



Decoding Confusing Guidelines – Practical Management of Hypertension



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Conflict of Interest

- Participated in research studies funded by:
 - NIH
 - NHLBI
 - -VA
 - Kowa Pharmaceuticals.





The burden of disease



>100 Million Americans

• Every 1:3

• Egan, et al. *Circulation*. 2014;130:1692–1699



DICINE

 Individuals who are normotensive at 55 years have a <u>90% likelihood</u> of developing high blood pressure during the next 25 years

• Vasan RS, Beiser A, Seshadri S, et al. Residual lifetime risk for developing hypertension in middleaged women and men: The Framingham Heart Study. *JAMA*. 2002;287:1003-1010







- 43 year old AA man New patient coming in with cold symptoms noted sustained BP 138/99 mmHg (untreated)
- Strong family history of hypertension (parents, 2 older sibs)
- Exam unremarkable



One Million Hypertensives Can't Be Wrong

Meta-analysis of one million adults aged 40 to 89 in 61 prospective observational studies.

 Changes in <u>SBP of 20</u> mm Hg or <u>DBP of</u> <u>10 mm</u> Hg associated with a <u>two-fold</u> <u>difference</u> in death from ischemic heart disease, stroke or other vascular reasons.

• Lewington S, et al. 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





CV Mortality Risk Doubles with Each 20/10 mm Hg BP Increment



CV Mortality Risk

LANCET 2002;60:1903-13 JNC VII JAMA 2003;289:2560-72





Moser M, Hebert PR. Prevention of disease progression, left ventricular hypertrophy and congestive heart failure in hypertension treatment trials. J Am Coll Cardiol 1996;27:1214–8.

Neal B, MacMahon S, Chapman N. Effects of ACE inhibitors, calcium antagonists, and other blood-pressure-lowering drugs. *Lancet.* 2000;356:1955-1964





Changes in Categories from JNC7 to the New 2017 ACC/AHA Guideline

SBP		DBP	JNC7	2017 ACC/AHA
<120	and	<80	Normal BP	Normal BP
120-129	and	<80	Prehypertension	Elevated BP
130–139	or	80–89	Prehypertension	Stage 1 hypertension
140–159	or	90-99	Stage 1 hypertension	Stage 2 hypertension
≥160	or	≥100	Stage 2 hypertension	Stage 2 hypertension









- 43 year old AA man New patient coming in with cold noted sustained BP 138/99 mmHg (untreated)
- Strong family history of hypertension (parents, 2 older sibs)
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Which one of the following predicts CV mortality more accurately?

A. Systolic HTN or B. Diastolic HTN

Relative Importance of DBP and SBP as Predictors of CHD as a Function of Age



CHD, coronary heart disease.

*The difference between SBP and DBP proportional hazard regression coefficients, ie, β (SBP) - β (DBP), was estimated for each age group.

Franklin SS et al. Circulation. 2001;103:1245-1249.

DUEGE SBP, But Not DBP, Increases Throughout Life

- With age,
 - **SBP** increases in linear fashion
 - DBP rises less steeply, plateaus, and declines slightly after the fifth decade



777

DICINE

IIX

Adapted from Galarza CR et al. *Hypertension*. 1997;30:809-816.



LECE



Adapted from Neaton JD et al. Arch Intern Med. 1992;152:56-64.

Systolic BP is directly correlated to risk of stroke and CHD death



Adjusted relative risks of stroke and coronary heart disease death according to baseline SBP in men screened for the Multiple Risk Factor Intervention Trial. Relative risk was adjusted for age, race, serum cholesterol, cigarettes per day, use of medication for diabetes, and income, using a multiple Cox proportional hazards model. Adapted from He, *J Hypertens*, 1999.









- 43 year old AA man New patient coming in with cold noted sustained BP 138/99 mmHg (untreated)
- Strong family history of hypertension (parents, 2 older sibs)
- Exam unremarkable





What would be the first step?

