


Common Cardiology Problems in the Outpatient Setting

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- 
- I have no relevant financial relationships to disclose at this time

Learning Objectives

- Recognizing common outpatient cardiac conditions
- Management of common cardiac conditions
- Review current practice guidelines for common cardiac conditions

Common Presenting Symptoms

- Chest pain
- Shortness of breath
- Palpitations
- Syncope

Chest Pain

- Can be classified into the following categories:
 - Cardiac Etiology
 - Coronary Artery Disease/ASCVD
 - Patients can present with:
 - Typical angina
 - Atypical angina
 - ACS
 - Unstable angina
 - NSTEMI
 - STEMI
 - Coronary Artery Spasm/Prinzmetal's angina
 - Chest pain at rest
 - Pericarditis
 - Non-cardiac Etiology
 - Pleuritic
 - Musculoskeletal
 - GERD

Types of stress test

- Exercise EKG stress test
- Exercise Echo stress test
- Exercise MPI
- Vasodilator MPI
- Dobutamine ECHO
- Dobutamine MPI

Type of Stress Test	Sensitivity %	Specificity %
Exercise EKG Stress Test	68	70
Exercise MPI	87	73
Vasodilator MPI	89	75
Dobutamine	85	72
Exercise Echo	86	81
Dobutamine Echo	82	84
Vasodilator Rubidium-82 PET Imaging	93	83

Indications for noninvasive imaging

- Diagnosis of CAD – Class I indications
 - Intermediate pretest likelihood patients
 - Males >30 years atypical angina, nonanginal chestpain
 - Females >50 years with atypical angina
 - Males 30-40 years with typical angina
 - Females 30-60 years with typical angina
 - High Risk patients
 - Male >40 years with typical angina
 - Females >60 years with typical angina
- Prognosis and risk stratification – Class I indications
 - Intermediate or high pretest likelihood
 - Change in clinical status in established CAD patients (post-revascularization)
 - Post-MI patients
 - Unstable angina(low to intermediate risk)
- Assessment of myocardial viability
- Assessment of ventricular function

Exercise Stress Test Variables Predictive of High Risk

- ST ↓ >2.0 mm
- ST ↓ appearing at low workload
- ST ↓ lasting >5 min in recovery
- Low change in heart rate from rest to exercise
- Abnormal BP response
- Achieve <6 METs workload
- Exercise-induced VT
- Abnormal heart rate decline post-exercise

Prognosis and risk stratification nuclear SPECT imaging

High-Risk SPECT Imaging Variables

1. Multiple perfusion defects in >1 coronary supply region (multivessel CAD scan pattern)
2. An extensive area of stress-induced hypoperfusion, even if confined to the territory of a single coronary artery (e.g., proximal LAD coronary artery scan pattern).
3. A high ischemic burden reflected by multiple reversible defects.
4. Transient ischemic LV cavity dilation.
5. Multiple abnormal regional wall motion or thickening abnormalities, even if not associated with perfusion defects.
6. A gated SPECT EF of <40%.
7. Increased diastolic and end-systolic volumes on quantitative SPECT, increased lung:heart ratio of thallium uptake when ^{201}Tl employed for exercise imaging.

The most powerful predictor of high risk CAD on stress myocardial perfusion SPECT imaging is TID (ischemia induced subendocardial hypoperfusion associated with high incidence of multivessel CAD).

Diagnosis of CAD

- Gold standard test is conventional **Coronary Angiography**
- Other Modalities
 - Coronary CTA
 - Sensitivity 85% (some studies >90%) & Specificity 90%
 - Negative predictive value for CTA is considered to be its greatest strength, as it is useful for excluding significant CAD in low to intermediate risk patients with chest pain.
 - Diagnostic accuracy for detection of significant CAD favors the use of CTA over MR coronary angiography.
 - Limitations are:
 - Unable to visualize stents less than 3mm in diameter
 - Difficulty in visualizing native coronaries after CABG
 - CMR Coronary Angiography
 - Anomalous coronary arteries (equivalent or superior to conventional X-ray coronary angiography).
 - Evaluation of patients with Kawasaki disease (Detection of aneurysm and thrombus within aneurysms).
 - Serial MR angiography avoids the risk of X-ray exposure in children with Kawasaki disease.

