

Preventive Cardiology

Strategies to Prevent the Event

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Real change lives here



Case Presentation

49 y/o CM 2 months away from his 50th birthday

- LDL - 150, untreated
- SBP - 125 on HCTZ
- Obesity - BMI of 28
- Hyperglycemic – HbA1c ranging between 6.5-7.0
- Sedentary Lifestyle

Has been encouraged by his PCP to diet and exercise for risk factor mitigation but has not been told about statins, given a specific exercise regimen, specific diet regulations, or that he is pre-diabetic/diabetic and may benefit from a hyperglycemic agent.

He has not been referred to a Cardiovascular specialist or Endocrinologist.



Case Presentation

- He has been asymptomatic and has not had any provocative testing.
- In November, with the first snowfall, he begins to notice mild CP while shoveling snow -- but is still able to shovel the driveway and sidewalk.
- This progresses throughout the winter to the point where he can no longer shovel even a dusting of snow without experiencing significant CP with associated SOB.
- He finally mentions something to his wife who immediately has him call his PCP and is instructed to go to the ED for further evaluation.

Case Presentation

➤ **Laboratory results from the ED**

- Trop - <0.04
- ECG without ischemic changes nor pathologic Q waves
- CXR is negative for acute pathology
- His BMP and CBC are unremarkable except for a glucose level of 150

➤ **He is admitted – ruled-out overnight and scheduled for a stress echo**

- The stress echo is stopped prematurely after he develops CP and palpitations on the treadmill.
- He is referred for a cardiac catheterization which demonstrates a 99% proximal LAD, no other significant flow limiting lesions were noted with an EF= $>50\%$. He undergoes PCI with a single DES.



Hallmarks of Prevention

1. ASCVD Risk Estimators
2. Lipid Management
2. Hypertension Management
3. Hyperglycemia Management
4. Exercise Prescription
5. Weight Management
6. Tobacco Cessation



ASCVD
Risk Estimator

10-Year ASCVD Risk

~% calculated risk

~% risk with optimal
risk factors ⓘ

Lifetime ASCVD Risk

~% calculated risk

~% risk with optimal
risk factors ⓘ

ASCVD Risk Estimator

Intended for patients with LDL-C < 190 mg/dL (4.92 mmol/L), without ASCVD, not on LDL-C lowering therapy

- **Pooled Cohort Equations improve accuracy in sex and race specific individuals and includes stroke as an endpoint to better identify modifiable risk in women and minorities.**
- **Pooled Cohort equations can overestimate risk in**
 - Groups with 10-year risk >10% -- probably lesser clinical significance though
 - Higher socioeconomic status who are more likely to receive preventative services because of increased access to care
- **Pooled Cohort equations can underestimate risk in**
 - Lower socioeconomic status who are less likely to receive any preventative services
 - People with Chronic Inflammatory Disease
 - HIV, Rheumatoid arthritis, sarcoidosis, etc



AMERICAN
COLLEGE of
CARDIOLOGY



American
Heart
Association

ASCVD
Risk Estimator

10-Year ASCVD Risk

13.0% calculated risk

1.9% risk with optimal risk factors ⓘ

Lifetime ASCVD Risk

69% calculated risk

5% risk with optimal risk factors ⓘ

- Sex – Male
- Age – 49 y/o
- Race – White
- Total Cholesterol – 220
- HDL Cholesterol – 30
- Systolic Blood Pressure – 125
- Diabetic – Yes
- Smoker – No
- Treatment for Hypertension – Yes



2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Donna K. Arnett, Roger S. Blumenthal, Michelle A. Albert, Andrew B. Buroker, Zachary D. Goldberger, Ellen J. Hahn, Cheryl Dennison Himmelfarb, Amit Khera, Donald Lloyd-Jones, J. William McEvoy, Erin D. Michos, Michael D. Miedema, Daniel Muñoz, Sidney C. Smith Jr, Salim S. Virani, Kim A. Williams Sr, Joseph Yeboah, Boback Ziaieian

Originally published 17 Mar 2019 | <https://doi.org/10.1161/CIR.0000000000000678> | Circulation. 2019;140:e596–e646

▶ Emphasis on Team-Based Care Delivery

- ***“In a team-based care model that compared patients enrolled in a preventive cardiology clinic staffed by advanced practice providers with a propensity-matched cohort of patients enrolled in primary care clinics, a reduction in cardiovascular risk was demonstrated through effective risk stratification and preventive management.”***

