Hypertension 101

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Objectives

1. Understand differences between JNC-7 and JNC-8
2. Understand the approach to the diagnosis and evaluation of hypertension
3. Recognize when to look for secondary hypertension
4. Understand current recommendations for the management of hypertension

References

- JNC 7
- JNC 8
- Wright et al. Evidence Supporting a Systolic Blood Pressure Goal of Less Than150 mmHg in Patients Aged 60 Years or Older: The Minority View. Annals of Internal Medicine. Published online January 14, 2014.
- Weber et. al, Clinical Practice Guidelines for the Management of Hypertension in the Community: A Statement by the American Society of Hypertension and the International Society of Hypertension. Journal of Clinical Hypertension, 2014; 16(1):14-26.

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JNC7

- Nonsystematic review of evidence
- Large range of study designs
- Recommendations based on consensus

JNC8

- Systematic review of randomized control trials only*
- Standardized protocol for reviewing RCT's
- Standardized protocol for making recommendations
  - 100% consensus if possible
  - 2/3 majority for evidence based recommendations
  - 75% majority for expert opinion

*In accordance with IOM standards for systematic reviews

Adapted from JNC8

JNC7

- 5 Classes of medications
  - Thiazide-type diuretics
  - ACE inhibitors
  - ARBs
  - Calcium Channel Blockers
  - *Beta Blockers*
- Thiazide-type diuretics first line

JNC8

- 4 Classes of medications
  - Thiazide-type diuretics
  - ACE inhibitors
  - ARB
  - Calcium Channel Blockers
- Therapy dependent on subgroups
  - Nonblack: CCB, ACEi, ARB, Thiazide
  - Black: CCB, Thiazide
  - CKD: ACEi, ARB

Adapted from JNC8

JNC7	JNC8

• Comprehensive discussion of the diagnosis, evaluation, and management of hypertension
  • How to measure BP's appropriately
  • Defines hypertension
  • Initial evaluation of the hypertensive patient
  • Evaluation of secondary hypertension
  • Effects of lifestyle modification on BP
	• Review limited to answering high priority questions
	  • Should therapy be initiated at specific BP thresholds?
	  • Should treatment be focused on achieving BP goals?
	  • What are the differing benefits of different drugs and drug classes?

Adapted from JNC8

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Diagnosing Hypertension

- Normal- Recheck in 2 years
  - Systolic: <120 mmHg
  - Diastolic: <80 mmHg
- Prehypertension- Recheck in 1 year
  - Systolic: 120 – 139 mmHg
  - Diastolic: 80 – 89 mmHg
- Stage 1 Hypertension- Confirm within 2 months
  - Systolic: 140 – 159 mmHg
  - Diastolic: 90 – 99 mmHg
- Stage 2 Hypertension- Immediate treatment or within 1 month
  - Systolic: ≥ 160 mmHg
  - Diastolic: ≥ 100 mmHg

JNC 7

Diagnosing Hypertension

- Blood pressure readings should be obtained
  - With patient's feet on the floor
  - After 5 minutes of rest
  - Arm supported at heart level
  - Caffeine, exercise, and smoking avoided 30 minutes prior

JNC 7

Diagnosing Hypertension

- Home blood pressure measures
  - white coat hypertension
  - masked hypertension

- 24 hour ambulatory blood pressure monitoring
  - Systolic Blood Pressure Intervention Trial (SPRINT).

JNC 7

Once the diagnosis is made, evaluate for cardiovascular risk factors:

- Diabetes
- Family history of premature cardiovascular disease
- History of strokes/MI
- Retinopathy
- CKD
- Smoking
- Left ventricular hypertrophy
- Age

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New Diagnosis Hypertension:

- 12 Lead ECG
- urinalysis
- blood glucose
- hematocrit
- serum calcium
- serum potassium
- serum creatinine
- lipid profile

- Liver Function Tests:
  - ASH/ISH recommendation

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When to evaluate for secondary hypertension:

- Age, severity of hypertension, or labs indicate
- BP's poorly controlled despite appropriate therapy
  - Resistant Hypertension: Uncontrolled BP despite use of 3 medications in different classes with one being a diuretic
- Previously controlled BP's become uncontrolled
- Sudden onset of hypertension

JNC 7

Etiology of Secondary Hypertension

- Hyperaldosteronism
  - Potassium is frequently in the normal, low-normal range
- Obstructive sleep apnea
- Coarctation of the aorta
- Cushing syndrome
- Pheochromocytoma
- Thyroid/parathyroid disease

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43YO male with history of hypertension, hyperlipidemia, Type 2 DM, with previously well controlled hypertension presented after home blood pressure readings of 173/103. He was taking lisinopril and atenolol. He had been on hydrochlorothiazide previously but this was discontinued due to significant hypokalemia.

