

Welcome to Clinical Detection & Management of High Blood Pressure for Public Health Nurses



Presented by: MCD Global Health

**Massachusetts Dept
of Public Health
November 17, 2025**

Today's Hosts & Presenters



Today's Host:

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Disclaimer:

We have no conflict of interest relating to the material covered today.



Introductions



Sources and Evidence HOT OFF THE PRESS

AMA | JOHNS HOPKINS
SELF-MEASURED BLOOD PRESSURE MONITORING PROGRAM:
ENGAGING PATIENTS IN
SELF-MEASUREMENT



**Hypertension
Control
CHANGE PACKAGE**

A MILLION HEARTS ACTION GUIDE



PREVENT™ Risk Calculator

The American Heart Association PREVENT™ risk calculator is designed to estimate cardiovascular disease risk based on cardiovascular, kidney and metabolic health factors.



2025 AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/ NMA/PCNA/SGIM Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

A Report of the American Heart Association/American College of Cardiology Joint Committee
on Clinical Practice Guidelines



American Association of Nurse Practitioners;
Society of Pediatric Nurses; American Medical Association;
American Association of Endodontics; American Association of
Preventive Cardiovascular Nurses



Agenda

Day 1

8:30 am Welcome

Cardiovascular Health, Cardiovascular disease and
Blood Pressure Control

10:30 am-10:45 am Break

Measurement of BP

12:00 -12:45pm Lunch

Promoting and supporting self-management
BP Technique & Hands on Practice

4:00 pm Wrap up

Day 2

Virtual

8:30 am Review of Day 1 and questions

9:00 am Overview of Pediatric Hypertension

10:00am Blood Pressure Care and Management in
Community-Based Organizations

11:00am Questions, Post Test, Evaluation and CEU's



Pre-Test



Learning Objectives

Day 1

Explain the importance of understanding cardiovascular risk factors, disease prevention and the effects of uncontrolled high blood pressure on public health

Explain why taking an accurate measurement matters

Define the types and risk factors of High Blood Pressure

Demonstrate how to accurately measure, record and categorize blood pressure measurements

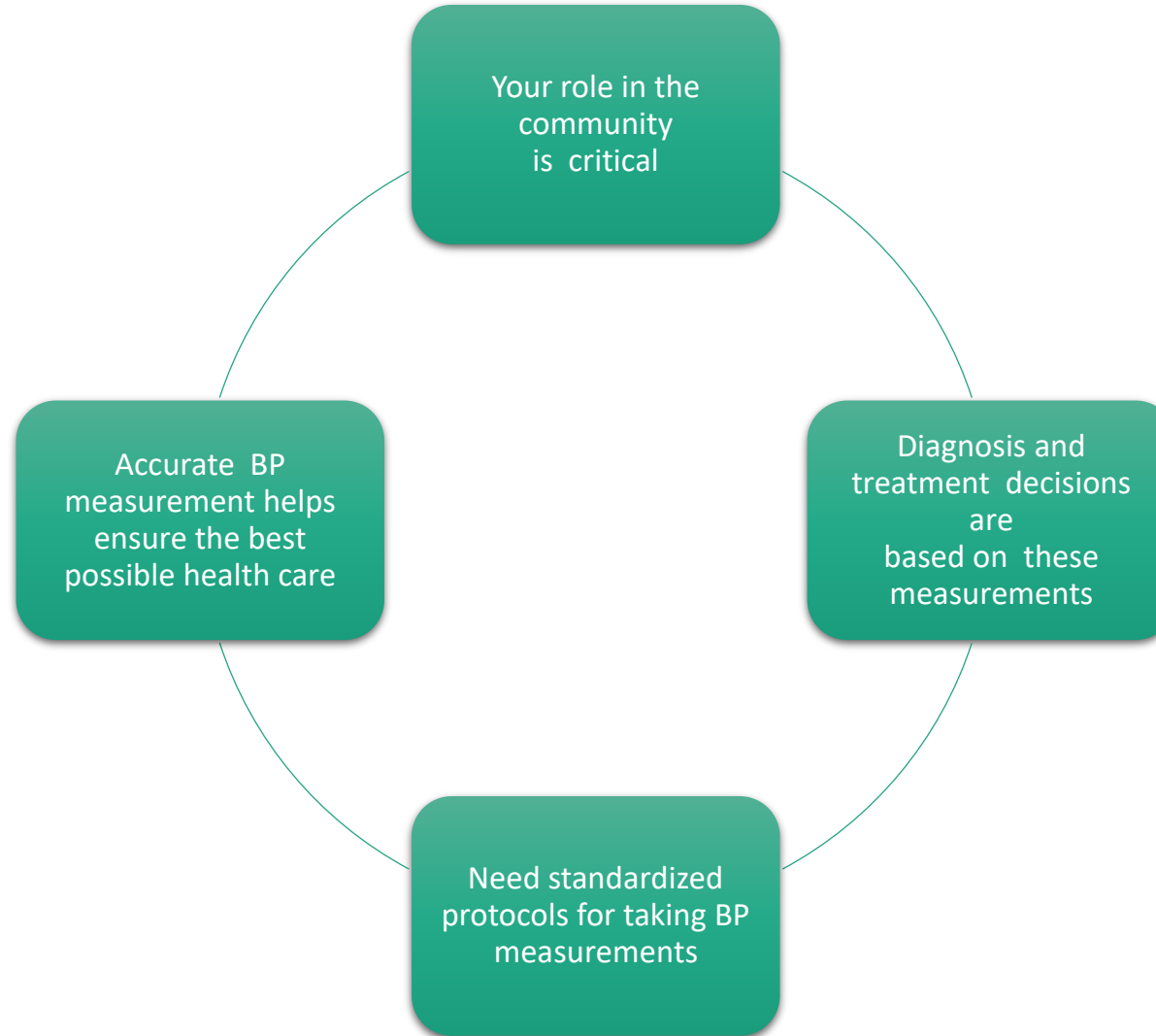
Identify common errors in BP measurement and their impact

Identify Korotkoff sounds

Discuss the benefits of Self-Measured Blood Pressure Monitoring

Complete hands-on practice

Why Role is Critical



Why you're here



Prior training and recent experience in
BP measurement



Routinely perform
BP measurement



Basic
Knowledge of Guidelines



Successful completion of the
MCD Detection and Management of High Blood Pressure Training



Successful completion of a written and performance examination



And... Lots of Practice

Key Take-away
Multidisciplinary
Team Approach



A little History

1930s and 1940s:

- Experts question whether or not elevated BP is truly a risk
 - ❑ Were increased pressures necessary to get blood to the brain and kidneys?¹

Women were thought to tolerate elevated BP well²

The Framingham Heart Study data +and other epidemiologic

- Indicated elevated BP was a major cardiovascular risk factor²

1. Moser, M. (2006), Hypertension Treatment—A Success Study. The Journal of Clinical Hypertension, 8: 313–314. doi: 10.1111/j.1524-6175.2005.05153.

2. Kannel, W. (2008) Framingham Study Insights on Hazards of Elevated Blood Pressure, JAMA.2008;300(21):2545-2547. doi: 10.1001/jama.2008.759

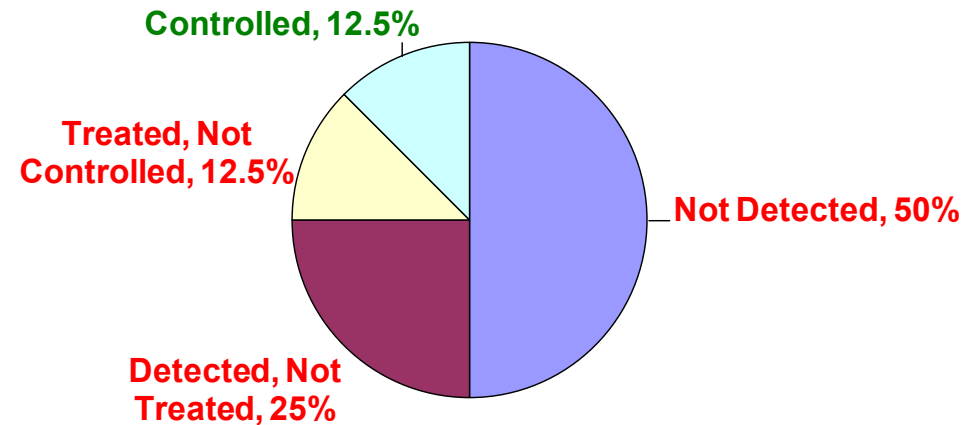


In early 1970's... “100 plus your age”

At that time

- Had just been shown that controlling mild to moderate High BP reduces risks for heart failure and stroke
- No national guidelines
- Few efforts to screen for High BP
- Little training of proper methods for calibration & measurement

Hypertension in USA, mid-1970s

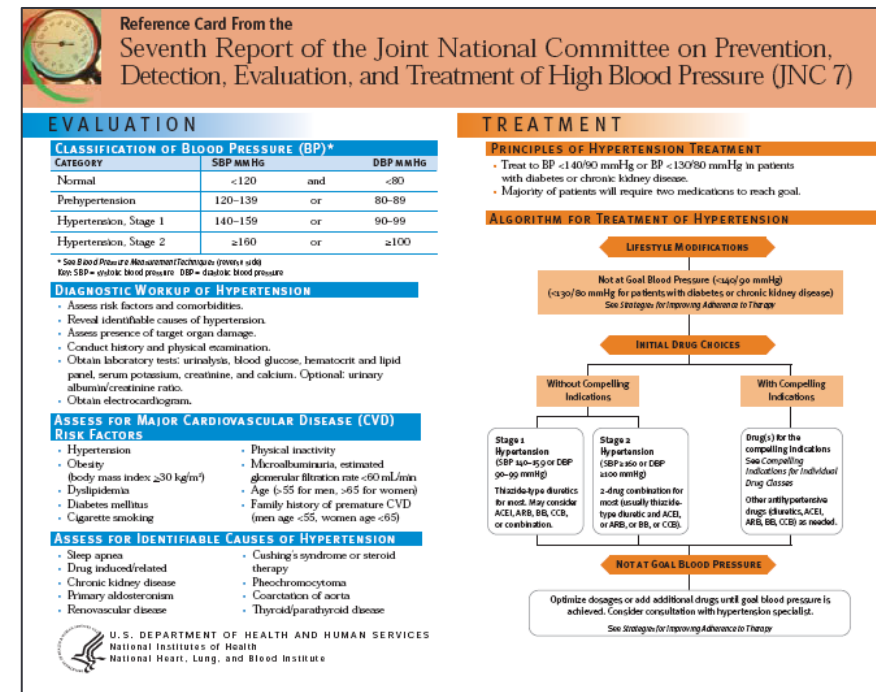


Courtesy of N. Burgess Record, MD
ScoreHealth Systems
Franklin Community Health Network
Central Maine Health Family

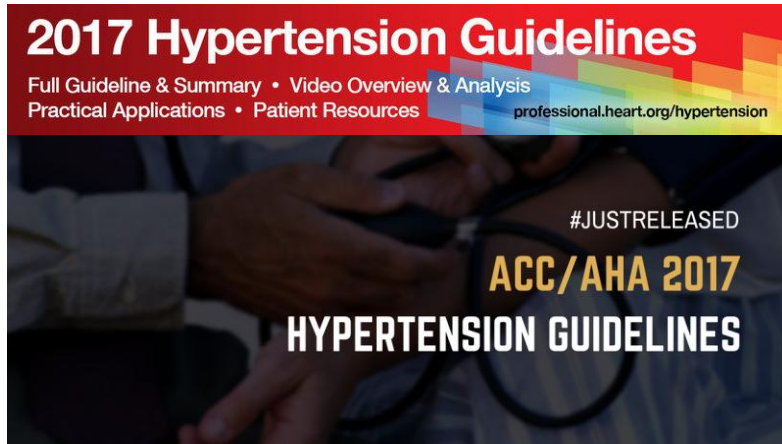


Where we were until 2003

- JNC 7 Guidelines
- “Normal” BP
- “Pre-hypertension”
- “Hypertension”
- “Treatment Goal”



Where we have been since 2017....



