



Hypertension Update 2021

Hint: Forget Your Training

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CME Disclosures

- I disclose the following relevant financial relationships
 - Chair of Data and Safety Monitoring Committees
 - Lilly, Inc. (Chair, DSMCs)
 - Silence Therapeutics, Inc. (Chair, DSMC)





Outline

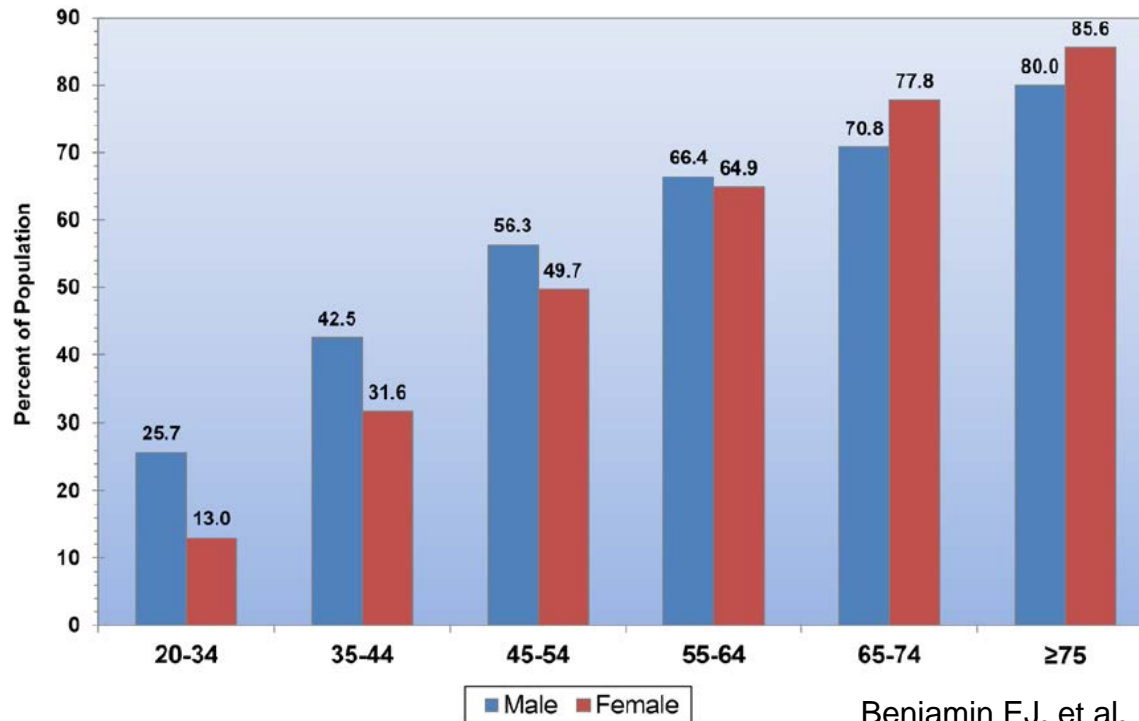
- Key steps to treating hypertension (HTN)
 - Measurement
 - Blood pressure (BP) thresholds
 - Choice of initial & combination therapies
- Patients ≥ 65 years old





