80$  mm Hg for those with high CVD risk) and ACC/AHA guideline (SBP  $\geq 130$  mm Hg or DBP  $\geq 80$  mm Hg).

We calculated summary statistics for US adults with diabetes not taking antihypertensive medication who would not be recommended initiation of antihypertensive medication according to either the ACC/AHA guideline or the ADA position statement and recommended initiation of antihypertensive medication by the ACC/AHA guideline only and by both documents. Also, we calculated summary

statistics for US adults with diabetes taking antihypertensive medication without BP above the treatment goal according to either document and with BP above the treatment goal according to the ACC/AHA guideline only and both documents.

Prevalence estimates and differences in prevalence estimates across sub-groups were calculated as weighted proportions and 95% confidence intervals were computed with variance estimates determined using Taylor Series Linearization. NHANES sampling weights were used in all calculations to obtain US nationally representative prevalence estimates for the overall population and sub-groups (e.g., those with diabetes).(12)

Sampling weights were recalibrated based on the proportion of participants missing data by age, sex, and race-ethnicity within each NHANES cycle. The data analysis took into account the complex survey design of NHANES and was conducted using Stata V14 (Stata Corporation, College Station, TX).

## RESULTS

According to data from NHANES 2011-2016, 56.6% (95% CI 53.3%, 59.9%) of US adults with diabetes were taking antihypertensive medication. Of US adults with diabetes, 57.4% (95% CI 53.1%, 61.6%) of those not taking and 80.2% (95% CI 76.6%, 83.4%) of those taking antihypertensive medication had high CVD risk. Among US adults with diabetes, those with high CVD risk (history of CVD or 10-year ASCVD risk  $\geq$  10%) were on average 15 to 20 years older and the prevalence of smoking and CKD was 10% to 20% higher when compared to their counterparts without high CVD risk (**Supplemental Table 1**). Among US adults with diabetes without high CVD risk, the

mean 10-year and 30-year predicted CVD risks were 3.8% (95% CI 3.5%, 4.2%) and 25.0% (95% CI 23.4%, 26.6%), respectively, for those not taking antihypertensive medication and 5.8% (95% CI 5.3%, 6.4%) and 37.4% (95% CI 34.5%, 40.3%), respectively, for those taking antihypertensive medication.

The prevalence of hypertension was 77.1% (95% CI 73.9%, 80.0%) according to the ACC/AHA guideline and 66.3% (95% CI 63.4%, 69.1%) according to the ADA position statement (**Figure 1, left panel** and **Supplemental Table 2, top panel**). Overall, 10.8% (95% CI 9.0%, 12.8%) of US adults with diabetes had hypertension according to the ACC/AHA guideline but not the ADA position statement. Among US adults with diabetes not taking antihypertensive medication, 52.8% (95% CI 47.7%, 57.8%), 24.8% (95% CI 20.6%, 29.6%) and 22.4% (95% CI 19.2%, 25.9%) were recommended antihypertensive medication initiation by neither document, the 2017 ACC/AHA guideline only and both documents, respectively (**Figure 1, middle panel** and **Supplemental Table 2 middle panel**). Among US adults with diabetes taking antihypertensive medication, 45.3% (95% CI 41.3%, 49.4%), 4.3% (95% CI 2.8%, 6.6%) and 50.4% (95% CI 46.5%, 54.2%) had an average BP that met the goal in both documents, was above the ACC/AHA goal but not the ADA goal, and was above the goals in both documents, respectively (**Figure 1, right panel** and **Supplemental Table 2, bottom panel**). The overall agreement between the ACC/AHA guideline and the ADA position statement was 89.2% (95% CI 87.2%, 91.0%) for the presence of hypertension, 75.2% (95% CI 70.4%, 79.4%) for the recommendation to initiate antihypertensive medication and 95.7% (95% CI 93.4%, 97.2%) for having a BP above

the recommended treatment goal. The ACC/AHA guideline and ADA position statement provided concordant antihypertensive medication treatment recommendations for 86.7% (95% CI 84.4%, 88.8%) of US adults with diabetes (**Supplemental Figure 1**). When defining high CVD risk as a history of CVD or a 10-year ASCVD risk  $\geq 20\%$  for the ADA position statement, the overall agreement between the ACC/AHA guideline and ADA position statement for having BP above the recommended treatment goal was 90.8% (95% CI 88.1%, 93.0%; **Supplemental Table 3**).

Based on both the ACC/AHA guideline and ADA position statement, 17.8 (95% CI 16.2, 19.3) million US adults with diabetes had hypertension (**Figure 2, left bar**). An additional 2.9 (95% CI 2.3, 3.5) million US adults had hypertension based on the ACC/AHA guideline only. Among US adults with diabetes not taking antihypertensive medication, 2.6 (95% CI 2.1, 3.1) million were recommended initiation of antihypertensive medication by both the ACC/AHA guideline and the ADA position statement with an additional 2.9 (95% CI 2.3, 3.5) million recommended initiation of antihypertensive medication by the ACC/AHA guideline only (**Figure 2, middle bar**). Among US adults with diabetes taking antihypertensive medication, 7.6 (95% CI 6.8, 8.5) million had a BP above the goal in both documents, with an additional 700,000 (95% CI 400,000, 900,000) having a BP above the goal recommended in the ACC/AHA guideline only (**Figure 2, right bar**).

Among US adults not taking antihypertensive medication, the mean 10-year CVD risk was 10.7% (95% CI 9.4%, 12.0%) for those not recommended treatment initiation by

either the ACC/AHA guideline or the ADA position statement, 14.6% (95% CI 11.5%, 17.6%) for those recommended treatment initiation by the ACC/AHA guideline but not the ADA position statement and 23.2% (95% CI 19.5%, 27.0%) among those recommended treatment initiation by the ACC/AHA guideline and the ADA position statement (**Table 2**). The mean 30-year CVD risk exceeded 25% in each of these groups. Among US adults with diabetes taking antihypertensive medication, the mean 10-year CVD risk was 10.6% (95% CI 9.4%, 12.0%), 6.5% (95% CI 5.6%, 7.3%), and 33.8% (95% CI 32.1%, 35.5%) among those with above goal BP according to neither document, the ACC/AHA guideline only and both documents, respectively (**Supplemental Table 4**). The 30-year CVD risk exceeded 40% in each group.

