An Update in Hypertension Management

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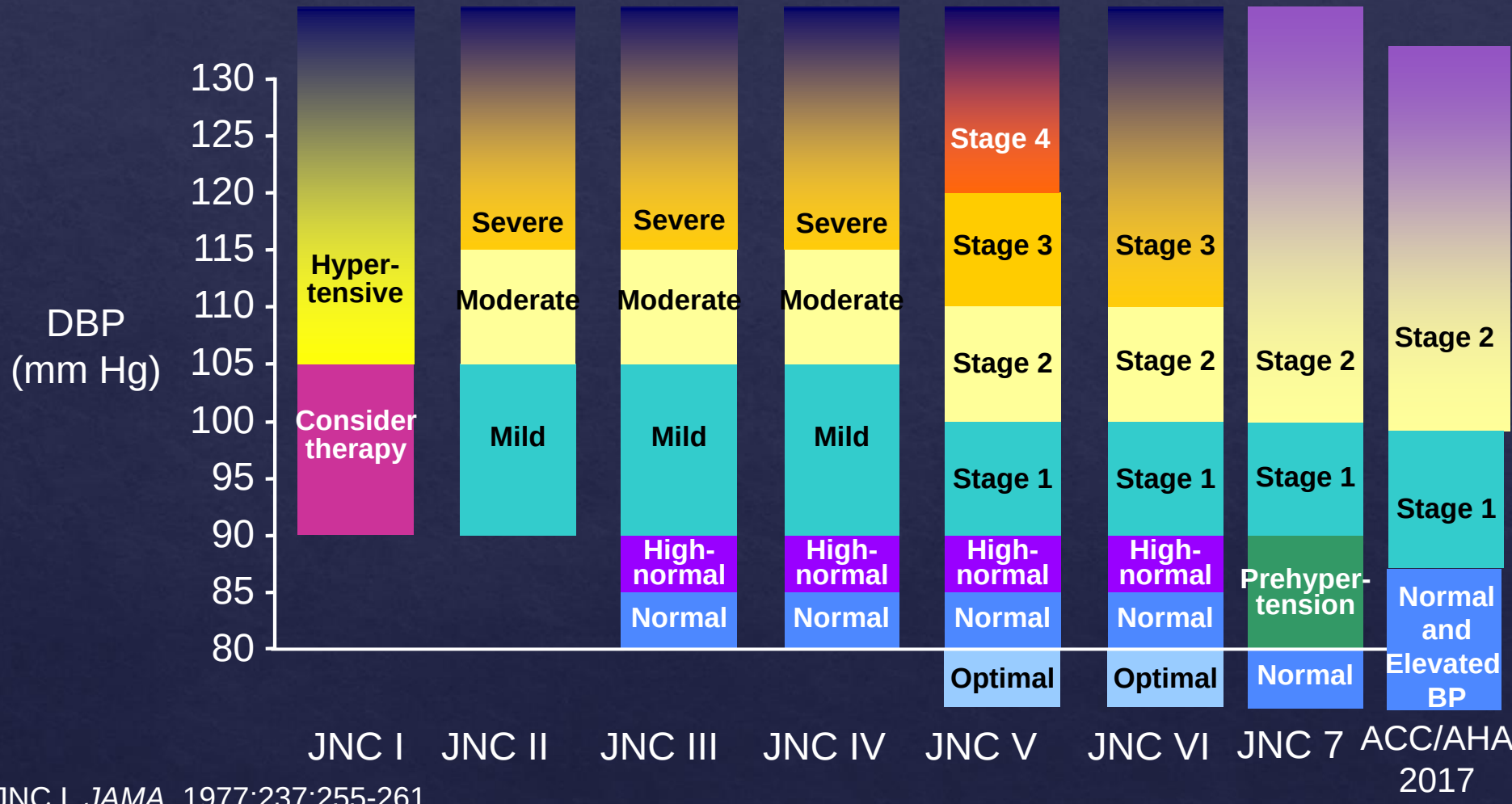
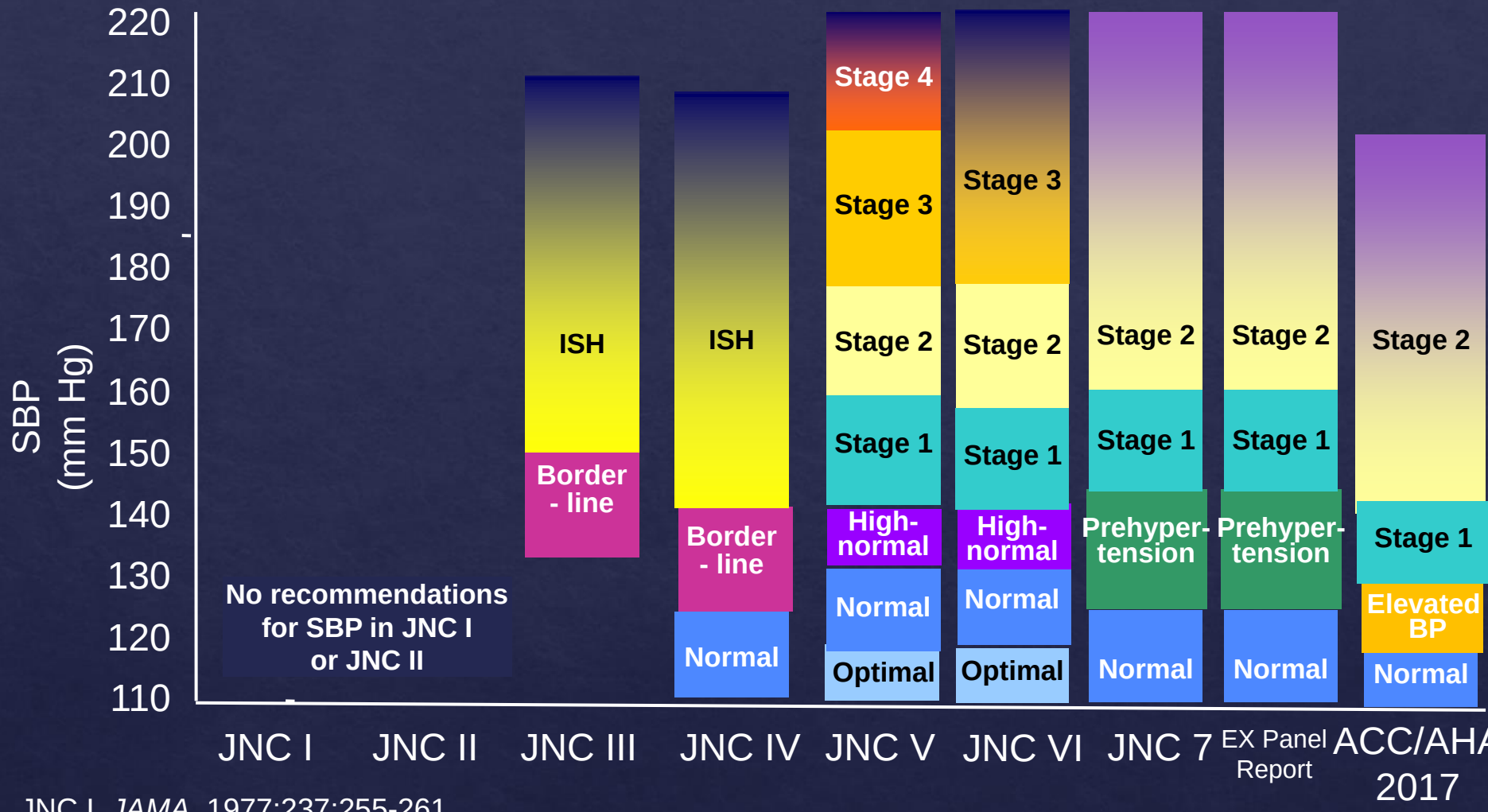
JNC/AHA/ACC BP Classifications: DBP



