HHS Public Access

Author manuscript

*Hypertension*. Author manuscript; available in PMC 2023 October 16.

Published in final edited form as:

*Hypertension*. 2023 October ; 80(10): e143–e157. doi:10.1161/HYP.0000000000000232.

# Implementation Strategies to Improve Blood Pressure Control in the United States: A Scientific Statement From the American Heart Association and American Medical Association

**Marwah Abdalla, MD, MPH [Vice Chair]**,

**Shari D. Bolen, MD, MPH**,

**Jeffrey Brettler, MD**,

**Brent M. Egan, MD**,

**Keith C. Ferdinand, MD**,

**Cassandra D. Ford, PhD**,

**Daniel T. Lackland, DrPH**,

**Hilary K. Wall, MPH**,

**Daichi Shimbo, MD [Chair]**

**on behalf of the American Heart Association and American Medical Association**

## Abstract

Hypertension is one of the most important risk factors that contribute to incident cardiovascular events. A multitude of US and international hypertension guidelines, scientific statements, and policy statements have recommended evidence-based approaches for hypertension management and improved blood pressure (BP) control. These recommendations are based largely on high-quality observational and randomized controlled trial data. However, recent published data demonstrate troubling temporal trends with declining BP control in the United States after decades of steady improvements. Therefore, there is a widening disconnect between what hypertension experts recommend and actual BP control in practice. This scientific statement provides information on the implementation strategies to optimize hypertension management and to improve BP control among adults in the United States. Key approaches include antiracism efforts, accurate BP measurement and increased use of self-measured BP monitoring, team-based care, implementation of policies and programs to facilitate lifestyle change, standardized treatment protocols using team-based care, improvement of medication acceptance and adherence, continuous quality improvement, financial strategies, and large-scale dissemination



The findings and conclusions in this report are those of the authors and do not necessarily reflect the official position of the Centers for Disease Control and Prevention.

Supplemental Material is available at https://www.ahajournals.org/doi/suppl/10.1161/HYP.0000000000000232.

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

and implementation. Closing the gap between scientific evidence, expert recommendations, and achieving BP control, particularly among disproportionately affected populations, is urgently needed to improve cardiovascular health.

**Keywords**

AHA Scientific Statements; blood pressure; hypertension

Hypertension is one of the most important risk factors that contribute to incident cardiovascular events, including coronary heart disease, stroke, and heart failure, as well as kidney disease.[1,2] Hypertension is also associated with more disability-adjusted life-years lost in the United States than other modifiable cardiovascular disease risk factors.[1,3]

## TRENDS IN PREVALENCE, AWARENESS, TREATMENT, AND CONTROL OF HYPERTENSION

In the NHANES (National Health and Nutrition Examination Survey), among US adults with hypertension, blood pressure (BP) control, defined as systolic BP <140 mm Hg and diastolic BP <90 mm Hg, increased from 31.8% in 1999 to 2000 to 53.0% in 2009 to 2010 and 53.8% in 2013 to 2014.[4] BP control then fell to 48.4% in 2015 to 2016 and 43.7% in 2017 to 2018.[4] Among adults with hypertension, hypertension awareness increased from 69.9% in 1999 to 2000 to 84.7% in 2013 to 2014 and then declined to 77.0% in 2017 to 2018. Among adults who reported being aware that they had hypertension, antihypertensive medication use increased from 85.0% in 1999 to 2000 to 92.7% in 2009 to 2010 and declined to 88.2% in 2017 to 2018. A more recent study using data from NHANES 2009 to 2012, 2013 to 2016, and 2017 to 2020 has confirmed that BP control has declined.[5]

In NHANES 2015 to 2018, access to care, including lack of health care insurance, not having a regular source of health care, and not having a health care visit in the past year, was associated with having uncontrolled BP.[4] There are racial disparities in BP control.[4] Compared with non-Hispanic White adults, BP control in 2015 to 2018 was less likely among non-Hispanic Black adults (age- and sex-adjusted prevalence ratio, 0.85 [95% CI, 0.77–0.94]), non-Hispanic Asian adults (prevalence ratio, 0.86 [95% CI, 0.75–0.99]), and Hispanic adults (prevalence ratio, 0.83 [95% CI, 0.72–0.96]). After further adjustment for education, household income, type of health insurance, and access to care, the racial and ethnic disparity in BP control was attenuated and remained statistically significant for non-Hispanic Black adults (prevalence ratio, 0.88 [95% CI, 0.81–0.96]). In another study by Egan et al[6] using data from NHANES 2015 to 2018, non-Hispanic Black and Hispanic adults were less likely to have controlled BP than non-Hispanic White adults in unadjusted analyses (odds ratio, 0.79 [95% CI, 0.66–0.95] for non-Hispanic Black adults and 0.74 [95% CI, 0.57–0.95] for Hispanic adults). Non-Hispanic Asian adults were not examined in this study. After adjustment for access to care, education, and obesity, the disparity in BP control between non-Hispanic Black and non-Hispanic White adults and between Hispanic and non-Hispanic White adults was attenuated (adjusted odds ratio, 0.84 [95% CI, 0.70–1.00] and 0.98 [95% CI, 0.74–1.30], respectively).[6] These findings suggest that racial

and ethnic disparities in BP control may be partially explained by socioeconomic status or cardiovascular risk factors such as obesity.

