Updates and Practical Approaches in Hypertension Guideline Implementation

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- Associate Editor for Innovation, ACC.org

2017 ACC/AHA Hypertension Guideline

Learning Objectives

1. Review **key aspects** of the 2017 ACC/AHA hypertension guidelines regarding the management of hypertension.
2. Discuss the **rationale** behind those recommendations.
3. Discuss the **clinical application** of the hypertension guidelines for various subsets.

Key Concepts to be Covered:

- Hypertension definition and stages.
- Optimal BP target.
- Role of Global ASCVD Risk Assessment.
- Treatment targets for patients with hypertension and comorbidities.
- White coat hypertension /Masked Hypertension- Utility of home and ambulatory BP measurements.
- Resistant and Secondary Hypertension.
- Putting it all together.

Question 1

Hypertension is defined as:

1. **≥ 150/90 mm Hg**
2. **≥ 140/90 mm Hg**
3. **≥ 130/80 mm Hg**
4. **I have no idea because the guidelines keep changing.**

Question 2

A blood pressure of 128/78 mm Hg is classified as:

1. **Hypotension**
2. **Pre-hypertension**
3. **Elevated blood pressure**
4. **Normal blood pressure**

Question 3

First line agents for treatment of hypertension include:

1. **Thiazide diuretics**
2. **Beta-blockers**
3. **Angiotensin receptor blockers**
4. **1 and 3**
5. **2 and 3**

Blood Pressure Categories and Definitions

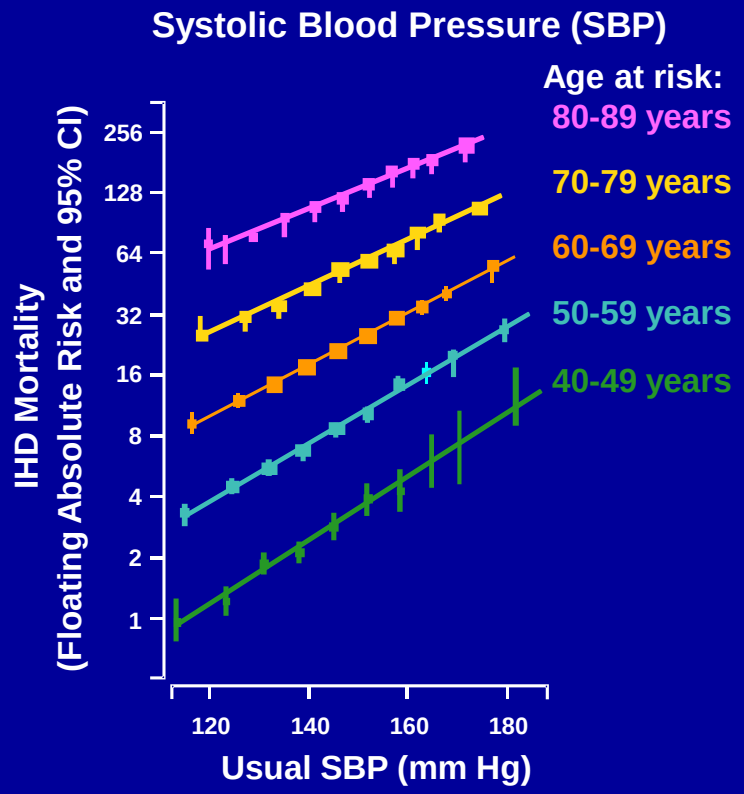
2017 ACC/AHA Hypertension Guideline

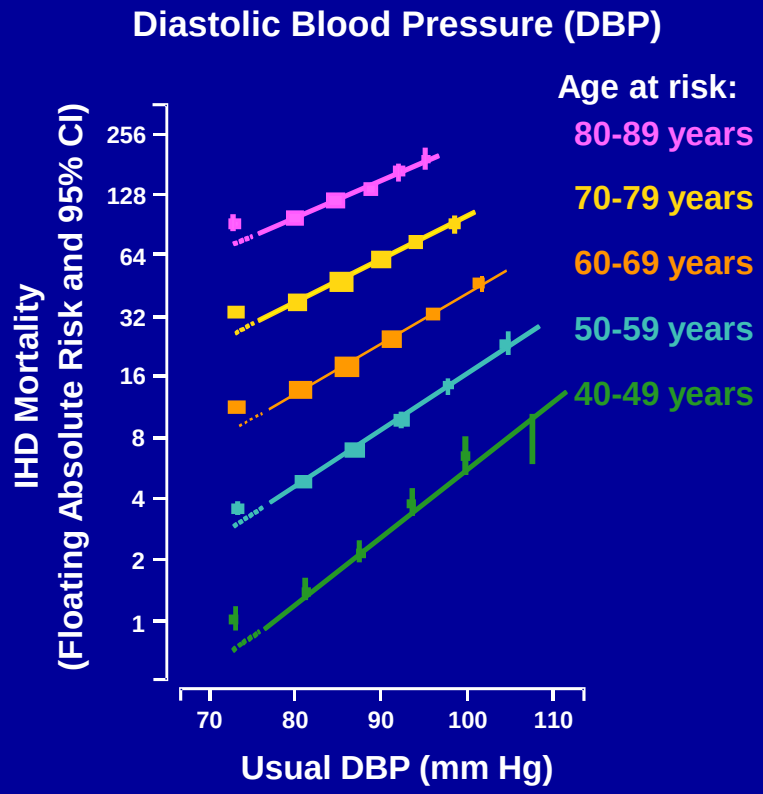
Blood Pressure Categories

Blood Pressure			Blood Pressure Classification	
SBP, mmHg		DBP, mmHg	2003 JNC7	2017 ACC/AHA
<120	and	<80	Normal BP	Normal BP
120-129	and	<80	Prehypertension	Elevated BP
130-139	or	80-89	Prehypertension	Stage 1 hypertension
140-159	or	90-99	Stage 1 hypertension	Stage 2 hypertension
≥160	or	≥100	Stage 2 hypertension	Stage 2 hypertension

Based on an average of ≥ 2 careful readings on ≥ 2 occasions. Adults with SBP or DBP in two categories should be designated to the higher BP category.

Blood Pressure (BP) and Cardiovascular Disease (CVD) Risk
69 prospective studies, 1 million adults





Lewington et al. *Lancet.* 2002;360:1903-1913.

Association between SBP/DBP and CVD risk

- Meta-analysis of 29 prospective studies with 1,010,858 participants

	Systolic/Diastolic blood pressure, mm Hg		
Outcome	**<120/80**	**120-129/80-84**	**130-139/85-89**
Cardiovascular mortality	Ref	1.24 (1.10 – 1.39)	1.56 (1.36 – 1.76)
Stroke	Ref	1.35 (1.10 – 1.66)	1.95 (1.69 – 2.24)
Coronary heart disease	Ref	1.11 (0.87 – 1.42)	1.33 (0.96 – 1.83)
Myocardial infarction	Ref	1.43 (1.10 – 1.86)	1.99 (1.59 – 2.50)

Guo et. al. Current Hypertension Reports 2013; 15: 703-716.

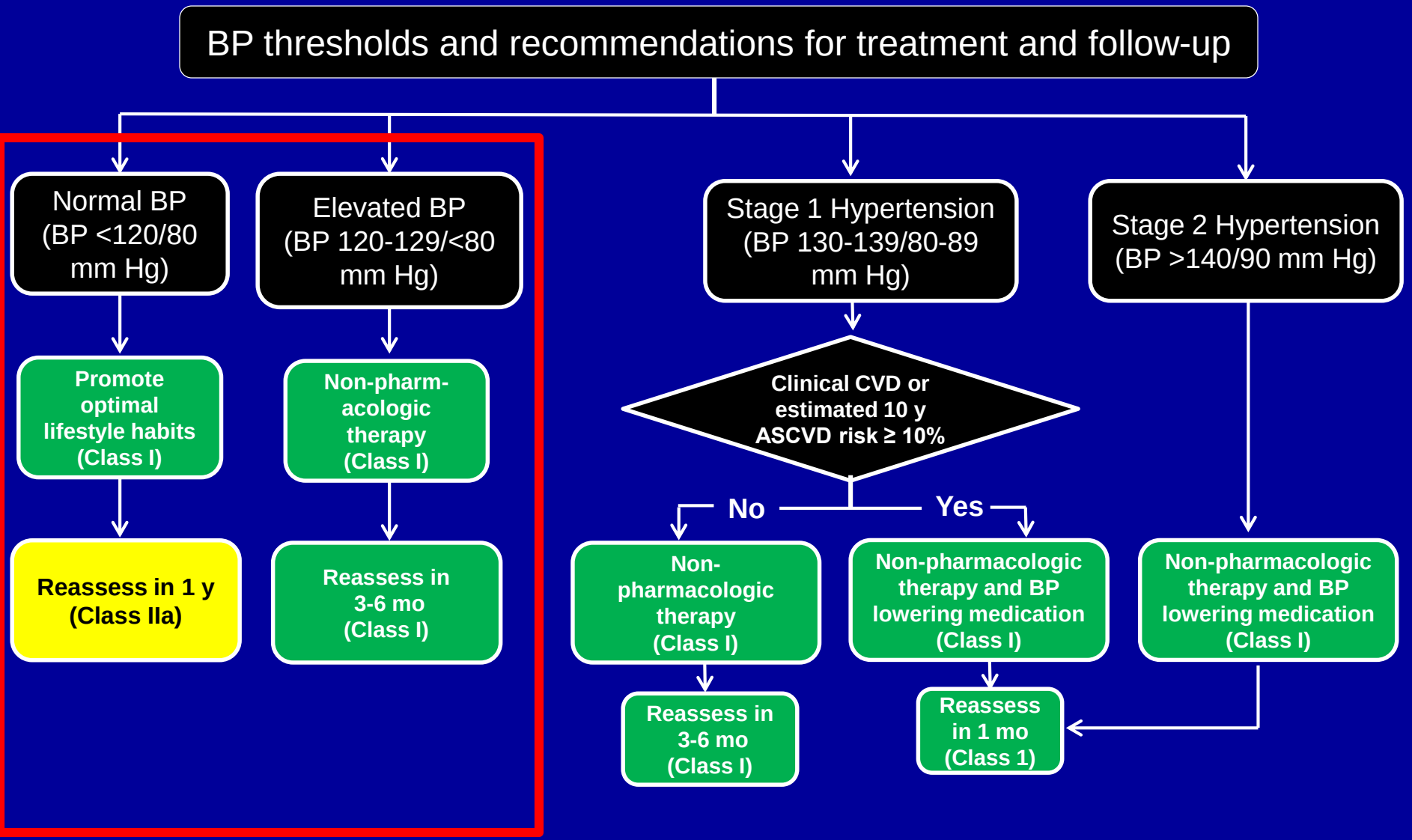
Guo et. al. PLoS One, 2013; 8e61796. Huang et. al. Neurology, 2014; 82: 1153-1161.
Huang et. al. American Journal of Kidney Diseases, 2014; 63: 76-83. Lee et. al., Neurology 2011; 77: 1330-1337.
Shen, American Journal of Cardiology, 2013; 112: 266-271.