Blood Pressure Categories



BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120



AND NOW...2025

Key Take-away
Know your
Numbers



Blood Pressure Categories

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (top/upper number)		DIASTOLIC mm Hg (bottom/lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120–129	and	LESS THAN 80
STAGE 1 HYPERTENSION (High Blood Pressure)	130–139	or	80–89
STAGE 2 HYPERTENSION (High Blood Pressure)	140 OR HIGHER	or	90 OR HIGHER
SEVERE HYPERTENSION (If you don't have symptoms*, call your health care professional)	HIGHER THAN 180	and/or	HIGHER THAN 120
HYPERTENSIVE EMERGENCY (If you have any of these symptoms*, call 911)	HIGHER THAN 180	and/or	HIGHER THAN 120

*symptoms: chest pain, shortness of breath, back pain, numbness, weakness, change in vision, or difficulty speaking

heart.org/bplevels

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Table 3. Applying the American College of Cardiology/American Heart Association Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care* (Updated December 2024)

CLASS (STRENGTH) OF RECOMMENDATION	LEVEL (QUALITY) OF EVIDENCE†
CLASS 1 (STRONG) Benefit >>> Risk Suggested phrases for writing recommendations: - Is recommended - Is indicated/useful/effective/beneficial - Should be performed/administered/other - Comparative-Effectiveness Phrases‡: - Treatment/strategy A is recommended/indicated in preference to treatment B - Treatment A should be chosen over treatment B	LEVEL A - High-quality evidence‡ from more than 1 RCT - Meta-analyses of high-quality RCTs - One or more RCTs corroborated by high-quality registry studies
CLASS 2a (MODERATE) Benefit >> Risk Suggested phrases for writing recommendations: - Is reasonable - Can be useful/effective/beneficial - Comparative-Effectiveness Phrases‡: - Treatment/strategy A is probably recommended/indicated in preference to treatment B - It is reasonable to choose treatment A over treatment B	LEVEL B-R (Randomized) - Moderate-quality evidence‡ from 1 or more RCTs - Meta-analyses of moderate-quality RCTs
CLASS 2b (WEAK) Benefit ≥ Risk Suggested phrases for writing recommendations: - May/might be reasonable - May/might be considered - Usefulness/effectiveness is unknown/unclear/uncertain or not well-established	LEVEL B-NR (Nonrandomized) - Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies - Meta-analyses of such studies
CLASS 3: No Benefit (MODERATE) Benefit = Risk (Generally, LOE A or B use only) Suggested phrases for writing recommendations: - Is not recommended - Is not indicated/useful/effective/beneficial - Should not be performed/administered/other	LEVEL C-LD (Limited Data) - Randomized or nonrandomized observational or registry studies with limitations of design or execution - Meta-analyses of such studies - Physiological or mechanistic studies in human subjects
CLASS 3: Harm (STRONG) Risk > Benefit Suggested phrases for writing recommendations: - Potentially harmful - Causes harm - Associated with excess morbidity/mortality - Should not be performed/administered/other	LEVEL C-EO (Expert Opinion) Consensus of expert opinion based on clinical experience.

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

Key Take-Aways

- Most prevalent and modifiable risk factor for development of Cardiovascular disease
- Collaborate & Screen All Adults
- Team Approach Matters
- Know your numbers, normal, elevated, Stage 1, Stage 2
- Lifestyle Changes Strongly Recommended
- Starting Medication recommendation for high-risk individuals
- Lower risk individuals
- Stage 2 HTN-Medication Therapy using 2 first line agents
- Home monitoring and frequent team check ins
- Severe Hypertension Treatment (previously Hypertensive Urgency)



Blood Pressure Basics



BP:

Moves blood so
the body gets
oxygen and
nutrients



**Healthy
Arteries:**

Are elastic
And stretch



**How much
stretch
depends on:**
Force + Volume



Arteries Need:
BP to be within
a healthy range

Source: AHA 2014

http://www.heart.org/HEARTORG/Conditions/Heart-Health-Screenings_UCM_428687_Article.jsp



What Happens when someone has High Blood Pressure?

Key Take-away
Most Prevalent
and Modifiable
Risk Factor

Artery Walls

- Stiffen
- Become Less Elastic
- May Narrow

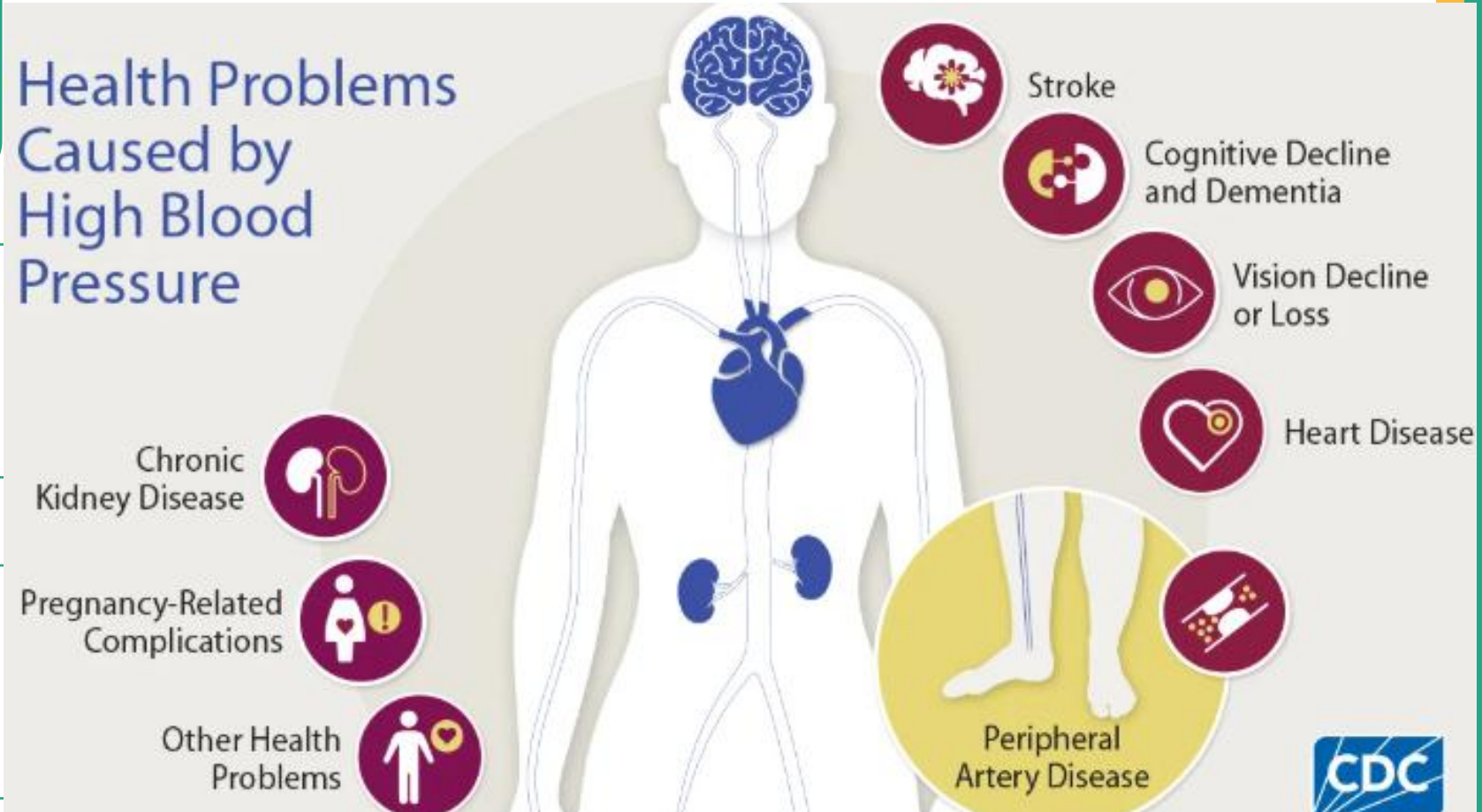
The Heart

- Works Harder
- May Dilate
- Walls may Thicken

End Organ Damage

- Heart Disease
- Heart Attack
- Heart Failure
- Stroke
- Kidney Disease

Health Problems Caused by High Blood Pressure



Types of High Blood Pressure

Primary High Blood Pressure

90-95% of cases

Exact Cause unknown

No Symptoms
“Silent Killer”

Treatment only controls

Secondary High Blood Pressure

5-25% of cases

Cause is identified

Patient has symptoms

Treatment may reverse



Heart Disease & Stroke in the United States

In 2022, more deaths from Heart Disease and Stroke than all forms of cancer and chronic lower respiratory disease combined

Average annual direct and indirect costs of CVD estimated \$417.9 billion in 2020 to 2021

The estimated direct and indirect cost of HBP in the United States for 2020 to 2021 (annual average) was \$49.0 billion

Estimated US health care expenditures for hypertension in 2016 were \$79 billion.

Of 154 health conditions, hypertension ranked 10th in health care expenditures

Adults with Hypertension

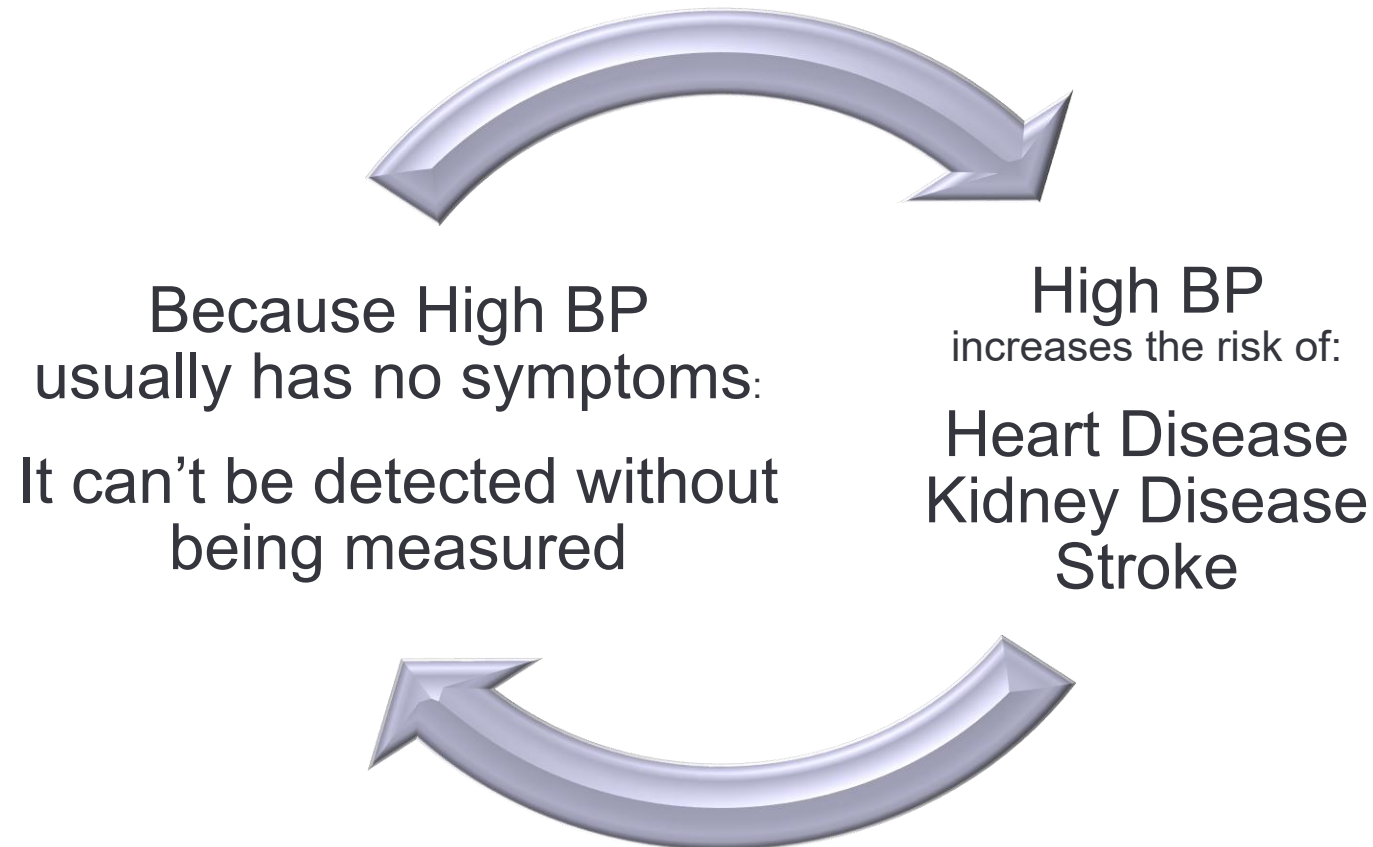
2017 to 2020

- ✓ 16.6% of adults with hypertension current smokers
- ✓ 72.6% were overweight or obese
- ✓ 12.3% had diabetes
- ✓ 13.4% had diagnosed CKD increasing their risks for CVD



Why is BP Screening Important?