Labs:
Sodium: 139mmol/L
potassium: 3.7mmol/L
Bicarb:32mmol/L
BUN: 10mg/dL
Creatinine: 1.13mg/dL

Renin: <0.1ng/mL/hr
Aldosterone: 15.5 ng/dL

High suspicion for primary hyperaldosteronism

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Lifestyle Modification

Recommendation	SBP Reduction
Maintain normal body weight: BMI 18.5-24.9kg/m^2	5-20 mm Hg/10 kg
DASH Diet	8-14 mm Hg
Consume less than 2,400 mg of sodium daily	2-8 mm Hg
30 minutes of aerobic activity most days of the week	4-9 mm Hg
No more than 2 alcoholic drinks per day for men and 1 for women	2-4 mm Hg

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Hypertension Management

Stage 1 Hypertension: 140-159 / 90-99 mmHg

- **Consider starting treatment based on cardiovascular risk factors**
- **May consider trial of lifestyle modification**

Stage 2 Hypertension: ≥160 / ≥100 mmHg

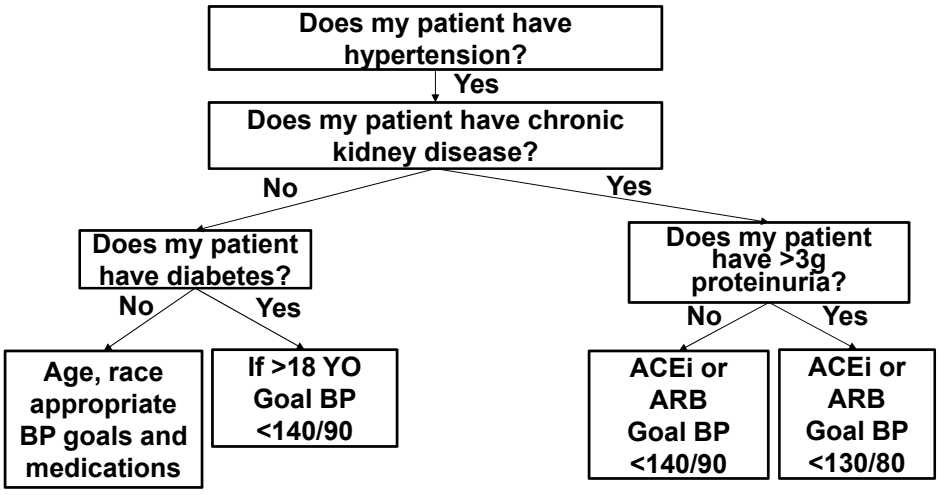
- **Initiate treatment**
- **Consider 2 drug regimen right away**

Strength of Recommendation

- **Grade A**
  - **Strong Recommendation- high certainty of substantial benefit**
- **Grade B**
  - **Moderate Recommendation- moderate certainty of moderate benefit**
- **Grade C**
  - **Weak Recommendation- moderate certainty of a small net benefit**
- **Grade D**
  - **Recommendation against- moderate certainty of no benefit or of risk of harm**
- **Grade E**
  - **Expert Opinion- Net benefit is unclear but it was important to make a recommendation**
- **Grade N**
  - **No recommendation for or against**

