Home Blood Pressure Monitoring: Cost-Effectiveness, Patients' Preference and Barriers for Clinical Use

9

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9.1 Introduction

Blood pressure (BP) is one of the most common measurements performed in clinical practice. Many guidelines from around the world recommend recording BP outside of the clinic setting to confirm a diagnosis of possible hypertension, prior to initiating antihypertensive medication [1–4]. Also, obtaining out-of-office BP readings is recommended for monitoring the control of blood pressure for patients taking antihypertensive medication. The most commonly used methods for measuring BP outside of the clinic setting are ambulatory blood pressure monitoring (ABPM) and

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home blood pressure monitoring (HBPM) [5]. While many guidelines and scientific statements consider ABPM to be the reference standard for measuring BP, HBPM is often considered to be a reasonable alternative [6].

The decision to use ABPM or HBPM often reflects the preferences of the individual patient and those of the healthcare provider. The health system in which a patient receives care may also be a factor. Shared decision-making may play a large role in which technique is used for out-of-office BP monitoring, as both ABPM and HBPM appear reliable. It remains unclear whether one approach is superior to the other for diagnosing hypertension and monitoring control of BP. Clinicians can often guide the decision to use ABPM or HBPM based on which devices they have available and their preference. However, the use of ABPM or HBPM may be based ultimately on the patients' own viewpoint.

Hypertension is a lifelong condition and patients must be willing to monitor their BP outside of the office setting for ABPM or HBPM to be effective. Although HBPM involves patients in their own BP care, it also relies on the provider and other factors related to the healthcare system. Clinicians and healthcare systems can either facilitate access to HBPM or present barriers to its use. An appreciation of the barriers and facilitators to out-of-office testing as perceived by patients may facilitate clinicians' ability to provide patient-centered care. In this chapter, we review studies on patient and provider preferences for HBPM and the cost-effectiveness of HBPM.

9.2 Patient Preference

9.2.1 Results from Focus Groups

A number of researchers have conducted focus group discussions with patients to investigate their acceptance of HBPM. In a study conducted in the Netherlands, patients who had completed out-of-clinic BP monitoring with ABPM were recruited by their general practitioner and through social media [7]. None of the patients enrolled in this study had prior experience with HBPM. Patients reported HBPM would be useful, easier and more effective than ABPM since it would not interrupt their daily activity or cause pain/bruising.

In a separate set of focus groups conducted among patients who did not have hypertension and were recruited from clinics for low income populations in New York City, facilitators explained the concept of white coat hypertension and recommendations for ABPM and HBPM [8]. Many patients reported concerns about performing HBPM, including skepticism of the validity and reliability of devices, the challenges of arranging their schedule to obtain readings in the morning and evening and lack of confidence in performing the procedure. Also, the cost of buying a HBPM device was a concern for this low-income population. Patients reported a higher likelihood of performing HBPM if they were provided instructions on to how to conduct the procedure. HBPM was preferred over ABPM by some patients, as they perceived it to be more convenient and it would not disrupt their sleep. However, advantages of ABPM noted by patients included insurance

coverage for the procedure, the involvement of medical staff setting up and initiating the device for testing, the limited time requirement (i.e., only 24 hours), and concerns about forgetfulness with HBPM.

A third set of focus groups was conducted in the United Kingdom and aimed at identifying the HBPM schedules that could increase its use and adherence [9]. These groups included patients who had participated in a trial of self-management of BP. Patients reported that having formal schedules could improve adherence to HBPM. It was recognized that obtaining more readings provided a more accurate estimate of BP, but that anxiety could also be experienced. Flexibility was deemed to be important with the HBPM schedule. Patients preferred a shorter schedule (e.g., 3 days) but stated they would comply with a 7 day schedule if was recommended by their healthcare provider.

9.2.2 Results from Structured Patient Surveys

Several studies have enrolled participants who have undergone both HBPM and ABPM and then asked about their preferred BP measurement approach. In 2002, Little and colleagues published data from 200 patients with newly diagnosed hypertension or with established hypertension and uncontrolled BP [10]. All participants had BP measured by a nurse, a doctor, in their own home (i.e., HBPM), and by ABPM. Patients reported HBPM to be associated with less anxiety than when BP was measured by a nurse or physician. It was also preferred due to the ability to avoid waiting around when compared to nurse or physician measured BP. Also, HBPM resulted in fewer disturbances and was more comfortable than ABPM. Finally, patients reported a greater feeling of self-control with HBPM and that it was a good way to save doctors' or nurses' time.

