

Home Blood Pressure Monitoring

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Introduction

- Home blood pressure monitoring (HBPM) is an easy and standardized tool to measure BP at home
- Recommended by several national and international guidelines to obtain reliable BP values.
- It is a useful and dependable measure of BP, which can add information to the more common and standardized methods

HOME BLOOD PRESSURE MONITORING

Out-of-office BP assessment: 2 forms

- Self (or home) BP measurement (SBPM) and
- Ambulatory BP monitoring (ABPM)

Home(Self) BP measurement (HBPM)

HBPM is defined as the regular measurement of blood pressure by the patient outside the clinical setting at home.

The Advantage of Home Blood Pressure Monitoring

- Multiple measurements of BP in different days, weeks or months
- Measurements are made in individual's usual environment.
- Good Reproducibility
- Can detect the white-coat and masked hypertension
- Improvement of compliance to drug treatment
- Relatively low cost
- Correlates with hypertension-induced target organ damage and predicts the risk of CV events better than office BP.



SELECTION OF BLOOD PRESSURE MONITORS:

**AN ESSENTIAL TOOL FOR AT-HOME
MONITORING**

Home BP Monitors

Types of monitors:

- ▣ Manual BP Monitors
 - Aneroid
 - Column Monitors
- ▣ Digital BP Monitors
 - Oscillatory Devices

Mercury-column sphygmomanometers

- Used for the traditional BP measurement.
- Reliable and provides the reference standard for indirect measurement.
- **Disadvantage:**
 - Bulky, fragile and safety & economic concerns about the toxic effects of mercury
- **Non-mercury devices :**
 - Operate in a similar way to the traditional mercury column
 - Provide a suitable alternative to mercury devices when manual auscultation is required to measure BP



Aneroid manometers

Aneroid manometers also require

- Skill by the patient
- Training by the physician,
- They can become inaccurate with use.
- *For these reasons, these devices are also not recommended for routine use.*



Digital BP Monitors

- Currently available automated and semiautomated HBPM devices use the oscillometric technique.
- Popular with patients mainly because of simplicity of use.



