CASE STUDY: HYPERTENSION

A.C. is a 56-year old black woman who presents to her primary care provider (PCP) concerned about high BP. At an employee health screening last month, she was told she had hypertension. Her medical history is significant for allergic rhinitis, diabetes mellitus (DM), and osteoarthritis in her right knee. Her BP was 144/84 and 146/86 mmHg last year during an employee health screening at work.

A.C.'s father had hypertension and died of a MI at age 54. Her mother had DM, CKD, gout, and HTN and died of a stroke at age 68. A.C. smokes 1 pack per day of cigarettes and thinks her BP is high because of job-related stress. She does not believe that she really has HTN. A.C. does not engage in any regular exercise and does not restrict her diet in any way, although she knows she should lose weight.

Physical exam shows she is 5'8" tall, weighs 108 kg (BMI = 35.2), BP is 148/88 (left arm) and 146/86 (right arm) and heart rate is 80 bpm. Six months ago, her BP values were 152/88 and 150/84 when she was seen by her doctor for allergic rhinitis.

A.C. takes metformin (Glucophage) 1000 mg PO BID before breakfast and dinner for her DM, fluticasone (Flonase) for her allergic rhinitis, and naproxen (Naprosyn) 500 mg PO BID for her osteoarthritis.

A.C.'s fasting lab serum values are as follows:

BUN: 32 mg/dL (7-18 mg/dL)
Cr: 1.5 mg/dL (0.6-1.2 mg/dL)
Albuminurea: 210 mg/24 hrs (< 30 mg/24 hrs)
Glucose: 165 mg/dL (70-115 mg/dL)
K: 4.8 mEq/L (3.5-5.2 mEq/L)
Uric acid: 6.9 mg/dL (2.6-6.0 mg/dL)
Total cholesterol: 240 mg/dL (< 200 mg/dL)
LDL-C: 165 mg/dL (< 130 mg/dL)
HDL-C: 32 mg/dL (> 35 mg/dL)
Triglycerides: 240 mg/dL (35-135 mg/dL)

An ECG is normal except for left ventricular hypertrophy (LVH).

Assess A.C.'s current and past medical history and provide a treatment plan to control her hypertension.

Chronic kidney disease classification based upon glomerular filtration rate and albuminuria

GFR stages	GFR (mL/min/1.73 m^2)	Terms
G1	≥90	Normal or high
G2	60 to 89	Mildly decreased
G3a	45 to 59	Mildly to moderately decreased
G3b	30 to 44	Moderately to severely decreased
G4	15 to 29	Severely decreased
G5	<15	Kidney failure (add D if treated by dialysis)
Albuminuria stages	**AER (mg/day)**	**Terms**
A1	<30	Normal to mildly increased (may be subdivided for risk prediction)
A2	30 to 300	Moderately increased
A3	>300	Severely increased (may be subdivided into nephrotic and nonnephrotic for differential diagnosis, management, and risk prediction)

The cause of CKD is also included in the KDIGO revised classification but is not included in this table.

GFR: glomerular filtration rate; AER: albumin excretion rate; CKD: chronic kidney disease; KDIGO: Kidney Disease Improving Global Outcomes.

CrCl = (140-Age)(IBW) / (72)(sCr)

IBW = (2.3)(inches > 5') + 45.5 kg

IBW = (2.3)(8) + 45.5 kg
= 63.9 kg

CrCl = (140 - 56)(63.9) / (72)(1.5)
= 49.7 ml/min

CrCl (female) = (49.7)(0.85)
= 42.2 ml/min

- GFR Stage: G3b (mod-severe CKD)
- Albuminuria: A2 (moderately increase)

In CKD, Discontinue NSAIDs: DC Naproxen and recommend (1) Voltaren (diclofenac) topical cream QID, (2) Tylenol (APAP) trial, (3) Duloxetine (Cymbalta) 60 mg daily, (4) Ultram (tramadol) 50 mg Q6H prn mod-severe pain.

