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# Recognizing and Controlling Hypertension: a Webinar for Clinicians

Presenter:

Mark Backus, MD, FACP, Cascade Internal Medicine Specialists

Hosted and funded by:

Oregon Health Authority Transformation Center



HEALTH POLICY AND ANALYTICS  
Transformation Center

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# Presenter



Mark Backus, MD, FACP  
Cascade Internal  
Medicine Specialists

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# Recognizing and Controlling Hypertension



**MARK BACKUS, MD, FACP**  
**CASCADE INTERNAL MEDICINE SPECIALISTS**

# Conflicts of Interest



Minor stock holdings:

- Biogen
- Celgene
- Bioverative
- Resmed

No other relationships with any entity producing, selling, marketing, or distributing health care goods or services consumed by, or used on, patients.

# Learning Objectives



- 1) Review CCO hypertension metric specifications
- 2) Explain the implications of the SPRINT blood pressure study and new American Heart Association guidelines
- 3) Illustrate the proper body position for taking blood pressure
- 4) Identify ways to for providers to improve blood pressure control
- 5) Identify strategies for clinics to improve blood pressure control
- 6) Identify patients that require referral or special testing for their hypertension

# Today's Outline



- Hypertension background
- Review CCO metric
- Review guidelines
- Review goal blood pressures and definitions
- Patient positioning and monitoring
- Lifestyle/medication contributors
- Common strategies for control
- Difficult cases
- When to look for secondary causes

# The Scope of the Problem



- NEW (11/2017) per AHA: over 100 million with hypertension, 46% of adults
- Over half are not controlled, 52.5% in recent evaluation
- Compliance is a big issue
- Worldwide 9.4 million deaths/year – most of the disease burden in low or middle income economies
- Control decreases risk for heart attack, stroke, kidney disease, heart failure – by large amounts 20-50% over time – well documented



# Health Care Costs



- US costs per GDP = 17% in 2015
- Per capita \$9990 in 2015
- 32% of all health care costs spent on hospital care – it's the number one category of expenditure
- Stroke, heart attack and heart failure dwarf other reasons for hospital admission for people over the age of 50

## Causes of death:

- 1) Heart Disease
- 2) Cancer
- 3) Stroke

# What Is Hypertension Control in Oregon?



- Lack surveillance data outside the CCOs
- Current control of Medicaid population around 68%, (<140/<90) with the goal of 70.6%
- How well does the electronic medical record reflect control of a provider's patient population?
- What is an ideal % control?
- Many providers assume better control/data than is really true
- Does monitoring a situation improve control?

# Why Isn't Hypertension Control Better?



- Identification of patients
- Patient compliance on return visit
- Follow-up interval by the doctor
- Provider knowledge on treatment of resistant hypertension
- Inaccurate measurement of blood pressure
- Clinic system management/patient flow issues
- Medical assistant and team education
- Patient continues activities that raise blood pressure
- Patient doesn't take the medications

# Mining the Data



- Registry query: Total patients 18–85
- Number with ICD 10 code I10
- How close to 28.7%\* is this (that's the prevalence of a 251,590 patient review, with diagnosis at 62.9%) before the American Heart Association changes? (should move towards 46%)
- Number with BP <140/<90 divided into total I10
- Greater than 80% = excellent
- Greater than 70% = very good

\*Am J Hyperten 2012 January; 25(1): 97-102 (NIH)

# Missing Hypertension Patients?



- Run: Total patients 18–85
- Number without the diagnosis I10 (subset NOT), then
- Subset: >139/>89
  
- Also, pre-hypertension: R03.0
- Use: high blood pressure without the diagnosis of hypertension R03.0 consistently
- What percent of patients with pre-hypertension have had an ambulatory monitor and close follow-up?

# White Coat Hypertension



- Code this specifically in your progress notes and problem lists to show the world you are aware of the issue (still I10)
- Listed as with hypertension (still I10)
- Or without underlying (R03.0)
- Always document with ambulatory monitor
- Typically 10–20% of identified hypertensive patients in your practice

# CCO Incentive Measure Specifics



- Calendar year 2018 hypertension metric
- Patients with diagnosis of I10 essential hypertension within the first 6 months of measurement period or anytime prior
- Ages 18–85
- Exclusions: end stage renal disease grouping value set, stage 5 chronic kidney disease, hospice, pregnancy, history of dialysis or renal transplant

# CCO Incentive Measure Specifics



- Denominator: number of I10 patients of age minus exclusions
- Numerator: number of patients from the denominator with systolic blood pressure less than 140 **and** diastolic blood pressure less than 90 = “controlled”
- Most recent visit
- Home, or hospital, ambulatory monitor readings are not accepted
- If more than one reading at a visit – using lowest
- If no readings in recording period, assumed **not controlled**



# CCO Incentive Measure Specifics



- Why did <140/<90 get chosen for designating the patient as “controlled”?
- **2018 Benchmark: 70.6%** (from the 2016 Medicaid 90<sup>th</sup> percentile)
- **Individual CCO improvement target: 10% reduction in gap between the baseline and benchmark, with 2% floor** (for quality pool payments)
- Prior benchmarks:
  - 2014 64.6%
  - 2015 64.7%
  - 2016 65.9%
  - 2017 68.3%

# Goals and Guidelines



- JNC 8
- Recent SPRINT study
- ACCORD study
- HOPE – 3 study
- Diabetic Patients
- Chronic kidney disease
- Orthostatic patients
- American Heart Association/American College of Cardiology (AHA/ACC) November 2017 guidelines

# Joint National Commission



- **JNC 7: 2003**, goals  $<140/90$  ( $<130/80$  DM and CKD)
- **JNC 8\***: Age greater than 60:  $<150/90$  and age 18–59:  $<140/90$ . Dissent amongst the experts!
- CKD or DM:  $<140/90$
- General agreement that age greater than 80:  $<150/90$ 
  - European Society of Hypertension
  - Cardiology Joint Committee
  - American Society of Hypertension
  - International Society of Hypertension
- AHA/ACC November 2017 Guidelines: See below:  
Aggressive reduction in BP!