JNC 8: Strength of Recommendation

Recommendation Grade	Number of Recommendations
A	2
B	2
C	1
D	0
E	5
N	0



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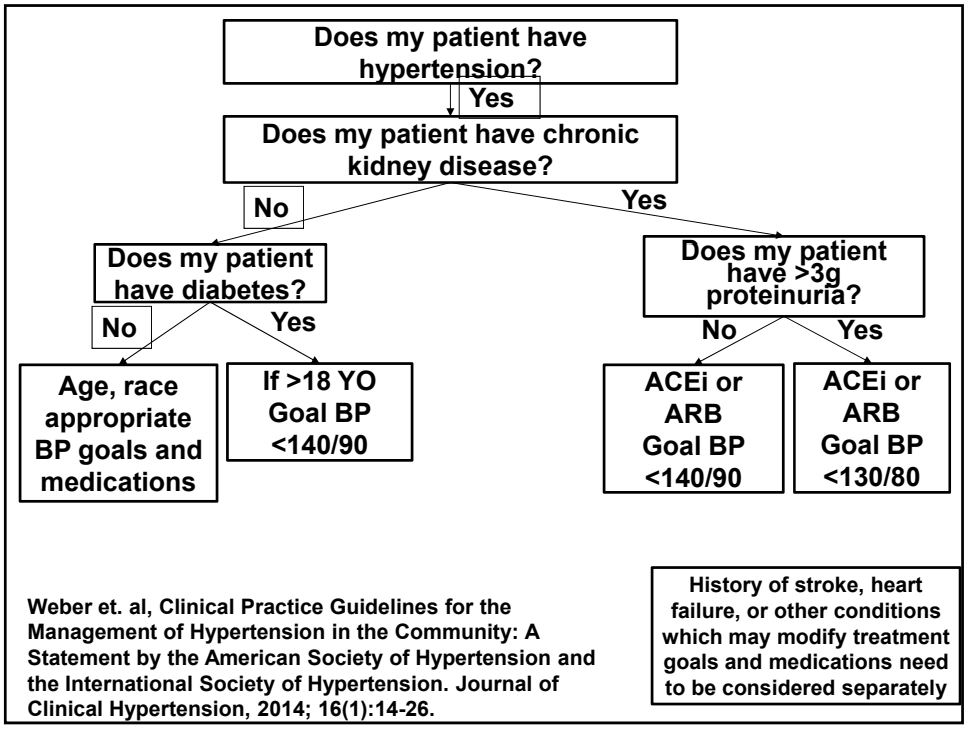

Hypertension Management JNC8

- 18-59 Years Old
  - Treatment Goal: <140/90 mmHg
- >60 Years Old
  - Treatment Goal: <140-150**/90 mmHg
- >80 Years Old
  - Treatment Goal: <150/90 mmHg

18-59 Years Old: Treatment Goal <140/90 mmHg JNC 8 recommendations 2 and 3

Systolic BP Goals <140 mmHg (Grade E)

- No trials comparing other systolic BP goals to the goal of <140 mmHg
- Current standard of treatment
- In diastolic BP trials, many of those who reached diastolic BP goal of <90 mmHg also had systolic pressures <140 mmHg

18-59 Years Old: Treatment Goal <140/90 mmHg JNC 8 recommendations 2 and 3

Diastolic BP Goal <90 mmHg

30-59YO (Grade A)

18-29YO (Grade E)

- **BP goal <90 mmHg non-inferior to goals <85 mmHg or <80 mmHg**

Hypertension Management JNC8

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  - Treatment Goal: <140/90 mmHg
- >60 Years Old
  - Treatment Goal: <140-150**/90 mmHg
- >80 Years Old
  - Treatment Goal: <150/90 mmHg

>60 Years Old Treatment Goal: <140-150**/90 mmHg

<u>SBP Goal <150 mmHg: If <140 mmHg and tolerating, no need to change</u>

JNC 8

<u>SBP Goal <140 mmHg</u>

American Society of Hypertension (ASH)
International Society of Hypertension (ISH)
American College of Cardiology (ACC)
American Heart Association (AHA)
European Society of Hypertension
European Society of Cardiology
Canadian Hypertension Education Program
London National Institute for Health and Clinical Excellence

>60 Years Old Treatment Goal: <140-150**/90 mmHg

<150/90 mmHg (Grade A)

- Few trials
- No difference in outcomes
  - <140 mmHg vs 140-149 mmHg
  - <140 vs 140-160 mmHg
- No evidence to support more aggressive goal

