CLINICAL GUIDELINE

Annals of Internal Medicine

Screening for High Blood Pressure in Adults: U.S. Preventive Services Task Force Recommendation Statement

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Description: Update of the 2007 U.S. Preventive Services Task Force (USPSTF) reaffirmation recommendation statement on screening for high blood pressure in adults.

Methods: The USPSTF reviewed the evidence on the diagnostic accuracy of different methods for confirming a diagnosis of hypertension after initial screening and the optimal rescreening interval for diagnosing hypertension.

Population: This recommendation applies to adults aged 18 years or older without known hypertension.

Recommendation: The USPSTF recommends screening for high blood pressure in adults aged 18 years or older. (A recommendation)

The USPSTF recommends obtaining measurements outside of the clinical setting for diagnostic confirmation before starting treatment.

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* For a list of USPSTF members, see the **Appendix** (available at www.annals.org).

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The U.S. Preventive Services Task Force (USPSTF) makes recommendations about the effectiveness of specific preventive care services for patients without related signs or symptoms.

It bases its recommendations on the evidence of both the benefits and harms of the service and an assessment of the balance. The USPSTF does not consider the costs of providing a service in this assessment.

The USPSTF recognizes that clinical decisions involve more considerations than evidence alone. Clinicians should understand the evidence but individualize decision making to the specific patient or situation. Similarly, the USPSTF notes that policy and coverage decisions involve considerations in addition to the evidence of clinical benefits and harms.

Summary of Recommendation and Evidence

The USPSTF recommends screening for high blood pressure in adults aged 18 years or older. (A recommendation)

The USPSTF recommends obtaining measurements outside of the clinical setting for diagnostic confirmation before starting treatment (see the Clinical Considerations).

See also:

Summary for Patients I-32

Web-Only
CME quiz
Consumer Fact Sheet

See **Figure 1** for a summary of the recommendation and suggestions for clinical practice.

Appendix Table 1 describes the USPSTF grades, and **Appendix Table 2** describes the USPSTF classification of levels of certainty about net benefit (both tables are available at www.annals.org).

Rationale

Importance

High blood pressure is a prevalent condition, affecting approximately 30% of the adult population (1). It is the most commonly diagnosed condition at outpatient office visits. High blood pressure is a major contributing risk factor to heart failure, heart attack, stroke, and chronic kidney disease. In 2010, it was the primary or contributing cause of death for more than 362 000 Americans (1).

Detection

The evidence on the benefits of screening for high blood pressure is well-established. In 2007, the USPSTF reaffirmed its 2003 recommendation to screen for hypertension in adults aged 18 years or older (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 (2, 3). However, these reviews did not address the diagnostic accuracy of different blood pressure measurement protocols or identify a reference standard for measurement confirmation. For the current recommendation, the USPSTF examined the diagnostic accuracy of office blood pressure measurement, ambulatory blood pressure monitoring (ABPM), and home blood pressure monitoring (HBPM).

Figure 1. Screening for high blood pressure in adults: clinical summary.

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Population	Adults aged ≥18 y without known hypertension
Recommendation	Screen for high blood pressure; obtain measurements outside of the clinical setting for diagnostic confirmation. Grade: A

Risk Assessment	Persons at increased risk for high blood pressure are those who have high-normal blood pressure (130–139/85–89 mm Hg), those who are overweight or obese, and African Americans.
Screening Tests	Office measurement of blood pressure is done with a manual or automated sphygmomanometer. Proper protocol is to use the mean of 2 measurements taken while the patient is seated, allow for ≥5 min between entry into the office and blood pressure measurement, use an appropriately sized arm cuff, and place the patient's arm at the level of the right atrium. Multiple measurements over time have better positive predictive value than a single measurement. Ambulatory and home blood pressure monitoring can be used to confirm a diagnosis of hypertension after initial screening.
Screening Interval	Adults aged ≥40 y and persons at increased risk for high blood pressure should be screened annually. Adults aged 18 to 39 y with normal blood pressure (<130/85 mm Hg) who do not have other risk factors should be rescreened every 3 to 5 y.
Treatment and Interventions	For nonblack patients, initial treatment consists of a thiazide diuretic, calcium-channel blocker, angiotensin-converting enzyme inhibitor, or angiotensin-receptor blocker. For black patients, initial treatment is thiazide or a calcium-channel blocker. Initial or add-on treatment for patients with chronic kidney disease consists of either an angiotensin-converting enzyme inhibitor or an angiotensin-receptor blocker (not both).
Balance of Benefits and Harms	The net benefit of screening for high blood pressure in adults is substantial.

