

British Hypertension Society

Blood Pressure Measurement Recommendations on the 2007 DVD

INTRODUCTION

This DVD from the British Hypertension Society aims to show the basic process of having blood pressure measured as reliably and accurately as possible. Blood pressure measurement is almost certainly one of the most common clinical procedures undertaken around the world, but is often done badly, resulting in unreliable recordings. By following simple standardisation principles measurement can be greatly improved.

As blood pressure measurements using mercury are being phased out due to perceived toxicity problems, this DVD also illustrates how to measure blood pressure using the new, validated semi-automatic devices, which include monitors that resemble those of the traditional mercury and aneroid sphygmomanometers. By taking blood pressure measurements properly, patients can be clear that their readings are the best that routine measurement can achieve.

This DVD covers

- The importance of using validated blood pressure measuring machines
- You (the person / 'patient'), your position, which arm and when to measure your blood pressure
- The right CUFF size
- Special situations such as pregnancy, childhood, irregular heart rhythms and 24-hour monitoring.

The advice here applies to everyone; that is to doctors, nurses and other health professionals in a general practice, a hospital clinic or anywhere else, to patients measuring their own blood pressure at home, or to anyone wanting a reliable estimate of their blood pressure for interest, 'diagnosis', treatment and monitoring, for which the BHS guidelines should be followed.

CHOICE OF VALIDATED MACHINES

Although there are hundreds of blood pressure monitors on the market, only relatively few of these have been validated. Wrist monitors in most instances are not as accurate as upper arm devices and, even though some have passed validation criteria, upper arm devices are preferred. Treatment decisions are based on results from machines measuring blood pressure by a cuff and inflatable bladder around the upper arm.

The blood pressure devices shown on the DVD have all been independently validated on British Hypertension Society criteria. Up-to-date details of all validated devices for both home and hospital use can be found on our website (<http://www.bhsoc.org>).

HOME MEASUREMENT OF BLOOD PRESSURE

If you are measuring your own blood pressure at home, as anywhere else, you should first make yourself comfortable sitting upright. Your arm should be supported on a table or desk so that you can apply the right size cuff comfortably, with the cuff on your arm at the level of your heart. You should wear loose-fitting or short-sleeved clothing, as the cuff must be applied next to your skin.

The readings should be taken after a minimum of 5 minutes rest in the seated position, and 2-3 measurements made on each occasion. You should remain still and not talk during the readings.

Generally the same arm should be used each time you measure your blood pressure. If you change arms, always record which arm is used.

For home measurement, the recommendation is that sets of 3 measurements be taken twice a day, in the morning **before** taking blood pressure treatment and again in the evening approximately 12 hours later. Repeating this process over several days is ideal.

If there is more than a 10mmHg difference between consecutive recordings, further readings are required. Do not be concerned but try to continue, after resting for a bit longer, and aim to obtain at least 2 stable readings. Remember not to talk or be talked to, during a reading.

Keeping a record of blood pressure measurements, along with the date and time is very important, particularly in relation to when blood pressure tablets are taken.

It is very important that you do not alter how you take any medication as a result of blood pressure readings taken at home unless you are advised to do so by a doctor or nurse.

BLOOD PRESSURE MEASUREMENT BY HEALTHCARE PROFESSIONALS

Greeting the person or patient and making them welcome and comfortable are key to a relaxed atmosphere. The patient might find the cuff becomes quite tight, more so if a higher pressure is expected, and people can be anxious when having their pressure measured.

As mentioned before, the patient should remain seated comfortably, still and without speaking for 5 minutes before measurements are taken. During this time, avoid making any potentially stressful comments to the patient.

A cuff of the right size is applied to the mid-upper arm, next to the skin. Many cuffs show which part should be applied over the inner part of the arm above where it bends at the elbow, under which the brachial artery runs (medial to the biceps tendon). Being able to slip 2 fingers under the cuff indicates that it is closely applied but not too tight.

The person or patient should be asked not to talk until all the readings have been taken.

Often the best results are from taking 2 or 3 readings and using the average for the last 2 to guide your action. Each reading is done about a minute apart. The aim is to obtain at least 2 stable, reproducible, readings.

It is essential to keep careful written records of the systolic and diastolic blood pressure each time, along with the date and time of the reading. Recording the pulse rate is also important.

For home measurement, the recommendation is that sets of 3 measurements be taken twice a day, in the morning **before** taking antihypertensive treatment and again in the evening approximately 12 hours later. Repeating this process over several days is recommended for initial assessment and after changes in therapy and it is usual practice to omit the readings from the first 24 hours to allow for habituation. Thereafter, measurements can be taken less frequently.

In some older or diabetic patients who complain of light-headedness following meals, postprandial measurements may be advisable as this may detect low blood pressure after meals.

Readings taken standing are sometimes of interest, usually taken one minute after standing upright. The arm should be supported at the level of the heart as this avoids overestimating the standing blood pressure.

The British Hypertension Society publishes currently recommended target blood pressures, which are given on our website (<http://www.bhsoc.org>). It is important to note that these vary according to the way that blood pressure is assessed and according to the other clinical conditions that a patient may have. For example, the target blood pressures for patients who have diabetes or renal diseases are lower than for those who do not.

SELECTION OF CUFF SIZE

The selection of the correct cuff size is crucial to obtain an accurate measurement. Too small a cuff on a large arm leads to 'over-reading' – that is a higher pressure than is really there. On people with big arms, a large cuff is needed as the inflatable bladder needs to encircle at least 80% of the arm. The width of the cuff should be at least 40% of the arm circumference.

