

New Hypertension Guidelines

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Disclosures

★ None

Objectives

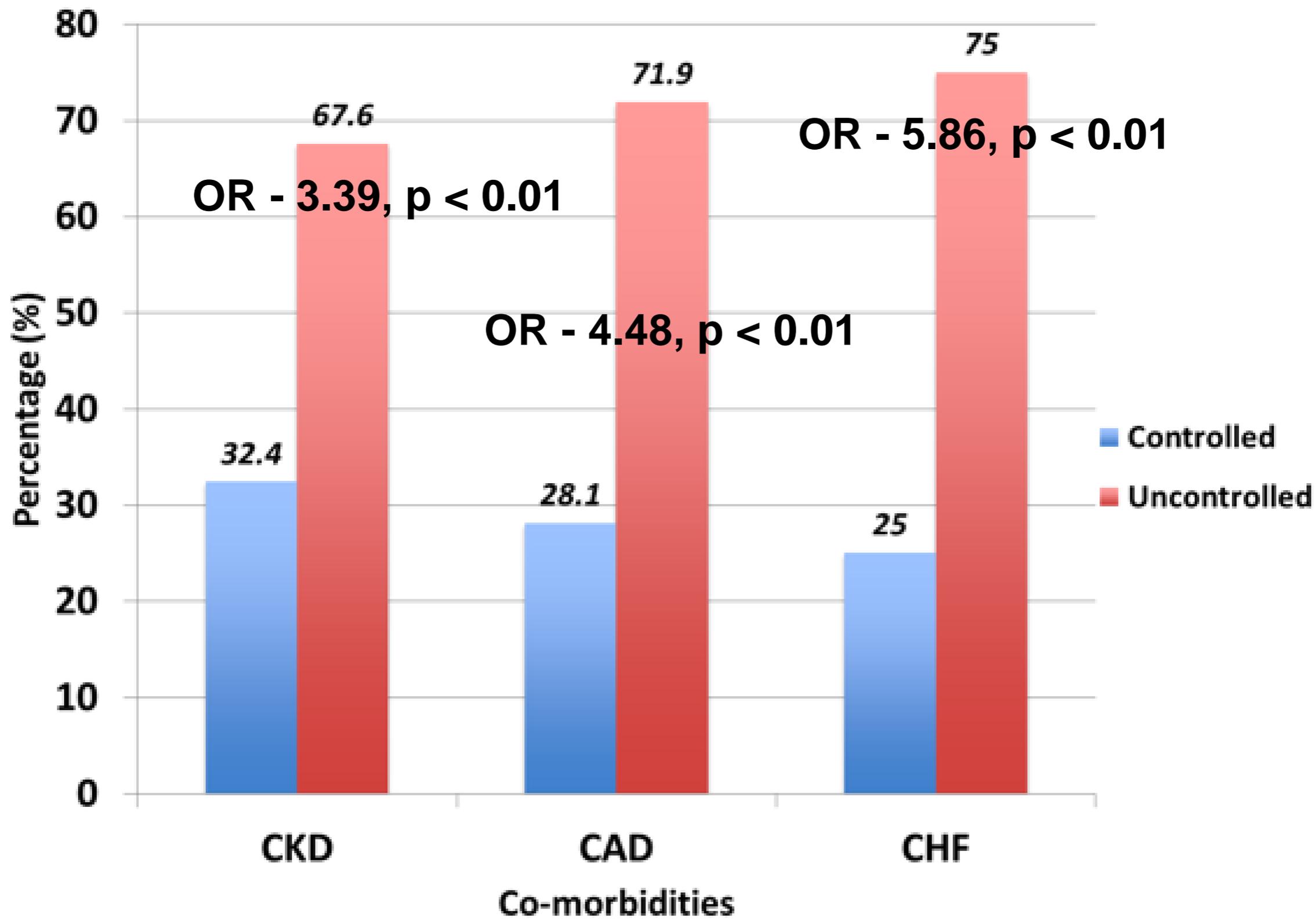
- ★ The new blood pressure definitions and cardiovascular risk
- ★ The role to time and location in the diagnosis of hypertension
- ★ Apply evidence-based approach to choice of antihypertensive agents.

