ROPER ST. FRANCIS HEALTHCARE

Updated Hypertension

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RSFH Primary Care Symposium Feb 2026

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Learning objectives

Accurately diagnose hypertension using office and home-based measurements.

Correctly counsel patients on lifestyle modifications and pharmacotherapy for the treatment of hypertension

Develop and identify an individualized recommendation/treatment plan for patients based on difference in pharmacotherapy classes and comorbid conditions

Identify who needs a secondary evaluation for secondary hypertension evaluation and specialist referral

WHY DOES IT MATTER?

- having high blood pressure increases risk of heart disease and stroke—which are the leading cause of death in the US

- in 2023, HTN was a primary or contributing cause of **664,470 deaths** in the US

- HTN is the **#1modifiable** risk factor for CV disease
  - Every 20/10mmHg increase above 115/75mmHg doubles risk

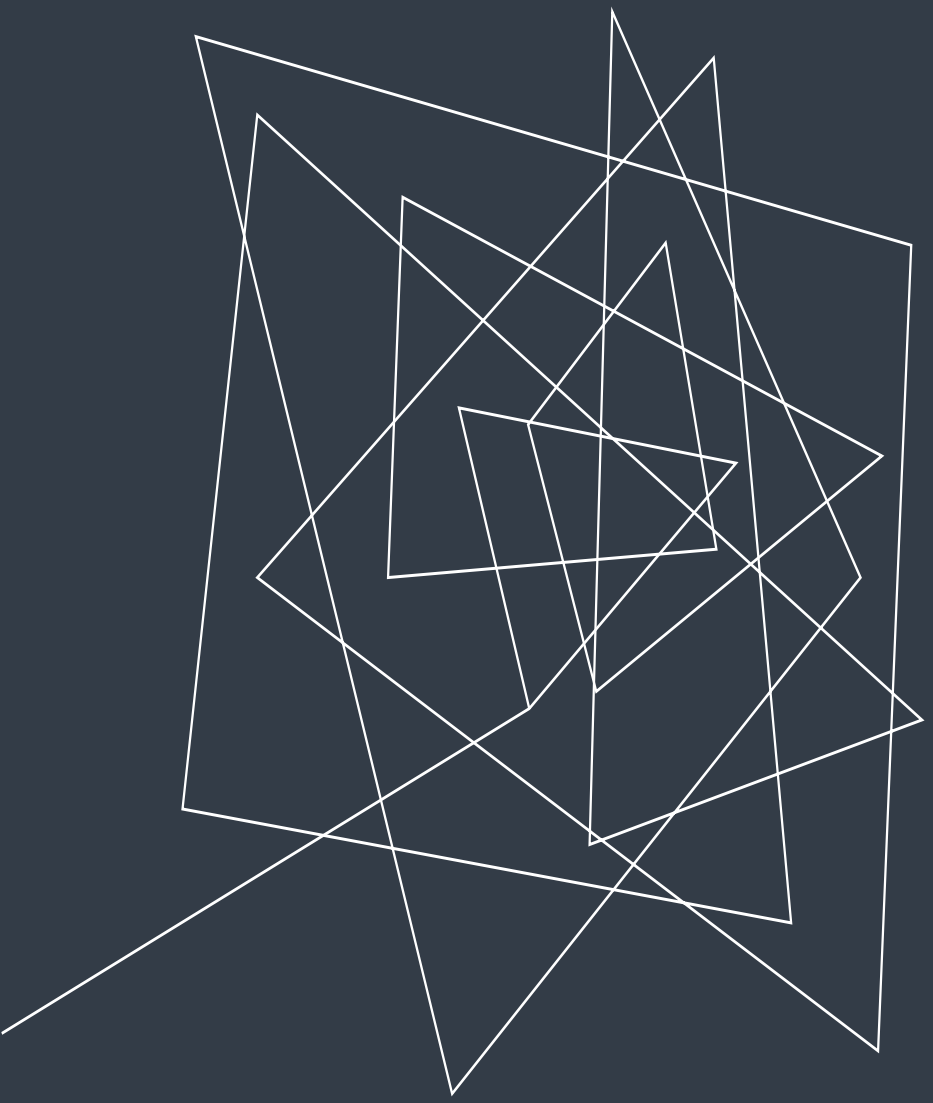
- nearly **HALF** of adults have HTN (48.1%/119.1 million)
  - Estimated **1.4 BILLION adults 30-79yo** worldwide have HTN in 2024; 33% of the population in the age range

https://www.cdc.gov/high-blood-pressure/data-research/facts-stats/index.html
https://www.who.int/news-room/fact-sheets/detail/hypertension