\*JAMA 2014; 311:507

# American College of Cardiology



## Hypertension

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[ACC/AHA/AAPA/ABC/ACPM/AGS/APHA/ASH/ASPC/NMA/PCNA CLINICAL PRACTICE GUIDELINE](#)

2017

### ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Paul K. Whelton, Robert M. Carey, Wilbert S. Aronow, Donald E. Casey, Karen J. Collins, Cheryl Dennison Himmelfarb, Sondra M. DePalma, Samuel Gidding, Kenneth A. Jamerson, Daniel W. Jones, Eric J. MacLaughlin, Paul Muntner, Bruce Ovbiagele, Sidney C. Smith, Crystal C. Spencer, Randall S. Stafford, Sandra J. Taler, Randal J. Thomas, Kim A. Williams, Jeff D. Williamson, Jackson T. Wright

# American College of Cardiology



**Table 1. Applying Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care\* (Updated August 2015)**

CLASS (STRENGTH) OF RECOMMENDATION	LEVEL (QUALITY) OF EVIDENCE†
<b>CLASS I (STRONG)</b> <span style="float: right;">Benefit &gt;&gt;&gt; Risk</span> Suggested phrases for writing recommendations: <ul style="list-style-type: none"> <li>Is recommended</li> <li>Is indicated/useful/effective/beneficial</li> <li>Should be performed/administered/other</li> <li>Comparative-Effectiveness Phrases‡:                             <ul style="list-style-type: none"> <li>Treatment/strategy A is recommended/indicated in preference to treatment B</li> <li>Treatment A should be chosen over treatment B</li> </ul> </li> </ul>	<b>LEVEL A</b> <ul style="list-style-type: none"> <li>High-quality evidence‡ from more than 1 RCT</li> <li>Meta-analyses of high-quality RCTs</li> <li>One or more RCTs corroborated by high-quality registry studies</li> </ul>
<b>CLASS IIa (MODERATE)</b> <span style="float: right;">Benefit &gt;&gt; Risk</span> Suggested phrases for writing recommendations: <ul style="list-style-type: none"> <li>Is reasonable</li> <li>Can be useful/effective/beneficial</li> <li>Comparative-Effectiveness Phrases‡:                             <ul style="list-style-type: none"> <li>Treatment/strategy A is probably recommended/indicated in preference to treatment B</li> <li>It is reasonable to choose treatment A over treatment B</li> </ul> </li> </ul>	<b>LEVEL B-R</b> <span style="float: right;">(Randomized)</span> <ul style="list-style-type: none"> <li>Moderate-quality evidence‡ from 1 or more RCTs</li> <li>Meta-analyses of moderate-quality RCTs</li> </ul>
<b>CLASS IIb (WEAK)</b> <span style="float: right;">Benefit ≥ Risk</span> Suggested phrases for writing recommendations: <ul style="list-style-type: none"> <li>May/might be reasonable</li> <li>May/might be considered</li> <li>Usefulness/effectiveness is unknown/unclear/uncertain or not well established</li> </ul>	<b>LEVEL B-NR</b> <span style="float: right;">(Nonrandomized)</span> <ul style="list-style-type: none"> <li>Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies</li> <li>Meta-analyses of such studies</li> </ul>
<b>CLASS III: No Benefit (MODERATE)</b> <span style="float: right;">Benefit = Risk</span> <i>(Generally, LOE A or B use only)</i> Suggested phrases for writing recommendations: <ul style="list-style-type: none"> <li>Is not recommended</li> <li>Is not indicated/useful/effective/beneficial</li> <li>Should not be performed/administered/other</li> </ul>	<b>LEVEL C-LD</b> <span style="float: right;">(Limited Data)</span> <ul style="list-style-type: none"> <li>Randomized or nonrandomized observational or registry studies with limitations of design or execution</li> <li>Meta-analyses of such studies</li> <li>Physiological or mechanistic studies in human subjects</li> </ul>
<b>CLASS III: Harm (STRONG)</b> <span style="float: right;">Risk &gt; Benefit</span> Suggested phrases for writing recommendations: <ul style="list-style-type: none"> <li>Potentially harmful</li> <li>Causes harm</li> <li>Associated with excess morbidity/mortality</li> <li>Should not be performed/administered/other</li> </ul>	<b>LEVEL C-EO</b> <span style="float: right;">(Expert Opinion)</span> Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

\* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

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# American College of Cardiology



Whelton PK, et al.

