



Hypertension: What Does the Expert Say and What Should I Do?

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Disclosure

Relevant Financial Relationships

None

Off-Label/Investigational Uses

None

Learning Objectives

- To review the health impact of HTN.
- To review the different methods of measurement of blood pressure.
- To review the multiple recent guidelines regarding goal blood pressure control.
- To discuss specific treatment options including pharmacologic and non pharmacologic including in special populations.

Clinical case

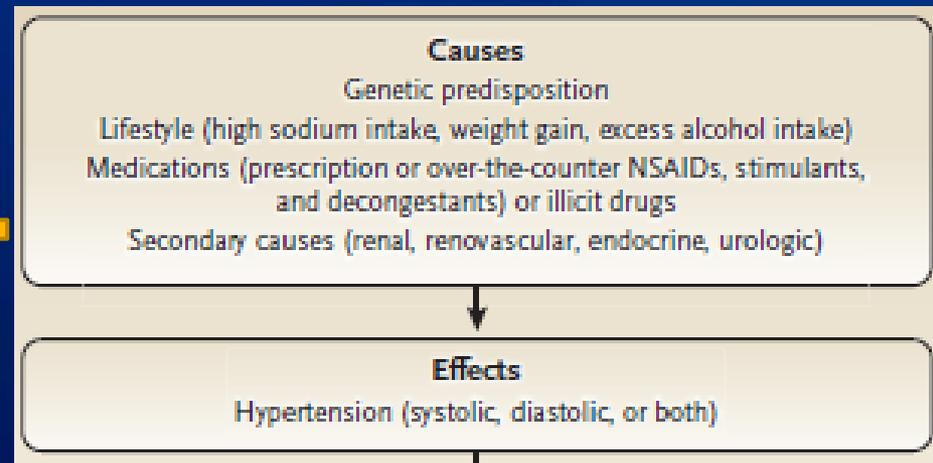
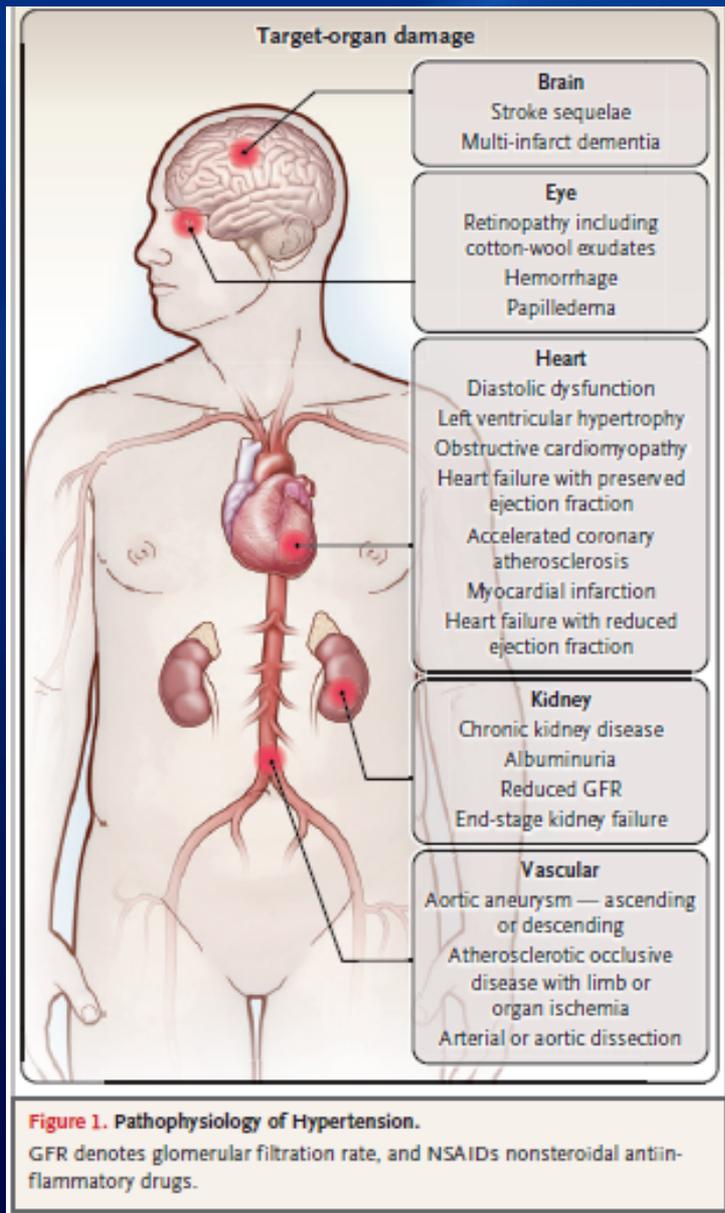
- 56 yo woman presenting for evaluation of high blood pressure noted during a job-site screening.
- She has gained 20 lbs over the past 5 y, take naproxen 220 mg daily for joint pain.
- She has never smoked. She drinks 1 to 2 alcoholic drinks per day. No drug use. FH: positive for HTN.
- On examination: BP 163/94 mmHg in both arms while seated and 150/96 mmHg while standing.
- Na: 138, K: 3.8, Creatinine: 0.8 mg/dl. UA normal.

Clinical case: questions

- What are the implications of high blood pressure on the patient?
- What work-up is required for this new finding?
- What is the goal blood pressure to target?
- How do you reach the goal blood pressure?
- How do you advise patient to monitor blood pressure?

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Hypertension: health impact

- In the Global Burden of Disease Study 2010, high BP was the leading cause of death and disability-adjusted life years worldwide¹.
- In the United States, hypertension accounted for more CVD deaths than any other modifiable CVD risk factor and was second only to cigarette smoking as a preventable cause of death for any reason².
- In a follow-up study of 23 272 US NHANES (National Health and Nutrition Examination Survey) participants, >50% of deaths from coronary heart disease (CHD) and stroke occurred among individuals with hypertension³.
- In 2012, hypertension was the second leading assigned cause of ESRD, behind diabetes mellitus (DM), and accounted for 34% of incident ESRD cases in the US population⁴.

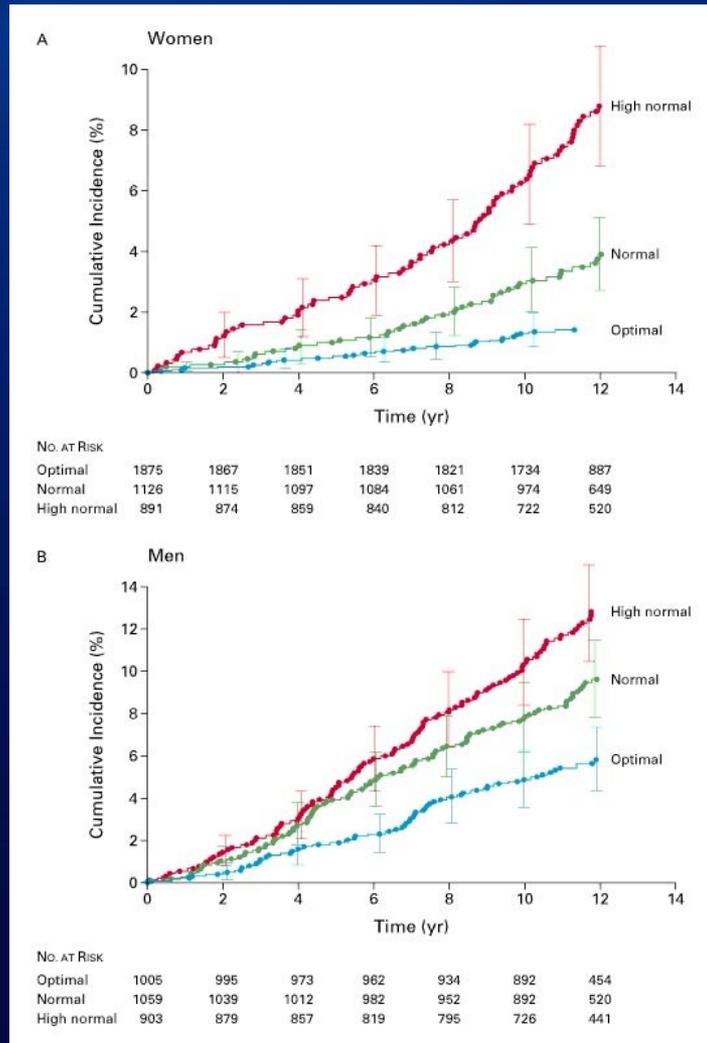
1- Lancet. 2012 Dec 15;380(9859):2224-60. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010.

