



HEARTS IN THE AMERICAS

Regional Workshop

Punta Cana, Dominican Republic
May 14-17, 2019





HEARTS

IN THE AMERICAS
Regional Workshop

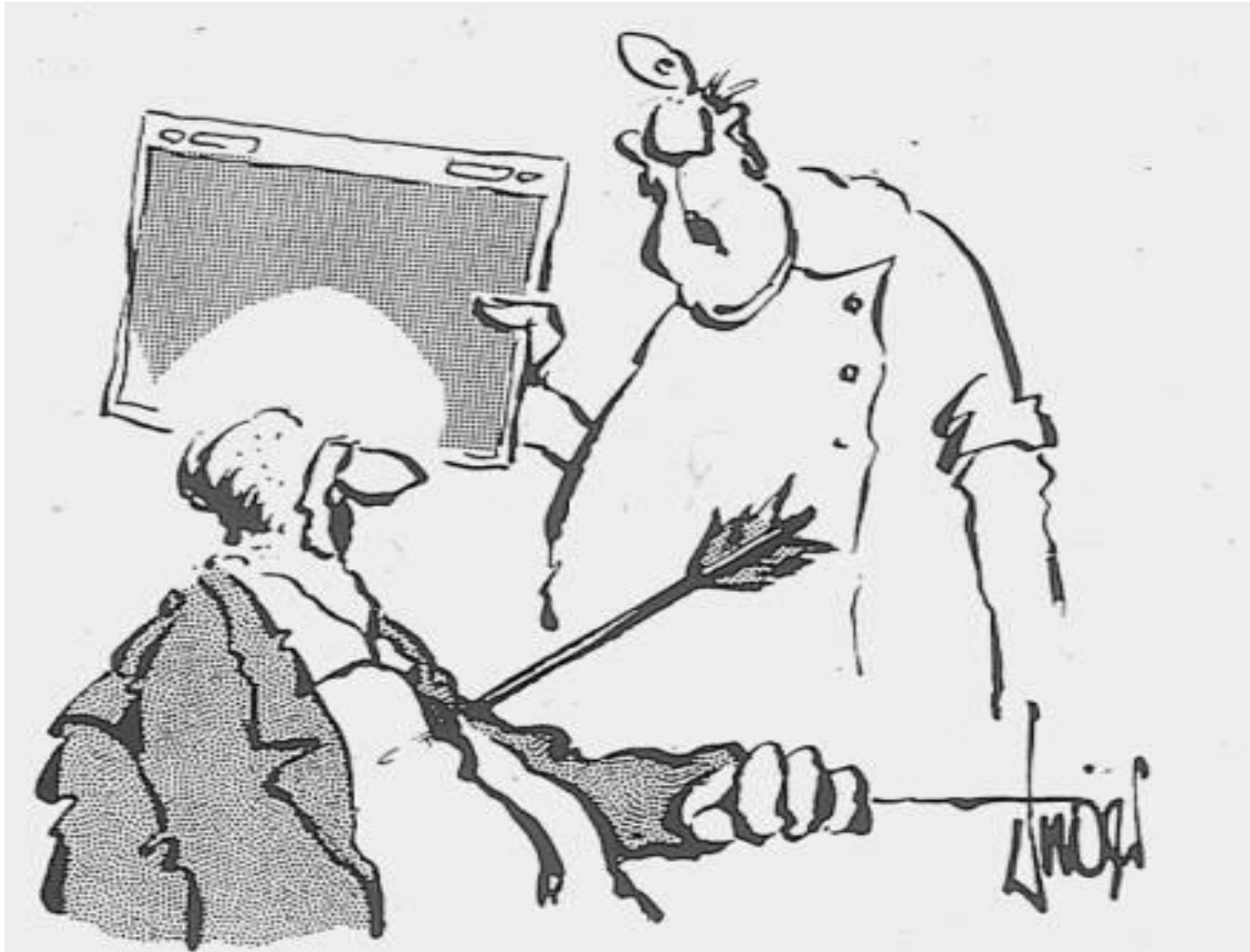
Blood Pressure Assessment in Clinical Practice and Research

