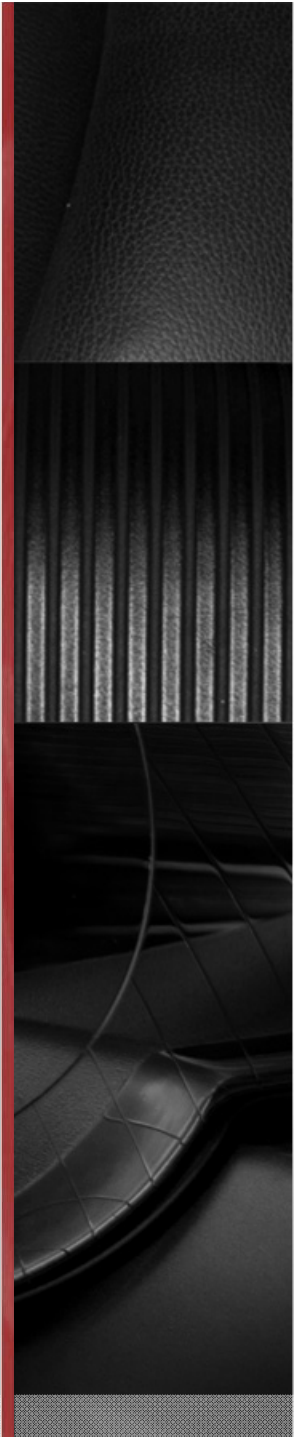


What Every Houseofficer Needs to Know about Hypertension

Michael M. Garrett, M.D.
Hospitalist
Associate Clinical Professor
University of Arizona
School of Medicine





Goals

- Identify the medications which are first line anti-hypertensives
- Identify the BP targets for different patient groups
- Identify hypertensive urgencies and emergencies.