2- PLoS Med. 2009 Apr 28;6(4). The preventable causes of death in the United States: comparative risk assessment of dietary, lifestyle, and metabolic risk factors.

3- Circulation 2011. Trends in mortality from all causes and cardiovascular disease among hypertensive and nonhypertensive adults in the United States.

4- Am J Kidney Dis. 2015 Jul;66(1 Suppl 1). US Renal Data System 2014 Annual Data Report: Epidemiology of Kidney Disease in the United States.

Hypertension: Cumulative Incidence of Cardiovascular Events



Optimal blood pressure: SBP < 120 mm Hg and DBP < 80 mm Hg.

Normal blood pressure: SBP 120 to 129 mm Hg or DBP 80 to 84 mm Hg.

High-normal blood pressure: SBP 130 to 139 mm Hg or DBP of 85 to 89 mm Hg.

Hazard Ratio for CVD
of 2.5 among women and 1.6
among men

N= 6859 participants in the
Framingham Heart Study

HTN coexists frequently with other CVD risk factors

Table 5. CVD Risk Factors Common in Patients With Hypertension (Table view)

Modifiable Risk Factors*	Relatively Fixed Risk Factors†
Current cigarette smoking, secondhand smoking	CKD
	Family history
Diabetes mellitus	Increased age
Dyslipidemia/hypercholesterolemia	Low socioeconomic/educational status
Overweight/obesity	Male sex
Physical inactivity/low fitness	Obstructive sleep apnea
Unhealthy diet	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^{S2.4-12}), 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.



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AHA Scientific Statement

Measurement of Blood Pressure in Humans A Scientific Statement From the American Heart Association

Paul Muntner, PhD, MHS, FAHA, Chair; Daichi Shimbo, MD, Vice Chair;
Robert M. Carey, MD, FAHA; Jeanne B. Charleston, PhD; Trudy Gaillard, PhD;
Sanjay Misra, MD, FAHA; Martin G. Myers, MD; Gbenga Ogedegbe, MD, FAHA;
Joseph E. Schwartz, PhD; Raymond R. Townsend, MD, FAHA;
Elaine M. Urbina, MD, MS, FAHA; Anthony J. Viera, MD, MPH, FAHA;
William B. White, MD, FAHA; Jackson T. Wright Jr, MD, PhD, FAHA; on behalf of the American
Heart Association Council on Hypertension; Council on Cardiovascular Disease in the Young; Council
on Cardiovascular and Stroke Nursing; Council on Cardiovascular Radiology and Intervention; Council
on Clinical Cardiology; and Council on Quality of Care and Outcomes Research

Hypertension. 2019;73:e35–e66

accurate reading possible.

“

This is a big deal. A lot of people have blood pressure that are on the borderline of having hypertension, and these small errors can sway you one way or the other in a diagnosis and treatment with medication you might not need.”

– Michael Rakotz

https://www.heart.org/-/media/files/professional/million-hearts/success-stories/7-simple-tips-to-get-accurate-blood-pressure-ucm_493556.pdf



7 SIMPLE TIPS TO GET AN ACCURATE BLOOD PRESSURE READING

The common positioning errors can result in inaccurate blood pressure measurement. Figures shown are estimates of how improper positioning can potentially impact blood pressure readings.

Sources:

1. Pickering, et al. Recommendations for Blood Pressure Measurement in Humans and Experimental Animals Part 1: Blood Pressure Measurement in Humans. *Circulation*. 2005;111: 697-716.
2. Handler J. The importance of accurate blood pressure measurement. *The Permanente Journal*/Summer 2009/Volume 13 No. 3 51

This 7 simple tips to get an accurate blood pressure reading was adapted with permission of the American Medical Association and The Johns Hopkins University. The original copyrighted content can be found at <https://www.ama-assn.org/ama-johns-hopkins-blood-pressure-resources>.

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https://www.heart.org/-/media/files/professional/million-hearts/success-stories/7-simple-tips-to-get-accurate-blood-pressure-ucm_493556.pdf



Measurement of Blood Pressure in Humans

A Scientific Statement From the American Heart Association

- Fully automated oscillometric devices capable of taking multiple readings even without an observer being present may provide a more accurate measurement of BP than auscultation.
- Ambulatory BP monitoring is considered the reference standard for out-of-office BP assessment, with home BP monitoring being an alternative when ambulatory BP monitoring is not available or tolerated.

Hypertension. 2019;73:e35–e66

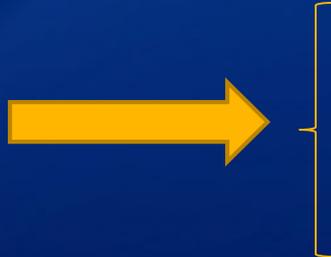
Measurement of Blood Pressure in Humans

A Scientific Statement From the American Heart Association

- Initial and ongoing training of technicians and healthcare providers and the use of validated and calibrated devices are critical for obtaining accurate BP measurements.

Hypertension. 2019;73:e35–e66

Key Components for Training in BP Measurement

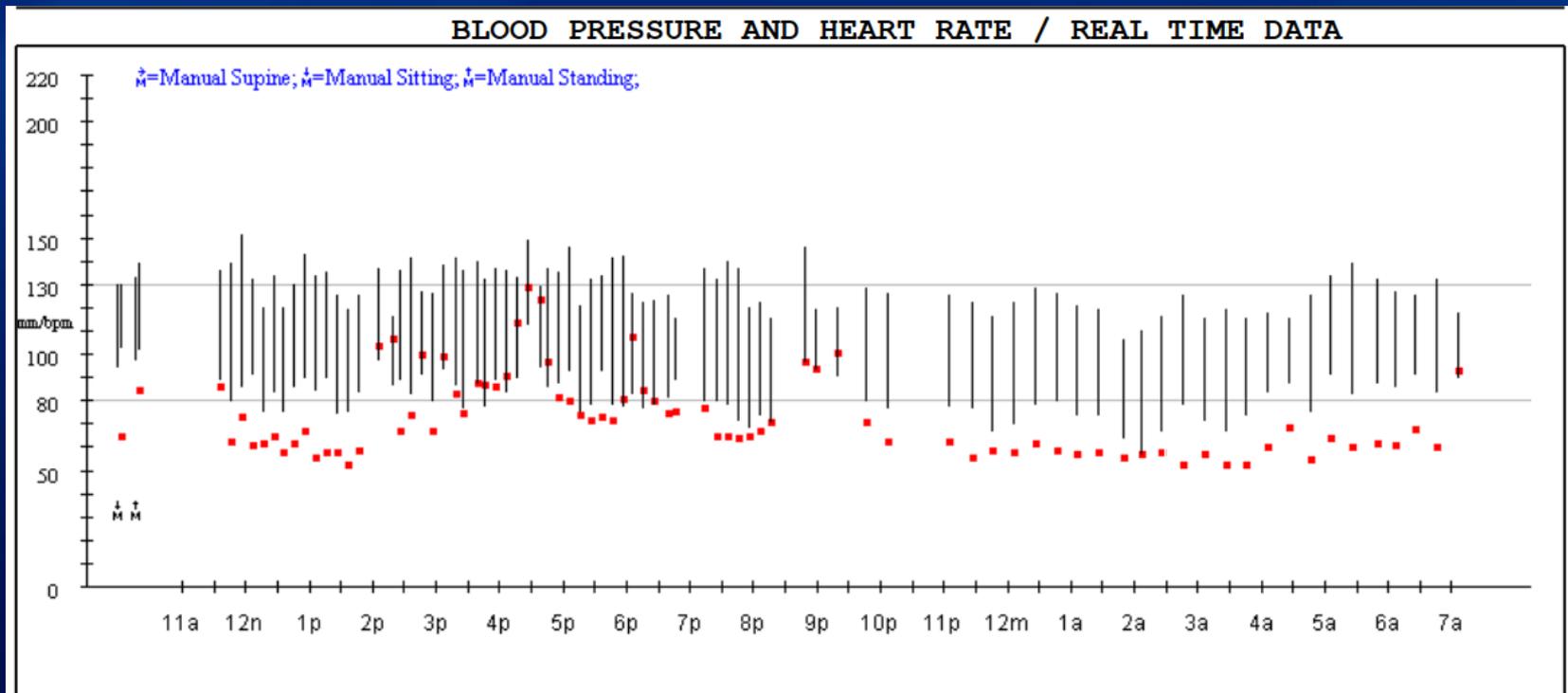


Observers should be aware of the need to do the following:
Use only validated devices that are well maintained (including regular recalibration)
Choose a quiet location with adequate room temperature ($\geq 72^{\circ}\text{F}$)
Correctly position the person whose BP is being measured
Ensure that the person does not talk or move during the rest and measurement periods
Ensure that the person does not have a full bladder when BP is measured
The skills of the technician or provider should be demonstrated by assessing the following:
Positioning the patient
Selecting the appropriate size cuff
Obtaining a valid and reliable measurement
Recording the measurement accurately
Reporting of abnormal levels
Observers should also know how to interpret and how and when to communicate BP readings to healthcare providers and patients.
Questionnaires or interviews can be used to assess knowledge of the BP measurement methodology.
Retraining of healthcare professionals every 6 mo to 1 y should be considered.