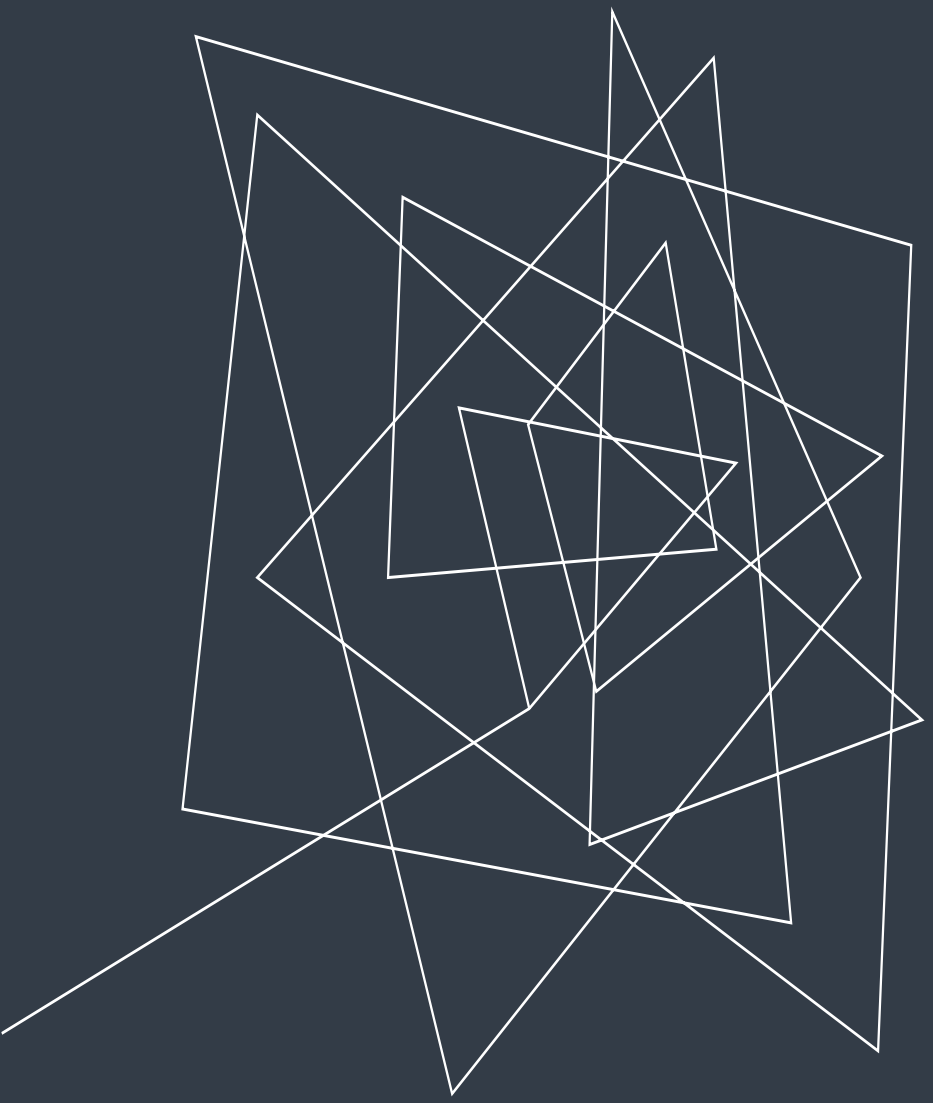
WHY DOES IT MATTER?

- There is a disparity
  - More men (50%) than women (44%) in the US have HTN
  - 2/3 of adults 30-79 yo with HTN live in middle/low income countries
  - In the US HTN is more common in non-Hispanic black (58%)than in non-Hispanic Asian (45%), non-Hispanic white (49%) and Hispanic (39%)
  - Est **600 MILLION** of those with HTN are unaware of diagnosis
  - Only **320 of the 630 MILLION** adults with hypertension have their HTN under control

https://www.cdc.gov/high-blood-pressure/data-research/facts-stats/index.html
https://www.who.int/news-room/fact-sheets/detail/hypertension



How to diagnose/screen for hypertension



Case:

45yo AfAm M presented to clinic to est care. No acute complaints. Hasn't seen a doctor in >10 years because he didn't have any issues/symptoms

No rx medications, no OTC meds other than occasional ibuprofen for MSK pain (very into pickle ball right now)

Family hx of MI in father at 75yo

VS 138/88mmHg, 80bpm, 99% on RA, 13 resp/min, afebrile, BMI 32 kg/m2

Exam: obese, otherwise unremarkable

What do you want to do?

