

Home Blood Pressure Monitoring Protocol

Introduction

Home Blood Pressure Monitoring (HBPM) is being increasingly used in many health systems worldwide and is well accepted by patients. A recent survey undertaken in the UK found that around 30% of patients with hypertension monitor their own blood pressure at home. In other countries, this figure stands at over 70%. To realise the full value of HBPM, however, it is important that HBPM is carried out in a way that is consistent with the current evidence base and therefore in line with this protocol.

All healthcare professionals (e.g. doctors, nurses, healthcare assistants, pharmacists) using HBPM with their patients should be adequately trained and have their performance reviewed periodically.

*Please note that the guidance below frequently makes reference to patients with hypertension. However, there will be a group of patients who do not meet the diagnostic criteria for hypertension, but who have blood pressure too high for their clinical condition (e.g. CKD, type 2 diabetes). In such cases, HBPM should be used as per the guidance for patients with confirmed or suspected hypertension.

1. Clinical indications for HBPM

1.1. HBPM provides a useful addition to clinic blood pressure measurement in a number of circumstances, including in the:

1.1.1. Diagnosis of hypertension, where ambulatory blood pressure monitoring (ABPM) is not tolerated, including in the detection of:

- Possible white coat hypertension (*blood pressure in the hypertensive range when taken in a clinical setting, but not when taken at home*)
- Possible white coat effect in patients with hypertension (*a difference of more than 20/10mmHg between clinic blood pressure and average home blood pressure, but where home readings are still in the hypertensive range. Such patients are at risk of receiving more blood pressure medication than they need*)
- Possible masked hypertension (*blood pressure in the hypertensive range when taken at home, but not when taken in a clinical setting*)
- Unusual variability of blood pressure.

1.1.2. Treatment of hypertension, to:

- Inform unclear/equivocal treatment decisions
- Determine the efficacy of antihypertensive therapy and supporting appropriate adjustment, particularly in hypertensive patients with white coat effect
- Support the appropriate adjustment of drug therapy for patients who have been previously misdiagnosed or over-treated
- Promote medication adherence (compliance) and lifestyle changes and to make patients more aware of their condition
- Evaluate blood pressure control in patients discharged home from hospital with newly commenced or altered antihypertensive therapy
- Evaluate drug resistant hypertension
- Evaluate symptomatic hypotension.

1.1.3. Long term monitoring of patients on stable treatment for hypertension (i.e. hypertensive patients who have well controlled blood pressure).

1.2. HBPM performed with most automated devices is contraindicated in patients with pulse irregularities, such as atrial fibrillation (AF) [see manufacturers' instructions for further information]. Prior to introducing HBPM, therefore, in patients not known to have an irregular pulse, it may be appropriate to check for any pulse irregularities (rate and rhythm). Some HBPM devices will do this automatically.

1.3. HBPM should not be considered universally contraindicated in some patient groups such as those with motor disabilities or cognitive impairments. These patients may be able to undertake HBPM with additional support, either from a trained healthcare professional or family member.

2. HBPM devices and cuffs

2.1. Devices used for HBPM should be clinically validated for home use. An up to date list of such devices is available at www.bhsoc.org and www.bloodpressureuk.org. Where patients wish to purchase their own device, they should be specifically advised to purchase a monitor from this list. If the patient has already purchased a monitor that is not validated for home use, this should not be used for clinical purposes and the patient should be advised that this is the case.

2.2. An appropriately sized cuff, containing the correct sized inflatable bladder, must be used (see box below) and upper arm monitors are preferred to wrist or watch devices.

2.3. All devices, including those that belong to patients and those available to loan to them, should be maintained and calibrated according to manufacturers' instructions. Where patients are using their own device for HBPM, it is important to check when the monitor was purchased and/or last calibrated. If outside the recommended timeframe for calibration/recalibration, the

monitor should not be used for clinical purposes and it should be recommended that the monitor is recalibrated according to the manufacturer's instructions or replaced. It is also good practice to occasionally check patients' monitors against other validated devices.

- 2.4. If devices are loaned to patients, from an infection control point of view, it is important to ensure that cuffs and inflatable bladders are cleaned according to the manufacturers' instructions and in compliance with local infection control procedures.

