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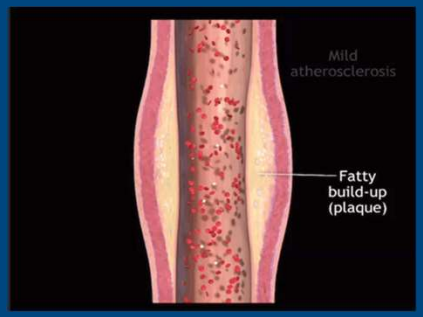
# Physiologic Debris and Detritus plugging the biologic pipes?

## Management of Coronary Artery Disease


Viet Le, MPAS PA-C FACC FAHA
Associate Professor of Cardiovascular Research,
Intermountain Heart Institute
President, Association of PAs in Cardiology
Co-Chair ACC CVT PA Committee
PA Faculty, Rocky Mtn Univ of Health Professions

Intermountain Healthcare
*Healing for life®*

# Disclosures

I have relevant relationships with ineligible companies* to disclose within the past 24 months

Amgen– Sub-Investigator on a Research Grant

Janssen – Primary Investigator on a Research Grant

Novartis – Sub-Investigator on a Research Grant

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

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

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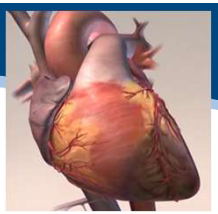
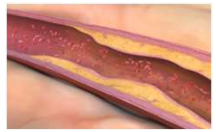
# Objectives

- 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

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# Which of the following is a part of the pathophysiology of atherosclerotic cardiovascular disease(s)?

a. The accumulation of plaque in the walls of arteries
b. The formation of blood clots in arteries
c. The constriction of arteries due to spasm
d. The presence of cholesterol crystals in the plaque
e. All the above

# What is a modifiable risk factor for coronary artery disease (CAD)?

a. Age

b. Family history

c. High blood pressure

d. Sex

# In patients with atrial fibrillation and stable coronary artery disease, what is the best anti-thrombolytic therapy?

a. Aspirin 81 mg daily

b. Aspirin 81 mg + P2y12 inhibitors daily

c. Aspirin 81 mg + P2y12 inhibitors + oral anticoagulant daily

d. P2y12 inhibitor + oral anticoagulant daily

e. Oral anticoagulant daily

# 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 ≥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 ca ases where blood was not collected for cardiac biomarker testing.



rily defined by el patients with normal ) or a rise
line values are e er (i) symptoms sugg ischemic
s or new LBBB, ( y artery or a side bran olization,
on of new loss o abnormality is requir

**Type 4: MI related to PCI or stent thrombosis**

M of myocardial ischemi biomarker

**Type 5: MI related to CA**

MI associated with CABG vation of cardiac biom p s (<99th
percentile URL). In ac ogical Q waves or new ne cclusion,
or (iii) imaging evide yocardium or new regio

CABG indicates coronary a ary artery disease; cTn, car ock; LVH, left ventricular hypertrophy; MI, myocardial infarction; $MVO_2$, myocard ercutaneous coronary inte
Modified from Thygesen e

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J Am Coll Cardiol. 2014 Dec, 64 (24) e139–e228; Circulation. 2018;138:e618–e651.

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

**TABLE A** **Universal Classification of MI**

| |
|---|
| **Type 1: Spontaneous MI** |
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| **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 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 × 99th percentile URL in patients with normal baseline values (<99th 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 ≥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 × 99th percentile URL in patients with normal baseline cTn values (<99th 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).

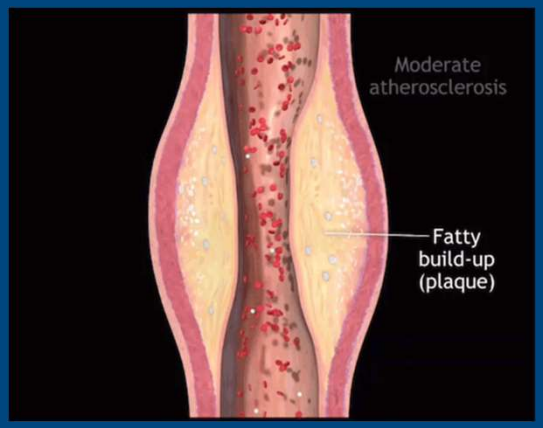
J Am Coll Cardiol. 2014 Dec, 64 (24) e139–e228; Circulation. 2018;138:e618–e651.

# Acute Coronary Syndrome/Chronic Stable

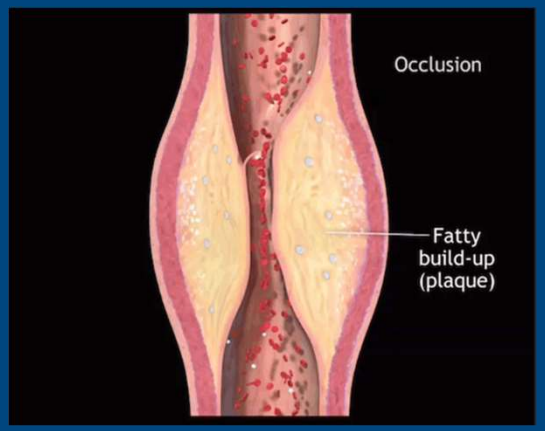


## Stable Angina


## NSTE-ACS

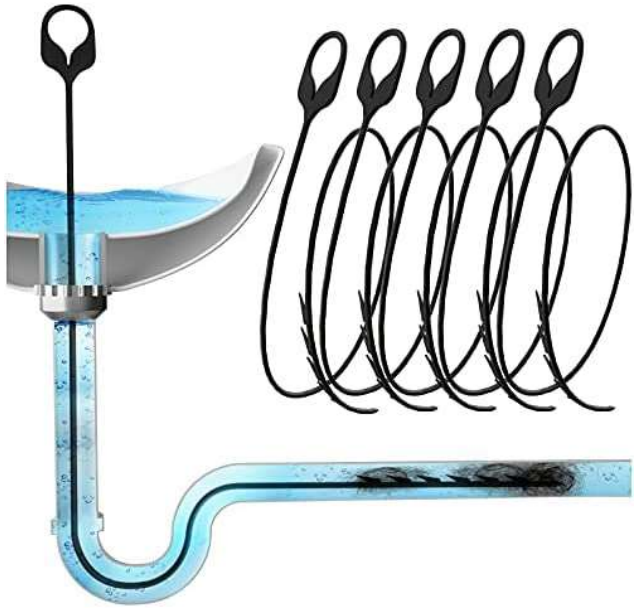

## STEMI

# Tools of the “trade”

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

www.plumbingsupply.com%2Fclogbusters.html&psig=AOvVaw3iT0dXRoxDvHDBT5VcXh4y&ust=1668264017895000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwjYtqeVr6b7AhUAAAAAHQAAAAAQCg



www.amazon.com%2FUpgraded-Anti-break-Plumbing-Bathroom-Cleaning%2Fdp%2FB09GK99MQ4&psig=AOvVaw3iT0dXRoxDvHDBT5VcXh4y&ust=1668264017895000&source=images&cd=vfe&ved=0CA0Q3YkBahcKEwjYtqeVr6b7AhUAAAAAHQAAAAAQAw

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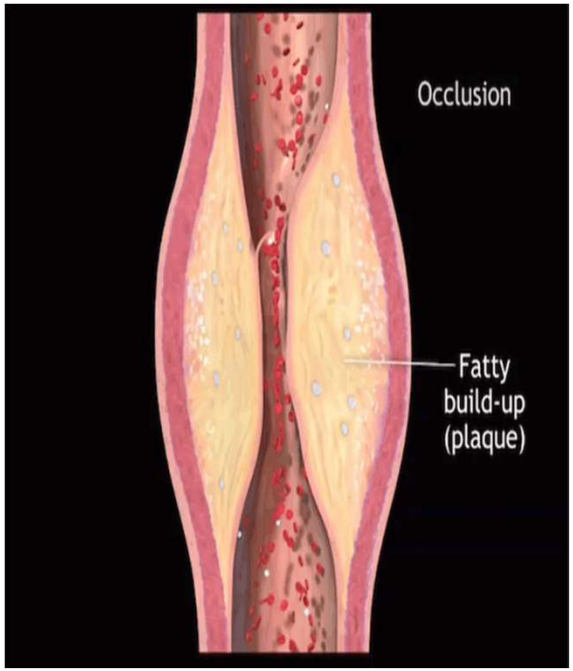
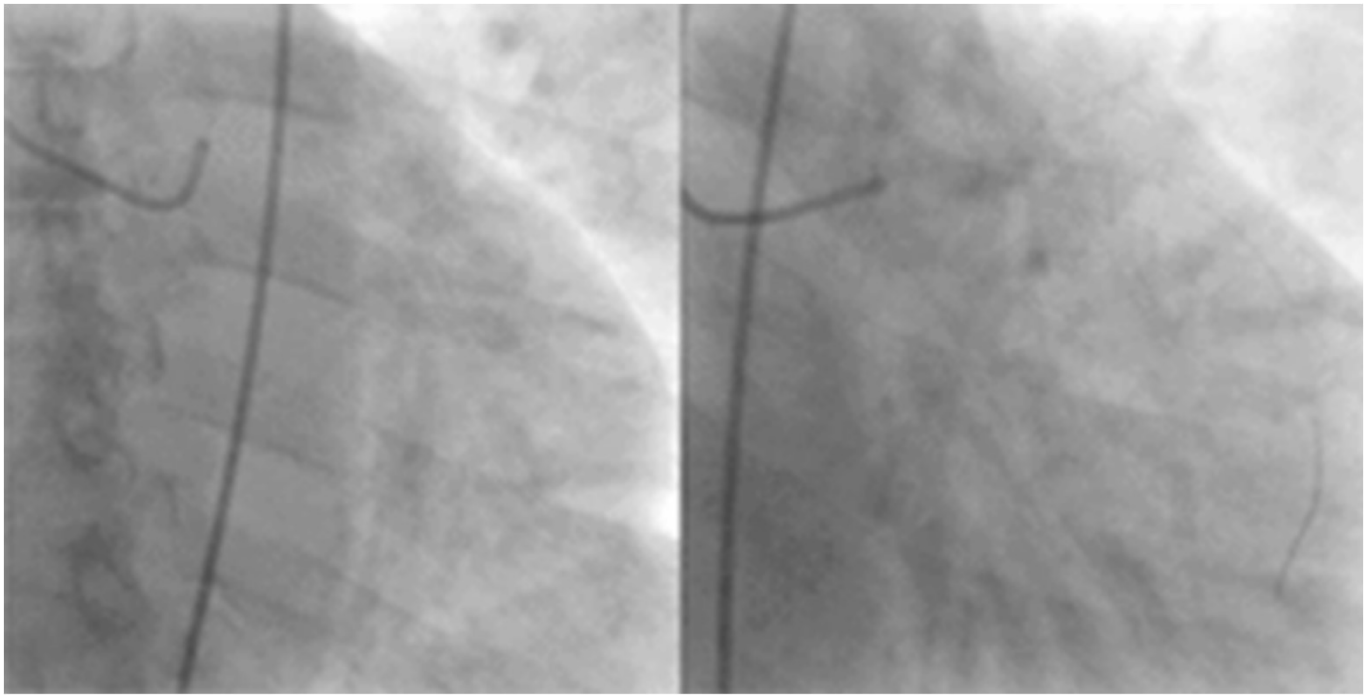
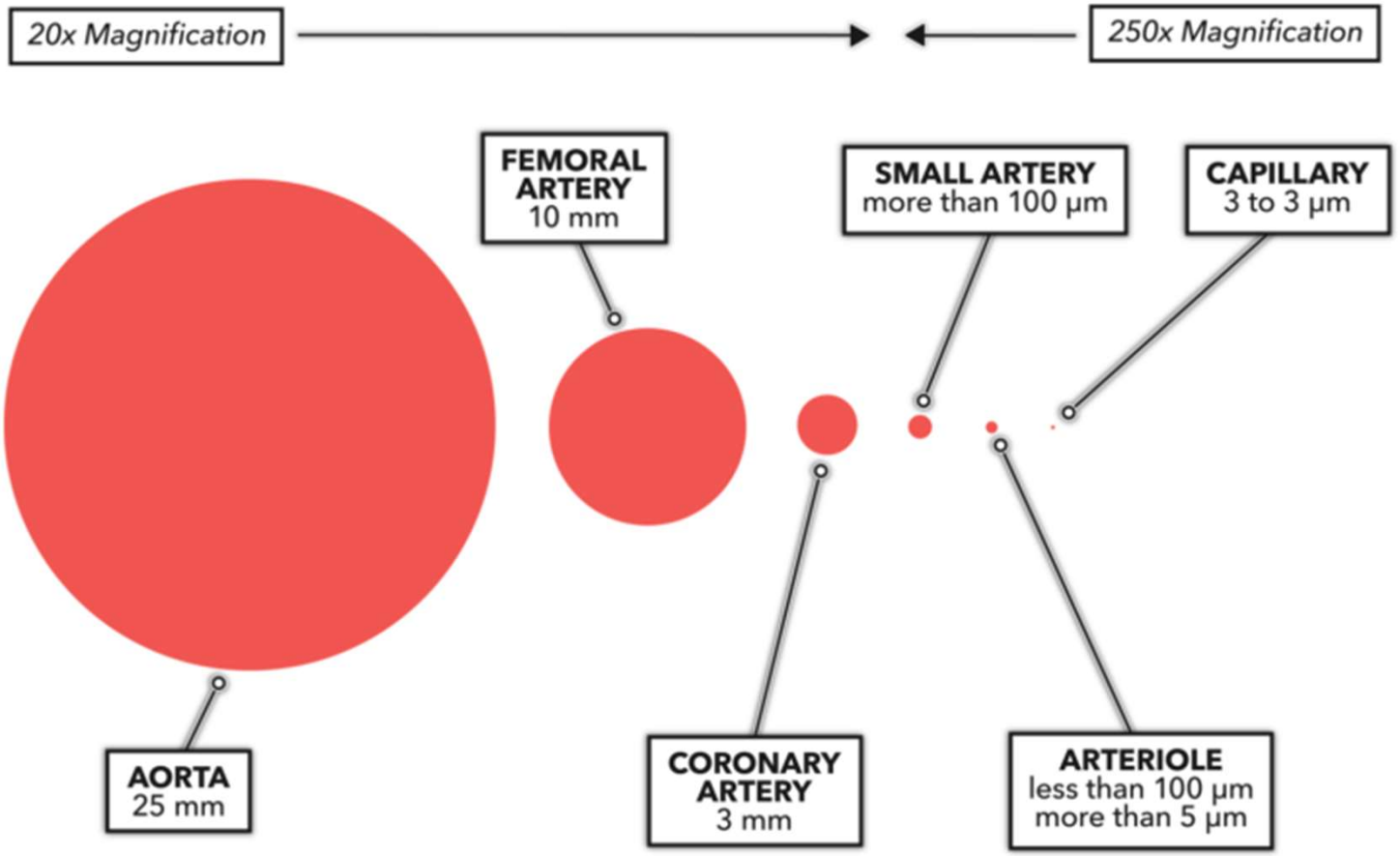
# Tools of the “trade”