JNC I. *JAMA.* 1977;237:255-261.
JNC II. *Arch Intern Med.* 1980;140:1280-1285.
JNC III. *Arch Intern Med.* 1984;144:1047-1057.
JNC IV. *Arch Intern Med.* 1988;148:1023-1038
JNC V. *Arch Intern Med.* 1993;153:154-183.
JNC VI. *Arch Intern Med.* 1997;157:2413-2446.
JNC 7. *JAMA.* 2003;289:2560-2572.
Expert Panel Report-JAMA 2014;311:507-520
ACC/AHA BP Guidelines Hypertension 2017

JNC/AHA-ACC BP Classifications: SBP



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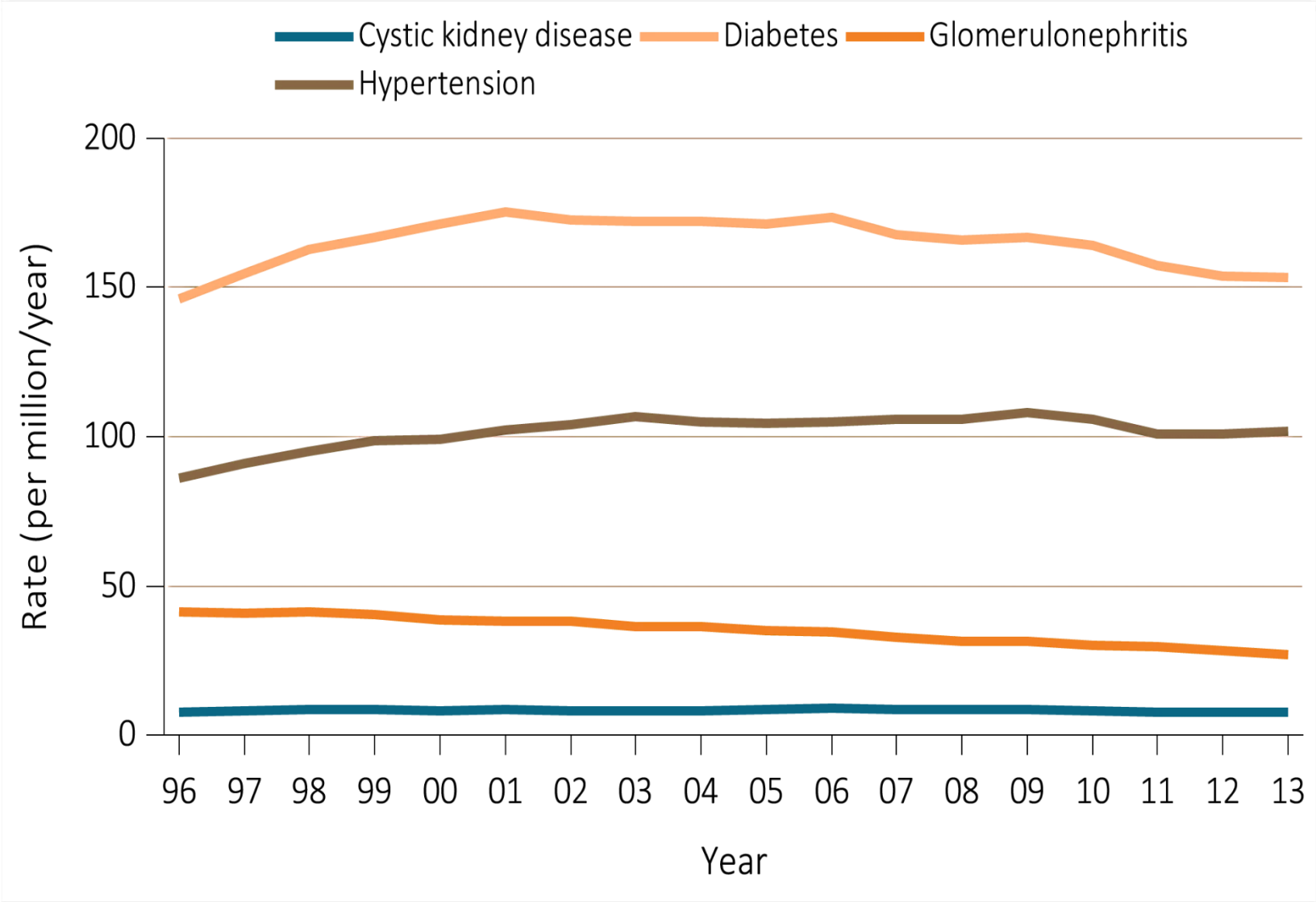