Ambulatory Blood Pressure Monitoring: advantages

- Noninvasive, fully automated technique in which BP is recorded over an extended period of time, typically 24 hours.
- Substantial data have demonstrated that BP measured by ABPM has a stronger association with hypertension-related target-organ damage and clinical cardiovascular outcomes compared with office-based BP measurements.

Ambulatory Blood Pressure Monitor



Office BP

126/80	116/78	114/78
Left arm	Left arm	Left arm
Sitting	Sitting	Standing
Regular	Regular	Regular 68

Ambulatory Blood Pressure Monitor

SUMMARY STATISTICS

	#	Avg	sd	Min	Med	Max
Systolic						
Active:	80	128	9	106	130	151
InActive:	0	0	0	0	0	0
Asleep:	0	0	0	0	0	0
Total:	80	128	9	106	130	151
Diastolic						
Active:	80	82	8	57	83	113
InActive:	0	0	0	0	0	0
Asleep:	0	0	0	0	0	0
Total:	80	82	8	57	83	113
HeartRate						
Active:	80	73	17	53	77	129
InActive:	0	0	0	0	0	0
Asleep:	0	0	0	0	0	0
Total:	80	73	17	53	77	129

18 hr summary Awake(7AM-9PM), Nocturnal(12AM-5AM)

	#	Avg	sd	Min	Med	Max
Systolic						
Awake:	26	131	9	115	133	149
Nocturnal:	15	118	6	106	119	128
Diastolic						
Awake:	26	83	9	69	83	113
Nocturnal:	15	73	7	57	74	88
HeartRate						
Awake:	26	83	18	64	80	129
Nocturnal:	15	57	4	53	58	69

Active Period

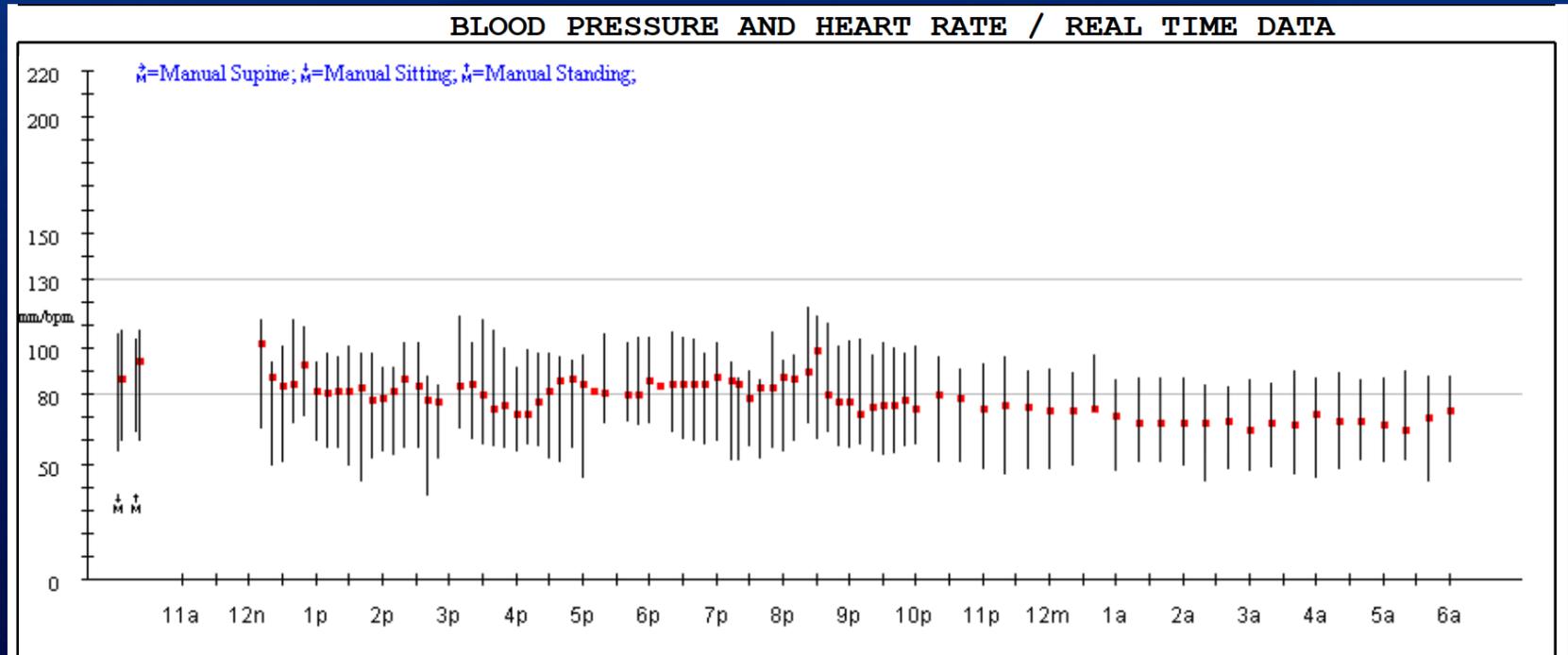
Systolic	>= 135:	31 % of	80 Readings
Systolic	>= 130:	46 % of	80 Readings
Diastolic	>= 80:	59 % of	80 Readings

InActive Period

Systolic	>= 120:	0 % of	0 Readings
Systolic	>= 110:	0 % of	0 Readings
Diastolic	>= 65:	0 % of	0 Readings

Diagnosis: Elevated blood pressure -- Elevated nocturnal systolic blood pressure, Normal nocturnal fall in systolic blood pressure

Ambulatory Blood Pressure Monitor



Ambulatory Blood Pressure Monitoring Compared to Home and Office Reading

Table 11. Corresponding Values of SBP/DBP for Clinic, HBPM, Daytime, Nighttime, and 24-Hour ABPM Measurements ([Table view](#))

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.

2017 ACC/AHA Guidelines for HTN Management

Ambulatory Blood Pressure Monitoring: advantages

- Allows the diagnosis of masked HTN and white coat HTN.

Hypertension based on: Office Blood Pressure	Yes	White Coat Hypertension	Sustained Hypertension
	No	Sustained Normotension	Masked Hypertension
		No	Yes
		Hypertension based on: Out-of-office Blood Pressure	

Figure 1. Cross-classification of office and out-of-office hypertension. Out-of-office hypertension is defined on the basis of home blood pressure (BP) monitoring or ambulatory BP monitoring. Reprinted from Pickering et al⁶⁶ with permission. Copyright © 2008, Wolters Kluwer Health.

