ORIGINAL RESEARCH

Diagnosing Hypertension in Primary Care Clinics According to Current Guidelines

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Purpose: **This descriptive study examines hypertension diagnostic practices in Utah primary care clinics relative to the 2015 US Preventive Services Task Force (USPSTF) recommendations for the accurate diagnosis of hypertension. We assessed clinic procedures in place to facilitate accurate in-office and out-of-office blood pressure (BP) measurement.**

Methods: **An online questionnaire was administered to 321 primary care clinics. We compared current clinic BP measurement practices with the USPTF recommendations and assessed the level of adherence to the recommendations by level of clinic integration with a hospital.**

Results: **Of the 321 primary care clinics that received the assessment, 123 (38.3%) completed the questionnaire. Clinics varied significantly in their ability to provide accurate in-office measurement, ranging from 57.5% to 93.5% of clinics complying with USPSTF recommendations. Only 25.2% of clinics reported having access to ambulatory monitoring and 36.6% had instructional materials for accurate home BP monitoring. Clinics integrated with a hospital were more likely to report adherence to recommendations than solo or independent clinics (36.4% vs 10.5%; $P < .01$).**

Conclusion: **This assessment shows that many primary care clinics are not well prepared to implement the USPSTF guidelines for accurate diagnosis of hypertension. Most office practices will benefit from support to develop their capacities. (J Am Board Fam Med 2017;30:170–177.)**

Keywords: **Ambulatory Blood Pressure Monitoring, Blood Pressure, Hypertension, Primary Health Care, Surveys and Questionnaires, Utah**

Inaccurate diagnosis of hypertension in the office setting is a major concern. First, multiple studies demonstrate that office staff most often measure blood pressure (BP) using incorrect technique.[1–3] Because most technical errors falsely elevate BP, measurement by usual office staff averages 10/7 mmHg higher than BP measured according to current guidelines.[1,2] Second, systematic and narrative reviews conclude that about 30% of patients with elevated BP measured in an office have isolated office ("white-coat") hypertension but normal BP out of the office.[4,5] Considering 24-hour ambulatory BP monitoring (ABPM) as the reference standard for an accurate hypertension diagnosis and prediction of future cardiovascular events, a large proportion of people with elevated in-office BP may be normotensive with out-of-office BP monitoring (ranging from 5% to 65% among 24 studies reviewed by Piper et al.[4]). A false-positive diagnosis of hypertension exposes patients and the health care system to the unnecessary costs of antihypertension medications and office visits, to the potential side effects of these medications, and, albeit with less certainty, to the possible adverse psychological effects from being labeled as "hypertensive." As a result, to avoid misdiagnosis and overtreatment, new US and international guidelines propose that office BP measurement (OBPM) be used only as a screening test for

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hypertension.[6–10] These guidelines, including a 2015 grade A recommendation from the US Preventive Services Task Force,[6] propose that, for most patients, confirmation of a diagnosis of hypertension should be achieved with out-of-office BP monitoring, preferably using 24-hour ABPM.[6–10] If ABPM is not available, or not tolerated, standardized home BP monitoring (HBPM) may be a substitute.[6–10]

Are primary care clinics adequately prepared to implement these recommendations for accurate OBPM and out-of-office BP monitoring for the 70 million patients with hypertension in the United States?[11] Effective implementation of these interventions requires the use of OBPM and HBPM devices validated for accuracy by international protocols,[12] training and subsequent monitoring of both clinic staff and patients in correct OBPM and HBPM protocols,[13,14] convenient access to 24-hour ABPM services,[15,16] and, optimally, use of an electronic health record (EHR) or electronic registry that can identify and track hypertension patients and their HBPM values.[17]

Utah formed the Utah Million Hearts Coalition (UMHC) as part of the national Million Hearts initiative to prevent 1 million heart attacks and strokes by 2017.[18] The UMHC is a multistakeholder group of health care and public health entities, including subject matter experts in hypertension care, with a mission to prevent heart attacks and strokes in Utah through improved clinical care and accurate BP measurement and control in health care settings and at home. The objective of this descriptive study, led by the UMHC, was to assess the policies and procedures currently in place in Utah primary care clinics related to in-office and out-of-office BP measurement, and to identify gaps between current practices and the 2015 USPSTF diagnosis guidelines.