## CONCLUSIONS

In this study of US adults with diabetes, we compared the prevalence of hypertension and recommendations for pharmacological antihypertensive treatment in the 2017 ACC/AHA BP guideline<sup>(5)</sup> with the 2017 ADA diabetes and hypertension position statement.<sup>(6)</sup> The results demonstrate a high level of agreement between these documents with a few small differences. Consistent with the use of lower SBP and DBP thresholds, the prevalence of hypertension was 10.8% higher, representing 2.9 million US adults with diabetes, according to the ACC/AHA guideline compared with the ADA position statement. Among US adults with diabetes not taking antihypertensive medication, 75.2% had an identical recommendation for initiation of antihypertensive drug therapy according to the ACC/AHA guideline and the ADA position statement. The majority of those recommended initiation of pharmacological antihypertensive therapy

according to the ACC/AHA guideline but not the ADA position statement had high CVD risk. Among US adults taking antihypertensive medication, there was almost complete agreement with respect to meeting goal BP levels in the ACC/AHA guideline and the ADA position statement.

Prior to the 2017 ACC/AHA guideline, hypertension in the US was defined by an average SBP  $\geq 140$  mm Hg or DBP  $\geq 90$  mm Hg for adults with and without diabetes.(13; 14) The lower BP thresholds used to define hypertension in the ACC/AHA guideline are supported by observational data on the association between higher SBP and DBP and increased risk for CVD and kidney disease, as well as randomized controlled trials of lifestyle modification and treatment with antihypertensive medication to lower BP and prevent CVD.(5) The ADA position statement retained SBP  $\geq 140$  mm Hg and DBP  $\geq 90$  mm Hg to define hypertension.(6) Two authors of the ADA position statement argued that the prevalence of hypertension is already high among adults with diabetes and would not increase substantially by applying lower BP thresholds.(15) The current study provides data to support this statement. The prevalence of hypertension was high when defined using BP thresholds in both the ACC/AHA guideline and the ADA position statement and only 10.8% of US adults with diabetes (2.9 million) would be classified differently when using the ACC/AHA guideline versus the ADA position statement definition of hypertension.

The recommendation in the ACC/AHA guideline to use CVD risk to guide the decision to initiate antihypertensive medication was based, in part, on data showing the absolute

benefit of antihypertensive medication on CVD risk reduction is larger among individuals with higher CVD risk.(16) As a matter of practical convenience for clinicians, all adults with diabetes and hypertension are grouped with other adults who have high CVD risk in the ACC/AHA guideline. Not all US adults with diabetes had a high 10-year predicted ASCVD risk in the current study. However, the Pooled Cohort risk equations do not include heart failure as an outcome likely leading to an underestimation of CVD risk.(4) The risk for heart failure is high among adults with diabetes and BP control reduces this risk. It may be useful if future risk prediction models used to guide antihypertensive medication initiation included heart failure as an outcome. Also, many younger adults with diabetes have a high CVD risk over a longer time horizon.(11) In the current study, characteristics were more similar for those recommended initiation of antihypertensive medication by the ACC/AHA guideline but not the ADA position statement compared to those not recommended antihypertensive medication initiation by either the ACC/AHA guideline or the ADA position statement than for those recommended initiation of antihypertensive medication by both the ACC/AHA guideline and ADA position statement. However, the mean 10-year and 30-year ASCVD risk were higher among those recommended initiation of antihypertensive medication by the ACC/AHA guideline but not the ADA position statement compared to those not recommended antihypertensive medication initiation by either the ACC/AHA guideline or the ADA position statement. Additionally, initiating antihypertensive medication at lower BP levels may have advantages. Prior studies have reported that maintaining lower BP levels across the life course may have CVD risk reduction benefits.(17)

The basis for the 2017 ACC/AHA guideline recommendation to achieve a target SBP < 130 mm Hg among adults with diabetes includes the results of several randomized clinical trials and meta-analyses of these trials. In the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial, randomization to a SBP goal of 120 mm Hg versus 140 mm Hg was not associated with a statistically significant risk reduction for the primary CVD outcome but it did lead to a reduced stroke event rate.(18) Several *post-hoc* analyses of ACCORD have supported an SBP goal lower than 140 mm Hg for adults with diabetes.(19-23) Another large randomized controlled trial conducted among adults with diabetes, the Action in Diabetes and Vascular Disease: preterAx and diamicroN-MR Controlled Evaluation(ADVANCE) trial, demonstrated lower CVD event rates with randomization to antihypertensive medication versus placebo among participants with SBP < 140 mm Hg at baseline.(24) Results from a post-hoc analysis of the Systolic Blood Pressure Intervention Trial (SPRINT) suggest that the CVD risk reduction benefits of an intensive versus standard SBP goal (<120 mm Hg versus < 140 mm Hg) does not differ by levels of fasting serum glucose.(25) In addition, a meta-analysis of randomized controlled trials with participants who had diabetes demonstrated statistically significant reductions in stroke, retinopathy and albuminuria with initiation of antihypertensive medication at SBP < 140 mm Hg and when an SBP < 130 mm Hg was achieved.(26)

The decision to initiate and intensify antihypertensive medication should take into consideration both the benefits of treatment and potential harm. Some patients experience side effects from antihypertensive medication. In SPRINT, they tended to be



transient and associated with complete recovery.(27) In ADVANCE, there was no evidence that rates of treatment discontinuation due to side effects were higher among participants with baseline SBP between 120 and 139 mm Hg than among their counterparts with baseline SBP between 140 and 159 mm Hg.(28) However, randomization to a goal SBP < 120 mm Hg in the ACCORD study was associated with a 3-year cumulative incidence of CKD of 10.0% versus 4.1% for their counterparts randomized to a goal SBP < 140 mm Hg.(29) Studies are needed to determine the long-term outcomes associated with developing CKD following intensive antihypertensive treatment and whether this outweighs the CVD risk reduction benefit. Kidney function should be monitored among adults receiving antihypertensive medication with increased vigilance when treating individuals to lower BP levels.

At the population level, the ACC/AHA guideline and ADA position statement have more similarities than differences. However, the differences in the recommendations to initiate antihypertensive treatment and BP goals differ for some patients with diabetes. The decision to initiate and intensify antihypertensive medication should always be individualized, based on discussions between patients and their clinicians. Both the ACC/AHA BP guideline and ADA position statement acknowledge the need to individualize treatment decisions to align with patients' interests.