Although multiple epidemiological studies have demonstrated that non-Hispanic Black adults have been the population at highest risk for hypertension-related morbidity and mortality compared with non-Hispanic White adults, other racial and ethnic groups also are at high risk. Recent data have also shown that Hispanic populations and Indigenous populations in the United States have a high prevalence of uncontrolled BP.[7,8] However, data examining intersectionality theory (ie, the intersection of race and ethnicity, sex, and other factors) with hypertension or BP control are scarce.[9]

## BP CONTROL DURING THE CORONAVIRUS DISEASE 2019 PANDEMIC

During the coronavirus disease 2019 (COVID-19) pandemic, the use of telehealth, defined as telecommunication technology to connect patients and clinicians who are physically apart, expanded as in-person office visits decreased.[10] In a study of 461 362 Medicare beneficiaries in 441 primary care clinics, patients with hypertension who had a telehealth visit were less likely to have a BP measurement recorded in their electronic health record than those with an in-person visit (32% versus 96%, respectively).[11] In an employer-sponsored wellness program of 464 585 participants, both systolic and diastolic BPs increased during the COVID-19 pandemic.[12] Emerging evidence suggests that the COVID-19 pandemic may have disrupted routine health care and may have exacerbated decreases in hypertension awareness and control.[13,14] Data from 3 large US health systems (N=137 593) demonstrated that during the first 8 months of the COVID-19 pandemic (April–November), systolic and diastolic BPs increased by 1.79 mm Hg (95% CI, 1.57–2.01) and 1.30 mm Hg (95% CI, 1.18–1.42), respectively, compared with a prepandemic period (April 2018–January 2020).[15] Optimal telehealth use for hypertension management includes regular and ongoing monitoring with validated self-measured BP (SMBP) monitoring devices, electronic transmission of the BP readings from the devices to the clinicians for evaluation, and consultation by either phone or video with a team to implement strategies for BP control if readings are high.[16]

## PURPOSE OF THIS SCIENTIFIC STATEMENT

The declining BP control[4,6] indicates widening gaps between what experts recommend in guidelines and scientific statements and successful hypertension management. In addition, most guidelines and scientific statements have not focused on implementation strategies for BP control. The writing group for this scientific statement was tasked with providing information on implementation strategies to optimize the treatment of hypertension and to improve BP control among US adults, including disproportionately affected populations. This scientific statement focuses on strategies at multiple levels of the socioecological framework.[17] The online Data Supplement includes the search strategy used to inform this scientific statement.

## BP MEASUREMENT AND EVIDENCE-BASED BP CONTROL INTERVENTIONS

The most recent US guideline includes updates on the definition of hypertension, target BP levels, BP measurement, and interventions to control BP.[18] The accurate measurement of BP is the basis for proper hypertension diagnosis and management.[18,19] The determination of BP control is based on the average of multiple office BP measurements with or without out-of-office BP measurements, including ambulatory BP monitoring or SMBP monitoring.[18] Lifestyle modification strategies, including weight loss, healthy diet, reduced intake of dietary sodium, enhanced intake of dietary potassium, increased physical activity, and moderation in alcohol consumption, are recommended as first-line therapy.[18] First-line antihypertensive medication should include thiazide-type diuretics, calcium channel blockers, angiotensin-converting enzyme inhibitors, and angiotensin receptor blockers.[18,19] Guidelines have also stated that 2 first-line agents of different classes are recommended in adults with stage 2 hypertension and an average systolic/diastolic BP >20/10 mm Hg above their BP target.[18] Furthermore, treatment with a single-dose combination pill may improve antihypertensive medication adherence and BP control.[18,19]

## BARRIERS TO SUCCESSFUL IMPLEMENTATION OF BP CONTROL INTERVENTIONS

Identifying and addressing barriers to successful implementation of interventions is a critical component of BP control.[20] Social determinants of health (SDOH) are the conditions in which people live and work that affect health risks and outcomes. Adverse SDOH include socioeconomic factors (eg, disinvestment in education, low health literacy, inadequate employment opportunities, constrained social support, concentrated poverty) and the built environment (eg, inadequate-quality affordable housing, fragmented and undermaintained transportation systems, neighborhood deprivation). They can affect health directly through stress and other mechanisms and indirectly by influencing the ability to adapt behaviors and preventing access to quality health care.[21] Race is a social construct, and racial disparities in BP control are not due to inherent biological causes or genetic traits[22,23] but can be explained by SDOH and the experience of racism, which is a major cause of adverse SDOH.[24] A meta-analysis of 44 studies[25] demonstrated that perceived racial discrimination, including institutional racism, was associated with hypertension status and higher BP.

Herein, the socioecological framework[17] was used as a guide to identify potential barriers to the successful implementation of BP control interventions (Table 1). The socioecological framework includes barriers at several levels—individual, organization, community, and policy—that may be singular or exist across multiple levels. Many of the SDOH operate at multiple levels of the socioecological framework and impede successful BP control.[3,26,27] Although the underlying causes of the recent decline in BP control have not yet been fully elucidated, this scientific statement focuses on the major barriers to BP control.

### Individual-Level Barriers

In a study of patients within a primary care clinic, BP control and hypertension management were associated with patient beliefs.[28] Suboptimal adherence to antihypertensive medication is a well-recognized barrier to achieving BP control.[29] Additional examples of barriers include declination of lifestyle modifications, neuropsychological disorders affecting cognition, substance abuse, low digital literacy, lack of transportation or lack of time off to attend clinical visits (ie, due to lack of childcare, adult care, elder care, or time off from work), and lack of access to high-speed internet and SMBP monitoring devices.[30,31] There are several important barriers to improved BP control at the clinician level, including confusion and perception that hypertension guidelines are too complex or lack of belief in or agreement with guideline recommendations; therapeutic inertia, including concerns about side effects and the presence of comorbidities; competing priorities and lack of time; and implicit bias among the health care workforce.[32–36] Clinicians may also not believe that BP measured in the office setting reflects their patients' real BP in normal daily life, which may lead to clinical inertia if out-of-office BP measurements are not performed.[37]

### Organization-Level Barriers

A barrier at the organization level is a lack of standardized and accurate BP measurements. BP measurement is often performed inaccurately in clinical practice, which may lead to underestimation or overestimation of BP.[38] The underestimation or overestimation of BP can have a substantial impact on the number of people misclassified as having their BP controlled and whether antihypertensive medications should be appropriately intensified.[39] A lack of workflow support for SMBP monitoring impedes the uptake of this evidence-based practice; examples of necessary support include personnel to receive, interpret, and provide feedback to the patient and integration of SMBP monitoring devices with or without telemonitoring into the electronic health record.[35,36,40,41]

### Community-Level Barriers

Limited access to healthy food, safe places to exercise because of issues such as traffic or crime, and access to health care services are examples of community-level barriers experienced at the community, state, or regional level that can affect people's abilities to control their BP.[3] In addition, people from underrepresented racial and ethnic groups and historically excluded populations are further negatively affected by long-standing inequities, including income inequality, racial segregation, and interpersonal and structural racism. In a study of Black participants with hypertension and their family members, community-level barriers included few places to exercise within neighborhoods, lack of resources to check BP between office visits, and insufficient access to fresh affordable produce.[42,43] Neighborhood infrastructure issues, including lack of recreational activities and quality housing options, are barriers to BP control.[44,45] Additional barriers include lack of communal social support[46] and neighborhood racial residential segregation.[47] Many of these community-level barriers are rooted in economic/social inequities. Addressing economic disparities may contribute greatly to a reduction in health inequities.