https://en.ecgpedia.org/index.php?title=File:Before-and-After_copy.gif







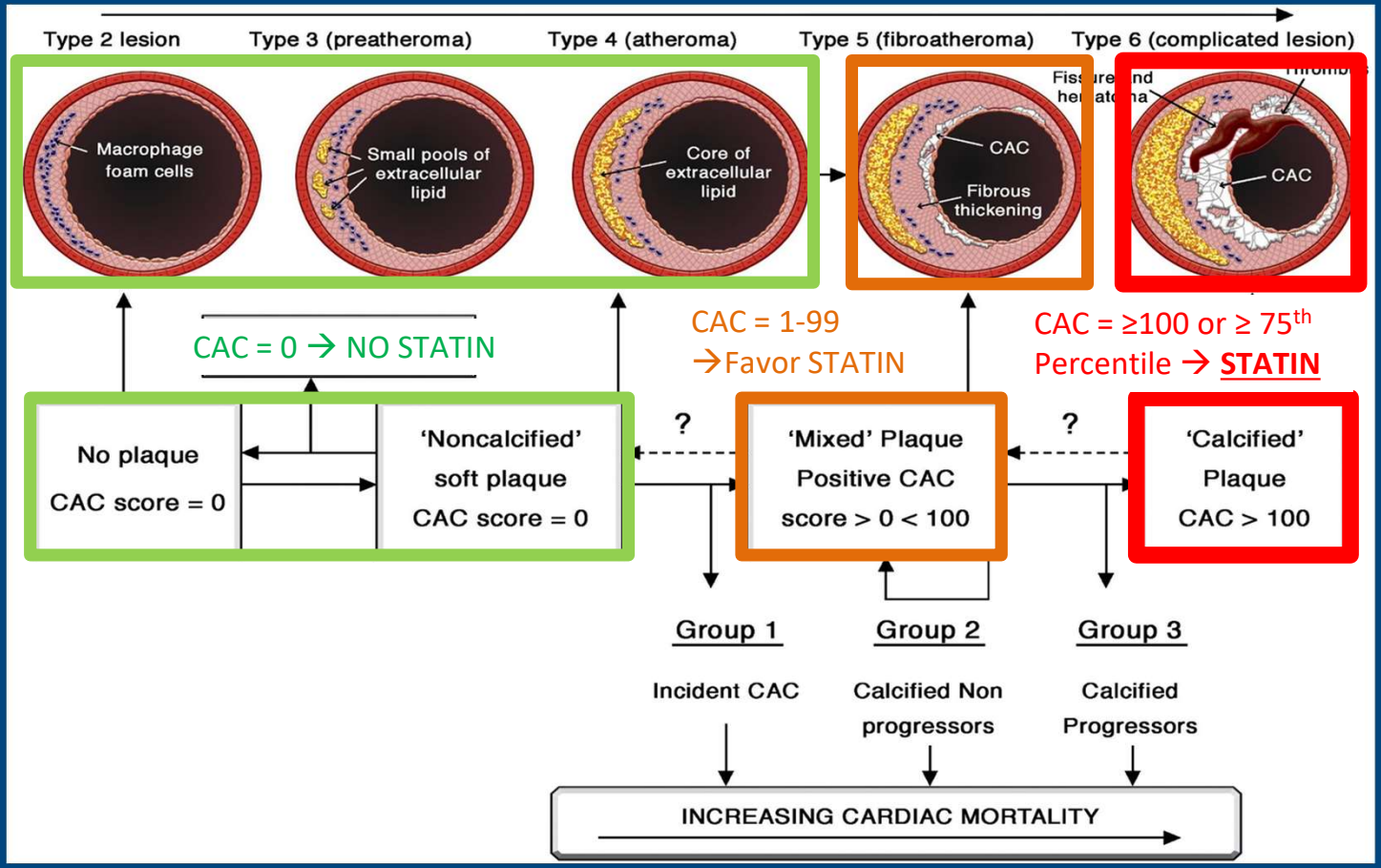
https://www.crossfit.com/essentials/the-heart-part-6-blood-vessel-basics; Lorbeer. 2018. PLoS One. 13(6): e0197559; Dodge Jr. 1992. Circulation. 86:232–246; Paruchuri. 2015. Cardiology. 131:265-272

# Coronary Calcium and statin eligibility (2019 GL)

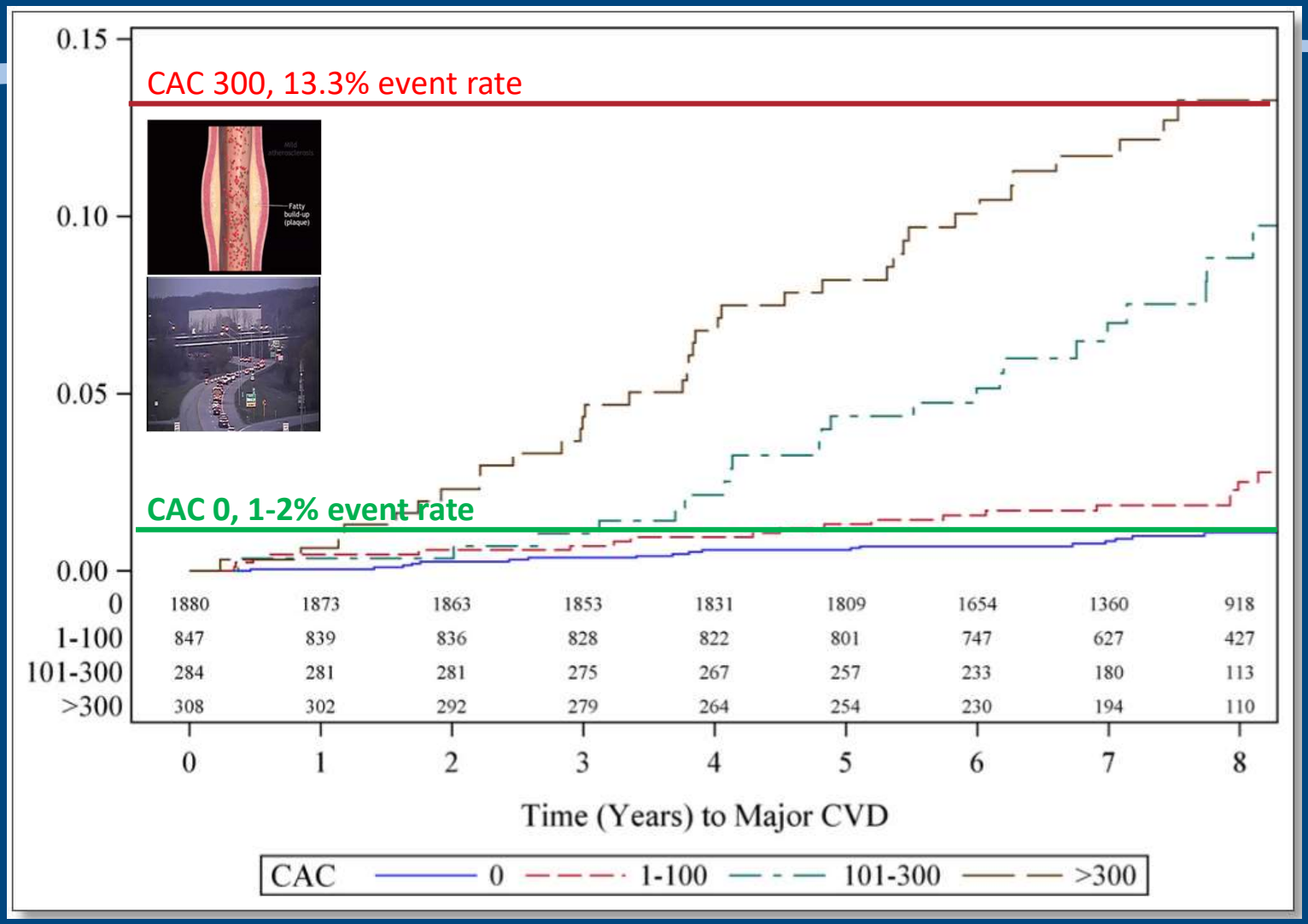
CAC = 0 → NO STATIN

CAC = 1-99 → Favor STATIN

CAC = ≥100 or ≥ 75th Percentile → **STATIN**




McEvoy, et al. JACC 2010. https://doi.org/10.1016/j.jacc.2010.06.038




POPULATION: Framingham (Offspring and 3rd 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]).

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Hoffmann. JAHA. 2016 Feb 22;5(2):e003144

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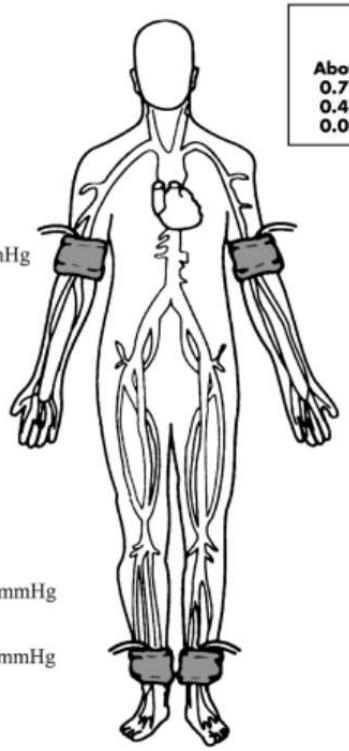
## ABI WORKSHEET

**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

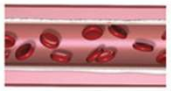
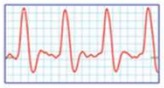
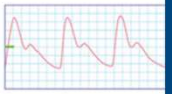
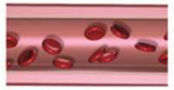
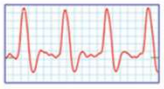
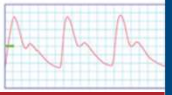
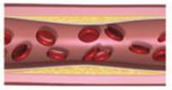
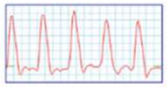
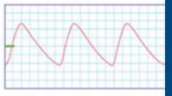
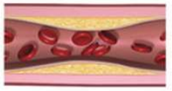
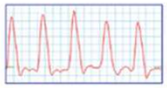
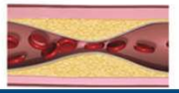
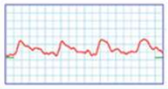
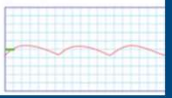
**Right Ankle:**
**Systolic Pressure**
Posterior Tibial (PT) ☐☐☐ mmHg
Dorsalis Pedis (DP) ☐☐☐ mmHg

**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 |  |  |

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

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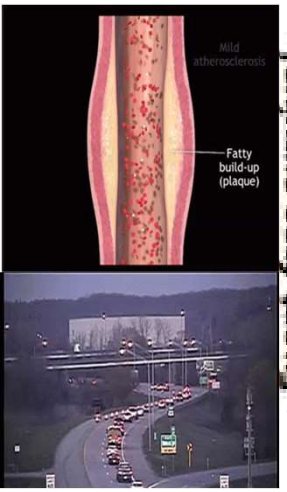
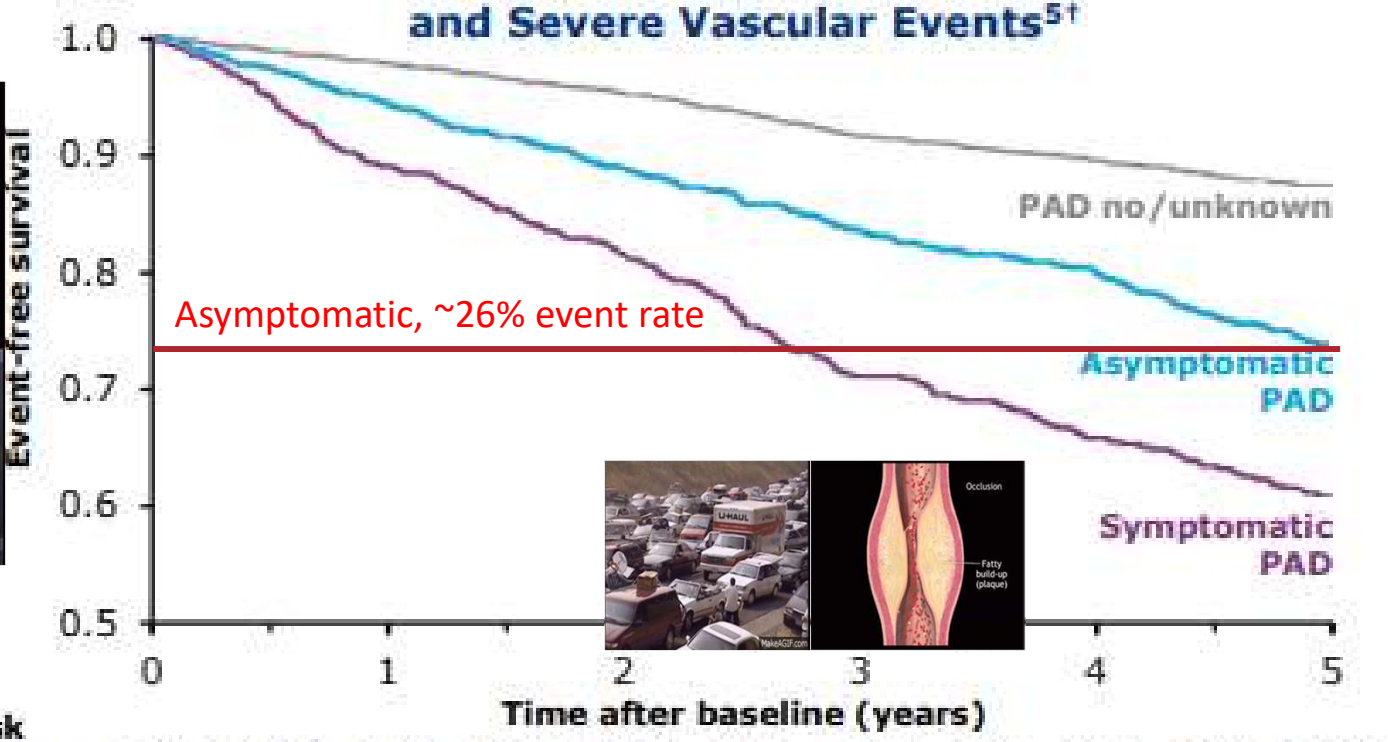





## 5-Year KM Estimates of ACM and Severe Vascular Events[5†]




| Persons at risk | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PAD no/unknown | 5392 | 5303 | 5192 | 5085 | 5017 | 4935 | 4464 | 4004 | 3953 | 3885 | 3850‡ |
| Asymptomatic PAD | 836 | 810 | 776 | 742 | 722 | 700 | 612 | 528 | 520 | 493 | 484‡ |
| Symptomatic PAD | 593 | 561 | 515 | 484 | 463 | 433 | 357 | 301 | 286 | 276 | 268‡ |