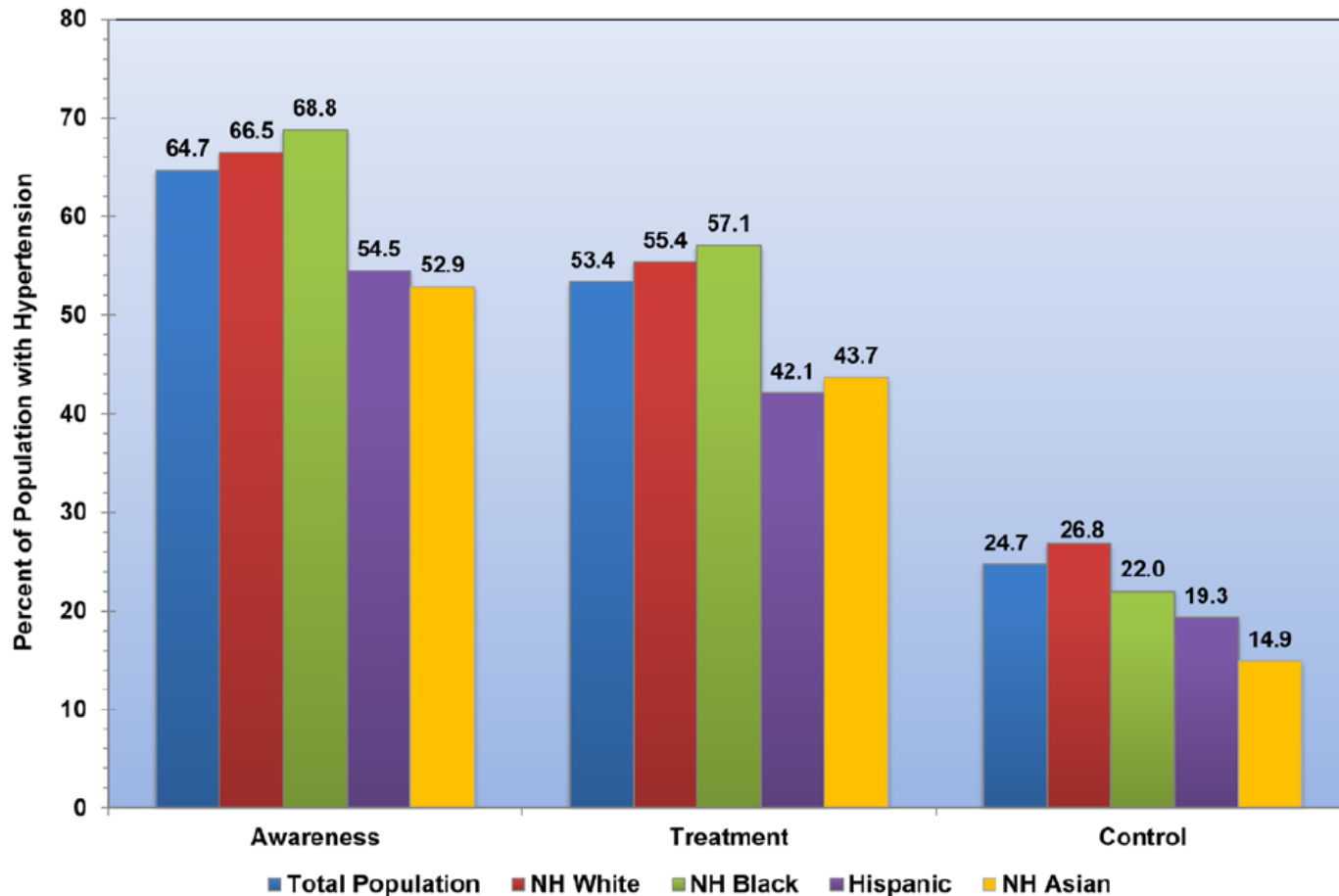
Hypertension is a Highly Prevalent, Modifiable Risk Factor for Many Diseases

- MI, CHF, Stroke, CKD, & CVD death
- ~116 million US adults have HTN (46%)





Unacceptably Low Hypertension Awareness, Treatment, and Control





What “We” Learned in our Training

- Diagnose hypertension if BP $\geq 140/90$ mmHg
 - Systolic blood pressure should 100+ age
 - Diastolic HTN is worse than systolic HTN
- For diagnosing and titrating therapy
 - Manual is more accurate than automated sphygmomanometry
 - Office BPs are more accurate than home BPs
- HCTZ or beta-blockers are the first-line medications for the *vast majority* of patients





6 Key Steps to Treating HTN in 2021

1. Make the correct diagnosis
2. Use out of office BP measurements to confirm the diagnosis AND titrate medical therapy
3. Identify and address secondary and contributing causes
4. Get off on the right foot: choose the right initial medication(s)
5. Use the right medication combinations
6. LIFESTYLE/LIFESTYLE/LIFESTYLE!!





Step 1. Make the Correct Diagnosis

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	or	80–89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg

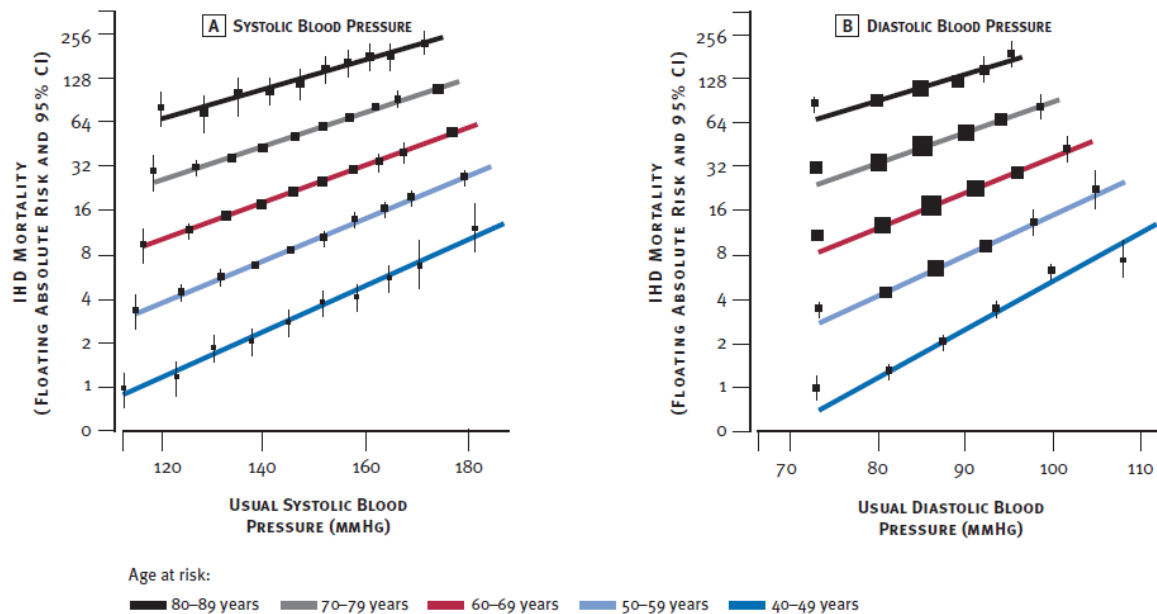
- Average of ≥ 2 careful readings on ≥ 2 visits
- If SBP and DBP categories differ, use higher





Why 130/80 mmHg?