Recommendation

Recommendation for Definition of High Blood Pressure (BP)

COR	LOE	Recommendations
I	B-NR	1. BP should be categorized as normal, elevated, or stages 1 or 2 hypertension in order to prevent and treat high BP

BP THRESHOLDS AND RECOMMENDATIONS FOR TREATMENT AND FOLLOW UP



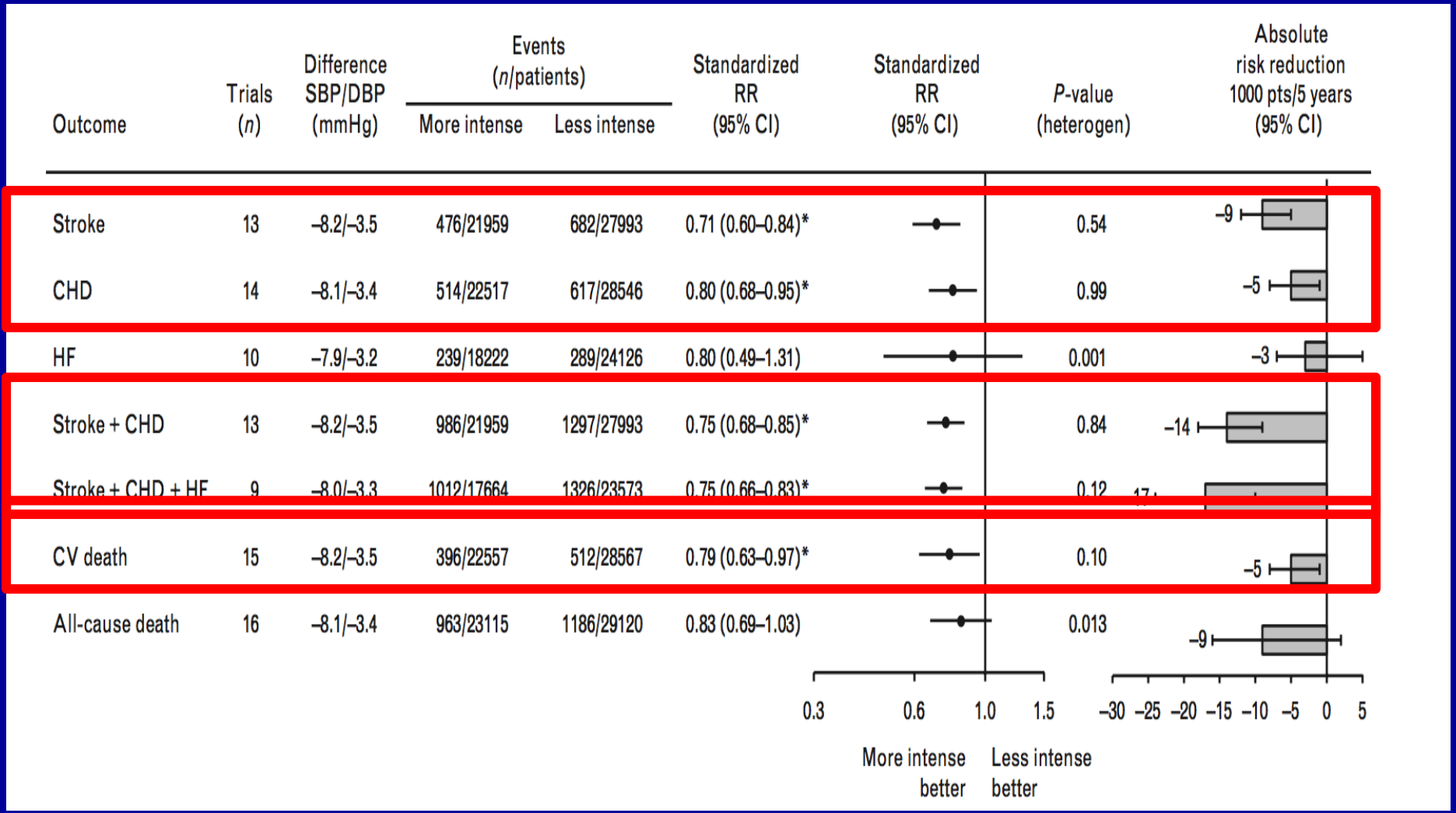
What is the Optimal Blood Pressure Target?

BP Thresholds for and Goals of Pharmacological Therapy in Patients With Hypertension According to Clinical Conditions

Clinical Condition(s)	BP Threshold, mm Hg	BP Goal, mm Hg
General		
Clinical CVD or 10-year ASCVD risk ≥10%	≥130/80	<130/80
No clinical CVD and 10-year ASCVD risk <10%	≥140/90	<130/80
Older persons (≥65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥130 (SBP)	<130 (SBP)
Specific comorbidities		
Diabetes mellitus	≥130/80	<130/80
Chronic kidney disease	≥130/80	<130/80
Chronic kidney disease after renal transplantation	≥130/80	<130/80
Heart failure	≥130/80	<130/80
Stable ischemic heart disease	≥130/80	<130/80
Secondary stroke prevention	≥140/90	<130/80
Secondary stroke prevention (lacunar)	≥130/80	<130/80
Peripheral arterial disease	≥130/80	<130/80

ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

Meta Analysis of Trials of Intensive BP Targets (~10/5 mm Hg BP reduction)



Adapted from Thomopolus, Parati, and Zanchetti Journal of Hypertension 2016

Hazard Ratios (95% CI) for Major Cardiovascular Disease at Different Levels of Achieved Systolic BP

120-124 mm Hg vs. higher SBPs

130-134 mm Hg vs. higher SBPs

140-144 mm Hg vs. higher SBPs

150-154 mm Hg vs. higher SBPs

Network Meta-analysis (42 RCTs: N = 144,220)

Mean Achieved Systolic Blood Pressure, mm Hg	Hazard Ratio (95% CI)
Reduction to 120-124	
120-124 vs 125-129	0.82 (0.67-0.97)
120-124 vs 130-134	0.71 (0.60-0.83)
120-124 vs 135-139	0.68 (0.55-0.85)
120-124 vs 140-144	0.58 (0.48-0.72)
120-124 vs 145-149	0.55 (0.42-0.72)
120-124 vs 150-154	0.46 (0.34-0.63)
120-124 vs 155-159	0.41 (0.32-0.54)
120-124 vs ≥160	0.36 (0.26-0.51)
130-134 vs 135-139	0.96 (0.83-1.14)
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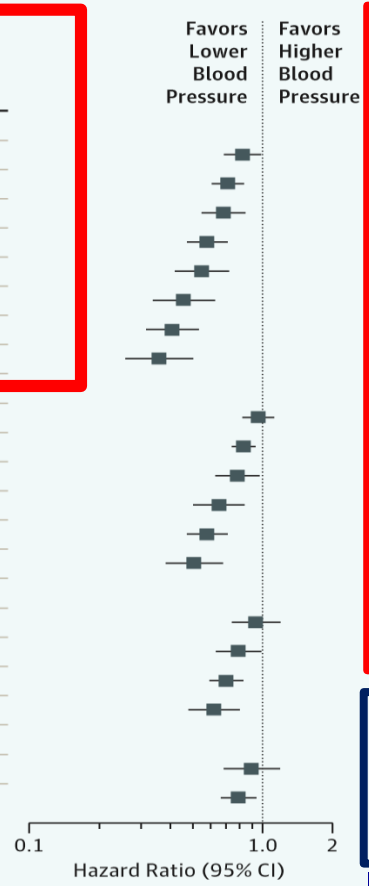

Key Findings

- In randomized comparisons, progressive reduction in risk of CVD at lower levels of achieved SBP down to levels below current US & European recommendations
- Similar findings for stroke, CHD and all-cause mortality
- Similar pattern in sensitivity analyses where
  - SPRINT results excluded
  - Results from four trials with risk for bias excluded
- Consistent results with direct meta-analysis

- Similar findings for CVD benefit in several other meta-analyses (including Bangalore et al, Verdecchia et al., and Xie et al.)

Bundy JD et al. JAMA Cardiol. 2017;2:775-781.

More intensive blood pressure lowering significantly reduced CV risk

CV Event	Relative Risk	95% CI
MI	0.86	0.76-0.99
Stroke	0.77	0.65-0.91
Heart failure	0.75	0.56-0.99
CVD composite	0.83	0.75-0.92

ERC report for the 2017 ACC/AHA Hypertension Guideline. *J Am Coll Cardiol*. 2018 15;71(19):2176-2198

RR/95% CI for a Given Outcome for BP target <130 mm Hg versus any Standard BP Target

Outcome	Studies included, N	Study participants included, N	Events, N (%)		RR	(95% CI)
			Intensive BP target	Standard BP target		
All-cause mortality	9[a]	24,569	493 (4.0)	546 (4.4)	0.92	(0.79, 1.06)
CVD mortality	5[b]	19,039	117 (1.2)	145 (1.5)	0.81	(0.58, 1.14)
Major Cardiovascular Disease Events	5[a]	19,814	610 (6.2)	724 (7.3)	0.84	(0.73, 0.99)
Fatal or non-fatal myocardial infarction	6	22,077	269 (2.4)	316 (2.9)	0.85	(0.73, 1.00)
Fatal or non-fatal stroke	7	23,169	274 (2.4)	339 (2.9)	0.82	(0.70, 0.96)
Fatal or non-fatal heart failure	4	16,296	175 (2.2)	220 (2.7)	0.81	(0.58, 1.14)
Renal Events	5[b]	9,641	347 (7.4)	346 (7.0)	1.01	(0.89, 1.16)

ERC report for the 2017 ACC/AHA Hypertension Guideline. J Am Coll Cardiol. 2018 15;71(19):2176-2198

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ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