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

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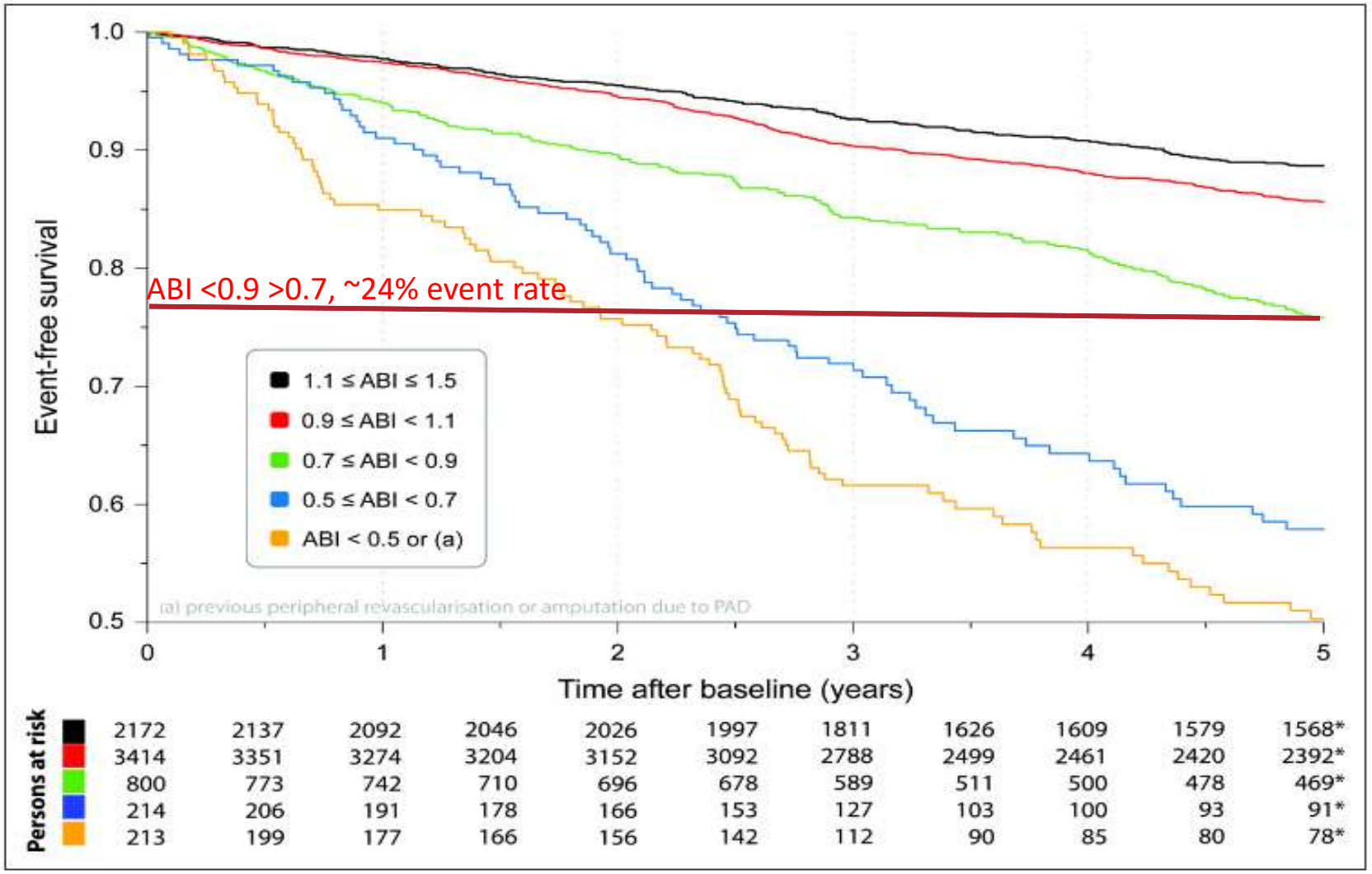
Diehm C et al. Circulation. 2009;120(21):2053-2061.

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Diehm C et al. Circulation. 2009;120(21):2053-2061.

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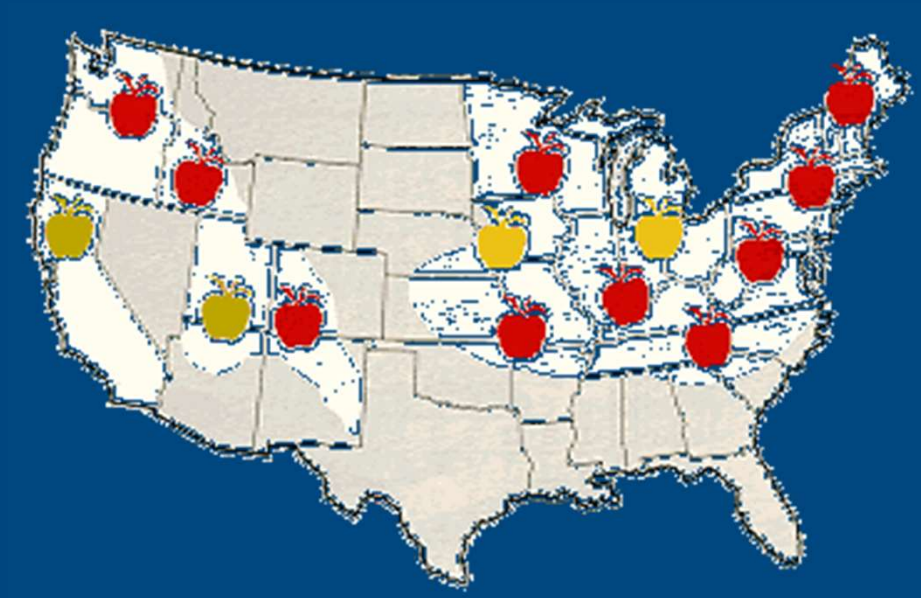
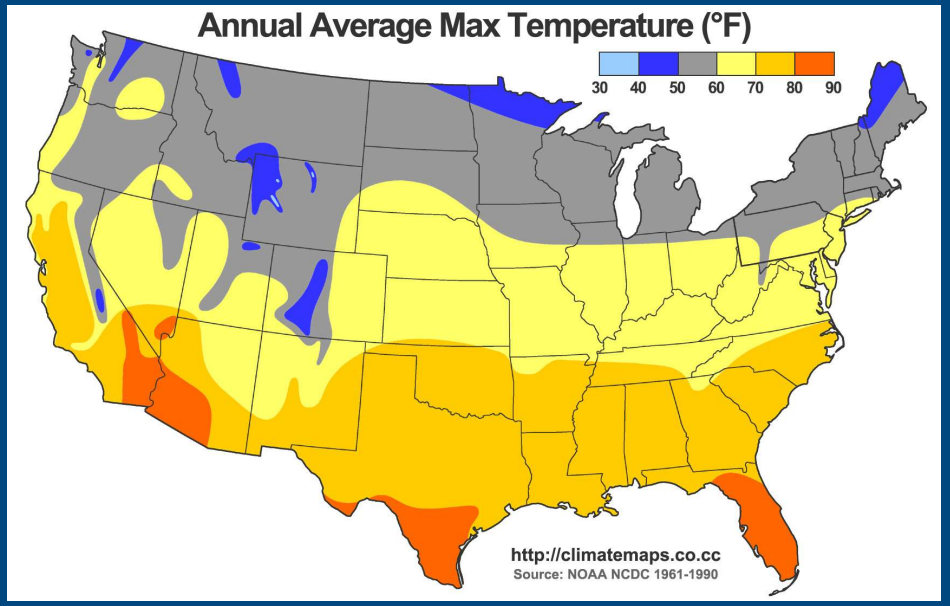
# Where would you find a stand of trees that would most likely yield apples?



https://web.extension.illinois.edu/apples/images/us_map.gif




https://en.wikipedia.org/wiki/Climate_of_the_United_States

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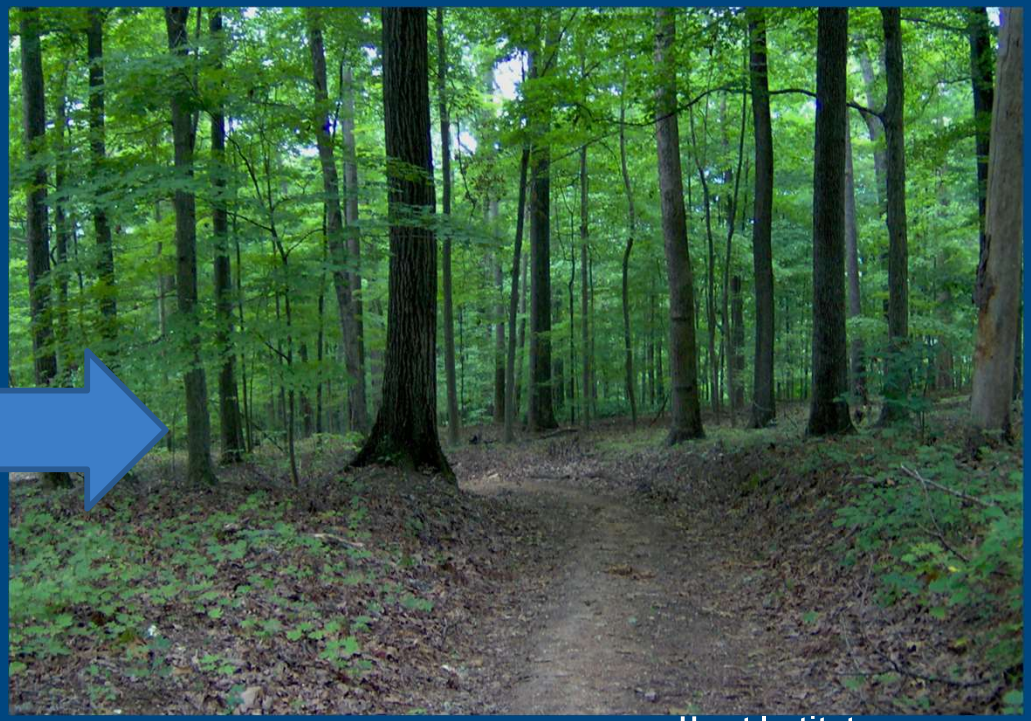
# Which stand of trees would you most likely find apples?



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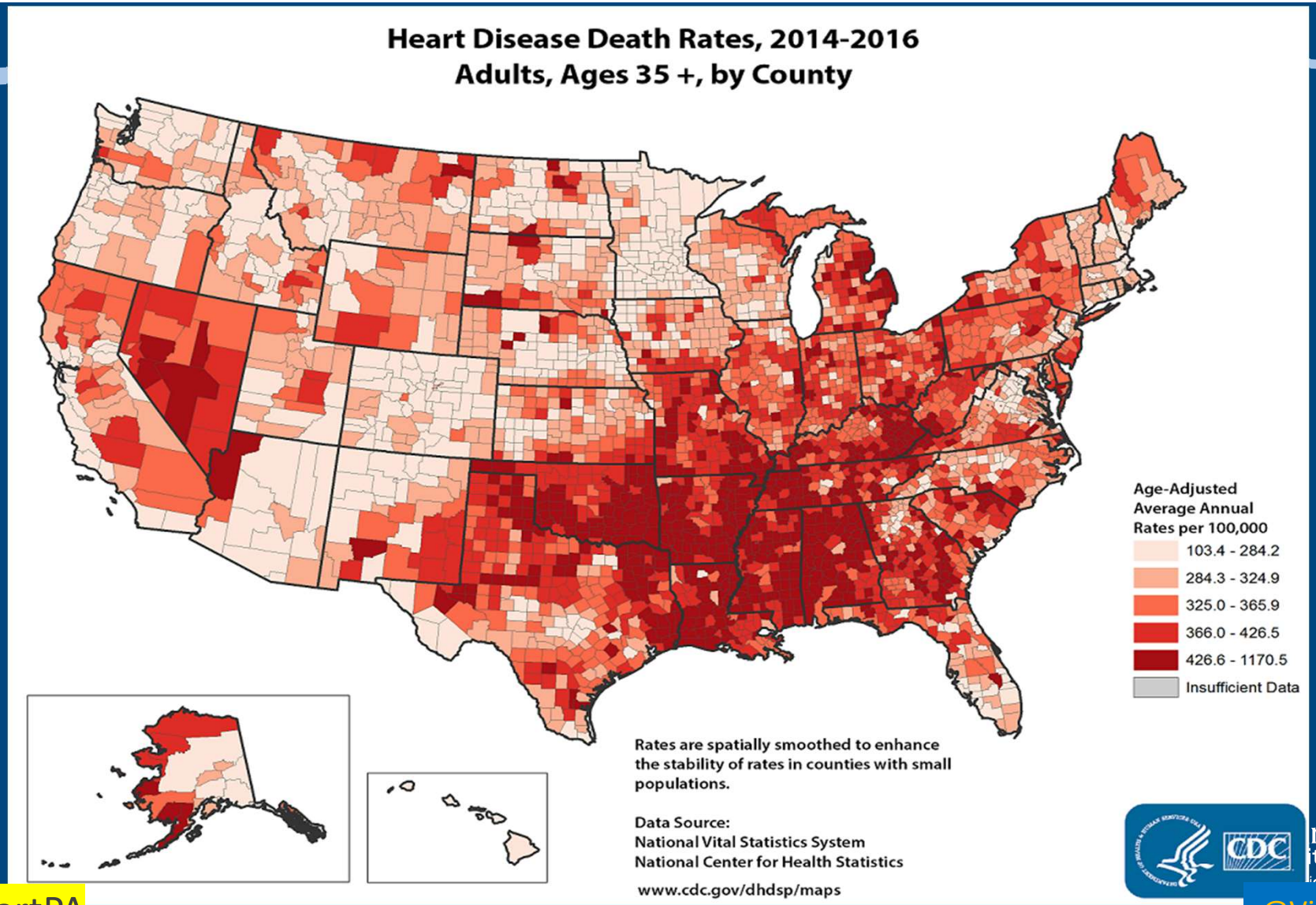
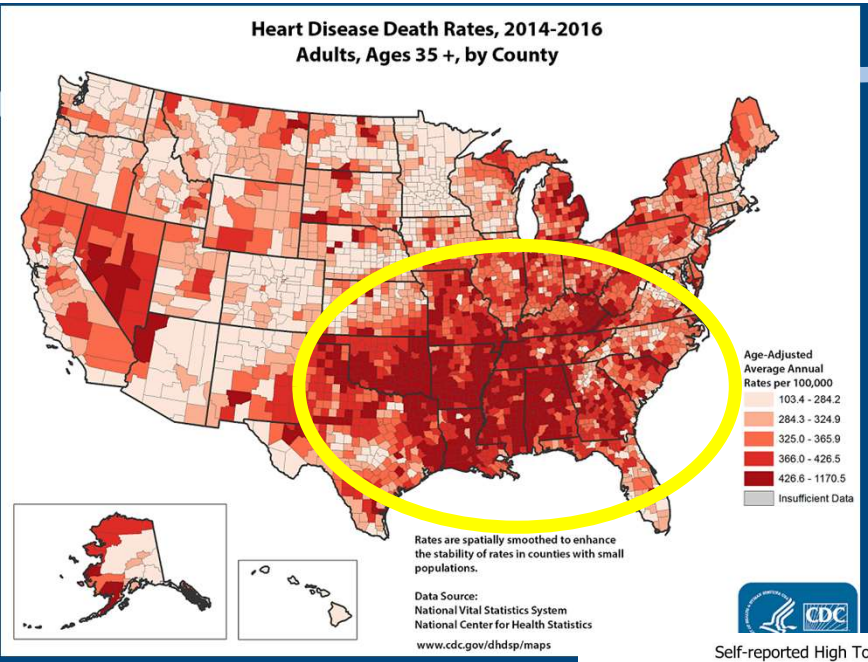
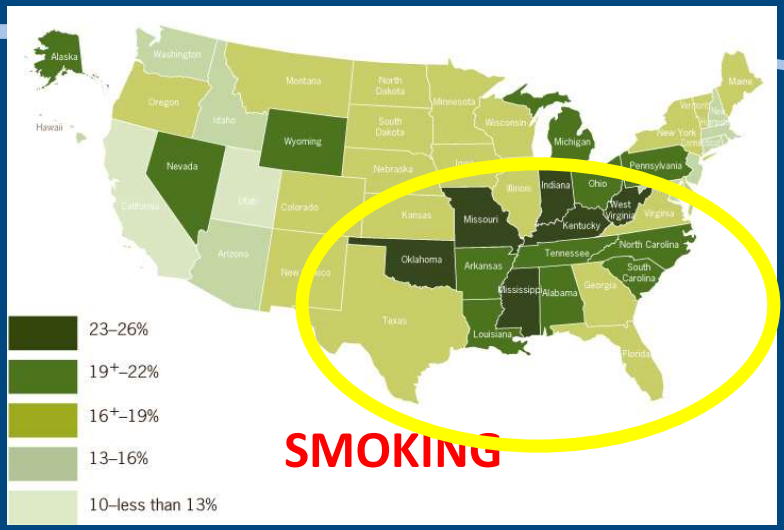
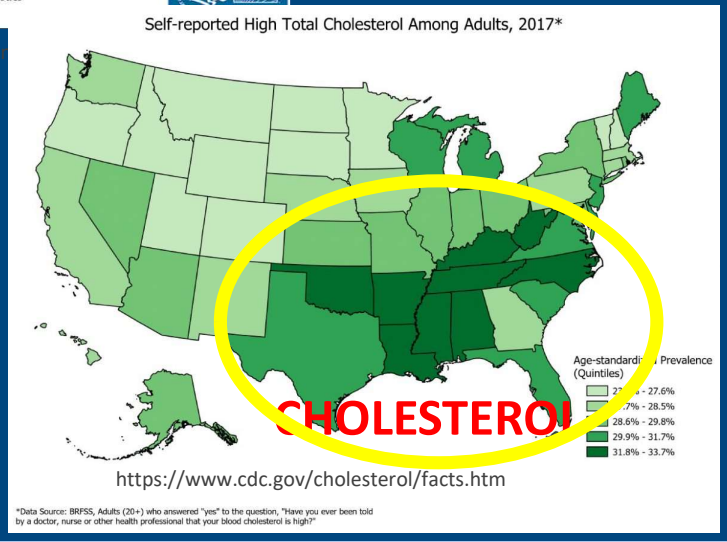

