

***Home Blood PRESSURE
MONITORING***

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*Accurate Diagnosis of HTN is based
on averaged multiple BP
measurements taken on separate
occasions*

◆ **Self-monitoring of blood pressures by patients at home, or in the nonclinic setting, has steadily become more common during recent years. The advent of more accessible, affordable, and user-friendly automated blood pressure machines has certainly helped to fuel this growth.**

Blood Pressure Assessment: Patient preparation and posture

◆ Standardized technique:

◆ Patient

1. **No caffeine** in the preceding hour.
2. **No smoking** or nicotine in the preceding 15-30 minutes.
3. **No** use of substances containing **adrenergic stimulants** such as phenylephrine or pseudoephedrine (may be present in nasal decongestants or ophthalmic drops).
4. **Bladder and bowel comfortable.**
5. **Quiet environment.** Comfortable room temperature.
6. **No tight clothing** on arm or forearm.
7. **No acute anxiety, stress or pain.**
8. Patient should stay **silent** prior and during the procedure.

Blood Pressure Assessment: Patient preparation and posture

- ◆ **Standardized technique:**
- ◆ **Posture**
- ◆ The patient should be **calmly seated for at least 5 minutes**, with his or her **back well supported and arm supported at the level of the heart**. His or her feet should touch the floor and legs should not be crossed.
- ◆ The patient should be instructed **not to talk** prior and during the procedure.

BP Measurement Devices

Non invasive/Manual sphygmomanometers:

Mercury and aneroid sphygmomanometer

Semi automated/Automated sphygmomanometers:

- Used in hospitals**
- Self measurement**
- AMBP measurement**
- Measurement in community settings**

Blood Pressure Measurement Devices

Validation Standards

- ◆ 1987 *AAMI: Association for the Advancement of Medical Instrumentation*
- ◆ 1990 *BHS: British Hypertension Society protocol*

Validation Standards

- ◆ The *criteria for fulfilling the AAMI* protocol are that the test device must not differ from the mercury standard by a mean of difference $> 5 \text{ mmHg}$ or standard deviation $> 8 \text{ mmHg}$
- ◆ The *criteria for fulfilling the BHS* protocol are that devices must achieve at least *Grade B* (where *A* denotes greatest agreement with mercury standard and *D* denotes least agreement) for SBP and DBP.

Recommended Technique for Measuring Blood Pressure

Standardized technique:

Use a mercury manometer
or a recently calibrated
aneroid or a validated
electronic device.

Aneroid devices should
only be used if there is
an established
calibration check every
6-12 months.



Recommended Technique for Measuring Blood Pressure

Electronic oscillometric devices:

Use a validated electronic device according to BHS, AAMI or IP standards.