- A. Order secondary hypertension work up
- B. Order lipids, fasting Chem 7, CBC, UA, EKG
- C. Order lipids, fasting Chem 7, UA, CBC, EKG and ECHO
- D. Counsel for life style modifications
- E. Start antihypertensive medication





What would be the first step?

A. Order secondary hypertension work up **B.** Order lipids, fasting Chem 7, CBC, UA, EKG C. Order lipids, fasting Chem 7, UA, CBC, **EKG and ECHO** D. Counsel for life style modifications E. Start antihypertensive medication





How to proceed

- Three key questions to address before starting therapy
 - Essential vs Secondary
 - Assessing other <u>CV risk factors</u>
 - Presence of target organ damage
 (TOD)





DICINE

The management of hypertension is all about global cardiovascular risk management

Treating Hypertension and Other Risk Factors

E



Adapted from Emberson et al. Eur Heart J. 2004;25:484-491.

 43 year old AA man, new patient came in for URI but noted sustained BP 148/99 mmHg (untreated).

E

• Strong family history of hypertension (parents, 2 older sibs).

• Exam and evaluation unremarkable.





What would you prescribe?

A.Lisinopril **B.** Metoprolol C.HCTZ D.Amlodipine E. Losartan





What would you prescribe?

A.Lisinopril B.Metoprolol C.HCTZ D.Amlodipine E.Losartan



Hansson L, et al Lancet 1999. 354:1751-1756,



? Difference in BP control? CVD mortality and morbidity

ALLHAT-JAMA 2002. 288



Cumulative Event Rates for the ARIZONA FYIOENIX Outcome (Fatal CHD or Nonfatal MI) by ALLHAT Treatment Group







JNC 8

2014 Evidence-Based Guidelines for the Management of High Blood Pressure in Adults

JAMA. 2014;311(5):507-520

BHS Antihypertensive Drug Treatment

iE ICINE X

	Aged <55yrs	Aged ≥55yrs or Black	A = ACEi or ARB C = CCB D = Thiazide-like divretic
Step 1	Α	C *	C* = CCB preferred but
Step 2	A	\ + C*	people intolerant of C or at high risk of heart failure
Step 3	A +	- C* + D	
Step 4 Resistant Hypertension	A + C* + D + or add α- ar Consider sp	• Further Diuretic ⁺ nd/or β-blocker ecialist Advice	+ Further Diuretic: Consider low dose spironolactine or higher dose thiazide

http://www.nice.org.uk/guidance/CG127

OF VETE



ACE-inhibitors
ARB
CCB
DURETICS





Evidence is unfavorable

- α-blockers
- β-blockers
- Do not combine an ACE inhibitor with an ARB to treat hypertension

Drugs lacking evidence

DICINE

There are no randomized controlled trials of acceptable quality to determine CV benefit when starting drug therapy with:

- Loop diuretic,
- Nitroglycerin containing agents
- Combined α/β blocking agent
- Direct vasodilator
- Central α2-adrenergic agonist
- Mineralocroticoid receptor antagonist +
- Peripheral adrenergic neuron antagonist



- 45 year old white man (BMI is 34 kg/m2)
- BP 148/100 mmHg
- Fasting glucose 123 mg/dl
- Exam normal

• What would you start?

COLLEC

- 1. Hydrochlorthalidone
- 2. Atenolol
- 3. Lisinopril
- 4. Losartan
- 5. Amlodipine



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Patients with Impaired Glucose

line

- **Diuretics**: Highest rate of "diagnosing" new onset diabetes (NOD)
- Beta Blocker: Higher rate of NOD
- CCB: Neutral
- ACE inhibition: Decreased rate of NOD

BUT

Long term consequences of NOD in hypertensive patients???





E.