Methods

Assessment

A descriptive assessment of primary care clinics in Utah was conducted to determine the extent to which clinics throughout the state have policies and processes in place to ensure appropriate BP measurement and hypertension diagnosis. The UMHC developed a questionnaire to obtain clinic-level information on self-reported OBPM technique, ABPM availability, and HBPM patient instructional materials and processes. Because a broad range of processes are involved in the accurate diagnosis of hypertension, and because no one person in the clinic would likely be able to accurately answer all parts of the questionnaire, the assessment was designed to be completed by a team. Clinics were instructed to include, at a minimum, a medical assistant or registered nurse, a primary care physician, and an office manager or patient services representative. Questions were primarily quantitative and used either a yes/no response or a Likert scale, with responses ranging from "never" to "always" (see online Appendix).

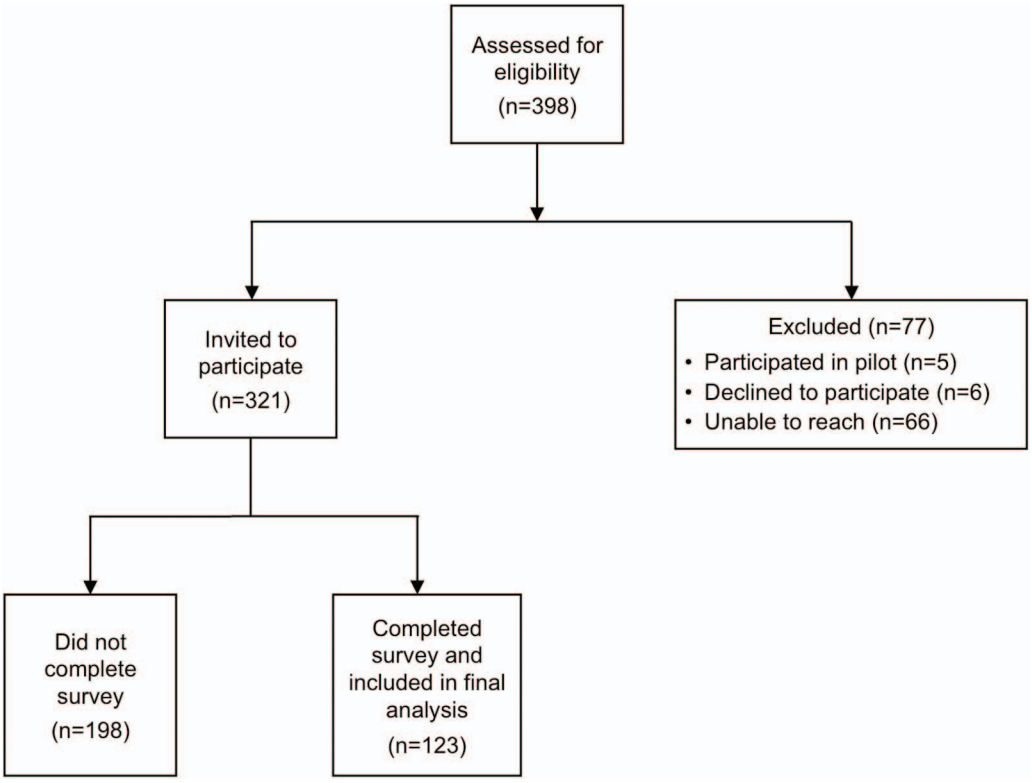
The Utah Department of Health Institutional Review Board determined that the assessment collected information on professional opinions and not patient-specific data. The institutional review board reviewed the study proposal and deemed it to be exempt, in particular because the purpose of the assessment was quality improvement.

The questionnaire was drafted in early 2015 and administered to Utah primary clinics from April through August 2015. The UMHC was aware of the USPSTF draft document that was open for comment in late 2015, during questionnaire development. The assessment was pilot tested by 5 clinics, and questions were modified to improve clarity, as needed. Data from pilot clinics were not included in the final analysis.

A list of all known Utah primary care clinics was compiled. Lists were obtained from the Division of Professional Licensing, HealthInsight (Utah's quality innovation network–quality improvement organization), the Utah Health Information Exchange database, and local health system websites. UMHC partners work closely with most practices in the state and are aware of practice types. Clinics that practice family medicine, general practice, internal medicine, and geriatric medicine were included. A total of 398 primary care clinics were identified for the study. To ensure that clinic eligibility requirements were met, a screening question was included at the start of the assessment: "Does your practice provide primary care *and* treatment for patients with hypertension?" A summary of the clinic enrollment process is illustrated in Figure 1.