Brief Facts

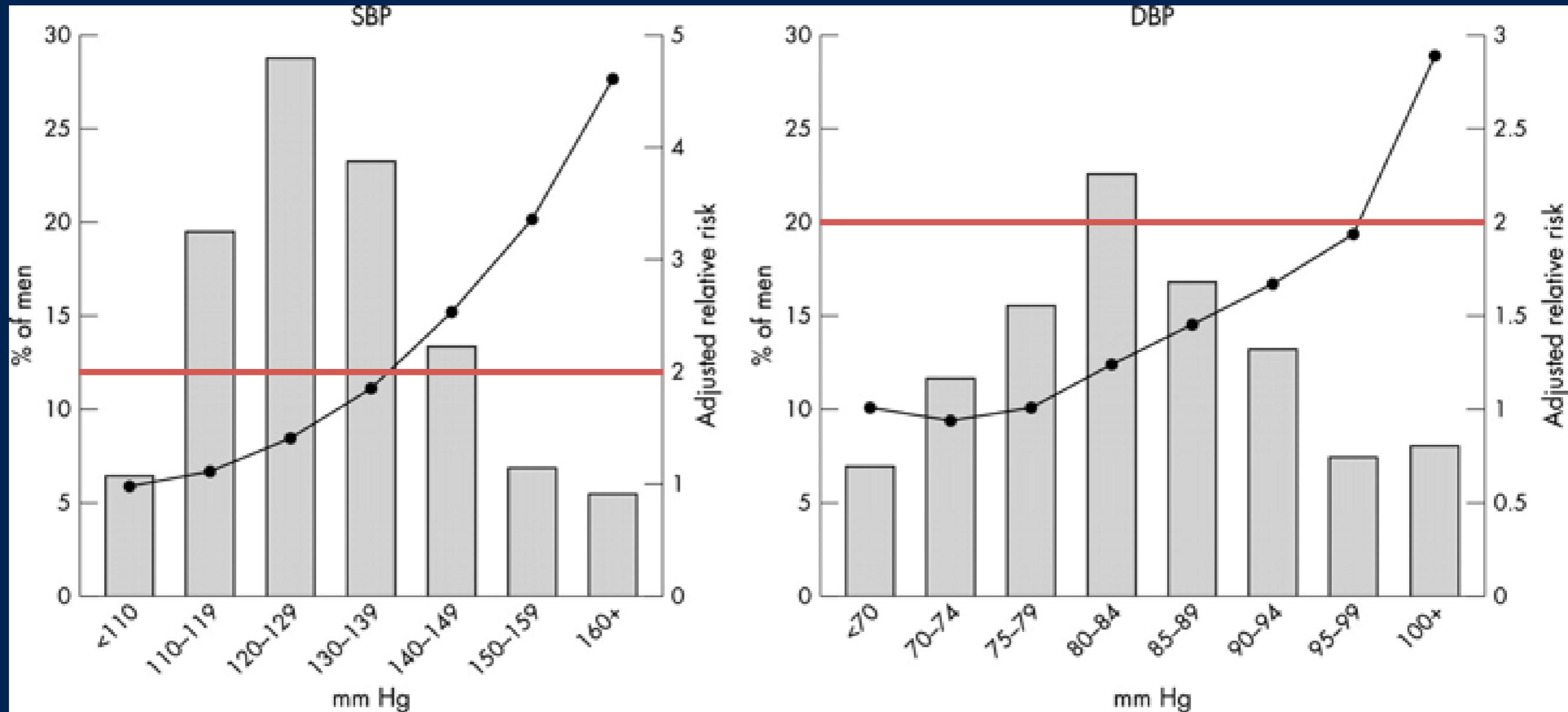
- ★ 9 million deaths / yr, 15% of all deaths
- ★ ASCVD risk & hypertension - **Dose - effect response**
- ★ Awareness has improved by about 80%
- ★ One in 4 adult Americans has hypertension

Let's Bring it Home!

- ★ 49% of clinic patients have hypertension
- ★ 59% were controlled
- ★ Ethnicity and Insurance status did not have any effect on control
- ★ Controlled patients - 1.5 medications
- ★ Uncontrolled patients - 3.1 medications



Adjusted relative risk of CV mortality by SBP and DBP



FDR Hobbs Heart 2004; 90: iv22-iv25

Heart

New Blood Pressure Definition

Categories of BP in Adults*

| BP Category | SBP | | DBP |
|---------------------|---------------|-----|-------------|
| Normal | <120 mm Hg | and | <80 mm Hg |
| Elevated | 120-129 mm Hg | and | <80 mm Hg |
| Hypertension | | | |
| Stage 1 | 130-139 mm Hg | or | 80-89 mm Hg |
| Stage 2 | ≥140 mm Hg | or | ≥90 mm Hg |