Key Take-away
Collaborate
and Screen all
adults



Because High BP
usually has no symptoms:
It can't be detected without
being measured

High BP
increases the risk of:
Heart Disease
Kidney Disease
Stroke

Source: AHA 2014

http://www.heart.org/HEARTORG/Conditions/Heart-Health-Screenings_UCM_428687_Article.jsp



What the guidelines say about Detection

Rule out

- Rule out White Coat Hypertension or Masked HTN

Screen

- Screen for secondary hypertension
- Screen for & manage other CVD risk factors

Include

- Include lab testing for primary hypertension



Risk Factors for High Blood Pressure

Key Take-away
Most Prevalent
and Modifiable
Risk Factor

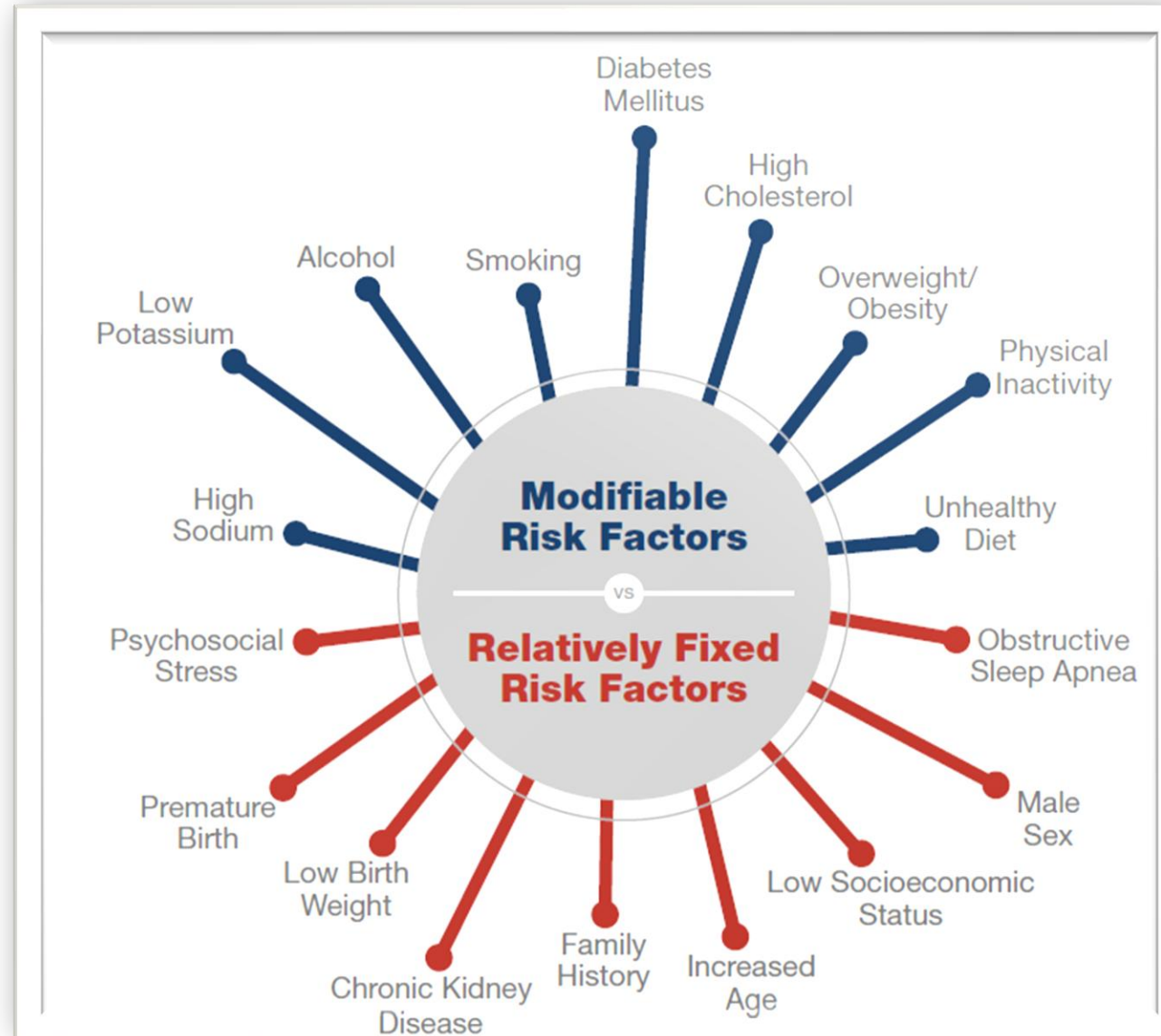


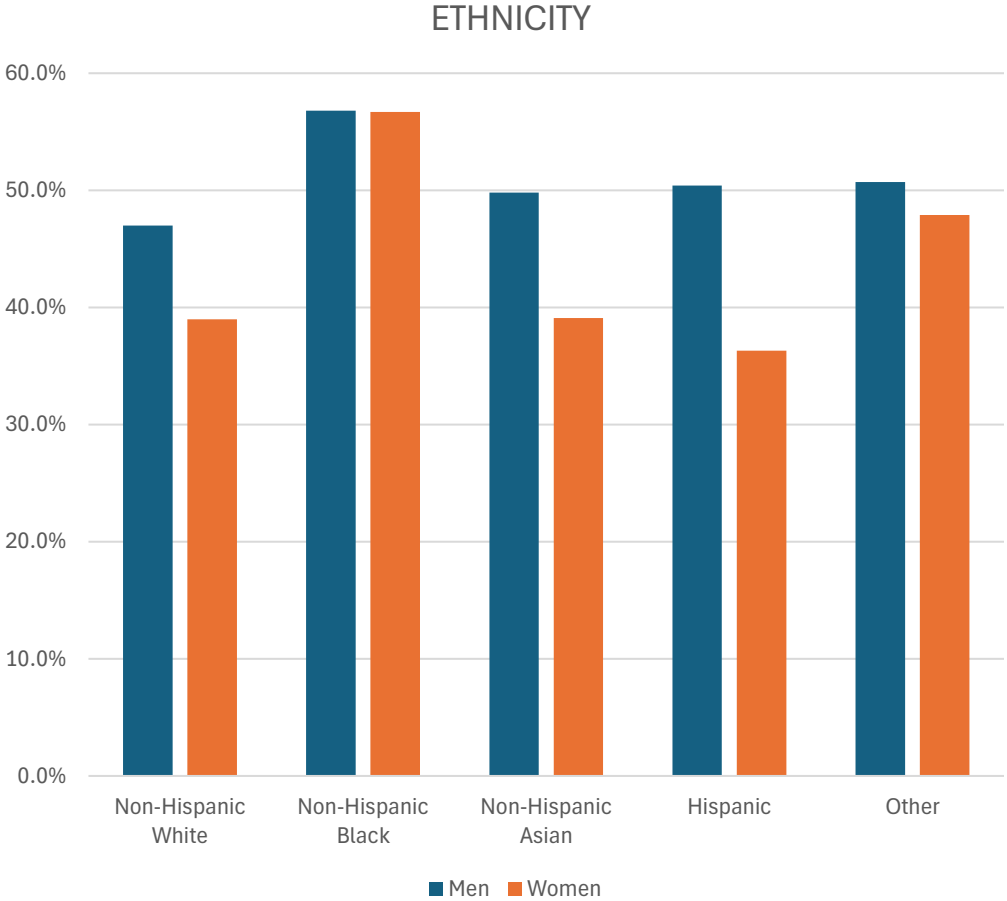
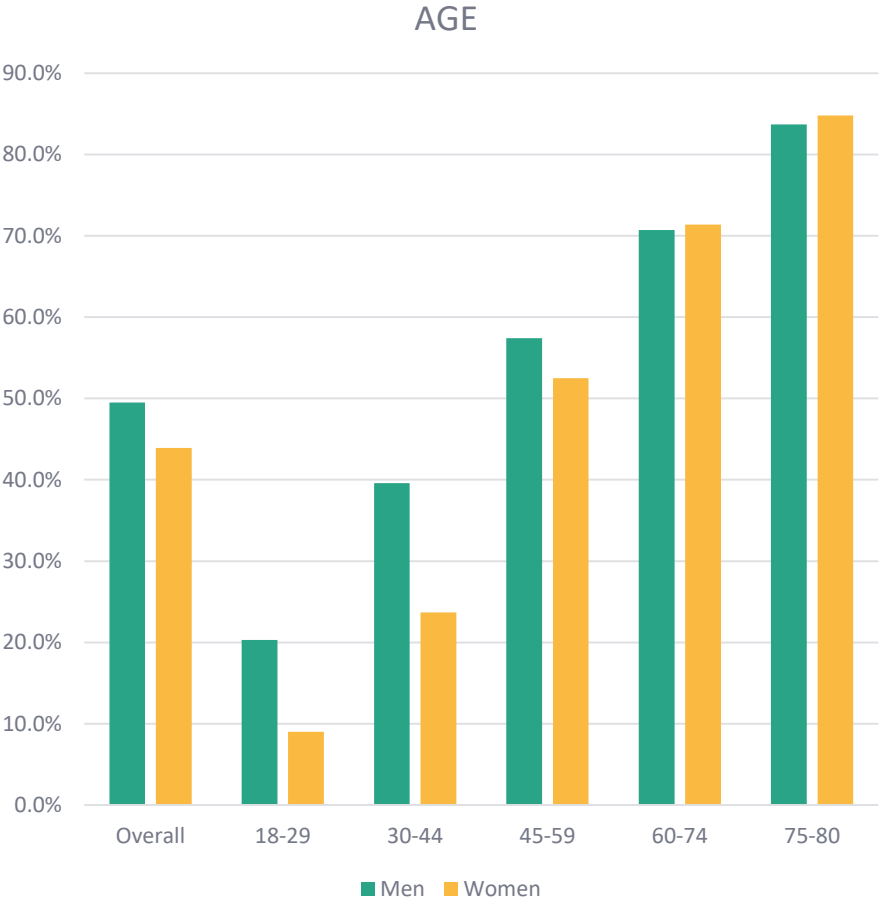
Table 5. Prevalence of Hypertension* Among U.S. Adults Aged 18 to 80 Years, 2017 to 2020

	Prevalence	
Demographic group	Men	Women
Overall	49.5% (59.0 million)	43.9% (56.3 million)
Age groups, years		
18-29	20.3%	9.0%
30-44	39.6%	23.7%
45-59	57.4%	52.5%
60-74	70.7%	71.4%
75-80	83.7%	84.8%
Racial and ethnic groups (age-adjusted)		
NH White	47.0%	39.0%
NH Black	56.8%	56.7%
NH Asian	49.8%	39.1%
Hispanic	50.4%	36.3%
Other	50.7%	47.9%

*Hypertension defined as diagnosed hypertension, BP $\geq$ 130/80 mm Hg, or receiving antihypertensive therapy.

BP indicates blood pressure; and NH, non-Hispanic. Derived from NHANES.

Prevalence



Non-pharmacologic (Controllable) Interventions



Weight Loss

Reduce Sodium

Moderate
Alcohol Intake

Physical Activity

Healthy Diet

Enhance
Dietary
Potassium

Key Take-away
Lifestyle
Changes
Strongly
Recommended



Weight Loss



Weight and body fat
reduction



Expect about 1 mm Hg for every
1kg reduction in body weight

-5
mm
Hg

Reduce Sodium



Dietary sodium



Optimal goal is <1500mg/d but aim
for at least a 1000mg/d reduction
in most adults

-5/6
mm
Hg

Healthy Diet



DASH dietary pattern



Consume a diet rich in fruits,
vegetables, whole grains and
low fat dairy products, with
reduced content of saturated fats

-11
mm
Hg



Enhance
Dietary
Potassium



Dietary Potassium



Aim for 3500–5000 mg/d,
preferably by consumption
of a diet rich in potassium



Physical Activity



Aerobic
90-150
min/wk



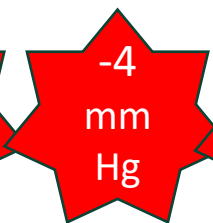
65%-75%
Heart rate
reserve



Dynamic
Resistance
90-150
min/wk



50%-80%
1 rep min
6 exercises
3 sets/exercise
10 reps/set



Isometric
Resistance



4 × 2 min (hand grip)
1 min rest between
exercises
30%–40% maximum
voluntary contraction,
3 sessions/wk
• 8–10 wk



Moderate
Alcohol Intake



Alcohol consumption



In individuals who drink alcohol
reduce alcohol[†] to:

- Men: ≤2 drinks daily
- Women: ≤1 drink daily



US Standard Drink Sizes



12 ounces
5% ABV beer



8 ounces
7% ABV malt liquor



5 ounces
12% ABV wine



1.5 ounces
40% (80 proof)
ABV distilled spirits
(gin, rum, vodka,
whiskey, etc.)

ABV = Alcohol by Volume

DRINKING IN MODERATION:

1 drink or less
in a day
for women

2 drinks or less
in a day
for men

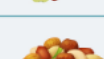
or nondrinking

DASH Eating Plan

The Benefits: Lowers blood pressure & LDL “bad” cholesterol.

 **Eat This**

 **Limit This**

 Vegetables	 Fatty meats
 Fruits	
 Whole grains	 Full-fat dairy
 Fat-free or low-fat dairy	
 Fish	 Sugar sweetened beverages
 Poultry	
 Beans	 Sweets
 Nuts & seeds	
 Vegetable oils	 Sodium intake

www.nhlbi.nih.gov/DASH



NIH

National Heart, Lung,
and Blood Institute



Blood Pressure Treatment Threshold and the Use of CVD Risk Estimation to Guide Drug Treatment of Hypertension

Recommendations for Blood Pressure Treatment Threshold and the Use of CVD Risk Estimation to Guide Drug Treatment of Hypertension

Referenced studies that support the recommendations are summarized in the evidence table.