ACC/AHA Guideline – Indications for CTA or MRA

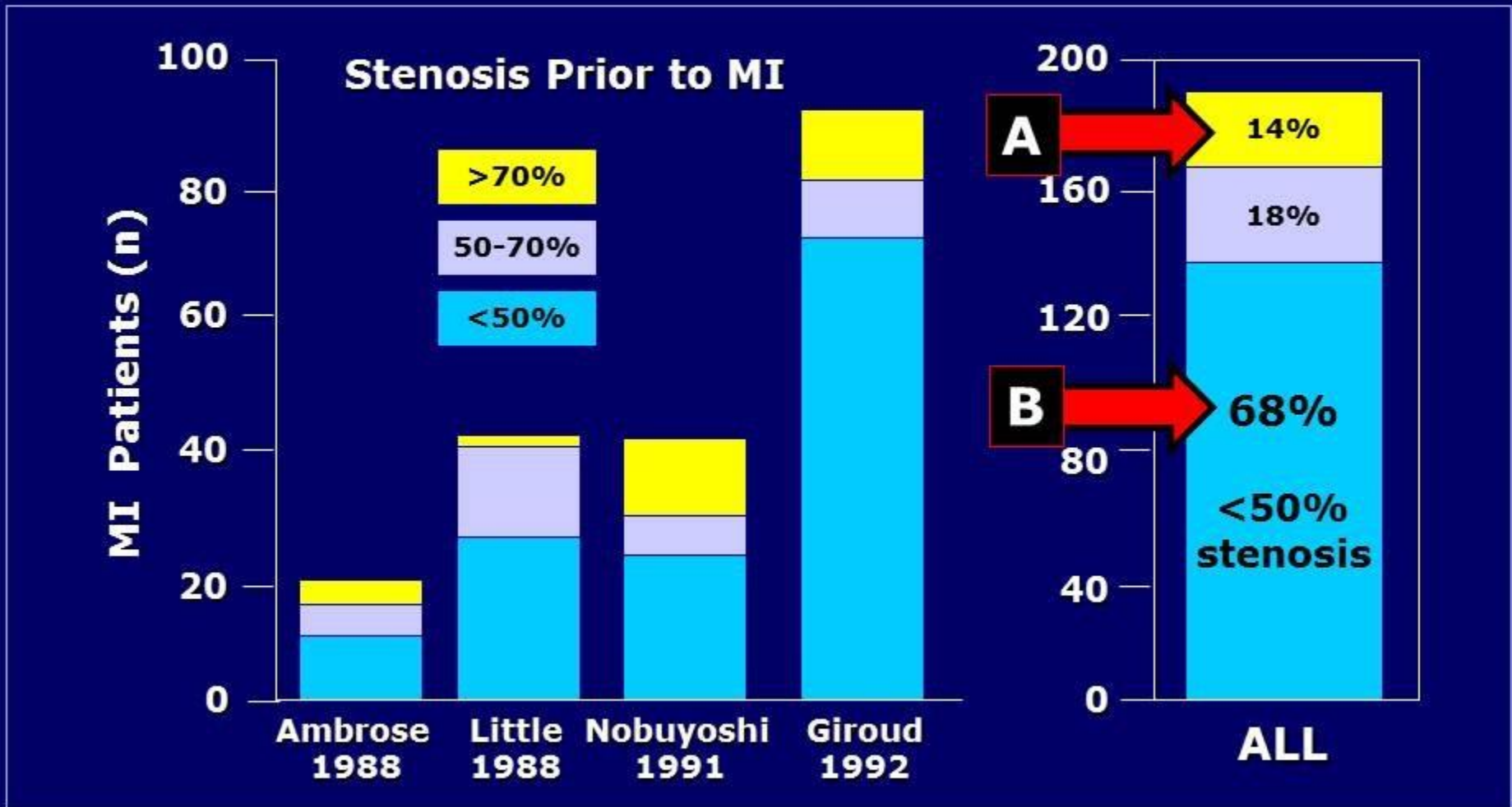
- Class IIa
 - Evaluation of anomalous coronaries
 - Symptomatic patients with intermediate risk of CAD after initial risk stratification with conventional methods, and in particularly those with equivocal stress test results
 - Radiation protection concerns favors the use of MRA

ASCVD Risk Reduction

- Clinician – Patient Risk Discussion
 - “Tell me, I may listen.”
 - “Teach me, I may remember.”
 - “Involve me, I will do it.”

	NOMANCLATURE AND MAIN HISTOLOGY	SEQUENCES IN PROGRESSION OF ATHEROSCLEROSIS	EARLIEST ONSET	MAIN GROWTH MECHANISM	CLINICAL COLLERLATION
ENDOTHELIAL DYSFUNCTION ↓	Initial lesion <ul style="list-style-type: none"> • histologically "normal" • macrophage infiltration • isolated foam cells 		from first decade	growth mainly by lipid addition	clinically silent
	Fatty streak mainly intracellular lipid accumulation		from third decade		
	Intermediate lesion <ul style="list-style-type: none"> • intracellular lipid accumulation • small extracellular lipid pools 		from fourth decade		
	Atheroma <ul style="list-style-type: none"> • intracellular lipid accumulation • core of extracellular lipid 		from fourth decade	thrombosis and/or hematoma	
	Fibroatheroma <ul style="list-style-type: none"> • single or multiple lipid cores • fibrotic/calcific layers 				
	Complicated lesion <ul style="list-style-type: none"> • surface defect • hematoma-hemorrhage • thrombosis 				

Most Heart Attacks are due to Rupture of Unstable Cholesterol Plaques that Cause No Significant Obstruction



ASCVD Risk Calculator

- Risk factors that predict the 10-year risk of cardiovascular death, MI, and stroke
 - Age
 - Sex
 - Ethnicity (African Americans at higher risk)
 - Total Cholesterol & HDL Cholesterol
 - Systolic Blood Pressure
 - Treatment for Hypertension
 - Diabetes Mellitus
 - Current Tobacco Use
 - [ACC ASCVD Risk Calculator](#)

ASCVD

- Additional Risk Factors (not included in the calculator)
 - Family history of premature ASCVD in a first degree relative
 - hs – CRP (more than or equal to 2mg/L)
 - CT Coronary Artery Calcium score
 - Ankle-brachial index < 0.9