The current study has several strengths. NHANES is designed to provide nationally representative estimates. Therefore, there is a high degree of generalizability of the current findings. Data collection in NHANES is rigorous and conducted following

standardized protocols. Despite these strengths, the results should be interpreted in the context of known and potential limitations. BP was measured at a single visit using a mercury sphygmomanometer. Both the ACC/AHA BP guideline and the ADA position statement recommend making the diagnosis of hypertension based on two or more BP measurements at two or more visits. As some NHANES participants may not have had high BP if measurements were obtained at a follow-up visit, the prevalence of hypertension, defined by both the ACC/AHA BP guideline and the ADA position statement, may be lower than reported. Therefore, some participants' hypertension status may have been misclassified. Additionally, mercury sphygmomanometers are rarely used in clinical practice in the US. A history of CVD was determined using self-report and is subject to recall errors. Finally, data were not available on whether SBP < 130 mm Hg and DBP < 80 mm Hg could be achieved without undue treatment burden. Therefore, we may have over-estimated the percentage of US adults with diabetes for whom this BP goal is recommended by the ADA position statement. This would result in lower agreement than we report for above goal BP.

In conclusion, the current study demonstrates a high degree of concordance between the 2017 ACC/AHA BP guideline and the 2017 ADA position statement on diabetes and hypertension. Using either document, the majority of US adults with diabetes have hypertension. A substantial proportion of US adults with diabetes not taking antihypertensive medication are recommended to initiate treatment by both documents with additional individuals being candidates for antihypertensive medication treatment by the ACC/AHA guideline only. US adults with diabetes recommended for initiation of

antihypertensive medication by the ACC/AHA guideline but not the ADA position statement have high CVD risk. Finally, almost all US adults with diabetes taking antihypertensive medication have identical recommendations to intensify or not intensify drug treatment to achieve a SBP < 130 mm Hg and DBP < 80 mm Hg according to both the ACC/AHA guideline and the ADA position statement. These data demonstrate the high prevalence of hypertension among US adults with diabetes and the need to increase the appropriate use of antihypertensive medication to reduce CVD in this high risk population.

## Contributions

Drs. Muntner, Whelton, and Carey conceived the hypotheses for the current manuscript. Dr. Muntner conducted the statistical analysis. Dr. Woodward provided guidance on the statistical analysis and all authors were involved in the interpretation of the results and provided guidance for the presentation of results. Drs. Muntner and Carey drafted the manuscript. Drs. Whelton and Woodward reviewed draft versions of the manuscript and provided substantive input to all sections of the manuscript.

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## Duality of Interest

Dr. Whelton was chair, Dr. Carey was vice-chair and Dr. Muntner was a member of the writing group for the 2017 American College of Cardiology/American Heart Association Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. Dr. Muntner was a member of the writing group for the 2017 American Diabetes Association Position Statement on Diabetes and Hypertension.

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**Table 1.** Blood pressure levels used to define hypertension, recommend initiation of antihypertensive medication, and treatment goal for adults with diabetes according to the 2017 ACC/AHA blood pressure guideline and the American Diabetes Association diabetes and hypertension position statement.

	2017 ACC/AHA	ADA
	Definition of hypertension <sup>†</sup>	
Systolic blood pressure, mm Hg	≥ 130	≥ 140
Diastolic blood pressure, mm Hg	≥ 80	≥ 90
	2017 ACC/AHA	ADA
	Recommendation for initiation of antihypertensive medication	
Systolic blood pressure, mm Hg	≥ 130	≥ 140
Diastolic blood pressure, mm Hg	≥ 80	≥ 90
	2017 ACC/AHA	ADA
	Goal blood pressure (among those taking antihypertensive medication)	
Systolic blood pressure, mm Hg	< 130	< 140 <sup>††</sup>
Diastolic blood pressure, mm Hg	< 80	< 90 <sup>††</sup>

ACC/AHA – American College of Cardiology/American Heart Association

ADA – American Diabetes Association

<sup>†</sup> Participants taking antihypertensive medication were considered to have hypertension regardless of their blood pressure level.

<sup>††</sup> The American Diabetes Association position statement recommends patients and clinicians use a shared decision making process to determine blood pressure goals. Therefore, blood pressure goals may differ from those listed in the table on a patient-by-patient basis. A goal blood pressure of systolic blood pressure < 130 mm Hg and diastolic blood pressure < 80 mm Hg may be appropriate for individuals at high risk of cardiovascular disease without undue treatment burden. For this analysis, high cardiovascular risk was defined by a 10-year predicted atherosclerotic cardiovascular disease risk ≥ 10% using the Pooled Cohort risk equations or history of cardiovascular disease.

**Table 2.** Characteristics of US adults with diabetes not taking antihypertensive medication by recommended for initiation of antihypertensive medication by the ACC/AHA blood pressure guideline and the ADA diabetes and hypertension position statement.