In 2007, Logan and colleagues published data from a survey of 142 patients with hypertension from the province of Ontario, Canada [11]. Overall, 78% of participants reported owning an HBPM device and 68% of participants had measured their BP at home in the past year. Most participants reported their own interest in BP was the most important reason for using HBPM. For participants who did not use HBPM, they reported it was because their doctor didn't tell them to (53%) and they preferred to have their BP measured by their doctor or medical staff (50%). Only 16% of participants reported not being confident enough to measure their BP at home and only 9% did not use HBPM because it made them more anxious.

In a study of 83 patients recruited from the Edinburgh, Scotland ABPM service who had undergone ABPM and HBPM, 81% preferred HBPM to ABPM [12]. The main reasons reported were the ability to instantly see their BP level, being more in control of obtaining BP measurements, less embarrassment in public, and HBPM did not interfere with their sleep. Only 16% of study participants reported having difficulty adhering to the time constraints required of HBPM and only 4% reported an increase in anxiety with HBPM. The 19% of patients who preferred ABPM over HBPM stated that it was because the procedure was over in 24 h. Additionally, the authors noted that the time required to explain the procedure to

Table 9.1 Patient preferences and concerns for conducting home blood pressure monitoring

Preferences	Concerns
• Does not interrupt daily activity • Does not cause pain/bruising • More convenient than ambulatory blood pressure monitoring • Does not disrupt sleep • Less anxiety than clinic-measured blood pressure • More self-control • Can save doctor/nurse time • Easy to perform	• Skepticism about device validity • Lack of confidence in performing home blood pressure monitoring • Cost of devices • Requires long-term commitment

patients was less for HBPM compared with ABPM (10–15 min for HBPM versus 30 min for ABPM).

In 2014, Nasothimiou and colleagues reported on a study wherein patients (n = 104) were randomized to undergo ABPM followed by HBPM or HBPM followed by ABPM [13]. After completing each test, a higher proportion of participants reported a positive opinion for HBPM (82%) versus ABPM (63%). Participants were more likely to request HBPM (60%) than ABPM (40%) if they needed to perform out-of-office BP monitoring again. HBPM was reported to be easy to perform by 95% of participants compared to only 61% for ABPM. Moderate to severe discomfort was reported for ABPM by 55% of participants versus only 13% for HBPM. Moderate/severe restriction of daily activity was reported for 30% of participants after undergoing ABPM versus 7% after HBPM.

Patient preferences and concerns for conducting HBPM are summarized in Table 9.1.

9.3 Healthcare Provider's Perspective

9.3.1 Focus Groups

In a series of nine nominal groups, 63 providers were asked to discuss and rank barriers and facilitators to conducting HBPM and ABPM [14]. Providers suggested that there were several barriers that prevented the use of HBPM in their clinic. These were grouped into themes according to the Theoretical Domains Framework. The most commonly reported barrier that prevented the conduct of HBPM related to beliefs about capability and consequences (e.g., ability of patients to correctly perform HBPM, test results being inaccurate due to the use of an invalid device or patients not following the BP measurement protocol). Additionally, the cost of the HBPM devices, low reimbursement to physicians, and lack of time to train patients were noted as barriers to performing HBPM. A second study that used focus group discussions with physicians in the Netherlands had similar findings. Specifically, physicians reported that HBPM was inferior to ABPM and that not all of their patients would be capable of conducting HBPM [7]. In this study, it was found that physicians discouraged the

use of HBPM as they believed ABPM was a superior approach to measuring BP outside of the clinic setting.