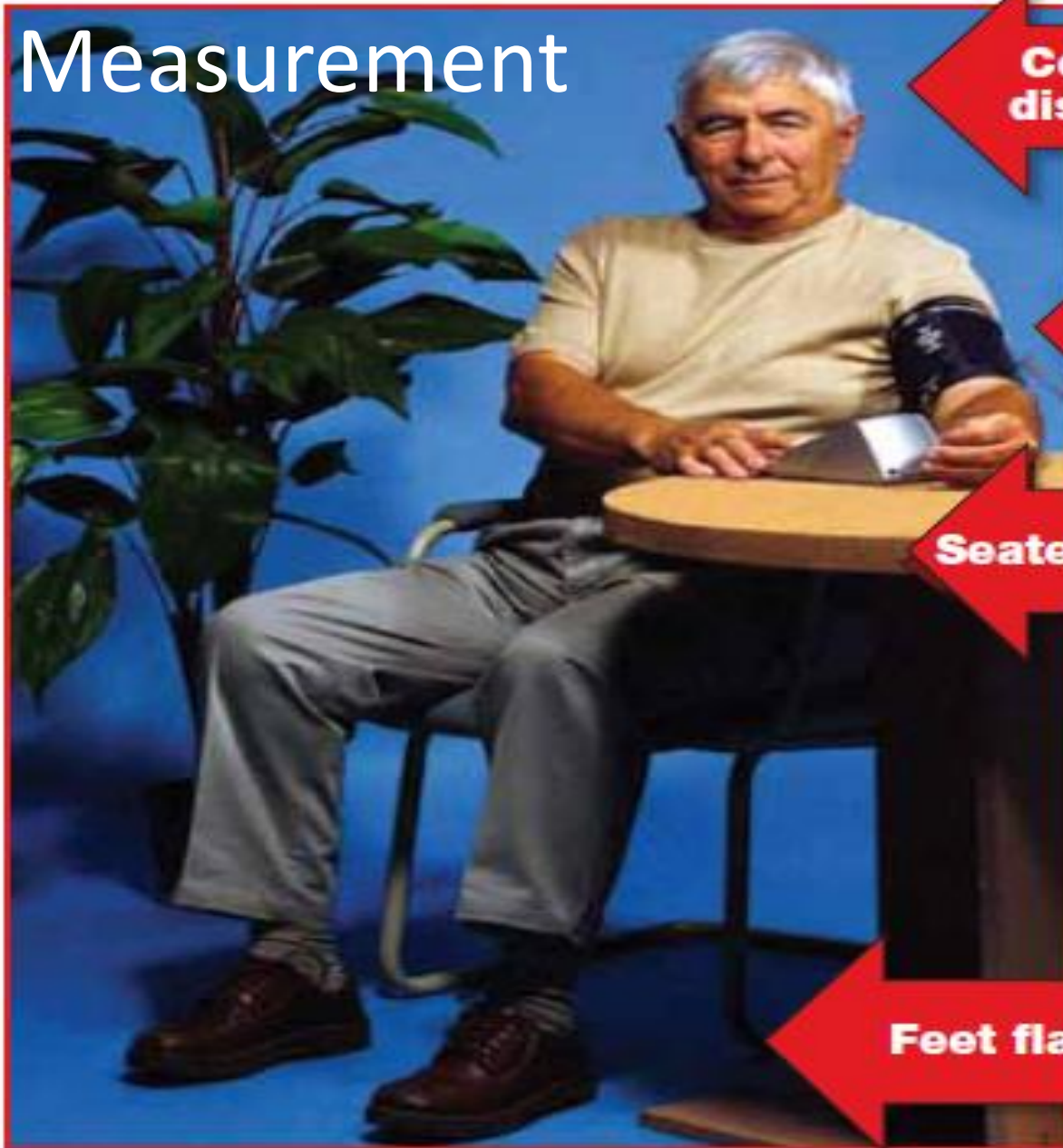
Devices for HBPM: Validation

- Fully automated monitors that use the brachial artery for measurements are the most reliable.
- Devices must have passed a minimum B grade for both systolic and diastolic measurements for the revised British Hypertension society protocol or pass the accepted criteria of the ESH International Protocol ,ESH International Protocol
- Documentation can be improved if patients use monitors capable of printing and storing readings.
- Oscillometric devices may not work well with patients who have atrial fibrillation or other arrhythmias.
- Patients monitor should be checked against mercury sphygmomanometer.

Devices for HBPM: selection

- Auscultatory (aneroid or mercury) devices not recommended for home monitoring except under specific circumstances (e.g. arrhythmia)
- Finger cuff devices not recommended
- Wrist cuff devices not recommended
- Only validated semi-automated oscillometric arm cuff devices are recommended
- Optional small and large adult cuffs should be available

Measurement



Comfortable with no distractions or talking

Arm supported at heart level

Seated with back support

Feet flat on the floor

Do's and Don't

Advice for home blood pressure monitoring

- DO** take all clothing off upper arm and put cuff on.
- DO** sit on a chair, back supported, arm on a table at heart level, feet flat on the floor.
- DO** wait for 5 minutes before taking the first measurement.
- DO** wait for one minute before taking the second measurement.
- DO** record date and time of both measurements on BP log.
- DO** measure twice a day, morning and evening, on same arm, same time for 7 days before visit to your health care provider.

- DO NOT** cross your feet.
- DO NOT** take your BP if you are in a hurry.
- DO NOT** smoke or drink caffeine 30 minutes before measuring BP.
- DO NOT** eat a big meal for 2 hours before measuring your BP.
- DO NOT** talk or watch TV during a measurement.
- DO NOT** measure your pressure if you are uncomfortable, anxious, stressed or in pain.

Table 1. Comparison of Main Features of 3 Main Methods of BP Measurement

Feature	Office BP	ABPM	HBPM
No. of readings	Low	High	Medium
White coat effect	Yes	No	No
Operator dependency	Yes	No	No
Need of device validation (yes if oscillometric device used)	No	Yes	Yes
Daytime BP	+	+ + +	+ +
Nighttime BP and dipping	—	+ + +	—
Morning BP	±	+ +	+
24-h BP variability	—	+ +	±
Long-term BP variability	—	±	+ +
WCH and MH diagnosis	—	+ +	+ +
Placebo effect	+ +	—	—
Reproducibility	Low	High (24-h average values)	High (average of several values)
Prognostic value	+	+ + +	+ +
Patient involvement	—	—	+ +
Need of patient training	—	±	+ +
Physician involvement	+ + +	+ +	+
Patient acceptance	+ +	±	+ +
Monitoring of treatment effects	Limited information	Extensive information on diurnal BP profile, cannot be repeated frequently	Appropriate for long-term monitoring, limited information on BP profile
Hypertension control improvement	+	+ +	+ + +
Cost	Low	High	Low
Availability	High	Low	High