Norm Campbell

University of calgary

Canada

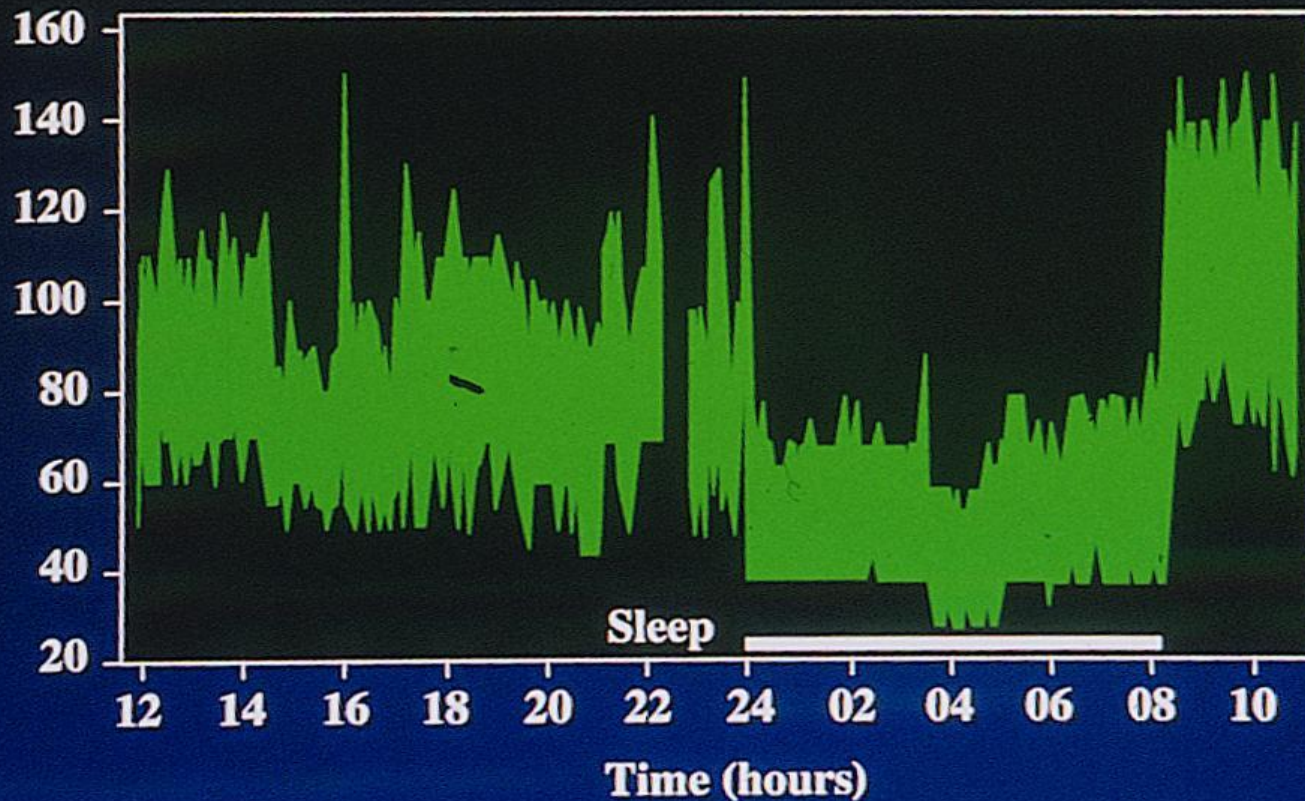




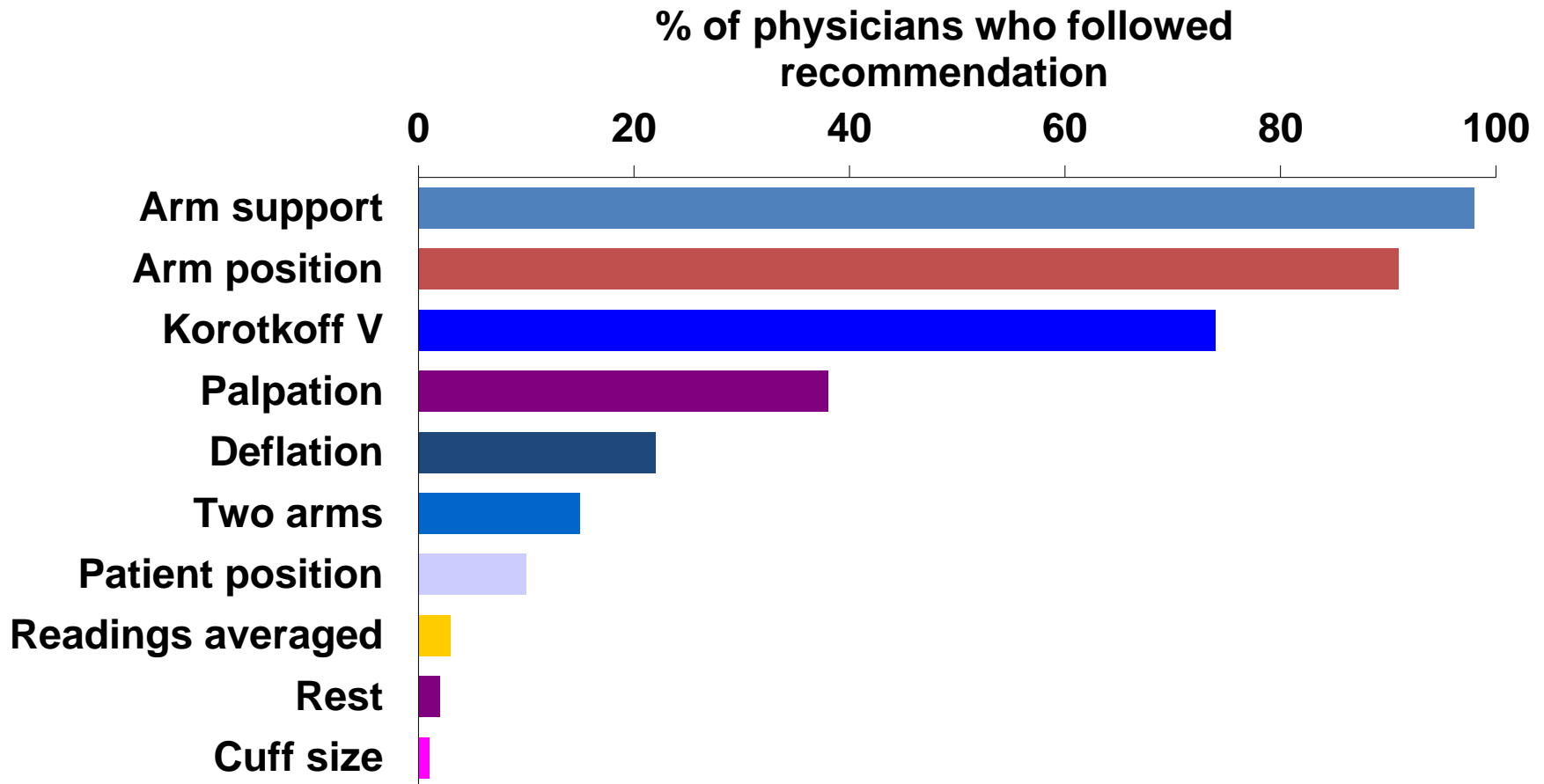
“According to this X-ray,
it’s stuck in your leg.”