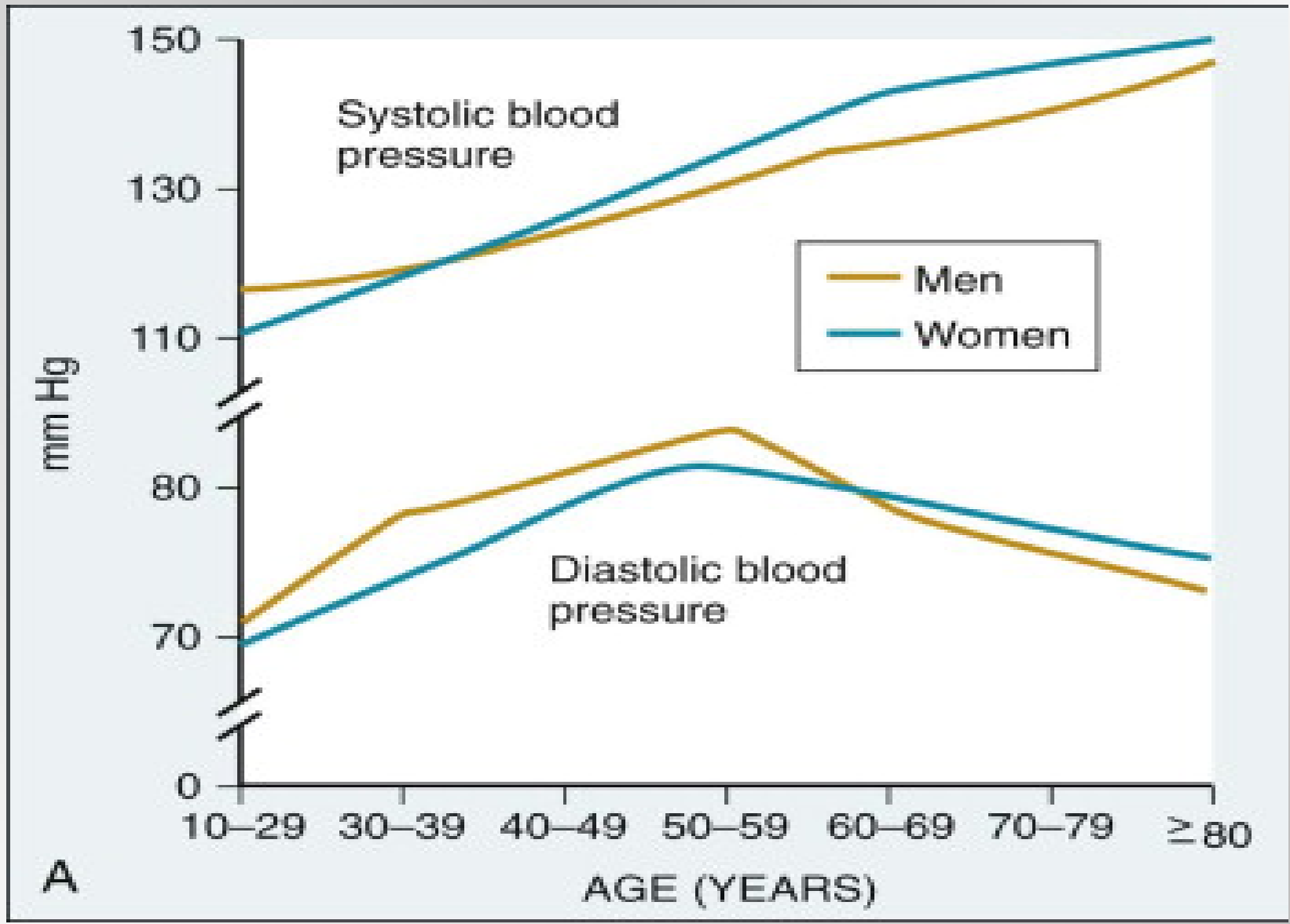


Incidence of HTN in the United States

- Whites and Hispanics 25%
- Blacks 40%
- 80 million Americans

Hypertension goes up with age

Age	Men (%)	Women (%)
20-34	11.1	6.8
35-44	25.1	19.0
45-54	37.1	35.2
55-64	54.0	53.3
65-74	64.0	69.3
>=75	66.7	78.5



A

Only ~ one half of patients with HTN in the U.S. are controlled.

National Health and Nutrition Examination Survey


	NHANES II 1976-1980	NHANES III 1988-1994	NHANES 1999-2004	NHANES 2007-2008
Awareness	51	68.5	71.8	80.7
Treatment	31	53.1	61.4	72.5
Control	10	26.1	35.1	50.6



White Coat Hypertension: New Insights from Recent Studies

Hypertension. 2013;62:982-987.

- Defined as Office $>140/90$ and ABPM $<130/80$.
- Incidence: 15-30% of those with office BP $>140/90$.
- If $>140/90$, average reduction by 3rd visit: 15/7 mm.
- Up to 1/3rd of patients with apparent resistant HTN have WCH on ABPM.