Who to screen

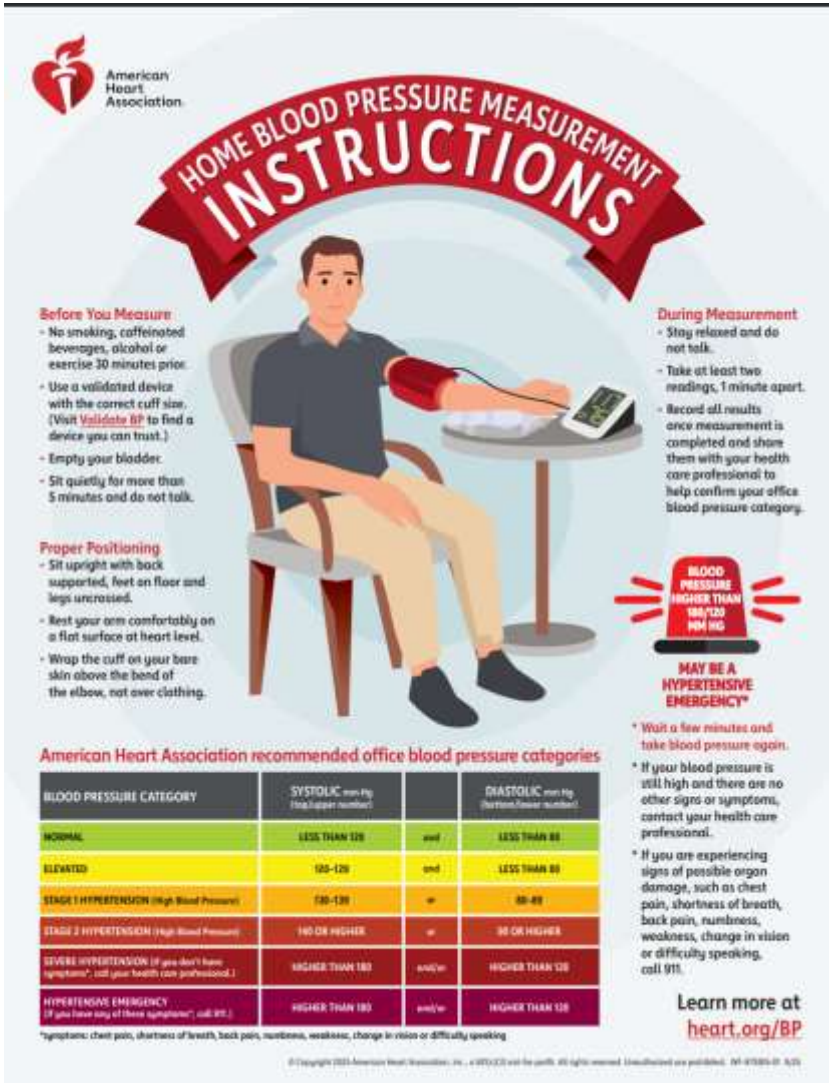
Population	Recommendation	Grade
Adults 18 years or older without known hypertension	The USPSTF recommends screening for hypertension in adults 18 years or older with office blood pressure measurement (OBPM). The USPSTF recommends obtaining blood pressure measurements outside of the clinical setting for diagnostic confirmation before starting treatment.	A

The American Academy of Pediatric recommends blood pressure screening at well child checks STARTING AT THE AGE OF 3. (grade 1 evidence)

https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/hypertension-in-adults-screening Published 2021
Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents. Pediatrics. 2017;140(3):e20171904

How to measure

https://www.validatebp.org/



If we aren't doing a good job at measuring...

Who can do ambulatory BP measurements?

ABPM PATIENT FAQS

Question	Sample response
Do I need to prepare the night before?	No, you can do everything you normally do the night before starting your test.
Do I need special attire?	We recommend that you wear a loose shirt, tank top, short-sleeved shirt, or button-down shirt so that you can comfortably wear the blood pressure (BP) cuff on your upper arm.
How often will my BP be measured?	Your BP will be measured every 30 minutes. During the day, the device will beep to warn you a measurement is about to be taken. During the night, the device will not beep while you are sleeping. If an accurate measurement cannot be o... or some other reason, then the device w... measurement one minute later.
Do I have to wear the device when I sleep?	Yes. We realize it can be uncomfortable ... sleep. But measurements obtained durin... information about your BP. We recomme... device during sleep.
What happens if I can't sleep with the device on?	If you are unable to continue monitoring ... turn off the device and remove it until th... the device back on in the morning, rem... again.
Should I shower with it?	No, you should remove and turn off the ...
Can I exercise with the device?	Yes. You can perform light exercise with ... recommend that you remove the device ... such as sports or running. The device als... contact with water.

Patient with an ABPM machine fitted
Photo: mwandiology.com

Fam Pract Manag. 2020;27(3):19-25

COMMON ABPM INDICATIONS AND INSURANCE COVERAGES

Enlarge Print

Indication (ICD-10)	Covered by Medicare/Medicaid	Covered by commercial insurers
White coat hypertension (R03.0)	Yes	Usually
Masked hypertension (ICD-10 code pending)	Planned	Usually
Resistant or labile hypertension (I10)	No	Usually
Nocturnal hypertension (no specific ICD-10 code)	No	Usually
Post-prandial or orthostatic hypotension or syncope (I95.1 or R55)	No	Usually

Enlarge Print

CMS coverage indications for ABPM*	
For diagnosis of suspected white coat hypertension	Elevated average office BP (per new American Heart Association guideline) on two separate visits with at least two separate measurements made at each visit and with at least two BP measurements outside the office < 130/80 mm Hg
For diagnosis of suspected masked hypertension	Average office systolic BP 120-129 mm Hg or diastolic BP 75-79 mm Hg on two separate office visits with at least two separate measurements made at each visit and with at least two BP measurements outside the office ≥ 130/80 mm Hg
*Patient is covered for one test per year	

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WHAT EVALUATION DO PATIENTS NEED