COR	LOE	Recommendations
1	A	1. In all adults with hypertension, initiation of medications to lower BP is recommended when average SBP is ≥ 140 mm Hg to reduce the risk of cardiovascular events and total mortality.
1	A	2. In all adults with hypertension, initiation of medications to lower BP is recommended when average DBP is ≥ 90 mm Hg to reduce the risk of cardiovascular events and total mortality.
1	A	3. In adults with hypertension and clinical CVD, initiation of medications to lower BP is recommended when average SBP is ≥ 130 mm Hg to reduce the risk of cardiovascular events and total mortality.

Blood Pressure Treatment Threshold and the Use of CVD Risk Estimation to Guide Drug Treatment of Hypertension (con't.)

1	C-LD	4. In adults with hypertension and clinical CVD, initiation of medications to lower BP is recommended when average DBP is ≥ 80 mm Hg to reduce the risk of cardiovascular events and total mortality.
1	A	5. In adults with hypertension without clinical CVD but with diabetes or CKD or at increased short-term CVD risk (ie, estimated 10-year CVD risk $\geq 7.5\%$ based on PREVENT*), initiation of medications to lower BP is recommended when average SBP is ≥ 130 mm Hg to reduce the risk of CVD events and total mortality.
1	C-LD	6. In adults with hypertension without clinical CVD but with diabetes or CKD or at increased 10-year CVD risk (ie, $\geq 7.5\%$ based on PREVENT*), initiation of medications to lower BP is recommended when average DBP is ≥ 80 mm Hg to reduce the risk of CVD events and total mortality.

*Increased short-term or 10-year risk is defined as a 10-year predicted risk for CVD events of $\geq 7.5\%$ based on PREVENT (Predicting Risk of cardiovascular disease EVENTS).

Blood Pressure Treatment Threshold and the Use of CVD Risk Estimation to Guide Drug Treatment of Hypertension (con't.)

1	B-R	7. In adults with hypertension without clinical CVD and with estimated 10-year CVD risk <7.5% based on PREVENT*, initiation of medications to lower BP is recommended if average SBP remains ≥ 130 mm Hg after a 3- to 6-month trial of lifestyle intervention to prevent target organ damage and mitigate further rise in BP.
1	B-R	8. In adults with hypertension without clinical CVD and with estimated 10-year CVD risk <7.5% based on PREVENT*, initiation of medications to lower BP is recommended if average DBP ≥ 80 mm Hg after a 3- to 6-month trial of lifestyle intervention to prevent target organ damage and mitigate further rise in BP.

*Increased short-term or 10-year risk is defined as a 10-year predicted risk for CVD events of $\geq 7.5\%$ based on PREVENT (Predicting Risk of cardiovascular disease EVENTS).

The American Heart Association PREVENT™ Online Calculator - Professional Heart Daily | American Heart Association

About the PREVENT Equations

[Online Calculator](#)

Results for CVD

[Print Result](#)

[Related Content to CVD](#)

Estimated **10-year**
risk of CVD

16.7%

Estimated **30-year**
risk of CVD

35.5%

The risk estimates were calculated using the base model

Recalculate or Pick another Calculator

CVD

ASCVD

Heart Failure

Sex*

☒ Male ☐ Female

Age (years)*

57

Total Cholesterol (mg/dL)*

300

Diabetes

Any history of diabetes.

☒ No ☐ Yes

Current Smoking

Any cigarette use within the last 30 days

☒ No ☐ Yes

HDL Cholesterol (mg/dL)*

88

SBP (mmHg)*

155

Anti-hypertensive medication

Current use of any medication for hypertension

☒ No ☐ Yes

Lipid-lowering medication

Current use of statin medication to lower cholesterol

☒ No ☐ Yes

BMI (kg/m²)*

35

eGFR (mL/min/1.73m²)*

30



Key Take-away
Initiate
Medication

Figure 6. Use of Risk-Based Thresholds for Initiation of BP Treatment in Adults

Use of Risk-Based Thresholds for Initiation of BP Treatment in Adults

BP Level-Only

Does the patient have an average BP $\geq 140/90$ mm Hg?

YES

Initiate antihypertensive medications to lower BP and reduce CVD risk for primary or secondary prevention of CVD

1

NO

Risk-Based Thresholds for Initiation of BP Treatment for Adults*

Does the patient have existing clinical CVD (CHD, stroke, HF)?

YES

Initiate antihypertensive medications to lower BP and reduce CVD risk if average SBP ≥ 130 mm Hg or DBP ≥ 80 mm Hg for secondary prevention of CVD

1

NO

Does the patient have diabetes or CKD, or is the patient at increased short-term risk of CVD (10-year PREVENT-CVD risk $\geq 7.5\%$ †)?

YES

Initiate antihypertensive medications to lower BP and reduce CVD risk if average SBP ≥ 130 mm Hg or DBP ≥ 80 mm Hg for primary prevention of CVD

1

NO

Initiate antihypertensive medications to lower BP if average SBP ≥ 130 mm Hg or DBP ≥ 80 mm Hg after 3-6 months of lifestyle intervention

1

LEGEND

COR 1

COR 2a

COR 2b

COR 3-No Benefit

COR 3-Harm

(Class of Recommendation)



2025 High Blood Pressure

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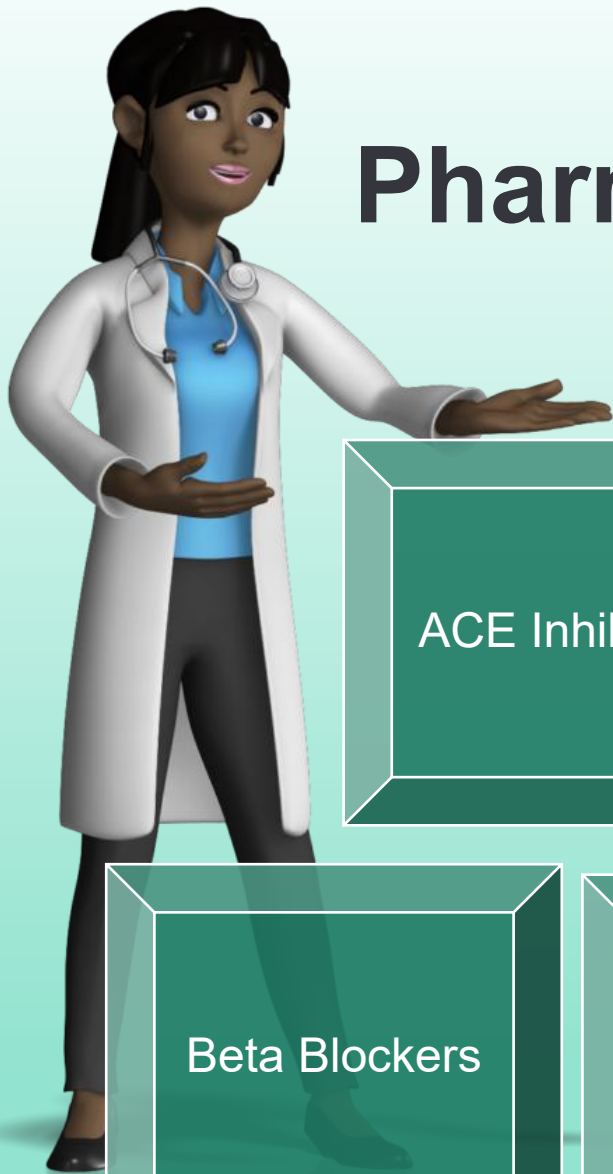


BP indicates blood pressure; CHD, coronary heart disease; CKD, chronic kidney disease; CVD, cardiovascular disease; DBP, diastolic blood pressure; HF, heart failure; PREVENT, Predicting Risk of cardiovascular EVENTS; and SBP, systolic blood pressure.

*In older adults who may be frail or have a limited life expectancy, a clinician-patient assessment of potential benefits and harms of BP lowering should be pursued to align care with patient goals.

†Increased short-term or 10-year risk is defined as a 10-year predicted risk for CVD events of $\geq 7.5\%$ using PREVENT.

Pharmacologic Interventions



ACE Inhibitors

ARBs

Alpha Blockers

Beta Blockers

Calcium
Channel
Blockers

Diuretics

Direct
Vasodilators



Angiotensin Converting Enzyme (ACE) Inhibitors

- Drug names- “pril”
- Example- Lisinopril, Enalapril
- Mechanism of Action- Inhibits/blocks action of ACE enzyme, when inhibited it cannot convert Angiotensin I into Angiotensin II (potent vasoconstrictor in lungs) as effectively
- Main Effect on BP- decrease SVR, SV
- Side Effects-
 - Renal Impairment
 - Angioedema
 - Dry Cough
 - Hyperkalemia
 - Postural Hypotension
- Pharmacokinetics- Oral Route, Onset -15min, Peak- 30-90 min, half-life 2hrs. Metabolized in Liver, Excreted in Kidneys
- Indications- HTN, HF, Diabetic Nephropathy, Safety not established in children, not allowed in pregnancy, higher risk in older adults- monitor hepatic and renal function
- Nursing Considerations- Advise patients to seek medical attention immediately for facial, lip or tongue swelling



Angiotensin Receptor Blockers (ARBs)

- Drug names- “sartan”
- Example- Losartan, Valsartan
- Mechanism of Action- Blocks vasoconstriction and release of aldosterone through selective blocking of Angiotensin II from binding with receptors in vascular smooth muscles and adrenal cortex, resulting in vasodilation and decreased bp
- Main Effect on BP- decrease SVR, SV
- Side Effects-
 - Headache
 - Postural Hypotension
 - Hyperkalemia
 - Dizziness
- Nursing Considerations- Advise patients to avoid potassium supplements



Alpha Blockers

- Drug names- “osin”
- Example- Doxazosin, Terazosin
- Mechanism of Action-Block Alpha Receptor, relaxes muscles in blood vessel walls
- Main Effect on BP- decrease SVR,
- Side Effects-
 - Drowsiness
 - Orthostatic Hypotension and/or Vaso-Vagal Syncope esp. after first dose
 - Headache
- Pharmacokinetics- metabolized in the liver, half life varies from 3hr (Prazosin) to 9hrs (Doxazosin)
- Indications- hyperlipidemia, Benign Prostatic Hypertrophy
- Nursing Considerations- fall risk



Beta Blockers

- Drug names- “lol”
- Example- Metoprolol, Labetalol
- Mechanism of Action- Inhibits adrenaline and noradrenaline from binding onto beta-adrenergic receptors which results in decreased bp
- Main Effect on BP- decrease HR, SV
- Side Effects –
 - Bradycardia/Bronchospasm
 - Arrhythmias
 - Masked Hypoglycemia
- Nursing Considerations- Inform patients with diabetes these can mask s/s hypoglycemia



Calcium Channel Blockers (CCBs)

- Drug names- “dipine”
- Example- Amlodipine, Verapamil
- Mechanism of Action- Relaxes and widens blood vessels and reduces workload on the heart
- Main Effect on BP- decrease SVR
- Side Effects –
 - Bradycardia
 - Hypotension
 - Peripheral edema
 - Reflex Tachycardia
- Nursing Considerations – Patients should be advised to report any s/s of angina with initial dosing and dose changes