- Matthew, a smoker, 53 years of age, is director of finances at your hospital. A diagnosis of stage 1 HTN was made at his annual medical exam 2 years ago
- He lost 15 pounds, walks to work everyday, but is unable to stop smoking
- HbA1c and lipids are normal
- No signs or symptoms of target organ damage
- His initial Rx was hydrochlorothiazide 25 mg qd but with home BP readings averaging 154/90 mmHg in the AM before meds and 132/84 in the PM

You consider

- 1.Leave things as they are. Encourage quitting smoking
- 2. Switch HCTZ to Chlorthalidone
- 3.Stop HCTZ
- 4. Add Amlodipine
- 5.Add Lisinopril




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Diuretic Type

- <u>Both</u> types of diuretics reduced CV events, cerebrovascular events, and HF
- <u>Only</u> thiazide-like diuretics additionally reduced coronary events and all-cause mortality

Event	Thiazide-Type	Thiazide-Like		
CV	0.67 (.5681)	0.67 (0.60-0.75)		
Coronary	0.81 (0.63-1.05)	0.76 (0.61-0.96)		
Cerebrovascular	0.52 (0.38-0.69)	0.68 (0.57-0.80)		
Heart Failure	0.36 (0.16-0.84)	0.47 (0.36-0.61)		
All-cause Mortality	0.86 (0.75-1.00)	0.84 (0.74-0.96)		

Olde Engberink RH. Hypertension 2015;65(5):1033-40



Kruskal-Wallis test used with Dunn's test for multiple comparisons; comparison between baseline and Wilcoxon signed rank test results. Mean 24h SBP was significantly lower for the chlorthalidone group than for the HCTZ group at week 4 (125.52 vs. 139.71 mmHg, respectively, P=0.019) and week 12 (121.87 vs. 136.64 mmHg, respectively, P=0.013). Intent-to-treat population.





• Longer-acting (thiazide-like) diuretics appear more effective at reducing CV évents and SBP & DBP than shorteracting (thiazide) diuretics







- New patient coming to you. 58 AAM with sustained BP 166/98, creatinine of 2.2, and a K of 5.0.
- What would you start?
 - 1. Lisinopril
 - 2. Terazocine
 - 3. Verapamil
 - 4. Amlodipine
 - 5. HCTZ







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Chronic kidney disease

1040
ndifion

Initial Therapy Options

Clinical Trial Basis

Chronic kidney disease

ACEI, ARB

NKF Guideline, Captopril Trial, RENAAL, IDNT, REIN, AASK







• Same patients. Now tells you that he had an MI and stroke 5 years ago in another city.

- What should be his goal BP?
 - 1. <150/90
 - 2. <140/90
 - 3. <130/90
 - 4. <140/80
 - 5. <180/85







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 - 2. <140/90
 - 3. <130/90
 - 4. <140/80
 - 5. <180/85







Hypertension Guidelines 2017

	ACC/AHA 2017		Canada 2017		ACP/AAFP/ESC 2018	
	Threshh old for Rx	Target BP	Threshh old for Rx	Target BP	Threshh old for Rx	Target BP
Low CV Risk			>160/100	<140/90		
Moderate CV Risk	>140/90	<130/80	>140/90	<140/90	>150/90 Age >60 y	<140/90
High CV Risk	>130/80	<130/80	>130/80	<130/80	>140/90	<140/90

- 65 year old man on an Lisinopril 40 mg qd, aspirin, atorvastatin come for post-hospital f/u. Had a small thrombotic stroke (weak right arm) 2 weeks ago.
- BPs are 154-162/80 without orthostasis; heart rate is 68 beats/minute. Labs are normal; EKG Left ventricular strain pattern
- What would you suggest?
 - 1. Metoprolol
 - 2. Nifidipine
 - 3. Chlorthalidone
 - 4. Losartan
 - 5. Increae Lisinopril to 80 mg

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Recurrent stroke prevention

• Thiazide type diuretics plus ACEI

NICE and BSH guidelines 2012 JNC VIII 2003 Lancet. 2001 Sep 29;358(9287):1033-41.



• A 70 man, HTN, Hyperlipidemia, CAD with MI 6 years ago presents with right knee pain for the past 6 months. X-ray - osteoarthritis.