Trends in adjusted* ESRD incidence rate (per million/year), by primary cause of ESRD, in the U.S. population, 1996-2013



*Data Source: Special analyses, USRDS ESRD Database. *Adjusted for age, sex, and race.*
The standard population was the U.S. population in 2011. Abbreviation: ESRD, end-stage renal disease.

AHA/ACC Focus on CV risk to determine BP goals

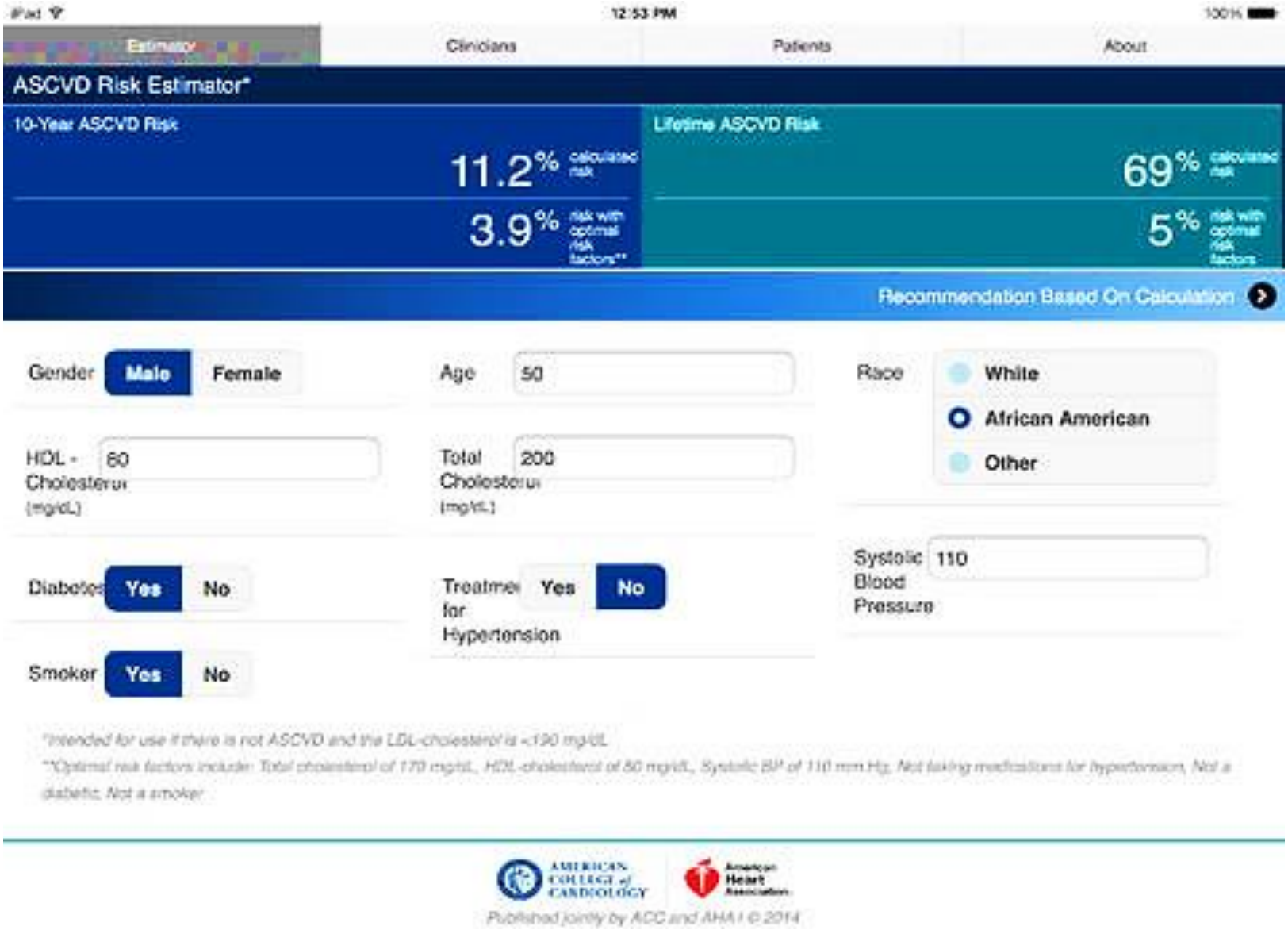
- For adults with confirmed hypertension and greater than 10% 10-year CVD event risk, a BP target of < 130/80 mm Hg is recommended

