Management of High Blood Pressure:
Best Practices in Measurement, Treatment Goals, Diet, and Medications

Robert B. Baron, MD MS
Professor of Medicine
Associate Dean, Continuing Medical Education
Director, UCSF Osher Mini Medical School
bobby.baron@ucsf.edu

1

Disclosure

No relevant financial relationships

2

Explaining the Decrease in Deaths from Heart Disease and Stroke

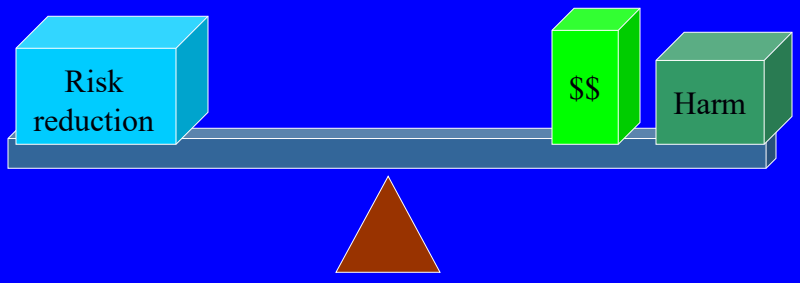
1980 to 2000: US death rate fell by approximately 50% in both women and men

2000 to 2020: Death fell further, down by 30%

- About 1/2 from acute treatments, 1/2 from risk factor modification:
  - Predominantly BP, cholesterol, smoking

3

A RISK-BASED APPROACH



The benefit from any given intervention is a function of:
1) The relative risk reduction conferred by the intervention, and
2) The native risk of the patient

4

68 year-old
Office BP 145/85. No history of diabetes, heart disease or stroke. Kidney function is normal. Otherwise well. Our treatment goal is:

1) <150 mm Hg
2) <140 mm Hg
3) <130 mm Hg

5

How Should We Measure Blood Pressure?

Office measurement: most common, used in clinical trials

Home BP measurement: less intensive drug Rx & less BP control

Ambulatory monitor: best correlation with cardiovascular disease

Baron RB, JAMA Int Med. 2018

6

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

7

Accurate Office BP Measurement

- Which value should you record?
  - Most guidelines: average multiple measurements
  - Quality metrics: OK to record last measurement

8

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**

9

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

10

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

11

Summary BP Measurement

- Offices must use best practices.
- Repeat measurements
- Decide which measure to record (averaged or last)
- Home measurements for many patients; use same best practices
- Use ambulatory monitoring more, but not in every patient

12

68 year-old
BP 145/85. Which non-drug lifestyle modification is most effective for BP reduction:

1) Weight loss if overweight or obese
2) Alcohol restriction
3) Sodium restriction
4) DASH diet
5) Physical activity

13

68 year-old
BP 145/85. Which non-drug lifestyle modification is most effective for BP reduction:

1) Weight loss if overweight or obese
2) Alcohol restriction
3) Sodium restriction
4) DASH diet
5) Physical activity

14

Lifestyle Modifications for BP Control

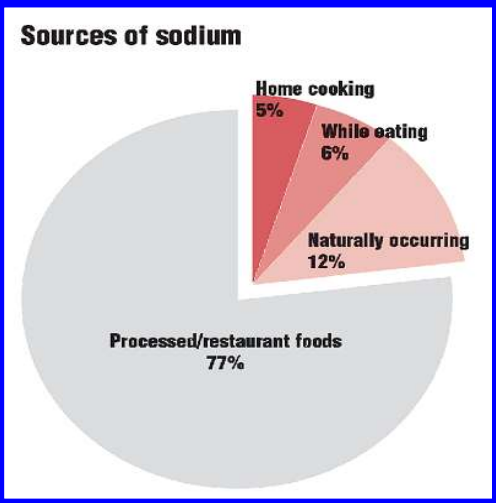
- Weight loss if overweight: 5-20 mm Hg per 20-pound weight loss
- Limit alcohol to ≤ 1 oz/day: 2-4 mm Hg
- Reduce sodium intake to ≤2.4 grams Na per day: 2-8 mm Hg in SBP
- DASH Diet: 6 mm alone; 14 mm plus Na
- Physical activity 30 min/day: 4-9 mm Hg

PS: Habitual caffeine consumption not associated with risk of hypertension

15

Salt in the US Diet

80% in processed or pre-prepared foods



Sources: Mattes et al.

16

Top Sodium Sources in U.S. Diet

1. Breads
2. Chicken and chicken-mixed dishes
3. Pizza
4. Soda, energy drinks, and sports drinks
5. Cold cuts
6. Condiments
7. Mexican mixed dishes
8. Sausage, franks, bacon and ribs
9. Cheeses
10. Desserts

17

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

18

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 – (but not unanimous)

19

Key Points of JNC 8

- Patients ≥60 yo: goal ≤150 mm Hg
- Others: <140/<90 mm Hg
- Meds: thiazides, calcium channel blockers, ACE inhibitors (ACEI), angiotensin receptor blockers (ARB)
- CKD: ACEI or ARB

20

SPRINT STUDY

- 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

21

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)

22

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)

23

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

24

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: high risk patients- would only apply 1/6 of current patients treated for HTN

25

SPRINT Reflections

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

26

ACC/AHA Guidelines (Cardiology)

- 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)

27

ACC/AHA Guidelines (Cardiology)

- Secondary Prevention <130 and <80
- Primary Prevention <130 and <80
  (High cardiovascular risk)
- Primary Prevention <140 and <90
  (Lower cardiovascular risk)

28

ACP/AAFP Guidelines
(Internal Medicine and Family Medicine)

- Over age 60:
  - Goal <150 mm Hg
- For patients over age 60 with stroke, heart disease, high cardiovascular risk:
  - Goal < 140 mm Hg
- All Others:
  - Goal <140 mm Hg

29

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%)

30

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

31

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*

32

Other Recent Guidelines

- European Society of Cardiology-European Society of Hypertension
  - HTN ≥140 mm Hg
- National Institute for Health and Care Excellence (NICE)
  - HTN ≥140 mm Hg
- International Society of Hypertension:
  - HTN ≥ 140 mm Hg

33

68 year-old woman.
Office BP 145/85. No history of diabetes, heart disease or stroke. Kidney function is normal. Otherwise well. Our treatment goal is:

1) <150 mm Hg
2) <140 mm Hg
3) <130 mm Hg

34

Final Thoughts

- Rethink the way BP is measured
- OK to ask for repeat measurement
- Use home monitoring with greater rigor
- Consider ambulatory BP monitoring before making major treatment decisions

35

Final Thoughts

- Use goal <140/90 for most patients
- Use <150/90 for some older patients
- Use <130/80 for some high-risk patients
  - Heart disease, stroke, kidney disease
  - High risk primary prevention

36

Final Thoughts

- Use shared decision-making
- Use team approaches and build trust with patients and families and specialty colleagues.
- Emphasize primary prevention of high blood pressure

37