Heart Disease Death Rates, 2014-2016
Adults, Ages 35 +, by County
Age-Adjusted
Average Annual
Rates per 100,000
103.4 - 284.2
284.3 - 324.9
325.0 - 365.9
366.0 - 426.5
426.6 - 1170.5
Insufficient Data
Rates are spatially smoothed to enhance the stability of rates in counties with small populations.
Data Source:
National Vital Statistics System
National Center for Health Statistics
www.cdc.gov/dhdsp/maps



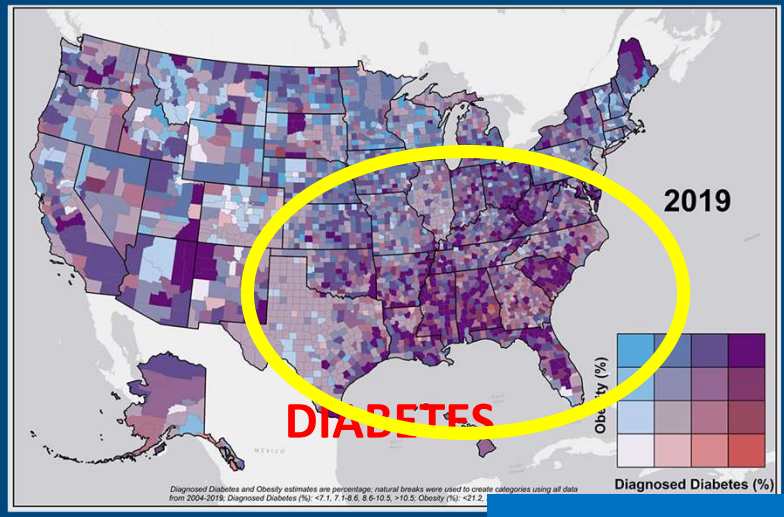

https://www.cdc.gov/heartdisease/facts.htm




https://www.cdc.gov/vitalsigns/tobaccouse/smoking/infographic.html




https://www.cdc.gov/cholesterol/facts.htm




https://www.cdc.gov/diabetes/data/center/slides.ht

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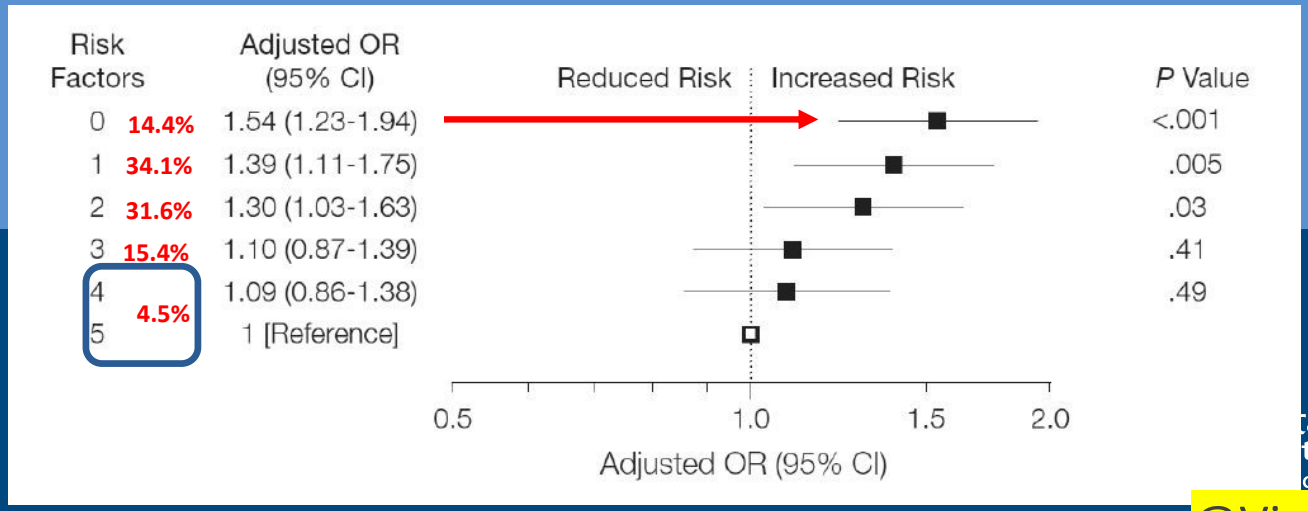
# Traditional risk factors in First MI

WAIT!!

- Significant number of folks with 1st MI also have 0 RF, in addition they may have 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**

Canto et al, JAMA 2011;306:2120–7.

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# SMuRF-Less

Intermountain data presented at ACC 22. Patients with 1st STEMI from 2000-2021comparing 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.

*Diabetes, hypertension, smoking, hyperlipidemia


| A. Demographics | SMuRF | | SMuRF-less | |
|---|---|---|---|---|
| | n=2591 | | n=919 | |
| | n | % | n | % |
| Age groups | | | | |
| <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% |
| Gender | | | | |
| Male | 1885 | 72.75% | 709 | 77.15% |
| Female | 706 | 27.25% | 210 | 22.85% |
| Race | | | | |
| 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% |

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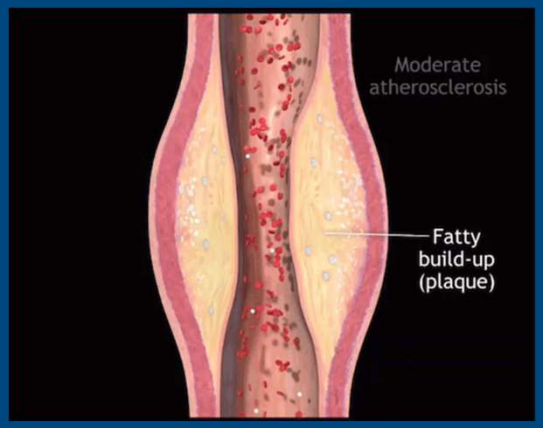
# You have a patient with Atherosclerosis. Now WHAT?

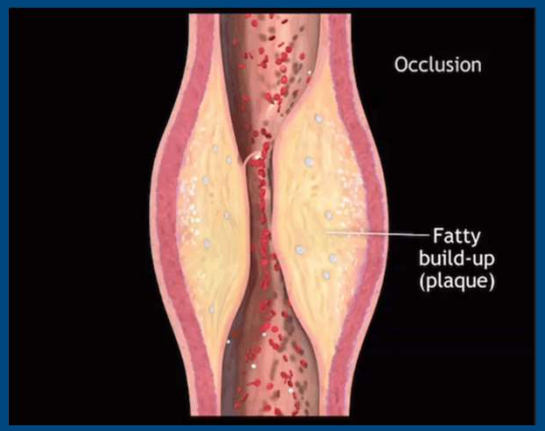


## Stable Angina/Claudication

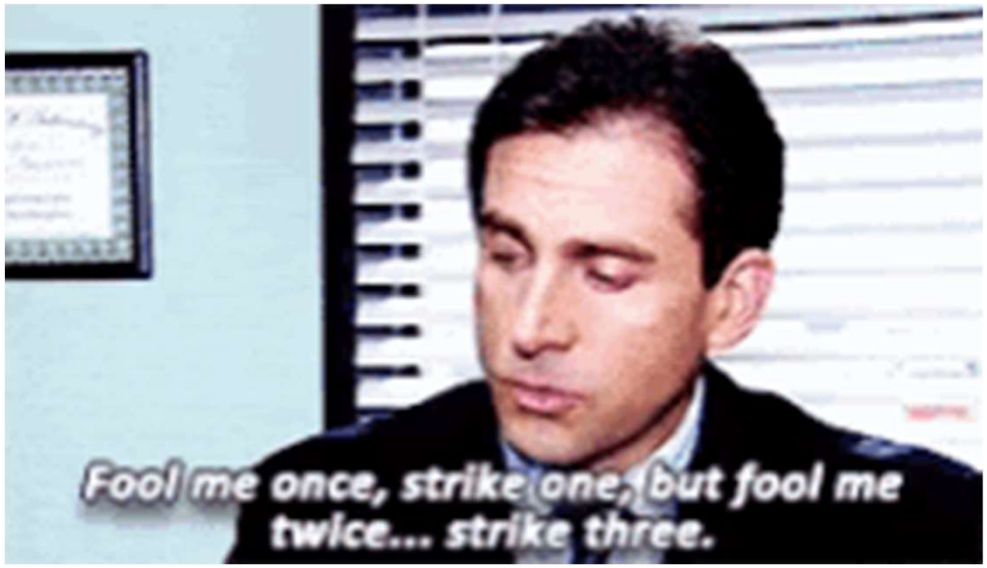

## NSTE-ACS/Acute limb ischemia


## STEMI/Stroke/Amputation

# Secondary Prevention: Avoiding a 2nd Event





Find the culprits for future problems

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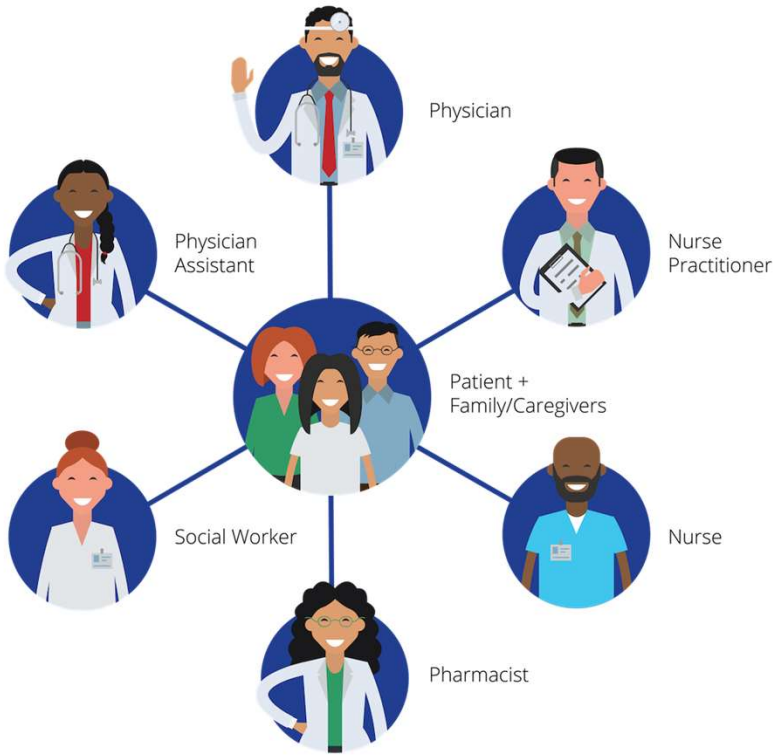
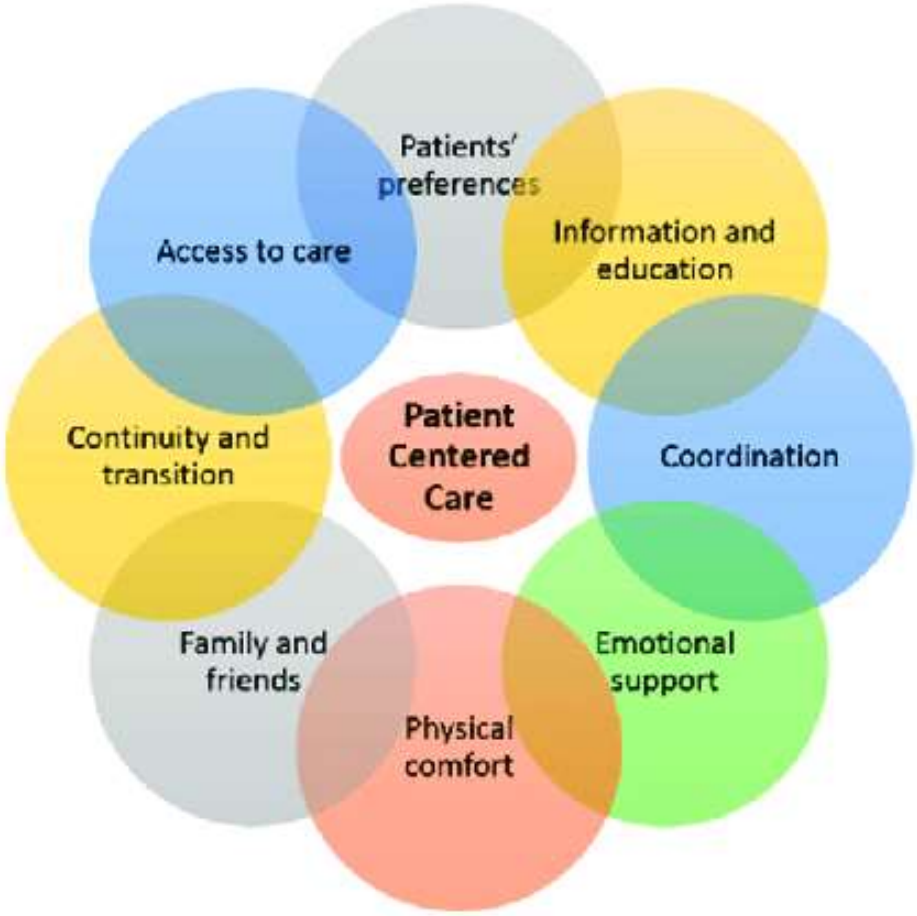
# Team-Based Care



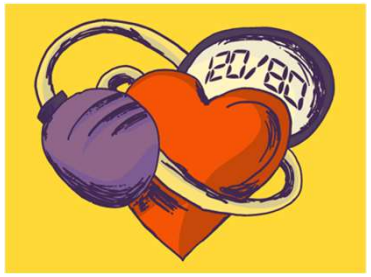




https://www.acponline.org/practice-resources/covid-19-practice-management-resources/covid-19-recovery-team-based-care-toolkit

Int. J. Environ. Res. Public Health 2021, 18(11), 6057

# Risk Factors

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

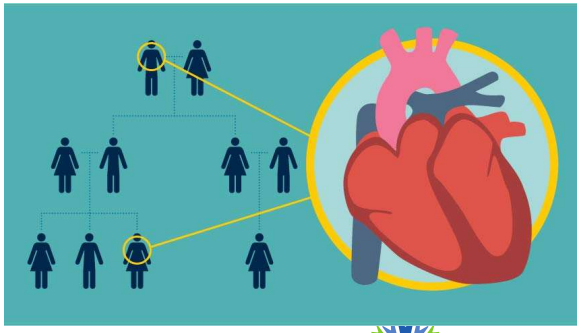



https%3A%2F%2Fdribbble.com%2Fshots%2F2092098-Know-Your-Numbers&psig=AOvVaw1hJasK6jFWqkMS4GtzZaTK&ust=1668266362677000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwig2r7Ttqb7AhUAAAAAHQAAAAQCA

www.tandfonline.com%2Fdoi%2Fpdf%2F10.1080%2F14779072.2017.1372193&psig=AOvVaw3LYXMOz7MMRgNzhUxbxRui&ust=1668266458800000&source=images&cd=vfe&ved=0CBEQ3YkBahcKEwjguKSQt6b7AhUAAAAAHQAAAAQDA

https%3A%2F%2Fgiphy.com%2Fexplore%2Fsmokers&psig=AOvVaw2SpAccR8J5kzAqJdyxMIj1&ust=1668265641971000&source=images&cd=vfe&ved=0CBAQ3YkBahcKEwjQmMv5s6b7AhUAAAAAHQAAAAQBA