Physiologic blood pressure variability in a normotensive individual

Arterial pressure (mmHg)



How many clinicians follow recommendations for patient preparation, technique and equipment?



Some factors impacting BP

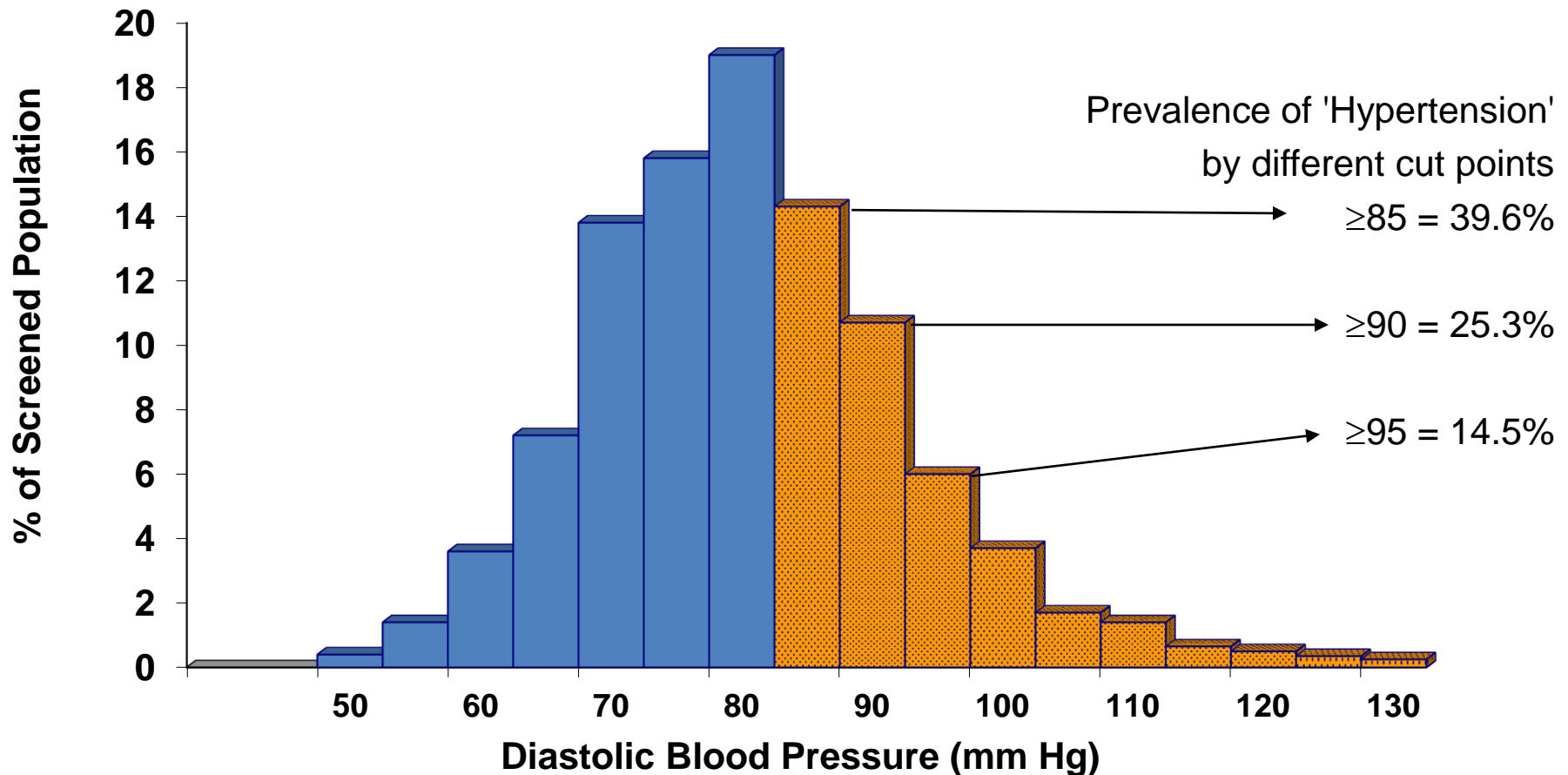
Before measurement

Acute meal ingestion, mm Hg	-6	-5 to -1.9
Acute alcohol consumption, mm Hg	-23.6 to +24	-14 to +16
Acute caffeine consumption, mm Hg	+3 to +14	+2.1 to +13
Acute nicotine use or exposure, mm Hg	+2.8 to +25	+2 to +18
Bladder distension, mm Hg	+4.2 to +33	+2.8 to +18.5
Cold exposure, mm Hg	+5 to +32	+4 to +23
Insufficient rest period, mm Hg	+4.2 to +11.6	+1.8 to +4.3

