

Blood Pressure: How High is Too High and How Do I Lower it Safely?

**Blood Pressure:
How High Is Too High and How Do I
Lower It Safely?**



Robert B. Baron, MD MS
Professor and Associate Dean
UCSF School of Medicine
baron@medicine.ucsf.edu

Disclosure

**No relevant financial
relationships**

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Goals For Tonight

- How do I know if I have high blood pressure?
- What is the best way to measure it?
- How can I lower my blood pressure without medications?
- When do I need medications?
- What medications are best?

How Should We Measure Blood Pressure?

Office measurement: most common, used in clinical trials

Home BP measurement: less intensive drug Rx & less BP control. Identifies “white-coat” HTN

Ambulatory monitor: best correlation with CVD

Baron RB, JAMA Int Med. 2018

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Accurate Office BP Measurement

- 1) Patient seated for 5 minutes in chair
- 2) Back supported and feet on ground
- 3) No caffeine, exercise, smoking for 30 minutes
- 4) No talking by patient or observer
- 5) Removal of clothing under cuff
- 6) Support arm horizontally at level of atrium
- 7) Correct cuff size
- 8) Repeat measurements with results averaged

Whelton PK, JACC, 2017

Accurate Office BP Measurement

- Failure to adhere may lead to dramatic increase in BP
- For example:
 - Recent study in 20 clinics
 - All BP \geq 140/90 repeated by MA
 - 36% had normal second measurement

Einstadter D, JAMA Inter Med, 2018

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Accurate Office BP Measurement

- Which value should be recorded?
 - Guidelines: average multiple measurements
 - Quality measures: OK to use lowest measurement

Accurate Office BP Measurement

- What about “research grade” measurement?
- Systolic BP Intervention Trial (SPRINT)
 - 5 minutes rest
 - 3 automated measurements
 - No human in room
- **Research grade was 12.7 mm Hg lower than routine office measurement**

Agarwal E, JAHA, 2017

Blood Pressure: How High is Too High and How Do I Lower it Safely?

**USPSTF: Screening for HTN
2015**

- **Begin at age 18**
- **Measure carefully**
- **Obtain measurements outside of the clinical setting before starting treatment**
- **2016 NICE Guidelines (UK) concur**

Accurate Home BP Measurement

- **Not well standardized**
- **Not fully evidence-based**
- **Correct home monitoring requires**
 - Patient training
 - **Same principles as office measurement**
 - Correct equipment
 - Correct timing
 - **AM before meds and before dinner**

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Accurate Home BP Measurement

- Home measurements lower, but relationship not uniformly predictable
- Correlation with ambulatory monitoring about 60-70%
- Clinical trials of home monitoring alone to improve BP control have shown little impact at 6-12 months

Ambulatory BP Monitoring (ABPM)

- Best approach to out-of-office measurement
- Several times per hour during normal daily (and nighttime) activities
- Lower than office, but relationship unsettled
- ABPM better predicts CV risk than office measurement

Piper MA, Ann Int Med, 2015

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Ambulatory BP Monitoring (ABPM)

- **Most effective at detecting white coat HTN**
- **Monitor drug treatment**
- **Detect occasional patient with normal office BP but elevated out- of-office BP (“masked HTN”)**

Summary BP Measurement 2018

- **Clear office strategy: training, work flow, physical settings. Consider “research grade” approach**
- **Repeat measurements (MA or MD)**
- **Decide which measure to record (averaged or lowest)**
- **Home measurements for some patients; use best practices**
- **Use ambulatory monitoring more, but not in every patient**

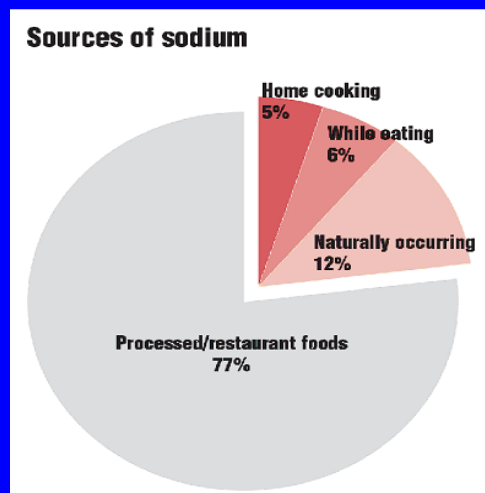
Blood Pressure: How High is Too High and How Do I Lower it Safely?

Lifestyle Modifications for BP Control

- Weight loss if overweight: 5-20 mm Hg/10-kg weight loss
- Limit alcohol to ≤ 1 oz/day: 2-4 mm Hg
- Reduce sodium intake to ≤ 100 meq/d (2.4 g Na): 2-8 mm Hg in SBP
- DASH Diet: 6 mm alone; 14 mm plus Na
- Physical activity 30 min/day: 4-9 mm Hg
- Habitual caffeine consumption not associated with risk of HTN

Salt in the US Diet

80% in processed or pre-prepared foods



Sources: Mattes et al.

