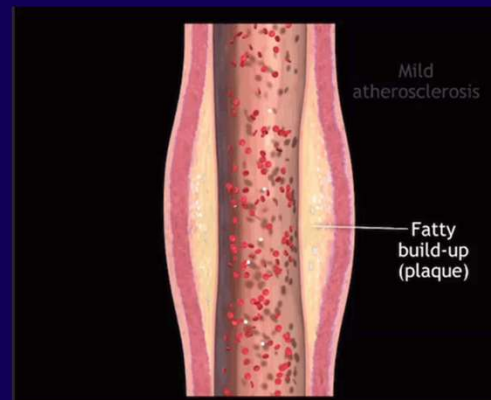


# Physiologic Debris and Detritus plugging the biologic pipes?

Management of Coronary Artery Disease



**Viet Le, DMSc PA-C FACC FAHA**

Associate Professor of Research/Preventive Cardiology, Intermountain Heart & Vascular  
Pres-Elect, Utah Academy of PAs

Past President, Association of PAs in Cardiology

Adjunct Faculty, Rocky Mtn Univ of Health Professions

**@VietHeartPA**

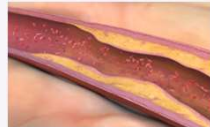
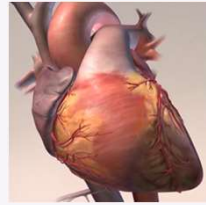
# Conflict of Interest

I **will/will not** discuss off-label use or investigation use in my presentation

I have a research grant from Janssen. I am an Ad Hoc Consultant for Novartis.

*\*All of the relevant financial relationships listed for this individual have been mitigated.*

# Objectives



- Outline the pathophysiology of coronary artery diseases and review atherosclerotic cardiovascular disease (ASCVD; CAD/MI, Ischemic Stroke, and Peripheral Artery Disease)
- Summarize the risk factors associated with atherosclerotic CAD.
- Explain the modifiable factors to reduce recurring coronary artery disease events.
- Discuss acute to chronic management of CAD (pharmacologic, surveillance, surgical and activity safety/“clearance”) and review the role of the interprofessional team in improving outcomes for patients with CAD
- Review potential acute and chronic sequelae of CAD events

# Not all MI's are the same: Type 1 - 5

**TABLE A Universal Classification of MI**

**Type 1: Spontaneous MI**

Spontaneous MI related to atherosclerotic plaque rupture, ulceration, fissuring, erosion, or dissection with resulting intraluminal thrombus in  $\geq 1$  of the coronary arteries leading to decreased myocardial blood flow or distal platelet emboli with ensuing myocyte necrosis. The patient may have underlying severe CAD, but on occasion nonobstructive or no CAD.

**Type 2: MI secondary to ischemic imbalance**

In instances of myocardial injury with necrosis where a condition other than CAD contributes to an imbalance between  $MVO_2$ , e.g., coronary endothelial dysfunction, coronary artery spasm, coronary embolism, tachy-/bradyarrhythmias, anemia, respiratory failure, hypotension, and hypertension with or without LVH.

**Type 3: MI resulting in death when biomarker values are unavailable**

Cardiac death with symptoms suggestive of myocardial ischemia and presumed new ischemic electrocardiographic changes or new LBBB, but death occurred before blood samples could be obtained, before catheterization, or in cases where blood was not collected for cardiac biomarker testing.



**Type 5: MI related to CABG**

MI associated with CABG (percentile URL). In addition to (i) or (ii) imaging evidence of new loss of viability



Modified from Thygesen et al.



# Not all MI's are the same: Type 1 - 5

**TABLE A Universal Classification of MI**

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**Type 3: MI resulting in death when biomarker values are unavailable**

Cardiac death with symptoms suggestive of myocardial ischemia and presumed new ischemic electrocardiographic changes or new LBBB, but death occurred before blood samples could be obtained, before cardiac biomarker could rise, or in rare cases where blood was not collected for cardiac biomarker testing.

**Type 4a: MI related to PCI**

MI associated with PCI is arbitrarily defined by elevation of cTn values  $> 5 \times 99$ th percentile URL in patients with normal baseline values ( $< 99$ th percentile URL) or a rise of cTn values  $> 20\%$  if baseline values are elevated and are stable or falling. In addition, either (i) symptoms suggestive of myocardial ischemia, (ii) new ischemic electrocardiographic changes or new LBBB, (iii) angiographic loss of patency of a major coronary artery or a side branch or persistent slow or no flow or embolization, or (iv) imaging demonstration of new loss of viable myocardium or new regional wall motion abnormality is required.

**Type 4b: MI related to stent thrombosis**

MI associated with stent thrombosis is detected by coronary angiography or autopsy in the setting of myocardial ischemia and with a rise and/or fall of cardiac biomarker values with  $\geq 1$  value above the 99th percentile URL.

**Type 5: MI related to CABG**

MI associated with CABG is arbitrarily defined by elevation of cardiac biomarker values  $> 10 \times 99$ th percentile URL in patients with normal baseline cTn values ( $< 99$ th percentile URL). In addition, either (i) new pathological Q waves or new LBBB, or (ii) angiographically documented new graft or new native coronary artery occlusion, or (iii) imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

CABG indicates coronary artery bypass graft; CAD, coronary artery disease; cTn, cardiac troponin; LBBB, left bundle-branch block; LVH, left ventricular hypertrophy; MI, myocardial infarction;  $MVO_2$ , myocardial oxygen consumption; PCI, percutaneous coronary intervention; and URL, upper reference limit.

Modified from Thygesen et al. (21).

# Acute Coronary Syndrome/Chronic Stable

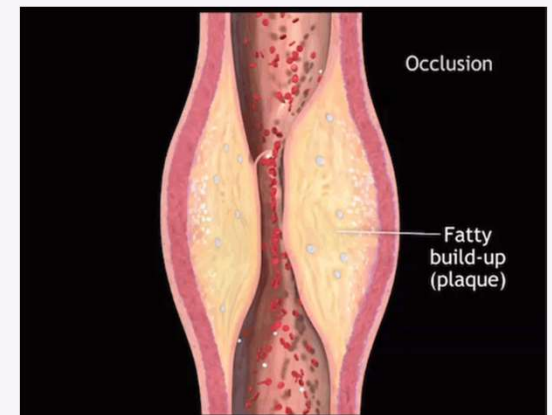
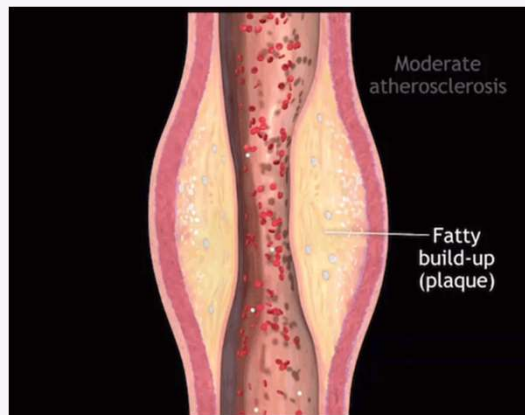
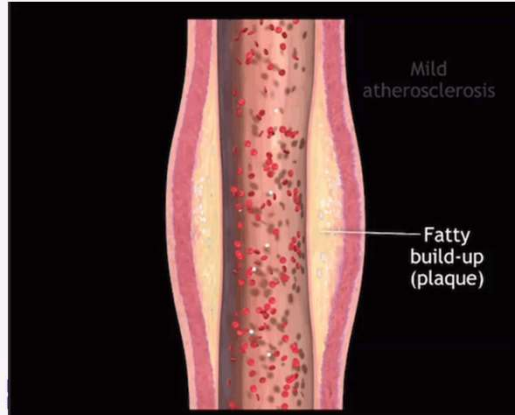
Stable Angina



NSTEMI-ACS



STEMI



# Tools of the “trade”



<https://www.plumbing-draincleaning.com/drain-cleaning.html>



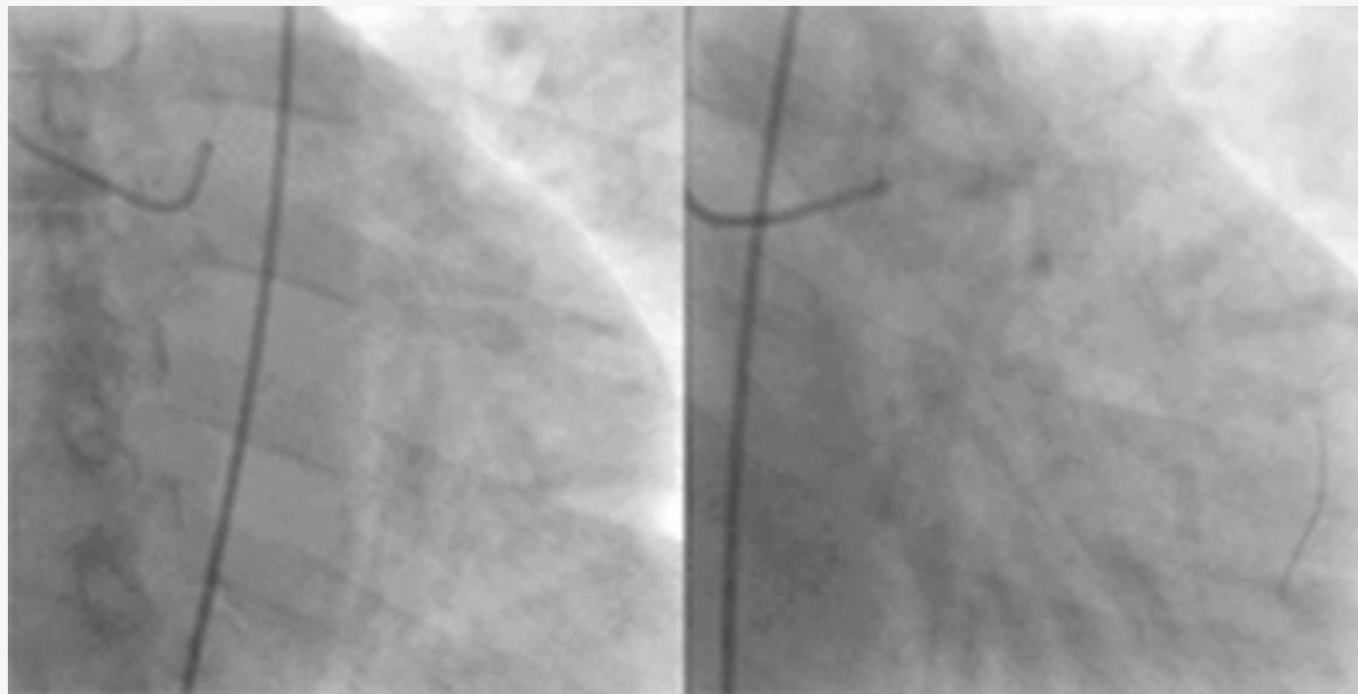
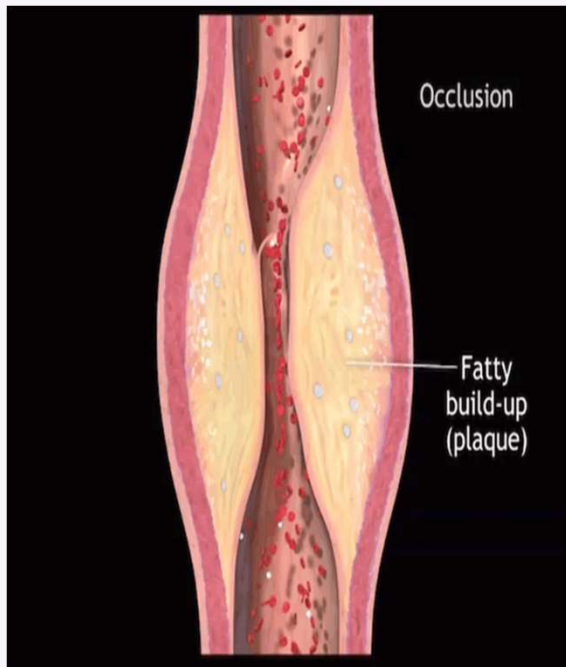
[www.plumbingsupply.com/%2Fflogbusters.html&psig=AOVvaw3iT0dXRoxDvHDBT5VcXh4y&ust=1668264017895000&source=images&cd=vfe&ved=OCBEQ3YkBahcKEwjYtqeVr6b7AhUAAAAAHQAAAAAQcg](http://www.plumbingsupply.com/%2Fflogbusters.html&psig=AOVvaw3iT0dXRoxDvHDBT5VcXh4y&ust=1668264017895000&source=images&cd=vfe&ved=OCBEQ3YkBahcKEwjYtqeVr6b7AhUAAAAAHQAAAAAQcg)



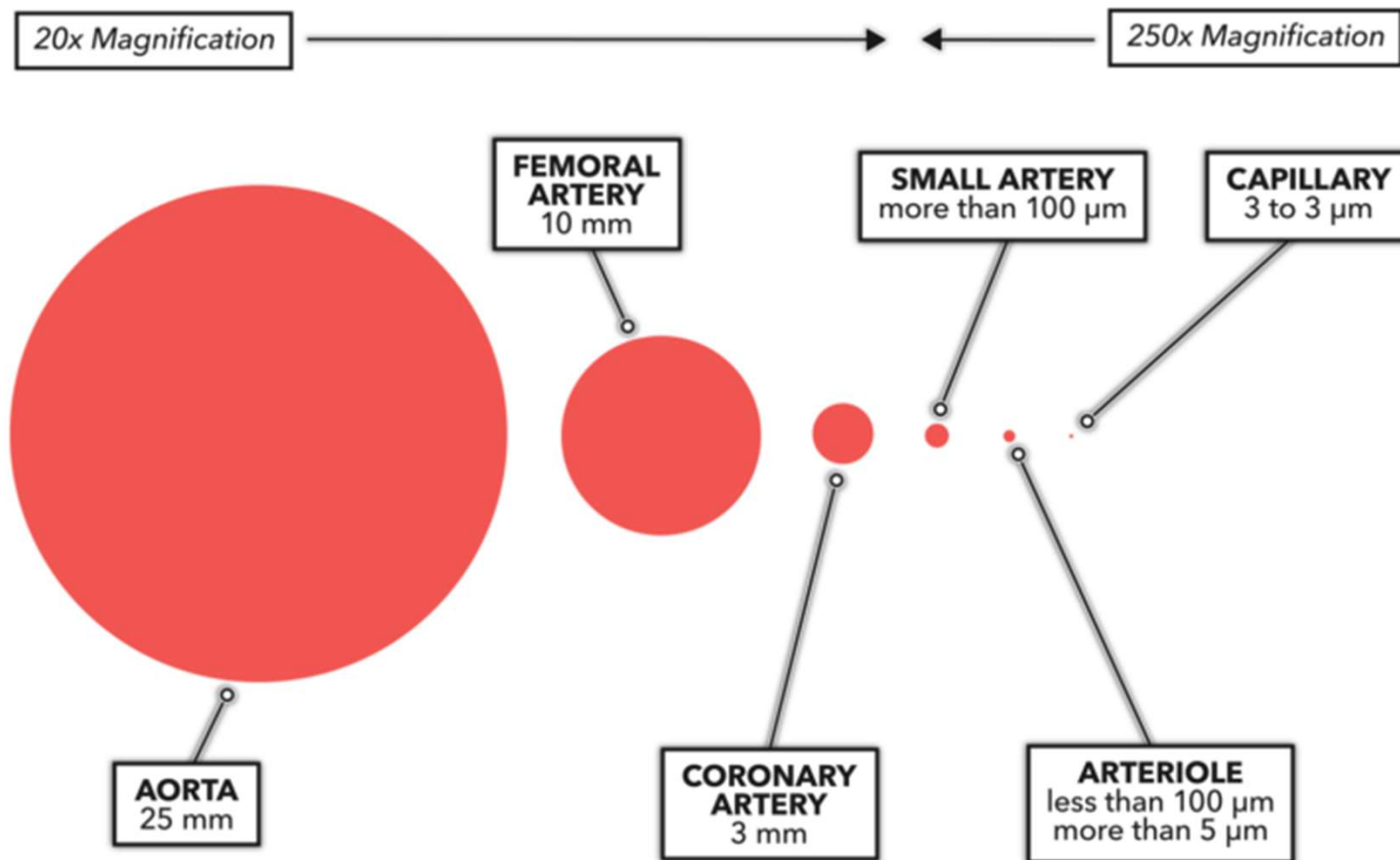
[www.amazon.com/%2FUpgraded-Anti-break-Plumbing-Bathroom-Cleaning%2Fdp%2FB09GK99MQ4&psig=AOVvaw3iT0dXRoxDvHDBT5VcXh4y&ust=1668264017895000&source=images&cd=vfe&ved=OCAQ3YkBahcKEwjYtqeVr6b7AhUAAAAAHQAAAAAQAw](http://www.amazon.com/%2FUpgraded-Anti-break-Plumbing-Bathroom-Cleaning%2Fdp%2FB09GK99MQ4&psig=AOVvaw3iT0dXRoxDvHDBT5VcXh4y&ust=1668264017895000&source=images&cd=vfe&ved=OCAQ3YkBahcKEwjYtqeVr6b7AhUAAAAAHQAAAAAQAw)