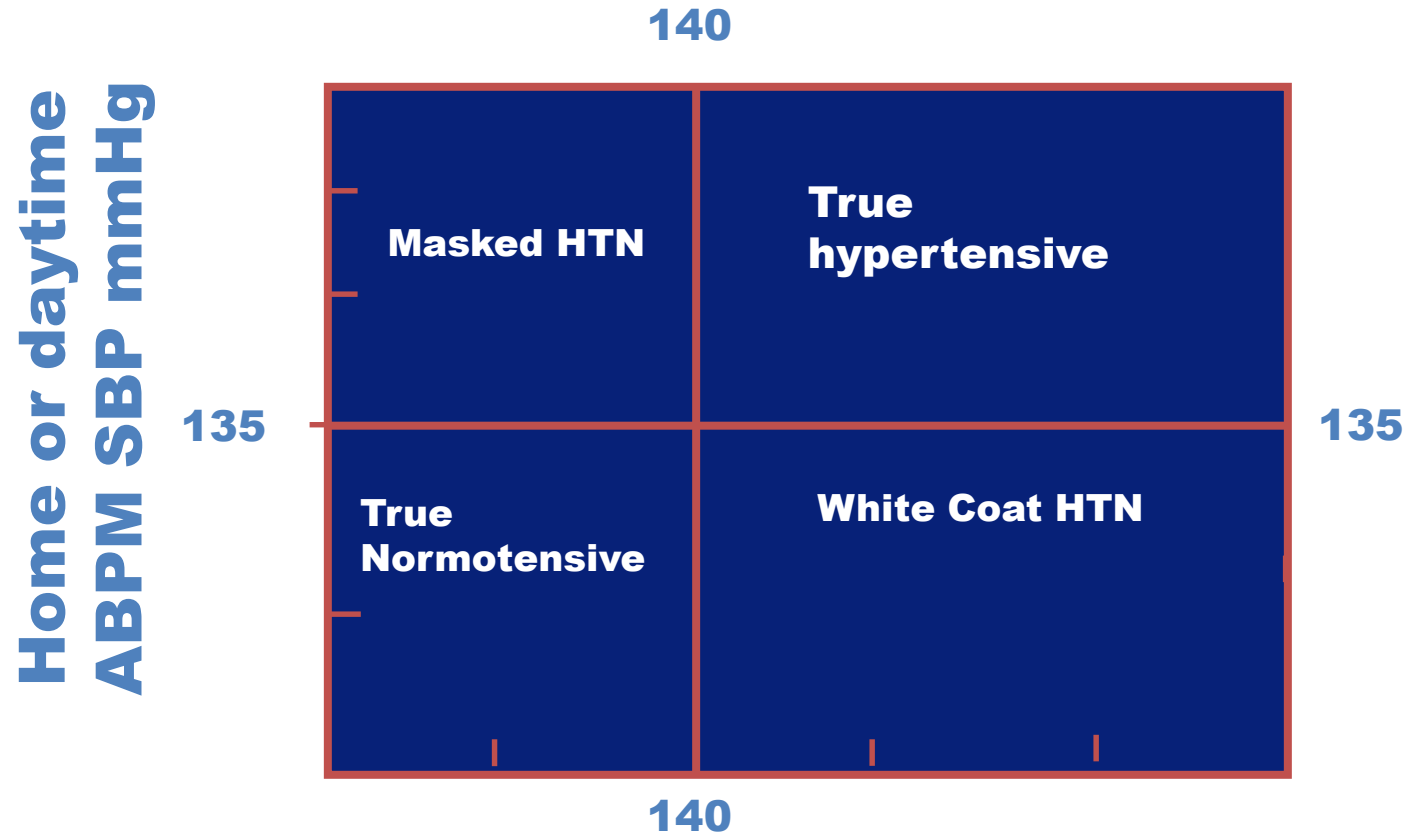
Patient positioning

Standing versus sitting, mm Hg	-2.9 to +5.0	+7
Supine versus sitting, mm Hg	-10.7 to +9.5	-13.4 to +6.4
Legs crossed at the knee, mm Hg	+2.5 to +14.9	+1.4 to +10.8
Unsupported back, mm Hg	Not significant effects	+6.5
Unsupported arm, mm Hg	+4.9	+2.7 to +4.8
Arm lower than heart level, mm Hg	+3.7 to +23	+2.8 to +12

