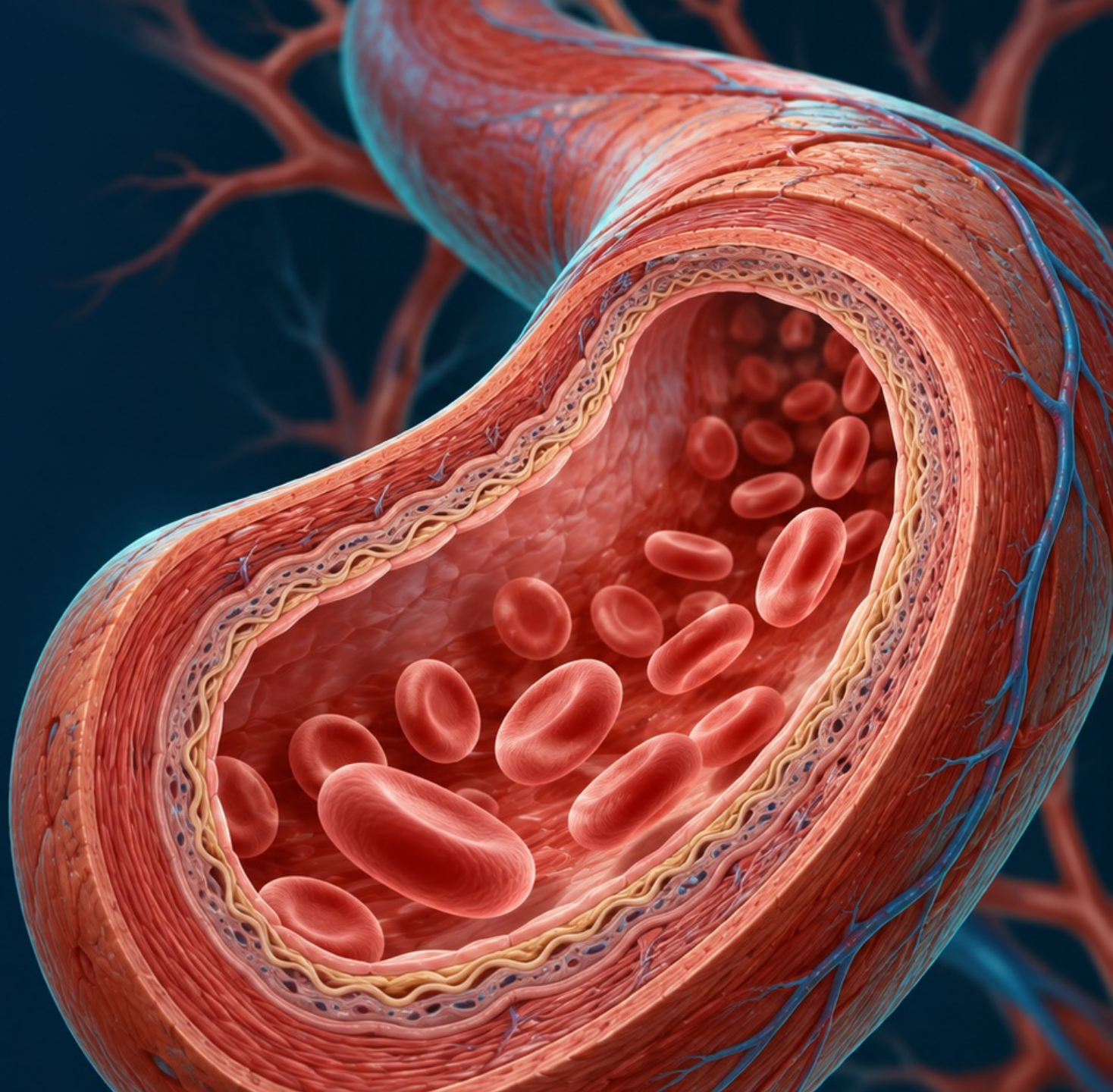


Hypertension

Mechanisms, diagnosis
and treatment in primary care

FAMILY MEDICINE

2025 AHA/ACC framework



Example case and workup

154/94

mm Hg at a routine visit

52-year-old adult, asymptomatic

Repeat office BP 150/92

Obesity, prepared foods, frequent ibuprofen

No known CVD, diabetes, or CKD

The clinical decisions

- 01 Confirm sustained hypertension
- 02 Classify pressure and assess risk
- 03 Choose treatment and follow-up