Blood Pressure: How High is Too High and How Do I Lower it Safely?

**NHLBI Panel on BP
(aka Joint National Commission 8)**

Three questions:

- 1) Does Rx at specific BP thresholds improve outcomes?
- 2) Does Rx to a specific BP goal improve outcomes?
- 3) Do various meds differ on outcomes?

Nine recommendations

**Recommendations for Management
of Hypertension**

Recommendation 1

≥60 years:

- ❖ Lower BP at SBP ≥150 mm Hg or DBP ≥90 mm Hg
- ❖ Treat to a goal SBP <150 mm Hg and goal DBP <90 mm Hg.

Strong Recommendation – Grade A (but not unanimous)

JAMA.2014;311(5):507-520.

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Recommendation 1

**Evidence from 6 studies of patients over age 60, treated to goal $\leq 150/90$:
HYVET, Syst-Eur, SHEP, JATOS, VALISH, CARDIO-SIS**

Some evidence (lower quality) comparing ≤ 160 to ≤ 140 and ≤ 150 to ≤ 140 showing no additional benefit

Key Points of JNC 8

- **Over age 60: goal ≤ 150**
- **Others $<140/<90$ (including DM, CKD, race/ethnicity)**
- **Non blacks: thiazide, CCB, ACEI, ARB**
- **Blacks: thiazide, CCB**
- **CKD: Ace Inhibitors or ARB**

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Evidence-based Medications

ACE inhibitors

Captopril
Enalapril
Lisinopril

Angiotensin receptor blockers

Eprosartan
Candesartan
Losartan
Valsartan
Irbesartan

Evidence-based Medications

Calcium channel blockers

Amlodipine,
Diltiazem ER
Nitrendipine

Thiazide-type diuretics

Bendroflumethiazide,
Chlorthalidone,
Hydrocholorthiazide,
Indapamide

Blood Pressure: How High is Too High and How Do I Lower it Safely?

SPRINT

- 9,361 men and women 50 and over (30% over age 75)
- SBP > 130 mm Hg
- Increased CV risk (but no DM)
- Design <120 mm Hg vs <140 mm Hg
 - 2.7 meds vs. 1.8 meds
- Actual 121.4 mm Hg vs 136.2

SPRINT, NEJM, 2015

Intensive BP Control in Type 2 DM: ACCORD

- RCT of 4733 patients with type 2 DM
- Compare BP less than 120 mm Hg vs 140

	<u>120</u>	<u>140</u>	<u>p</u>
• BP	119	133	
• CV events plus death	1.87%	2.09%	.20
• Mortality	1.28%	1.19%	.55
• Stroke	0.32%	0.53%	.01
• Adverse events	3.3%	1.3%	.001

In type 2 DM: treating to 120 mm Hg did not reduce the rate of composite fatal and non-fatal CV events

ACCORD, NEJM 2010

Blood Pressure: How High is Too High and How Do I Lower it Safely?

SPRINT: Results

- **Composite outcome**
 - 243 events (1.65% per year) vs 319 (2.19% per year)
 - HR 0.75 (0.64 – 0.89)
- **All cause mortality**
 - 155 (1.03% per year) vs. 210 (1.40% per year)
 - HR 0.73 (0.60 – 0.90)

SPRINT: Adverse Events

- Hypotension: HR= 1.67 (p=0.001)
- Syncope: HR 1.33 (p=0.05)
- Electrolyte abnormality: HR 1.35 (p=0.02)
- Acute kidney injury: HR 1.66 (p=<.001)

Blood Pressure: How High is Too High and How Do I Lower it Safely?**NNT and NNH from SPRINT**

Over 3.26 years of trial...	NNT	NNH
Primary aggregate outcome	61	-
Death from any Cause	90	-
Death from CVD	172	-
Serious Adverse Event	-	45
Hypotension	-	72
Syncope	-	93
Acute Kidney Injury	-	56
Electrolyte abnormality	-	97