9.3.2 Results from Structured Provider Surveys

In a study from a single health system in the US, more than 75% of providers completing a structured questionnaire on HBPM considered the procedure part of standard care in their practice [15]. Over 90% of providers who reported using HBPM said it was to guide treatment and two-thirds used it to improve adherence. Barriers to conducting HBPM included the lack of knowledge regarding validated devices and lack of data on the scientific evidence that HBPM will result in better BP control. Additionally, providers reported that patients' poor eyesight and lack of confidence would result in not obtaining valid BP measurements on HBPM. Also, a high proportion of providers (~40% to 50%) reported that they preferred measuring BP in the office setting. Nearly 33% thought that patients would be anxious if their BP was not controlled when measured on HBPM and over 40% of providers reported no one was available in their practice to teach patients how to properly conduct HBPM.

Among a random sample of all primary care providers in Hungary ($n = 405$; 58% response rate), 98.5% agreed that HBPM was part of standard of care and 94.4% often and almost always encouraged their patients to perform HBPM [16]. HBPM was considered to be equal or more important that office-based BP measurements by over 95% of providers. Despite the high proportion of providers who reported using HBPM, only 67% stated their service taught patients how to conduct HBPM. Barriers to conducting HBPM included concerns about the availability of validated devices (79%), that patients would become preoccupied with their BP (54%), and that most patients were not properly trained (40%). Also, over 25% of providers were concerned that the HBPM results would make their patients anxious and would result in frequent phone calls to the office. Facilitators to increase the use of HBPM included the availability of training facilities, inclusion of diagnostic and treatment protocols based on HBPM, programs that tabulate/display the HBPM results and evidence that it improved BP control.

In a third study, a random sample of primary care providers in Ontario, Canada, was mailed a survey on HBPM [11]. Among 478 providers (response rate 55%) who reported treating patients with hypertension, 52% considered HBPM part of standard of care and 63% often or almost always encouraged HBPM. Overall, 98% of providers reported using HBPM to detect white coat hypertension, 93% to guide antihypertensive treatment, 69% to improve medication adherence, and 56% to confirm the presence of resistant hypertension. Similar to the study in Hungary, a high percentage of providers reported barriers to HBPM with 70% being concerned that patients would become preoccupied with their BP and 65% uncertain of the accuracy of home devices. Also, 63% stated they would use HBPM more often if they had a list of validated devices, 49% if devices were more affordable and 45% if more evidence were available showing that HBPM improves BP. Only 5% of providers reported having someone in the office available to train patients.

Table 9.2 Healthcare provider concerns for conducting home blood pressure monitoring

Concerns
• Ability of patients to correctly perform home blood pressure monitoring
• Test results being inaccurate due to the use of an invalid device
• Patients not following the blood pressure measurement protocol
• Cost of the device
• Low reimbursement
• Lack of time to train patients
• Poor patient eyesight
• Patients' lack of confidence
• Patients would become anxious
• Lack of device availability

Finally, a structured telephone survey was conducted among primary care providers in Greece (n = 366; 87.4% participation rate) to investigate the implementation of HBPM guidelines [17]. Overall, 94% of providers reported using HBPM for their patients with hypertension. The most common indications were white coat hypertension, treatment titration, and detection of hypertension, while only 1% reported using HBPM to detect masked hypertension. Only 30% of providers based treatment decisions on the results of the HBPM. The main limitations noted for HBPM included 80% of providers who expressed concerns that patients were not reliable in reporting their BP and 41% who questioned the accuracy of the HBPM devices. Additionally, 86% of the providers who reported not using HBPM stated that they did not trust BP readings recorded by patients. While many patients do not accurately report their BP values on HBPM, this problem can be minimized by having patients use a device that stores readings and having them bring their device into the clinic [18]. Also, some HBPM devices have the capability of transmitting BP readings to the clinic which eliminates the need to rely on the accuracy of patients reporting their own BP [19].

Healthcare provider concerns with conducting HBPM are summarized in Table 9.2.