Nearly half of U.S. adults have hypertension

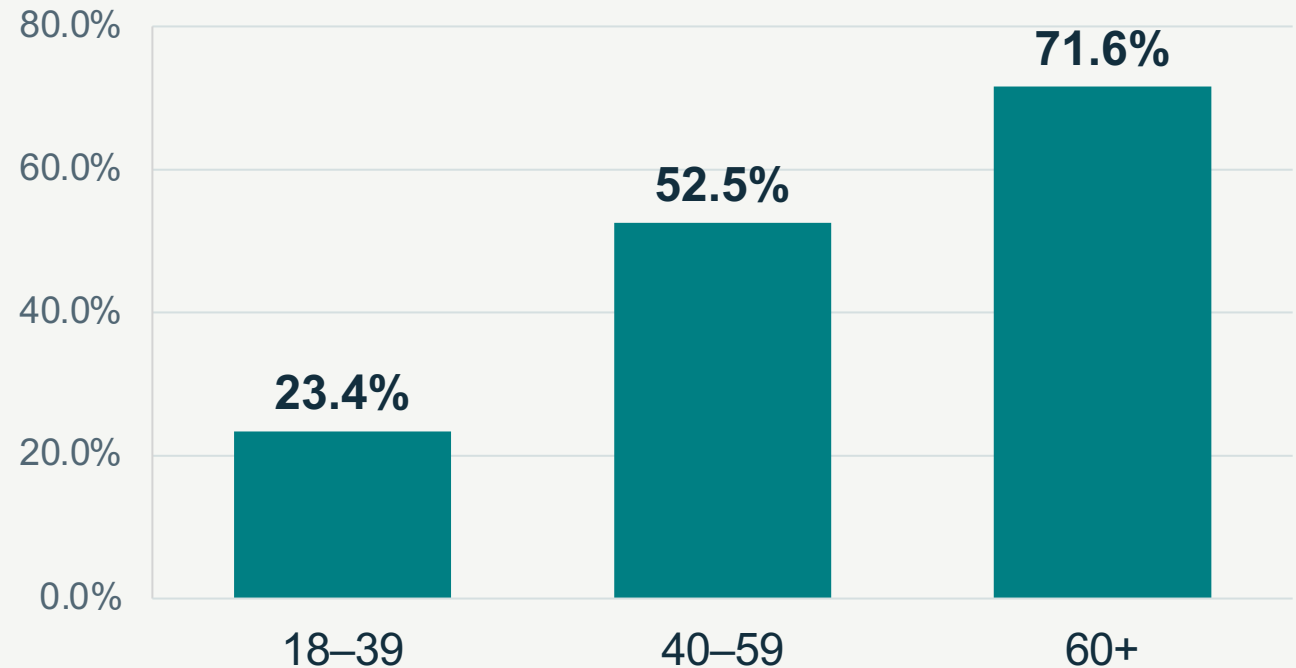
47.7%

of all adults had hypertension

20.7%

of adults with hypertension
were controlled to <130/80

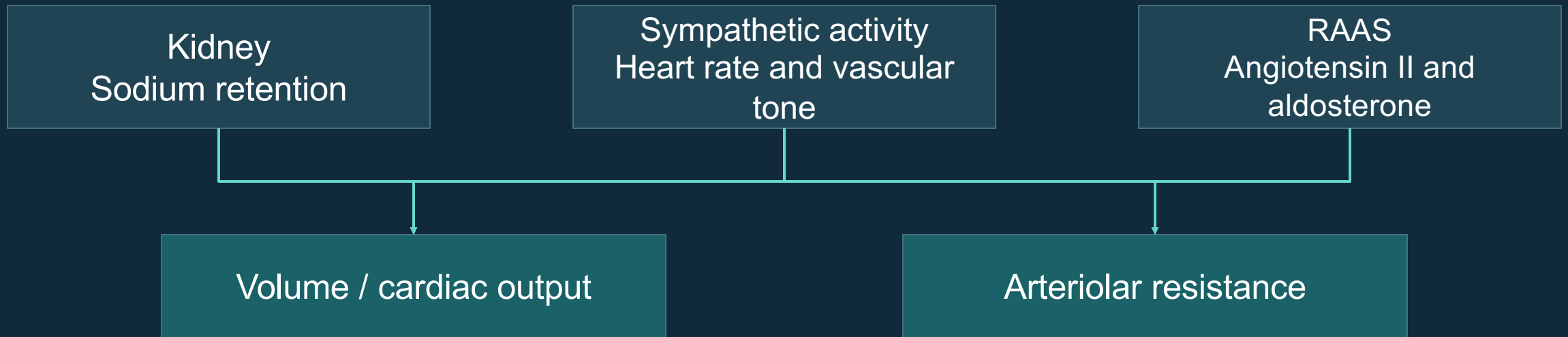
Prevalence by age



NHANES, August 2021–August 2023. Crude estimates. Definition: $\geq 130/80$ or medication use.

Pressure reflects volume and vascular resistance

Mean arterial pressure $\approx$ cardiac output $\times$ systemic vascular resistance



Endothelial dysfunction and remodeling sustain resistance.
Large-artery stiffness increases systolic pressure and pulse pressure.

Organ injury can develop before symptoms

Brain

Stroke
Cognitive decline

Kidneys

Albuminuria
Chronic kidney disease



Heart

Left ventricular hypertrophy
Coronary disease, heart failure

Risk rises with the degree and duration of elevated pressure.

Classification uses the higher category

U.S. category	Systolic, mm Hg	Relationship	Diastolic, mm Hg
Normal	<120	AND	<80
Elevated	120–129	AND	<80
Stage 1 hypertension	130–139	OR	80–89
Stage 2 hypertension	≥140	OR	≥90

126/84 = stage 1

146/76 = stage 2

Accurate measurement precedes treatment

5 minutes of quiet rest

2 readings, 1 minute apart

7 days of home readings

Office / out of office	Normal out of office	High out of office