COLLEGE

INE

- Labs are normal
- What would be the most appropriate management plan?
 - 1. Ibuprofen
 - 2. Acetaminophen
 - 3. Oxycodone
 - 4. Diclofenac
 - 5. Celecoxib



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NSAID Use in Patients with Hx of MI

- HR for Death with NSAID use
 - 1.59 at 1year,
 - 1.63 at 5 years.
- HR for recurrent MI with NSAID use
 - 1.3 at 1 year,
 - 1.41 at 5 years.

Circulation 2012, 126: 1955-1963.





NSAIDS and CHF

• Odds ratio for first admission for CHF if patient had heart disease and used NSAIDS - 10.5

• Odds ratio for admission for CHF for patients who have used NSAIDS - 2.1

Arch intern med 2000;160:777-784



- 69 WM with HTN, NIDDM, hypercholesterolemia, CAD s/p CABG, CHF NYHA class II, DJD with occasional LBP and depression on maximum doses of Lisinopril, Metoprolol XL, Amylodipine, Imdur, Simvastatin, Glyburide, Celebrax and Aspirin.
- F/u visit today VS 88, 162/80

Is this resistant hypertension? How do you manage this patient?

RESISTANT HYPERTENSION

•Blood pressure that remains higher than 140/90 mmHg with the optimal or best tolerated doses of 3 meds (ACE inhibitor or angiotensin-II receptor blocker plus a calcium channel blocker plus a diuretic) •Consider adding a fourth antihypertensive drug and/or increasing diuretic doses and/or seeking expert advice.







Hypertension Guidelines 2017

	ACC/AHA 2017		Canada 2017		ACP/AAFP 2017	
	Threshh old for	Target BP	<mark>Threshh</mark> <mark>old for</mark>	Target BP	<mark>Threshh</mark> <mark>old for</mark>	Target BP
	Rx		<mark>Rx</mark>		<mark>Rx</mark>	
Low CV Risk			>160/100	<140/90		
Moderate CV Risk	>140/90	<130/80	>140/90	<140/90	>150/90 Age >60 y	<140/90
High CV Risk	>130/80	<130/80	>130/80	<130/80	>140/90	<140/90







COLLEGE OF MEDICINE PHOENIX

 General population > 60 y/o, initiate medications and treat to BP goal of 150/90 mmHg.

• Level of Evidence: A

Comparison of HTN IN Elderly

COLLE

- JNC 8: > 60 y/o = < 150/90

- ESH/ESC: >80 y/o or elderly < 80 y/o = < 150/90
- CHEP: >80 y/o = < 150/90
- NICE: > 80 y/o = < 150/90
- ASH/ISH: > 80 y/0 = < 150/90

A 43 y/o woman with HTN returns for a follow up visit of her BP. She is without complaints but admits that she has gained about 15 pounds over the last year due to stress, poor diet, and inactivity. At her last visit 6 months ago, her BP was 132/78 mmHg on Lisinopril Hydrochloridone 20/6.5mg.

On exam today, her BP is 138/88 (and verified on repeat). Her exam is unchanged. Her serum creatinine is 1.3 mg/dL, and her RUA reveals > 500 mg/dL of proteinuria.

What would be your next step in managing her blood pressure and proteinuria?

- A. Encourage improved lifestyle adherence and weight reduction but make no medication changes
- B. Increase her thiazide diuretic
- C. Increase her ACE-inhibitor
- D. Increase both her ACE-I and her TZD





- A. Encourage improved lifestyle adherence and weight reduction but make no medication changes
- B. Increase her thiazide diuretic
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D. Increase both her ACE-I and her TZD









 In population > 18 y/o with CKD, initiate medications and treat to BP goal of 140/90 mmHg.

• Level of Evidence: E

• 50 male on Lisinopril and Losartan for HTN and CKD come for routine office visit . BP is well controlled and at goal, he feels well.

COLLEGE

NE

- Trace edema o/w normal exam. Labs eGFR of 55 (baseline 65) and a K of 5.1 (baseline 4.2).
- What would you do next?
 - 1. Add furosemide
 - 2. Add kayexalate
 - 3. Discontinue Lisinopril
 - 4. Discontinue Losartan
 - 5. Add HCTZ

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Dual RAS Inhibition?