Box 1. Cuff and Inflatable Bladder Size

Cuff Sizes	Indication	Width (cm)*	Length (cm)*	BHS Guidelines inflatable bladder width and length (cm)*	Arm circumference (cm)*
	Small Adult/Child	10-12	18-24	12 x 18	<23
	Standard Adult	12-13	23-35	12 x 26	<33
	Large Adult	12-16	35-40	12 x 40	<50
	Adult Thigh Cuff**	20	42	<53	

* The range of columns 2 and 3 are derived from recommendations from the British Hypertension Society (BHS), European Hypertension Society (ESH) and the American Heart Association. Columns 4 and 5 are derived only from the BHS guidelines.

** Large inflatable bladders for arm circumferences over 42cm may be required.

- 2.5. Manufacturers' instructions should be referred to for further information e.g. setting up the monitor, troubleshooting, battery replacement, calibration, using memory/storage functions.

3. Using HBPM upper arm devices

- 3.1. Prior to starting HBPM, patients should measure their blood pressure in both arms to determine which arm should be used for future measurements. The arm that gives the higher systolic reading (the top number) should be used for all future testing.

- 3.2. Patients should place the cuff on their arm with the lower edge of the cuff approximately 2cm above the bend in their elbow. The centre of the inflatable bladder should be positioned over the brachial



artery on the arm's interior surface. The forearm should be supported on a firm surface and should be level of the lower end of the breast bone.

- 3.3. No tight or restrictive clothing should be worn around the arm.
- 3.4. Patients should be seated, remain silent and be at rest for a minimum of five minutes before taking a measurement and should not have smoked, eaten, drunk a caffeinated drink or undertaken physical activity within the past thirty minutes. Patients should also avoid measuring their blood pressure with a full bladder.
- 3.5. Measurements should be taken in silence when the patient is relaxed, with both feet flat on the floor and their back and arm supported. Many patients automatically cross their legs, which raises their blood pressure, so it is particularly important to emphasise the need for the patient to uncross their legs when taking their blood pressure.
- 3.6. The device should then be used as per the manufacturer's instructions to produce a blood pressure reading. The manufacturer's instructions may also provide further specific guidance in relation to the appropriate use of the device.

4. Patient education for HBPM

- 4.1. All patients undertaking HBPM should receive adequate education and training/teaching. At a minimum, this should consist of information relating to:
 - The importance of using a validated and calibrated monitor, with the right sized cuff
 - Where the blood pressure cuff should be positioned on the arm
 - How to sit when taking blood pressure readings (e.g. feet flat on the floor, back and arm supported)
 - Factors that may affect the accuracy of blood pressure readings (e.g. exercise, caffeine, smoking, eating food)
 - The importance of taking more than one blood pressure measurement each time, leaving at least a minute in between each measurement
 - How long for, how often and at what time of day blood pressure measurements should be taken
 - How to document blood pressure readings and share them with a healthcare professional. This should include the importance of not rounding readings up or down and recording the time at which medications are taken
 - The potential for there to be natural variation in blood pressure readings
 - The circumstances under which individuals should contact a healthcare professional (and how they should do this)
 - The importance of not checking blood pressure too often

- The importance of continuing to take medication as prescribed, regardless of home blood pressure readings
- If the monitor has been loaned, the importance of caring for and returning the equipment.

4.2. Where possible, the above education and training/teaching should consist of a practical demonstration with the patient of how to use the blood pressure monitor.

4.3. In addition to verbal and practical education and training, written information should be provided in relation to the above points [see Patient Information Leaflet: 'Home Blood Pressure Monitoring Explained'].

4.4. Patients should be provided with information about how they can seek further support if required.

5. Monitoring schedule: timing, frequency and duration of HBPM

5.1. The appropriate timing, frequency and duration of HBPM is dependent on the reason for which HBPM is being used:

5.1.1. Diagnosis of hypertension:

- For each blood pressure recording, at least two consecutive measurements should be taken, at least one minute apart. Additional measurements should be taken where the first two measurements are quite different
- Blood pressure should be recorded twice daily, ideally in the morning (06:00-12:00) and evening (18:00-00:00)
- Blood pressure recording should continue for at least four consecutive days, ideally seven
- The average of the above readings should be calculated, ignoring the first day, and made available for decision making, as well as having the raw readings available for review.

5.1.2. Treatment of hypertension:

- For each blood pressure recording, at least two consecutive measurements should be taken, at least one minute apart. Additional measurements should be taken where the first two measurements taken are quite different
- Blood pressure should be recorded twice daily, ideally in the morning (06:00-12:00) (before drug treatment, if appropriate) and evening (18:00-00:00)
- Blood pressure recording should be undertaken over the course of four, ideally seven, consecutive days prior to the next clinic appointment
- The average of the above readings should be calculated, ignoring the first day, and made available for decision making, as well as having the raw readings available for review.