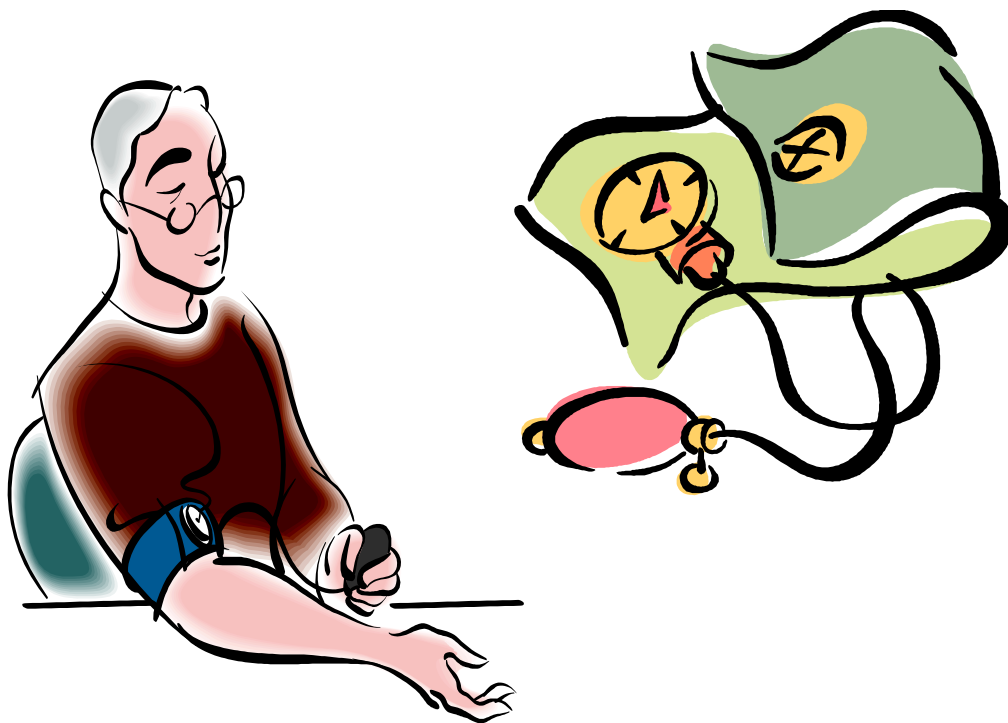
Data are from Reference,⁶ modified WCH indicates white coat hypertension; MH, masked hypertension.

GUIDELINES

NICE Recommendation

NICE recommend that if the clinic BP $\geq 140/90$ mmHg, 24hour ambulatory BP monitoring should be offered to confirm the diagnosis of hypertension.

- Home BP measurement may be used to confirm diagnosis if ambulatory BP monitoring is unsuitable
- Take at least two measurements/day during the day and use the average. Use average of at least 14 measurements.
- Record BP twice daily in the morning and evening for ≥ 4 days (ideally 7 days) discard first day's measurements)



The upper limit of normal for home pressure is **135/85 mm Hg**.
This corresponds to an office blood pressure of **140/90 mmHg**

Definitions of hypertension by office and out-of-office blood pressure levels

Category	Systolic BP (mmHg)		Diastolic BP (mmHg)
Office BP	≥140	and/or	≥90
Ambulatory BP			
Daytime (or awake)	≥135	and/or	≥85
Nighttime (or asleep)	≥120	and/or	≥70
24-h	≥130	and/or	≥80
Home BP	≥135	and/or	≥85

CLINICAL STUDIES

Predictors of the Home-Clinic Blood Pressure Difference: A Systematic Review and Meta-Analysis

James P. Sheppard,¹ Ben Fletcher,¹ Paramjit Gill,² Una Martin,³ Nia Roberts,⁴ and Richard J. McManus¹

- There are a number of common patient characteristics that predict the home-clinic BP difference, in particular for people with masked hypertension.

Integr Blood Press Control. 2015; 8: 43–49.