CVD RISK FACTORS COMMON IN PATIENTS WITH HYPERTENSION

Modifiable Risk Factors*	Relatively Fixed Risk Factors†
• Current cigarette smoking, secondhand smoking • Diabetes mellitus • Dyslipidemia/hypercholesterolemia • Overweight/obesity • Physical inactivity/low fitness • Unhealthy diet	• CKD • Family history • Increased age • Low socioeconomic/educational status • Male sex • Obstructive sleep apnea • Psychosocial stress

*Factors that can be changed and, if changed, may reduce CVD risk.
†Factors that are difficult to change (CKD, low socioeconomic/educational status, obstructive sleep apnea, cannot be changed (family history, increased age, male sex), or, if changed through the use of current intervention techniques, may not reduce CVD risk (psychosocial stress).
CKD indicates chronic kidney disease; and CVD, cardiovascular disease.

ASCVD Risk Calculator



https://itunes.apple.com/us/app/ascvd-risk-estimator/id808875968?mt=8

CHECKLIST FOR ACCURATE MEASUREMENT OF BP

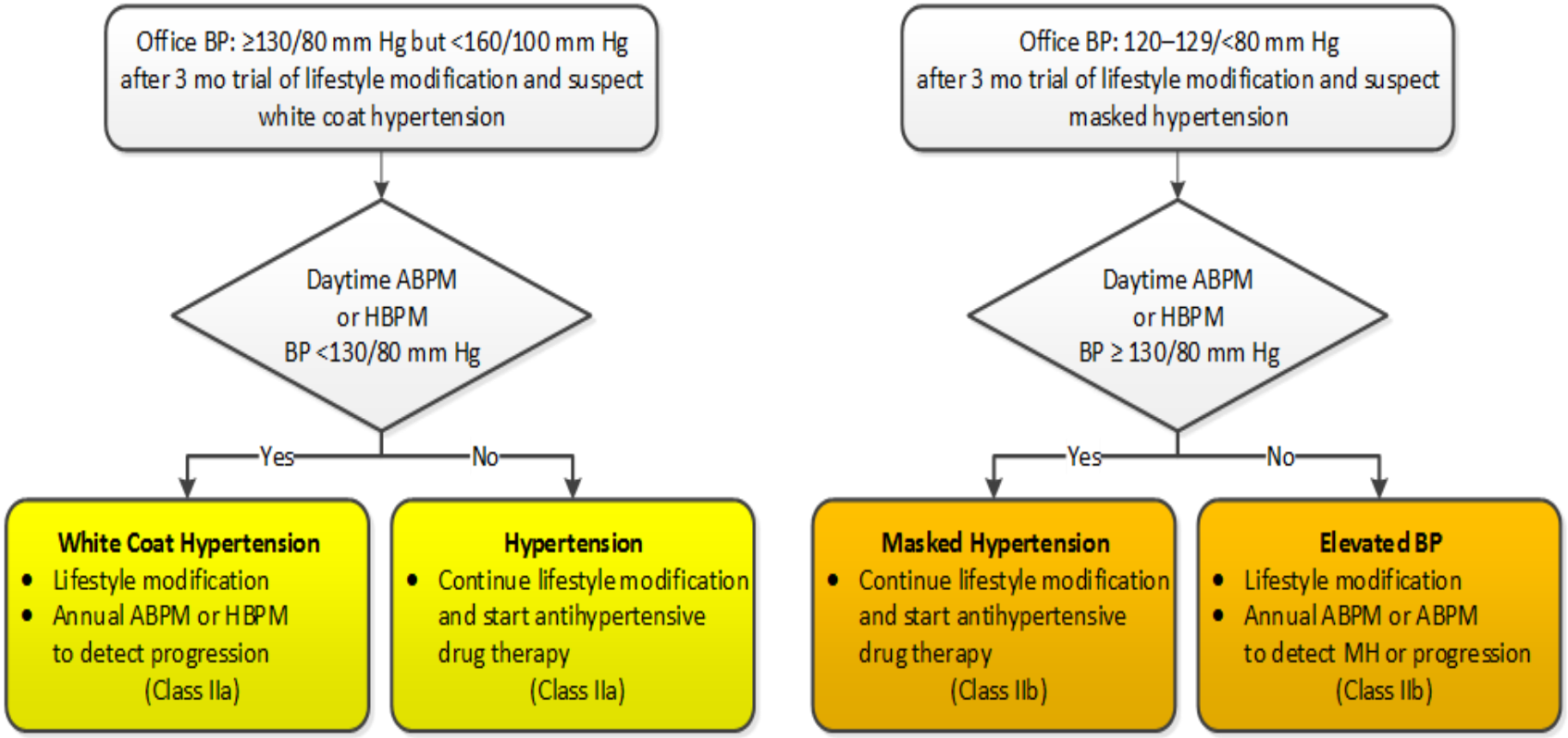
Key Steps for Proper BP Measurements
Step 1: Properly prepare the patient.
Step 2: Use proper technique for BP measurements.
Step 3: Take the proper measurements needed for diagnosis of elevated BP/hypertension.
Step 4: Properly document accurate BP readings.
Step 5: Average the readings.
Step 6: Provide BP readings to patient.

Out-of-Office and Self-Monitoring of 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.

SR indicates systematic review.

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



Colors correspond to Class of Recommendation in Table 1.
ABPM indicates ambulatory blood pressure monitoring; BP, blood pressure; and HBPM, home blood pressure monitoring.