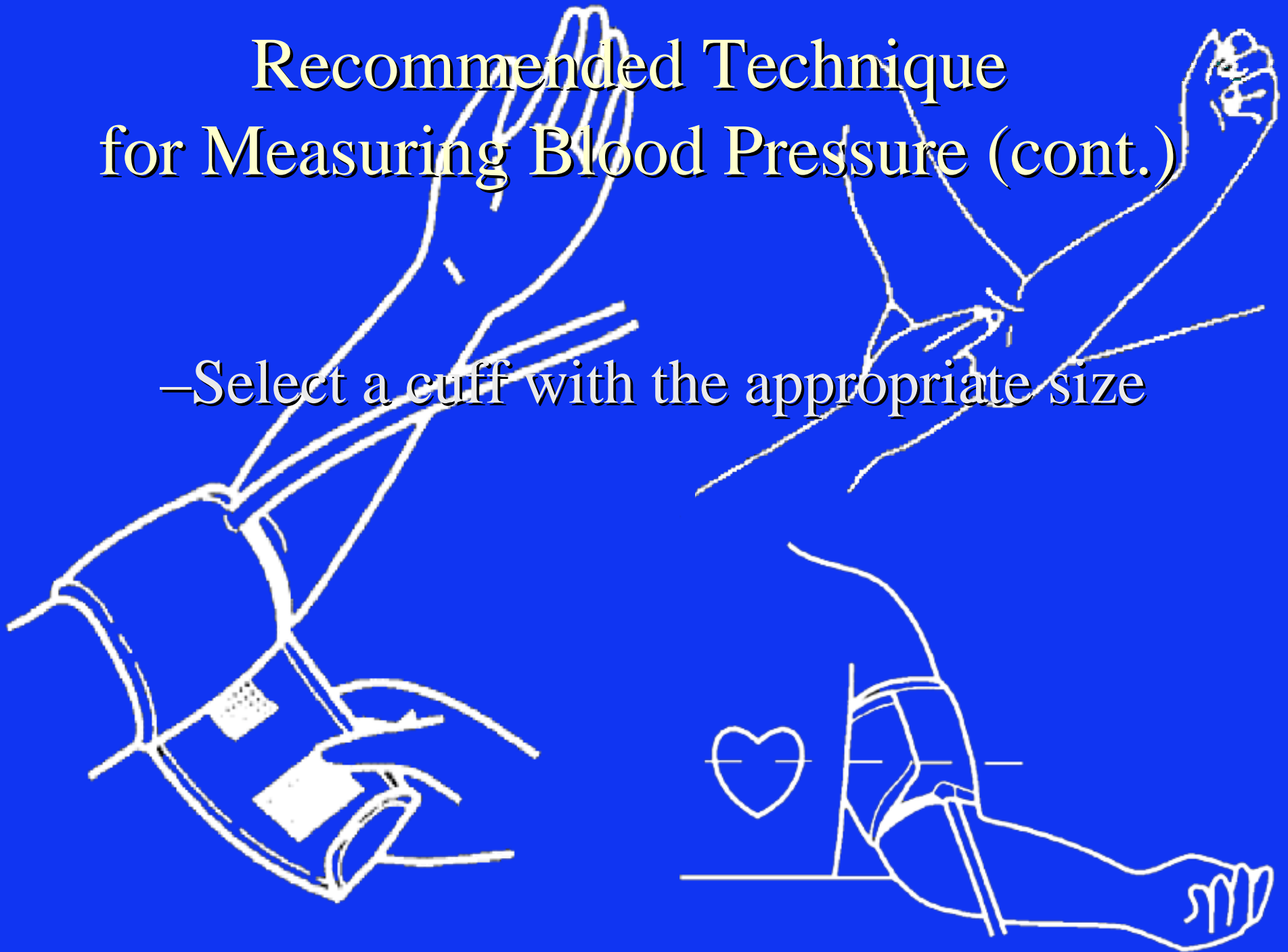
For **self blood pressure** measurement devices, a logo on the packaging ensures that this type of device and model meets the international standards for accurate blood pressure measurement.



AAMI=Association for the Advancement of Medical Instrumentation;
BHS=British Hypertension Society; IP: International Protocol.

Recommended Technique for Measuring Blood Pressure (cont.)

–Select a cuff with the appropriate size



Cuff size

Arm circumference (cm)	Size of Cuff (cm)
From 18 to 26	9 x 18 (child)
From 26 to 33	12 x 23 (standard adult model)
From 33 to 41	15 x 33 (large, obese)
More than 41	18 x 36 (extra large, obese)

Recommended Technique for Measuring Blood Pressure (cont.)

The seated blood pressure is used to determine and monitor treatment decisions.

