Compared with other modifiable risk factors, hypertension is associated with more target end-organ damage, cardiovascular disease (CVD) events, and disability-adjusted life-years lost in the United States.\(^1\) The measurement of blood pressure (BP) in the office setting has been the primary method to identify hypertension and assess for BP control.\(^2\) However, this approach may be insufficient, since studies have demonstrated that compared with office BP, BP measurements obtained outside of the office setting are more strongly associated with CVD.\(^3\) In the 2021 US Preventive Services Task Force (USPSTF) recommendation statement by Krist et al,\(^4\) hypertension screening using office BP measurement is recommended for adults aged 18 years or older. Out-of-office BP monitoring is also recommended for diagnostic confirmation before starting treatment. The USPSTF considered this recommendation to be a grade A, indicating there is high certainty that the net benefit of screening for hypertension is substantial.\(^4\)

The recommendation from the 2021 USPSTF recommendation statement\(^4\) was based on evidence from a systematic review by Guirguis-Blake et al\(^5\) commissioned by the USPSTF to evaluate key questions related to the benefits and harms of screening for hypertension in adults, the accuracy of office BP measurement for initial screening, and the accuracy of various confirmatory BP measurement methods after an initial high office BP. Regarding benefits of hypertension screening, the systematic review by Guirguis-Blake et al\(^5\) identified 1 good-quality community-based randomized clinical trial conducted in Canada examining the effectiveness of a 10-week multicomponent CVD health promotion program intervention with hypertension screening as a primary component on CVD outcomes (ie, the change in mean annual rate of hospital admissions for acute myocardial infarction, heart failure, or stroke in the year before compared with the year after intervention implementation) among residents 65 years or older. BP was measured by trained volunteers using a validated device. Compared with no intervention, the intervention led to a 9% reduction in hospitalizations per 1000 CVD events. The systematic review by Guirguis-Blake et al\(^5\) also identified a few studies on the harms of hypertension screening. Data from these studies suggested minimal associations of hypertension screening with quality of life and psychological outcomes.

For many people, BP differs when measured outside vs inside the office. Two BP phenotypes represent a mismatch between office and out-of-office BP: white coat hypertension and masked hypertension. **White coat hypertension** is defined by having high office BP and not having high out-of-office BP, and **masked hypertension** is defined by having high out-of-office BP and not having high office BP.\(^2,3\) Compared with sustained normotension, defined by not having high BP on either in-office or out-of-office BP measurements, white coat hypertension is associated with either no increased or moderately increased risk of CVD and mortality.\(^2,6\) Prior studies have also shown that compared with sustained normotension, masked hypertension is associated with an increased risk of CVD and mortality.\(^2,3\) White coat hypertension and masked hypertension can only be excluded by performing office measurements and out-of-office BP monitoring.

There are 2 standard approaches to out-of-office BP monitoring: ambulatory BP monitoring (ABPM) and home BP monitoring (HBPM).\(^7\) ABPM is a fully automated technique in which BP is recorded typically over a 24-hour period, while HBPM involves the self-measurement of BP by an individual at home. Prior hypertension guidelines, including the 2015 USPSTF recommendation...
statement on hypertension screening,7 have endorsed ABPM as the reference standard for out-of-office BP monitoring, since more studies have examined associations of out-of-office BP with CVD using ABPM than HBPM. The systemic review by Guirguis-Blake et al5 similarly accepted ABPM as the reference standard.

Examining the accuracy of office BP measurement for initial screening, Guirguis-Blake et al5 reported that office BP measured at a single visit had low sensitivity (0.54 [95% CI, 0.37-0.70]) and good specificity (0.90 [95% CI, 0.84-0.95]) for detecting high BP on ABPM. The consequence of a low sensitivity is that there is a greater likelihood that using office BP to screen for hypertension will provide a false negative: many individuals who have high BP on ABPM will not have high office BP measured at a single visit. Therefore, if a high office BP determined by a single visit is used to decide who should undergo ABPM, many individuals with masked hypertension will go undetected despite having an increased risk of CVD and mortality.