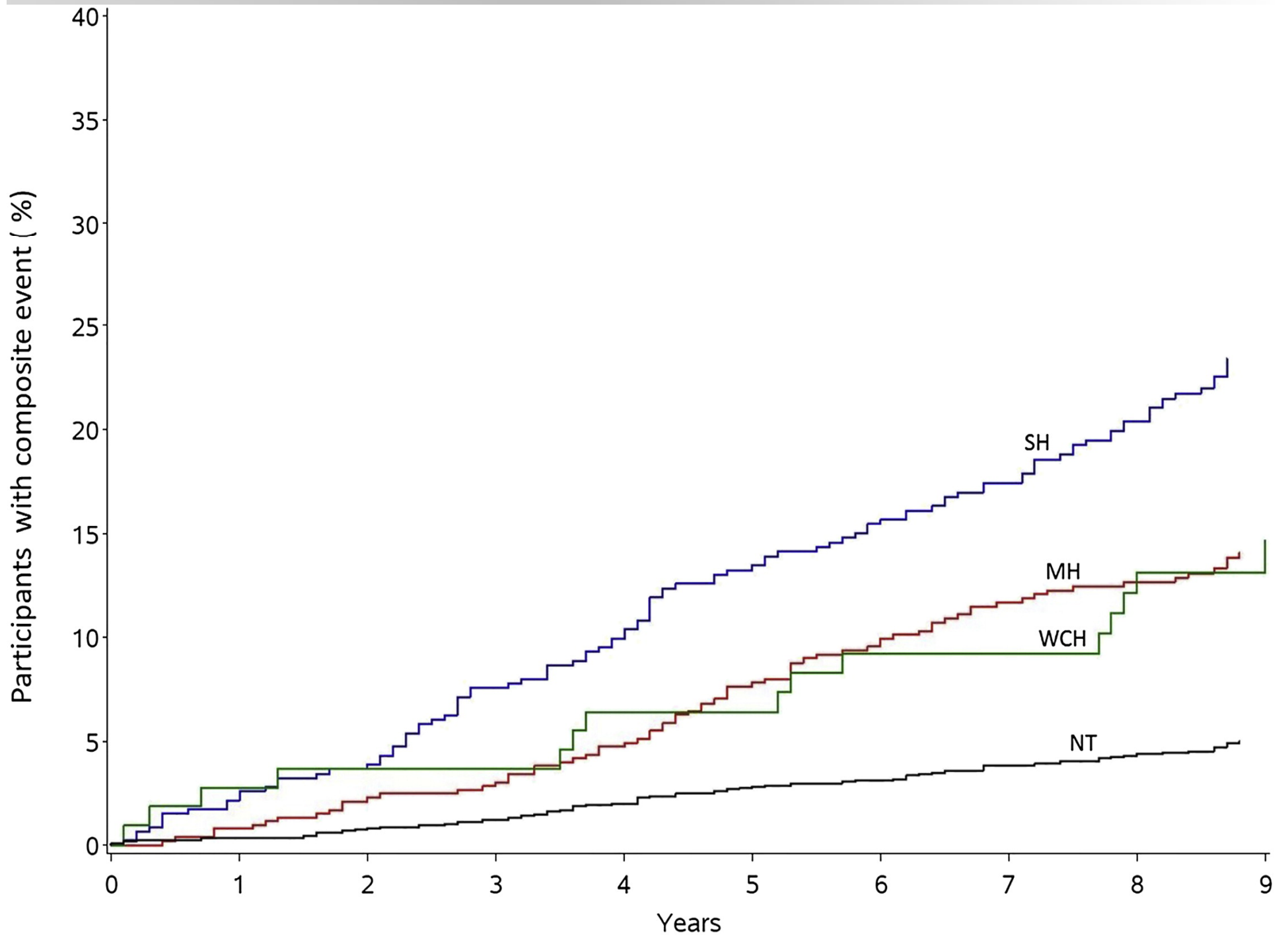
Target organ complications and cardiovascular events associated with masked hypertension and white coat hypertension: analysis from the Dallas heart study