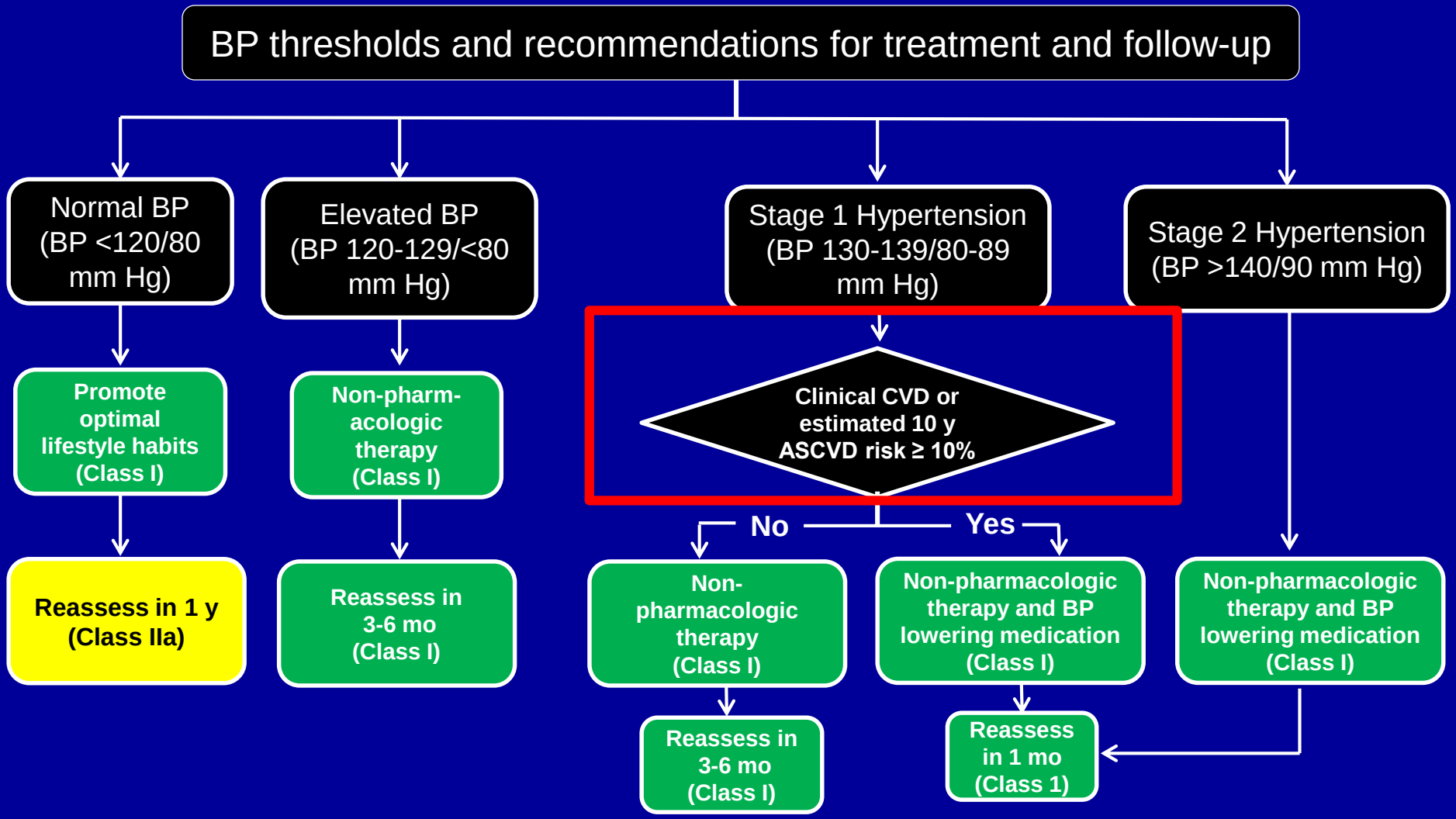
Is there any difference in expected benefit from BP lowering according to Global ASCVD risk?

BP TREATMENT THRESHOLD AND THE USE OF ASCVD RISK ESTIMATION TO GUIDE DRUG TREATMENT OF HYPERTENSION

Recommendations for BP Treatment Threshold and Use of ASCVD Risk Estimation* to Guide Drug Treatment of Hypertension		
COR	**LOE**	**Recommendations**
I	SBP: A DBP: C-EO	1. Use of BP-lowering medications is recommended for secondary prevention of recurrent CVD events in patients with clinical CVD and an average SBP of 130 mm Hg or higher or an average DBP of 80 mm Hg or higher, and for primary prevention in adults with an estimated 10-year atherosclerotic cardiovascular disease (ASCVD) risk of 10% or higher and an average SBP 130 mm Hg or higher or an average DBP 80 mm Hg or higher.
I	C-LD	2. Use of BP-lowering medication is recommended for primary prevention of CVD in adults with no history of CVD and with an estimated 10-year ASCVD risk <10% and an SBP of 140 mm Hg or higher or a DBP of 90 mm Hg or higher

* ACC/AHA Pooled Cohort Equations to estimate 10-y risk of ASCVD. ASCVD was defined as a first nonfatal MI or CHD death, or fatal or nonfatal stroke among adults free of CVD.