For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, please go to www.uspreventiveservicestaskforce.org.

The USPSTF also assessed the accuracy of these blood pressure measurements and methods in confirming the diagnosis of hypertension. In addition, it reviewed data on optimal screening intervals for diagnosing hypertension in adults.

Benefits of Early Detection and Treatment

The USPSTF found good evidence that screening for and treatment of high blood pressure in adults substantially reduces the incidence of cardiovascular events.

Harms of Early Detection and Treatment

The USPSTF found good evidence that screening for and treatment of high blood pressure has few major harms.

USPSTF Assessment

The USPSTF concludes with high certainty that the net benefit of screening for high blood pressure in adults is substantial.

CLINICAL CONSIDERATIONS

Patient Population Under Consideration

This recommendation applies to adults aged 18 years or older without known hypertension.

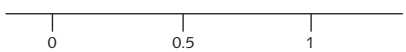
Screening Tests

Office Blood Pressure Measurement

Office measurement of blood pressure is most commonly done with a manual or automated sphygmomanometer. Little research has been done on the best approach to measuring blood pressure in the office setting. Most clinical trials of hypertension treatment, at a minimum, used the mean of 2 measurements taken while the patient was seated (some used the mean of the second and third measurements), allowed for at least 5 minutes between entry into the office and blood pressure measurement, used an appropriately sized arm cuff, and placed the patient's arm at the level of the right atrium during measurement. Multiple measurements over time have better positive predictive value for hypertension than a single measurement. Automated office blood pressure, which is an average of multiple automated measurements taken while the patient is alone in a room, may yield results similar to those of daytime ABPM (4, 5). Blood pressure is affected by various short-term factors, such as emotions, stress, pain, physical activity, and drugs (including caffeine and nicotine). In addition to within-patient temporal variability, isolated clinic hypertension in the medical setting and in the presence of medical person-

Figure 2. Proportion of elevated office blood pressure readings that are confirmed as hypertension by ABPM or HBPM.

