Practical advice for home blood pressure measurement

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Early diagnosis of hypertension is one benefit of home blood pressure monitoring. Home measurement may also be used for the detection of masked hypertension. Home blood pressure readings have a strong correlation with risk, and the method has many advantages over office measurement in the management of hypertension, especially in patients with chronic kidney disease or diabetes. The present article provides practical advice on incorporating home blood pressure monitoring into practice. Patient education and training are discussed, as are tips to aid in the selection of devices for blood pressure measurement at home.

Key Words: High blood pressure monitoring; Home blood pressure; Masked hypertension; White coat effect

Home blood pressure monitoring (HBPM) is an important tool in the diagnosis and management of hypertension (1). HBPM is exactly what the name implies, in that it is the measurement of BP in a person's home. The actual measurement may be performed by the patient, or by a friend or family member. Recent advances in the technology used to measure BP at home have improved the usefulness and convenience of home monitoring. The present article discusses how and where HBPM can be incorporated into practice, and provides advice about equipment and its use by patients.

DIAGNOSIS OF HYPERTENSION

HBPM can be especially useful in 'speeding up' the diagnosis of hypertension in patients who, after two office visits, continue to have BP readings in the range of 140-179/90-109 mmHg in the absence of target organ damage, diabetes mellitus or renal disease (2). Relying on office BP measurement alone, up to five hypertension-related office visits are needed before a diagnosis of hypertension can be made in these patients. An alternative to so many clinic visits is to use HBPM after the second hypertension-related office visit. The diagnosis of hypertension can be made in these patients when average HBPM readings are 135/85 mmHg or higher. The algorithm for using HBPM is shown in Figure 1.

To detect sustained hypertension at home, readings are taken in the morning and repeated in the evening for an initial seven-day period. The readings on the first day are recorded by the patient, but first-day readings are disregarded when calculating the average of the home BP values. The

Des conseils pratiques pour mesurer la tension artérielle à domicile

Le diagnostic précoce de l'hypertension constitue l'un des avantages de la surveillance de la tension artérielle (TA) à domicile. La mesure à domicile peut également permettre de déceler une hypertension masquée. Les lectures de la TA à domicile ont une forte corrélation avec le risque, et cette méthode comporte de nombreux avantages par rapport à la mesure en cabinet pour prendre en charge l'hypertension, notamment chez les patients atteints d'une maladie rénale chronique ou de diabète. Le présent article contient des conseils pratiques pour mettre la surveillance de la TA à domicile en pratique. On aborde l'éducation et la formation des patients et on donne des conseils sur la sélection des tensiomètres à utiliser à domicile.

first-day home readings are often elevated compared with readings over the next several days (3).

The diagnosis of a 'white coat' effect is better determined by ambulatory BPM (4), but HBPM still has a role as a screening test. Elevated HBPM levels are associated with sustained hypertension, but lower levels at home (ie, suggesting the white coat effect) are best confirmed by ambulatory BPM.

Masked hypertension can be detected by HBPM. Masked hypertension is the phenomenon in which a patient has office BP within the normal range (ie, lower than 140/90 mmHg) but elevated out-of-office levels (eg, 135/85 mmHg or higher as home or daytime ambulatory averages) (5). Thus, the patient's hypertension is real but 'masked' from the physician using office BP measurement. The prevalence of masked hypertension in the general population is in excess of 8% (6) and is higher in treated hypertensive patients (7). Some studies find masked hypertension to be more common than the white coat effect, but how often it is found is likely related to the care taken with office BP readings (8).

Patient risk is better associated with home (9) or ambulatory (10,11) BP readings than with office readings. Masked hypertension is more common in treated or untreated patients who have 'high normal' office readings (12). Currently, there is no precise 'picture' of who is likely to have masked hypertension, but taken together, results of several studies suggest that masked hypertension is more likely in a high-risk patient. In treated hypertensive patients, lower office BPs have, in some studies, been attributed to factors such as the onset of antihypertensive therapy (13) or the time of day (14).