BP THRESHOLDS AND RECOMMENDATIONS FOR TREATMENT AND FOLLOW UP

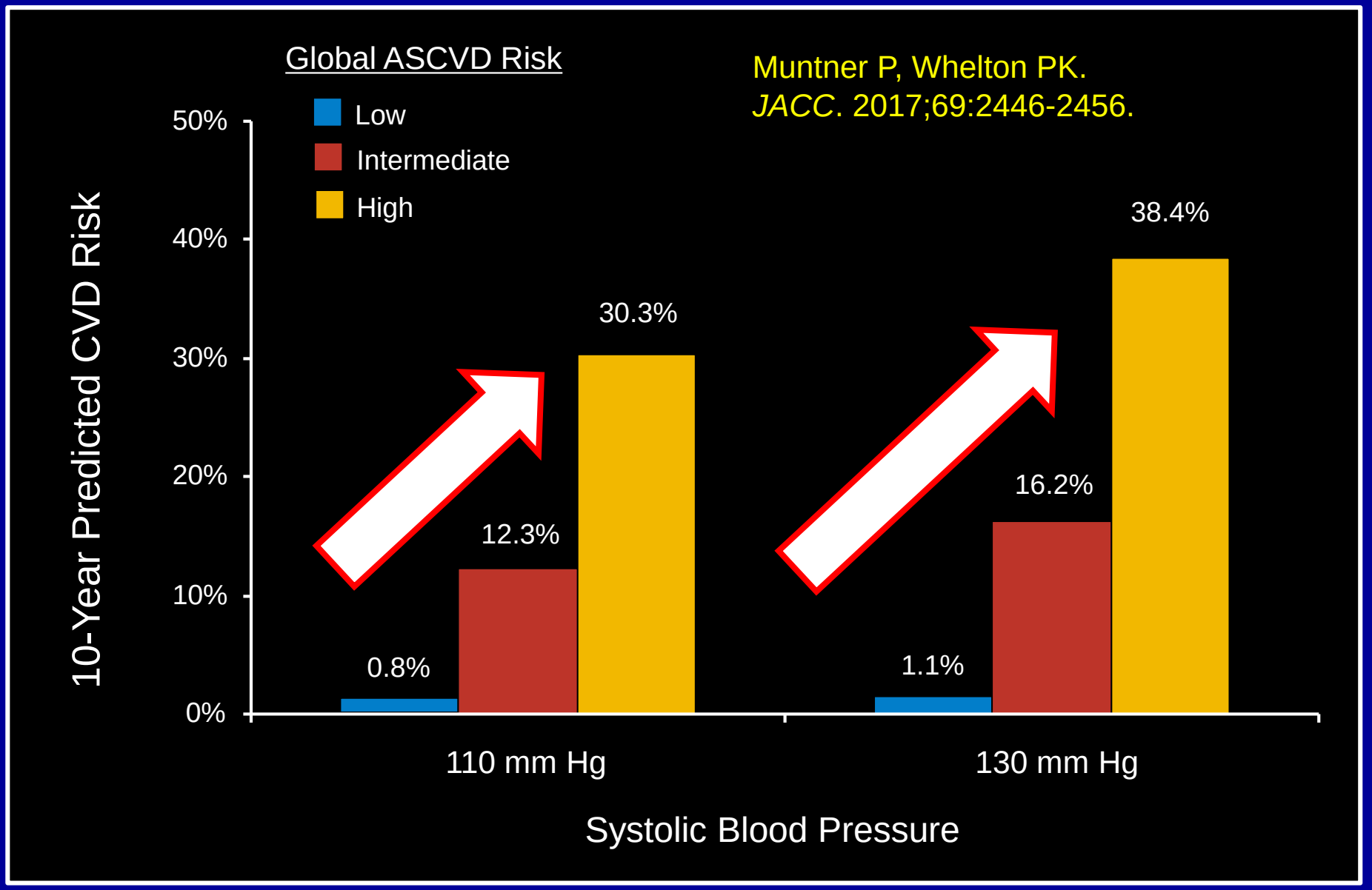


ACC/AHA POOLED COHORT EQUATIONS

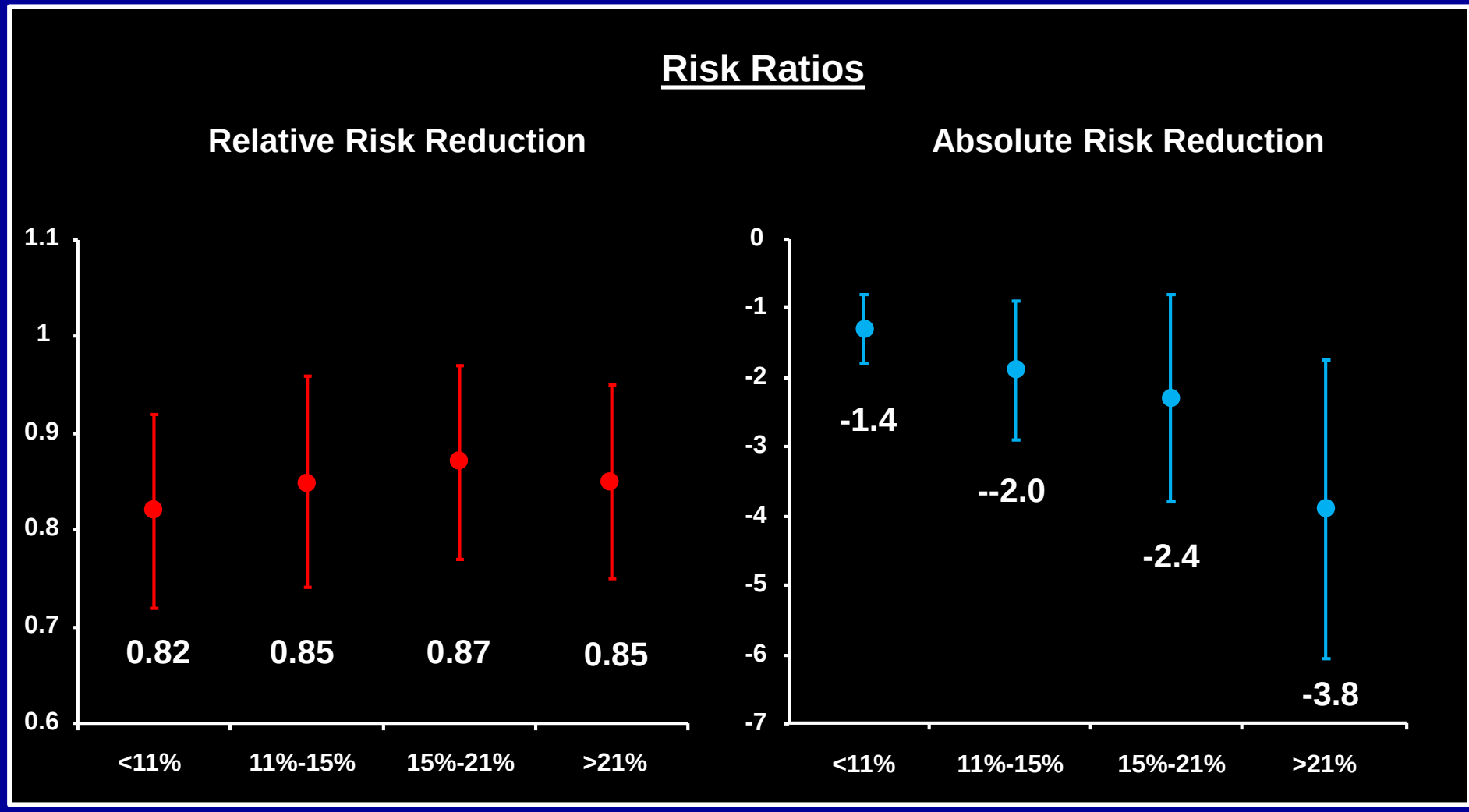
To estimate the 10-year risk of atherosclerotic CVD

http://tools.acc.org/ASCVD-Risk-Estimator/

TEN-YEAR PREDICTED CVD RISK FOR HYPOTHETICAL LOW, INTERMEDIATE AND HIGH RISK ADULTS

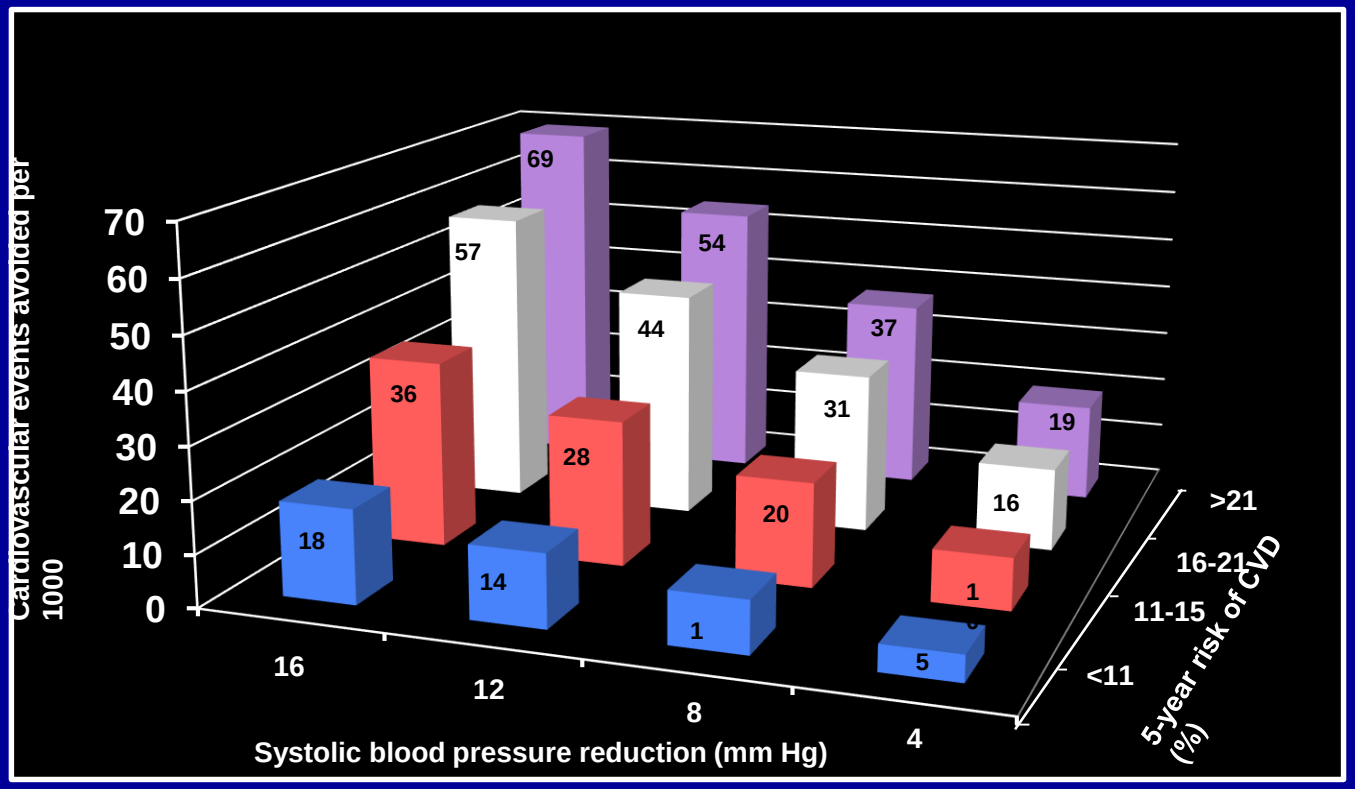


DIFFERENCES IN CVD EVENTS ASSOCIATED WITH ANTIHYPERTENSIVE MEDICATIONS IN 11 TRIALS (>50,000 PATIENTS)



Blood Pressure Lowering Treatment Trialists Collaboration. *Lancet*.2014;384;591-598.

CVD EVENTS AVOIDED BY BASELINE RISK AND MAGNITUDE OF SBP LOWERING



Sundstrom *et al. Lancet*. 2014;384:591–598

RISK-BASED TREATMENT OF HYPERTENSION

Treating 1,000 hypertensive patients…

5-Y ASCVD Risk (%)	Events Prevented (5Y)	NNT*
< 11	14	71
11-15	20	51
15-21	24	41
>21	26	26

* Number needed to treat (NNT) to prevent 1 event:

Blood Pressure Lowering Treatment Trialists. *Lancet*.2014;384;591-598.

What is the Treatment Target for Patients with Hypertension and Co-morbidities?

Management of Hypertension in Patients with Comorbidities

Comorbidities that may affect clinical decision making in hypertension:

- **Stable Ischemic Heart Disease (SIHD)**
- **Heart Failure with reduced ejection fraction (HFrEF)**
- **Heart Failure with Preserved Ejection Fraction (HFpEF),**
- **Chronic Kidney Disease (CKD) (including renal transplantation)**
-
-
-
-
-

“ As noted in Section 8.1.2, this guideline generally recommends use of BP-lowering medications in patients with clinical CVD (CHD, HF, and stroke) and an average BP ≥ 130/80 mm Hg. However., in some instances, clinical trial confirmation of treatment in patients with comorbidities is limited to a target BP of 140/90 mm Hg.”

ent of hypertension occurring with acute coronary syndromes.

American Heart Association. life is why™

AMERICAN COLLEGE of CARDIOLOGY

Recommendations for Treatment of Hypertension in Patients with Diabetes Mellitus

Recommendations that are supported by the ERC systematic review are denoted by "SR"

COR	LOE	Recommendations
I	SBP: B- R[SR]	1. In adults with DM and hypertension, antihypertensive drug treatment should be initiated at a BP greater than or equal to 130/80 mm Hg with a treatment goal of less than 130/80 mm Hg (1-7).
	DBP:C-EO	
I	A [SR]	2. In adults with DM and hypertension, all first line classes of antihypertensive agents (ie. diuretics, ACE inhibitors, ARBs, and CCBs) are useful and effective (1, 8, 9).
IIb	B-NR	3. In adults with DM and hypertension, ACE inhibitors or ARBs may be considered in the presence of albuminuria (10, 11).

BP Targets for Diabetes Mellitus

Hypertension is present in 80% of U.S. adults with DM and markedly increases risk for CVD events and mortality (~2-fold by risk calculator)

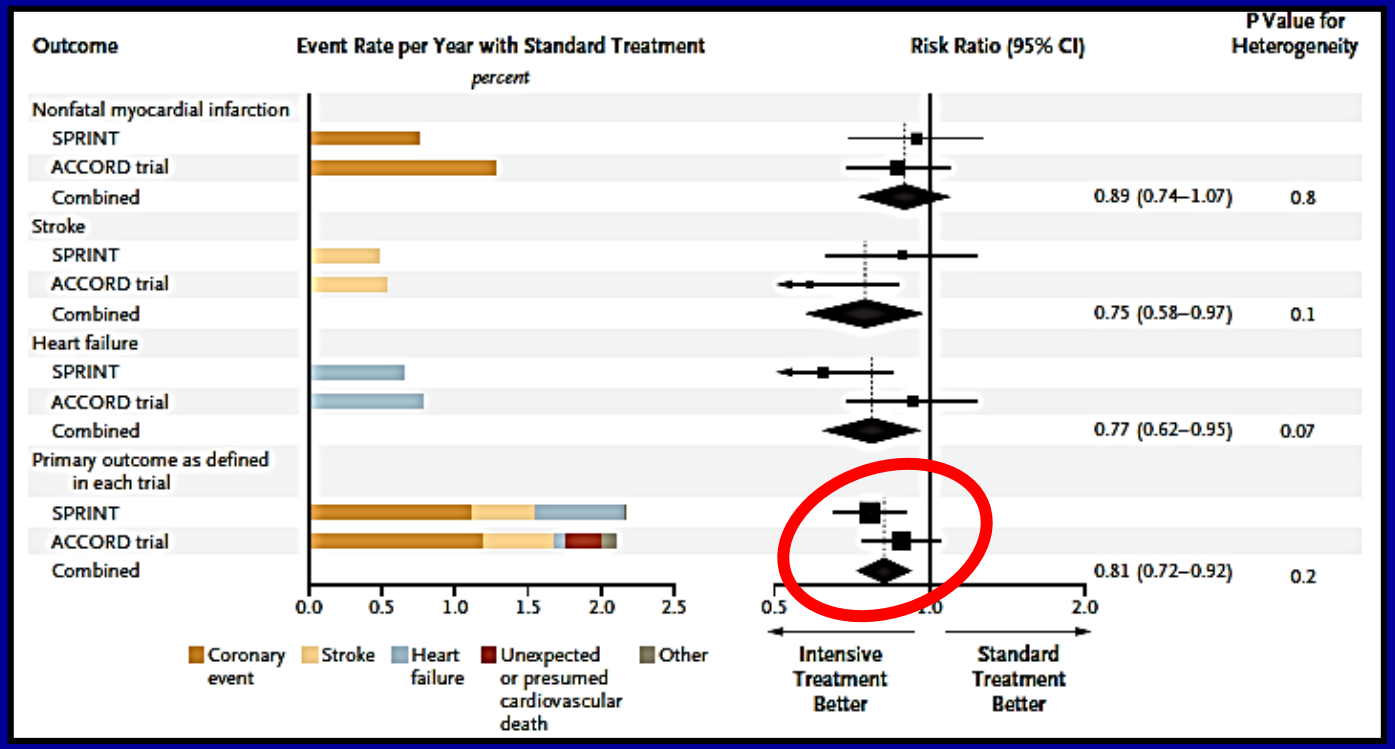
No single RCT study supports SBP target <140 mmHg however systematic reviews support this target