Study, Year (Reference)	Monitoring Type	PPV (95% CI)	Screened, *n*
ABPM			
Kario, 2014 (6)	24-h	0.89 (0.85–0.93)	239
Inden et al, 1998 (7)	24-h	0.88 (0.83–0.92)	232
Pierdomenico et al, 1995 (8)	24-h	0.79 (0.74–0.84)	255
Khoury et al, 1992 (9)	24-h	0.52 (0.43–0.60)	131
Hozawa et al, 2002 (10)	24-h	0.35 (0.27–0.42)	150
Myers, 2010 (11)	Daytime	0.93 (0.87–0.99)	69
Hond et al, 2003b (12)	Daytime	0.92 (0.89–0.96)	247
Gustavsen et al, 2003 (13)	Daytime	0.90 (0.88–0.93)	420
Zawadzka et al, 1998 (14)	Daytime	0.86 (0.83–0.90)	410
Verdecchia et al, 1995 (15)	Daytime	0.81 (0.79–0.83)	1333
Graves and Grossardt, 2010 (16)	Daytime	0.79 (0.74–0.83)	313
Celis et al, 2002 (17)	Daytime	0.78 (0.74–0.82)	419
Manning et al, 1999 (18)	Daytime	0.77 (0.71–0.83)	186
Nasothimiou et al, 2012 (19)	Daytime	0.77 (0.73–0.81)	361
Fogari et al, 1996 (20)	Daytime	0.74 (0.68–0.80)	221
Ungar et al, 2004 (21)	Daytime	0.74 (0.70–0.78)	388
Gerc et al, 2000 (22)	Daytime	0.65 (0.62–0.67)	1466
Pessanha et al, 2013 (23)	Daytime	0.61 (0.56–0.67)	336
Martínez et al, 1999 (24)	Daytime	0.61 (0.55–0.66)	345
Talleruphuus et al, 2006 (25)	Daytime	0.54 (0.44–0.63)	108
Zabludowski and Rosenfeld, 1992 (26)	Daytime	0.47 (0.40–0.55)	171
Cuspidi et al, 2011 (27)	Nighttime	0.95 (0.93–0.97)	658
HBPM			
Hond et al, 2003b (12)	HBPM	0.84 (0.80–0.89)	247
Kario, 2014 (6)	HBPM	0.84 (0.79–0.88)	239
Toyama et al, 2008 (28)	HBPM	0.83 (0.76–0.90)	100
Nasothimiou et al, 2012 (19)	HBPM	0.76 (0.72–0.81)	361
Tanabe et al, 2008 (29)	HBPM	0.51 (0.43–0.58)	156
Hozawa et al, 2002 (10)	HBPM	0.45 (0.37–0.53)	150



ABPM = ambulatory blood pressure monitoring; HBPM = home blood pressure monitoring; PPV = positive predictive value.

nel (known as "white coat" hypertension) is well-documented. Epidemiologic data suggest that 15% to 30% of the population believed to have hypertension may have lower blood pressure outside of the office setting (1). The disadvantages of diagnosing hypertension solely in the office setting include measurement errors, the limited number of measurements that can be made conveniently, and the confounding risk for isolated clinic hypertension.

Ambulatory and Home Blood Pressure Monitoring

In addition to office blood pressure measurement, ABPM and HBPM may be used to confirm a diagnosis of hypertension after initial screening. Ambulatory blood pressure monitoring devices are small, portable machines that record blood pressure at regular intervals over 12 to 24 hours while patients go about their normal activities and while they are sleeping. Measurements are typically taken at 20- to 30-minute intervals. Home blood pressure measurement devices are fully automated oscillometric devices that record measurements taken from the patient's brachial artery. Many of these devices are available for retail purchase, and some have undergone technical validation according to recommended protocols.

The USPSTF found convincing evidence that ABPM is the best method for diagnosing hypertension. Although the criteria for establishing hypertension varied across studies, there was significant discordance between the office diagnosis of hypertension and 12- and 24-hour average blood pressures using ABPM, with significantly fewer patients requiring treatment based on ABPM (**Figure 2**) (30). Elevated ambulatory systolic blood pressure was consistently and significantly associated with increased risk for fatal and nonfatal stroke and cardiovascular events, independent of office blood pressure (**Figure 3**) (30). For these reasons, the USPSTF recommends ABPM as the reference standard for confirming the diagnosis of hypertension.

Good-quality evidence suggests that confirmation of hypertension with HBPM may be acceptable. Several studies showed that elevated home blood pressure was significantly associated with increased risk for cardiovascular events, stroke, and all-cause mortality, independent of office blood pressure (**Figure 4**) (38–41). However, fewer studies have compared HBPM with office blood pressure measurement, so the evidence is not as substantial as it is for ABPM (1). Therefore, the USPSTF considers ABPM to be the reference standard for confirming the diagnosis of hypertension. However, the USPSTF acknowledges that the use of ABPM may be problematic in some situations. Home blood pressure monitoring using appropriate protocols is an alternative method of confirmation if ABPM is not available. Measurements from the office, HBPM, and ABPM must be interpreted with care and in the context of the indi-

vidual patient. Patients with very high blood pressure or signs of end-organ damage may need immediate treatment.