PMCID: PMC4498728

Published online 2015 Jul 3. doi: [10.2147/IBPC.S49205](https://doi.org/10.2147/IBPC.S49205)

Does home blood pressure monitoring improve patient outcomes? A systematic review comparing home and ambulatory blood pressure monitoring on blood pressure control and patient outcomes

[Tonya L Breaux-Shropshire](#),^{1,2} [Eric Judd](#),¹ [Lee A Vucovich](#),³ [Toneyell S Shropshire](#),⁴ and [Sonal Singh](#)⁵

- HBPM encourages patient-centered care and improves BP control and patient outcomes.

Journal of Hypertension

Home measurement of blood pressure and cardiovascular disease: systematic review and meta-analysis of prospective studies

Ward, Alison M.^a; Takahashi, Osamu^b; Stevens, Richard^a; Heneghan, Carl^a

- Home BP remained a significant predictor of CV events and mortality.
- It is an important prognostic variable over and above that of office BP.

Home Blood Pressure Monitoring and Hypertension Control

CME Available

Role of Home Blood Pressure Monitoring in Overcoming Therapeutic Inertia and Improving Hypertension Control A Systematic Review and Meta-Analysis

Rajiv Agarwal, Jennifer E. Bills, Tyler J.W. Hecht, Robert P. Light

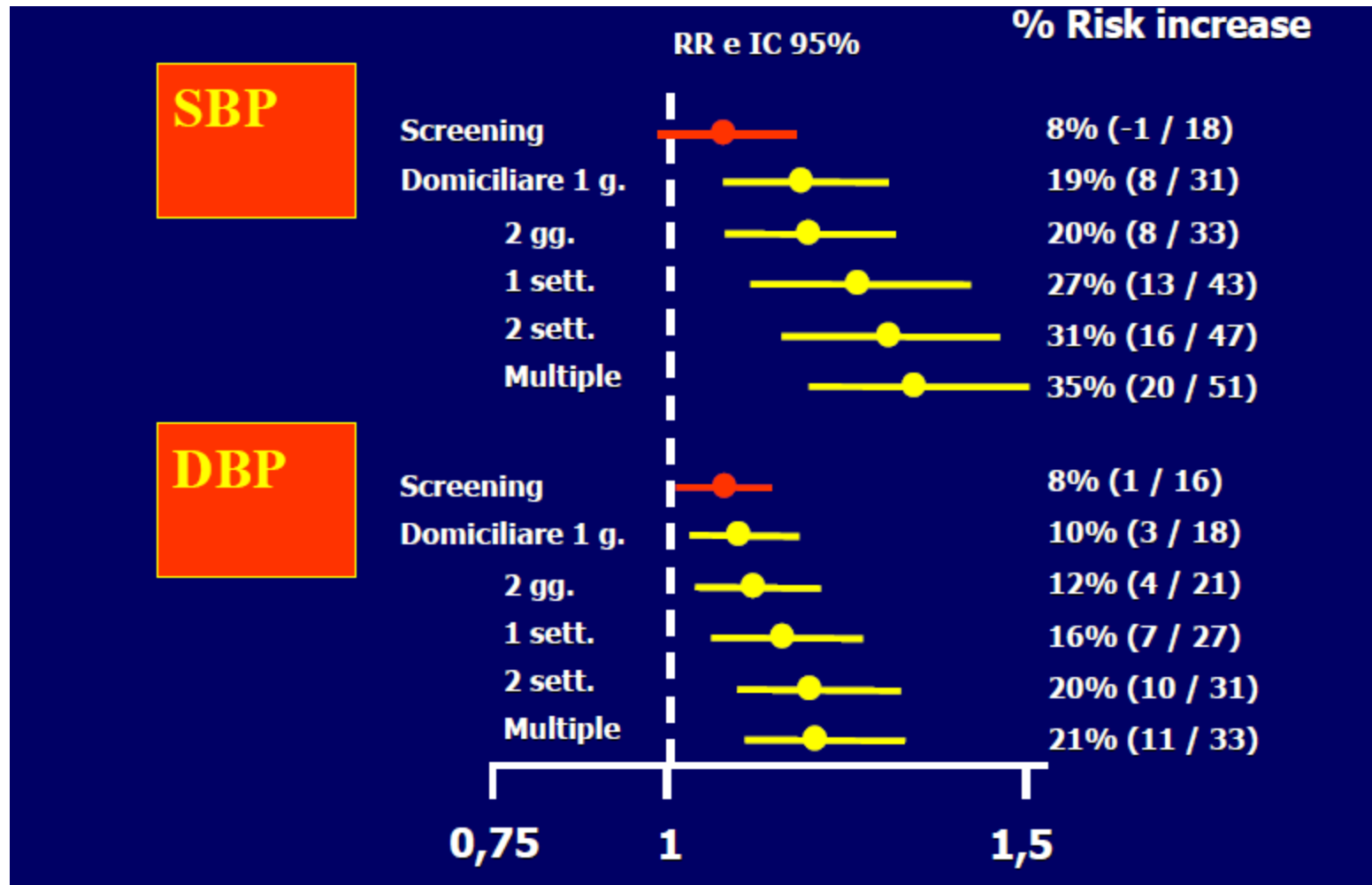
- Compared with clinic BP monitoring alone, home BP monitoring has the potential to overcome therapeutic inertia and lead to a small but significant reduction in systolic and diastolic BP.

