Presentation Update:
Revised HTN Guidelines

(originally presented June 2017)

Guideline Updates:

ACC/AHA HTN (2017): New BP categories

BP category	Systolic BP (mmHg)		Diastolic BP (mm Hg)
Normal	<120	and	<80
Elevated	120-129	and	<80
Stage 1	130- 139	or	80-89
Stage 2	≥140	or	≥90
HTN urgency	>180	and/or	>120
HTN emergency	>180 + target organ damage	and/or	>120 + target organ damage

Comparing HTN guidelines

ACC/AHA HTN (2017)

BP category	Systolic BP (mmHg)		Diastolic BP (mm Hg)
Normal	<120	and	<80
Elevated	120-129	and	<80
Stage 1	130- 139	or	80-89
Stage 2	≥140	or	≥90
HTN urgency	>180	and /or	>120
HTN emergency	>180 + target organ damage	and /or	>120 + target organ damage

JNC8 (2014)

Patient subgroup	Target SBP (mm Hg)	Target DBP (mm Hg)
≥ 60 years	<150	<90
< 60 years	<140	<90
> 18 years with CKD	<140	<90
> 18 years with DM	<140	<90

ACC/AHA guideline update: When to start medication?

Use of antihypertensive medications are recommended for:

- **Primary prevention of CVD in adults:**
  - 10-year ASCVD risk ≥10%, SBP ≥ 130 mm Hg or DBP ≥ 80 mm Hg
  - 10-year ASCVD <10%, SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg
- **Secondary prevention of CVD in adults:**
  - Average SBP ≥ 130 mm Hg or DBP ≥ 80 mm Hg
- **Adults with DM with BP ≥ 130/90 mm Hg**

10-year ASCVD risk calculator: http://tools.acc.org/ascvd-risk-estimator-plus/#!/calculate/estimate/

HyperTensioN

Relieving the Pressure

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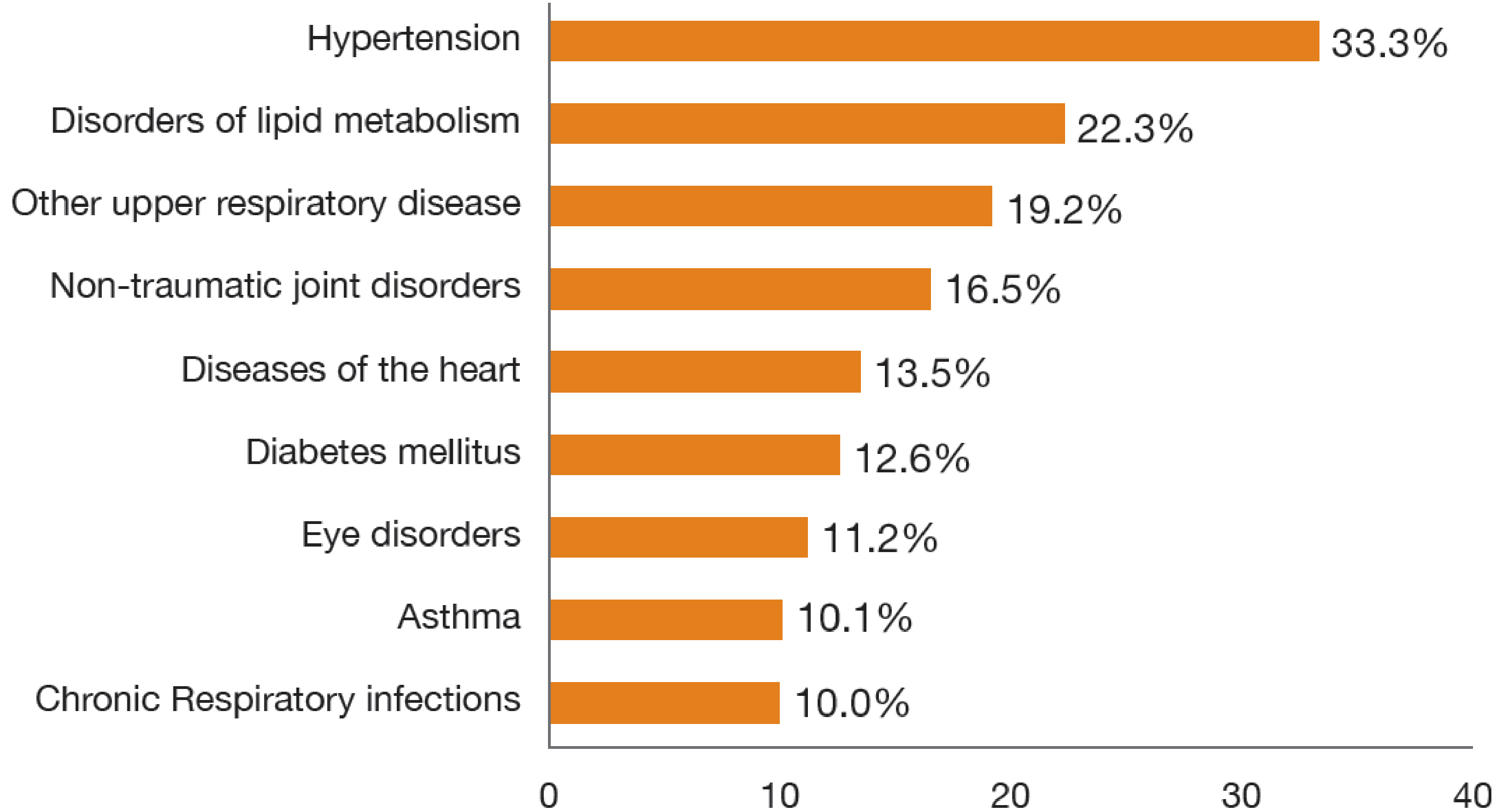
Today's Agenda

- Welcome and Introduction – 8:00
- Hypertension Guidelines – 8:05
- **Break – 9:00**
- Medication Management – 9:15
- **Break – 10:15**
- Nutrition & Lifestyle Intervention – 10:20
- Closing – 11:30

The Most Common Chronic Condition

Percentage of Non-Institutionalized People With Specific Chronic Conditions, All Ages



Source: Medical Expenditure Panel Survey, 2006

Chronic Health Problems by Primary Health Insurance Source

	Medicaid	Medicare	Employer or Unions	Military or Veteran's Benefits	Something else	Uninsured	Difference, Medicaid vs. employer
% Depression	22	14	7	12	9	8	15
% Asthma	16	8	6	8	7	6	10
% Diabetes	15	22	8	13	9	9	7
% Obese	34	28	27	22	20	30	7
% High Blood Pressure	24	51	20	25	19	14	4
% Heart Attack	4	10	2	4	3	3	2
% High Cholesterol	17	37	15	19	14	7	2

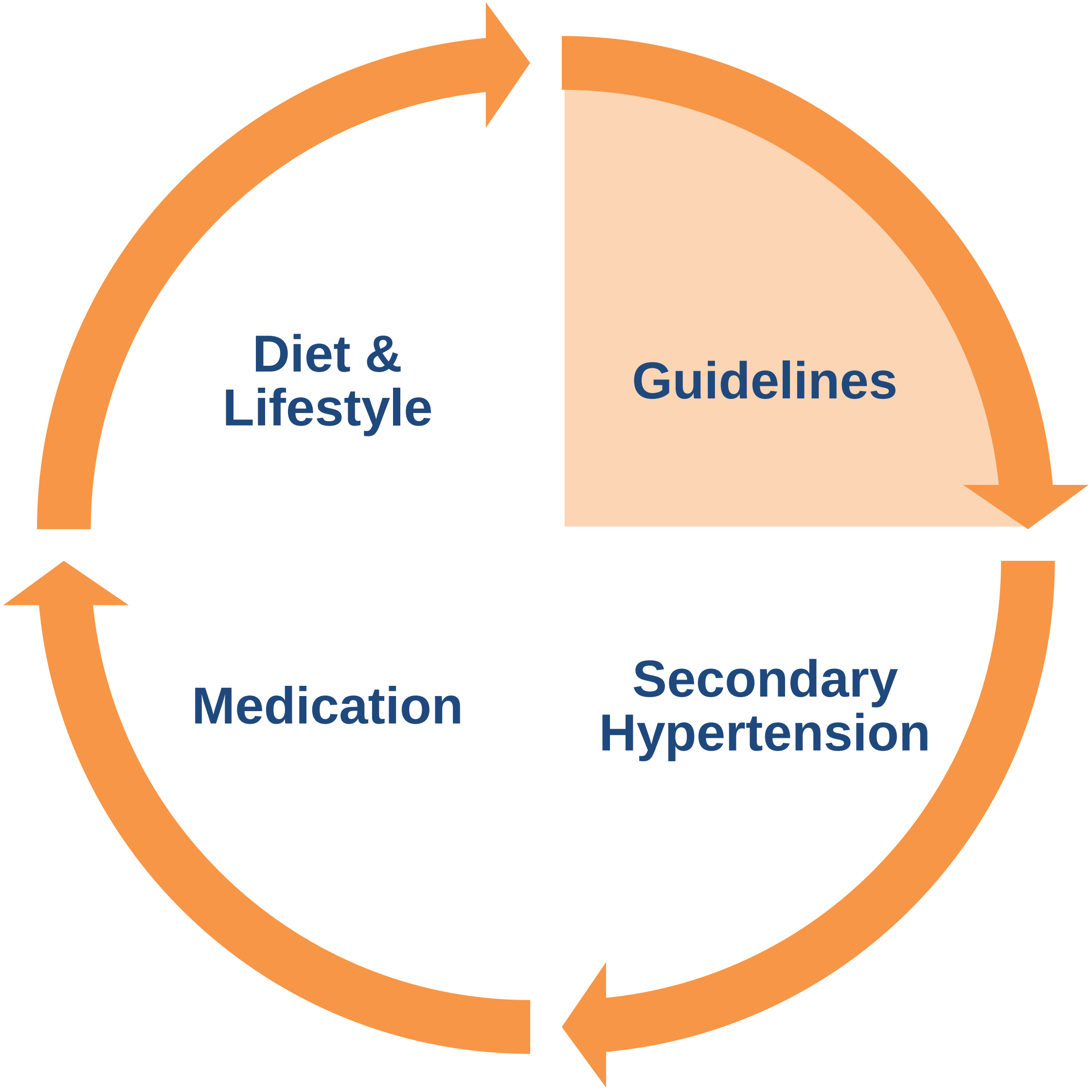
Gallup-Healthways Well-Being Index

Blood Pressure Cuffs

- Both manual and automatic blood pressure monitors are covered under the medical benefit with **no prior authorization required!** (Both Medicare and Medicaid/OHP.)
- DME vendor Prescription Codes: **A4660-A4670**

Range Start	Range End	Description
A4660	**A4670**	**BP cuff/monitor**

For BP cuffs, recommendation is for **arm cuffs**, NOT wrist or finger cuffs, given the lack of accuracy and validation. When in doubt, go to this website and see if the monitor they are using has been validated:
http://www.dableducational.org/sphygmomanometers/devices_2_sbpm.html


Diet &
Lifestyle
Guidelines
Medication
Secondary
Hypertension

Hypertension Guidelines

Jose Rueda, MD

Division of Nephrology and Hypertension

Director Comprehensive Hypertension Clinic at OHSU

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Objectives

- Describe JNC 8 guidelines for blood pressure goals
- Review the SPRINT trial
- Discuss indications for work up of secondary causes of HTN

Hypertension in America

- $73 **billion** in direct and indirect annual costs
- 73 **million** Americans affected
  - 1 in 3 adults → 2/3 over age 60
  - 1 in 6 deaths
- Most common cardiovascular risk factor
  - #2 leading cause of preventable death (tobacco #1)

IOM 2010 Report
Go, Circulation 2013
Lloyd-Jones, Circulation 2009

Management of HTN in US Adults

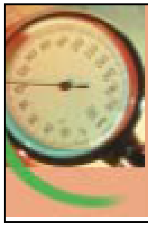
	NHANES II 1976-80	NHANES III 1988-91	NHANES III 1991-94	NHANES 1999-2000	NHANES 2007-08
Awareness (%)	51	73	68	70	81
Treatment (%)	31	55	54	59	72
Control (%)	10	29	27	34	50

www. cdc.gov

National Center for Health Statistics Data Brief Nov 2015

- Prevalence of controlled HTN among adults has increased from 31.5% for 1999-2000 to 54% in 2014
- No significant change was seen in the percentage of adults with HTN from 1999-2014 (29%)

CDC.gov accessed June 13 2017



Reference Card From the

Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)

EVALUATION

Classification of Blood Pressure (BP)*

Category	SBP mmHg		DBP mmHg
Normal	<120	and	<80
Prehypertension	120–139	or	80–89
Hypertension, Stage 1	140–159	or	90–99
Hypertension, Stage 2	≥160	or	≥100

* See *Blood Pressure Measurement Techniques* (reverse side)

Key: SBP = systolic blood pressure DBP = diastolic blood pressure

Diagnostic Workup of Hypertension

- Assess risk factors and comorbidities.
- Reveal identifiable causes of hypertension.
- Assess presence of target organ damage.
- Conduct history and physical examination.
- Obtain laboratory tests: urinalysis, blood glucose, hematocrit and lipid panel, serum potassium, creatinine, and calcium. Optional: urinary albumin/creatinine ratio.
- Obtain electrocardiogram.

Assess for Major Cardiovascular Disease (CVD) Risk Factors

- Hypertension
- Obesity (body mass index ≥30 kg/m²)
- Dyslipidemia
- Diabetes mellitus
- Cigarette smoking
- Physical inactivity
- Microalbuminuria, estimated glomerular filtration rate <60 mL/min
- Age (>55 for men, >65 for women)
- Family history of premature CVD (men age <55, women age <65)

Assess for Identifiable Causes of Hypertension

- Sleep apnea
- Drug induced/related
- Chronic kidney disease
- Primary aldosteronism
- Renovascular disease
- Cushing's syndrome or steroid therapy
- Pheochromocytoma
- Coarctation of aorta
- Thyroid/parathyroid disease

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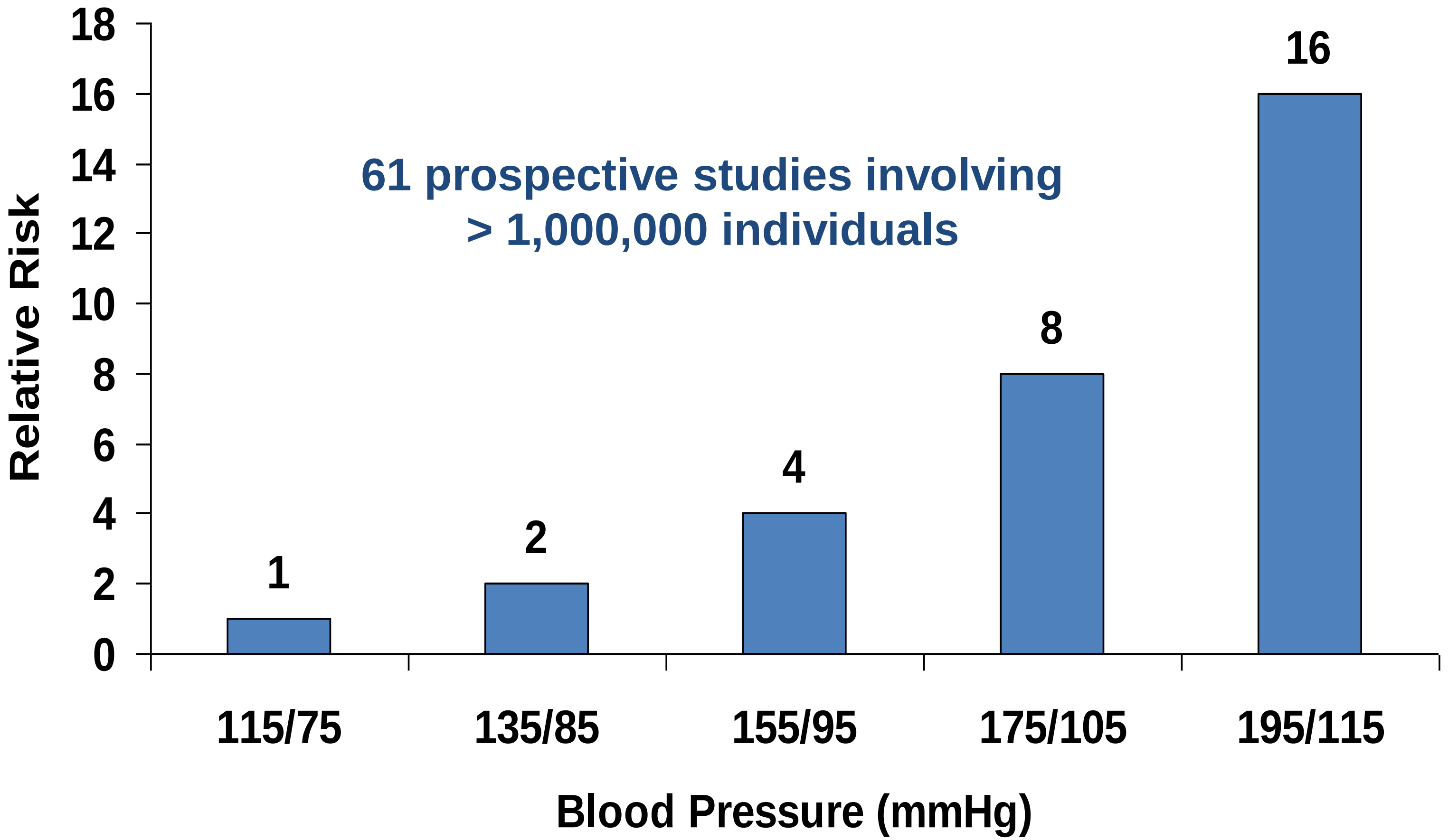
HTN Increases Risk of CV Mortality



Lewington, Lancet, 2002

What is the RCT data for BP control and events?

Systolic BP trials Testing SBP Goals and Showing CVD Benefit

	SHEP[2]	Syst-EUR[3]	Syst-China[4]	HYVET[5]
Systolic BP, mm Hg				
Entry	160-219	160-219	160-209	160-199
Goal	<148*	<150	<150	<150
Baseline	170	174	171	173
Achieved				
Drug	142	151	151	144
Placebo	155	161	160	159

All showed significant reductions in primary, other CVD outcomes or mortality

SHEP *JAMA* 1991
Syst-EUR *Lancet* 1997
Syst-China *Arch Int Med* 2000
HYVET *NEJM* 2008

Evidence for Blood Pressure < 150/90

Trial	Age	SBP	Medication	Blood Pressure		All Stroke	Death
				Tx	Control		
HYVET[1] (2008) n=3845	> 80	173	Indapamide + Perindopril	143/78	158/84	-30%*	-21%*
SHEP[2] (1997) n=4736	> 60	177	Chlorthalidone ± Atenolol or Reserpine	143/68	155/72	-36%*	-13%
Sys-EUR[3] (1991) n=4695	> 60	>160	Nitrendipine ± Enalapril or HCTZ	152/80	162/85	-42%*	-14% ns

*p<0.05

1. N Engl J Med. 2008;358(18):1887-98
2. Lancet. 1997;350(9080):757-64.
3. JAMA. 1991;265(24);3255-64.

What is the RCT data for BP control and events?

Randomized Control Trials Testing Systolic BP Goal <140 mm Hg

	JATOS n= 4418	VALISH n=3260
Duration	2 years	2.85 years
Systolic BP, mm Hg		
Entry	≥160	≥160
Goal	<140 vs 140–159	<140 vs 140–149
Achieved	136 vs 146	137 vs 142
Primary Outcome	No difference	No difference
Secondary Outcomes	No difference	No difference*

No Statistically Significant Difference Between Groups!