- Progressively \uparrow CVD risk going from normal to
 - Elevated BP (120-129/80-84 mmHg): HR = 1.1-1.5
 - Stage 1 HTN (130–139/85–89 mmHg): HR = 2.0
 - Consistent across sex, race/ethnicity, and age



Whelton PK, et al. J Am Coll Cardiol 2018;71:e127; Lewington S, et al. Lancet 2002;360:1903; Go AS, et al. Circulation 2014;129:e28; Chobanian AV, et al. JAMA. 2003;289:2560





Step 2. Use Out of Office BP Measurements to Confirm the Diagnosis AND Titrate Therapy

- **Out-of-office BP measurements recommended to**
 - Confirm the diagnosis
 - Titrate BP-lowering medication
- In conjunction with telehealth counseling or clinical interventions (i.e., MyChart, mobile apps)



UWHealth



Communicate with your doctor

Get answers to your medical questions from the comfort of your own home

*My*Chart



Access your test results

No more waiting for a phone call or letter — view your results and your doctor's comments within days





BP Patterns Based on Office and Out-of-Office Measurements

	Office/Clinic/Healthcare Setting	Home/Nonhealthcare/ABPM Setting
Normotensive	No hypertension	No hypertension
Sustained hypertension	Hypertension	Hypertension
Masked hypertension	No hypertension	Hypertension
White coat hypertension	Hypertension	No hypertension

ABPM = ambulatory blood pressure monitoring

BP = blood pressure





Steal my Smart Phrase

- .JSHOMEBP

Buy a home blood pressure cuff.

- It must be for the upper arm, digital, and automatic with a cuff that fits you snugly but not too loose or tight. Here are some home BP machine brands and models recommended by Consumer Reports:
 - Omron Silver BP5250, 5 Series BP 742, or 10 Series BP 785/786N (our recommendation)
 - A&D Medical UA 767F
 - Rite-Aid Deluxe Automatic BP3AR1-4DRITE
 - Wal-Mart Equate 4000 Series or ReliOn BP 200 HEM-741CRELN4
 - Walgreen's Deluxe WGNBPA-540
 - CVS Advanced Automatic BP3MV1-1ECVS #800230
- Please check your BP and pulse 2x daily. The goal BP is <130/80 mmHg with a pulse in the 60-90 bpm range.
 - Take 2 readings at least 1 minute apart in the morning before taking medications and in evening before supper.
 - Avoid smoking, eating, drinking, or exercise for 30 minutes before measuring.
 - Sit with back straight and supported on a straight-backed chair, feet flat on the floor, legs uncrossed.
 - Keep arm supported on a flat surface (such as a table) with the upper arm at heart level.
 - Place the bottom of the BP cuff directly above the crease at the bend of the elbow.
 - **Rest quietly for at least 5 minutes before measuring your BP.
- Call us or send us a MyChart message with your blood pressure and heart rate results in 4-5 days.





Step 3. Identify and Address Secondary and Contributing Causes

- Most common
 - High sodium intake
 - Overweight/obesity
 - Sleep apnea
 - Alcohol
 - NSAIDs
 - Stimulants