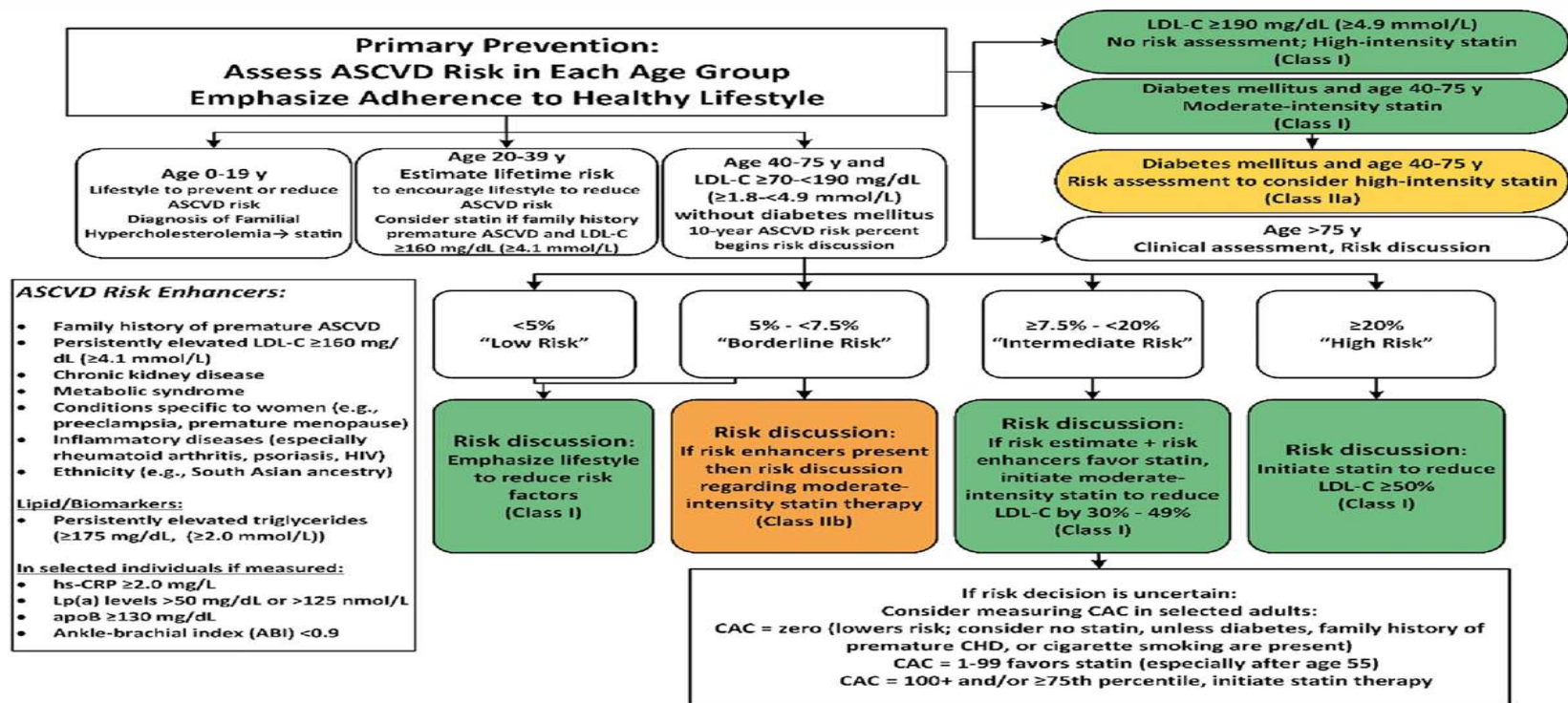
▶ Emphasis on Shared Decision-Making

- ***“Collaborative decisions are more likely to address potential barriers to treatment options, compared with treatment and guidance offered without patient input.”***

▶ Emphasis on Evaluation of Social Determinants of Health

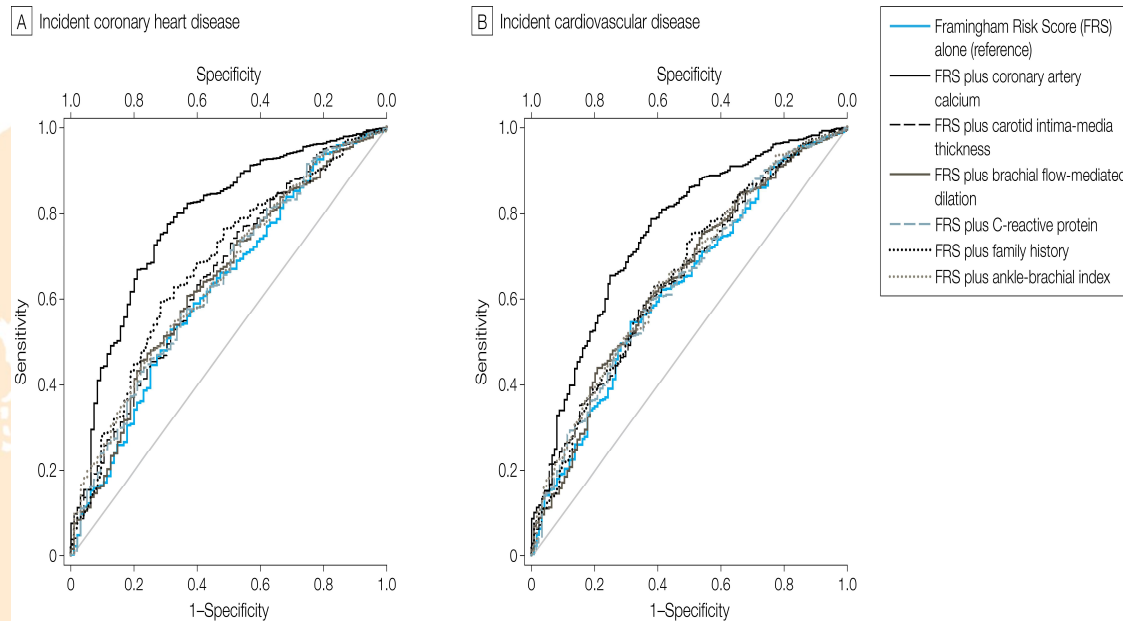
- ***“The clinician should tailor advice to a patient’s socioeconomic and educational status, as well as cultural, work, and home environments.”***

2019 ACC/AHA Primary Prevention Initiation of Statin Therapy



Framingham Risk Score Plus CAC

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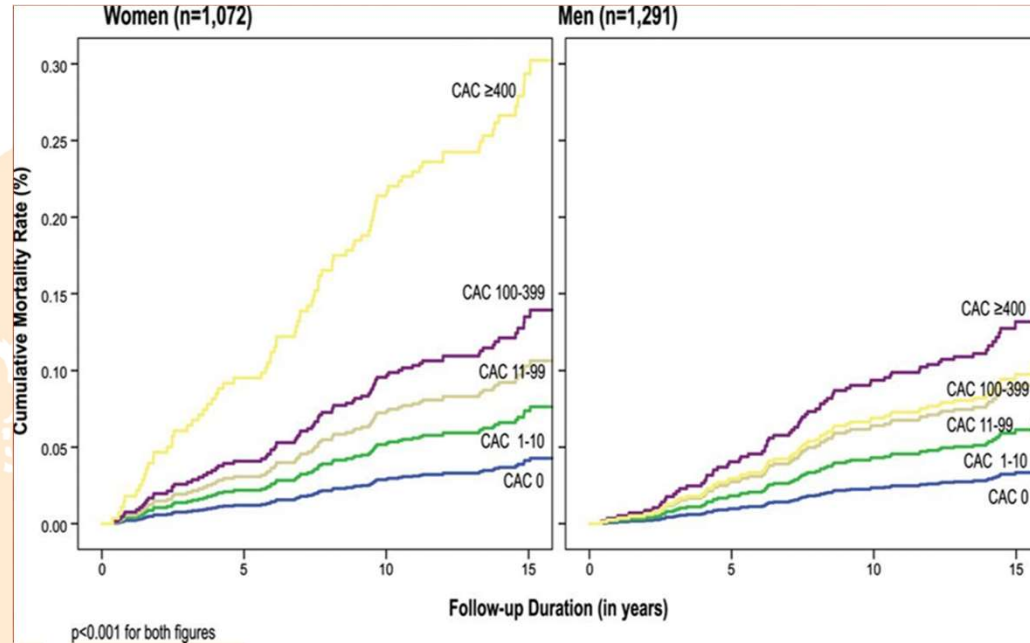
- CAC improves risk assessment over risk estimators alone.
- CAC measures “plaque burden” and not stenosis.
- Best for intermediate risk individuals when trying to determine statin therapy.
- Can be used to identify low-risk patients (CAC-0) where you can deescalate treatment.