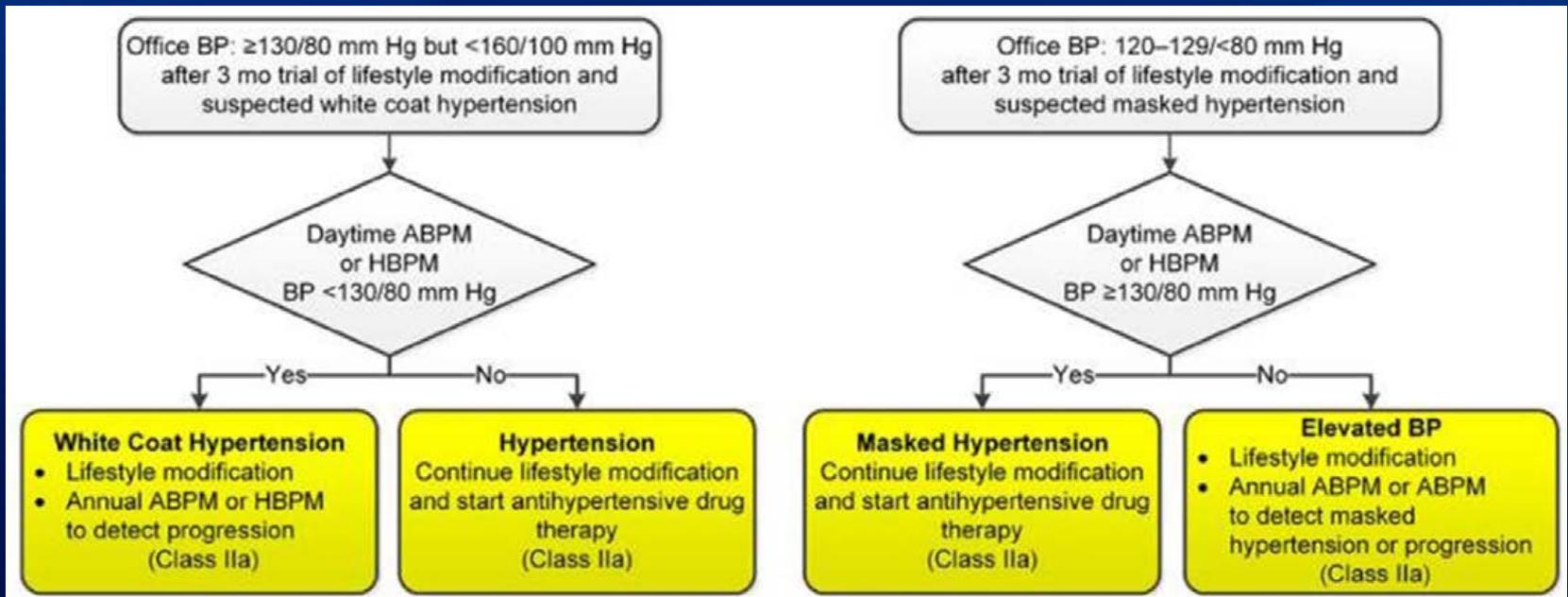
White Coat Hypertension

- Among patients with office BP in the hypertensive range, the prevalence of white-coat hypertension using awake or 24-hour BP to define out-of-office BP is 15% to 30%.
- In many cases are attributable to the effect of the observer (eg, clinician or medical staff taking the BP reading), using automated BP monitor in the office setting without an observer present may help lessen the prevalence of these phenotypes.
- Most studies, have shown that white-coat hypertension by itself confers minimal excess cardiovascular risk.

Masked Hypertension

- Refers to a mean out-of-office BP in the hypertensive range with BP not in the hypertensive range when measured in the office.
- Present in $\approx 15\%$ to 30% (estimated at 17 millions in USA).
- More common among those with diabetes mellitus, chronic kidney disease, and obstructive sleep apnea.
- Multiple cohort studies and meta-analyses have also reported that masked hypertension is associated with an incidence of CVD events similar to that seen among their counterparts with sustained hypertension.

Masked HTN vs White Coat HTN



Home Blood Pressure Reading

Guidance to Patients

Best practices for the patient
Preparation
Have an empty bladder
Rest quietly in seated position for at least 5 min
Do not talk or text
Position
Sit with back supported
Keep both feet flat on the floor
Legs should not be crossed
BP cuff should be placed on a bare arm (not over clothes)
BP cuff should be placed directly above the antecubital fossa (bend of the arm)
Center of the bladder of the cuff (commonly marked on the cuff by the manufacturer) should be placed over the arterial pulsation of the patient's bare upper arm
Cuff should be pulled taut, with comparable tightness at the top and bottom edges of the cuff, around the bare upper arm
The arm with the cuff should be supported on a flat surface such as a table
Number of readings
Take 2 readings at least 1 min apart in the morning before taking antihypertensive medications and 2 readings at least 1 min apart in the evening before going to bed
Duration of monitoring
Preferred monitoring period is ≥ 7 d (ie, 28 readings or more scheduled readings); a minimum period of 3 d (ie, 12 readings) may be sufficient, ideally in the period immediately before the next appointment with provider

When to Suspect Secondary HTN

BP

GUIDELINES MADE SIMPLE

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

Screening for Secondary Hypertension

New Onset or Uncontrolled Hypertension in Adults

Conditions

- Drug-resistant/induced hypertension;
- Abrupt onset of hypertension;
- Onset of hypertension at <30 y;
- Exacerbation of previously controlled hypertension;
- Disproportionate TOD for degree of hypertension;
- Accelerated/malignant hypertension
- Onset of diastolic hypertension in older adults (≥ 65 y)
- Unprovoked or excessive hypokalemia

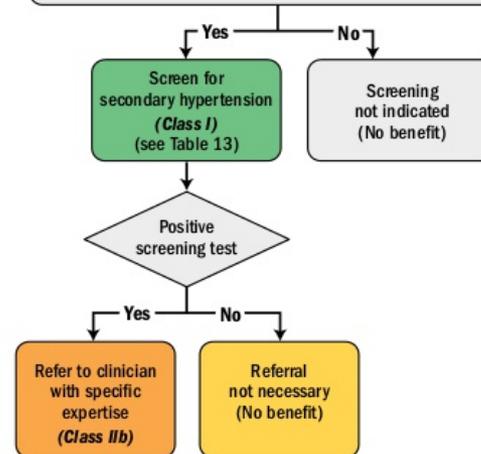


Figure 3

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Learning Objectives

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Common Theme: Emphasis on accuracy of Blood Pressure measurements

- Guidelines recommend office blood pressure (BP) measurement on repeated visits and ambulatory blood pressure monitoring (ABPM) or home blood pressure monitoring (HBPM) to confirm the diagnosis of hypertension (Class I).

2017 ACC/AHA vs JNC 7 Guidelines for HTN Management

Definition of Hypertension

Table 1. Classification of Blood Pressure in Adults.*

Blood-Pressure Category	Definition
Normal	Systolic pressure of <120 mm Hg and diastolic pressure of <80 mm Hg
Elevated	Systolic pressure of 120–129 mm Hg and diastolic pressure of <80 mm Hg
Hypertension	
Stage 1	Systolic pressure of 130–139 mm Hg or diastolic pressure of 80–89 mm Hg
Stage 2	Systolic pressure of \geq 140 mm Hg or diastolic pressure of \geq 90 mm Hg

* Definitions are derived from the 2017 American College of Cardiology–American Heart Association Hypertension Guideline.² Persons with systolic blood pressure and diastolic blood pressure in different categories should be designated in the higher blood-pressure category. Diagnosis is based on the average of two or more readings taken on two or more occasions.

2017 ACC/AHA Guidelines Compared to JNC 7

Individuals with systolic (SBP) and diastolic (DBP) blood pressure in 2 categories are designated to the higher blood pressure category.

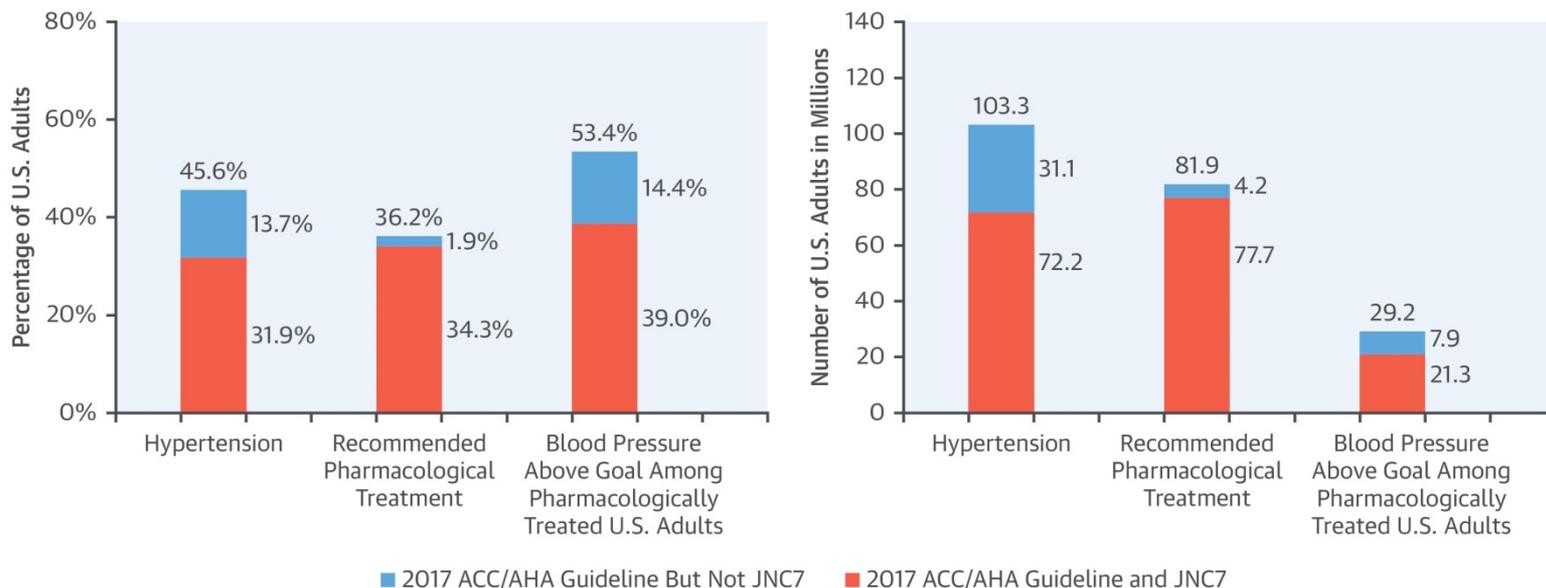
SBP (mmHg)		DBP (mmHg)	JNC 7	ACC/AHA 2017
<120	AND	<80	NORMAL BP	NORMAL BP
120-129	AND	<80	Prehypertension	Elevated BP
130-139	OR	80-89	Prehypertension	Stage 1 Hypertension
140-159	OR	90-99	Stage 1 Hypertension	Stage 2 Hypertension
≥160	OR	≥100	Stage 2 Hypertension	Stage 2 Hypertension