Table 3. Association of Hypertension Phenotypes with All-Cause and Cardiovascular Mortality in Cox Regression Models.*

Mortality and Blood-Pressure Phenotype	All Patients	Deaths	Model 1† Hazard Ratio (95% CI)	Model 1† P Value	Model 2‡ Hazard Ratio (95% CI)	Model 2‡ P Value
All-cause mortality						
Normotension	4,221	76	Reference	—	Reference	—
Controlled hypertension	6,692	202	0.76 (0.57–0.99)	0.04	0.81 (0.62–1.07)	0.133
White-coat hypertension	6,628	309	2.24 (1.74–2.88)	<0.001	1.79 (1.38–2.32)	<0.001
White-coat uncontrolled hypertension	11,042	669	1.30 (1.01–1.66)	0.045	1.06 (0.82–1.37)	0.66
Masked hypertension	2,278	113	2.92 (2.18–3.90)	<0.001	2.83 (2.12–3.79)	<0.001
Masked uncontrolled hypertension	3,092	237	1.89 (1.44–2.47)	<0.001	1.96 (1.50–2.56)	<0.001
Sustained hypertension	12,555	595	2.36 (1.86–2.99)	<0.001	1.80 (1.41–2.31)	<0.001
Sustained uncontrolled hypertension	17,402	1607	1.90 (1.49–2.42)	<0.001	1.43 (1.11–1.85)	0.006
Cardiovascular mortality						
Normotension	4,221	22	Reference	—	Reference	—
Controlled hypertension	6,692	84	0.90 (0.55–1.46)	0.66	0.95 (0.59–1.55)	0.84
White-coat hypertension	6,628	94	2.36 (1.49–3.76)	<0.001	1.96 (1.22–3.15)	0.005
White-coat uncontrolled hypertension	11,042	223	1.23 (0.78–1.94)	0.37	1.04 (0.65–1.66)	0.86
Masked hypertension	2,278	32	2.92 (1.70–5.03)	<0.001	2.85 (1.66–4.90)	<0.001
Masked uncontrolled hypertension	3,092	95	2.20 (1.36–3.55)	0.001	2.27 (1.41–3.68)	0.001
Sustained hypertension	12,555	172	2.42 (1.55–3.78)	<0.001	1.94 (1.23–3.07)	0.005
Sustained uncontrolled hypertension	17,402	573	1.93 (1.23–3.01)	0.004	1.57 (1.00–2.47)	0.046

Banegas JR et.al. N Engl J Med 2018;378:1509-20.