Normal office	Normotension	Masked hypertension
High office	White-coat hypertension	Sustained hypertension

Validated upper-arm cuff. Supported back, feet, and arm. No talking.
Home: two readings each morning and evening. ABPM when available.

[4] Muntner et al. Hypertension. 2019 [5] USPSTF. JAMA. 2021

The first evaluation establishes risk and safety

History and examination

Symptoms of organ injury
Family history, sleep, alcohol
Medication and supplement review

Baseline testing

Electrolytes, creatinine / eGFR
Glucose or A1c, lipid profile
Urinalysis, urine ACR, ECG

Contributors to address

NSAIDs, stimulants, decongestants
Excess alcohol, high sodium
Cost and barriers to adherence

Risk and organ damage

Established cardiovascular disease
Diabetes, CKD, albuminuria
PREVENT-CVD risk when eligible

Secondary causes deserve a deliberate search

Clinical clue	Consider	Initial evaluation
Resistant BP or hypokalemia	Primary aldosteronism	Aldosterone + renin
Snoring, apneas, sleepiness	Obstructive sleep apnea	Sleep assessment / study
Kidney dysfunction or renal clues	Renal / renovascular disease	eGFR, ACR ± targeted imaging
Episodic spells with compatible symptoms	Pheochromocytoma	Plasma or urine metanephrines

Normal potassium does not exclude primary aldosteronism.