SBP: Systolic blood pressure; DBP: Diastolic blood pressure; JNC 7: Seventh Report of the Joint National Committee on prevention, detection, evaluation, and treatment of high Blood Pressure; ACC/AHA: American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Figure- uploaded by Theodore Papaioannou

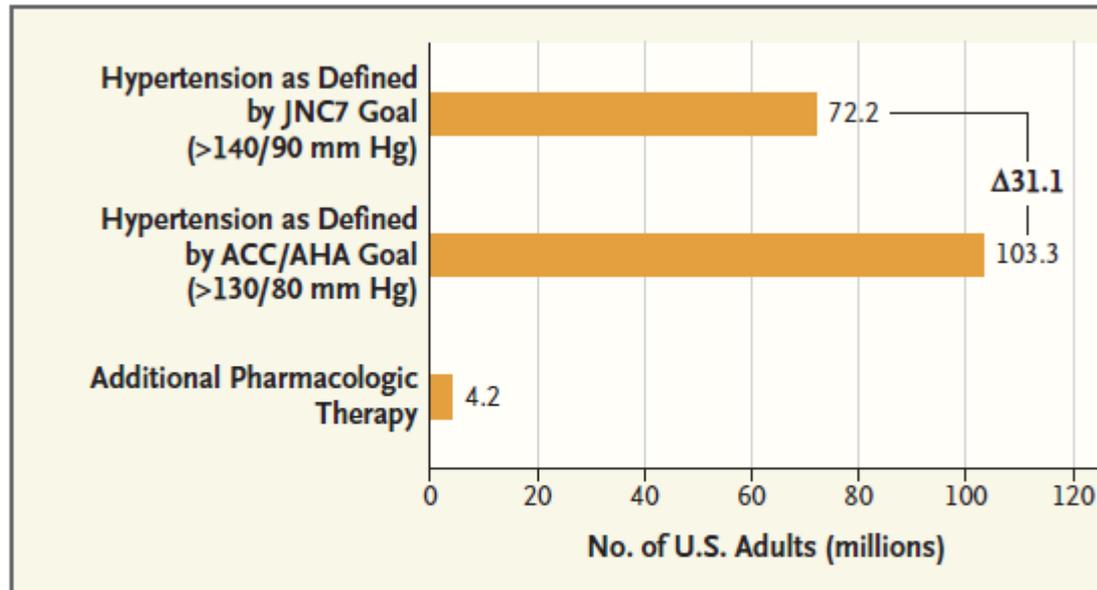
2017 ACC/AHA vs JNC 7 Guidelines for HTN Management

CENTRAL ILLUSTRATION: Prevalence of Hypertension, Recommendation for Pharmacological Antihypertensive Treatment, and Blood Pressure Above Goal Among U.S. Adults According to the 2017 ACC/AHA and the JNC7 Guidelines



Muntner, P. et al. *J Am Coll Cardiol.* 2018;71(2):109-18.

2017 ACC/AHA vs JNC 7 Guidelines for HTN Management



U.S. Adults with Hypertension as Defined by the JNC7 and ACC/AHA Guidelines and Effect on Use of Pharmacologic Therapy.

Data are from Muntner et al.³

Compared with the JNC7 guideline, the 2017 ACC/AHA guideline results in a substantial increase in the prevalence of hypertension, a small increase in the percentage of U.S. adults recommended for antihypertensive medication, and more intensive BP lowering for many adults taking antihypertensive medication

SPRINT TRIAL

The NEW ENGLAND
JOURNAL *of* MEDICINE

ESTABLISHED IN 1812

NOVEMBER 26, 2015

VOL. 373 NO. 22

A Randomized Trial of Intensive versus
Standard Blood-Pressure Control

The SPRINT Research Group*

ABSTRACT

SPRINT: Trial Design

- 9361 persons (>50yo) with a systolic blood pressure of 130 mmHg or higher and an increased cardiovascular risk, but without diabetes, to a systolic blood-pressure target:

Less than 120 mm Hg (intensive treatment)

or

Less than 140 mm Hg (standard treatment).

- The primary composite outcome was myocardial infarction, other acute coronary syndromes, stroke, heart failure, or death from cardiovascular causes.

N Engl J Med 2015;373:2103-16.

SPRINT: Trial Design

- Inclusion criteria:

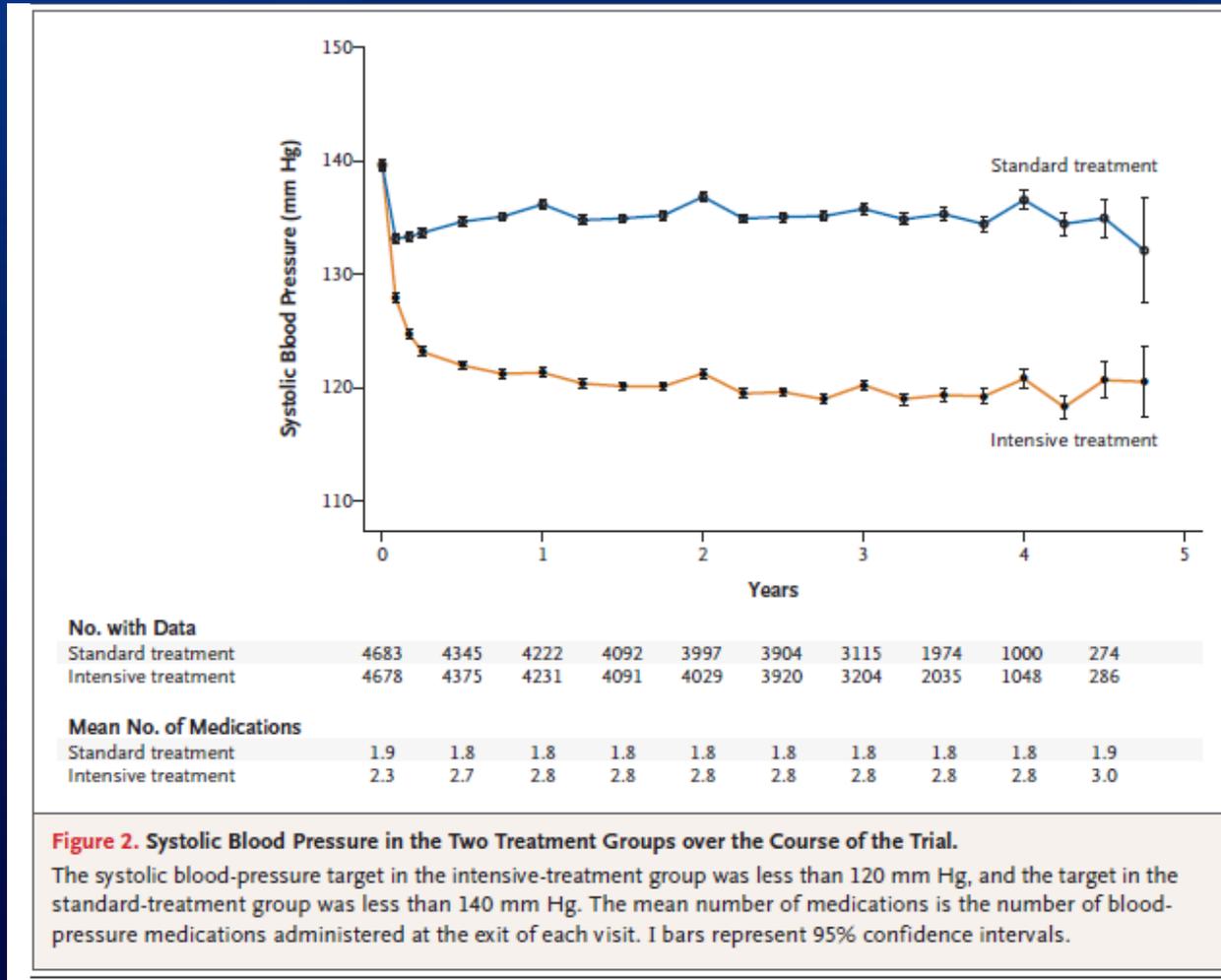
50 yo with SBP 130-180 mmHg with Increased cardiovascular risk defined by one or more of the following:

- Clinical or subclinical cardiovascular disease other than stroke.
- Chronic kidney disease, excluding polycystic kidney disease (eGFR 20-60ml/min).
- 10-year risk of cardiovascular disease of 15% or greater on the basis of the Framingham risk score
- Age of 75 years or older.