The assessment was conducted electronically using the online survey software Qualtrics, and links

Figure 1. Flow of participants in study.



were sent to all clinics that provided a valid E-mail address. In total, 321 clinics provided a valid E-mail address and were used as the sample frame for the study. Only completed questionnaires were included in the analysis. A total of 198 clinics either did not begin, or began but did not complete, the questionnaire, whereas 123 clinics (38.3%) completed the questionnaire. Although clinics were instructed to complete the assessment as a physician office team, only 1 in 4 clinics included all the requested team members in completing the questionnaire.

Data Analysis

UMHC assessment was completed on August 30, 2015; the USPSTF officially released its recommendations online on October 3, 2015.[6] We reviewed our questionnaire and identified 10 questions from our assessment that were relevant to the USPSTF guidelines. Data were then reviewed to better understand the extent to which the clinics were currently in compliance with the recommendations for OBPM, ABPM, and HBPM. Self-reported adherence to the recommendations was measured as a 2-category variable (adherent to/not adherent to recommendations). Clinics reporting "always" or "most of the time" to the Likert scale questions, or "yes" to the yes/no questions, were considered adherent to the recommendations. Descriptive analyses were used to determine the percentage of clinics that adhered to the recommendations. Recognizing that clinics that are part of a larger health care system with a hospital affiliation may have greater capacity to adhere to the recommendations than those in independent or solo clinics, we considered integration as a potential explanatory factor in recommendation compliance. Integration was measured as a 2-category variable: (1) low = not integrated with a health system affiliated with a hospital, and (2) high = integrated with a health system also affiliated with a hospital. We therefore examined the number of recommendations adhered to for each level of integration. Three categories were used: 0 to 4 (lowest), 5 to 7 (middle), and 8 to 10 (highest). The Fisher's exact test was used to determine the association between the level of integration and adherence to the USPSTF recommendations.

Table 1. Characteristics of Responding Clinics Compared to All Utah Primary Care Clinics

Clinic Characteristics	Respondents (n = 123)	Utah Primary Care Clinics (n = 398)
Clinic type		
Family medicine	83 (67.5)	252 (63.3)
General practice	12 (9.8)	10 (2.5)
Internal medicine	19 (15.4)	54 (13.6)
Geriatrics	3 (2.4)	7 (1.8)
Multispecialty	3 (2.4)	41 (10.3)
Other	3 (2.4)	34 (8.5)
Total	123 (100.0)	398 (100.0)
Geographic density		
Urban	76 (61.8)	243 (61.1)
Rural/frontier	47 (38.2)	155 (38.9)
Total	123 (100.0)	398 (100.0)
Integration level*		
Low	57 (46.3)	275 (69.1)
High	66 (53.7)	123 (30.9)
Total	123 (100.0)	398 (100.0)

Data are n (%).
*Low integration indicates a solo, independent clinic or a clinic that is part of a health care system that does not include a hospital. High integration represents a clinic that is part of a health care system that includes a hospital.

Results

In total, 123 primary care clinics completed the questionnaire (38.3% response rate) and were included in the final analysis. The respondent profile was similar to the descriptive characteristics of the state of Utah with respect to geographic density and practice type, but clinics considered to be highly integrated had a higher response rate than clinics with low integration (Table 1).

The characteristics of the respondents are outlined in Table 2. The clinics were likely to be urban, family medicine, or groups with >2 providers. More than half of the respondents (53.7%) were classified as highly integrated clinics.

We examined the extent to which clinics currently complied with the USPSTF recommendations for OBPM, HBPM, and ABPM based on responses to relevant assessment questions. Table 3 displays the USPSTF recommendations, the associated questions from our assessment, and the percentage of clinics that adhered to the recommendations. Recommendations were divided into 2 categories: (1) those that pertained to accurate OBPM techniques and (2) those used to confirm the diagnosis of hypertension with out-of-office BP monitoring. Only 58.5% of clinics self-reported the use of the mean of 2 OBPMs, and 57.7% reported allowing patients to rest at least 5 minutes before measuring BP. Only 25.2% of clinics reported having access to ABPM, and 36.6% had instructional materials to train patients in accurate HBPM.