JASH 9(4) April 2015

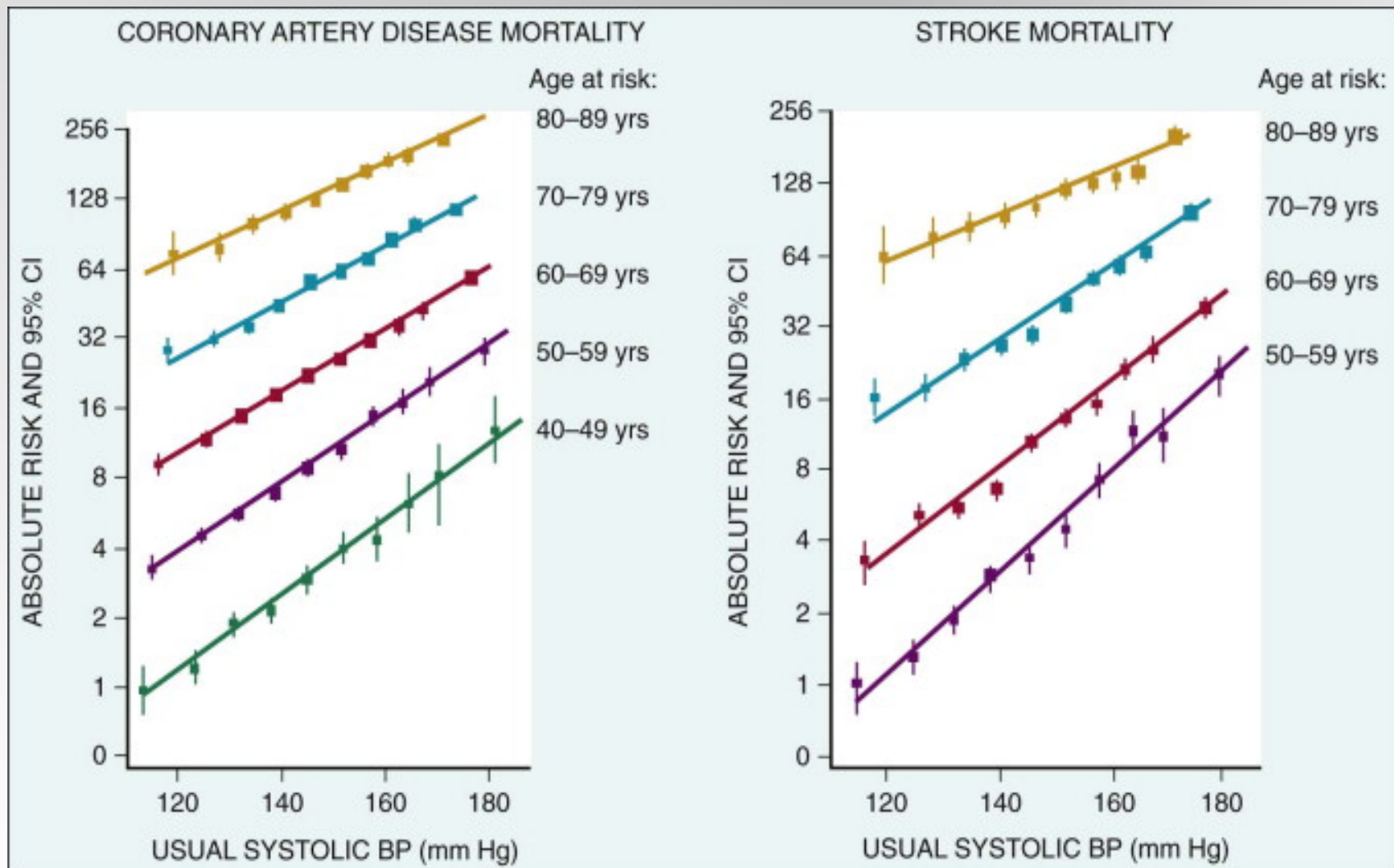
3027 patients in Dallas Heart Study followed for 9 years.

- White coat HTN (HBP < 135/85 & CBP > 140/99) = 4.1%
- Masked HTN (HBP > 135/85 & CBP < 140/90) = 19.2%
- Sustained HTN (HBP > 135/85 & CBP > 140/90) = 17.1%

→ Almost 3x as many CV events in the WCH and MH groups as in the normotensive group. This is the first evidence of target organ damage in a multi-ethnic group.



Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million Adults in 61 prospective studies *Lancet* 2002; 360: 1903–13



Note that risk rises with BP > 115/75.

A 20 mm increase doubles the Relative Risk at any age, but at older ages the Absolute Risk is logarithmically increased.

e.g. a 45 yo man whose sys goes from 140 to 160 moves his RR of a CV death from 2 to 4. An 85 yo man with the same increase moves his RR from ~80 to 160.

**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

JNC 8 Blood pressure Goals

Evidence grades range A (strong) to E (expert opinion)

Patient	BP Goal	Evidence Grade
<ul style="list-style-type: none">• < 60 years• Diabetes• CKD	140/90 mmHg	E
<ul style="list-style-type: none">• \geq 60 years	<i>150/90 mmHg</i>	A

- **JNC8 Medication selection**

Patient

Characteristics

First Line rx

Evidence Grade

Nonblack

ACEI or ARB
CCB
Chlorthalidone

B

Black

CCB
Chlorthalidone

B

C – pts with
diabetes

CKD (incl Blacks)

ACEI or ARB

B

“Triple therapy with an ACE or ARB, CCB, and chlorthalidone would precede use of alpha-blockers, beta-blockers, or any of several other agents.”