### Policy-Level Barriers

Lack of sufficient insurance coverage is considered a major barrier to implementation of BP control interventions. Uncontrolled BP is more likely among adults without compared with those with health insurance.[4] Additional barriers include insufficient coverage for medication formulations and modes of prescription delivery that improve medication adherence, inadequate coverage of SMBP monitoring devices, limited reimbursement for services provided by health care extenders, including pharmacists and community health workers, and other inadequate reimbursement models for hypertension care at the primary care level.[29,41,46,48–50] There has also been a lack of regulation of sodium content in restaurant and processed food.[51]

## STRATEGIES TO IMPROVE BP CONTROL

Key approaches that cut across different socioecological framework levels include antiracism efforts,[24] accurate BP measurement and increased use of SMBP monitoring,[18,39] team-based care,[52] lifestyle modification strategies,[53–55] standardized treatment protocols using team-based care,[56,57] improved medication acceptance and adherence,[29] continuous quality improvement (QI),[58] financial strategies that sustain the implementation of effective treatment strategies,[48] and large-scale dissemination and implementation[59] (Table 2 and Figure).

Table 3 indicates the socioecological framework level that each approach targets. The implementation of multiple approaches simultaneously while also leveraging evidence-based implementation science strategies[65] will likely lead to improved BP control. For example, Fontil et al[66] demonstrated in an implementation study that adapting Kaiser Permanente Northern California's evidence-based hypertension protocols consisting of a standardized BP measurement protocol, team-based care, standardized treatment protocols, and performance reports led to improved BP control in a racially and ethnically diverse network of safety-net clinics in San Francisco.

## ANTIRACISM EFFORTS

Racism can occur and operate on multiple levels, including but not limited to individual, interpersonal, internalized, institutional, and structural racism.[67] A meta-analysis of 44 studies demonstrated that perceived racial discrimination, including institutional racism, was associated with hypertension status and higher BP for individuals identifying as Black.[25] Data from the Jackson Heart Study demonstrated that among 1845 Black adults, high compared with low levels of lifetime discrimination were associated with a higher incidence of hypertension (hazard ratio, 1.34 [95% CI, 1.07–1.68]).[68] Studies examining the impact of structural racism on hypertension and antiracism implementation studies focused on improving BP control represent a critical gap in the literature. As described in the 2020 American Heart Association (AHA) presidential advisory,[24] efforts to address racism at multiple levels, including at the structural level, are needed, and several approaches are proposed (Table 2) because racism is a driver of hypertension disparities. For example, the presidential advisory states that systems at all levels of intervention should be restructured to improve conditions that affect health in workplaces, neighborhoods, and schools among

historically underrepresented and excluded groups. The advisory also states that this and other antiracism strategies should be addressed for the evidence-based interventions discussed later to be optimally implemented in the populations who can benefit most. As evidence-based interventions are being implemented, populations and communities who are disproportionately affected by hypertension due to adverse SDOH should be prioritized. The advisory also advocates for cultural tailoring to improve uptake.

## ACCURATE BP MEASUREMENT AND INCREASED SMBP MONITORING

Recent hypertension guidelines and statements[18,39,41] provide descriptions of standardized BP measurement protocols using validated BP devices. The US Blood Pressure Validated Device Listing[69] and STRIDEBP[70] websites list validated BP devices for use in office and out-of-office settings. Oscillometric BP devices that obtain BP readings automatically at preset intervals are preferred over manual devices.[39] Guidelines[18,71] endorse out-of-office BP monitoring for confirming the diagnosis of hypertension and determining BP control. SMBP monitoring improves BP control, particularly when provided with cointerventions, which include education, behavioral change management, communication of treatment recommendations to patients, telemonitoring and telecounseling, nurse or pharmacist management of antihypertensive medication, or prescription monitoring.[41] Data from randomized controlled trials have demonstrated that using SMBP monitoring, with or without telemonitoring, to titrate antihypertensive medication leads to lower BP than titration guided by office BP and is likely to be cost-effective.[72,73] Publicly available online resources exist to instruct patients and clinicians in accurate BP measurement and the successful conduct of SMBP monitoring.[74–76]

Accurate office BP measurement and SMBP monitoring strategies have been successfully implemented in primary care practices and community settings. For example, the American Medical Association (AMA) MAP Framework is a practical model that summarizes best practices in 3 intuitive domains: measure accurately, act rapidly, and partner with patients. A set of checklists that include accurate office BP measurement, evidence-based treatment protocols, and engaging patients in self-management and SMBP monitoring help clinical teams overcome challenges to effectively controlling BP in patients with hypertension.[77] An intervention program based on the AMA MAP Framework (AMA MAP BP), which included 20 hours of practice facilitation and monthly dashboards for physicians and staff in 16 family medicine clinics and >16 000 patients, resulted in improved BP measurement accuracy and decreased therapeutic inertia, with improved BP control from 64% to 74%, which was sustained at 12 months.[77] Strategies for implementing accurate office BP measurement included training clinic staff using standardized protocols with proper patient preparation and position, using the correct cuff size, and using a validated and automated device to obtain multiple readings. Strategies for implementing SMBP monitoring included use of standardized monitoring protocols, patient education on hypertension management and how to perform SMBP monitoring, effective patient-centric communication, use of a systematic approach to ensuring that patients and clinicians act rapidly to elevated BP readings, and telephone-based guidance on BP readings.[77,78]

The transmission of SMBP readings to the care team and communication of the treatment plan back to the patient have been underused and are inadequate in most care settings.[79] The use of SMBP monitoring with telemonitoring increases the sharing of patient-collected data with the care team and facilitates treatment decisions that are communicated back to the patient. Studies show that expanding access to validated telemonitoring devices and high-speed internet and cloud services in rural and low-socioeconomic-status communities can help ensure that implementation of these technologies does not widen disparities in BP control.[80] Having structured fields in the electronic health record for documenting average systolic and diastolic SMBP readings may also facilitate more timely treatment decisions.

