REVIEW

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Home Blood Pressure Monitoring in Clinical Practice: A Review

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ABSTRACT

Home blood pressure monitoring is a convenient and inexpensive technique to monitor blood pressure in hypertensive patients. There are convincing data that home blood pressure monitoring is a good predictor of future cardiovascular risk, perhaps better than office blood pressure. Home blood pressure measurement can be standardized using validated instruments and systematic protocols; normative criteria have established home blood pressure >135/85 mm Hg as hypertensive. Home blood pressure monitoring has been shown to improve compliance and blood pressure control, and to reduce health care costs. Ongoing studies are evaluating management of hypertension based on home blood pressure readings compared with traditional office-based readings. Home blood pressure monitoring is particularly useful for evaluation of white coat hypertension and masked hypertension. In this article, we discuss the methodology for measuring blood pressure at home, its comparison to the other measurement techniques, the advantages and disadvantages, cost benefit analyses, and ongoing clinical trials to help define the role of home blood pressure monitoring in the clinical management of hypertension.
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KEYWORDS: Blood pressure monitoring; Home blood pressure; Masked hypertension; Risk stratification; White coat hypertension

There has been increasing interest in measuring blood pressure outside the traditional office setting with the advent of validated home and ambulatory blood pressure monitoring devices. There has been considerable research in the recent past evaluating the role of these modalities in the diagnosis, risk stratification, and management of hypertension. Several recent national guidelines recommend incorporation of home and ambulatory blood pressure monitoring in the management of hypertension.[1-6] The purpose of this article is to review, in the context of available evidence, the use of home blood pressure measurement in the management of hypertensive patients.

Home blood pressure monitoring is an attractive tool; it allows measurement of blood pressure in an environment familiar to the patient, is relatively inexpensive, provides a convenient way for monitoring blood pressure over long periods of time, and multiple readings can be obtained in a day. In fact, when patients are asked which modality of blood pressure measurement they found most acceptable, self readings at home ranked higher than repeated measurements by a nurse, ambulatory monitoring, and measurement by a doctor.[7] Home blood pressure monitoring is not influenced by observer bias, and its reproducibility has been found to be better than, or at least equal to that of clinic blood pressure.[8-13] It allows estimation of antihypertensive drug effects, duration of drug action, and identification of drug resistance, if present.[14] Table 1 summarizes the characteristics of home blood pressure monitoring and its comparison with other methods of blood pressure measurements in practice. Home blood pressure monitoring may be particularly helpful in patients with diabetes, chronic kidney disease, non-adherence, suspected white coat effect, and masked hypertension, as discussed below.[4] It also is of

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value in suspected or newly diagnosed hypertensive patients, pregnant women, children, and elderly patients.[2]

MEASUREMENT OF HOME BLOOD PRESSURE

There are a number of devices validated by the American Association of Medical Instrumentation, the British Hypertension Society, and the International Protocol of the European Society for Hypertension that are available commercially for use.[15] The standard type of monitor for home use is an oscillometric device that records pressure from the brachial artery. Use of the arm cuff is preferred over wrist and finger monitors.[14] Home blood pressure should be measured twice daily for a 3- to 7-day period for diagnosis of hypertension; first day values are typically not used, to allow patients to acclimatize to the process.[2,4,16] A good regimen is to measure home blood pressure twice in the morning after 5 minutes of rest before breakfast (preferably between 6:00 and 10:00 AM) and twice in the evening (also preferably between 6:00 and 10:00 PM), while the patient is sitting at rest for 5 minutes, and with an empty bladder.[2] However, the Japanese Society of Hypertension guidelines for self-monitoring of blood pressure at home propose that the measurements be made after 1-2 minutes of rest (Table 2).[5]

CLINICAL SIGNIFICANCE

- Home blood pressure monitoring should be incorporated into the management scheme of most hypertensive patients.
- Measurements must be performed under standardized conditions after training the patients using validated monitors.
- This might improve patient compliance, and result in better blood pressure control.
- Monitoring of blood pressure at home is a better predictor of cardiovascular outcomes compared with office blood pressure measurements.
- Physicians should be aware of white coat and masked hypertension.

For optimal measurements, the arm must be supported at the level of the heart on a flat surface, the back should be supported, and both feet should be flat on the floor. The cuff has to be positioned such that the artery marker on the cuff lies exactly over the brachial artery. It is recommended that the measurements be taken in the nondominant arm unless there are contraindications like an arteriovenous fistula or obstructive arterial disease. The individual should not have consumed caffeinated drinks, smoked, or performed strenuous exercise or activities that increase blood pressure within the past half hour. The proper cuff size is when the cuff bladder encircles at least 80% of the arm at mid-level. The mid-arm circumference should be measured in order to determine if the patient needs a larger cuff.

Patients must be trained to measure blood pressure, and provided with written instructions.[17] Their equipment must be calibrated against a mercury manometer, with the difference in measurement compared with the auscultatory method being 5 mm Hg or less. It also is recommended that the device be calibrated annually.[2] Every measurement should be documented, along with the pulse rate, time, and date; devices with an attached printer or an integrated memory are helpful to avoid selection bias.

Table 1 Characteristics of Casual, Ambulatory, and Home Blood Pressure Measurements

	Casual BP (Office, Clinic, Screening)	Ambulatory BP	Home BP
Characteristic	May include reactive pressor response	Measurements under usual ambulatory conditions	Measurements under relatively stable conditions
Measurement bias	+	−	±
Measurement frequency	Few	Many	Many
Estimation of circadian BP variation	Not possible	Possible	Possible to a limited extent
Estimation of night-time BP	Not possible	Possible	Possible to a limited extent
Reproducibility	Poor	Poor- fair	Good
Estimation of drug effect	−	May lowers sample size requirement in clinical studies due to reduced variability	+
Estimation of duration of drug action	Limited	Excellent	Good
Estimation and diagnosis of white coat effect (hypertension)	Not possible by office readings alone	Adequate	Adequate
Estimation of paroxysmal hypertension or episodic hypotension	Not possible	Possible	Occasionally possible

BP = blood pressure.

Adapted and reproduced from Imai Y, Ohkubo T, Kikuya M, et al. Practical aspect of monitoring hypertension based on self-measured blood pressure at home. *Intern Med*. 2004;43:771-778.[14]