JATOS *Hypertens Res* 2008
VALISH *Hypertens* 2010

ACCORD Trial

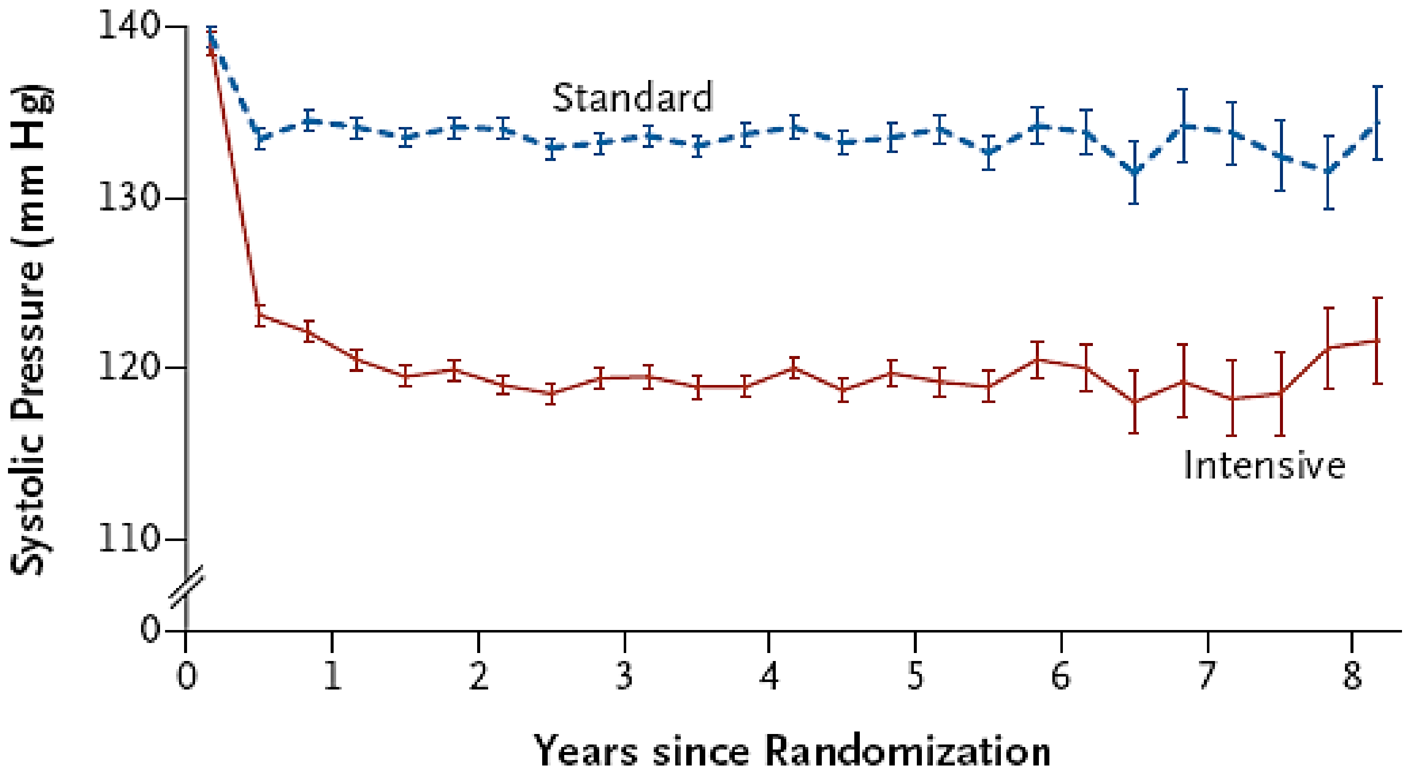
(Action to Control Cardiovascular Risk in DM)

- RCT including 4733 type 2 diabetics
- Two systolic BP goals: 140 mmHg and 120 mmHg
- Primary outcomes:
  - 1) Non-fatal MI or CVA
  - 2) CV mortality

ACCORD NEJM, 2010

ACCORD Trial

A Study of Blood Pressure Targets in DM2

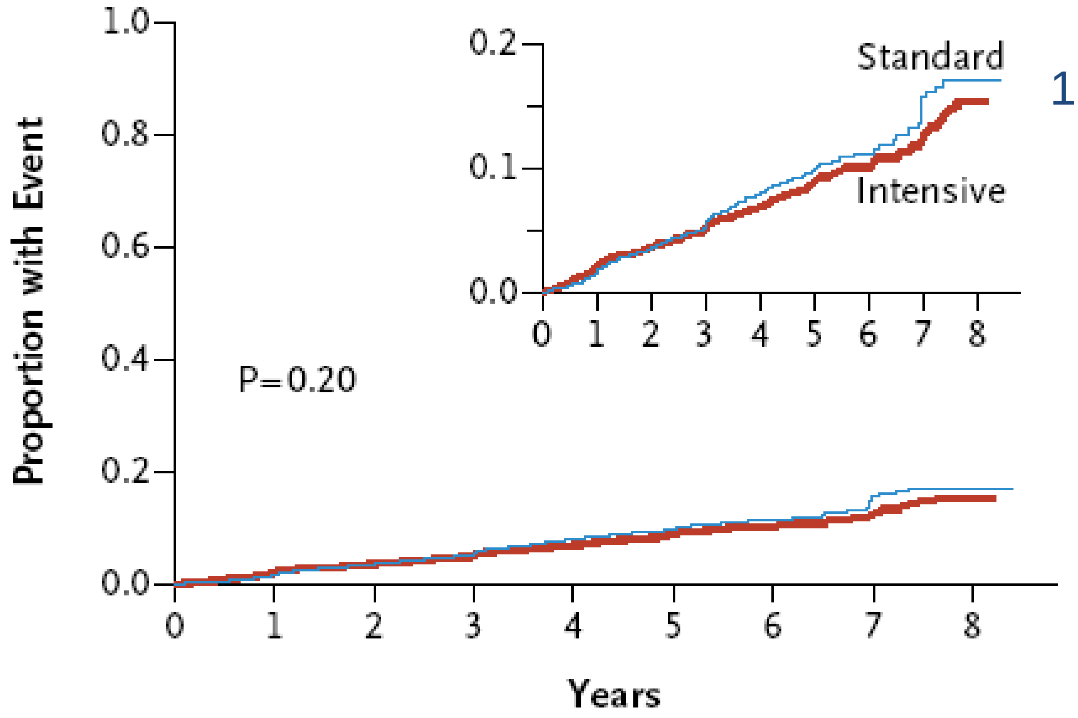


ACCORD NEJM, 2010

ACCORD Trial

A Study of Blood Pressure Targets in DM2

A Primary Outcome



No. at Risk									
Intensive	2362	2273	2182	2117	1770	1080	298	175	80
Standard	2371	2274	2196	2120	1793	1127	358	195	108

<u>Event rates</u>

1.87% intensive vs 2.09% conventional arm

HR 0.88 (95% CI 0.73-1.09),

P-value 0.20

Krumholz, Journal Watch, 2010

ACCORD Trial

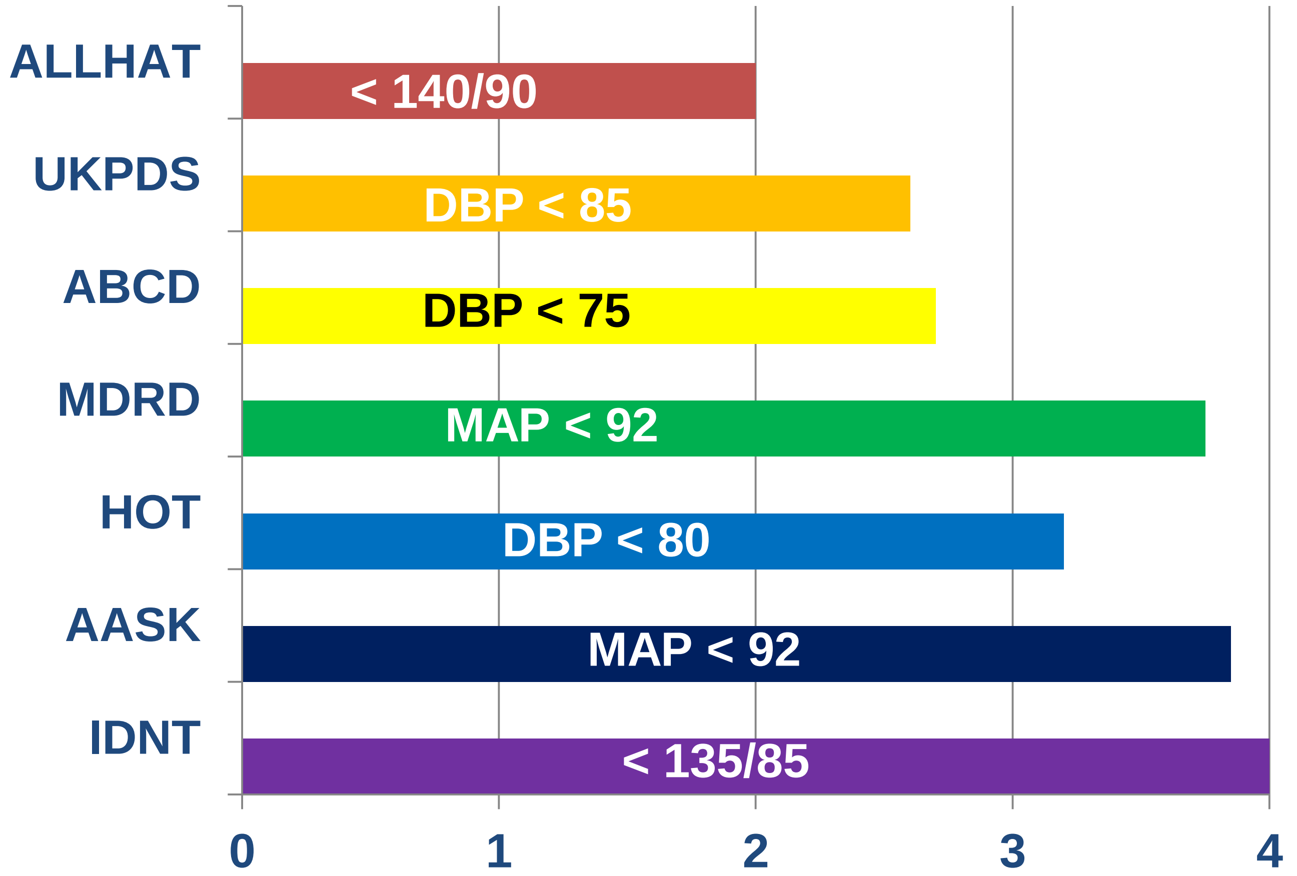
A Study of Blood Pressure Targets in DM2

- Overall event rate was low in both groups despite target
- Argues ***against*** intensive BP control in high-risk DM2 patients
- Still unclear what optimal the BP target is for these patients

Krumholz, Journal Watch, 2010

Multiple Medications are Often Required:

Associations in Clinical Trials with More Aggressive Targets



Multiple New Guidelines

- JNC 8 (2014)
- AHA / ACC /ASH 2015
- ASH/ISH 2014
- KDIGO 2012
- ADA 2015
- SPRINT TRIAL

•ASH – American Society of Hypertension
•AHA /ACC/ASH
•American Heart Association , American College of Cardiology and American Society of Hypertension

Special Communication

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)

Paul A. James, MD; Suzanne Oparil, MD; Barry L. Carter, PharmD; William C. Cushman, MD; Cheryl Dennison-Himmelfarb, RN, ANP, PhD; Joel Handler, MD; Daniel T. Lackland, DrPH; Michael L. LeFevre, MD, MSPH; Thomas D. MacKenzie, MD, MSPH; Olugbenga Ogedegbe, MD, MPH, MS; Sidney C. Smith Jr, MD; Laura P. Svetkey, MD, MHS; Sandra J. Taler, MD; Raymond R. Townsend, MD; Jackson T. Wright Jr, MD, PhD; Andrew S. Narva, MD; Eduardo Ortiz, MD, MPH

JAMA. 2014;311(5):507-520. doi:10.1001/jama.2013.284427
Published online December 18, 2013.

Primary Questions of JNC-8

1. What is the threshold for treatment of HTN?

2. What is the goal of BP reduction?

3. How to achieve BP reduction in the general population and specific groups (DM, CKD)?

NHLBI Classifications

Evidence Quality

High
- Excellent RCTs

Moderate
- RCTs with minor limitations
- Excellent observational studies

Low
- Any with major limitations

→

Recommendation Strength

A	Strong
B	Moderate
C	Weak
D	Against
E	Expert Opinion
N	No recommendation

JNC 8 Guideline Limitations

- Only 17 reviewers
  - 5 Authors have already recanted recommendation #1

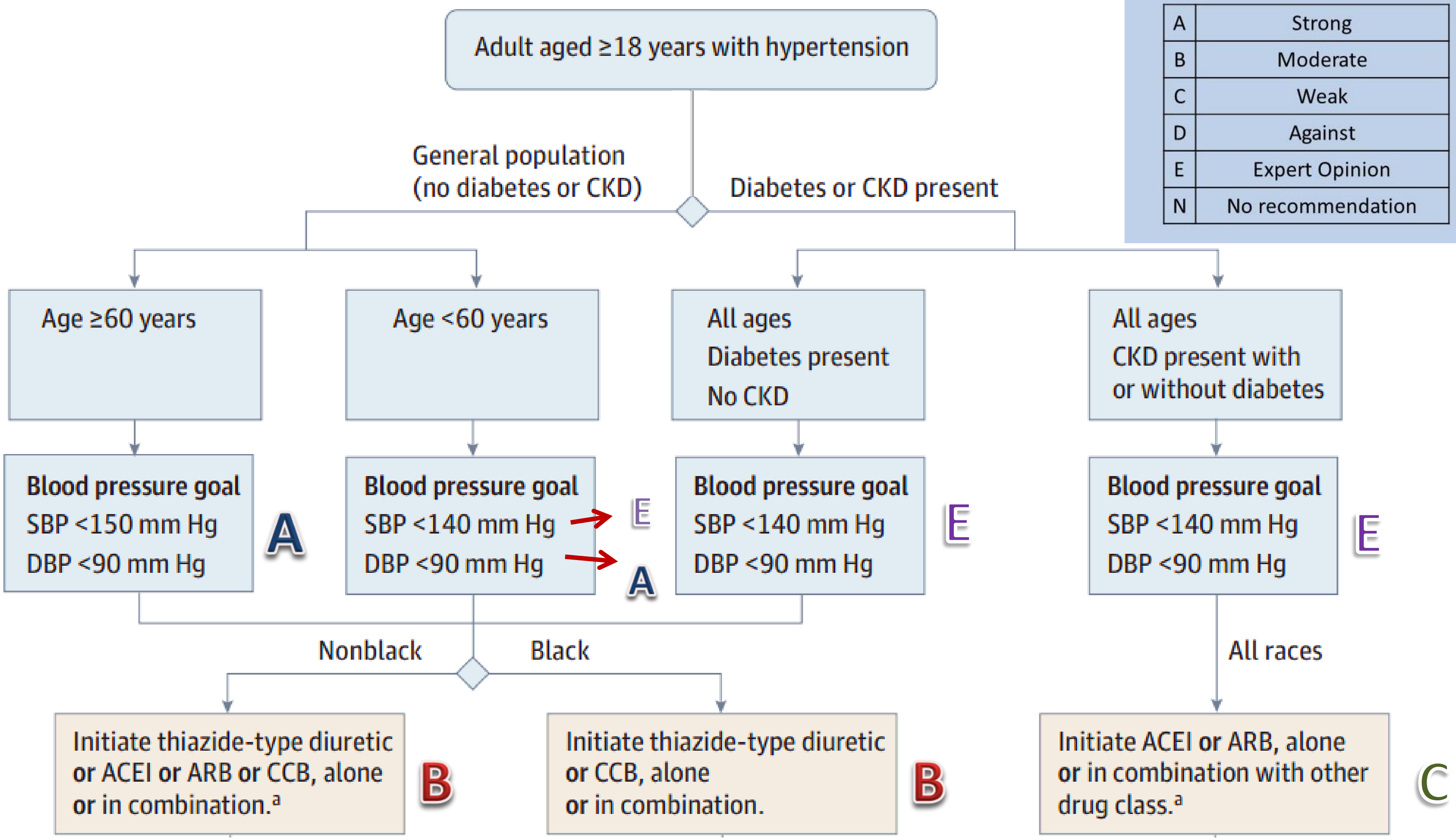
- Only RCTs
  - Expert opinion recommendation used frequently

- Limited scope
  - Only answered 3 questions, started with 23
  - Co-morbidity: only CKD and DM

Summary of JNC-8 Guidelines

Recommendation Strength

A	Strong
B	Moderate
C	Weak
D	Against
E	Expert Opinion
N	No recommendation



AHA/ACC/ASH Scientific Statement

Treatment of Hypertension in Patients With Coronary Artery Disease

A Scientific Statement From the American Heart Association, American College of Cardiology, and American Society of Hypertension

BP Goal, mm Hg	Condition	Class/Level of Evidence
<150/90	Age >80 y	IIa/B
<140/90	CAD	I/A
	ACS	IIa/C
	HF	IIa/B
<130/80	CAD	IIb/C
	Post–myocardial infarction, stroke or TIA, carotid artery disease, PAD, AAA	IIb/C

AAA indicates abdominal aortic aneurysm; ACS, acute coronary syndrome; BP, blood pressure; CAD, coronary artery disease; HF, heart failure; PAD, peripheral arterial disease; and TIA, transient ischemic attack.

Should be performed
Recommended

May/Might be considered
Usefulness is unknown

Circulation 2015 : 131

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Diabetes Care 2015;38(Suppl. 1):S49–S57 | DOI: 10.2337/dc15-S011

Recommendations

Screening and Diagnosis

- Blood pressure should be measured at every routine visit. Patients found to have elevated blood pressure should have blood pressure confirmed on a separate day. **B**

Goals

- People with diabetes and hypertension should be treated to a systolic blood pressure (SBP) goal of <140 mmHg. **A**
- Lower systolic targets, such as <130 mmHg, may be appropriate for certain individuals, such as younger patients, if they can be achieved without undue treatment burden. **C**
- Individuals with diabetes should be treated to a diastolic blood pressure (DBP) <90 mmHg. **A**
- Lower diastolic targets, such as <80 mmHg, may be appropriate for certain individuals, such as younger patients, if they can be achieved without undue treatment burden. **B**

Treatment

- Patients with blood pressure >120/80 mmHg should be advised on lifestyle changes to reduce blood pressure. **B**
- Patients with confirmed office-based blood pressure higher than 140/90 mmHg should, in addition to lifestyle therapy, have prompt initiation and timely subsequent titration of pharmacological therapy to achieve blood pressure goals. **A**
- Lifestyle therapy for elevated blood pressure consists of weight loss, if overweight or obese; a Dietary Approaches to Stop Hypertension (DASH)-style dietary pattern including reducing sodium and increasing potassium intake; moderation of alcohol intake; and increased physical activity. **B**
- Pharmacological therapy for patients with diabetes and hypertension should comprise a regimen that includes either an ACE inhibitor or an angiotensin receptor blocker (ARB). **B** If one class is not tolerated, the other should be substituted. **C**
- Multiple-drug therapy (including a thiazide diuretic and ACE inhibitor/ARB, at maximal doses) is generally required to achieve blood pressure targets. **B**

Unanswered Questions….