Step 3. Identify and Address Secondary and Contributing Causes

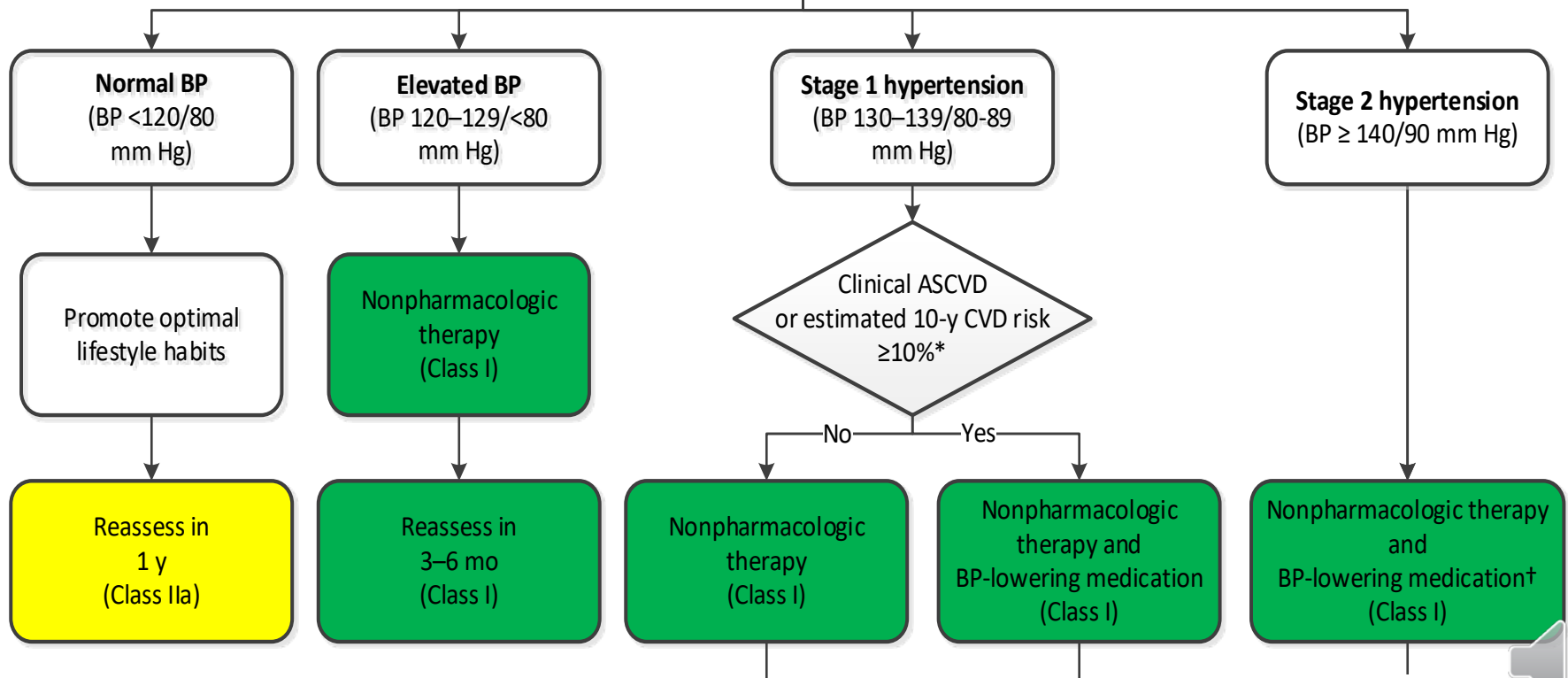
- Extensive work seldom needed or revealing
 - History, *plus* K^+ , creatinine, TSH, Ca^{+2}
- Consider secondary HTN
 - Severe hypokalemia
 - Very young (<30 years old)
 - Sudden onset HTN
 - Malignant/accelerated HTN
 - Disproportionate target organ damage
 - Resistant (>3 meds at optimal doses, inc. diuretic)

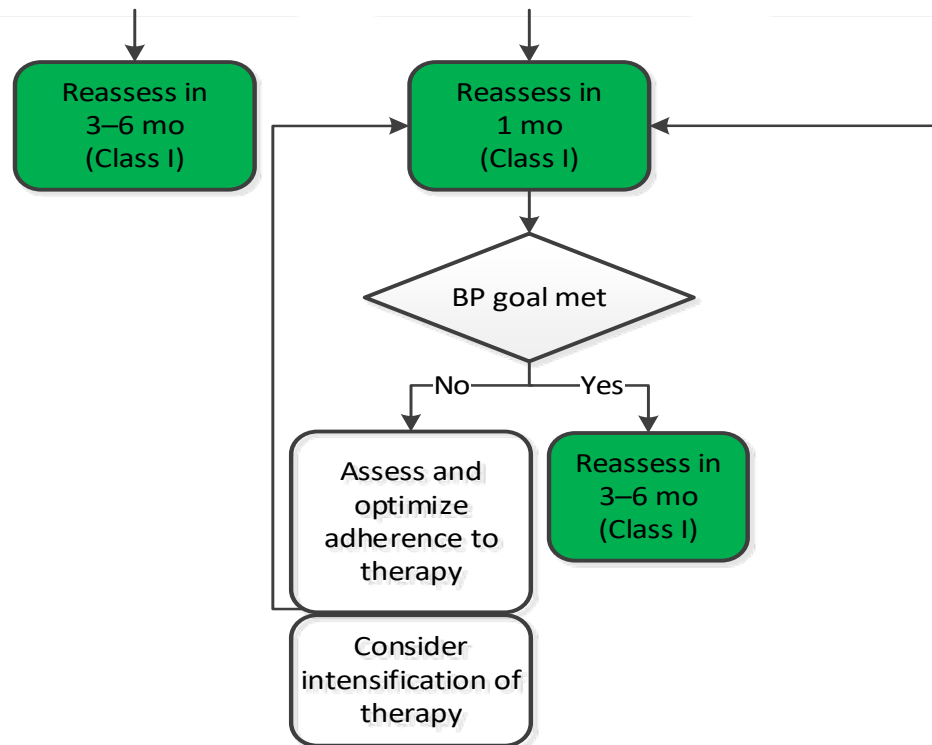




BP Thresholds and Recommendations for Treatment and Follow-Up (continued on next slide)