SPRINT Reflections

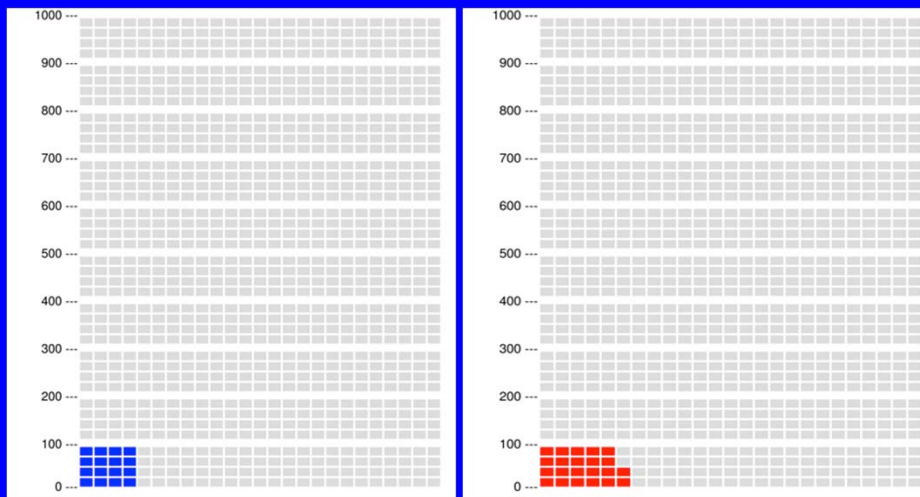
- **SPRINT showed that SBP <120 had better CVD/mortality benefit than SBP <140 (NNT 61 over 3 years)...**
- **But, notable adverse effects with a NNH 45 over 3 years.**
- **Generalizability: would only apply 1/6 of current patients treated for HTN**

Blood Pressure: How High is Too High and How Do I Lower it Safely?

SPRINT Reflections

- No DM, no stroke, no frail elderly, > age 50
- ASCVD risk: $\geq 15\%$ ten year risk to enter (actual risk $\geq 20\%$)
- Free care, frequent visits, research grade BP measurement

1000 people treated 3.2 years to an SBP goal <120 compared to <140



16 Benefit

22 Harmed

Blood Pressure: How High is Too High and How Do I Lower it Safely?

SPRINT Reflections

“This strategy would represent a big shift in the approach to screening and treatment, and in my view, the findings need replication before intensive treatment can be pushed as the standard of care.”

Harlan Krumholz, MD

ACP/AAFP Guidelines

- **Over age 60:**
 - **Goal <150 mm Hg**
- **For patients over age 60 with stroke/ TIA, high CV risk:**
 - **Goal < 140 mm Hg**

Annals IM, March 2017

Blood Pressure: How High is Too High and How Do I Lower it Safely?

ACC/AHA 2017 Guidelines

- **Normal** <120 (and DBP <80)
- **Elevated** 120 – 129 (and DBP <80)
- **Hypertension**
 - **Stage 1** 130 -139 (or DBP 80-89)
 - **Stage 2** ≥140 (or DBP ≥90)

JACC, November 2017

ACC/AHA 2017 Guidelines

- **Secondary Prevention** <130 and <80
- **Primary Prevention** <130 and <80
(ASCVD Risk ≥10%)
- **Primary Prevention** <140 and <90
(ASCVD Risk <10%)

JACC, November 2017

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Meta-Analysis of BP-Lowering, Mortality and CV Disease

- RCTs of BP meds vs. placebo
- 74 trials; 306,273 patients
- 40% women, mean age 63.6 years

Brunstrom M, JAMA Int Med, 2018

Meta-Analysis of BP-Lowering, Mortality and CV Disease

- If BP >160 mm Hg
 - Death 0.93*
 - CVD events 0.78*
- If BP 140 - 159 mm Hg
 - Death 0.87*
 - CVD events 0.88*

*Statistically significant

Brunstrom M, JAMA Int Med, 2018

Blood Pressure: How High is Too High and How Do I Lower it Safely?

**Meta-Analysis of BP-Lowering,
Mortality and CV Disease**

- **If BP <140 mm Hg**
 - Death 0.98 (NS)
 - CVD events 0.97 (NS)

- **If prior CHD and mean BP 138 mm Hg**
 - Death 0.98 (NS)
 - CVD events 0.90*

Brunstrom M, JAMA Int Med, 2018

**AAFP and ACP Both Decide Not to
Endorse AHA/ACC Guidelines**

- **JNC 8 upheld scientific rigor but AHA not based on systematic evidence review**

- **Mostly based on SPRINT**

- **Would lead to 46% of population categorized as HTN (vs 32%)**

Blood Pressure: How High is Too High and How Do I Lower it Safely?

Final Thoughts

- **Rethink the way BP is measured in the clinician's office**
- **Ask your clinician to retake the blood pressure if it is high (record the lowest of the measurements)**
- **Use home monitoring with greater rigor**
- **Consider ambulatory BP monitoring before making major treatment decisions**
- **Use overall cardiovascular risk for blood pressure decisions, too.**

Final Thoughts

- **Use goal <140/90 for most patients**
- **Use <150/90 for many/most older patients**
- **Use <130/80 for some high risk patients (mostly those with heart disease)**

- **Use shared decision-making**
- **Use team approaches and build trust with patients and families (and specialty colleagues)**

Blood Pressure: How High is Too High and How Do I Lower it Safely?