# Tools of the “trade”

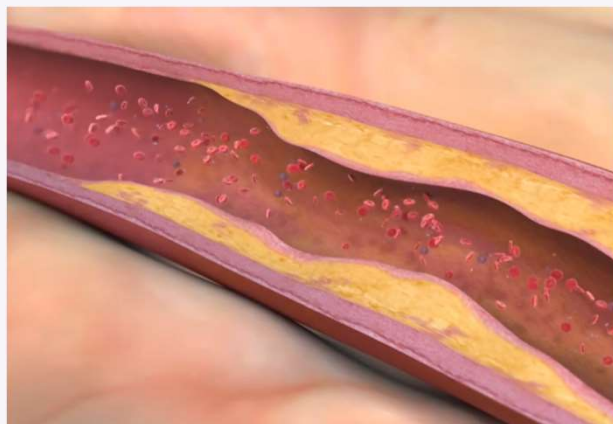






<https://www.grossit.com/essentials/the-heart-part-6-blood-vessel-basics>; Lorbeer. 2018. PLoS One. 13(6): e0197559; Dodge Jr. 1992. Circulation. 86:232-246; Paruchuri. 2015. Cardiology. 131:265-272

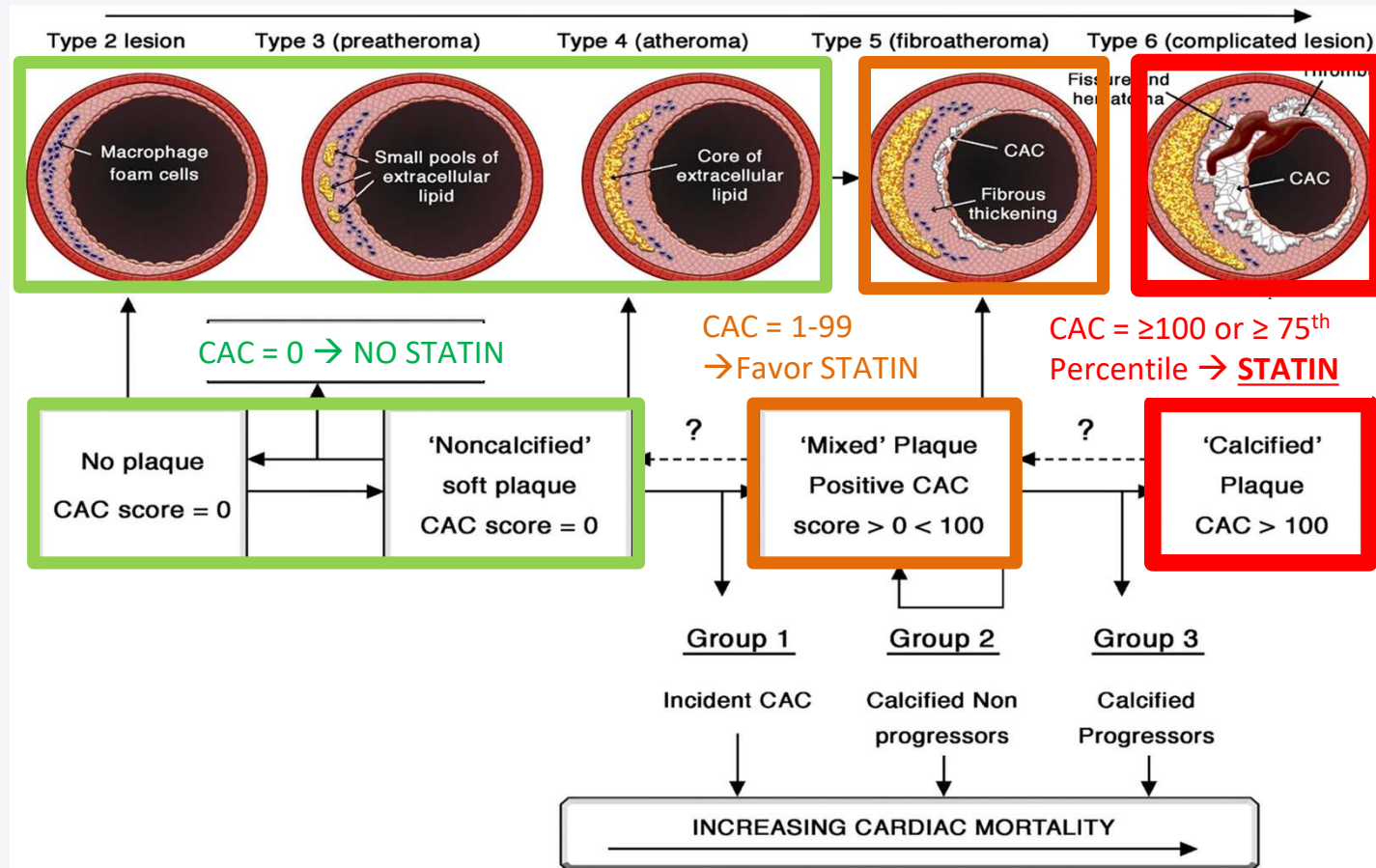
# Coronary Calcium and statin eligibility (2019 GL)

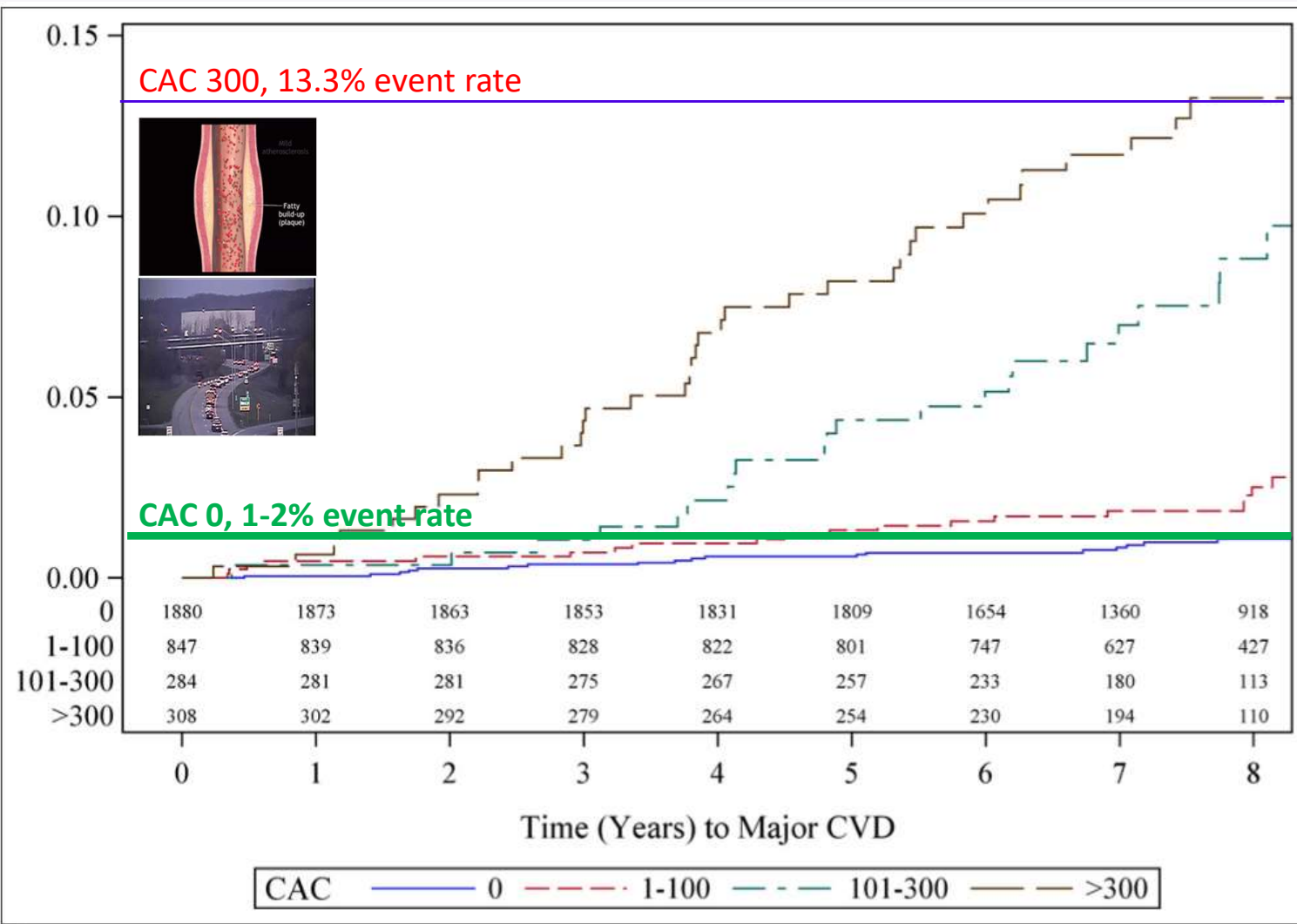


CAC = 0 → NO STATIN

CAC = 1-99 → Favor STATIN

CAC = ≥100 or ≥ 75<sup>th</sup> Percentile → **STATIN**





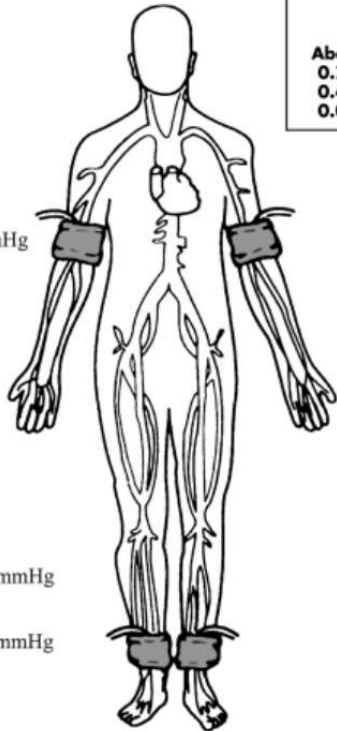
POPULATION: Framingham (Offspring and 3<sup>rd</sup> Generation). 50 ± 10 yrs of age. Female 50.9%.

**MAJOR CVD** included:  
 1 coronary heart disease (CHD),  
 2 stroke, and  
 3 peripheral arterial disease.

Additionally, authors included  
 4 MI, and  
 5 death from CHD (i.e., fatal coronary event, MI, or cerebrovascular accident [i.e., ischemic stroke, hemorrhagic stroke]).

# ABI WORKSHEET

@VietHeartPA



**Ankle-Brachial Index Interpretation**  
**Above 0.90: Normal**  
**0.71 - 0.90: Mild Obstruction**  
**0.41 - 0.70: Moderate Obstruction**  
**0.00 - 0.40: Severe Obstruction**

**Right Arm:**  
 Systolic Pressure  mmHg

**Left Arm:**  
 Systolic Pressure  mmHg

**Right Ankle:**  
**Systolic Pressure**  
 Posterior Tibial (PT)  mmHg  
 Dorsalis Pedis (DP)  mmHg

**Left Ankle:**  
**Systolic Pressure**  
 Posterior Tibial (PT)  mmHg  
 Dorsalis Pedis (DP)  mmHg

**Right ABI equals Ratio of:**  
 Higher of the Right Ankle Pressures (PT or DP)  mmHg = . \*  
 Higher Arm Pressure (right or left arm)  mmHg

**Left ABI equals Ratio of:**  
 Higher of the Left Ankle Pressures (PT or DP)  mmHg = . \*  
 Higher Arm Pressure (right or left arm)  mmHg

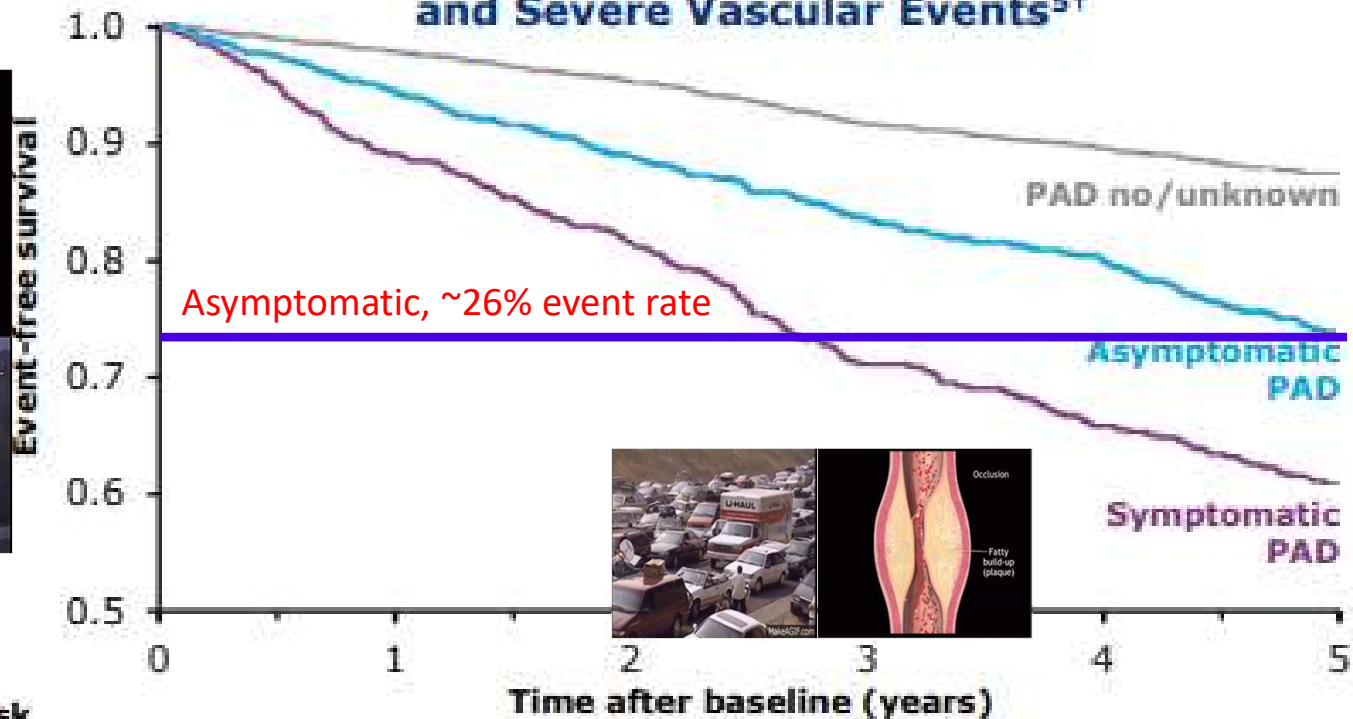
\* The lower of these numbers is the patient's overall ABI.  
 Overall ABI (lower ABI) = \_\_\_\_\_

Vessel Disease	ABI	TBI	Doppler	PVR
Calcified Vessel	> 1.4	unaffected		
Normal	0.9 - 1.4	> 0.6		
Mild PAD	0.7 - 0.89	0.34 - 0.59		
Moderate PAD	0.51 - 0.69	0.12 - 0.34		
Severe PAD	≤ 0.5	≤ 0.11		

Sibley III. 2017. Radiographics. 37:1, 346-357



### 5-Year KM Estimates of ACM and Severe Vascular Events<sup>5†</sup>



Persons at risk	Time after baseline (years)										
	0	1	2	3	4	5	6	7	8	9	10
<b>PAD no/unknown</b>	5392	5303	5192	5085	5017	4935	4464	4004	3953	3885	3850 <sup>†</sup>
<b>Asymptomatic PAD</b>	836	810	776	742	722	700	612	528	520	493	484 <sup>†</sup>
<b>Symptomatic PAD</b>	593	561	515	484	463	433	357	301	286	276	268 <sup>†</sup>