More...

- ACE inhibitors and ARBs should not be used in the same patient simultaneously.
- Start at half dose, so that there is only one more potential adjustment to make.
- If systolic > 20 mm over goal, begin two agents now.

HCTZ is a first line agent for the treatment of HTN in 2015.

True

or

False

False.

HCTZ is **NOT** a first line anti-hypertensive in 2015.

Beta blockers are indicated in most patients with CAD.

True

or

False

False!

If beta blockers had some special effect in patients with CAD, then all the early HTN trials would have demonstrated the superiority of beta blockers over other anti-hypertensive agents, because so many patients with HTN have CAD. This did not happen.

If you decide to move your patient from a beta blocker to a another class of agent, can you stop the metoprolol today and begin the new agent tomorrow?


No.

Abrupt cessation in a patient with underlying CAD can lead to increased BP, increased angina, MI, or sudden death.

Taper the dose by half every 3 days.

SPRINT

Systolic Blood Pressure Intervention Trial



A Randomized Trial of Intensive vs Standard BP Control

N Engl J Med 373:22 Nov 26, 2015

9631 pts w/ sys 130-180 **AND** increased CV risk* (any of below)

- CAD/PAD/CAS
- CKD w/ eGFR 20 – 59
- 10 yr Framingham risk score > 15%
- => 75 years old

Patients with **diabetes, stroke, and HF (EF<35%)** were excluded.

Randomized to <120 (**intensive**) or <140 (**standard**)

Omron HEM 907XL IntelliSense Professional Digital Blood Pressure Monitor from Omron


★★★★★ ▾ 17 customer reviews | 10 answered questions



About the Product

- Automatic cuff inflation and deflation eliminates the need to predetermine inflation level setting
- Average mode measures up to three readings and averages the total, for a more accurate measurement
- Greater choice of arm cuff circumferences with four cuff sizes included -- small, medium, large and extra-large
- Reliable power supply through included AC adapter or rechargeable battery pack

Number of agents	Intensive	Standard
0	125 (2.7)	530 (11.3)
1	493 (10.5)	1455 (31.1)
2	1429 (30.5)	1559 (33.3)
3	1486 (31.8)	807 (17.2)
4+	1137 (24.3)	323 (6.9)



SPRINT was stopped by safety monitoring board p 3.26 years because

	standard	intensive
	134.6 mm	121.5 mm
Primary outcome (MI, ACS, CVA, HF, CV death)	2.19%	1.65%


Risk of CV death → 43% lower in intensive group.

	NNT
To prevent primary outcome event	199/yr

No difference in MI or CVA.

HF drove the difference in primary outcome.

To prevent a CV death	561/yr
-----------------------	--------



Blood pressure lowering for prevention of CV disease and death: a systematic review and meta-analysis

Lancet 2015; DOI:10.1016/S0140-6736(15)01225-8.

123 studies between 1966 and late 2015. Over 600,000 patients.

Every 10 mm reduction in sys BP produced a decrease of

- 20% for major CV events
- 17% for coronary heart disease
- 27% for stroke
- 28% for heart failure
- 13% for all-cause mortality

Conclusion:

The findings strongly support the strategy of aiming for a systolic blood pressure below 130 mm Hg, as well as antihypertensive therapy for patients at increased risk for heart disease and stroke, regardless of baseline blood pressures.

Total dollar amount to save one CV death
if patient requires 3 agents.

	Local pharmacy	VA cost
lisinopril 40	\$48/yr	\$12.45
amlodipine 10	84/yr	4.89
chlorthalidone 25	<u>144/yr</u>	<u>44.50</u>
	\$276/yr	\$61.84/yr

561 pts treated x \$276/yr = \$154,836 to prevent one CV death.

VA's cost = \$34,692

Systolic BPs to Aim for

High risk group

CAD/PAD/carotid

Diabetes

CKD

10 yr CV risk > 15%

CVA (ischemic)

>=75 yo

systolic

<125-130

<125-130

<125-130

<125-130

<125-130

<125-130

Others

<140

As always, individualize

Your patient is on half dose of one of the three first line agents i.e.

lisinopril 20 mg, *or*
chlorthalidone 12.5 mg, *or*
amlodipine 5 mg,
and BP is not yet to goal.