2025 Endocrine Society: conditional suggestion to screen all adults with hypertension for PA.

Lifestyle treatment has measurable effects

-11.5

mm Hg systolic

**DASH + low sodium
versus control + high sodium**

Hypertensive subgroup in a
controlled feeding trial

DASH eating pattern

Vegetables, fruit, whole grains

Lower sodium intake

Read labels and plan substitutions

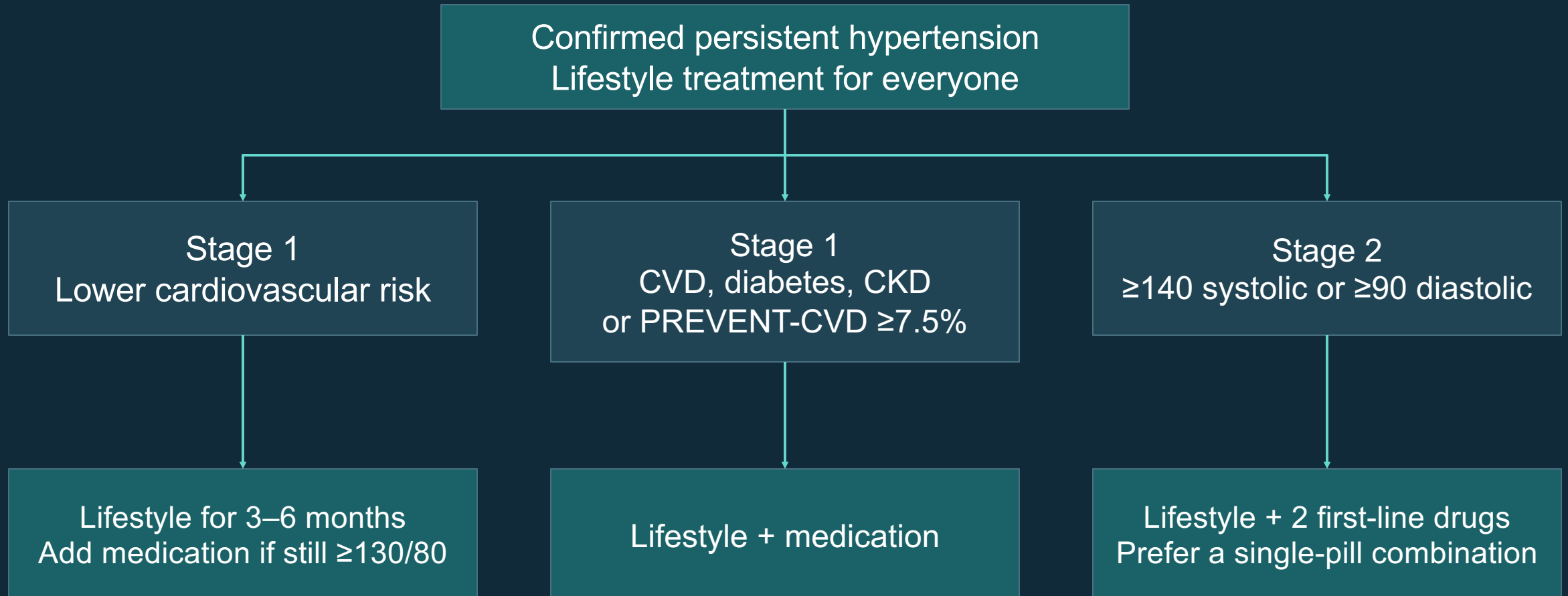
Activity and weight

Regular exercise and attainable goals

Less alcohol

Reduce intake or avoid alcohol

Medication initiation depends on pressure and risk



Stage 1: 130–139 systolic or 80–89 diastolic. PREVENT applies to eligible adults aged 30–79.

Four first-line classes, complementary mechanisms

Class / mechanism	Example starting dose*	Important adverse effects
Thiazide-like diuretic Renal sodium excretion	Chlorthalidone 12.5 mg daily	Low Na / K, gout Monitor renal function
Dihydropyridine CCB Arteriolar vasodilation	Amlodipine 5 mg daily	Ankle edema, headache Minimal electrolyte effects
ACE inhibitor Reduced angiotensin II	Lisinopril 10 mg daily	Cough, angioedema, high K Creatinine rise
ARB AT₁ receptor blockade	Losartan 50 mg daily	High K, creatinine rise Less cough than ACE inhibitors