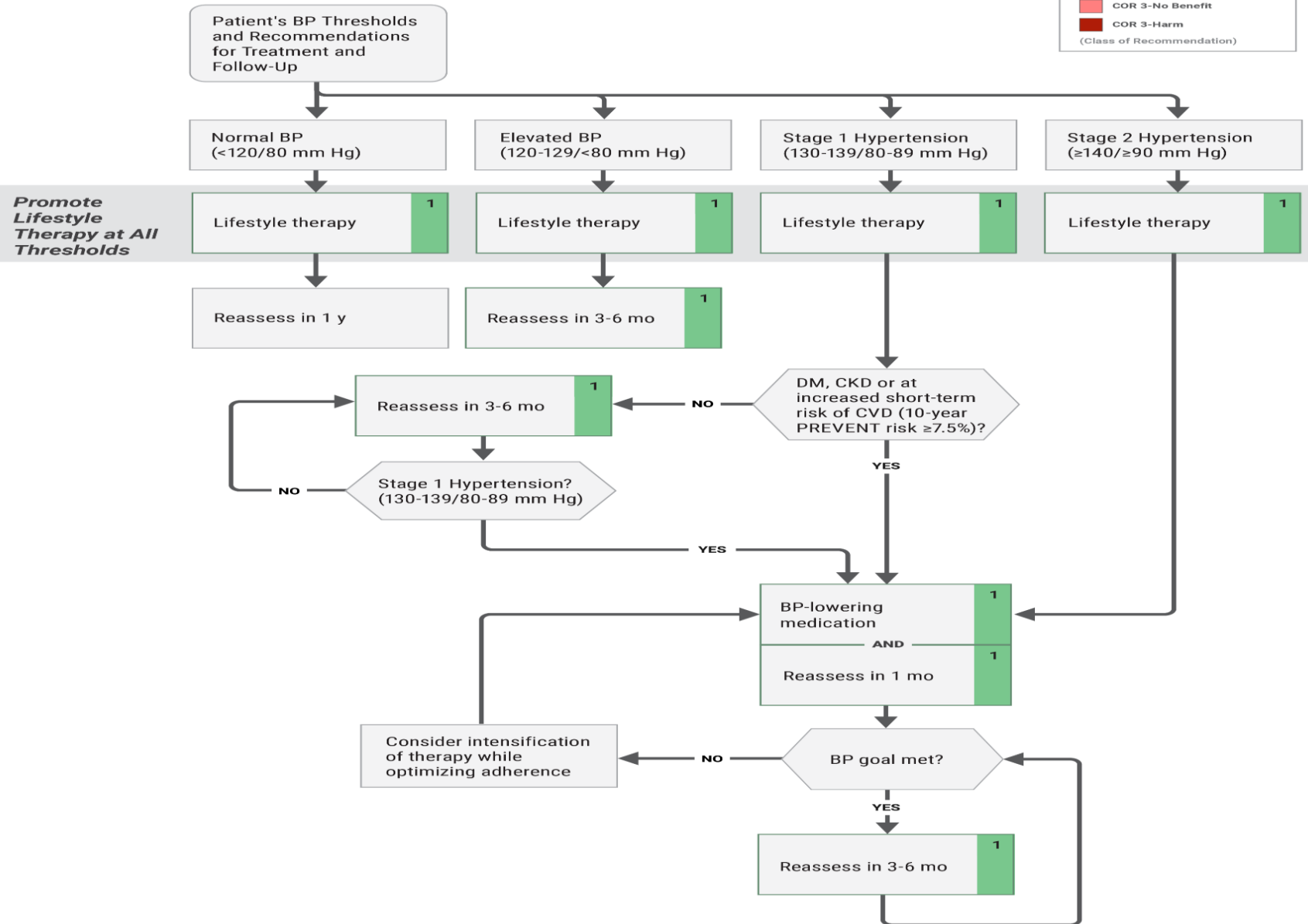
Diuretics

- Drug names- “ide”
- Example- Furosemide, Hydrochlorothiazide
- Mechanism of Action- Facilitates Diuresis by excretion of sodium and water through the urine, resulting in decreased blood volume (less fluid circulating in blood stream)
- Main Effect on BP- decrease SV
- Diuretic Types-
 - Loop - furosemide, bumetanide
 - Thiazide – hydrochlorothiazide (HCTZ)
 - Thiazide like – chlorthalidone
 - Potassium Sparing- Spironolactone
- Side Effects –
 - Hypokalemia
 - Hypotension
 - Frequent urination
 - Dehydration
 - Postural Hypotension
- Nursing Considerations- Advise patients to take in AM to prevent nocturia



Key Take-away
Lifestyle
changes strongly
recommended
for all adults
And Reassess
according to
protocol

Blood Pressure Thresholds and Recommendations for Treatment and Follow-Up



*Based on the PREVENT calculator.

Modified with permission from Whelton et al. Copyright 2018 American College of Cardiology Foundation.



Time Check

BREAK



First step in diagnosis is accurate measurement

Measurement of blood pressure is one of the most frequently performed medical tests. Because it seems to be such an easy measurement to take, the accuracy of the results is seldom questioned.

However, studies show that in many cases... there is good reason to doubt the accuracy of blood pressure readings.



Why is taking accurate Blood Pressure Important?



May not accurately detect, diagnose, manage, treat or control



Costs to patient and society



Medication side effects

Accurate Measurement

Step	Key Instructions
1. Prepare the patient	• Have the patient relax, sitting in a chair (feet on floor, back supported) for >5 min. • Make sure the patient avoids caffeine, exercise, and smoking for at least 30 min before the measurement.
2. Use the proper technique for BP measurements	• Support the patient's arm (eg, resting on a desk). • Using the correct cuff size, position the middle of the cuff on the patient's upper arm at the midpoint of the sternum.
3. Take measurements needed for diagnosis and treatment	• At the first visit, record BP in both arms, and use the arm with the higher reading. • Use a palpated estimate of radial pulse obliteration pressure for systolic BP and inflate the cuff 20-30 mm Hg above this level to determine the BP level. • Deflate the cuff pressure 2 mm Hg per second and listen for Korotkoff sounds.
4. Document accurate BP readings	• Record systolic BP at the onset of the first Korotkoff sound and diastolic BP at the disappearance of all Korotkoff sounds, using the nearest even number.
5. Average the readings	• Use an average based on ≥ 2 readings obtained on ≥ 2 occasions to estimate the individual's level of BP.
6. Provide BP readings to patient	• Provide patients the systolic/diastolic BP readings both verbally and in writing.

See Table 8 of the 2017 Hypertension Guideline for more information.

Adapted with permission from Mancia et al.²¹ Pickering et al.²² and Weir et al.²³

Patient Prep & Positioning

Key considerations for patients:

- ✓ Bare Arm
- ✓ 30 minutes prior to appointment, refrain from smoking, exercise, caffeine or alcohol
- ✓ Empty bladder

Key considerations for staff to remind patients:

- Feet flat on floor
- Back supported
- Arm supported at heart level
- Bare arm
- Sitting for 5 minutes

Come prepared for a correct
blood pressure CHECK



Bare arm **Don't smoke** **Use bathroom** **Sit quietly**

- 1** **Wear a short-sleeved shirt** or have a bare arm.
- 2** At least **30 minutes before your appointment** **DO NOT:**
 - Smoke
 - Exercise
 - Drink caffeine or alcohol (no coffee, tea or soda)
- 3** **Go to the bathroom** and empty your bladder.
- 4** **Sit quietly** for five minutes and:
 - Sit up straight and support your back
 - Keep both feet flat on the floor
 - Don't talk during your measurement

Measurement Variations



Errors in procedure:

- Equipment
- Observer
- Patient



Physiological variations

Equipment to Measure Blood Pressure

Stethoscope

Inflation
System
BP cuffs &
bladders

Manometers



Stethoscope



Ear Tips or Buds

- Select size
- Insert facing forward

Lumen or Tubing

- Single vs. Double
- Select appropriate length

Diaphragm vs. Bell

- Differences
- No need to cover hole

PLACEMENT of the Stethoscope

- Apply the stethoscope directly over the brachial artery, never under the cuff or tubing
- Apply with light pressure

Stethoscope Errors



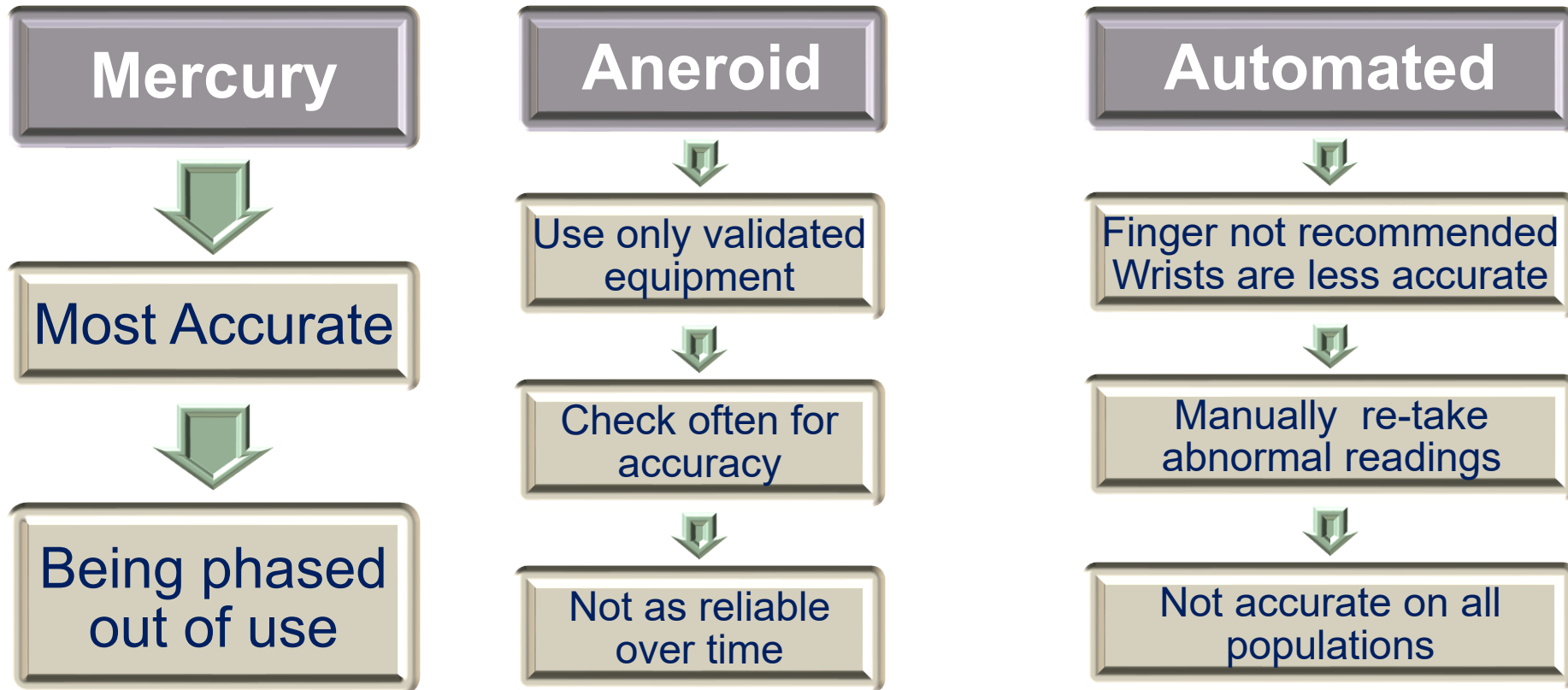
Ear tips
incorrectly
inserted

Not activating
correct side
of the head

Incorrect
tubing length

Applying
under the BP
cuff

Sphygmomanometers



(Check accuracy of home BP devices for patients.)



Manometer Errors



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Using non-validated/calibrated equipment

Not checking for accuracy

Using improperly maintained equipment

Manometer not at eye level

Inflation System



Cuff

- Proper measurement

Bladder

- Inflation

Inflation Bulb

- Inflates the bladder

Control Valve

- Regulates the deflation rate

Tubing

- Attaches the system

Cuff Sizing

Bladder size determines cuff size

Length encircles 80% of
arm

(The closer to 100%, the better)

Too narrow or short
(BP reading may be falsely
high)

Width covers at least
40%
of the arm circumference

Too wide or too long
(BP reading may be falsely
low)