No RCT evidence for specific DBP threshold using current diagnostic criteria for DM

ACCORD was underpowered and complicated by factorial design yet showed a trend to benefit consistent with SPRINT

Evidence to Support Recommendations - Diabetes

Combined Data from SPRINT and ACCORD



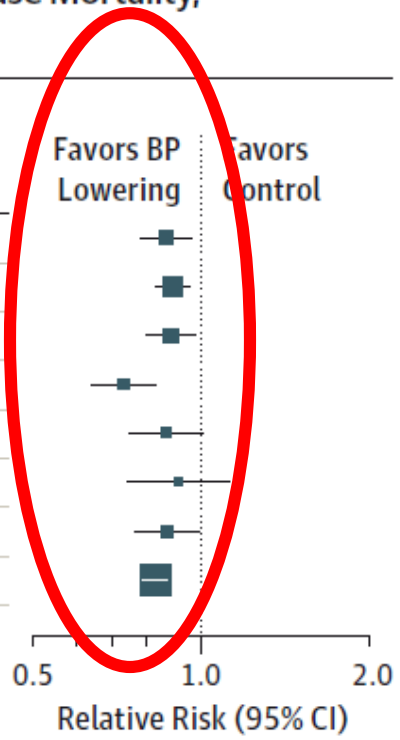
Perkovic V and Rodgers A. NEJM 2015;373:2175-8

Evidence to Support Recommendations - Diabetes

Meta-Analysis of BP Lowering Treatment in Diabetic patients (40 trials, n = 100,354)

Figure 2. Standardized Associations Between 10-mm Hg Lower Systolic BP and All-Cause Mortality, Macrovascular Outcomes, and Microvascular Outcomes in Diabetic Patients

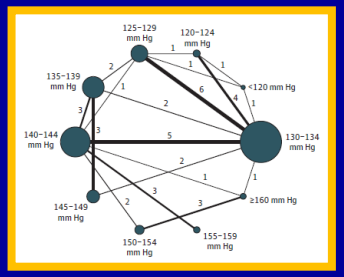
Outcome	No. of Studies	BP Lowering		Control		Relative Risk (95% CI)
		Events	Participants	Events	Participants	
Mortality	20	2334	27693	2319	25864	0.87 (0.78-0.96)
Cardiovascular disease	17	3230	25756	3280	24862	0.89 (0.83-0.95)
Coronary heart disease	17	1390	26150	1449	24761	0.88 (0.80-0.98)
Stroke	19	1350	27614	1475	26447	0.73 (0.64-0.83)
Heart failure	13	1235	21684	1348	20791	0.86 (0.74-1.00)
Renal failure	9	596	19835	560	18912	0.91 (0.74-1.12)
Retinopathy	7	844	9781	905	9566	0.87 (0.76-0.99)
Albuminuria	7	2799	13804	3163	12821	0.83 (0.79-0.87)



Emdin CA et. al. JAMA. 2015;313:603-615.

Evidence to Support Recommendations - Diabetes

Network meta-analysis of 42 trials, 30 trials including type 2 DM subjects



120-124 mm Hg vs. higher SBPs

130-134 mm Hg vs. higher SBPs

140-144 mm Hg vs. higher SBPs

150-154 mm Hg vs. higher SBPs

Major CVD Events

Mean Achieved Systolic Blood Pressure, mm Hg	Hazard Ratio (95% CI)
Reduction to 120-124	
120-124 vs 125-129	0.82 (0.67-0.97)
120-124 vs 130-134	0.71 (0.60-0.83)
120-124 vs 135-139	0.68 (0.55-0.85)
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120-124 vs 155-159	0.41 (0.32-0.54)
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Reduction to 130-134	
130-134 vs 135-139	0.96 (0.83-1.14)
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Reduction to 150-154	
150-154 vs 155-159	0.90 (0.68-1.19)
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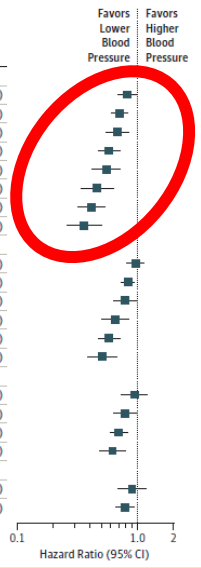
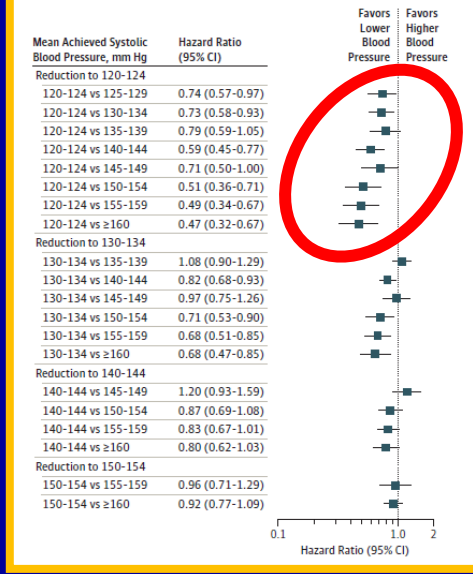


All-Cause Mortality

Mean Achieved Systolic Blood Pressure, mm Hg	Hazard Ratio (95% CI)
Reduction to 120-124	
120-124 vs 125-129	0.74 (0.57-0.97)
120-124 vs 130-134	0.73 (0.58-0.93)
120-124 vs 135-139	0.79 (0.59-1.05)
120-124 vs 140-144	0.59 (0.45-0.77)
120-124 vs 145-149	0.71 (0.50-1.00)
120-124 vs 150-154	0.51 (0.36-0.71)
120-124 vs 155-159	0.49 (0.34-0.67)
120-124 vs ≥160	0.47 (0.32-0.67)
Reduction to 130-134	
130-134 vs 135-139	1.08 (0.90-1.29)
130-134 vs 140-144	0.82 (0.68-0.93)
130-134 vs 145-149	0.97 (0.75-1.26)
130-134 vs 150-154	0.71 (0.53-0.90)
130-134 vs 155-159	0.68 (0.51-0.85)
130-134 vs ≥160	0.68 (0.47-0.85)
Reduction to 140-144	
140-144 vs 145-149	1.20 (0.93-1.59)
140-144 vs 150-154	0.87 (0.69-1.08)
140-144 vs 155-159	0.83 (0.67-1.01)
140-144 vs ≥160	0.80 (0.62-1.03)
Reduction to 150-154	
150-154 vs 155-159	0.96 (0.71-1.29)
150-154 vs ≥160	0.92 (0.77-1.09)



Bundy JD, et. al. JAMA Cardiol 2017;2:775-781.

Recommendations for Treatment of Hypertension in Patients with Chronic Kidney Disease

COR	LOE	Recommendations
I	SBP: B-R [SR] DBP: C-EO	1. Adults with hypertension and CKD should be treated to a BP goal of less than 130/80 mm Hg (1-6).
IIa	B-R	2. In adults with hypertension and CKD (stage 3 or higher or stage 1 or 2 with albuminuria ≥300_mg/day or >300 mg/g by first morning void albumin to creatinine ratio or the equivalent) treatment with an ACE inhibitor is reasonable to slow kidney disease progression (3, 7-12).
IIb	C-EO	3. In adults with hypertension and CKD (stage 3 or higher or stage 1 or 2 with albuminuria ≥300 mg/day, or >300 mg/g by first morning void albumin to creatinine ratio) (7, 8) treatment with an ARB may be reasonable, if an ACE inhibitor is not tolerated.

BP Targets for Chronic Kidney Disease

CKD historically excluded from clinical trials

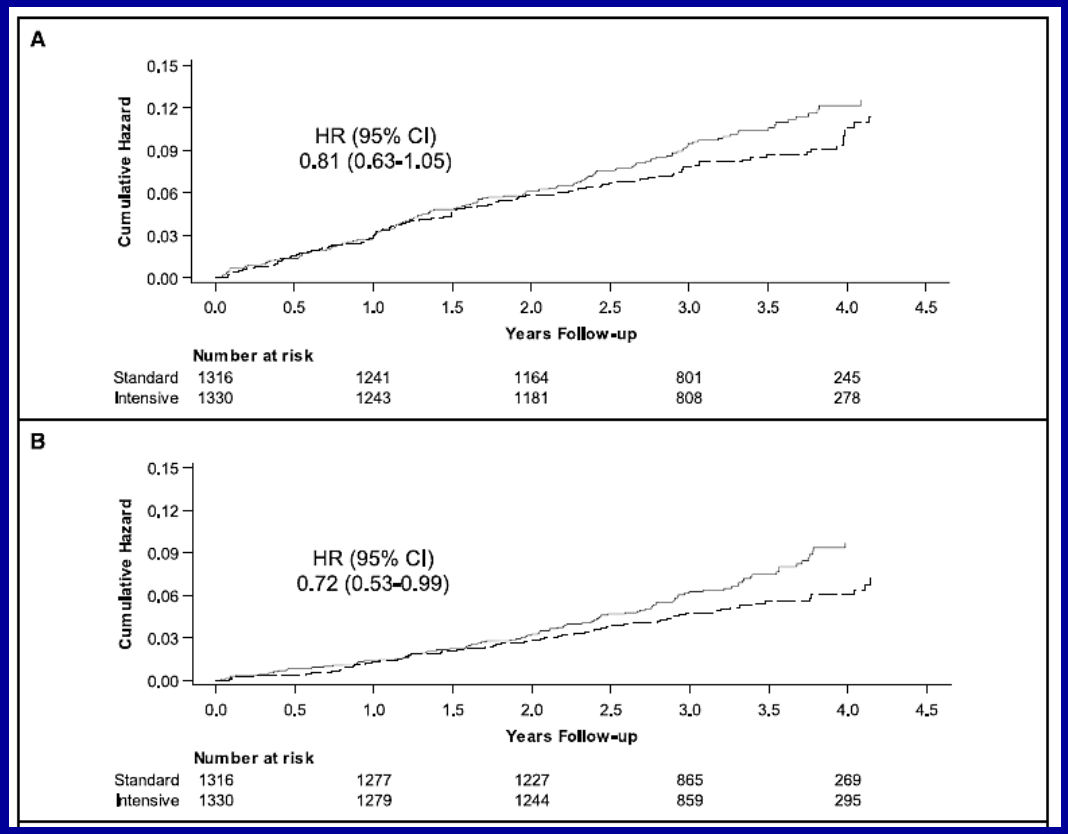
CKD not included in CV risk calculations