The applicability of home blood pressure measurement in clinical practice: A review of literature

[Willem J Verberk](#), [Abraham A Kroon](#), [Heidi A Jongen-Vancraybex](#), and [Peter W de Leeuw](#)

- HBPM correlates better with target organ damage and cardiovascular mortality than office blood pressure measurement (OBPM).
- It enables prediction of sustained hypertension in patients with borderline hypertension, and proves to be an appropriate tool for assessing drug efficacy.

Effect Of The Number Of Home BP Measurements On Stroke Prediction



Prospective Studies Relating Home BP and Office BP to Cardiovascular Events and Mortality

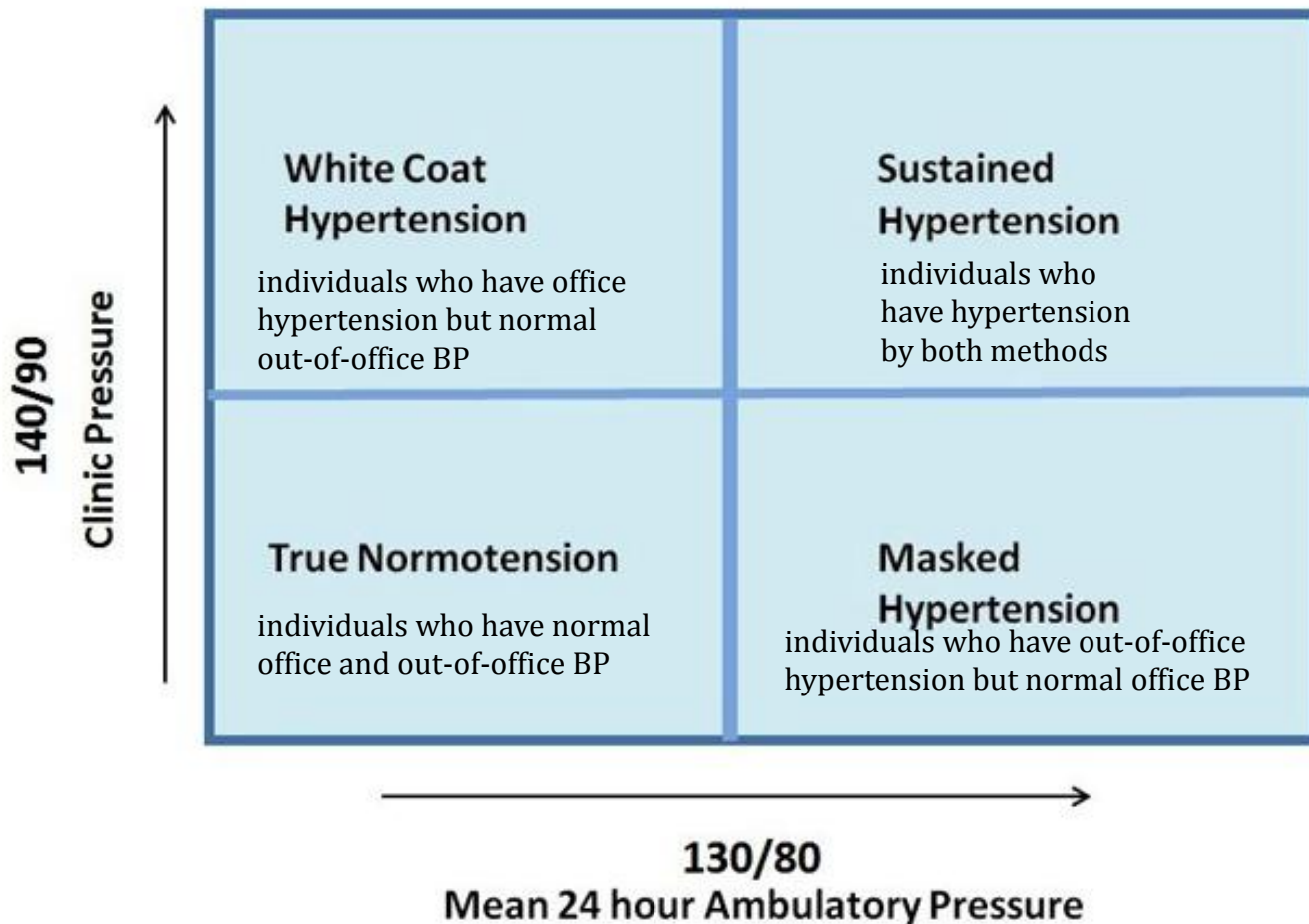
Study	No. of Subjects	Home BP Schedule				Outcome
		Days	AM	PM	Total	
Ohasama	1789	28	1	0	28	Strokes and mortality predicted better by HBPM
SHEAF	4939	4	3	3	24	CV morbidity and mortality predicted better by HBPM
PAMELA	2051	1	1	1	2	CV and total mortality predicted better by HBPM
Belgian	391	1	3	0	3	Combined CV events predicted better by HBPM
Didima	662	3	2	2	12	CV events predicted by both HBPM and office BP