Screening Interval

The USPSTF recommends annual screening for adults aged 40 years or older and for those who are at increased risk for high blood pressure. Persons at increased risk include those who have high-normal blood pressure (130 to 139/85 to 89 mm Hg), those who are overweight or obese, and African Americans. Adults aged 18 to 39 years with normal blood pressure (<130/85 mm Hg) who do not have other risk factors should be rescreened every 3 to 5 years. The USPSTF recommends rescreening with properly measured office blood pressure and, if blood pressure is elevated, confirming the diagnosis of hypertension with ABPM.

Treatment

The benefits of treatment of hypertension in preventing important health outcomes are well-documented. Moderate- to high-quality randomized, controlled trials (RCTs) demonstrate the efficacy of treatment of the general population of persons aged 60 years or older to a target blood pressure of 150/90 mm Hg in reducing the incidence of stroke, heart failure, and coronary heart disease events. Similarly, RCTs demonstrate the efficacy of treatment of younger adults to a target diastolic blood pressure of less than 90 mm Hg in reducing cerebrovascular events, heart failure, and overall mortality (42). In the absence of sufficient RCT data, expert opinion has been used to establish a target systolic blood pressure of 140 mm Hg in adults younger than 60 years (42), and some experts believe that this should also be maintained in those aged 60 years or older (43). However, published results from a recently completed large RCT, the Systolic Blood Pressure Intervention Trial, are not yet available to inform current treatment goals. Clinicians should consult updated blood pressure treatment guidelines informed by this trial as they become available.

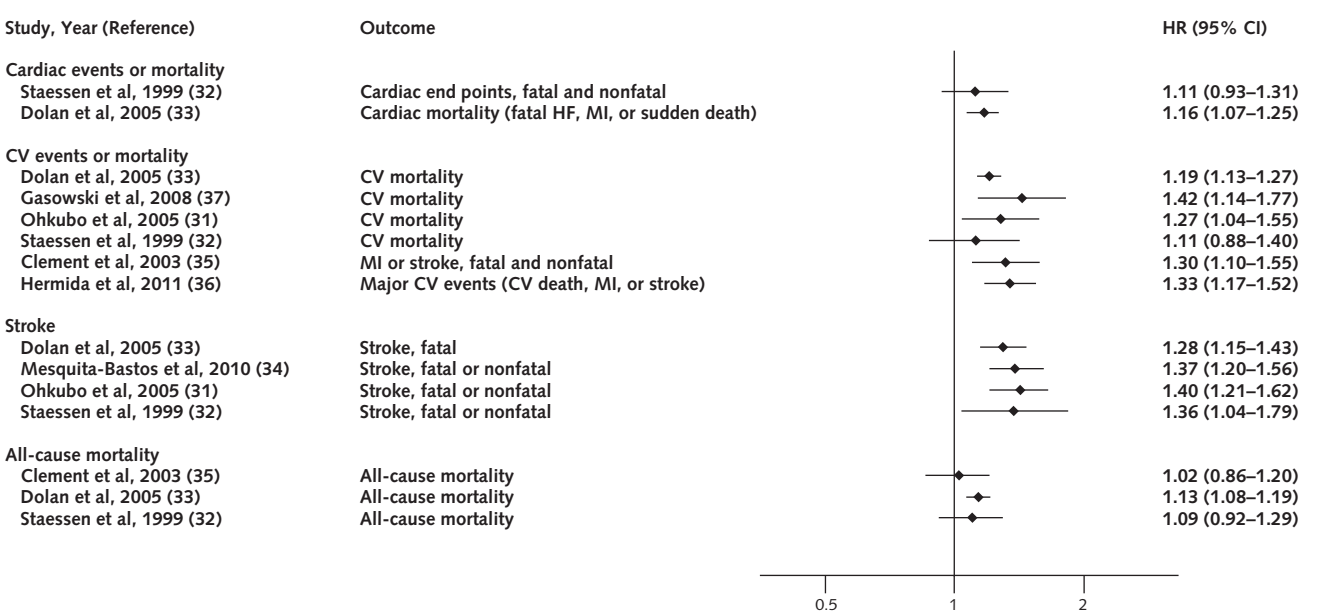
For nonblack patients, initial treatment consists of a thiazide diuretic, calcium-channel blocker, angiotensin-converting enzyme inhibitor, or angiotensin-receptor blocker. For black patients, initial treatment is thiazide or a calcium-channel blocker. Initial or add-on treatment for patients with chronic kidney disease consists of either an angiotensin-converting enzyme inhibitor or an angiotensin-receptor blocker (not both).