## TEAM-BASED CARE

Team-based health care is the provision of health services to individuals, families, or their communities by at least 2 health care professionals who work collaboratively with patients and their caregivers—to the extent preferred by each patient—to accomplish shared goals within and across settings to achieve coordinated, high-quality care.[52] A systematic review[81] of 100 randomized controlled trials focusing on multilevel, multicomponent implementation strategies for BP control among patients with hypertension (N=55 000) demonstrated that team-based care was most effective, with an average systolic BP decrease of 7.1 mm Hg. In addition to medication titration by a nurse or pharmacist, cointerventions such as health coaching, SMBP monitoring, and clinician training were often incorporated. Systematic reviews from the Community Preventive Services Task Force looked at 80 studies from 1980 to 2013[49] and 54 studies from 2012 to 2020.[82] In both systematic reviews, team-based care was effective, especially when using nurses and pharmacists, with an increase in BP control of 12% and 8.5%, respectively. The 2020 systematic review found that team-based care was cost-effective.[82] In another systematic review of 26 studies of multicomponent interventions in community health centers serving mainly underrepresented racial and ethnic groups, pharmacists and community health workers were effective in improving BP control.[83] Team-based care has also been shown to be effective in various community settings, including barbershops, faith-based organizations, pharmacies, and home out-reach visits.[49,84,85]

## LIFESTYLE MODIFICATION STRATEGIES

Large-scale implementation and uptake of lifestyle programs more broadly remain challenging because of coverage policies, capacity/training within health systems, patient engagement, and clinician apathy or skepticism that lifestyle modification will be successful.[86,87] Clinicians are often untrained in effective lifestyle counseling techniques.[88,89] Studies have shown that when clinician referral to lifestyle counselors is incorporated into clinician workflows, there is an improvement in BP control attributed to increased support and monitoring of lifestyle interventions.[90] Other strategies include improving the built environment (ie, access to healthy foods and green spaces) and reducing dietary sodium in processed and commercial foods. For example, findings from the UK Biobank study of 429 334 participants demonstrated that each interquartile increment in walkability was associated with lower systolic and diastolic BPs and lower risk for hypertension (risk ratio, 0.97 [95% CI, 0.96–0.98]).[91] A modeling study using NHANES data evaluated the impact of New York City's voluntary National Salt Reduction Initiative

dietary sodium standards for commercially processed and prepared foods on US sodium intake and projected a reduction in the proportion of US adults consuming excess dietary sodium (≥2300 mg sodium) from 88% to 71%.[92] Recently, the US Food and Drug Administration issued guidance on voluntary targets for the reduction of sodium in commercially processed, packaged, and prepared food with a goal of reducing average daily sodium to 3000 mg over a 2.5-year period.[51]

## ANTIHYPERTENSIVE MEDICATION TREATMENT PROTOCOLS

Standardized antihypertensive medication treatment protocols are a mainstay for treating hypertension and improving BP control[93] and may help to achieve equitable care.[94] Protocols support once-daily, low-cost, effective BP medications, medication intensification and adherence, and timely follow-up. They also facilitate team-based medication titration such as with nurses or clinical pharmacists. Treatment protocols have typically been implemented successfully as part of bundled interventions through the use of standard QI approaches, including practice facilitation and audit and feedback.[95] Treatment protocols have also been implemented through the use of team-based care models with staffled monthly visits to enhance treatment intensification using stepped treatment protocols to improve BP control.[77,95,96]

## IMPROVING ACCEPTANCE OF AND ADHERENCE TO ANTIHYPERTENSIVE MEDICATIONS

The 2021 AHA scientific statement “Medication Adherence and Blood Pressure Control”[29] summarizes the contribution of antihypertensive medication adherence on BP control and provides strategies to improve antihypertensive medication adherence. Many successful interventions are multicomponent and intensive; therefore, a sustained coordinated effort that targets multiple barriers to medication taking in an individual is likely to be the most effective approach.[29] Strategies that improve adherence to antihypertensive medication include the use of simplified medication regimens (ie, once-daily dosing and single-dose combination pills or polypills)[97,98] or blister/dose packs (ie, medications packaged together to take at specific times).[99] Additional strategies for improving medication adherence include refill reminders, electronic monitoring and feedback, medication refill synchronization, use of patient financial incentives, pharmacist-led interventions, use of SMBP monitoring, addressing health literacy, motivational interventions, and effective communication.[29,100] Facilitating access to multiple strategies can help clinicians, health systems, and insurers to maximize the effects of taking antihypertensive medication.

## CONTINUOUS QI

Walsh et al[58] categorized QI strategies into clinician focused (education, reminders, audit and feedback), patient focused (education, reminders, promotion of self-management), and system focused (team change, financial incentives). A systematic review of 44 clinical trials of QI strategies, consisting of 34 randomized controlled trials, 5 quasi-randomized controlled trials, and 5 controlled before-after studies, showed that the majority of QI strategies demonstrated improvements in BP.[101] Strategies that included team change,

patient education, facilitated relay of clinical data (ie, clinical information collected directly from patients and relayed to the clinician when the data were not routinely collected during a visit), or promotion of self-management had greater improvements in BP control. Another systematic review[102] by the National Heart, Lung, and Blood Institute looked specifically at clinician issues affecting implementation of clinical practice guidelines: reminders, educational out-reach visits (academic detailing), audit and feedback, and financial incentives. Audit and feedback were found to be effective in improving both processes of care and clinical outcomes, particularly in terms of clinician adherence to guidelines. A key feature of large, high-performing health systems is regular performance feedback to practices and clinicians. In the Veterans Administration,[103] where BP control rates improved from 45% to 76% between 2000 and 2010, automatic reminders in the electronic medical record alerted clinicians when BP was elevated. Regular feedback was given to clinicians based on regimen adjustment and performance relative to national standards. In Kaiser Permanente Southern California,[96] where BP control increased from 54% to 86% from 2004 to 2010, feedback was provided to overcome physician therapeutic inertia, with lower-performing physicians receiving additional education, mentoring, and coaching. As described, AMA MAP BP, an intervention program[77] based on the AMA MAP Framework, which included 20 hours of practice facilitation with monthly dashboards for physicians and staff, resulted in improved BP control.