It is currently recommended that, in patients with mid-upper arm circumferences exceeding 33 cm, a large cuff is used. Every medical facility should have a supply of ordinary adult and large adult cuffs. For very big people, outsize large cuffs may be required, which are however difficult to fit.

CHILDREN

If measuring blood pressure in children, a much smaller cuff size is needed, and, depending on the size and age of the child, specialist paediatric cuffs may be needed.

Ensure the child is comfortable and try using distraction to keep the child sitting quietly. With very young children or babies, if the child is upset, the measurements may have to be taken while the child is sucking a dummy or feeding.

The US National Heart, Lung and Blood Institute has published ranges of usual values for different ages and child height and these are available on the Institute's web site (<http://www.nhlbi.nih.gov>).

MANUAL METHODS

Particular circumstances may sometimes require the use of manual methods. For instance, semi-automatic machines in some people may not be able to record blood pressure reliably. This is often the case where an irregular pulse is present such as in atrial fibrillation (known as 'AF'). In such cases, the old-fashioned stethoscope method is still required.

The brachial pulse is palpated and the cuff is inflated until the brachial pulse can no longer be felt, giving an estimate of systolic pressure. (Note that it is acceptable to have the tubing face upwards so as not to interfere with the stethoscope.)

The cuff is deflated, the stethoscope is then applied to the brachial pulse and the cuff inflated to 30mmHg above the estimated systolic pressure. The cuff is then deflated at 2mmHg per second, whilst listening over the brachial pulse. The first appreciation of a regular tapping sound is the phase 1 Korotkoff sound and this represents the systolic blood pressure. (Note that it is often a problem detecting when 'regular' sounds are heard in AF.)

The complete disappearance of sounds is Korotkoff phase 5 and this represents the diastolic blood pressure. If sounds persist all the way down to zero then phase 4 (the muffling of sounds) can be used and recorded as phase 4.

To avoid reading errors the observer should view the falling mercury column front on and not from above or below.

24-HOUR BLOOD PRESSURE MEASUREMENT

In some situations it may be useful to have blood pressured monitored over a 24 hour period:

- Unusual blood pressure variability
- Possible 'white-coat hypertension'
- Informing equivocal treatment decisions
- Evaluation of nocturnal hypertension
- Evaluation of drug-resistant hypertension
- Determining the efficacy of drug treatment over 24 hours
- Diagnoses and treatment of hypertension in pregnancy
- Evaluation of symptomatic hypotension

24-hour blood pressure monitoring usually requires the device to be programmed by a computer and then attached, usually by a belt to the waist, with the inflation tube running underneath their clothing to the cuff on the upper arm. The belt can be taken off at night and the monitor can be placed under the pillow.

The device is set to inflate at different time periods during the day and night, usually at 15-20 minute intervals during the day and half-hourly or hourly at night. Patients should cease activity if possible and let their arm hang motionless by their side during a reading.

Occasionally the machine may repeat a measurement if a reading cannot be obtained. The machine can be taken off and switched off for brief periods to allow for showers etc.

Compared with the 2 or 3 standard clinic measurements, 24-hour blood pressure monitoring usually gives 40-70 readings, considerably reducing the variability of the measurement. The results provide an average of all daytime, night time or 24-hour values.

Night time blood pressure measurement is relevant as people whose blood pressure does not fall during sleep may need treatment to be adjusted accordingly. Daytime blood pressure is often used to make treatment changes as is 24-hour mean blood pressure.

There are differences in the interpretation of mean ambulatory blood pressure data compared with daytime clinic blood pressure. Treatment and target thresholds for blood pressure measured by home monitors are adjusted downwards. The precise level is still a matter of some debate but at least 10mm/5mmHg is commonly applied.

PREGNANCY

In pregnancy, exactly the same procedure can usually be followed as for non-pregnant people, with the woman sitting comfortably with her arm supported.

As in other adults, Korotkoff phase 5 should be used to detect diastolic blood pressure. In the very rare event that sounds do approach zero or are low, readings should be repeated. If the problem is persistent, then Korotkoff phase 4 should be noted and 4 and 5 sounds recorded.

Women who are in the 2nd or 3rd trimester of pregnancy should not lie flat on their back during blood pressure recording as this may cause erroneous readings. Lateral tilt will prevent this, but care must be taken to ensure the cuff is level with the heart.

Oscillometric automated devices often under-record the blood pressure in pregnancy associated with pre-eclampsia (high blood pressure associated with proteinuria). This can occur even with devices that are validated and accurate in non-pregnant adults. Blood pressure in women with pre-eclampsia should thus be taken either with a machine validated specifically for use in pre-eclampsia, or with a mercury sphygmomanometer.

SUMMARY

In summary, there are 5 important points to consider:

- Use only **validated** machines from an authoritative list, such as the British Hypertension Society website (<http://www.bhsoc.org>).
- **Sit comfortably** with the machine and cuff at heart level for a minimum of 5 minutes before readings are taken.
- **Use the appropriate cuff size** – small for children, standard for adults with arm circumference ≤ 33 cm, large for adults with arms > 33 cm.
- If the heart rhythm/pulse is a little irregular, ‘older fashioned’ methods with a stethoscope may be needed (but always use a validated machine).
- **In pregnancy**, measurements can be taken in the usual way. However, in women with significantly elevated pressures, a machine validated specifically for use in pre-eclampsia is required.