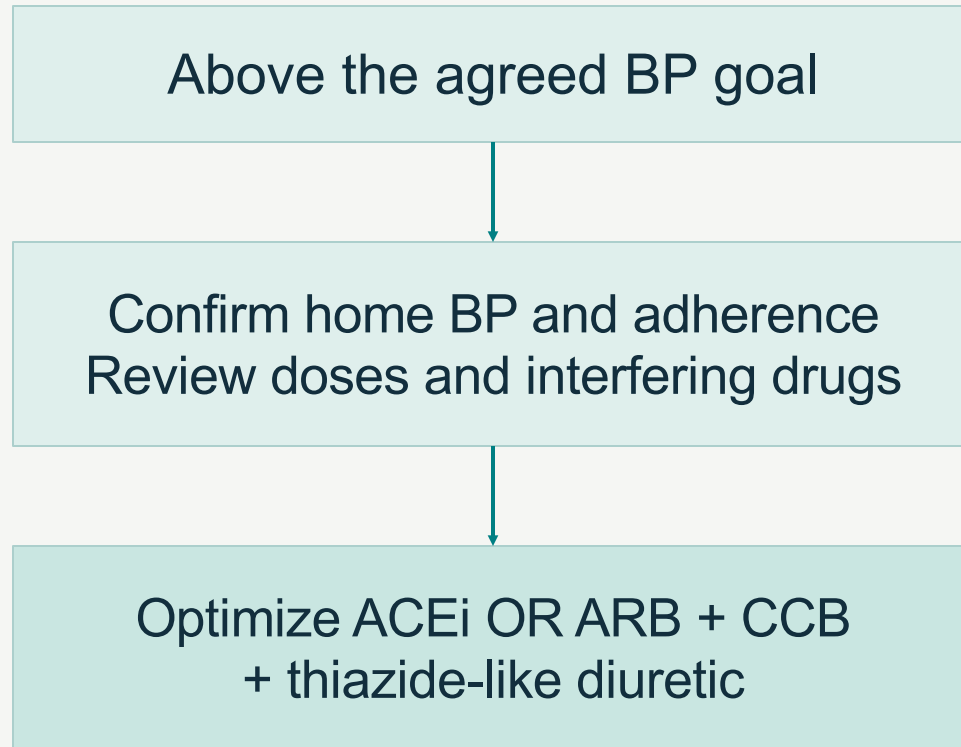
*Common adult examples. Individualize dose. Avoid ACEi/ARB in pregnancy and avoid ACEi + ARB.

Comorbidity changes the preferred regimen

Clinical context	Treatment implication
CKD with albuminuria	ACE inhibitor or ARB when appropriate
HFrEF / compelling cardiac indication	Use disease-specific therapy, including an indicated beta blocker
Pregnancy or pregnancy planning	Separate pathway: often labetalol or nifedipine ER Avoid ACE inhibitors and ARBs
Frailty or symptomatic orthostasis	Individualize the target and titrate cautiously

Diabetes alone does not require an ACEi/ARB when albuminuria is absent.