- The medication taken at the time of the recordings including name of drugs, dose and time when taken should be recorded and be available for review.

5.1.3. Long term monitoring of hypertensive patients on stable treatment for hypertension:

- For each blood pressure recording, at least two consecutive measurements should be taken, at least one minute apart. Additional measurements should be taken where the first two measurements taken are quite different
- Blood pressure can be taken less frequently than above, for example, a maximum of once or twice per week, although this could be inappropriately intensive for some. Overuse of HBPM should be avoided
- Where blood pressure has been stable for a long time, intermittent checks, 2 readings twice daily for 4-7 consecutive days (with average recorded), every 4 to 6 months are advised
- For patients on stable treatment, immediately prior to the patient's annual hypertension review, consider asking the patient to record their blood pressure for a course of four, ideally seven, days in accordance with the schedule outlined in 5.1.2.
- It is important that the records of the blood pressure and all medication are made available for any clinical review
- It is recommended that the patient brings their blood pressure machine with them to reviews so that an appropriately trained healthcare professional can check that a validated device and the right sized cuff are being used, and also that the device is being used in the correct way. Equivalence with clinic blood pressure readings can also be checked.

6. Recording HBPM readings

- 6.1. Patients should systematically document all home blood pressure readings immediately after each recording/ measurement. For each measurement they should clearly note the date, time of day, systolic and diastolic blood pressure and anything that may have affected the reading, such as changes in treatment and episodes of illness, and any symptoms being experienced at the time, such as headaches and dizziness [see Patient Diary: 'Home Blood Pressure Diary'- paper and electronic versions available].
- 6.2. For any clinical review, the patient should be asked to bring along all their documented blood pressure readings and a list of their medication, highlighting any changes that have been made.
- 6.3. Where the blood pressure device being used has an internal memory that stores the patient's blood pressure readings, patients may bring the monitor to their clinical review. However, not all monitors record the dates and/or times at which the measurements were taken, so a separate record of blood pressure readings should also be kept by the patient and brought along to the review/appointment. This is particularly important, as more than one person may

use the same monitor and it is vital not to confuse which readings belong to each patient. It is also good practice to clear the memory of any monitor between patients, particularly where devices are loaned to patients.

7. Interpretation of HBPM readings

- 7.1. Where HBPM is used short-term for diagnostic purposes or to monitor the treatment of hypertension, readings taken on the first day should be discarded and an average of the remaining values- systolic and diastolic individually- taken.
- 7.2. Where patients have been monitoring their blood pressure at home previously (e.g. previously for diagnostic purposes and now to monitor treatment response), it may not be appropriate to discard the readings taken on the first day, although this issue is still a matter of debate.
- 7.3. If patients have taken more than two measurements at each recording, due to their first two readings being vastly different, consider including only the last two measurements when calculating the average.
- 7.4. To achieve equivalence with clinic-measured blood pressure, home blood pressure readings should be adjusted by $-5/5\text{mmHg}$. For example, a blood pressure reading of 135/85 taken at home is equivalent to a reading of 140/90 in a clinic setting.

IT IS VITALLY IMPORTANT THAT HOME BLOOD PRESSURE READINGS ARE ADJUSTED IN THIS WAY AS FAILURE TO DO SO CAN RESULT IN AN UNDERTREATMENT AND UNDERDIAGNOSIS OF HYPERTENSION.

- 7.5. Healthcare professionals should explain the interpretation of the home blood pressure measurements provided, and their implications for management, with the patient and, where appropriate, his or her carer.

According to local agreement:

- Recording and coding HBPM information in the patient's record (e.g. using recognised Read codes in GP practices)
- Processes for administering HBPM devices to patients

Other HBPM resources available in this series:

- Why consider HBPM for your patients?
- HBPM in your practice. Getting started.....
- NICE blood pressure treatment targets
- Introducing patients to HBPM
- Patient HBPM information leaflet and video [Home Blood Pressure Monitoring Explained]
- Patient HBPM diary [Home Blood Pressure Diary]
- Additional patient resources ['Why monitoring my blood pressure at home?' and 'Monitoring my blood pressure at home. Getting started...']

Related guidance/resources:

National Institute for Health and Clinical Excellence (NICE), (2011). *The clinical management of primary hypertension in adults: Clinical Guideline 127*. NICE: London.

Parati et al., (2010). European Society for Hypertension Practice Guidelines for home blood pressure monitoring. *Journal of Human Hypertension*, 24(12), pp. 779-785.

www.bloodpressureuk.org