5 mm Hg DBP Error Doubles the Number of Hypertensive Patients

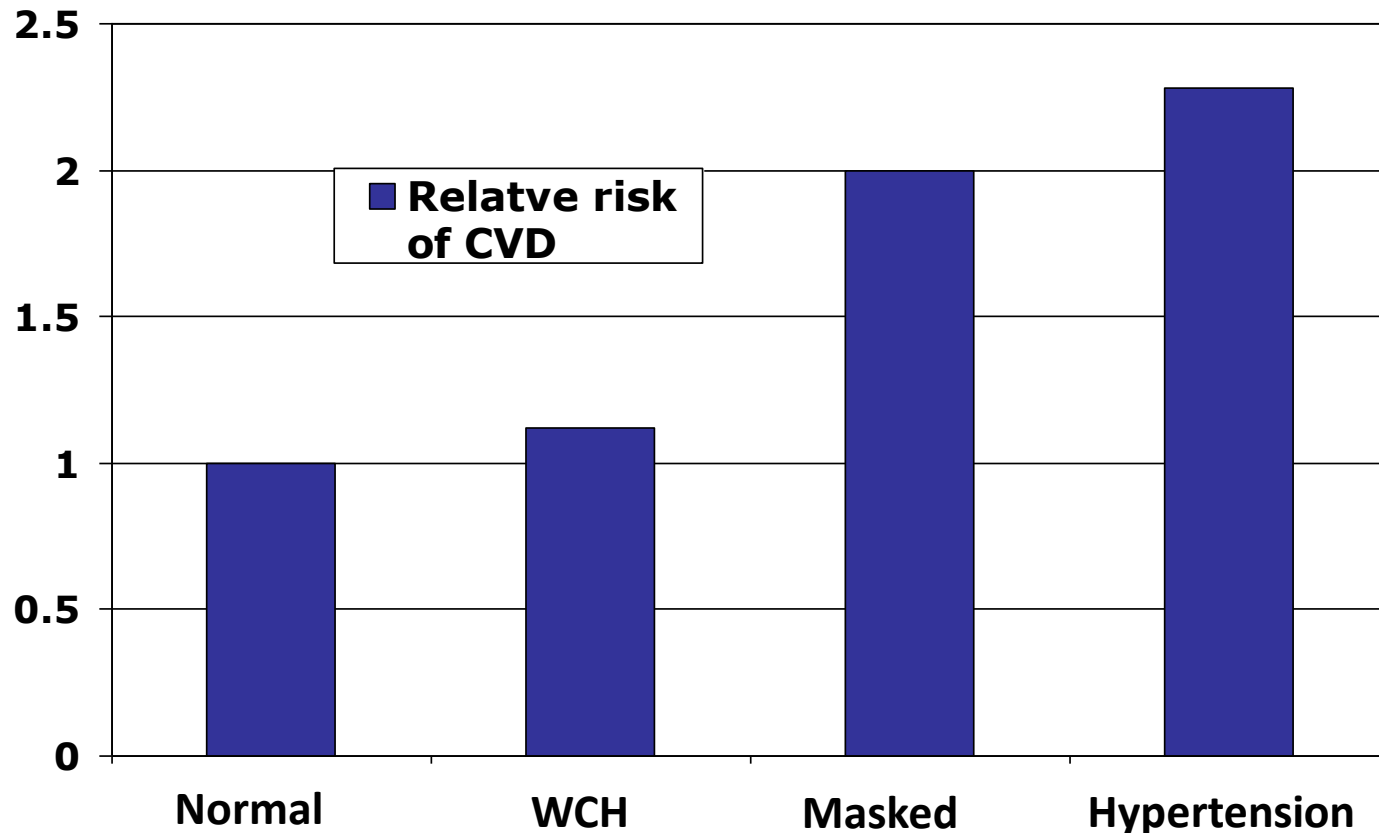


Masked and White Coat Hypertension



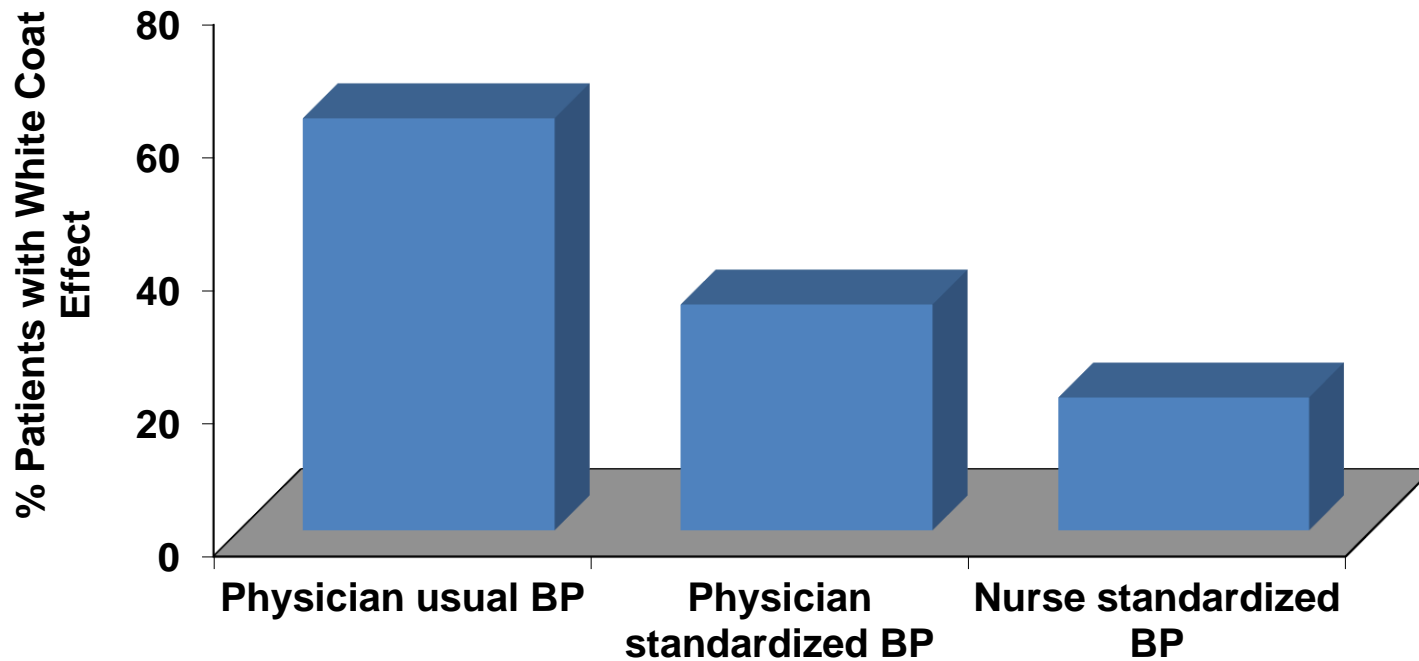
Office SBP mmHg

Prevalence of masked hypertension is ~ 10% in the general population and WCH is ~ 20% of those with office hypertension.



Change in BP Measurement According to Technique and “Who” Takes the BP

Prevalence of white coat hypertension using different measurement techniques



In another study, 57% of patients had a change in diagnosis when going from usual to standardized measurement

Clinic Measurements

Home BP Monitoring

Ambulatory BP Monitoring

Automated office

- BP measured in a medical setting
- Patient should be seated, resting quietly with their back supported and feet flat on the floor

Community settings

- BP measured while seated at home, resting quietly with back supported and feet flat on the floor
- BP readings obtained in the morning and evening

- BP measured during routine activities
- 48 to 72 readings obtained over 24 hours

Strengths

- Associated with cardiovascular outcomes
- Only method that has been used to guide treatment in large outcome trials

- Strong association with cardiovascular outcomes
- Detects white coat and masked hypertension

- Strong association with cardiovascular outcomes
- Detects white coat and masked hypertension
- BP measured at work and at night (i.e., during sleep)

Weaknesses

- Less precise as only 1 or 2 BP measurements typically obtained
- Many factors affect the accuracy of readings
- Requires training and frequent re-training of staff

- Patients may not correctly measure and report their BP
- Requires patient training and re-training
- Many home devices are not validated

- Not tolerated by some patients
- Equipment is not widely available
- Requires two clinic visits: to set up and return the device

Clinical and research measurement of BP

- 1) Have a specifically and regularly trained (preferably certified) non physician office worker use a validated automated device for office measures. Audit measurement technique.
- 2) Supplement office readings with Home and or Ambulatory blood pressure (ABPM) to diagnose and management hypertension where feasible.
- 3) Encourage community screening of blood pressure

Keys to accurate reproducible office and home blood pressure measurement

1. Patient preparation
2. Quiet, comfortable (warm), environment
3. Standardized measurement technique
4. Accurate and appropriate equipment (validated automated device) with a proper sized cuff
5. Supplement office readings with Home and or ABPM where feasible