## 2017 High Blood Pressure Clinical Practice Guideline

**Table 23. 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
<b>General</b>		
Clinical CVD or 10-year ASCVD risk $\geq 10\%$	$\geq 130/80$	$< 130/80$
No clinical CVD and 10-year ASCVD risk $< 10\%$	$\geq 140/90$	$< 130/80$
Older persons ( $\geq 65$ years of age; noninstitutionalized, ambulatory, community-living adults)	$\geq 130$ (SBP)	$< 130$ (SBP)
<b>Specific comorbidities</b>		
Diabetes mellitus	$\geq 130/80$	$< 130/80$
Chronic kidney disease	$\geq 130/80$	$< 130/80$
Chronic kidney disease after renal transplantation	$\geq 130/80$	$< 130/80$
Heart failure	$\geq 130/80$	$< 130/80$
Stable ischemic heart disease	$\geq 130/80$	$< 130/80$
Secondary stroke prevention	$\geq 140/90$	$< 130/80$
Secondary stroke prevention (lacunar)	$\geq 130/80$	$< 130/80$
Peripheral arterial disease	$\geq 130/80$	$< 130/80$

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

# ACC/AHA 2017



Understanding the 2017 Hypertension Guidelines



<b>BLOOD PRESSURE CATEGORY</b>	<b>SYSTOLIC mm Hg (upper number)</b>		<b>DIASTOLIC mm Hg (lower number)</b>
<b>NORMAL</b>	<b>LESS THAN 120</b>	<b>and</b>	<b>LESS THAN 80</b>
<b>ELEVATED</b>	<b>120 – 129</b>	<b>and</b>	<b>LESS THAN 80</b>
<b>HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1</b>	<b>130 – 139</b>	<b>or</b>	<b>80 – 89</b>
<b>HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2</b>	<b>140 OR HIGHER</b>	<b>or</b>	<b>90 OR HIGHER</b>
<b>HYPERTENSIVE CRISIS (SEE YOUR DOCTOR IMMEDIATELY)</b>	<b>HIGHER THAN 180</b>	<b>and/or</b>	<b>HIGHER THAN 120</b>

MORE VIDEOS

# Pooled Cohort Risk



- (<http://tools.acc.org/ASCVD-Risk-Estimator/>)

## Pooled Cohort Risk Assessment Equations

Predicts 10-year risk for a first atherosclerotic cardiovascular disease (ASCVD) event


 ClinCalc.com » Cardiology » Pooled Cohort 10-Year ASCVD Risk Assessment Equations

### Risk Factors for ASCVD

Gender	<input type="radio"/> Male <input type="radio"/> Female	Systolic BP	<input type="text"/> mmHg
Age	<input type="text"/> years	Receiving treatment for high blood pressure (if SBP > 120 mmHg)	<input type="radio"/> No <input type="radio"/> Yes
Race	White or other ▾	Diabetes	<input type="radio"/> No <input type="radio"/> Yes
Total Cholesterol	<input type="text"/> mg/dL	Smoker	<input type="radio"/> No <input type="radio"/> Yes
HDL Cholesterol	<input type="text"/> mg/dL		

Reset

Calculate

 US units



# Cardiovascular Risk Realism



- **Ideal cardiovascular health: Ideal Seven\***
  - No smoking
  - Fasting glucose less than 100
  - Total cholesterol less than 200
  - Blood pressure less than 120/80
  - BMI normal (18.5–25)
  - Exercise 150 min per week, moderate intensity
  - Diet with fruit, vegetables, whole grains, lowfat dairy, fish, nuts and limit red meat and sugar

\*AHA, 2010

# Cardiovascular Risk Realism



- Do we choose to medicate natural aging?
- What percent of adults have all 7 ideal factors:
  - 0.5 to 15% over various populations\*
- For cardiovascular risk, most adult men will cross the 10% risk threshold in their 60s or earlier, even if they have low cholesterol.
  - Example: 65-year-old male: SBP 120, total cholesterol 180, HDL (good cholesterol) 50
  - Atherosclerotic cardiovascular disease (ASCVD) risk = **10.6%\***
- CV risk calculator, based on the pooled cohort equations, allows provider and patients to estimate 10-year and lifetime risk for death, heart attack and stroke ([www.cvriskcalculator.com](http://www.cvriskcalculator.com))

\*JAMA January 9, 2018, vol 319, Num 2

# Cardiovascular Risk Realism



- Too many individuals in the United States, and around the world are:
  - Overweight or obese
  - Eat unhealthy diets
  - Fail to get exercise
  - Smoke or use tobacco products
- Consequently: **They fail the ideal 7!**

# Systolic Blood Pressure Goal?



## AAFP Decides to Not Endorse AHA/ACC Hypertension Guideline

*Academy Continues to Endorse JNC8 Guideline*

December 12, 2017 03:44 pm [Chris Crawford](#) – The AAFP has decided to not endorse the recent hypertension guideline from the American Heart Association (AHA), the American College of Cardiology (ACC) and nine other health professional organizations.

The AAFP wasn't involved in the development of the new guideline ([hyper.ahajournals.org](http://hyper.ahajournals.org)) and continues to endorse the 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults, ([jamanetwork.com](http://jamanetwork.com)) developed by panel members appointed to the Eighth Joint National Committee (JNC8).

David O'Gurek, M.D., chair of the AAFP's Commission on Health of the Public and Science (CHPS), which recommended non-endorsement of the AHA/ACC guideline, told *AAFP News* the commission used the same process and criteria to review both the AHA/ACC and JNC8 guidelines.



# Systolic PRessure INtervention Trial



The NEW ENGLAND  
JOURNAL of MEDICINE

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ORIGINAL ARTICLE

## A Randomized Trial of Intensive versus Standard Blood-Pressure Control

The SPRINT Research Group\*

N Engl J Med 2015; 373:2103-2116 | November 26, 2015 | DOI: 10.1056/NEJMoa1511939

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Abstract

Article

References

Citing Articles (755)

Letters

Metrics

### BACKGROUND

The most appropriate targets for systolic blood pressure to reduce cardiovascular morbidity and mortality among persons without diabetes remain uncertain.