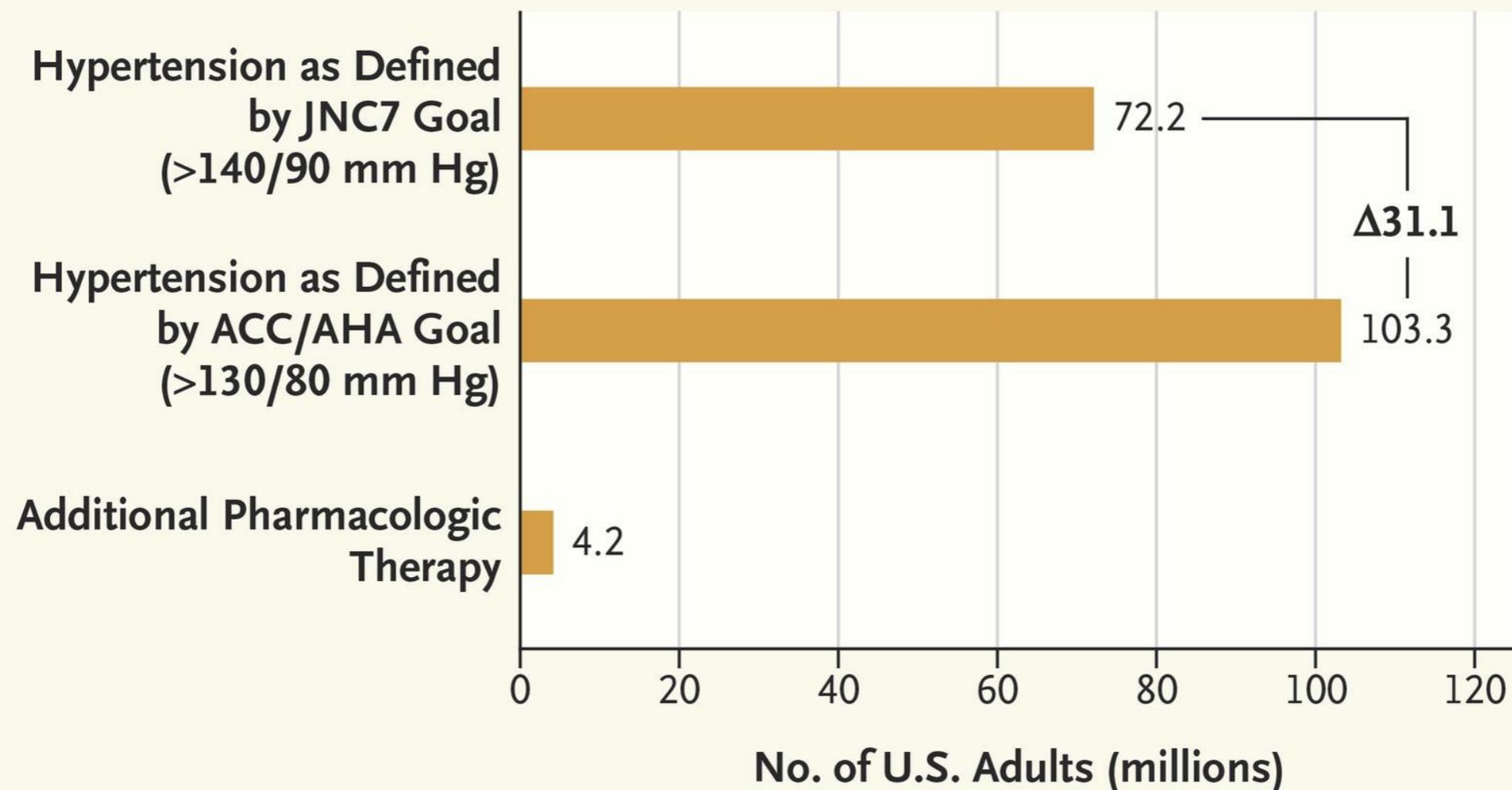
*Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.

Table 6

Based on the new hypertension thresholds what is the new prevalence of hypertension in the US?

- A. 1 out of 3
- B. 1 out of 4
- C. 1 out of 5
- D. 2 out of 5
- E. 1 out of 6

Hypertension Prevalence



Patient One

- ★ A 29 yo M UGA graduate student presents to the clinic for PREP. The office assistant checked his blood pressure and assessed it to be an average of 139/93 after three readings. 4 weeks prior he was treated for bronchitis at which time his blood pressure was 132/85. He has a significant family history of hypertension. What is the next step in management?
- A. Repeat office measurements in 3 month
 - B. Start antihypertensives, as per the new guidelines he has hypertension
 - C. Home blood pressure monitoring for a week
 - D. Assess him for secondary causes of hypertension since he is very young.

Out-of-Office and Self-Monitoring BP

| COR | LOE | Recommendation for Out-of-Office and Self-Monitoring of BP |
|-----|-----------------|--|
| I | A ^{SR} | Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions. |

- ★ Confirming diagnosis of hypertension
- ★ Diagnosing white coat or masked hypertension
- ★ Monitoring therapy

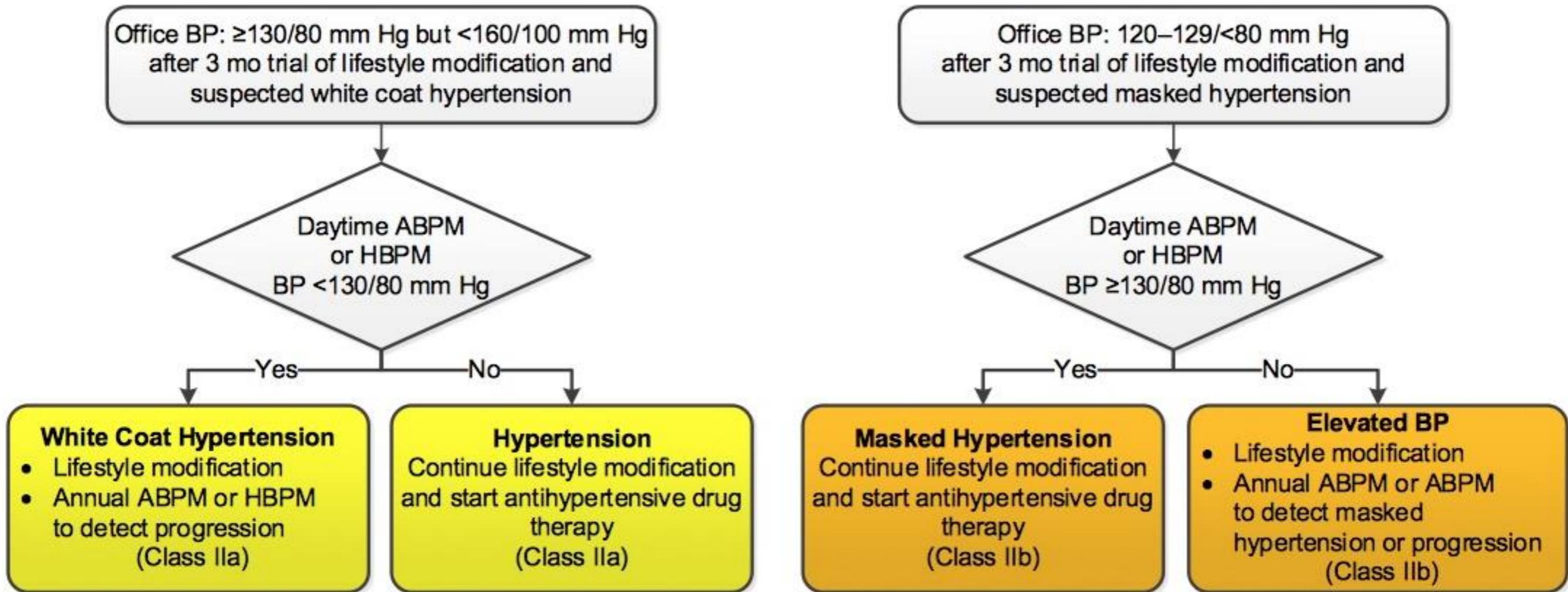
Time! Time! Time!