	Recommended antihypertensive medication initiation by:		
	Neither ACC/AHA BP guideline or ADA position statement <sup>†</sup> (n=510)	ACC/AHA BP guideline but not ADA position statement <sup>††</sup> (n=231)	ACC/AHA BP guideline and ADA position statement <sup>†††</sup> (n=213)
Age, years	53.6 (51.9, 55.3)	53.8 (50.9, 56.8)	59.2 (57.3, 61.1)
Male, %	53.2 (48.6, 57.8)	60.2 (53.1, 66.9)	61.1 (50.2, 71.0)
Race/ethnicity, %			
Non-Hispanic White	51.1 (43.1, 59.1)	58.7 (48.4, 68.3)	58.1 (47.6, 67.9)
Non-Hispanic Black	12.0 (8.6, 16.4)	12.8 (8.3, 19.3)	15.6 (10.5, 22.5)
Non-Hispanic Asian	8.6 (6.4, 11.4)	7.0 (4.6, 10.6)	8.9 (5.7, 13.7)
Hispanic	22.7 (17.4, 29.1)	21.0 (14.2, 29.9)	16.2 (11.0, 23.3)
< HS education, %	26.0 (21.3, 31.4)	21.8 (15.7, 29.4)	25.5 (19.0, 33.4)
Current smoking, %	20.8 (17.4, 24.7)	18.8 (13.0, 26.4)	18.3 (12.5, 26.0)
Body mass index, kg/m <sup>2</sup>	32.4 (31.5, 33.2)	32.4 (30.9, 33.9)	33.0 (31.1, 35.0)
SBP, mm Hg	115.8 (114.7, 116.9)	130.6 (129.4, 131.8)	151.4 (148.1, 154.7)
DBP, mm Hg	67.0 (66.0, 67.9)	75.8 (73.9, 77.6)	78.3 (75.8, 80.8)
Total cholesterol, mg/dL	186 (180, 192)	200.6 (193.0, 208.3)	194.1 (185.8, 202.3)
HDL cholesterol, mg/dL	45.6 (43.7, 47.5)	46.6 (44.2, 48.9)	45.2 (42.4, 47.9)
eGFR < 60 ml/min/1.73 m <sup>2</sup> , %	8.6 (6.6, 11.1)	8.0 (4.5, 13.7)	18.0 (11.0, 27.9)
ACR > 30 mg/g, %	11.8 (8.9, 15.4)	27.4 (19.3, 37.2)	40.5 (30.9, 50.9)
Chronic kidney disease, %	18.4 (14.7, 22.8)	32.6 (23.3, 43.6)	48.8 (41.1, 56.5)
Mean 10-year CVD risk <sup>‡</sup>	10.7 (9.4, 12.0)	14.6 (11.5, 17.6)	23.2 (19.5, 27.0)
10-year ASCVD risk ≥10%, %	44.1 (38.2, 50.2)	52.3 (42.2, 62.2)	76.4 (67.3, 83.6)
History of CVD, %	15.2 (11.1, 20.5)	13.1 (8.4, 19.9)	13.1 (8.2, 20.2)
High CVD risk*, %	49.1 (43.0, 55.2)	56.9 (47.0, 66.2)	77.7 (69.1, 84.4)
Mean 30-year ASCVD risk <sup>††</sup>	28.4 (25.5, 31.3)	36.6 (32.2, 41.0)	50.0 (44.5, 55.4)

ADA – American Diabetes Association, ACC/AHA – American College of Cardiology/American Heart Association, HS – High School, eGFR – Estimated glomerular filtration rate, ACR – Albumin-to-creatinine ratio, CVD – Cardiovascular disease, ASCVD – Atherosclerotic cardiovascular disease.

\* High cardiovascular disease risk was defined as a history of cardiovascular disease or a 10-year predicted atherosclerotic cardiovascular disease risk ≥ 10%.

† The group not recommended antihypertensive medication initiation according to either the ACC/AHA guideline or the ADA position statement had systolic blood pressure < 130 mm Hg and diastolic blood pressure < 80 mm Hg.

†† The group recommended antihypertensive medication initiation according to the ACC/AHA guideline but not the ADA position statement had systolic blood pressure of 130 to 139 mm Hg with diastolic blood pressure < 90 mm Hg or diastolic blood pressure of 80 to 89 mm Hg with systolic blood pressure < 140 mm Hg.

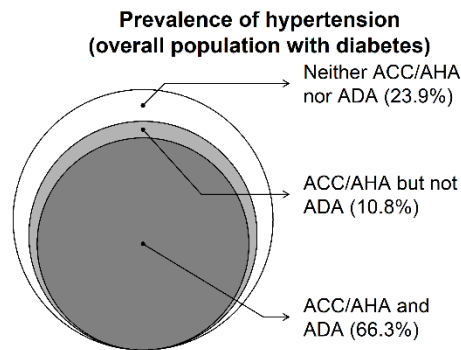
††† The group recommended antihypertensive medication initiation according to both the ACC/AHA guideline and the ADA position statement had systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg.

‡ Mean 10-year atherosclerotic cardiovascular disease risk was calculated among participants without a history of cardiovascular disease.

\* High CVD risk was defined as a history of cardiovascular disease or a 10-year predicted atherosclerotic cardiovascular disease risk ≥ 10%.

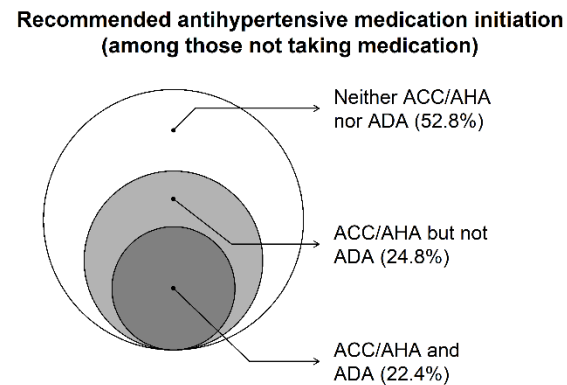
‡‡ Mean 30-year atherosclerotic cardiovascular disease risk was calculated among participants 20 to 59 years of age without a history of cardiovascular disease.

**Figure 1.** Percentage of US adults with diabetes: who have hypertension (left panel); who are recommended antihypertensive medication initiation (middle panel); and with above goal blood pressure among those taking antihypertensive medication (right panel).



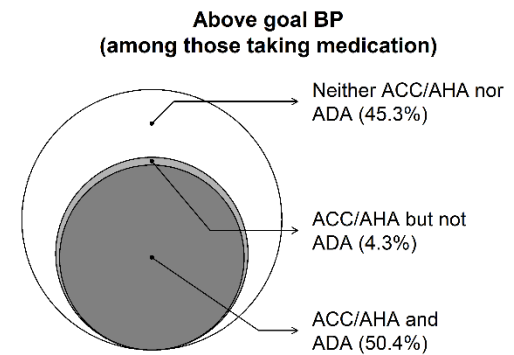
**Summary statistics:**

Neither ACC/AHA nor ADA:	23.9%
ADA, overall:	66.3%
ACC/AHA, overall:	77.1%
	(66.3%+10.8%=77.1%)
Agreement between ACC/AHA and ADA:	89.2%
	(23.9%+66.3%=89.2%)



**Summary statistics:**

Neither ACC/AHA nor ADA:	52.8%
ADA, overall:	22.4%
ACC/AHA, overall:	47.2%
	(22.4%+24.8%=47.2%)
Agreement between ACC/AHA and ADA:	75.2%
	(52.8%+22.4%=75.2%)