MEDIA IN THIS  
ARTICLE

QUICK TAKE VIDEO  
SUMMARY

<120 mm Hg

# Systolic PRessure INtervention Trial



- 14,692 patients assessed for eligibility
- 5,331 ineligible
- 9,361 randomized
- Close to 500 patients on each side discontinued intervention, lost to follow-up or withdrew consent

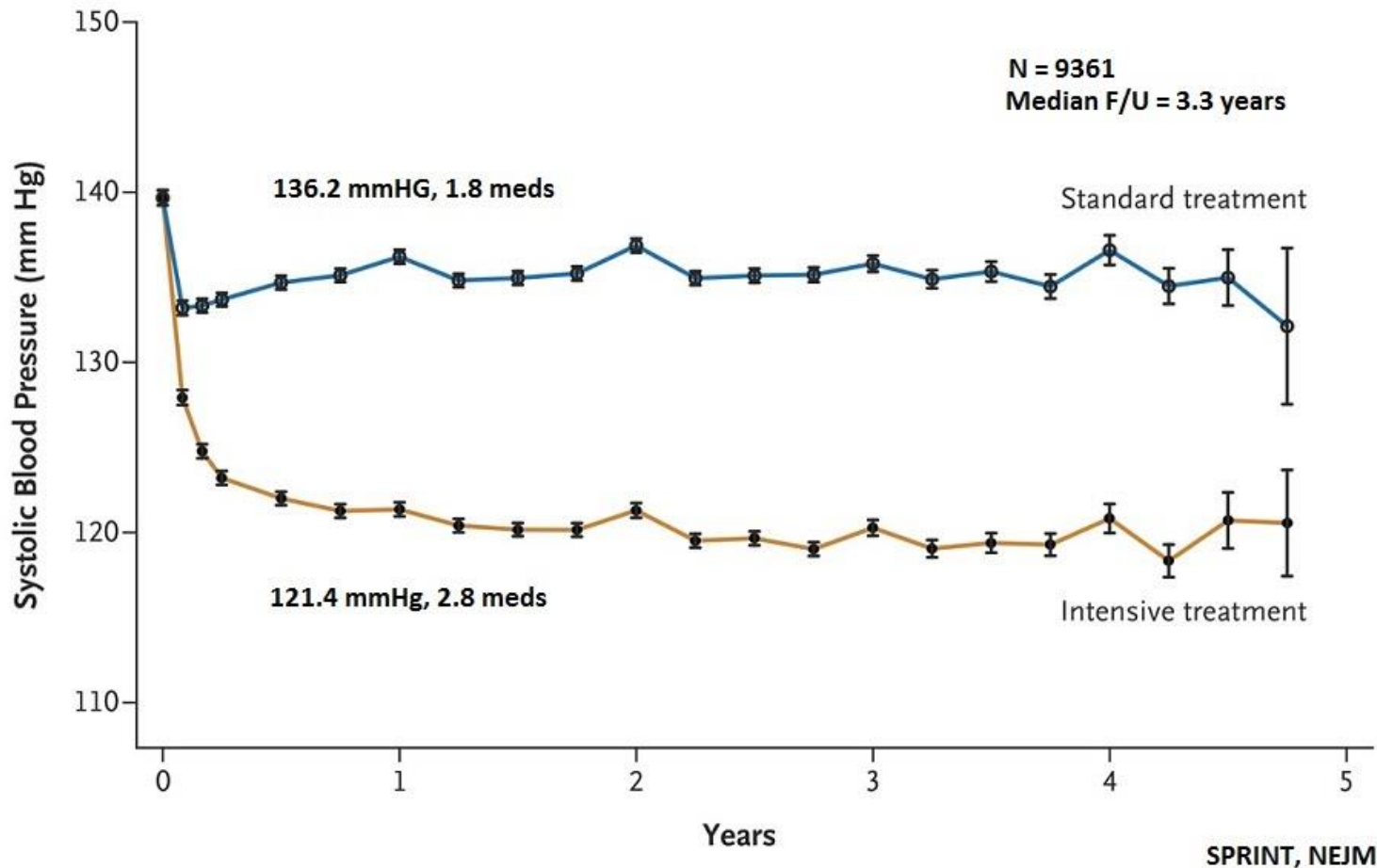
# Systolic PReSSure INtervention Trial



- Age 50 plus with starting SBP 130–180
- 1 or more cardiovascular risk (CAD, PAD, EBT, LVH, CKD, 10 year Framingham risk >15%, clinical disease)
- Exclude: Diabetics, CHF with symptoms, history of CVA, proteinuria, nursing home patients
- 9,361 patients randomized to <120 or <140

# Systolic Pressure Intervention Trial

## SPRINT BP Control





# SPRINT Outcomes



- Many fewer endpoint events (243 vs. 319): MI, CHF, CVA, acute coronary syndrome
- Death any cause: 155 vs. 210
- No outcome difference in patients with CKD (1330 patients vs. 1,316 patients at baseline (GFR 20–59) as far as long-term dialysis or >50% reduction in estimated GFR

NEJM 2015; 373:2103

# SPRINT Serious Adverse Events



- 37% serious events, but not significantly different
- 1,793/4,678 vs. 1,736/4,683
- Slightly more hypotension, syncope, electrolyte changes, creatinine elevation, NOT more falls or orthostasis
- Serious adverse events most likely related to the intervention: (4.7% vs. 2.5%)

# SPRINT >74 years old



- Subgroup pre-specified was 2,636 patients
- Mean age 79.9; 38% women
- Median follow-up 3.14 years, significantly decreased events and mortality
- Serious adverse events same in both groups

# Systolic PResure INtervention Trial



- Blood pressure measured in an unusual way:  
Automated blood pressure measured without any staff in the room
- Most trials have used a nurse coordinator over the years

# Action to Control Cardiovascular Risk in Diabetes



- The ACCORD trial occurred before JNC 8 (SPRINT after)
- N = 4733, Diabetics with SBP >130, Age >40, no CKD followed 4.7 years
- Driving down systolic BP to around 119 vs. 133
- Most similar outcomes to SPRINT were not significantly better but trending — **Stroke with improved outcomes**
- Less risky patients? Underpowered compared to SPRINT?