- NHLBI wanted to sponsor a clinical trial:
  - Does lowering SBP < 120mmHg reduce clinical events versus goal SBP < 140mmHg?
  - Non Diabetics
  - Representative of population in the U.S.
  - Definitive trial (thus, appropriate sample size)

NHLBI = National Heart Lung Blood Association

Systolic Blood Pressure Intervention Trial

Effects on CV outcomes and total mortality

NEJM Nov 2015; 373:2103-2116

SPRINT Research Question

- RCT investigating outcomes of more intense BP control compared to standard therapy

Systolic BP Goals

Intensive Treatment	Standard Treatment
SBP < 120 mm Hg	SBP < 140 mm Hg

SPRINT
Systolic Blood Pressure Intervention Trial

SPRINT Major Inclusion Criteria

- ≥50 years old
- Systolic blood pressure : 130 – 180 mm Hg
- Additional cardiovascular disease (CVD) risk (one or more of the following)
  - Presence of clinical or subclinical CVD (not stroke)
  - Chronic kidney disease (CKD), defined as eGFR 20 – 59 mL/min/1.73m^2
  - Framingham Risk Score for 10-year CVD risk ≥ 15%
    - Not needed if eligible based on preexisting CVD or CKD
  - Age ≥ 75 years

SPRINT Systolic Blood Pressure Intervention Trial

National Heart Lung and Blood Institute NIDDK National Institute of Diabetes and Digestive and Kidney Diseases National Institute on Aging

SPRINT Major Exclusion Criteria

- Stroke
- Diabetes mellitus
- Polycystic kidney disease
- Symptomatic CHF or EF < 35%
- Proteinuria > 1g/d
- eGFR < 20 mL/min/1.73m2
- Nonadherence

SPRINT
Systolic Blood Pressure Intervention Trial

National Heart Lung and Blood Institute

NIDDK

National Institute of Diabetes and Digestive and Kidney Diseases

National Institute on Aging

SPRINT Pre-specified Subgroups of Special Interest

- Age ≥ 75 years
- Gender
- Black versus non-black
- Presence of pre-existing CKD or CVD
- Level of SBP broken into tertiles
  - < 132 mmHg
  - 132-145 mmHg
  - > 145 mmHg

SPRINT
Systolic Blood Pressure Intervention Trial

SPRINT Primary Outcome

- Primary hypothesis
  - CVD event rates would be lower in the intensive group compared to those receiving standard treatment
- Primary outcome
  - Non-fatal acute coronary syndrome
  - Non-fatal CVA
  - Non-fatal acute decompensated HF
  - Death from CV disease

SPRINT
Systolic Blood Pressure Intervention Trial

National Heart Lung and Blood Institute
NIDDK National Institute of Diabetes and Digestive and Kidney Diseases
National Institute on Aging

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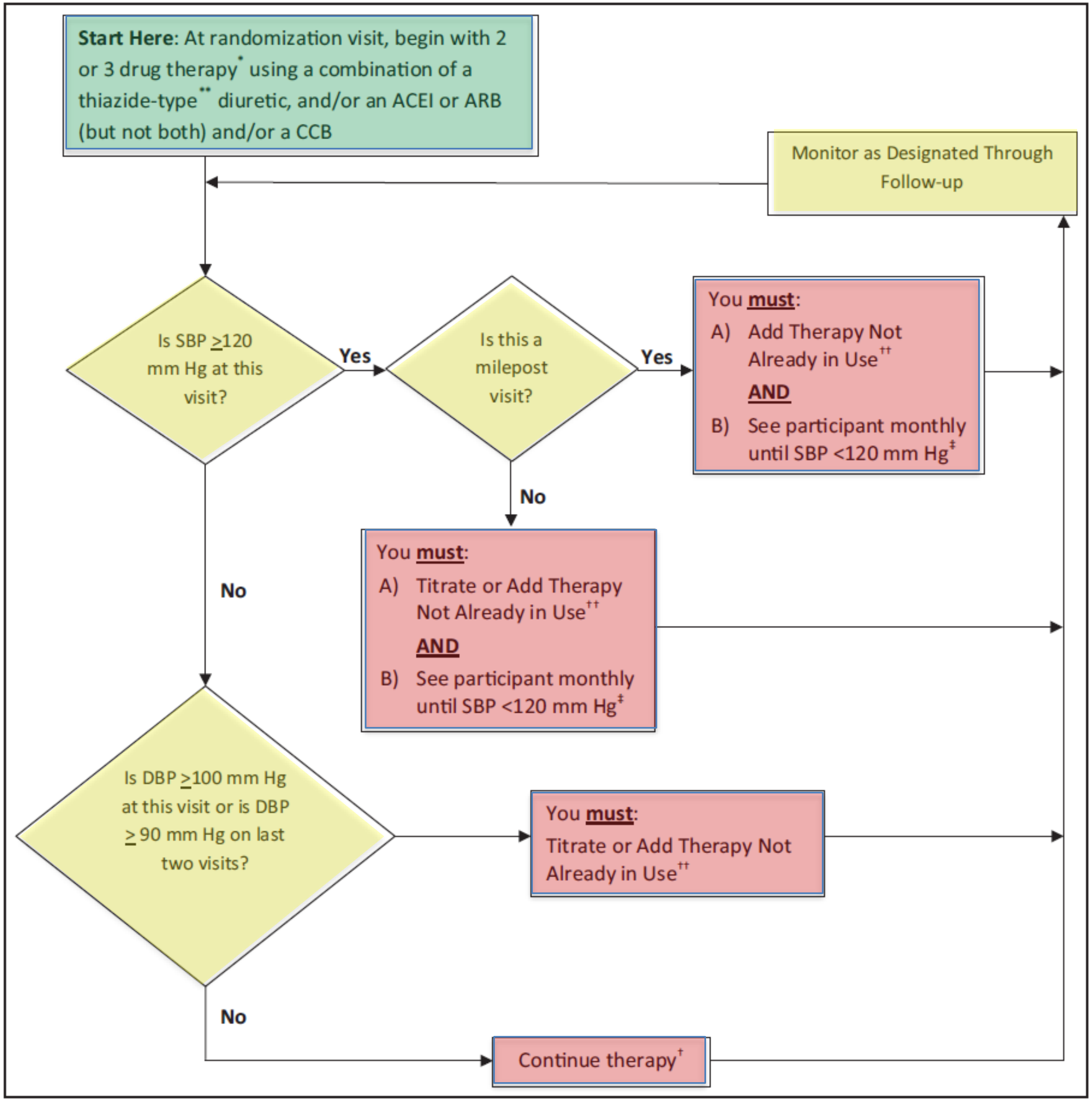
SPRINT Additional Outcomes

- CVD secondary outcomes:
  - Individual categories of MI, non-MI ACS, all stroke, all heart failure, CVD mortality, all-cause mortality, primary outcome + all-cause mortality
- Renal outcomes:
  - Main secondary outcome: >50% decline in eGFR or ESRD in CKD subgroup
  - Additional secondary outcomes:
    - Non-CKD subgroup
      - Incidence of decreased eGFR (>30% decrease in eGFR to <60 mL/min/1.73m^2)
    - All trial participants
      - Incidence of albuminuria : doubling of urinary albumin/creatinine (<10 to >10mg/g)

SPRINT Systolic Blood Pressure Intervention Trial

National Heart Lung and Blood Institute NIDDK National Institute of Diabetes and Digestive and Kidney Diseases National Institute on Aging



Treatment algorithm for SBP < 120mmHg

SPRINT Formulary

Class	Drug	Usual dose range/day
Diuretic	Chlorthalidone	12.5–25 mg
	Furosemide	20–80 mg
	Spironolactone	25–50 mg
	Triamterene/HCTZ	37.5/25 mg–75/50 mg
	Amiloride[a]	5–10
	Amiloride/HCTZ[a]	5/50
	HCTZ[a]	12.5–50
Ace inhibitor (ACEI)	Lisinopril	5–40 mg
ACEI/diuretic	Lisinopril/HCTZ[a]	10–40/12.5–50
Angiotensin receptor blocker (ARB)	Valsartan[a]	80–320 mg
	Losartan	25–100 mg
	Azilsartan	40–80 mg
ARB/diuretic	Azilsartan/chlorthalidone	40/12.5–40/25 mg
Calcium channel blockers (CCB)	Diltiazem	120–540 mg
	Amlodipine	2.5–10 mg
Beta blockers	Metoprolol tartrate	50–200 mg
	Metoprolol ER[a]	50–200
	Atenolol	25–100 mg
Beta blocker/diuretic	Atenolol/chlorthalidone	50/25 mg
Vasodilators	Hydralazine	50–200 mg
	Minoxidil	2.5–40 mg
Alpha 2 agonist	Guanfacine	0.5–3 mg
	Clonidine patch[a]	0.1–0.3
Alpha blockers	Doxazosin	1–16 mg
Potassium supplements	KCl tablets	20–80 mEq
	KCl oral solution (10%)	20–80 mEq

SPRINT Systolic Blood Pressure Intervention Trial

Enrollment and Follow-up Experience

Screened
(N=14,692)

↓

Randomized
(N=9,361)

Intensive Treatment (N=4,678)		Standard Treatment (N=4,683)
Consent withdrawn	*154*	*121*
Discontinued intervention	*224*	*242*
Lost to follow-up	*111*	*134*
Analyzed *(Intention to treat)*	***4,678***	***4,683***

SPRINT Systolic Blood Pressure Intervention Trial

Demographic and Baseline Characteristics

SPRINT
Systolic Blood Pressure Intervention Trial

	Total N=9361	Intensive N=4678	Standard N=4683
Mean (SD) age, years	67.9 (9.4)	67.9 (9.4)	67.9 (9.5)
% ≥75 years	28.2%	28.2%	28.2%
Female, %	35.6%	36.0%	35.2%
White, %	57.7%	57.7%	57.7%
African-American, %	29.9%	29.5%	30.4%
Hispanic, %	10.5%	10.8%	10.3%
Prior CVD, %	20.1%	20.1%	20.0%
Mean 10-year Framingham CVD risk, %	20.1%	20.1%	20.1%
Taking antihypertensive meds, %	90.6%	90.8%	90.4%
Mean (SD) number of antihypertensive meds	1.8 (1.0)	1.8 (1.0)	1.8 (1.0)
Mean (SD) Baseline BP, mm Hg			
Systolic	139.7 (15.6)	139.7 (15.8)	139.7 (15.4)
Diastolic	78.1 (11.9)	78.2 (11.9)	78.0 (12.0)

SPRINT Baseline Laboratory Characteristics

	Total N=9361	Intensive (N=4678)	Standard (N=4683)
Serum creatinine (mg/dL)	1.07 (0.34)	1.07 (0.34)	1.08 (0.34)
eGFR (mL/min/1.73 m^2)	71.8 (20.6)	71.8 (20.7)	71.7 (20.5)
CKD (eGFR<60 mL/min/1.73m^2 - %)	2648 (28.3)	1331 (28.4)	1317 (28.1)
CKD (eGFR <45 mL/min/1.73 m^2- %)	890 (9.5)	446 (9.5)	444 (9.5)
Urine albumin/creatinine (mg/g)	42.6 (166.3)	44.1 (178.7)	41.1 (152.9)
Prior cardiovascular disease (%)	1877 (20.1)	940 (20.1)	937 (20.0)
Total cholesterol (mg/dL)	190.1 (41.2)	190.2 (41.4)	190.0 (40.9)
Fasting HDL-C (mg/dL)	52.9 (14.5)	52.9 (14.3)	52.8 (14.6)
Fasting LDL-C (mg/dL)	112.4 (35.1)	112.6 (35.4)	112.2 (34.8)
Fasting total triglycerides (mg/dL)	125.9 (90.5)	124.8 (85.8)	127.1 (95.0)
Fasting plasma glucose (units)	98.8 (13.5)	98.8 (13.7)	98.8 (13.4)

SPRINT
Systolic Blood Pressure Intervention Trial

Ambrosius WT et al., Clinical Trials. 2014;11:532-546

National Heart Lung and Blood Institute
NIDDK National Institute of Diabetes and Digestive and Kidney Diseases
National Institute on Aging

BP Intervention

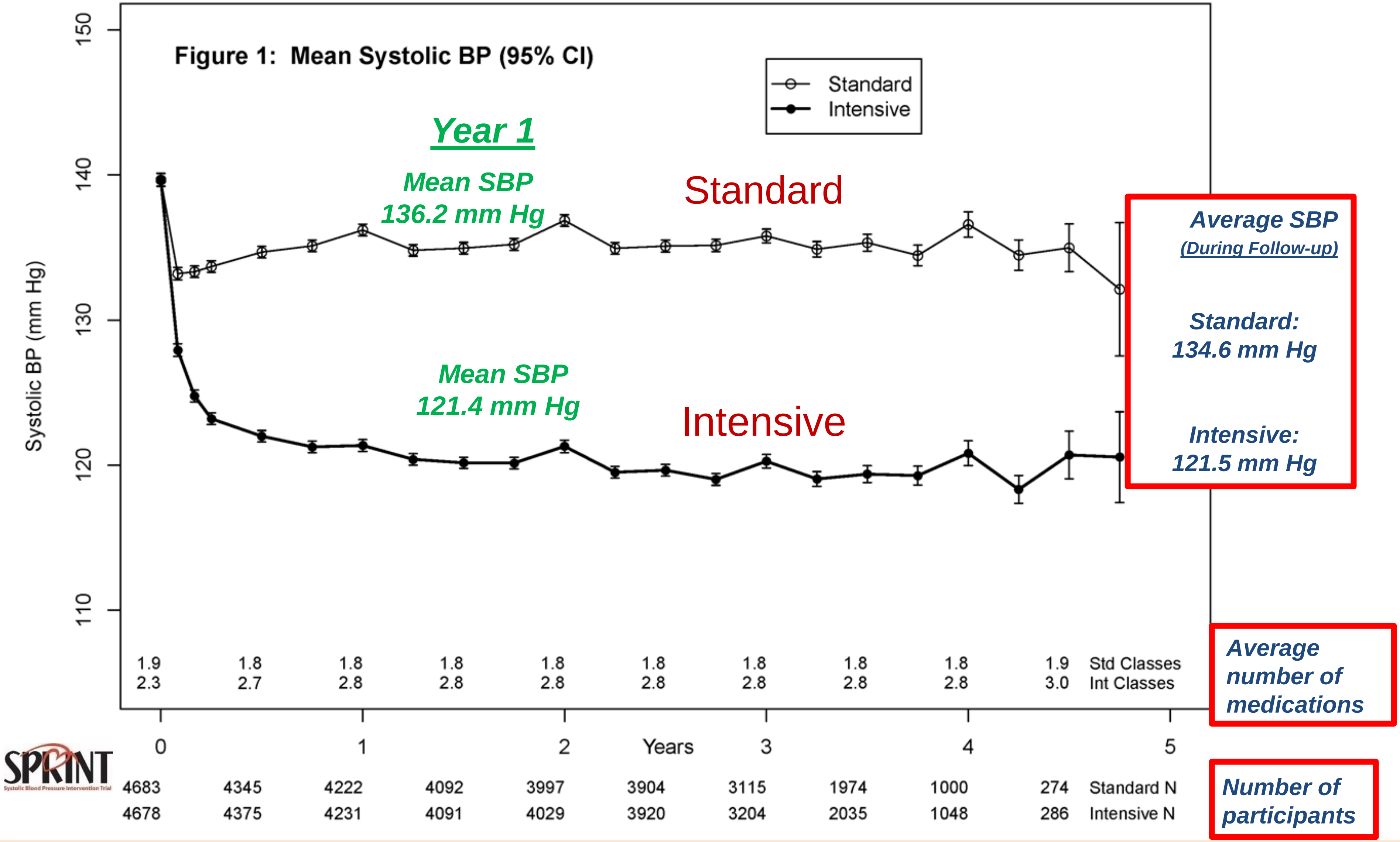
- BP monitored **monthly** for 3 months, then **every 3 months** thereafter
- Mean BP of 3 readings used to titrate medications
- Agents from all major drug classes available free of charge
- Periodic assessment for orthostatic hypotension and related symptoms

Decision to Stop BP Intervention

- On 8/20/15, SPRINT investigators and participants informed of CVD results
- Concurrently, decision made to stop BP intervention
- This presentation based on adjudicated events that occurred through August 20th, 2015
  - Median follow-up = 3.26 years

SPRINT
Systolic Blood Pressure Intervention Trial

Systolic BP During Follow-up



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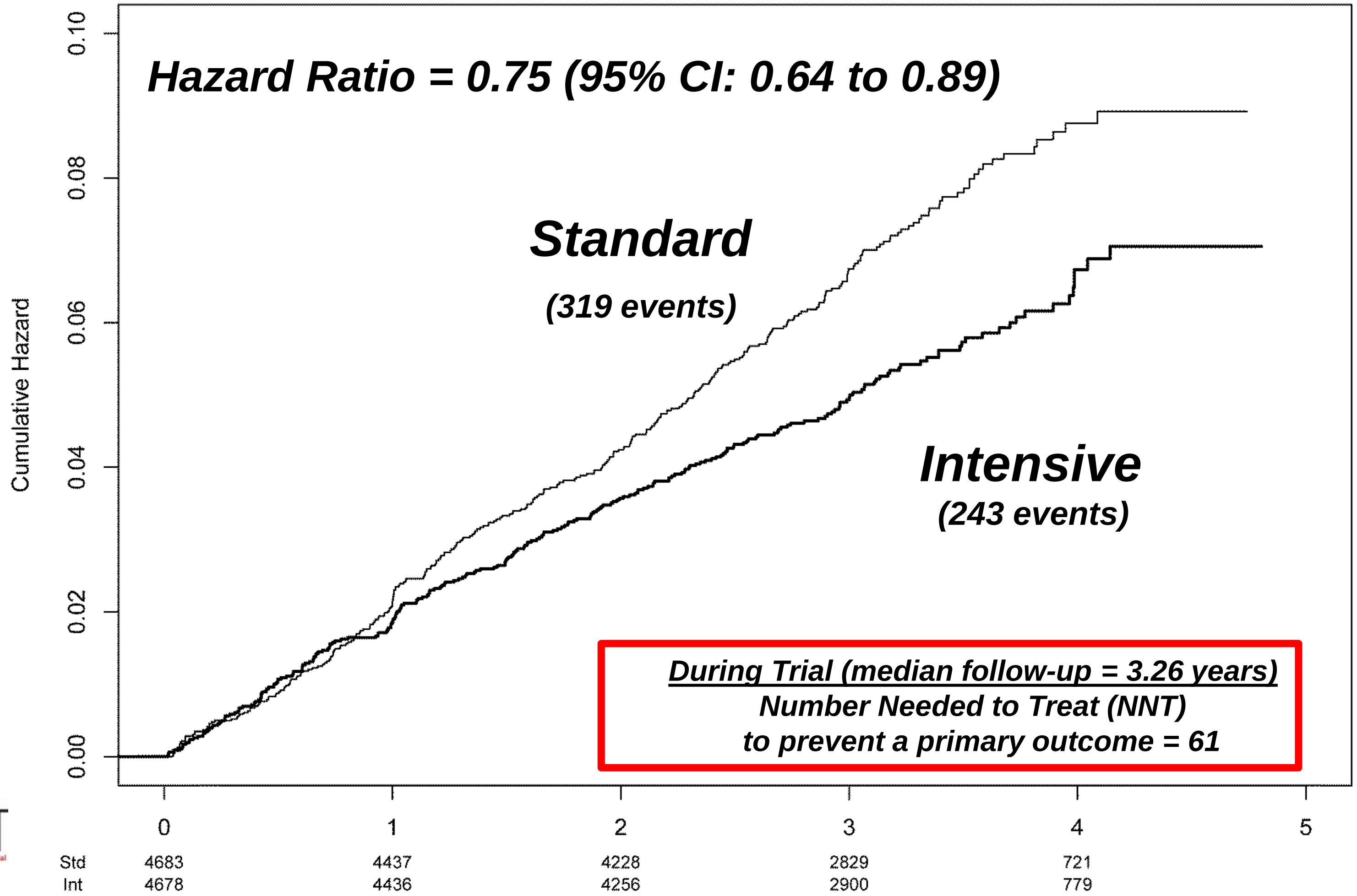
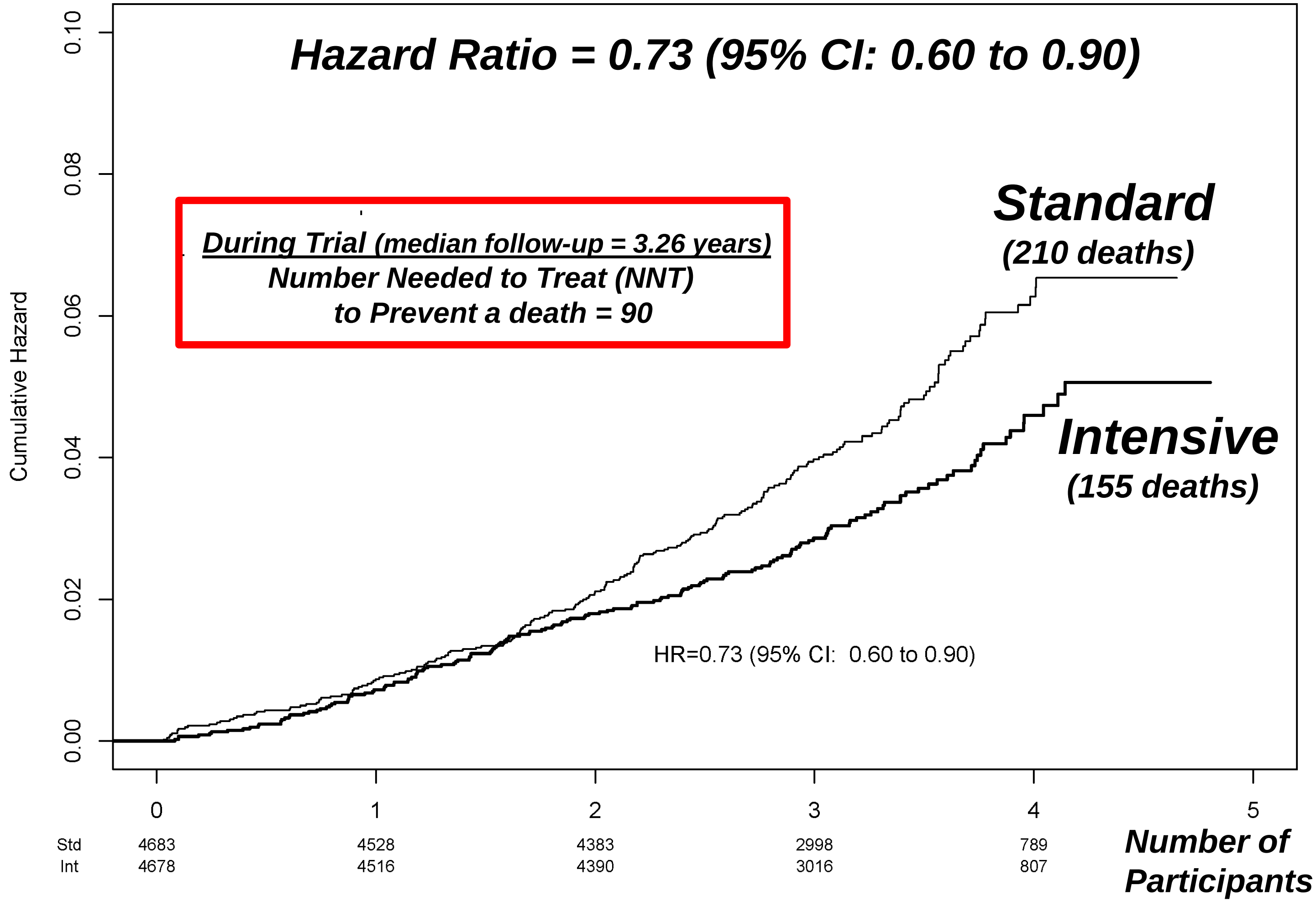
SPRINT Primary Outcome Cumulative Hazard