Associations between the level of clinic integration and the number of USPSTF recommendations adhered to are displayed in Table 4. A

Table 2. Characteristics of Clinics Responding to Assessment

Practice Characteristics	No. (%)
Setting	
Federally qualified health center	20 (16.3)
Hospital-based practice	3 (2.4)
University-based practice	11 (8.9)
Group practice (>2 providers)	61 (49.6)
Small or solo practice (1 or 2 providers)	22 (17.9)
School-based community clinic	2 (1.6)
Other	4 (3.3)
Total	123 (100.0)
Practice type	
Family medicine	83 (67.5)
General practice	12 (9.8)
Internal medicine	19 (15.4)
Geriatrics	3 (2.4)
Multispecialty	3 (2.4)
Other	3 (2.4)
Total	123 (99.9)*
Practice size†	
1–2	40 (32.5)
3–5	35 (28.5)
6–10	30 (24.4)
≥10	15 (12.2)
Missing	3 (2.4)
Total	123 (100.0)
Geographic density	
Urban	76 (61.8)
Rural	47 (38.2)
Total	123 (100.0)
Integration level‡	
Low	57 (46.3)
High	66 (53.7)
Total	123 (100.0)

*This total did not equal 100% because of rounding.
†Full-time equivalent physicians and advanced practice clinicians.
‡Low integration indicates a solo, independent clinic or a clinic that is part of a health care system that does not include a hospital. High integration indicates a clinic that is part of a health care system that includes a hospital.

Table 3. Percentage of Clinics Adherent to US Preventive Services Task Force Recommendations

USPSTF Recommendation[6]	Utah Million Hearts Assessment Question	Clinics Adherent to Recommendation, % (95% CI)
In-office blood pressure measurement		
Use the mean of 2 measurements	Q11: Repeat the measurement within 1 to 2 minutes and use the mean of 2 measures	58.5 (49.7–67.4)
Measure while the patient is seated	Q5: Patient seated in a chair with back support	87.0 (81.0–93.0)
Allow for ≥5 minutes between entry into office and BP measurement	Q8: Measure BP after the patient has rested quietly for 5 minutes before measurement	57.7 (48.9–66.6)
Use an appropriately sized arm cuff	Q10: Use a cuff size appropriate to the patient's midarm circumference	93.5 (89.1–97.9)
Place the patient's arm at the level of the right atrium	Q7: Measure BP with the patient arm and cuff at midsternal level	84.6 (78.1–91.0)
Out-of-office hypertension diagnosis confirmation		
ABPM may be used to confirm a diagnosis after initial screening	Q18: Practice has access to 24-hour ABPM studies	25.2 (17.4–33.0)
HBPM may be used to confirm a diagnosis after initial screening	Q15: Practice has a written policy for training patients on accurate HBPM	27.6 (19.6–35.7)
	Q16: Staff distribute materials for HBPM for newly diagnosed patients or those with uncontrolled hypertension	36.6 (28.0–45.2)
	Q17: Practice designates at least 1 member of the care team to provide individualized training in accurate HBPM	48.8 (39.8–57.7)
Recommends use of a regular screening interval	Q23: Practice has a system to alert patients with uncontrolled hypertension of a missed appointment or overdue BP check	55.3 (46.4–64.2)

ABPM, 24-hour ambulatory blood pressure monitoring; CI, confidence interval; BP, blood pressure; HBPM, home blood pressure monitoring; USPSTF, US Preventive Services Task Force.

Table 4. Level of Clinic Integration and Number of US Preventive Services Task Force Recommendations Adhered to by Clinic

Integration Level*	Number of USPSTF Recommendations Adhered To			Total
	0–4	5–7	8–10	
Low	20 (35.1)	31 (54.4)	6 (10.5)	57 (100.0)
High	17 (25.8)	25 (37.9)	24 (36.4)	66 (100.0)
Total	37 (30.1)	56 (45.5)	30 (24.4)	123 (100.0)

Data are n (%).
Differences are statistically significant ($P < .01$).
*Low integration indicates a solo, independent clinic or a clinic that is part of a health care system that does not include a hospital. High integration represents clinics that are part of a health care system that includes a hospital.
USPSTF, US Preventive Services Task Force.

statistically significant association exists between integration and the number of recommendations adhered to by clinics. A higher percentage of clinics that were highly integrated adhered to 8 to 10 recommendations compared with clinics with low integration (36.4% and 10.5%, respectively).

Discussion

The 2015 USPSTF Recommendations for Screening for High BP in Adults[6] and other recent international guidelines[7–10] aim to improve the accuracy of hypertension diagnosis (1) by using correct OBPM technique to avoid the frequent overestimation and occasional underestimation of office BP resulting from incorrect technique,[1–3] and (2) by confirming the diagnosis of hypertension with out-of-office BP measurement using 24-hour ABPM or HBPM to detect isolated office hypertension—known as "white-coat hypertension"—that is present in 30% of patients with elevated office BP.[4,5] Unfortunately, our assessment of primary care practices in Utah confirms previous studies demonstrating incorrect OBPM as a widespread phenomenon in clinical practice. Our findings also

suggest there likely are major challenges to the effective implementation of out-of-office BP measurement with either ABPM or HBPM.