9.4 Cost-Effectiveness

The widespread implementation of HBPM may require data on its cost-effectiveness for diagnosing hypertension and managing BP among those with established hypertension. Data on the cost-effectiveness of HBPM have been generated from analyses of randomized controlled trials and simulation studies. Without other co-interventions, HBPM has been found to provide only a small BP lowering benefit that is not sustained over time [20, 21]. The BP-lowering benefit of HBPM has been greater when used with co-interventions (e.g., telemonitoring, pharmacist visits) [20]. Therefore, the cost-effectiveness of HBPM needs to be considered within the context of, and costs associated with, these co-interventions. When interpreting these data it is important to distinguish HBPM from the broader category of self-measured BP, which may also include the use of kiosks or measurements obtained

by a patient using an automated device at their healthcare provider's office [22]. The section below focuses on HBPM and does not include studies that have investigated the cost-effectiveness of self-measurement protocols unless it was explicitly stated that HBPM was performed.

9.4.1 Data from Randomized Controlled Trials

A randomized trial conducted in the Kaiser Permanente Medical System evaluated the cost of HBPM versus usual care among 430 patients who were randomized at a 1:1 ratio to a HBPM intervention or usual care [23]. The intervention included receipt of a HBPM device with the request to measure BP twice weekly and mail a record of the recordings along with changes in medications/side effects every 4 weeks. After a 1-year intervention period, the decline in SBP and DBP were 3.3 mm Hg and 1.6 mm Hg larger among participants randomized to the HBPM intervention compared with usual care. Participants randomized to the HBPM intervention had 1.2 fewer office visits and 0.8 more telephone calls with medical staff compared to their counterparts randomized to usual care. In 1986 US dollars, the cost of hypertension care was lower in the HBPM versus usual care randomization arm ($88.28 versus $125.37). Even considering the cost of the HBPM device and patient training, the authors of this study concluded HBPM to be cost saving.

The cost-effectiveness of HBPM was evaluated in a randomized trial that showed HBPM in conjunction with clinical pharmacist specialist meetings reduced SBP by 21 mm Hg versus 8 mm Hg for those randomized to usual care [24]. Over 6 months of follow-up, the HBPM intervention was associated with hypertension-related costs of $455 per-patient versus $179 per-patient for those randomized to usual care. The higher costs with HBPM resulted from increased contact with healthcare providers, laboratory monitoring, medication use, and the HBPM device. HBPM did not reduce the need for outpatient, hospital or emergency department visits. Total healthcare costs were also higher among participants randomized to the intervention versus usual care ($1530 versus $1283). Extrapolating the BP-lowering of the HBPM intervention across the lifespan, it was associated with a favorable incremental cost-effectiveness ratio (ICER); $20.50 for each 1 mm Hg lowering of SBP and $3330 per additional life-year gained.

9.4.2 Modeling Studies

Using a Markov model based on healthcare expenditures in Japan and the prevalence of white coat hypertension from the Ohasama study, HBPM was reported to be associated with cost savings for the Japanese population (medical costs: $9.33 million US dollars [1.09 billion Yen] per 1000 patients over a five-year period with implementation of HBPM versus $10.89 US dollars [1.27 billion Yen] without implementation of HBPM) [25]. The authors reported that the cost-effectiveness of HBPM would be more favorable when conducted in populations with a higher

prevalence of white coat hypertension and a lower annual transition rate from white coat hypertension to hypertension based on HBPM.

In a US-based study of patients with health insurance, a decision-analytic model was used to evaluate the short- and long-term cost-benefit and return on investment comparing HBPM versus BP recorded in the clinic setting for the diagnosis and treatment of hypertension [26]. From the health insurer's perspective, HBPM was associated with net savings that were higher at older age and increased over progressively longer follow-up. For example, over a 10-year time horizon, HBPM was estimated to result in cost-savings of $414.81, $439.14, and $1364.27 among adults 20–44, 45–64, and ≥ 65 years of age, respectively. When the cost-effectiveness of HBPM was divided into its use for the diagnosis versus treatment of hypertension, it was estimated that HBPM provided a better return on investment for diagnosis at younger ages and for guiding treatment at older ages.