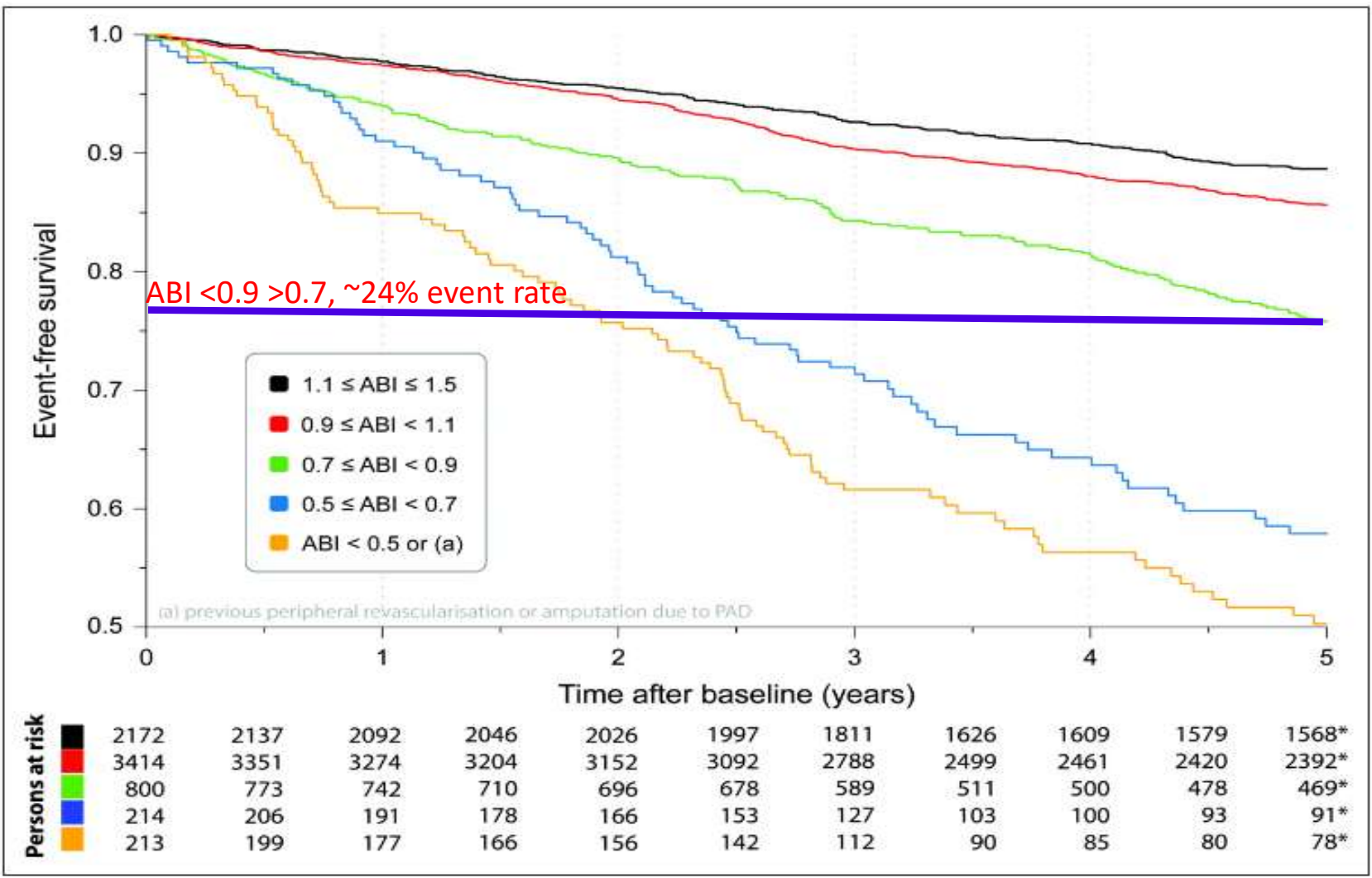
Older: 72  
 Female: 58%  
 ABI >1.5 excluded

- OUTCOMES:**
- 1 all-cause mortality OR severe vascular events
  - 2 myocardial infarction,
  - 3 coronary revascularization,
  - 4 stroke,
  - 5 carotid revascularization,
  - 6 peripheral revascularization, or
  - 7 amputation

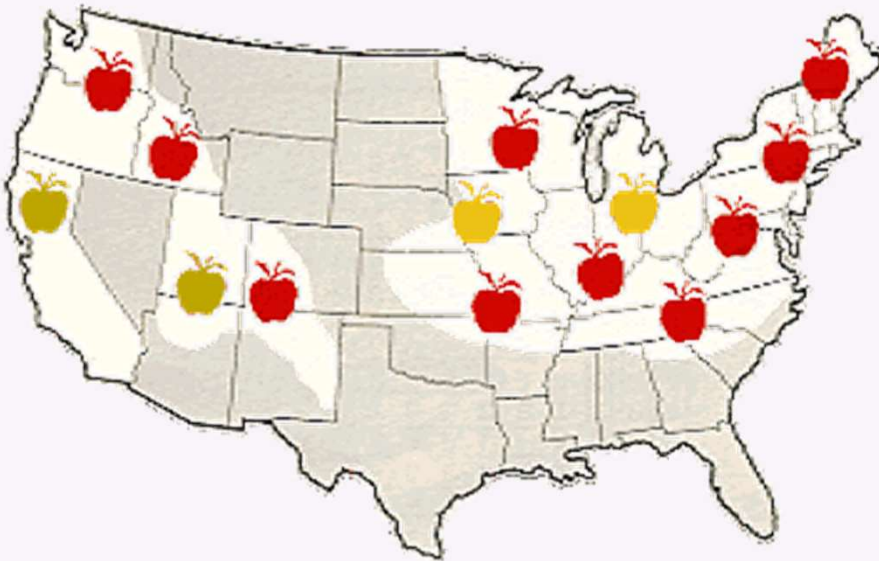
Older: 72  
 Female: 58%  
 ABI >1.5 excluded

**OUTCOMES:**

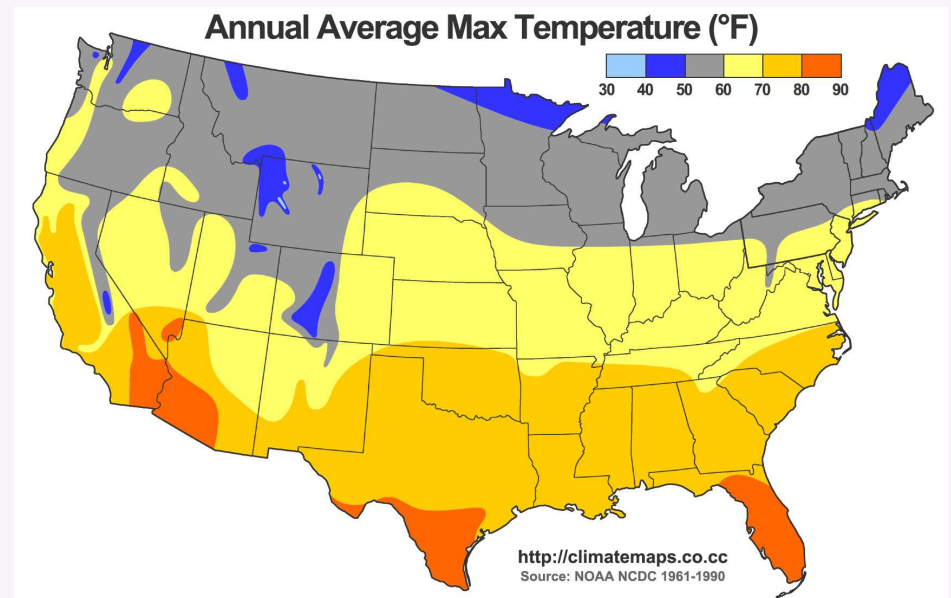
- 1 all-cause mortality
- OR severe vascular events
- 2 myocardial infarction,
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- 4 stroke,
- 5 carotid revascularization,
- 6 peripheral revascularization, or
- 7 amputation



Where would you find a stand of trees that would most likely yield apples?



[https://web.extension.illinois.edu/apples/images/us\\_map.gif](https://web.extension.illinois.edu/apples/images/us_map.gif)



[https://en.wikipedia.org/wiki/Climate\\_of\\_the\\_United\\_States](https://en.wikipedia.org/wiki/Climate_of_the_United_States)

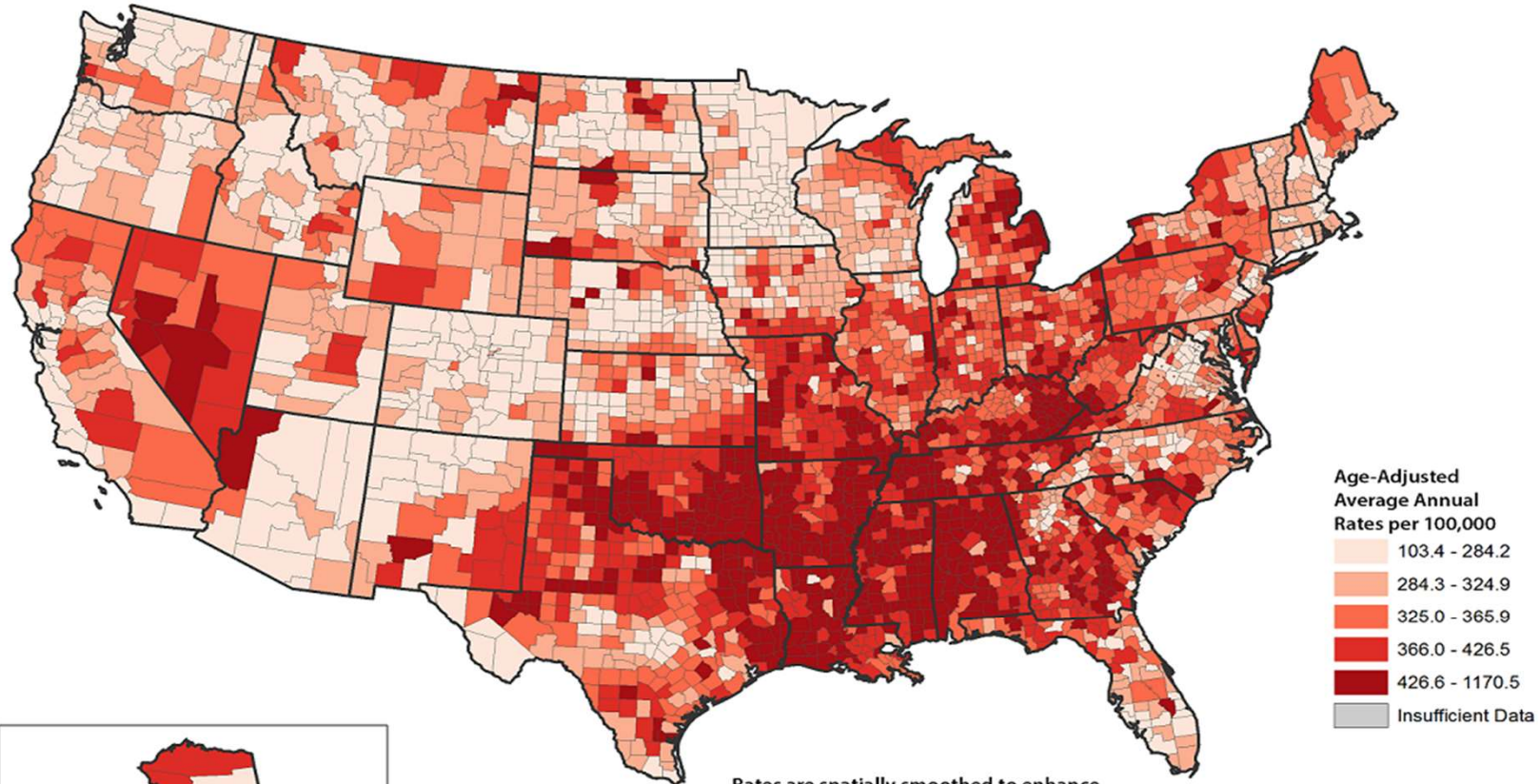


Which stand of trees would you most likely find apples?





### Heart Disease Death Rates, 2014-2016 Adults, Ages 35 +, by County



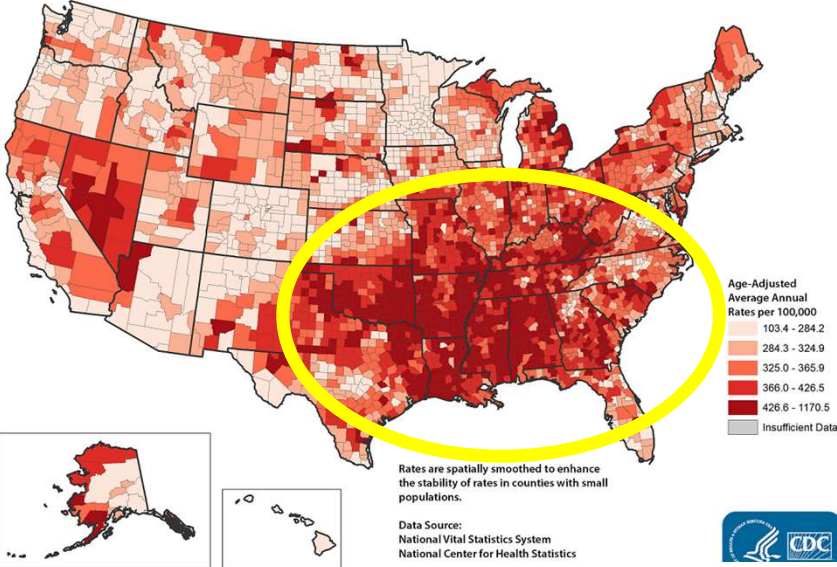
- Age-Adjusted  
Average Annual  
Rates per 100,000
- 103.4 - 284.2
  - 284.3 - 324.9
  - 325.0 - 365.9
  - 366.0 - 426.5
  - 426.6 - 1170.5
  - Insufficient Data

Rates are spatially smoothed to enhance the stability of rates in counties with small populations.

Data Source:  
National Vital Statistics System  
National Center for Health Statistics  
[www.cdc.gov/dhdsp/maps](http://www.cdc.gov/dhdsp/maps)



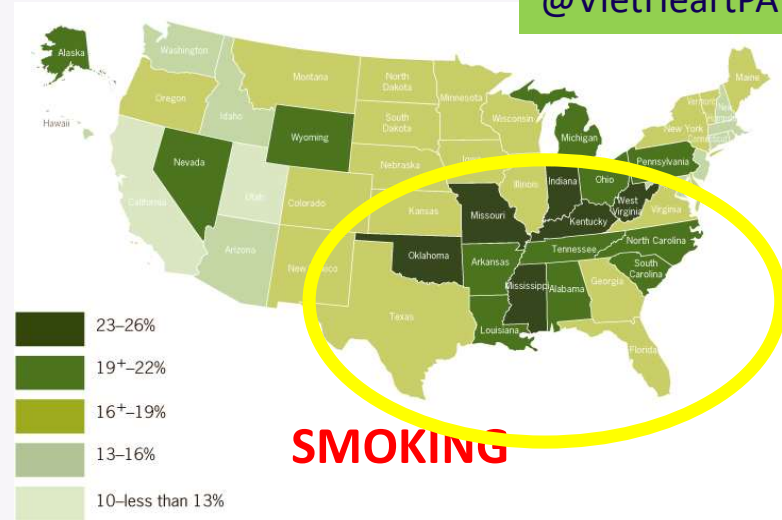
**Heart Disease Death Rates, 2014-2016  
Adults, Ages 35+, by County**



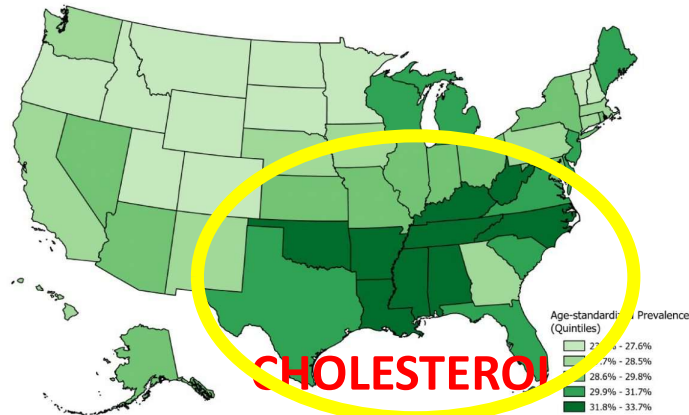
<https://www.cdc.gov/heartdisease/facts.htm>



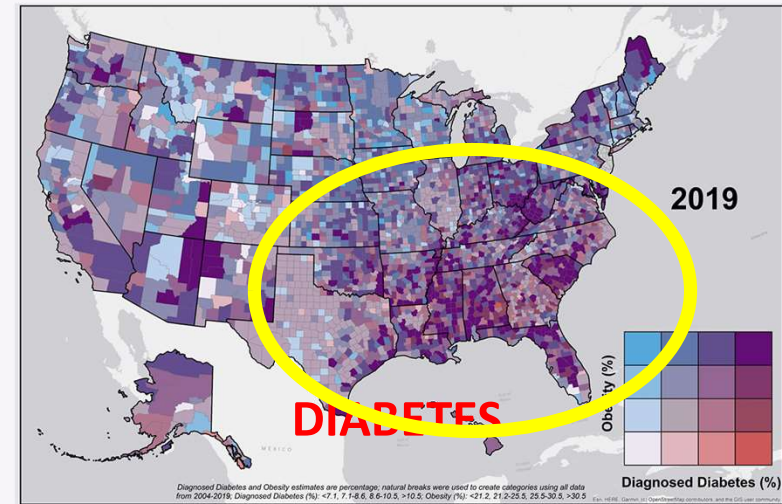
@VietHeartPA



**Self-reported High Total Cholesterol Among Adults, 2017\***



\*Data Source: BRFSS, Adults (20+) who answered "yes" to the question, "Have you ever been told by a doctor, nurse or other health professional that your blood cholesterol is high?"