# SPRINT vs. ACCORD



- SPRINT patients had more cardiovascular risk
- SPRINT average age 68 vs. 62 for ACCORD
- ACCORD widely listed as showing no improvement in intensive lowering of blood pressure, but actually had a 12% reduction in composite cardiovascular events with a confidence interval that put it within reach of SPRINT
- Diabetes in ACCORD vs. not in SPRINT; does it matter?
- Difference in patients in SPRINT: DBP, multiple meds, SPRINT stopped early

# Heart Outcomes Prevention Evaluation - 3



- HOPE 3 trial: Lowering high normal BP in patients with one risk factor (inc waist/hip, low HDL, tobacco use, abnormal blood sugar, family history, mild renal disease)
- N = 12,705, 38% had HTN, 22% on medications
- Candesartan/HCTZ (16/12.5) vs. placebo
- Baseline BP 138/82 and followed 5.6 years

No difference in outcomes (lowered about 6 points systolic blood pressure)

# Orthostatic Hypotension



- Defined as  $>20$  mm Hg systolic or  $>10$  diastolic drop when standing
- It is normal to drop 5–10 mm Hg when standing, accompanied by a small compensatory increase in diastolic pressure and pulse
- Up to 20 % of adults greater than 65 years old have orthostatic hypotension, but only around 2% are symptomatic\*

\*Clin Auton Res 2011 Apr,21(2) 69 - 72



# Diastolic Blood pressure



- How low is too low? Nearly everybody agrees it should not be  $<60$ .
- In the elderly and those with coronary disease, some say it should be more than 70.
- Multiple analyses seem to back up this data, although one would think the SPRINT trial would have shown difficulty with aggressive reduction.
- Does low diastolic pressure lead to retinal ischemia?
- Be careful with low diastolic pressure and glaucoma.

# Summary of SBP Goal



- Meta-analysis with 21 randomized trials\*
- Many studies with high quality evidence supported the SBP <150 goal.
- Fewer studies supported a more aggressive goal with small benefit, particularly with stroke prevention.
- That benefit came at the cost of slightly more adverse events, (ACCORD 3.3% vs. 1.3%, SPRINT 4.7% vs. 2.5%) and more medication burden.
- Tighter targets didn't increase risk for dementia, falls, fractures, or quality of life.

\*Weiss et al, Annal of Int Med Jan 2017

# Summary of SBP goal



- Choice of patients for tighter control includes:
  - Patient preference
  - Higher cardiac risk
  - Particular patient concern for stroke (better evidence)
  - Lack of glaucoma or retinal ischemia issues
  - Lack of orthostatic symptoms
  - DBP >60 or even 70
  - Your own philosophy of medicine

# WAS YOUR BLOOD PRESSURE MEASURED CORRECTLY TODAY?



## Why does it matter?

- Taking your blood pressure the same way, on the same arm every time is important.
- This helps us to get correct numbers, so we can provide the right treatment.

## About high blood pressure

- One in three adults has high blood pressure.
- Most people with high blood pressure have no signs or symptoms.
- High blood pressure is a major risk factor for heart attack, stroke, kidney disease, and diabetes complications.
- High blood pressure contributes to nearly 1,000 deaths each year.

SOURCES: PICKERING, ET. AL. CIRCULATION, 2005 AND O'BRIEN, ET. AL. J HYPERTENSION, 2003

WE WANT TO GET IT RIGHT!

# Body Positioning



- Unsupported back: raises 5–10 mmHg
- Unsupported or crossed legs: raises 2–8 mm
- Talking during measurement: raises 5–15 mm
- BP arm supported: Unsupported raises 10 mm
- Cuff on bare arm: on clothing raises 10–40 mm
- BP cuff at level of heart, and correct for arm size: raises and lowers variably

# Ambulatory Blood Pressure



Ambulatory blood pressure monitoring is a better predictor of cardiovascular and renal risk and **is more accurate** compared to office readings



# Ambulatory Blood Pressure



<u>Category:</u>	<u>24 hr</u>	<u>Daytime</u>	<u>Nighttime</u>
------------------	--------------	----------------	------------------

Ideal: less than	115/75	120/80	100/65
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Elevated blood pressure:		120s/70	
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HTN: more than	125/75	130/80	110/75
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ACC/AHA 2017 guidelines



# Assessing blood pressure



- Basic method
- Home readings (oscillatory)
- Ambulatory monitoring (oscillatory)
- Office readings (usually auscultatory) 5–10 mmHg more
- Palpation for systolic blood pressure
- Daily patterns: the morning surge, dipping at night



# Home Monitors



- Reads 5–10 mmHg lower than auscultation
- How accurate? Recent review of an Omron device stated within 3 mmHg — is this true?
- How about free monitors to use in the store?
- Validated BP cuffs: Dabl Educational Trust and British Hypertension Society
- Mi-Hyang et al., 2015: 212 patients had 85% of “validated” BP cuffs within 5 mmHG
- Ringrose et al., Am J Hypertens (2017) 30 (7): 683-689: 85 patients; 31% more than 10 mmHg
- Ruzicka 2014: 210 patients, 8% of cuffs >10 mmHg
- Many more studies come in as 65–80% accurate

# Home Monitor Accuracy



- Bottom line: Home monitors should be checked against clinic readings, preferably with at least two measurements averaged compared to auscultation
- Consider more than **10 mmHg** as inaccurate