ACC/AHA: Clinical Practice Guidelines (2017)

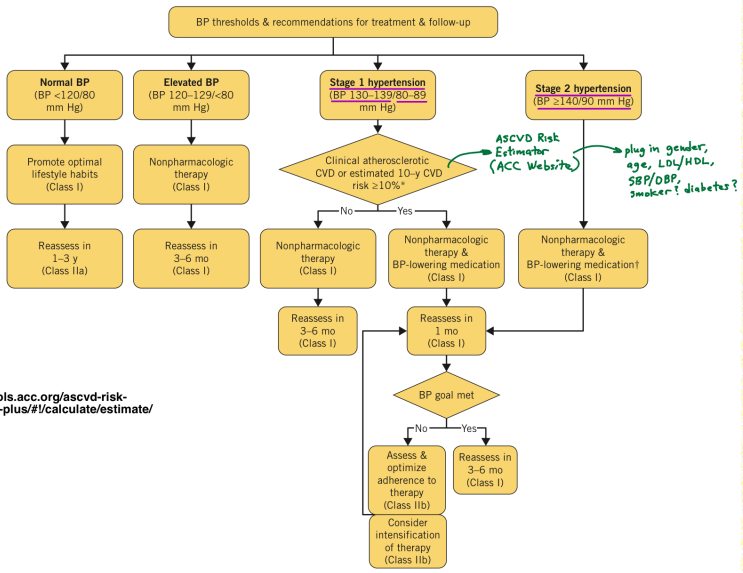
TABLE 1. Comparing BP classifications[4,7]

If the patient's systolic and diastolic BPs fall into different categories, classify the patient's hypertension according to the highest category.

Systolic BP (mm Hg)	Diastolic BP (mm Hg)	2017 guideline	JNC 7
<120	<80	Normal	Normal
120-129	<80	Elevated	Prehypertension
130-139	80-89	Stage 1 hypertension	
140-159	90-99	Stage 2 hypertension	Stage 1 hypertension
≥160	≥100		Stage 2 hypertension