Best Proven Nonpharmacologic Interventions for Prevention and Treatment of Hypertension*

			Approximate Impact SBP	
	Nonpharmacologic Intervention	Dose	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 x 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
Healthy diet	DASH dietary pattern	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
Weight loss	Weight/body fat	Ideal body weight is best goal but at least 1 kg reduction in body weight for most adults who are overweight	-5 mm Hg	-2/3 mm Hg
Reduced intake of dietary sodium	Dietary sodium	<1,500 mg/d is optimal goal but at least 1,000 mg/d reduction in most adults	-5/6 mm Hg	-2/3 mm Hg
Enhanced intake of dietary potassium	Dietary potassium	3,500-5,000 mg/d, preferably by consumption of a diet rich in potassium	-4/5 mm Hg	-2 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 Hg

Definition of hypertension according to clinic (office), ambulatory and home BP levels

ESC/ESH 2018

Category	Systolic (mmHg)		Diastolic (mmHg)
Office BP	≥ 140	And/or	≥ 90
Ambulatory BP			
Daytime mean	≥ 135	And/or	≥ 85
Night time mean	≥ 120	And/or	≥ 70
24 -h mean	≥ 130	And/or	≥ 80
Home BP mean	≥ 135	And/or	≥ 85

AHA/ACC 2017

Category	Systolic (mmHg)		Diastolic (mmHg)
Clinic BP	≥ 130	And/or	≥ 80
Ambulatory BP			
Daytime mean	≥ 130	And/or	≥ 80
Night time mean	≥ 110	And/or	≥ 65
24 -h mean	≥ 125	And/or	≥ 75
Home BP mean	≥ 130	And/or	≥ 80

Bakris GL et.al. JACC, in Press

AHA/ACC 2017

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.

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.
IIa	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.

ESH on Initial Combination Therapy

- Very strong proponents of combo therapy

- **Preferred use of two-drug combination** therapy for the initial treatment of most people with hypertension.
- **A single-pill treatment strategy for hypertension** with the preferred use of SPC therapy for most patients.
- **Simplified drug treatment algorithms** with the preferred use of an ACE inhibitor or ARB, combined with a CCB and/or a thiazide/thiazide-like diuretic, as the core treatment strategy for most patients, with beta-blockers used for specific indications.

Williams B et.al. European Heart Journal (2018) 39, 3021–3104

Chronic Kidney Disease

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

Three Randomized Trials of BP control on CKD progression In Non-Diabetic CKD

- **MDRD (Modification of Dietary Protein in Renal Disease)**
- **REIN-2 (Ramipril Efficacy in Nephropathy)**
- **AASK (African American Study of Kidney Disease)**
- **SPRINT-RENAL (not powered)**

NONE SIGNIFICANTLY FURTHER SLOWED NEPHROPATHY EXCEPT?? >1 GRAM ALBUMINURIA

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DIABETES STATEMENTS from AHA/ACC 2017 BP Guidelines

- 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 (Level 1 B)
- In adults with DM and hypertension, all classes of antihypertensive agents are useful and effective (Level 1A)
- In adults with DM and hypertension, ACE inhibitors or ARBs may be considered in the presence of albuminuria (Level 2B)