SPRINT: Trial Design

- Exclusion criteria were:
 - Diabetes mellitus.
 - History of stroke.
 - >1 g proteinuria.
 - Heart failure.
 - Estimated glomerular filtration rate <20 mL/min or dialysis.

At 1 year, the mean systolic blood pressure was **121.4 mmHg** in the intensive treatment group and **136.2 mmHg** in the standard-treatment group

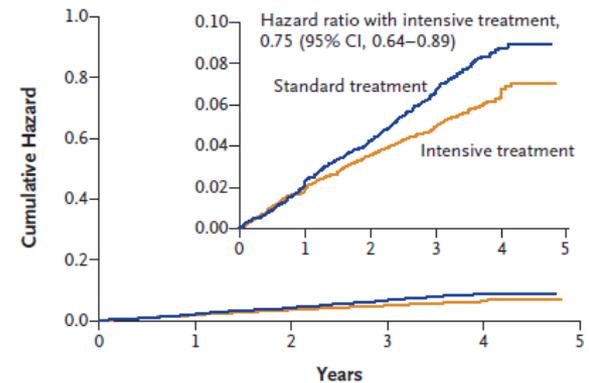


SPRINT TRIAL

The intervention was stopped early after a median follow-up of 3.26 years owing to a significantly lower rate of the primary composite outcome in the intensive-treatment

Rates of serious adverse events of hypotension, syncope, electrolyte abnormalities, and acute kidney injury or failure, but not of injurious falls, were higher in the intensive treatment Group.

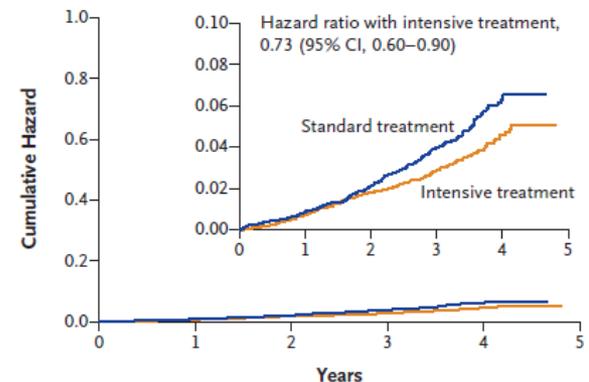
A Primary Outcome



No. at Risk

Standard treatment	4683	4437	4228	2829	721
Intensive treatment	4678	4436	4256	2900	779

B Death from Any Cause



No. at Risk

Standard treatment	4683	4528	4383	2998	789
Intensive treatment	4678	4516	4390	3016	807

Figure 3. Primary Outcome and Death from Any Cause.

Shown are the cumulative hazards for the primary outcome (a composite of myocardial infarction, acute coronary syndrome, stroke, heart failure, or death from cardiovascular causes) (Panel A) and for death from any cause (Panel B). The inset in each panel shows the same data on an enlarged y axis. CI denotes confidence interval.

SPRINT TRIAL: Benefit of Intensive Therapy

Table 3
Benefits of intensive versus standard therapy in SPRINT

Outcome	Relative Risk Reduction
Composite primary endpoint	–25%
Secondary endpoints	
Myocardial infarction	–17%
Heart failure	–38%
Death from cardiovascular causes	–43%
Death from all causes	–27%

Adapted from SPRINT Research Group, Wright JT Jr, Williamson JD, Whelton PK, et al. A randomized trial of intensive versus standard blood-pressure control. N Engl J Med 2015;373:2103–16.

N Engl J Med 2015;373:2103-16.

SPRINT TRIAL: > 75 YO

Table 3. Incidence of Cardiovascular, Renal, and Mortality Outcomes by Treatment Group

	Intensive Treatment		Standard Treatment		HR (95% CI) ^b	P Value
	No. With Outcome Events (n = 1317) ^a	% (95% CI) With Outcome Events/y	No. With Outcome Events (n = 1319) ^a	% (95% CI) With Outcome Events/y		
All participants						
Cardiovascular disease primary outcome ^c	102	2.59 (2.13-3.14)	148	3.85 (3.28-4.53)	0.66 (0.51-0.85)	.001
Myocardial infarction (MI) ^d	37	0.92 (0.67-1.27)	53	1.34 (1.02-1.75)	0.69 (0.45-1.05)	.09
ACS not resulting in MI ^d	17	0.42 (0.26-0.68)	17	0.42 (0.26-0.68)	1.03 (0.52-2.04)	.94
Stroke ^d	27	0.67 (0.46-0.97)	34	0.85 (0.61-1.19)	0.72 (0.43-1.21)	.22
Heart failure ^d	35	0.86 (0.62-1.20)	56	1.41 (1.09-1.83)	0.62 (0.40-0.95)	.03
Cardiovascular disease death ^d	18	0.44 (0.28-0.70)	29	0.72 (0.50-1.03)	0.60 (0.33-1.09)	.09
Nonfatal MI	37	0.92 (0.67-1.27)	53	1.34 (1.02-1.75)	0.69 (0.45-1.05)	.09
Nonfatal stroke	25	0.62 (0.42-0.91)	33	0.83 (0.59-1.16)	0.68 (0.40-1.15)	.15
Nonfatal heart failure	35	0.86 (0.62-1.20)	55	1.39 (1.06-1.81)	0.63 (0.40-0.96)	.03
All-cause mortality	73	1.78 (1.41-2.24)	107	2.63 (2.17-3.18)	0.67 (0.49-0.91)	.009
Primary outcome plus all-cause mortality	144	3.64 (3.09-4.29)	205	5.31 (4.63-6.09)	0.68 (0.54-0.84)	<.001

In community-dwelling persons aged 75 years or older, treatment goal for SBP of less than 120 mm Hg reduced incident cardiovascular disease by 33% (from 3.85% to 2.59% per year) and total mortality by 32% (from 2.63% to 1.78% per year).

The overall SAE rate was comparable by treatment group, including among the most frail participants.

Potential Impact of Implementation of SPRINT

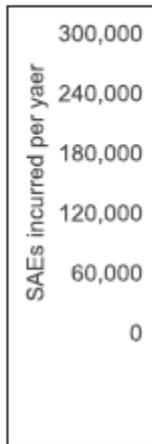


Figure 2. Potential number of SAEs if intensive blood pressure (SBP) control is implemented in eligible US adults who meet the SPRINT (Systolic Blood Pressure in the Action Goals) criteria. The projected number of SAEs is based on the number of SAEs in the SPRINT trial and dividing it by 3.26 (the ratio of the number of US adults meeting the SPRINT eligibility criteria to the number of SPRINT trial participants).

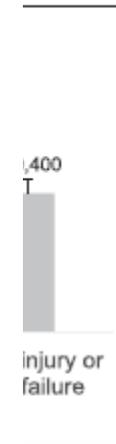
Clinical Perspective

What Is New?

- In this population-based study, if fully implemented in eligible US adults, intensive blood pressure treatment was projected to prevent $\approx 107\,500$ deaths per year and give rise to $\approx 56\,100$ episodes of hypotension, 34,400 episodes of syncope, 43,400 serious electrolyte disorders, and 88,700 cases of acute kidney injury per year compared with standard blood pressure treatment.

What Are the Clinical Implications?