OTHER CONSIDERATIONS

Suggestions for Implementation

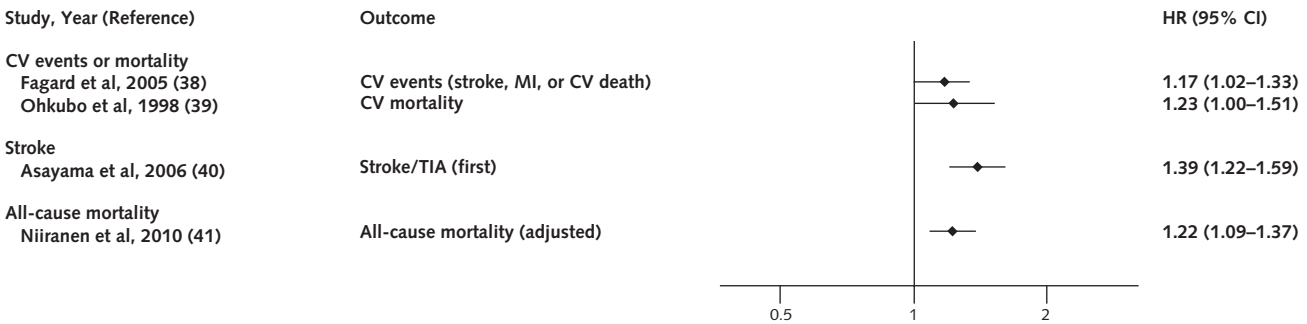
Screening for high blood pressure may be done in the office setting by using the proper methods described previously. However, the USPSTF recommends confirmation outside of the clinical setting before a diagnosis of hypertension is made and treatment is started. Confirmation may be done by using HBPM or ABPM. Because blood pressure is a continuous value with natural variations throughout the day, repeated measurements over time are generally more accurate in establishing a diagnosis of hypertension. The USPSTF did not find evidence for a single gold standard protocol for HBPM or ABPM. However, both may be used in conjunction with proper office measurement to make a diagnosis and guide management and treatment options. Blood pressure cuffs used for HBPM should be compliant with sphygmomanometer stan-

Figure 3. Risk for cardiovascular outcomes and death: 24-h ambulatory monitoring of systolic blood pressure, adjusted for office blood pressure.



Weights are from random-effects analysis. CV = cardiovascular; HF = heart failure; HR = hazard ratio; MI = myocardial infarction.

Figure 4. Risk for cardiovascular outcomes and death: home monitoring of systolic blood pressure, adjusted for office blood pressure.



Weights are from random-effects analysis. CV = cardiovascular; HR = hazard ratio; MI = myocardial infarction; TIA = transient ischemic attack.

dards set by the Association for the Advancement of Medical Instrumentation (44).

Research Needs and Gaps

Most of the evidence supports ABPM as the best method for confirming a diagnosis of hypertension. More research is needed on the accuracy of HBPM versus ABPM and the best HBPM protocols for follow-up of elevated office blood pressure. The diagnostic accuracy of blood pressure measurements taken by a visiting nurse or another health care worker in the home setting also merits more research. Self-use blood pressure measurement kiosks in community settings, such as pharmacies and grocery stores, may be frequently used by the public but are not regulated by the U.S. Food and Drug Administration. More research on the accuracy of kiosk measurements is needed. New technology has been developed that uses a wireless brachial blood pressure monitor that connects to a smartphone, a desktop computer, or the Internet for recording and analysis. More research is needed on the accuracy of these monitors, their use in primary prevention, and their association with long-term health outcomes.