All-cause Mortality Cumulative Hazard



SPRINT Systolic Blood Pressure Intervention Trial

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SPRINT Primary Outcome and its Components Event Rates and Hazard Ratios

	Intensive		Standard			
	# Events	Rate, %/year	# Events	Rate, %/year	HR (95% CI)	P value
Primary Outcome	243	1.65	319	2.19	0.75 (0.64, 0.89)	<0.001
All MI	97	0.65	116	0.78	0.83 (0.64, 1.09)	0.19
Non-MI ACS	40	0.27	40	0.27	1.00 (0.64, 1.55)	0.99
All Stroke	62	0.41	70	0.47	0.89 (0.63, 1.25)	0.50
All HF	62	0.41	100	0.67	0.62 (0.45, 0.84)	0.002
CVD Death	37	0.25	65	0.43	0.57 (0.38, 0.85)	0.005

Renal Disease Outcomes
Without Pre-existing CKD

	Intensive		Standard			
	Events	%/yr	Events	%/yr	HR (95% CI)	P
Secondary CKD outcomes						
≥30% reduction in eGFR*	127	1.21	37	0.35	3.48 (2.44, 5.10)	<.0001
Incident albuminuria**	110	2.00	135	2.41	0.81 (0.63, 1.04)	0.10

*Confirmed on a second occasion ≥90 days apart
**Doubling of urinary albumin/creatinine ratio from <10 to >10

SPRINT
Systolic Blood Pressure Intervention Trial

Serious Adverse Events* (SAE) During Follow-up

	Number (%) of Participants		
	Intensive	Standard	HR (P Value)
All SAE reports	1793 (38.3)	1736 (37.1)	1.04 (0.25)
SAEs associated with Specific Conditions of Interest			
Hypotension	110 (2.4)	66 (1.4)	1.67 (0.001)
Syncope	107 (2.3)	80 (1.7)	1.33 (0.05)
Injurious fall	105 (2.2)	110 (2.3)	0.95 (0.71)
Bradycardia	87 (1.9)	73 (1.6)	1.19 (0.28)
Electrolyte abnormality	144 (3.1)	107 (2.3)	1.35 (0.020)
Acute kidney injury or acute renal failure	193 (4.1)	117 (2.5)	1.66 (<0.001)

SPRINT Systolic Blood Pressure Intervention Trial

*Fatal or life threatening event, resulting in significant or persistent disability, requiring or prolonging hospitalization, or judged important medical event.

SPRINT Systolic Blood Pressure Intervention Trial

Number (%) of Participants with a Monitored Clinical Measure During Follow-up

	Number (%) of Participants		
	Intensive	Standard	HR (P Value)
Laboratory Measures[1]			
Sodium <130 mmol/L	180 (3.9)	100 (2.2)	1.76 (<0.001)
Potassium <3.0 mmol/L	114 (2.5)	74 (1.6)	1.50 (0.006)
Potassium >5.5 mmol/l	176 (3.8)	171 (3.7)	1.00 (0.97)
Signs and Symptoms			
Orthostatic hypotension[2]	777 (16.6)	857 (18.3)	0.88 (0.013)
Orthostatic hypotension with dizziness	62 (1.3)	71 (1.5)	0.85 (0.35)

1. Detected on routine or PRN labs; routine labs drawn quarterly for first year, then q 6 months
2. Drop in SBP ≥20 mmHg or DBP ≥10 mmHg 1 minute after standing (measured at 1, 6, and 12 months and yearly thereafter)

Summary and Conclusions

- Rapid and sustained difference in SBP achieved between the two treatment arms
- Trial stopped early, due to benefit, after median follow-up of 3.26 years
- Incidence of primary outcome (composite of CVD events) 25% lower in Intensive compared to Standard Group and all-cause mortality reduced by 27%.
- Treatment effect similar in all six pre-specified groups of interest.
- The “number needed to treat” to prevent primary outcome event or death 61 and 90, respectively

Summary and Conclusions

- In participants with CKD at baseline, no differences in renal outcomes
- In participants without CKD at baseline, incidence of eGFR reduction ≥ 30% more common in Intensive Group
- No overall difference in serious adverse events (SAEs) between treatment groups
- SAEs associated with hypotension, syncope, electrolyte abnormalities, and hospital discharge reports of acute kidney injury or acute renal failure more common in Intensive Group
- Overall, benefits of more intensive BP lowering exceeded the potential for harm

Comparing ACCORD and SPRINT

	ACCORD	SPRINT
Focus group	Diabetics	Non-diabetics
Presence of CKD	Low	30%
Average Age	62	68 30% > 75 yrs
Study Size	SPRINT twice as large	
BP targets	• < 120 mmHg • < 140 mmHg	
CV outcome	No benefit	

Clinical Decisions – NEJM Nov 2015 Bakris and Taler

- 75 year-old female who would like to discuss the recent trial results. What do you think about "lower BP might be better."
- PMHX:
- - HTN, Afib, PVD with claudication, Left wrist fracture 6 years ago when fell on icy sidewalk, and cataract
- Meds:
- Metoprolol 100 mg daily, Apixaban, Chlorthalidone 25 mg daily, ASA and Atorvastatin

Clinical Decisions

- BMI 26.8
- BP 136/72
- HR 70-72 Irregular
- Labs : Chol 174 mg/dl, HDL 65, LDL 87
- Serum Creat 0.9 mg/dl
- What recommendations do you make to her about the management of her Blood Pressure?
- Maintain current regimen or add an agent to further reduce her blood pressure?

What do we know?

- Falls and anticoagulation= Potential harm with increasing BP meds or adding meds
- Her 10 year-year Framingham risk score is 7 %
- Risks for CV events:

  - HTN, Lipids, Peripheral Artery Disease

JNC 8 rec goal BP of less than 150/90 for persons over 60 years of age based on 5 RCT and 6 observational studies

In the SPRINT trial, the risks for serious adverse events of hypotension and syncope were 67% and 33% higher, respectively with the lower blood pressure target than with the higher target

Bakris' response

Clinical Decision

- “SPRINT provides strong evidence to support lower BP targets for persons 50 years or older who do NOT have Diabetes but who have other CV risk factors”
- “Many patients will accept small inconveniences, such as having to get up slowly to avoid symptomatic hypotension or taking an extra pill, to preserve their health.”

Dr Taler’s response

How to discuss the issue with your patient?

Two possible options to discuss with your patients:

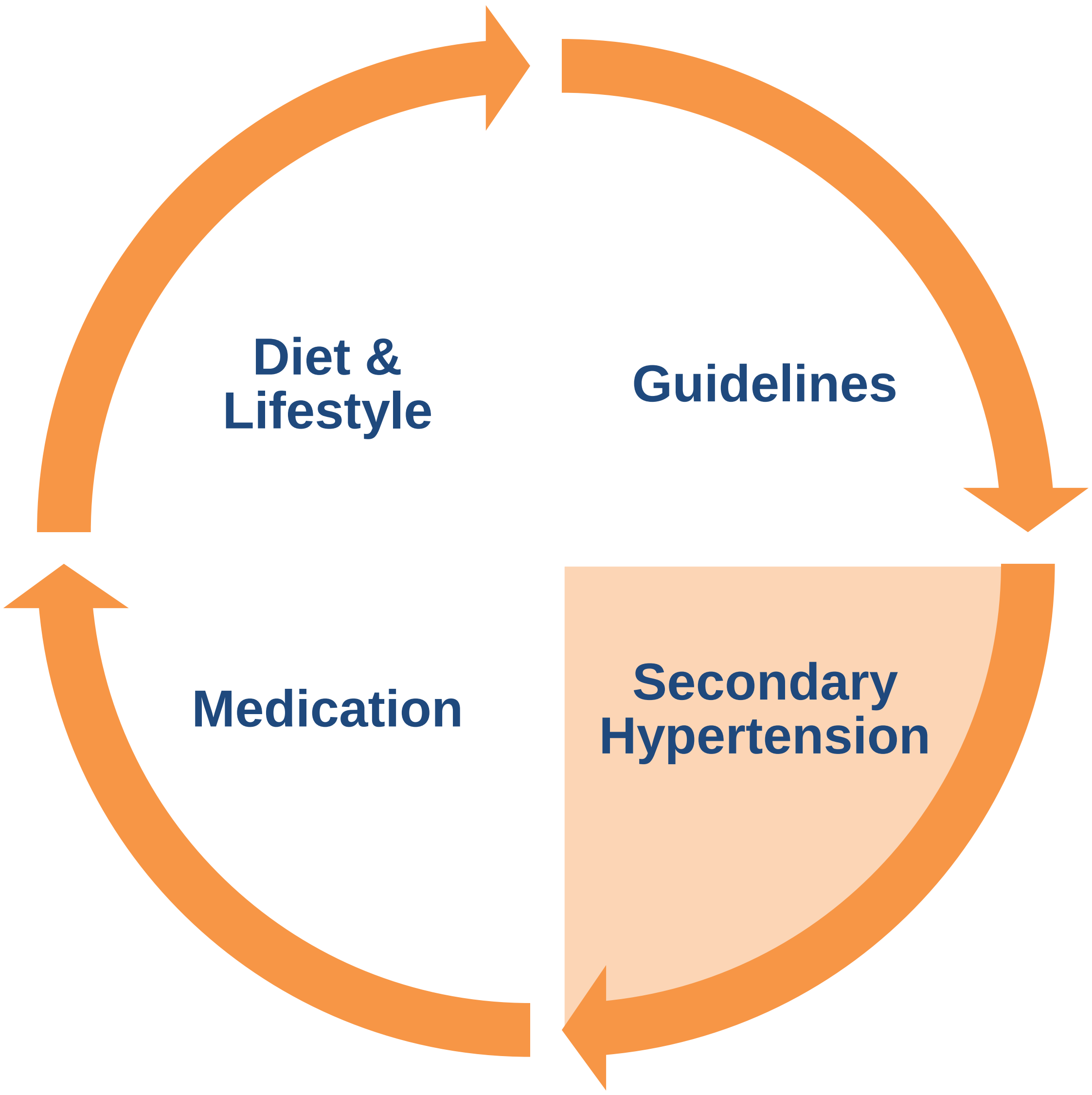
1. "Enthusiastically" tell your patient that lowering SBP to ≤ 120 mmHg by taking 3 drugs every day for more than 3 years will reduce cardiovascular events by 25% and risk of death by 27% while increasing the risk of adverse merely from 2.5 to 4.7%

Messerli F Am J of Med 2016

What to do?

2. “You gravely frown on the newspaper clip of SPRINT, mentioning that lowering the SBP to ≤120 mmHg by taking at least 3 drugs for more than 3 years will reduce cardiovascular events from 7 out of 100 to 5 out of 100, or by a MERE 0.54 % per year, with NO benefit at preventing stroke or heart attack, while increasing the risk of HYPOTENSION, SYNCOPE, ELECTROLYTE ABNORMALITIES, and ACUTE RENAL FAILURE by as much as 88%.

Messerli F Am J of Med 2016


Diet &
Lifestyle
Guidelines
Medication
Secondary
Hypertension

Causes of Secondary HTN

- Common
  - Intrinsic Renal Disease (CKD)
  - Renovascular Disease
  - Mineralocorticoid excess/ Aldosteronism
  - Obstructive Sleep Apnea
- Uncommon
  - Pheochromocytoma
  - Glucocorticoid excess/ Cushing's disease
  - Coarctation of Aorta
  - Hyper/Hypothyroidism

What is Primary Aldosteronism (PA)?

- PA is a group of disorders in which Aldosterone production is inappropriately high for sodium status, relatively autonomous of major regulators of secretion (angiotensin II, plasma K concentration), and non-suppressible by sodium loading.
- Commonly caused by an adrenal adenoma, unilateral or bilateral adrenal hyperplasia (BAH), or in rare cases adrenal carcinoma or inherited conditions of familial hyperaldosteronism

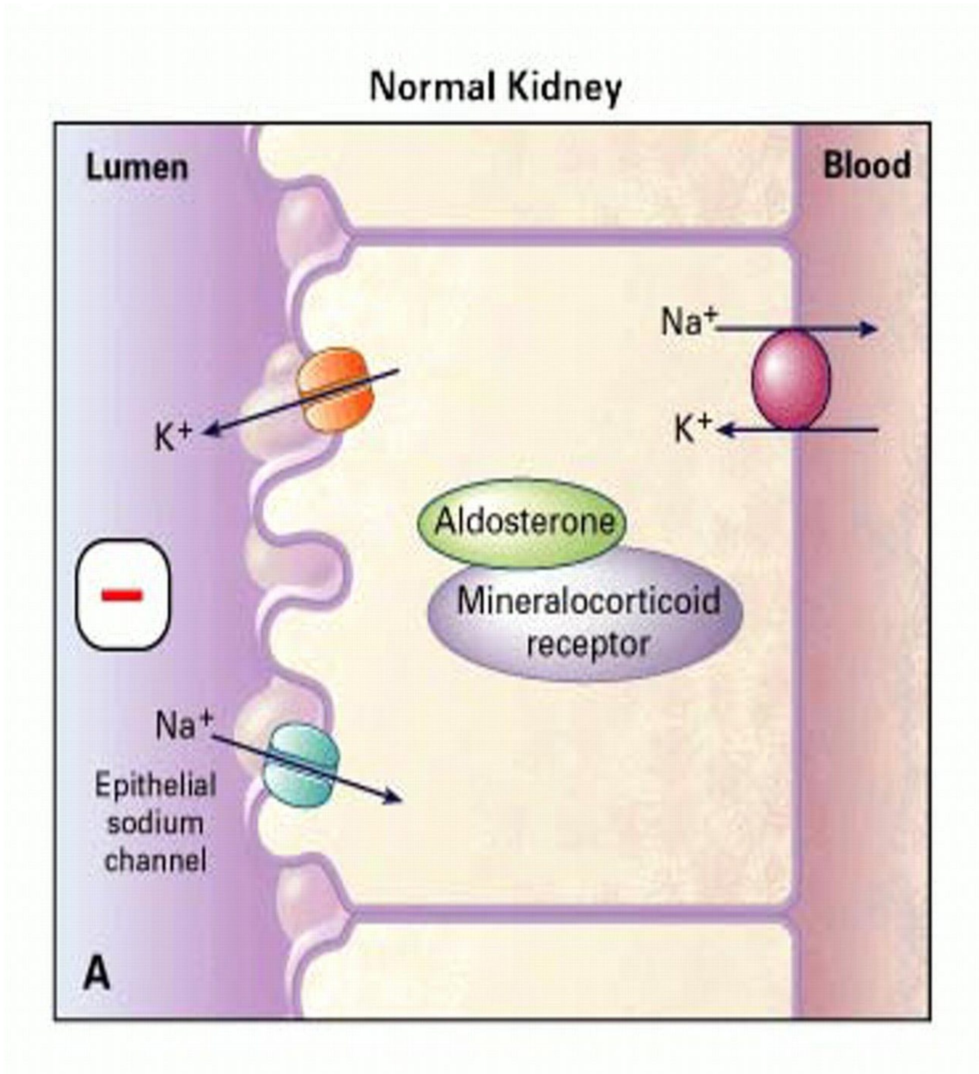
J Clin Endocrinol Metab, May 2016, 101(5):1889–1916

Clinical Features of Hyperaldosteronism

- * Hypertension
- * Hypokalemia

} *Classic Criteria For Screening*

- * Metabolic alkalosis
- * High aldosterone/non-suppressible
- * Suppressed Plasma Renin (PRA)



Scheinman, NEJM 1999.

Recognition of Primary Aldosteronism (PA)

- Most common form of secondary HTN
- ~10% of HTN patients have biochemical criteria for PA
- 20% with resistant HTN have PA
- Aldosterone contributes broadly to the development of HTN

The Management of Primary Aldosteronism: Case Detection, Diagnosis, and Treatment: An Endocrine Society Clinical Practice Guideline

John W. Funder, Robert M. Carey, Franco Mantero, M. Hassan Murad, Martin Reincke, Hirotaka Shibata, Michael Stowasser, and William F. Young, Jr

Hudson Institute of Medical Research (J.W.F.), Clayton, VIC 3168, Australia; University of Virginia Health System (R.M.C.), Charlottesville, Virginia 22908; University of Padova (F.M.), 35122 Padua, Italy; Mayo Clinic, Evidence-based Practice Center (M.H.M.), Rochester, Minnesota 55905; Klinikum of the Ludwig-Maximilians-University of Munich (M.R.), 80366 München, Bavaria, Germany; Oita University (H.S.), Oita 870-1124, Japan; University of Queensland (M.S.), Brisbane, Australia; and Mayo Clinic (W.F.Y.), Rochester, Minnesota 55905

Objective: To develop clinical practice guidelines for the management of patients with primary aldosteronism.

J Clin Endocrinol Metab, May 2016, 101(5):1889–1916

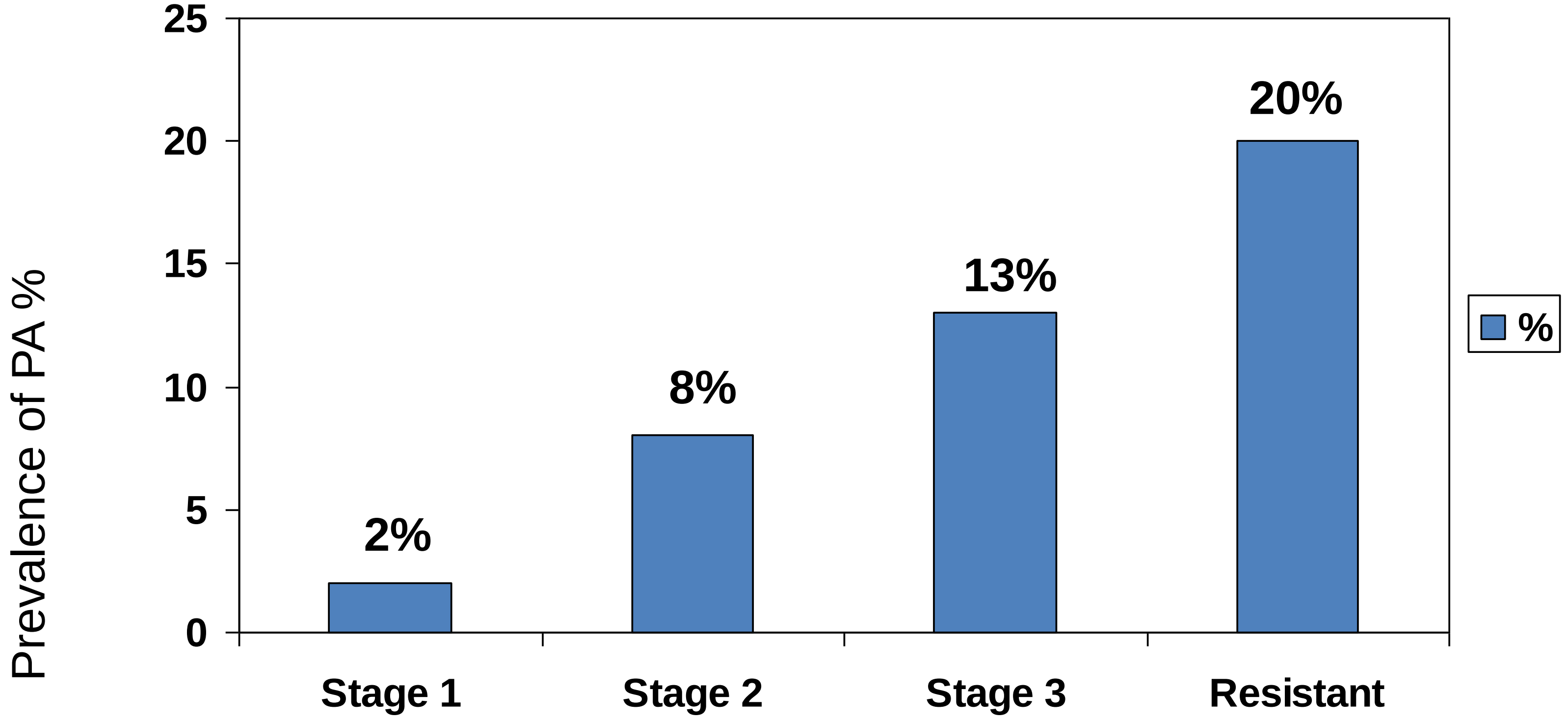
1° Aldosteronism: When to Evaluate?