These gaps identified with Utah practices are not surprising. Use of ABPM in the United States, as assessed by Medicare claims, is indeed very low,[19] likely because of a combination of limited availability, inadequate reimbursement by payers,[20] and limited clinician knowledge about ABPM as an important diagnostic tool. In fact, 80% of a small sample of 143 primary care physicians in a large urban city (Portland, Oregon) reported access to ABPM, although fewer than half reported using it.[21]

The accuracy of HBPM performed in real-world settings is of concern. Recent studies indicate that only 10% to 17% of clinicians provide HBPM training that is even minimally adherent to guidelines for accurate measurement,[22–24] and fewer than 20% of patients may be sufficiently adherent to the recommended HBPM technique to ensure reliable HBPM.[14,25,26] Compared with ABPM, HBPM requires a substantial commitment to training by both clinics and patients, and it may require individual, face-to-face instruction for optimal results.[13,14,26] Our assessment of Utah primary care clinics found similar concerns about their current delivery of patient training to facilitate accurate HBPM. Only 27.6% had a written policy for training patients in HBPM, 36.6% distributed written HBPM instructional materials, and just 48.8% had designated a team member to provide individual HBPM instruction.

This study had several limitations. First, UMHC conducted the assessment before the USPSTF hypertension assessment document was finalized, and thus the actual questionnaire was not perfectly aligned with the final wording of the USPSTF guidelines. Second, 198 primary care clinics did not complete the assessment, which could have introduced bias; however, our response rate (38.3%) seems to be within the range for current office practice surveys.[27,28] Third, our results show a higher response rate from larger, highly integrated health systems than from smaller practices. This may be the result of greater capacity by staff to complete the assessment at these sites and/or greater organizational interest in the topic. In addition, some clinics did not complete the assessment using all team members requested, which could lead to incomplete descriptions of office practices. Finally, the self-report aspect of the questionnaire may have introduced bias toward overestimating adherence to recommended BP measurement practices as a result of social desirability. Physician self-report and peer report may not accurately reflect actual adherence to best practices in clinical settings.[29] In light of these limitations, we believe our estimates of BP measurement practices are likely to overestimate adherence to guideline recommendations.

Our findings point to the low use of both ABPM and HBPM, both of which may be cost-beneficial in diagnosing hypertension from both societal[30] and payer[31] perspectives by identifying only sustained hypertension in and out of the office and by eliminating subsequent unnecessary treatment, potential adverse events from overtreatment, and unnecessary follow-up costs. The 2015 USPSTF recommendations favor ABPM over HBPM for diagnosing hypertension because of a larger number of supporting studies,[4,6] although a recent systematic review found no definitive evidence to prefer 1 over the other.[32] ABPM may be more time-efficient for clinics to diagnose hypertension because it does not require intensive patient training in performing HBPM.

This study suggests several ways that physicians can facilitate implementation of the 2015 USPSTF recommendations for hypertension diagnosis. First, OBPM may be improved by the use of automated OBPM (AOBPM) using validated devices that automatically perform and average 3 to 6 measurements at 1-minute intervals while patients are isolated, alone in an examination room or in a quiet corner of the waiting room.[33,34] AOBPM eliminates a number of technical errors in manual BP measurement, is a better predictor of cardiovascular outcome than OBPM, and substantially reduces "white-coat hypertension," thereby reducing the need for out-of-office BP measurement.[1,2,33,34] An unobserved AOBPM reading of 135/85 mmHg carries a cardiovascular risk equivalent to that of an observed guideline-quality office BP measurement of 140/90 mmHg.[34] Second, ABPM availability must be expanded, and this will require adjustment of third-party payer policies as well as primary care clinic education.[20] Third, primary care clinics must be supported to develop HBPM patient training programs. HBPM data collection schemes[35–39] and EHR systems that can easily integrate HBPM measurements into clinic workflow will be important.[17]

Finally, continued support of office practices to use their EHRs to monitor population-wide hypertension control rates and to target the groups at highest risk is imperative. State and local health departments and quality improvement organizations, perhaps under the umbrella of the national Million Hearts campaign, which is sponsored jointly by the Centers for Disease Control and Prevention and Centers for Medicare and Medicaid Services, can, we hope, help bring infrastructure to primary care clinics to help implement the 2015 USPSTF guidelines for hypertension diagnosis.

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