

ABC of Blood Pressure Measurement

EOIN T O'BRIEN
KEVIN O'MALLEY

THE PATIENT

Age	Alcohol
Race	Smoking
Temperature	Exercise
Pain	Illness
Emotion	Obesity

A person's blood pressure varies from moment to moment with respiration, emotion, exercise, meals, tobacco, alcohol, temperature, bladder distension, and pain, and it is influenced by changes in circadian rhythms, age, and race. Furthermore, the patient may have physical characteristics, such as obesity, or diseases which may modify the blood pressure or make its measurement difficult or inaccurate. We cannot standardise our patients but we can minimise the effect of environmental influences by taking account of such factors.

Adequate explanation of the procedure is important to allay the fears of anxious patients. It is essential if the patient with hypertension is to take part in the management of his or her disease and adhere to treatment. Home recording of blood pressure may become an important part of management.

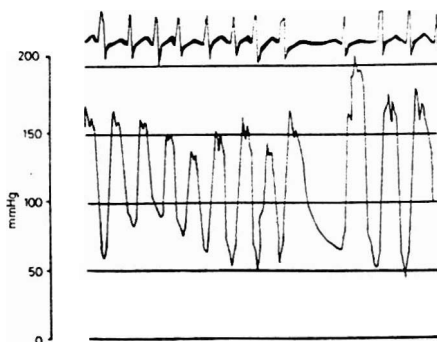
Patients should avoid exertion and not eat or smoke for thirty minutes before having their blood pressure measured. The room should be comfortably warm and quiet, and the patient should be allowed to rest for at least five minutes before the measurement. When it is not possible to achieve optimum conditions this should be noted with the blood pressure reading—for example, "BP 150/95/90 (patient very nervous)."

Obesity



High blood pressure is commoner in obese people, but this increase may be at least partly artefactual, since the inflatable rubber bladder may be too short for the obese arm—causing "cuff hypertension." Ideally the bladder should encircle the arm, the recommended dimensions being 12 × 35 cm, but if the bladder does not do so (and most bladders will not) it should be 1.2 times wider than the arm's diameter (or 40% of arm circumference). When the bladder does not completely encircle the arm the centre of the bladder must be placed directly over the brachial artery.

Arrhythmias



Many cardiac arrhythmias cause variations in stroke volume, and the blood pressure may vary with each cardiac contraction. This is particularly so with atrial fibrillation. The average of at least three readings should be recorded for both systolic and diastolic pressure, and a note of the arrhythmia should be made with the blood-pressure reading. The mercury should be lowered very slowly to avoid underestimating systolic and overestimating diastolic pressures.

Arm position and support

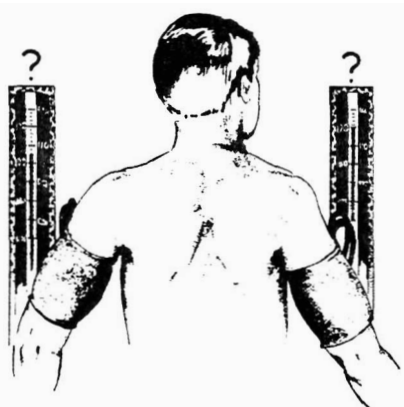


In normal people there is no significant difference in blood pressure between supine, sitting, and standing positions provided that the arm is supported at heart level. Patients should be comfortable whatever their position, and they should not change their position for five minutes before the blood pressure is measured. Some antihypertensive drugs cause postural hypertension, and when this is expected blood pressure should be measured both lying and standing.

Vertical displacement of the arm increases the hydrostatic pressure as the arm is lowered. The error may be as large as 10 mm Hg for both the systolic and diastolic pressures. The arm in which pressure is being measured should be horizontal with the fourth intercostal space at the sternum. This is especially important in the sitting and standing positions: in the supine position the arm is usually at heart level.

If the arm is unsupported the patient will perform isometric exercise, which may increase diastolic pressure by up to 10%. This effect is greater in hypertensive patients and in those taking beta-adrenoceptor blocking drugs. This isometric effect is most likely to occur in sitting and standing positions, when the arm has been extended forward at an angle of 45° to keep it at heart level. When extended this way the arm can readily be supported by the observer's arm.

Which arm?



There may be small differences in pressure between arms, and it has been suggested that pressures are higher in the right arm (by 2 to 10 mm Hg). In clinical practice most pressures are recorded from the right side.

At the initial examination, however, the blood pressure should be estimated in both arms. If the systolic or diastolic pressures are 10 mm Hg or more higher in one arm further measurements should be made in that limb.

Repeated measurements

1. Inflate fast to 30 mmHg above systolic
2. Deflate at 2 mmHg/s
3. Note appearance of sounds (systolic)
muffling of sounds
disappearance of sounds (diastolic)
4. Deflate rapidly to zero
5. Wait ≥ 15 s before repeating measurement

Repeated inflation of the bladder causes venous congestion of the limb, the duration of inflation rather than the pressure being the important factor. Systolic pressure may be up to 30 mm Hg above or 14 mm Hg below the true arterial level, and diastolic readings may be up to 20 mm Hg above or 10 mm Hg below the true level. To avoid venous congestion the cuff should be inflated as rapidly as possible and then deflated completely between successive readings. At least 15 seconds should be allowed between successive measurements.

The Blood Pressure Evaluation and Treatment Centre, The Charitable Infirmary, Dublin: Dr Eoin O'Brien is consultant physician (cardiology) and Professor Kevin O'Malley professor of clinical pharmacology at the Royal College of Surgeons in Ireland.

This is the third of a series of seven papers, and no reprints will be available from the authors.