- A systematic review and meta-analysis: 33 randomized controlled trials with 68,405 patients (mean age 61 years, 71% men) and mean duration of 52 weeks
- Dual blockade of the renin-angiotensin system was not associated with any significant benefit for all cause mortality (relative risk 0.97, 95% CI 0.89 to 1.06) and cardiovascular mortality (0.96, 0.88 to 1.05) compared with monotherapy.





Dual RAS Inhibition?

- Compared with monotherapy, dual therapy was associated with an 18% reduction in admissions to hospital for heart failure (0.82, 0.74 to 0.92).
- However, compared with monotherapy, dual therapy was associated with
 - -55% increase in the risk of hyperkalaemia (P < 0.001)
 - 66% increase in the risk of hypotension (P < 0.001)
 - 41% increase in the risk of renal failure (P = 0.01)
 - 27% increase in the risk of withdrawal owing to adverse events (P <0.001).

BMJ 2013;346:f360





- The labels for the aliskiren drugs are being updated based on preliminary data from a clinical trial, "Aliskiren Trial in Type 2 Diabetes Using Cardio-Renal Endpoints (ALTITUDE)."
- The trial involved 8606 patients with type 2 diabetes and renal impairment who are at high risk of cardiovascular and renal events.
- The DSMB terminated the trial concluded that
 - patients were unlikely to benefit from treatment added on top of standard anti-hypertensives (ACEI or ARB)
 - and identified an increased incidence after 18-24 months
 - non-fatal stroke
 - renal complications
 - hyperkalemia
 - hypotension





Aliskiren - a Renin Inhibitor

- Aliskiren should not be used in combination with ACEIs and ARBs in patients with
 - -diabetes

moderate to severe renal impairment (GFR < 60 mL/min).





Aliskirin Products

- Tekturna (aliskiren hemifumarate)
- Tekturna HCT (aliskiren hemifumarate and hydrochlorothiazide)
- Tekamlo (aliskiren hemifumarate and amlodipine besylate)
- Amturnide (aliskiren hemifumarate, amlodipine besylate, and hydrochlorothiazide)
- Valturna (aliskiren hemifumarate and valsartan). Valturna has been withdrawn from market.

• A 49 man has had diarrhea and foul smelling stool for the past 8 months.

- PMH of depression ,GERD, hyperlipidemia and hypertension.
- Meds: sertraline, omeprazole, ezetimibe, rosuvastatin and olmesartan.
- Extensive work up was negative.
- What is the most likely cause of his symptoms
 - 1. Sertraline
 - 2. Omeprazole
 - 3. Ezetimibe
 - 4. rosuvastatin
 - 5. Olmesartan

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Olmesartan and Sprue Like Enteropathy

- Case series
- Patient were on 40mg of Olmesartan.
- Villous atrophy or submucosal collagen deposition
- Patients symptoms resolved upon discontinuing Olmesartan.

Mayo Clin Proc. 2012 Aug;87(8):732-8





54 YO WM comes to your office. He has HTN, CAD, HPL on 4 BP/Heart meds but his BP remain uncontrolled around 168/94. You suspect meds nonadherence. Which one could be the best option to check for adherence/compliance.

- 1. Directly observed drug administration
- 2. Medication event monitoring systems (MEMS)
- 3. Patient self-reports since it accurately reflects compliance
- 4. Pharmacy prescription refill data
- 5. A urine test to check compliance with meds.