BP thresholds and recommendations for treatment and follow-up







Case Study

71 yo woman with “mild” HTN has been on HCTZ 12.5 mg QD for “swelling” for many years. Office BP = 166/78 mmHg, pulse 88 bpm. She said she was “rushing” and “it’s always high at the doctor’s office.” Repeat = 162/74 mmHg. Re-check in a month: BP = 168/76 mmHg, pulse 84 bpm. Chart review shows BPs 136-172/60-81 mmHg for >6 years. PCP adds metoprolol 25 mg bid. Recheck in 2 weeks: BP = 166/66 mmHg, pulse 62 bpm. PCP adds losartan 25 mg Q AM. Recheck in 2 weeks: BP = 158/60 mmHg. Titrated over 3 months to 100 mg QAM. BP = 154/56 mmHg. Frustrated, she finds a new PCP.

You change metoprolol to carvedilol 12.5 mg BID, then over 2 months to 25 mg BID. Office BP = 148/50 mmHg, pulse 58 bpm. You add hydralazine 25 mg BID, but she stops it after 2 days because she gets lightheaded, fatigued, and feels her heart pounding. You stop it and prescribe diltiazem 180 mg QD. Re-check in week: BP is 144/50 mmHg, pulse 52 bpm and she is constipated, so you change it to clonidine 0.1 mg BID.

Re-check in 2 weeks: BP = 136/54 mmHg, pulse 54 bpm. She is tired, lightheaded when she stands up, has a dry mouth, and wants fewer meds. Also, her older sister said BP pills “don’t agree” with her either and that their mom had high BP. She had stopped her pills & lived to be over 100 years old.





What Went Wrong? She Started off on the Wrong Foot!

~~HCTZ~~

~~Metoprolol
(Atenolol)~~

~~Carvedilol~~

~~Losartan
(Valsartan)
(QD)~~

~~Hydralazine~~

~~Diltiazem
(Verapamil)~~

~~Clonidine~~





Step 4. Get off on the Right Foot: Choose the Right Initial Medication(s)

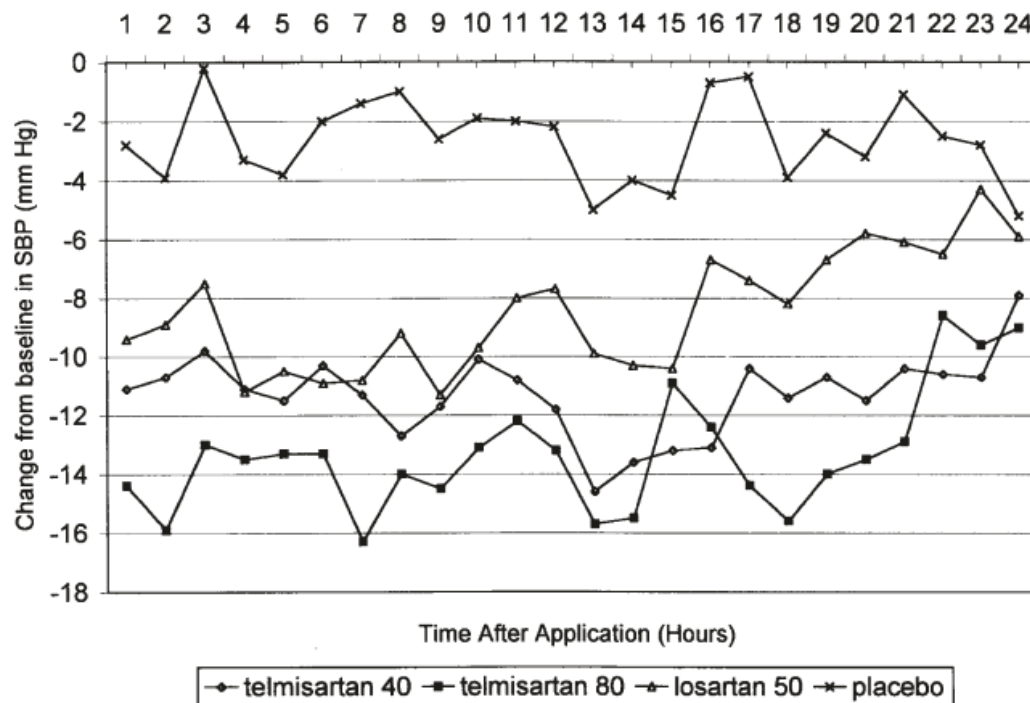
- 1st line:
 - Dihydropyridine CCB (dCCB, amlodipine 5-10 mg, nifedipine XL 30-120 mg QD); but edema (Na⁺ restrict)
 - ARB (irbesartan 75/150-300 mg, candesartan 4/8-32 mg, telmisartan 20-80 mg QD) → check BMP in a week
 - Chlorthalidone (CTD, 12.5-25 mg QD): longer-acting, better natriuresis; but more metabolic effects (Na⁺, K⁺, glucose) → check BMP after a week
- **These 3 classes should be the backbone of most drug regimens, unless very compelling reason**





Whoa! Why not Losartan?