| Clinic | HBPM | Daytime ABPM | Nighttime ABPM | 24-Hour ABPM |
|---------|--------|--------------|----------------|--------------|
| 120/80 | 120/80 | 120/80 | 100/65 | 115/75 |
| 130/80 | 130/80 | 130/80 | 110/65 | 125/75 |
| 140/90 | 135/85 | 135/85 | 120/70 | 130/80 |
| 160/100 | 145/90 | 145/90 | 140/85 | 145/90 |

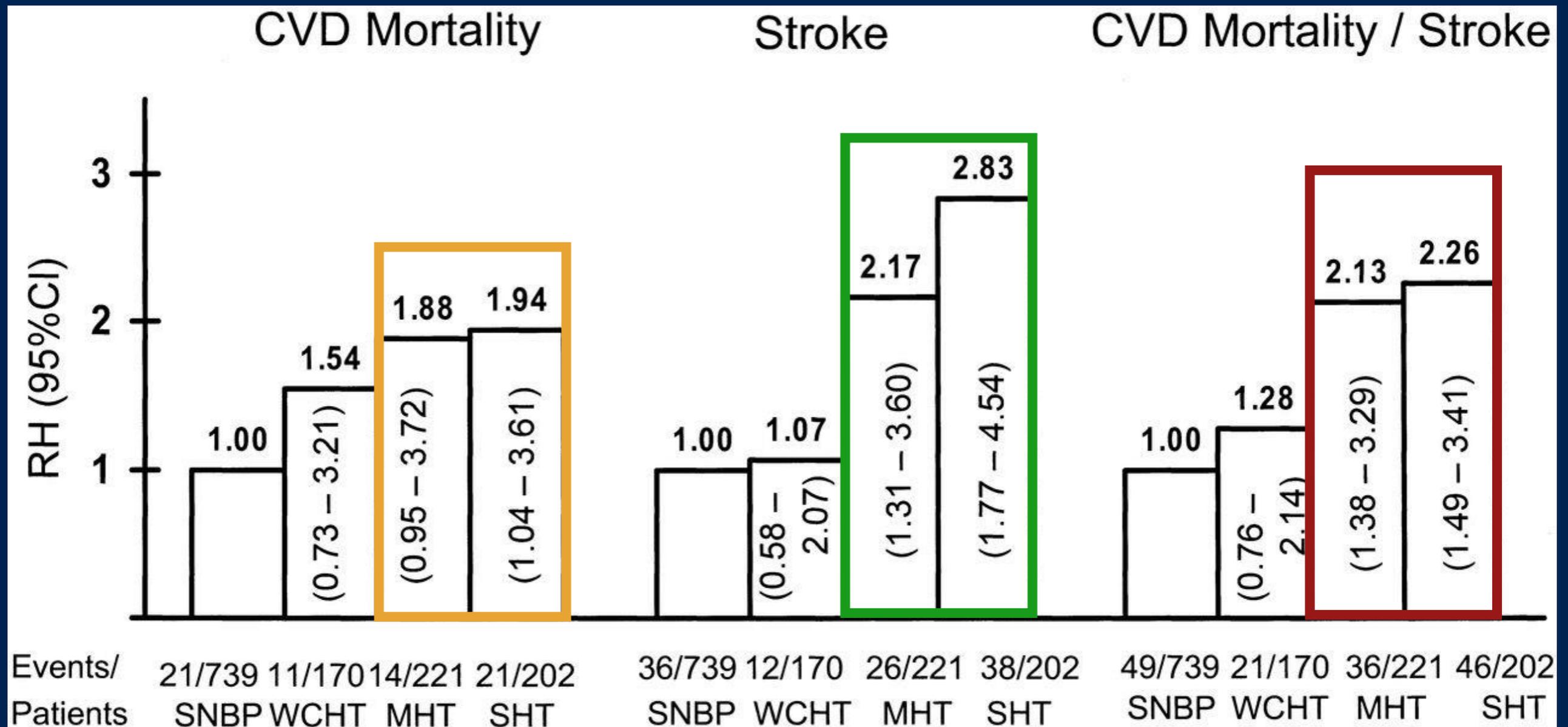
Types of Hypertension

| | Office/Healthcare Setting | Home/ABPM |
|-------------------------|---|-----------|
| Normotensive | - | - |
| Sustained hypertension | + | + |
| Masked hypertension | - | + |
| White coat hypertension | + | - |
| Secondary hypertension | Sustained hypertension due to underlying etiology | |
| Resistant Hypertension | Not at goal despite 3 meds + Diuretic | |