## FINANCIAL STRATEGIES

Strong evidence supports that reducing or eliminating patient out-of-pocket costs of antihypertensive medications improves hypertension control.[48] Although almost all effective monotherapy and single-dose combination antihypertensive medications have low-cost options, cost can be a burden when a patient is on 7 to 10 medications because of having multiple chronic conditions or when the use of the newer single-dose combination antihypertensive medications is considered.[104,105] Beyond medications, SMBP monitoring devices may not be affordable for many patients. Data on the impact of eliminating cost sharing for patients with regard to SMBP monitoring devices are limited. Current coverage for devices is insufficient, and although a plan may partially cover automatic devices, inadequate coverage remains problematic for wider implementation of SMBP monitoring.[41] Some clinical settings have implemented device loaner programs, although they are not yet wide-spread.[106] Rethinking insurance coverage through a value-based insurance design model, which includes both antihypertensive medication and SMBP monitoring devices, can improve costs related to individuals not taking medications as prescribed.[107,108] Providing medications and devices is often cost neutral or cost saving for insurers because they are preventing the high cost of later complications and hospitalizations.[41,109] Because antihypertensive medication adherence can be improved by simplifying medication regimens and refill synchronization, ideal antihypertensive medication coverage would support these prescribing and dispensing methods.[110]

Financial incentives as part of QI efforts have been shown to improve BP control[97,99] and are currently used in many value-based payment models. Financial incentives for providing services for lifestyle counseling may be advantageous for implementing lifestyle changes for BP control more broadly in clinical practice and health systems. For SMBP monitoring,

lack of adequate reimbursement for clinician and staff time to train patients to use devices and interpret patient-generated BP readings may prevent clinicians from recommending SMBP monitoring.[50] On January 1, 2020, 2 Current Procedural Terminology codes, 99473 and 99474, were introduced for initial and ongoing clinical services for SMBP monitoring, although they are currently underused.[16,41]

## LARGE-SCALE IMPLEMENTATION AND DISSEMINATION

Large scale implementation and dissemination of evidence-based strategies to improve BP control have been successful in accelerating the translation of evidence into care.[59,65,66] Active implementation efforts have had greater impact than passive dissemination strategies, although these efforts are often used together to enhance impact.[59] Consultation and practice facilitation, which includes not only QI but also practice management, coaching, and organizational management delivered on site by a trained individual or team, have been a cornerstone of successful large-scale implementation efforts. A systematic review by Wang et al[111] demonstrated that practice facilitation led to improvements in BP and cardiovascular disease.

The Centers for Disease Control and Prevention, the Centers for Medicare & Medicaid Services, the Agency for Healthcare Research and Quality, the Health Resources and Services Administration, Million Hearts, the National Association of Community Health Centers, the AMA, the AHA, and others have focused on BP control efforts. Many of these efforts focus on selected areas of the socioecological framework, focus on selected regions or states, or are time limited because of grant or program funding and therefore have limited reach. Coordinated multilevel interventions across the United States could facilitate large-scale implementation and dissemination to improve BP control; sustainability efforts could ensure that the gains in BP control are maintained.

Increased education for interested parties, including patients, clinicians, practices, health systems, community organizations, the private sector (including insurance companies), and governmental agencies, may help with successful implementation of aforementioned strategies for improved BP control by interested parties. Some key areas of education are adverse implications to public health attributable to poor BP control, barriers to BP control, and the potential for implementation strategies to improve BP control.

## PRIORITIES

Strategies at the individual, organization, community, and policy levels could help to close the gap between scientific recommendations and BP control. This AHA/AMA scientific statement has identified the following top strategic priorities, organized by implementation approach:

- Antiracism efforts
  - Adverse SDOH can be mitigated through partnership with underrepresented racial and ethnic groups or historically excluded communities, and mitigation efforts can be paired with multilevel

strategies that support wider adoption of evidence-based interventions for BP control to increase access to high-quality health care services within communities.

- Accurate BP measurement and increased use of SMBP monitoring
  - Increase and synergize efforts to educate and train clinicians and patients in how to select validated BP measurement devices and to measure BP accurately inside and outside of the office setting
  - Increase the use of SMBP monitoring in clinical practice supported by patient engagement
  - Create a robust, integrated, and scalable health information technology infrastructure for efficiently relaying patient SMBP data to the care team and communicating the treatment plan back to the patients
- Team-based care
  - Wider implementation to disseminate and sustain team-based care in practice settings, including advanced practice health care professionals, nurses, pharmacists, care managers, and community health care workers
- Lifestyle modification strategies
  - Use of individual-level and system-level strategies to reduce sodium levels in food, to increase access to healthy food, and to ensure safe areas for physical exercise
- Standardized treatment protocols using team-based care
  - Increase use of standardized antihypertensive medication treatment protocols as part of team-based care
  - Increase use of once-daily, low-cost, effective BP medications and single-dose combination pill regimens
- Improving medication acceptance and adherence
  - Optimize antihypertensive medication adherence through multicomponent interventions that optimize prescribing and dispensing methods
  - Ask patients to communicate their preferences about antihypertensive medication
- Continuous QI
  - Wider implementation of continuous QI with clear, time-defined, standardized metrics coupled with reminders and regular feedback to clinicians and practices
- Financial strategies

  - Expansion of coverage that supports SMBP monitoring, including devices and telemonitoring services
  - Financial incentives to disseminate and sustain team-based care in practice settings
  - Financial incentives for providing services for lifestyle counseling
- Large-scale dissemination and implementation
  - Dissemination efforts at the individual, organization, and community levels can be coupled with strong and actionable antiracist policies.
  - Successful implementation strategies for BP control are multilevel, sustainable, adaptable, and culturally appropriate and provide equitable health care.
  - Broader use of practice facilitation to improve BP control
  - Support of large-scale implementation and dissemination efforts by national partners would help accelerate the translation of evidence-based best practices into care.