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_Zbwt6b7AhUAAAAAHQAAAAQAw



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

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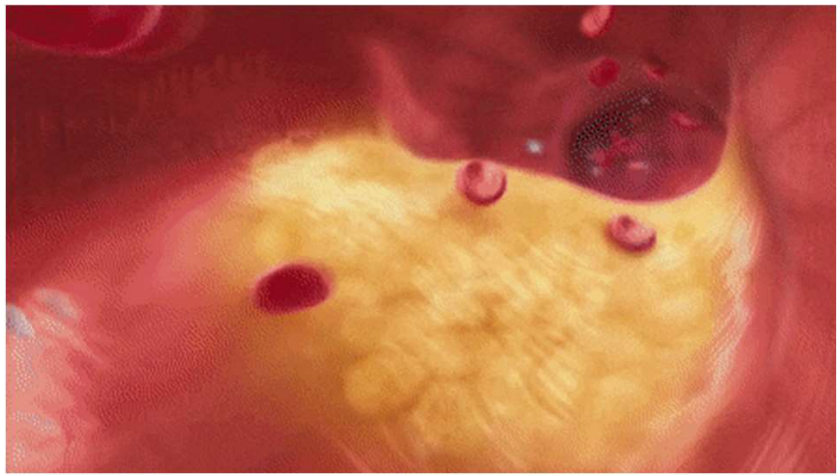
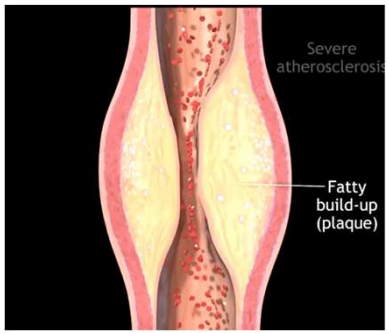
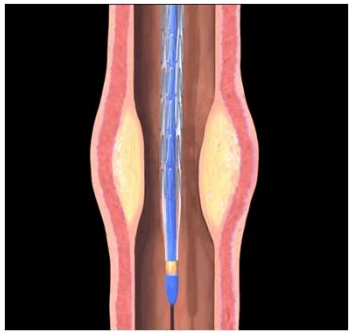
# Antiplatelet(s):
# Plaque presence = potential for rupture or thrombus;



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?

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**FIGURE 1** Master Treatment Algorithm for Duration of $P2Y_{12}$ Inhibitor Therapy in Patients With CAD Treated With DAPT

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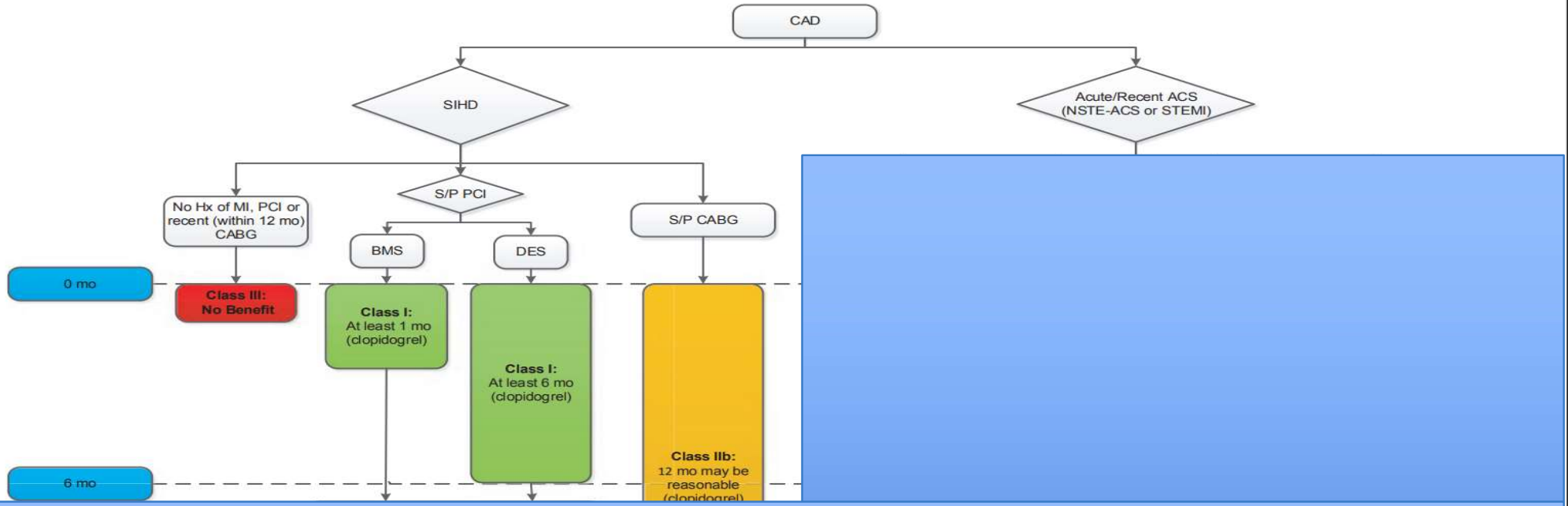

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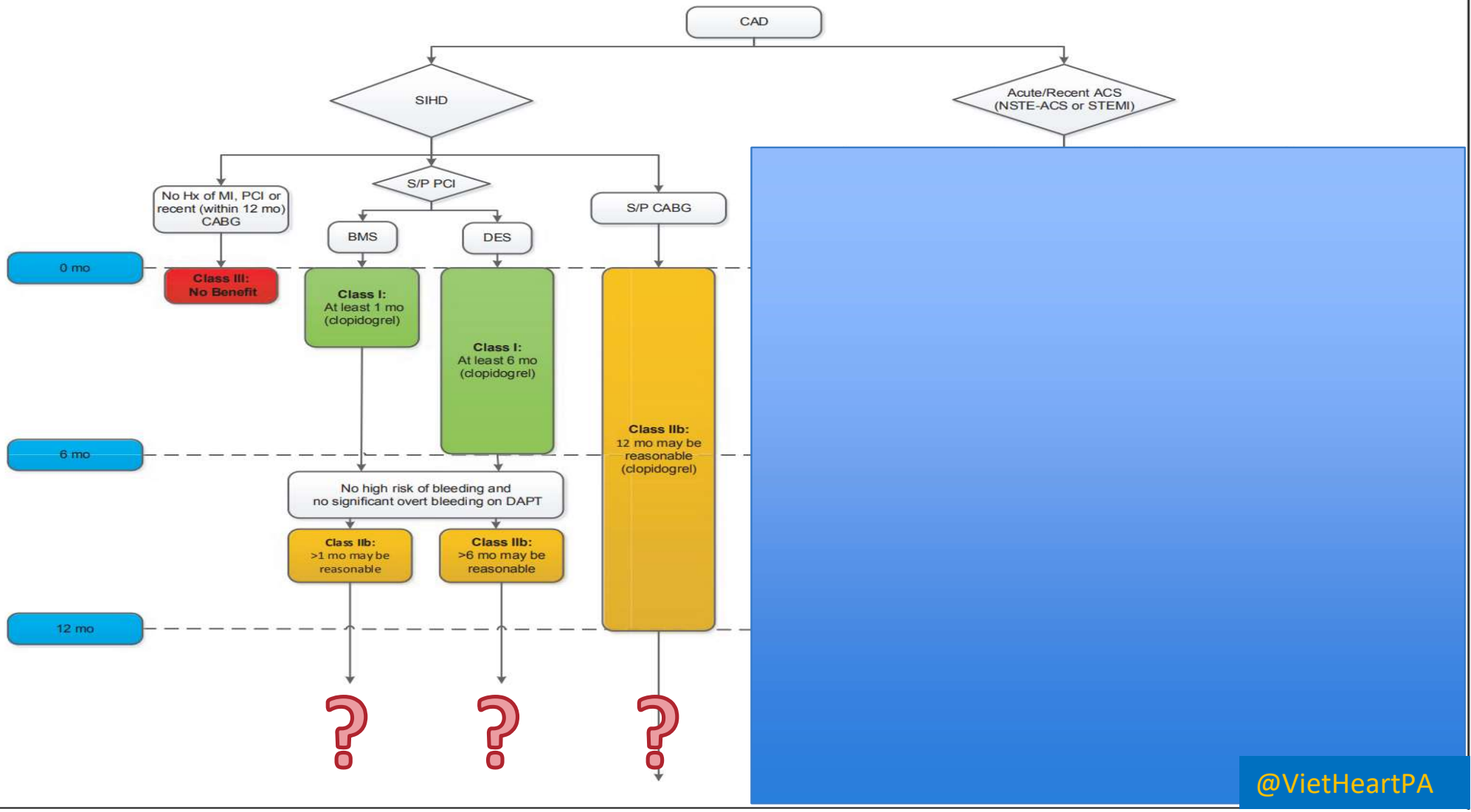

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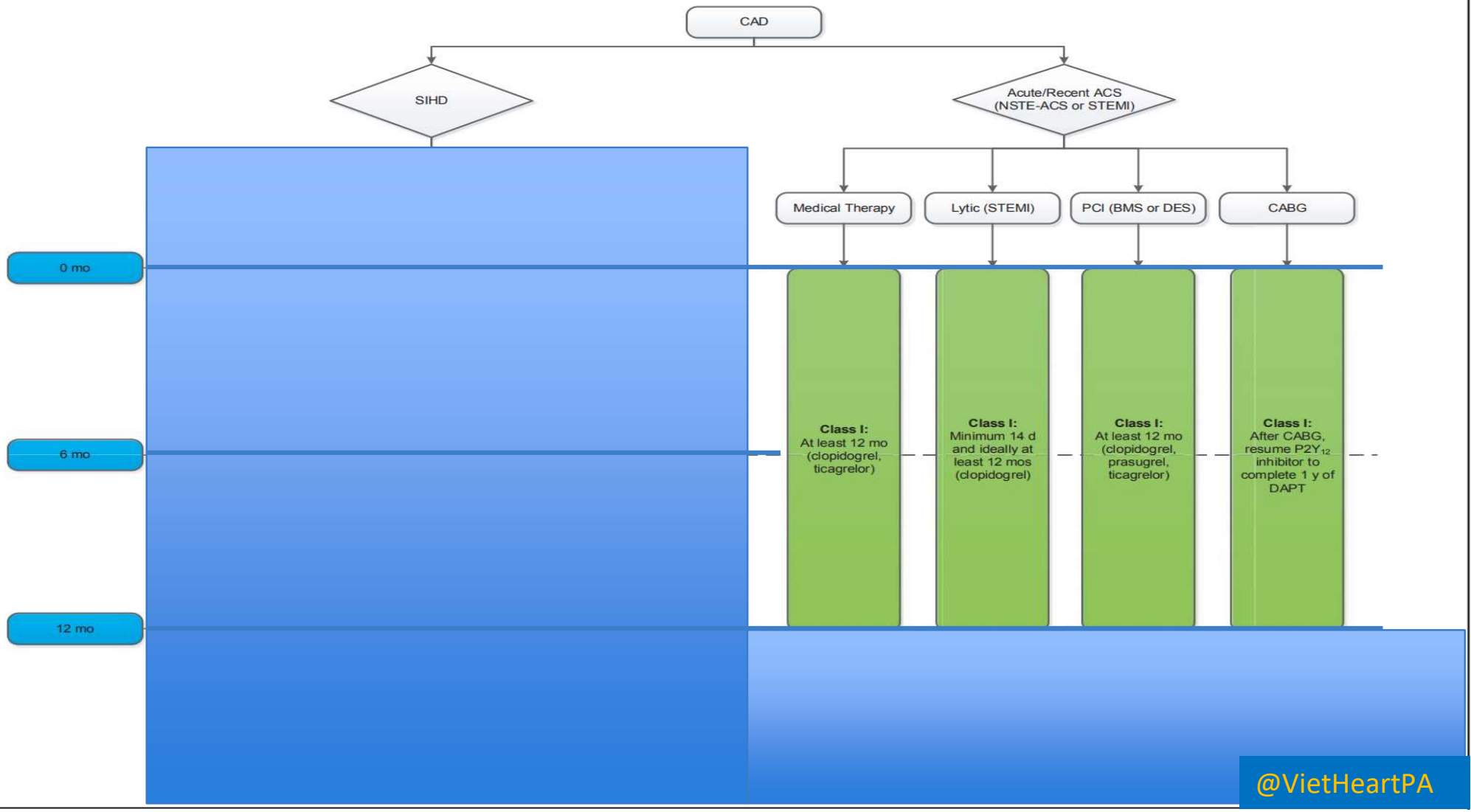

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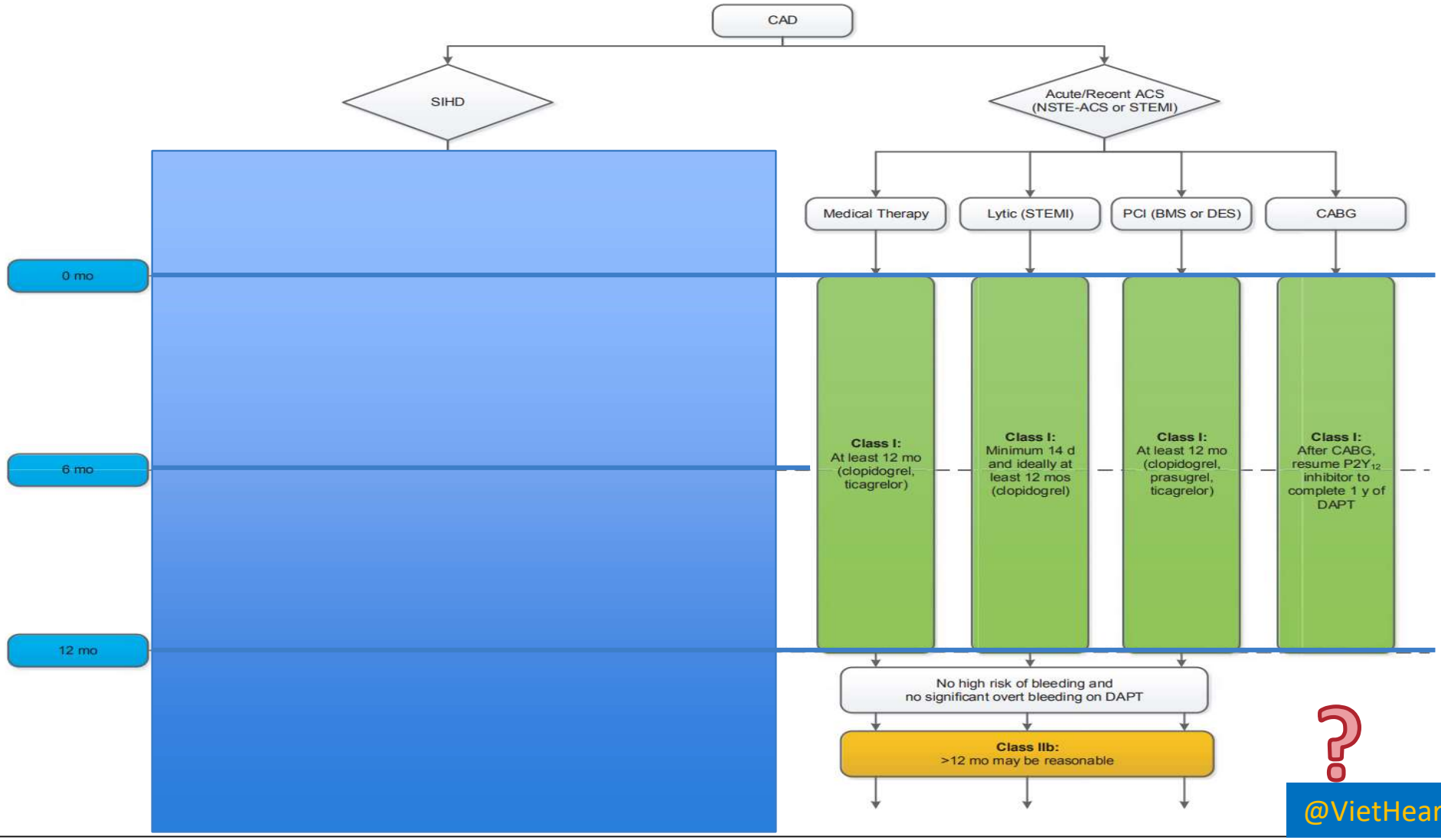

