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PERFORMANCE AND QUALITY MEASURES

2019 AHA/ACC Clinical Performance and Quality Measures for Adults With High Blood Pressure

A Report of the American College of Cardiology/American Heart Association Task Force on Performance Measures

Developed in Collaboration With the American Medical Association and the Preventive Cardiovascular Nurses Association

Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation, American Association of Clinical Endocrinologists, American Nurses Association, American Society for Preventive Cardiology, American Society of Health-System Pharmacists, and Association of Black Cardiologists

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PREAMBLE

The American College of Cardiology (ACC) and the American Heart Association (AHA) performance measurement sets serve as vehicles to accelerate translation of scientific evidence into clinical practice. Measure sets developed by the ACC and AHA are intended to provide practitioners and institutions that deliver cardiovascular services with tools to measure the quality of care provided and identify opportunities for improvement.

Writing committees are instructed to consider the methodology of performance measure development (1,2) and to ensure that the measures developed are aligned with ACC/AHA clinical guidelines. The writing committees also are charged with constructing measures that maximally capture important aspects of quality of care, including timeliness, safety, effectiveness, efficiency, equity, and patient-centeredness, while minimizing, when possible, the reporting burden imposed on hospitals, practices, and practitioners.

Potential challenges from measure implementation may lead to unintended consequences. The manner in which challenges are addressed is dependent on several factors, including the measure design, data collection method, performance attribution, baseline performance rates, reporting methods, and incentives linked to these reports.

The ACC/AHA Task Force on Performance Measures (Task Force) distinguishes quality measures from performance measures. Quality measures are those metrics that *may* be useful for local quality improvement but are not yet appropriate for public reporting or pay-for-performance programs (uses of performance measures). New measures are initially evaluated for potential inclusion as performance measures. In some cases, a measure is insufficiently supported by the guidelines. In other instances, when the guidelines support a measure, the writing committee may feel it is necessary to have the measure tested to identify the consequences of measure implementation. Quality measures may then be promoted to the status of performance measures as supporting evidence becomes available.

Gregg C. Fonarow, MD, FACC, FAHA
Chair, ACC/AHA Task Force on Performance Measures

1. INTRODUCTION

In 2018, the Task Force convened the writing committee to begin the process of revising the existing performance measures set for hypertension that had been released in 2011 (3). The writing committee also was charged with the task of developing new measures to evaluate the care of patients in accordance with the 2017 Hypertension Clinical Practice Guidelines (4).

The writing committee developed a comprehensive measure set for the diagnosis and treatment of high blood pressure (HBP) that includes 22 new measures: 6 performance measures, 6 process quality measures, and 10 structural quality measures. In conceptualizing these

TABLE 1 Applying Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care (Updated August 2015)*

CLASS (STRENGTH) OF RECOMMENDATION	
CLASS 1 (STRONG)	**Benefit >>> Risk**
Suggested phrases for writing recommendations: • Is recommended • Is indicated/useful/effective/beneficial • Should be performed/administered/other • Comparative-Effectiveness Phrases†: – Treatment/strategy A is recommended/indicated in preference to treatment B – Treatment A should be chosen over treatment B	
CLASS 2a (MODERATE)	**Benefit >> Risk**
Suggested phrases for writing recommendations: • Is reasonable • Can be useful/effective/beneficial • Comparative-Effectiveness Phrases†: – Treatment/strategy A is probably recommended/indicated in preference to treatment B – It is reasonable to choose treatment A over treatment B	
CLASS 2b (WEAK)	**Benefit ≥ Risk**
Suggested phrases for writing recommendations: • May/might be reasonable • May/might be considered • Usefulness/effectiveness is unknown/unclear/uncertain or not well-established	
CLASS 3: No Benefit (MODERATE) **(Generally, LOE A or B use only)**	**Benefit = Risk**
Suggested phrases for writing recommendations: • Is not recommended • Is not indicated/useful/effective/beneficial • Should not be performed/administered/other	
Class 3: Harm (STRONG)	**Risk > Benefit**
Suggested phrases for writing recommendations: • Potentially harmful • Causes harm • Associated with excess morbidity/mortality • Should not be performed/administered/other	

LEVEL (QUALITY) OF EVIDENCE‡	
LEVEL A	
• High-quality evidence‡ from more than 1 RCT • Meta-analyses of high-quality RCTs • One or more RCTs corroborated by high-quality registry studies	
LEVEL B-R	**(Randomized)**
• Moderate-quality evidence‡ from 1 or more RCTs • Meta-analyses of moderate-quality RCTs	
LEVEL B-NR	**(Nonrandomized)**
• Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies • Meta-analyses of such studies	
LEVEL C-LD	**(Limited Data)**
• Randomized or nonrandomized observational or registry studies with limitations of design or execution • Meta-analyses of such studies • Physiological or mechanistic studies in human subjects	
LEVEL C-EO	**(Expert Opinion)**
• Consensus of expert opinion based on clinical experience	

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

measures, the writing committee paid very close attention to the current Class of Recommendation (COR) and Level of Evidence (LOE) guideline classification scheme used by ACC and AHA in all of its guidelines, as shown in Table 1.

Generally, performance measures are developed from Class 1 CORs and Level A and B LOEs (i.e., strong recommendations based on the highest quality of evidence), but quality measures are generally based on lower ranges of CORs and LOEs. This distinction is important to remember throughout the present document, given that performance measures are most commonly designed to be considered for use in national quality payment and reporting programs by entities such as the Centers for Medicare & Medicaid Services (CMS) and the National Committee for Quality Assurance (NCQA), whereas quality measures are typically designed to support quality improvement initiatives and activities at the national or microsystem levels.

The effective implementation of this measure set by clinicians, care teams, and health systems will lead to significant improvements in effective detection and treatment of HBP for millions of people across the United States. Specifications for these new measures take into full account the revised classification taxonomy of HBP

TABLE 2 BP Classification (JNC 7 and the 2017 Hypertension Clinical Practice Guidelines)

SBP (mm Hg)	and/or	DBP (mm Hg)	JNC 7 (5)	2017 GL (4)
<120	and	<80	Normal BP	Normal BP
120–129	and	<80	Prehypertension	Elevated BP
130–139	or	80–89	Prehypertension	Stage 1 hypertension
140–159	or	90–99	Stage 1 hypertension	Stage 2 hypertension
≥160	or	≥100	Stage 2 hypertension	Stage 2 hypertension

BP should be based on an average of ≥2 careful readings on ≥2 occasions. Adults with SBP or DBP in 2 categories should be designated to the higher BP category.

BP indicates blood pressure; DBP, diastolic blood pressure; GL, guideline; JNC, Joint National Committee; and SBP, systolic blood pressure.

from the 2017 Hypertension Clinical Practice Guidelines (4), as noted in Table 2.

The writing committee felt that it was critically important to incorporate this revised classification into the construction of each of the new performance and quality measures presented in this document. The writing committee believed that the former HBP classification scheme previously published by the Joint National Committee (5) was now out of date and needed replacement with that of the 2017 Hypertension Clinical Practice Guidelines (4), described in Table 2, to reduce confusion in the field. The current *International Classification of Diseases*, 10th edition, codes have not yet been modified to reflect the new classification from the 2017 Hypertension Clinical Practice Guidelines (4), which may create some initial challenges with implementation. The writing committee is sensitive to the fact that the current version (2019 at the time of this writing) of the performance measures for controlling HBP developed by the NCQA for the Healthcare Effectiveness Data and Information Set (6) and currently in use in 2019 by CMS (7) also does not incorporate the 2017 Hypertension Clinical Practice Guidelines classification scheme. It is well understood that these measures are already in widespread use, especially for quality-related payment programs promulgated by CMS, such as the Medicare Advantage "Stars" ratings, the Medicare Shared Savings Program, and the Physician Quality Payment Program, as well as many other programs promoted by commercial health insurers. In particular, the widespread use of the 2017 Hypertension Clinical Practice Guidelines (4) classification scheme will also help to guide decision-making about when to prescribe antihypertensive medications in accordance with its current recommendations for the ACC/AHA stages of HBP (i.e., stage 2, stage 1, and elevated blood pressure [BP]), as outlined in Table 3.

TABLE 3 Guideline Recommendation for BP-Lowering Medications: ACC/AHA COR/LOE

ASCVD Risk	Stage 2 High BP (≥140 mm Hg)	Stage 1 High BP (139-130 mm Hg)	Elevated BP (129-120 mm Hg)
ASCVD Risk ≥10%	COR: 1, LOE: A	COR: 1, LOE: A	Not recommended
ASCVD Risk <10%	COR: 1, LOE: C-LD	Not recommended	Not recommended

All require intensive lifestyle modification (COR: 1, LOE: A) (applies to the entire table). For older adults (≥65 years of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit are reasonable for decisions about intensity of BP lowering and choice of antihypertensive drugs (COR: 2a, LOE: C-EO).

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; COR, Class of Recommendation; and LOE, Level of Evidence.

In the 2017 Hypertension Clinical Practice Guidelines (4), the authors emphasized the critical importance of measuring atherosclerotic cardiovascular disease (ASCVD) risk for all patients with HBP, regardless of stage. Therefore, it will be important for the end users of the new ACC/AHA performance measure set to incorporate this risk assessment process in order to achieve successful implementation as a key component of quality improvement for patients with HBP.

Because the current NCQA and CMS performance measures for controlling HBP assess only the population with ACC/AHA stage 2 HBP (6), the writing committee also felt that it was important to emphasize the 2017 Hypertension Clinical Practice Guidelines (4) recommendations to lower BP below the 130/80-mm Hg threshold for both ACC/AHA stage 2 and stage 1 patients. In formulating these new performance measures, the writing committee was sensitive to the fact that there is currently not complete consensus among other guidelines from the American College of Physicians (ACP) and the American Academy of Family Physicians (AAFP) (8) and also the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH) (9). Nonetheless, despite this ongoing debate, the writing committee felt strongly that it is now time to move the US healthcare system ahead to reflect these differing points of view and expects that widespread use of this new measure set will help to achieve this goal.

In addition, the writing committee was concerned that NCQA and CMS would be less likely to consider testing and adopting performance measures with denominator specifications different from those of the "Controlling High Blood Pressure" measure currently in widespread use (and recently revised in 2019) (10). Therefore, the writing committee chose to promote flexible denominator congruity and harmonization (as defined by the National Quality Forum [NQF]) with both NCQA and CMS measure specifications in the new ACC/AHA performance measure set to promote its initial widespread use by clinicians and entities who support the treatment recommendations for ACC/AHA stage 1 HBP as emphasized in the 2017 Hypertension Clinical Practice Guidelines (4). This new performance measure set also includes a new composite measure for control of HBP for both ACC/AHA stage 2 and ACC/AHA stage 1

TABLE 4 Summary of 2019 ACC/AHA Performance and Quality Measures for the Diagnosis and Management of HBP

Measure No.	Measure Title/Description	ACC/AHA Stage 2 HBP	ACC/AHA Stage 1 HBP	ACC/AHA Elevated BP	COR/LOE
Performance Measures*					
PM-1a	ACC/AHA stage 2 HBP control SBP <140 mm Hg	+	-	-	COR: 1, LOE: A
PM-1b	ACC/AHA stage 2 HBP control SBP <130 mm Hg	+	-	-	COR: 1, LOE: A / COR: 2a, LOE: C-EO
PM-2	ACC/AHA stage 1 HBP control SBP <130 mm Hg	-	+	-	COR: 1, LOE: A
PM-3	ACC/AHA stage 2 and stage 1 HBP control SBP <130 mm Hg (composite measure combining PM-1b and PM-2)	+	+	-	COR: 1, LOE: A / COR: 2a, LOE: C-EO
PM-4	Nonpharmacological interventions for ACC/AHA stage 2 HBP	+	-	-	COR: 1, LOE: A
PM-5	Use of HBPM for management of ACC/AHA stage 2 HBP	+	-	-	COR: 1, LOE: A
Process Quality Measures*					
QM-1	Nonpharmacological interventions for ACC/AHA stage elevated BP	-	-	+	COR: 1, LOE: A
QM-2	Nonpharmacological interventions for ACC/AHA stage 1 HBP	-	+	-	COR: 1, LOE: A
QM-3	Nonpharmacological interventions for all ACC/AHA stages of HBP (composite measure combining PM-4, QM-1, and QM-2)	+	+	+	COR: 1, LOE: A
QM-4	Medication adherence to drug therapy for ACC/AHA stage 1 with ASCVD risk ≥10% or ACC/AHA stage 2 HBP	+	+	-	COR: 1, LOE: A
QM-5	Use of HBPM for management of ACC/AHA stage 1 HBP	-	+	-	COR: 1, LOE: A
QM-6	Use of HBPM for management of ACC/AHA stage 1 or ACC/AHA stage 2 (composite measure combining PM-5 and QM-5)	+	+	-	COR: 1, LOE: A

*Performance measures are used in national quality payment and reporting programs, whereas process quality measures support quality improvement initiatives and activities at the national or microsystem levels.
+Indicates the corresponding ACC/AHA stage for the measure. -Indicates that the ACC/AHA stage does not correspond to the measure.

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; COR, Class of Recommendation; HBP, high blood pressure; HBPM, home blood pressure monitoring; LOE, Level of Evidence; PM, performance measure; QM, quality measure; and SBP, systolic blood pressure.

to a systolic goal of <130 mm Hg. Furthermore, the new Process Quality Measures are intended for use in quality improvement initiatives that are designed to take into account management and control for all ACC/AHA stages of HBP without creating controversy or conflict with CMS, NCQA, NQF, and professional societies with differing recommendations and points of view about treatment of ACC/AHA stage 2 and stage 1 HBP. CMS recently determined that the evidence is sufficient to cover ambulatory BP monitoring for the diagnosis of hypertension in Medicare beneficiaries with suspected white coat or masked hypertension (11,12). *Annals of Internal Medicine* also published an "In the Clinic" section for screening, prevention, diagnosis, and treatment of hypertension, citing the 2017 Hypertension Clinical Practice Guidelines (13).

The writing committee was also interested in translating some of the 2017 Hypertension Clinical Practice Guidelines recommendations for systematic strategies that support the consistent and accurate diagnosis and treatment of populations of patients with HBP (4). In its deliberations on this challenge, the writing committee felt that it would be cumbersome and challenging to collect data at the patient and individual clinician levels, thereby limiting the use and utility of measures specified at these levels. With these potential constraints in mind, the writing committee created 10 new structural quality measures designed to evaluate the capability and capacity of various levels of the US healthcare system to implement 2017 Hypertension Clinical Practice Guidelines recommended strategies, such as standardized BP measurement protocols, electronic health record surveillance, telehealth, team-based care, a single plan of care, and performance measurement (4). These new measures are intended for qualitative evaluation of process and infrastructure for these strategies at the care delivery unit (CDU) level (including solo/small physician offices, group practices, health systems, public health sites, accountable care organizations, and clinically integrated networks).

Summaries for these measures are displayed in **Tables 4 and 5**, which provide information on each measure. **Tables 4 and 5** also list each of the new measures and which ACC/AHA classes of HBP are addressed for each. More detailed descriptive and technical specifications for each measure are listed in Appendix A, which provides additional details for each measure description, numerator, denominator (including denominator exclusions and

TABLE 5 Summary of 2019 ACC/AHA Structural Measures for the Diagnosis and Management of HBP

Measure No.	Measure Title/Description	ACC/AHA Stage 2 HBP	ACC/AHA Stage 1 HBP	ACC/AHA Elevated BP	COR/LOE
Diagnosis, Assessment, and Accurate Measurement					
SM-1	Use of a standard protocol to consistently and correctly measure BP in the ambulatory setting	+	+	+	COR: 1, LOE: C-EO
SM-2	Use of a standard process for assessing ASCVD risk (2019 Prevention Guideline [14])	+	+	+	COR: 1, LOE: B-NR
SM-3	Use of a standard process for properly screening all adults ≥18 years of age for HBP (USPSTF [15])	+	+	+	Grade A (USPSTF)
SM-4	Use of an EHR to accurately diagnose and assess HBP control	+	+	+	COR: 1, LOE: B-NR
Patient-Centered Approach for Controlling HBP					
SM-5	Use of a standard process to engage patients in shared decision-making, tailored to their personal benefits, goals, and values for evidence-based interventions to improve control of HBP (2019 Prevention Guideline [14])	+	+	+	COR: 1, LOE: B-R
SM-6	Demonstration of infrastructure and personnel that assess and address social determinants of health of patients with HBP (2019 Prevention Guideline [14])	+	+	+	COR: 1, LOE: B-NR
Implementation of a System of Care for Patients With HBP					
SM-7	Use of team-based care to better manage HBP	+	+	+	COR: 1, LOE: A
SM-8	Use of telehealth, m-health, e-health, and other digital technologies to better diagnose and manage HBP	+	+	+	COR: 2a, LOE: A / COR: 1, LOE: A
SM-9	Use of a single, standardized plan of care for all patients with HBP	+	+	+	COR: 1, LOE: C-EO
Use of Performance Measures to Improve Care for HBP					
SM-10	Use of performance and quality measures to improve quality of care for patients with HBP	+	+	-	COR: 2a, LOE: B-NR

+Indicates the corresponding ACC/AHA stage for the measure. -Indicates that the ACC/AHA stage does not correspond to the measure.

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; COR, Class of Recommendation; e-health, healthcare services provided electronically via the Internet; EHR, electronic health record; HBP, high blood pressure; LOE, Level of Evidence; m-health, practice of medicine and public health supported by mobile devices; SM, structural measure; and USPSTF, US Preventive Services Task Force.

exceptions), rationale for the measure, guideline recommendations that support the measure, measurement period, source of data, and attribution.