# Lifestyle Contributors



- Nicotine use
- Obesity (sleep apnea)
- Exercise
- Diet: Mediterranean Diet, DASH
- Stress
- Sedentary lifestyle
- Alcohol
- Medications

# Non pharmacologic strategies



- Weight reduction: 5–20 mmHg/10 kg weight loss
- DASH 8–14 mmHg
- Physical exercise 4–9 mmHg
- Decrease alcohol 2–4 mmHg
- Treat sleep apnea 3–5 mmHg

# Dietary Approach to Stop Hypertension



- DASH diet is recommended by many to lower blood pressure, lose weight, and treat insulin resistance (11.4 mmHg SBP reduction in the trial)\*
- It may decrease the risk of certain kinds of cancer, as well as decrease the risk of stroke, heart disease, kidney stones, diabetes, heart failure
- Low sodium, high in fruits, vegetables, lowfat or nonfat dairy, less refined grains, low to moderate fat

\*N Engl J Med 1997; 336:1117-1124

# Initial Evaluation of Hypertension



- History of endocrine symptoms, and question for snoring, fatigue, headaches
- Chemistry 14, urinalysis, TSH, lipid panel
- Physical exam: murmurs? Brachial/femoral pulse delay, abdominal bruit? Body habitus to suggest Cushing's disease? Thyroid enlargement? BMI and oropharyngeal exam regarding sleep apnea
- EKG

# Medication Contributors



## **Increasing:**

- NSAIDS, NSAIDS, NSAIDS
- NSRIs: Venlafaxine, duloxetine
- Sympathomimetics: pseudoephedrine, weight loss drugs
- Methylphenidate, birth control pills, calcineurin inhibitors, erythropoietin
- Natural black licorice, herbal meds such as ephedra, Ma Huang

## **Decreasing orthostatically:**

- Alpha blockers: Tamsulosin, Doxazosin and others
- Older antidepressants: Trazodone, tricyclic antidepressants
- Sildenafil and others in class

# Basic Medications to Lower BP



- ACE/ARB
- Diuretics
- Calcium channel blockers
- Beta blockers
- Aldosterone antagonists
- Lesser used: Clonidine, Hydralazine, nitrates, alpha blockers



# BP lowering



Each medication lowers blood pressure **8–14** points of mercury on average, with much of it before max dose

# Which Medication to Use?



- The most important aspect of blood pressure control is starting a pill, regardless of class.
- It is rare a pill won't work, pills are additive.
- Universally, patients should have no side effects from their regimen. I do not consider edema from calcium channel blockers acceptable.
- Never allow an ACEI cough to linger, some patients ask to not switch.

# Medications: ACEI/ARB



- ACEI: Usually will max dose to 40 mg lisinipril
- ARB: Usually will max dose to 100 mg losartan, but more lowering with max dose irbesartan 300 mg, or 320 mg Valsartan
- Hyperkalemia, renal failure in renal artery stenosis, angioedema, urticaria

# Medications: Calcium Channel Blockers



- Subclass: dihydropyridine
- Practically speaking amlodipine 2.5 and 5 mg a day, occasionally 10 mg or 20 mg a day,
- Nifedipine XL 30 mg , 60 mg, rarely 90 mg a day
- Edema: Extremely common and often limiting at any dose over 5 mg a day amlodipine or 30 mg a day nifedipine
- More likely to tolerate with a diuretic
- Minimal to no decrease in heart rate

# Medications: Calcium Channel Blockers



- Subclass non-dihydropyridine
- Used more often if need to decrease heart rate in control of tachyarrhythmia
- Just as prone to edema
  
- Verapamil ER 120–360 mg once a day
- Diltiazem CD 120–360 mg once a day

# Medications: Diuretics



- Practically speaking: HCTZ 12.5 or 25 mg a day, but more BP lowering with **chlorthalidone**
- Generally stop or add if GFR = 30 or less
- Decreases kidney stone formation in some calcium containing stones and associated risk for usually mild hypercalcemia; increases gout risk
- Occasionally causes low sodium
- Often needs extra potassium rx– risk for compliance, pill esophagitis, and can decrease the need for potassium with triamterene
- Also furosemide for BP control 20 mg or 40 mg twice a day max 200 mg or use once a day torsemide 20 mg

# Medications: Beta Blockers



- Usually 4<sup>th</sup> line unless coronary disease, or chronic headache, aneurysm, or tremor (maybe glaucoma)
- Monitoring pulse: 50s ok, lower usually not
- Asthma and COPD risk
- Prefer metoprolol succinate once a day 12.5 mg, 25 mg, 50 mg or 100 mg
- Many cardiologists prefer carvedilol despite twice a day generic dosing

# Medications: Aldosterone Antagonists



- Can be extremely powerful often 4<sup>th</sup> or 5<sup>th</sup> line
- Spironolactone: 25 mg, 50 mg, occasionally 100 mg
- Risk for hyperkalemia – typical monitoring intensive at the start: 1 wk, 3 wk, 6 wk (2% K > 6 in one study)
- Gynecomastia risk, or can use the alternative and expensive eplerenone 25 mg to 100 mg
- Can substitute for potassium pills with HCTZ in difficult to control patients
- Prefer CrCl >50 to use, even then with caution
- More effective with low plasma renin



# Medications: Clonidine/Hydralazine



- Rare use
- Clonidine 0.1 or 0.2 twice a day
- Dry mouth, bradycardia
  
- Hydralazine – occasionally used for heart failure with nitrates
- Sedating, risk for drug induced lupus

# Case #1



45-year-old male for his first office visit. He has no complaints, and just wants a physical. BP is 156/78, pulse 72. A few minutes later 136/86, BMI 29. He is on no medications.