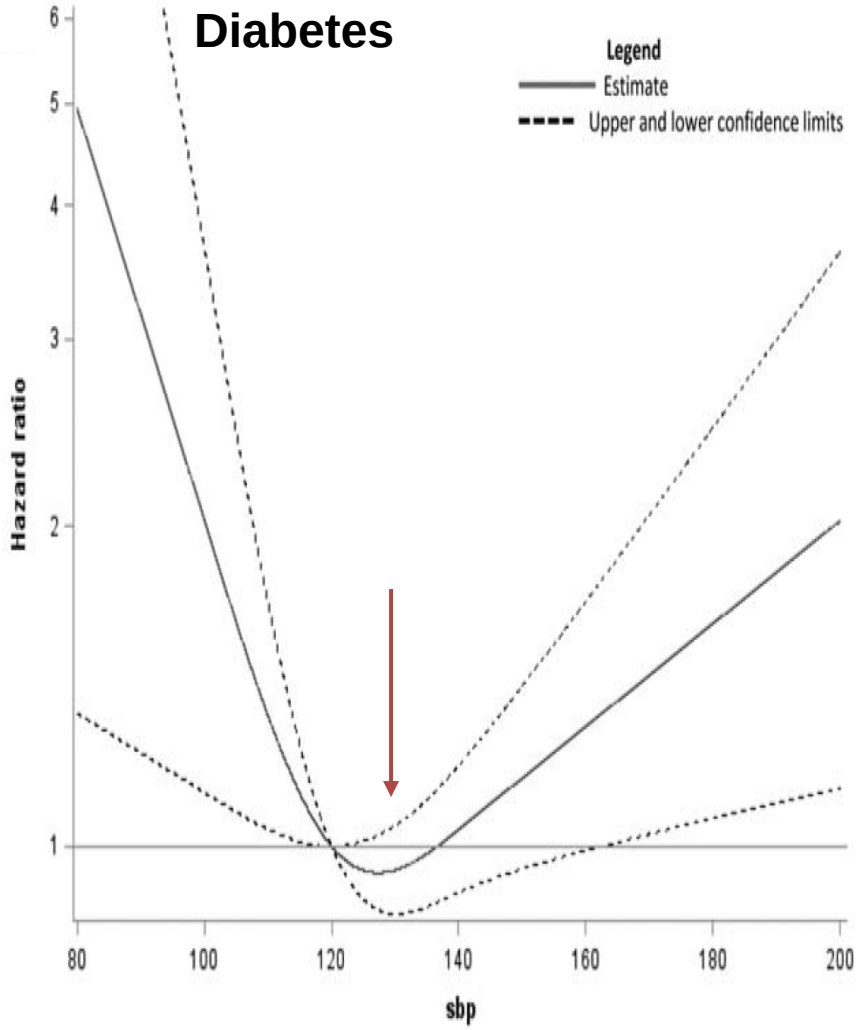
Whelton P et.al. Hypertension 2017

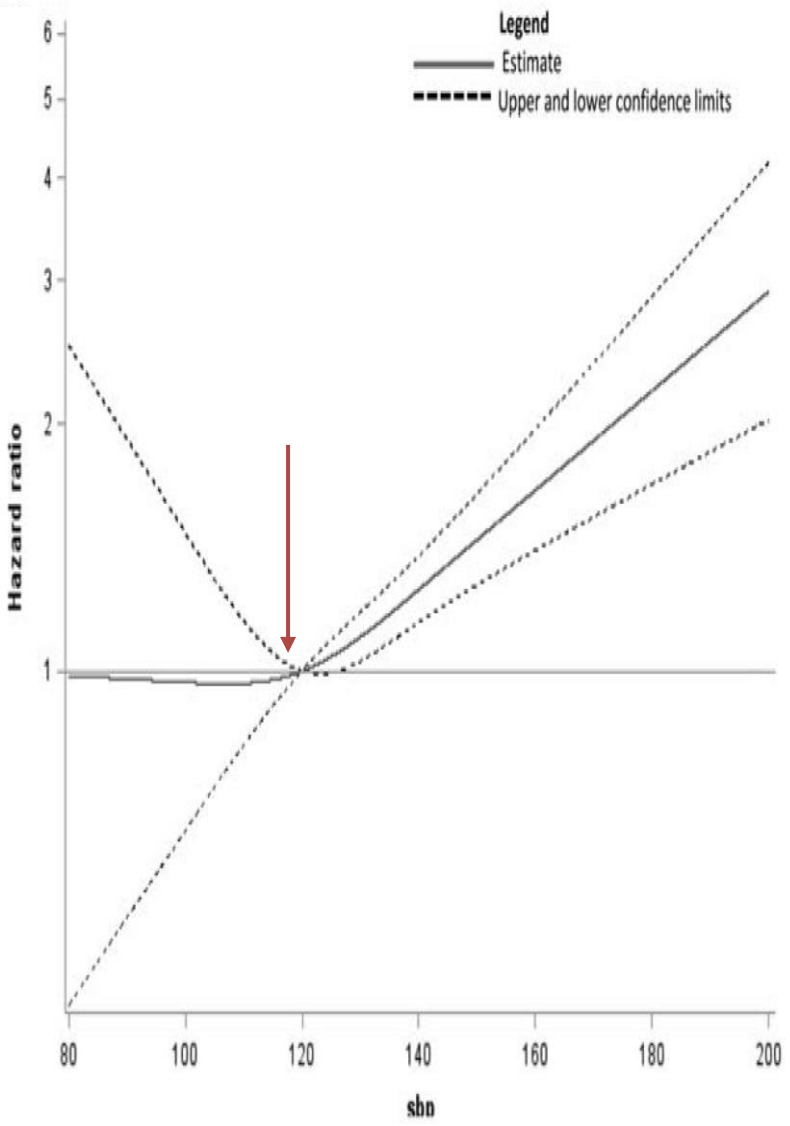
Adjusted cubic spline model of the association between hazard ratio and SBP of persons with and without diabetes mellitus