- Moderate/Severe hypertension:
  Sustained BP above 150/100 mmHg on each of 3 measurements on different days *(NEW)*
- HTN and hypokalemia (spontaneous or induced)
  † absence of hypokalemia does not exclude dx
- Uncontrolled Resistant HTN (3 drugs including diuretic)
- Controlled Resistant HTN (on 4 or more meds) *(NEW)*
- Adrenal incidentaloma , defined as an adrenal mass detected incidentally during imaging performed for extra-adrenal reasons.
- Early onset of HTN (pt < 20 yrs old)
- Hypertension and Sleep Apnea (NEW)
- Hypertension and a family history of early onset hypertension or cerebrovascular accident at a young age (<40 years)

The Journal of Clinical Endocrinology & Metabolism **2016,** 101, 1889-1916

Aldosteronoma

Prevalence of 1° Aldosteronism in HTN Patients



Based on JNC VI Staging

Hypertension 2003;
Calhoun Hypertension 2002

1° Aldosteronism: Screening

- Ensure normal serum K
  - hypokalemia suppresses aldosterone secretion

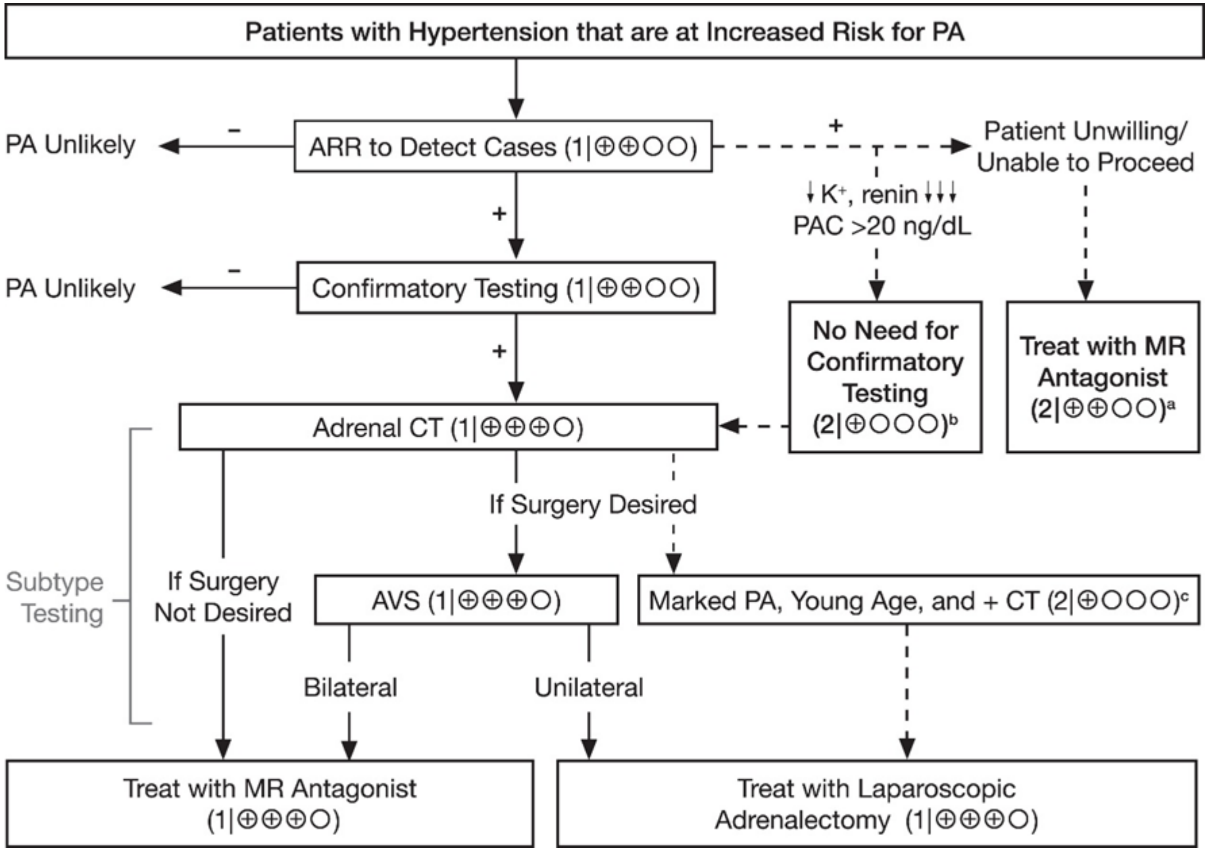
- Discontinue the following medications for 6 weeks
  - MR antagonists, amiloride, direct renin inhibitors, NSAIDS
  - Can continue ACEi/ARB, other diuretics, BBs, CCBs, and centrally acting agents

- Obtain plasma levels of aldo (PAC) and renin <u>activity</u> (PRA)
  - Should be in the morning (0800-1000) with patient ambulatory

PAC/PRA Ratio: 3 scenarios

- ↑ renin, ↑ aldosterone (ratio <10)
  - 2° hyperaldosteronism
    - RAS, malignant HTN, vasculitis
- ↓ renin, ↑ aldosterone (ratio >30)
  - 1° hyperaldosteronism
  - If PAC > 15 ng/dl
- ↓ renin, ↓ aldosterone
  - Non-aldosterone-mediated
    - Liddle's, Apparent Mineralocorticoid excess, Cushing's, Geller Syndrome

New Guidelines JCEM 2016



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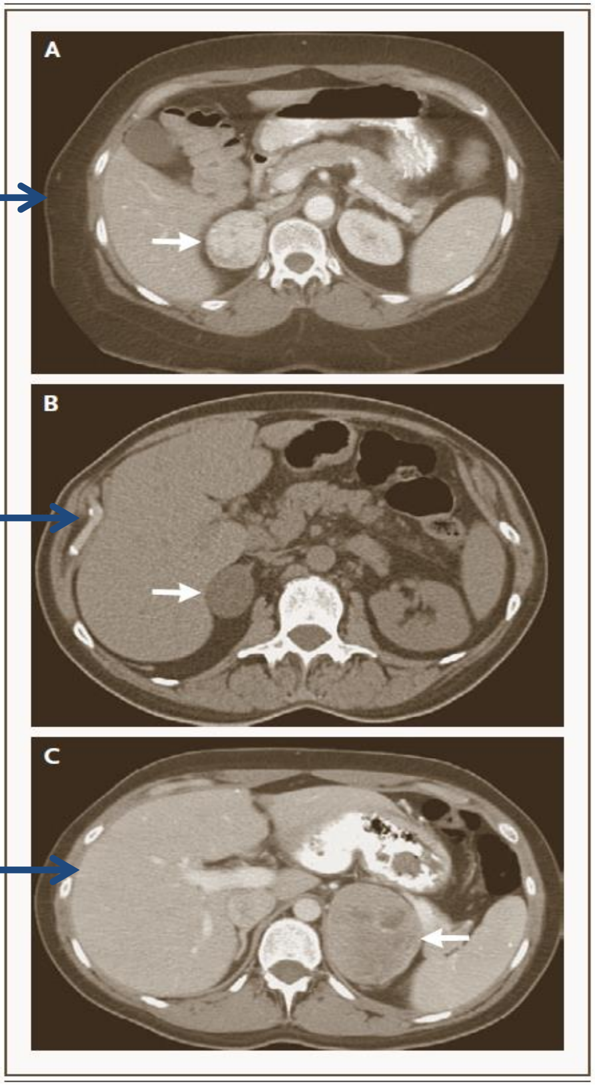
The Incidentaloma

The Hounsfield scale, is a quantitative scale for describing radiodensity.

Air −1000
Fat −120
Water 0
Muscle +40
Contrast +130
Bone +400 or more



Pheo

Right Adrenal Mass 4.5 cm
40 HU
Contrast medium washout
<50% at 10 minutes
Pt had no SXS!

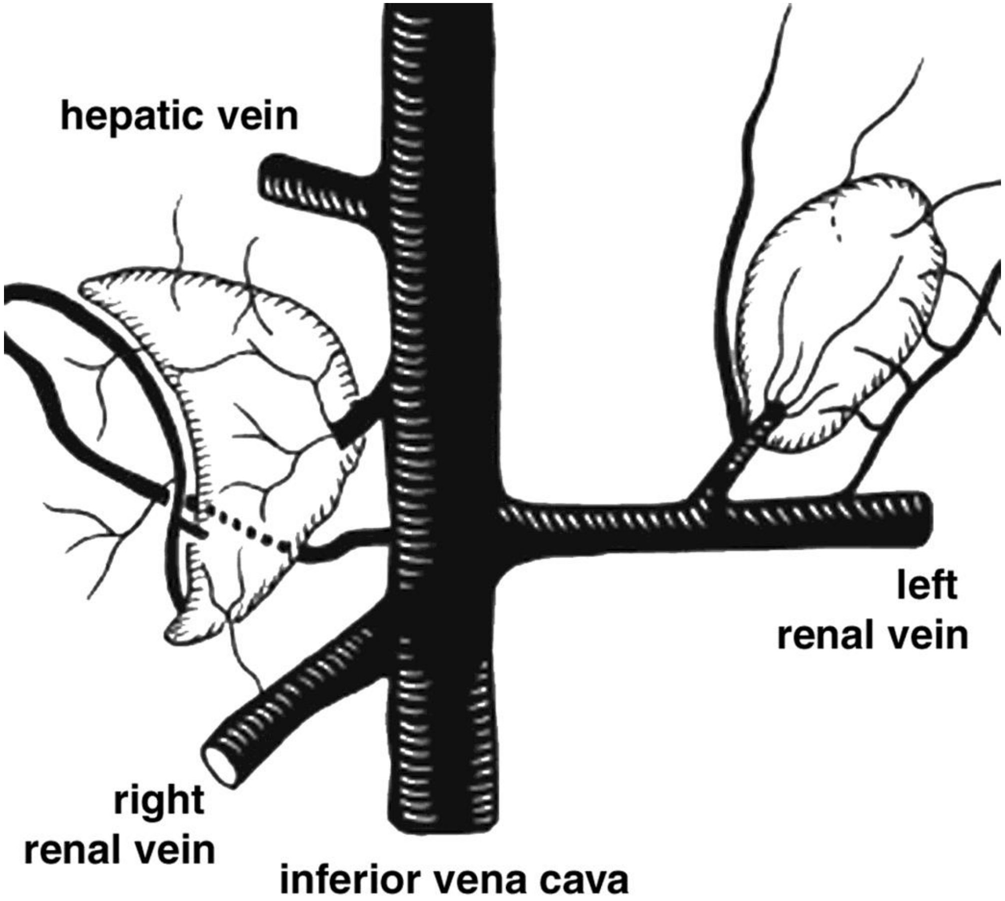
Adenoma

Right Adrenal 3.6 cm mass
-10 HU
Contrast medium washout
> 50% by 10 minutes

Adrenal Carcinoma

Left Adrenal mass 7.5 cm
HU > 10
Contrast medium washout
< 50% at 10 minutes

Young, NEJM 2007



Daunt N Radiographics 2005;25:S143-S158

Aldosterone/Cortisol (A/C) ratios

	Time	Aldosterone	Cortisol	A/C ratio
RT. ADRENAL	8:56	38200.0	1181.1	32.34
LT. ADRENAL	8:59	267.0	485.0	0.55
PERIPHERAL	9:00	75.0	25.8	2.91

LI: Ratio R to L 1:58

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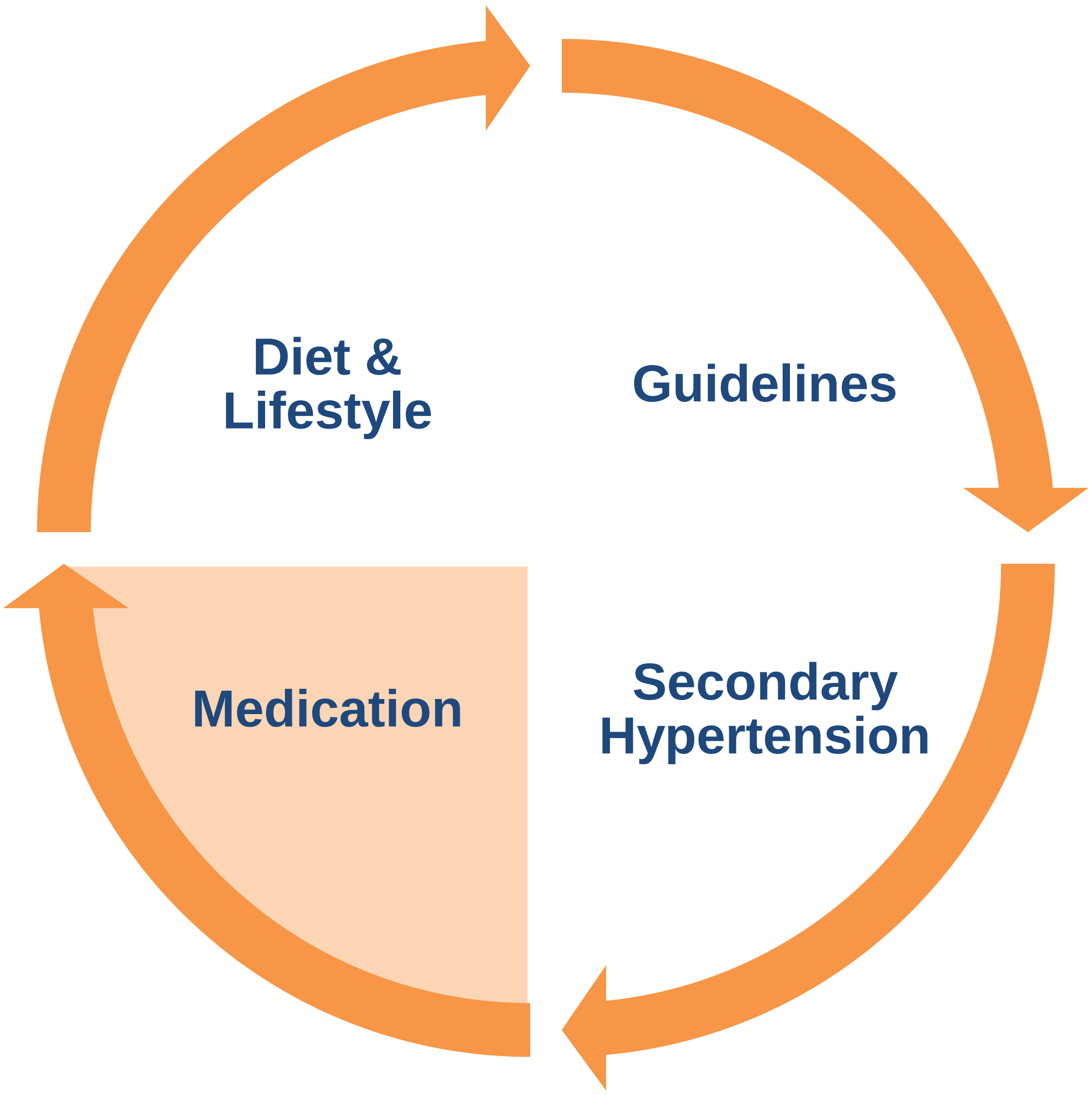
- http://hyper.ahajournals.org/content/65/6/1372 HTN in pts with CAD
- http://circ.ahajournals.org/content/circulationaha/123/21/2434.full.pdf Expert Consensus on HTN in the elderly
- http://hyper.ahajournals.org/content/hypertensionaha/51/6/1403.full.pdf Resistant Hypertension

Case Study

- 59 year-old male with 10 year hx of HTN on 4 meds, hx of CVA. BP 136/102. K 3.1
- Meds
  - Full doses of atenolol, lisinopril and HCTZ-triamterene; nifedipine 30; KCl 40-60 BID
- FH of HTN
- Studies
  - Serum Aldo 33 ng/dl, PRA 0.1
  - No confirmatory test was done
  - CT adrenals normal
  - AVS : lateralization to left side > 4:1

35 Break


Diet &
Lifestyle
Guidelines
Medication
Secondary
Hypertension

Hypertension: Why and how do I take all these meds?

Chris Blem, PharmD., BCACP
Legacy Medical Group Emanuel

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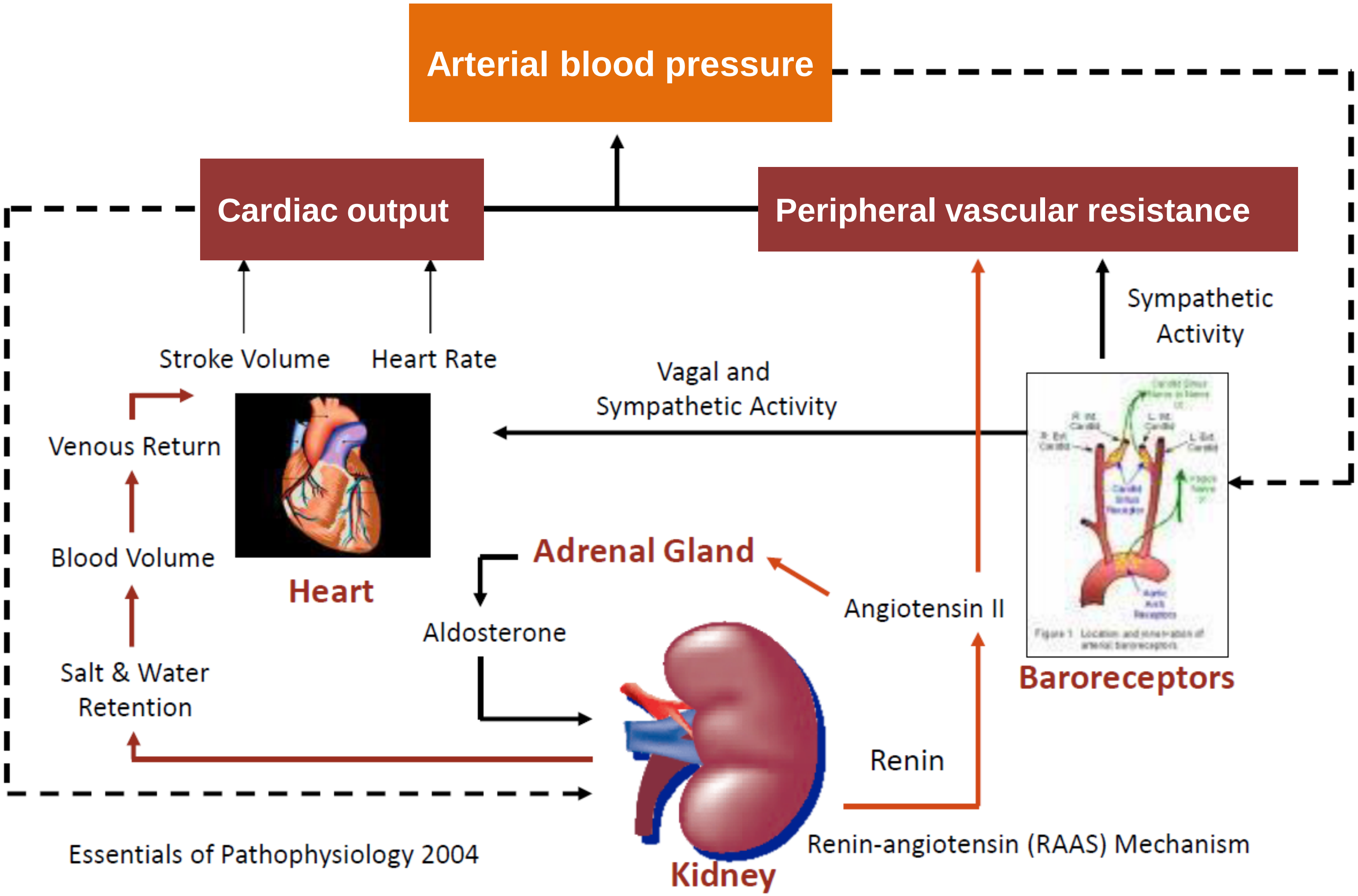
Learning Objectives

- Recognize which medications are in which drug class and the general way they work.
- Be able to discuss ways to improve adherence to the medications.
- Understand why sometimes medications don't help.