ASCVD – Hyperlipidemia

Treatment

- Healthy lifestyle is the foundation of prevention
- Diet should aim for:
 - 5-6% of calories from saturated fat and no trans fat
 - Emphasize vegetables, fruit, whole grains, low-fat dairy, poultry, fish, legumes, nontropical vegetable oils and nuts
 - Limit sweets, sugar-sweetened beverages, red meat
 - Follow DASH, USDA or AHA diet plans
- Low sodium intake if hypertension present (<2.4 g/d)
- Exercise
 - Cardio 3-4 times per week, 40 minutes per session, at moderate to vigorous intensity

ASCVD – Hyperlipidemia

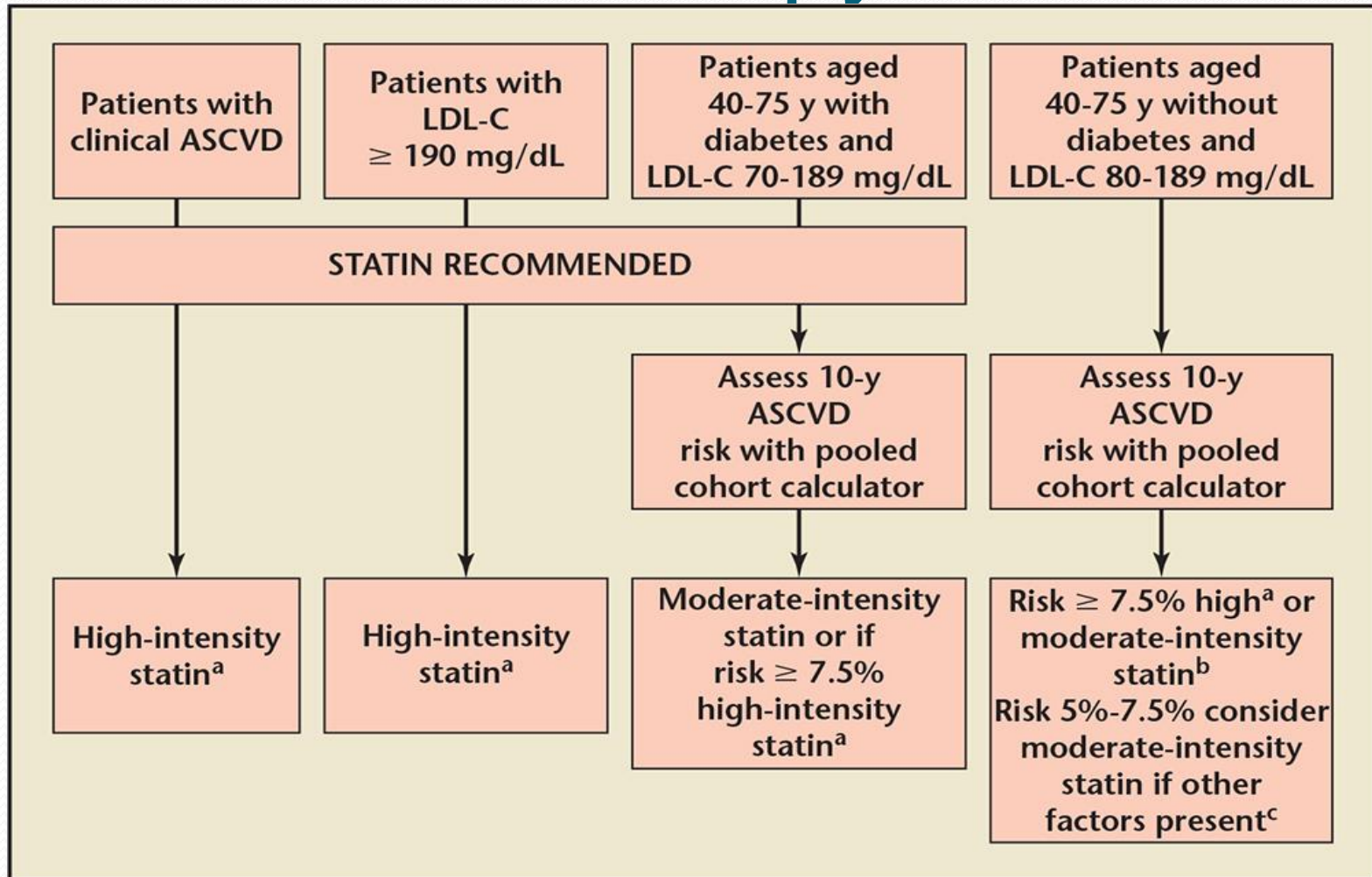
Treatment

- Statin therapy is the most efficacious medical therapy for the prevention of ASCVD events for at-risk populations
- At this time, there is no non-statin cholesterol lowering therapy included within the ACC/AHA cholesterol treatment guideline
 - Addition of non-statin ezetimibe (Zetia) may be included in the guidelines in the near future
 - Improved Reduction of Outcomes: Vytorin Efficacy International Trial (IMPROV-IT)
 - Absolute reduction of cardiovascular risk by 2%

ASCVD – Hyperlipidemia Treatment

- Goal
 - Identifying population at risk of ASCVD is more important than treating to target cholesterol levels
 - “Fixed dose statin” approach is now advocated over the prior “treat to target” method

Patient Groups Who Benefit From Statin Therapy



High- Moderate- and Low-Intensity Statin Therapy

Table 5. High- Moderate- and Low-Intensity Statin Therapy (Used in the RCTs reviewed by the Expert Panel)*