life-style modifications

pharmacologic treatment



https://tools.acc.org/ascvd-risk-estimator-plus/#!/calculate/estimate/

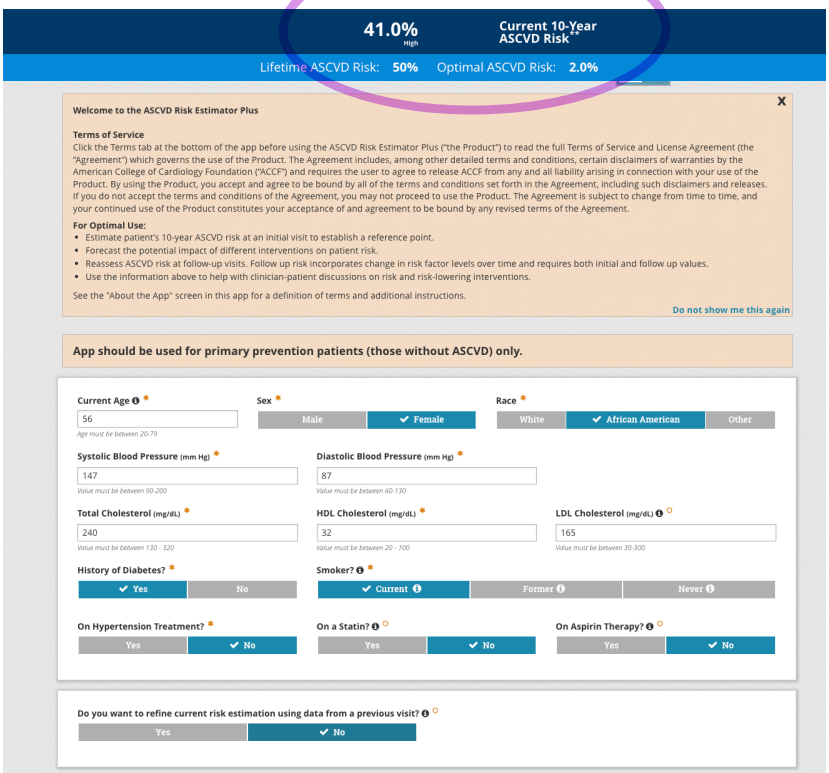
CASE STUDY: TREATMENT PLAN

- **RECOMMENDATION 1:** Change naproxen to diclofenac topical cream and/or acetaminophen and/or duloxetine and/or tramadol.
- **RECOMMENDATION 2**: ACE-I / ARB + thiazide diuretic in patient with "Stage 2" HTN with CKD.
  - ACE-I / ARB improves kidney outcomes in HTN and CKD
  - Diuretics are useful when added to ACE-I / ARB in patients with HTN & CKD because …
    - Diuretics reduce edema and extracellular fluid (ECF) volume associated with CKD.
    - Diuretics reduce the risk of hyperkalemia in CKD patients taking ACE-I / ARB.
      - Note: A.C.'s serum K = 4.8 (normal: 3.5-5.2)
      - The risk of hyperkalemia in a patient with CKD taking an ACE-I / ARB is minimized by adding a diuretic (thiazide or Loop).
    - A.C. should receive a prescription for allopurinol (Zyloprim) 300 mg PO daily to maintain uric acid levels < 6.0 while on a diuretic.
- **RECOMMENDATION 3**: High-intensity statin to reduce LDL-C level by 50% or more in a hypertensive patient with DM and a 10-year ASCVD risk > 20%: Atorvastatin (Lipitor) 20-40 mg PO daily or Rosuvastatin (Crestor) 20-40 mg PO daily.
  - Ezetimibe may be added to a high-intensity statin in a patient with HTN and DM with a 10-year ASCVD risk > 20% to reduce LDL-C by 50% or more.
    - Ezetimibe (Zetia) 10 mg PO daily works by inhibiting the absorption of cholesterol in the small intestines.
- **RECOMMENDATION 4**: Add a SGLT-2 inhibitor (Dapagliflozin) to (1) improve glycemic control, (2) reduce the progression of CKD, and (3) reduce ASCVD risk.

INITIAL TREATMENT RECOMMENDATIONS

- In the absence of specific compelling indications: ACE-I or ARB, CCB, and thiazide diuretic.
- General non-black population, including those with diabetes, initial pharm treatment should include: ACE-I or ARB, CCB, and thiazide diuretic.
- General black population, initial treatment should include: CCB and thiazide diuretic.
- All patients with CKD and HTN, initial tx should include: ACE-I or ARB → improve kidney outcomes
- In all hypertensive patients, if goal BP is not reached within a month of initiating treatment, increase the dose of the initial drug OR add a 2nd drug from a different class.

(1) increase dose of initial drug **(2) add 2nd drug from a different class** **(3) discontinue initial drug and try drug from a different class.**



Treatment Advice*

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LDL-C Management (for this Patient)

At least moderate intensity statin initiation is indicated (I, A). High-intensity statin therapy is reasonable to reduce LDL-C by ≥50%. (IIa, B-R). Addition of ezetimibe to statin therapy is also reasonable to reduce LDL-C by ≥50%.

- Clinicians and patients should engage in a risk discussion that considers patient preferences for individualized treatment.
  Discussion checklist
- Clinician should evaluate for presence of risk enhancing factors that may favor statin initiation.
  Overall list of risk enhancing factors
  Additional risk factors for diabetes patients
  Race/ethnic specific factors in assessing and treating ASCVD risk
- If statin therapy is decided upon, clinician and patient should discuss risk and benefits before initiation.
  Statin types and intensities

Supporting Guideline Recommendations

Clinician-Patient Risk Discussion

- Clinicians and patients should engage in a risk discussion that considers risk factors, adherence to healthy lifestyle, the potential for ASCVD risk-reduction benefits and the potential for adverse effects and drug–drug interactions, as well as patient preferences for an individualized treatment decision. (I,B-NR)
- A clinician-patient risk discussion is recommended before initiating statin therapy to review net clinical benefit, weighing the potential for ASCVD risk reduction against the potential for statin-associated side effects, statin-drug interactions and safety, while emphasizing that side effects can be addressed successfully. (I,A)

Drug Therapy for Risk Reduction

- In adults 40 to 75 years of age with diabetes mellitus, regardless of estimated 10-year ASCVD risk, moderate-intensity statin therapy is indicated. (I,A)
- In patients with diabetes mellitus who have multiple ASCVD risk factors, it is reasonable to prescribe high-intensity statin therapy to reduce LDL-C by 50% or more. (IIa, B-R)
- In adults with diabetes mellitus and 10-year ASCVD risk 20% or higher, it may be reasonable to add ezetimibe to maximally tolerated statin therapy to reduce LDL-C by 50% or more. (IIb, C-LD)