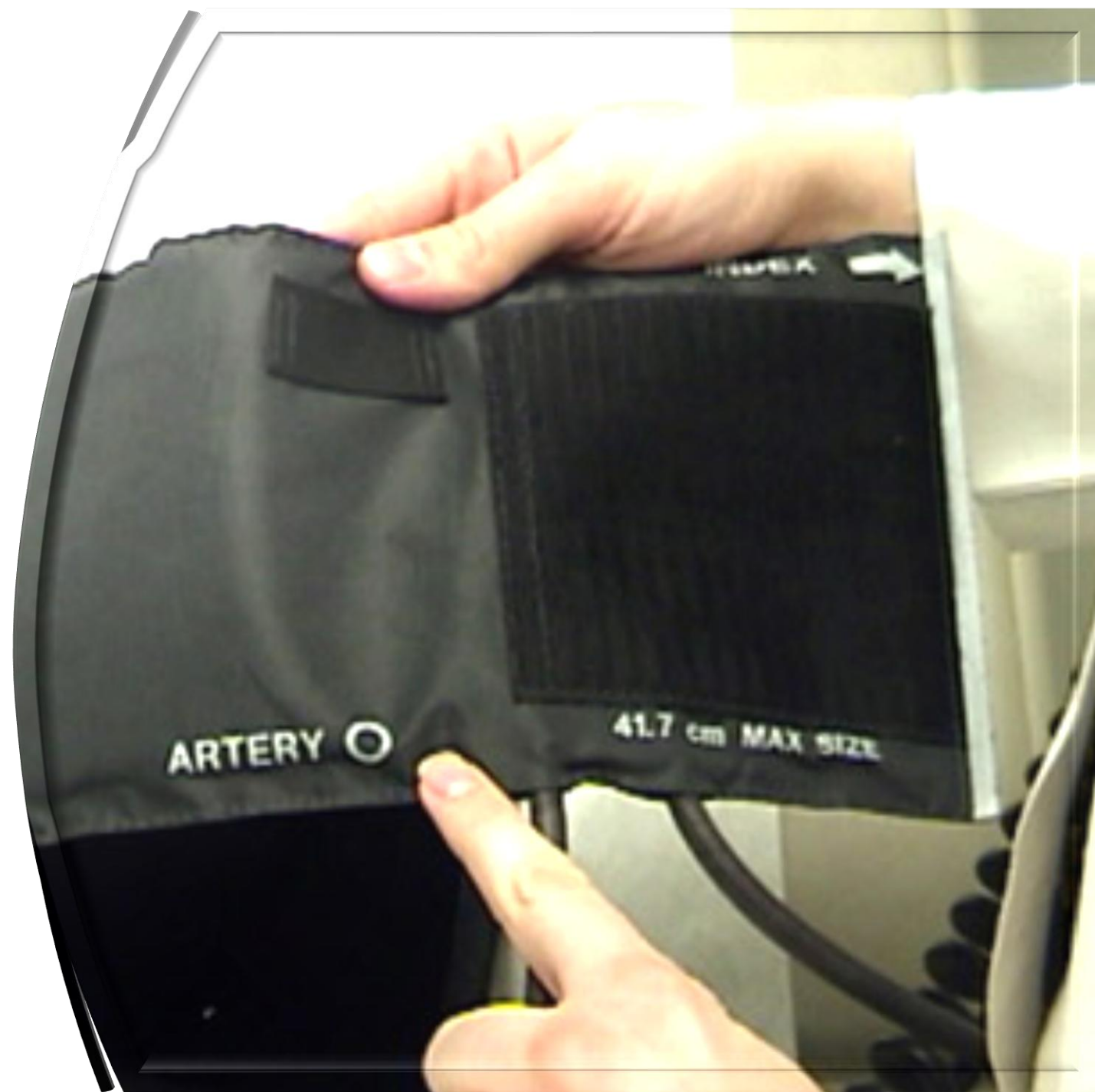
Cuff Application

Apply to bare arm

Apply snugly

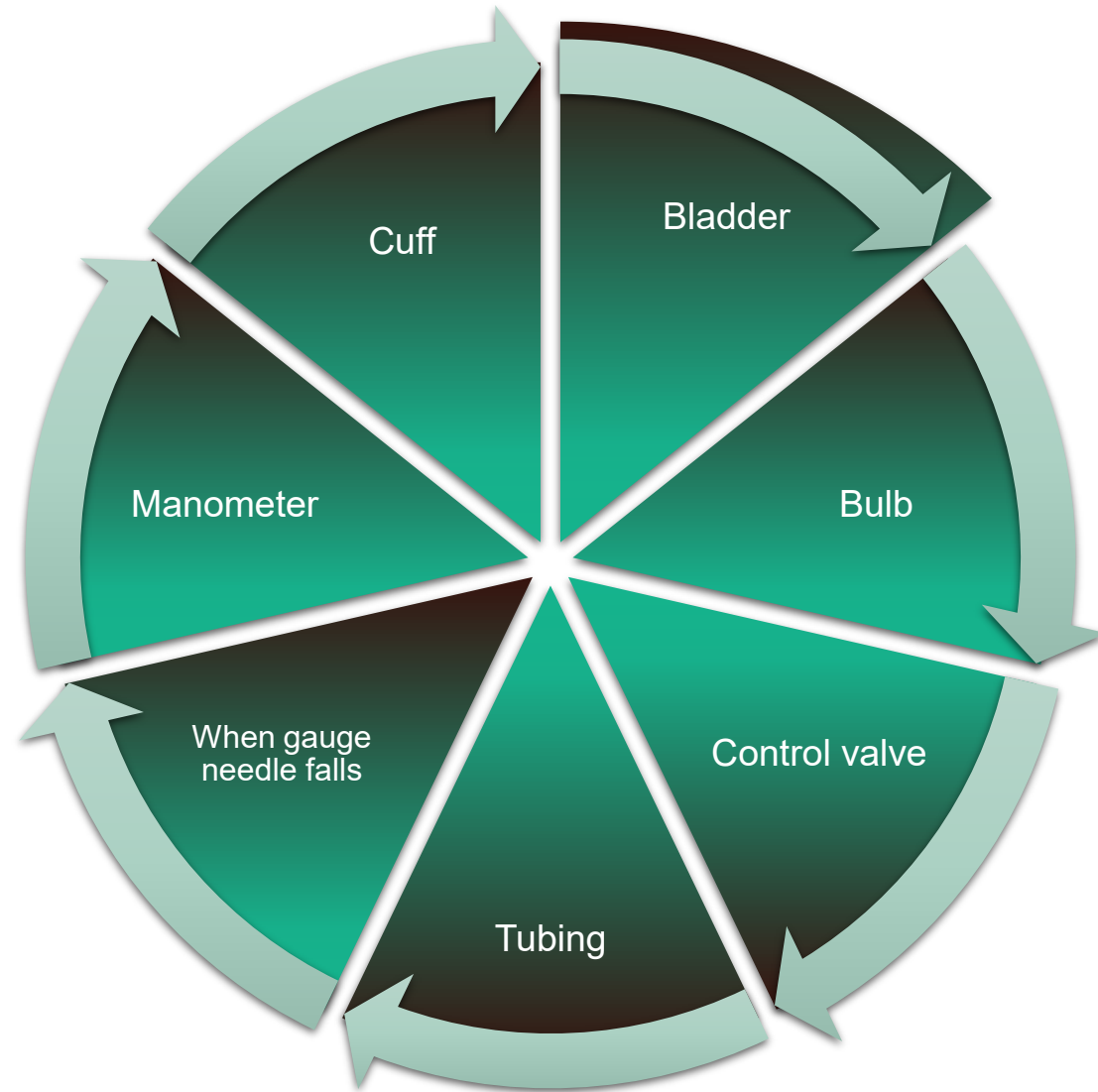
Center the bladder

If upper arm is too short?



Air Leaks

Leaks can occur in:



(Test for leaks and replace defective parts)



Cuff and Inflation system Errors

Incorrect Cuff Size

Applied over clothing

Leaks

Worn or Sticking parts

Not Centering the Bladder

Observer Error

Poor
Technique

Rapid cuff
deflation

Inattention

Manometer
not at eye
level

Reaction
Time

Confusion of
auditory and
visual signals

Observer Error (continued)

Hearing Loss

Vision Loss

Orthopedic
Conditions

Bias/Terminal
Digit
preference

Environment

Patient Errors

Position of Body

Position of arm

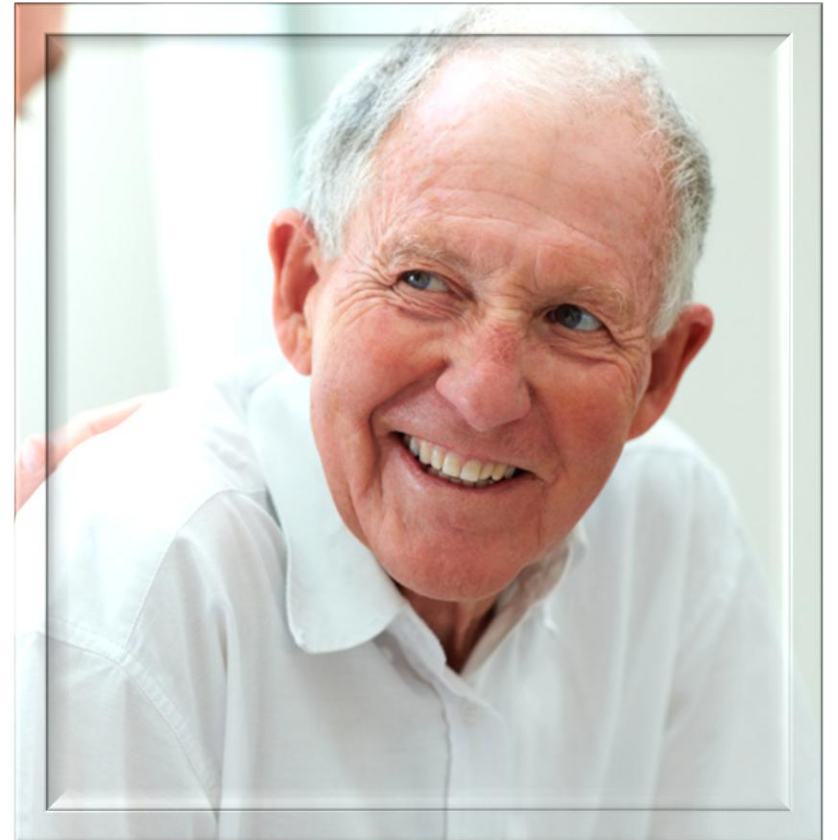
- Support
- Heart level
- Leaning on arm

Mentally Relaxed

Recent eating or smoking

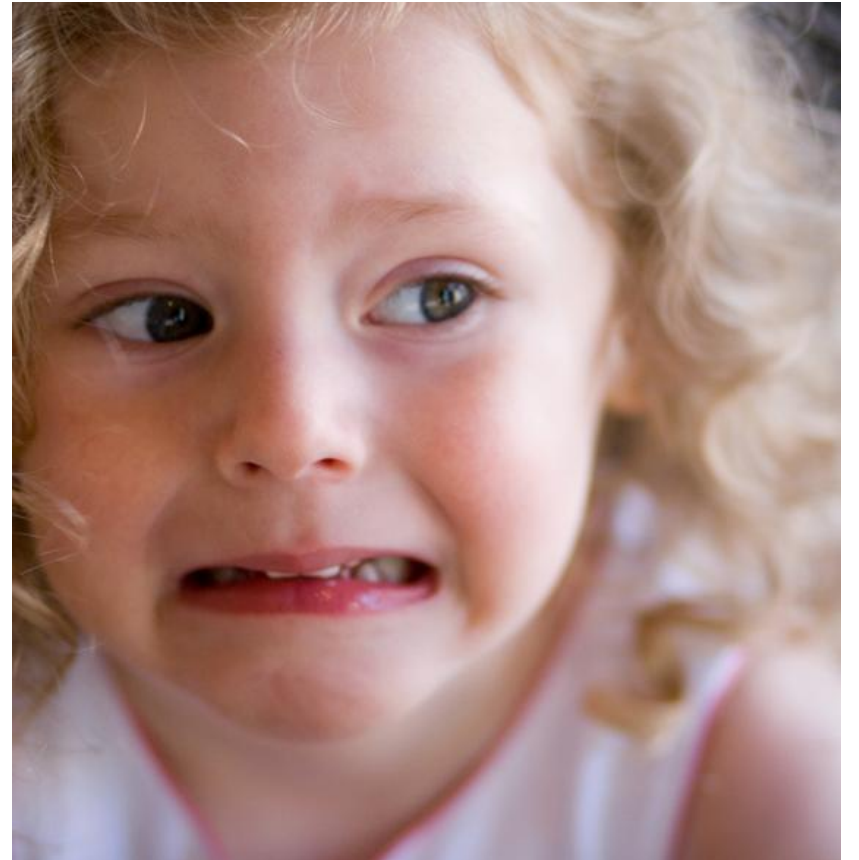
Rest vs. Exercise

Talking



Physiological Variations

- White Coat
- Medications
- Full bladder
- Emotional state
- Time of day/Fatigue
- Temperature of Room
- Recent Exercise
- Tobacco/Caffeine use