WCHT & MHT



Cardiovascular Risk associated with WCHT and MHT



Secondary Hypertension

Indications for Secondary hypertension Work-up

Drug-resistant hypertension

Abrupt onset of hypertension

Onset of hypertension at < 30 yrs

Exacerbation of previously controlled hypertension

Disproportionate target organ damage for degree of hypertension

Accelerated/malignant hypertension

Onset of diastolic hypertension in older adults ≥ 65 y

Unprovoked or excessive hypokalemia

Secondary Hypertension

| Common Causes | Uncommon Causes | |
|---------------------------|--|---|
| Renal parenchymal disease | Pheochromocytoma /paraganglioma | Primary hyperparathyroidism |
| Renovascular disease | Cushings Syndrome | Congenital adrenal hyperplasia |
| Primary aldosteronism | Hypthroidism | Mineralocorticoid excess syndromes other than primary aldosteronism |
| Obstructive sleep apnea | Hyperthyroidism | Acromegaly |
| Drug or alcohol induced | Aortic Coarctation (undiagnosed or repaired) | |

Testing

| Basic Testing | Optional Testing |
|----------------------------------|-------------------------------------|
| Fasting blood glucose | Echocardiogram |
| Complete blood count | Uric acid |
| Lipid profile | Urinary albumin to creatinine ratio |
| Serum creatinine with eGFR | |
| Serum sodium, potassium, calcium | |
| Thyroid-stimulating hormone | |
| Urinalysis | |
| Electrocardiogram | |

Treatment

ASCVD Risk

| Demography | Cholesterol | Blood Pressure | Risk Factors |
|---|---|--|--|
| Age 50 Gender - Male Race: White | Total - 250 HDL - 40 LDL - 120 Statin - NO | Systolic - 155 Diastolic - 85 On Meds - NO | Diabetes - NO Smoking - Yes Aspirin - NO |
| Age - 55 Gender - Female Race: AA | Total - 200 HDL - 35 LDL - 110 Statin - NO | Systolic - 145 Diastolic - 92 On Meds - NO | Diabetes - No Smoking - Yes Aspirin - NO |

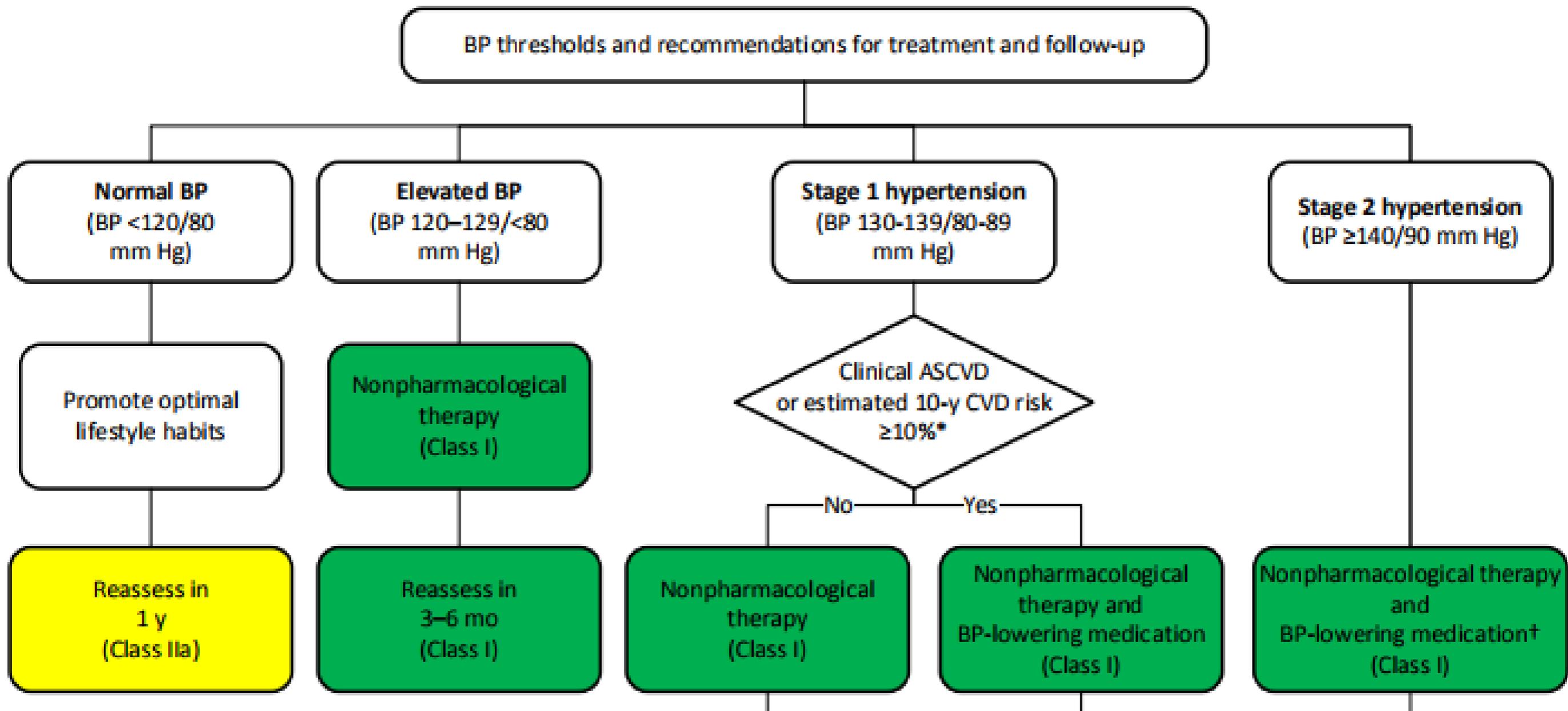
<https://tools.acc.org/ascvd-risk-estimator-plus/#!/calculate/estimate/>