Risk Enhancing Factors

- Clinicians should consider conditions specific to women such as premature menopause (age < 40 years) and history of pregnancy-associated disorders (hypertension, preeclampsia, gestational diabetes mellitus, small-for-gestational-age infants, preterm deliveries); when discussing lifestyle intervention and the potential for benefit of statin therapy. (I,B-NR)
- For clinical decision-making in adults of different race/ethnicities, it is reasonable for clinicians to review race/ethnic features that can influence ASCVD risk (1) so as to adjust choice of statin or intensity of treatment. (IIa, B-NR)
- In adults 40-75 years who have LDL-C 70-189 mg/dL (1.7 to 4.8 mmol/L) who have a 10-year ASCVD risk 7.5% or higher, chronic kidney disease not treated with dialysis or kidney transplantation is a risk-enhancing factor and initiation of a moderate-intensity statin or moderate-intensity statins combined with ezetimibe can be useful. (IIa, B-R)
- In adults 40-75 years of age with LDL-C 70-189 mg/dL (1.7 to 4.8 mmol/L)who have a 10-year ASCVD risk 7.5 or higher, chronic inflammatory disorders and HIV are risk enhancing factors and in risk discussion favor moderate intensity statin or high-intensity statin therapy. (IIa, B-NR)
- In patients with heart failure with reduced ejection fraction attributable to ischemic heart disease who have a reasonable life expectancy (3-5 years) and are not already on a statin because of ASCVD, clinicians may consider initiation of moderate-intensity statin therapy to reduce the occurrence of ASCVD events. (IIb, B-R)

Hypertriglyceridemia

- In adults 40 to 75 years of age with moderate or severe hypertriglyceridemia and ASCVD risk 7.5% or higher, it is reasonable to re-evaluate ASCVD risk after lifestyle and secondary factors are addressed, and consider a persistently elevated triglyceride level as a factor favoring initiation or intensification of statin therapy. (IIa, B-R)
- In adults 40-75 years with severe hypertriglyceridemia (fasting triglycerides ≥500 mg/dL [≥5.6 mmol/L]) and ASCVD risk 7.5% or higher, it is reasonable to address reversible causes of high triglyceride and to initiate statin therapy.(IIa, B-R)
- In adults with severe hypertriglyceridemia (fasting triglycerides ≥ 500 mg/dL [≥ 5.7 mmol/L]) and especially fasting triglycerides ≥ 1000 mg/dL (11.3 mmol/L)), it is reasonable to identify and address other causes of hypertriglyceridemia; and if triglycerides are persistently elevated or increasing, to further reduce triglycerides by implementation of a very low fat diet, avoidance of refined carbohydrates and alcohol, consumption of omega-3 fatty acids and if necessary to prevent acute pancreatitis, fibrate therapy. (IIa, B-NR)

Link to Full ACC/AHA Cholesterol Guideline
Link to Full ACC/AHA CV Risk Guideline

- Ezetimibe (Zetia) is classified as a anti-lipids if agent, which inhibits absorption of cholesterol at the brush border of the small intestine.

LDL-C Management (for this Patient)

Blood Pressure Management (for this Patient)

Patient has stage 2 hypertension.

- Initiation of BP-lowering medication therapy (with 2 agents of different classes) is recommended in combination with nonpharmalogical therapy.
- First line antihypertensive agents include thiazide diuretics, CCBs, and ACE inhibitors or ARBs. For nonpharmalogical therapy recommendations, see the Lifestyle section of this table.
- Patient should be evaluated by or referred to a primary care provider within 1 month of the initial diagnosis, and have a repeat BP evaluation in 1 month after therapy initiation.
- A BP target of less than 130/80 mm Hg is recommended.

Supporting Guideline Recommendations

- Use of BP-lowering medications is recommended for secondary prevention of recurrent CVD events in patients with clinical CVD and an average SBP of 130 mm Hg or higher and an average DBP of 80 mm Hg or higher, or for primary prevention in adults with an estimated 10-year atherosclerotic cardiovascular disease (ASCVD) risk of 10% or higher and an average SBP 130 mm Hg or higher or an average DBP 80 mm Hg or higher (SBP:I, A; DBP:I, C).
- Adults with stage 2 hypertension should be evaluated by or referred to a primary care provider within 1 month of the initial diagnosis, have a combination of nonpharmacological and antihypertensive drug therapy (with 2 agents of different classes) initiated, and have a repeat BP evaluation in 1 month (I, B).
- For initiation of antihypertensive drug therapy, first-line agents include thiazide diuretics, CCBs, and ACE inhibitors or ARBs (I, A).
- Simultaneous use of an ACE inhibitor, ARB, and/or renin inhibitor is potentially harmful and is not recommended to treat adults with hypertension (III, A).
- For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher, a BP target of less than 130/80 mm Hg is recommended (SBP:I, B; DBP:I, C).