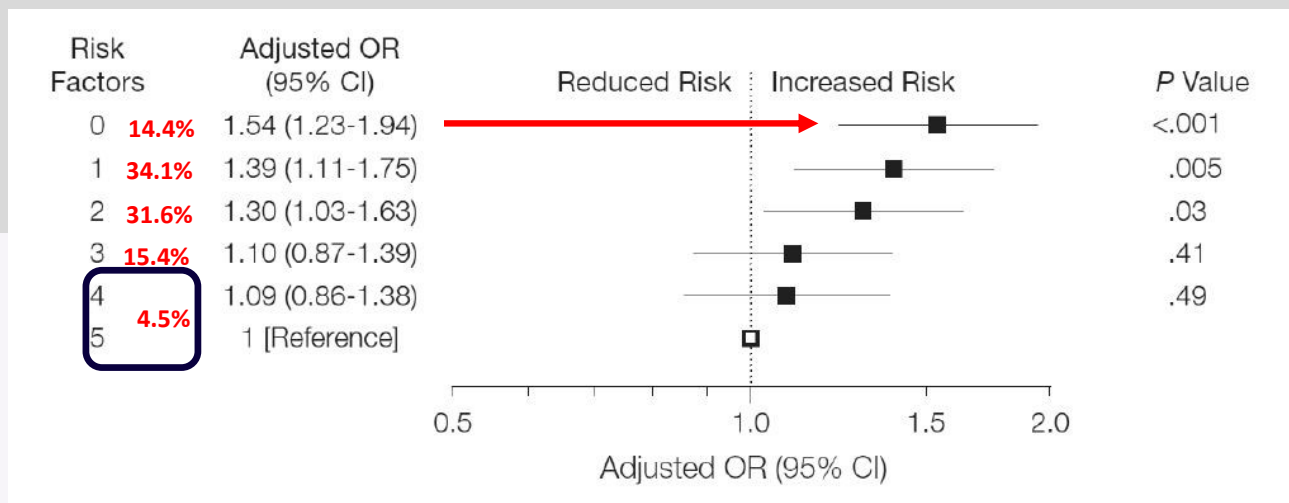
# Traditional risk factors in First MI

WAIT!!

- Significant number of folks with 1<sup>st</sup> MI also have 0 RF; in addition, they may have an increased risk of death.
- In 542,008 patients presenting with a first myocardial infarction: the percentage with 0, 1, 2, 3, and 4 risk factors was 14.4%, 34.1%, 31.6%, 15.4%, and 4.1%, respectively

**Risk Factors:**

- Hypertension
- Smoking
- Dyslipidemia
- Diabetes
- Family Hx of CAD





# SMuRF-Less

Intermountain data presented at ACC 22. Patients with 1st STEMI from 2000-2021 comparing those with **standard modifiable risk factors (SMuRF)\*** and those without **SMuRF-Less**.

- STEMI pts (n=3,510), SMuRF-Less made up over 1 in 4 pts, or 26.2% (n=919).
- SMuRF-Less pts were younger, more frequently male, and had fewer overall co-morbidities
- While unadjusted HR for MACE favored SMuRF-Less, an adjusted HR demonstrated similar outcomes other than persistent lower HF admissions.



A. Demographics	SMuRF		SMuRF-less	
	n=2591		n=919	
	n	%	n	%
<b>Age groups</b>				
<40	85	3.28%	49	5.33%
40-49	360	13.89%	140	15.23%
50-59	720	27.79%	228	24.81%
60-69	717	27.67%	271	29.49%
70-79	471	18.18%	150	16.32%
>79	238	9.19%	80	8.71%
<b>Gender</b>				
Male	1885	72.75%	709	77.15%
Female	706	27.25%	210	22.85%
<b>Race</b>				
White/Caucasian	2260	87.23%	818	89.01%
African American	14	0.54%	8	0.87%
Asian	57	2.20%	15	1.63%
Pacific Islander	5	0.19%	3	0.33%
Unknown	255	9.84%	75	8.16%



# You have a patient with Atherosclerosis. Now WHAT?

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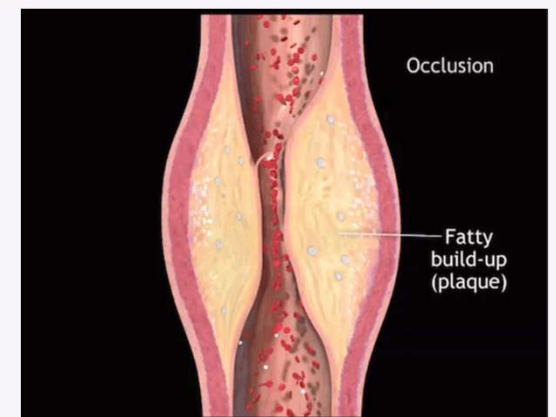
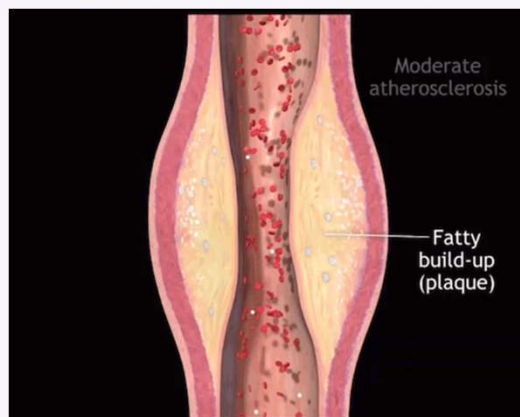
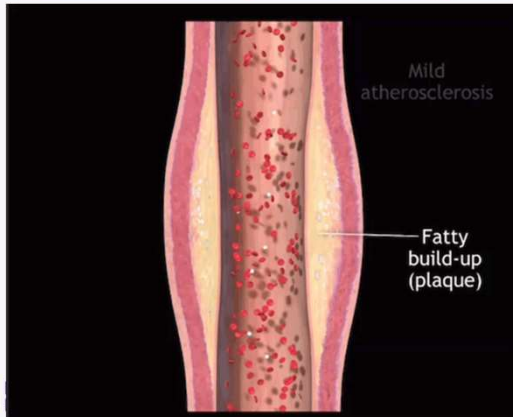
Stable Angina/Claudication



NSTEMI-ACS/Acute limb ischemia



STEMI/Stroke/Amputation

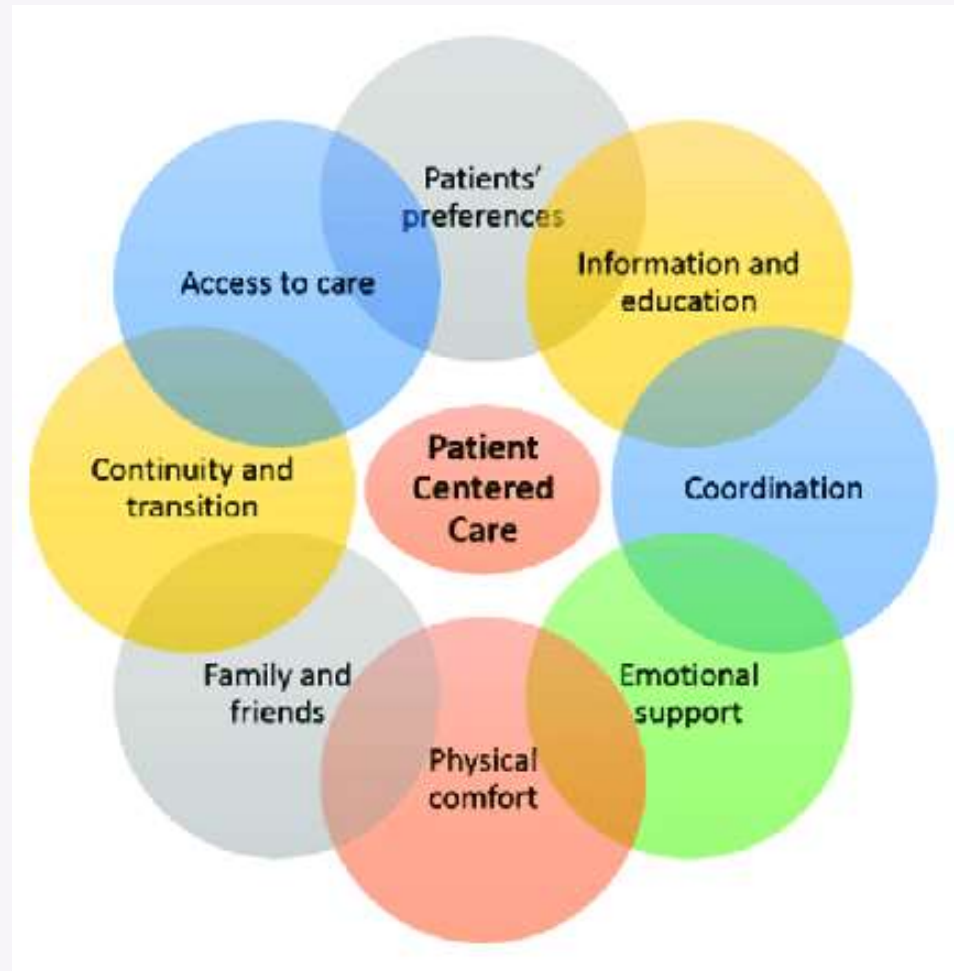
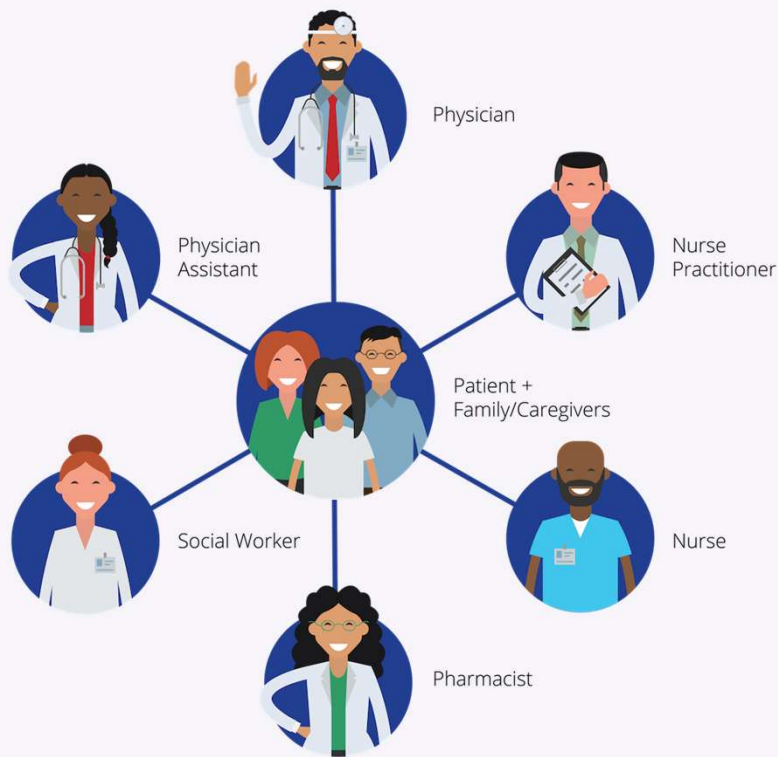


## Secondary Prevention: Avoiding a 2<sup>nd</sup> Event



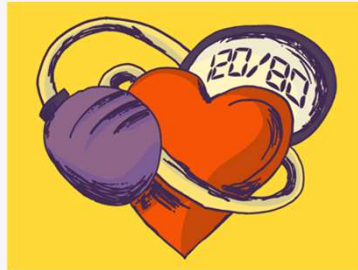
Find the culprits for future problems

# Team-Based Care



# Risk Factors

- Hypertension
- Smoking
- Dyslipidemia
- Diabetes
- Family Hx of CAD



<https%3A%2F%2Fribbble.com%2Fshots%2F2098-Know-Your-Numbers&psig=AOvVaw1hJasK6jFWqkMS4GtzZaTK&ust=1668266362677000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwig2r7Ttb7AhUAAAAHQAAAAQCA>



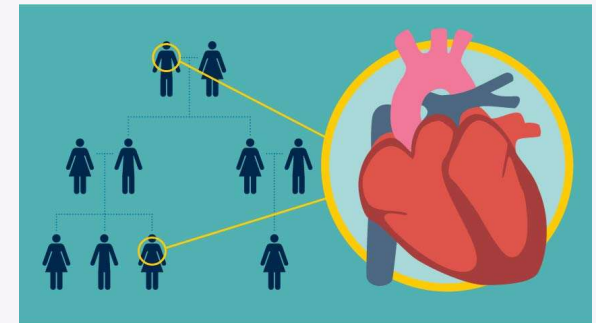
[www.tandfonline.com%2Fdoi%2Fpdf%2F10.1080%2F14779072.2017.1372193&psig=AOvVaw3LYXMOz7MMRgNzhUxbxRui&ust=166826645880000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwiguKSQt6b7AhUAAAAHQAAAAQDA](http://www.tandfonline.com%2Fdoi%2Fpdf%2F10.1080%2F14779072.2017.1372193&psig=AOvVaw3LYXMOz7MMRgNzhUxbxRui&ust=166826645880000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwiguKSQt6b7AhUAAAAHQAAAAQDA)



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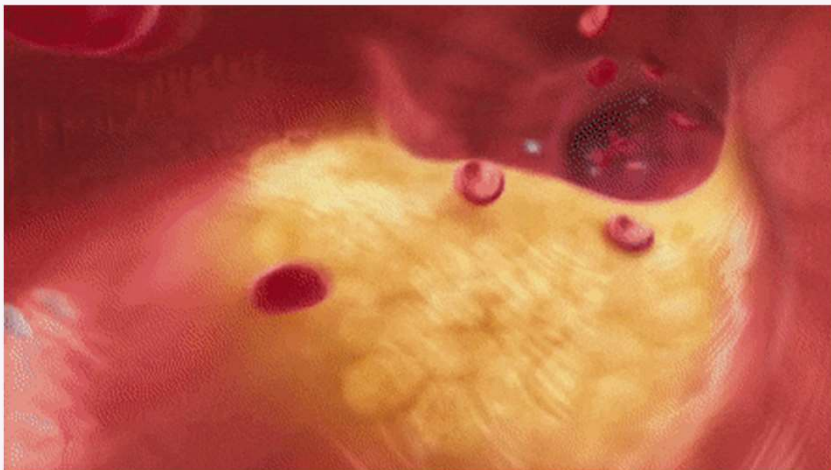
[www.genengnews.com%2Fnews%2Fnovel-diabetes-therapy-might-be-found-in-protein-commonly-found-throughout-the-body%2F&psig=AOvVaw35kYHy3dHbnP8eRYj5AGmt&ust=1668266607632000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwiw\\_Zbwt6b7AhUAAAAHQAAAAQAw](http://www.genengnews.com%2Fnews%2Fnovel-diabetes-therapy-might-be-found-in-protein-commonly-found-throughout-the-body%2F&psig=AOvVaw35kYHy3dHbnP8eRYj5AGmt&ust=1668266607632000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwiw_Zbwt6b7AhUAAAAHQAAAAQAw)



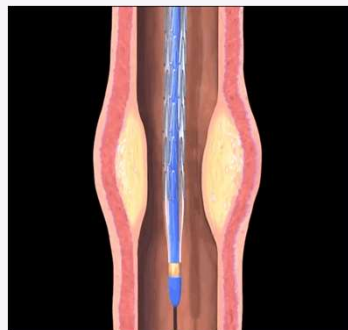
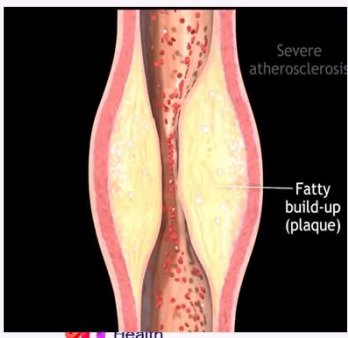
<https://healthblog.uofmhealth.org/heart-health/what-you-should-know-about-counseling-and-testing-for-genetic-heart-disease>



# Antiplatelet(s): Plaque presence = potential for rupture or thrombus;



<https://gfycat.com/gifs/search/myocardial>



1. **Aspirin** 81 mg or 325 mg

- ADAPTABLE trial = either; 81 mg demonstrates same benefit, less bleeding

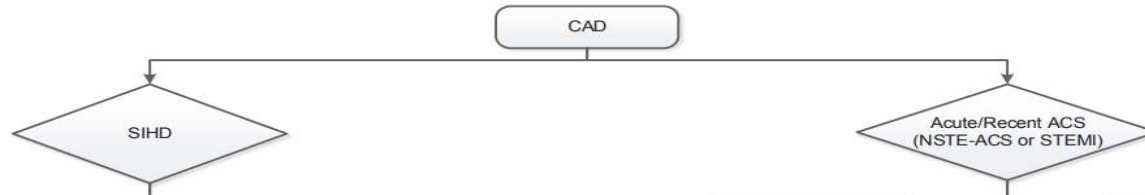
2. **P2y12 inhibitors**: Clopidogrel 75 mg, Prasugrel 10 mg, or Ticagrelor (90 mg po bid or 60 mg po bid).

3. **Dual antiplatelet therapy (DAPT)**: Both ASA + P2y12i

When to go to ASA or P2y12i alone?