JAMA. 2012;308(8):788-795. doi:10.1001/jama.2012.9624

Long-Term Prognosis After Coronary Artery Calcium Scoring Among Low-Intermediate Risk Women and Men

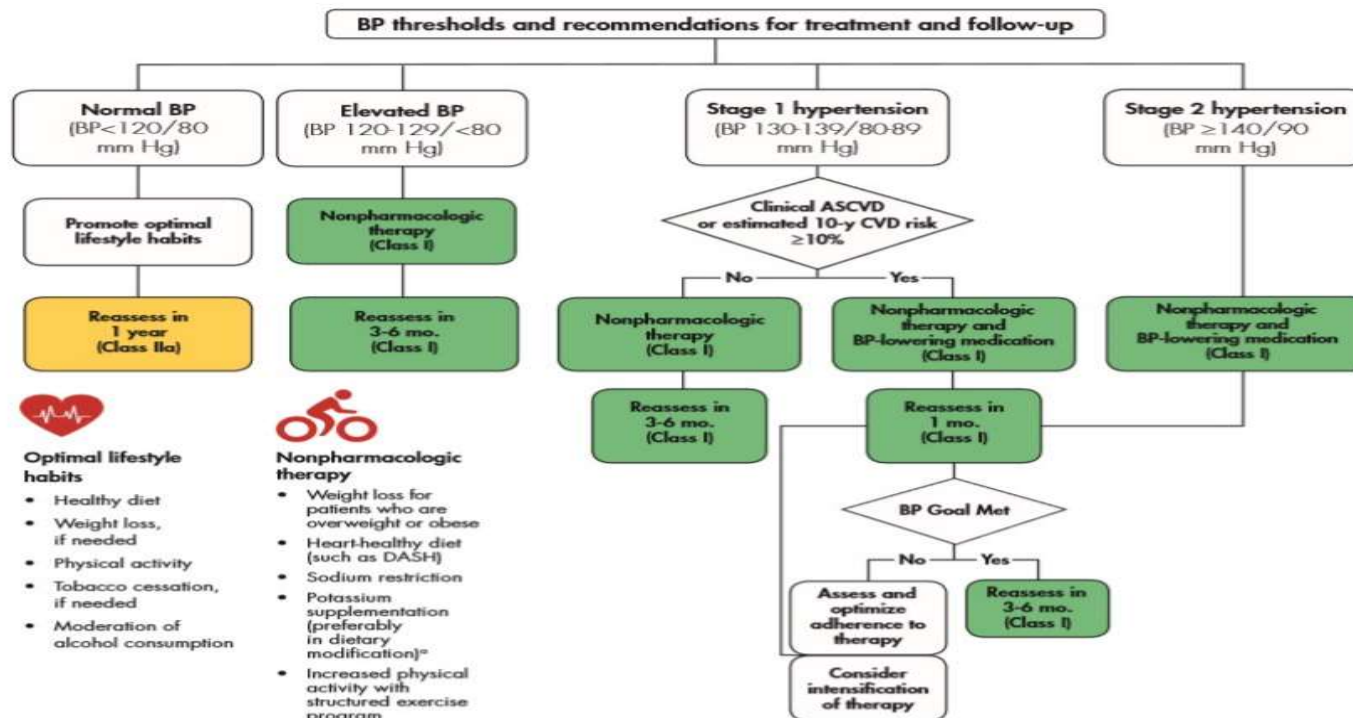
Anita A. Kelkar, William M. Schultz, Faisal Khosa, Joshua Schulman-Marcus, Briain W.J. O'Hartaigh, Heidi Gransar, Michael J. Blaha, Joseph T. Knapper, Daniel S. Berman, Arshed Quyyumi, Matthew J. Budoff, Tracy Q. Callister, James K. Min, and Leslee J. Shaw 

Originally published 12 Apr 2016 | <https://doi.org/10.1161/CIRCIMAGING.115.003742> | Circulation: Cardiovascular Imaging. 2016;9:e003742



- CAC is a safe and effective tool for improving ASCVD risk assessment in women – in which traditional risk calculators underestimate their risk.
- Power of 0 – Patients with CAC score of 0 have extremely low 5 year risk for CVD events.
- Not good for low or high risk patients*.

2017 ACC/AHA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults



Optimal lifestyle habits

- Healthy diet
- Weight loss, if needed
- Physical activity
- Tobacco cessation, if needed
- Moderation of alcohol consumption