Home Blood Pressure Monitoring – White Coat and Masked Hypertension

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Patterns of Blood Pressure

- 4 patterns of BP based on 24-hour ambulatory BP monitoring and office BP readings, 4 patterns of BP



Masked Hypertension

Defined as normal clinic blood pressure (CBP) and elevated out-of-clinic BP assessed using either self monitoring of BP by the patients at home (HBP) or ambulatory BP (ABP) monitoring.

Masked Hypertension (MH)

- Occur in as many as 10% of the general population.
- Prevalence of MH vary from 8 to 48% depending on the study methods and population.
- MH is not diagnosed by routine medical examinations, carries an adverse prognosis, both in terms of increased target organ damage and CV events.

Possible characteristics of individuals with masked hypertension

Possible characteristics include:

- relatively young
 - age,
 - male sex,
 - stress or
 - increased physical activity during the daytime, and
 - smoking or alcohol habits.
- Masked hypertension has also been described in treated hypertensive patients and in children, in whom it may be a precursor of sustained hypertension.

Prevalence of Masked Hypertension in Various Studies

- The available information in the population-based studies is disturbing..

Author	Population	N	ABP criterion	Prevalence (%)
Imai <i>et al.</i> (47)	Population Ohasama	969	133/78	10
Sega <i>et al.</i> (39)	Population PAMELA	3,200	125/79	9
Björklund <i>et al.</i> (48)	Population 70-year-old men	578	135/85	14
Liu <i>et al.</i> (9)	Healthy volunteers	234	135/85	21
Selenta <i>et al.</i> (33)	Healthy volunteers	319	135/85	23

Implications

- *Masked Hypertension existence strengthens the case for recommending home blood pressure monitoring as part of the routine care of hypertensive patients.*