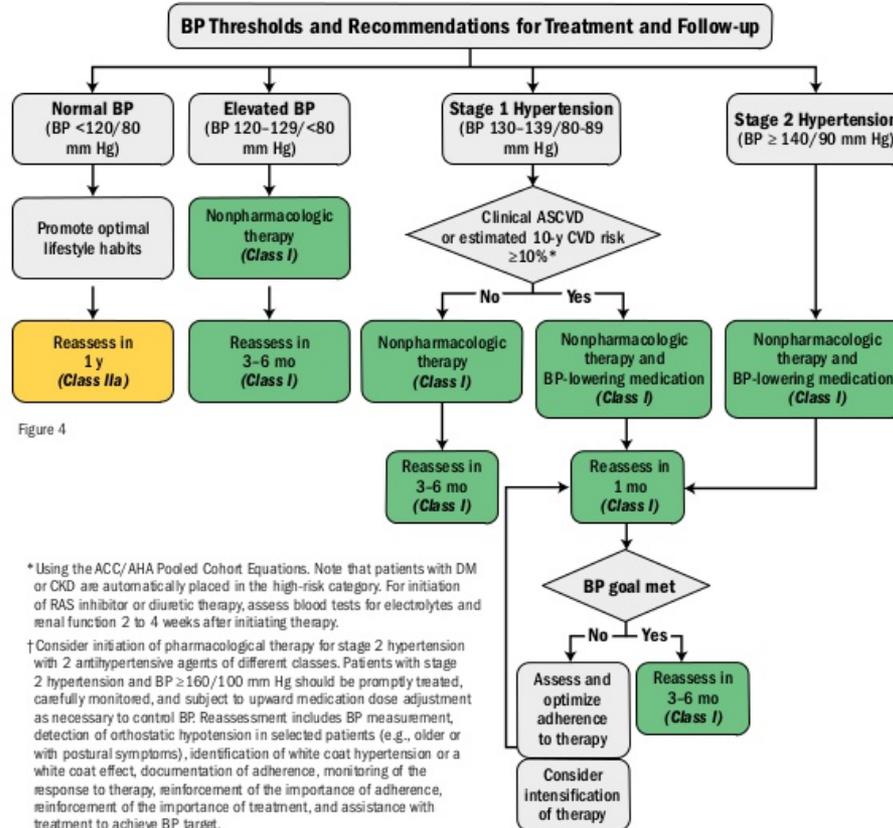
- If fully implemented in eligible US adults with raised blood pressure and at high risk for cardiovascular disease, intensive blood pressure treatment has the potential to prevent $\approx 107\,500$ deaths per year compared with standard blood pressure treatment.
- Careful patient selection and implementation are important because intensive treatment is associated with increased risk of hypotension, syncope, electrolyte abnormalities, and acute kidney injury.



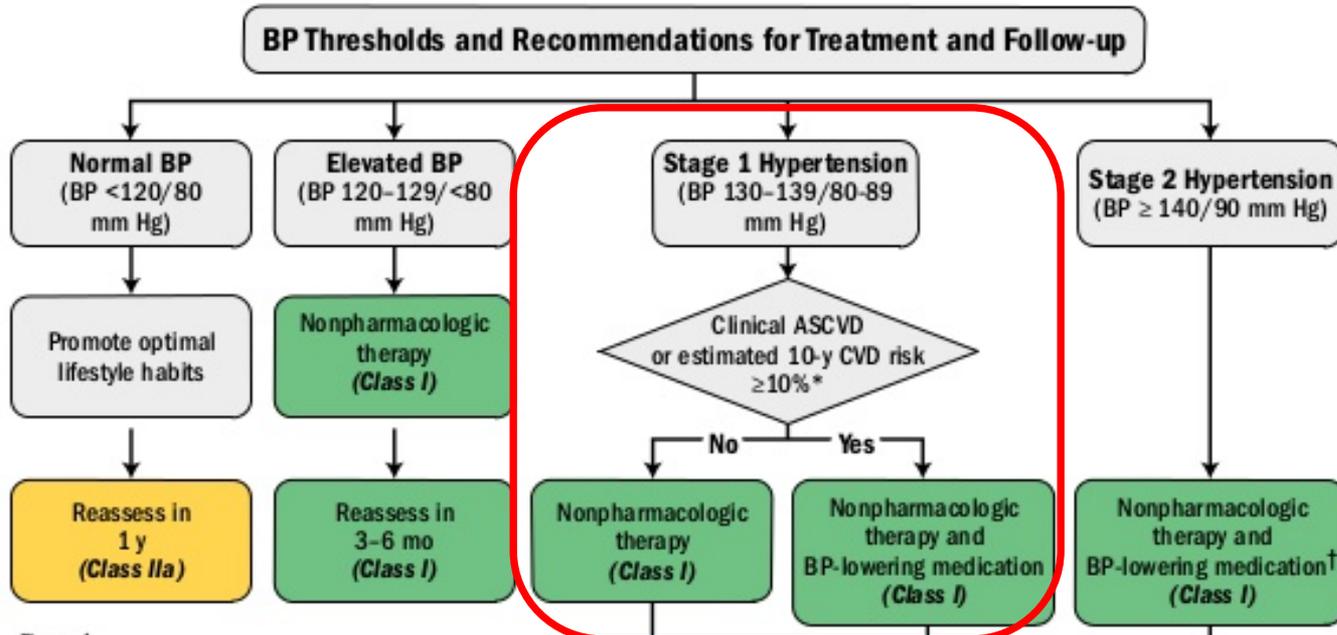
Intensive systolic blood pressure control in high-risk participants who

received intensive treatment had a lower SAE rate in SPRINT compared with standard treatment (1.4% vs 1.8%; $P < .001$). The 95% confidence interval for the difference in SAE rate was 0.2% to 2.6%.

Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up



Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up



Note that patients with DM and CKD are automatically in the high CVD risk category

Current Age  *

Age must be between 20-79

Sex *

Male

Female

Race *

White

African American

Other

Systolic Blood Pressure (mm Hg) *

Value must be between 90-200

Diastolic Blood Pressure (mm Hg)  ○

Value must be between 60-130

Total Cholesterol (mg/dL) *

Value must be between 130 - 320

HDL Cholesterol (mg/dL) *

Value must be between 20 - 100

LDL Cholesterol (mg/dL)  ○

Value must be between 30-300

History of Diabetes? *

 Yes NoSmoker?  * Current  Former  Never 

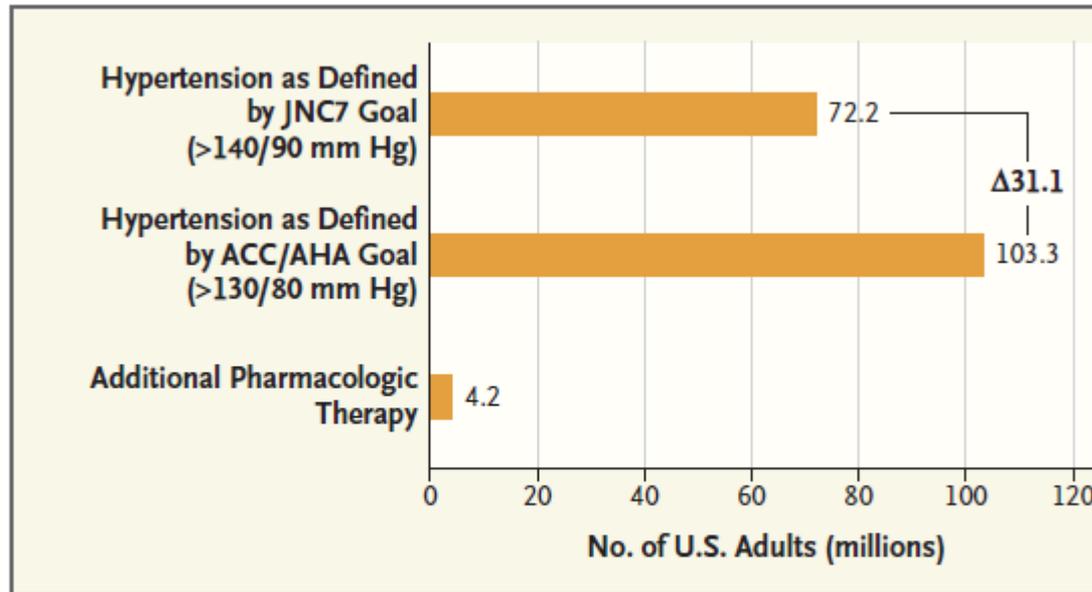
On Hypertension Treatment? *

 Yes NoOn a Statin?  ○ Yes NoOn Aspirin Therapy?  ○ Yes NoDo you want to refine current risk estimation using data from a previous visit?  ○ Yes No<http://tools.acc.org/ASCVD-Risk-Estimator>

2017 ACC/AHA Guidelines: Summary

- Elevated BP (120-129/80):
 - Non pharmacological therapy, recheck in 3-6 months
- Stage 1 HTN (130-139/80-89):
 - If ASCVD > 10% or DM or CKD: start drug therapy
 - If ASCVD <10%: non pharmacological therapy
- Stage 2 HTN (>140/90):
 - Start drug therapy regardless of ASCVD
 - Consider starting 2 agents combination.