Critical implementation and dissemination gaps are summarized in Table 4.

## SUMMARY

Despite multiple advancements in hypertension management, BP control has recently fallen in the United States. Although BP can be controlled with lifestyle modification and antihypertensive medications, increasing gaps are noted between recommendations from guidelines and scientific statements and successful BP control. Barriers to BP control exist across multiple levels of the socioecological framework, including individual, organization, community, and policy levels. Key areas for implementation include antiracism efforts; accurate BP measurement; team-based care; lifestyle modification programs at the organization, community, and policy levels; standardized treatment protocols using team-based care; medication acceptance and adherence; continuous QI; and financial levers. These strategies could be coupled with successful large-scale implementation and dissemination strategies and shared accountability at multiple levels of the socioecological framework to achieve successful BP control in the United States.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Disclosures

Writing Group Disclosures

| Writing group member | Employment | Research grant | Other research support | Speakers' bureau/ honoraria | Expert witness | Ownership interest | Consultant/ advisory board | Other |
|---|---|---|---|---|---|---|---|---|
| Daichi Shimbo | Columbia University Irving Medical Center | None | None | None | None | None | None | None |
| Marwah Abdalla | Columbia University Irving Medical Center | None | None | None | None | None | None | None |
| Shari D. Bolen | MetroHealth Medical Center, Case Western Reserve University | CDC REACH grant (coinvestigator linking a project that screens and links patients to community resources for social determinants of health) *; Agency for Health Care Research and Quality (funded to establish a statewide cardiovascular health collaborative and implement a heart-healthy quality improvement project in 60 primary care practices across the state focused on hypertension and smoking cessation. They do not promote specific medications or devices as part of this project.) *; Ohio Department of Medicaid (project to continue to disseminate evidence-based best practices to primary care teams around cardiovascular topics. They | None | None | None | None | None | None |

| Writing group member | Employment | Research grant | Other research support | Speakers' bureau/ honoraria | Expert witness | Ownership interest | Consultant/ advisory board | Other |
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| | | do not recommend specific medications or devices.)* | | | | | | |
| Jeffrey Brettler | Regional Hypertension Program, Southern California Permanente Medical Group Department of Health Systems Science, Kaiser Permanente Bernard J. Tyson School of Medicine | None | None | None | None | None | PAHO (Pan American Health Organization)* | None |
| Brent M. Egan | American Medical Association | None | None | None | None | None | UpToDate (CME accredited)† | None |
| Keith C. Ferdinand | Tulane University, School of Medicine | None | None | None | None | None | Novartis*; Eli Lilly*; Amgen*; Quantum Genomics*; Sanofi*; Medtronic*; Novo Nordisk* | None |
| Cassandra D. Ford | The University of Alabama Capstone College of Nursing | None | None | None | None | None | None | None |
| Daniel T. Lackland | Medical University of South Carolina | NHLBI (steering committee and executive committee chair for CARDIA study)*; NHLBI (chair of OSMB for the RURAL study)* | None | None | None | None | None | None |
| Hilary K. Wall | Centers for Disease Control and Prevention | None | None | None | None | None | None | None |

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $5000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $5000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

Reviewer Disclosures

| Reviewer | Employment | Research grant | Other research support | Speakers' bureau/ honoraria | Expert witness | Ownership interest | Consultant/ advisory board | Other |
|---|---|---|---|---|---|---|---|---|
| James B. Byrd | University of Michigan | Apple (coinvestigator on a project funded by Apple) *; NIH/ NHLBI (NIH grant K23HL128909) †; FastGrants (COVID-19 clinical trial) † | None | None | None | None | PhaseBio * | None |
| Robert M. Carey | University of Virginia Health System | NIH (research grant on hypertension) † | None | None | None | None | None | None |
| Paul Muntner | University of Alabama at Birmingham | None | None | None | None | None | None | None |
| Gbenga Ogedegbe | New York University School of Medicine | None | None | None | None | None | None | None |
| Suzanne Oparil | University of Alabama at Birmingham | CinCor (UAB site PI, primary aldosterone study) *; HIGI (UAB site PI, BP Validation) *; UAB site PI, GMRx2 treatment of hypertension * | None | None | None | None | CinCor Pharma Inc *; Preventric Diagnostics, Inc * | None |

This table represents the relationships of reviewers that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all reviewers are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $5000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $5000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