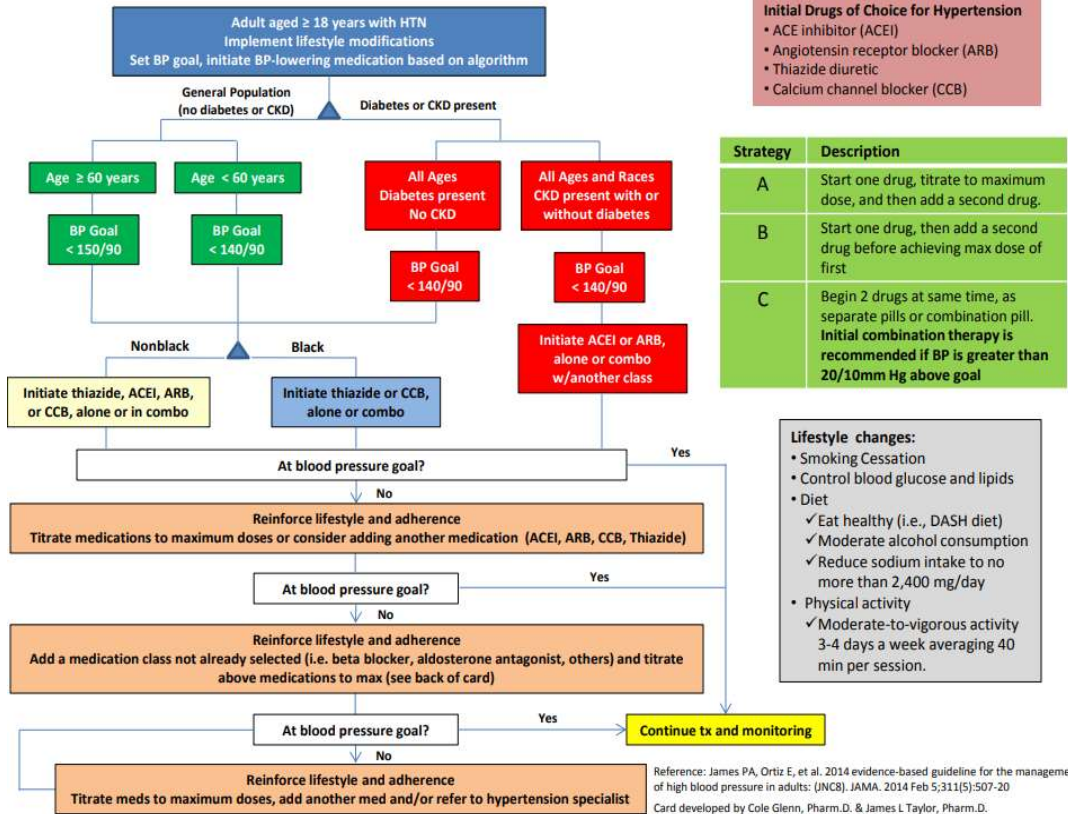
Nonpharmacologic therapy

- Weight loss for patients who are overweight or obese
- Heart-healthy diet (such as DASH)
- Sodium restriction
- Potassium supplementation (preferably in dietary modification)^a
- Increased physical activity with structured exercise program
- Limitation of alcohol to 1 (women) or 2 (men) standard drinks per day^b

^a Unless contraindicated by the presence of chronic kidney disease or use of drugs that reduce potassium excretion.
^b In the United States, one standard drink is equivalent to 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), or 1.5 oz of distilled spirits (usually about 40% alcohol).

JNC 8 Hypertension Guidelines

JNC 8 Hypertension Guideline Algorithm



Compelling Indications	
Indication	Treatment Choice
Heart Failure	ACEI/ARB + BB + diuretic + spironolactone
Post-MI/Clinical CAD	ACEI/ARB AND BB
CAD	ACEI, BB, diuretic, CCB
Diabetes	ACEI/ARB, CCB, diuretic
CKD	ACEI/ARB
Recurrent stroke prevention	ACEI, diuretic
Pregnancy	labetolol (first line), nifedipine, methyldopa

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension

	Nonpharmacological Intervention	Goal	Approximate Impact on SBP		
			Hypertension	Normotension	Reference
Weight loss	Weight/body fat	Best goal is ideal body weight, but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.	-5 mm Hg	-2/3 mm Hg	S4.4-2
Healthy diet	DASH dietary pattern†	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	-11 mm Hg	-3 mm Hg	S4.4-7, S4.4-8
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg	-2/3 mm Hg	S4.4-10, S4.4-12
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.	-4/5 mm Hg	-2 mm Hg	S4.4-14
Physical activity	Aerobic	90–150 min/wk. 65%–75% heart rate reserve	-5/8 mm Hg	-2/4 mm Hg	S4.4-19, S4.4-20
	Dynamic resistance	90–150 min/wk. 50%–80% 1 rep maximum 6 exercises, 3 sets/exercise, 10 repetitions/set	-4 mm Hg	-2 mm Hg	S4.4-19
	Isometric resistance	4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk 8–10 wk	-5 mm Hg	-4 mm Hg	S4.4-21, S4.4-78
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol‡ to: Men: ≤2 drinks daily Women: ≤1 drink daily	-4 mm Hg	-3 mm Hg	S4.4-20, S4.4-24, S4.4-25