DISCUSSION

Burden of Disease

Hypertension is a prevalent condition, affecting 29.1% of U.S. adults in 2011 to 2012 (45). Prevalence rates increase with age, from 7.3% in persons aged 18 to 39 years to 32.4% in those aged 40 to 59 years and to 65.0% in those aged 60 years or older. Non-Hispanic black adults have the highest prevalence (42.1%) compared with white (28.0%), Hispanic (26.0%), and Asian (24.7%) Americans. Uncontrolled hypertension is a risk factor for heart attack, stroke, and congestive heart failure and a major contributing factor to cardiovascular and all-cause mortality in the United States (46). Persons with high blood pressure often have no signs or symptoms of the condition; however, once diagnosed, it is usually amenable to treatment.

Scope of Review

In its previous evidence reviews, the USPSTF found substantial indirect evidence to support the effectiveness of screening for high blood pressure in adults (2, 3). For the current recommendation statement, the USPSTF examined the diagnostic accuracy of different methods for confirming a diagnosis of hypertension after initial screening. The USPSTF also examined data to determine the optimal rescreening interval for diagnosing hypertension.

Effectiveness of Early Detection

The USPSTF found 1 new study that directly assessed screening for high blood pressure in an adult population (47). This study was a good-quality cluster RCT of community-based pharmacy screening in adults aged 65 years or older living in Ontario, Canada. Results showed 3 fewer annual cardiovascular-related hospitalizations per 1000 persons in the intervention group compared with the no-screening group (rate ratio, 0.91 [95% CI, 0.86 to 0.97]). However, because this study was limited to adults aged 65 years or older, the USPSTF concluded that there is still inadequate direct evidence about the benefits and harms of screening for hypertension in younger adults. Substantial indirect evidence continues to support the net benefit of screening for high blood pressure in adults aged 18 years or older (2, 3).

Accuracy of Screening Tests

Office Blood Pressure Measurement

The USPSTF did not find evidence suggesting that a particular office blood pressure measurement protocol is more accurate than any other (1). Data comparing manual (ausculatory) versus automated office blood pressure measurement with a reference standard, such as ABPM, are lacking.

The USPSTF found that office blood pressure variably predicted true hypertension, as defined by the reference standard of ABPM. Isolated elevated clinic blood pressure was not confirmed after ABPM in approximately 5% to 65% of study participants (Figure 2) (1). Positive predictive values (with ABPM as the refer-

ence standard) increased with the following factors: patient population characteristics, such as age; blood pressure; and the number of abnormal screening results before confirmation. Given the variability of office blood pressure in predicting sustained, true hypertension, confirmatory measurement is needed for patients with elevated blood pressure at the initial office screening.

Ambulatory and Home Blood Pressure Monitoring

The USPSTF found that elevated 24-hour ambulatory systolic blood pressure was consistently and significantly associated with stroke and other cardiovascular outcomes, independent of office blood pressure and with greater predictive value. Because of its large evidence base, ABPM is considered the best confirmatory test for hypertension. The USPSTF found 9 studies that evaluated the predictive value of 24-hour ABPM on long-term health outcomes (1). Four studies found that each 10–mm Hg increment in ambulatory blood pressure (adjusted for office measurements) was significantly associated with increased risk for fatal and nonfatal stroke (Figure 3) (31–34). Six studies found that each 10–mm Hg increment was associated with increased risk for fatal and nonfatal cardiovascular events, with hazard ratios ranging from 1.11 to 1.42 (Figure 3) (31–33, 35–37).