1.1. Scope of the Problem

Failing to correctly diagnose and control HBP can put people at increased risk for cardiovascular disease, stroke, and renal failure. Recent analyses suggest that >100 million Americans currently have HBP, and the 2011-2014 US National Health and Nutrition Examination Survey estimated that 46% of US adults have HBP (16). An additional 12% of US adults have elevated BP and are at high risk of developing HBP. Among US adults taking antihypertensive medication, 53% have uncontrolled BP (16). Of US adults with hypertension, 20% were unaware they had the condition (17). In a large cohort study of US adults ≥45 years of age, the incidences of ASCVD and all-cause death were 20.5 and 29.6 per 1,000 person-years, respectively, among participants with ACC/AHA stage 1 HBP who had been recommended to initiate antihypertensive medication, and 22.7 and 32.9 per 1,000 person-years, respectively, among participants with ACC/AHA stage 2 HBP. Among participants taking antihypertensive medication with above-goal BP (i.e., systolic BP ≥130 mm Hg or diastolic BP ≥80 mm Hg), the incidences of ASCVD and all-cause death were 33.6 and 42.5 events per 1000 person-years, respectively (18). In addition, individuals with HBP face on average nearly $2000 more in annual healthcare expenses than those without HBP (19).

Two studies have projected large reductions in ASCVD and all-cause death among US adults through the achievement of the BP goals in the 2017 Hypertension Clinical Practice Guidelines (20,21). In 1 study, it was estimated that 3 million ASCVD events could be averted over the next 10 years through achievement and maintenance of the 2017 ACC/AHA BP goals (systolic/diastolic BP <130/80 mm Hg; <130 mm Hg for adults ≥65 years of age with low ASCVD risk), as compared with maintaining current BP and treatment and control levels (20). Overall, 33% of all ASCVD events prevented would be in those initiating antihypertensive treatment, and

67% would be in those intensifying current antihypertensive treatment (20).

Despite the evidence-based recommendations for lower BP goals (<130/80 mm Hg) in the 2017 Hypertension Clinical Practice Guidelines (4), existing quality measures from the NCQA for controlling HBP (for hypertensive adults 18–59 years of age whose BP was <140/90 mm Hg) (6) have not changed substantially over the past several years for various insured populations, including commercial, Medicaid, Medicare Fee for Service, and Medicare Advantage (10). Re-examining both the targets and processes of managing HBP are thus warranted to help support the use of the latest evidence in optimizing the quality of care and outcomes for patients with HBP.

1.2. Disclosure of Relationships With Industry and Other Entities

The Task Force makes every effort to avoid actual, potential, or perceived conflicts of interest that could arise as a result of relationships with industry or other entities (RWI). Detailed information on the ACC/AHA policy on RWI can be found online. All members of the writing committee, as well as those selected to serve as peer reviewers of this document, were required to disclose all current relationships and those existing within the 12 months before the initiation of this writing effort. ACC/AHA policy also requires that the writing committee chair and at least 50% of the writing committee have no relevant RWI.

Any writing committee member who develops new RWI during his or her tenure on the writing committee is required to notify staff in writing. These statements are reviewed periodically by the Task Force and by members of the writing committee. Author and peer reviewer RWI that are pertinent to the document are included in the appendixes: Appendix B for relevant writing committee RWI and Appendix C for comprehensive peer reviewer RWI. Additionally, to ensure complete transparency, the writing committee members' comprehensive disclosure information, including RWI not relevant to the present document, is available online. Disclosure information for the Task Force is also available online.

The work of the writing committee was supported exclusively by the ACC and the AHA without commercial support. Members of the writing committee volunteered their time for this effort. Meetings of the writing committee were confidential and attended only by writing committee members, staff from the ACC and AHA, and representatives of the American Medical Association (AMA) and Preventive Cardiovascular Nurses Association (PCNA), which served as collaborators on this project.

1.3. Abbreviations and Acronyms

Abbreviation/Acronym	Meaning/Phrase
ASCVD	atherosclerotic cardiovascular disease
BP	blood pressure
CDU	care delivery unit
CMS	Centers for Medicare & Medicaid Services
COR	Class of Recommendation
HBP	high blood pressure
LOE	Level of Evidence
NCQA	National Committee for Quality Assurance
NQF	National Quality Forum

2. METHODOLOGY

2.1. Literature Review

In developing the updated HBP measure set, the writing committee reviewed evidence-based guidelines and statements that would potentially impact the construction of the measures. The clinical practice guidelines and scientific statements that most directly contributed to the development of these measures are shown in Table 6.

2.2. Definition and Selection of Measures

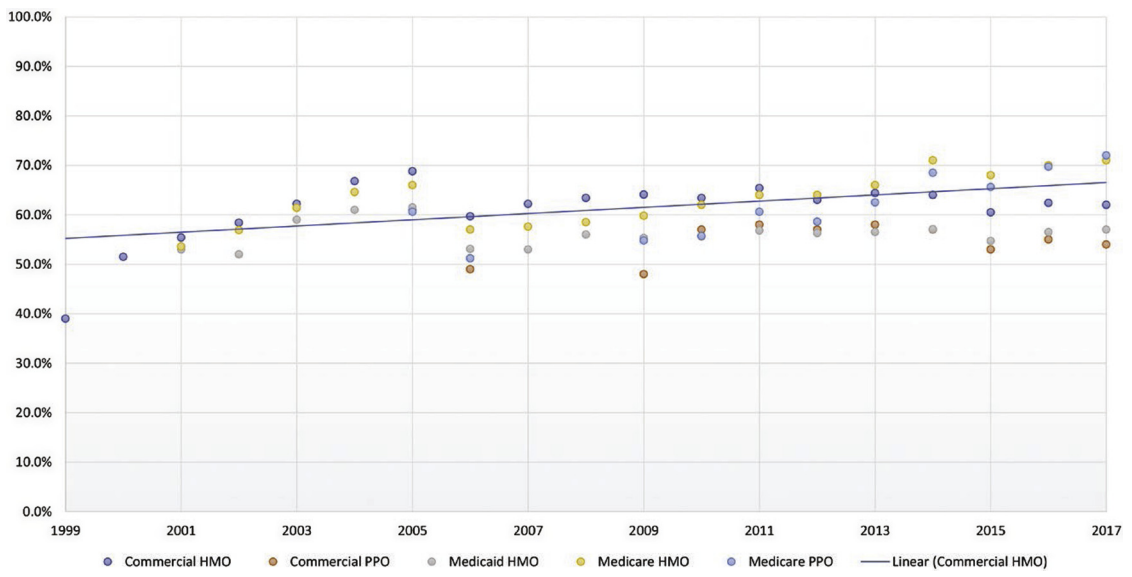
In constructing the measure set, the writing committee recognized that other organizations (e.g., CMS, NCQA) have developed or are continuing to develop HBP performance measures in response to the release of the 2017 Hypertension Clinical Practice Guidelines (4). Hence, the committee created performance measures for ACC/AHA stage 2 HBP that are aligned with these other groups, called *harmonizing measures*. In addition, the committee created *enhancing measures* that incorporate emerging evidence showing improved outcomes with more aggressive BP control (i.e., for ACC/AHA stage 1 HBP). When defining harmonization, the writing committee followed the NQF Guidance for Measure Harmonization

TABLE 6 Associated Clinical Practice Guidelines and Other Clinical Guidance Documents

Clinical Practice Guidelines	
1	2017 Hypertension Clinical Practice Guidelines (4)
2	2019 Cardiovascular Disease Prevention Guideline (14)
3	2017 USPSTF High Blood Pressure Guideline (15)
Performance Measures and Scientific Statements	
1	2011 Hypertension Performance Measures (3)
2	NQF Measure 0018 Controlling High Blood Pressure (NCQA) (22)
3	ACC/AHA Performance Measures Methodology (1)

ACC indicates American College of Cardiology; AHA, American Heart Association; NCQA, National Committee for Quality Assurance; NQF, National Quality Forum; and USPSTF, US Preventive Services Task Force.

FIGURE 1 Performance of HEDIS Controlling HBP Measure 1999–2017 (Percent of Patients With Hypertension Treated in Accordance With the HEDIS Controlling HBP Measure)



The HEDIS Hypertension Measure (6) assesses adults 18–85 years of age who had a diagnosis of hypertension and whose blood pressure was adequately controlled according to the following criteria: 1) Adults 18–59 years of age whose blood pressure was <140/90 mm Hg. 2) Adults 60–85 years of age, with a diagnosis of diabetes mellitus, whose blood pressure was <140/90 mm Hg. 3) Adults 60–85 years of age, without a diagnosis of diabetes mellitus, whose blood pressure was <150/90 mm Hg (likely to be lowered in 2018 to <140/90 mm Hg). Data in graph from National Committee for Quality Assurance (NCQA) (6). HBP indicates high blood pressure; HEDIS, Healthcare Effectiveness Data and Information Set; HMO, health maintenance organization; and PPO, preferred provider organization.

report, which states "measure harmonization should be considered when measures are intended to address either the same measure focus—the target process, condition, event, outcome (e.g., numerator)—or the same target population (e.g., denominator)." (23); The enhancing performance and quality measures are intended to promote the widespread application in clinical practice of the current recommendations from the 2017 Hypertension Clinical Practice Guidelines (4) to improve care and outcomes for all patients with HBP, including those with ACC/AHA stage 1 HBP and elevated BP. The writing committee acknowledges that adding new performance measures may not be initially feasible in the current regulatory environment, in which many healthcare entities already have a high burden to collect and report existing quality measures. Nonetheless, it is imperative that national quality improvement efforts urgently incorporate high-quality, evidence-based recommendations into practice, especially given the recent lack of significant progress in controlling HBP with national measures in current use by CMS, NCQA, state Medicaid agencies, NQF, and other entities (**Figure 1**) (6).

The writing committee reviewed clinical practice guidelines and other clinical guidance documents recently published by other entities, in addition to ACC/AHA documents. The writing committee also examined available information on gaps in care to address which new measures might be appropriate as performance measures or quality measures for this measure set update, based on the attributes for performance measures outlined in **Table 7**.

3. AHA/ACC HBP MEASURE SET PERFORMANCE MEASURES

3.1. Discussion of Changes to 2011 Hypertension Measure Set

After reviewing the existing guidelines and the 2011 hypertension measure set (3), the writing committee discussed which measures required revision to reflect updated science related to HBP and identified which guideline recommendations could serve as the basis for new performance or quality measures. The writing committee also reviewed existing publicly available measure sets.

TABLE 7 ACC/AHA Task Force on Performance Measures: Attributes for Performance Measures (24)

1. Evidence Based	
High-impact area that is useful in improving patient outcomes	a. For structural measures, the structure should be closely linked to a meaningful process of care that in turn is linked to a meaningful patient outcome. b. For process measures, the scientific basis for the measure should be well established, and the process should be closely linked to a meaningful patient outcome. c. For outcome measures, the outcome should be clinically meaningful. If appropriate, performance measures based on outcomes should adjust for relevant clinical characteristics through the use of appropriate methodology and high-quality data sources.
2. Measure Selection	
Measure definition	a. The patient group to whom the measure applies (denominator) and the patient group for whom conformance is achieved (numerator) are clearly defined and clinically meaningful.
Measure exceptions and exclusions	b. Exceptions and exclusions are supported by evidence.
Reliability	c. The measure is reproducible across organizations and delivery settings.
Face validity	d. The measure appears to assess what it is intended to.
Content validity	e. The measure captures most meaningful aspects of care.
Construct validity	f. The measure correlates well with other measures of the same aspect of care.
3. Measure Feasibility	
Reasonable effort and cost	a. The data required for the measure can be obtained with reasonable effort and cost.
Reasonable time period	b. The data required for the measure can be obtained within the period allowed for data collection.
4. Accountability	
Actionable	a. Those held accountable can affect the care process or outcome.
Unintended consequences avoided	b. The likelihood of negative unintended consequences with the measure is low.

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ACC indicates American College of Cardiology; and AHA, American Heart Association.

These subsections serve as a synopsis of the revisions that were made to previous measures and a description of why the new measures were created for both the inpatient and outpatient settings.

3.1.1. Retired Measures

The writing committee decided to retire the BP Control Measure because it was not concordant with the 2017 Hypertension Clinical Practice Guidelines (4).

3.1.2. New Measures

On the basis of the 2017 Hypertension Clinical Practice Guidelines (4) and the 2019 Prevention Guideline (14), the writing committee created a comprehensive list of measures intended to be used to improve important gaps in the quality of care for patients with HBP (4,14). This set includes 22 new measures: 6 performance measures, 6 process quality measures, and 10 structural quality measures. **Table 8** includes a list of the measures with information on the attribution and a brief rationale. Performance measures are typically outcome measures that target meaningful gaps in the quality of care, are based on Class 1 clinical practice guideline recommendations, and are appropriately designed for use in accountability in programs that rely on public reporting and pay-for-value initiatives promoted by organizations such as CMS, commercial payers, the NCQA, and the NQF. The writing committee believes that it is important to confirm its full support of the performance measure for BP control in current widespread use by CMS and NCQA for HBP (i.e., the proportion of stage 2 patients with HBP with control below the Joint National Committee (5) traditional target of 140/90 mm Hg). In addition, the writing committee unanimously feels it important to include new harmonizing measures for stage 1 HBP and a composite measure (i.e., for ACC/AHA stage 2 and ACC/AHA stage 1 combined) that emphasize the importance of controlling HBP below the new ACC/AHA target of 130/80 mm Hg, as recommended by the 2017 Hypertension Clinical Practice Guidelines (4). Because of the importance of the promotion of intensive nonpharmacological "healthy lifestyle" modifications and home BP monitoring for patients with stage 2 HBP (as emphasized in the 2017 Hypertension Clinical Practice Guidelines (4), new performance measures to assess quality of care in this regard have been included. These new performance measures are also intended to harmonize with the performance measure for stage 2 HBP currently in use by CMS and NCQA.

Quality measures, on the other hand, are intended to be deployed in collaborative quality improvement initiatives (such as those promoted by the ACC and AHA) that do not require the degrees of technical rigor required for performance measures. The writing committee decided to include 6 new process quality measures based on Class 1 recommendations from the 2017 Hypertension Clinical Practice Guidelines (4) recommendations that address

TABLE 8 New Performance, Quality, and Structural Measures for the Diagnosis and Management of HBP in the Outpatient Care Setting*

Measure No.	Measure Title	Attribution	Rationale for Creating New Measure
PM-1a	ACC/AHA stage 2 HBP control SBP <140 mm Hg (harmonizing measure)	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)	Harmonizes with current performance measure "Controlling High Blood Pressure" for ACC/AHA stage 2 HBP currently in widespread use.
PM-1b	ACC/AHA stage 2 HBP control SBP <130 mm Hg (enhancing measure)	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)	Harmonizes with current performance measure "Controlling High Blood Pressure" for ACC/AHA stage 2 HBP currently in widespread use and adds lower target for further risk reduction.
PM-2	ACC/AHA stage 1 HBP control SBP <130 mm Hg (harmonizing measure)	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)	Harmonizes with current performance measure "Controlling High Blood Pressure" for ACC/AHA stage 2 HBP currently in widespread use. Adds emphasis on including the ACC/AHA stage 1 HBP population.
PM-3	ACC/AHA stage 2 and stage 1 HBP control SBP <130 mm Hg (composite measure combining PM-1b and PM-2)	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)	Harmonizes with current performance measure "Controlling High Blood Pressure" for ACC/AHA stage 2 HBP currently in widespread use. Adds emphasis on including the ACC/AHA stage 1 HBP population and combines both ACC/AHA stage 2 and stage 1 HBP populations.
PM-4	Nonpharmacological interventions for ACC/AHA stage 2 HBP	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system	Harmonizes with current performance measure "Controlling High Blood Pressure" for ACC/AHA stage 2 HBP currently in widespread use. Adds new emphasis on high-quality evidence and strong recommendation for promoting lifestyle modification, as recommended in the 2017 Hypertension Clinical Practice Guidelines for this population as an important strategy for controlling HBP.
PM-5	Use of HBPM for management of ACC/AHA stage 2 HBP	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)	Harmonizes with current performance measure "Controlling High Blood Pressure" for ACC/AHA stage 2 HBP currently in widespread use. Adds new emphasis on correct measurement of BP by individuals at home or elsewhere outside the clinic setting, as recommended in the 2017 Hypertension Clinical Practice Guidelines for this population as an important strategy for evaluating control of HBP.
QM-1	Nonpharmacological interventions for ACC/AHA stage elevated BP	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system	Adds new emphasis on high-quality evidence and strong recommendation for promoting lifestyle modification, as recommended in the 2017 Hypertension Clinical Practice Guidelines for ACC/AHA elevated BP population as an important strategy for controlling HBP.
QM-2	Nonpharmacological interventions for ACC/AHA stage 1 HBP	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system	Adds new emphasis high-quality evidence and strong recommendation for promoting lifestyle modification, as recommended in the 2017 Hypertension Clinical Practice Guidelines for ACC/AHA stage 1 population as an important strategy for controlling HBP.
QM-3	Nonpharmacological interventions for all ACC/AHA stages of HBP (composite measure combining PM-4, QM-1, and QM-2)	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system	Adds new emphasis on high-quality evidence and strong recommendation for promoting lifestyle modification, as recommended in the 2017 Hypertension Clinical Practice Guidelines for all 3 ACC/AHA stages of HBP population as an important strategy for controlling HBP. Composite measure permits assessment of effectiveness for all stages combined.
QM-4	Medication adherence to drug therapy for ACC/AHA stage 1 with ASCVD risk ≥10% or ACC/AHA stage 2 HBP	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system	Adds new emphasis on high-quality evidence and strong recommendation for assessing and promoting medication adherence, as recommended in the 2017 Hypertension Clinical Practice Guidelines for the combined ACC/AHA stage 1 with ASCVD risk ≥10% and ACC/AHA stage 2 HBP population as an important strategy for controlling HBP.
QM-5	Use of HBPM for management of ACC/AHA stage 1 HBP	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system	Harmonizes with new performance measure PM-5 for ACC/AHA stage 2 HBP. Adds new emphasis on correct measurement of BP by individuals at home or elsewhere outside the clinic setting, as recommended in the 2017 Hypertension Clinical Practice Guidelines for this population as an important strategy for evaluating control of ACC/AHA stage 1 HBP and ASCVD risk ≥10%.