Patient Two

★ 52 yo M, smoker for the past 35 yrs. He had a minor ischemic stroke 10 yrs ago but recovered with no deficits. He takes a baby aspirin daily, but not on an antihypertensive. His blood pressures in the office averages 125/82 and his home blood pressures average 132/86. You diagnose him with Stage 1 hypertension. What is the next step in management?

- A. Calculate his ASCVD
- B. No need for ASCVD calculation
- C. Non-pharmacologic treatment
- D. Ambulatory blood pressure monitoring

Treatment



Which non-pharmacologic intervention results in greatest BP reduction in hypertensive patients?

- A.** DASH diet
- B.** Weight loss
- C.** Reduction in salt intake
- D.** Increasing physical activity

Non-pharmacologic

| Intervention | Dose | Approximate impact on SBP |
|------------------------------|--|----------------------------------|
| Weight loss | 1 mmHg reduction for every 1kg | -5 mmHg |
| DASH diet | Diet rich in fruits, vegetables, whole grains, low fat dairy | -11 mmHg |
| Physical activity | 90 - 150 mins/wk | -5/8 mmHg |
| Moderation in alcohol intake | Men \leq 2 drinks/day Women \leq 1 drink/day | -4 mmHg |
| Reduced salt intake | $<$ 1500 mg/d | -4/5 mmHg |

Patient Three

★62 yo F with T2DM A1c 7.8% was recently admitted to the hospital after she suffered a right MCA ischemic stroke. She underwent rehabilitation and has regained about 80% of function in the left arm and legs. She follows up at the clinic after rehab. Apart from her oral antidiabetic medications, she is on aspirin, atorvastatin. Her blood pressure is 159/98 mmHg. Which antihypertensive class is shown to reduce stroke risk significantly?