Patient Factors That Affect BP Measurement

- Talking
- Recent heavy physical exercise
- Pain, stress, anxiety
- Changes in temperature
- Distended bladder or bowel
- Recent eating
- Smoking and/or caffeine consumption
- Over-the-counter medication
 - e.g., cold remedies, vasopressors such as decongestants, nicotine gum

Recommended Technique for Measuring BP

TABLE 1 Key Steps and Instructions for the Proper Measurement of Clinic BP

Key Steps for Proper BP Measurements	Specific Instructions
Step 1: Properly prepare the patient	<ol style="list-style-type: none"> 1. The patient should avoid caffeine, exercise, and smoking for at least 30 min before the measurement procedure begins. 2. Ensure the patient has emptied his/her bladder. 3. Neither the patient nor the observer should talk during the rest period or during the measurement. 4. Remove clothing covering the location of cuff placement. Be sure to avoid rolling up sleeves; this may cause a (partial) tourniquet effect. 5. Measurements made while the patient is sitting or lying on an examining table do not fulfill these criteria.
Step 2: Use proper technique for BP measurements	<ol style="list-style-type: none"> 1. Use a BP measurement device that has been validated, and ensure that the device is calibrated at recommended intervals. 2. Obtain the patient's mid-arm circumference. For more details on how to accurately obtain mid-arm circumference, see the Anthropometry Procedures Manual on the NHANES website. 3. Record the mid-arm circumference for future use. 4. Support the patient's arm (e.g., resting on a desk). 5. Position the middle of the cuff on the patient's upper arm at the level of the right atrium (the midpoint of the sternum). 6. Use the correct cuff size, such that the bladder encircles 75% to 100% of the arm and a width that is 37% to 50% of the arm circumference. 7. Once the patient is prepared, have him/her relax, sitting in a chair with their feet flat on the floor and back supported. The patient should be seated for 5 min without talking or moving around before recording the first BP reading. A shorter wait period is used for some AOBP devices. 8. Either the stethoscope diaphragm or bell may be used for auscultatory readings.
Step 3: Take the proper measurements needed for diagnosis and treatment of elevated BP/hypertension	<ol style="list-style-type: none"> 1. At the first visit, record BP in both arms. Use the arm that gives the higher reading for subsequent readings if there is a consistently higher level (e.g., ≥ 10 mm Hg) in one arm versus the other. 2. Separate repeated measurements by 1 to 2 min. 3. For auscultatory determinations, use a palpated estimate of radial pulse obliteration pressure to estimate SBP. Inflate the cuff 20 to 30 mm Hg above this level for an auscultatory determination of the BP level. 4. For auscultatory determinations, place the head of the stethoscope over the brachial artery. 5. For oscillometric devices, position the center of the blood pressure cuff over the upper arm brachial artery at least 1 inch above the crease of the elbow. 6. For auscultatory readings, deflate the cuff pressure 2 mm Hg/s, and listen for Korotkoff sounds. 7. Staff retraining required at 6-month intervals.
Step 4: Properly document accurate BP readings	<ol style="list-style-type: none"> 1. Record SBP and DBP. If using the auscultatory technique, record SBP as onset of the first of at least 2 consecutive beats and the last audible sound as DBP, Korotkoff phases 1 and 5, respectively. In case that the sounds are audible at full deflation or until very low DBP levels (< 40 mm Hg), then Korotkoff phase 4 (muffling of sounds) should be recorded and reported for DBP. 2. If using the auscultatory approach, record SBP and DBP to the nearest even number. 3. Note the time of most recent BP medication taken before measurements.
Step 5: Average the readings	Use an average of ≥ 2 readings obtained on ≥ 2 occasions to estimate the individual's level of BP.
Step 6: Provide BP readings to patient	Provide patients their SBP/DBP readings both verbally and in writing. Information to help patients interpret their BP values should also be provided.

Clinical and research measurement of BP

- 1) Have a specifically and regularly trained (preferably certified) office worker use a validated automated device for office measures. Audit measurement technique.
- 2) Supplement office readings with Home and or Ambulatory blood pressure (ABPM) to diagnose and management hypertension where feasible.
- 3) Encourage community screening of blood pressure

RESOURCES

- Padwal R et al. Optimizing Observer Performance of Clinic Blood Pressure Measurement: A Position Statement from the Lancet Commission on Hypertension Group. *J Hypertension* 2019;37. [doi:10.1097/HJH.0000000000002112](https://doi.org/10.1097/HJH.0000000000002112).
- TRUE Consortium. Recommended Standards for Assessing Blood Pressure in Human Research Where Blood Pressure or Hypertension is a Major Focus. *J Clin Hypertension*. 2016. [doi: 10.1111/jch.12948](https://doi.org/10.1111/jch.12948).
- Munter P et al. Measurement of Blood Pressure in Humans. A Scientific Statement From the American Heart Association. *Hypertension*. 2019;73:e35-e66. [DOI: 10.1161/HYP.0000000000000087](https://doi.org/10.1161/HYP.0000000000000087)
- Munter P et al. Blood Pressure Assessment in Adults in Clinical Practice and Clinic-Based Research. *JACC* 2019;73:317-335. doi.org/10.1016/j.jacc.2018.10.069
- [WHL resource for community screening programs. www.whleague.org/index.php/j-stuff/blood-pressure-assessment-train-the-trainer](http://www.whleague.org/index.php/j-stuff/blood-pressure-assessment-train-the-trainer)
- Boonyasai RT. A bundled quality improvement program to standardize clinical blood pressure measurement in primary care. *J Clin Hypertens*. 2018;20:324–333. [doi: 10.1111/jch.13166](https://doi.org/10.1111/jch.13166)