Continued on the next page

TABLE 8 Continued

Measure No.	Measure Title	Attribution	Rationale for Creating New Measure
QM-6	Use of HBPM for management of ACC/AHA stage 1 or ACC/AHA stage 2 (composite measure combining PM-5 and QM-5)	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)	Harmonizes with new measures PM-5 and QM-5 and adds new emphasis on correct measurement of BP by individuals at home or elsewhere outside the clinic setting, as recommended in the 2017 Hypertension Clinical Practice Guidelines for this population as an important strategy for evaluating control of ACC/AHA stage 2 and stage 1 HBP and ASCVD risk ≥10%. Composite measure permits assessment of effectiveness for these 2 stages combined.
SM-1	Use of a standard protocol to consistently and correctly measure BP in the ambulatory setting	CDU†	Accurate measurement and recording of BP are essential to categorize level of BP, ascertain BP-related CVD risk, and guide management of high BP. Office BP measurement is often unstandardized, despite the well-known consequences of inaccurate measurement. Errors are common and can result in a misleading estimation of an individual's true level of BP if staff are not trained and a protocol is not followed.
SM-2	Use of a standard process for assessing ASCVD risk	CDU†	To facilitate decisions about preventive interventions, it is recommended to screen for traditional ASCVD risk factors and apply the race- and sex-specific PCE (ASCVD Risk Estimator) to estimate 10-year ASCVD risk for asymptomatic adults 40–79 years of age.
SM-3	Use of a standard process for properly screening all adults ≥18 y of age for HBP	CDU†	The evidence on the benefits of screening for HBP is well established. In 2007, the USPSTF reaffirmed its 2003 recommendation to screen for HBP in adults ≥18 y of age.
SM-4	Use of an EHR to accurately diagnose and assess HBP control	CDU†	A growing number of health systems are developing or using registries and EHRs that permit large-scale queries to support population health management strategies to identify undiagnosed or undertreated HBP.
SM-5	Use of a standard process to engage patients in shared decision-making, tailored to their personal benefits, goals, and values for evidence-based interventions to improve control of HBP	CDU†	Decisions about primary prevention should be collaborative decisions made between a clinician and a patient.
SM-6	Demonstration of infrastructure and personnel that assess and address social determinants of health of patients with HBP	CDU†	It is important to tailor advice to an individual's socioeconomic and educational status, as well as cultural, work, and home environments.
SM-7	Use of team-based care to better manage HBP	CDU†	RCTs and meta-analyses of RCTs of team-based HBP care involving nurse or pharmacist intervention demonstrated reductions in SBP and DBP and/or greater achievement of BP goals when compared with usual care.
SM-8	Use of telehealth, m-health, e-health, and other digital technologies to better diagnose and manage HBP	CDU†	Meta-analyses of RCTs of different telehealth interventions have demonstrated greater SBP and DBP reductions and a larger proportion of patients achieving BP control than those achieved with usual care without telehealth.
SM-9	Use of a single, standardized plan of care for all patients with HBP	CDU†	Studies demonstrate that implementation of a plan of care for HBP can lead to sustained reduction of BP and attainment of BP targets over several years.
SM-10	Use of performance and quality measures to improve quality of care for patients with HBP	CDU†	A large observational study showed that a systematic approach to HBP control, including the use of performance measures, was associated with significant improvement in HBP control compared with historical control groups.

*Including office, clinic, home, or ambulatory.
†Including, but not limited to, solo/small physician offices, group practices, ambulatory care centers, health systems, public health sites, accountable care organizations, and clinically integrated networks that diagnose and treat patients with HBP.

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CDU, care delivery unit; CVD, cardiovascular disease; DBP, diastolic blood pressure; e-health, healthcare services provided electronically via the Internet; EHR, electronic health record; HBP, high blood pressure; HBPM, home blood pressure monitoring; m-health, practice of medicine and public health supported by mobile devices; PCE, pooled cohort equations; PM, performance measure; QM, quality measure; RCT, randomized controlled trial; SBP, systolic blood pressure; SM, structural measure; and USPSTF, US Preventive Services Task Force.

important gaps in care for patients with HBP. If additional evidence evolves that demonstrates significant impact on the quality of care and meets NQF requirements for reliability, feasibility, usability, validity, and acceptable burden of data collection for these measures, then they may be considered as potential future performance measures by the writing committee and other entities, such as CMS, NCQA, state Medicaid agencies, and NQF.

Given the extensive emphasis on developing more effective systems of care for patients with HBP, the writing committee also feels it is important to present a new concept of *structural measures*, which are designed to improve these systems. This category of quality measure is intended to evaluate care at the aggregate care delivery unit (CDU) level, as opposed to the performance and quality measures, which are designed to summarize the evaluation of care of prespecified populations with HBP at the individual, group clinician, or health plan levels. A CDU represents the organizational structure of the clinicians who are delivering care to these patients. This measurement includes a hierarchical scale of the health delivery infrastructure for optimal management of patients with HBP that is available to organizations such as a small medical practice, a multispecialty clinic, a community-based health center (e.g., a Federally Qualified Health Center), a hospital-owned ambulatory care site, or even a large, geographically dispersed health system (e.g., the U.S. Department of Veterans Affairs).

The writing committee developed this new category of 10 structural measures in hopes that they could be implemented within a CDU at any level of the health system to assess strengths and weaknesses of available infrastructure designed to improve accurate diagnosis and management of patients with HBP, again in accordance with relevant recommendations from the 2017 Hypertension Clinical Practice Guidelines (4). The writing committee emphasizes that expecting the structural measures to be interpreted as rigid requirements for CDUs would not permit the high level of flexibility these diverse entities need to use these measures for their own self-assessment and collaborative quality improvement implementation initiatives. Hence, these new measures are currently not designed or intended to be used for accountability "standards" but rather to be used as a roadmap for solo/small physician offices, group practices, health systems, public health sites, accountable care organizations, and clinically integrated networks, etc., in their collective journeys to establish better and more standardized guideline-based systems of care for the many millions of patients with HBP across the United States.

More detailed information on the specifications for these new performance, quality, and structural measures for care of patients with HBP is presented in Appendix A.

4. AREAS FOR FURTHER RESEARCH

Several additional areas of research will potentially have an impact on HBP performance and quality measures:

- Further research is needed on devices for measuring BP for diagnosis and control, including continuous measurements from digital devices and entering BP measurements into electronic health records.
- Further research is needed on improving the accuracy of office BP measurements, including appropriate technique, number of measurements, and training of healthcare providers in measuring BP to help standardize care and improve utilization of performance measures.
- Technology for measurement of BP continues to evolve. Several ambulatory BP monitoring and home BP monitoring devices, including cuffless devices that incorporate optical BP monitoring algorithms, are available, although out-of-office BP measurements using validated upper-arm devices with appropriately sized cuffs are recommended to confirm the diagnosis of HBP and for titration of BP-lowering medications. Additional data on accuracy, reproducibility, costs, and device comparisons are needed.
- The field would benefit from further research on how improvement in HBP measurement, such as the use of home BP monitoring and use of a standard protocol to measure BP accurately, as incorporated into guideline-based clinical interventions (e.g., AHA and AMA Target: BP), translates into improvement in BP care (26).
- Field testing is needed to determine the utilization of new process and structural quality measures for the future development of new performance measures. This is especially true for lifestyle modifications, shared decision making, and implementation of a standardized protocol to consistently and correctly measure BP.
- Efforts to standardize BP data entry into electronic health records are needed to improve diagnosis and management of HBP. These include entering multiple readings and averages of readings, with electronic health record systems having the ability to perform the averaging function automatically for multiple BP readings within a visit and across ≥2 visits. Future HBP patient registries should include a broader range of races/ethnicities and incorporate data on other socioeconomic determinants of health, as well as patient engagement and activation, to better understand the impact of these variables on medication adherence and BP control.
- Continued research to examine temporal trends and disparities (with respect to sex, race/ethnicity, and socioeconomic status) in the achievement of performance and quality measures is critical for future revisions of

these measure sets. Before adoption of behavioral and motivational strategies as new performance measures, prospective studies evaluating their efficacy in achieving a healthy lifestyle and a standardized process for patient-centered shared decision making for BP control are needed.

- Utilization of new performance measures in public accountability and payment programs is needed. The impact of inclusion of HBP performance measures in pay-for-performance strategies on HBP diagnosis, management, and outcomes should be prospectively evaluated. The impact of compliance with some or all performance measures on hospital quality of care and short- and long-term clinical outcomes should be assessed.
- The HBP performance measures may further evolve on the basis of additional evidence, along with future focused updates and revisions to the 2017 Hypertension Clinical Practice Guidelines.

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KEY WORDS ACC/AHA Performance and Quality Measures, high blood pressure, hypertension, performance measures, quality measures, quality indicators

APPENDIX A. HBP MEASURE SET

Performance Measures for HBP

SHORT TITLE: PM-1A **ACC/AHA Stage 2 HBP Control SBP <140 mm Hg (Harmonizing Measure)**

PM-1a: Percentage of Patients 18 to 85 years of Age Who Had a Diagnosis of ACC/AHA Stage 2 HBP and Whose SBP Was <140 mm Hg During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage 2 HBP with SBP <140 mm Hg (harmonizes with current performance measure "Controlling High Blood Pressure" in widespread use)

Numerator	Patients with SBP <140 mm Hg
Denominator	All patients 18–85 y of age with ACC/AHA stage 2 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	Documentation of a medical reason (e.g., treatment intolerance, significant risk of treatment intolerance, especially for frail patients ≥65 y of age) Documentation of a patient reason (e.g., economic/access issues)
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Effective management of BP in patients with hypertension can help prevent cardiovascular events, including MI, stroke, and the development of HF, and reduce the risk of death from these complications. This performance measure harmonizes with NCQA HEDIS 2019, ICSI, VHA, NQF Measure 0018, Medicaid, Medicare Physician QPP (formerly PQRS), MSSP, Million Hearts, physician feedback/QRUR, physician VBM, QHP, QRS commonly used in payment programs, public reporting, quality improvement (internal to the specific organization), and regulatory and accreditation programs. National average rates of performance have been consistently <70% for several years for HEDIS.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. BP should be categorized as normal, elevated, or stage 1 or 2 hypertension to prevent and treat high BP (27–46). *(Class 1, Level of Evidence: B-NR)*
2. Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions (47–50). *(Class 1, Level of Evidence: A^{SR})*
3. For adults with confirmed hypertension and known CVD or 10-y ASCVD event risk of 10% or higher, a BP target of less than 130/80 mm Hg is recommended (46,51–54). *(Class 1, Level of Evidence: SBP: $B\text{-}R^{SR}$, DBP: C-EO)*
4. For older adults (≥65 y of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit are reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs. *(Class 2a, Level of Evidence: C-EO)*
5. Use of the EHR and patient registries is beneficial for identification of patients with undiagnosed or undertreated hypertension (55–57). *(Class 1, Level of Evidence: B-NR)*
6. Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 y of age) with an average SBP of 130 mm Hg or higher (58). *(Class 1, Level of Evidence: A)*
7. Adults with stage 2 hypertension should be evaluated by or referred to a primary care provider within 1 month of the initial diagnosis, have a combination of nonpharmacological and antihypertensive drug therapy (with 2 agents of different classes) initiated, and have a repeat BP evaluation in 1 month (59,60). *(Class 1, Level of Evidence: B-R)*
8. In adults with an untreated SBP greater than 130 mm Hg but less than 160 mm Hg or DBP greater than 80 mm Hg but less than 100 mm Hg, it is reasonable to screen for the presence of white coat hypertension by using either daytime ABPM or HBPM before diagnosis of hypertension (61–68). *(Class 2a, Level of Evidence: B-NR)*

Resources: 1) Qualified Electronic Health Record (69), 2) PCPI National Quality Registry Network (NQRN) (70). 3) American College of Cardiology Foundation (ACCF) American Heart Association (AHA) Physician Consortium for Performance Improvement (PCPI) Hypertension Performance Measurement Set. 4) NQF Measure 0018 Controlling High Blood Pressure (NCQA) (22).

Additional note: 2017 Hypertension Clinical Practice Guidelines relies on average BP readings. NCQA HEDIS relies on most recent BP reading: The member is numerator compliant if the BP is <140/90 mm Hg. The member is not compliant if the BP is ≥140/90 mm Hg, if there is no BP reading during the measurement year, or if the reading is incomplete (e.g., the systolic or diastolic level is missing). If there are multiple BPs on the same date of service, use the lowest systolic and diastolic BP on that date as the representative BP.

ABPM indicates ambulatory blood pressure monitoring; ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; DBP, diastolic blood pressure; EHR, electronic health record; HBP, high blood pressure; HBPM, home blood pressure monitoring; HEDIS, Healthcare Effectiveness Data and Information Set; HF, heart failure; ICSI, Institute for Clinical Systems Improvement; MI, myocardial infarction; MSSP, Medicare Shared Savings Program; NCQA, National Committee for Quality Assurance; NQF, National Quality Forum; PCPI, Physician Consortium for Performance Improvement; QCDR, Qualified Clinical Data Registry; QHP, Qualified Health Plan; QPP, Quality Payment Program; QRS, Quality Rating System; QRUR, Quality and Resource Use Reports; SBP, systolic blood pressure; VBM, Value-Based Payment Modifier; and VHA, Veterans Health Administration.

APPENDIX A. CONTINUED

SHORT TITLE: PM-1B **ACC/AHA Stage 2 HBP Control SBP <130 mm Hg (Enhancing Measure)**

PM-1b: Percentage of Patients 18 to 85 Years of Age Who Had a Diagnosis of ACC/AHA Stage 2 HBP and Whose SBP Was <130 mm Hg During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage 2 HBP with SBP <130 mm Hg (harmonizes with current performance measure "Controlling High Blood Pressure" in widespread use)

Numerator	Patients with SBP <130 mm Hg
Denominator	All patients 18–85 y of age with ACC/AHA stage 2 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	Documentation of a medical reason (e.g., treatment intolerance, significant risk of treatment intolerance, especially for frail patients ≥65 y of age) Documentation of a patient reason (e.g., economic/access issues)
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Effective management of BP in patients with hypertension can help prevent cardiovascular events, including MI, stroke, and the development of HF, and reduce the risk of death from these complications. This performance measure enhances NCQA HEDIS 2019, ICSI, VHA, NQF Measure 0018, Medicaid, Medicare Physician QPP (formerly PQRS), MSSP, Million Hearts, physician feedback/QRUR, physician VBM, QHP, QRS commonly used in payment programs, public reporting, quality improvement (internal to the specific organization), and regulatory and accreditation programs.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. BP should be categorized as normal, elevated, or stage 1 or 2 hypertension to prevent and treat high BP (27–46). *(Class 1, Level of Evidence: B-NR)*
2. Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions (47–50). *(Class 1, Level of Evidence: A^{SR})*
3. For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher, a BP target of less than 130/80 mm Hg is recommended (46,51–54). *(Class 1, Level of Evidence: SBP: $B\text{-}R^{SR}$, DBP: C-EO)*
4. For older adults (≥65 y of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit are reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs. *(Class 2a, Level of Evidence: C-EO)*
5. Use of the EHR and patient registries is beneficial for identification of patients with undiagnosed or undertreated hypertension (55–57). *(Class 1, Level of Evidence: B-NR)*
6. Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 y of age) with an average SBP of 130 mm Hg or higher (58). *(Class 1, Level of Evidence: A)*
7. Adults with stage 2 hypertension should be evaluated by or referred to a primary care provider within 1 month of the initial diagnosis, have a combination of nonpharmacological and antihypertensive drug therapy (with 2 agents of different classes) initiated, and have a repeat BP evaluation in 1 month (59,60). *(Class 1, Level of Evidence: B-R)*
8. In adults with an untreated SBP greater than 130 mm Hg but less than 160 mm Hg or DBP greater than 80 mm Hg but less than 100 mm Hg, it is reasonable to screen for the presence of white coat hypertension by using either daytime ABPM or HBPM before diagnosis of hypertension (61–68). *(Class 2a, Level of Evidence: B-NR)*

Resources: 1) Qualified Electronic Health Record (69). 2) PCPI National Quality Registry Network (NQRN) (70). 3) American College of Cardiology Foundation (ACCF) American Heart Association (AHA) Physician Consortium for Performance Improvement (PCPI) Hypertension Performance Measurement Set. 4) NQF Measure 0018 Controlling High Blood Pressure (NCQA) (22).

Additional note: 2017 Hypertension Clinical Practice Guidelines relies on average BP readings. NCQA HEDIS relies on most recent BP reading: The member is numerator compliant if the BP is <140/90 mm Hg. The member is not compliant if the BP is ≥140/90 mm Hg, if there is no BP reading during the measurement year, or if the reading is incomplete (e.g., the systolic or diastolic level is missing). If there are multiple BPs on the same date of service, use the lowest systolic and diastolic BP on that date as the representative BP.