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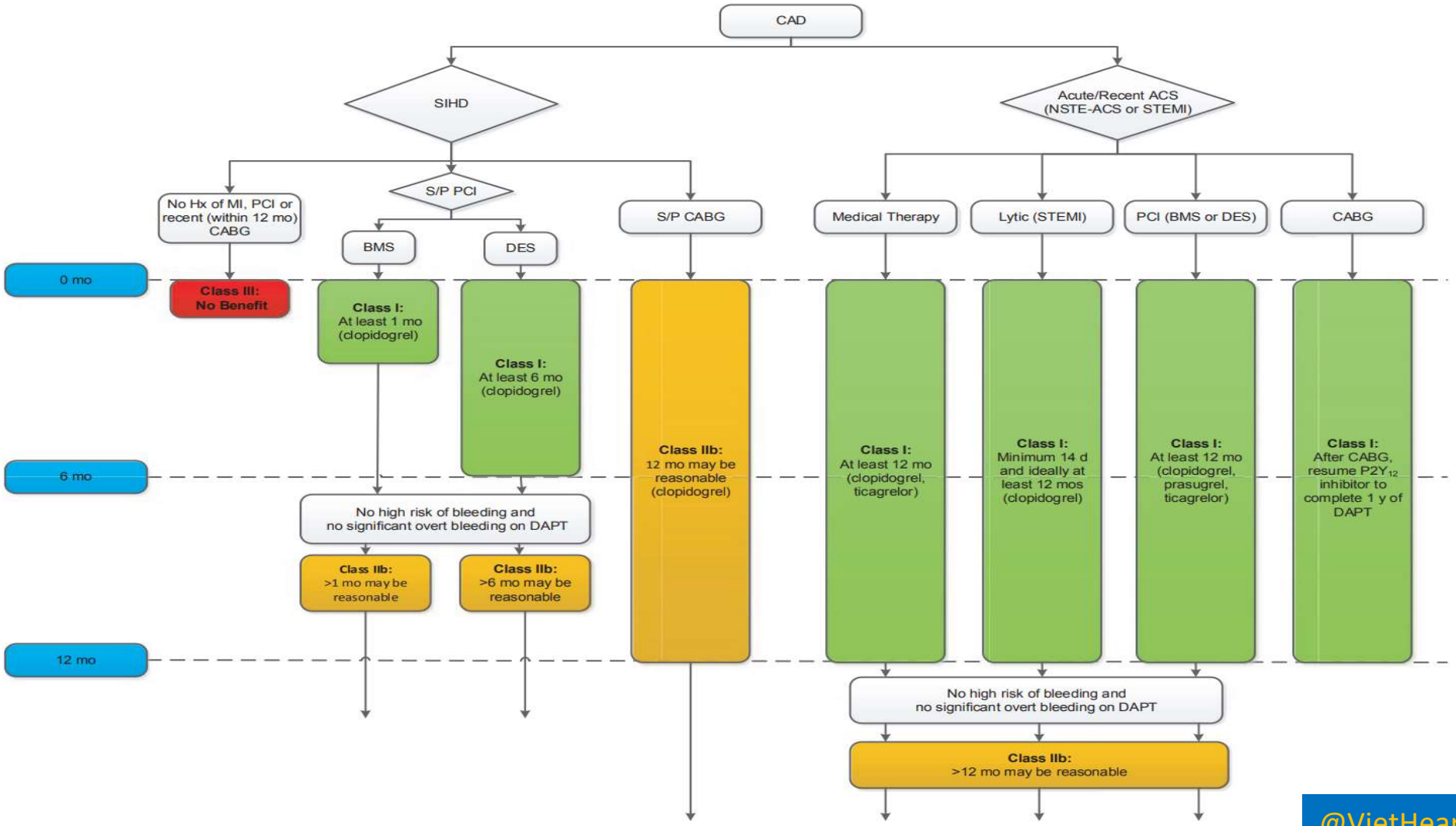

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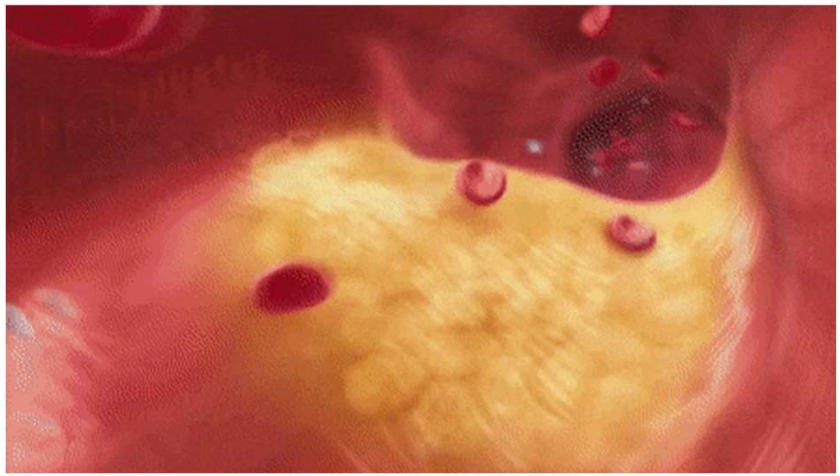
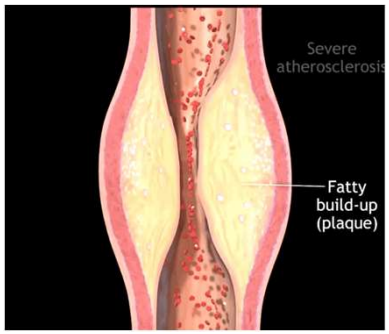
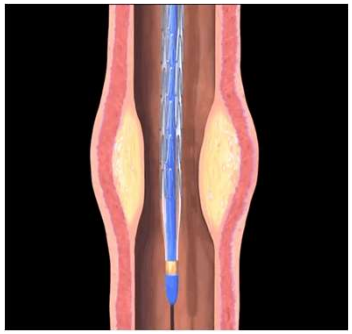


https://gfycat.com/gifs/search/myocardial



1. **<u>Aspirin</u>** 81 mg or 325 mg OR **<u>P2y12 inhibitors</u>** 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.

Guidelines are still geared to ASA 81 mg monotherapy.

# What about Atrial Fibrillation and Coronary Artery Disease?

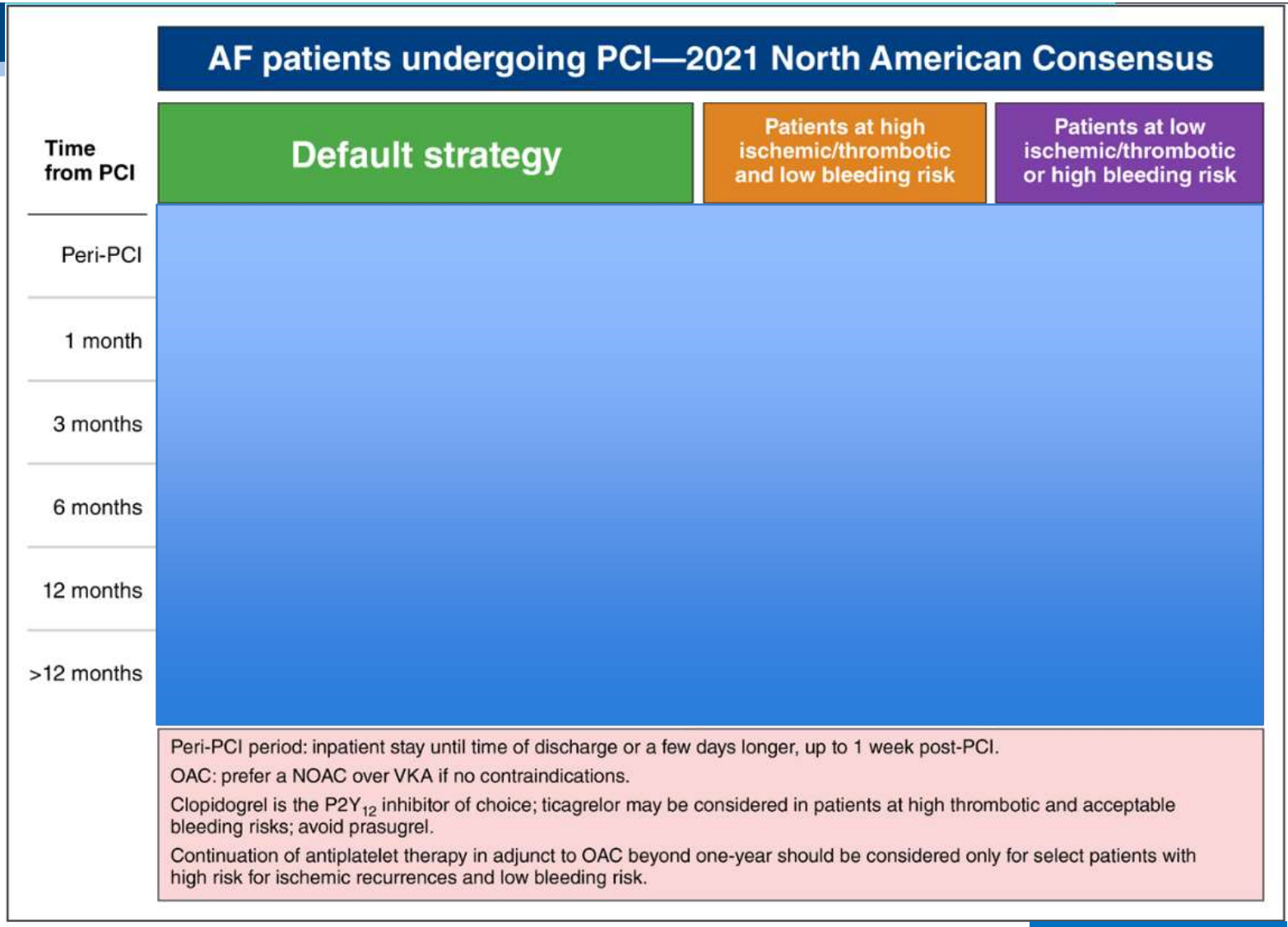



Figure 2. Management of antiplatelet therapy in patients with atrial fibrillation (AF) undergoing percutaneous coronar
with an oral anticoagulant: 2018 North American Consensus Update.

Circulation. 2021;143:583–596.

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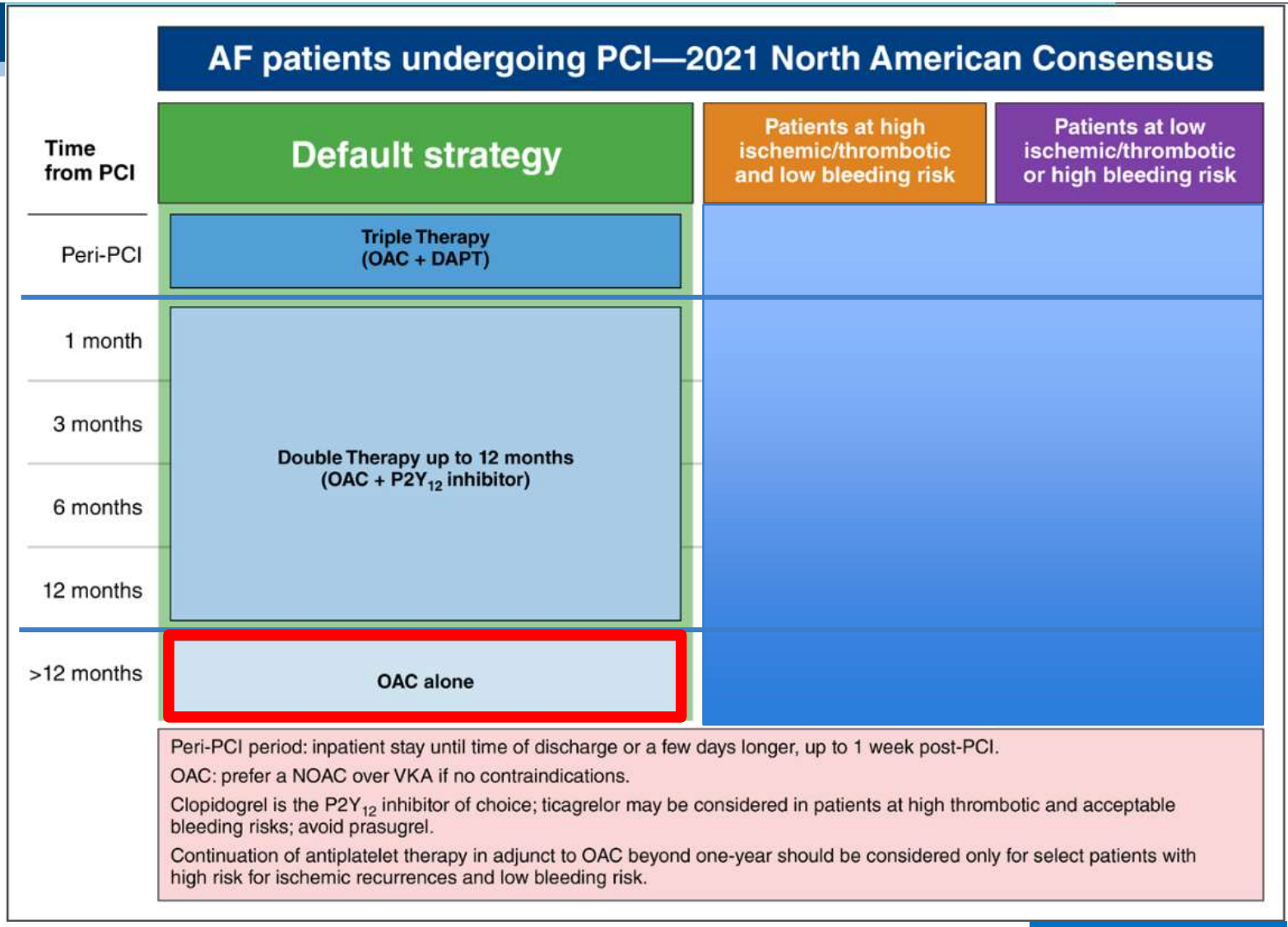