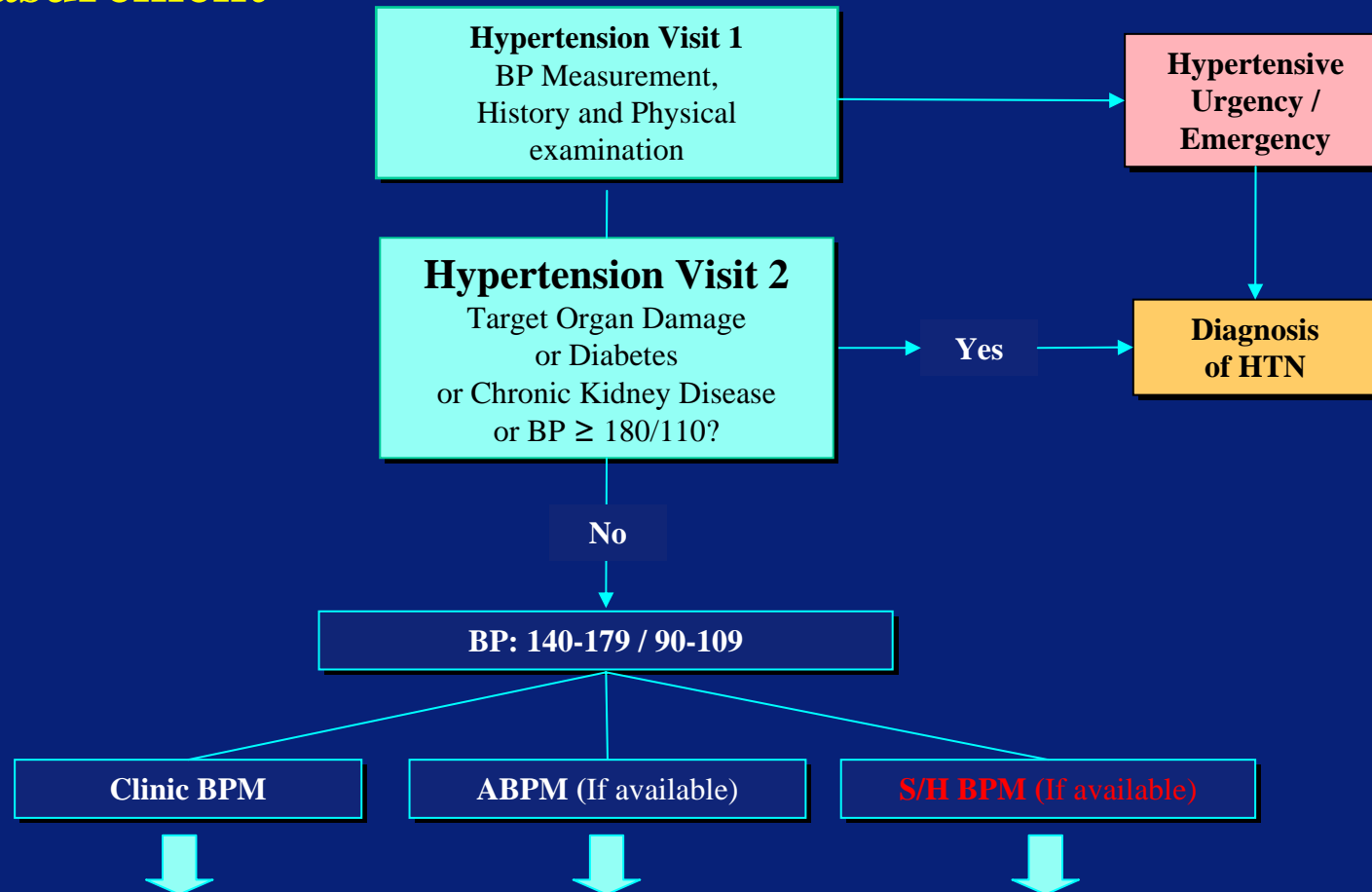
The standing blood pressure is used to test for postural hypotension, if present, which may modify the treatment.