No single studies supported SBP target <140 mm Hg until SPRINT (28% CKD Stage 3-4) although post-hoc analyses favor lower targets for patients with proteinuria

Meta-analyses including CKD patients support intensive SBP targets to reduce CV events but not renal events

Intensive targets associated with reduction in eGFR

Evidence to Support Recommendations - CKD



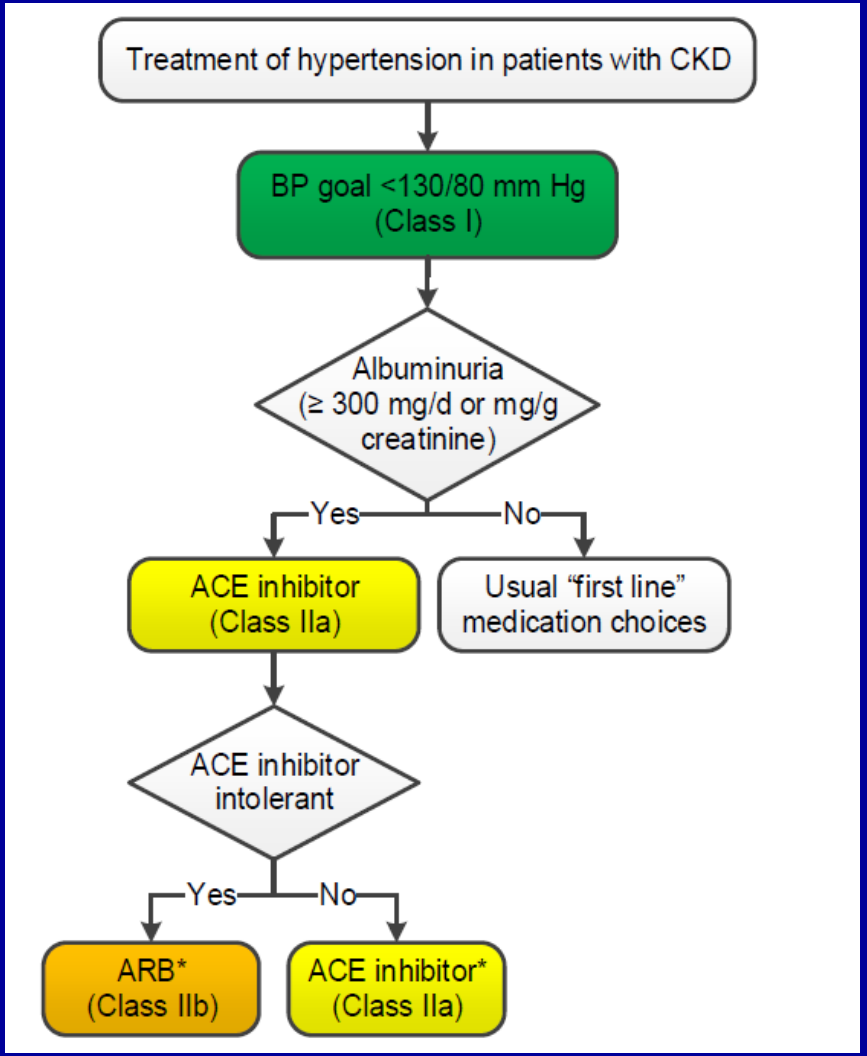
Dashed line: intensive; solid line: standard group

Cardiovascular events: MI, ACS, stroke, CHF, CV death
Primary composite outcome in 112 intensive, 131 standard group subjects
(HR 0.72; 95% CI 0.63-1.05)

All cause mortality
Lower all cause death rate in intensive group 70/1330 than standard group 95/1316
(HR 0.72; 95% CI 0.53-0.99)

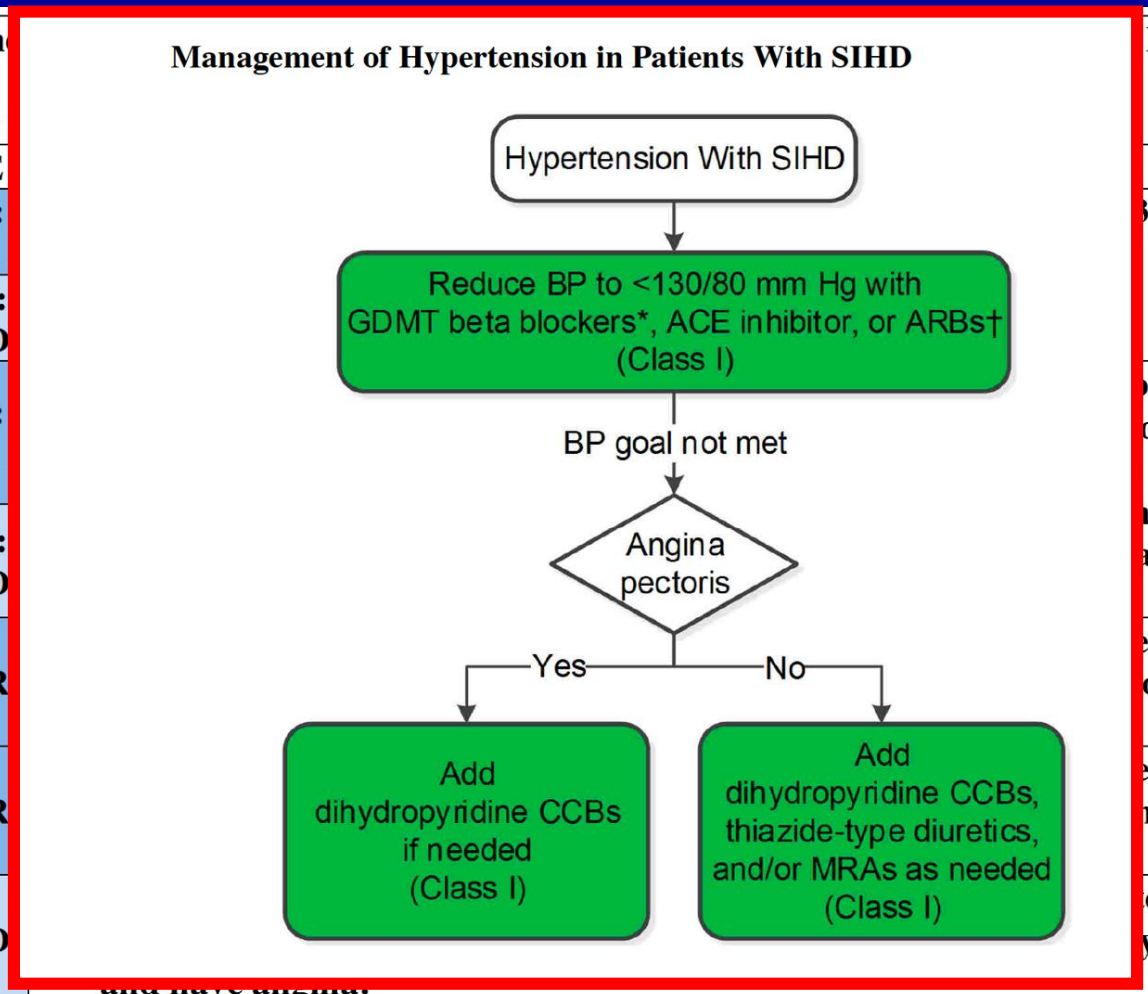
Cheung AK et al. JASN , 2017;28(9):2812-2823

Chronic Kidney Disease Algorithm



*CKD stage 3 or higher or stage 1 or 2 with albuminuria ≥300 mg/day.

Recommen		Heart
References		
COR	LOE	
I	SBP: B-R	30/80 mm
	DBP: C-EO	
I	SBP: B-R	be treated
	DBP: C-EO	or ARBs) first-line ne CCBs, as needed
I	B-NR	rtension, ockers is
IIa	B-NR	easonable n therapy
IIb	C-EO	ension in years ago



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Recommendations for Treatment of Hypertension in Patients With HF*r*EF

References that support recommendations are summarized in Online Data Supplement

COR	LOE	Recommendations
		Heart Failure
		Recommendation for Prevention of HF in Adults With Hypertension References that support the recommendation are summarized in Online Data Supplement
		COR / **LOE** / **Recommendation**
		I / **SBP: B-R** / **DBP: C-EO** — **1. In adults at increased risk of HF, the optimal BP in those with hypertension should be less than 130/80 mm Hg.**
		overload, diuretics should be prescribed to control hypertension.
I	**C-LD**	**2. Adults with HF*p*EF and persistent hypertension after management of volume overload should be prescribed ACE inhibitors or ARBs and beta blockers titrated to attain SBP of less than 130 mm Hg.**