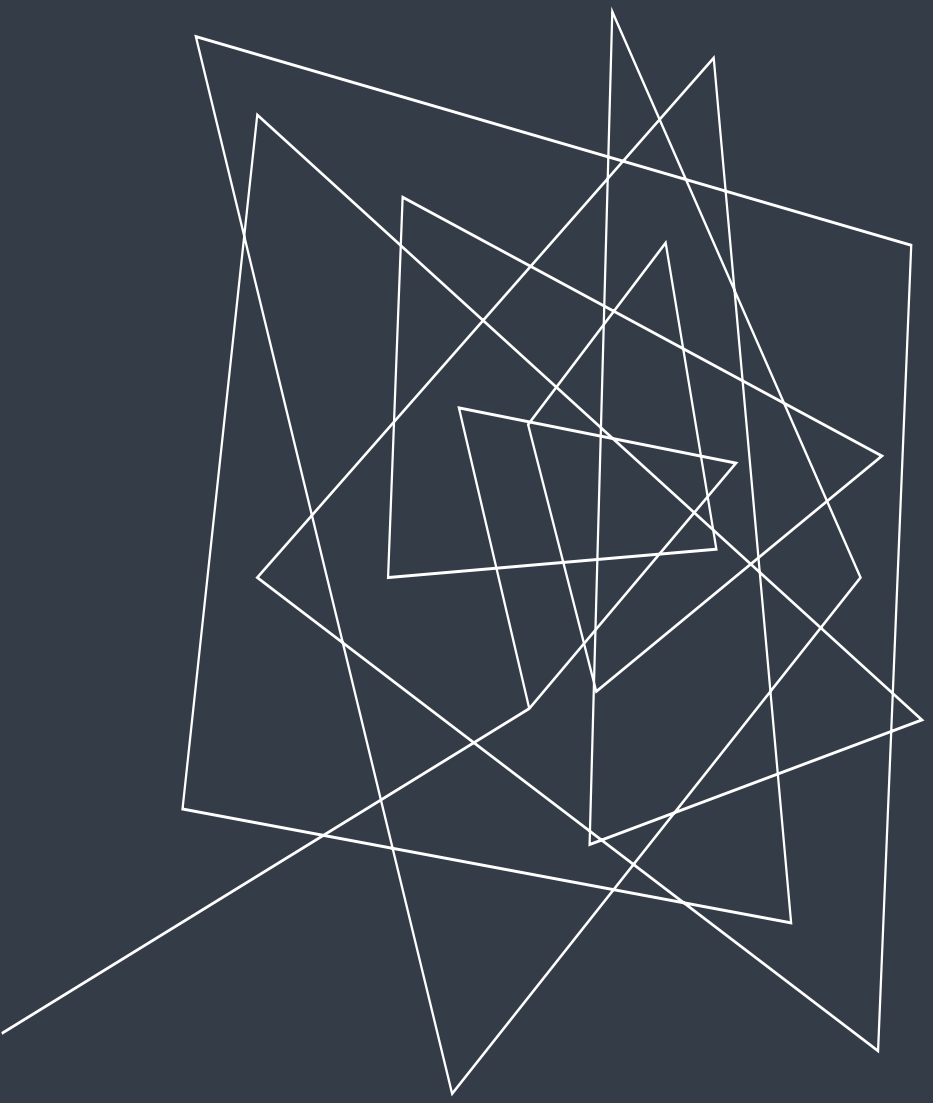
Basic testing:

- Fasting blood sugar
- CBC
- Lipid screening (ASCVD/Prevent)
- Cr/eGFR
- Na/K/Ca2+
- TSH
- UA
- Urine albumin/Cr

Optional testing:

- EKG
- TTE

Guideline-Driven Management of Hypertension: An Evidence-Based Update. Circulation Research. 2021;128(7):827-846



Back to our patient…

He has been monitoring his BP and sent it through his mychart BP log. He is averaging 138/84 mmHg