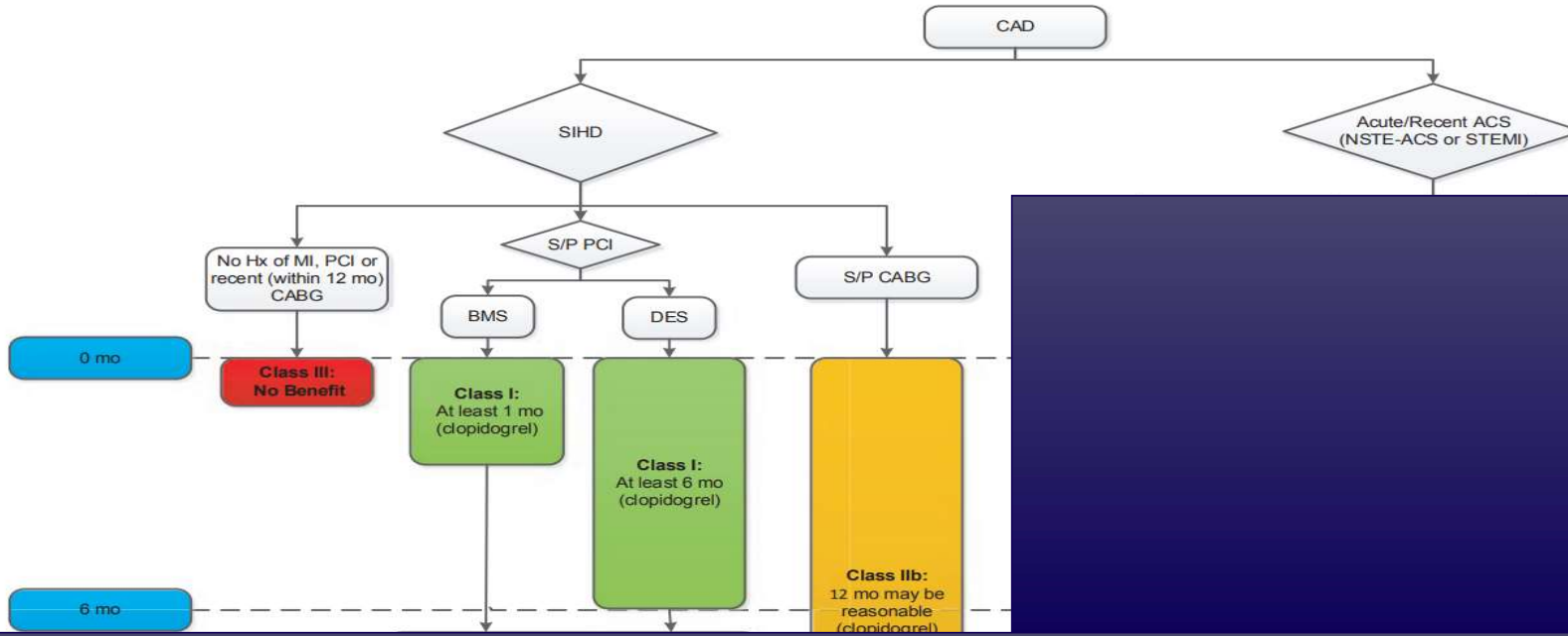
**FIGURE 1** Master Treatment Algorithm for Duration of P2Y<sub>12</sub> Inhibitor Therapy in Patients With CAD Treated With DAPT

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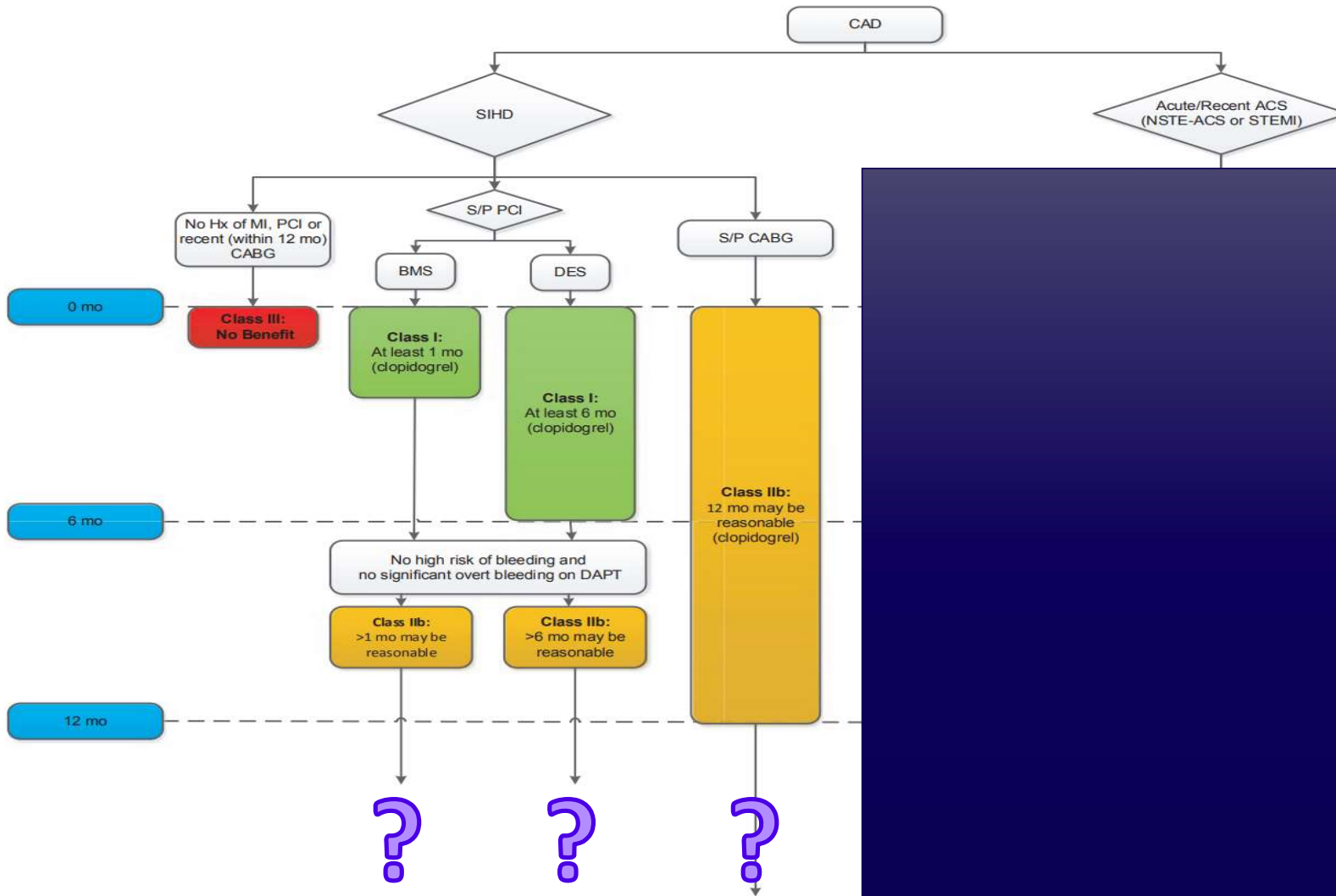
**FIGURE 1** Master Treatment Algorithm for Duration of P2Y<sub>12</sub> Inhibitor Therapy in Patients With CAD Treated With DAPT

@VietHeartPA



**FIGURE 1** Master Treatment Algorithm for Duration of P2Y<sub>12</sub> Inhibitor Therapy in Patients With CAD Treated With DAPT

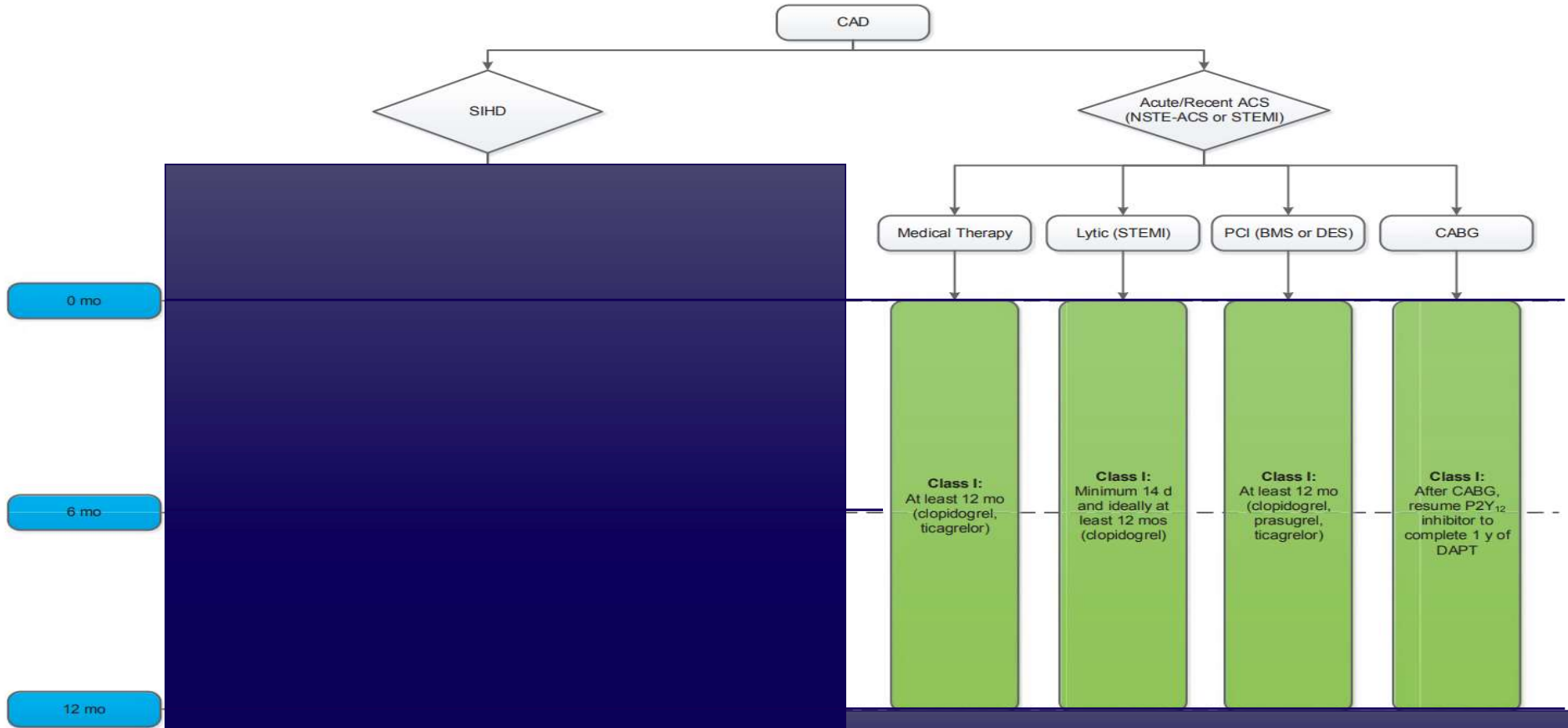
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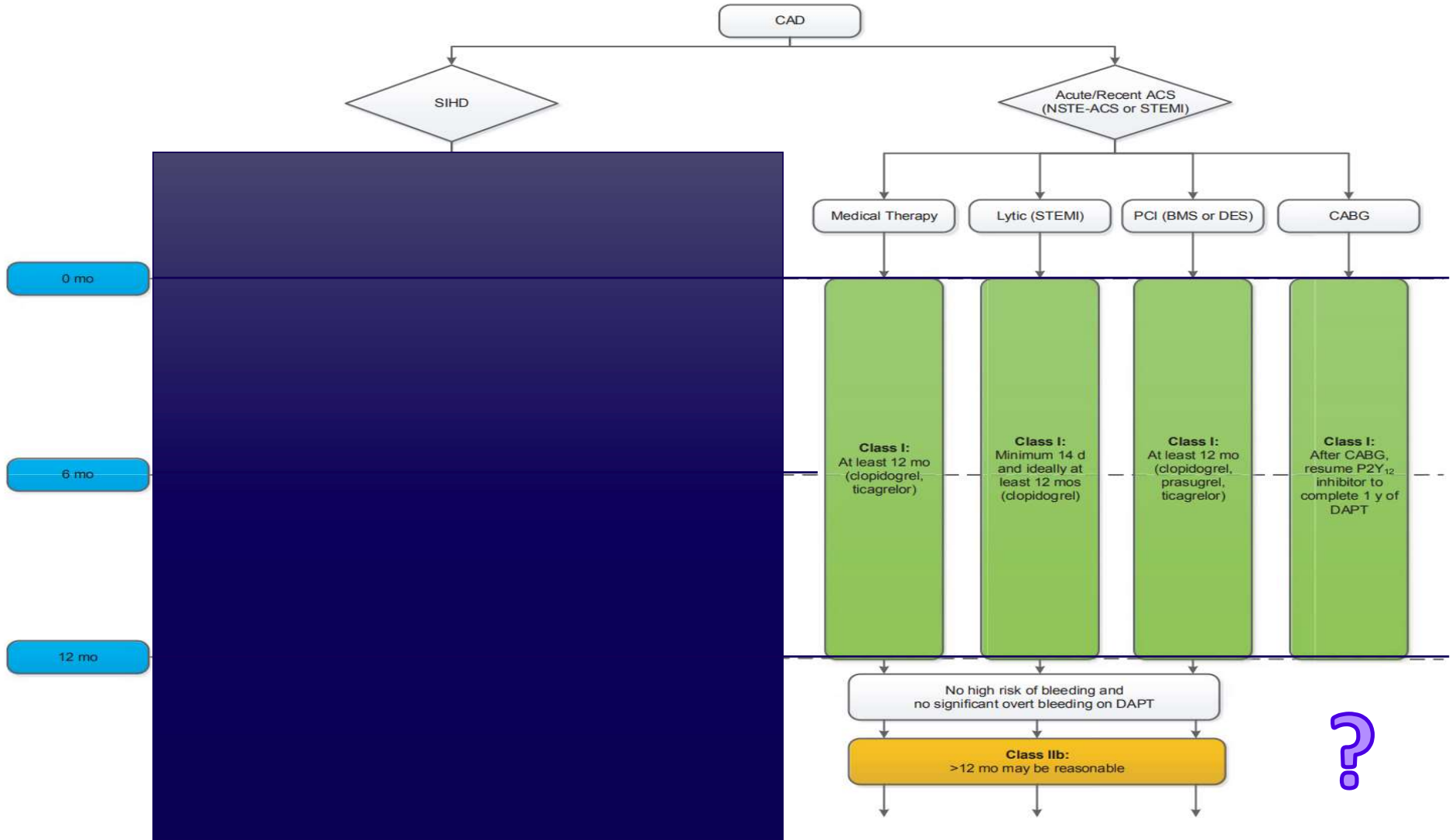
**FIGURE 1** Master Treatment Algorithm for Duration of P2Y<sub>12</sub> Inhibitor Therapy in Patients With CAD Treated With DAPT

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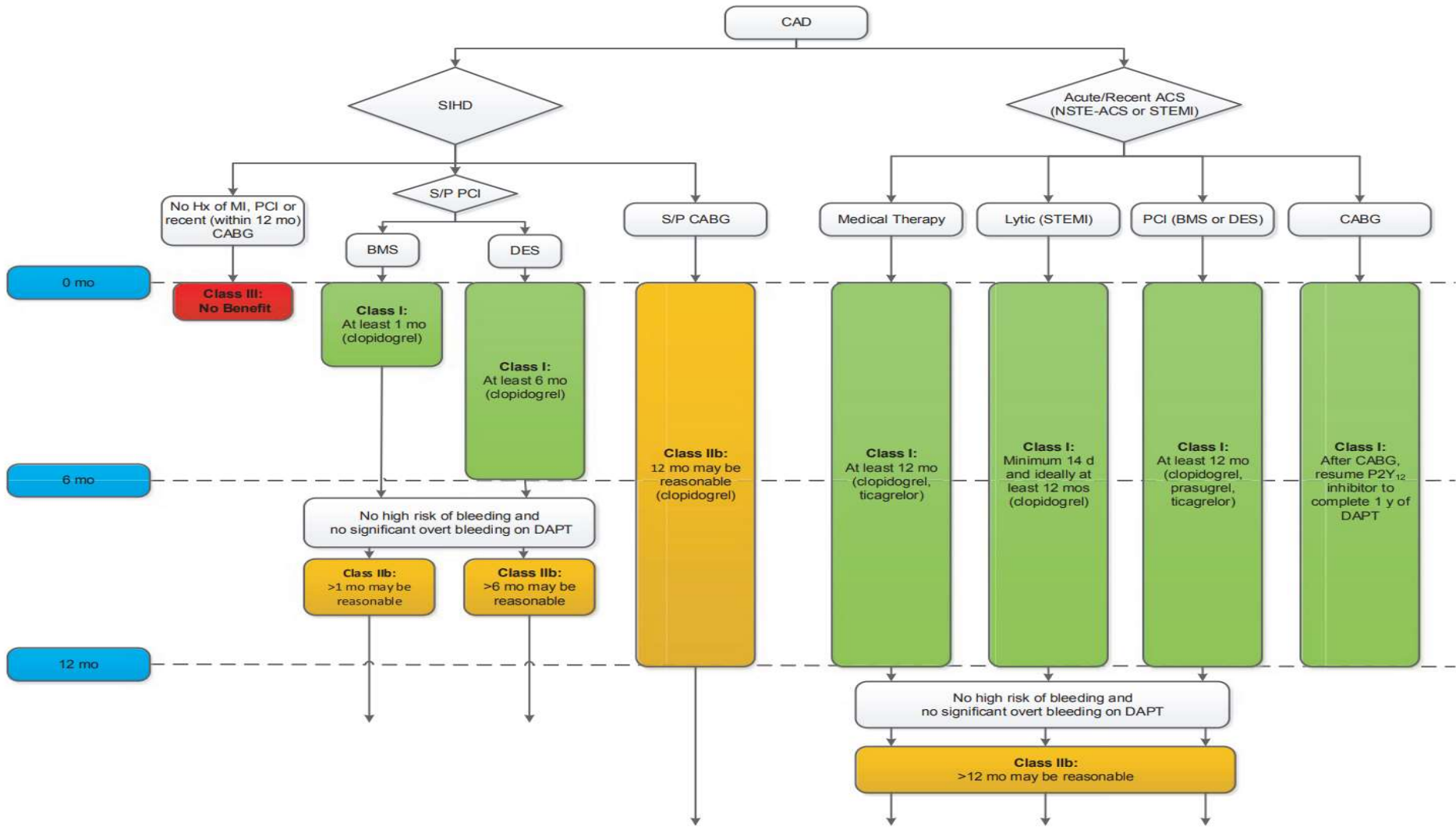
**FIGURE 1** Master Treatment Algorithm for Duration of P2Y<sub>12</sub> Inhibitor Therapy in Patients With CAD Treated With DAPT