Blood Pressure Assessment: Patient preparation and posture

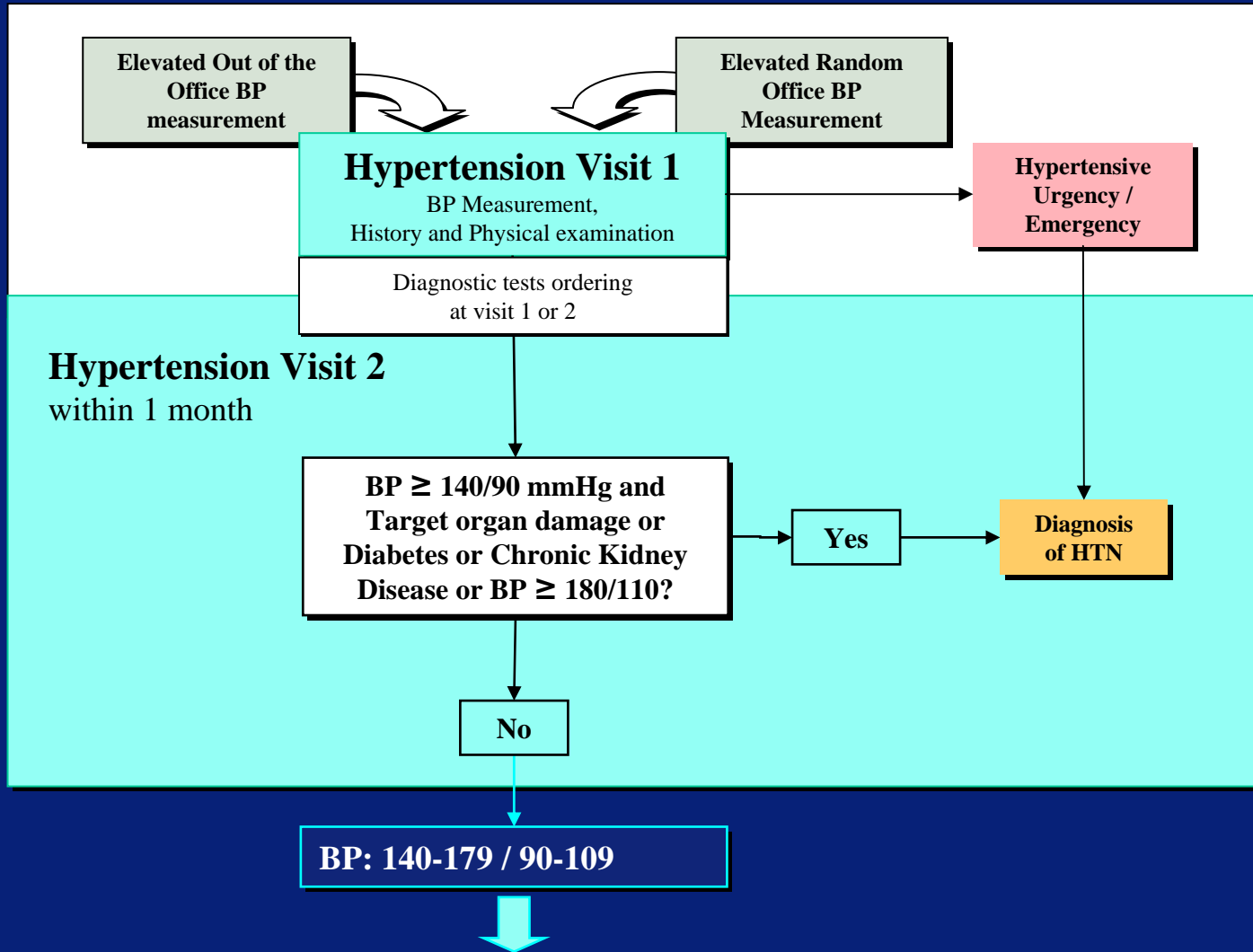
Standing position

For patients over age 65, diabetics and patients being treated with antihypertensives, check if there are postural changes while taking blood pressure reading, i.e. after one to five minutes in the standing position and under circumstances when the patients complains of symptoms suggestive of hypotension.

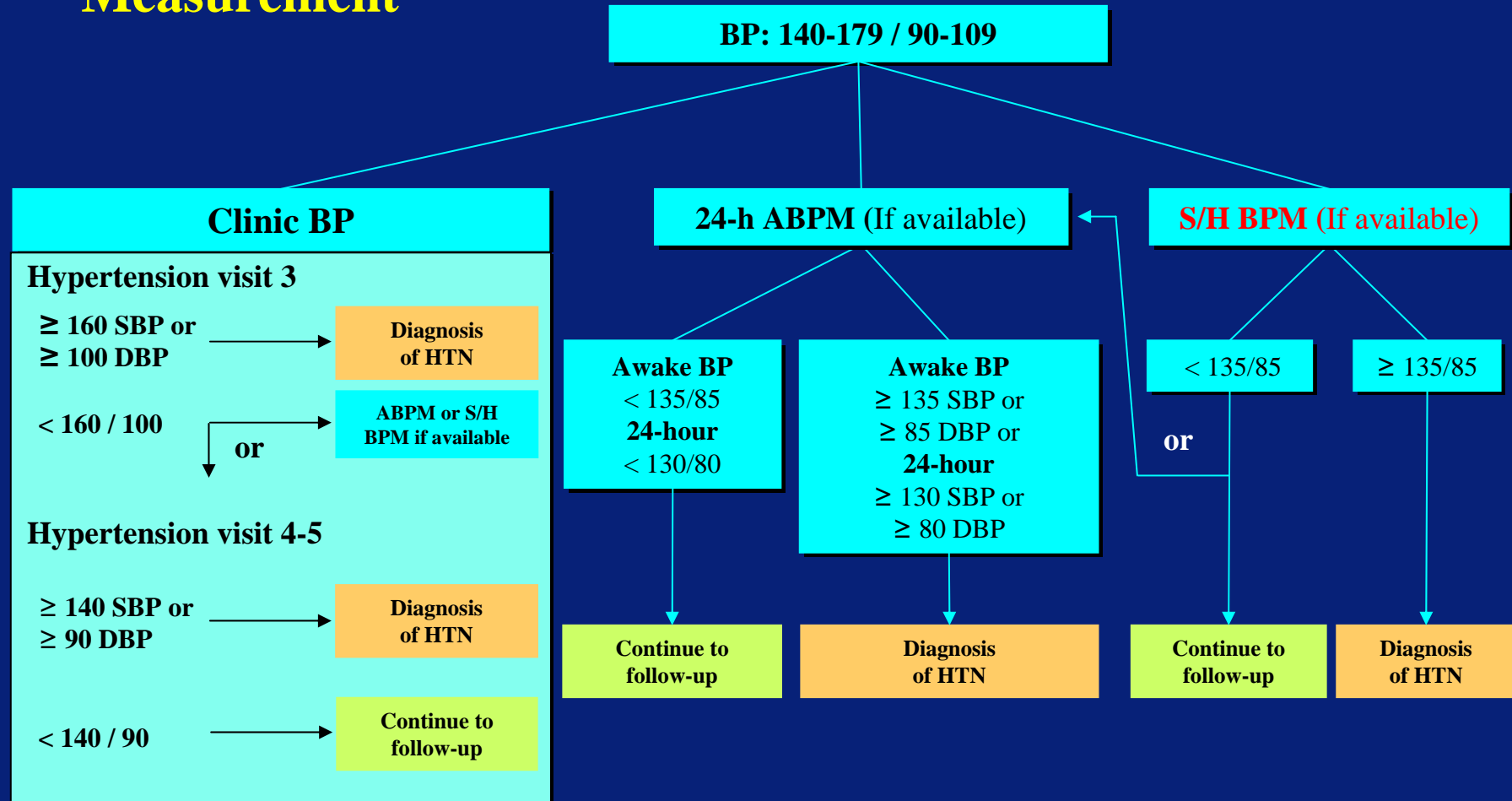
Overview: Diagnostic algorithm for high Blood Pressure including Office, ABPM and Self/Home Blood Pressure Measurement