- Weaker ARB; at a minimum should dose BID
- 24 hour ABPM: losartan in the 18-24 hr post administration statistically no different than placebo





Step 4. Get off on the Right Foot: Choose the Right Initial Medication(s)

- Demographic considerations
 - Age <50 yrs: ARB (ACE-I) or dCCB
 - Age \geq 60 yrs: dCCB or chlorthalidone
 - African-Americans: dCCB or chlorthalidone
- Co-morbidities (BP control > class)
 - MI/LV dysfunction: favor beta-blocker or ARB/ACE-I
 - Atrial arrhythmia: favor beta-blocker or non-dCCB
 - Kidney disease/proteinuria: ACE-I, loop diuretic if \downarrow GFR
 - K: low, avoid diuretic; high, avoid ARB/ACE-I
 - Obese: chlorthalidone





Step 5. Use the Right Medication Combinations

- Next, add the 1st line medication you didn't use
 - dCCB + ARB
 - CTD + dCCB
 - CTD + ARB
- Then, add in the 3rd • • •
- If BP <140/90 mmHg
 - ASVCVD risk <10% → non-med tx first
 - ASVCVD risk ≥10% → med
- BP ≥140/90 mmHg, start 2 meds (I, LOE C)

Yes, it really
is that is
easy.





ASCOT-BPLA

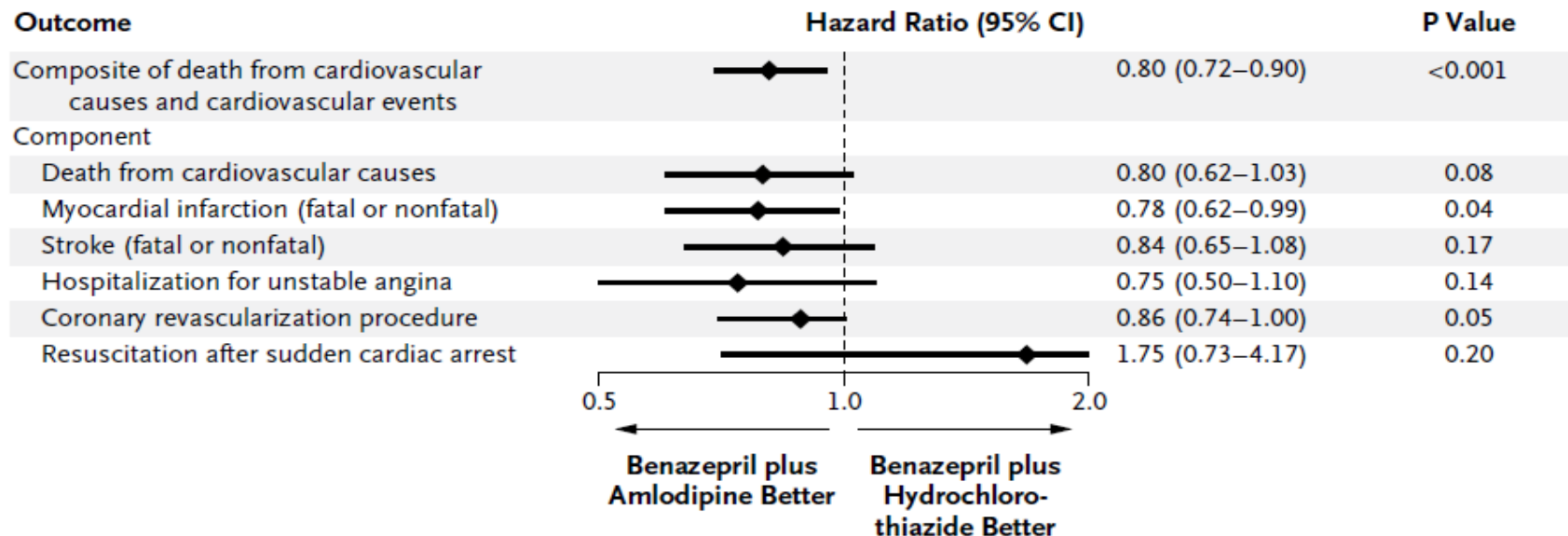
- N = 19,257 w/HTN and ≥ 3 markers of \uparrow ASCVD risk
- Randomized to amlodipine (+ perindopril) vs. atenolol (+ bendroflumethazide)
- Stopped early (median 5.5 years); superiority amlodipine/perindopril arm
 - 11% less all-cause mortality (ARR 1%, $p=0.02$)
 - 24% less CVD mortality (ARR 2%, $p=0.001$)
 - 23% less stroke (ARR 2%, $p<0.001$)
 - 30% less diabetes mellitus (ARR 4.9%, $p=0.0001$)
- Mean BP difference 2.7/1.9 mmHg ($p<0.0001$)