He got his blood work done

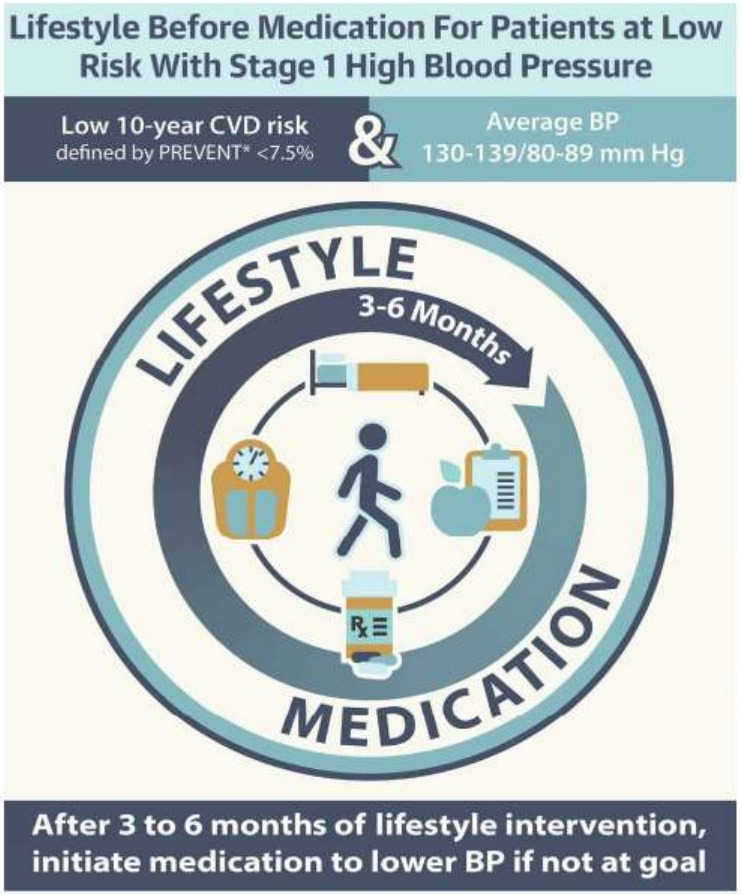
- eGFR 102
- K 3.7
- BG 87 (A1c 5.6)
- CBC wnl
- TSH 3.3
- Cholesterol 215
- HDL 38
- LDL 150
- TG 250
- UA with reflex normal
- urine microalb/cr 3

CLINICAL PRACTICE GUIDELINE

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

- Rx for BP if:
  - >140/90 on average
  - PREVENT score is >7.5%
  - Diabetes or CKD
  - Clinical CVD

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



Food, exercise and lifestyle

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Weight loss	Weight/body fat	Best goal is ideal body weight but aim for at least a 1-kg reduction in body weight if overweight. **Expect about 1 mm Hg for every 1-kg reduction in body weight.**	-5 mm Hg	-2/3 mmHg
Healthy diet	**DASH dietary pattern**	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	-11 mm Hg	-3 mmHg
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d but aim for at least a 1000-mg/day reduction in most adults.	-5/6 mm Hg	-2/3 mmHg
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.	-4/5 mm Hg	-2 mmHg

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

https://www.myplate.gov/

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

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

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Physical activity	Aerobic	• 90–150 min/wk • 65%–75% heart rate reserve	-5/8 mm Hg	-2/4 mm Hg
	Dynamic resistance	• 90–150 min/wk • 50%–80% 1 rep maximum • 6 exercises, 3 sets/exercise, 10 repetitions/set	-4 mm Hg	-2 mm Hg
	Isometric resistance	• 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk • 8–10 wk	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol† to: • Men: ≤2 drinks daily • Women: ≤1 drink daily	-4 mm Hg	-3 mm

2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

Children need more!
AT LEAST 60 minutes of moderate to vigorous physical activity daily

https://www.cdc.gov/physical-activity-basics/guidelines/adults.html

Example 1

Moderate-intensity aerobic activity (such as brisk walking) for 150 minutes every week (for example, 30 minutes a day, 5 days a week).

AND

Muscle-strengthening activities on 2 or more days a week that work all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms).

Example 2

Vigorous-intensity aerobic activity (such as jogging or running) for 75 minutes (1 hour and 15 minutes) every week.

AND

Muscle-strengthening activities on 2 or more days a week that work all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms).

Example 3

An equivalent mix of moderate- and vigorous-intensity aerobic activity on 2 or more days a week.

AND

Muscle-strengthening activities on 2 or more days a week that work all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms).

Pharmacotherapy

For every 10mmHg decrease in SBP there is a **60% reduction** risk of stroke

Every **20/10mmHg** increase in BP **DOUBLES CV** mortality risk

Adding a low dose of a **2nd medication** is **4 TIMES** more effective than doubling dose

Control usually requires at least 2 medications; can be combo meds

Lewington S, Clarke R, Qizilbash N, Peto R, Collins R; Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies [published correction appears in Lancet. 2003 Mar 22;361(9362):1060]. Lancet. 2002;360(9349):1903-1913. doi:10.1016/s0140-6736(02)11911-8

Wald DS, Law M, Morris JK, Bestwick JP, Wald NJ. Combination therapy versus monotherapy in reducing blood pressure: meta-analysis on 11,000 participants from 42 trials. Am J Med. 2009;122(3):290-300. doi:10.1016/j.amjmed.2008.09.038

Copley JB, Rosario R. Hypertension: a review and rationale of treatment. Dis Mon. 2005;51(10-11):548-614. doi:10.1016/j.disamonth.2005.10.004

Case:

32 yo F who is 6 months post-partum and still breast feeding. She did have gestational HTN and was on nifedipine but she stopped it at home. BP measured appropriately in clinic was 142/100 mmHg. Home measurements taken appropriately were similar. What do you want to start?

A. nifedipine
B. losartan
C. chlorthalidone
D. spironolactone

Case

50-year-old obese male who has not been seen in 10 years (wasn't having any problems) presented because his partner made him. BP measured appropriately in clinic was 160/98mmHg, HR 80bpm, BMI 40 m/kg2. He drinks 2-3 drinks most nights and smokes 1 PPD. No labs available but a BP in express care 2 years ago was 170/100 mmHg when he was seen for a viral URI. Other than counseling on EtOH and nicotine use, what would you recommend?