Diagnostic algorithm for high Blood Pressure including Office, ABPM and Self/Home Blood Pressure Measurement



Diagnostic algorithm for high Blood Pressure including Office, ABPM and Self/Home Blood Pressure Measurement



Home blood pressure (BP) monitoring has been recommended as a supplement to measurements in the clinic in:

- The 2003 European Society of Hypertension-European Society of Cardiology (ESH-ESC) hypertension guidelines (1).
- The first international guidelines for home BP monitoring (2)

1. O'Brien E, Asmar R, Beilin L, Imai Y, Mallion JM, Mancia G, et al. European Society of Hypertension recommendations for conventional, ambulatory and home blood pressure measurement. *J Hypertens* 2003; 21: 821-848.

2. Asmar R, Zanchetti A. Guidelines for the use of self-blood pressure monitoring: a summary of the first international consensus conference. *J Hypertens* 2000; 18: 493-508.

Clinic, Home/Self, Ambulatory (ABP) Blood Pressure Measurement equivalence numbers

- A clinic blood pressure of 140/90 mmHg has the equivalent risk of a:

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Description	Blood Pressure mmHg
Home/Self pressure average	135 / 85
Daytime average ABP	135 / 85
24-hour average ABP	130 / 80

Characteristics of home blood pressure monitoring

- The mean home BP in studies is generally **lower** than clinic BP, and **similar** to the average daytime ambulatory BP. However, timing of measurements, definitions of clinic and home BP, and differences between study populations may partly explain why this clinic-home difference is small or absent in some studies .

Prognostic significance

Cross-sectional studies have shown that home BP is indicative of hypertensive target organ damage (1).

The reduction in home BP during treatment also predicts regression of left ventricular hypertrophy (2)

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1-Reims H, Fossum E, Kjeldsen SE, Julius S. Home blood pressure monitoring. Current knowledge and directions for future research. *Blood Press* 2001; 10: 281-287.

2-Mancia G, Zanchetti A, Agabiti-Rosei E, Benemio G, De

Cesaris R, Fogari R, et al. Ambulatory blood pressure is superior to clinic blood pressure in predicting treatment-induced regression of left ventricular hypertrophy. *Circulation* 1997; 95: 1464-1470.

Prognostic significance

- In the Tecumseh study, home BP was more predictive than clinic BP of hypertension and normotension after three years in untreated borderline hypertensives

Nesbitt SD, Amerena JV, Grant E, Jamerson KA, Lu H, Weder A, et al. Home blood pressure as a predictor of future bloodpressure stability in borderline hypertension. The Tecumseh study. Am J Hypertens 1997; 10: 1270-1280.