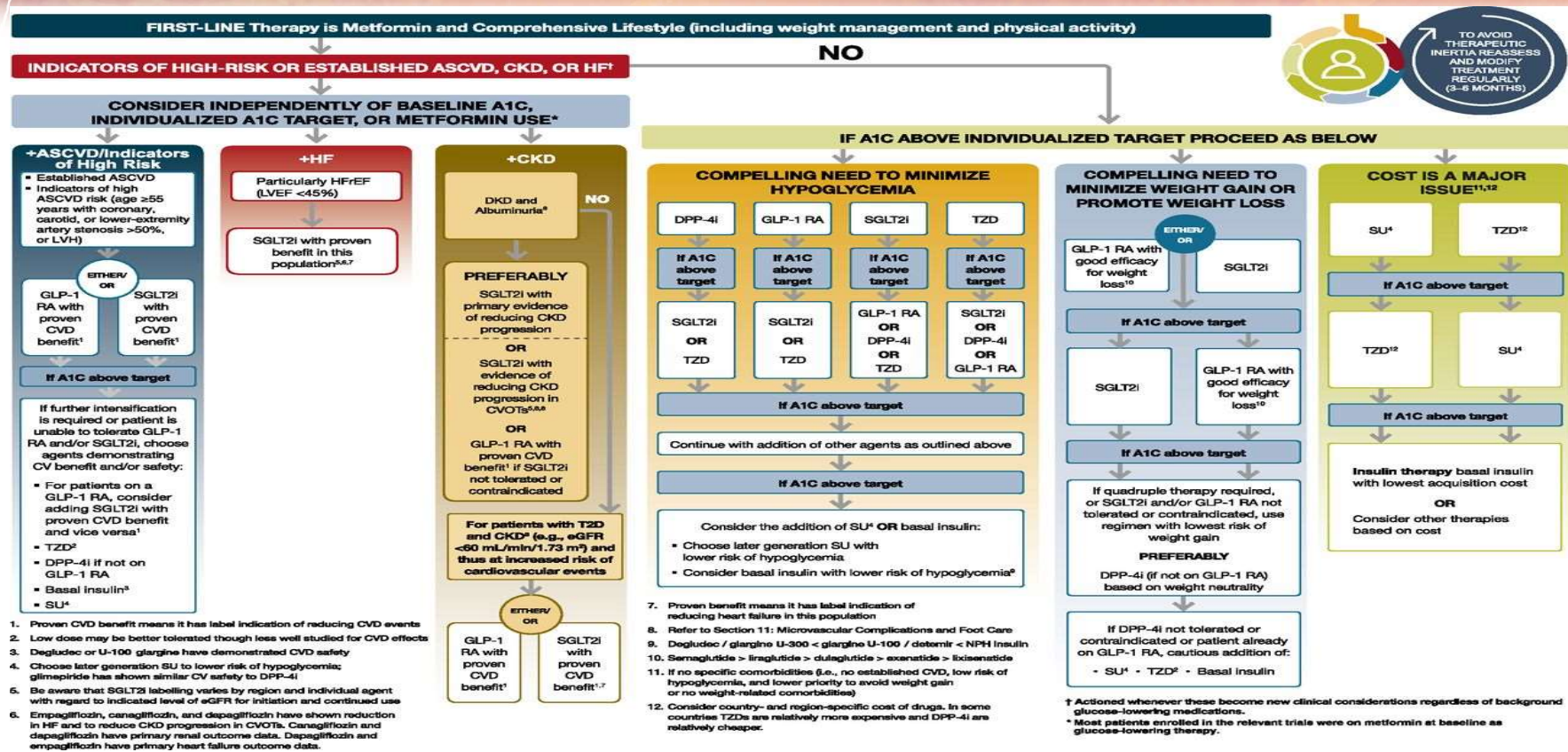
*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.

†Detailed information about the DASH diet is available via the NHLBI^{54,6-81} and Dashdiet.org.^{54,4-82}

‡In the United States, 1 “standard” drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).^{54,4-80}

BP indicates blood pressure; DASH, Dietary Approaches to Stop Hypertension; NHLBI, National Heart, Lung, and Blood Institute; and SBP, systolic blood pressure. Reproduced with permission from Whelton et al.^{54,4-1} Copyright © 2017, American College of Cardiology Foundation and the American Heart Association, Inc.

ADA - Standards of Medical Care in Diabetes - 2021



2019 ACC/AHA Guidelines on Primary Prevention

-- Exercise Recommendations

Recommendations for Exercise and Physical Activity		
Referenced studies that support recommendations are summarized in Online Data Supplements 6 and 7.		
COR	LOE	Recommendations
I	B-R	1. Adults should be routinely counseled in healthcare visits to optimize a physically active lifestyle. ^{53.2-1,53.2-2}
I	B-NR	2. Adults should engage in at least 150 minutes per week of accumulated moderate-intensity or 75 minutes per week of vigorous-intensity aerobic physical activity (or an equivalent combination of moderate and vigorous activity) to reduce ASCVD risk. ^{53.2-3-53.2-8}
IIa	B-NR	3. For adults unable to meet the minimum physical activity recommendations (at least 150 minutes per week of accumulated moderate-intensity or 75 minutes per week of vigorous-intensity aerobic physical activity), engaging in some moderate- or vigorous-intensity physical activity, even if less than this recommended amount, can be beneficial to reduce ASCVD risk. ^{53.2-5,53.2-6}
IIb	C-LD	4. Decreasing sedentary behavior in adults may be reasonable to reduce ASCVD risk. ^{53.2-3,53.2-9-53.2-11}

**The American Heart Association
Recommendations for Physical Activity in Adults**

For Overall Cardiovascular Health:

At least **30** minutes of moderate-intensity aerobic activity At least **5** days per week for a total of **150** minutes

OR

At least **25** minutes of vigorous aerobic activity At least **3** days per week for a total of **75** minutes