N=17,650 NHANES III + 1439 DM Heart Study

Mean 16.2 yr. F/U

TOTAL N=19,089





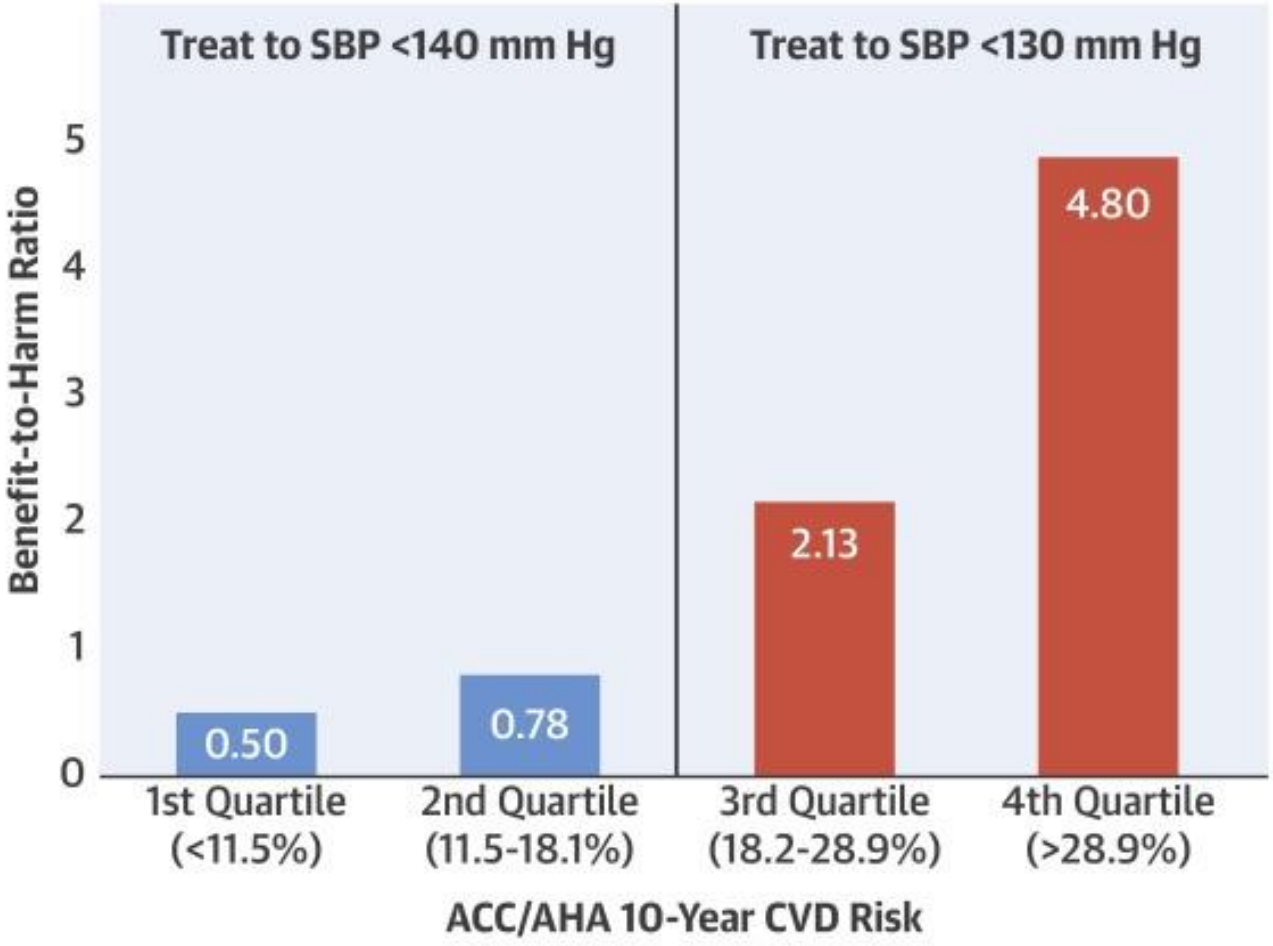
Gomadam P et.al. J Hypertens 2017;36:85–92

ESH OVERALL GUIDANCE

Table 23 Office blood pressure treatment target range

Age group	Office SBP treatment target ranges (mmHg)					Office DBP treatment target range (mmHg)
	Hypertension	+ Diabetes	+ CKD	+ CAD	+ Stroke[a]/TIA	
18 - 65 years	**Target to 130** *or lower if tolerated* Not <120	**Target to 130** *or lower if tolerated* Not <120	**Target to <140 to 130** *if tolerated*	**Target to 130** *or lower if tolerated* Not <120	**Target to 130** *or lower if tolerated* Not <120	70–79
65 - 79 years[b]	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	70–79
≥80 years[b]	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	**Target to 130-139** *if tolerated*	70–79
Office DBP treatment target range (mmHg)	70–79	70–79	70–79	70–79	70–79	

CENTRAL ILLUSTRATION: Treatment Recommendations Based on Benefit and Harm Experienced in SPRINT by 10-Year CVD Risk



Phillips, R.A. et al. J Am Coll Cardiol. 2018;71(15):1601-10.

Summary

- No strong data supporting a BP <130/80 to slow CKD progression unless there is more than 1 gr of albuminuria.
- CV outcomes are reduced in patients with diabetes at high CV risk when < 130/80 mmHg.
- Thus, most MAJOR guidelines recommend lower goal BP for most people with diabetes <130/80 mmHg.
- RAAS blockers have a clear role in those with CKD and >300 mg/d albuminuria or heart failure otherwise no evidence providing protection.

O'Hare A et.al. Ann Intern Med 2009; de Boer, I et.al. JAMA 2018; Kalaitzidis R et.al. Curr Cardiol Rep 2009 ;ADA Clinic Pract. Guidelines Diabetes Care 2019;KDIGO BP guidelines-Kidney Int 2013

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