2017 ACC/AHA vs JNC 7 Guidelines for HTN Management



U.S. Adults with Hypertension as Defined by the JNC7 and ACC/AHA Guidelines and Effect on Use of Pharmacologic Therapy.

Data are from Muntner et al.³

Compared with the JNC7 guideline, the 2017 ACC/AHA guideline results in a substantial increase in the prevalence of hypertension, a small increase in the percentage of U.S. adults recommended for antihypertensive medication, and more intensive BP lowering for many adults taking antihypertensive medication

European Society of Cardiology/European Society of Hypertension 2018 Guidelines

Table 1: Comparison of ACC/AHA and ESC/ESH Blood Pressure Thresholds

	ACC/AHA	ESC/ESH
Definition of Hypertension (mm Hg)	≥ 130/80	≥ 140/90
Normal Blood Pressure ranges (mm Hg)	Normal: < 120/80 Elevated: 120-129/<80	Optimal: < 120/80 Normal: 120-129/80-84 High normal: 130-139/85-89
Hypertension Stages (mm Hg)	Stage 1: 130-139/80-89 Stage 2: ≥ 140/90	Grade 1: 140-159/90-99 Grade 2: 160-179/100-109 Grade 3: ≥ 180/110
Age Specific Blood pressure targets (mm Hg)	< 65 years: < 130/80 ≥ 65 years: < 130/80	< 65 years < 120-129/70-79 ≥ 65 years < 130-139/70-79

Garima Sharma et al. Comparison of the ACC/AHA and ESC/ESH Hypertension Guidelines. JACC 2019.

Learning Objectives

- To review the health impact of HTN.
- To review the different methods of measurement of blood pressure.
- To review the multiple recent guidelines regarding goal blood pressure control.
- To discuss specific treatment options including pharmacologic and non pharmacologic including in special populations.

Non Pharmacologic Therapy

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

	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 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



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Pharmacological Therapy

- First Line therapy:
 - Thiazide diuretic.
 - Ace Inhibitor or ARB.
 - Calcium channel blockers.

- Do not combine Ace Inh with ARB or Renin Blockers
- Ok to combine dihydropyridine with non dihydropyridine calcium channel blockers

Heart Failure with Reduced Ejection Fraction (HFrEF)

Recommendations for Treatment of Hypertension in Patients with Heart Failure with Reduced Ejection Fraction (HFrEF)

Referenced studies that support recommendations are summarized in
online Data Supplement 34

COR	LOE	Recommendations
I	C-E0	1. Adults with HFrEF and hypertension should be prescribed GDMT* titrated to attain a BP less than 130/80 mm Hg.
III: No Benefit	B-R	2. Nondihydropyridine CCBs are not recommended in the treatment of hypertension in adults with HFrEF.

Heart Failure with Preserved Ejection Fraction (HFpEF)

Recommendations for Treatment of Hypertension in Patients with Heart Failure with Preserved Ejection Fraction (HFpEF)

Referenced studies that support recommendations are summarized in
online Data Supplement 35, 36

COR	LOE	Recommendations
I	C-E0	1. In adults with HFpEF who present with symptoms of volume overload, diuretics should be prescribed to control hypertension.
I	C-LD	2. Adults with HFpEF and persistent hypertension after management of volume overload should be prescribed ACE inhibitors or ARB and beta blockers titrated to attain systolic BP less than 130 mm Hg.

Hypertension in Diabetic Population

Diabetes Mellitus

COR	LOE	Recommendations for Treatment of Hypertension in Patients With DM
I	SBP: B-R ^{SR}	In adults with DM and hypertension, antihypertensive drug treatment should be initiated at a BP of 130/80 mm Hg or higher with a treatment goal of less than 130/80 mm Hg.
	DBP: C-EO	
I	A ^{SR}	In adults with DM and hypertension, all first-line classes of antihypertensive agents (i.e., diuretics, ACE inhibitors, ARBs, and CCBs) are useful and effective.
IIb	B-NR	In adults with DM and hypertension, ACE inhibitors or ARBs may be considered in the presence of albuminuria.

SR indicates systematic review.



Hypertension in Chronic Kidney Disease

Recommendations for Treatment of Hypertension in Patients With CKD

References that support recommendations are summarized in Online Data Supplements 37 and 38 and Systematic Review Report.

COR	LOE	Recommendations
I	SBP: B-R ^{SR}	1. Adults with hypertension and CKD should be treated to a BP goal of less than 130/80 mm Hg. ^{S9.3-1-S9.3-6}
	DBP: C-EO	
IIa	B-R	2. 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. ^{S9.3-3,S9.3-7-S9.3-12}
IIb	C-EO	3. 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]) (S9.3-7,S9.3-8), treatment with an ARB may be reasonable if an ACE inhibitor is not tolerated.

SR indicates systematic review.

After kidney transplantation, it is reasonable to treat patients with hypertension with a calcium antagonist on the basis of improved GFR and kidney survival

Hypertension in Black Patients

- In black adults with hypertension but without HF or CKD, including those with DM, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.
- Two or more antihypertensive medications are recommended to achieve a BP target of less than 130/80 mm Hg in most adults with hypertension, especially in black adults with hypertension.

Medication adherence Strategies

- Up to 25% of patients do not fill the first prescription of anti-hypertensive medication.
- During the first year of treatment, the average patient has possession of antihypertensive medications only 50% of the time.
- Only 1 in 5 patients has sufficiently high adherence to achieve the benefits observed in clinical trials.

Medication adherence Strategies

- In adults with hypertension, dosing of antihypertensive medication once daily rather than multiple times daily is beneficial to improve adherence.
- Use of combination pills rather than free individual components can be useful to improve adherence to antihypertensive therapy.

Summary

KEY CLINICAL POINTS

INITIAL TREATMENT OF HYPERTENSION

- The 2017 ACC–AHA Hypertension Guideline redefines hypertension as a systolic blood pressure of 130 mm Hg or more or a diastolic blood pressure of 80 mm Hg or more and lowers the blood-pressure target to less than 130/80 mm Hg.
- This blood-pressure target is supported by the SPRINT trial, which showed lower hypertension-associated morbidity and all-cause mortality with a systolic blood-pressure target of less than 120 mm Hg than with a target of less than 140 mm Hg; electrolyte abnormalities, syncope, and acute kidney injury were more common in the lower-target group.
- The initial assessment should consider coexisting conditions, including cardiovascular disease, diabetes mellitus, chronic kidney disease, and elevated risk of cardiovascular disease, in determining when to start blood-pressure–lowering medication.
- Recommended lifestyle modifications include restriction of dietary sodium intake, weight loss if the patient is overweight, exercise, moderation of alcohol intake, and increased consumption of potassium-rich foods.
- The initial antihypertensive agent should generally be selected from one of four drug classes shown to reduce cardiovascular events: ACE inhibitors, angiotensin-receptor blockers, calcium-channel blockers, and thiazide-type diuretics.
- Repeat visits are required to ensure ongoing hypertension control.

Clinical Case

- Primary hypertension, with a positive family history and contributing lifestyle factors, including weight gain and NSAID use.
- Her alcohol intake, at more than one drink per day, may be a contributor.
- Initiate single-agent therapy for her stage 2 hypertension.
- Encourage lifestyle changes, including sodium restriction, weight reduction, and discontinuation of contributing medications.

Clinical Case

- A thiazide-type diuretic or ACE inhibitor is a reasonable first agent to prescribe, with follow-up blood-pressure and electrolyte measurements in 3 to 4 weeks.
- Recommend regular visits during dose adjustment, combined with home blood-pressure measurements; lifestyle factors and medication adherence.
- Once her blood pressure is at goal (<130/80 mm Hg), follow-up at 6-month intervals.

THANK YOU

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ACC/AHA 2017 Guidelines for HTN Management

Table 2. Systematic Review Questions on High BP in Adults ([Table view](#))

Question Number	Question	Section Number
1	Is there evidence that self-directed monitoring of BP and/or ambulatory BP monitoring are superior to office-based measurement of BP by a healthcare worker for 1) preventing adverse outcomes for which high BP is a risk factor and 2) achieving better BP control?	4.2
2	What is the optimal target for BP lowering during antihypertensive therapy in adults?	8.1.59.39.6
3	In adults with hypertension, do various antihypertensive drug classes differ in their comparative benefits and harms?	8.1.68.2
4	In adults with hypertension, does initiating treatment with antihypertensive pharmacological monotherapy versus initiating treatment with 2 drugs (including fixed-dose combination therapy), either of which may be followed by the addition of sequential drugs, differ in comparative benefits and/or harms on specific health outcomes?	8.1.6.1

BP indicates blood pressure.