

# Home Based Blood Pressure Monitoring in Indian Setting: A Consensus Document

EXPERT GROUP (1-23)

## ABSTRACT

Hypertension is one of the most significant public health problem and a common lifestyle disease today in India. Monitoring of blood pressure along with appropriate and timely management is critical in order to avoid any morbidity and mortality associated with hypertension. The use of Home Blood Pressure Monitoring (HBPM) for the measurement of blood pressure by the patient outside the clinical setting, either at home or at work place, is increasing across the world. The practice of monitoring blood pressure at home is well accepted by the patients as well and can be a useful adjuvant to the routine office based blood pressure measurements. Recently, experts in the field of hypertension management across India were invited to develop a consensus document on the role of HBPM in the Indian setting. This consensus document reflects the views and suggestions of the experts who had participated in developing this document.

**Keywords:** Antihypertensive medications, Healthcare education, Hypertension

## INTRODUCTION

Hypertension is the leading preventable risk factor for premature death and disability worldwide. It is an important global health challenge, owing to its high prevalence and impact on cardiovascular and chronic kidney diseases [1-4]. In order to avoid hypertension related serious complications, accurate blood pressure monitoring and appropriate management is imperative.

Three ways of blood pressure monitoring have been evaluated for their usefulness in the routine management of hypertension. Conventional office (clinic/hospital based) measurement of blood pressure is useful, but has a great variability [1]. The other two methods commonly used are HBPM and 24-hour Ambulatory Blood Pressure Monitoring (ABPM) [5,6].

In ABPM, blood pressure is measured using a digital monitor while the person performs his/her routine activities. ABPM provides information about blood pressure changes during routine activities and eliminates higher readings due to 'white coat' effect. However, 24-hour ABPM is associated with limitations such as sleep disturbances in some patients and need of 24-hour assistance (in case patient has some problem).

Self-monitoring of blood pressure at home by patients is gaining recognition and is being increasingly practiced. HBPM has certain advantages over the other two methods and its acceptance by the patients is also good [7]. According to a recently published French study, utility of HBPM is aiding in reducing blood pressure in elderly population [6]. Ideally, all hypertensive patients should be encouraged to adopt the method of HBPM. Several guidelines recommend the use of HBPM for the management of hypertension [8].

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## Indications and Scope of HBPM

HBPM is a useful adjuvant to office blood pressure measurement in a number of conditions, including but not limited to:

1. Diagnosis of possible hypertension [9]:
  - White coat hypertension (blood pressure readings in hypertensive range when measured in the clinic/hospital setting but not at home).
  - White coat effect in known hypertensive patients i.e., blood pressure reading higher by 20/10 mmHg when measured in the clinic/hospital than average reading at home (home readings in the hypertensive range). These patients are at risk of getting more antihypertensive medications than required.
  - Masked hypertension (higher reading of blood pressure at home compared to reading measured in the clinic/hospital).
  - Unusual variations in blood pressure readings.
2. Treatment of hypertension [9]:
  - Evaluate efficacy of antihypertensive treatment and support/rationalise dose adjustment, especially in hypertensive patients with white coat effect.
  - Support/rationalise antihypertensive medication dose adjustment in previously misdiagnosed or over treated patients.
  - Assess control of blood pressure in patients discharged from the hospital in whom the treatment is either newly initiated or modified.
  - Improve treatment adherence/compliance and lifestyle changes.
  - Improve patient awareness about hypertension.
3. Management and monitoring of patients with difficult to treat/resistant hypertension.
4. High risk patients (e.g. diabetic patients, people with chronic kidney disease, and pregnancy) in whom a close monitoring of blood pressure control is required.
5. Ideal tool to monitor and follow up patients with pre-hypertension/

high normal blood pressure.