1. **Give him 3 months to work on lifestyle and if no improvement start medications**
2. **Start amlodipine monotherapy and lifestyle changes**
3. **Start combination therapy with ACEi/ARB/thiazide/CCB with lifestyle changes**
4. **Refer to cardiology**

First line agents

Thiazide-like (HCTZ/chlorthalidone)

Indications considerations	Contraindications considerations
ESLD	
Nephrolithiasis	ESRD? (CLICK trial)
Hyperkalemia	Gout
	Hyponatremia

CCB (dihydropyridines)

Indications considerations	Contraindications considerations
	Swelling?
Breast feeding	
Raynauds	
PRES/CVA/ICH (nicardipine gtt)	

Thiazide/thiazide like

NAME	Comparison	Dosing schedule
hydrochlorothiazide	Less BP lowering 3-6mmHg less than others	12.5-50mg daily but >25mg not recommended
chlorthalidone	**PREFERRED AGENT** **More hypoK**	12.5-25mg daily
indapamide	Not used as much	1.25-2.5mg daily

Comparative Efficacy and Safety of Chlorthalidone and Hydrochlorothiazide-Meta-Analysis.
Dineva S, Uzunova K, Pavlova V, et al.
Journal of Human Hypertension. 2019;33(11):766-774. doi:10.1038/s41371-019-0255-2.

Dihydropyridine CCBs

NAME	Comparison	Dosing schedule
amlodipine	Onset 24-48 hours LASTS at least 24 if not 72 hrs	2.5-10mg daily
nifedipine ER	Don't use IR form for chronic BP INC risk of hypotension	30-90mg daily
felodipine	Onset 2-5 hours, lasts 24 hours	2.5-10mg daily
nicardipine	Not great outpatient medication, good inpatient drip	20-40mg TID

UpToDate

First line agents

ACEi

Indications considerations	Contraindications considerations
HFrEF	
Post-MI	b/l RAS
CKD	angioedema
microalbuminuria	Hyperkalemia
	cough

ARB

Indications considerations	Contraindications considerations
Ditto to ace-I with the following exceptions: losartan (gout/uricosuric) candesartan (migraine) No cough No angioedema (can start after ace-I with washout)	

ARBs

NAME	Potency	Dosing schedule
losartan	LEAST	25-100mg in 1-2 divided doses
valsartan	Around irbesartan	80-320mg daily
irbesartan	#5	150-300mg daily
telmisartan	#4	20-80mg daily
candesartan	#3	8-32mg daily
olmesartan	#2	20-40mg daily
azilsartan	MOST	40-80mg daily

Antihypertensive Efficacy of Angiotensin Receptor Blockers as Monotherapy as Evaluated by Ambulatory Blood Pressure Monitoring: A Meta-Analysis.
European Heart Journal. 2014;35(26):1732-42. doi:10.1093/eurheartj/eht333.
Comparison of Angiotensin II Type 1 Receptor Antagonists in the Treatment of Essential Hypertension.
Drugs. 2008;68(9):1207-25. doi:10.2165/00003495-200868090-00003.

ACEi

NAME	Potency	Dosing schedule
lisinopril	24 hours	5-40mg daily
enalapril	12-24 hours	5-40mg in 1-2 divided doses
ramipril	24 hours	2.5-20 mg in 1-2 divided doses
benazepril	24 hours	10-40mg in 1-2 divided doses
quinapril	24 hours	10-80 mg in 1-2 divided doses

Second line therapy

Aldosterone antagonists (spironolactone/eplerenone)

Indications considerations	Contraindications considerations
CKD (K/Cr caution)	hyperK
ESLD	Gynecomastia
PCOS	
Hormonal acne	

BB

Indications considerations	Contraindications considerations
Post-MI	DM?
ESRD	Elderly?
Aortic dissection (esmolol)	?asthma
Esophageal varicies	
Tachycardia	
Anxiety?	
ET	
migraine 	

Second line therapy

alpha-1 antagonist (Prazosin)

Indications considerations	Contraindications considerations
PTSD/nightmares	
BPH	
ESRD	

alpha-2 agonist (clonidine)

Indications considerations	Contraindications considerations
Opiate withdrawal	Reflex HTN
Insomnia	
GAD	

Beta-Blockers

NAME	Type	Considerations
atenolol	B1	Bronchospasm, only with MI/arrythmia
metoprolol	B1	Succinate in HF Not first line unless comorbidities
propranolol	B1/B2	NOT first line Ischemic heart disease, ET, migraine, hyperthyroidism
bisoprolol	HIGHLY B1	Ischemic heart disease, HFrEF, arrythmia
carvedilol	Alpha 1/ B1/ B2	Ischemic heart disease, HFrEF, arrythmia
labetalol	Alpha 1/ B1/ B2	pregnancy

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 College of Cardiology/-American Heart Association Joint Committee on Clinical Practice Guidelines.
Journal of the American College of Cardiology. 2025;86(18):1567-1678. doi:10.1016/j.jacc.2025.05.007.