or a combination of the two

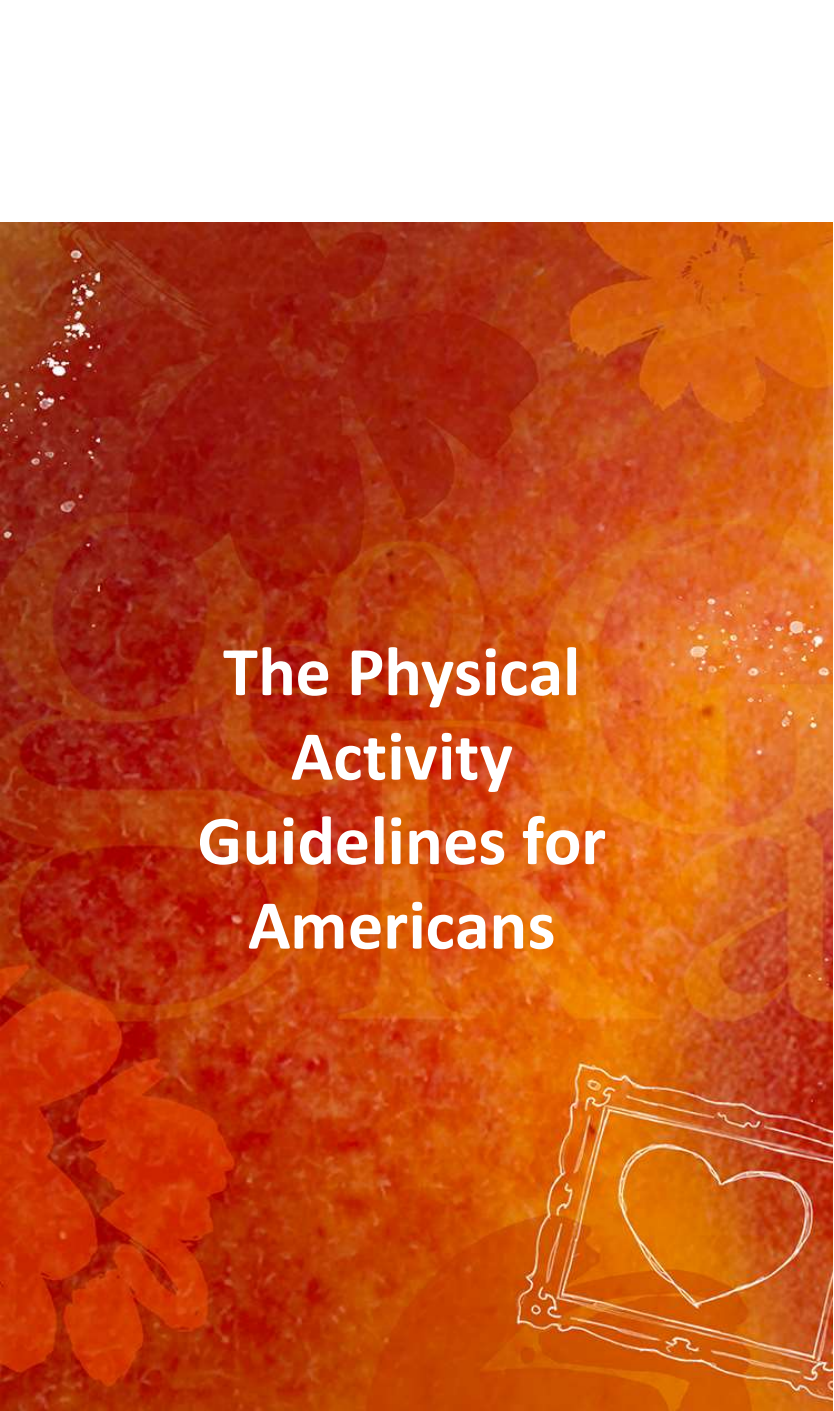
AND

Moderate **HIGH INTENSITY** muscle-strengthening activity At least **2** days per week for additional health benefits

For Lowering Blood Pressure and Cholesterol:

An average of **40** minutes of moderate- to vigorous-intensity aerobic activity **3-4** days per week

© 2016 Learn more at heart.org/ActivityRecommendations.



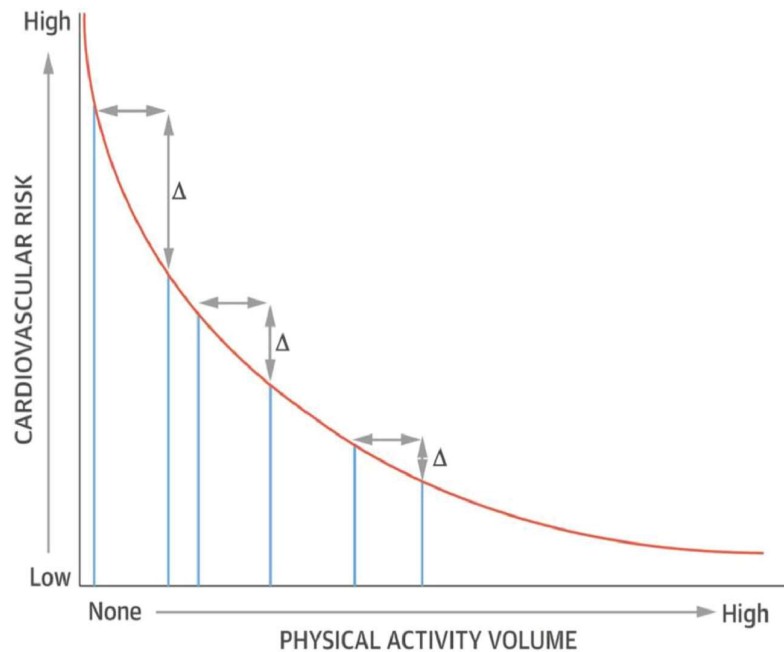
The Physical Activity Guidelines for Americans

- Older adults should do multicomponent physical activity that includes balance training as well as aerobic and muscle-strengthening activities. Benefits of increased physical activity include lower risk of mortality including cardiovascular mortality, lower risk of cardiovascular events and associated risk factors (hypertension and diabetes), and lower risk of many cancers (including bladder, breast, colon, endometrium, esophagus, kidney, lung, and stomach). Additional improvements have been seen in cognition, risk of dementia, anxiety and depression, improved bone health, lower risk of falls, and associated injuries.
- Adults with chronic conditions or disabilities, who are able, should follow the key guidelines for adults and do both aerobic and muscle-strengthening activities. Pregnant and postpartum women should do at least 150 minutes of moderate-intensity aerobic activity a week.

The Physical Activity Guidelines for Americans. JAMA 2018;Nov 12

The Curvilinear Relationship Between Physical Activity and Cardiovascular Risk

Reproduced from Eijsvogels et al



- Participation in any level of physical activity is associated with a lower 10-year CVD risk for overweight and obese adults – Any movement is better than no movement.
- We still see our biggest benefits in the highest risk patients.

2019 ACC/AHA Guidelines on Primary Prevention of CVD

The three diets associated with a decreased ASCVD risk, CHD, and mortality

Recommendations for Nutrition and Diet		
Referenced studies that support recommendations are summarized in Online Data Supplements 4 and 5.		
COR	LOE	Recommendations
I	B-R	1. A diet emphasizing intake of vegetables, fruits, legumes, nuts, whole grains, and fish is recommended to decrease ASCVD risk factors. ^{S3.1-1-S3.1-11}
Ila	B-NR	2. Replacement of saturated fat with dietary monounsaturated and polyunsaturated fats can be beneficial to reduce ASCVD risk. ^{S3.1-12,S3.1-13}
Ila	B-NR	3. A diet containing reduced amounts of cholesterol and sodium can be beneficial to decrease ASCVD risk. ^{S3.1-9,S3.1-14-S3.1-16}
Ila	B-NR	4. As a part of a healthy diet, it is reasonable to minimize the intake of processed meats, refined carbohydrates, and sweetened beverages to reduce ASCVD risk. ^{S3.1-17-S3.1-24}
III: Harm	B-NR	5. As a part of a healthy diet, the intake of <i>trans</i> fats should be avoided to reduce ASCVD risk. ^{S3.1-12,S3.1-17,S3.1-25-S3.1-27}