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KardiAssure Urine Test

- A new convenient, accurate, objective evaluation of Medication Adherence
- Urinalysis to determine nonadherence to prescribed antihypertensive medications is associated with improved adherence.
- Capable of assessing 50+ medications across 3 major CV conditions (hypertension, coronary artery disease, heart failure).
- Cost ~\$100. Though covered by Insurance/Medicare





- A 43 y/o AAM w/ Type 2 DM and HTN, presents for follow up. His is asymptomatic and adherent to his medication regimen: Metformin 500mg BID, Lis/HCT 20/25mg daily, Amlodipine 5mg, and ASA 81mg. On exam, his BP = 138/80 mmHg. His cardiovascular exam is normal. He has decreased pinprick sensation in his bilateral great toes. Peripheral pulses are normal. On lab review, his CBC, BMP, and RUA are normal. His A1c=8.3%.
- In addition to adjusting his Type 2 DM medication regimen, what additional changes would you make?
- A. None
- B. Increase Amlodipine to 10mg
- C. Increase Lisinopril to 40mg
- D. Add an additional BP agent, such as a beta-blocker





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Treatment initiation is based on 1. BP levels 2. CVD risk

- SBP <130 and <80 mm Hg
 - Don't treat

• SBP ≥130-140 or DBP ≥80-90 mm Hg

- Treat if any of the following:
 - History of CVD, DM, or CKD
 - 10 yr risk of $CVD \ge 10\%$ using the Pooled Cohort equations
 - Age \geq 65 years and SBP \geq 130
- SBP \geq 140 or DBP \geq 90, mm Hg

LEGE

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Trials Testing the Impact of an Intensive BP Goal on Hypertension Morbidity/Mortality

•





 Stopped early after a median followup of 3.26 years with

Did not achieve it's primary end point



- Did not achieve total recurrent stroke reduction
- Fewer hemorrhagic stroke

A 72 year old male presents to your primary care clinic having recently moved to town. He has no complaints. His PMHx includes high cholesterol (with an unknown LDL) for which he takes Simvastatin 10mg. He had one prior hospitalization for chest pain, but was told "nothing was wrong" with his heart after a 1 night hospital stay. He has a 15 pck-yr history of tobacco use and quit 17 years ago. He swims regularly and abides by a strict Mediterranean diet.

On exam, his BP = 146/86 (repeated to verify) and other vital signs are normal. His cardiovascular and eye exam are unremarkable.

Lab studies reveal a normal CBC, normal serum creatinine, and no proteinuria. His EKG exhibits voltage criteria for LVH.

How would you manage his BP (assume his reading is verified by home monitoring)?

- A. Encourage more exercise and a better diet
- B. Order 24 hr ambulatory monitoring and decide therapy based on those results
- C. Begin therapy with a thiazide-type diuretic
- D. Inform him that based on new guidelines, no anti-hypertension therapy is needed
- E. Let him decide if he wants to take medicines





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E

The BP relationship to risk of CVD is continuous, consistent, and <u>independent</u> of other risk factors.

Each increment of <u>20/10</u> mmHg <u>doubles</u> the risk of CVD across the entire BP range starting from <u>115/75</u> mmHg.

Overall CVD and risk assessment is mandatory.



CINF

- Life style modification is essential
- <u>Degree of blood pressure control</u> appears to be more important than the type of medicines used except in certain situations.
- Systolic hypertensions strong predictor of CVD events for persons over age 50
- Establish <u>mutual goals.</u>



- Monotherapy individualized Diuretics, CCBs, ARBs, ACEIs are safe and effective.
- Most patients with hypertension will **require 2 or more** medications to achieve their BP goals
- When BP is more than 20/10 mm Hg above goal, consideration should be given to initiating therapy with 2 drugs, either as separate prescriptions or in fixed-dose combinations

Key Points

In the absence of compelling indications, follow a standard treatment algorithm, e.g., BHS – NICE, which is effective and linked to good outcomes (ACCOMPLISH)

 Most treatment resistant hypertension can be managed in primary care settings & control rates of 80+% are feasible

• Don't forget statins

Now you should have high confidence in yourself

GE DICINE IX



Light at the end of tunnel







Thank YOU!!







Is it the lowering of BP or the use of specific medication that reduces CV mortality?





Blood Pressure Control in ACCOMPLISH



Jamerson K, et al. NEJM. 2008;359:2417-2428.



COLLEGE

Kaplan-Meier Curves for Time to First Primary Composite End Point



Jamerson K, et al. NEJM. 2008;359:2417–2428.