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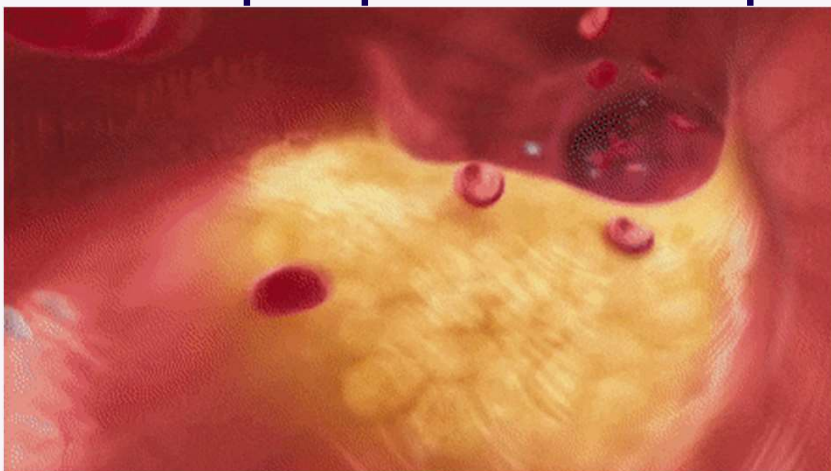


**FIGURE 1 Master Treatment Algorithm for Duration of P2Y<sub>12</sub> Inhibitor Therapy in Patients With CAD Treated With DAPT**

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## Antiplatelet(s): Plaque presence = potential for rupture or thrombus;



<https://gfyca.com/gifs/search/myocardial>

1. **Aspirin** 81 mg or 325 mg OR **P2y12 inhibitors**  
Clopidogrel 75 mg, Prasugrel 10 mg, or Ticagrelor (90 mg po bid or 60 mg po bid).

As a single agent going forward? CAPRIE, 1996 study demonstrated cardiovascular benefit and less bleeding with clopidogrel over aspirin monotherapy.

Host-Exam 2022 affirmed data from CAPRIE trial of P2Y12i over aspirin.

Guidelines are still geared to ASA 81 mg monotherapy.

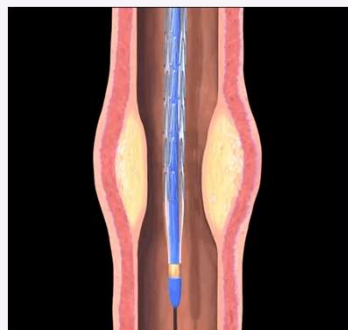
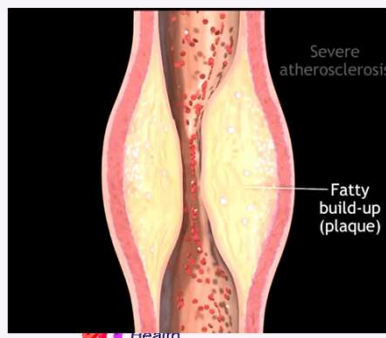
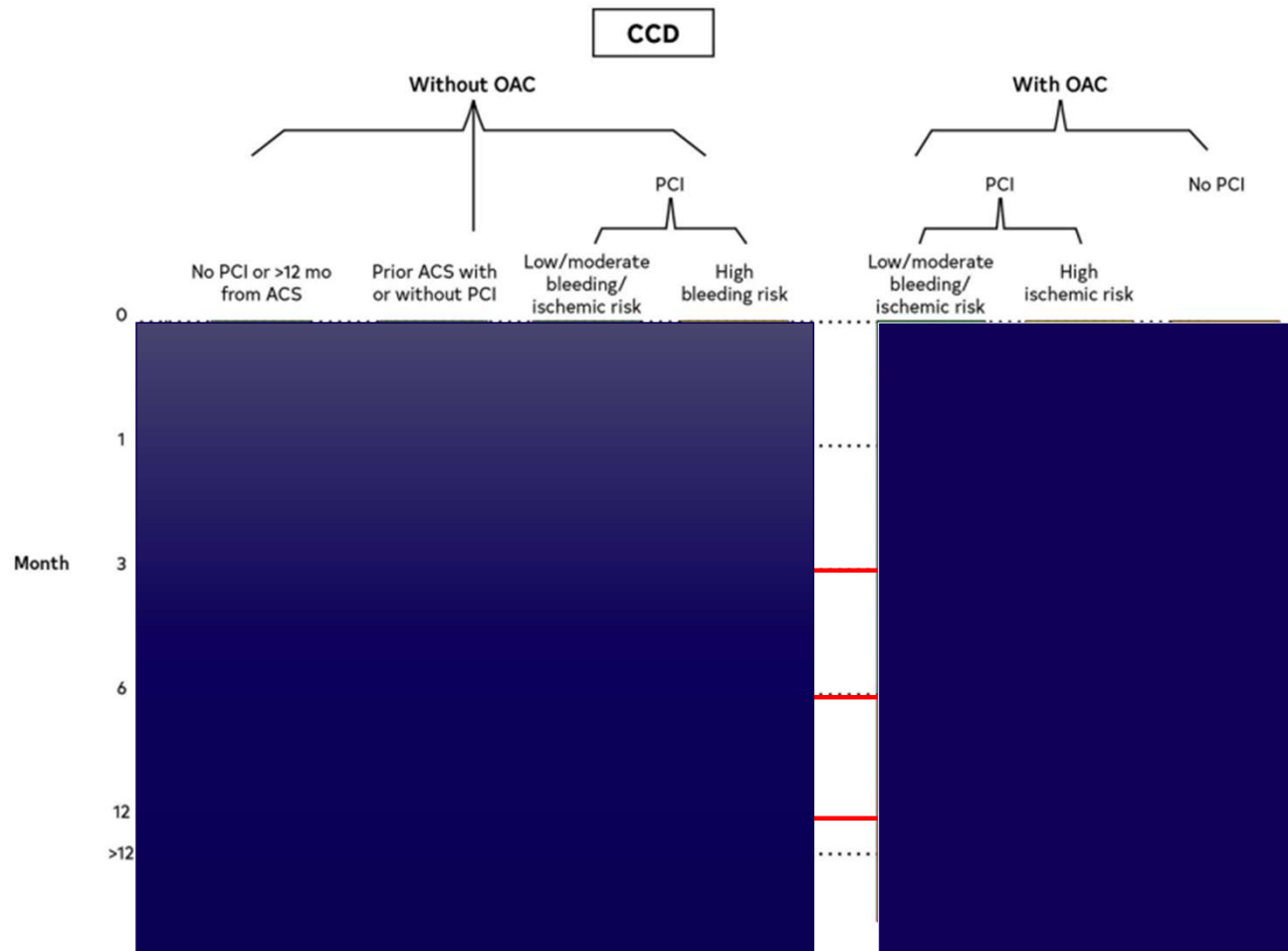




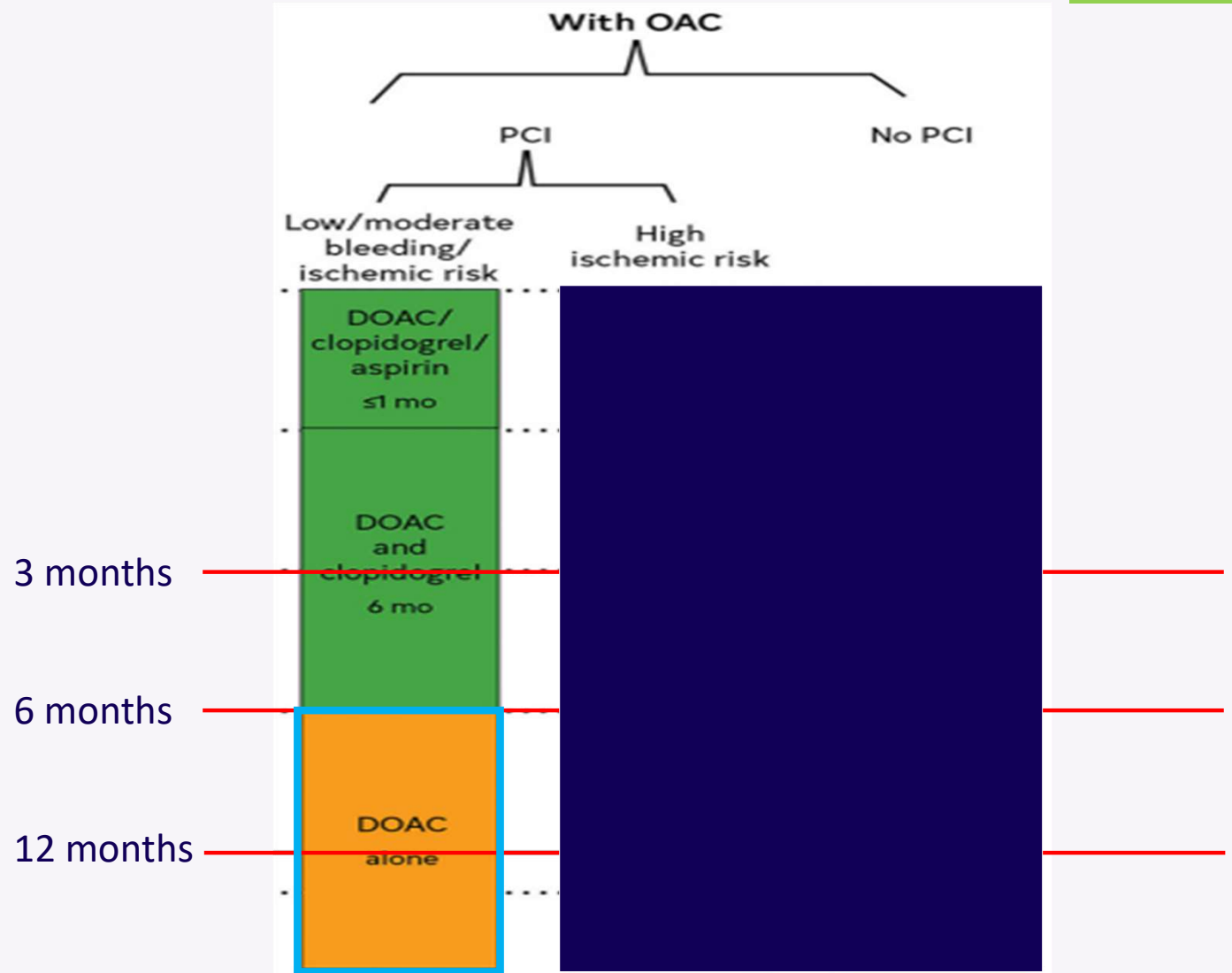
FIGURE 9 Recommended Duration of Antiplatelet Therapy\*†



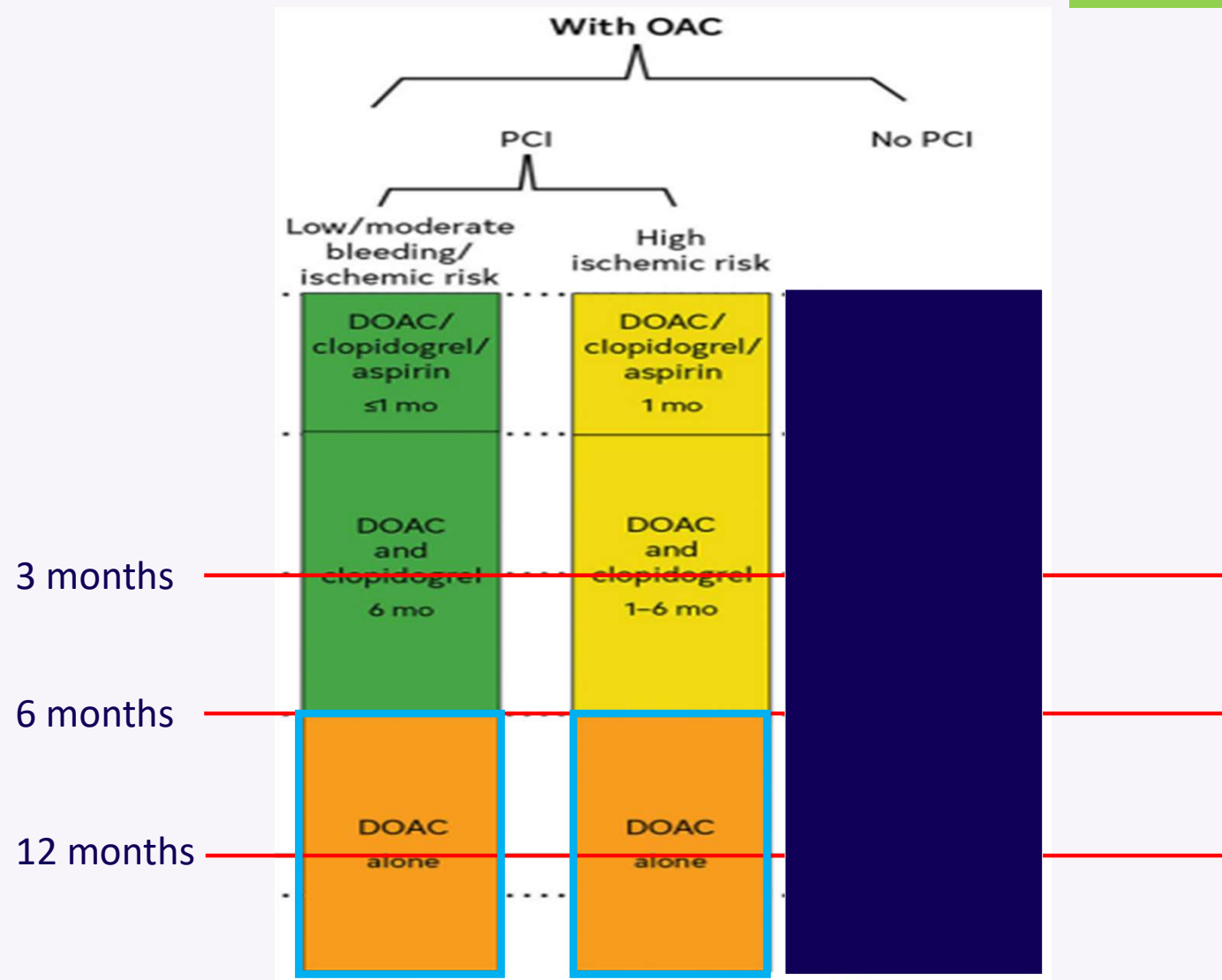
ACS indicates acute coronary syndrome; ASA, aspirin; CCD, chronic coronary disease; DAPT, dual antiplatelet therapy; DES, drug-eluting stent; DOAC, direct oral anticoagulant; MI, myocardial infarction; OAC, oral anticoagulants; PCI, percutaneous coronary intervention; SAPT, single antiplatelet therapy. \*Colors correspond to Class of Recommendation in Table 3. †This figure does not encompass all recommendations within this section.