ACCOMPLISH

- N=11,506 patients with HTN + ASCVD, CKD, or DM
- Rdm: benazepril + amlodipine or benazepril + HCTZ
- Terminated early after a mean 36 months
- 1° endpoint: (9.6 vs.11.8%, RRR 19%, ARR 2.2%, $p < 0.001$)



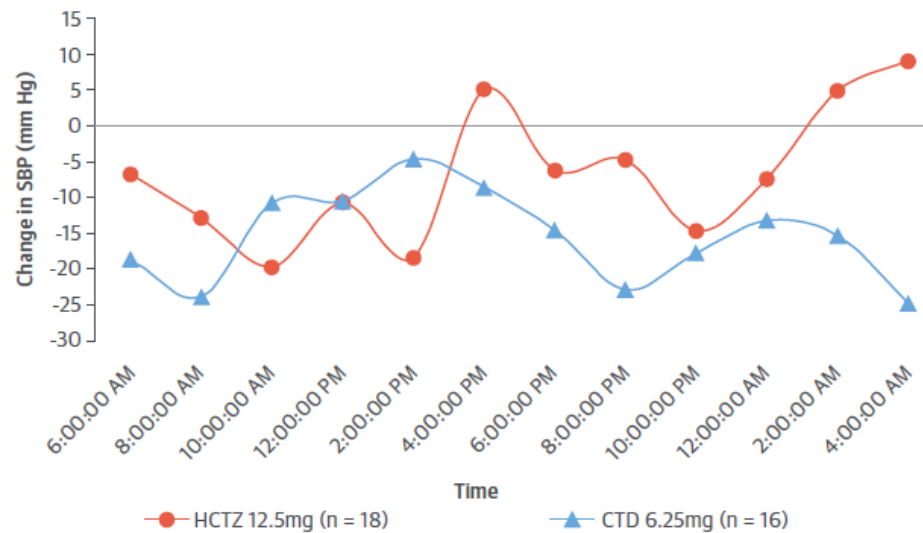
- Similar in obese; amlodipine favored if over- or normal weight





Why Chlorthalidone over HCTZ?

- CTD: more potent, longer-acting (24 vs. 6-12 hrs)
- HCTZ: converts sustained HTN into masked HTN
- Larger, more sustained BP reduction → reduces risk for CVD, HF ($p < 0.001$)



Ernst ME, et al. Hypertension 2006;47:352.

Pareek, A.K. et al. J Am Coll Cardiol. 2016; 67:379. Olde Engberink RH, et al. Hypertension 2015;65:1033





Use of Chlorthalidone and HCTZ

- CTD more effective at controlling BP and reducing CVD events
- Metabolic side-effects are more common
 - Hypokalemia in ~7-8% (HR 2.7)
 - Hyponatremia, esp. in older patients (HR 1.3)
 - Hyperglycemia
 - Hypercalcemia
 - Acute kidney injury
- BMP 7-10 days after starting





WHOA! Why not Beta-Blockers?

- Class I: LV systolic dysfunction, recent MI (<1-3 yrs), angina pectoris, afib rate control, but otherwise ...
 - Less stroke protection than dCCBs or ACE-I/ARBs
 - No effect on CAD c/w placebo (*worse* than diuretics)
 - Increased CVD mortality (esp. >60 yrs old and c/w dCCBs)
 - More side-effects: fatigue, exercise intolerance, sexual dysfunction (except diuretics)
 - Metabolic risks: IGT, dyslipidemia
- Why? Less vasodilation & prolonged ejection (carvedilol no better ☹)





Step 6. Lifestyle, Lifestyle, Lifestyle

	Dose	Impact on SBP
Weight/body fat	<ul style="list-style-type: none">• Goal is ideal body weight; aim for ≥ 1 kg reduction if overweight• Expect ~ 1 mmHg for every 1 kg reduction in body weight	-5 mm Hg
DASH dietary pattern	Consume a diet rich in fruits, vegetables, whole grains, & low-fat dairy, w/reduced saturated fat	-11 mm Hg
Dietary Na ⁺	Optimal < 1500 mg/day; aim for ≥ 1000 mg/day reduction	-5 to 6 mm Hg
Dietary K ⁺	Aim for 3500–5000 mg/d, preferably by dietary intake	-4 to 5 mm Hg





Step 6. Lifestyle, Lifestyle, Lifestyle

	Dose	Impact on SBP
Aerobic exercise	<ul style="list-style-type: none">• 90–150 min/week• 65%–75% heart rate reserve	-5/8 mm Hg
Dynamic resistance exercise	<ul style="list-style-type: none">• 90–150 min/week• 50%–80% 1 rep maximum• 6 exercises, 3 sets/exercise, 10 reps/set	-4 mm Hg
Isometric resistance exercise	<ul style="list-style-type: none">• 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% max. voluntary contraction, 3/week• 8–10 wk	-5 mm Hg
Alcohol consumption	<p>In individuals who drink, reduce to:</p> <ul style="list-style-type: none">• Men: ≤2 drinks daily• Women: ≤1 drink daily	-4 mm Hg





Steal my Smart Phrases

• .JSDASHDIET

- Dietary changes - DASH-Sodium diet.
 - Sodium restriction to <1500 mg/day. Never add salt.
 - Read labels. Buy foods that say "no sodium" or "low sodium."
 - At restaurants, tell the server "no added salt."
 - Increase fruits and vegetables, limit saturated fat, limit alcohol.
 - Make sure you get adequate calcium from low fat dairy products.
 - Dietician to review with you.