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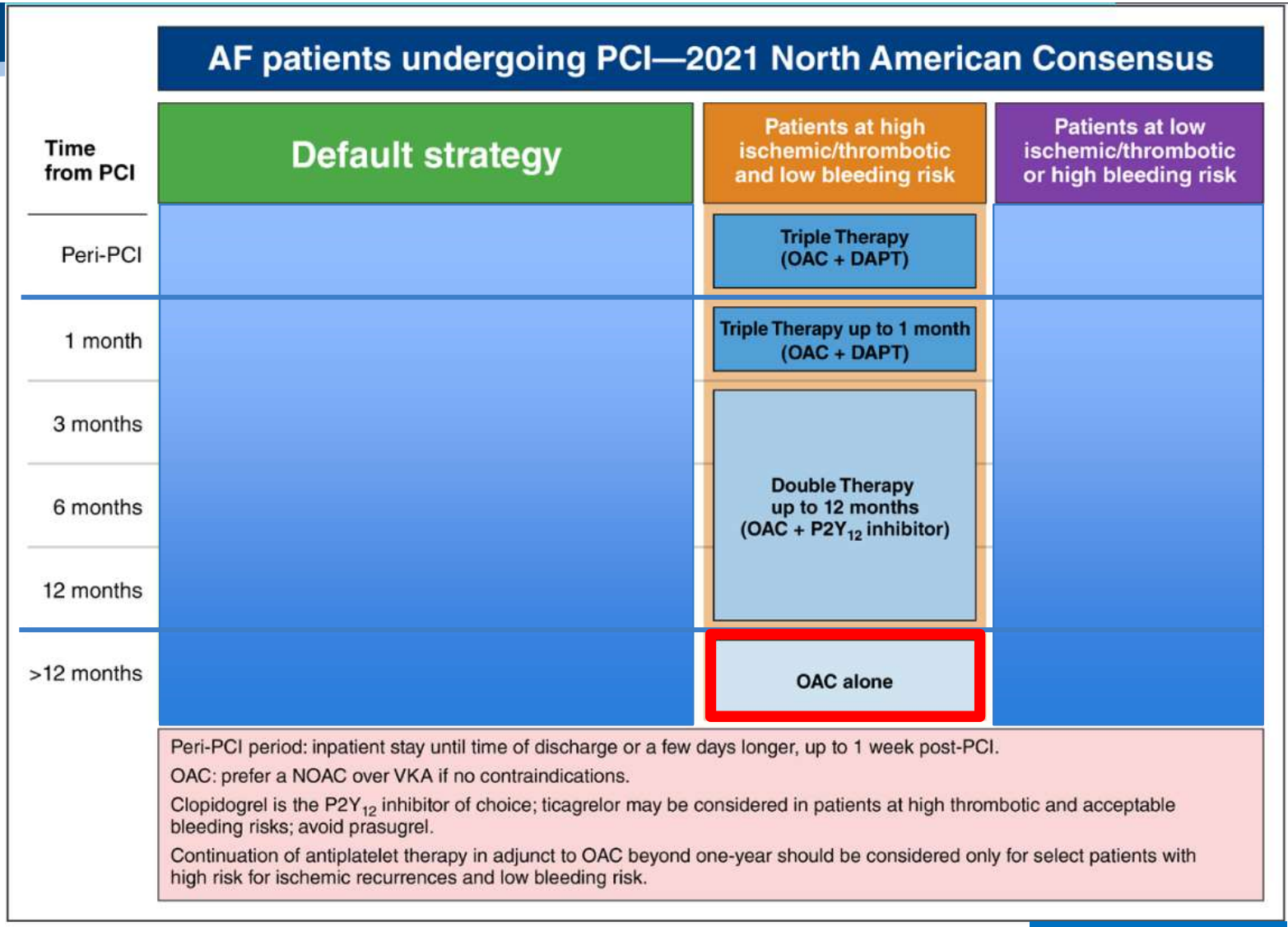


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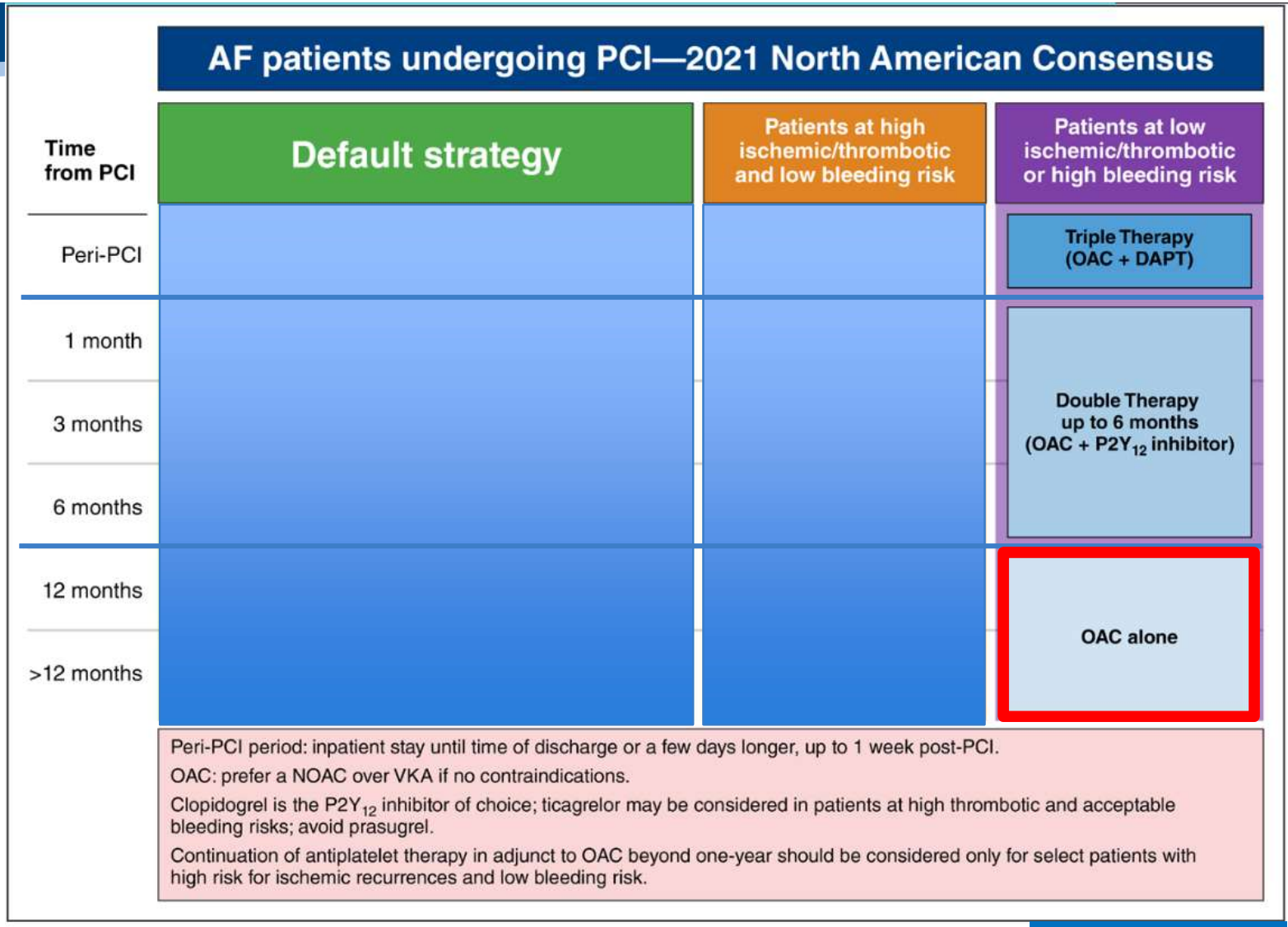


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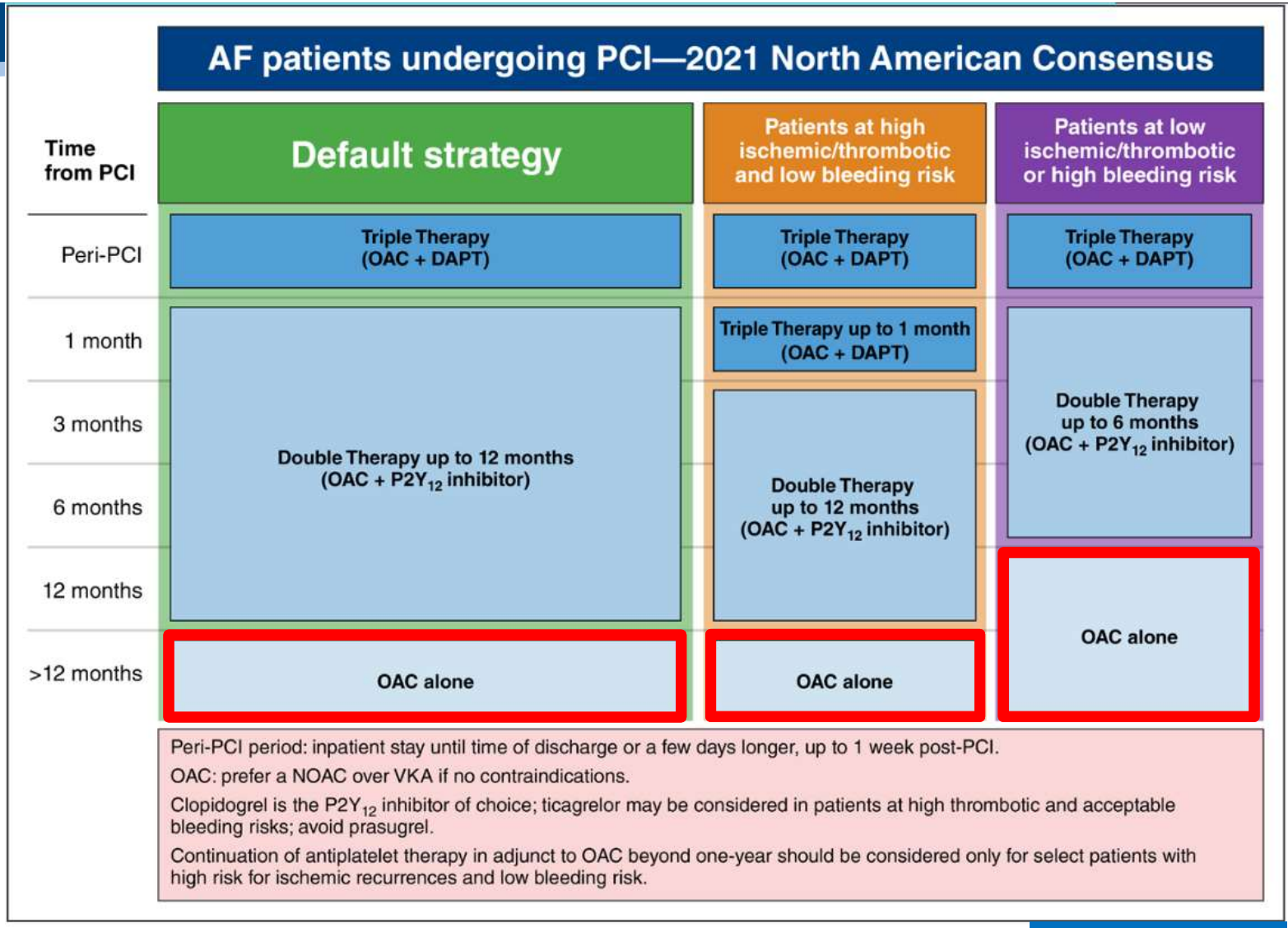


Figure 2. Management of antiplatelet therapy in patients with atrial fibrillation (AF) undergoing percutaneous coronar with an oral anticoagulant: 2018 North American Consensus Update.

Circulation. 2021;143:583–596.

# 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 evolocumab 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)

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


https://gfycat.com/totaltiredfinch

1. GDMT

- Beta-blockers
- ACE Inhibitors or ARB

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

1. Both ASA + P2y12i, ASA alone, or P2y12i alone?

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*Guideline directed medical therapies, e.g., beta blockers, ACE inhibitor, or ARBs

# 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‡ |
| Diabetes | <130/80 mm Hg |
| Chronic kidney disease | <130/80 mm Hg |

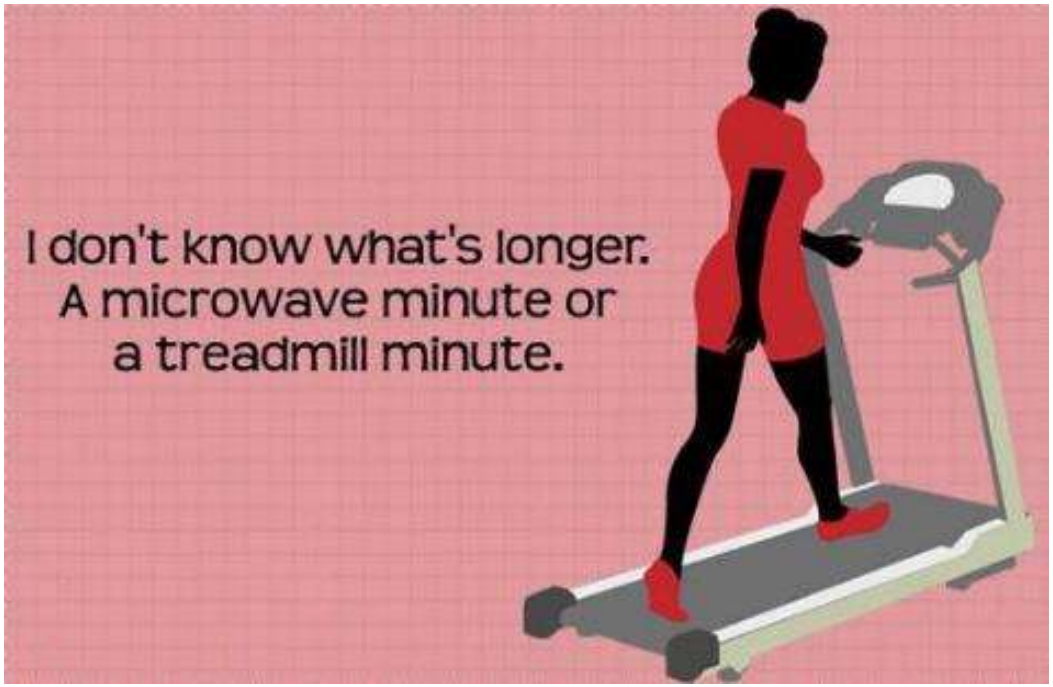
*Includes patients with atherosclerotic cardiovascular disease (ASCVD) or an estimated 10-year risk ≥10%, as well as patients needing primary prevention or those with 10-year ASCVD risk <10%.

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

‡Ambulatory, community-dwelling, noninstitutionalized patients ≥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.