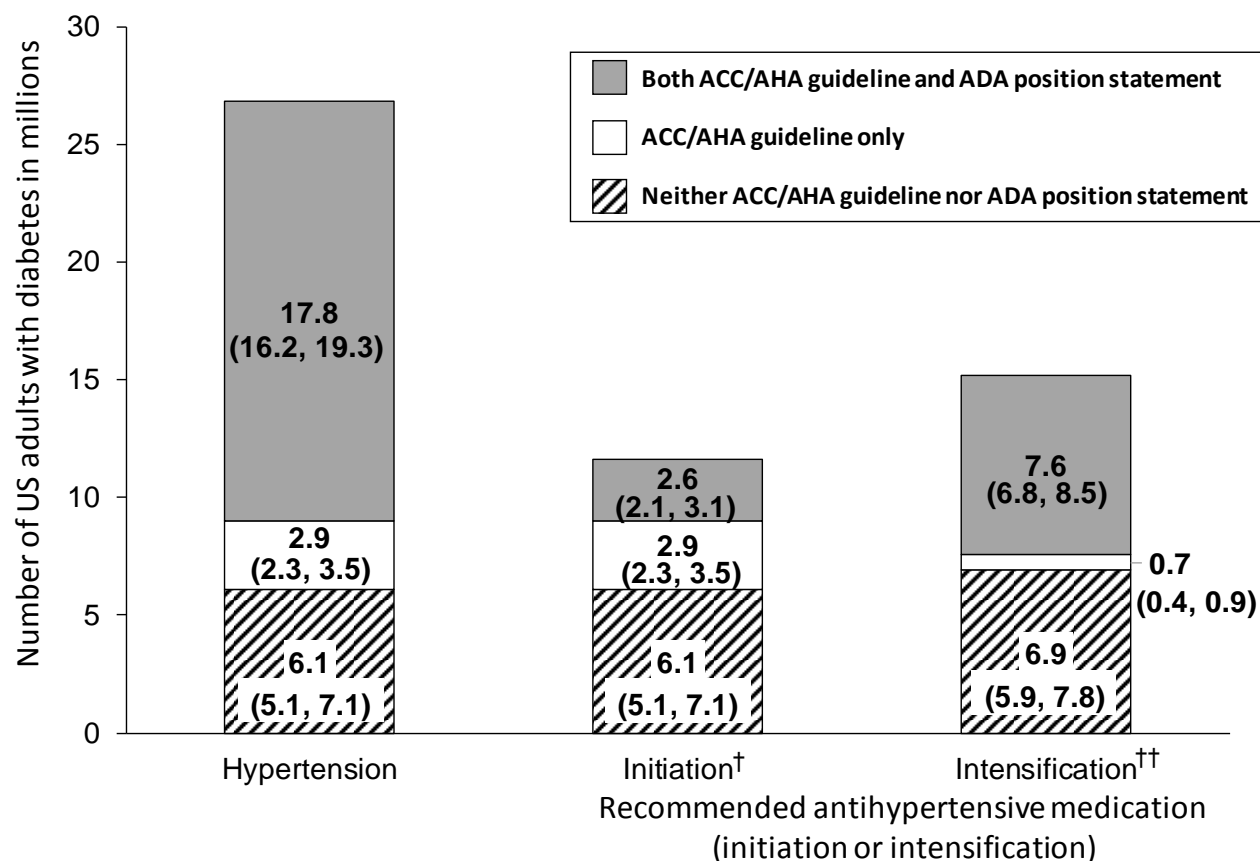


**Summary statistics:**

Neither ACC/AHA nor ADA:	45.3%
ADA, overall:	50.4%
ACC/AHA, overall:	54.7%
	(50.4%+4.3%=54.7%)
Agreement between ACC/AHA and ADA:	95.7%
	(45.3%+50.4%=95.7%)

Estimates from the US National Health and Nutrition Examination Survey data using definitions from the 2017 American College of Cardiology/American Heart Association blood pressure guideline and the American Diabetes Association diabetes and hypertension position statement. Supplemental Table 1 has the 95% confidence intervals for the percentages presented in this figure.

**Figure 2.** Number of US adults with diabetes: who have hypertension (left bar); who are recommended antihypertensive medication initiation among those not taking antihypertensive medication (middle bar); and with above goal blood pressure among those taking antihypertensive medication (right bar) according to the 2017 ACC/AHA blood pressure guideline and the American Diabetes Association diabetes and hypertension position statement.



Numbers in Figure are point estimates in millions with 95% confidence intervals in parentheses.

ACC/AHA – American College of Cardiology/American Heart Association; ADA – American Diabetes Association.

<sup>†</sup> Recommended antihypertensive medication initiation among those not taking antihypertensive medication.

<sup>††</sup> Recommended antihypertensive medication intensification due to above goal blood pressure (see Table 1 for the definitions of above goal blood pressure) among those taking antihypertensive medication.

## ONLINE SUPPLEMENT

A comparison of the 2017 American College of Cardiology/American Heart Association blood pressure guideline and the 2017 American Diabetes Association diabetes and hypertension position statement for US adults with diabetes.

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**Supplemental Table 1.** Characteristics of US adults with diabetes not taking and taking antihypertensive medication, overall and by cardiovascular disease risk.