- What gets recorded in the EMR?
- If everything is normal on the physical, what gets ordered?
- What questions need to be asked?
- Do you start medications?
- When is follow-up?

# Case #2



75-year-old male new visit. No complaints. He just transferred care and wants to review his blood pressure. The nurse records 148/88 pulse 75, and a few minutes later, 142/82, BMI 26. He has frequent urination and takes tamsulosin 0.4 mg a day as his only medication.

- What blood pressure gets recorded?
- Is he orthostatic?
- What is the treatment goal?

# Case #3



65-year-old female for routine visit. No complaints. Nurse BP 148/82 pulse 56, repeat 146/77. BMI = 29. On exam, lungs are clear, cardiac exam normal, 1 plus leg swelling to mid calf. She has hypertension, hyperlipidemia, and gout with one attack a month on average. Meds: lisinipril 40 mg a day, allopurinol 300 mg a day, hctz 25 mg a day, amlodipine 7.5 mg a day, atorvastatin 20 mg a day. Labs: creatinine 0.9, sodium 133, potassium 3.5, uric acid 6.9.

# Case #3



What is her blood pressure goal?

- What do you do next?
- Does she need a workup for secondary hypertension?
- Drug interactions? Side effects?

## Case #4



A 65-year-old female comes in to follow up difficult to control blood pressure. She is on HCTZ 25 mg daily, losartan 100 mg daily, amlodipine 5 mg a day. Exam is unremarkable with clear lungs, regular heart rhythm at 60 bpm, no edema is noted at the legs. BMI 28, BP:148/94 and repeat 146/92. Home readings average 144/90 in AM and 140/88 in the evening. No dizziness is noted.

- What to do next?

# Case #4



## Options:

- 1) Leave as is with meds, check ambulatory BP
- 2) Add beta blocker metoprolol 25 mg a day
- 3) Switch losartan to valsartan 320 mg a day
- 4) Switch HCTZ to chlorthalidone 25 mg a day
- 5) Increase amlodipine to 10 mg a day

# Resistant Hypertension



Defined as blood pressure that remains elevated, despite therapy with 3 drugs (one of which is a diuretic), at substantial doses

- 1) Is it a good regimen?
- 2) How is compliance? Up to 50% of resistant patients may not be compliant
- 3) Is there substance abuse?
- 4) Is it white coat hypertension?
- 5) Is there a secondary cause?
- 6) How is sodium intake?



# Sodium in Diet!



Dr. Edward Pimenta studied sodium intake with 12 subjects with resistant hypertension:

- 2 weeks low salt diet supplied by the study—ABPM
- 2-week washout then 2 weeks 5 times that amount and around the average for Alabama residents at that time (each received 6 grams of NaCl tablets a day)
- Difference in systolic blood pressure **22 mmHg +!**

# Resistant Hypertension



- 68045 HTN Patients; 8295 classified as resistant (12%)
- 30-37% of resistant hypertension had normal ambulatory blood pressure monitoring – **white coat!**
- Roughly 2-10% of HTN patients may have resistant hypertension

De la Sierra, Hypertension 2011; 57, 898-902

# Resistant Hypertension: Experimental Therapies



- **Renal Denervation:** Radiofrequency ablation therapy failed in a pivotal trial in 2014, not effective
- **Carotid Baro-reflex activation therapy:** Not FDA approved with high complication rates
- **A-V anastomosis in the iliac circulation:** Lots of complications, low numbers, needs more studies

# Masked Hypertension



- The opposite of white coat hypertension
- Normal office blood pressure
- Out-of-office blood pressures consistently high on home monitors and ambulatory monitoring
- Masked hypertension has increased risk of cardiovascular disease and mortality similar to sustained hypertension

# Secondary Blood Pressure



- Chronic kidney disease
- Renovascular
- Obstructive sleep apnea (Snorelab app)
- Endocrine: (aldosteronism, pheochromocytoma, Cushing's disease, hypothyroidism, hyperparathyroidism)
- Drugs (NSAIDs, birth control pills, SNRIs)
- Anatomic: Coarctation

# Resistant Hypertension



- Is it from hyperaldosteronism?
- Roughly 20% of patients have aldosterone excess
- Low potassium is often not seen – maybe half the time in an over-secreting adenoma, and more like 13% of the time in adrenal hyperplasia\*
- ACE/ARB raise potassium levels a little

\*Dr. Raymond Townsend, May 2016 ACP lecture

# Secondary Blood pressure



- When to consider:
  - Needs 3+ agents to control
  - Unusually young < 30 years old, or unusually severe rapid onset
  - History or physical suggesting
- What to order: Targeted ordering for kidney disease, renovascular disease, aldosterone/renin, endocrine disorders
- Use plasma metanephrines for pheo evaluations

# Hypertensive Urgency



- Defined at  $>180$  and/or  $>110$  and **no symptoms**
- No role for IV or rapid acting medications
- Should be monitored in a quiet room over time
- Can usually start a regimen that will be used over long-term treatment
- In rare cases will try to bring it down a little faster, and no more than 30% over a few days (e.g., AAA at risk but asymptomatic), with  $<160/<100$  a safe intermediate goal



# Hypertensive Emergency



- Defined as DBP >120 with end organ damage such as encephalopathy, heart failure, heart attack, kidney damage, retinal hemorrhage, aortic dissection
- Treated aggressively in a monitored setting
- Usually lower blood pressure 10–20 % in an hour, then another 5–15% over the next 23 hours
- EXCEPT: Acute ischemic stroke with minimal lowering <185/110 for thrombolytics or <200/120 if not
- Aortic dissection to SBP 100–120
- Intracerebral hemorrhage: variable goals
- Specific scenarios: heart failure, MI, renal crisis, pregnancy