ABPM indicates ambulatory blood pressure monitoring; ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; DBP, diastolic blood pressure; EHR, electronic health record; HBP, high blood pressure; HBPM, home blood pressure monitoring; HEDIS, Healthcare Effectiveness Data and Information Set; HF, heart failure; ICSI, Institute for Clinical Systems Improvement; MI, myocardial infarction; MSSP, Medicare Shared Savings Program; NCQA, National Committee for Quality Assurance; NMA, National Medical Association; NQF, National Quality Forum; PCPI, Physician Consortium for Performance Improvement; QCDR, Qualified Clinical Data Registry; QHP, Qualified Health Plan; QPP, Quality Payment Program; QRS, Quality Rating System; QRUR, Quality and Resource Use Reports; SBP, systolic blood pressure; VBM, Value-Based Payment Modifier; and VHA, Veterans Health Administration.

APPENDIX A. CONTINUED

SHORT TITLE: PM-2 **ACC/AHA Stage 1 HBP Control SBP <130 mm Hg (Harmonizing Measure)**

PM-2: Percentage of Patients 18 to 85 Years of Age Who Had a Diagnosis of ACC/AHA Stage 1 HBP and Whose SBP Was <130 mm Hg During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage 1 HBP with SBP <130 mm Hg (harmonizes with current performance measure "Controlling High Blood Pressure" for ACC/AHA stage 2 HBP currently in widespread use)

Numerator	Patients with SBP <130 mm Hg
Denominator	All patients 18–85 y of age with ACC/AHA stage 1 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	Documentation of a medical reason (e.g., treatment intolerance, significant risk of treatment intolerance, especially for frail patients ≥65 y of age) Documentation of a patient reason (e.g., economic/access issues)
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Effective management of BP in patients with hypertension can help prevent cardiovascular events, including MI, stroke, and the development of HF, and reduce the risk of death from these complications. This performance measure harmonizes and supplements the existing measure for stage 2 with NCQA HEDIS 2019 (currently in draft form for public comment), ICSI, VHA, NQF Measure 0018, Medicaid, Medicare Physician QPP (formerly PQRS), MSSP, Million Hearts, physician feedback/QRUR, physician VBM, QHP, QRS commonly used in payment programs, public reporting, quality improvement (internal to the specific organization), and regulatory and accreditation programs. There is currently no HEDIS or other standardized measurement of a national average rate of performance for stage 1 HBP.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. BP should be categorized as normal, elevated, or stage 1 or 2 hypertension to prevent and treat high BP (27–46). *(Class 1, Level of Evidence: B-NR)*
2. Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions (47–50). *(Class 1, Level of Evidence: A^{SR})*
3. For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher, a BP target of less than 130/80 mm Hg is recommended (46,51–54). *(Class 1, Level of Evidence: SBP: $B\text{-}R^{SR}$, DBP: C-EO)*
4. For older adults (≥65 y of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit are reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs. *(Class 2a, Level of Evidence: C-EO)*
5. Use of the EHR and patient registries is beneficial for identification of patients with undiagnosed or undertreated hypertension (55–57). *(Class 1, Level of Evidence: B-NR)*
6. Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 y of age) with an average SBP of 130 mm Hg or higher (58). *(Class 1, Level of Evidence: A)*
7. Adults with stage 2 hypertension should be evaluated by or referred to a primary care provider within 1 month of the initial diagnosis, have a combination of nonpharmacological and antihypertensive drug therapy (with 2 agents of different classes) initiated, and have a repeat BP evaluation in 1 month (59,60). *(Class 1, Level of Evidence: B-R)*
8. In adults with an untreated SBP greater than 130 mm Hg but less than 160 mm Hg or DBP greater than 80 mm Hg but less than 100 mm Hg, it is reasonable to screen for the presence of white coat hypertension by using either daytime ABPM or HBPM before diagnosis of hypertension (61–68). *(Class 2a, Level of Evidence: B-NR)*

Resources: 1) Qualified Electronic Health Record (69). 2) PCPI National Quality Registry Network (NQRN) (70). 3) American College of Cardiology Foundation (ACCF) American Heart Association (AHA) Physician Consortium for Performance Improvement (PCPI) Hypertension Performance Measurement Set. 4) NQF Measure 0018 Controlling High Blood Pressure (NCQA) (22).

Additional note: 2017 Hypertension Clinical Practice Guidelines relies on average BP readings. NCQA HEDIS relies on most recent BP reading: The member is numerator compliant if the BP is <140/90 mm Hg. The member is not compliant if the BP is ≥140/90 mm Hg, if there is no BP reading during the measurement year, or if the reading is incomplete (e.g., the systolic or diastolic level is missing). If there are multiple BPs on the same date of service, use the lowest systolic and diastolic BP on that date as the representative BP.

ABPM indicates ambulatory blood pressure monitoring; ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; DBP, diastolic blood pressure; EHR, electronic health record; HBP, high blood pressure; HBPM, home blood pressure monitoring; HEDIS, Healthcare Effectiveness Data and Information Set; HF, heart failure; ICSI, Institute for Clinical Systems Improvement; MI, myocardial infarction; MSSP, Medicare Shared Savings Program; NCQA, National Committee for Quality Assurance; NQF, National Quality Forum; PCPI, Physician Consortium for Performance Improvement; QCDR, Qualified Clinical Data Registry; QHP, Qualified Health Plan; QPP, Quality Payment Program; QRS, Quality Rating System; QRUR, Quality and Resource Use Reports; SBP, systolic blood pressure; VBM, Value-Based Payment Modifier; and VHA, Veterans Health Administration.

APPENDIX A. CONTINUED

SHORT TITLE: PM-3 | **ACC/AHA Stage 2 and Stage 1 HBP Control SBP <130 mm Hg (Composite Measure Combining PM-1b and PM-2)**

PM-3: Percentage of Patients 18 to 85 years of Age Who Had a Diagnosis of Either ACC/AHA Stage 2 or Stage 1 HBP and Whose SBP Was <130 mm Hg During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage 2 or stage 1 HBP with SBP <130 mm Hg (enhances current performance measure "Controlling High Blood Pressure" in widespread use based on current ACC/AHA guidelines by including patients with ACC/AHA stage 1 HBP)

Numerator	Patients with SBP <130 mm Hg
Denominator	All patients 18–85 y of age with ACC/AHA stage 2 or stage 1 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	Documentation of a medical reason (e.g., treatment intolerance, significant risk of treatment intolerance, especially for frail patients ≥65 y of age) Documentation of a patient reason (e.g., economic/access issues)
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Effective management of BP in patients with hypertension can help prevent cardiovascular events, including MI, stroke, and the development of HF, and reduce the risk of death from these complications. This performance measure harmonizes and supplements the existing measure for stage 2 with NCQA HEDIS 2019 (currently in draft form for public comment), ICSI, VHA, NQF Measure 0018, Medicaid, Medicare Physician QPP (formerly PQRS), MSSP, Million Hearts, physician feedback/QRUR, physician VBM, QHP, QRS commonly used in payment programs, public reporting, quality improvement (internal to the specific organization), and regulatory and accreditation programs. There is currently no HEDIS or other standardized composite measurement of a national average rate of performance for stage 2 and stage 1 HBP combined.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. BP should be categorized as normal, elevated, or stage 1 or 2 hypertension to prevent and treat high BP (27–46). *(Class 1, Level of Evidence: B-NR)*
2. Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions (47–50). *(Class 1, Level of Evidence: A^{SR})*
3. For adults with confirmed hypertension and known CVD or 10-y ASCVD event risk of 10% or higher, a BP target of less than 130/80 mm Hg is recommended (46,51–54). *(Class 1, Level of Evidence: SBP: $B\text{-}R^{SR}$, DBP: C-EO)*
4. For older adults (≥65 y of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit are reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs. *(Class 2a, Level of Evidence: C-EO)*
5. Use of the EHR and patient registries is beneficial for identification of patients with undiagnosed or undertreated hypertension (55–57). *(Class 1, Level of Evidence: B-NR)*
6. Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 y of age) with an average SBP of 130 mm Hg or higher (58). *(Class 1, Level of Evidence: A)*
7. Adults with stage 2 hypertension should be evaluated by or referred to a primary care provider within 1 month of the initial diagnosis, have a combination of nonpharmacological and antihypertensive drug therapy (with 2 agents of different classes) initiated, and have a repeat BP evaluation in 1 month (59,60). *(Class 1, Level of Evidence: B-R)*
8. In adults with an untreated SBP greater than 130 mm Hg but less than 160 mm Hg or DBP greater than 80 mm Hg but less than 100 mm Hg, it is reasonable to screen for the presence of white coat hypertension by using either daytime ABPM or HBPM before diagnosis of hypertension (61–68). *(Class 2a, Level of Evidence: B-NR)*

Resources: 1) Qualified Electronic Health Record (69). 2) PCPI National Quality Registry Network (NQRN) (70). 3) American College of Cardiology Foundation (ACCF) American Heart Association (AHA) Physician Consortium for Performance Improvement (PCPI) Hypertension Performance Measurement Set. 4) NQF Measure 0018 Controlling High Blood Pressure (NCQA) (22).

Additional note: 2017 Hypertension Clinical Practice Guidelines relies on average BP readings. NCQA HEDIS relies on most recent BP reading: The member is numerator compliant if the BP is <140/90 mm Hg. The member is not compliant if the BP is ≥140/90 mm Hg, if there is no BP reading during the measurement year, or if the reading is incomplete (e.g., the systolic or diastolic level is missing). If there are multiple BPs on the same date of service, use the lowest systolic and diastolic BP on that date as the representative BP.

ABPM indicates ambulatory blood pressure monitoring; ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; DBP, diastolic blood pressure; EHR, electronic health record; HBP, high blood pressure; HBPM, home blood pressure monitoring; HEDIS, Healthcare Effectiveness Data and Information Set; HF, heart failure; ICSI, Institute for Clinical Systems Improvement; MI, myocardial infarction; MSSP, Medicare Shared Savings Program; NCQA, National Committee for Quality Assurance; NQF, National Quality Forum; PCPI, Physician Consortium for Performance Improvement; QCDR, Qualified Clinical Data Registry; QHP, Qualified Health Plan; QPP, Quality Payment Program; QRS, Quality Rating System; QRUR, Quality and Resource Use Reports; SBP, systolic blood pressure; VBM, Value-Based Payment Modifier; and VHA, Veterans Health Administration.

APPENDIX A. CONTINUED

SHORT TITLE: PM-4 **Nonpharmacological Interventions for ACC/AHA Stage 2 HBP**

PM-4: Percentage of Adults 18 to 85 Years of Age Who Had a Diagnosis of ACC/AHA Stage 2 HBP Who Have Documentation of a Discussion of Intensive Lifestyle Modification With Their Healthcare Providers During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage 2 HBP who have a documented discussion of intensive lifestyle modification in ≥1 visits during the measurement year	
Numerator	Patients who have a documented discussion of intensive lifestyle modification at least once in the performance year and in accordance with ACC/AHA guidelines on nonpharmacological therapy
Denominator	All patients 18–85 y of age with ACC/AHA stage 2 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	BP readings taken during an inpatient stay
Denominator Exceptions	None
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Nonpharmacological therapy in combination with drug therapy is an integral part of management of ACC/AHA stage 2 hypertension. Prompt and frequent discussion of lifestyle modification among patients with ACC/AHA stage 2 hypertension is important because of the elevated risk of ASCVD events. Dietary modification is a fundamental approach to the prevention and management of hypertension and complements pharmacological management of hypertension. The DASH diet, which is high in fruits, vegetables, potassium, calcium, magnesium, and fiber and low in saturated and total fat, has been demonstrated to be effective in lowering BP. Among those diagnosed with hypertension, the DASH diet produces, on average, overall reductions in SBP and DBP and is particularly effective among black patients (71). Conversely, among blacks, a US Southern-style diet characterized by high intake of fried foods, organ meats, processed meats, added fats, high-fat dairy foods, sugar-sweetened beverages, and bread contributes to the disproportionate burden of hypertension (72). The Mediterranean (73,74), low-carbohydrate (75), high-protein (76), and vegetarian dietary patterns (77) have been demonstrated to lower BP. There is a strong and dose-dependent association between excessive alcohol consumption (>3 standard drinks per day) and BP.

There is strong evidence that adequate physical activity lowers BP. The average reductions in SBP with aerobic exercise are approximately 2–4 mm Hg and 5–8 mm Hg in adult patients who are normotensive and hypertensive, respectively. In patients with elevated BP, weight loss has been demonstrated to lower BP, with a dose-response relationship of about 1 mm Hg per kilogram of weight loss. Among patients who do not achieve weight-loss goals, pharmacological therapy or surgical procedures may be considered, with careful consideration of complications. SDM (78,79) between the provider and patient should be considered in selecting specific lifestyle interventions, with consideration of the patient's individual values, preferences, socioeconomic status, associated conditions, and comorbidities to enhance adherence to lifestyle modification.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension (80–82). *(Class 1, Level of Evidence: A)*
2. Sodium reduction is recommended for adults with elevated BP or hypertension (83–87). *(Class 1, Level of Evidence: A)*
3. Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion (88–92). *(Class 1, Level of Evidence: A)*
4. Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks* per day, respectively (93–98). *(Class 1, Level of Evidence: A)*
5. Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension (87,99–105). *(Class 1, Level of Evidence:*
6. Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese (99,100,106,107). *(Class 1, Level of Evidence: A)*
7. Effective behavioral and motivational strategies to achieve a healthy lifestyle (i.e., tobacco cessation, weight loss, moderation in alcohol intake, increased physical activity, reduced sodium intake, and consumption of a healthy diet) are recommended for adults with hypertension (108,109). *(Class 1, Level of Evidence: C-EO)*

*In the United States, 1 "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CKD, chronic kidney disease; DASH, Dietary Approaches to Stop Hypertension; DBP, diastolic blood pressure; HBP, high blood pressure; QCDR, Qualified Clinical Data Registry; SBP, systolic blood pressure; and SDM, shared decision making.

APPENDIX A. CONTINUED

SHORT TITLE: PM-5 **Use of HBPM for Management of ACC/AHA Stage 2 HBP**

PM-5: Use of HBPM for Management of ACC/AHA Stage 2 HBP

Measure Description: Percentage of patients who had a diagnosis of ACC/AHA stage 2 HBP for whom HBPM is recommended and HBPM data are documented in the patient record

Numerator	Documentation of home BP readings in the medical record
Denominator	All patients 18–85 y of age who had a diagnosis of ACC/AHA stage 2 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	Documentation of a patient reason (e.g., economic issues, refusal, cognitive deficits)
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

HBPM or self-monitoring of BP refers to the regular measurement of BP by an individual at home or elsewhere outside the clinic setting. Home-based measurement has been found to be a better predictor of cardiovascular risk than clinic-based measurement. Evidence also suggests that home-based BP measurement in combination interventions with telemedicine with nurse- or pharmacist-led care may be effective for improving hypertension management.

Procedures for Use of HBPM (4)

Patient training should occur under medical supervision, including:
- Information about hypertension
- Selection of equipment
- Acknowledgment that individual BP readings may vary substantially
- Interpretation of results

Devices:
- Verify use of automated validated devices. Use of auscultatory devices (mercury, aneroid, or other) is not generally useful for HBPM because patients rarely master the technique required for measurement of BP with auscultatory devices.
- Monitors with provision for storage of readings in memory are preferred.
- Verify use of appropriate cuff size to fit the arm.
- Verify that left/right inter-arm differences are insignificant. If differences are significant, instruct patient to measure BPs in the arm with higher readings.

Instructions on HBPM procedures:
- Remain still:
  - Avoid smoking, caffeinated beverages, or exercise within 30 min before BP measurements.
  - Ensure ≥5 min of quiet rest before BP measurements.
- Sit correctly:
  - Sit with back straight and supported (on a straight-backed dining chair, for example, rather than a sofa).
  - Sit with feet flat on the floor and legs uncrossed.
  - Keep arm supported on a flat surface (such as a table), with the upper arm at heart level.
- Bottom of the cuff should be placed directly above the antecubital fossa (bend of the elbow).
- Take multiple readings:
  - Take at least 2 readings 1 min apart in morning before taking medications and in evening before supper. Optimally, measure and record BP daily. Ideally, obtain weekly BP readings beginning 2 wk after a change in the treatment regimen and during the week before a clinic visit.
- Record all readings accurately:
  - Monitors with built-in memory should be brought to all clinic appointments.
  - BP should be based on an average of readings on ≥2 occasions for clinical decision making.

Clinical Recommendation

2017 Hypertension Clinical Practice Guidelines (4)

1. Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions (47-50). *(Class 1, Level of Evidence: A^{SR})*

ACC indicates American College of Cardiology; AHA, American Heart Association; BP, blood pressure; HBP, high blood pressure; HBPM, home blood pressure monitoring; and QCDR, Qualified Clinical Data Registry.

APPENDIX A. CONTINUED

Process Quality Measures

SHORT TITLE: QM-1 **Nonpharmacological Interventions for ACC/AHA Stage Elevated BP**

QM-1: Percentage of Adults 18 to 85 Years of Age Who Had a Diagnosis of ACC/AHA Stage Elevated BP Who Have a Documented Discussion of Intensive Lifestyle Modification in ≥1 Visits During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage elevated BP who have a documented discussion of intensive lifestyle modification in ≥1 visits during the measurement year

Numerator	Patients who have a documented discussion of intensive lifestyle modification at least once in the performance year and in accordance with ACC/AHA guidelines on nonpharmacological therapy
Denominator	All patients 18–85 y of age who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	Pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	None
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Effective management of elevated BP requires intensive lifestyle modification. In those diagnosed with elevated BP, nonpharmacological therapy is useful in preventing ACC/AHA stage 1 or 2 hypertension. Dietary modification is a fundamental approach to the prevention and management of elevated BP and complements pharmacological management of hypertension. The DASH diet, which is high in fruits, vegetables, potassium, calcium, magnesium, and fiber and low in saturated and total fat, has been demonstrated to be effective in lowering BP. Among those diagnosed with hypertension, the DASH diet produces, on average, overall reductions in SBP and is particularly effective among black patients (71). Conversely, among blacks, a US Southern-style diet characterized by high intake of fried foods, organ meats, processed meats, added fats, high-fat dairy foods, sugar-sweetened beverages, and bread contributes to the disproportionate burden of hypertension (72). The Mediterranean (73,74), low-carbohydrate (75), high-protein (76), and vegetarian dietary patterns (77) have been demonstrated to lower BP. There is a strong and dose-dependent association between excessive alcohol consumption (>3 standard drinks per day) and BP.