Do you increase to full dose?
Or add a 2nd agent?

Response to a second single antihypertensive agent used as monotherapy for hypertension after failure of the initial drug.

Arch Intern Med. 1995;155(16):1757.

1292 men with diastolic 96 – 109 mm.

410 failed initial treatment and moved sequentially to a second or third medication.

Sequential monotherapy

In a patient who has little or no fall in BP after an adequate dose of drug 1, switching to (rather than adding) drug 2 and, if this is ineffective, switching to drug 3 may allow as many as 60 to 80 percent of patients with mild hypertension to initially be controlled with a single agent.

**Combination therapy versus monotherapy in reducing
blood pressure:
meta-analysis on 11,000 participants from 42 trials.**

American Journal of Medicine. 122(3):290-300, 2009 March

42 trials, ~11,000 patients

Conclusion: The extra blood pressure reduction from combining drugs from 2 different classes at half dose each is approximately 5 times greater than doubling the dose of 1 drug.

“In every category of hypertensive drug the largest reduction in blood pressure was seen at a half standard dose with only modestly greater reductions in systolic and diastolic blood pressures at standard doses.”

	BP drop	BP drop
lisinopril	20 mg → 8mm	40 mg → 12 mm
chlorthalidone	12.5 mg → 8mm	25mg → 12mm
amlodipine 5 mg	5 mg → 8mm	10mg → 12mm



Management strategy:

- If your first drug produced a good response at half dose, and you are close to goal, then increase to full dose.
- If your first drug produced a poor response, discontinue that drug and move to a second drug. Depending on response, you may later DC this and move to a third.

You are following a 55 year old Hispanic man with history of an MI three years ago. Ave BP 142/91. He has no comorbidities.

Do you treat him for HTN?

If so, what med to start?

What systolic do you aim for?

He has CAD. He is a high risk patient.

Start an ACEI or an ARB, a CCB or chlorthalidone.

Aim for systolic < 125-130.

At f/u, his BP on amlodipine 5 mg qd is 137/88.

What should you do now?

He has had a poor response, only a 5 mm drop.

You could add a 2nd agent, but it makes more sense to DC amlodipine and go for sequential monotherapy, now with chlorthalidone or an ACEI.

A 67 yo black man presents with ave BP 152/102.
He is found to be diabetic. Other labs are normal.
He is on no meds.

What meds for his BP?

What systolic do you aim for?

Start both a CCB and chlorthalidone. He is more than 20/10 mm over goal, so you will not get him to goal with one agent.

An ACEI is not indicated in a patient who is black, even if they have diabetes.

Aim for systolic < 125 – 130.

You continue to follow this man. Six years later he has developed albuminuria.

His creatinine is 1.1.

His BP on diltiazem and chlorthalidone is 129/82.

Should you change your management?

Yes.

He has now developed CKD.

He now has a primary indication for an ACE.

All races with CKD need an ACEI.

DC one of his two meds and begin an ACE.

The med that should be DCd is chlorthalidone, because non-dihydropyridines delay progression of proteinuric renal failure.

A 67 yo man presents 6 weeks p NSTEMI and 5v CABG.

He is taking dilt SR 180 and metoprolol 25 bid, started at time of MI.

His PCP has read SPRINT and adds lisinopril 10 mg qd for BP 136/82, because she wants systolic < 130.

Is this the best idea?

No.

All MI patients should be DCd on a beta blocker to improve longevity. Continue 3 years.

Goal dose of metoprolol p MI is 100 bid. So a 3rd med should not be added till metoprolol is at goal dose.

Finally, if lisinopril were started, the starting dose is 20 mg, not 10 mg.

A 54 yo man is new to your clinic. The nurse rushes into your office to report his BP is 233/125. He has no symptoms other than slight HA.

You confirm his BP in each arm. What should you do next?