WHITE-COAT HYPERTENSION

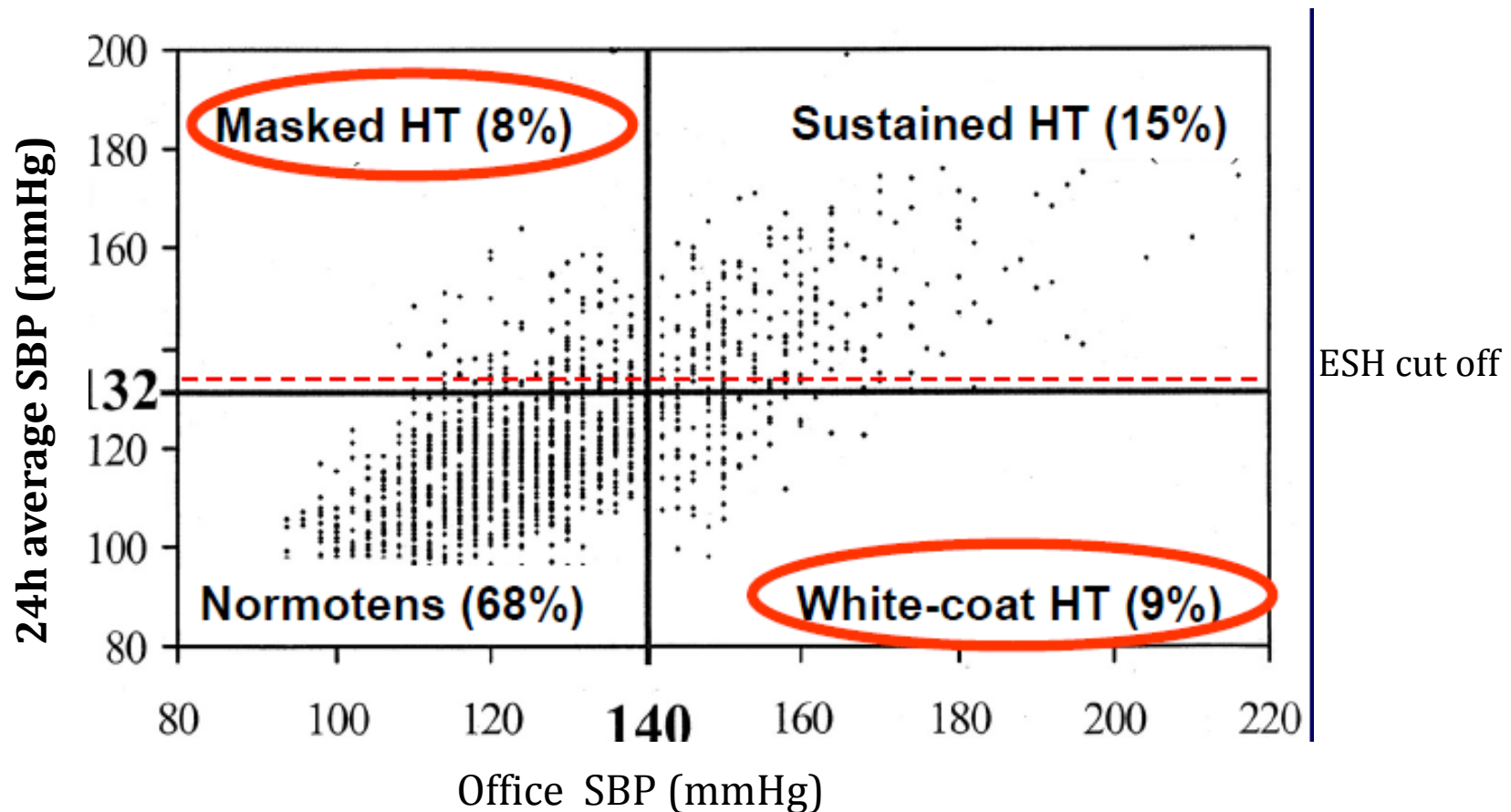
White-coat Hypertension

- White coat hypertension is defined by at least three separate clinic-based measurements $>140/90$ mmHg and at least two non-clinic-based measurements $<140/90$ mmHg in the absence of any evidence of target organ damage when their blood pressure is measured.
- A Condition where a patient's feeling of anxiety in a medical environment results in an abnormally high reading