### Benefits of HBPM Over Other Methods of Blood Pressure Monitoring

- Major advantage of HBPM is the ability to take multiple readings of blood pressure during the day and for several days to months.
- White coat hypertension can be diagnosed as the blood pressure is measured by the patient at home i.e., away from the clinical/hospital settings.
- Home based monitoring may provide a better prediction of hypertension induced end organ damage or other complications compared to the office settings though this has not been unequivocally proved [7].
- Advantages of HBPM over 24-hour continuous ABPM include feasibility of long term monitoring, easy and wide availability of equipment to monitor blood pressure, convenience and possibly economic benefits for the patient [7].
- Results of HBPM are reproducible [5].
- May improve treatment compliance resulting in better hypertension control rates [5].
- May be useful in deciding timing of antihypertensive drug administration.

HBPM was found to be a stronger predictor of cardiovascular risk with a better prognostic value compared to office blood pressure monitoring, as per the Finn-Home study [10]. Further, HBPM use has been reported to reduce therapeutic inertia and result in significant reduction in blood pressure [11].

The benefits of home based monitoring in the measurement of nocturnal blood pressure in treatment naive subjects have been reported in a study conducted in India [12]. In this study, blood pressure was measured once during the daytime and once at night. The night reading was taken three hours after sleep. The results indicated that HBPM device could be a useful method for detecting nocturnal dipping of BP and detect early signs of left ventricular hypertrophy [12].

Blood pressure measured at night time with HBPM and by ABPM have shown similar results [13]. A recent systematic review and meta-analysis also suggested that night time home blood pressure and night time ambulatory blood pressure have similar risk of target organ damage [14]. However, a recent study demonstrated superiority of home blood pressure measurement over office blood pressure for long term effect on left ventricular mass [15]. Considering these results, HBPM, if practiced widely, will play an important role in the management of hypertension.

### Limitations of HBPM

- HBPM is not useful for monitoring blood pressure when person is at work station (office) or during sleeping hours.
- Variations in the blood pressure readings over short period may not be detected by HBPM [5].
- The tendency for missing or avoiding a medicine in case of normal blood pressure cannot be ruled out. Similarly, it may also cause a panic reaction due to elevated reading and increased tendency of self-medication.
- There might be differences in the readings because of a non trained operator or device related errors [5].
- Monitoring blood pressure before breakfast and after dinner is cumbersome and patients may not follow it.

Recently, night time home blood pressure measurement algorithm for taking three readings at one hour intervals using a cuff oscillometric

device has been developed. It can be preset to take night time home blood pressure measurements at 2 a.m, 3 a.m and 4 a.m [16].

### Normal Level of Home based Blood Pressure

In most subjects, home blood pressure less than 130/80 mmHg is considered as normal whereas, average home blood pressure reading more than 135/85 mmHg is considered elevated. It is generally agreed that in high risk subjects, lower levels should be achieved; however, there are no defined target levels in these patients [7,17].

### Types of Blood Pressure Monitoring Devices

Blood pressure monitoring device of appropriate size should be given to the patient according to health and body condition. Although, conventional sphygmomanometer provides accurate data compared to digital devices, the auscultatory devices such as mercury sphygmomanometer or aneroids should not be preferred because of their limitations such as need for training for auscultation and environmental problems with mercury.

However, auscultatory devices are of use in specific patient population such as arrhythmia. Semi-automated or automated devices which provide electronic readings should be preferred. The advantages of such devices include less intensive training and avoidance of reading bias. Devices with inbuilt memory avoid wrong reporting of the readings by patients. Finger and wrist devices should be avoided because these are not so accurate.

There may be errors in the measurement with different devices. Some errors may be specifically related to the device [5]; hence, the instruments validated for their accuracy should be recommended for home use. The list of validated HBPM devices can be found on British Hypertension Society website [18].

### Demonstration of Using the HBPM Device

The healthcare professional should demonstrate the application of device to the patient before recommending self-recording at home. Blood pressure measuring instruments may need specific validation in special patient population such as elderly, children, pregnancy and patients with end-stage renal disease and arrhythmias. Sometimes patients may require telephonic assistance for resolving their questions. Such facility is useful in improving acceptance of HBPM. However, medico legal aspects should be considered before recommending telephonic advice.

### Requirements and Guidance for HBPM

Before adapting the HBPM, few basic and important guidelines need to be considered.