<140/90 mmHg

- Trials are underpowered and not generalizable
- Improvements in cardiovascular disease rates likely due, in part, to BP control
- Slippery Slope
- No evidence of harm with lower BP target

Hypertension Management JNC8

- 18-59 Years Old
  - Treatment Goal: <140/90 mmHg
- >60 Years Old
  - Treatment Goal: <140-150**/90 mmHg
- >80 Years Old (Grade E)
  - Treatment Goal: <150/90 mmHg

Hypertension Management JNC8

Black Patients

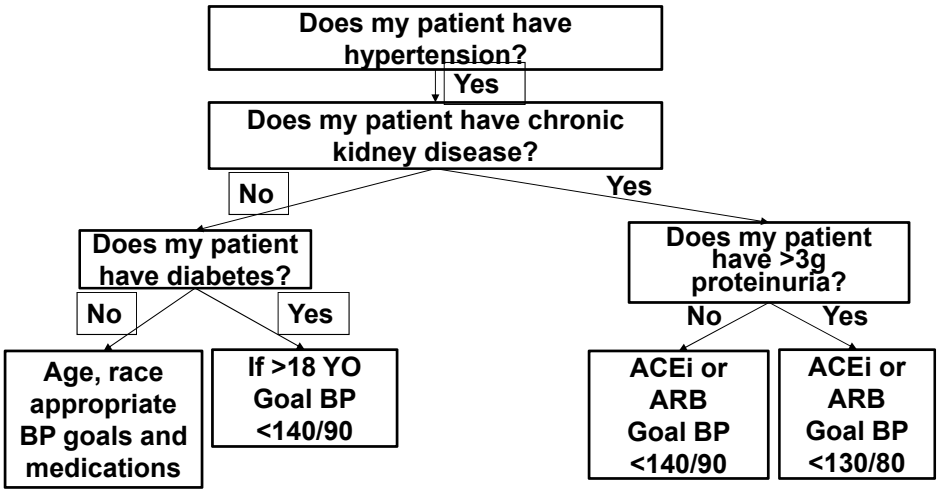
- First Line: (Grade B)
  - Calcium Channel Blockers
  - Thiazide Type Diuretic
- Second Line
  - ACE inhibitor++
  - ARB

++ 51% higher rate of strokes in black patients on ACEi as first line therapy compared to CCB in ALLHAT

Non-Black Patients

- First Line (Grade B)
  - Calcium Channel Blockers
  - Thiazide Type Diuretic
  - ACE inhibitor
  - ARB

*Beta Blockers Not Recommended in JNC8



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History of stroke, heart failure, or other conditions which may modify treatment goals and medications need to be considered separately

Hypertension Management JNC8

- DM >18 years old *without* CKD
  - Goal BP <140/90 mmHg (Grade E)

Hypertension Management JNC8

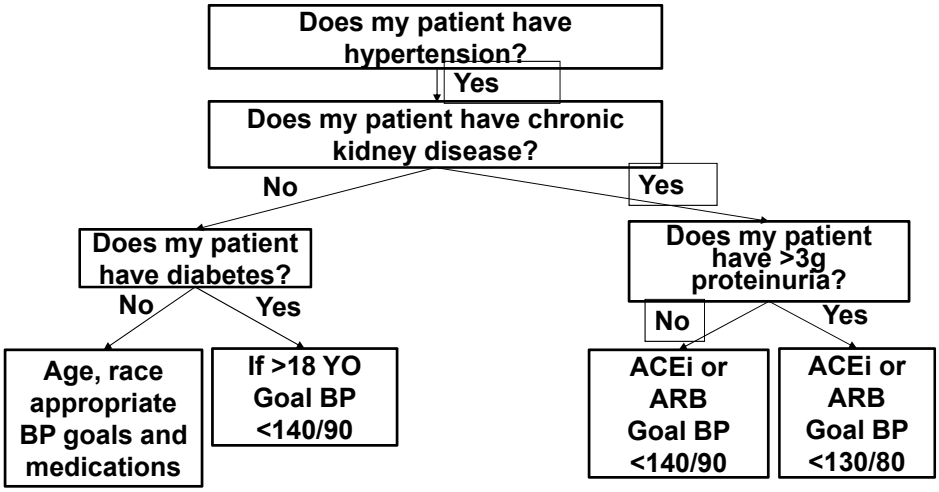
Black Patients

- First Line: (Grade C)
  - Calcium Channel Blockers
  - Thiazide Type Diuretic
- Second Line
  - ACE inhibitor
  - ARB