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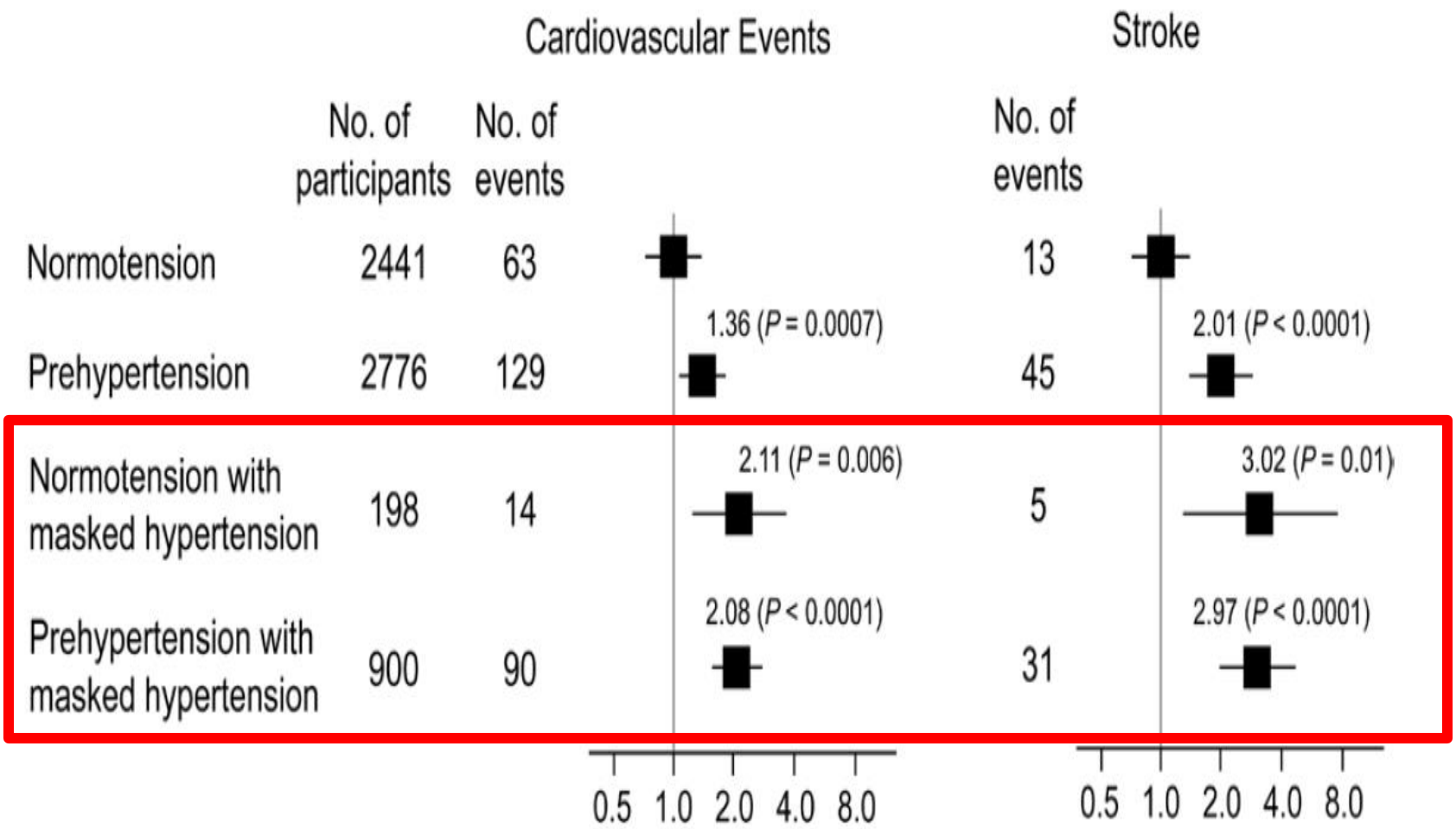
White Coat Hypertension or Masked Hypertension-Utility of Home and Ambulatory BP Measurements

BP Patterns Based on Office and Out-of-Office Measurements

	Office/Clinic/Healthcare Setting	Home/Nonhealthcare/ ABPM Setting
Normotensive	No hypertension	No hypertension
Sustained hypertension	Hypertension	Hypertension
Masked hypertension	No hypertension	Hypertension
White coat hypertension	Hypertension	No hypertension

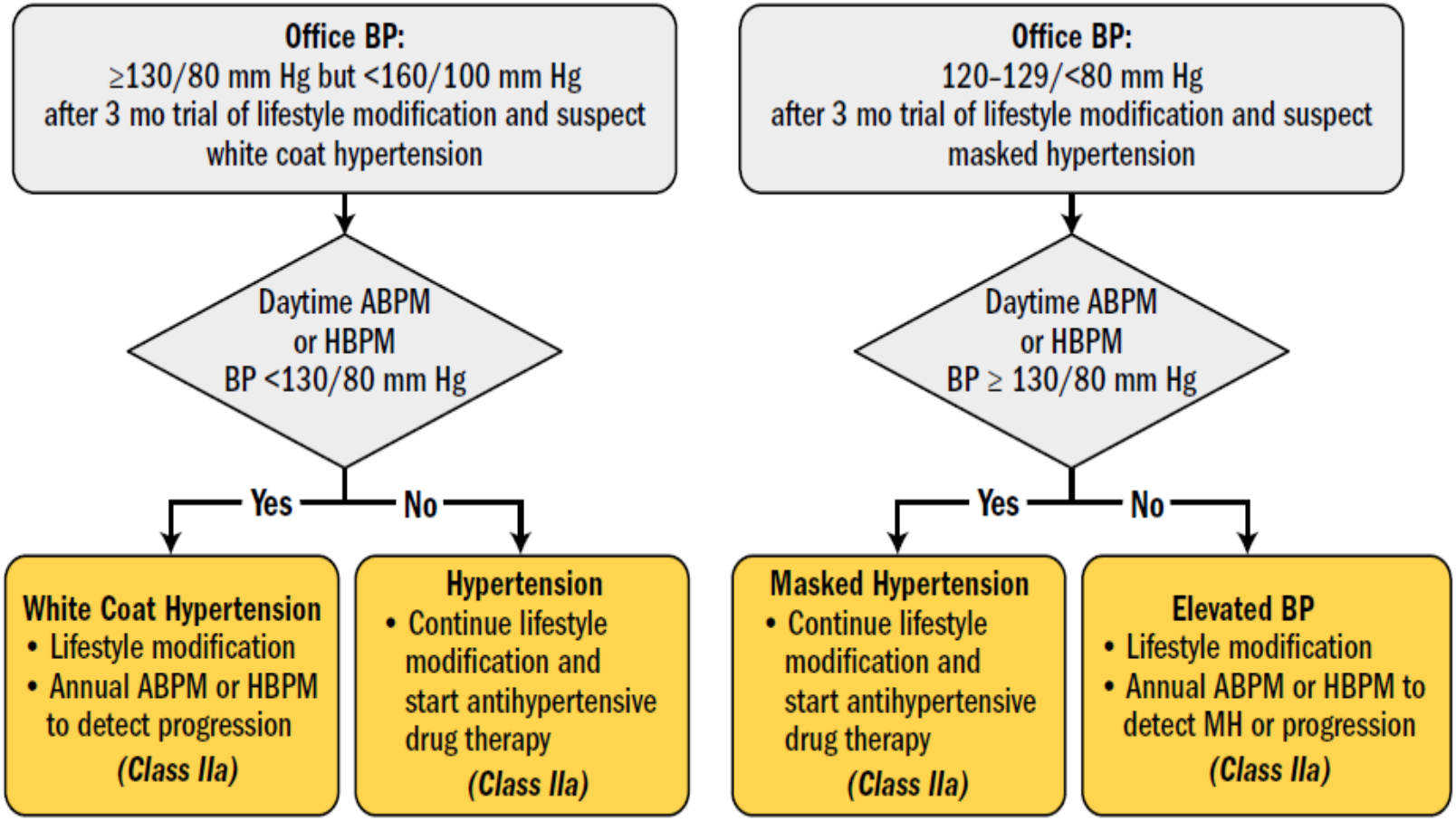
ABPM indicates ambulatory blood pressure monitoring; and BP, blood pressure.

Masked Hypertension

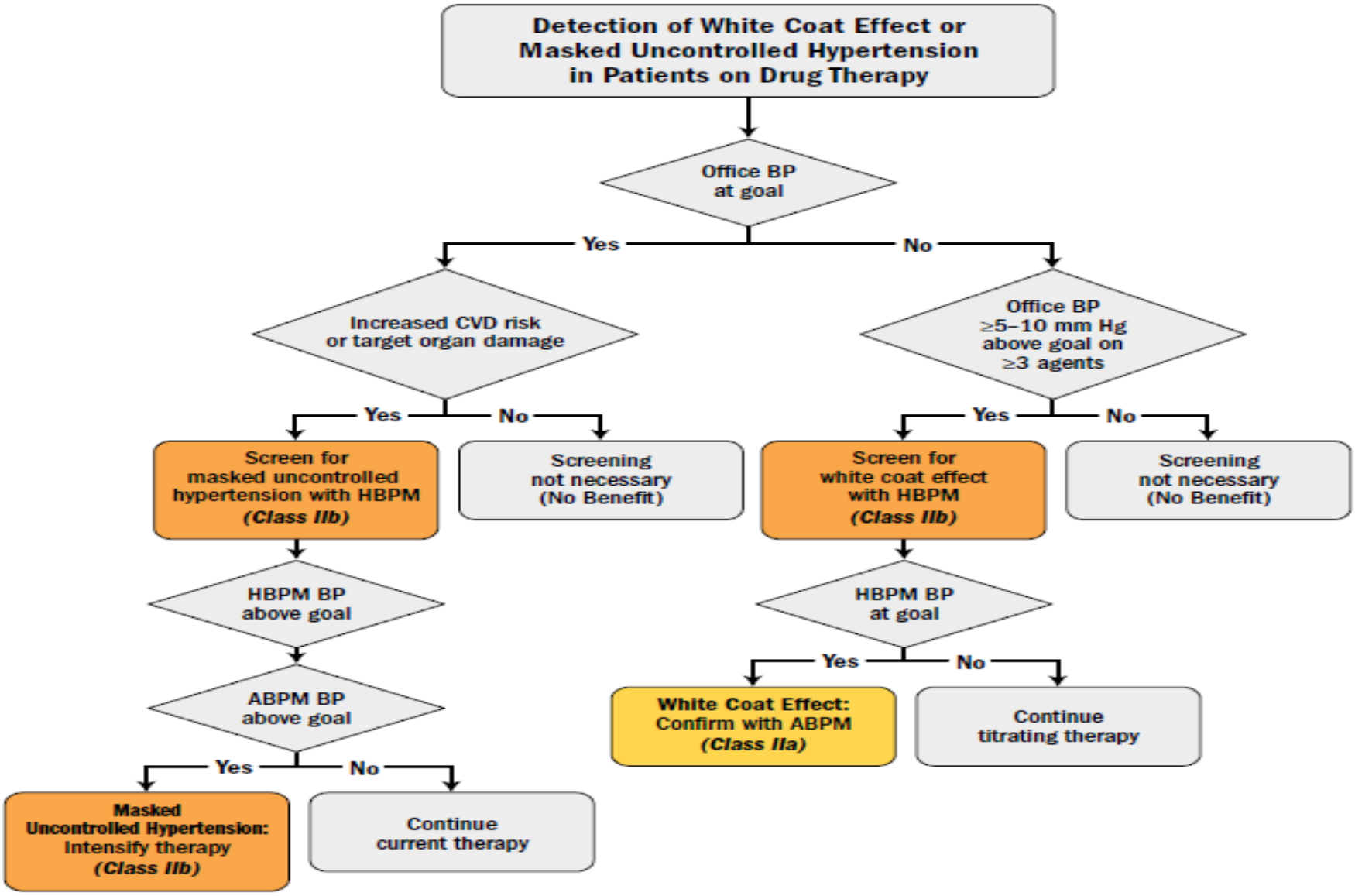


Stanley S. Franklin et al. Hypertension. 2015;65:16-20

Detection of White Coat Hypertension or Masked Hypertension in Patients Not on Drug Therapy



Detection of White Coat Hypertension or Masked Hypertension in Patients on Drug Therapy



Corresponding Values of SBP/DBP for Clinic, HBPM, Daytime, Nighttime, and 24-Hour ABPM Measurements

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

ABPM indicates ambulatory blood pressure monitoring; BP, blood pressure; DBP diastolic blood pressure; HBPM, home blood pressure monitoring; and SBP, systolic blood pressure.