Home blood pressure monitoring may also be a reasonable confirmatory method but has less evidence to support its use. Four good-quality studies found that elevated blood pressure with HBPM showed a significant association with increased risk for cardiovascular outcomes, with hazard ratios ranging from 1.17 to 1.39 (Figure 4) (38–41).

Screening Interval

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 years (1). These data are summarized in the Table.

The percentage of patients who are diagnosed with hypertension after confirmatory monitoring is significantly higher among African Americans, persons with an initial high-normal blood pressure (130 to 139/85 to 89 mm Hg), those who are obese or overweight, and those older than 40 years (1). In most studies, the risk for hypertension exceeded 20% at 3 to 5 years in persons with at least 1 of these risk factors. Given the higher incidence of hypertension in populations with these risk factors, annual screening may be warranted for persons aged 40 years or older, African Americans of any age, and persons who are overweight or obese. Blood pressure exceeding the optimal level of less than 120/80 mm Hg may confer a graded risk; persons with blood pressure closest to the threshold for a diagnosis of hypertension have a higher incidence of hypertension at rescreening. Adults aged 18 to 39 years with no other risk factors have a low incidence of hypertension (about 1% to 6% at 2 years).

The USPSTF recommends rescreening with adequate office blood pressure measurement using the techniques described previously and, if indicated, confirmation with ABPM. Ambulatory blood pressure monitoring can be performed every year in high-risk persons and every 3 to 5 years in those at low risk (adults aged 18 to 39 years with no risk factors).

Potential Harms of Screening

The USPSTF found 9 studies that evaluated the harms of screening for high blood pressure (1). Four studies found no significant differences in psychological distress or quality of life before versus after participants were labeled with hypertension or prehypertension (48–51). Four studies addressed harms associated with ABPM and found that use of the monitoring device was associated with sleep disturbances, discomfort, and restrictions in daily activities (52–55). These studies suggest that the harms of screening may be relatively minor and short-term in nature. However, persons with isolated elevated clinic blood pressure who do not receive confirmatory ABPM or HBPM may be misdiagnosed with hypertension and could subsequently experience the more serious harms of unnecessary drug treatment. Misdiagnosis of hypertension is an area that warrants future research.

Estimate of Magnitude of Net Benefit

The USPSTF determined that the benefits of screening for high blood pressure in adults to prevent cardiovascular morbidity and mortality are substantial and that the harms of screening are small. The USPSTF concludes with high certainty that the net benefit of screening is substantial.

Response to Public Comment

A draft version of this recommendation statement was posted for public comment on the USPSTF Web site from 23 December 2014 to 26 January 2015. The USPSTF reviewed all public comments received in response. The USPSTF acknowledges the current barriers to implementation of its recommendation, including the availability and affordability of ABPM. In response, it revised the final recommendation to include HBPM as an alternative for confirming a diagnosis of hypertension when ABPM is not feasible. The USPSTF also pro-

Table. Hypertension Incidence, by Rescreening Interval

Variable	Rescreening Interval				
	1 y	2 y	3 y	4 y	5 y
Weighted mean incidence of hypertension (range), %	2.5 (2.5–4.4)	7.7 (1.2–12.3)	14.2 (6.6–24.9)	12.4 (2.1–23.7)	13.8 (2.1–28.4)
Studies (participants), *n*	2 (17 740)	6 (76 753)	6 (25 443)	5 (25 778)	16 (54 240)

vided more information on the implementation of diagnostic confirmation and industry standards for home blood pressure monitors.

UPDATE OF PREVIOUS USPSTF RECOMMENDATION

This recommendation updates the 2007 reaffirmation recommendation statement on screening for high blood pressure in adults. The current statement recommends screening for high blood pressure using office blood pressure measurement and confirming a diagnosis of hypertension with ABPM. In addition, the USPSTF recommends optimal screening intervals for diagnosing hypertension in adults.