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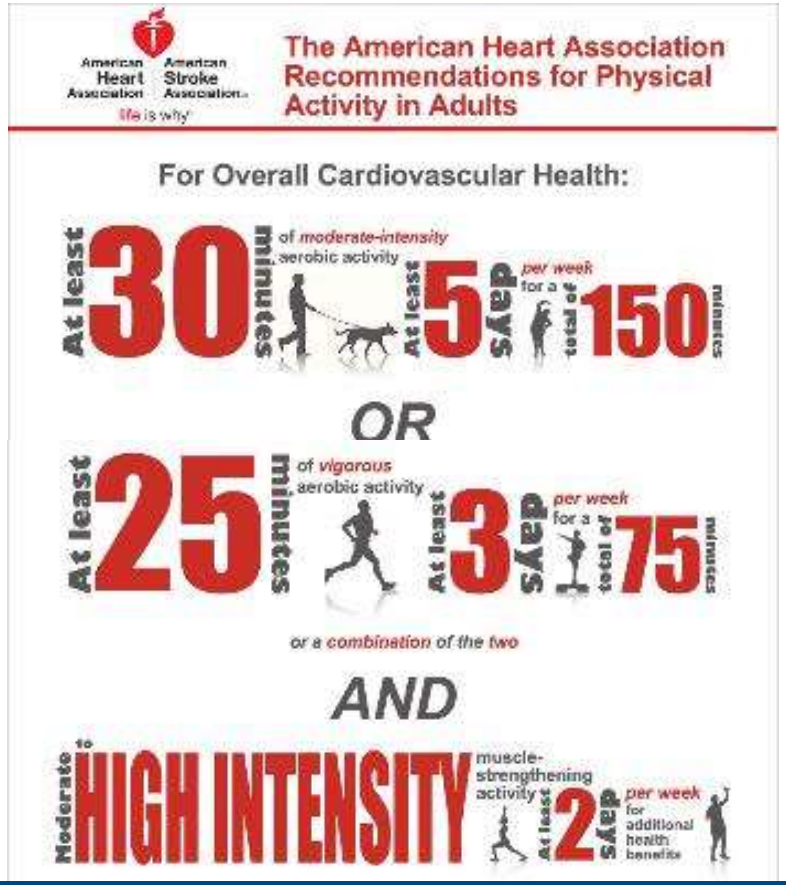
# Physical Activity Recommendations in CAD patients





Consider **FITT** principle for ALL

**F**requency, e.g., 1-2x/wk: add a day

**I**ntensity, e.g., HR 90-110, talk easily: 10-20% increase

**T**ime, e.g., 5-10 minutes: 10-20% increase

**T**ype, 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)

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*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 (≥300 mg/day or ≥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 140/80, 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 - ≥ 130/ ≥ 80, ASCVD ≥ 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)

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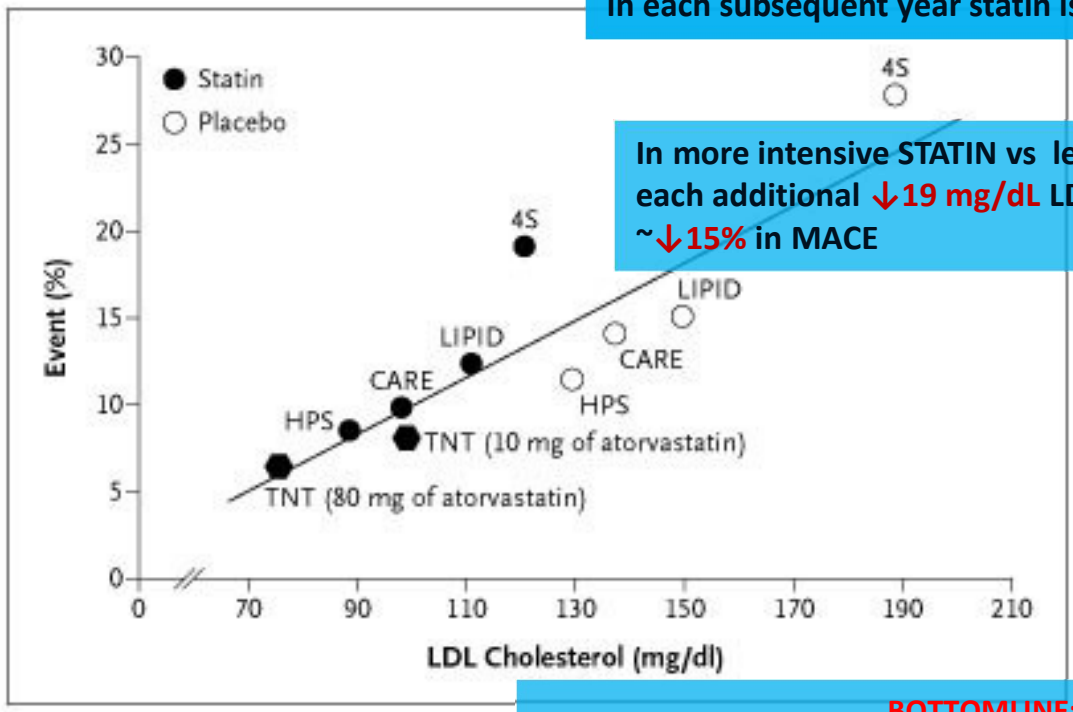
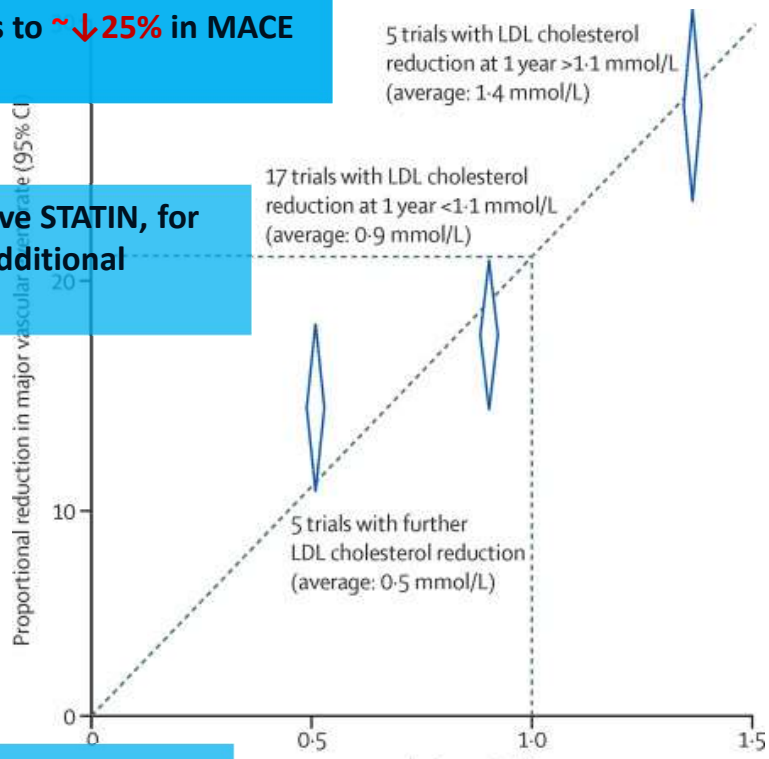
**In STATIN vs NO-STATIN, for every ↓38 mg/dL LDL-C, there is a proportional ↓20% in MACE in the 1st year.**

**After the 1st year, ongoing statin use leads to ~↓25% in MACE in each subsequent year statin is used.**




**In more intensive STATIN vs less intensive STATIN, for each additional ↓19 mg/dL LDL-C, an additional ~↓15% in MACE**




**BOTTOMLINE:**
High intensity statin = Each ~ ↓ **50 mg/dL** LDL-C, there is a ~ ↓ **28%** MACE

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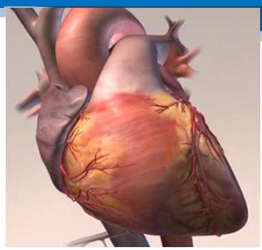
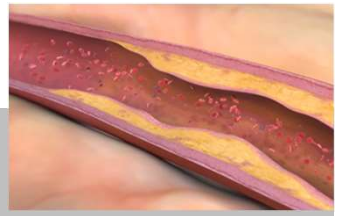
LaRosa JC. N Engl J Med 2005; 352:1425-1435; Collins R. Lancet 2016; 388: 2532-61

# Secondary Prevention

## STATIN…please.





**MINIMUM 1st GOAL:**
**≥50% LDL-C Reduction from baseline.-**

**High Intensity Statins (HIST)**
- Atorvastatin 40, 80 mg
- Rosuvastatin 20, 40 mg

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

**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**

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# Case

65-year-old man presents for follow-up.

PMHx: HTN. MI at age 60; initial 2 stents, followed by unstable angina and 2 more stents at age 62. EF 60%

FMHx: Mom and dad did not have ASCVD. 2 brothers, 1 with DMII.

SocHx: Accountant, working part-time. Married with 2 adult children. Former smoker, no EtOH. Vague and inconsistent physical activity regimen.

MEDS: Clopidogrel 75 mg, rosuvastatin 20 mg, valsartan 80 mg. SL NTG 0.4 mg PRN.

Vitals: BP 115/65, HR 70, SaO2 96%, T 98.9, Wt. 190 Ht. 5'5" BMI 31.6

LABS: TC 200, Trig 130, HDL 40, LDL 72. A1c 5.5%, Fasting Glucose 85 mg/dL

What are your recommendations?

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

1. Lifestyle modifications for health
2. Consider increase in statin: **Increase rosuvastatin 20 mg (6% expected decrease, 72-(72*0.06) = 68)**
3. Add **ezetimibe 10 mg (20% expected decrease, 68-(68*0.2) = 54)**
4. Reassess labs in 4-6 weeks in-person or by appropriate real-time communication (e.g., text, phone, or video-visit)

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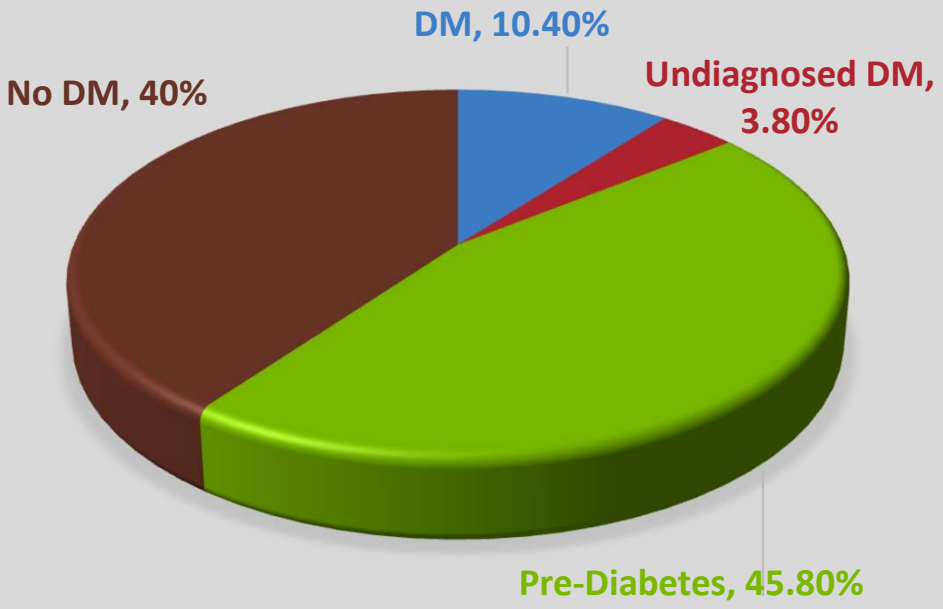
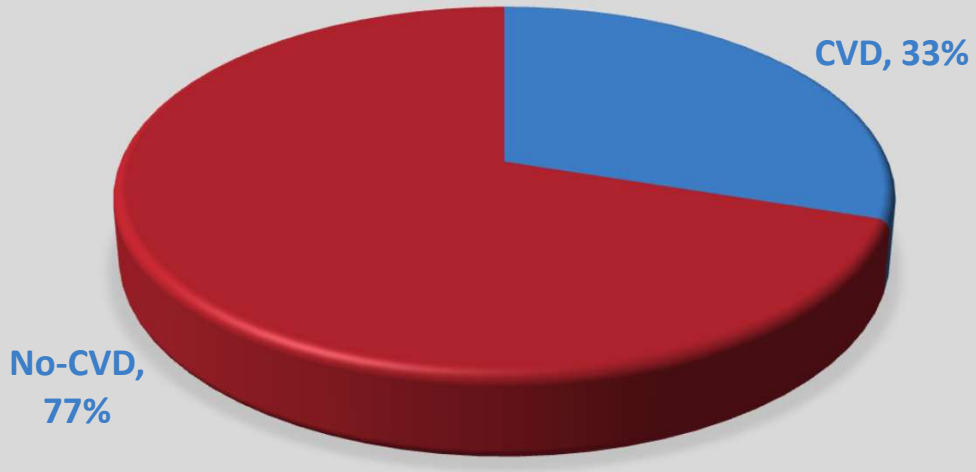
# Diabetes Mellitus + CAD

## DIABETES PREVALENCE



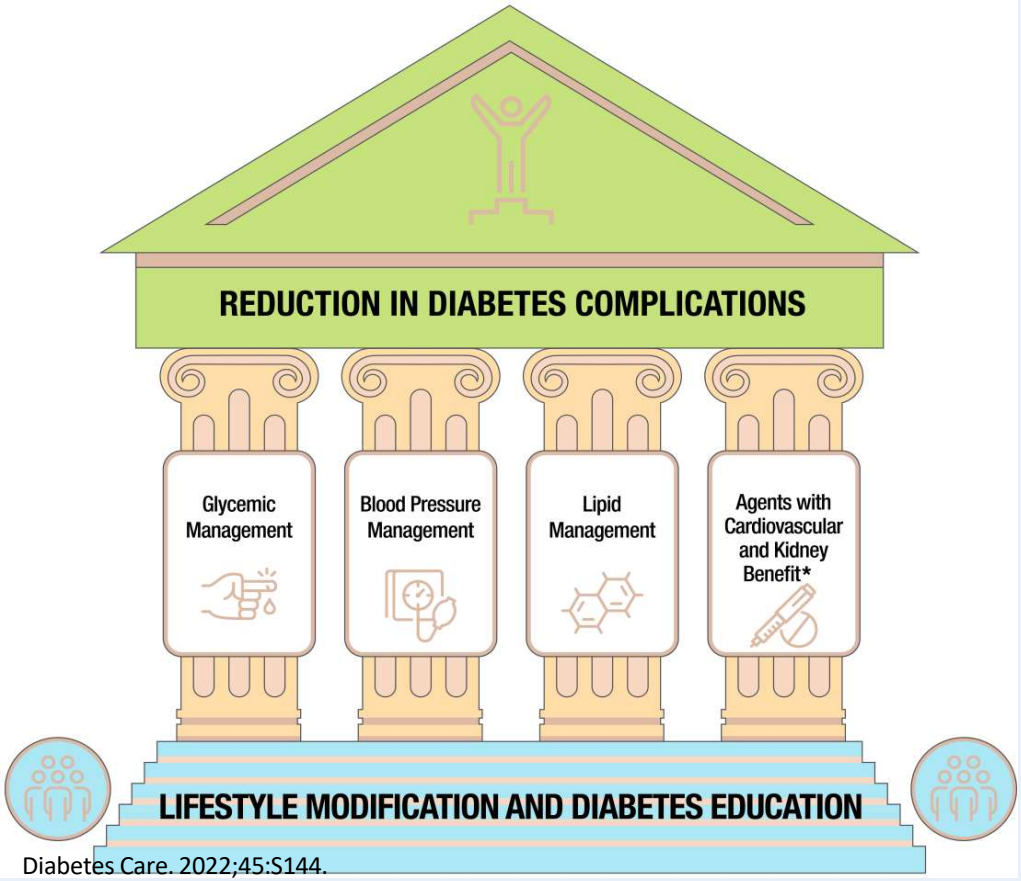

Cardiovasc Diabetol (2018) 17:83

## CVD PREVALENCE IN DIABETES




Circulation.2022;145:e153–e639

# Diabetes Mellitus + CAD




Diabetes Care. 2022;45:S144.

**ASCVD/INDICATORS OF HIGH RISK, HF, CKD**

↓

**Recommend independently of baseline A1C, individualized A1C target, or metformin use**

↓

## +ASCVD/INDICATORS OF HIGH RISK

GLP-1 RA with proven CVD benefit

Either/or

SGLT2i with proven CVD benefit

↓

**IF A1C ABOVE TARGET**

↓

- For patients on a GLP-1 RA, consider incorporating SGLT2i with proven CVD benefit and vice versa
- TZD

↓

If A1C remains above target, consider treatment intensification based on comorbidities, patient-centered treatment factors, and management needs

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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, Insulin glargine 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 decrease, 65-(65*0.2) = 52)**
3. **Add Amlodipine, Chlorthalidone, or Metoprolol Succinate**
4. **SGLT2i and/or GLP1ra**
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)

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# ASCVD Sequelae

## Death, non-fatal MI or stroke, PAD,

- 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.0000000000000106; 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!

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