There is strong evidence that adequate physical activity lowers BP. The average reductions in SBP with aerobic exercise are approximately 2–4 mm Hg and 5–8 mm Hg in adult patients who are normotensive and hypertensive, respectively. In patients with ACC/AHA elevated BP, weight loss has been demonstrated to lower BP, with a dose-response relationship of about 1 mm Hg per kilogram of weight loss. Among patients who do not achieve weight-loss goals, pharmacological therapy or surgical procedures may be considered, with careful consideration of complications. SDM (78,79) between the provider and patient should be considered in selecting specific lifestyle interventions, with consideration of the patient's individual values, preferences, socioeconomic status, associated conditions, and comorbidities to enhance adherence to lifestyle modification.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension (80–82). *(Class 1, Level of Evidence: A)*
2. Sodium reduction is recommended for adults with elevated BP or hypertension (83–87). *(Class 1, Level of Evidence: A)*
3. Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion (88–92). *(Class 1, Level of Evidence: A)*
4. Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks* per day, respectively (93–98). *(Class 1, Level of Evidence: A)*
5. Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension (87,99–105). *(Class 1, Level of Evidence: A)*
6. Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese (99,100,106,107). *(Class 1, Level of Evidence: A)*
7. Effective behavioral and motivational strategies to achieve a healthy lifestyle (i.e., tobacco cessation, weight loss, moderation in alcohol intake, increased physical activity, reduced sodium intake, and consumption of a healthy diet) are recommended for adults with hypertension (108,109). *Class 1, Level of Evidence: C-EO)*
8. Adults with an elevated BP or stage 1 hypertension who have an estimated 10-y ASCVD risk less than 10% should be managed with nonpharmacological therapy and have a repeat BP evaluation within 3 to 6 months (59,60). *(Class 1, Level of Evidence: B-R)*

*In the United States, 1 "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CKD, chronic kidney disease; DASH, Dietary Approaches to Stop Hypertension; HBP, high blood pressure; QCDR, Qualified Clinical Data Registry; SBP, systolic blood pressure; and SDM, shared decision making.

APPENDIX A. CONTINUED

SHORT TITLE: QM-2 **Nonpharmacological Interventions for ACC/AHA Stage 1 HBP**

QM-2: Percentage of Adults 18 to 85 Years of Age Who Had a Diagnosis of ACC/AHA Stage 1 HBP Who Have a Documented Discussion of Intensive Lifestyle Modification in ≥1 Visits During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage 1 HBP who have a documented discussion of intensive lifestyle modification in ≥1 visits during the measurement year	
Numerator	Patients who have a documented discussion of intensive lifestyle modification at least once in the performance year and in accordance with ACC/AHA guidelines on nonpharmacological therapy
Denominator	All patients 18–85 y of age with ACC/AHA stage 1 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	Pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	None
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Effective management of ACC/AHA stage 1 hypertension requires intensive lifestyle modification. Among patients with ACC/AHA stage 1 hypertension with ASCVD risk ≥10%, nonpharmacological therapy should be used in addition to pharmacological therapy as first-line therapy. Lifestyle modification is also a fundamental approach to prevention and management of ACC/AHA stage 1 BP and complements pharmacological management of hypertension. The DASH diet, which is high in fruits, vegetables, potassium, calcium, magnesium, and fiber and low in saturated and total fat, has been demonstrated to be effective in lowering BP. Among those diagnosed with hypertension, the DASH diet produces, on average, overall reductions in SBP and is particularly effective among black patients (71). Conversely, among blacks, a US Southern-style diet characterized by high intake of fried foods, organ meats, processed meats, added fats, high-fat dairy foods, sugar-sweetened beverages, and bread contributes to the disproportionate burden of hypertension (72). The Mediterranean (73,74), low-carbohydrate (75), high-protein (76), and vegetarian dietary patterns (77) have been demonstrated to lower BP. There is a strong and dose-dependent association between excessive alcohol consumption (>3 standard drinks per day) and BP.

There is strong evidence that adequate physical activity lowers BP. The average reductions in SBP with aerobic exercise are approximately 2–4 mm Hg and 5–8 mm Hg in adult patients who are normotensive and hypertensive, respectively. In patients with elevated BP, weight loss has been demonstrated to lower BP, with a dose-response relationship of about 1 mm Hg per kilogram of weight loss. Among patients who do not achieve weight-loss goals, pharmacological therapy or surgical procedures may be considered, with careful consideration of complications. SDM (78,79) between the provider and patient should be considered in selecting specific lifestyle interventions, with consideration of the patient's individual values, preferences, socioeconomic status, associated conditions, and comorbidities to enhance adherence to lifestyle modification.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension (80–82). *(Class 1, Level of Evidence: A)*
2. Sodium reduction is recommended for adults with elevated BP or hypertension (83–87). *(Class 1, Level of Evidence: A)*
3. Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion (88–92). *(Class 1, Level of Evidence: A)*
4. Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks* per day, respectively (93–98). *(Class 1, Level of Evidence: A)*
5. Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension (87,99–105). *(Class 1, Level of Evidence: A)*
6. Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese (99,100,106,107). *(Class 1, Level of Evidence: A)*
7. Effective behavioral and motivational strategies to achieve a healthy lifestyle (i.e., tobacco cessation, weight loss, moderation in alcohol intake, increased physical activity, reduced sodium intake, and consumption of a healthy diet) are recommended for adults with hypertension (108,109). *(Class 1, Level of Evidence: C-EO)*
8. Adults with an elevated BP or stage 1 hypertension who have an estimated 10-y ASCVD risk less than 10% should be managed with nonpharmacological therapy and have a repeat BP evaluation within 3 to 6 months (59,60). *(Class 1, Level of Evidence: B-R)*
9. Adults with stage 1 hypertension who have an estimated 10-y ASCVD risk of 10% or higher should be managed initially with a combination of nonpharmacological and antihypertensive drug therapy and have a repeat BP evaluation in 1 month (59,60). *(Class 1, Level of Evidence: B-R)*

*In the United States, 1 "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CKD, chronic kidney disease; DASH, Dietary Approaches to Stop Hypertension; HBP, high blood pressure; QCDR, Qualified Clinical Data Registry; SBP, systolic blood pressure; and SDM, shared decision making.

APPENDIX A. CONTINUED

SHORT TITLE: QM-3 **Nonpharmacological Interventions for All ACC/AHA Stages of HBP (Composite Measure Combining PM-4, QM-1, and QM-2)**

QM-3: Percentage of Adults 18 to 85 Years of Age Who Had a Diagnosis of Any ACC/AHA Stage of HBP (Elevated BP, Stage 1 HBP, or Stage 2 HBP) Who Have a Documented Discussion of Intensive Lifestyle Modification in ≥1 Visits During the Measurement Year

Measure Description: Percentage of patients with any ACC/AHA stage of HBP (elevated BP, stage 1 HBP, or stage 2 HBP) who have a documented discussion of intensive lifestyle modification in ≥1 visits during the measurement year

Numerator	Patients who have a documented discussion of intensive lifestyle modification at least once in the performance year and in accordance with ACC/AHA guidelines on nonpharmacological therapy
Denominator	All patients 18–85 y of age with any ACC/AHA stage of HBP (elevated BP, stage 1 HBP, or stage 2 HBP) who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	BP readings taken during an inpatient stay
Denominator Exceptions	None
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Effective management of HBP requires intensive lifestyle modification. Dietary modification is a fundamental approach to prevention and management of elevated BP and complements pharmacological management of hypertension. The DASH diet, which is high in fruits, vegetables, potassium, calcium, magnesium, and fiber and low in saturated and total fat, has been demonstrated to be effective in lowering BP. Among those diagnosed with hypertension, the DASH diet produces, on average, overall reductions in SBP and is particularly effective among black patients (71). Conversely, among blacks, a US Southern-style diet characterized by high intake of fried foods, organ meats, processed meats, added fats, high-fat dairy foods, sugar-sweetened beverages, and bread contributes to the disproportionate burden of hypertension (72). The Mediterranean (73,74), low-carbohydrate (75), high-protein (76), and vegetarian dietary patterns (77) have been demonstrated to lower BP. There is a strong and dose-dependent association between excessive alcohol consumption (>3 standard drinks per day) and BP.

There is strong evidence that adequate physical activity lowers BP. The average reductions in SBP with aerobic exercise are approximately 2–4 mm Hg and 5–8 mm Hg in adult patients who are normotensive and hypertensive, respectively. In patients with elevated BP, weight loss has been demonstrated to lower BP, with a dose-response relationship of about 1 mm Hg per kilogram of weight loss. Among patients who do not achieve weight-loss goals, pharmacological therapy or surgical procedures may be considered, with careful consideration of complications. SDM (78,79) between the provider and patient should be considered in selecting specific lifestyle interventions, with consideration of the patient's individual values, preferences, socioeconomic status, associated conditions, and comorbidities to enhance adherence to lifestyle modification.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension (80–82). *(Class 1, Level of Evidence: A)*
2. Sodium reduction is recommended for adults with elevated BP or hypertension (83–87). *(Class 1, Level of Evidence: A)*
3. Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion (88–92). *(Class 1, Level of Evidence: A)*
4. Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks* per day, respectively (93–98). *(Class 1, Level of Evidence: A)*
5. Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension (87,99–105). *(Class 1, Level of Evidence: A)*
6. Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese (99,100,106,107). *(Class 1, Level of Evidence: A)*
7. Effective behavioral and motivational strategies to achieve a healthy lifestyle (i.e., tobacco cessation, weight loss, moderation in alcohol intake, increased physical activity, reduced sodium intake, and consumption of a healthy diet) are recommended for adults with hypertension (108,109). *(Class 1, Level of Evidence: C-EO)*
8. Adults with an elevated BP or stage 1 hypertension who have an estimated 10-y ASCVD risk less than 10% should be managed with nonpharmacological therapy and have a repeat BP evaluation within 3 to 6 months (59,60). *(Class 1, Level of Evidence: B-R)*
9. Adults with stage 1 hypertension who have an estimated 10-y ASCVD risk of 10% or higher should be managed initially with a combination of nonpharmacological and antihypertensive drug therapy and have a repeat BP evaluation in 1 month (59,60). *(Class 1, Level of Evidence: B-R)*

*In the United States, 1 "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CKD, chronic kidney disease; DASH, Dietary Approaches to Stop Hypertension; HBP, high blood pressure; QCDR, Qualified Clinical Data Registry; SBP, systolic blood pressure; and SDM, shared decision making.

APPENDIX A. CONTINUED

SHORT TITLE: QM-4 **Medication Adherence to Drug Therapy for ACC/AHA Stage 1 With ASCVD Risk ≥10% or ACC/AHA Stage 2 HBP**

QM-4: Percentage of Adults 18 to 85 Years of Age Who Had a Diagnosis of ACC/AHA Stage 1 HBP With ASCVD Risk ≥10% or ACC/AHA Stage 2 HBP With ≥1 Prescriptions for BP Medication Who Had ≥80% Adherence to BP Medication(s) During the Measurement Year

Measure Description: Percentage of patients with ACC/AHA stage 1 HBP and ASCVD risk ≥10% or ACC/AHA stage 2 HBP who had ≥80% adherence to prescribed BP medication(s) during the measurement year

Numerator	Patients with ≥1 prescriptions for BP medication(s) who met the PDC threshold of ≥80% during the measurement year
Denominator	All patients 18–85 y of age with ACC/AHA stage 1 HBP and ASCVD risk ≥10% or ACC/AHA stage 2 HBP who had at least 1 outpatient encounter with a diagnosis of HBP and had ≥1 or more prescriptions for BP medications during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay, patients solely on nonpharmacological therapy
Denominator Exceptions	Documentation of a medical reason (e.g., treatment intolerance, significant risk of treatment intolerance, especially for frail patients ≥65 y of age)Documentation of a patient reason (e.g., economic/access issues)
Measurement Period	12 mo/measurement year
Sources of Data	Medicaid claims data, commercial claims data, Medicare claims data, Tricare claims data
Attribution	Physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

Adherence to drug therapy lowers BP and reduces the risk of cardiovascular events and death (110–112). As many as 50% to 80% of patients prescribed antihypertensive medications demonstrate suboptimal adherence (113). Adherence to drug therapy is influenced by several interrelated factors, including large pill burden, complex drug regimen, cost of medications, side effects of multidrug antihypertensive regimens, poor patient-provider relationship, and clinical inertia (114).

No single strategy has been found to be more effective than others in improving adherence, but rather, a combination of patient-level, provider-level, and system-level strategies is likely to be the most effective. Medication adherence is highest with once-daily dosing and declines within increasing dosing frequency (115,116). Medication adherence tools, such as the Hill-Bone Compliance to HBP Therapy Scale (117), may be used to identify barriers to medication adherence, in combination with other more objective methods, such as pill counts and data on medication refills. PDC is one of the most popular methods to calculate medication adherence and is endorsed and validated by the PQA as a high-quality measure of medication adherence (118,119).*

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

1. In adults with hypertension, dosing of antihypertensive medication once daily rather than multiple times daily is beneficial to improve adherence (115,116,120). *(Class 1, Level of Evidence: B-R)*
2. Adults initiating a new or adjusted drug regimen for hypertension should have a follow-up evaluation of adherence and response to treatment at monthly intervals until control is achieved (59,60,121). *(Class 1, Level of Evidence: B-R)*
3. Use of BP-lowering medications is recommended for secondary prevention of recurrent CVD events in patients with clinical CVD and an average SBP of 130 mm Hg or higher or an average DBP of 80 mm Hg or higher, and for primary prevention in adults with an estimated 10-y atherosclerotic cardiovascular disease (ASCVD) risk of 10% or higher and an average SBP 130 mm Hg or higher or an average DBP 80 mm Hg or higher (29,37,42,43,46,122–125). *(Class 1, Level of Evidence: SBP: A, DBP: C-EO)*
4. Use of BP-lowering medication is recommended for primary prevention of CVD in adults with no history of CVD and with an estimated 10-y ASCVD risk <10% and an SBP of 140 mm Hg or higher or a DBP of 90 mm Hg or higher (39,125–128). *(Class 1, Level of Evidence: C-LD)*
5. Initiation of antihypertensive drug therapy with 2 first-line agents of different classes, either as separate agents or in a fixed-dose combination, is recommended in adults with stage 2 hypertension and an average BP more than 20/10 mm Hg above their BP target. *(Class 1, Level of Evidence: C-EO)*
6. Use of combination pills rather than free individual components can be useful to improve adherence to antihypertensive therapy (129–132). *(Class 2a, Level of Evidence: B-NR)*
7. Initiation of antihypertensive drug therapy with a single antihypertensive drug is reasonable in adults with stage 1 hypertension and BP goal <130/80 mm Hg with dosage titration and sequential addition of other agents to achieve the BP target. *(Class 2a, Level of Evidence: C-EO)*

*We encourage stratification by clinically relevant subsets, such as stage 1 with ASCVD risk ≥10, or stage 2, for quality improvement efforts.

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; DBP, diastolic blood pressure; HBP, high blood pressure; PDC, proportion of days covered; PQA, Pharmacy Quality Alliance; and SBP, systolic blood pressure.

APPENDIX A. CONTINUED

SHORT TITLE: QM-5 **Use of HBPM for Management of ACC/AHA Stage 1 HBP**

QM-5: Use of HBPM for Management of ACC/AHA Stage 1 HBP

Measure Description: Percentage of patients 18–85 y of age who had a diagnosis of ACC/AHA stage 1 HBP for whom HBPM is recommended and HBPM data are documented in the patient record

Numerator	Documentation of home BP readings in the medical record
Denominator	All patients 18–85 y of age with ACC/AHA stage 1 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	None
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

HBPM or self-monitoring of BP refers to the regular measurement of BP by an individual at home or elsewhere outside the clinic setting. Home-based measurement has been found to be a better predictor of cardiovascular risk than clinic-based measurement. Evidence also suggests that home-based BP measurement in combination interventions with telemedicine with nurse- or pharmacist-led care may be effective for improving hypertension management.

Recommended procedures for the collection of HBPM data are as follows (4):

Patient training should occur under medical supervision, including:
- Information about hypertension
- Selection of equipment
- Acknowledgment that individual BP readings may vary substantially
- Interpretation of results

Devices:
- Verify use of automated validated devices. Use of auscultatory devices (mercury, aneroid, or other) is not generally useful for HBPM because patients rarely master the technique required for measurement of BP with auscultatory devices.
- Monitors with provision for storage of readings in memory are preferred.
- Verify use of appropriate cuff size to fit the arm.
- Verify that left/right inter-arm differences are insignificant. If differences are significant, instruct patient to measure BPs in the arm with higher readings.

Instructions on HBPM procedures:
- Remain still:
  - Avoid smoking, caffeinated beverages, or exercise within 30 min before BP measurements.
  - Ensure ≥5 min of quiet rest before BP measurements.
- Sit correctly:
  - Sit with back straight and supported (on a straight-backed dining chair, for example, rather than a sofa).
  - Sit with feet flat on the floor and legs uncrossed.
  - Keep arm supported on a flat surface (such as a table), with the upper arm at heart level.
- Bottom of the cuff should be placed directly above the antecubital fossa (bend of the elbow).
- Take multiple readings:
  - Take at least 2 readings 1 min apart in morning before taking medications and in evening before supper. Optimally, measure and record BP daily. Ideally, obtain weekly BP readings beginning 2 wk after a change in the treatment regimen and during the week before a clinic visit.
- Record all readings accurately:
  - Monitors with built-in memory should be brought to all clinic appointments.
  - BP should be based on an average of readings on ≥2 occasions for clinical decision making.