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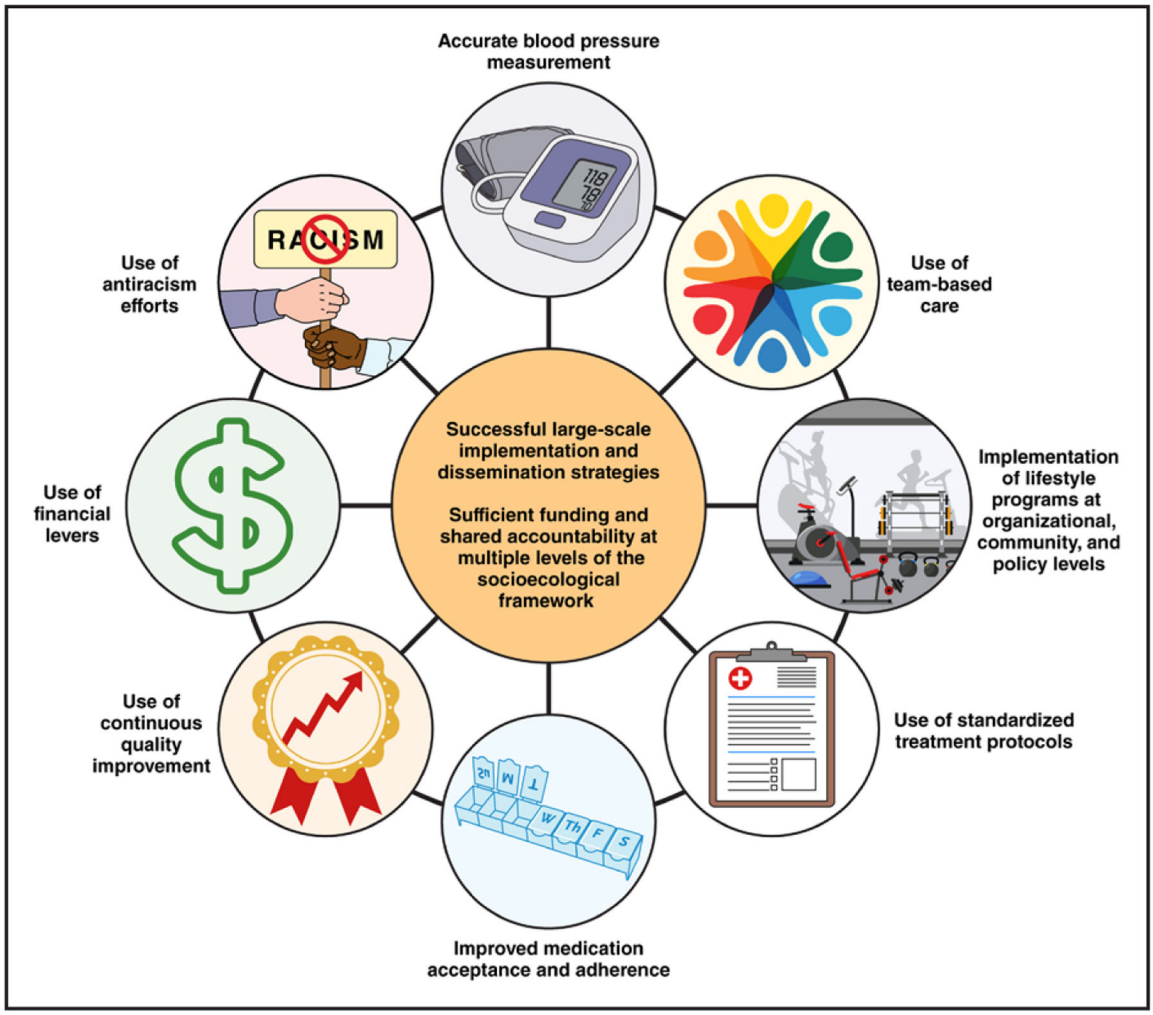


**Figure.**
Key strategies to improve blood pressure control.

**Table 1.**

Potential Barriers to the Successful Implementation of BP Control Based on the Socioecological Framework[17]

| Level | Barriers |
|---|---|
| Individual | Patient |
| | Behavioral |
| | Inability to modify lifestyle behaviors as recommended |
| | Not taking antihypertensive medications as prescribed |
| | Cognitive/affective |
| | Lack of knowledge about hypertension and BP control |
| | Lack of knowledge about SMBP monitoring |
| | Neuropsychological disorders affecting cognition |
| | Substance abuse |
| | Low health literacy |
| | Low digital literacy |
| | Sociodemographic |
| | Lower socioeconomic status (eg, disinvestment in education, concentrated poverty, inadequate employment opportunities) |
| | Lack of transportation or lack of time off to attend clinical visits (ie, attributable to lack of childcare, adult care, elder care, or time off from work) |
| | Limited access to high-speed internet, SMBP monitoring, technologies, including devices and telemonitoring |
| | Lower language proficiency |
| | Health care professional |
| | Treatment inertia |
| | Lack of confidence in measured BP readings |
| | Lack of knowledge about hypertension and BP control |
| | Uncertainty about treatment goals and guideline recommendations |
| | Lack of knowledge about office and out-of-office BP measurement |
| | Absence of feedback/QI |
| | Inadequate time |
| | Reduced communication skills/trust building |
| | Individual racism/discrimination |
| Organization | System |
| | Lack of standardization of BP measurement |
| | Lower-quality care |
| | Lack of protocol-driven care |
| | Lack of decision support |
| | Absence of feedback/QI |
| | Absence of team-based care/coordination of care |
| | Lack of educational resources (dietary, lifestyle, medication) |
| | Shortage of staff |
| | Limited hours of access |
| | Institutional racism |
| Community | Food insecurity and absence of healthy foods |

| Level | Barriers |
|---|---|
| | Housing instability |
| | Fragmented and undermaintained transportation systems |
| | Neighborhood deprivation |
| | Inability to exercise safely because of issues such as traffic or crime |
| | Racial segregation |
| | Reduced access to clinics and other health care services |
| | Reduced access to high-quality health care |
| | Interpersonal racism; structural racism |
| Policy | Limited health insurance coverage/health care reform |
| | Lack of regulation on salt content in restaurants, processed foods |
| | Unclear food labeling |
| | Limited primary care/FQHC funding/reimbursement |
| | Lack of value-based incentive programs |
| | Limited cost/coverage of antihypertensive medication and |
| | SMBP monitoring devices |
| | Absence of public education on the importance of BP control |
| | Structural racism |

BP indicates blood pressure; FQHC, Federally Qualified Health Center; QI, quality improvement; and SMBP, self-measured blood pressure.