- A) Give clonidine po 0.2 mg or hydralazine 25 mg po STAT and send pt straight to ED
- B) Call the hospitalist for immediate admission to tele
- C) Call the MICU for immediate nitroprusside drip
- D) Give the patient scrips for two anti-hypertensive meds and send him home with f/u in one week



Hypertensive Emergency

Operational definition:

- Blood pressure must be reduced within minutes to hours to prevent a medical catastrophe.

Clinical Policy:

**Critical Issues in the Evaluation and Management
of Adult Patients in the Emergency Department With
Asymptomatic Elevated Blood Pressure**

Approved by the ACEP Board of Directors, February 6, 2013

<http://www.acep.org/clinicalpolicies/>

“In patients with asymptomatic markedly elevated blood pressure, routine ED medical intervention is not required.

Patients ... should be referred for outpatient follow up.”

You are seeing a 54 yo man whose BP is 233/125. He has no symptoms other than slight HA.

What should you do?


D) Give the patient scripts for two anti-hypertensive meds and send him home with f/u within one week




Hypertensive Urgency

Operational definition:

- Any blood pressure high enough to frighten a practitioner into providing inappropriate therapy.



Does it matter what time your patient takes
his BP medication?



INFLUENCE OF CIRCADIAN TIME OF HYPERTENSION TREATMENT ON CARDIOVASCULAR RISK: RESULTS OF THE MAPEC STUDY

Chronobiology International Sep 2010, Vol. 27, No. 8: 1629–1651.

2156 hypertensives randomized to take all meds in AM,
or ≥ 1 med at hs.

Cardiovascular events at 5.6 years

am meds	187
hs meds	68 (RR 0.39)



Bedtime Dosing of Antihypertensive Medications Reduces Cardiovascular Risk in CKD

Journal of the American Society of Nephrology. 22(12):2313-21, 2011 Dec.

661 hypertensives randomized to take all meds in AM,
or ≥ 1 med at hs.

Cardiovascular events at 5.4 years

am	104
hs	35 (RR .31)

Your patient's BP is not controlled on max doses of chlorthalidone, lisinopril, and amlodipine.

What should you think about?

Compliance.

Compliance.

Compliance.

High salt.

ETOH.

NSAIDs.

Sleep apnea.

Secondary causes.

Your patient's BP is not controlled on max doses of chlorthalidone, lisinopril, and amlodipine.

You've eliminated compliance, etc, etc.

What medication now?

Options:

- *Spironolactone

 - 1st choice for add-on therapy.

- *B blockers

 - Double duty if patient has rapid a fib, angina, EF <40%, or is post MI within 3 yr

- * Alpha blockers

 - Double duty if patient has BPH. Bid for HTN.

- *Minoxidil

 - Big gun → possible 10, 20, 30 mm decrease.

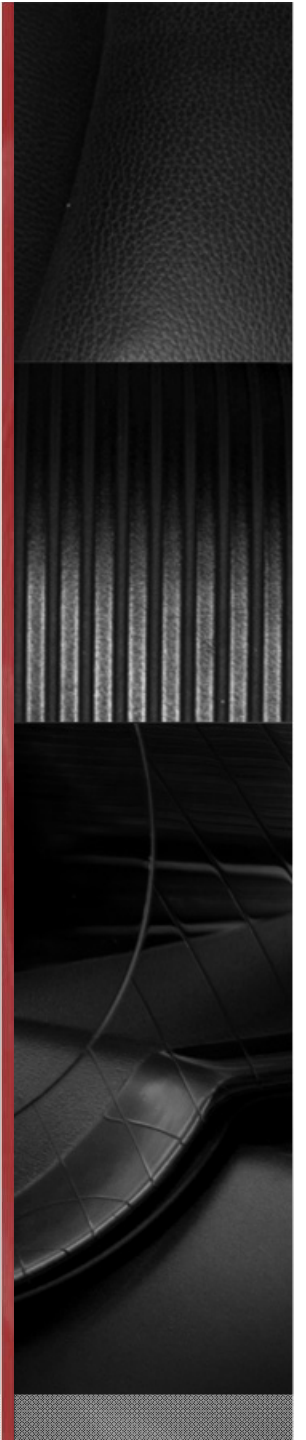
- *Hydralazine

 - Dose bid, not tid or qid

- *Clonidine

 - Possible problems if added to b blocker

Patient examples



63 yo woman presented to ED with chest pain.