# Million Hearts



- The campaign: A 5-year initiative to prevent a million heart attacks and strokes; CDC and CMS co-partners
- The contest: greater than 70% controlled
- <http://millionhearts.hhs.gov/partners-progress/champions/index.html>
- 2015: 18 champions
- 2014: 30 champions
- 2013: 9 champions
- 2012: 2 champions

# Hypertension Experts



- [www.ash-us.org](http://www.ash-us.org)
- American Society of Hypertension
- Provides certification for expertise in hypertension

# Summary



- 1) Know how to accurately check blood pressures with patients and staff – teach them!
- 2) Be mindful of revised blood pressure control target guidelines.
- 3) If you are responsible for a group of patients, check your group control for  $<140/90$ , with a goal of 70% or better.
- 4) Review patients not controlled and identify each one individually to improve their care.

# Cascade Internal Medicine Specialists



# References



- WheltonPK et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NM A/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. Journal of the American College of Cardiology 2017.
- Sacks FM, Svetkey LP, Vollmer WM, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. N Engl J Med 2001;344:3-10
- Lonn EM, Bosch J, López-Jaramillo P, et al. Blood-pressure lowering in intermediate-risk persons without cardiovascular disease. N Engl J Med 2016;374:2009-2020
- ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group. Major outcomes in high-risk hypertensive patients randomized to angiotensin-converting enzyme inhibitor or calcium channel blocker vs diuretic: the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). JAMA2002;288:2981-2997
- Margolis KL, O'Connor PJ, Morgan TM, et al. Outcomes of combined cardiovascular risk factor management strategies in type 2 diabetes: the ACCORD randomized trial. Diabetes Care 2014;37:1721-1728
- The SPRINT Research group. A randomized Trial of Intensive vs Standard Blood Pressure Control. N Engl J Med 2015; 373:2103-2116

# References page 2



- Chobanian AV, Bakris GL, Black HR, et al. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 Report. *JAMA* 2003;289:2560-2572
- Vasan RS, Larson MG, Leip EP, et al. Impact of high-normal blood pressure on the risk of cardiovascular disease. *N Engl J Med* 2001;345:1291-1297
- Sundström J, Arima H, Jackson R, et al. Effects of blood pressure reduction in mild hypertension: a systematic review and meta-analysis. *Ann Intern Med* 2015;162:184-191
- Lim SS, Vos T, Flaxman AD, et al. 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. *Lancet* 2012;380:2224-2260
- Beckett NS, Peters R, Fletcher AE, et al. Treatment of hypertension in patients 80 years of age or older. *N Engl J Med* 2008;358:1887-1898
- Ogihara T, Saruta T, Rakugi H, et al. Target blood pressure for treatment of isolated systolic hypertension in the elderly: Valsartan in Elderly Isolated Systolic Hypertension study. *Hypertension* 2010;56:196-202

# References page 3



- 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8) *JAMA*. 2014;311(5):507-520.
- Mills KT et al. Comparative effectiveness of implementation strategies for blood pressure control in hypertensive patients. A systematic review and meta-analysis. *Ann Intern Med* 2018 vol 168: 110 – 120.
- Missed Opportunities for Treatment of Uncontrolled Hypertension at Physician Office Visits in the United States, 2005 Through 2009. [Raman Ravi Khanna, MD, MAS](#), et al: *Arch Intern Med*. 2012;172(17):1344-1345.
- Tucker KL, Sheppard JP, Stevens R, et al. Self-monitoring of blood pressure in hypertension: a systematic review and individual patient data meta-analysis. *PLoS Med*. 2017;14:e1002389.
- Qaseem A, et al. Clinical Guidelines Committee of the American College of Physicians and the Commission on Health of the Public and Science of the American Academy of Family Physicians *Ann Intern Med* 2017 vol 166: pages 430 - 437
- Individualizing Blood Pressure Targets for People With Diabetes and Hypertension: Comparing the ADA and the ACC/AHA Recommendations [Ian H. de Boer, MD, MS<sup>1</sup>](#); [George Bakris, MD<sup>2</sup>](#); [Christopher P. Cannon, MD<sup>3</sup>](#) *JAMA*. 2018;319(13):1319-1320



# References page 4



- Cushman WC, Evans GW, Byington RP, et al. Effects of intensive blood-pressure control in type 2 diabetes mellitus. *N Engl J Med* 2010;362:1575-1585
- De la Sierra et al. Clinical Features of 8295 Patients With Resistant Hypertension Classified on the Basis of Ambulatory Blood Pressure Monitoring. *Hypertension*. 2011; *Hypertension* 2011; 57: 898-902
- Pimenta et al. Effects of Dietary Sodium Reduction on Blood Pressure in Subjects with Resistant Hypertension. *Hypertension*. 2009; 54: 475-481
- Weiss et al. Benefits and Harms of Intensive Blood Pressure Treatment in Adults Aged 60 years and Older: A systematic review and Meta Analysis. *Ann Intern Med* 2017; 166(6): 419-429
- Figueroa et al. Orthostatic Hypotension: A Management Opportunity. *Clin Auton Res* 2011 Apr 21(2): 69-72
- Banerjee et al. Underdiagnosis of hypertension using electronic medical records. *Am J Hypertens* 2012 Jan: 25(1): 97-102

# Thank you!

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- For more information about this presentation, contact [Transformation.Center@state.or.us](mailto:Transformation.Center@state.or.us)
- Find more resources for controlling high blood pressure here: <https://www.oregon.gov/oha/HPA/CSI-TC/Pages/Hypertension-TA.aspx>
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