Clinical Recommendation

2017 Hypertension Clinical Practice Guidelines (4)

1. Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions (47–50). *(Class 1, Level of Evidence: A^{SR})*

ACC indicates American College of Cardiology; AHA, American Heart Association; BP, blood pressure; HBP, high blood pressure; HBPM, home blood pressure monitoring; and QCDR, Qualified Clinical Data Registry.

APPENDIX A. CONTINUED

SHORT TITLE: QM-6 | **Use of HBPM for Management of ACC/AHA Stage 1 or ACC/AHA Stage 2 (Composite Measure Combining PM-5 and QM-5)**

QM-6: Use of HBPM for Management of ACC/AHA Stage 1 HBP or ACC/AHA Stage 2 HBP (Composite Measure Combining PM-5 and Process QM-5)

Measure Description: Percentage of patients 18–85 y of age who had a diagnosis of either ACC/AHA stage 1 HBP or ACC/AHA stage 2 HBP for whom HBPM is recommended and HBPM data are documented in the patient record

Numerator	Documentation of home BP readings in the medical record
Denominator	All patients 18–85 y of age who had a diagnosis of either ACC/AHA stage 1 HBP or ACC/AHA stage 2 HBP who had at least 1 outpatient encounter with a diagnosis of HBP during the first 6 mo of the measurement year or any time before the measurement period
Denominator Exclusions	End-stage renal disease, kidney transplantation, pregnancy, BP readings taken during an inpatient stay
Denominator Exceptions	None
Measurement Period	12 mo/measurement year
Sources of Data	Paper medical record/prospective data collection flow sheet, Qualified Electronic Health Record, QCDR, electronic administrative data (claims), expanded (multiple source) administrative data, electronically or telephonically transmitted BP readings
Attribution	Healthcare provider (healthcare provider, physician group practice, accountable care organization, clinically integrated network, health plan, integrated delivery system)
Care Setting	Outpatient (office, clinic, home, or ambulatory)

Rationale

HBPM or self-monitoring of BP refers to the regular measurement of BP by an individual at home or elsewhere outside the clinic setting. Home-based measurement has been found to be a better predictor of cardiovascular risk than clinic-based measurement. Evidence also suggests that home-based BP measurement in combination interventions with telemedicine with nurse- or pharmacist-led care may be effective for improving hypertension management.

Recommended procedures for the collection of HBPM data are as follows (4):

Patient training should occur under medical supervision, including:
- Information about hypertension
- Selection of equipment
- Acknowledgment that individual BP readings may vary substantially
- Interpretation of results

Devices:
- Verify use of automated validated devices. Use of auscultatory devices (mercury, aneroid, or other) is not generally useful for HBPM because patients rarely master the technique required for measurement of BP with auscultatory devices.
- Monitors with provision for storage of readings in memory are preferred.
- Verify use of appropriate cuff size to fit the arm.
- Verify that left/right inter-arm differences are insignificant. If differences are significant, instruct patient to measure BPs in the arm with higher readings.

Instructions on HBPM procedures:
- Remain still:
  - Avoid smoking, caffeinated beverages, or exercise within 30 min before BP measurements.
  - Ensure ≥5 min of quiet rest before BP measurements.
- Sit correctly:
  - Sit with back straight and supported (on a straight-backed dining chair, for example, rather than a sofa).
  - Sit with feet flat on the floor and legs uncrossed.
  - Keep arm supported on a flat surface (such as a table), with the upper arm at heart level.
- Bottom of the cuff should be placed directly above the antecubital fossa (bend of the elbow).
- Take multiple readings:
  - Take at least 2 readings 1 min apart in morning before taking medications and in evening before supper. Optimally, measure and record BP daily. Ideally, obtain weekly BP readings beginning 2 wk after a change in the treatment regimen and during the week before a clinic visit.
- Record all readings accurately:
  - Monitors with built-in memory should be brought to all clinic appointments.
  - BP should be based on an average of readings on ≥2 occasions for clinical decision making.

Clinical Recommendation

2017 Hypertension Clinical Practice Guidelines (4)

1. Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions (47-50). *(Class 1, Level of Evidence: A^{SR})*

ACC indicates American College of Cardiology; AHA, American Heart Association; BP, blood pressure; HBP, high blood pressure; HBPM, home blood pressure monitoring; and QCDR, Qualified Clinical Data Registry.

APPENDIX A. CONTINUED

Structural Quality Measures

The Structural Quality Measure domain should be considered to be at the CDU level (can be a physician group practice, accountable care organization, clinically integrated network, health plan, or integrated delivery system), as opposed to the specific patient or physician/clinician level. The goal will be to guide and motivate CDUs to implement and evaluate these specific guideline recommendations to improve the various and necessary evidence-based components of a guideline-driven system of care and accompanying infrastructure needed for effective identification and management of patients with HBP.

Diagnosis, Assessment, and Accurate Measurement

SM-1: Use of a Standard Protocol to Consistently and Correctly Measure BP in the Ambulatory Setting

Measure Components	**The CDU uses a standard process/protocol for properly measuring BP consistently and correctly, including:** ■ Adoption and implementation of a protocol for accurate measurement and documentation of BP. ■ Availability of staff who are trained in measurement and documentation of BP. ■ Documentation of staff assessment of correct BP measurement skill.
Elements	Protocol includes preassessment tools, checklists, and metrics to assess gaps in care. Certification of staff in correct BP measurement skills.
Recommended Protocol	2017 Hypertension Clinical Practice Guidelines (4). Blood Pressure Assessment in Adults in Clinical Practice and Clinic-Based Research (133).
Documentation	**Documenting the implementing protocols may impose additional burdens on HCOs. Potential options to consider:** ■ Attestation, self-reported information ■ External auditor/rater ■ Competency testing

Rationale

Accurate measurement and recording of BP are essential to categorize level of BP, ascertain BP-related ASCVD risk, and guide management of high BP. Office BP measurement is often unstandardized, despite the well-known consequences of inaccurate measurement. Errors are common and can result in a misleading estimation of an individual's true level of BP if staff are not trained and a protocol is not followed. The use of automated office BP measurements should be considered as part of the protocol for accurate measurement (134).

Checklist for Accurate Measurement of BP (135,136)

Key Steps for Proper BP Measurements
Specific Instructions:
Step 1: Properly prepare the patient
1. Have the patient relax, sitting in a chair (feet on floor, back supported) for >5 min.
2. The patient should avoid caffeine, exercise, and smoking for at least 30 min before measurement.
3. Ensure patient has emptied his/her bladder.
4. Neither the patient nor the observer should talk during the rest period or during the measurement.
5. Remove all clothing covering the location of cuff placement.
6. Measurements made while the patient is sitting or lying on an examining table do not fulfill these criteria.

Step 2: Use proper technique for BP measurements
1. Use a BP measurement device that has been validated, and ensure that the device is calibrated periodically.
2. Support the patient's arm (e.g., resting on a desk).
3. Position the middle of the cuff on the patient's upper arm at the level of the right atrium (the midpoint of the sternum).
4. Use the correct cuff size, such that the bladder encircles 80% of the arm, and note if a larger- or smaller-than-normal cuff size is used.
5. Either the stethoscope diaphragm or bell may be used for auscultatory readings (137,138).

Step 3: Take the proper measurements needed for diagnosis and treatment of elevated BP/hypertension
1. At the first visit, record BP in both arms. Use the arm that gives the higher reading for subsequent readings.
2. Separate repeated measurements by 1–2 min.
3. For auscultatory determinations, use a palpated estimate of radial pulse obliteration pressure to estimate SBP. Inflate the cuff 20–30 mm Hg above this level for an auscultatory determination of the BP level.
4. For auscultatory readings, deflate the cuff pressure 2 mm Hg per second, and listen for Korotkoff sounds.

Step 4: Properly document accurate BP readings
1. Record SBP and DBP. If using the auscultatory technique, record SBP and DBP as onset of the first Korotkoff sound and disappearance of all Korotkoff sounds, respectively, using the nearest even number.
2. Note the time of most recent BP medication taken before measurements.

Step 5: Average the readings
1. Use an average of ≥2 readings obtained on ≥2 occasions to estimate the individual's level of BP.

Step 6: Provide BP readings to patient
1. Provide patients the SBP/DBP readings both verbally and in writing.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)
Recommendation for Accurate Measurement of BP in the Office (Guideline Section 4)
1. For diagnosis and management of high BP, proper methods are recommended for accurate measurement and documentation of BP. *(Class 1, Level of Evidence: C-EO)*

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CDU, care delivery unit; DBP, diastolic blood pressure; HCO, home care organization; QCDR, Qualified Clinical Data Registry; and SBP, systolic blood pressure.

APPENDIX A. CONTINUED

SM-2: Use of a Standard Process for Assessing ASCVD Risk

Measure Components	**The CDU uses a standard process/protocol for properly measuring/assessing ASCVD risk, including:** 1. **Measurement of ASCVD Risk** a. Use of ACC/AHA Risk Estimator (139,140) is recommended. Others may be used as alternatives when evaluated in the population seen clinically. b. Healthcare providers identify the health provider responsible for insuring competency and implementation of risk assessment in practice. 2. **Incorporation Into Record** a. Baseline risk should be part of patient demographics and included in each note when BP is 130–139/80–89 mm Hg, with indication of how it is used in defining treatment strategy. b. EMR for systems (e.g., Epic, Cerner) should be requested to automatically place cardiovascular risk assessment in the patient record as part of vital signs. 3. **Confirmation of Patient–Clinician Discussion** a. The risk assessment used in the patient-clinician discussion should be entered 1) directly by EHR (e.g., Epic, Cerner) or 2) by physician or other healthcare provider as part of documentation of the discussion. b. Patients should be knowledgeable about their results and, if interested, may be instructed on how to use the mobile ASCVD risk assessment app (139,140).

Rationale

Assessment of cardiovascular risk is the fundamental first step toward developing effective evidence-based therapy for treatment strategies for and shared decision discussions with patients. This includes using this assessment to correctly classify a patient's current stage of HBP in accordance with recommendations from the 2017 Hypertension Clinical Practice Guidelines (4). In general, the ACC/AHA race- and sex-specific PCE (ASCVD Risk Estimator [139,140]) should be used for screening and management of hypertension. The 10-y risk is used for patients without ASCVD who have stage 1 hypertension (130/80–139/89 mm Hg) to determine those who should be treated with medical therapy (10-y risk >10%) and those who should who should be managed with nonpharmacological therapy (10-y risk <10%). Patients should know their current cardiovascular risk and how it relates to decisions about their therapy.

Observational studies have demonstrated that ASCVD risk factors frequently occur in combination, with ≥3 risk factors present in 17% of patients (141). A meta- analysis from 18 cohort studies involving 257 384 patients identified a lifetime risk of ASCVD death, nonfatal MI, and fatal or nonfatal stroke that was substantially higher in adults with ≥2 ASCVD risk factors than in those with only 1 risk factor (141,142).

To facilitate decisions about preventive interventions, it is recommended to screen for traditional ASCVD risk factors and apply the race- and sex-specific PCE (ASCVD Risk Estimator [139,140]) to estimate 10-y ASCVD risk for asymptomatic adults 40–75 y of age (59,139,140). For management of blood cholesterol, adults should be categorized as having low (<5%), borderline (5% to <7.5%), intermediate (≥7.5% to <20%), or high (≥20%) 10-y risk (143). The PCEs are best validated among non-Hispanic whites and non-Hispanic blacks living in the United States (19,144–147). In other racial/ethnic groups (148,149) or in some non-US populations (148–151), the PCE may over- or under-estimate risk. Therefore, clinicians may consider use of another risk prediction tool, as an alternative to the PCE, if validated in a population with similar characteristics to the evaluated patient. Examples include the general Framingham ASCVD risk score (152), Reynolds risk scores (153,154), SCORE (155), and QRISK/JBS3 (156) tools. Other professional societies have incorporated some of these alternative validated risk scores into their lipid management guidelines or have considered different risk thresholds for preventive interventions (155–160). Although slight differences exist across organizational guidelines, they are all very similar in their overarching goal of matching the intensity of preventive therapies to absolute (generally 10-y) risk of the patient (155–160).

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

Recommendation for Screening and Management of CVD Risk (Guideline Section 2.4)

1. Screening for and management of other modifiable CVD risk factors are recommended in adults with hypertension (141,142). *(Class 1, Level of Evidence: B-NR)*

2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease (14)

Recommendation for ASCVD Risk Assessment (Section 2.2, 2019 Prevention Guideline)

1. For adults 40 to 75 y of age, clinicians should routinely assess traditional cardiovascular risk factors and calculate 10-y risk of ASCVD by using the pooled cohort equations (PCE) (139,140,146). *(Class 1, Level of Evidence: B-NR)*

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CDU, care delivery unit; CVD, cardiovascular disease; DBP, diastolic blood pressure; EHR, electronic health record; HBP, high blood pressure; MI, myocardial infarction; PCE, pooled cohort equations; QCDR, Qualified Clinical Data Registry; and SBP, systolic blood pressure.

APPENDIX A. CONTINUED

SM-3: Use of a Standard Process for Properly Screening All Adults ≥18 Years of Age for HBP (USPSTF)

Measure Components	**The CDU uses a standard process/protocol for properly screening all adults ≥18 years of age for HBP (based on an average of ≥2 BP measurements), including:** 1. Adults ages 18–39 y with office-measured SBP/DBP <120/80 mm Hg who do not have other hypertension risk factors can space out screenings to every 3–5 y (USPSTF) (15). 2. Annual BP screening should be done for adults at increased risk for hypertension, defined as those ≥40 y of age and those <40 y of age who are overweight or obese or black, regardless of age. 3. For adults, the finding of an office BP consistent with hypertension and with SBP/DBP <160/100 mm Hg at an initial visit should be confirmed at a follow-up visit within 1 month, based on an average of ≥2 BP measurements at each visit. 4. 2017 Hypertension Clinical Practice Guidelines Recommendation (4) : In adults with an untreated SBP >130 mm Hg but <160 mm Hg or DBP >80 mm Hg but <100 mm Hg, it is reasonable to screen for the presence of white-coat hypertension by using either daytime ABPM or HBPM before diagnosis of hypertension (61–68). *(Class 2a, Level of Evidence: B-NR)* 5. 2017 Hypertension Clinical Practice Guidelines Recommendation (4): In adults with untreated office BPs that are consistently between 120 mm Hg and 129 mm Hg for SBP or between 75 mm Hg and 79 mm Hg for DBP, screening for masked hypertension with HBPM (or ABPM) is reasonable (61,62,65,67,161). *(Class 2a, Level of Evidence: B-NR)*

Rationale

The evidence for the benefits of screening for HBP is well established. In 2007, the USPSTF reaffirmed its 2003 recommendation to screen for hypertension in adults ≥18 y of age (Grade A recommendation). Previous evidence reviews commissioned by the USPSTF found good-quality evidence that screening for hypertension has few major harms and provides substantial benefits (162,163). However, these reviews did not address the diagnostic accuracy of different BP measurement protocols or identify a reference standard for measurement confirmation. For the present recommendation, the USPSTF examined the diagnostic accuracy of office BP measurement, ABPM, and HBPM. The USPSTF also assessed the accuracy of these BP measurements and methods in confirming the diagnosis of hypertension. In addition, it reviewed data on optimal screening intervals for diagnosing hypertension in adults.

The USPSTF found good evidence that screening for and treatment of HBP has few major harms. The USPSTF concluded with high certainty that the net benefit of screening for HBP in adults is substantial (15). No clinical trials randomly assigned patients to different rescreening intervals and evaluated clinical outcomes. Many observational studies have followed patients over time to determine how many develop hypertension at intervals of 1 to 5 y (15,164).

Clinical Recommendations

USPSTF Final Recommendation Statement on HBP in Adults (15)

1. The USPSTF recommends screening for HBP in adults aged 18 y or older. The USPSTF recommends obtaining measurements outside of the clinical setting for diagnostic confirmation before starting treatment (164). *(USPSTF, Grade A)*

ABPM indicates ambulatory blood pressure monitoring; BP, blood pressure; CDU, care delivery unit; DBP, diastolic blood pressure; HBP, high blood pressure; HBPM, home blood pressure monitoring; SBP, systolic blood pressure; and USPSTF, US Preventive Services Task Force.

APPENDIX A. CONTINUED

SM-4: Use of an EHR to Accurately Diagnose and Assess HBP Control

Measure Components	**The CDU uses an EHR system to obtain data that permit assessment of accurate diagnosis and assessment of HBP control and documentation of ASCVD risk, including:** The EHR/registry vendor should be able to export SDP and DBP measurements associated with ambulatory clinic visits, including the date of service. The CDU should consider a standardized field in which the clinician can document the BP used in decision making and the date of service. The CDU should consider a standardized field to record home BP determinations and ASCVD risk assessment. The EHR/registry vendors should consider creating structured data elements using established, standardized nomenclature.

Rationale

A growing number of health systems are developing or using registries and EHRs that permit large-scale queries to support population health management strategies to identify undiagnosed or undertreated hypertension. Such innovations are implemented as ongoing quality improvement initiatives in clinical practice. To reduce undiagnosed hypertension and improve hypertension management, a multipronged approach may include: 1) application of hypertension screening algorithms to EHR databases to identify at-risk patients, 2) contacting at-risk patients to schedule BP measurements, 3) monthly written feedback to clinicians about at-risk patients who have yet to complete a BP measurement, and 4) electronic prompts for BP measurements whenever at-risk patients visit the clinic (55,57).

