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THE ROLE OF AMBULATORY BLOOD PRESSURE MONITORING IN CLINICAL PRACTICE

Abstract: Brief review of the current recommendations for ambulatory blood pressure monitoring (ABPM), such as the devices and software, recording requirements, the thresholds for the day and night and how to analyze and use ABPM data in clinical practice. Ambulatory blood pressure monitoring is a fully automated technique in which multiple blood pressure (BP) measurements are taken at regular intervals (usually every 15 to 30 minutes) over a 24 hour period, providing BP values during the patient's normal daily activities. Some experts propose the use of 24-hour ABPM for all first diagnoses of hypertension and for treatment decision-making. The National Institute for Health and Clinical Excellence in the United Kingdom recommended that ABPM should be offered as a cost-effective technique to all people suspected of having hypertension. Measuring circadian changes, ABPM has been shown to predict cardiovascular morbidity and mortality, predicting disease severity and prognosis among patients with significant cardiovascular risk. Only validated devices are recommended for ABPM use. Position papers generally recommend ABPM to exclude white coat hypertension and common recommendations include the assessment of masked hypertension, circadian blood pressure patterns, BP variability, and hypotension assessment. Structured training in the use of ABPM could take place during medical school clerkships, residency or fellowship, workshops or conferences on ABPM could also play a role in training practicing physicians improving patient care and procedural skills. Over the past several decades evidence has emerged that mean BP measured by ABPM has a stronger association with CVD and mortality risk than office BP.

Key words: ambulatory blood pressure monitoring, ABPM, use, analysis

Foreword of ambulatory blood pressure monitoring

Ambulatory blood pressure monitoring (ABPM) is a fully automated technique in which multiple blood pressure (BP) measurements are taken at regular intervals

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(usually every 15 to 30 minutes) over a 24 hour period, providing BP values during the patient's normal daily activities. (1) The National Institute for Health and Clinical Excellence in the United Kingdom recommended that ABPM should be offered as a cost-effective technique to all people suspected of having hypertension. (2)

Clinical indications for ambulatory blood pressure monitoring

Identifying white-coat hypertension phenomena;
White-coat hypertension in untreated patients;
White-coat effect in treated or untreated patients;
False-resistant hypertension in treated patients;
Identifying masked hypertension phenomena;
Masked hypertension in untreated patients;
Masked uncontrolled hypertension in treated patients;
Identifying abnormal 24-h BP patterns;
Daytime hypertension;
Siesta dipping/postprandial hypotension;
Nocturnal hypertension;
Dipping status;
Morning hypertension and morning BP surge;
Obstructive sleep apnea;
Increased blood pressure variability;
Assessment of treatment;
Increased on-treatment blood pressure variability;
Assessing 24-h BP control;
Identifying true-resistant hypertension;
Assessing hypertension in the elderly;
Assessing hypertension in children and adolescents;
Assessing hypertension in pregnancy;
Assessing hypertension in high-risk patients;
Identifying ambulatory hypotension;
Identifying BP patterns in Parkinson's disease;
Endocrine hypertension.

Choosing an ambulatory blood pressure monitoring device

An accurate device is fundamental to all Bpmeasurements. Updated lists of validated devices are available at several websites www.pressionearteriosa.net; www.bihsoc.org; www.medaval.org, and www.dableducational.org.

Selecting the appropriate cuff and bladder

It is important, to select a cuff containing an inflatable bladder of correct length and width for the arm in which ABPM is to be measured. There is clear evidence that either too narrow or too short bladder will cause overestimation of BP, and there is growing evidence that too wide or too long a bladder may cause underestimation of BP. ABPM is best measured in the nondominant arm so as to interfere as little as possible with daily activity unless there has been documented evidence of a difference in BP between arms in which case the arm known to have the higher BP values should be chosen.