A. Beta-blockers

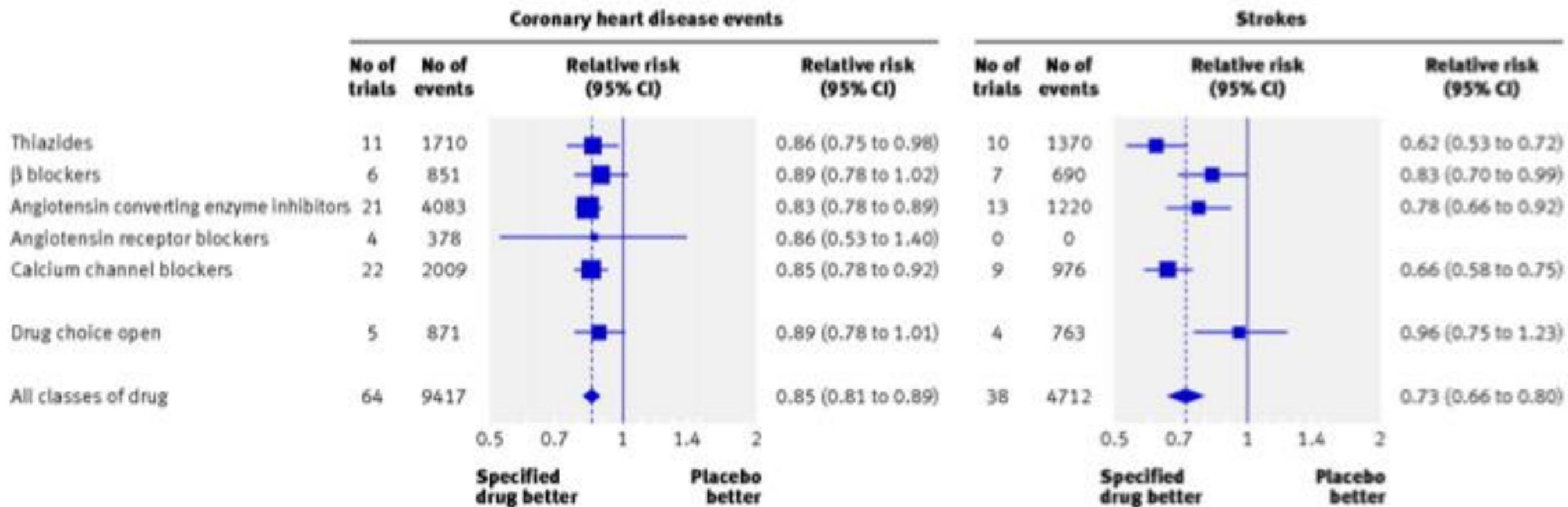
B. ARBs

C. Thiazides

D. Nitrates

E. Centrally acting agents like clonidine

Clinical ASCVD reduction vs Class of BP meds



CCBs vs RAIs

First-line RAS inhibitors compared to first-line CCBs for hypertension

Patient or population: people with hypertension

Settings: outpatients with mean follow-up of 4.5 years

Intervention: First-line RAS inhibitors

Comparison: First-line CCBs

| Outcomes | Illustrative comparative risks* (95% CI) | | Relative effect (95% CI) | No of participants (studies) | Certainty of the evidence (GRADE) | Comments |
|--|--|---------------------------|--------------------------|------------------------------|-----------------------------------|--------------------------|
| | Assumed risk | Corresponding risk | | | | |
| | CCBs | RAS inhibitors | | | | |
| All-cause death | 124 per 1000 | 127 per 1000 (121 to 135) | RR 1.03 (0.98 to 1.09) | 35,226 (5) | ⊕⊕⊕○ moderate ¹ | |
| Total cardiovascular events | 178 per 1000 | 174 per 1000 (166 to 182) | RR 0.98 (0.93 to 1.02) | 35,223 (6) | ⊕⊕⊕○ moderate ¹ | |
| Death or hospitalization for heart failure | 72 per 1000 | 60 per 1000 (55 to 65) | RR 0.83 (0.77 to 0.90) | 35,143 (5) | ⊕⊕⊕○ moderate ¹ | ARR = 1.2% NNTB = 83 |
| Total myocardial infarction | 68 per 1000 | 69 per 1000 (63 to 74) | RR 1.01 (0.93 to 1.09) | 35,043 (5) | ⊕⊕⊕○ moderate ¹ | |
| Total stroke | 39 per 1000 | 46 per 1000 (42 to 51) | RR 1.19 (1.08 to 1.32) | 34,673 (4) | ⊕⊕⊕○ moderate ¹ | ARI = 0.7% NNTB = 143 |
| End stage renal failure | 25 per 1000 | 22 per 1000 (19 to 26) | RR 0.88 (0.74 to 1.05) | 19,551 (4) | ⊕⊕○○ low ^{1,2} | |

Thiazides vs RAIs

First-line RAS inhibitors compared to first-line thiazides for hypertension

Patient or population: people with hypertension

Settings: outpatients with mean follow-up of 4.9 years

Intervention: First-line RAS inhibitors

Comparison: First-line thiazides

| Outcomes | Illustrative comparative risks* (95% CI) | | Relative effect (95% CI) | No of participants (studies) | Certainty of the evidence (GRADE) | Comments |
|--|--|---------------------------|--------------------------|------------------------------|-----------------------------------|--------------------------|
| | Assumed risk | Corresponding risk | | | | |
| | Thiazides | RAS inhibitors | | | | |
| All-cause death | 144 per 1000 | 144 per 1000 (135 to 154) | RR 1.00 (0.94 to 1.07) | 24,309 (1) | ⊕⊕⊕○ moderate ¹ | |
| Total cardiovascular events | 194 per 1000 | 204 per 1000 (194 to 215) | RR 1.05 (1.00 to 1.11) | 24,379 (2) | ⊕⊕⊕○ moderate ¹ | |
| Death or hospitalization for heart failure | 57 per 1000 | 68 per 1000 (61 to 75) | RR 1.19 (1.07 to 1.31) | 24,309 (1) | ⊕⊕⊕○ moderate ¹ | ARI = 1.1% NNTH = 91 |
| Total myocardial infarction | 93 per 1000 | 86 per 1000 (80 to 94) | RR 0.93 (0.86 to 1.01) | 24,379 (2) | ⊕⊕⊕○ moderate ¹ | |
| Total stroke | 44 per 1000 | 50 per 1000 (45 to 56) | RR 1.14 (1.02 to 1.28) | 24,309 (1) | ⊕⊕⊕○ moderate ¹ | ARI = 0.6% NNTH = 167 |
| End stage renal failure Follow-up: mean 4.9 years | 13 per 1000 | 14 per 1000 (11 to 18) | RR 1.10 (0.88 to 1.37) | 24,309 (1) | ⊕⊕○○ low ^{1,2} | |