MEASURING BLOOD PRESSURE THE RIGHT WAY

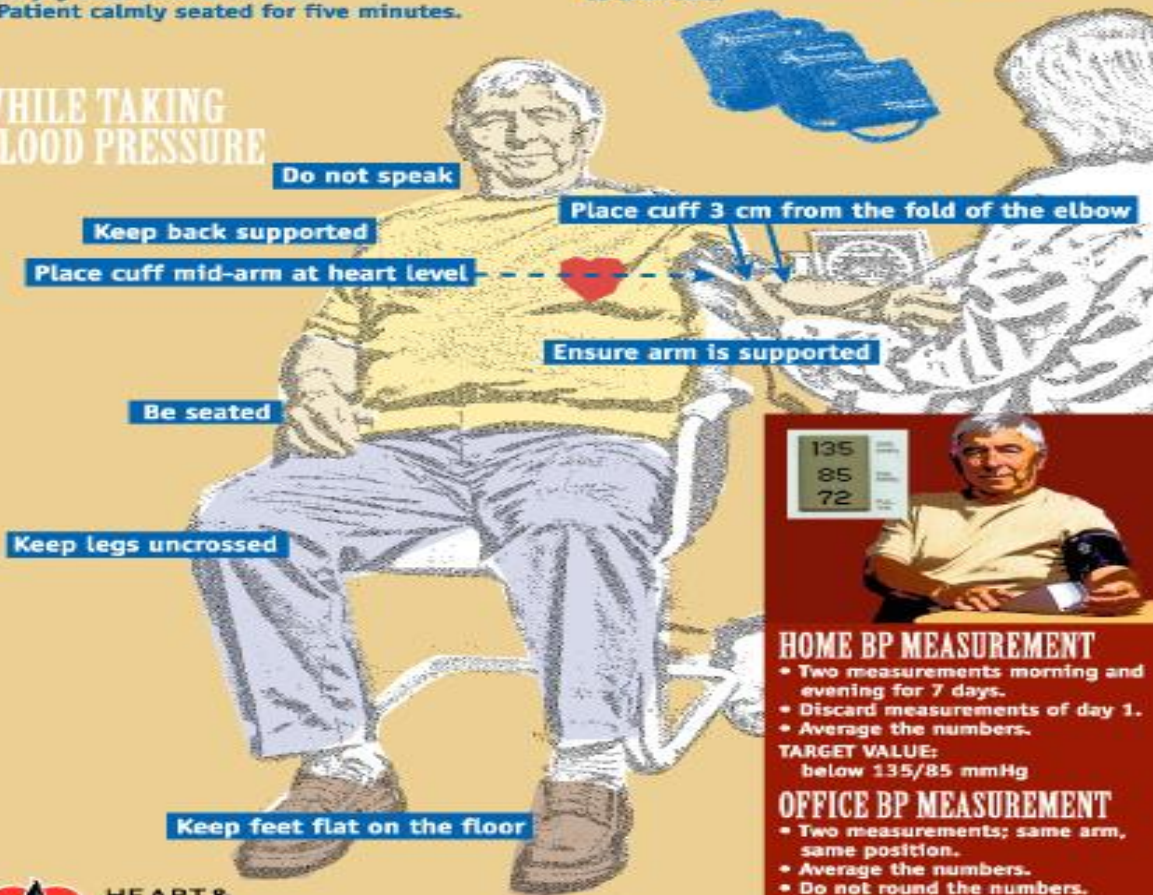
PREPARATION

- Calm, warm environment.
- No exercising in the preceding 30 min.
- No coffee, food, smoking or decongestant in the preceding hour.
- Empty bladder and bowel.
- Patient calmly seated for five minutes.

DEVICE

- Validated device (www.hypertension.ca).
- Have the device calibrated regularly according to manufacturers' recommendations.
- Cuff size: small, medium, or large according to arm size.

WHILE TAKING BLOOD PRESSURE



135
85
72

HOME BP MEASUREMENT

- Two measurements morning and evening for 7 days.
- Discard measurements of day 1.
- Average the numbers.

TARGET VALUE:
below 135/85 mmHg

OFFICE BP MEASUREMENT

- Two measurements; same arm, same position.
- Average the numbers.
- Do not round the numbers.

TARGET VALUES:
< 140/90 mmHg
< 130/80 mmHg diabetes or nephropathy