Guirguis-Blake et al5 also examined the accuracy of in-office confirmatory BP measurement among adults who initially had high office BP in a screening visit compared with ABPM. Conducting BP measurement at additional office visits had good sensitivity (0.80 [95% CI, 0.68-0.88]) but poor specificity (0.55 [95% CI, 0.42-0.66]) for high BP on ABPM. The implication of a low specificity indicates a greater chance of a false positive test: many individuals without high BP on ABPM will have high BP based on measurements from repeat office visits. Similarly, HBPM also had good sensitivity (0.84 [95% CI, 0.76-0.90]) but poor specificity (0.60 [95% CI, 0.48-0.71]) for detecting high BP on ABPM. Therefore, whether relying on BP measurements from additional office visits or HBPM, not conducting ABPM may lead to the underdetection of white coat hypertension and potentially to overtreatment with antihypertensive medication. The findings by Guirguis-Blake et al5 suggest that after a single visit with high office BP, it may be appropriate to proceed with ABPM without conducting additional office visits or HBPM. However, while this approach will exclude white coat hypertension, individuals without high office BP and with masked hypertension may still be missed.

It remains unclear how masked hypertension should be detected during hypertension screening. One approach is to perform ABPM on all adults without high office BP. Another is to only perform ABPM among a subset of adults without high office BP and who have a high prevalence of masked hypertension, including those who have office BP near the threshold for hypertension, or with high 10-year estimated CVD risk.8,9 Estimation models for high out-of-office BP, such as Predicting Out-of-Office Blood Pressure in the Clinic,10 based on office BP along with age, sex, body mass index, previous diagnosis of hypertension, and history of CVD, have also been proposed to help determine who should undergo ABPM for excluding masked hypertension.

Emphasizing the importance of out-of-office BP monitoring is meaningful. However, the 2021 USPSTF recommendation statement by Krist et al4 does not address a critical issue facing out-of-office BP monitoring in the US: the poor implementation of ABPM in clinical practice. In the US, ABPM is not widely available.3,11 We reported in a 2017 study12 that clinician-level barriers to ABPM include the need for staff training, time constraints in patient preparation, and inaccessibility of equipment and specialists to whom clinicians could refer their patients for ABPM. There are also patient-level barriers, including low patient tolerability to ABPM and sleep disturbance.3,5 Therefore, without effective strategies for the implementation of ABPM, the well-intentioned 2021 USPSTF recommendation statement,4 which considers ABPM the reference standard for out-of-office BP monitoring, will have little impact on hypertension screening among US adults.

Perhaps an obvious solution is to perform HBPM rather than ABPM. HBPM is more widely available, less expensive, and better tolerated by patients.13 Specialists are also not needed to implement HBPM. In our 2016 systematic review of 9 studies,14 there was insufficient evidence indicating whether ABPM is superior to HBPM or vice versa for the association of BP with CVD. Therefore, there is equipoise as to whether ABPM or HBPM should be the reference standard for out-of-office BP monitoring. In 2020,15 we reported that, compared with ABPM, HBPM may have better reliability and stronger associations with left ventricular mass index, a validated measure of...
target end-organ damage, among individuals not using antihypertensive medication. These results suggest that HBPM may be a better reference standard than ABPM. Additional evidence demonstrating that HBPM is superior to ABPM would have great impact on public health, as ABPM has been difficult to implement in the US.

Additionally, Guirguis-Blake et al.\(^5\) noted that only a few of the included studies reported race/ethnicity. Among those studies, there was limited racial and ethnic diversity, with a disproportionately high representation of White participants. As a result, it is unclear how out-of-office BP monitoring strategies should be tailored to ensure that its benefits may be realized by all populations. For example, African American individuals have a very high prevalence of masked hypertension.\(^9\) Screening approaches that focus on performing out-of-office BP monitoring only for adults with high office BP, an approach that misses masked hypertension, have the potential to disproportionately hinder a historically disadvantaged group that is at increased risk of hypertension and CVD. To deliver equitable care, addressing hypertension screening research questions that also consider socioeconomic and structural barriers to care among a diverse racial/ethnic sample must be a priority.

Given the substantial evidence generated over the past several decades, the focus on office and out-of-office BP measurements by the 2021 USPSTF recommendation statement\(^4\) is appropriate. The greatest challenges to overcome are how to successfully implement ABPM for adults with high office BP, while also ensuring masked hypertension is not missed for adults without high office BP.

ARTICLE INFORMATION

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Conflict of Interest Disclosures: None reported.

Funding/Support: Dr Shimbo received support through grant No. K24-HL125704 from the National Institutes of Health (NIH) National Heart, Lung, and Blood Institute (NHLBI). Dr Anstey received support through an Investigator Research Supplement (grant No. R01 HL137818-03S1) from NIH/NHLBI.

Role of the Funder/Sponsor: The funder had no role in the preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

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