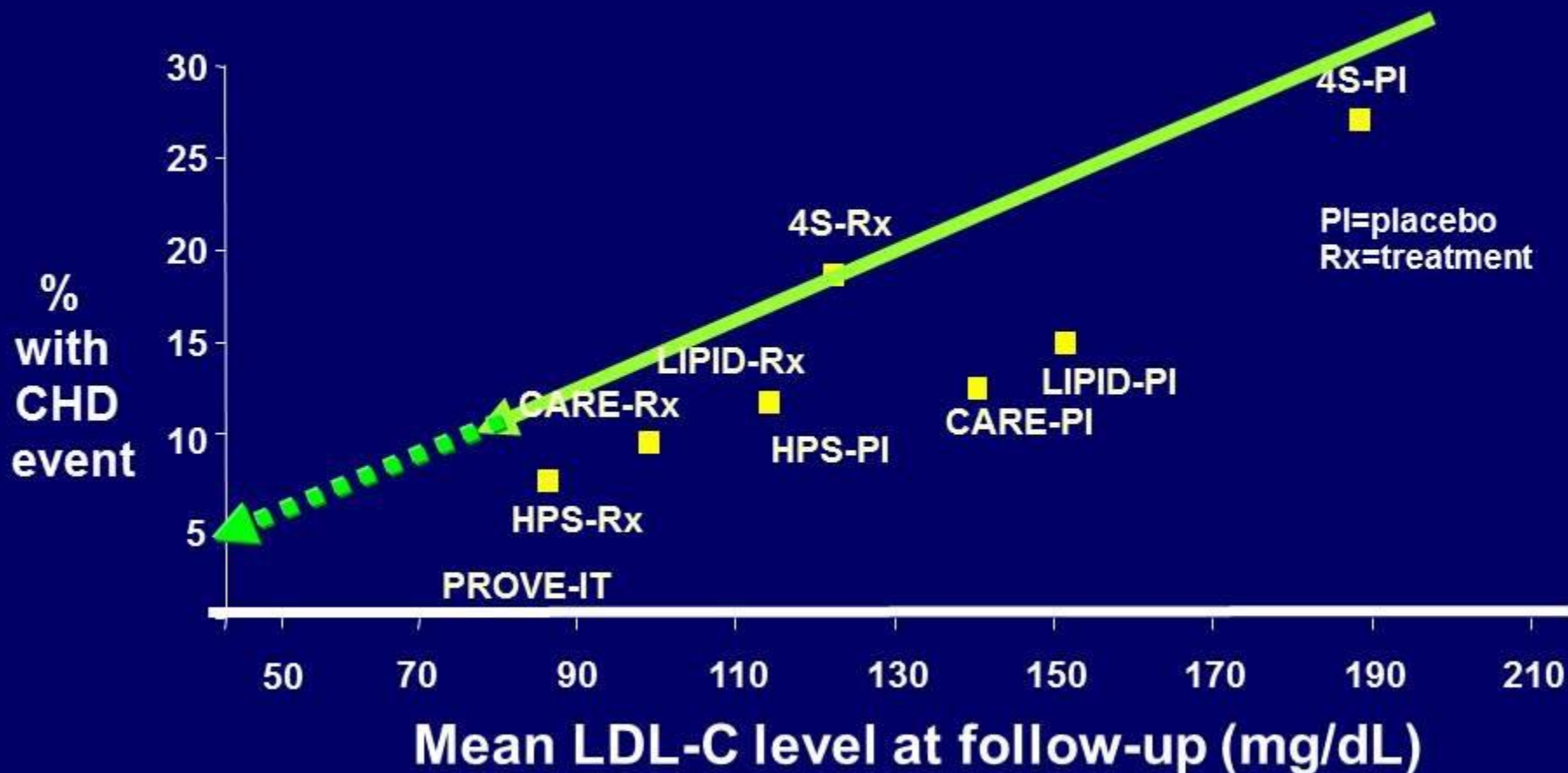
High-Intensity Statin Therapy	Moderate-Intensity Statin Therapy	Low-Intensity Statin Therapy
Daily dose lowers LDL-C on average, by approximately $\geq 50\%$	Daily dose lowers LDL-C on average, by approximately 30% to $< 50\%$	Daily dose lowers LDL-C on average, by $< 30\%$
Atorvastatin (40[†])–80 mg Rosuvastatin 20 (40) mg	Atorvastatin 10 (20) mg Rosuvastatin (5) 10 mg Simvastatin 20–40 mg[†] Pravastatin 40 (80) mg Lovastatin 40 mg <i>Fluvastatin XL 80 mg</i> Fluvastatin 40 mg bid <i>Pitavastatin 2–4 mg</i>	<i>Simvastatin 10 mg</i> Pravastatin 10–20 mg Lovastatin 20 mg <i>Fluvastatin 20–40 mg</i> <i>Pitavastatin 1 mg</i>

Specific statins and doses are noted in bold that were evaluated in RCTs (17,18,46-48,64-67,69-78) included in CQ1, CQ2 and the CTT 2010 meta-analysis included in CQ3 (20). All of these RCTs demonstrated a reduction in major cardiovascular events. Statins and doses that are approved by the U.S. FDA but were not tested in the RCTs reviewed

Why not “treat to target”?