#### Patient education and training

- Healthcare provider plays an important role in disseminating information about correct method and importance of blood pressure monitoring. Patients and their attendants should be trained under the supervision of a healthcare professional i.e., either doctor or health attendant.
- Training should cover basic information about hypertension, importance of achieving and maintaining optimum blood pressure, adherence to therapy, blood pressure variability, factors responsible for it and detailed information about the procedure and timings of blood pressure readings.
- Importance of adherence to therapy and consequences of missed therapy should be explained to the patient.
- Patients should also be informed about the available validated blood pressure monitoring devices.
- Patients should be counseled so that they do not become anxious/panic in case of a single high or low reading. However, they should be informed to contact healthcare provider in case

of persistently abnormal blood pressure and/or blood pressure reading associated with physical discomfort in the form of chest pain, breathlessness or sweating.

- Patient should be informed that use of HBPM cannot be correlated with glucose monitoring at home (e.g., diagnosing hypoglycaemia by checking blood glucose).

### Guidance for measuring blood pressure and frequency of recording

Following prerequisites should be emphasised while recording blood pressure for HBPM [14]:

- Before taking a reading of blood pressure, patients should be at rest for at least five minutes.
- The arm in which blood pressure is measured should not be covered with tight clothing.
- The cuff should be appropriately placed on the arm with the lower edge about 2 cm above the elbow joint. The centre of the inflatable bladder should cover the brachial artery on the arm's interior surface. The forearm should be rested on a firm surface at level of the lower end of the breast bone.
- Initially, blood pressure in both arms should be measured and the arm with higher systolic reading should be used for all future recordings.
- While measuring blood pressure in sitting position, both the feet should remain flat on the floor with support to the back and arm. Crossing of the legs should be avoided, as it can increase the blood pressure.
- Taking blood pressure reading in supine position is preferable.
- Smoking, eating, consumption of caffeinated drink or physical activity within 30 minutes prior to blood pressure measurement should be avoided.
- Blood pressure should not be measured with urinary bladder full.
- Patients should not measure blood pressure when they are suffering from a headache or any severe pain in the body.
- Manufacturer's instructions should be followed while recording the blood pressure.
- If the patient is uncomfortable, then family/neighbours can check the blood pressure.
- The reading should be immediately recorded in the log book or diary.

### Standard formats for blood pressure recording

If possible, standardised format for recording of the blood pressure readings should be provided to the patients. Such formats may improve the adherence to the given timelines of blood pressure recording and provide accurate data for the assessment and interpretation of readings over longer period.

### Frequency of monitoring for initial evaluation or modification of treatment

- Blood pressure reading should be taken preferably daily, or if not possible, then at least three days in a week. Readings should be taken in the morning and evening. For each blood pressure recording, at least two consecutive measurements should be taken, at least one minute apart. Additional measurement of blood pressure should be taken when the first two readings taken are considerably different.
- Records of the first monitoring day should not be considered for taking any decision as they are usually higher.
- If the patient is on long term therapy, less frequent readings i.e., once or twice in a week may be taken. For the patients who are on antihypertensive therapy, morning reading (before

getting from the bed in supine position) is recommended before consumption of medicine whereas, the evening reading is advocated before dinner.

Before labeling a patient as hypertensive, it is highly recommended to take blood pressure readings twice daily for a week, rather than thrice a week as it provides better understanding about blood pressure fluctuations and persistence of high blood pressure at different settings. The recordings of at least a week should be available before the patient is labeled as hypertensive.

For the patients on medication, measurement of blood pressure once daily may be sufficient to reduce the anxiety about the diseased state. It may also improve the compliance to treatment. In case of need for change over or addition of another drug, twice daily measurement is required for at least two weeks.

Clinical decisions in the form of modification in the management of hypertension should not be taken based only on home based readings. The decisions should be based on the average of measurements taken at different times. Patient should contact healthcare provider if blood pressure is high and avoid self-medications (e.g., sedatives or antihypertensives).

## CONCLUSION

Home blood pressure monitoring could be a useful and important tool in routine management of hypertension. Patients should be counseled, educated and trained by medical personnel on use of HBPM device. Patients need to be regularly followed up for assessing the control of blood pressure and modify the therapy, if required.

## DISCLOSURE

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