Since passage of the Hitech Act, the use of EHRs and registries in clinical practice has become nearly ubiquitous. The purpose of this SM is to provide guidance to the CDU to aid in the identification of patients with elevated BP or stage 1 or stage 2 HBP through the EHR and/or registry.

Previous studies have demonstrated that many patients with elevated BP or stage 1 or stage 2 HBP are undiagnosed with conventional administrative data sets (ICD-10). Use of free-text data searches or structured data searches can facilitate the identification of appropriate patients. In particular, we recommend the use of NQF's denominator exceptions for medical, patient, and system exceptions to improve the accuracy of the data.

The evaluation of structured data will greatly facilitate the accuracy of this hypertension performance measure. The intention of this measure is to promote the accurate collection and analysis of BP and demographics through the EHR by using standards-based tools. Currently, most EHRs and registries do not have a specific mapping of sufficient elements to allow the accurate recording and attribution of BPs.

The intention of this SM is to provide guidance to EHR and registry vendors to support fluid data flow between the EHR and the registry, using existing established structured data elements.

Potential additional benefits and characteristics of using properly configured EHRs and registries include:

1. CDS-based algorithms that support evidence-based guideline recommendations for accurate measurement, risk assessment, diagnosis, classification, and appropriate treatment for patients with or at risk of HBP.
2. Properly vetted reminders and alerts for both clinicians and patients to ensure follow-up appointments, patient engagement, and adherence to GDMT.
3. Compliance with current national interoperability standards to facilitate exchange of information, including the timely transmission of digital data from BP measurement and monitoring devices.
4. Easy extraction of data needed for advanced analytic approaches to accurate classification and treatment of populations with or at risk of HBP.
5. Accurate and automated extraction of necessary data elements for construction, benchmarking, auditing, and feedback to providers and external reporting (e.g., to CMS, NCQA, commercial payers, quality improvement initiatives, and professional society accrediting bodies) of standardized performance and quality measures.
6. Facilitation of internal and external quality improvement initiatives, such as Target: BP (AHA and AMA) and The Million Hearts campaign (HHS, CDC).
7. Documentation of nonclinical data, such as social determinants of health, health literacy, and shared decision making.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

Recommendations for EHR and Patient Registries (Guideline Section 12.3)

1. Use of the EHR and patient registries is beneficial for identification of patients with undiagnosed or undertreated hypertension (55–57). *(Class 1, Level of Evidence: B-NR)*
2. Use of the EHR and patient registries is beneficial for guiding quality improvement efforts designed to improve hypertension control (55–57). *(Class 1, Level of Evidence: B-NR)*

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CDC, Centers for Disease Control and Prevention; CDS, clinical decision support; CDU, care delivery unit; EHR, electronic health record; GDMT, guideline-directed medical therapy/treatment; HBP, high blood pressure; HHS, Health and Human Services; ICD-10, *International Classification of Diseases,* 10th edition; NCQA, National Committee for Quality Assurance; PCE, pooled cohort equations; and SM, structural measure.

APPENDIX A. CONTINUED

A Patient-Centered Approach for Controlling HBP

SM-5: Use of a Standard Process to Engage Patients in Shared Decision-Making, Tailored to Their Personal Benefits, Goals, and Values for Evidence-Based Interventions to Improve Control of HBP

Measure Components	**The CDU uses a standard process/protocol for implementing SDM in clinical settings for patients with HBP, including:** One of the following: ■ Structured decision aids ■■ A formal SDM tool is available, with evidence that it is being routinely used in clinical encounters. ■■ The choice of a decision aid should be informed by a formal quality assessment, as recommended by IPDAS (165). The tool should be published, free of bias, and ideally endorsed by professional organizations. ■■ A process exists whereby patients with hypertension are identified and exposed to the SDM tool. ■■ A formal SDM encounter occurs between the patient and provider using an evidence-based decision tool before initiation or adjustment of GDMT. ■ Communication skills training for providers ■■ A program exists to provide skills in SDM to practitioners, with periodic assessments of providers' skills. ■■ Built-in triggers in EHRs to remind clinicians to provide a decision aid to patients with hypertension. ■■ The use of an SDM tool is documented within the EHR. ■■ A process exists for identifying patients with hypertension who have not participated in SDM so that such a process can be offered.
Rationale	
Decisions about primary prevention should be collaborative between a clinician and a patient. SDM occurs when practitioners engage patients in discussions about personalized ASCVD risk estimates and their implications on the perceived benefits of preventive strategies, including lifestyle habits, goals, and medical therapies. Collaborative decisions are more likely to address potential barriers to treatment options (166–169). SDM is defined as "an approach where clinician and patients share the best available evidence when faced with the task of making decisions, and where patients are supported to consider options, to achieve informed preferences." (79,170); It draws on the principles of patient-centered care to increase patient commitment to treatment plans, including long-term adherence to drug therapy and lifestyle modification (168,171,172). Adherence to GDMT of hypertension can be enhanced by SDM between clinicians and patients. Patients should be engaged in the selection of antihypertensive drug therapy and lifestyle modification strategies, with consideration of individual values, preferences, and associated conditions and comorbidities (2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease [14]).	
Measuring SDM in clinical settings	
One of the following, supplemented with a process for systematic analysis and feedback to practitioners: ■ Patient-reported measures of SDM ■■ The 3-item CollaboRATE Scale (173) ■■ The 9-item Shared Decision-Making Questionnaire (SDM-Q-9 Patient Version) (174) ■■ The 4-item SURE Scale (175) ■ Provider-reported measures of SDM ■■ The 9-item Shared Decision-Making Questionnaire (SDM-Q-Doc) (176)	
Clinical Recommendations	
2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease (14) **Recommendations for Shared Decision Making (Section 2.1, 2019 Prevention Guideline)** 1. Shared decision making should guide discussions regarding the best strategies to reduce ASCVD risk (166–169). *(Class 1, Level of Evidence: B-R)*	

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CDU, care delivery unit; EHR, electronic health record; GDMT, guideline-directed medical therapy/treatment; HBP, high blood pressure; IPDAS, International Patient Decision Aid Standards; and SDM, shared decision making.

APPENDIX A. CONTINUED

SM-6: Demonstration of Infrastructure and Personnel That Assess and Address Social Determinants of Health of Patients With HBP

Measure Components	**The CDU uses a standard process/protocol for addressing SDoH in clinical settings for patients with HBP, including:** ■ Utilization of a standardized tool, such as the Accountable Health Communities Screening Tool (177), to screen health-related social needs in clinical settings. ■ Integration of social and behavioral domains (Table A) into EHRs to monitor efforts to address SDoH. ■ Documentation of patient assessments of SDoH and referrals to social services in medical records. ■ Integration of clinical staff members (e.g., social workers, case managers, registered dietitians) to link patients with appropriate community resources. ■ Training of volunteers within the CDU to access a database of resources to address SDoH and provide follow-up until a resolution of unmet social needs is achieved. ■ Identification of community health workers to conduct home social assessments to connect socially deprived patients with community resources. ■ Creation of partnerships with community organizations that provide healthy food and assist with enrollment in federal nutrition assistance programs. ■ Creation of partnerships with pharmacies to provide access to home delivery options for obtaining medication to manage HBP.

Rationale

Socioeconomic inequalities are strong determinants of ASCVD risk internationally (178,179). Therefore, it is important to tailor advice to a patient's socioeconomic and educational status, as well as cultural, work, and home environments (180). The CMS has developed a tool to assess 5 domains of non-health-related measures that impact health outcomes: housing instability, food insecurity, transportation difficulties, utility assistance needs, and interpersonal safety (177). ASCVD prevention could benefit from such screening. ASCVD risk begins early in life, with heightened susceptibility tied to low socioeconomic status (181). Examples of upstream SDoH that affect adherence and ASCVD health outcomes include comorbid mental illness, low health literacy, exposure to adversity (e.g., home/community violence, trauma exposures, safety concerns), financial strain, inadequate housing conditions, food insecurity (e.g., access to affordable and nutritious food), and inadequate social support (182). Systems of care should evaluate SDoH that affect care delivery for the primary prevention of ASCVD (e.g., transportation barriers, the availability of health services).

Important considerations related to socioeconomic disadvantage are not captured by existing ASCVD risk equations (183). Addressing unmet social needs improves management of BP and lipids (184), highlighting the importance of dietary counseling and encouraging physical activity (185). More time may be required to address ASCVD prevention when working with adults of low health literacy or disadvantaged educational backgrounds. Differential cardiovascular outcomes persist by important sociodemographic characteristics, including but not limited to age, gender, and race/ethnicity (186–189). Failure to address the impact of SDoH impedes efficacy of proven prevention recommendations. Standardized use of EHRs that include social and behavioral domains could improve care for patients with HBP. Table A outlines social and behavioral domains that may be integrated into EHRs to address SDoH (190).

Clinical Recommendations

2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease (14)
Recommendations for Addressing Social Determinants of Health (SDoH) (Section 2.1, 2019 Prevention Guideline)

1. Social determinants of health should inform optimal implementation of treatment recommendations for the prevention of ASCVD. (178–181,185,189,191) *(Class 1, Level of Evidence: B-NR)*

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; CDU, care delivery unit; EHR, electronic health record; HBP, high blood pressure; and SDoH, social determinants of health.

TABLE A Core Domain and Measures

Domain	Measure
Social	
Race/ethnicity	US Census (2 questions)
Education	Educational attainment (2 questions)
Financial resource strain	Overall financial resource strain (1 question)
Stress	Stress symptoms (192) (1 question)
Depression	PHQ-2 (2 questions)
Social connections and social isolation	NHANES III (4 questions)
Exposure to violence: intimate partner violence	HARK (4 questions)
Neighborhood and community compositional characteristics	Residential address Census tract-median income
Behavioral	
Physical activity	Exercise Vital Sign (2 questions)
Tobacco use and exposure	NHIS (2 questions)
Alcohol use	AUDIT-C (3 questions)

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AUDIT-C indicates Alcohol Use Disorders Identification Test-C; HARK, Humiliation, Afraid, Rape, Kick; NHANES III, National Health and Nutrition Examination Survey III; NHIS, National Health Interview Survey; and PHQ-2, Patient Health Questionnaire-2.

APPENDIX A. CONTINUED

Implementation of a System of Care for Patients With HBP

SM-7: Use of Team-Based Care to Better Manage HBP

Measure Components

The CDU relies on various available components of team-based care in clinical settings for patients with HBP, which may include:

- Pharmacists
- RNs/APRNs
- Physician assistants
- Medical assistants
- Community health workers
- Integrated care managers
- Social workers
- Behavioral interventionists
- Trainees
- Algorithms to support clinicians
- EHR support (BP recording, actionable prompts for clinicians, population health management)
- Remote HBPM (EHR integration)
- Monitoring performance metrics
- Population health management
- Telephone-based follow-up
- Regular team meetings (best practice updates, workflow evaluation)
- Assigned roles and responsibilities (patient and clinicians, clarity about team member roles)
- *Optional: SM-4: EHR to diagnose and assess, SM-8: use of telehealth, SM-10: performance measurement

Goals of team-based care:

- Improve clinical workflow
- Patient education
- Closer follow-up of BP after initiation
- Medication titration
- Laboratory follow-up
- Improved adherence
- Lower clinician burn-out (193)

Checklist

Goal: To optimize outpatient hypertension management (to be specifically stated as team's purpose/responsibility).

Team Members:

- Lead clinician (at least 1): APRN or physician
- Clinical support (at least 1): pharmacist, nurse, physician assistant, medical assistant, community health worker, care manager, or EHR support modules specific to hypertension
- Administrative support (at least 1): scheduler, receptionist
- Expert referral (onsite or external): designated referral system for refractory patients: cardiologist, nephrologist, endocrinologist

Team meetings: regular meetings on at least a quarterly basis to evaluate delivery of care for patients with hypertension.

Performance monitoring: Use of PM 1–5 and QM 1–6 for feedback on performance and quality of care.

Program elements (at least 2):

1. Patient educational materials or sessions on hypertension.
2. Availability of BP-specific follow-up in 1 mo (telephone based, with HBPM, telehealth, or clinical support or clinician follow-up).
3. Ability of patients to contact team-based care team in a timely fashion about hypertension concerns (telephone, secure EHR messaging, email, urgent appointments).
4. Algorithm for medication titration led by clinical support team member and lead clinician supervision.
5. Timely follow-up and monitoring of laboratory results, with titration of relevant drug classes.
6. Monitoring adherence by using pharmacy fill data.
7. Provider-specific performance reports with hypertension metrics.

Rationale

RCTs and meta-analyses of RCTs of team-based hypertension care involving nurse or pharmacist intervention demonstrated reductions in SBP and DBP and/or greater achievement of BP goals when compared with usual care (194–197).

Similarly, systematic reviews of team-based care for patients with primary hypertension, including a review of studies that included community health workers, showed reductions in SBP and DBP and improvements in BP control, appointment keeping, and hypertension medication adherence as compared with usual care (198,199).

Team-based care can be defined by numerous structures that are functional and improve care in various settings and patient populations. Inherently, they try to provide a division of labor and improved workflows so that the delivery of quality care is maximized/optimized. Disease-management-specific programs and protocols help identify areas to improve workflow and patient-centered care.

AHRQ summary statement of team-based care: "the primary goal of medical teamwork is to optimize the timely and effective use of information, skills, and resources by teams of health care professionals for the purpose of enhancing the quality and safety of patient care." (200);

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

Recommendation for Structured, Team-Based Care Interventions for Hypertension Control (Guideline Sections 8.3.2 and 12.2)

1. A team-based care approach is recommended for adults with hypertension. (194–197,199,201,202) *(Class 1, Level of Evidence: A)*
2. For older adults (≥65 y of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit are reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs. *(Class 2a, Level of Evidence: C-EO)*
3. Follow-up and monitoring after initiation of drug therapy for hypertension control should include systematic strategies to help improve BP, including use of HBPM, team-based care, and telehealth strategies (47,203–207). *(Class 1, Level of Evidence: A)*

ACC indicates American College of Cardiology; AHA, American Heart Association; AHRQ, Agency for Healthcare Research and Quality; APRN, advanced practice registered nurse; BP, blood pressure; CDU, care delivery unit; DBP, diastolic blood pressure; EHR, electronic health record; HBP, high blood pressure; HBPM, home blood pressure monitoring; NAM, National Academy of Medicine; PM, performance measure; QM, quality measure; RCTs, randomized controlled trials; RN, registered nurse; SM, structural measure; and SBP, systolic blood pressure.

APPENDIX A. CONTINUED

SM-8: Use of Telehealth, m-Health, e-Health, and Other Digital Technologies to Better Diagnose and Manage HBP

Measure Components	**The CDU uses various available components of telehealth, m-health, e-health, and other digital technologies proven by high-quality evidence to better diagnose and manage HBP in clinical settings for patients with HBP, which may include:**
	■ Deployment of ≥1 telehealth, m-health, or e-health strategies (e.g., Table B)
	■ For patients engaged in self-monitoring, a platform is required to communicate home BP measurements to the healthcare provider team. This may require several methods including:
	  ■ Telephonic communication of BP readings
	  ■ Written communication of BP readings
	  ■ Direct integration and delivery of BP readings via the EHR
	■ Designating ≥1 individuals to implement changes in nonpharmacological or pharmacological treatment based on self-monitoring or behavioral/coaching strategies. This may include development of algorithms and involve several members of the care team, including but not limited to:
	  ■ Medical practice coordinators
	  ■ Pharmacists
	  ■ Physician assistants
	  ■ Nurse practitioners
	  ■ Nutritionists
	  ■ Nurses
	  ■ Physicians
	■ Developing a framework to iteratively and routinely assess ongoing efficacy of different telehealth strategies for the CDU
	■ Maintaining flexibility to modify strategies as new telehealth technologies emerge (e.g., novel BP measurement devices, data integration software)

Rationale

Meta-analyses of RCTs of different telehealth interventions have demonstrated greater SBP and DBP reductions (208–210) and a larger proportion of patients achieving BP control (210) than those achieved with usual care without telehealth. The effect of various telehealth interventions on BP lowering was significantly greater than that of BP self-monitoring without transmission of BP data, which suggests a possible added value of the teletransmission approach (209,211). Although m-health interventions in general showed promise in reducing SBP in patients with hypertension, results were inconsistent (212). It is unclear which combination of telehealth intervention features is most effective, and telehealth has not been demonstrated to be effective as a standalone strategy for improving hypertension control.

Telehealth, m-health, and e-health technologies refer to means of transmission with wired or wireless devices to communicate with a healthcare provider (212). E-health, or digital health, is the use of emerging communication and information technologies to improve health and health care. M-health, a subsegment of e- health, is the use of mobile computing and communication technologies (e.g., mobile phones, wearable sensors) for health services and information (212). Table B provides a list of examples of telehealth strategies and telehealth technologies. Importantly, these strategies include interventions beyond reminders for nonpharmacological or pharmacological intervention and increased awareness of BP measurement. They include active self-titration of medication and in-person coaching or e-coaching. M-health technologies are becoming more prevalent, and their use will continue to grow, consistent with recommendations from the Institute of Medicine (213). As new technologies emerge, including new devices for self-monitoring, it is unlikely that clinical trials will be repeated using each new technology. However, if self-monitoring is used, it is important to ensure that the BP measurement device used has been validated with an internationally accepted protocol and the results have been published in a peer-reviewed journal (214). Telehealth strategies that compare different frequencies of HBPM or ABPM have not been rigorously tested.