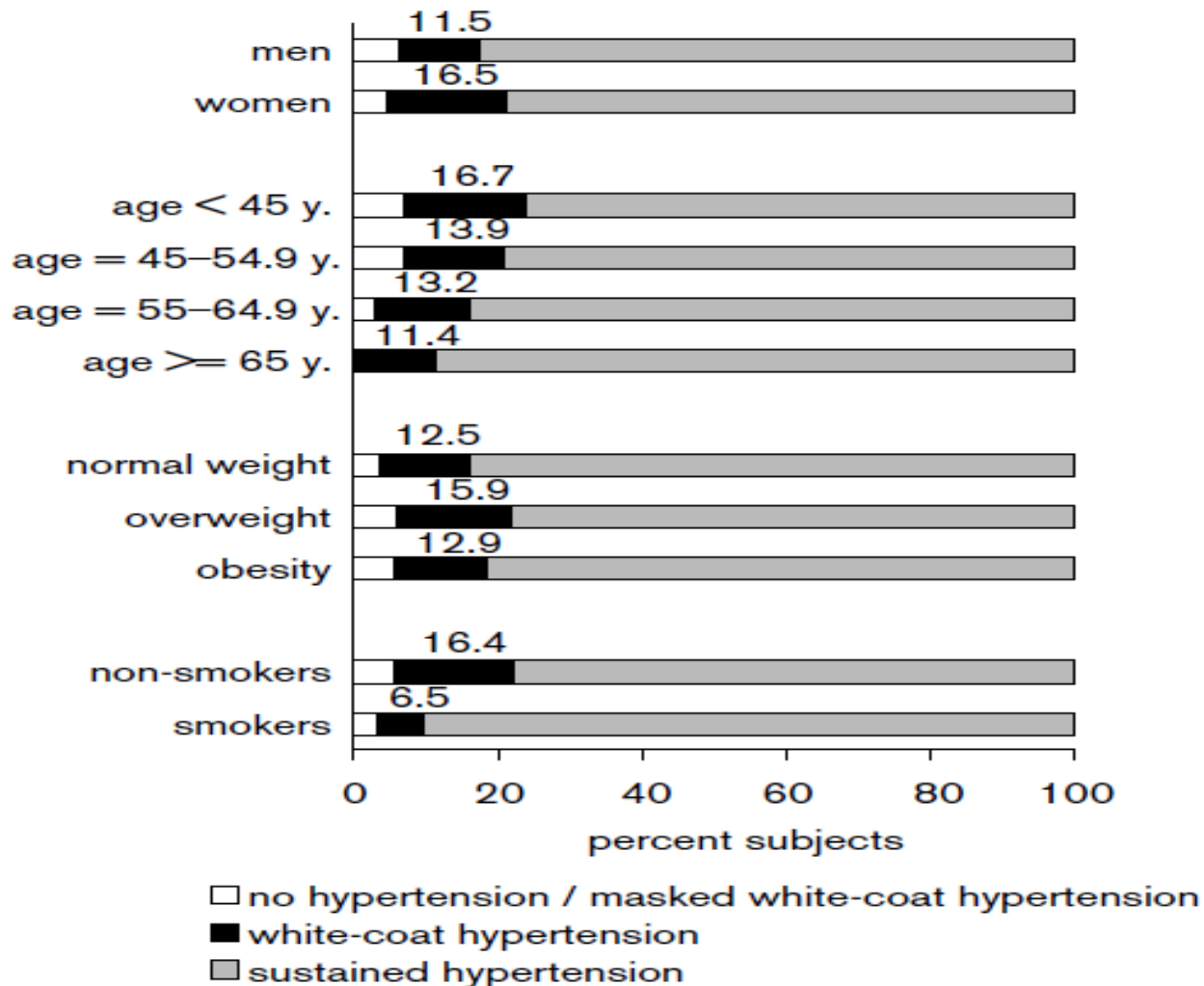
White-coat Hypertension

- Individuals with white coat hypertension are also at increased risk for developing sustained hypertension.
- White Coat Hypertension (WCH) is reported to occur in as many as 15% to 30% of the population.
- The size of white coat effect in individuals can vary over time and a small proportion (4%) may demonstrate atypical very high clinic readings

Patients Distribution according to Clinic and Home SBP in the Pamela* Study



Determinants of white-coat HT



The self-measured
white-coat
Hypertension was
greater than the
ambulatory white-
coat hypertension



J Am Soc Hypertens. 2013 May-Jun;7(3):236-43. doi: 10.1016/j.jash.2013.02.005. Epub 2013 Mar 21.

Treated hypertension and the white coat phenomenon: Office readings are inadequate measures of efficacy.

Agarwal R¹, Weir MR.

- The prevalence of WCH increases three-fold with treatment as a result of fewer patients having sustained hypertension.
- Thus, out-of-office BP monitoring especially among treated hypertensive patients is necessary to provide better assessment of overall BP and response to treatment

SUMMARY AND CONCLUSION

Summary and Conclusions

- Patients who monitor their BP 'at home' have a lower 'clinic' BP compared to those whose BP is monitored in the healthcare system
- A greater proportion of them also achieve BP targets when assessed 'in the clinic'

Summary and Conclusions

- Greater direct involvement of the patient in his/her own care might be beneficial through greater awareness, motivation, concordance etc
- Home blood pressure measurement can be used as an adjunctive practice to help patients manage their hypertension more effectively

Thank You