Non-Black Patients

- First Line: (Grade B)
  - Calcium Channel Blockers
  - Thiazide Type Diuretic
  - ACE inhibitor
  - ARB

*Beta Blockers Not Recommended in JNC8



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Hypertension Management
JNC8

CKD Defined:

GFR <60mL/min/1.73m^2

OR

Albuminuria: >30mg of albumin/g of creatinine

CKD: 18-70 Years Old**

- Treatment Goal: <140/90 mmHg (Grade E)

**Insufficient evidence to make recommendations for patients >70 YO

Hypertension Management
JNC8

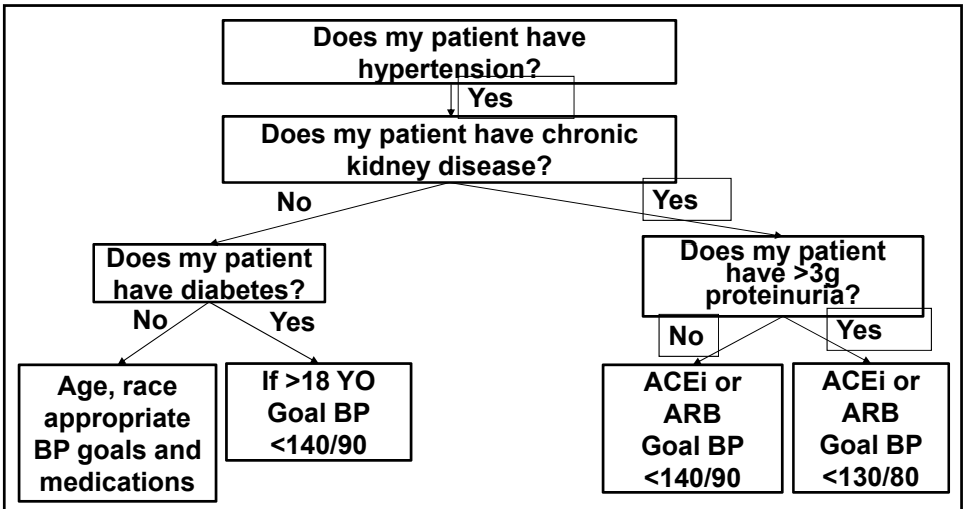
CKD 18-70YO with or without Diabetes (Grade B)

- **Black and Non-black patients**
  - **ACE inhibitor**
  - **ARB**

Hypertension Management
JNC8

Black Patient aged 18-70YO with CKD and hypertension

- **With Proteinuria (Grade E)**
  - **ACEi**
  - **ARB**
- **Without Proteinuria (Grade E)**
  - **CCB**
  - **Thiazide Type Diuretic**
  - **ACEi**
  - **ARB**



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Hypertension Management

- CKD: 18-70 Years Old and >3 gram proteinuria
  - Goal BP <130/80 mmHg
  - Improvement in renal outcomes only

Sarnak MJ et al. The effect of a lower target blood pressure on the progression of kidney disease: Long-term follow-up of the modification of diet in renal disease study. Ann Intern Med. 2005;142: 342–351.

Beta Blockers- Recommend Against JNC 8

	Losartan (n=4605)	Atenolol (n=4588)
Age	66.9	66.9
White	92%	93%
Initial BP (mmHg)	174.3/97.9	174.5/97.7
BP Reduction (mmHg)	30.2/16.6	29.1/16.8

Composite Endpoint: Death, MI, Stroke
Atenolol: 588 events / 1000 patient-years
Losartan: 508 events / 1000 patient-years
HR: 0.87 (p=0.021)

Endpoint: Stroke
Atenolol: 309 events / 1000 patient-years
Losartan: 232 events / 1000 patient-years
HR: 0.75 (p=0.001)