	Not taking antihypertensive medication			Taking antihypertensive medication		
	Overall (n=954)	High CVD risk*		Overall (n=1,312)	High CVD risk*	
		No (n=398)	Yes (n=556)		No (n=195)	Yes (n=1,117)
Age, years	54.9 (53.8, 56.0)	44.1 (43.0, 45.3)	62.9 (61.6, 64.2)	62.8 (62.1, 63.5)	50.7 (49.3, 52.1)	65.8 (65.1, 66.4)
Male, %	56.7 (52.7, 60.7)	40.5 (33.6, 47.7)	68.8 (62.7, 74.3)	50.3 (46.5, 54.2)	34.6 (24.4, 46.5)	54.2 (50.3, 58.1)
Race/ethnicity, %						
Non-Hispanic White	54.6 (47.1, 61.8)	43.9 (35.4, 52.7)	62.5 (54.1, 70.2)	60.5 (54.7, 66.0)	64.3 (54.4, 73.2)	59.5 (53.3, 65.4)
Non-Hispanic Black	13.0 (9.7, 17.2)	15.4 (11.1, 20.9)	11.2 (8.0, 15.6)	18.8 (14.9, 23.5)	10.9 (7.3, 15.9)	20.8 (16.2, 26.2)
Non-Hispanic Asian	8.3 (6.4, 10.6)	9.4 (7.1, 12.4)	7.4 (5.3, 10.2)	5.4 (3.9, 7.2)	4.9 (3.2, 7.6)	5.5 (3.9, 7.6)
Hispanic	20.8 (15.8, 26.9)	27.5 (20.5, 35.9)	15.9 (11.3, 21.8)	12.7 (9.2, 17.4)	18.5 (12.3, 26.8)	11.3 (7.9, 15.8)
< HS education, %	24.9 (20.5, 29.8)	24.1 (18.7, 30.5)	25.4 (20.2, 31.4)	21.6 (18.5, 25.0)	16.5 (11.4, 23.1)	22.8 (19.4, 26.7)
Current smoking, %	19.8 (17.1, 22.7)	13.0 (9.4, 17.6)	24.8 (20.5, 29.6)	14.3 (11.6, 17.3)	2.3 (0.6, 8.2)	17.2 (14.1, 20.8)
Body mass index, kg/m <sup>2</sup>	32.5 (31.7, 33.4)	33.8 (32.6, 34.9)	31.6 (30.4, 32.8)	33.9 (33.3, 34.5)	36.5 (34.9, 38.1)	33.2 (32.6, 33.8)
Total cholesterol, mg/dL	191 (187, 196)	192 (186, 198)	191 (185, 197)	178 (174, 182)	181 (172, 189)	178 (173, 182)
HDL cholesterol, mg/dL	45.6 (44.3, 47.2)	47.4 (45.9, 48.9)	44.6 (42.6, 46.5)	47.3 (45.9, 48.7)	48.3 (45.5, 51.1)	47.0 (45.8, 48.3)
eGFR < 60 ml/min/1.73 m <sup>2</sup> , %	10.5 (8.2, 13.5)	3.4 (1.3, 8.3)	15.8 (12.4, 20.0)	25.9 (23.0, 29.0)	7.6 (3.7, 15.3)	30.4 (27.0, 33.9)
ACR > 30 mg/g, %	22.1 (18.3, 26.4)	18.5 (13.9, 24.1)	24.7 (19.8, 30.5)	28.0 (24.9, 31.4)	17.7 (11.6, 26.0)	30.6 (26.8, 34.7)
Chronic kidney disease, %	28.7 (24.9, 32.9)	20.7 (15.5, 27.1)	34.7 (29.9, 39.8)	41.8 (37.9, 45.7)	20.0 (13.5, 28.6)	47.1 (42.5, 51.8)
SBP, mm Hg	127 (126, 129)	122 (120, 124)	132 (129, 134)	132 (131, 133)	122 (120, 124)	135 (133, 136)
DBP, mm Hg	72 (71, 73)	73 (72, 74)	70 (69, 72)	69 (68, 70)	73 (71, 74)	68 (67, 69)

SBP/DBP category, mm Hg						
<130/80	52.8 (47.7, 57.8)	63.1 (56.0, 69.7)	45.1 (38.7, 51.7)	45.3 (41.3, 49.4)	66.9 (57.5, 75.0)	40.0 (35.7, 44.4)
130-139 or 80 to 89 <sup>†</sup>	24.8 (20.6, 29.6)	25.2 (19.4, 32.0)	24.6 (19.3, 30.8)	24.8 (20.6, 29.6)	21.9 (14.3, 32.0)	25.5 (22.3, 29.0)
≥ 140/90	22.4 (19.2, 25.9)	11.7 (7.9, 17.0)	30.3 (25.2, 35.9)	29.9 (26.2, 34.0)	11.3 (6.9, 17.9)	34.5 (30.4, 38.9)
Mean 10-year CVD risk <sup>††</sup>	16.1 (14.9, 17.4)	3.8 (3.5, 4.2)	25.0 (23.0, 27.0)	26.5 (25.1, 27.9)	5.8 (5.3, 6.4)	30.8 (29.1, 32.6)
10-year ASCVD risk ≥10%, %	53.4 (49.1, 57.6)	0	100	77.1 (73.3, 80.5)	0	100
History of CVD, %	14.2 (11.6, 17.3)	0	24.7 (20.5, 29.6)	28.2 (25.2, 31.5)	0	35.2 (31.8, 38.8)
High risk*, %	57.4 (53.1, 61.6)	0	100	80.2 (76.6, 83.4)	0	100
Mean 30-year ASCVD risk <sup>†††</sup>	34.3 (31.8, 36.8)	25.0 (23.4, 26.6)	57.8 (54.6, 61.0)	46.3 (43.7, 48.9)	37.4 (34.5, 40.3)	57.2 (53.6, 60.8)

Numbers in table are mean (95% confidence interval) or percentage (95% confidence interval).

ADA – American Diabetes Association, ACC/AHA – American College of Cardiology/American Heart Association, HS – High School, eGFR – Estimated glomerular filtration rate, ACR – Albumin-to-creatinine ratio, CVD – Cardiovascular disease, ASCVD – Atherosclerotic cardiovascular disease.

\* High CVD risk was defined as a history of cardiovascular disease or a 10-year predicted atherosclerotic cardiovascular disease risk ≥ 10%.

<sup>†</sup> This category included participants with systolic blood pressure between 130 and 139 mm Hg or diastolic blood pressure between 80 and 89 mm Hg with systolic blood pressure < 140 mm Hg and diastolic blood pressure < 90 mm Hg.

<sup>††</sup> Mean 10-year atherosclerotic cardiovascular disease risk was calculated among participants without a history of cardiovascular disease.

<sup>†††</sup> Mean 30-year atherosclerotic cardiovascular disease risk was calculated among participants 20 to 59 years of age without a history of cardiovascular disease.

**Supplemental Table 2.** Percentage of US adults with diabetes: who have hypertension (top panel); who are recommended antihypertensive medication initiation among those not taking antihypertensive medication (middle panel); and with above goal blood pressure among those taking antihypertensive medication (bottom panel).