**Table 2.**

AHA- and AMA-Advised Cross-Cutting Strategies to Accelerate Improvement in BP Control

| Strategy | Components |
|---|---|
| Antiracism efforts | Eliminating health disparities in hypertension as described in the 2020 AHA presidential advisory "Call to Action: Structural Racism as a Fundamental Driver of Health Disparities"[24]<br>Organization-level, community-level, and policy-level systems need to be restructured to improve conditions that affect health in workplaces, neighborhoods, and schools among historically underrepresented and excluded groups to advance health equity.<br>Policies to dismantle residential segregation and its negative economic, educational, employment, and environmental consequences that affect downstream health outcomes<br>Policies must eliminate inequities in access to and quality of health care. Universal health care should be made available. Furthermore, segregated care should be eliminated.<br>Awareness about racism should increase, and attitudes about it should be transformed. Awareness should foster changes in individual cultural attitudes, political support for change, and public empathy that change needs to occur. |
| Accurate BP measurement and increasing adoption of SMBP monitoring | Standardized BP measurement protocols<br>Automated oscillometric BP devices with multiple readings<br>Use of out-of-office BP monitoring, including SMBP monitoring<br>Use of validated BP devices |
| Team-based care | Deploy health care extenders (eg, nurses, pharmacists, or community health workers)<br>Community setting interventions (eg, barber/beauty shops, home visits, pharmacies, faith-based organizations) |
| Lifestyle modification strategies | Intensive counseling or behavioral strategies with designated lifestyle counseling services<br>Improved built environment for safe physical exercise<br>Applying standards for sodium reduction to processed and commercially prepared foods |
| Antihypertensive medication treatment protocols | Prioritize single-dose, low-cost, once-daily medications<br>Million Hearts treatment protocol[56]<br>AMA MAP BP hypertension treatment protocol[57] |
| Improving acceptance of and adherence to antihypertensive medications | Practical objective assessments of medication adherence<br>Multicomponent interventions targeting specific medication adherence barriers * |
| Continuous QI | Patient focused (education, reminders, self-management promotion)<br>Health care professional focused (education, reminders, audit and feedback)<br>System focused (team change, financial incentive, academic detailing, practice facilitation) |
| Financial | Value-based insurance design for antihypertensive medications and SMBP monitoring devices<br>Appropriate reimbursement for time and training of patients on SM B P monitoring<br>Coverage of validated SMBP monitoring devices |
| Large-scale implementation and dissemination | Stakeholders (ie, patients, health care professionals, practices, health systems, community organizations, the private sector, including insurance companies, and governmental bodies) must be informed and educated about multilevel barriers and implementation strategies.<br>Dissemination to stakeholders must include clear and effective communication, persistent pressure, and trust-building approaches, including combatting medical misinformation.<br>Clinicians, health systems, and health centers can access implementation tools and resources to help with BP control efforts:<br>• The Million Hearts Hypertension Control Change Package presents a listing of process improvements that outpatient clinical settings can implement as they seek optimal BP control.[60]<br>• Target: BP, from the AHA and AMA, helps health care organizations and care teams improve BP control rates through an evidence-based QI program.[61] |

*Hypertension*. Author manuscript; available in PMC 2023 October 16.

| Strategy | Components |
|---|---|
| | • The National Association of Community Health Centers Improving Blood Pressure Control for African Americans Roadmap helps clinicians achieve high levels of BP control.[62]<br>• The Million Hearts self-measured BP monitoring website curates resources from many organizations for clinicians, public health professionals, and patients.[63]<br>• The Million Hearts Hypertension Control Champions formally recognizes clinicians, practices, health centers, and health systems that have achieved high levels of BP control among their patients with hypertension.[64] |

AHA indicates American Heart Association; AMA, American Medical Association; BP, blood pressure; QI, quality improvement; and SMBP, self-measured blood pressure.

*For detailed summaries of effective medication adherence interventions, see the 2021 AHA scientific statement "Medication Adherence and Blood Pressure Control"[29] and the 2017 Hypertension Clinical Practice Guidelines[18] (Data Supplement 60 and Data Supplement F).

**Table 3.**

Implementation Strategies for Improving BP Control and the Socioecological Framework Level That Each Approach Targets

| | Socioecological framework level | | | |
|---|---|---|---|---|
| **Strategy** | **Individual** | **Organization** | **Community** | **Policy** |
| Antiracism efforts | X | X | X | X |
| Accurate BP measurement and increased adoption of SMBP monitoring | X | X | | X |
| Team-based care | | X | X | X |
| Lifestyle modification strategies | X | X | X | X |
| Antihypertensive medication treatment protocols | X | X | | |
| Improved acceptance of and adherence to antihypertensive medications | X | X | | X |
| Continuous QI | X | X | | X |
| Financial | X | X | X | X |
| Large-scale implementation and dissemination | X | X | X | X |

BP indicates blood pressure; QI, quality improvement; and SMBP, self-measured blood pressure.

**Table 4.**

Critical Implementation and Dissemination Gaps

| |
|---|
| Task shifting hypertension care to other practitioners and allied health professionals |
| Instituting primordial prevention in federally sponsored food sources, including school meal programs |
| Evaluating implementation strategies focused on increasing uptake of effective lifestyle modification approaches |
| Implementing culturally sensitive interventions for lifestyle changes (ie, food preparation, exercise) |
| Testing methods for accelerating large-scale dissemination and implementation of evidence-based strategies, including lifestyle programs for BP control across health systems and across communities |
| Assessing efficacy and acceptability of patient self-titration of antihypertensive medication |
| Assessing feasibility and efficacy of standardized antihypertensive medication protocols across large health care systems |
| Exploring and evaluating antiracism, health equity, and SDOH implementation strategies focused on improving BP control |
| Improving reimbursement for evaluating SDOH (Z Codes, *ICD-10*, Z55–Z65) |
| Evaluating implementation strategies addressing climate change and air pollution for improving BP control |
| Assessing the effect of environmental public health interventions such as urban planning and increasing green spaces on BP control |
| Determining best approaches for education and training of clinicians to conduct proper BP measurements inside and outside the office setting |
| Identifying the most practical approach to SMBP training protocols for patients and the clinical team |
| Assessing efficacy of SMBP monitoring among people of underrepresented races and ethnicities |
| Exploring the processes and cost-effectiveness of linking SMBP readings to the electronic health record |
| Improving the ability to scale SMBP monitoring with telemonitoring in health systems and community settings |
| Implementing and evaluating the effect of policy-level changes such as salt reduction in foods and all-payer coverage of SMBP monitoring devices on improvement in BP control |
| Improving ability for health systems to implement data infrastructure to identify and improve key BP control process measures |

BP indicates blood pressure; *ICD-10*, *International Classification of Diseases, 10th Revision*; SDOH, social determinants of health; and SMBP, self-measured blood pressure.