- There is no randomized control data that defines a specific LDL-cholesterol target
- Future randomized control data may warrant reconsideration of using this strategy

Relation Between CHD Events and LDL-c Outcomes in Statin Trials

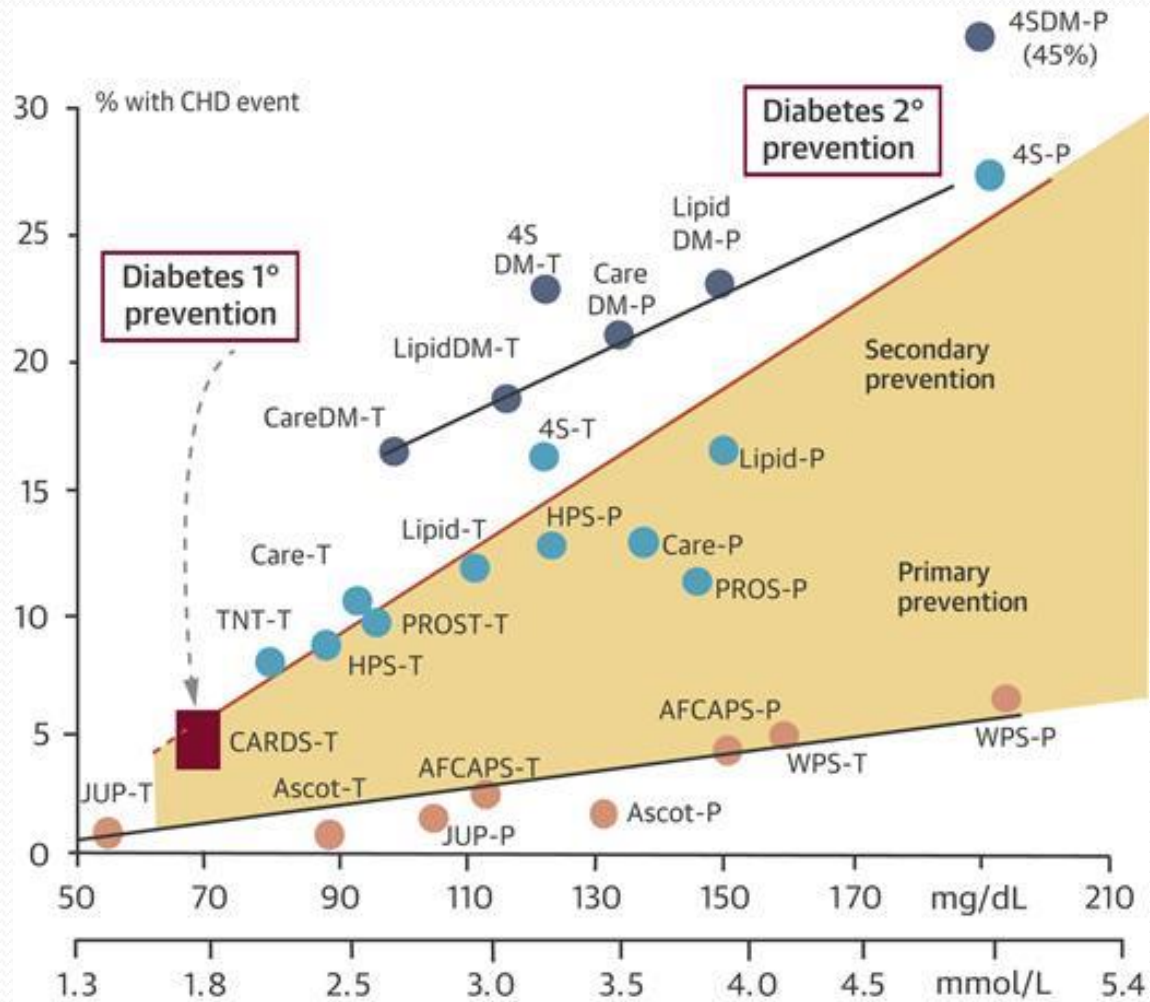


HPS enrolled high-risk primary- and secondary-prevention patients.

HPS. *Lancet*. 2002;360:7. Downs. *JAMA*. 1998;279:1615.