Mechanism of Blood Pressure Regulation



Essentials of Pathophysiology 2004

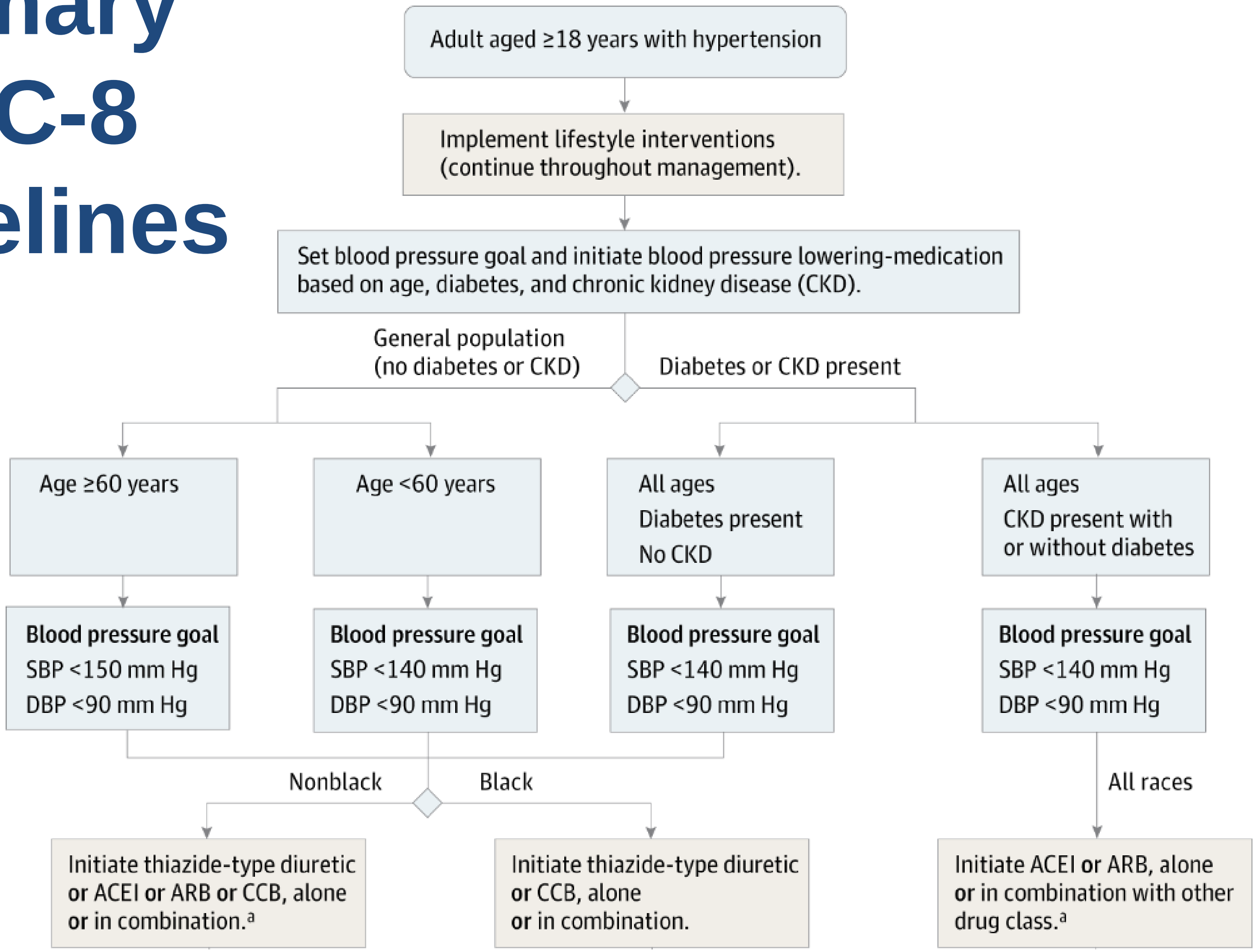
Target Organ Damage from HTN

- Brain: stroke, TIA, dementia
- Eyes: retinopathy
- Heart: left ventricular hypertrophy (HF), angina
- Kidney: chronic kidney disease
- Peripheral Vasculature: peripheral arterial disease

Drug Therapy Benefits

- Pharmacotherapy has been associated with the following benefits:
  - 35-40% reduced risk of stroke
  - 20-25% decrease in MI
  - >50% decrease in CHF
- For patients with stage 1 HTN and additional CVD risk factors, a sustained 12mmHg reduction in SBP for 10 years prevents 1 death for every 11 persons treated
- Most major drug classes are proven to prevent complications

Summary of JNC-8 Guidelines



ACEIs (the 'prils')

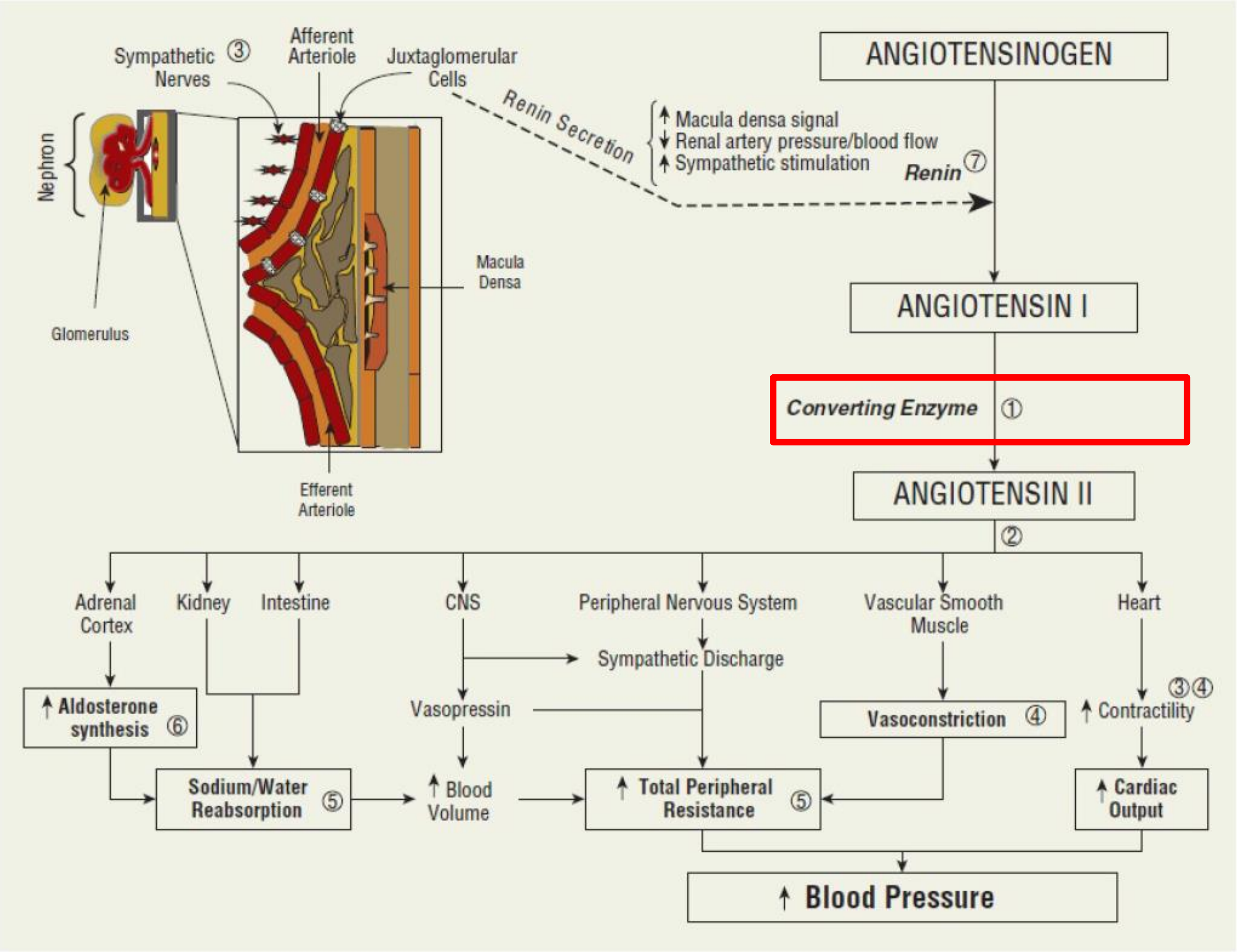
(Angiotensin Converting Enzyme Inhibitors)

Benazepril	Lotensin
Captopril	Capoten
Enalapril	Vasotec
Fosinopril	Monopril
Lisinopril	Prinivil, Zestril
Perindopril	Aceon
Quinapril	Accupril
Ramipril	Altace
Trandolapril	Mavik

Comparison of ACEIs

DRUG	DOSE (mg)	ONSET (hrs)	PEAK EFFECT (hrs)	DURATION (hrs)
Captopril (Capoten)	6.25-150 in 2 or 3 doses	0.25	1 - 2	4 - 6
Enalapril (Vasotec)	2.5 - 20 qd - bid	1 - 4	4 - 8	12 -24
Lisinopril (Zestril, Prinivil)	2.5 - 20 qd	1	7	24
Quinapril (Accupril)	5-40 mg qd-bid	1/2 - 1	2-4	12-24
Fosinopril (Monopril)	10-40 mg in 1 or 2 doses	1	2-6	24
Benazepril (Lotensin)	10 - 40 mg in 1-2 doses	1	2-4	24
Moexipril (Univasc)	7.5-30 mg in 1-2 doses	1-2	3-6	24
Trandolapril (Mavik)	1-4 mg qd		4	24
Ramipril (Altace)	2.5 to 20 mg qd-bid	2	6-8	24
Perindopril (Aceon)	4-8 mg qd-bid	2	10-12	12-24

*FDA approved indications vary. Refer to individual product prescribing information.



Source: DiPiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM: *Pharmacotherapy: A Pathophysiologic Approach, 8th Edition*: www.accesspharmacy.com

ACEIs

- Place in therapy: First line agents
- Clinical benefits
  - Reduces progression of nephropathy, albuminuria, DM and non-DM kidney disease
  - Reduces morbidity and mortality
  - Stroke prevention when used with thiazides

ACEIs

- Adverse effects
  - Dry cough (10-30%)
    - Nothing makes it better, continuous, not usually just 1-2x day
  - Hyperkalemia
    - Watch for after starting or dose titrations
  - Skin rash (10% with captopril)
  - Angioedema (0.1-0.2%)
    - (blacks>whites)
    - Lip/Tongue swelling, tingling, itching. SOB if severe.
  - Decreased renal function
    - Especially if on diuretic already and not held while starting
    - Preexisting renal artery stenosis
  - Hypotension
    - Usually only first dose or two
- Contraindications
  - Pregnancy
  - Bilateral renal artery stenosis

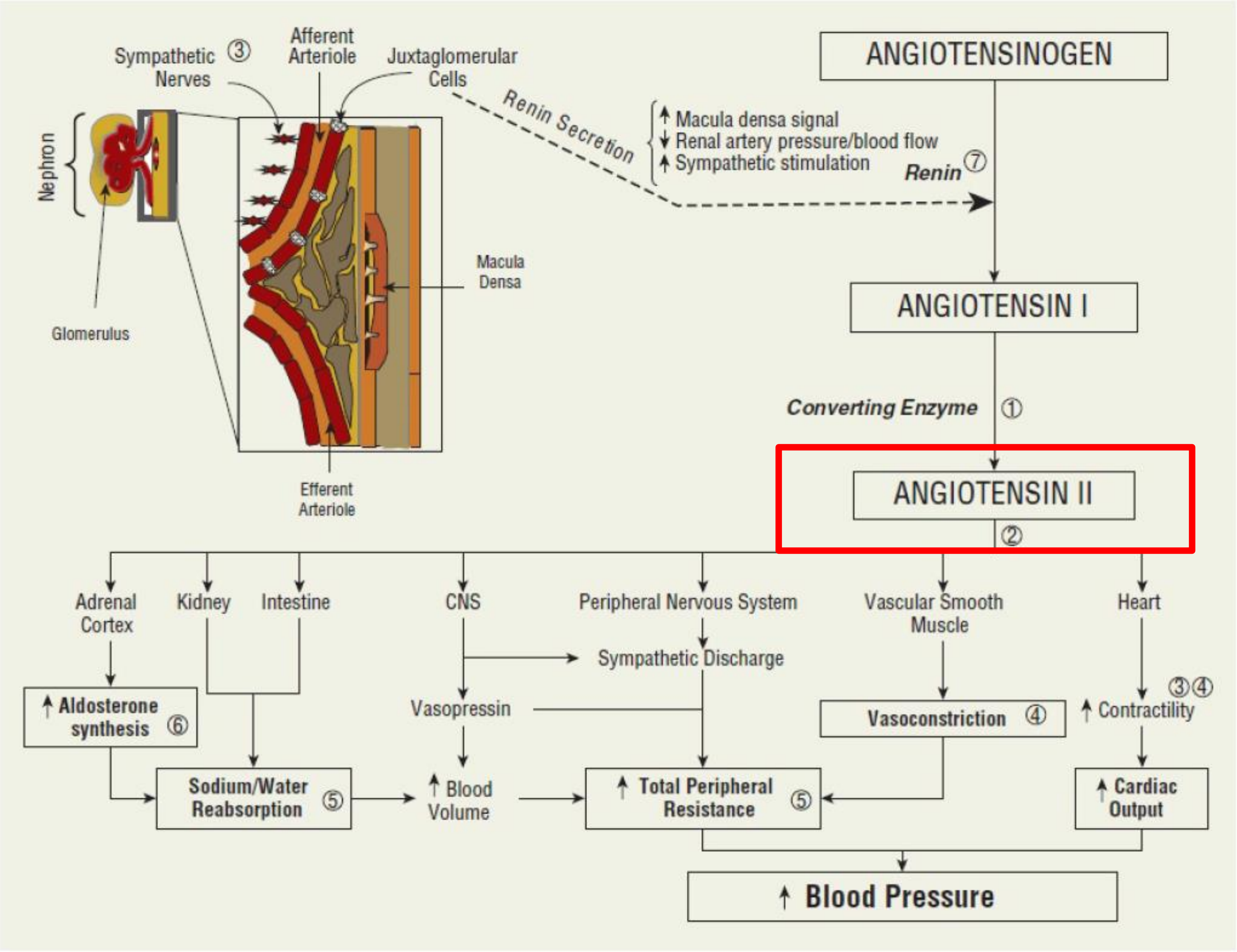
ARBs the ‘sartans’
(Angiotensin Receptor Blockers)

Azilsartan	Edarbi
Candesartan	Atacand
Eprosartan	Teveten
Irbesartan	Avapro
Losartan	Cozaar
Olmesartan	Benicar
Telmisartan	Micardis
Valsartan	Diovan

ARBs

Drug	Brand	Daily Dose
Losartan	Cozaar	25 – 100 mg in 1-2 doses
Valsartan	Diovan	80 – 320 mg QD
Azilsartan	Edarbi	40 – 80mg QD
Telmisartan	Micardis	40 – 80 mg QD
Candesartan	Atacand	8 -32 mg QD
Irbesartan	Avapro	150 – 300 mg QD
Olmesartan	Benicar	20 – 40 mg QD
Eprosartan	Teveten	400 – 800 mg 1-2 doses

*FDA approved indications vary. Refer to individual product prescribing information.



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ARBs

- Place in therapy: First line agents
  - ACE Inhibitors have a longer history of evidence but more side effects

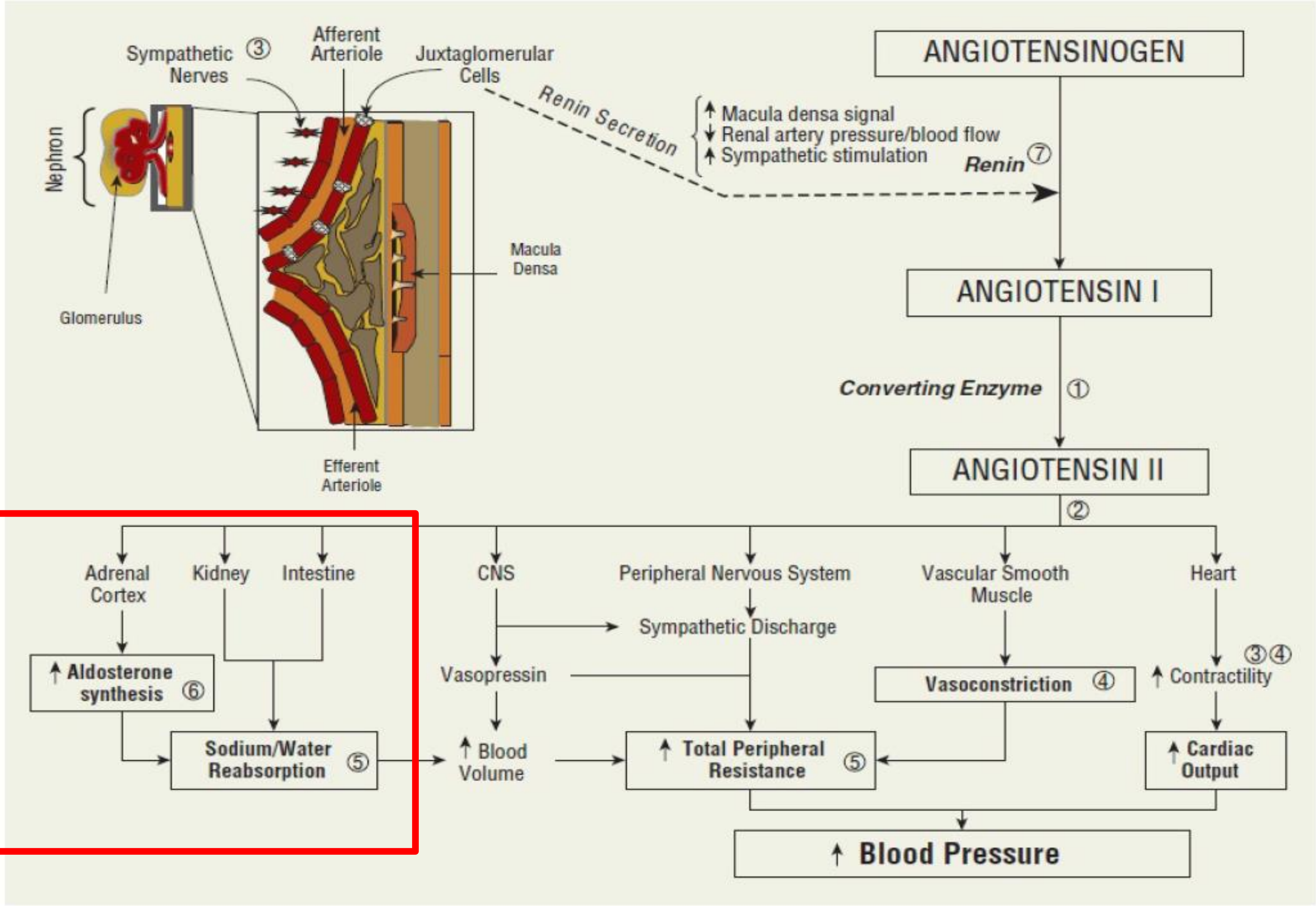
- Clinical Benefits
  - Similar to ACE inhibitors