Lovibond and colleagues conducted a Markov model-based analysis to compare the cost-effectiveness and quality adjusted life years gained when diagnosing hypertension based on BP recorded monthly in the clinic setting over 3 months and by HBPM over 1 week [27]. At each age evaluated (40, 50, 60, 70, and 75 years), diagnosing hypertension by HBPM and clinic-measured BP were equivalent in terms of costs and quality-adjusted life years gained for both men and women. However, HBPM was deemed to be cost-effective in sensitivity analyses wherein it was presumed to have the same sensitivity and specificity for identifying hypertension as ABPM or in younger age groups when the frequency of repeat monitoring following a normal results was reduced from 5 years to 1 year. A subsequent modeling analysis using data from the US reported HBPM to be associated with higher costs and lower quality-adjusted life years than using clinic-measured BP for the initial diagnosis of hypertension [28]. It should be noted that these studies were strongly influenced by the sensitivity and specificity of HBPM for diagnosing hypertension and there are few data available for generating these estimates [29]. Additionally, data are needed on the cost-effectiveness of screening for masked hypertension.

9.5 Conclusion

The value of HBPM for diagnosing hypertension and monitoring BP among individuals taking antihypertensive medication is well recognized. Data from several countries suggest that HBPM is preferred over ABPM by a majority of patients. While providers have concerns about their patients' ability to perform HBPM and the accuracy of devices used, they see potential benefits for their patients who conduct HBPM. There appear to be some discrepancies in the perception of HBPM between patients and providers. For example, providers believe that many patients will become anxious with the results of HBPM whereas patients do not report this concern. Published data on the cost-effectiveness of HBPM have been conflicting. Some analyses have suggested that HBPM may not be cost-effective for diagnosing hypertension. However, the results of these studies may have been heavily influenced by assumptions about the sensitivity and specificity of different

approaches for identifying hypertension, an area for which few data are available. Additionally, data are needed on the cost-effectiveness of conducting HBPM for patients with suspected white coat hypertension and masked hypertension as recommended in clinical practice guidelines. Taken together, the preferences of patients and providers, and the cost-effectiveness data support the use of HBPM.

References

1. Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and Management of High Blood Pressure in adults: executive summary: a report of the American College of Cardiology/American Heart Association task Force on clinical practice guidelines. J Am Coll Cardiol. 2018;71:2199–269.
2. Leung AA, Daskalopoulou SS, Dasgupta K, McBrien K, Butalia S, Zarnke KB, et al. Hypertension Canada's 2017 guidelines for diagnosis, risk assessment, prevention, and treatment of hypertension in adults. Can J Cardiol. 2017;33:557–76.
3. Gabb GM, Mangoni AA, Anderson CS, Cowley D, Dowden JS, Golledge J, et al. Guideline for the diagnosis and management of hypertension in adults - 2016. Med J Aust. 2016;205:85–9.
4. Williams B, Mancia G, Agabiti Rosei E, Azizi M, Burnier M, Spiering W, et al. 2018 ESC/ESH guidelines for the management of arterial hypertension. Eur Heart J. 2018;39:3021–104.
5. Shimbo D, Abdalla M, Falzon L, Townsend RR, Muntner P. Role of ambulatory and home blood pressure monitoring in clinical practice: a narrative review. Ann Intern Med. 2015;163:691–700.
6. Siu AL, Force USPST. Screening for high blood pressure in adults: U.S. preventive services task Force recommendation statement. Ann Intern Med. 2015;163:778–86.
7. Carrera PM, Lambooij MS. Implementation of out-of-office blood pressure monitoring in the Netherlands: from clinical guidelines to Patients' adoption of innovation. Medicine (Baltimore). 2015;94:e1813.
8. Carter EJ, Moise N, Alcantara C, Sullivan AM, Kronish IM. Patient barriers and facilitators to ambulatory and home blood pressure monitoring: a qualitative study. Am J Hypertens. 2018;31:919–27.
9. Grant S, Hodgkinson JA, Milner SL, Martin U, Tompson A, Hobbs FR, et al. Patients' and clinicians' views on the optimum schedules for self-monitoring of blood pressure: a qualitative focus group and interview study. Br J Gen Pract. 2016;66:e819–30.
10. Little P, Barnett J, Barnsley L, Marjoram J, Fitzgerald-Barron A, Mant D. Comparison of acceptability of and preferences for different methods of measuring blood pressure in primary care. BMJ. 2002;325:258–9.
11. Logan AG, Dunai A, McIsaac WJ, Irvine MJ, Tisler A. Attitudes of primary care physicians and their patients about home blood pressure monitoring in Ontario. J Hypertens. 2008;26:446–52.
12. McGowan N, Padfield PL. Self blood pressure monitoring: a worthy substitute for ambulatory blood pressure? J Hum Hypertens. 2010;24:801–6.
13. Nasothimiou EG, Karpettas N, Dafni MG, Stergiou GS. Patients' preference for ambulatory versus home blood pressure monitoring. J Hum Hypertens. 2014;28:224–9.
14. Kronish IM, Kent S, Moise N, Shimbo D, Safford MM, Kynerd RE, et al. Barriers to conducting ambulatory and home blood pressure monitoring during hypertension screening in the United States. J Am Soc Hypertens. 2017;11:573–80.
15. Steinmann WC, Chitima-Matsiga R, Bagree S. What are specialist and primary care Clinicians' attitudes and practices regarding home blood pressure monitoring for hypertensive patients? Mo Med. 2011;108:433–47.

