Home and ambulatory blood pressure monitoring: when? who?

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Blood pressure measurement in the diagnosis and management of hypertension, including the technique required for ambulatory blood pressure monitoring and home blood pressure monitoring, will be reviewed in this article. Home and ambulatory measurements are widely used, both to confirm the diagnosis and to improve adherence to therapy. The major advantage of out-of-office blood pressure monitoring is that it provides a large number of blood pressure measurements away from the medical environment, which represents a more reliable assessment of actual blood pressure than office blood pressure. The advantage of ambulatory blood pressure monitoring is its unique ability to measure nocturnal blood pressure. Although not fully validated in large-scale clinical trials, ambulatory blood pressure monitoring appears to correlate best with prognosis. Ambulatory blood pressure monitoring and home blood pressure monitoring provide somewhat different information on the subject's blood pressure status, and the two methods should thus be regarded as complementary, rather than competitive or alternative.

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Correct measurement of blood pressure (BP) is essential in the diagnosis and management of hypertension (HT). It is important that BP devices are properly calibrated, proper cuff sizes are selected, users are properly trained, and the patient is positioned correctly. There is increasing evidence that office BP measurement procedure may cause inadequate or misleading estimates of a patient's true BP status.

The main conditions causing limitation of office BP measurements are:

1. The small number of readings that are typically taken in the doctor's office.
2. Poor technique (rapid cuff deflation, improper cuff, and bladder dimensions), often due to inadequate training of the personnel.
3. White-coat HT (WCH), hypertensive in the medical care environment, but normotensive by ambulatory measurements.
4. The masked effect, normotensive by clinic measurement and hypertensive by ambulatory measurement, which may lead to undertreatment.

The major advantage of out-of-office BP monitoring is that it provides a large number of BP measurements away from the medical environment, which represents a more reliable assessment of actual BP than office BP. Out-of-office monitoring comprises two techniques, home blood pressure measurements (HBPM) and ambulatory blood pressure monitoring (ABPM).[1]

The use of HBPM and ABPM as adjunct to office BP monitoring has been recommended by several guidelines for the management of HT.[2–7]

HBPM is a self-recorded BP measurement taken at home or work, and correlates more closely with the results of 24-h or daytime ambulatory monitoring than with office-based measurements. Increasing evidence suggests that at least 12 to 14 measurements should be obtained, with both morning and evening readings taken everyday within 1 week. The target HBPM goal for treatment is $<135/85$ or $<130/80$ mm Hg in high-risk patients.[7] Patients should be advised to purchase oscillometric monitors that measure BP on the upper arm with an appropriate cuff size. It is essential to validate BP devices according to the standard international protocols; adapt bladder dimensions to arm circumference; and check accuracy of devices periodically. Health-care providers should guide their patients in the selection of appropriate devices.

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ABPM is determined using a device (worn by the patient) that takes BP measurements over a 24- to 48-h period, usually every 15 to 20 min during daytime, and every 30 to 60 min during sleep.[8] These measurements are recorded on the device, and diurnal or nocturnal BP pressure recordings are evaluated by computer. The percentage of BP readings exceeding the upper limit of normal can also be calculated. When ABPM is the technique to perform, HT is defined as BP greater than or equal to 135/85 mm Hg.[6,7]

CLINICAL SITUATIONS THAT WARRANT AMBULATORY BLOOD PRESSURE MONITORING

ABPM and HBPM provide somewhat different information on the subject's BP status and risk, and the two methods should thus be regarded as complementary, rather than competitive or alternative.[6]

In order to decide for whom and when to use office BP, ABPM, and HBPM, randomized trials are required. These trials should be sufficiently large and controlled to draw firm conclusions that affect overall morbidity and mortality.

Self-monitoring of BP at home and work is a practical approach to assess differences between office and out-of-office BP before consideration of ABPM. For those whose out-of-office BPs are consistently $<130/80$ mm Hg despite an elevated office BP, and who lack evidence of target organ disease, 24-h monitoring, or drug therapy can be avoided. Ambulatory BP in general is a more sensitive risk predictor of clinical cardiovascular outcomes, such as coronary morbidity or fatal events and stroke, than office BP.[9,10] Self-measurement or ABPM may be particularly helpful in assessing BP in smokers.[2]

Out-of-office BP monitoring has been recommended by several guidelines for the management of HT. Recent ESH/ESC guidelines pointed out that the following clinical indications regarding to out-of-office monitoring:[6]

- Suspicion of WCH
  -Grade 1 HT in the office.
  -High office BP in individuals without organ damage and at low total cardiovascular risk.
- Suspicion of masked HT
  -High normal BP in the office.
  -Normal office BP in individuals with asymptomatic organ damage or at high total cardiovascular risk.
- Identification of white-coat effect in hypertensive patients.
- Considerable variability of office BP over the same or different visits.
- Autonomic, postural, postprandial, siesta- and drug-induced hypotension.
- Elevated office BP or suspected pre-eclampsia in pregnant women.
- Identification of true and false resistant HT.

Whether subjects with WCH can be considered equal to true normotensive individuals is an issue still under debate, because in a recent study marked increase in adjusted risk of developing sustained HT, a significant increase in adjusted risk for all-cause mortality and cardiovascular mortalities were demonstrated in WCH patients compared with normotensive subjects.[10]

HBPM is indicated especially in patients with newly diagnosed or suspected HT, in whom it may distinguish between white-coat and sustained HT. In patients with pre-HT, HBPM may be useful for detecting masked HT. HBPM is recommended for evaluating the response to any type of antihypertensive treatment and may improve adherence. HBPM is particularly useful in the elderly, in whom both BP variability and the white-coat effect are increased; in patients with diabetes, in whom tight BP control is of foremost importance, such as pregnancy, children with suspected HT, and patients with kidney diseases.[2–4]

According to JNC 7 guidelines, ABPM is recommended for the evaluation of:[2]

- Suspected WCH in patients with HT and no target organ damage.
- Apparent drug resistance (office resistance).
- Hypotensive symptoms with antihypertensive medication.
- Episodic HT.
- Autonomic dysfunction.

In addition to that, the most recent guideline of ESH/ESC lists clinical indications of ABPM as follows:[6]

- Marked discordance between office and home BP.
- Assessment of dipping status.
- Suspicion of nocturnal HT or absence of dipping, such as in patients with sleep apnea, chronic kidney disease, or diabetes.
- Assessment of BP variability.

The main advantage of ABPM is its unique ability to measure nocturnal BP, the measure reported to be most accurate for prognosis.[11]

Despite all the advantages of home and ABPM suggested, outcome studies evaluating cost effectiveness, their predictive value in short- and long-term morbidity and mortality, and comparing office, home, and ambulatory measurements are warranted. Office sphygmomanometers still remain as the primary tool for diagnosing and monitoring HT. However, home readings are increasingly used, both to confirm the diagnosis and to provide better assurance of appropriate therapy. Out-of-office monitoring appears of particular value in evaluating WCH and therapy resistance, and to determine the adequacy of therapy.

DISCLOSURE

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