# What about Atrial Fibrillation and Coronary Artery Disease?

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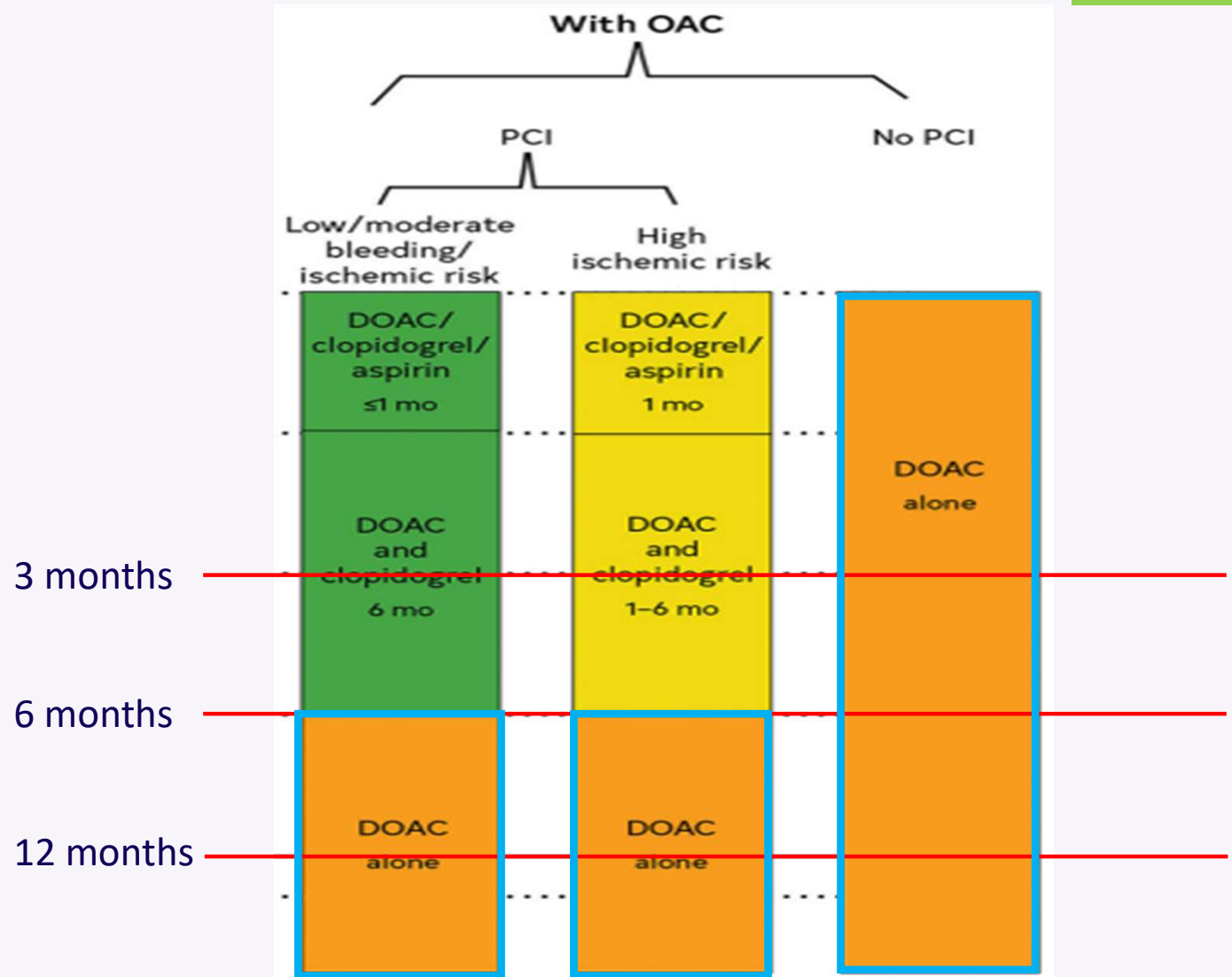
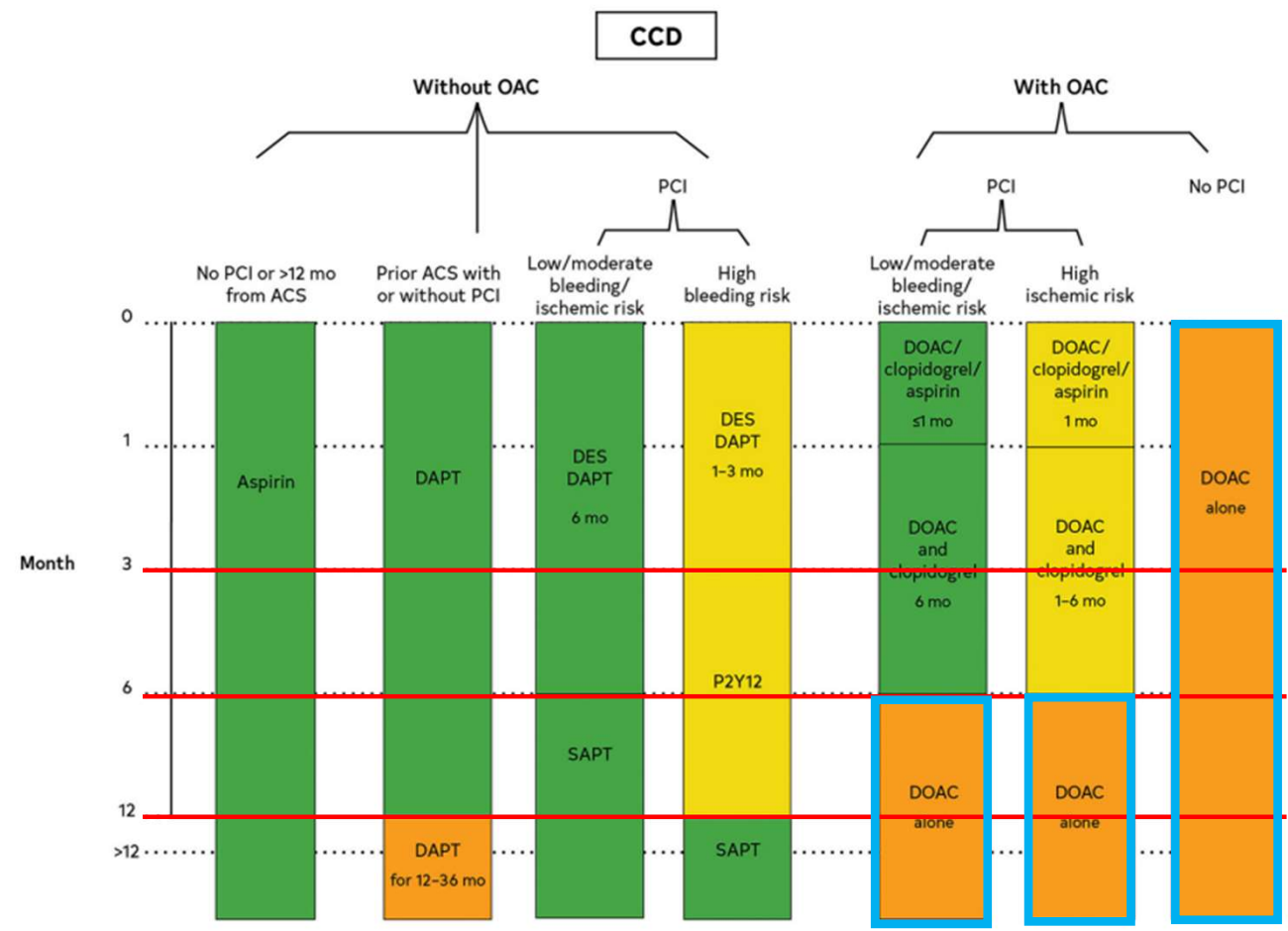




FIGURE 9 Recommended Duration of Antiplatelet Therapy\*†



ACS indicates acute coronary syndrome; ASA, aspirin; CCD, chronic coronary disease; DAPT, dual antiplatelet therapy; DES, drug-eluting stent; DOAC, direct oral anticoagulant; MI, myocardial infarction; OAC, oral anticoagulants; PCI, percutaneous coronary intervention; SAPT, single antiplatelet therapy. \*Colors correspond to Class of Recommendation in Table 3. †This figure does not encompass all recommendations within this section.

# What about Atrial Fibrillation and Coronary Artery Disease?

# Case

55-year-old man returns for annual follow-up.

PMHx: Had an MI at age 50, 2vCABG. Has Paroxysmal Afib.

FMHx: Mom had MI at age 55. Has one sister, A&W.

SocHx: Florist. Single. Lifetime non-smoker, drinks 1-2 beers on the weekends. Lifts weights 2-3 times a week at the gym.

MEDS: Clopidogrel 75 mg, rosuvastatin 40 mg, ezetimibe 10 mg, bi-weekly Repatha 140 mg/mL SC, metoprolol succinate 50 mg. SL NTG 0.4 mg PRN.

Vitals: BP 120/80, HR 55, SaO2 95%, T 98.7, Wt 200 Ht 5'9"  
BMI 29.5

LABS: TC 200, Trig 110, HDL 42, LDL 50. A1c 5.5%, Fasting Glucose 92 mg/dL



What are your recommendations?

## Paroxysmal AF. Antithrombotic regimen?

1. Lifestyle modifications for health
2. **Initiate oral anticoagulant and stop P2y12 inhibitor.**
3. Watch for bleeding complications of bleeding (e.g., GI)

# Hypertension, the pressure is on! BP goal <130/80 mmHg with GDMT\*

## 1. GDMT

- Beta-blockers
- ACE Inhibitors or ARB
- Thiazides
- DHP/NDHP CCBs



<https://gfycat.com/totaltiredfinch>

# Differences in HTN categories

- JNC 7, JNC 8, and ACC/AHA 2017

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

### BP Classification (JNC 7 and ACC/AHA Guidelines)

SBP		DBP	JNC 7	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

- Blood Pressure should be based on an average of ≥2 careful readings on ≥2 occasions
- Adults being treated with antihypertensive medication designated as having hypertension



## HTN goals ACC/AHA 2017

Patient group	2017 ACC/AHA
General	<130/80 mm Hg*
Older patients	<130 mm Hg <sup>†</sup>
Diabetes	<130/80 mm Hg
Chronic kidney disease	<130/80 mm Hg

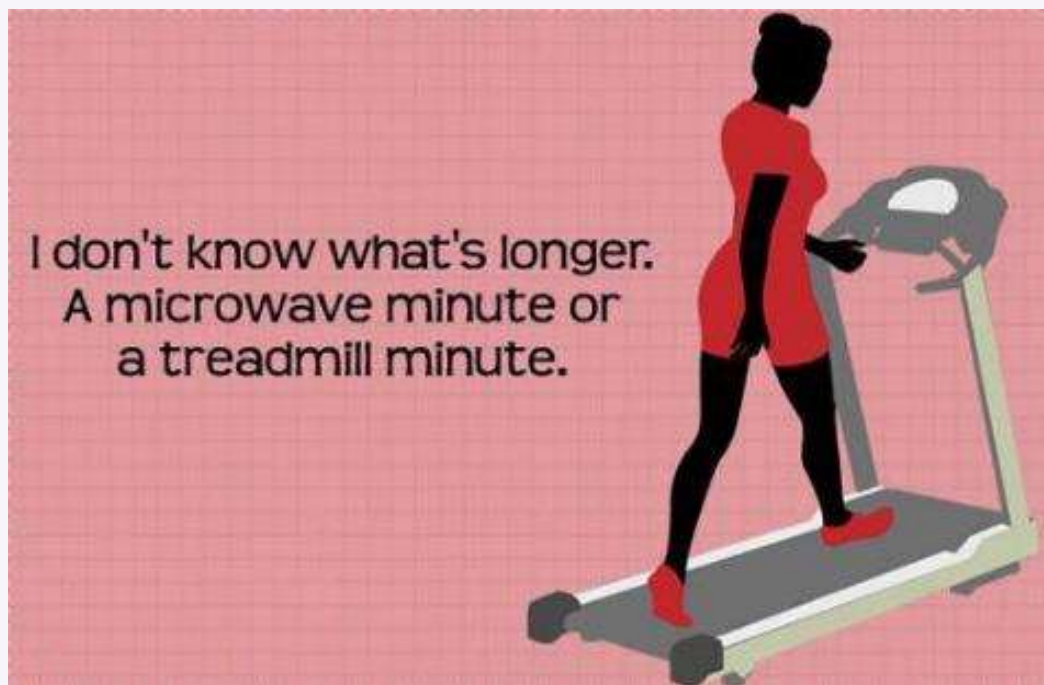
\*Includes patients with atherosclerotic cardiovascular disease (ASCVD) or an estimated 10-year risk  $\geq 10\%$ , as well as patients needing primary prevention or those with 10-year ASCVD risk  $< 10\%$ .

<sup>†</sup>General population  $\geq 60$  years of age. Treatment does not need to be adjusted in patients  $\geq 60$  years who may have lower systolic BP (eg,  $< 140$  mm Hg) and are not experiencing adverse effects.

<sup>‡</sup>Ambulatory, community-dwelling, noninstitutionalized patients  $\geq 65$  years of age. Clinical judgment, patient preference, and a team-based approach to assess benefits and risks are reasonable for patients with a high burden of comorbidity and limited life expectancy.

# Lifestyle first, foremost, and always

- Its about the quality of life we live, not just how long we live it



Consider discussing lifestyle modifications not as “work” you do to become healthy. Rather as doing enjoyable activities by yourself or with others that happen to help keep you feeling healthy.

# Physical Activity Recommendations in CAD patients



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

For Overall Cardiovascular Health:

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

**OR**

At least **25** minutes of vigorous aerobic activity **or** 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](http://heart.org/ActivityRecommendations).

Consider FITT principle for ALL

- Frequency, e.g., 1-2x/wk: **add a day**
- Intensity, e.g., HR 90-110, talk easily: **10-20% increase**
- Time, e.g., 5-10 minutes: **10-20% increase**
- Type, e.g., walking, chair exercises: **10-20% increase**

# Pharmacotherapeutics

- Initiation: what to start with? First-line and/or condition driven

Regardless of underlying conditions, **start with agents that have data for clinical outcomes benefits**, i.e., have clinical trial data demonstrating reduction of CVD events, CKD progression, etc.

Primary agents used in the treatment of hypertension include:

- **Thiazide diuretics** – (e.g., chlorthalidone, hydrochlorothiazide, indapamide, etc.)
- **ACE inhibitors\*** – (e.g., enalapril, lisinopril, benazepril, etc.)\*
- **ARBs\*** – (e.g., candesartan, irbesartan, losartan, etc.)
- **CCBs dihydropyridine** – (e.g., amlodipine, felodipine, nicardipine, etc.)
- **CCBs nondihydropyridine** – (e.g., diltiazem and verapamil)
- **B-blockers\*** – (e.g., metoprolol succinate, carvedilol, bisoprolol)



**\*Class IB, preference towards ACEi/ARB and/or B-Blocker for HTN and/or MI/LV Dysfunction**



# Specific diseases and populations

- BP goals (<130/<80) for all. Individuals and disease presence may differ.

- **Stable Ischemic Heart Disease** – GDMT ACEi/ARB +/- B-blockers

- **Angina Pectoris** present DHP CCB thiazides, MRA
- **Post-ACS**, LV dysfunction present B-blocker +/- ACEi/ARB; not present ACEi/ARB

e.g., lisinopril 5-10 mg/valsartan 80-160 mg, metoprolol succinate 25-50 mg, amlodipine 5-10 mg

- HFrEF – GDMT Bblockers, ACEi/ARB/ARNI, MRA. NDHP CCB NOT recommended.
- CKD – albuminuria ( $\geq 300$  mg/day or  $\geq 300$  mg/g creatinine by first morning void) is present, ACEi, ARB if ACEi not tolerated.
- DM – All first line medications (e.g., thiazides, ACEi/ARB, DHP/NDHP CCBs) are reasonable.

# Case

63-year-old woman presents for follow-up. She continues to have **stable angina** with climbing 2 flights of stairs.

PMHx: Occasional headaches OB/GYN: Post-menopausal since early 50's. She had an **MI at age 60, 3vCABG**, EF 55%.

FMHx: Parents have passed. 2 brothers, 1 with DMII.

SocHx: Medical Technologist, working part-time. Married with 2 adult children. Former smoker, no EtOH. Does not follow any specific physical activity regimen.

MEDS: Clopidogrel 75 mg, rosuvastatin 40 mg, ezetimibe 10 mg, valsartan 80 mg. SL NTG 0.4 mg PRN.

Vitals: **BP 138/80**, HR 80, SaO2 96%, T 98.9, Wt 155 Ht 5'5" BMI 25.8

LABS: TC 220, Trig 200, HDL 50, LDL 68. A1c 5.6%, Fasting Glucose 99 mg/dL

What are your recommendations?