Dietary Pattern	Includes	Restricts	Health Benefits	Key Differences
Dietary Approaches to Stop Hypertension (the DASH diet) ¹⁷	Vegetables, fruits, low-fat dairy products, whole grains, lean meats, fish, poultry, fish, beans, and nuts	Sodium intake ≤2,300mg or ≤1,500mg per day.	Lower blood pressure Lower LDL cholesterol level Reduced cardiovascular disease risk	More emphasis on restricting sodium intake than other diets. Less emphasis on sea food.
The Mediterranean Diet ¹²⁻¹⁵	Vegetables, fruits, nuts, legumes, whole grains, and extra-virgin olive oil, lean meats, fish, and poultry.	Limited red meat, processed meats, low-fat dairy, and sweets intake.	Primary and secondary prevention of cardiovascular disease Reduced risk of cardiovascular disease mortality Reduced risk of myocardial infarction and stroke Reduced risk of all-cause mortality	More emphasis on nuts, fish, and olive oil. Less emphasis on dairy.
Healthy Vegetarian Eating Pattern ^{3,20}	Vegetables, fruits, whole grains, legumes, soy products, nuts, low-fat dairy products, and seeds.	All meats, poultries, and sea food.	Lower blood pressure Lower LDL cholesterol level Reduced cardiovascular disease risk	More emphasis on soy products, legumes, and dairy products. Lean protein is plant-based.

2019 ACC/AHA Guidelines on Primary Prevention of CVD -- Tobacco Cessation Therapies

Timing of Behavioral Intervention [†]			
<3 min of tobacco status assessment with cessation counseling at each clinic encounter	>3-10 min of tobacco status assessment with cessation counseling at each clinic encounter	>10 min of tobacco status assessment with cessation counseling at each clinic encounter	
Treatment	Dosing [‡]		Precautions
NRT*			
Patch	21 mg, 14 mg, or 7 mg	Starting dose: 21 mg for ≥10 CPD; 14 mg for <10 CPD	Local irritation possible; avoid with skin disorders; may remove for sleep if needed
Gum	2 mg or 4 mg	Starting dose: 4 mg if first tobacco use is ≤30 min after waking; 2 mg if first tobacco use is >30 min after waking; maximum of 20 lozenges or 24 pieces of gum/d. Chew and park gum*	Hiccups/dyspepsia possible; avoid food or beverages 15 min before and after use
Lozenge	2 mg or 4 mg		
Nasal spray	10 mg/mL	Starting dose: 1-2 doses/h (1 dose=1 spray each nostril); maximum of 40 doses/d	Local irritation possible; avoid with nasal or reactive airway disorders
Oral inhaler	10-mg cartridge	Starting dose: Puff for 20 min/cartridge every 1-2 h; maximum 16 cartridges/d	Cough possible; avoid with reactive airway disorders
Other[§]			
Bupropion (Zyban [GlaxoSmithKline], Wellbutrin SR [GlaxoSmithKline])	150 mg SR	150 mg once daily (am) for 3 d; then 150 mg twice daily; may use in combination with NRT ^{§4,5-21}	Avoid with history/risk of seizures, eating disorders, MAO inhibitors, or CYP 2D6 inhibitor
Varenicline (Chantix [Pfizer])	0.5 mg or 1 mg	0.5 mg once daily (am) for 3 d; then 0.5 mg twice daily for 4 d; then 1 mg twice daily (use start pack followed by continuation pack) for 3-6 mo	Nausea common; take with food. Renal dosing required. Very limited drug interactions; near-exclusive renal clearance.

*CPD can guide dosing. 1 CPD is ≈1-2 mg of nicotine. Note: Use caution with all NRT products for patients with recent (≤2 wk) MI, serious arrhythmia, or angina; patients who are pregnant or breastfeeding; and adolescents.

[†]Timing of assessment relates to ICD-10 coding.

[‡]Dose and duration can be titrated on the basis of response.^{§4,5-21}

[§]The FDA has issued a removal of black box warnings about neuropsychiatric events.^{§4,5-20,§4,5-21}

am indicates morning; CPD, cigarettes smoked per day; FDA, US Food and Drug Administration; ICD-10, International Classification of Diseases, Tenth Revision; MAO, monoamine oxidase; NRT, nicotine replacement; and SR, sustained release.

Special Considerations

Emerging Risk Factors

Traditional Risk Factors

SLE: 3-fold higher risk of IHD events [18]
 Rheumatoid arthritis: elevates IHD risk as much as DM [18]



Gestational diabetes
 • 4-fold higher risk of DM
 • 59% higher risk of MI[17]



Hypertension in pregnancy:
 • Gestational HTN and preclampsia:
 3-fold higher risk of IHD[18]

Early menopause confers 4.5 times higher risk of IHD[99]



Depression is more prevalent in women
 Doubles the risk of IHD[16]



Menopause results in ↑TG, ↑LDL, ↓HDL
 Women are less likely to achieve lipid goals (OR 0.50) [97]



80% of women ≥75 have HTN
 Only 29% have adequate BP control [22,98]



Diabetes confers a 45% higher risk of IHD[16]



Smoking confers a 25% higher risk of IHD[96]



Obesity confers a higher risk of IHD in women (64% vs 46%)[94]