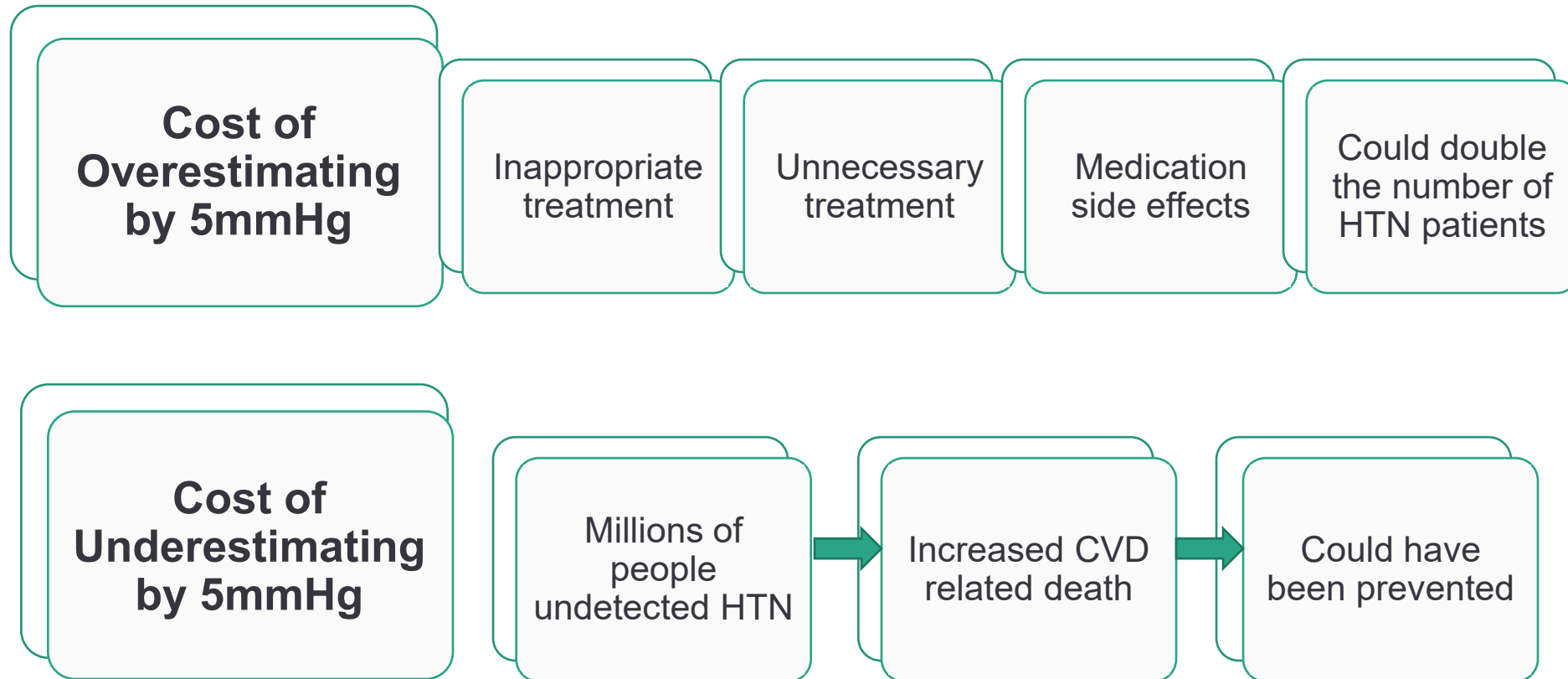


Cumulative Effect Errors

COMMON ERRORS	Effect on SYSTOLIC BP	CORRECTIVE ACTION
Sitting without back support	+ 6 to 10	Support back (sit in chair)
Full bladder	+ 15	Empty bladder prior to BP is taken
Tobacco/caffeine use	+ 6 to 20	Don't use before clinic appointment
BP taken when arm is: •Incorrect position •Unsupported •Elbow too high •Elbow too low	•+ 9 to 13 • + 1 to 10 • False Low • False High	While seated in chair, patient's arm must be supported, with elbow at heart level
"White coat" reaction	+ 11 to 30	Have someone else take the BP
Talking or hand gestures	+ 7 to 10	No talking or using hands during BP measurement
Cuff too narrow/small	≥ 10	Place the correct-sized cup properly AND Place it over a bare upper arm
Cuff too wide/large	False low	
Cuff not centered	+ 4	
Cuff over clothing	+ 5 to 50	



Impact of Errors



Manual measurements – determine the Maximum Inflation Level – (MIL)

What is it ?

- How high you need to inflate your cuff to accurately assess the systolic pressure

Why ?

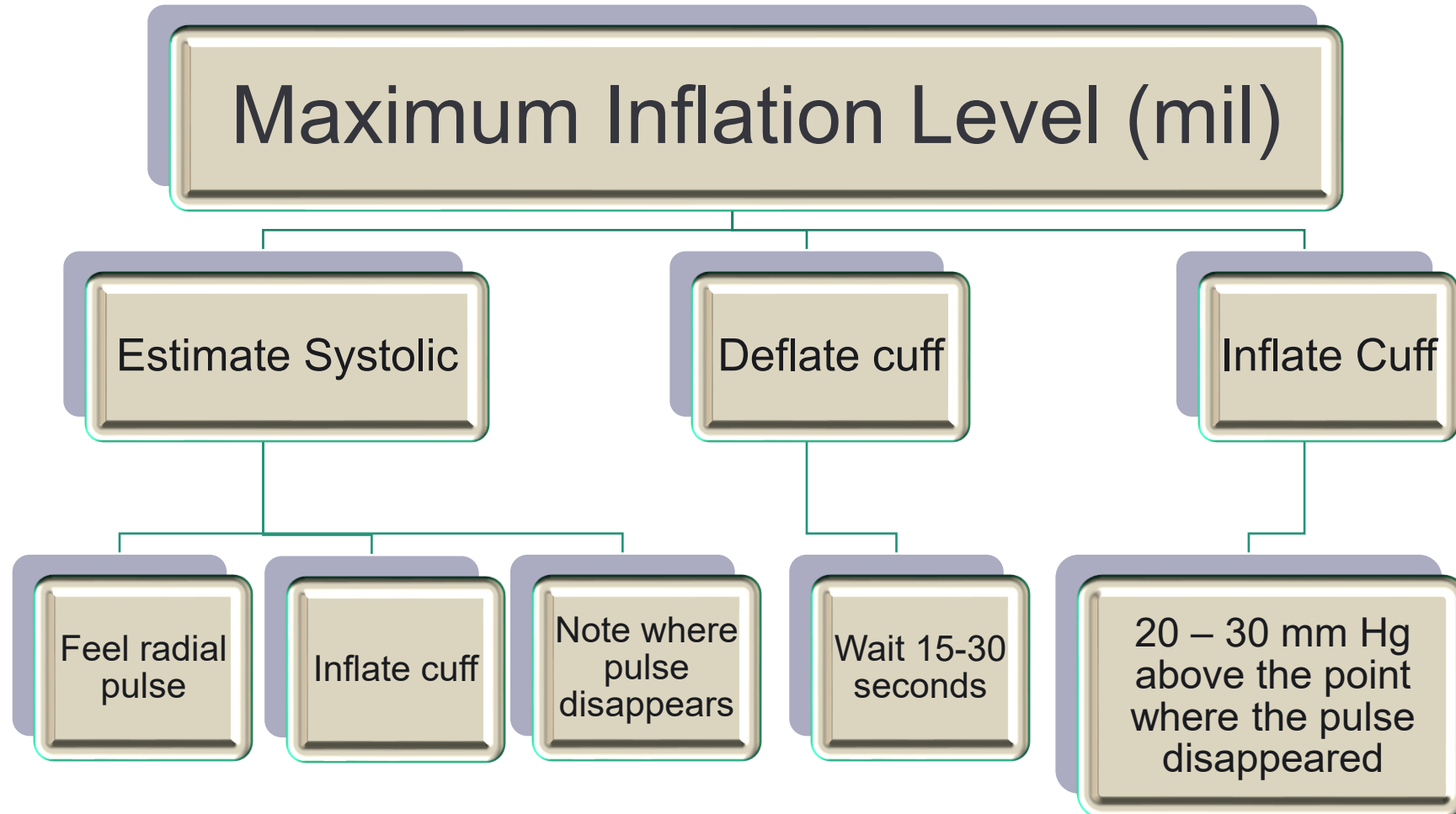
- Auscultatory gap
- Accurate inflation

Caution

- Once needle falls, do not re-inflate w/o deflating and waiting 15-30 sec.



Review of MIL Determination



Auscultatory Gap

What is it?

Sounds fade or disappear and reappear above the diastolic pressure.

This period of silence is called an auscultatory gap.

Especially common in older and hypertensive patients.



Absent 5th Phase

What is it?

Sounds
heard below
the true
diastolic
pressure

Sounds
heard all the
way to zero.

Especially
common in
children and
hypertensive
patients

Continue deflation for 10 mm Hg after sounds disappear

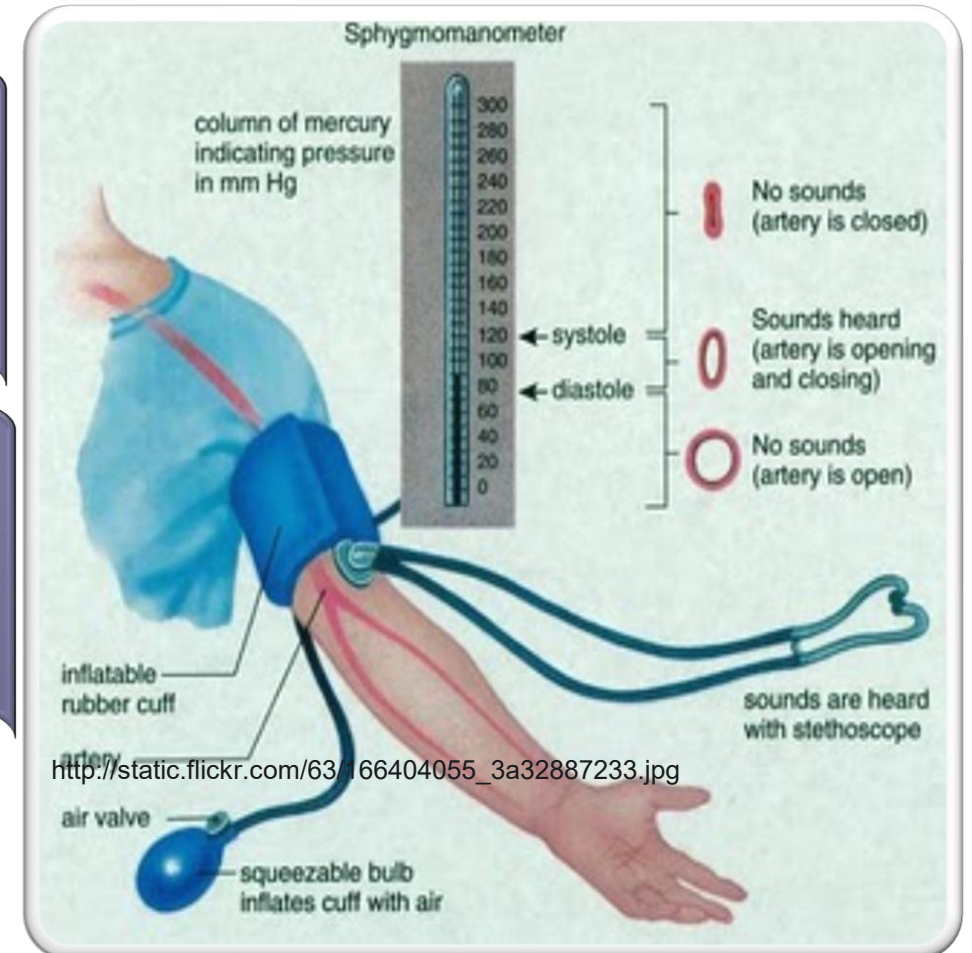
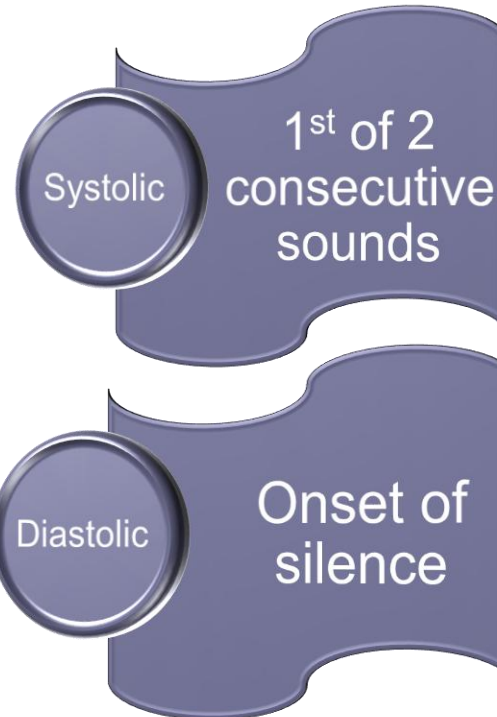


Korotkoff Sounds

What is it?

5 Phases:

- 1 Tapping
very faint at first
- 2 Swishing
- 3 Knocking
- 4 Muffling
- 5 Sounds
disappear



Enhancing Korotkoff Sounds

Rapidly
inflate cuff

Inflate cuff while arm is elevated

Open, close fist 8-10 times after
inflating above estimated systolic level



Korotkoff Sounds Practice

Take out a piece of paper and pen

Introduction

8 video scenarios



Lunch



Detection and Management of High Blood Pressure

Self-Measured Blood Pressure Monitoring (SMBP)

Home Blood Pressure Monitoring (HBPM)

Ambulatory Blood Pressure Monitoring (ABPM)