ARBs

- Adverse effects
  - Same as ACE Inhibitors
  - Cough is much less likely
  - Angioedema
    - Much less likely. Can still give if mild sx on ACE
- Contraindications
  - Same as ACE

Aldosterone Receptor Antagonist

Spironolactone	Aldactone
Eplerenone	Inspra



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Aldosterone Receptor Antagonist

- Place in therapy
  - Commonly used for resistant HTN
  - Concomitant HF
- Adverse effects
  - Hyperkalemia
  - Gynecomastia with spironolactone
- Monitoring
  - Serum creatinine at 3 days, 7 days and then monthly for 3 months after initiation
  - Avoid if K^+>5

Thiazide/Thiazide-like Diuretics

Thiazides	
Chlorthalidone	Thalidone
Chlorothiazide	Diuril
Hydrochlorothiazide	Microzide
Indapamide	Lozol

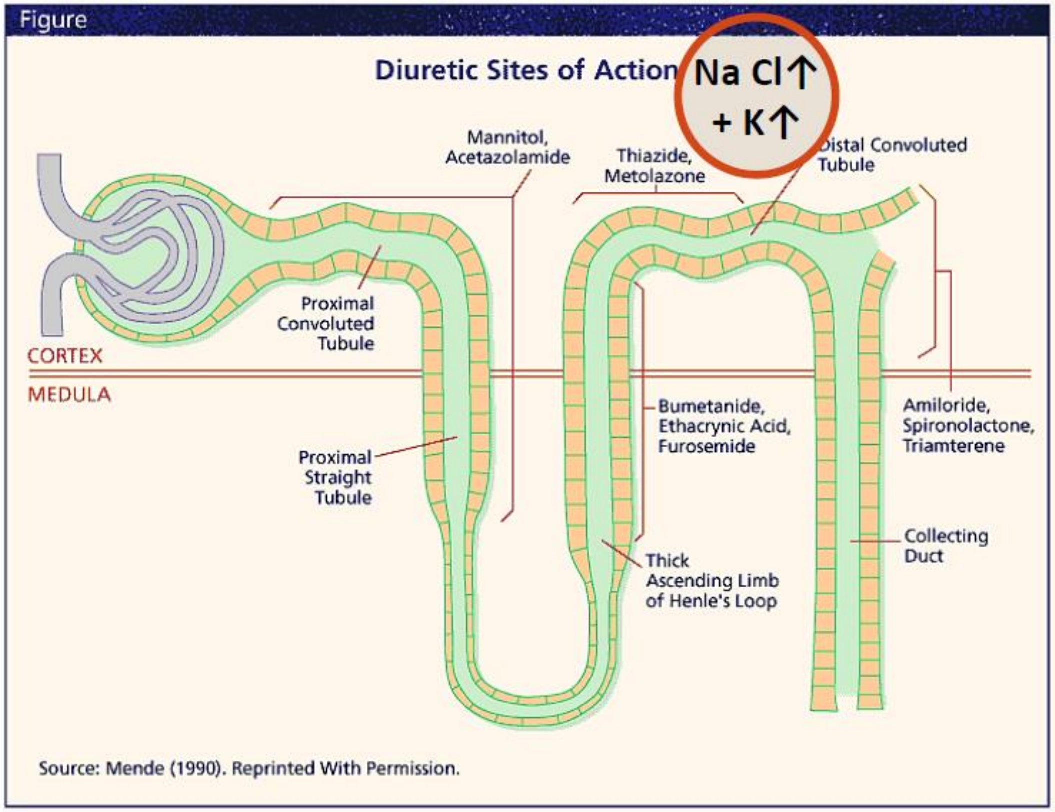
Loops	
Bumetanide	Bumex
Furosemide	Lasix
Torsemide	Demadex
Ethacrynic acid	Edecrin

Potassium Sparing	
Amiloride	Midamor
Spironolactone	Aldactone
Triamterene	Dyrenium

Quinazoline	
Metalozone	Zaroxolyn

Thiazide Diuretics

- Act on renal distal convoluted tubules (DCT)
- Increases urinary excretion
- Increases urinary excretion of potassium



Thiazide/Thiazide-like Diuretics

- Place in therapy
  - Cornerstone of therapy since JNC1
  - First line agents alone or in combination with other drug classes

- Adverse effects
  - Hypokalemia, hypomagnesemia, hypercalcemia, hyperuricemia, hyperglycemia, hyperlipidemia, sexual dysfunction
  - Lithium toxicity if used with lithium

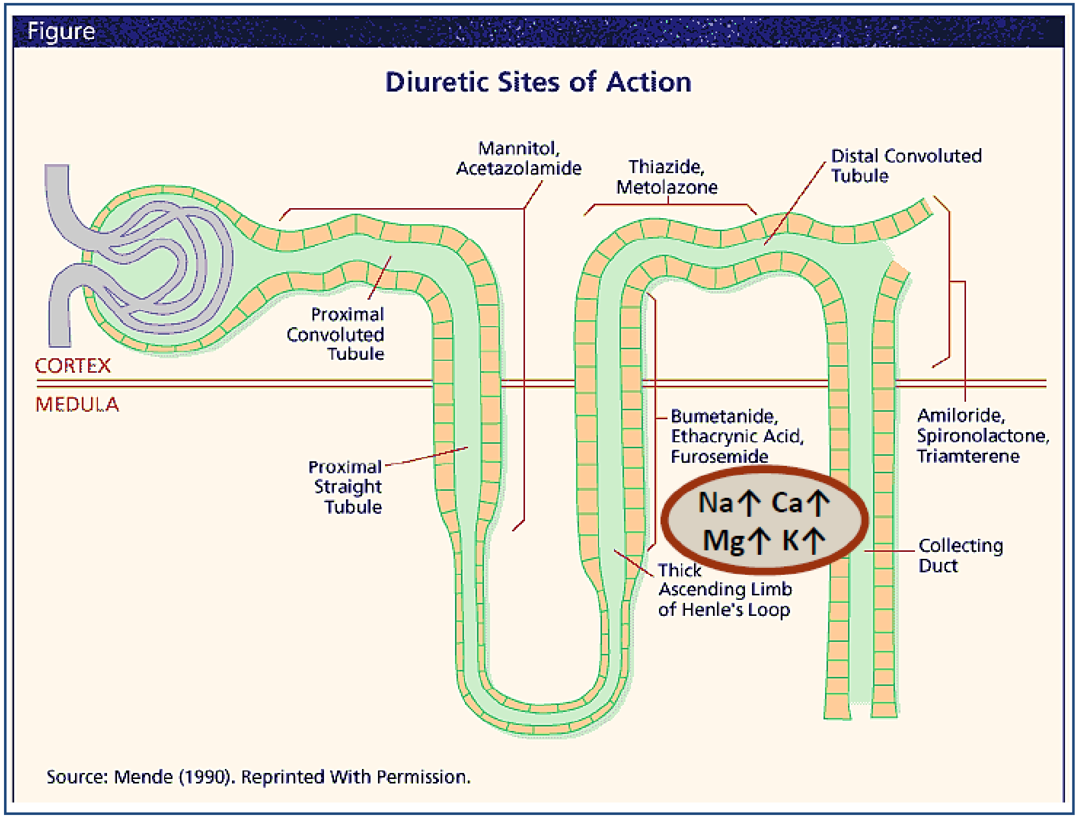
Thiazide/Thiazide-like Diuretics

- Monitoring
  - Chemistry panel in 7-10 days after initiation or titration
  - Chlorthalidone (1.5 - 2 times as potent as HCTZ)

- Contraindications
  - No kidney function (anuria)

Loop Diuretics

- Act mainly in ascending loop of Henle to decrease sodium reabsorption
- Action is shorter but more intense than other diuretics
- Preferred for edema rather than BP management



Loop Diuretics

- Place in therapy
  - Patients with Heart Failure and/or Chronic Kidney Disease
  - Dose in AM or afternoon to avoid nocturnal diuresis
- Adverse Effects
  - Hypokalemia, hypomagnesemia, hypocalcemia
  - Hyperuricemia – may precipitate gout
  - Dehydration

Potassium-Sparing Diuretics

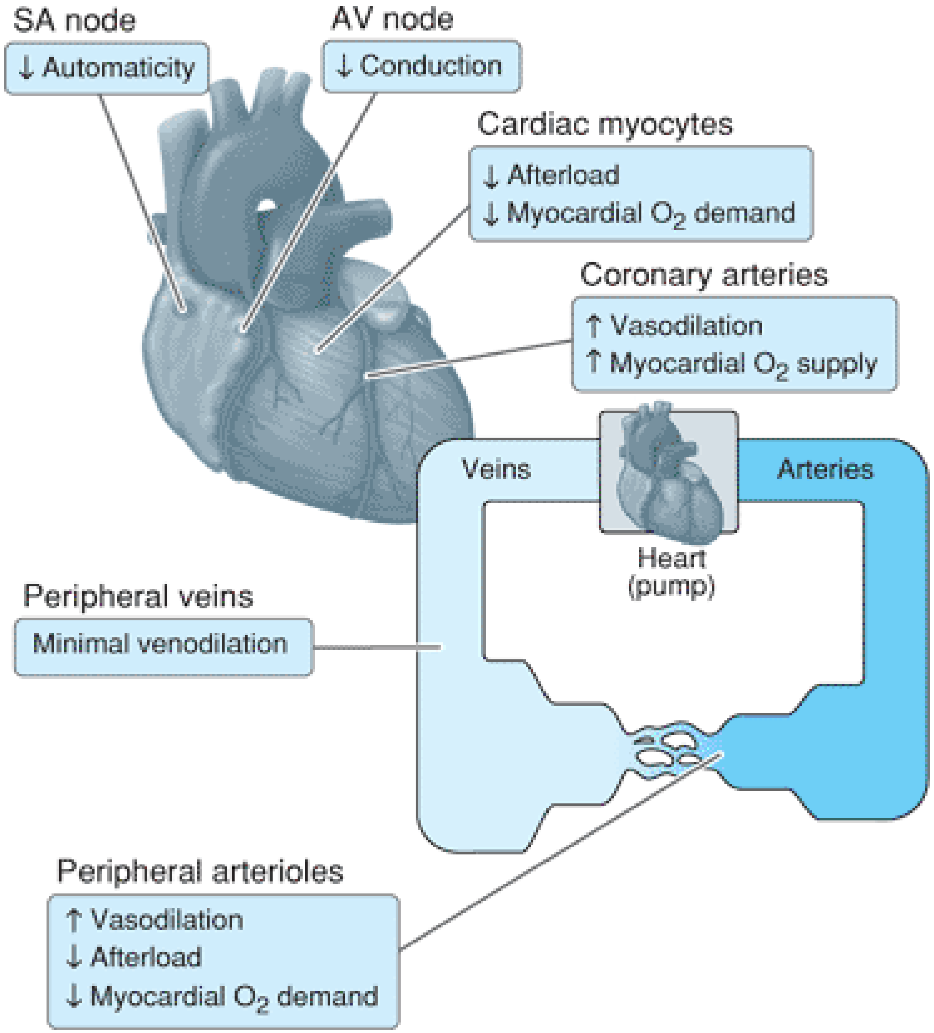
- Weak diuretics
  - Usually used in combination with thiazide diuretics to minimize hypokalemia
- Dose in AM or afternoon to avoid nocturnal diuresis
- Adverse effects
  - May cause hyperkalemia especially when used in combination with an ACEI, ARB or potassium supplements
- Avoid or use cautiously in patients with CKD

Calcium Channel Blockers (CCBs)

Dihydropyridines (DHP)	Amlodipine	Norvasc
	Nifedipine	Procardia
	Felodipine	Plendil
	Nicardipine	Cardene
	Isradipine	DynCirc, Dynacirc
Non-Dihydropyridines (NDHP)	Diltiazem	Cardizem, Dilacor, Taztia, Tiazac
	Verapamil	Calan, Isoptin, Verelan

CCBs

Bind to calcium channels located on the vascular smooth muscle, cardiac myocytes, and cardiac nodal tissue to inhibit calcium influx



Dihydropyridine (DHP) CCBs

- Place in Therapy
  - First line agents for most patients
  - Avoid short-acting CCBs
- Clinical Benefits
  - Potent BP lowering
  - Improves anginal symptoms
- Adverse Effects
  - Peripheral edema
    - Dose dependent, not better with elevation
  - Reflex tachycardia
  - Flushing
  - Dizziness, headaches
    - Usually improves after first few doses

Non-Dihydropyridine (NDHP) CCBs

- Place in therapy
  - Concomitant conditions
  - Extended Release products preferred in HTN
- Clinical benefits
  - Reduce the risk of HTN complications
  - Rate control for arrhythmias
  - Headache prophylaxis
- Adverse Effects
  - Peripheral edema, constipation, bradycardia
- Dosing and monitoring
  - CYP450 inhibitors, caution with BB use
- Contraindications: bradycardia, heart block, EF <40%

Beta Blockers (BBs)

Cardioselective	Metoprolol	Lopressor, Toprol
	Atenolol	Tenormin
	Bisoprolol	Monocor
	Betaxolol	Kerlone
	Nebivolol	Bystolic
Non-Cardioselective	Propranolol	Inderal
	Nadolol	Corgard
	Timolol	Betimol, Istalol, Blocadren
Intrinsic Sympathomimetic Activity	Acebutolol	Sectral
	Penbutolol	Levatol
	Pindolol	Visken
Mixed α/β-blockade	Carvedilol	Coreg
	Labetolol	Trandate

BBs

- Work by inhibiting the effects of the sympathetic nervous system
- In kidneys, reduces the activity of the renin-angiotensin system
- In heart, reduces heart rate and cardiac contractility

BBs

- Place in therapy
  - Uncomplicated HTN: 3rd or 4th line agents
  - Concomitant heart failure, arrthymias
- Clinical benefits
  - HF and post-MI: reduces morbidity and mortality
- Adverse effects
  - Bradycardia, heart block, bronchospastic disease, exercise intolerance, fatigue, depression and sexual dysfunction
- Contraindication
  - Sinus or AV node dysfunction, severe bronchospastic disease

Practical Management Pearls

- Most medications within antihypertensive classes are used interchangeably. There are small differences.
- Losartan is the only ARB with known uricosuric effects. Also the “weakest” ARB
- Loop diuretics are not typically used for HTN
- Need to consider electrolytes disturbances when on ACE, ARB, or Diuretics; Not BB, CCB typically
- BB may mask some hypoglycemic symptoms in diabetes patients (ie, tachycardia, tremor)

Practical Management Pearls

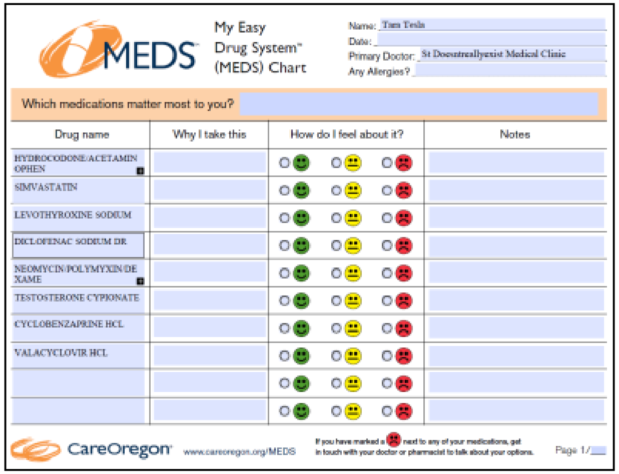
- Watch out for diuretic/ACE or ARB/NSAID combo
- No concerns with Amlodipine and regular amounts of grapefruit juice
- Do not combine RAAS drugs, (ie, ACE + ARB)
- Chlorthalidone about 2x as potent as Hctz
- Choosing medications most often dictated by comorbidities
- Start low and go slow in the elderly

Improving Adherence

Bubble packs – Pro vs Cons

- Pro's
  - If meds are stable can really help someone remember whether they have been taking meds regularly or not
  - Can be delivered to patients home/doctors office
  - Only get meds once per month
- Con's
  - If meds are changing or patient is transitioning in care it can be very confusing
  - Packs are sometimes confusing and hard to push out bubbles
  - Wasteful packaging?

Other Adherence Ideas



MEDS My Easy Drug System™ (MEDS) Chart

Name:
Date:
Primary Doctor:
Any Allergies?

Which medications matter most to you?

Drug name	Why I take this	How do I feel about it?	Notes
HYDROCODONE/ACETAMINOPHEN			
SIMVASTATIN			
LEVOTHYROXINE SODIUM			
DICLOFENAC SODIUM DR			
NEOMYCIN/POLYMYXIN/DEXAME			
TESTOSTERONE CYPIONATE			
CYCLOBENZAPRINE HCL			
VALACYCLOVIR HCL			

CareOregon www.careoregon.org/MEDS

If you have marked a ☹ next to any of your medications, get in touch with your doctor or pharmacist to talk about your options.

Page 1/

- Pill boxes + Meds Chart
  - If patients/family can fill them regularly
- Locked/Timed pill dispensers
  - If family can fill them and you can afford them
- Combination therapy where possible (the “polypill”)
  - Many pills come in 2 drug combo’s, and some even 3 drugs
- Syncing refills at the pharmacy
  - If the pharmacy will do this – Was recently approved by state

MEDS™ My Easy Drug System™ (MEDS) Chart

Name: Tara Tesla
Date:
Primary Doctor: St Doesntreallyexist Medical Clinic
Any Allergies?

Which medications matter most to you?

Drug name	Why I take this	How do I feel about it?	Notes
HYDROCODONE/ACETAMINOPHEN		○ 🙂 ○ 😐 ○ ☹	
SIMVASTATIN		○ 🙂 ○ 😐 ○ ☹	
LEVOTHYROXINE SODIUM		○ 🙂 ○ 😐 ○ ☹	
DICLOFENAC SODIUM DR		○ 🙂 ○ 😐 ○ ☹	
NEOMYCIN/POLYMYXIN/DEXAME			
TESTOSTERONE CYPIONATE			
CYCLOBENZAPRINE HCL			
VALACYCLOVIR HCL			
		○ 🙂 ○ 😐 ○ ☹	

MEDS Charts with a patient's medications already prefilled can be provided for CareOregon members by calling 503-416-4915 or by sending a HIPAA secure email to: medschart@careoregon.org

If you have marked a ☹ next to any of your medications, get in touch with your doctor or pharmacist to talk about your options.

Causes for Lack of Therapeutic Response

- Non-adherence to therapy
  - Cost of medication
  - Instructions not clear and/or not given to patient in writing
  - Inadequate or no patient education
  - Lack of involvement of patient in treatment plan
  - Side effects of medication
  - Organic brain syndrome (e.g. memory deficit)
  - Inconvenient dosing

Causes for Lack of Therapeutic Response: Drug Related

- Doses too low
- Inappropriate combinations
  - 2 drugs in one class
- Drug Interactions
  - NSAIDS
  - Oral contraceptives
  - Sympathomimetics (e.g. - psuedoephedrine)
  - Antidepressants (e.g. - Venlafaxine)
  - Adrenal steroids (e.g. - prednisone)
  - Nasal decongestants (e.g. - Afrin)
  - Licorice-containing substances (e.g. chewing tobacco)
  - Cocaine or methamphetamines
  - Cyclosporine and tacrolimus
  - Erythropoietin

Causes for Lack of Therapeutic Response

- Associated conditions
  - Increasing obesity
  - Alcohol intake: more than 1-2 drinks/day
  - Chronic pain
  - Sleep apnea
  - White coat hypertension

Causes for Lack of Therapeutic Response

- Volume overload
  - Inadequate diuretic therapy
  - Excess sodium intake
  - Fluid retention from reduction of blood pressure
  - Progressive renal damage
- Improper blood pressure measurements
- Lack of clinical inertia

Case

- You are working with a 61 yo AA male patient who has been to the ED several times recently for work related back pain. It was noted his blood pressure was high in the ED. He reports his blood pressures at home to be in the “150’s/90’s”. He has a past medical history only significant for high cholesterol and low back pain, and a family history of diabetes, but personally is only at increased risk of diabetes with an A1c of 5.8%. Low normal potassium at 3.6. Otherwise normal electrolytes and no proteinuria.
- He states he has been told about sodium and the DASH diet before and does his best to reduce sodium and eat those vegetables. He has a physical job but doesn’t do much exercise outside of work.