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Figure 1) Canadian Hypertension Education Program diagnostic algorithm for hypertension (HTN) using office and out-of-office blood pressure (BP)-measuring technologies. All BP values are expressed in mmHg. ABPM Ambulatory BP monitoring; DBP Diastolic BP; HBPM Home BP monitoring; SBP Systolic BP. Reproduced with permission from reference 32

Identifying masked hypertension requires repeated office BP readings and a slightly longer series of HBPM readings (15). Practical issues surrounding the identification and management of masked hypertension have been discussed elsewhere (16).

MANAGEMENT OF HYPERTENSION

HBPM is also recommended for the management of patients with chronic kidney disease, diabetes mellitus or suspected nonadherence (1). Home BP readings are prognostic of end-stage renal disease in patients with chronic kidney disease (17). In addition to identifying chronic kidney disease patients who are at risk, HBPM may be used to diagnose 'occult' hypertension in these patients, whose BP varies markedly due to dialysis. BP values from HBPM correlate well with proteinuria (18) and left ventricular hypertrophy (19), both of which are indicators of target organ damage.

BP control can reduce the incidence of cardiovascular events or slow the progression of nephropathy in diabetics (20-22). HBPM is a better predictor of diabetic nephropathy than office-based BP readings (23), but physicians and patients need to be aware of the benefits of tighter control of both home and office BP in the diabetic population (24).

HBPM is recommended for use by patients to improve adherence to antihypertensive therapy (1). As was discussed in a recent meta-analysis on this subject (25), most studies that have found BP-lowering effects of home measurement have used home monitoring as one element of a larger program to improve adherence. A recent randomized controlled trial (26) showed that subjects who were provided devices for home measurement were more adherent to antihypertensive therapy. Unfortunately, only adherence, and not BP, was measured in this study. At least two major trials (27,28) of home measurement and its effects on BP and adherence are underway.

Although these studies will provide stronger evidence of any effects of home measurement on BP reduction and adherence, both studies lack 'hard' clinical end points.

METHODS AND DEVICES

As with any BP reading, the quality of HBPM (and, thus, its clinical usefulness) depends on the accuracy and suitability of the equipment, the conditions under which BP is measured, as well as the knowledge and ability of the person taking the BP measurement.

Only those automated devices that meet or exceed current accepted standards or clinical testing protocols should be recommended to patients (1). The Canadian Hypertension Society maintains a list of independently validated automated models available for sale in Canada (available at <www.hypertension.ca/cheep/public/publicEducationva.asp>). In addition to using quality equipment, these devices need to be tested for their accuracy, ease of use and suitability on individual patients. Arrhythmias, in particular, may result in erroneous BP readings, although some available devices may be more robust in the case of irregular heart rhythms. Cuff size and fit, simplicity of operation and visibility of the readout are other factors that need to be considered when observing and instructing patients in home BP measurement. Patients (or whoever is supervising the home measurements) benefit by having their technique (eg, cuff placement, arm position, back support, legs uncrossed) witnessed and corrected as necessary before they embark on home monitoring (29). Fundamentally, a high-quality home reading depends on the same types of factors that contribute to a high-quality office

reading (1). Patients need to be advised to rest and relax before the reading, and avoid those activities known to influence BP (eg, caffeine, exercise, eating, talking or cold exposure before the measurement). They also need to know when to take the measurement with respect to the timing of medication or meals. Typically, duplicate morning readings are taken on rising and after voiding, but before meals or medication. Duplicate evening readings are best taken before meals or medication, or taken a couple of hours after eating but before taking any medication that may affect BP. Patients need to be told to record their duplicate morning and evening readings, and the dates and times, as well as any pertinent comments (eg, medications, illness or unusual occurrences) that may aid in the interpretation of these values.

Results of some studies have shown some discrepancies between BP diaries recorded by patients and the values stored in the internal memory device of an automated home BP monitor (30). For the models of devices that have a printout, patients may be asked to bring their diaries and printouts with them to office visits as one way of ensuring that their records are accurate. Others suggest that patients use home BP measuring devices that have a built-in memory feature so that diary entries can be checked with actual readings. Of course, nothing is fail-proof. The values on the printout or in the internal memory device may or may not all belong to the patient in question, because patients often share these devices with family members and friends (31). Keeping in mind the limitations that accompany any method of BP measurement, HBPM is useful in diagnosing and managing hypertension, and may be recommended to patients in many instances.

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