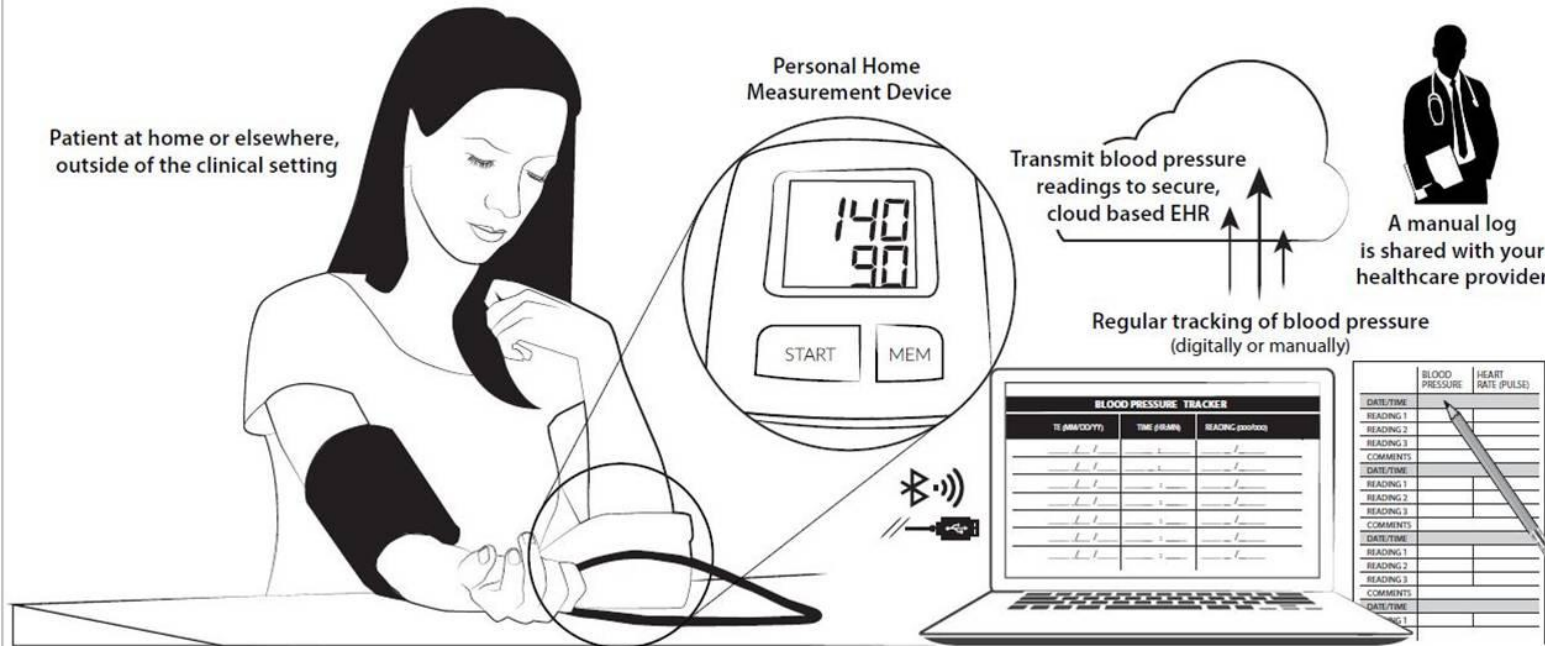


MCD
Global Health

Self-Measured Blood Pressure

What is Self-Measured Blood Pressure Monitoring (SMBP)?

Key Take-away
Home monitoring with frequent interactions with multidisciplinary team improves rates of BP Control



Use validated blood pressure devices. www.validatebp.org



Why Implement a SMBP Program

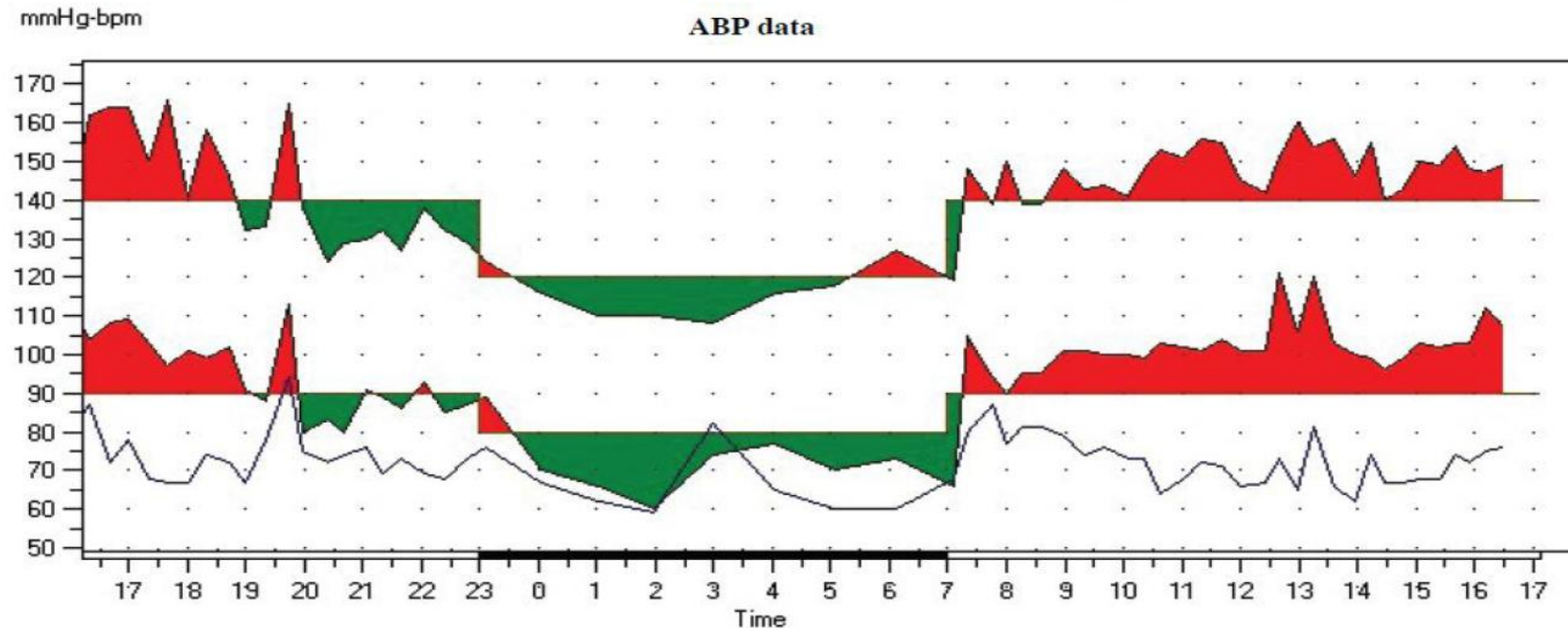
Highlights Changes in Blood Pressure

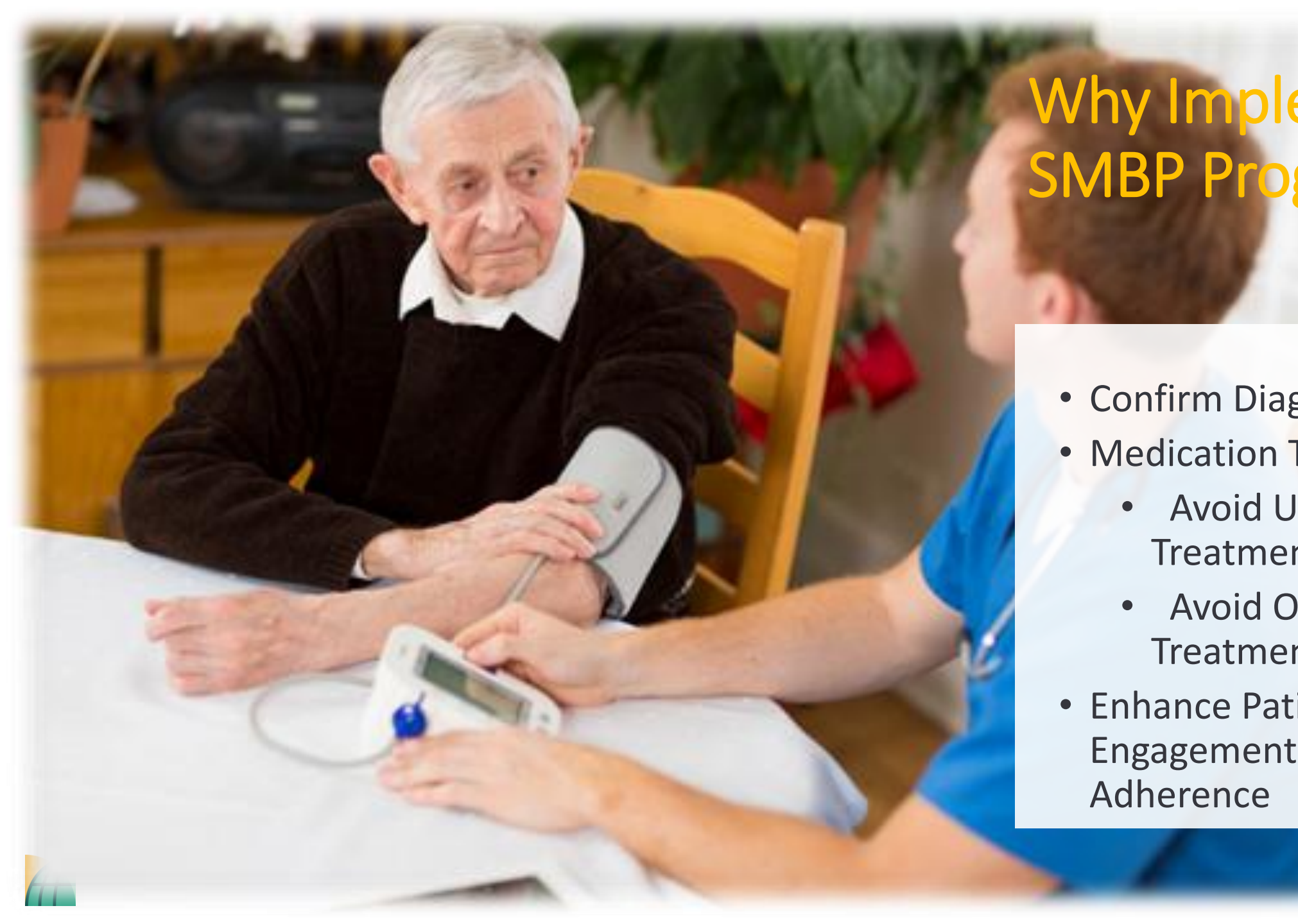
Confirm Diagnosis

White Coat

Masked hypertension

Blood pressure variability exists throughout the day and in all patients





Why Implement a SMBP Program?

- Confirm Diagnosis
- Medication Titration:
 - Avoid Under Treatment
 - Avoid Over Treatment
- Enhance Patient Engagement and Adherence

SMBP Program



- SMBP better predicts morbidity and mortality than do office blood pressure measurements
- Using it to guide diagnosis and treatment decisions likely produce better outcomes than using office blood pressure readings alone
- Self-measurements may better represent true blood pressure, because there are more readings over a longer period of time.



Identifying Patients for SMBP

Patients to consider for self-measurement include:

- Those with hypertension/uncontrolled hypertension
- Those with elevated office BP (Confirm Dx)
- Those recently diagnosed/med changes

Others that may benefit include patients with other health conditions such as:

- Diabetes, heart-kidney disease
- Elderly patients
- Pregnant women
- Rule out suspected “white-coat” or masked” hypertension
- Evaluate labile or resistant hypertension



Patients Who It May Not Be Appropriate to do SMBP

- Large-conical upper arms
- Distinct muffling at Korotkoff phase 4
- Motion conditions
 - Parkinson's
 - Atrial fibrillation
 - Cardiac and other arrhythmias
- Physical and/or mental disabilities



What's Wrong?



Proper Positioning



Manual Technique



1. Position the Patient

Seated in chair with back supported

Bare arm on flat surface at heart level

Feet flat on floor



2. Size & Place the cuff

Length 80-100%

Width 40 % arm circumference

Bottom edge of cuff
1" above the bend in elbow

Center over brachial artery



3. Estimate Systolic measure

Palpate radial pulse

Inflate cuff

Note where pulse disappears



4. Determine M.I.L

Add 20-30 points

Manual Technique



5. Wait 15-30 seconds

Place stethoscope in ears



6. Feel for a brachial pulse

Place stethoscope over the brachial pulse



7. Inflate cuff to the M.I.L

Take BP

Deflate at a rate of 2-3mmHg per second



8. Take additional readings

Record the average of the readings



Automated Technique

www.validatebp.org

Cuffless Blood Pressure Devices

Recommendation for Cuffless Blood Pressure Devices		
COR	LOE	Recommendation
3: No Benefit	C-LD	1. In adults, the use of cuffless BP devices is not recommended for the diagnosis or management of high BP.

1. Position patient

- Seated in chair with back supported
- Bare arm on table at heart level
- Feet flat on the floor

2. Size & place cuff

- Length 80-100% + width 40% arm circumference
- Bottom edge of cuff 1" above bend in elbow
- Center over brachial artery

3. Recognize

- Automated method is not accurate on all populations



Hands On Practice

- Pair Up
- Please find a space where you can be in proper position
- Keep the noise at a minimum

Questions?

Wrap Up

Evaluations

Materials



Thank you

- Contact Information
 - Shiqi Tao
 - stao@mcd.org
 - Jodi Beck, RN
 - jbeck@mcd.org

Resources

AHA/ACC Guideline

- <https://targetbp.org/best-practices/guidelines/>

AHA PREVENT Calculator

- <https://professional.heart.org/en/guidelines-and-statements/prevent-risk-calculator/prevent-calculator>

DASH Diet

- <https://www.nhlbi.nih.gov/education/dash-eating-plan>

MCD Global Health Online Training

- <https://bponline.mcd.org/>



Resources

Medication adherence and BP Control

- <https://www.ahajournals.org/doi/10.1161/HYP.0000000000000203>

Million Hearts Initiative

- <https://millionhearts.hhs.gov/index.html>

Self-Management Support

- https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/public/about-ama/iho-bp-engaging-patients-in-self-measurment_0.pdf

US Blood Pressure Validated Device Listing (VDL)

- <https://www.validatebp.org/>