• .JSEXERCISE

- Get regular exercise. Every day - target 30-60 minutes.
 - **Schedule it** - preferably in the morning
 - Accountability - get a partner, join a group, join a class, join a club
 - Dose:
 - 150 minutes per week is the minimum, but 250-300 minutes per week are needed for weight loss.
 - Moderate intensity = 12-14/20 = short of breath and sweating, but not so bad that you can't speak.
- Type of exercise:
 - You like to do the following: ***
 - Do a mixture of activities and vary your routine so you do not get bored, get an overuse injury, or get so efficient that you burn fewer calories.
 - Add muscle toning, core, and/or balance training 1-2x a week.





Resistant Hypertension

- Confirm **accurate measurements** (technique, calibrated system)
- Assure taking at least **3 drugs at optimal doses**, including a diuretic and compliant
- Assure **compliance with lifestyle** measures (esp. Na⁺ restriction, NSAIDS, alcohol)
- **Add spironolactone** (25-50 mg/day); as effective as clonidine, > doxazosin, bisoprolol
- **Add doxazosin**
- **Increase diuresis** (add loop diuretic), esp. if CKD or on powerful vasodilator

Krieger EM, et al. Hypertension 2018;71:681

Williams B, et al. Lancet 2015;386:2059

Whelton PK, et al. J Am Coll Cardiol 2018;71:e127





Patients ≥ 65 Years Old

COR	LOE	Recommendations
I	A	Treatment goal <130 mm Hg for <u>noninstitutionalized, ambulatory, community-dwelling</u> adults
Ia	C-EO	For older adults w/ <u>high burden of comorbidity & limited life expectancy</u> , clinical judgment, patient preference, and a team-based approach to assess risk/benefit is reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs.

UW Health: **Less intensive target BP considered** in patients

- With a one-minute standing SBP <110 mmHg
- With a history of orthostatic hypotension
- Who are intolerant to their current medications
- With a history of falls and/or frailty
- Who have difficulty with medication adherence including alcohol abuse, psychiatric disease



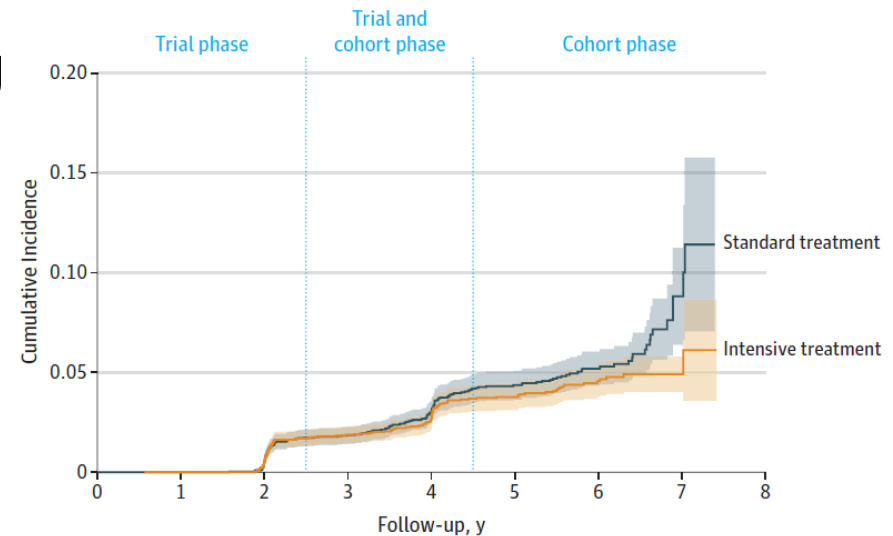


Patients ≥ 65 Years Old

COR	LOE	Recommendation for Prevention of Cognitive Decline and Dementia
Ia	B-R	In adults with hypertension, BP lowering is reasonable to prevent cognitive decline and dementia.

SPRINT-MIND (N=9358)

- Mean 67.9 yo; SBP 139.7 mmHg
- Randomized:
 - SBP ≤ 140 vs < 120 mmHg
- Median follow-up: 5.1 years
- 19% reduction in mild cognitive impairment ($p=0.007$)
- 17% reduction in dementia ($p=0.10$)





Summary

- Use home BP measurements (technique matters!)
- Use dCCBs, long-acting ARBs, and chlorthalidone
- Avoid beta-blockers, HCTZ, ndCCBs, and short-acting meds
- Limit sodium intake
- Add spironolactone
- It's not 1999!





What's Good for the Heart is Good for the Mind