Resistant Hypertension & Secondary Hypertension

Resistant Hypertension

3 antihypertensive medications with complimentary mechanisms of action (including a diuretic) without BP control

or

BP control requiring ≥ 4 medications

Resistant Hypertension Risk

Myocardial infarction (MI), stroke, and end-stage renal disease (ESRD) risk may be increased 2-6 fold.

Calhoun D. Resistant hypertension: diagnosis, evaluation, and treatment. *Hypertension.* 2008;51:1403-19.

Bangalore S, et al. Clinical outcomes with β-Blockers for myocardial infarction. *The Am J of Med. 2014*;127(10):939-53.

2017 Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults

Resistant Hypertension Prevalence

Blood Pressure	Prevalence
140/90 mmHg	13%
130/80 mmHg	17% (estimated)

Persell SD. Prevalence of resistant hypertension in the United States, 2003-2008. *Hypertension.* 2011;57:1076-80.

Resistant Hypertension: Diagnosis, Evaluation, and Treatment

Confirm Treatment Resistance

Office SBP/DBP ≥130/80 mm Hg

and

Patient prescribed ≥3 antihypertensive medications at optimal doses, including a diuretic, if possible

or

Office SBP/DBP <130/80 mm Hg but patient requires ≥4 antihypertensive medications

↓

Exclude Pseudo-Resistance

Ensure accurate office BP measurements
Assess for nonadherence with prescribed regimen
Obtain home, work, or ambulatory BP readings to exclude white coat effect

↓

Identify and Reverse Contributing Lifestyle Factors

Obesity
Physical inactivity
Excessive alcohol ingestion
High salt, low-fiber diet

↓

Discontinue or Minimize Interfering Substances

NSAIDs
Sympathomimetic (e.g., amphetamines, decongestants)
Stimulants
Oral contraceptives
Licorice
Ephedra

↓

Screen for Secondary Causes of Hypertension

Primary aldosteronism (elevated aldosterone/renin ratio)
CKD (eGFR <60 mL/min/1.73 m^2)
Renal artery stenosis (young female, known atherosclerotic disease, worsening kidney function)
Pheochromocytoma (episodic hypertension, palpitations, diaphoresis, headache)
Obstructive sleep apnea (snoring, witnessed apnea, excessive daytime sleepiness)

↓

Pharmacologic Treatment

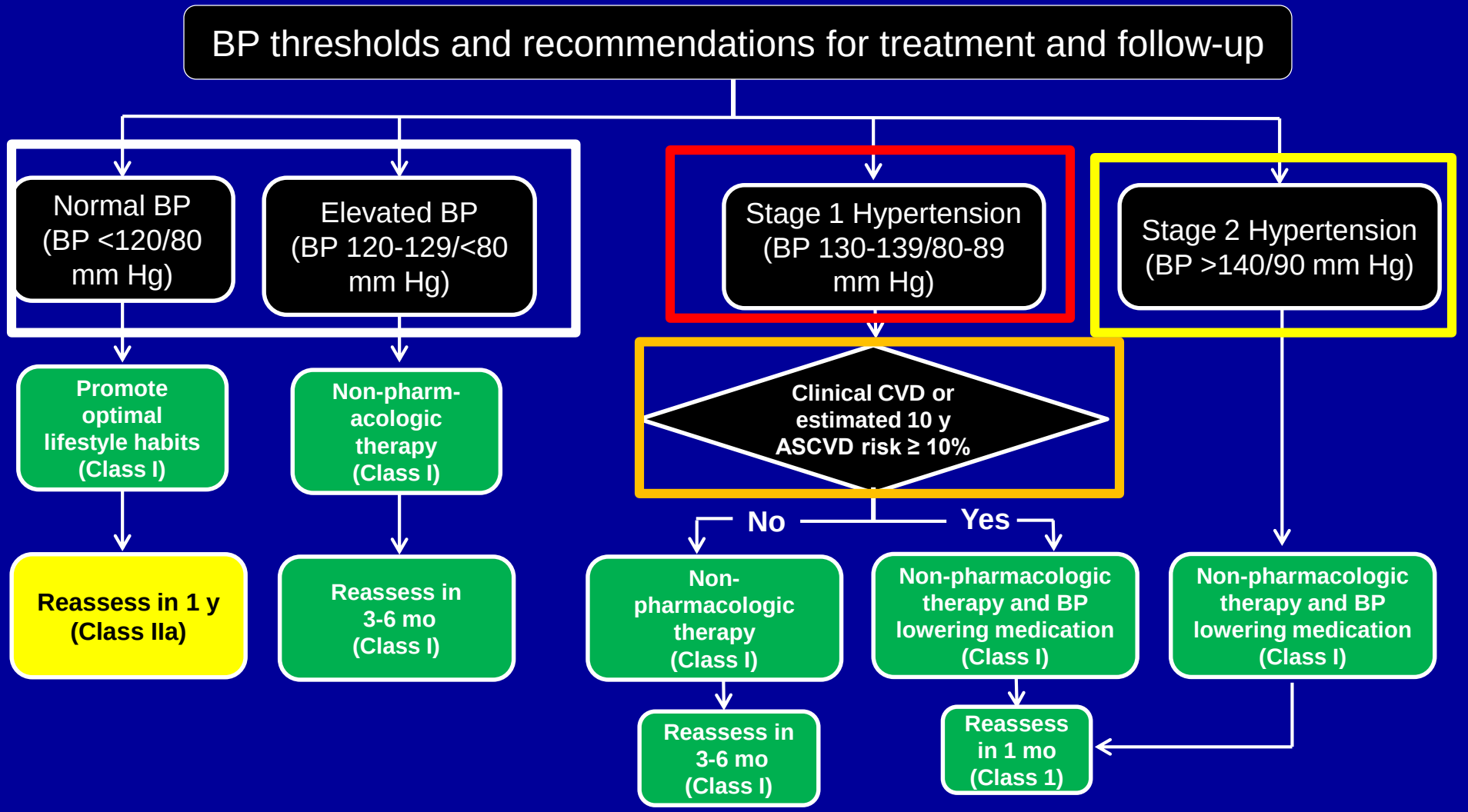
Maximize diuretic therapy
Add a mineralocorticoid receptor antagonist
Add other agents with different mechanisms of actions
Use loop diuretics in patients with CKD
and/or patients receiving potent vasodilators (e.g., minoxidil)

↓

Refer to Specialist

Refer to appropriate specialist for known or suspected secondary cause(s) of hypertension
Refer to hypertension specialist if BP remains uncontrolled after 6 mo of treatment

Putting It All Together



BP Thresholds for and Goals of Pharmacological Therapy in Patients With Hypertension According to Clinical Conditions

Clinical Condition(s)	BP Threshold, mm Hg	BP Goal, mm Hg
General		
Clinical CVD or 10-year ASCVD risk ≥10%	≥130/80	<130/80
No clinical CVD and 10-year ASCVD risk <10%	≥140/90	<130/80
Older persons (≥65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥130 (SBP)	<130 (SBP)
Specific comorbidities		
Diabetes mellitus	≥130/80	<130/80
Chronic kidney disease	≥130/80	<130/80
Chronic kidney disease after renal transplantation	≥130/80	<130/80
Heart failure	≥130/80	<130/80
Stable ischemic heart disease	≥130/80	<130/80
Secondary stroke prevention	≥140/90	<130/80
Secondary stroke prevention (lacunar)	≥130/80	<130/80
Peripheral arterial disease	≥130/80	<130/80

ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

	Nonpharmacologi-cal 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 for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.	-5 mm Hg	-2/3 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 and total fat.	-11 mm Hg	-3 mm Hg
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg	-2/3 mm Hg
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 mm Hg

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.
DASH indicates Dietary Approaches to Stop Hypertension; and SBP, systolic blood pressure.
Resources: Your Guide to Lowering Your Blood Pressure With DASH—How Do I Make the DASH?
Available at: https://www.nhlbi.nih.gov/health/resources/heart/hbp-dash-how-to.
Top 10 Dash Diet Tips. Available at: http://dashdiet.org/dash_diet_tips.asp

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension* (cont.)

	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

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.
†In the United States, one “standard” drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

Key Concepts that we have covered today:

- Hypertension definition and stages.
- Optimal BP target.
- Role of Global ASCVD Risk Assessment.
- Treatment targets for patients with hypertension and comorbidities.
- White coat hypertension /Masked Hypertension-Utility of home and ambulatory BP measurements.
- Resistant and Secondary Hypertension.
- Putting it all together.

Question 1

Hypertension is defined as:

1. **BP ≥ 150/90 mm Hg**
2. **BP ≥ 140/90 mm Hg**
3. **BP ≥ 130/80 mm Hg**
4. **I have no idea because the guidelines keep changing.**

Question 2

A blood pressure of 128/78 mm Hg is classified as:

1. **Hypotension**
2. **Pre-hypertension**
3. **Elevated blood pressure**
4. **Normal blood pressure**

Question 3

First line agents for treatment of hypertension include:

1. **Thiazide diuretics**
2. **Beta-blockers**
3. **Angiotensin receptor blockers**
4. **1 and 3**
5. **2 and 3**

Acknowledgements

- American College of Cardiology
- ACC/AHA/AAPA/ACPM/AGS/APha/ASH/ASPC/NMA/PCNA panel for the 2017 hypertension guideline.
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