Hypertension according to the:				
		ACC/AHA guideline		
		No	Yes	Total
ADA position statement	No	22.9% (20.0%, 26.1%)	10.8% (9.0%, 12.8%)	33.7% (30.9%, 36.6%)
	Yes	0%	66.3% (63.4%, 69.1%)	66.3% (63.4%, 69.1%)
	Total	22.9% (20.0%, 26.1%)	77.1% (73.9%, 80.0%)	100%
Overall concordance: 89.2% (87.2%, 91.0%)				
Overall discordance: 10.8% (9.0%, 12.8%)				

Antihypertensive medication initiation recommended by the:				
		ACC/AHA guideline		
		No	Yes	Total
ADA position statement	No	52.8% (47.7%, 57.8%)	24.8% (20.6%, 29.6%)	77.6% (74.1%, 80.8%)
	Yes	0%	22.4% (19.2%, 25.9%)	22.4% (19.2%, 25.9%)
	Total	52.8% (47.7%, 57.8%)	47.2% (42.2%, 52.3%)	100%
Overall concordance: 75.2% (70.4%, 79.4%)				
Overall discordance: 24.8% (20.6%, 29.6%)				

Above goal blood pressure according to the:				
		ACC/AHA guideline		
		No	Yes	Total
ADA position statement	No	45.3% (41.3%, 49.4%)	4.3% (2.8%, 6.6%)	49.6% (45.8%, 53.5%)
	Yes	0%	50.4% (46.5%, 54.2%)	50.4% (46.5%, 54.2%)
	Total	45.3% (41.3%, 49.4%)	54.7% (50.6%, 58.7%)	100%
Overall concordance: 95.7% (93.4%, 97.2%)				
Overall discordance: 4.3% (2.8%, 6.6%)				

Estimates from NHANES data using definitions from the 2017 American College of Cardiology/American Heart Association blood pressure guideline and the American Diabetes Association diabetes and hypertension position statement.

ACC/AHA – American College of Cardiology/American Heart Association; ADA – American Diabetes Association.

Supplemental Table 3. Percentage of US adults with diabetes with above goal blood pressure among those taking antihypertensive medication in a sensitivity analysis defining high cardiovascular disease risk in the ADA position statement as a history of cardiovascular disease or 10-year predicted cardiovascular disease risk  $\geq 20\%$ .

Above goal blood pressure according to the:				
		ACC/AHA guideline		
		No	Yes	Total
ADA position statement	No	45.3% (41.3%, 49.4%)	9.2% (7.0%, 11.9%)	54.5% (50.4%, 58.5%)
	Yes	0%	45.5% (41.5%, 79.6%)	45.5% (41.5%, 79.6%)
	Total	45.3% (41.3%, 49.4%)	54.7% (50.6%, 58.7%)	100%
Overall concordance: 90.8% (88.1%, 93.0%)				
Overall discordance: 9.2% (7.0%, 11.9%)				

Estimates from NHANES data using definitions from the 2017 American College of Cardiology/American Heart Association blood pressure guideline and the American Diabetes Association diabetes and hypertension position statement.

In this sensitivity analysis, goal blood pressure was defined as:

- 2017 American College of Cardiology/American Heart Association blood pressure guideline: systolic blood pressure < 130 mm Hg and diastolic blood pressure < 80 mm Hg for all individuals.
- American Diabetes Association diabetes and hypertension position statement: systolic blood pressure < 130 mm Hg and diastolic blood pressure < 80 mm Hg for those with history of cardiovascular disease or 10-year predicted cardiovascular disease risk  $\geq 20\%$  and systolic blood pressure < 140 mm Hg and diastolic blood pressure < 90 mm Hg for individuals without a history of cardiovascular disease and with a 10-year predicted cardiovascular disease risk < 20%.

ACC/AHA – American College of Cardiology/American Heart Association; ADA – American Diabetes Association

**Supplemental Table 4.** Characteristics of US adults with diabetes taking antihypertensive medication with above goal blood pressure according to the ACC/AHA blood pressure guideline and the ADA diabetes and hypertension position statement

	Above goal blood pressure according to:		
	Neither ACC/AHA BP guideline or ADA position statement (n=523)	ACC/AHA BP guideline but not ADA position statement (n=47)	ACC/AHA BP guideline and ADA position statement (n=742)
Age, years	60.5 (59.4, 61.7)	51.2 (48.4, 53.9)	65.8 (64.9, 66.7)
Male, %	49.7 (44.5, 54.8)	36.5 (18.7, 58.8)	52.2 (46.8, 57.5)
Race/ethnicity, %			
Non-Hispanic White	64.1 (56.2, 71.2)	70.2 (53.7, 82.7)	56.4 (48.7, 63.8)
Non-Hispanic Black	13.9 (10.3, 18.5)	12.4 (5.9, 24.0)	23.8 (18.3, 30.3)
Non-Hispanic Asian	5.0 (3.3, 7.4)	2.0 (0.5, 8.1)	6.0 (4.0, 8.9)
Hispanic	13.3 (9.3, 18.6)	15.4 (8.1, 27.5)	11.9 (8.2, 16.9)
< HS education, %	17.1 (13.6, 21.3)	26.3 (14.1, 43.7)	25.2 (21.4, 29.4)
Current smoking, %	16.9 (12.3, 23.0)	1.7 (0.2, 12.0)	12.9 (10.1, 16.4)
Body mass index, kg/m <sup>2</sup>	34.5 (33.3, 35.7)	37.3 (34.5, 40.1)	33.1 (32.4, 33.7)
SBP, mm Hg	117.3 (116.1, 118.5)	129.4 (127.0, 131.8)	145.7 (144.2, 147.2)
DBP, mm Hg	65.3 (64.5, 66.1)	79.0 (77.4, 80.6)	71.1 (69.7, 72.4)
Total cholesterol, mg/dL	172.0 (165.7, 178.3)	191.4 (171.8, 211.0)	182.4 (178.4, 186.4)
HDL cholesterol, mg/dL	45.9 (43.3, 48.5)	49.6 (45.1, 54.1)	48.3 (46.9, 49.6)
eGFR < 60 ml/min/1.73 m <sup>2</sup> , %	22.4 (17.8, 27.7)	4.0 (0.8, 17.6)	30.9 (27.1, 35.0)
ACR > 30 mg/g, %	17.8 (14.0, 22.3)	20.8 (8.7, 42.0)	37.9 (33.2, 42.8)
Chronic kidney disease, %	32.5 (26.5, 39.1)	21.8 (9.3, 43.1)	51.8 (47.1, 56.5)
Mean 10-year ASCVD risk <sup>†</sup>	10.6 (9.4, 12.0)	6.5 (5.6, 7.3)	33.8 (32.1, 35.5)
10-year ASCVD risk ≥10%, %	65.5 (58.7, 71.6)	0.0	94.2 (91.3, 96.2)
History of CVD, %	29.5 (25.5, 33.8)	0.0	29.5 (24.3, 35.3)
High CVD risk*, %	70.8 (64.0, 76.7)	0.0	95.6 (93.0, 97.2)
Mean 30-year ASCVD risk <sup>††</sup>	41.4 (38.3, 44.6)	41.9 (37.2, 46.6)	56.7 (53.6, 59.8)

ADA – American Diabetes Association, ACC/AHA – American College of Cardiology/American Heart Association, HS – High School, eGFR – Estimated glomerular filtration rate, ACR – Albumin-to-creatinine ratio, CVD – Cardiovascular disease, ASCVD – Atherosclerotic cardiovascular disease.