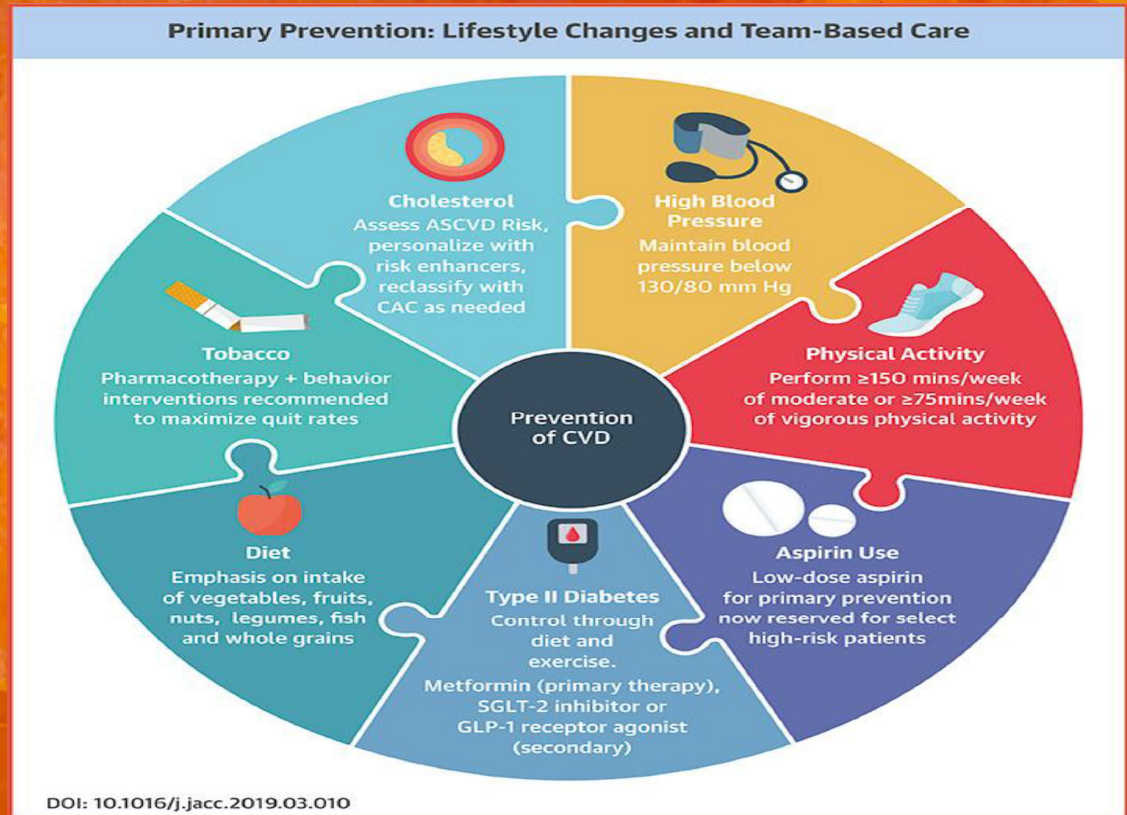
Women have a higher prevalence of inactivity
 25% of US women get no regular physical activity[95]

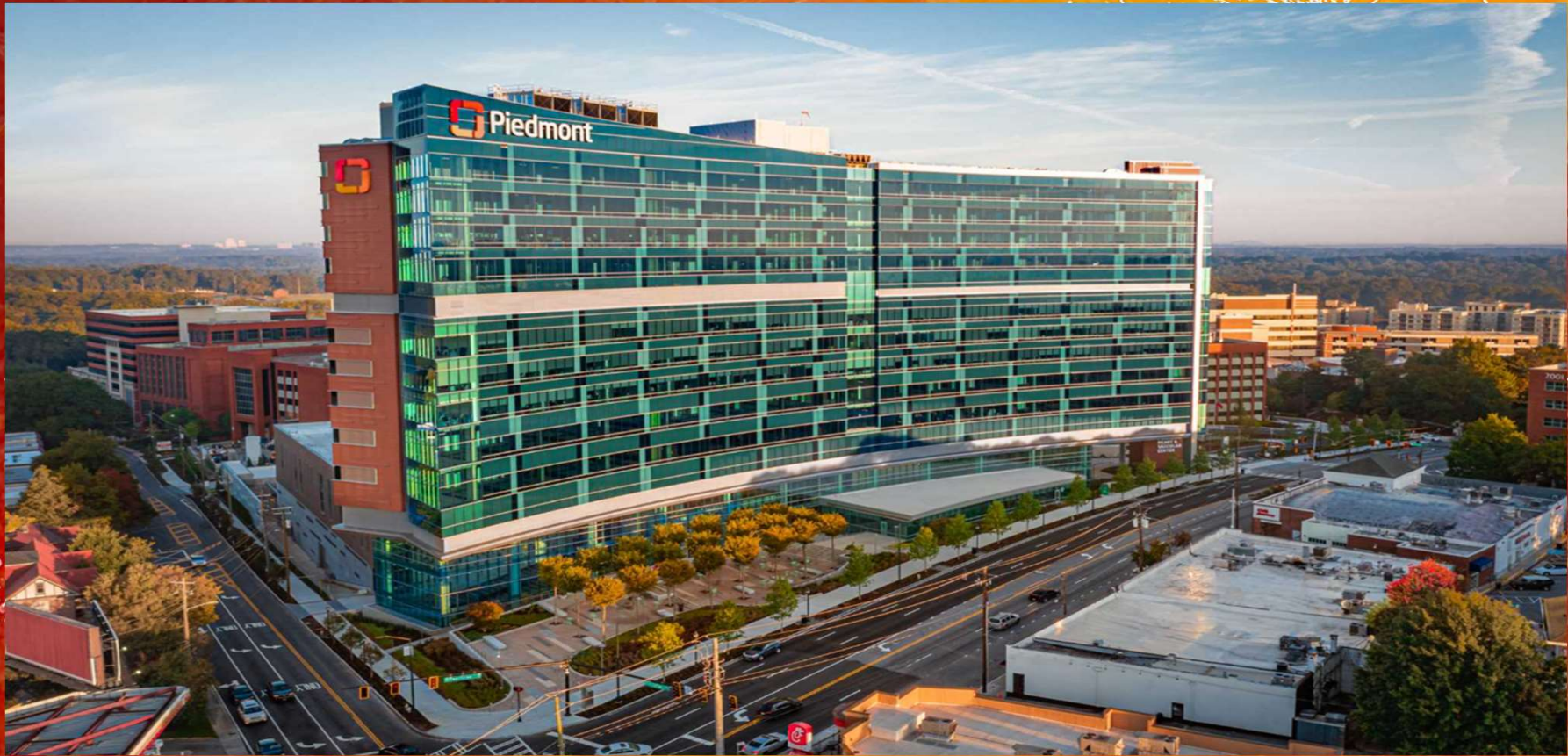


Family History of premature atherosclerosis confers a 2 fold higher risk of IHD in men and women[100]



In Summary





Thank you for your attention



Real change lives here