PMH: HTN, smoking, sciatica.

BP meds: HCTZ 12.5 mg, atenolol 25 mg

Blood Pressure: 116/68	04/06/10 09:26
Blood Pressure: 109/63	05/03/10 12:51
Blood Pressure: 118/66	04/18/11 12:35
Blood Pressure: 106/72	05/19/11 13:01
Blood Pressure: 111/67	07/19/11 13:17
Blood Pressure: 102/59	08/18/11 11:43
Blood Pressure: 109/53	04/16/12 10:41
Blood Pressure: 91/54	07/01/13 09:59
Blood Pressure: 96/58	07/31/13 10:39
Blood Pressure: 97/63	09/12/13 07:44
Blood Pressure: 97/50	07/08/14 10:17
Blood Pressure: 101/64	07/13/14 07:45

She is 30-40 mm below her goal <140/90.
Two BP meds at modest doses are not
expected to produce this decrement.

BP meds discontinued.

Follow up:

Blood Pressure: 106/66 07/24/14 08:50

59 yo hypertensive, diabetic black man admitted with diarrhea, BP 85/57 and AKI creat 2.0.

Hydrochlorothiazide	25 MG QD
Amlodipine	5 MG QD
Metoprolol tartrate	25MG BID
Lisinopril	20 MG QD

Creatinine falls to 1.2 the next morning and BP is up to 123/79. Do you send him home on this regimen?

No.

We don't use HCTZ in 2016.

We don't use an ACEI in blacks unless they have CKD.

We never use beta blockers, or anti-hypertensives from any other class, until we have maximized ACEI/ARB + chlorthalidone + CCB.

Your 82 yo man with no comorbidities
has BP 176/68.

Should you treat him for hypertension?

Of course!

He is over 75, so a high CV risk patient.

He is not close to goal of $<140/90$.

Your new patient is 58 yo, with BP 166/103, a creatinine of 3.2, urine albumin > 500, and a K of 4.2.

- You begin lisinopril 20, because you know that ACE or ARB is first choice in all patients with CKD.

or

- Ain't no freakin' way I'm starting an ACE on someone with a creatinine that high.

No creatinine is too high to start an ACE.

The higher the creatinine, the higher the K,
the more careful you must be.

But you may be able to postpone dialysis by
a year or two by doing this.

At 2AM the nurse calls to tell you that Mr. Jones' BP is 210/118. What do you do?

1. Call the resident (if you're the intern)
2. Call the nocturnist (if you're the res)
3. Order hydralazine 25 mg po now.
4. Go see the patient.

Go see the patient.

Take the BP yourself. In both arms.

Assess for catecholamine associated states
e.g. MI, PE, acute abdomen, etc.

Remember “regression to the mean”.

What is the correct hydralazine dose to give this patient with hypertensive urgency?

hydralazine 10 mg IV

or

hydralazine 25 mg po

There is no such thing as hypertensive urgency!

“Hypertensive urgency” is an artificial construct with no operational meaning.

There is **NEVER** an indication for a prn antihypertensive.

Your 82 yo man with HTN has been well controlled on chlorthalidone 12.5 mg. Now he has presented with a fib, rate ~ 140. He is asymptomatic.

What should you do?

Rate control drugs for a fib:

- diltiazem, verapamil
- beta blockers
- digoxin
- amiodarone

Dilt or verapamil are first line agents for HTN.

Beta blockers are not.

Diltiazem will control both his HR and his BP.

This 67 yo man has HTN and now BOO from BPH. BP 146/87.

Meds:

lisinopril 40 qd

metoprolol 25 bid

HCTZ 25 qd

What should we do?

Continue lisinopril, a first line agent.

Taper and DC metoprolol, a second line agent.

DC HCTZ, which is no longer used in 2016.

Begin an alpha blocker for both BPH and HTN.

Increase to full daily dose.

terazosin 10 - 20 mg

doxazosin 8 mg

tamsulosin 0.8 mg

Begin chlorthalidone or CCB if BP not to goal.