Blood Pressure Lowering Efficacy of Beta-1 Selective Beta Blockers for Primary Hypertension.
Wong GW, Boyda HN, Wright JM.
The Cochrane Database of Systematic Reviews. 2016;3:CD007451. doi:10.1002/14651858.CD007451.pub2

case

45yo M presented for HTN follow up. He was started on chlorthalidone at his last visit and got repeat blood work. On his metabolic panel his eGFR went from 102 to 95 and his K went from 3.6 to 2.9. His BP at home averages 146/88mmHg (previously was 160/90mmHg) and in clinic today his BP is 140/85mmHg. What do you want to do?

1. **Cont chlorthalidone and add olmesartan**
2. **Cont chlorthalidone, add olmesartan and get hyperaldosteronism labs**
3. **Stop chlorthalidone and change to CCB**
4. **Stop chlorthalidone. Change to CCB+ARB and get primary hyperaldosteronism work up**

Case

48yo F with a PMH of HTN presented to est care. BP in the office was 169/119mmHg measured appropriately. At home she can be >200mmHg systolic. She is asymptomatic and states 'this is normal for her' and she has been dealing with HTN for 20+ years. Her current med list has amlodipine 10mg, clonidine 0.3mg BID , doxazosin 2mg, carvedilol 25mg BID. HCTZ and chlorthalidone were also both listed but she isn't sure what she is taking. The pharmacy most recently filled clonidine 0.3mg BID, amlodipine 10mg and doxazosin 2mg. Carvedilol, HCTZ and chlorthalidone has all expired >6 months ago. She has an ACEi allergy listed (swelling).

What do you want to do?

Who gets a secondary work-up?

Resistant hypertension

- AHA/ACC:
  - BP above goal despite 3+ antihypertensives of different classes, including a diuretic at max tolerated doses.

Hyperaldosteronism—

20-35% resistant HTN have hyperaldo (ACC)

- Resistant hypertension
- Spontaneous OR diuretic induced hypoK
- Adrenal incidentaloma
- OSA
- Unexplained AF
- Fam hx

Primary Aldosteronism: An Endocrine Society Clinical Practice Guideline.

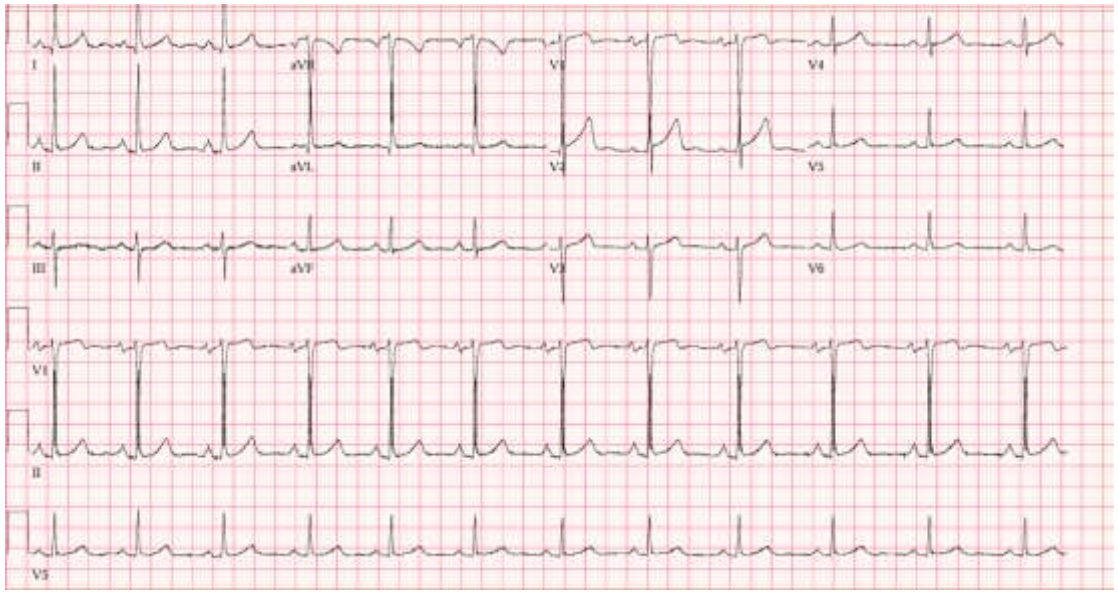
Adler GK, Stanwood AM, Correa RR, et al.
The Journal of Clinical Endocrinology and Metabolism. 2025;110(9):2453-2495. doi:10.1210/clinem/dgaf284