Prognostic significance

- In the Ohasama study, home BP had a stronger predictive power than clinic BP for cardiovascular and overall mortality in the general population, and predicted first-time stroke better than clinic BP

Ohkubo T, Imai Y, Tsuji I, Nagai K, Kato J, Kikuchi N, et al. Home blood pressure measurement has a stronger predictive power for mortality than does screening blood pressure measurement: a population-based observation in Ohasama, Japan. *J Hypertens* 1998; 16: 971-975. pressure measuring devices: recommendations of the

Prognostic significance

- In a recent study , home BP predicted cardiovascular events in elderly, treated hypertensive patients, whereas office BP did not.

Bobrie G, Chatellier G, Genes N, Clerson P, Vaur L, Vaisse B, et al. Cardiovascular prognosis of "masked hypertension" detected by blood pressure self-measurement in elderly treated hypertensive patients. JAMA 2004; 291: 1342-1349.

Prognostic significance

- Two meta-analyses of the home BP distribution in normotensives have resulted in proposals for diagnostic thresholds of 135/85 mm Hg (1) and 137/85 mm Hg (2), respectively.

1. Thijs L, Staessen JA, Celis H, de Gaudemaris R, Imiai Y, Julius S, et al. Reference values for self-recorded blood pressure. A meta-analysis of summary data. *Arch Intern Med* 1998; 158: 481-488.

2. Thijs L, Staessen JA, Celis H, Fagard R, De Cort P, de Gaudemaris R, et al. The international database of self-recorded blood pressures in normotensives and untreated hypertensive subjects. *Blood Press Monit* 1999; 4: 77-86.

Prognostic significance

- The first report to propose reference values based on prognostic criteria suggested a hypertensive threshold of **137/84 mm Hg**, based on overall 5-year mortality in the general population. The ESH-ESC guidelines for management of hypertension (1) and the international guidelines for home BP monitoring (2) have recommended values of **135/85 mm Hg** or higher to be considered hypertensive

1. O'Brien E, Asmar R, Beilin L, Imai Y, Mallion JM, Mancia G, et al. European Society of Hypertension recommendations for conventional, ambulatory and home blood pressure measurement. *J Hypertens* 2003; 21: 821-848.

2. Asmar R, Zanchetti A. Guidelines for the use of self-blood pressure monitoring: a summary of the first international consensus conference. *J Hypertens* 2000; 18: 493-508.

Home/Self measurement of blood pressure

Beyond diagnosis, Home/Self BP measurement may also be considered for selected patients for the management of hypertension

Which patients?

- **Uncomplicated hypertension**
- **Diabetes mellitus**
- **Chronic kidney disease**
- **Suspected nonadherence**
- **Hypertension and diabetes**
- **Office-induced blood pressure elevation (white coat effect)**
- **Masked hypertension**

If office BP measurement is elevated and Home BP is normal



Further assess using 24-h ambulatory blood pressure monitoring

Daytime average BP equal to or over 135/85 mm Hg should be considered elevated

Home (Self) Measurement of BP: Patient Education

How to?

Use devices:

- appropriate for the individual (cuff size)
- have met the standards of the AAMI
- and or the BHS and or IP

Adequate patient training in:

- measuring their BP
- interpreting these readings

Regular verifications

- accuracy of the device
- measuring techniques

Values over
135 / 85 mm Hg
should be
considered elevated

**Self
measurement
can help to
improve patient
adherence**

AAMI=Association for the Advancement of Medical Instrumentation;
BHS=British Hypertension Society; IP: International Protocol.

Suggested Protocol for Home (Self) Measurement of Blood Pressure

How?

Home blood pressure values for assessing white coat hypertension or sustained hypertension should be based on:

Duplicate measures,
Morning and evening,
For an initial 7-day period.

Singular values and First day home BP values should not be considered.

For patients treated for hypertension

- Morning measurement should be done before medication taking

Home BP monitoring•

- Home BP monitoring should be used under medical supervision.
- BP measurements should be performed in the seated position, after five minutes of rest.

Home BP monitoring

- The cuff should be kept at heart level, and the arm with the highest BP level should be used .
- The number of measurements that maximises the prognostic value of home BP is not known.

Home BP monitoring

- Home BP values **should not override** clinic BP values. Home BP monitoring should be **encouraged** in order to provide more information for the doctor's decision and improve patient's adherence to treatment regimens, but should be **discouraged** whenever it causes patients anxiety or induces self-modification of the treatment regimen