Escalation and resistant hypertension



Apparent resistance

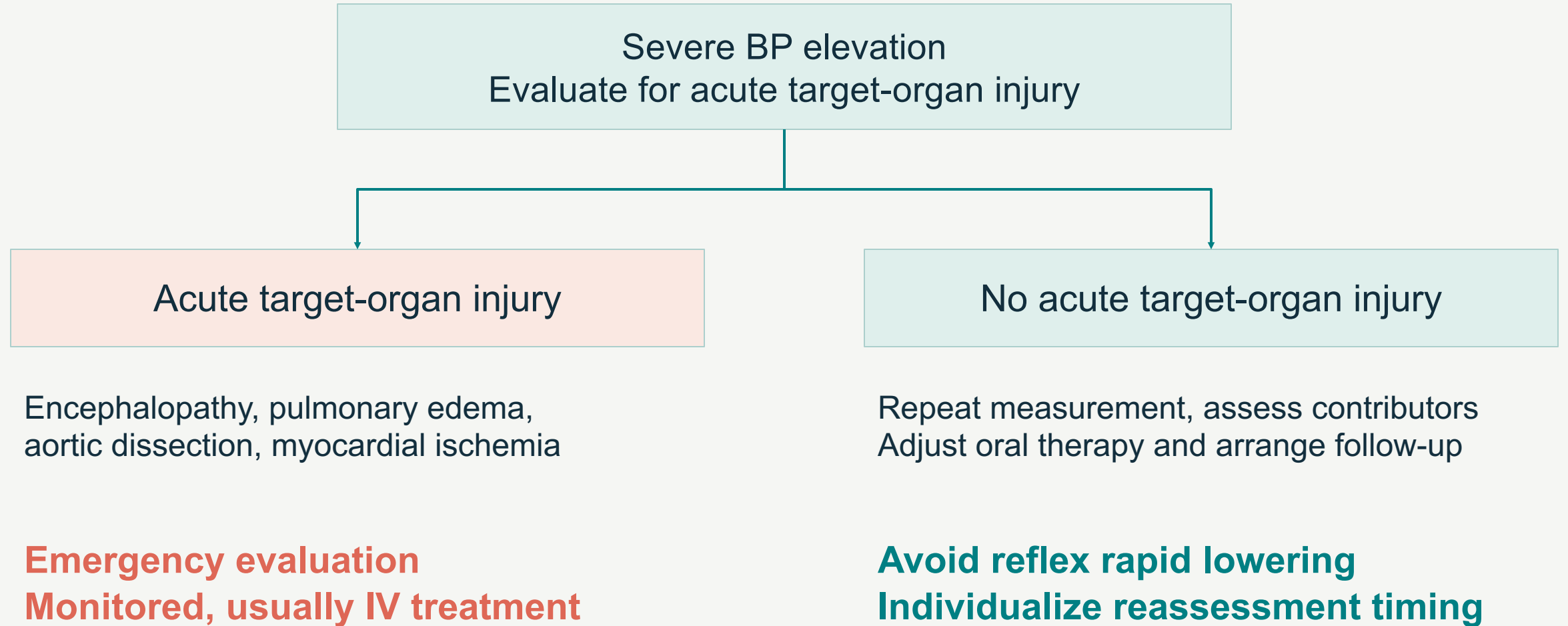
Above goal on 3 classes at maximally tolerated doses (including a diuretic), or controlled on ≥ 4 agents

After excluding pseudoresistance

Evaluate secondary causes
Consider spironolactone
Monitor K and kidney function

PATHWAY-2: spironolactone lowered home SBP 8.7 mm Hg more than placebo.