16. Tisler A, Dunai A, Keszei A, Fekete B, Othmane Tel H, Torzsa P, et al. Primary-care physicians' views about the use of home/self blood pressure monitoring: nationwide survey in Hungary. J Hypertens. 2006;24:1729–35.
17. Tsakiri C, Stergiou GS, Boivin JM. Implementation of home blood pressure monitoring in clinical practice. Clin Exp Hypertens. 2013;35:558–62.
18. Myers MG, Stergiou GS. Reporting bias: Achilles' heel of home blood pressure monitoring. J Am Soc Hypertens. 2014;8:350–7.
19. Parati G, Dolan E, McManus RJ, Omboni S. Home blood pressure telemonitoring in the 21st century. J Clin Hypertens (Greenwich). 2018;20:1128–32.
20. Uhlig K, Patel K, Ip S, Kitsios GD, Balk EM. Self-measured blood pressure monitoring in the management of hypertension: a systematic review and meta-analysis. Ann Intern Med. 2013;159:185–94.
21. Reboussin DM, Allen NB, Griswold ME, Guallar E, Hong Y, Lackland DT, et al. Systematic review for the 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and Management of High Blood Pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2018;138:e595–616.
22. Fletcher BR, Hinton L, Hartmann-Boyce J, Roberts NW, Bobrovitz N, McManus RJ. Self-monitoring blood pressure in hypertension, patient and provider perspectives: a systematic review and thematic synthesis. Patient Educ Couns. 2016;99:210–9.
23. Soghikian K, Casper SM, Fireman BH, Hunkeler EM, Hurley LB, Tekawa IS, et al. Home blood pressure monitoring. Effect on use of medical services and medical care costs. Med Care. 1992;30:855–65.
24. Billups SJ, Moore LR, Olson KL, Magid DJ. Cost-effectiveness evaluation of a home blood pressure monitoring program. Am J Manag Care. 2014;20:e380–7.
25. Fukunaga H, Ohkubo T, Kobayashi M, Tamaki Y, Kikuya M, Obara T, et al. Cost-effectiveness of the introduction of home blood pressure measurement in patients with office hypertension. J Hypertens. 2008;26:685–90.
26. Arrieta A, Woods JR, Qiao N, Jay SJ. Cost-benefit analysis of home blood pressure monitoring in hypertension diagnosis and treatment: an insurer perspective. Hypertension. 2014;64:891–6.
27. Lovibond K, Jowett S, Barton P, Caulfield M, Heneghan C, Hobbs FD, et al. Cost-effectiveness of options for the diagnosis of high blood pressure in primary care: a modelling study. Lancet. 2011;378:1219–30.
28. Beyhaghi H, Viera AJ. Comparative cost-effectiveness of clinic, home, or ambulatory blood pressure measurement for hypertension diagnosis in US adults. Hypertension. 2019;73(1):121–31.
29. Hodgkinson J, Mant J, Martin U, Guo B, Hobbs FD, Deeks JJ, et al. Relative effectiveness of clinic and home blood pressure monitoring compared with ambulatory blood pressure monitoring in diagnosis of hypertension: systematic review. BMJ. 2011;342:d3621.