Systems-level support, such as use of EHR (see SM-4), clinical decision support (i.e., treatment algorithms), technology-based remote monitoring (see Table B), self-management support tools, and monitoring of performance, are likely to augment and intensify team-based care efforts to reduce HBP (see SM-7).

Select telehealth strategies incorporate self-monitoring of BP. Among individuals with hypertension, self-monitoring of BP, without other interventions, has shown limited evidence for treatment-related BP reduction and achievement of BP control (50,211,215). However, with the increased recognition of inconsistencies between office and out-of-office BPs and closer correlation of out-of-office BPs versus office BPs with cardiovascular outcomes (216), and with greater reductions in BP being recommended for hypertension control, increased attention is being paid to out-of-office BP readings. Thus, telehealth, m-health, and e-health strategies will likely increasingly incorporate self-monitoring, as well.

As outlined in Table B, there are a wide variety of m-health, e-health, and telehealth strategies that may or may not be available to a specific CDU and therefore to the individual provider/patient. Because development of new mobile technologies is ongoing, we also wished to provide flexibility for each CDU to choose among these and any future strategies that are developed.

Although ABPM is generally accepted as the best out-of-office measurement method, HBPM is often a more practical approach in clinical practice. Recommended procedures for the collection of HBPM data are provided in Table C.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)

Recommendation for Telehealth Interventions to Improve Hypertension Control (Guideline Sections 8.3.2 and 12.3)

1. Telehealth strategies can be useful adjuncts to interventions shown to reduce BP for adults with hypertension (208–212). *(Class 2a, Level of Evidence: A)*
2. Follow-up and monitoring after initiation of drug therapy for hypertension control should include systematic strategies to help improve BP, including use of HBPM, team-based care, and telehealth strategies (47,203–207). *(Class 1, Level of Evidence: A)*

ABPM indicates ambulatory blood pressure monitoring; ACC, American College of Cardiology; AHA, American Heart Association; BP, blood pressure; CDU, care delivery unit; DBP, diastolic blood pressure; e-health, healthcare services provided electronically via the Internet; EHR, electronic health record; HBP, high blood pressure; HBPM, home blood pressure monitoring; m-health, practice of medicine and public health supported by mobile devices; RCTs, randomized controlled trials; SM, structural measure; and SBP, systolic blood pressure.

APPENDIX A. CONTINUED

TABLE B Examples of Telehealth Strategies and Technologies to Promote Effective Hypertension Management

Telehealth strategies
■ Automated BP data capture and transmission of the patient's self-measured BP
■ Self-management support, including education, reminders, and feedback that is automated or delivered by a healthcare professional
■ Medication titration and follow-up monitoring protocols/algorithm
■ Prescription refill reminders
■ Medication adherence assessments
■ Self-monitoring of lifestyle behaviors
■ Integration of behavior change techniques, including in-person counseling or e-counseling
■ Case/care/population health management
Commonly used telehealth technologies
■ Wired "landline" telephone
■ Wireless smartphone applications
■ Website accessed via computers and handheld devices
■ Text messaging
■ Email messaging
■ Social networking and social media websites/applications
■ Wireless BP measurement devices
■ Electronic pill dispensers/counters

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BP indicates blood pressure.

APPENDIX A. CONTINUED

TABLE C Procedures for Use of HBPM

Patient training should occur under medical supervision, including:
■ Information about hypertension
■ Selection of equipment
■ Acknowledgment that individual BP readings may vary substantially
■ Interpretation of results
Devices:
■ Verify use of automated validated devices. Use of auscultatory devices (mercury, aneroid, or other) is not generally useful for HBPM because patients rarely master the technique required for measurement of BP with auscultatory devices.
■ Monitors with provision for storage of readings in memory are preferred.
■ Verify use of appropriate cuff size to fit the arm.
■ Verify that left/right inter-arm differences are insignificant. If differences are significant, instruct patient to measure BPs in the arm with higher readings.
Instructions on HBPM procedures:
■ Remain still:
■ Avoid smoking, caffeinated beverages, or exercise within 30 min before BP measurements.
■ Ensure ≥5 min of quiet rest before BP measurements.
■ Sit correctly: ▪ Sit with back straight and supported (on a straight-backed dining chair, for example, rather than a sofa). ▪ Sit with feet flat on the floor and legs uncrossed. ▪ Keep arm supported on a flat surface (such as a table), with the upper arm at heart level. ▪ Bottom of the cuff should be placed directly above the antecubital fossa (bend of the elbow).
■ Take multiple readings: ▪ Take at least 2 readings 1 min apart in morning before taking medications and in evening before supper. Optimally, measure and record BP daily. Ideally, obtain weekly BP readings beginning 2 wk after a change in the treatment regimen and during the week before a clinic visit.
■ Record all readings accurately: ▪ Monitors with built-in memory should be brought to all clinic appointments. ▪ BP should be based on an average of readings on ≥2 occasions for clinical decision making.
The information above may be reinforced with the following: AHA webpage "Monitoring Your Pressure at Home" (217); and AHA video "At home blood pressure monitoring" (218);

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BP indicates blood pressure; and HBPM, home blood pressure monitoring.

APPENDIX A. CONTINUED

SM-9: Use of a Single, Standardized Plan of Care for All Patients With HBP

Measure Components	The CDU has developed and implemented a single, standardized plan of care for HBP that addresses health behaviors, comorbid conditions, follow-up, and treatment goals through shared decision making, in accordance with Table D.

Rationale

A specific plan of care for hypertension is essential and should reflect understanding of the modifiable and nonmodifiable determinants of health behaviors, including the social determinants of risk and outcomes. A clinician's sequential flow chart for management of hypertension is presented (Table D). The determinants will vary among demographic subgroups.

Studies demonstrate that implementation of a plan of care for hypertension can lead to sustained reduction of BP and attainment of BP targets over several years (219–224). Meta-analysis of RCTs shows reductions in BP of patients with hypertension and achievement of BP goals at 6 months and 1 year when compared with usual care (4). (See Table D.)

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)
The Plan of Care for Hypertension (Guideline Section 13)

1. Every adult with hypertension should have a clear, detailed, and current evidence-based plan of care that ensures the achievement of treatment and self-management goals, encourages effective management of comorbid conditions, prompts timely follow-up with the healthcare team, and adheres to CVD GDMT. *(Class 1, Level of Evidence: C-EO)*

ACC indicates American College of Cardiology; AHA, American Heart Association; BP, blood pressure; CDU, care delivery unit; CVD, cardiovascular disease; GDMT, guideline-directed medical therapy/treatment; HBP, high blood pressure; and RCTs, randomized controlled trials.

TABLE D Clinician's Steps for the Management of Hypertension

Clinician's Sequential Flowchart for the Management of Hypertension
Measure office BP accurately
Detect white-coat hypertension or masked hypertension by using ABPM and HBPM
Evaluate for secondary hypertension
Identify target-organ damage
Introduce lifestyle interventions
Identify and discuss treatment goals
Use ASCVD risk estimation to guide BP threshold for pharmacological therapy
Align treatment options with comorbidities
Account for age, race, ethnicity, sex, and special circumstances in antihypertensive treatment
Initiate antihypertensive pharmacological therapy
Insure appropriate follow-up
Use team-based care
Connect patient to clinician via telehealth
Detect and reverse nonadherence
Use health information technology for remote monitoring and self-monitoring of BP

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ABPM indicates ambulatory blood pressure monitoring; ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; and HBPM, home blood pressure monitoring.

APPENDIX A. CONTINUED

Use of Performance Measures to Improve Care for HBP

SM-10: Use of Performance and Quality Measures to Improve Quality of Care for Patients With HBP

Measure Components	**The CDU uses performance and quality measures for evaluation and improvement in clinical settings for the diagnosis and management of patients with HBP, which include:** ■ Performance measures that are developed according to established ACC/AHA standards. ■ Performance measures that identify key structural components, care processes, and/or outcomes that are highly correlated with important, high-priority patient care goals. ■ Methods to accurately and feasibly collect data in order to assess performance measures. ■ Process to identify appropriate patient groups, healthcare providers, and/or observation periods to be included in the measurement process. ■ Process to include outcomes of performance measurement in quality improvement strategies.

Rationale

Performance measures are systematic and standardized methods that are aimed at identifying and improving suboptimal medical care and patient outcomes. Performance measures represent one of several potential strategies that can be used, together or alone, to help reduce gaps in the quality of health care. Effective performance measures are those that are associated with meaningful, desirable patient outcomes and include broad sampling from appropriate and related medical domains (2). Performance measure design should follow established standards, as outlined by national organizations (2), and have precise, validated components that are feasible, actionable, and meaningful. Performance measures usually reflect clinical practice guidelines of the highest levels of recommendation and evidence. Given that the identification, treatment, and control of HBP are suboptimal (3,225,226), use of effective performance measures can help improve these gaps in care, as has been shown in 1 observational study from Kaiser Permanente of Northern California (56). No RCTs of HBP performance measures have been published (4).

Implementation of Performance Measures

1. Identify performances measures for hypertension that:
   a. Meet established ACC/AHA standards.
   b. Include key components that influence the impact and sustainability of hypertension detection, treatment, and control for the target population (medical care, cost of care, patient-reported factors).
   c. Help address the most pressing gaps in hypertension-related care for the healthcare provider, practice, or system.
2. Coordinate the most feasible and meaningful collection of performance measures data with available data sources (e.g., electronic health records, national data registries, administrative databases).

Uses of Performance Measures

1. To assess performance of the healthcare provider, practice, or system, identifying and characterizing gaps in quality of hypertension care (based on comparison to a national "benchmark" standard or based on comparison to previous performance by the same healthcare provider, practice, or system).
2. To be used to design and implement quality improvement plans to help address gaps in quality of hypertension care identified by performance measures.
3. To report the use and outcomes of performance measurement as part of healthcare quality payment programs that are used by organizations to determine reimbursement to healthcare providers, practices, and systems on the basis of achievement and reporting of various performance metrics.

Clinical Recommendations

2017 Hypertension Clinical Practice Guidelines (4)
Recommendation for Performance Measures (Guideline Section 12.4.1)

1. Use of performance measures in combination with other quality improvement strategies at patient-, provider-, and system-based levels is reasonable to facilitate optimal hypertension control (56,227,228). *(Class 2a, Level of Evidence: B-NR)*

ACC indicates American College of Cardiology; AHA, American Heart Association; CDU, care delivery unit; HBP, high blood pressure; and RCT, randomized controlled trial.

APPENDIX B. AUTHOR LISTING OF RELATIONSHIPS WITH INDUSTRY AND OTHER ENTITIES (RELEVANT)—2019 AHA/ACC CLINICAL PERFORMANCE AND QUALITY MEASURES FOR ADULTS WITH HIGH BLOOD PRESSURE

Committee Member	Employment	Consultant	Speakers Bureau	Ownership/ Partnership/ Principal	Personal Research	Institutional, Organizational, or Other Financial Benefit	Expert Witness
Donald E. Casey Jr, Chair	Thomas Jefferson College of Population Health—Adjunct Faculty; Rush Medical College—Faculty; University of Minnesota, Institute of Health Informatics—Affiliate Faculty; President, American College of Medical Quality; IPO 4 Health—Principal and Founder	None	None	None	None	None	None
Randal J. Thomas, Vice Chair	Mayo Clinic—Medical Director, Cardiac Rehabilitation Program	None	None	None	None	None	None
Vivek Bhalla	Stanford University Medical Center—Assistant Professor of Medicine, Nephrology; Stanford Hypertension Center—Director	■ Relypsa, Inc.	None	None	None	■ PyrAmes Health†	None
Yvonne Commodore-Mensah	Johns Hopkins School of Nursing—Assistant Professor	None	None	None	None	None	None
Paul A. Heidenreich	Stanford VA Palo Alto Health Care System—Professor of Medicine	None	None	None	None	None	None
Dhaval Kolte	Massachusetts General Hospital and Harvard Medical School—International Cardiology Fellow	None	None	None	None	None	None
Paul Muntner	University of Alabama at Birmingham—Professor, Department of Epidemiology	None	None	None	None	None	None
Sidney C. Smith Jr	University of North Carolina at Chapel Hill—Professor of Medicine; Division of Cardiology, Department of Medicine	None	None	None	None	None	None
John A. Spertus	Washington University School of Medicine in St. Louis—Adjunct Professor of Medicine, Cardiovascular Division; Saint Luke's Mid America Heart Institute—Director, Health Outcomes Research; University of Missouri-Kansas City—Professor, Daniel J. Lauer Missouri Endowed Chair in Metabolism and Vascular Disease Research	■ AstraZeneca* ■ Bayer Healthcare Pharmaceuticals ■ Boehringer Ingelheim* ■ Janssen* ■ Novartis*	None	None	None	■ AstraZeneca UK Limited ■ Novartis*	None
John R. Windle	University of Nebraska College of Medicine—Professor, Internal Medicine, Division of Cardiovascular Medicine	None	None	None	None	None	None

Continued on the next page

APPENDIX B. CONTINUED

Committee Member	Employment	Consultant	Speakers Bureau	Ownership/ Partnership/ Principal	Personal Research	Institutional, Organizational, or Other Financial Benefit	Expert Witness
Gregory D. Wozniak	American Medical Association—Director, Outcomes Analytics; Northwestern University, Feinberg School of Medicine—Adjunct Assistant Professor	None	None	None	None	None	None
Boback Ziaeian	UCLA David Geffen School of Medicine—Assistant Professor; US Department of Veterans Affairs—Assistant Professor	None	None	None	None	None	None

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*Significant relationship.

†No financial benefit.

ACC indicates American College of Cardiology; AHA, American Heart Association; UCLA, University of California, Los Angeles; and VA, Veterans Affairs.

APPENDIX C. REVIEWER LISTING OF RELATIONSHIPS WITH INDUSTRY AND OTHER ENTITIES (COMPREHENSIVE)—2019 AHA/ACC CLINICAL PERFORMANCE AND QUALITY MEASURES FOR ADULTS WITH HIGH BLOOD PRESSURE

Reviewer	Representation	Employment	Consultant	Speakers Bureau	Ownership/ Partnership/ Principal	Personal Research	Institutional, Organizational, or Other Financial Benefit	Expert Witness	Salary
Biykem Bozkurt	Official TFPM Lead; TFDS Content Reviewer	Baylor College of Medicine—Mary and Gordon Cain Chair Professor of Medicine and Director, Winters Center for Heart Failure Research; Michael E. DeBakey VA Medical Center, Cardiology—Chief, Cardiology Section	■ Bayer ■ Bristol-Myers Squibb ■ Lantheus Medical Imaging, Inc ■ LivaNova USA ■ Respicardia ■ scPharmaceuticals	None	None	■ LivaNova USA (DSMB)	■ Abbott	None	None
Nicole L. Lohr	Official ACC	Medical College of Wisconsin—Assistant Professor	None	None	None	None	■ Amgen‡	None	None
Andrea L. Price	Official ACC	Indiana University Health—Director, Quality Databases	None	None	None	None	■ ACC Accreditation Foundation Board*	None	None
Brent Egan	Official AHA	Medical University of South Carolina, Charleston (MUSC)—Professor of Medicine and Pharmacology	■ Medtronic	■ Emcure ■ Merck KGaA	None	None	■ UpToDate	None	None
John M. Flack	Official AHA	Southern Illinois University School of Medicine, Internal Medicine—Professor, Chair, and Chief of Hypertension Specialty Services	None	None	None	■ National Institutes of Health (DSMB)†	■ Bayer† ■ GlaxoSmithKline† ■ Valencia†	None	None
Sandra J. Taler	Official AHA	Mayo Clinic—Professor of Medicine	None	None	None	None	None	None	None
Michael Rakotz	Official AMA	American Medical Association—Vice President, Health Outcomes	None	None	None	None	■ AMA†	None	None
Cheryl Dennison-Himmelfarb	Official PCNA	Johns Hopkins School of Nursing—Associate Dean for Research, Sarah E. Allison Endowed Professor, and Deputy Director, Institute for Clinical Translational Research	None	None	None	■ Helene Fuld Health Trust* ■ NIH*	■ PCNA†	None	■ Johns Hopkins University*
Nathalie De Michelis	Content ACC	University of California, Irvine—Cardiovascular Program Manager	None	None	None	None	None	None	None
Eugene Yang	Content ACC	University of Washington School of Medicine—Medical Director and Clinical Associate Professor of Medicine, Division of Cardiology, Carl and Renée Behnke Endowed Professorship for Asian Health	■ Amgen* ■ RubiconMD*	None	None	None	■ Amgen*	■ Third Party, Firefighter who developed an arrhythmia at work, 2017*	None

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APPENDIX C. CONTINUED

Reviewer	Representation	Employment	Consultant	Speakers Bureau	Ownership/ Partnership/ Principal	Personal Research	Institutional, Organizational, or Other Financial Benefit	Expert Witness	Salary
Marjorie L. King	Content ACC/ AHA	Helen Hayes Hospital— Chief Medical Officer, Internal Medicine (Cardiology) and Director, Cardiopulmonary, Rehabilitation	■ Island Peer Review Organization*	None	None	None	None	None	None
Raj Padwal	Content AMA	University of Alberta—Professor of Medicine and Director, Hypertension Dyslipidemia Clinic	None	None	■ mmHG Inc.†	None	None	None	None
Nancy Houston-Miller	Content PCNA	The Lifecare Company—Associate Director	■ Moving Analytics*	None	None	None	None	None	None

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*Significant relationship.

†No financial benefit.

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ACC indicates American College of Cardiology; AHA, American Heart Association; AMA, American Medical Association; DSMB, Data Safety and Monitoring Board; HBP, high blood pressure; NIH, National Institutes of Health; PCNA, Preventive Cardiovascular Nurses Association; TFDS, Task Force for Data Standards; and TFPM, Task Force on Performance Measures.