Beta-Blockers vs RAs

First-line RAS inhibitors compared to first-line beta-blockers for hypertension

Patient or population: people with hypertension

Settings: outpatients with mean follow-up of 4.8 years

Intervention: First-line RAS inhibitors

Comparison: First-line beta-blockers

| Outcomes | Illustrative comparative risks* (95% CI) | | Relative effect (95% CI) | No of participants (studies) | Certainty of the evidence (GRADE) | Comments |
|-----------------------------|--|---------------------------|--------------------------|------------------------------|-----------------------------------|-------------------------|
| | Assumed risk | Corresponding risk | | | | |
| | B-blockers | RAS inhibitors | | | | |
| All-cause death | 94 per 1000 | 84 per 1000 (73 to 95) | RR 0.89 (0.78 to 1.01) | 9193 (1) | ⊕⊕○○ low ^{1,2} | |
| Total cardiovascular events | 143 per 1000 | 126 per 1000 (114 to 140) | RR 0.88 (0.80 to 0.98) | 9239 (2) | ⊕⊕○○ low ^{1,2} | ARR = 1.7% NNTB = 59 |
| Total heart failure | 35 per 1000 | 33 per 1000 (27 to 41) | RR 0.95 (0.76 to 1.18) | 9193 (1) | ⊕⊕○○ low ^{1,2} | |
| Total myocardial infarction | 41 per 1000 | 43 per 1000 (35 to 52) | RR 1.05 (0.86 to 1.27) | 9239 (2) | ⊕⊕○○ low ^{1,2} | |
| Total stroke | 67 per 1000 | 50 per 1000 (42 to 59) | RR 0.75 (0.63 to 0.88) | 9193 (1) | ⊕⊕○○ low ^{1,2} | ARR = 1.7% NNTB = 59 |

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; **RR:** risk ratio; **ARR:** absolute risk reduction. **NNTB:** number needed to treat to prevent one adverse outcome

Choice of Initial Medication

| COR | LOE | Recommendation for Choice of Initial Medication |
|-----|-----------------|--|
| I | A ^{SR} | For initiation of antihypertensive drug therapy, first-line agents include thiazide diuretics, CCBs, and ACE inhibitors or ARBs. |

Patient Four

- ★ 65 yo F comes to the clinic for blood pressure follow up. Her initial BP averaged 150/95. Based on her treatment plan the BP goal is 130/80 or less. She started amlodipine 5mg daily four weeks ago. Her BP today is 143/85. She notes adherence to the prescribed lifestyle modification plan including the DASH diet. In order to achieve BP, target the following is recommended?
 - A. Increase amlodipine dose to 10mg daily
 - B. No change, recheck BP in 4 weeks
 - C. Add HCTZ 12.5mg

Combo Therapy

- ★ All categories of antihypertensives produce similar reductions in blood pressure.
- ★ Average reduction at standard dose = **9.1 / 5.5** mmHg
- ★ Average reduction at half standard dose = **7.1 / 4.4** mmHg

Combo Therapy

Table 4. Efficacy: blood pressure lowering effects of drugs when used at half standard dose separately and in combination

| | Blood pressure reduction* (95% CI) | | |
|----------------------------------|------------------------------------|---------------------|---------------------|
| | One drug | Two drugs | Three drugs |
| Systolic blood pressure (mm Hg) | 6.7 (6.1 to 7.2) | 13.3 (12.4 to 14.1) | 19.9 (18.5 to 21.3) |
| Diastolic blood pressure (mm Hg) | 3.7 (3.1 to 4.3) | 7.3 (6.2 to 8.3) | 10.7 (9.1 to 12.4) |

↩*Reductions in blood pressure adjusted to a usual pretreatment blood pressure of 150/90 mm Hg, the average blood pressure in people aged 50–69 years who have a stroke or ischaemic heart disease event.⁷

M R Law et. al. BMJ 2003; 326: 1427



| COR | LOE | Recommendations for Choice of Initial Monotherapy Versus Initial Combination Drug Therapy* |
|------------|-------------|--|
| I | C-EO | Initiation of antihypertensive drug therapy with 2 first-line agents of different classes, either as separate agents or in a fixed-dose combination, is recommended in adults with stage 2 hypertension and an average BP more than 20/10 mm Hg above their BP target. |
| Ila | C-EO | Initiation of antihypertensive drug therapy with a single antihypertensive drug is reasonable in adults with stage 1 hypertension and BP goal <130/80 mm Hg with dosage titration and sequential addition of other agents to achieve the BP target. |

In addition, combo therapy may improves tolerability and adherence

Hypertension in ...

- ★ HFrEF - prescribe GDMT per HF guidelines
- ★ HFpEF - use GDMT per HF guidelines
- ★ DM with albuminuria - ACEI/ARBs
- ★ DM no albuminuria - First line agents (FLAs)
- ★ CAD - GDMT - BBs, ACE/ARBs then add FLAs
- ★ CKD with albuminuria - ACEI then add other FLAs
- ★ CKD no albuminuria - FLAs

Treating other Risk Factors

| Modifiable Risk Factors | Relatively Fixed Risk Factors |
|---|---|
| <ul style="list-style-type: none">•Current cigarette smoking, secondhand smoking•Diabetes mellitus•Dyslipidemia/hypercholesterolemia•Overweight/obesity•Physical inactivity/low fitness•Unhealthy diet | <ul style="list-style-type: none">•CKD•Family history•Increased age•Low socioeconomic/educational status•Male sex•Obstructive sleep apnea•Psychosocial stress |

Treatment Goal

< 130 / 90 mmHg

Take Home Points

- ★ 1 out of 3 persons has hypertension in the US
- ★ Home BP measurement is needed to confirm diagnosis
- ★ Treatment goal < 130 / 90
- ★ ACE/ARBs, CCB, Thiazides are first line - each have their relative strengths.

Questions

Thank you