Acute organ injury defines the emergency



Lower pressure reduces cardiovascular events

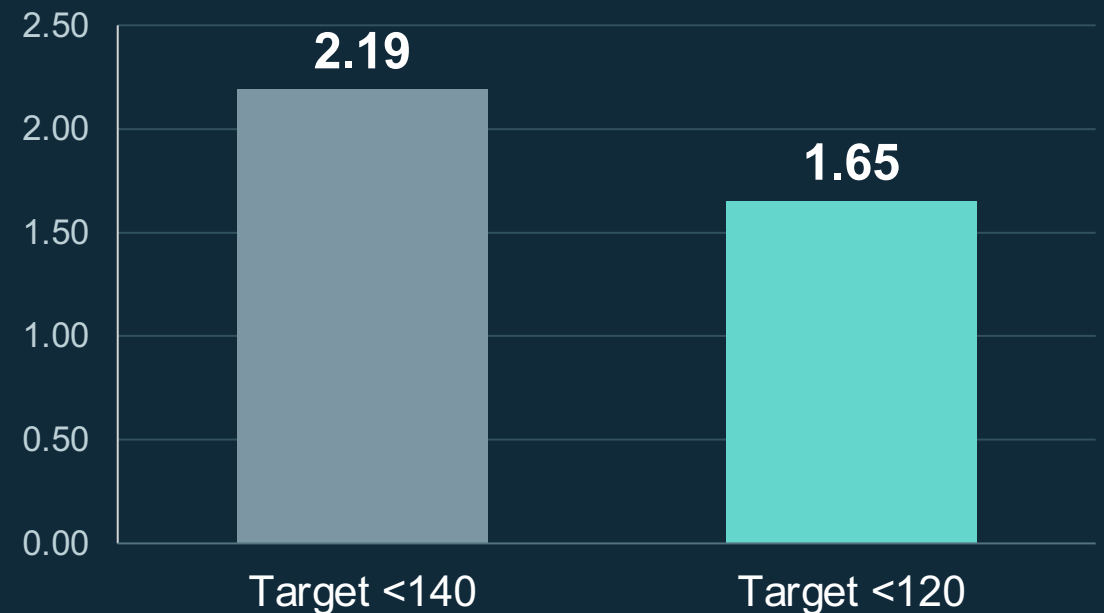
5 mm Hg lower SBP

≈10%

relative reduction in
major cardiovascular events

Absolute benefit depends on baseline risk.
Monitor hypotension, kidney injury,
and electrolyte abnormalities.

SPRINT: primary cardiovascular events

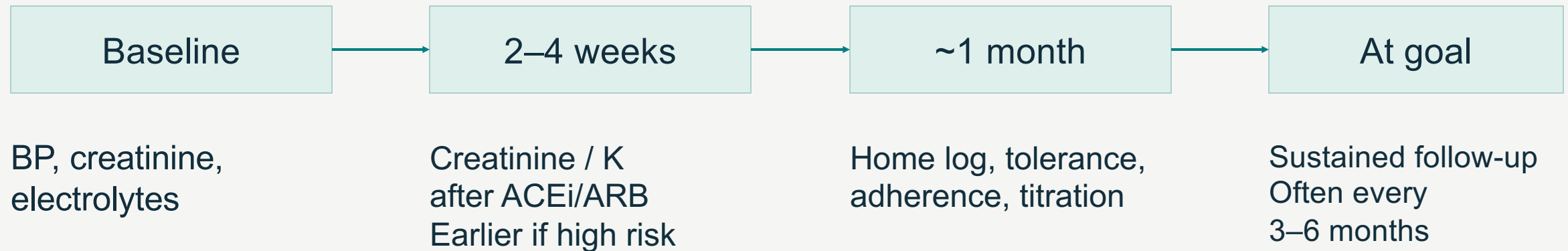


Events per 100 person-years
High-risk adults without diabetes or prior stroke

Follow-up turns a prescription into control

Usual AHA/ACC goal

<130/80 mm Hg



Individualize for orthostasis, frailty, competing illness, and patient preferences.

The case: a complete primary-care plan

148/91

Average home BP confirms
sustained hypertension

Normal K, eGFR, and urine ACR
No acute target-organ injury

Illustrative treatment plan

Medication

Low-dose ARB + amlodipine

Lifestyle

DASH / sodium goal and NSAID review

Monitoring

Labs in 2–4 weeks, BP review in ~1 month

Accurate measurement. Individualized treatment. Sustained follow-up.

Appendix: guideline targets differ

Guideline	Usual treatment target	Clinical qualification
AHA/ACC 2025	<130/80 mm Hg	Individualize for tolerance and clinical context
ESC 2024	SBP 120–129 mm Hg for most treated adults	If tolerated; exceptions for frailty, age ≥85, limited life expectancy, or orthostasis
AAFP 2022	<140/90 mm Hg	Consider <135/85 to reduce MI risk with shared decision-making

Diagnosis threshold, treatment threshold, and treatment target are separate decisions.

Appendix: example adult doses and monitoring

Drug	Common start	Usual daily range	Monitoring / caution
Chlorthalidone	12.5 mg daily	12.5–25 mg	Na, K, creatinine, gout
Amlodipine	5 mg daily	2.5–10 mg	Edema; 2.5 mg may suit frail adults
Lisinopril	10 mg daily	10–40 mg	K, creatinine; cough / angioedema
Losartan	50 mg daily	25–100 mg	K, creatinine; adjust for clinical context
Spironolactone*	12.5–25 mg daily	25–50 mg	K / creatinine early, often ≤ 1 week

*Add-on for selected resistant hypertension. Renal function and potassium may limit use.
ACEi/ARB: avoid in pregnancy. Doses require individualization and product-specific review.

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