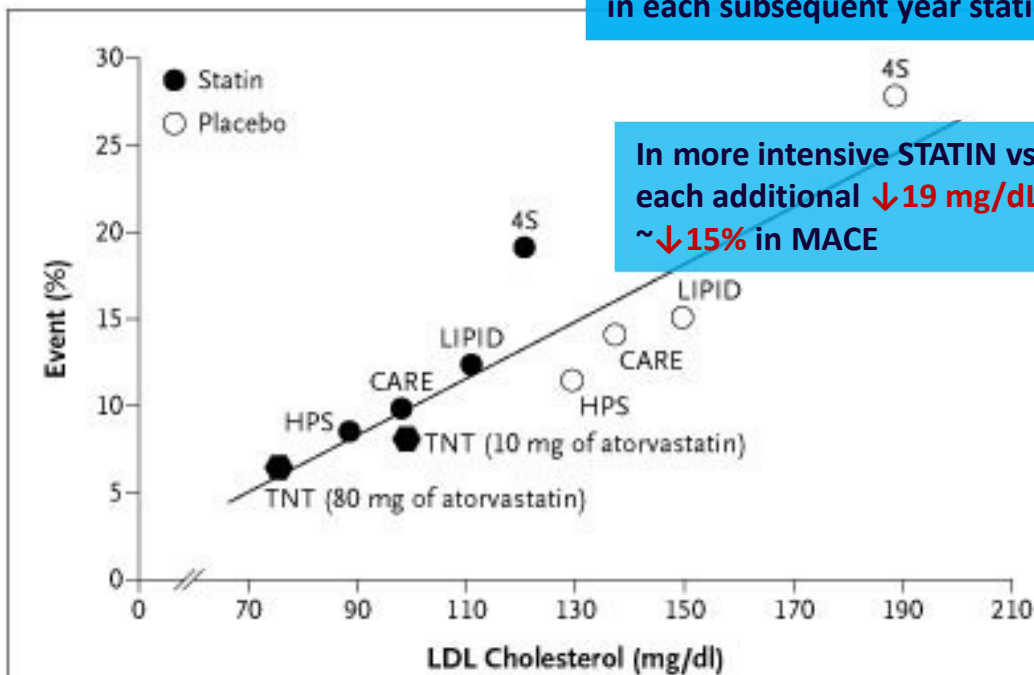
## Stage 1 - $\geq 130 / \geq 80$ , ASCVD $\geq 10\%$

1. Lifestyle modifications for health
2. Titrate BP medication: **Increase valsartan to 160 mg and consider adding amlodipine 5 mg**
3. Reiterate importance of self measurement and keeping a home BP journal
4. Reassess in 4-6 weeks in-person or by appropriate real-time communication (e.g., text, phone, or video-visit)

In STATIN vs NO-STATIN, for every  $\downarrow 38$  mg/dL LDL-C, there is a proportional  $\downarrow 20\%$  in MACE in the 1<sup>st</sup> year.

After the 1<sup>st</sup> year, ongoing statin use leads to  $\sim \downarrow 25\%$  in MACE in each subsequent year statin is used.

In more intensive STATIN vs less intensive STATIN, for each additional  $\downarrow 19$  mg/dL LDL-C, an additional  $\sim \downarrow 15\%$  in MACE



5 trials with LDL cholesterol reduction at 1 year  $> 1.1$  mmol/L (average: 1.4 mmol/L)

17 trials with LDL cholesterol reduction at 1 year  $< 1.1$  mmol/L (average: 0.9 mmol/L)

5 trials with further LDL cholesterol reduction (average: 0.5 mmol/L)

Proportional reduction in major vascular events (95% CI)

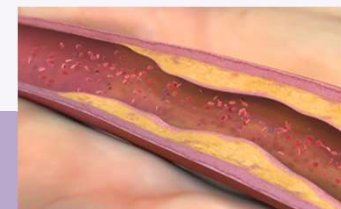
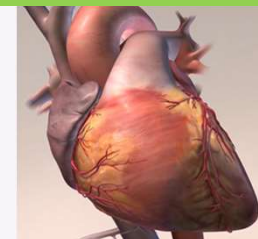
Mean 1-year LDL cholesterol difference between treatment groups (mmol/L)

**BOTTOMLINE:**

High intensity statin = Each  $\sim \downarrow 50$  mg/dL LDL-C, there is a  $\sim \downarrow 28\%$  MACE

# Secondary Prevention

## STATIN...please.



**MINIMUM 1<sup>st</sup> GOAL:**  
**>50% LDL-C Reduction from baseline.**

### High Intensity Statins (HIST)

- Atorvastatin 40, 80 mg
- Rosuvastatin 20, 40 mg

**AHA/ACC 2018 2<sup>nd</sup> GOAL:**  
**LDL-C <70 mg/dL OR non-HDL-C <100 mg/dL**

### Updated AHA/ACC 2022:

**ASCVD NOT at very high-risk** LDL-C <70 mg/dL OR non-HDL-C <100 mg/dL  
**ASCVD at Very HIGH RISK,** **LDL-C <55 mg/dL** OR non-HDL-C <85 mg/dL

### Key TAKEAWAY in ASCVD:

1. Statin FIRST
2. Reduce LDL-C by >50% from baseline.
3. Add non-statins when LDL-C >70 or LDL >55
4. Check lipids 4-6 weeks after initiation or dose titration.



# Case

**66-year-old** man presents for follow-up. Returns for follow-up.

PMHx: Had an **MI** at 63, PCI w/2 stents to proximal LAD, EF 60%.  
**Type II Diabetes**

FMHx: 1 brother with DMII

SocHx: Retired construction worker. Married with 1 adult child.  
Former smoker, no EtOH. Walks daily for 40 minutes.

MEDS: Clopidogrel 75 mg, rosuvastatin 40 mg, ezetimibe 10 mg,  
valsartan HCT 160/12.5 mg, dapagliflozin 10 mg, semaglutide 1.7  
mg/weekly. SL NTG 0.4 mg PRN.

Vitals: BP 125/80, HR 80, SaO2 96%, T 98.9, Wt 155 Ht 5'5" BMI  
25.8

LABS: TC 220, Trig 200, HDL 50, **LDL 88**. A1c 6.7%

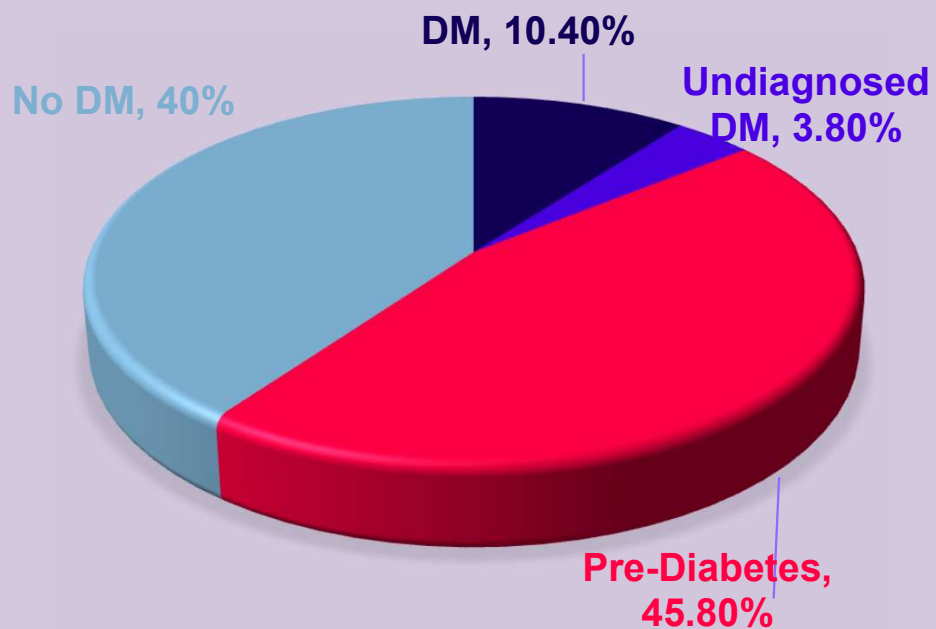
What are your recommendations?

## Very High-Risk ASCVD, LDL-C <55 mg/dL

1. Lifestyle modifications for health
2. Titrate lipid-lowering medication:  
**Add Repatha or Praluent (50% expected decrease,  $88 - (88 * 0.5) = 44$  mg/dL).**
3. Reiterate the importance of self-measurement and keeping a home BP journal
4. Reassess in 4-6 weeks in-person or by appropriate real-time communication (e.g., text, phone, or video visit)

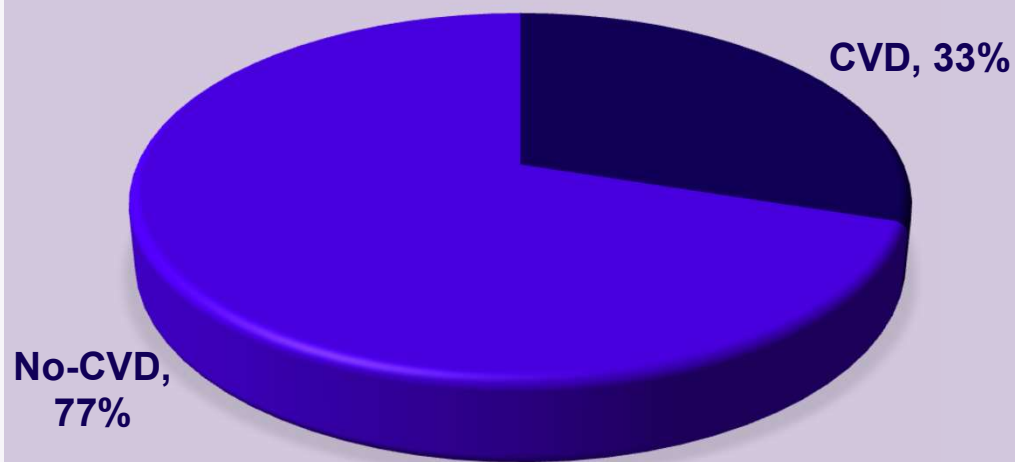
# Diabetes Mellitus + CAD

## DIABETES PREVALENCE



Cardiovasc Diabetol (2018) 17:83

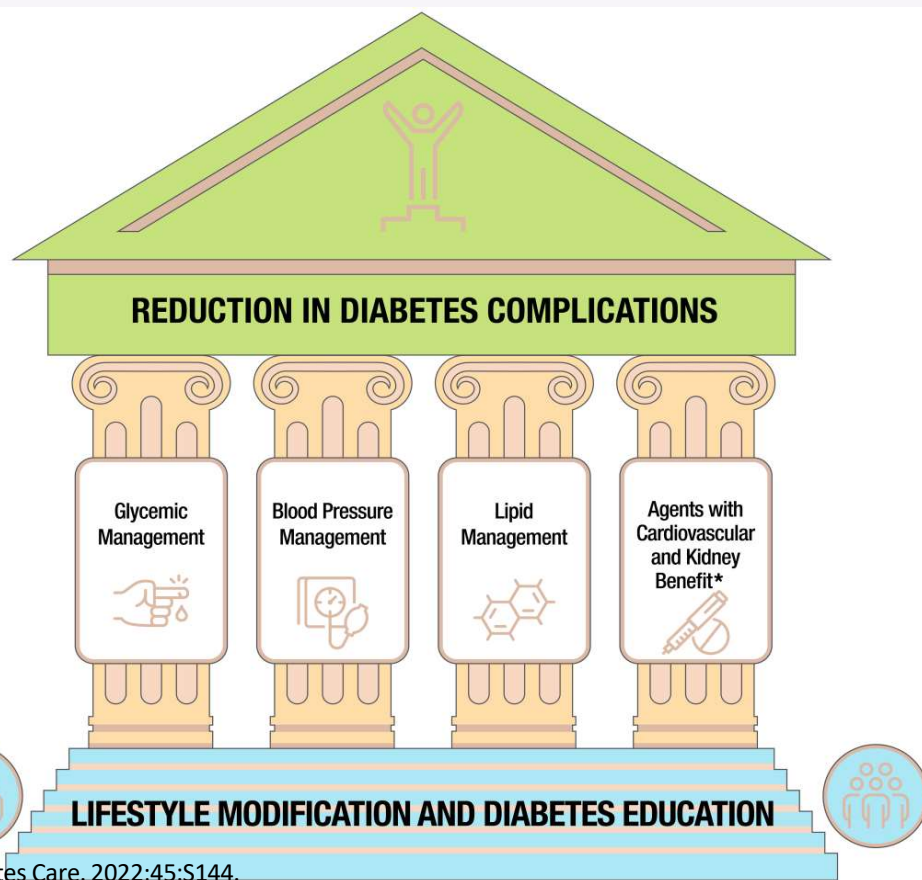
## CVD PREVALENCE IN DIABETES



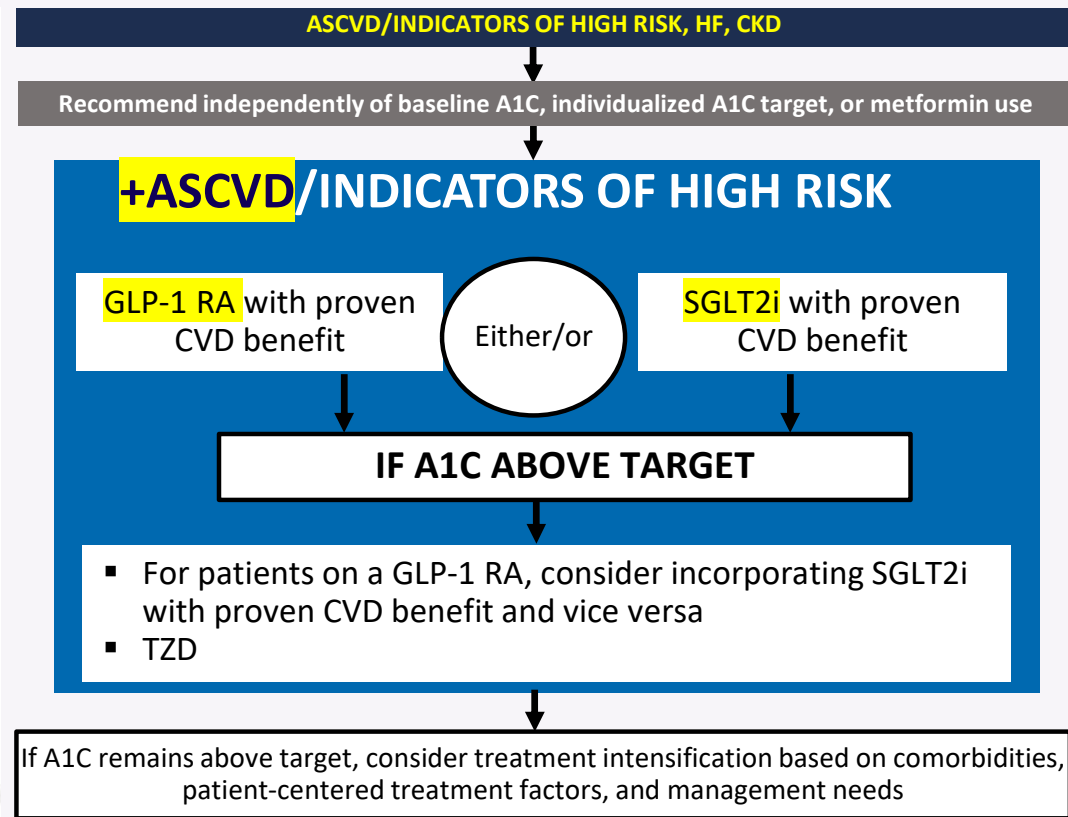
Circulation.2022;145:e153-e639

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# Diabetes Mellitus + CAD



Diabetes Care. 2022;45:S144.



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# Case

50-year-old woman presents for follow-up.

PMHx: DMII since age 30. HTN. MI at age 45; 3VCABG. EF 55%

FMHx: Mom with DMII. Dad with MI age 70. 3 brothers, 2 with DMII.

SocHx: Director of Nursing. Married with 1 adult child. Life-time nonsmoker, no EtOH. Five day/week gym class.

MEDS: Clopidogrel 75 mg, rosuvastatin 40 mg, valsartan 180 mg. SL NTG 0.4 mg PRN. Metformin 1000 mg 2 tabs QD, Lantus 30U daily, Insulin Aspart 15U with meals, glipizide 10 mg bid

Vitals: BP 140/80, HR 60, SaO2 96%, T 98.9, Wt. 200 Ht. 5'3" BMI 35.4

LABS: TC 170, Trig 145, HDL 45, LDL 65. A1c 7.5%, Fasting Glucose 190 mg/dL

What are your recommendations?

## Very High-Risk ASCVD, goal LDL-C <55 mg/dL

1. Lifestyle modifications for health
2. Add **ezetimibe 10 mg (20% expected to decrease,  $65 - (65 * 0.2) = 52$ )**
3. **Add Amlodipine, Chlorthalidone, or Metoprolol Succinate**
4. **Add SGLT2i and/or GLP1ra and remove glipizide, reducing basal and short-acting insulin.**
5. Reassess labs in 4-6 weeks, with BP check, glucose journal (CGM?), by appropriate real-time communication (e.g., in-person text, phone, or video-visit)



# ASCVD Sequelae

Death, nonfatal MI or stroke, PAD, etc.

- Angina – Optimal medical therapy or revascularization (PCI or CABG) + Optimal medical therapy
- Surveillance – Ankle Brachial Index, Carotid and/or abdominal ultrasound, stress tests

# Common Questions

Cardiac evaluation for non-cardiac surgery (2022 ESC

<https://www.ahajournals.org/doi/10.1161/cir.0b013e3182447787>; 2014 AHA/ACC

<https://www.ahajournals.org/doi/full/10.1161/CIR.000000000000106>; Nice summary

<https://www.acc.org/latest-in-cardiology/ten-points-to-remember/2022/09/01/13/18/2022-esc-guidelines-on-noncardiac-surgery-esc-2022>)

Return to work post cardiac bypass – work, severity, and patient dependent.

Intimacy and intercourse, 2012 AHA Scientific Statement

(<https://www.ahajournals.org/doi/10.1161/cir.0b013e3182447787>)

When to de-escalate therapies (age, cognitive, failure to thrive, terminal illnesses, etc.) – (Beers Criteria,

<https://geriatricscareonline.org/ProductAbstract/american-geriatrics-society-updated-beers-criteria/CL001/?param2=search>)

Thank you!