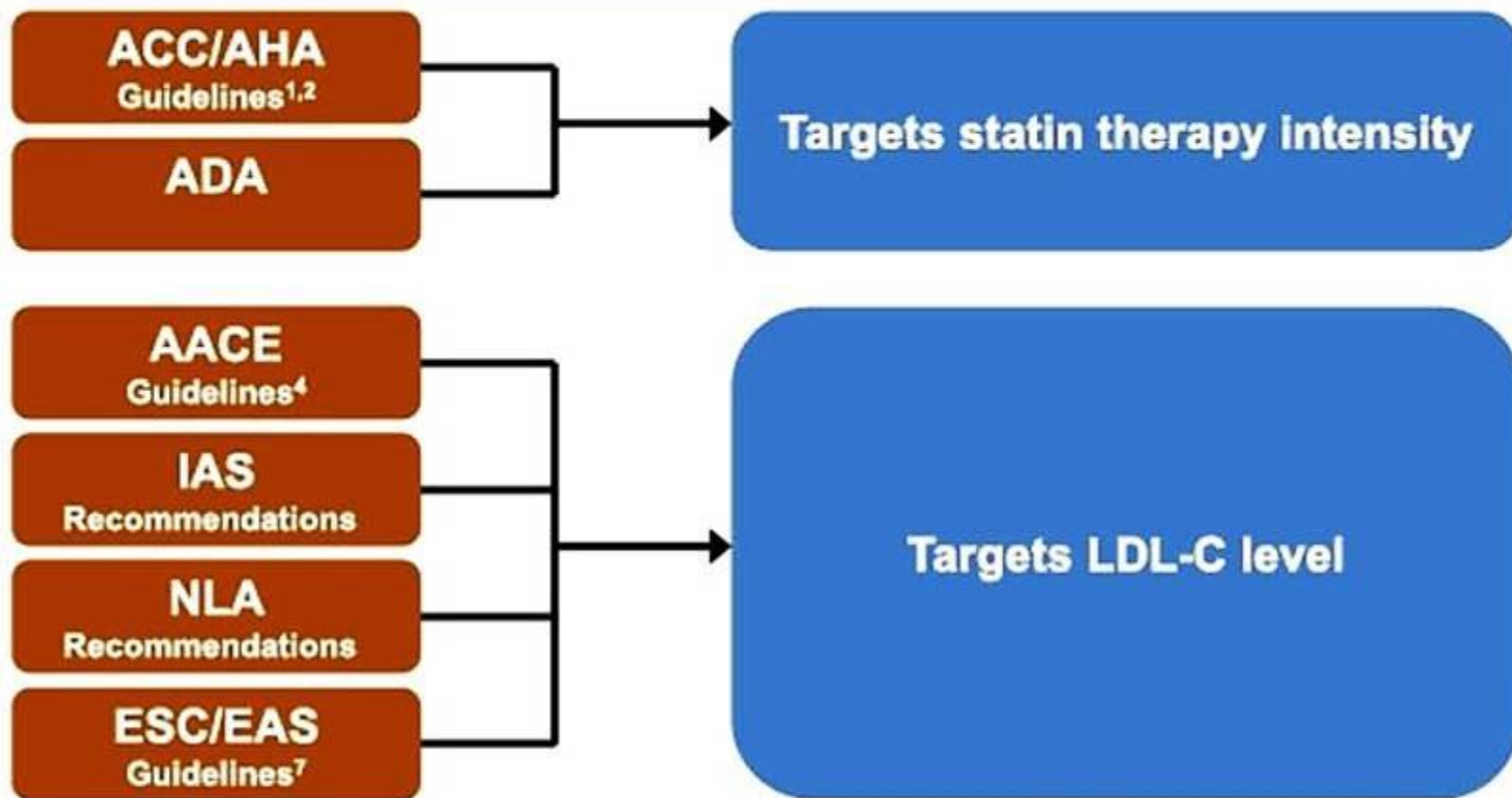
LIPID. *N Engl J Med*. 1998;339:1349. Sacks. *N Engl J Med*. 1996;335:1001. 4S. *Lancet*.

1995;345:1274. Shepherd. *N Engl J Med*. 1995;333:1301.



Treat to Target vs Fixed Dosing

ACC/AHA, ADA, AACE, IAS, NLA, and ESC/EAS
Recommend LDL-C Lowering



Are PCSK9 Inhibitors the Next Breakthrough in the Cardiovascular Field?

- Proprotein Convertase Subtilisin/Kexin Type 9
- **Gain of Function** mutation in PCSK9 leads to marked increase in LDL cholesterol and causes premature atherosclerosis
 - Heterozygous familial hypercholesterolemia (autosomal dominant inherited disorder)
 - All children between ages 9-11 should have cholesterol testing if one or more parents have high cholesterol or are known to have HeFH
 - It is recommended that the entire family be tested for HeFH if LDL cholesterol is greater than 160 mg/dL in children and 190 mg/dL in adults
- **Loss of Function** mutation leads to modest LDL cholesterol reduction and causes low rates of coronary atherosclerosis

Are PCSK9 Inhibitors the Next Breakthrough in the Cardiovascular Field?

- PCSK9 Inhibitor
 - Alirocumab (Praluent) – 75mg q2w → 150 q2w sq
 - Evolocumab (Repatha) – 140mg q2w sq
- Reduction of LDL-cholesterol by 50 – 70%
- Common Side-effects
 - Itching, swelling, pain or bruising at injection site, nasopharyngitis, and hypersensitivity vasculitis (reported)
 - Longer exposure is necessary to more completely evaluate potentially delayed adverse effects, such as neurocognitive impairment and cancer