Treatment Advice*

Collapse All

LDL-C Management (for this Patient)

Blood Pressure Management (for this Patient)

Tobacco Cessation (for this Patient)

Diabetes Mellitus Management (General)

In patients who have A1c > 6.5% consistent with type 2 diabetes

- Dietary counseling regarding key aspects of a heart healthy diet is recommended (I, A)
- At least 150 minutes/week of moderate intensity or 75 minutes/week of vigorous physical activity is recommended (I, A)
- Metformin as a first line pharmacologic therapy to improve glycemic control and reduce CVD risk may be considered (IIa, B-R)

After assessing response to lifestyle therapies and metformin

- **If A1c < 7.0% NOT achieved, and**
  - If patient has other CVD risk factors, consideration may be given to an SGLT-2i or a GLP-1R agonist to improve glycemic control and reduce CVD risk (IIb, C-LD)
  - If no additional CVD risk factors, further management of diabetes per primary care provider or endocrinology is suggested
- **If A1c < 7.0% is achieved**
  - Reinforce importance of diet and physical activity and continue current management

Lifestyle Recommendations (General)

Aspirin Use Recommendations (for this Patient)

Immunization Practice (General)

Therapy Safety Information (General)

Treatment Advice*

Collapse All

LDL-C Management (for this Patient)

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Tobacco Cessation (for this Patient)

Diabetes Mellitus Management (General)

Lifestyle Recommendations (General)

Aspirin Use Recommendations (for this Patient)

Supporting Guideline Recommendations

- **Low dose aspirin (75-100 mg oral daily) may be considered for primary prevention of ASCVD among select higher risk ASCVD adults aged 40-70 years who are not at increased bleeding risk. (IIb, A)**
  - Given the narrow balance between benefits and harms of prophylactic aspirin, there is less justification for aspirin use at doses >100 mg daily for primary prevention.
  - Meta-analyses suggest that the ASCVD benefit for low-dose aspirin is equivalent to high-dose aspirin, but the bleeding risk is higher.
  - Low-dose prophylactic aspirin may be best justified among high-ASCVD risk persons who cannot achieve optimal control of other ASCVD risk factors.
- **Low-dose aspirin (75-100 mg oral daily) should not be administered for primary prevention of ASCVD among adults at any age who are at increased risk for bleeding. (III: Harm, C-LD)**
  - A non-exhaustive list of conditions associated with increased bleeding risk includes: history of GI bleeding or peptic ulcer disease or bleeding at other sites, age > 70 years, thrombocytopenia, coagulopathy, chronic kidney disease, or concurrent use of other medications that increase bleeding risks such as NSAIDs, steroids, DOACs or warfarin.

Immunization Practice (General)

CDC's Standards for Adult Immunization Practice

1. **ASSESS** the immunization status of all your patients at every clinical encounter.
2. Strongly **RECOMMEND** vaccines that your patients need.
3. **ADMINISTER** needed vaccines or REFER your patients to a vaccination provider.
4. **DOCUMENT** vaccines received by your patients.

Therapy Safety Information (General)

See Resource Section of this app for full prescribing information.

- **Statins:** There is moderate quality evidence that statins do not increase the overall risk of adverse events, but that they may increase the risk of diagnosis of type 2 diabetes in certain individuals.
- **Blood Pressure-Lowering Therapies:** Adverse effects of blood-pressure-lowering therapies are generally poorly reported, and vary by drug class.
- **Tobacco Cessation:** Adverse effects of tobacco cessation therapies are generally poorly reported, and vary by drug.
- **Aspirin:** There is high-quality evidence indicating that aspirin may increase the risk of major bleeding. A calculator for considering major bleeding risks and potential benefits of aspirin therapy for MI and stroke prevention is available here.