Dahlof et al. LIFE. Lancet. 2002

Additional Thoughts

- **No data on RAAS blockade in patients >75 years old and higher risk of kidney injury**
- **No studies showing benefit of direct renin inhibitors**
- **Do not combine ACE inhibitors and ARBs**

Additional Thoughts

- **Thiazide Type Diuretics- chlorthalidone is most studied in the class, longer duration of action vs HCTZ**
- **Simplicity 3 Trial- Renal denervation for resistant hypertension. Stopped in January.**
- **Sprint Trial: ongoing trial evaluating cardiovascular outcomes for systolic BP goals <120 versus <140 in patients >50 years old**

Conclusion

Lifestyle Modification

Recommendation	SBP Reduction
Maintain normal body weight: BMI 18.5-24.9kg/m^2	5-20 mm Hg/10 kg
DASH Diet	8-14 mm Hg
Consume less than 2,400 mg of sodium daily	2-8 mm Hg
30 minutes of aerobic activity most days of the week	4-9 mm Hg
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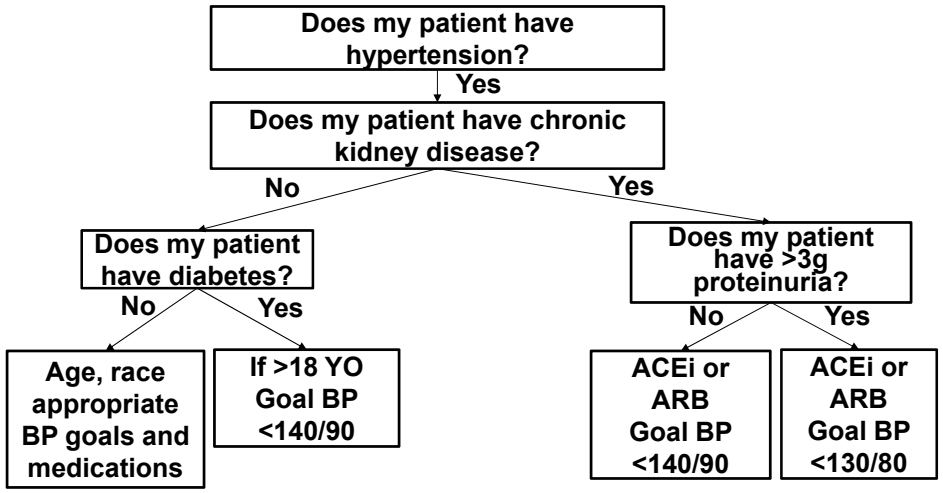
JNC 7



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History of stroke, heart failure, or other conditions which may modify treatment goals and medications need to be considered separately

Case 1

A 43YO black male presents for evaluation of hypertension after being told his blood pressure was high at the dentist's office. In your office, you confirm an elevated BP of 152/94. The patient has a BMI of 29.2kg/m^2, he rarely exercises, and his father had an MI at age 51. Laboratory testing reveals that he has dyslipidemia, an A1C of 6.1, and an estimated GFR of 53mL/min/1.73m^2. He has no proteinuria. He had a normal EKG. After recommending lifestyle modification, what would be your next step in managing this patient with suspected hypertension?

Case 1

1. May be reasonable to give him a trial of lifestyle modification alone for 2-3 months
   a. Home blood pressure monitoring: alert sooner if BP >160/100
   b. Recheck GFR prior to next office visit
   c. Initiate treatment next visit if home BP's are elevated or evidence of CKD

2. Initiate treatment right away
   a. Elevated BP on repeat measures, metabolic syndrome, and significant family history
   b. Reduce treatment at a later time if lifestyle modifications are effective
   c. Without proteinuria: CCB, Thiazide diuretic, ACEi, or ARB would be appropriate

Case 2

A 28YO white male presents to establish care. He was diagnosed with diabetes last year and is on metformin. His blood pressure in your office is 174/102 and he states he frequently has headaches. His BMI is 38kg/m^2. What should be the next steps in evaluation and management?

Case 2

1. Initiate treatment with 2 antihypertensive medications
   a. Patient is potentially symptomatic from hypertension
   b. Medications: CCB, ACEi, ARB, Thiazide type diuretic
2. Home BP monitoring
3. Initiate work-up for secondary hypertension
   a. High suspicion for OSA