BMP:
Na 137
K 5.1
Cl 102
Co2 22
BG 87
BUN 23
Cr 2.1
eGFR 29

Ua with proteinuria but no prior urine microalbumin/cr

TTE LVEF 55% with grade 2 diastolic dysfunction

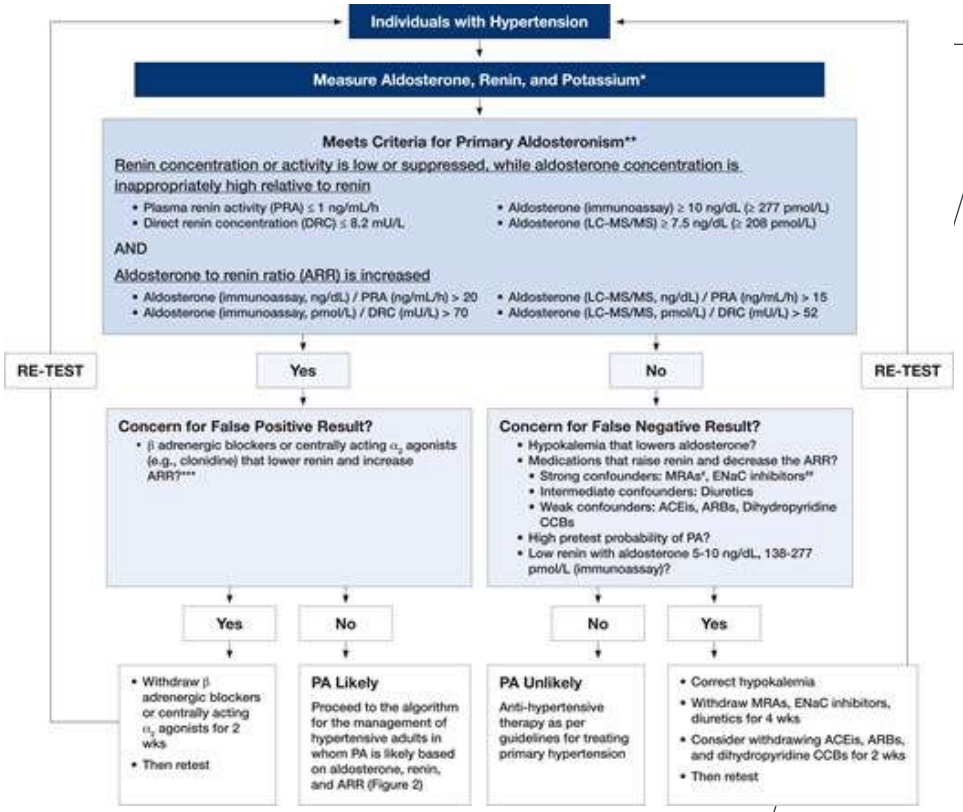
-Serum metanephrines normal
-urine metanephrine/normetanephrines normal
-renin/aldo:
renin 0.366
aldosterone 4.5
renin/aldosterone 13.4



How do you test for hyperaldosteronism?

Positive

1. Renin <1ng/mL/h
2. Elevated aldosterone >10ng/dL



Gail K Adler, Michael Stowasser, Ricardo R Correa, Nadia Khan, Gregory Kline, Michael J McGowan, Paolo Mulatero, M Hassan Murad, Rhian M Touyz, Anand Vaidya, Tracy A Williams, Jun Yang, William F Young, Maria-Christina Zennaro, Juan P Brito, Primary Aldosteronism: An Endocrine Society Clinical Practice Guideline, *The Journal of Clinical Endocrinology & Metabolism*, Volume 110, Issue 9, September 2025, Pages 2453–2495, https://doi.org/10.1210/clinem/dgaf284

Who do you re-test?

1. **If hypokalemia or interfering meds were present**
2. **High pretest probability despite neg results**
3. **Renin is low but aldosterone is 5-10ng/dL**

Primary Aldosteronism: An Endocrine Society Clinical Practice Guideline.
The Journal of Clinical Endocrinology and Metabolism. 2025;110(9):2453-2495. doi:10.1210/clinem/dgaf284.

Another case

- 52yo F presented for HTN after her home measurements were high. She did have a HA that has since resolved.
- BP in the office 207/120 mmHg
- Started on losartan-HCTZ with ER precautions
- BMP:
  - Na 136
  - K3.6 (from 3.9)
  - Cr 0.9; eGFR 89
  - Neg urine for microalbuminuria

- In follow up her BP was 166/88 mmHg

Renin 0.382
Aldosterone **19.7**
Renin/aldo **51.6**

CT abdomen: slight thickening of the L adrenal gland w/o discrete nodule. Normal R adrenal

What are some combo meds?

ACE/ARB + diuretic

- Lisinopril-HCTZ (Zestoretic)
- Losartan-HCTZ (Hyzaar)
- benazepril-HCTZ (Lotensin)
- Valsartan-HCTZ (Diovan)
- Candesartan-HCTZ (Atacand)

ACEi/ARB + CCB

- Amlodipine-Olmesartan (Azor)
- Amlodipine-valsartan (Exforge)
- Telmisartan-amlodipine (Twynsta)
- Amlodipine-benazepril (Lotrel)
- Trandolapril-verapamil (Tarka)

TRIPLE COMBINATIONS
Valsartan-amlodipine-HCTZ
Olmesartan-amlodipine-HCTZ
Telmisartan-amlodipine-HCTZ
Candesartan-amlodipine-chlorthalidone

Questions?