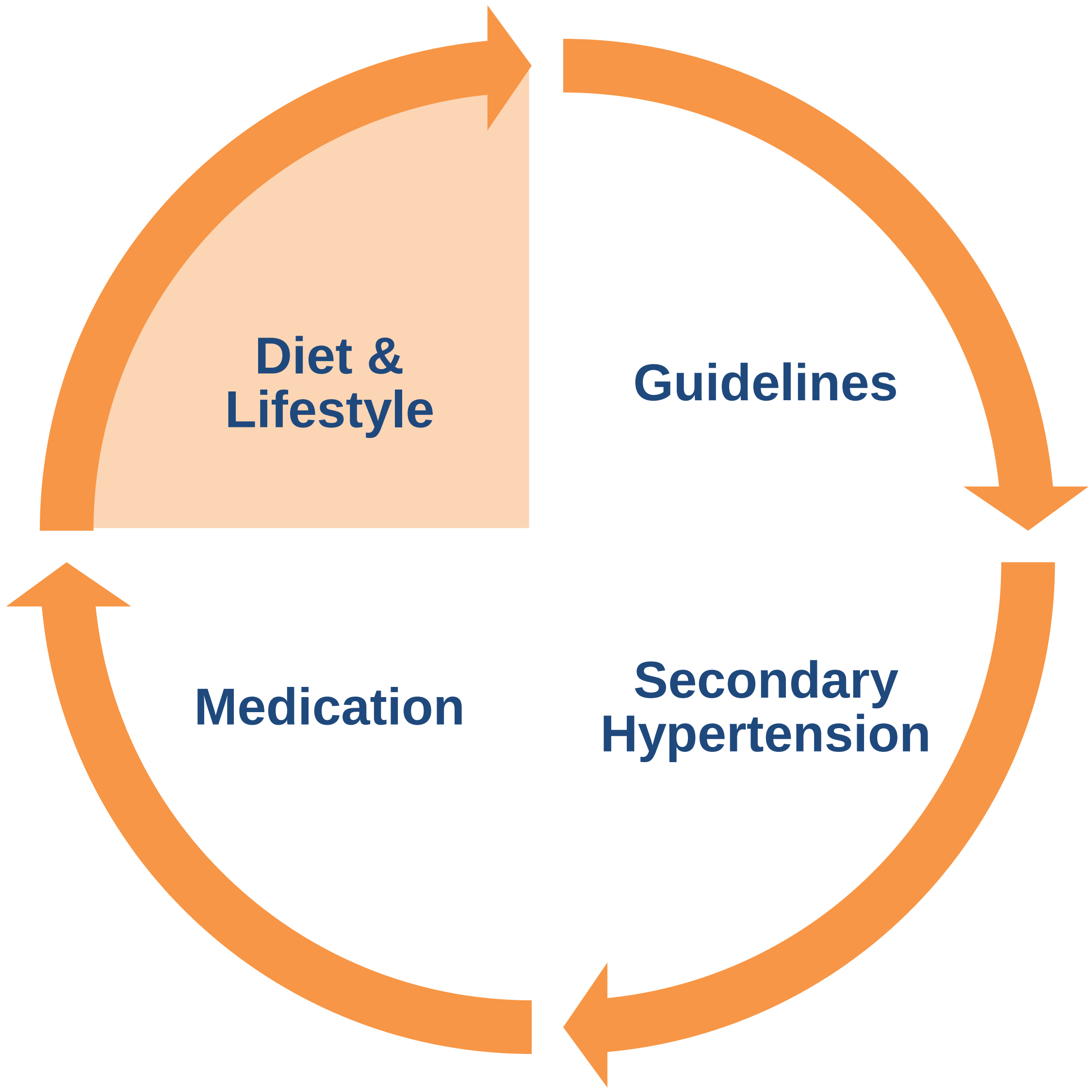
Case

- Meds
  - Aspirin 81mg daily
  - Atorvastatin 20mg daily
  - Ibuprofen 200mg – 2-3 tablets Q8hr PRN back pain

Case

- You recommend he come into clinic for a nurse blood pressure check.
- When he does this his blood pressure is 156/92 and HR is 84.
- What medication(s) would be most appropriate for this gentleman and what factors help form your thoughts around this choice?

35 Br eak


Diet & Lifestyle
Guidelines
Secondary Hypertension
Medication

Nutrition and Lifestyle Intervention for Controlling Hypertension

Julia Hanfling, RD, CDE

3 Peaches Nutrition & Diabetes Coaching

CareOregon®

MEDS Ed™

Objectives

- Recognize who is at risk for hypertension
- Explore the role of sodium and high blood pressure
- Address the three main dietary recommendations:
    - the DASH diet
    - the Mediterranean Diet
    - plus Anti-Inflammation Guidelines
- Identify the importance of lifestyle factors
- Understand the learning style of different patients
- Support your role as educator

Risk factors for Hypertension

Uncontrollable

- Age
- Race – African & Native American, Hispanic
- Family history

Controllable

- Low physical activity
- High sodium/ low potassium
- Other dietary factors
- Weight
- Stress
- Poor sleep
- Tobacco

Recommended Dietary Treatments

- The DASH Diet
- The Mediterranean Diet
- Anti-Inflammatory Guidelines

What is the DASH Diet?

Dietary
Approaches to
Stop
Hypertension

Developed by the National Heart, Lung and Blood Institute in 2001.
Widely recognized as effective and realistic for many people.

Two components to DASH Diet:

1. Reduce sodium to 2400mg

Additional benefits seen at 1500mg

2. Dietary modification

- Rich in fruits, vegetables, fat-free or low-fat milk and milk products, whole grains, fish, poultry, beans, seeds, and nuts.
- Contains less sugar; fats; and red meats
- Lower in saturated fat, *trans* fat, and cholesterol
- Higher in potassium, magnesium, and calcium, protein, and fiber.

Sodium decrease reduced BP by:

	Prehypertension	Hypertension
Systolic BP	2.8 mm/ Hg	5.5 mm/ Hg
Diastolic BP	1.1 mm/ Hg	3.8 mm/ Hg

DASH Diet reduced BP by:

Systolic BP	2.1 mm Hg	6.7 mm HG
Diastolic BP	1.8 mm Hg	3.5 mm Hg

Combined sodium reduction and DASH diet results are most effective

	Prehypertension	Hypertension
Systolic BP	7.1 mm/ Hg	11.5 mm/ Hg
Diastolic BP	4.8 mm/ Hg	6.9 mm/ Hg

These reductions occurred with no change in body weight

Dietary factors of the DASH Diet:

High in:

- Vegetables
- Fruits
- Whole grains
- Low fat dairy products
- Lean meats, fish, poultry, nuts, legumes
- Olive oil and olives

Limited in:

- Sodium
- Sugar sweetened foods and beverages
- Refined grains
- Red meat
- High fat dairy

Sodium facts

2400 mg Na+ = 1 teaspoon

Recommendation –

2400 mg/ day (or 1500mg/ day)

600mg/ meal (or 400mg/ meal)

Average American intake

= 3400-4800mg/ day

8 food groups contribute 40% on the average sodium intake. These include:

- Soup – canned or dried
- Canned vegetables
- Pasta dishes
- Pizza
- Cold cuts
- Chips and pretzels
- Bread
- Commercially fried foods

Reduce sodium intake by using:

- Fresh or frozen vegetables, not canned
- Garlic or onion powder, not garlic or onion salt
- Use ½ the seasoning packet in boxed mixes
- Low sodium soy sauce
- Add salt in the cooking process, not at the table
- Herbs and spices, such as curry, garlic, basil, cinnamon, cumin, and others

Too much salt masks other flavors

- It is very important that the food tastes good. Otherwise, the recommendation to reduce sodium will likely not last.
- Taste buds can and do change, and will adapt to a lower sodium intake.
- Give your patients the assurance that their food will still be enjoyable.

Finding sodium on a label

Watch for:

- Serving size
- Number of servings
- Sodium content

Is the size of the package the size someone actually eats?

Potassium facts

Recommendation –
4700mg/ day (120.5meq)
or
1000mg/ meal (25.6meq)

The average American intake
= 1800mg/ day (46.2meq)

High potassium foods include:

• 1 c white beans, cooked	1004 mg	25.6meq
• 5” avocado	975mg	25.0meq
• 1c acorn squash, cooked	899mg	23.0meq
• 1c spinach, cooked	840mg	21.5meq
• 4” potato, baked	926mg	23.7meq
• 8” banana	806mg	20.7meq
• 1c plain yogurt	625mg	16.1meq
• 3 oz. salmon	534mg	13.7meq

Consider produce with bright colors
Be careful of salt substitutes
(unplanned potassium)

The Mediterranean Diet

Mediterranean Diet Origins

- Credited to Walter Willett of Harvard University's School of Public Health, 1994
- Based on the food patterns typical of Crete, Greece and Southern Italy in the early 1960's.
- Includes regular physical activity.

Mediterranean Diet basics:

High in:

- Vegetables fresh or frozen
- Whole fruit
- Whole grains
- Beans and legumes
- “Good” fats
- Oil-rich fish
- Unprocessed meat & eggs
- Cultured whole milk dairy
- 1-2 glasses wine/ day

Limit:

- Canned vegetables
- Sugary drinks or juice
- Refined grains, white flour
- Fried foods, processed oils
- Processed
- “Fake” fooc

The Mediterranean Diet is similar to the DASH diet, but adds the following recommendations:

- Healthy oils, such as the Omega-3 fatty acids
  - EPA and DHA, such as olive oil and salmon
- Modest amounts of dark chocolate
- 1-2 glasses of wine or other alcohol, in moderation
- Whole fat cultured dairy (yogurt and kefir) in place or skim or 1% milk
- Physical activity is considered a **vital part** of this plan

Omega-3 fatty acids, including EPA and DHA.

- Olives and olive oil
- Oily fish, including salmon, mackerel,
- Nuts – walnuts, almonds, hazelnuts, pecans
- Seeds – sunflower, sesame, pumpkin
- Avocados
- Canola oil

Which foods to focus on?

- Food mostly from plant sources: whole grains and legumes
- Daily fruit and vegetables
- Protein: chicken, turkey & fish, occasional red meat cooked with less fat
- Extra-virgin olive oil, avocados, olives, nuts and seeds for good oils

Which food to limit?

- Refined grains – white flours, crackers, sweetened cereal
- Sugars and candy
- Commercially-fried food
- "Bliss points" are foods designed to balance salt, sweet and fats to keep you craving – and buying – more.

CareOregon Food RX program

Food Rx is an information and resources hub, connecting members, staff and community partners, capitalizing on the many programs that use nutrition to improve Oregonians' health and well-being. Food Rx offers four programs for members: Cooking Matters® classes, Curative Nutrition, Prenatal Healthy Eating Classes and The Gleaning Collaborative.

How big is your plate?

- Use medium size plate
  - less than 9 inches
- Fill **1/3** with **vegetables** – more color is better!
  - Find tasty ways to cook them, or eat them raw
- **1/3** plate = **protein/fat** (chicken, tuna, eggs, others, legumes)
- **1/3** plate = High fiber **starch –** brown rice, whole grain, whole fruit and dairy.

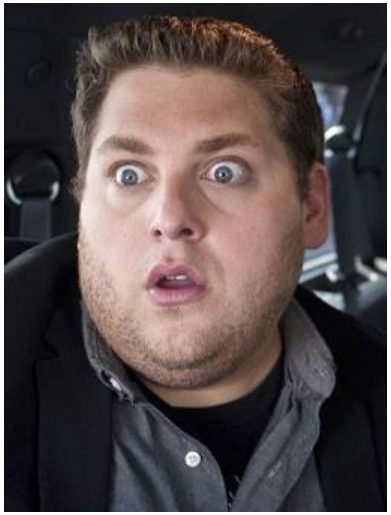
Times have changed

In 1980

- 75% of calories came from meals
- 25% of calories came from snacks

In 2010

- 40% of calories came from meals
- 60% of calories came from snacks



Encourage your patients to:

Eat more at meal times.
Eat less between meals as snacks.
That waistline will thank you.

Food for Thought

- A snack is smaller than a meal and is nourishing.
- A treat is entertainment for your mouth.

Lifestyle steps to reduce HTN

- Moving More Daily
- Get a good night's sleep
- Lose excess inches at the waist
- Relax, reduce stress
- Drink Water
- Get a dog or other pet

Movement and activity

Four types of physical activity work together

1. **Aerobic/ cardiac**
2. **Weight training/ resistance**
3. **Stretching/ yoga**
4. **Core strengthening/balance/ Pilates**

Walking is wonderful, but it is not for everyone.
Encourage your patients to move in ways that are fitting for each one.
Upper body movements work very well for many people.

Increasing rate of obesity
BMI >30

- 1980 – 46 states <15%, only 4 states > 15%
- 1990 – 2 states > 20%
- 2000 – 30 states > 20%
- 2010 – 38 states > 25%

  Of those, 17 states are >30%
- 2020 – ???

Age–Adjusted Prevalence of Obesity and Diagnosed Diabetes Among U.S. Adults Aged 18 years or older

Obesity (BMI $\geq$30 kg/m^2)

1994 2000 2010

☐ No Data ☐ <14.0% ☐ 14.0% –17.9% ☐ 18.0% – 21.9% ☐ 22.0% – 25.9% ☐ $\geq$26.0%

Diabetes

1994 2000 2010

☐ No Data ☐ <4.5% ☐ 4.5% –5.9% ☐ 6.0%–7.4% ☐ 7.5% –8.9% ☐ $\geq$ 9.0%

CDC's Division of Diabetes Translation. National Diabetes Surveillance System available at http://www.cdc.gov/diabetes/statistics

Rates of Obesity by Ethnic Group

- Non-Hispanic blacks 47.8%
- Hispanics 42.5%
- non-Hispanic whites 32.6%
- non-Hispanic Asians 10.8%

Rates of Obesity by Ethnic Group

In most groups, obesity in lower income groups are proportionally higher.

However, among non-Hispanic black and Mexican-American men, those with higher incomes are more likely to have obesity than those with low income.

For the overweight patient…

- Losing 10 pounds can reduce the risk of developing hypertension, diabetes and other health problems by up to 65%.
- If hypertensive, this may be as effective as some prescription drugs.
- Each pound of fat requires approximately **an extra mile** of blood vessels to supply nutrients and oxygen.*

*Judah Folkman, 1971 Harvard University Tumor Angiogenesis: Therapeutic implications.
New England Journal of Medicine 285: 1182-1186 [PubMed]

Encourage your patients to master the art of losing just 5 pounds – Then repeat as needed.

- Half through dietary changes
- Half through increased varied movement
- The other half through a good night's sleep

Have a drink!

- Drinking 6-8 8oz glasses of water/ day has been shown to lower systolic BP.
- Not drinking enough water tends to concentrate sodium retention, and minimize the capillary capacity to remain open.
- Caffeinated drinks act as diuretic.

What about alcohol?

- 1-2 servings of alcohol per day can be effective at reducing both systolic and diastolic BP by 2-4 mm/ Hg.

- A serving equals
  - 12 ounce beer
  - 5 ounces wine
  - 1.5 ounce 80 proof hard liquor

For the patient who does not drink alcohol, this is not the time to start.

Sleep is Precious

- 1 in 3 Americans have high blood pressure. About 40% of those have sleep apnea.
- In resistant hypertension, about 80% have sleep apnea.
- This is aggravated by and independent of diabetes.
- The AASM recommends all patients with HTN or DM be screened for sleep apnea.

How to fall sleep and stay asleep

- Set up a bedtime routine
- Have a small, nourishing snack, not a large meal
- Limit caffeine and alcohol before falling asleep
- Exercise earlier in the day, > 3-4 hours before bed
- Spending time in the sunshine will help you sleep
- Limit screen time for 30-60 minutes – TV, laptop, phone, etc.
- Focused breathing or meditation to prepare for sleep.
- If you snore excessively or wake up often, talk to your doctor.   You may have sleep apnea.

Common supplements patients may take for hypertension:

- Calcium and magnesium
  1000mg : 500mg

- Co Q 10 – Ubiquitol or Ubiquitone 100 – 300 mg/ day

- Vitamin C – 500-1000 mg/ day

- Omega-3 fatty acids:
  EPA (eicosapentaenoic acid) and
  DHA (docosahexaenoic acid)
  500-900 mg/ day (in a 2:1 or 1:2 ratio)

Seeking Calm May Include

- Gentle breathing
- Mindful observation
- Compassion toward self and others
- Gratitude
- Stress reduction

One source of stress reduction

Hypertension vs Blood Pressure

- A recent study showed that some patients hear “hypertension” as “too much stress” and the need to relax.
- They may hear “high blood pressure” and remember to take their medication.
- **Use the term “high blood pressure” instead of “hypertension” if possible.**

Finding the Right Balance

- Eat real food
- Separate meals from snacks
- Get a good night's sleep
- Move
- Drink water
- Practice stress reduction and relaxation

Your Powerful Message

- Give your patients the assurance that they can manage their condition.
- Reflect back what they say, so they know you are listening.
- Whenever possible, show them what you are teaching, not just talking about it. Have them show you what they learned. Use a "Teach Back" approach.
- Give written instructions at an appropriate literacy level.
- Patients will recall what is said in a medical office.
  Make sure it is the message you want them to remember.

Pearls

- Hypertension is very serious
  - It is also very treatable and often preventable
- Reducing sodium is a very effective change
- Focus on real food
- Give your patients realistic tools
- Include physical activity in your recommendations
- Be an example for your patients
- Keep joy and flavor in your daily life and in your patient's take home message.

Case Study

49 year old woman, Tracy, is 5’5”, 222#, has Type 2 diabetes, hypertension, sleep apnea, low vitamin D. She lives with her husband and two kids, ages 14 and 17. She works full time in a sedentary job. She has dieted many times without lasting success. She likes to cook but states she has very little time for food preparation. She wants to make some lifestyle changes before adding or increasing her medication. What would you recommend?

- Tracy is on HCTZ, 25 mg QD
- Lisinopril 10 mg QD
- Metformin 500mg BID
- Levothyroxine 100 mg QD
- Ergocalciferol 50,000 IU weekly

Thank You Very Much!

Julia Hanfling, RD, CDE

3 Peaches Nutrition and Diabetes Coaching

503-504-5050

www.3peachesnutrition.com

Good books

- Buettner, D. “**The Blue Zones**” 2008, National Geographic, Washington DC.
- Bland, J. “**The Disease Delusion**” Harper Collins, 2014, N.Y. N.Y.
- Hassell, M. “**Good Food, Great Medicine**” 2014, Portland, Oregon
- Northrup, C. “**Goddesses Never Age**” 2014, Hay House, NY, NY
- Weil, A “**Healthy Aging; A Lifelong Guide for your Wellbeing**” 2009, Anchor Books.

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- http://hyper.ahajournals.org/content/36/5/890.full Alderman, M "Salt, Blood pressure and Human Health, AHA
- http://www.todaysdietitian.com/newarchives/121112p50.shtml Increasing Dietary Potassium
- http://www.aasmnet.org/articles.aspx?id=3935 Patients with diabetes and hypertension must be evaluated for sleep apnea.
- Center for Disease Control and Prevention www.cdc.gov
- National Institutes for Health www.nih.gov
- US Census Bureau – State and County QuickFacts http://quickfacts.census.gov/qfd/states/53/53011.html
- **Washington Nutrition & Physical Activity Plan** - In 2008, Washington State Department of Health and University of Washington Center for Public Health released this Plan, supported by more than 700 community . www.doh.wa.gov/cfh/NutritionPA/default.htm.

Resources and handouts

- http://www.nhlbi.nih.gov/files/docs/public/heart/hbp_low.pdf -
 excellent booklet on hypertension
- http://www.nhlbi.nih.gov/files/docs/public/heart/dash_brief.pdf
 excellent booklet on DASH diet
- http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/dash-diet/art-20047110 - sample menus of the DASH diet
- http://www.wellnessproposals.com/nutrition/handouts/dash-diet/DASH-diet-plan-lowering-calories.pdf Reduced caloric intake on DASH diet
- http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/mediterranean-diet/art-20047801 Excellent introduction to the Mediterranean diet
- http://www.drweil.com/drw/ecs/pyramid/press-foodpyramid.html
 Mediterranean/ anti-inflammation food pyramid
- http://www.im4us.org/The+Mediterranean+Diet%3A+An+Approach+for+Teaching+Low+Literacy+Latino+Underserved+Patients For low literacy and Latino patients
- https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmi_tbl.pdf.
 For up to BMI 54
- http://www.nia.nih.gov/health/publication/good-nights-sleep Tips for sleep
- http://healthysleep.med.harvard.edu/healthy/getting/overcoming/tips Tips for sleep

Next Session

Severe and Persistent Mental Illness

September 21st

Thank you!

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better together

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