RECOMMENDATIONS OF OTHERS

The Eighth Joint National Committee does not address the diagnosis of hypertension in its 2014 guidelines (42). The Seventh Joint National Committee recommends screening for high blood pressure at least once every 2 years in adults with blood pressure less than 120/80 mm Hg and every year in adults with blood pressure of 120 to 139/80 to 89 mm Hg (56). The American Heart Association recommends blood pressure measurement at each regular health care visit or at least once every 2 years in adults with blood pressure less than 120/80 mm Hg (57). The American Academy of Family Physicians' recommendation is similar to that of the USPSTF (58). The American Congress of Obstetricians and Gynecologists recommends blood pressure screening as part of women's annual health care visits (59).

From the U.S. Preventive Services Task Force, Rockville, Maryland.

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Requests for Single Reprints: Reprints are available from the USPSTF Web site (www.uspreventiveservicestaskforce.org).

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Appendix: U.S. Preventive Services Task Force

Members of the USPSTF at the time this recommendation was finalized† are Albert L. Siu, MD, MSPH, *Chair* (Mount Sinai School of Medicine, New York, and James J. Peters Veterans Affairs Medical Center, Bronx, New York); Kirsten Bibbins-Domingo, PhD, MD, MAS, *Co-Vice Chair* (University of California, San Francisco, San Francisco, California); David Grossman, MD, MPH, *Co-Vice Chair* (Group Health Research Institute, Seattle, Washington); Linda Ciofu Baumann, PhD, RN, APRN (University of Wisconsin, Madison, Wisconsin); Karina W. Davidson, PhD, MASc (Columbia University, New York, New York); Mark Ebell, MD, MS (University of Georgia, Athens, Georgia); Francisco A.R. García, MD, MPH (Pima County Department of Health, Tucson, Arizona); Matthew Gillman, MD, SM (Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, Massachusetts); Jessica Herzstein, MD, MPH (independent consultant, Washington, DC); Alex R. Kemper, MD, MPH, MS (Duke University, Durham, North Carolina); Alex H. Krist, MD, MPH (Fairfax Family Practice, Fairfax, and Virginia Commonwealth University, Richmond, Virginia); Ann E. Kurth, PhD, RN, MSN, MPH (New York University, New York, New York); Douglas K. Owens, MD, MS (Veterans Affairs Palo Alto Health Care System, Palo Alto, and Stanford University, Stanford, California); William R. Phillips, MD, MPH (University of Washington, Seattle, Washington); Maureen G. Phipps, MD, MPH (Brown University, Providence, Rhode Island); and Michael P. Pignone, MD, MPH (University of North Carolina, Chapel Hill, North Carolina). Former USPSTF member Michael LeFevre, MD, MSPH, also contributed to the development of this recommendation.

† For a list of current USPSTF members, go to www.uspreventiveservicestaskforce.org/Page/Name/our-members.

Appendix Table 1. What the USPSTF Grades Mean and Suggestions for Practice

Grade	Definition	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer/provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer/provide this service.
C	The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer/provide this service for selected patients depending on individual circumstances.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.	Read the Clinical Considerations section of the USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

Appendix Table 2. USPSTF Levels of Certainty Regarding Net Benefit

Level of Certainty*	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by such factors as: the number, size, or quality of individual studies; inconsistency of findings across individual studies; limited generalizability of findings to routine primary care practice; and lack of coherence in the chain of evidence. As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: the limited number or size of studies; important flaws in study design or methods; inconsistency of findings across individual studies; gaps in the chain of evidence; findings that are not generalizable to routine primary care practice; and a lack of information on important health outcomes. More information may allow an estimation of effects on health outcomes.

* The USPSTF defines *certainty* as "likelihood that the USPSTF assessment of the net benefit of a preventive service is correct." The net benefit is defined as benefit minus harm of the preventive service as implemented in a general primary care population. The USPSTF assigns a certainty level on the basis of the nature of the overall evidence available to assess the net benefit of a preventive service.