Fitting an ABPM monitor

The key to successful ABPM is educating the patient on the process of monitoring and the instructions should be explained and printed on a diary card. In clinical practice, measurements are preferably performed on a routine working day. The frequency of measurement during the 24-h period is generally not more than every 15 min, nor less than every 30 min. Patients are asked to keep their arm still while the cuff is inflating. At the end of the recording period, the readings are downloaded into computer software as DABL for getting results. (3) Individuals are asked to fill out a diary during the monitoring period to record the time of activity, any symptoms, awakening and sleeping times, naps, periods of stress, timing of meals, and medication. Whether a ABPM recording is valid depends if a minimum of 70% of the planned readings are obtained; at least 14 readings obtained during the daytime period or at least 7 readings are obtained during the nighttime period. The daytime and nighttime periods on ABPM can be determined by using the patient's dairy which is recommended, instead of using estimated fixed time periods. Actigraphy can be used if device is equipped.

Interpretation of ABPM data

Software for ABPM data analysis should provide standardized plot format with each BP measurement on the vertical axis and time of day on horizontal axis, with different windows of the 24-h period identified and normal bands clearly demarcated.

Summary statistics for time-weighted SBP and DBP and heart rate in the windows of the 24-h period and separately for the awake and asleep subperiods, with the respective standard deviations and the number of valid BP readings included in the analysis and a facility for indicating the time of going to bed and awakening.

Average BP values (over 24 h, daytime, and night-time) are important parameters obtained from ABPM recordings.

NICE guidelines, the JNC 7 guideline, the ESH/ESC guidelines and the results of outcome studies, such as IDACO and Ohasama, have contributed to the definition of thresholds for hypertension diagnosis based on ABPM: 24h average 130/80mmHg, awake (daytime) average 135/85mmHg and asleep (night-time) average 120/70mmHg.

Pickering et al. (4) introduced the term 'white-coat hypertension' to describe this condition, which is now commonly defined as a BP reading at least 140mmHg systolic and/or at least 90mmHg diastolic in the clinic/office and a mean awake ambulatory SBP/DBP less than 135 and less than 85mmHg. After the initial diagnosis of white-coat hypertension has been made, patients should have their BP status monitored more carefully, with home BP or automated office BP. White-coat effect' is defined as the rise in BP that occurs in the medical environment regardless of the daytime ABPM level or the use of antihypertensive drugs. Definition of masked hypertension is that it is present in patients who have a normal office BP 140/90 mmHg or less with elevated daytime BP on ABPM or home BP at least 135/85 mmHg. (5) Adults with masked hypertension have increased risk of target organ damage and cardiovascular morbidity. In physiologic conditions, there is a decline in BP when shifting from wakefulness to sleep. It is generally agreed that a nocturnal BP fall more than 10% of daytime values, is acceptable as an arbitrary cutoff to define patients as 'dippers'. In some patients, the nocturnal decline in BP may be absent (nondipping). An increase in night-time BP may indicate the occurrence of angiographic coronary artery stenosis, lower cognitive performance left ventricular hypertrophy, renal damage or endocrine hypertension. A nocturnal 'rising' pattern occurs when BP rises above daytime pressures rather than falling during the night, thus as obstructive sleep apnea. These patients have the worst cardiovascular prognosis, both for stroke and cardiac events. (6) Patients with increased BP variability are more likely to have white-coat or masked hypertension and they are at higher cardiovascular risk. Unstable BP may also be an indication that antihypertensive treatment is being ineffective and ABPM will demonstrate both the efficacy of treatment and the smoothness of BP reduction. ABPM was an independent marker of risk for new cardiovascular events, suggesting that ABPM was useful in stratifying the risk in patients with resistant hypertension. Several guidance documents for the management of hypertension in pregnancy have provided suggestions on the use of ABPM and have acknowledged its usefulness in detecting white-coat hypertension and predicting women at risk of developing hypertension later in pregnancy.

We have emphasized the value of the ABPM in clinical practice in the hope that physicians will see the technique as having much greater value than merely using ABPM to confirm the diagnosis of hypertension. We have presented recommendations as to how ABPM might be used to initiate treatment and to assess the efficacy of BP-lowering therapy over time in order to improved BP control and lower cardiovascular consequences of hypertension.

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