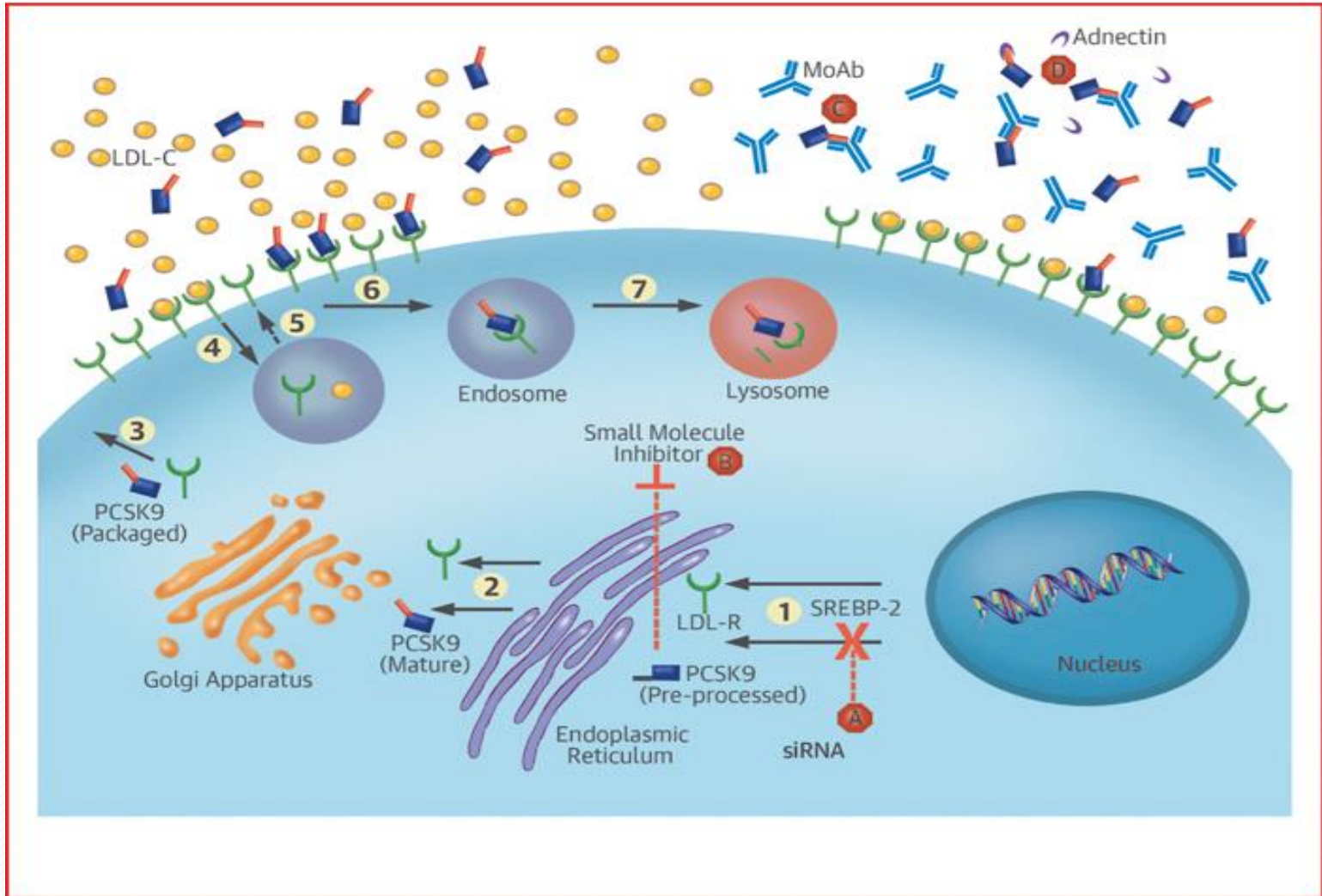
PCSK9 Inhibitors

- Indication

- Adjunct to diet and maximally tolerated statin therapy for the treatment of adults with heterozygous familial hypercholesterolemia (HeFH)
- Clinical atherosclerotic cardiovascular disease patients who require additional lowering of LDL-cholesterol
- ?? Statin intolerant patients who are at high cardiovascular risk (still waiting cardiovascular outcome data – possibly 2017)

PCSK9 Inhibitor

- Human monoclonal antibody
 - Binds to PCSK9, thereby preventing binding of PCSK9 to the LDL-R
 - prevents PCSK9 mediated LDL receptor degradation
 - permits LDL receptor to recycle back to the liver cell surface
 - Increasing the number of receptors available to remove LDL from the blood pool and decrease the LDL cholesterol level



Shortness of Breath

- Congestive Heart Failure
 - Systolic Heart Failure – acute, chronic, acute on chronic
 - CAD → MI → Ischemic Cardiomyopathy
 - Nonischemic Cardiomyopathy
 - Hypertensive heart disease
 - Myocarditis
 - Alcoholic
 - Metabolic → thyroid disorders
 - Tachycardia induced cardiomyopathy
 - Atrial fibrillation
 - Valvular Heart Disease
 - Aortic valve disease
 - Mitral valve disease

Shortness of Breath

- Congestive heart failure
 - Diastolic Heart Failure – acute, chronic, acute on chronic
 - Grade 1 – Abnormal relaxation
 - Grade 2 – Pseudonormal filling
 - Grade 3 – Restrictive filling (reversible)
 - Grade 4 – Restrictive filling (irreversible)

Shortness of Breath

- Diastolic Heart Failure (cont'd)
 - Hypertensive heart disease
 - Hypertrophic cardiomyopathy
 - Infiltrative cardiomyopathies
 - Hemochromatosis
 - Amyloidosis
 - Pericardial diseases

Shortness of Breath

- Combined Systolic and Diastolic Heart Failure

Congestive Heart Failure

- Diagnostic Modalities
 - Echocardiography
 - Cardiac Catheterization
 - Cardiac MRI and CT