Hazard Ratios for the Primary Outcome and the Individual Components

Outcome	Haz	ard Ratio (95% CI)		P Value
Composite of death from cardiovascular causes and cardiovascular events			0.80 (0.72-0.90)	<0.001
Component	1			
Death from cardiovascular causes			0.80 (0.62-1.03)	0.08
Myocardial infarction (fatal or nonfatal)			0.78 (0.62-0.99)	0.04
Stroke (fatal or nonfatal)		-	0.84 (0.65-1.08)	0.17
Hospitalization for unstable angina		-	0.75 (0.50-1.10)	0.14
Coronary revascularization procedure			0.86 (0.74-1.00)	0.05
Resuscitation after sudden cardiac arrest	0.5	2.0	1.75 (0.73–4.17)	0.20
	Benazepril plus Amlodipine Better	Benazepril plus Hydrochloro- thiazide Better		

 The benazepril-amlodipine combination was superior to the benazepril-hydrochlorothiazide combination in reducing cardiovascular events in patients with hypertension who were at high risk for such events

CENTRAL ILLUSTRATION: Efficacy and Safety of ACE Inhibitors and ARBs From Head-to-Head Studies and Compared With Placebo Trials

Outcomes	Trials		RR (95% CI)		
Efficacy	fficacy Head-to-Head Studies				
Cardiovascular mortality	5		1.00 (0.89-1.12)		
Myocardial infarction	5		1.07 (0.94-1.22)		
Stroke	4		0.92 (0.80-1.06)		
End-stage renal disease	2	-	0.88 (0.63 <mark>-</mark> 1.22)		
Safety					
Drug withdrawal	8	—	0.72 (0.65-0.81)		
		Favors ARBs Favors ACEIs	-		
Active Treatment Against Placebo					
ACEIs withdrawal	55		0.85 (0.67-1.07)		
ARBs withdrawal	26		0.68 (0.54-0.87)		
		Favors Active Treatment Favors Placebo			
		0.5 1 1.5			

Messerli, F.H. et al. J Am Coll Cardiol. 2018;71(13):1474-82.





Non Antihypertensive medications

COLLEGE

ICINE

• Aspirin:

- use 75mg daily if patient is aged ≥50 years with blood pressure controlled to <150/90 mm Hg
- target organ damage
- diabetes mellitus,
- -10 year risk of cardiovascular disease of $\geq 20\%$

• Statin:

- use sufficient doses to reach targets (up to age 80 years),
- with a 10 year risk of cardiovascular disease of $\geq 20\%$







- 57 year old woman with Type 2 DM. What is her BP goal?
 - 1. <130/80
 - 2. <150/90
 - 3. <140/90
 - 4. <130/90
 - 5. <140/80







• 57 year old woman with Type 2 DM. What is her BP goal?

<130/80
 <150/90
 <140/90
 <130/90
 <140/90







Recommendations

 SBP goal for "most" Patients at low-moderate CV risk Patients with diabetes Consider with previous stroke or TIA Consider with CHD Consider with diabetic or non-diabetic CKD 	<140 mmHg
SBP goal for elderly Ages <80 years Initial SBP ≥160 mmHg 	140-150 mmHg
SBP goal for fit elderly Aged <80 years	<140 mmHg
SBP goal for elderly >80 years with SBP•≥160 mmHg	140-150 mmHg
DBP goal for "most"	<90 mmHg
DB goal for patients with diabetes	<85 mmHg

SBP, systolic blood pressure; CV, cardiovascular; TIA, transient ischaemic attack; CHD, coronary heart disease; CKD, chronic kidney disease; DBP, diastolic blood pressure.

The Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC) - J Hypertension 2013;31:1281-1357



COLLEC

 55 year old white mal with hypertension and LVH (by EKG).

• Currently on a diuretic, with BP of 147/90 mmHg.