<sup>†</sup> The group without above goal blood pressure according to either the ACC/AHA guideline or ADA position statement had systolic blood pressure < 130 mm Hg and diastolic blood pressure < 80 mm Hg.

<sup>††</sup> The group with above goal blood pressure according to the ACC/AHA guideline but not the ADA position statement had systolic blood pressure of 130 to 139 mm Hg with diastolic blood pressure < 90 mm Hg or diastolic blood pressure of 80 to 89 mm Hg with systolic blood pressure < 140 mm Hg and did not have high cardiovascular disease risk.

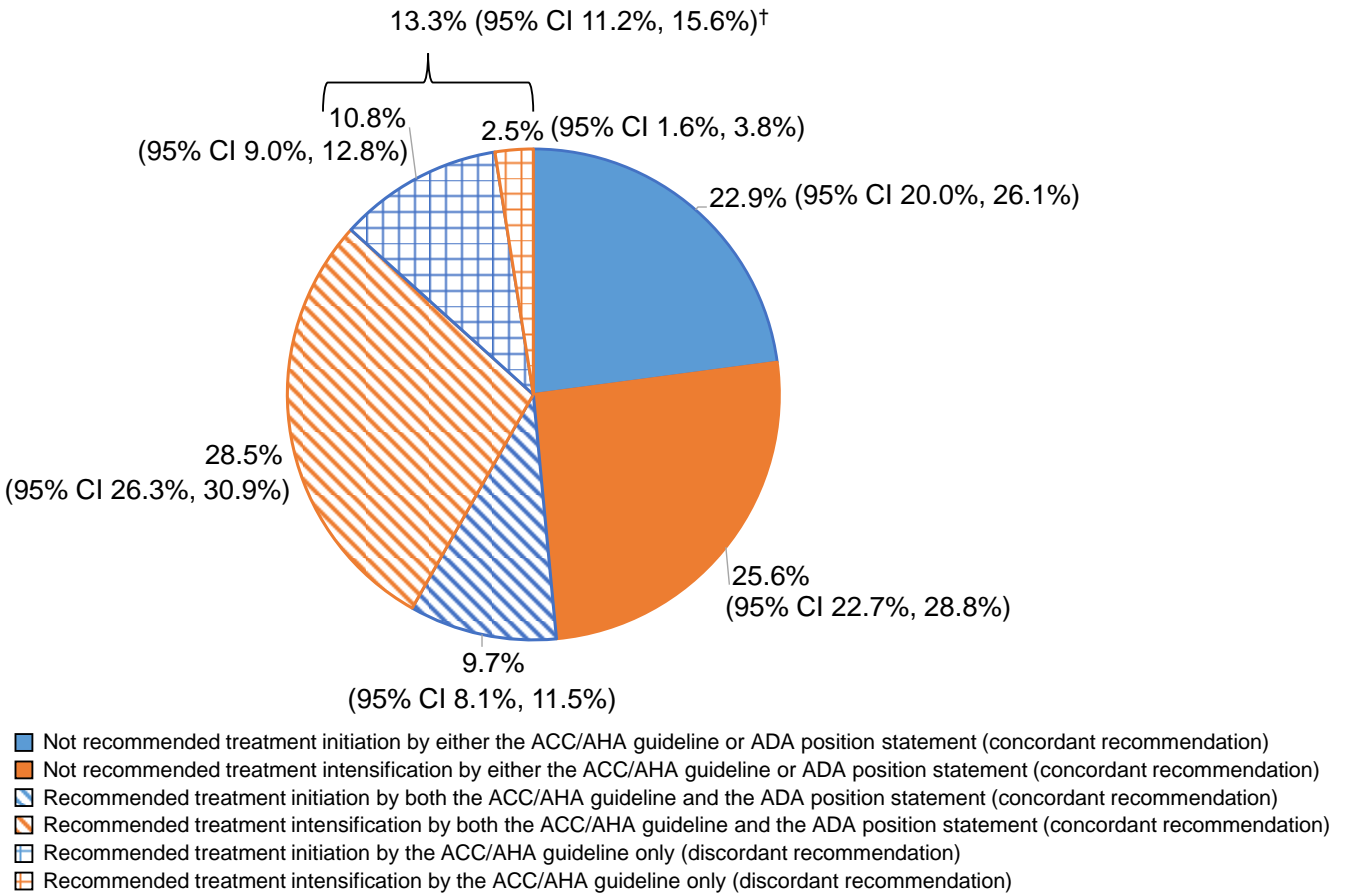
<sup>†††</sup> The group with above goal blood pressure according to the ACC/AHA guideline and the ADA position statement had systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg or had high cardiovascular disease risk and systolic blood pressure ≥ 130 mm Hg or diastolic blood pressure ≥ 80 mm Hg.

<sup>‡</sup> Mean 10-year atherosclerotic cardiovascular disease risk was calculated among participants without a history of cardiovascular disease.

\* High CVD risk was defined as a history of cardiovascular disease or a 10-year predicted atherosclerotic cardiovascular disease risk ≥ 10%.

<sup>‡‡</sup> Mean 30-year atherosclerotic cardiovascular disease risk was calculated among participants 20 to 59 years of age without a history of cardiovascular disease.

Supplemental Figure 1. Antihypertensive medication initiation and intensification recommendations according to the 2017 American College of Cardiology/American Heart Association blood pressure guideline and the American Diabetes Association diabetes and hypertension position statement.



ACC/AHA – American College of Cardiology/American Heart Association, ADA – American Diabetes Association

Blue segments represent US adults with diabetes not taking antihypertensive medication

Orange segments represent US adults with diabetes taking antihypertensive medication

<sup>†</sup> Overall, 86.7% (22.9%+25.6%+9.7%+28.5%) of US adults have identical recommendations for antihypertensive medication initiation or intensification according to both the 2017 ACC/AHA guideline and the ADA position statement. Also, 13.3% of US adults with diabetes do not have the same recommendation to initiate (10.8%) or intensify (2.5%) antihypertensive medication.