- Creatinine is 1.3 mg/dL (eGFR of 44 mL/min/1.73m2).
- K+ of 5.1 mEq/l





Comorbid Conditions

Condition	Initial Therapy Options	Clinical Trial Basis
Diabetes	THIAZ, ACE, ARB, CCB	NKF-ADA Guideline, UKPDS, ALLHAT
Chronic kidney disease	ACEI, ARB	NKF Guideline, Captopril Trial, RENAAL, IDNT, REIN, AASK





Comparison:

- ESH/ESC: < 140/85
- ASH/ISH: < 140/90
- CHEP: < 130/80
- ADA: < 140/80





 In population > 18 y/o with DM, initiate medication and treat to BP goal of 140/90 mmHg.

• Level of Evidence: E


 However, these recommendations are not a substitute for clinical judgment, and decisions about care must carefully consider and incorporate the clinical characteristics and circumstances of each individual patient."





Comparative Effectiveness of Implementation Strategies

Implementation Strategy		Net Change in BP (95% Cl) <i>. mm Hg</i>	Studies, <i>n</i>
Systolic BP	1		
Team-based care with titration by nonphys	ician 🛥	-7.1 (-8.9 to -5.2)	10
Team-based care with titration by physician	n 🗕	-6.2 (-8.1 to -4.2)	19
Multilevel strategy without team-based car	re ——	-5.0 (-8.0 to -2.0)	8
Health coaching		-3.9 (-5.4 to -2.3)	38
Electronic decision-support systems	-	-3.7 (-5.2 to -2.2)	4
Home BP monitoring	-	-2.7 (-3.6 to -1.7)	26
Provider training	-	-1.4 (-3.6 to 0.7)	5
Audit and feedback		-0.8 (-2.1 to 0.5)	2
	–15 0 1 ¹	5	
Net Change in BP, mm Hg			

Mills KT, Obst KM, Shen W, Molina S, Zhang H, He H, Ann Intern Med. 2018;168:110–120.



COLLEG

ICINE

- 45 year old man (BMI is 34 kg/m2)
- BP 148/100 mmHg
- Fasting glucose 123 mg/dl
- Exam normal

In obese patients

ICINE

- **Diuretics**: Highest rate of "diagnosing" new onset diabetes (NOD)
- Beta Blocker: Higher rate of NOD
- CCB: Neutral
- ACE inhibition: Decreased rate of NOD

BUT

Long term consequences of NOD in hypertensive patients???



- 64 year old diabetic man. BP 156/78 mmHg.
- Creatinine is 1.4 mg/dL (eGFR of 44 mL/min/1.73m2).
 K+ of 5.0 mEq/l

• What would you start? 1. Lisinopril 2. Metoprolol 3. Verapamil 4. Amlodipine 5. HCTZ

ICINE



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- Creatinine is 1.4 mg/dL (eGFR of 44 mL/min/1.73m2).
 K+ of 5.0 mEq/l

• What would you start? 1. Lisinopril 2. Metoprolol 3. Verapamil 4. Amlodipine 5. HCTZ

ICINE



Case Study



- 72 year old hypertensive woman on Lisinopril 40 mg.
- She also has osteoarthritis taking 500 mg naproxen twice daily.
- BP is 155/76 mmHg.

- What would be next step
- 1. Continue current treatment
- Increase Lisinopril to 80 mg
- 3. Stop Naproxen and try Acetaminophen
- 4. Add HCTZ
- 5. Add Amlodipine





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- She also has osteoarthritis taking 500 mg naproxen twice daily.
- BP is 155/76 mmHg.

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Modifiable Factors/Conditions

- Salt
- Smoking
- Obesity
- Lack of physical activity
- Sleep apnea
- Anxiety(GAD)/ Panic attack
- Pain-acute or chronic
- Vasculitis
- Delirium with autonomic excess

- Cocain
- NSAIDs, including coxibs
- Alcohol use >12-14 g/day
- Corticosteroids/anabolic steroids

E ICINE

- Oral contraceptive /sex hormones
- Sympathomimetic decongestants
- Cyclosporin and tacrolimus
- Erythropoietin and analogues
- Antidepressants: Monoamine oxidase inhibitors (MAOIs), SNRIs, SSRIs
- Midodrine