Congestive Heart Failure

- Treatment
 - Medical treatment
 - Beta Blockers
 - Ace Inhibitors
 - Diuretics - Spironolactone
 - Digoxin?
 - Ivabradine (Corlanor)
 - Lvef < 35%
 - Sinus rhythm with resting HR > 70 BPM on maximally tolerated betablocker treatment or have contraindications to betablocker use
 - Contraindications → Acute CHF, BP < 90/50, sick sinus syndrome, severe conduction disorder, pacemaker dependent patient
 - Correct underlying valvular heart disease and coronary artery disease
 - Aortic valve/Mitral valve repair or replacement
 - Coronary artery revascularization
 - CABG or PCI
 - Pericardectomy
 - Sudden death prevention
 - AICD
 - BIV pacing/ICD
 - L-VAD → Transplant

Valvular Heart Disease – Mitral Regurgitation

- Acute
 - Chordal rupture
 - Infective endocarditis
 - Ischemic heart disease

Valvular Heart Disease – Mitral Regurgitation

- Chronic
 - Annular
 - dilation
 - calcification
 - Leaflets
 - Perforation
 - Cleft
 - Redundancy/prolapse
 - Thickening
 - Commissural tissue
 - Chordae tendineae
 - Abnormal insertion
 - Elongation
 - Rupture
 - Thickening/fusion
 - Papillary muscle
 - Ischemia
 - Fibrosis
 - Rupture
 - Left ventricular free wall
 - Lateral distension
 - Ischemia
 - Fibrosis
 - dilation

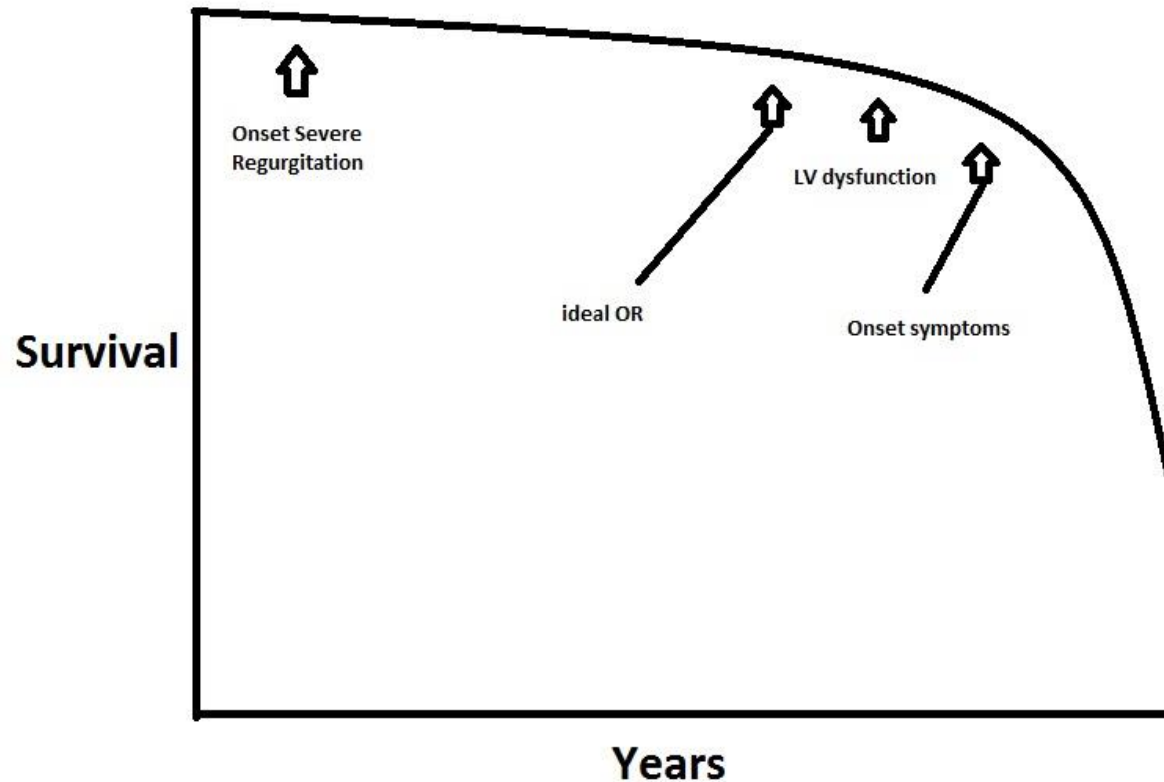
Etiology of Mitral Valve Regurgitation

- Degenerative mitral valve disease (MVP) – 65%
- Ischemia MR – 27%
- Endocarditis – 5%
- Rheumatic mitral valve disease – 1%
- Others – 2%

Definition of Severe MR (Echo)

- Color jet area $> \frac{1}{2}$ LA area
- Regurgitant volume $> 60\text{mL}$
- Regurgitant fraction $> 55\%$
- ERO $> 0.4\text{cm}^2$
- Venacontracta $> 0.6\text{cm}$

Regurgitation Lesion Natural History



What is LV dysfunction?

- EF < 60%
- ESD > 40mm

Indications for Surgery

- ACC/AHA Valve guidelines for repair/replacement
 - Severe organic MR
 - Any symptoms (II – IV)
 - EF < 60%
 - ESD > 40mm

Aortic Regurgitation

- Acute etiology
 - Root dissection
 - Valve endocarditis

Aortic Regurgitation – Chronic Etiology

Intrinsic Valvular

- Degenerative/calcific
- Bicuspid
- Endocarditis
- Rheumatic Fever
- Vasculitis (CTD)
- Anorectic drugs

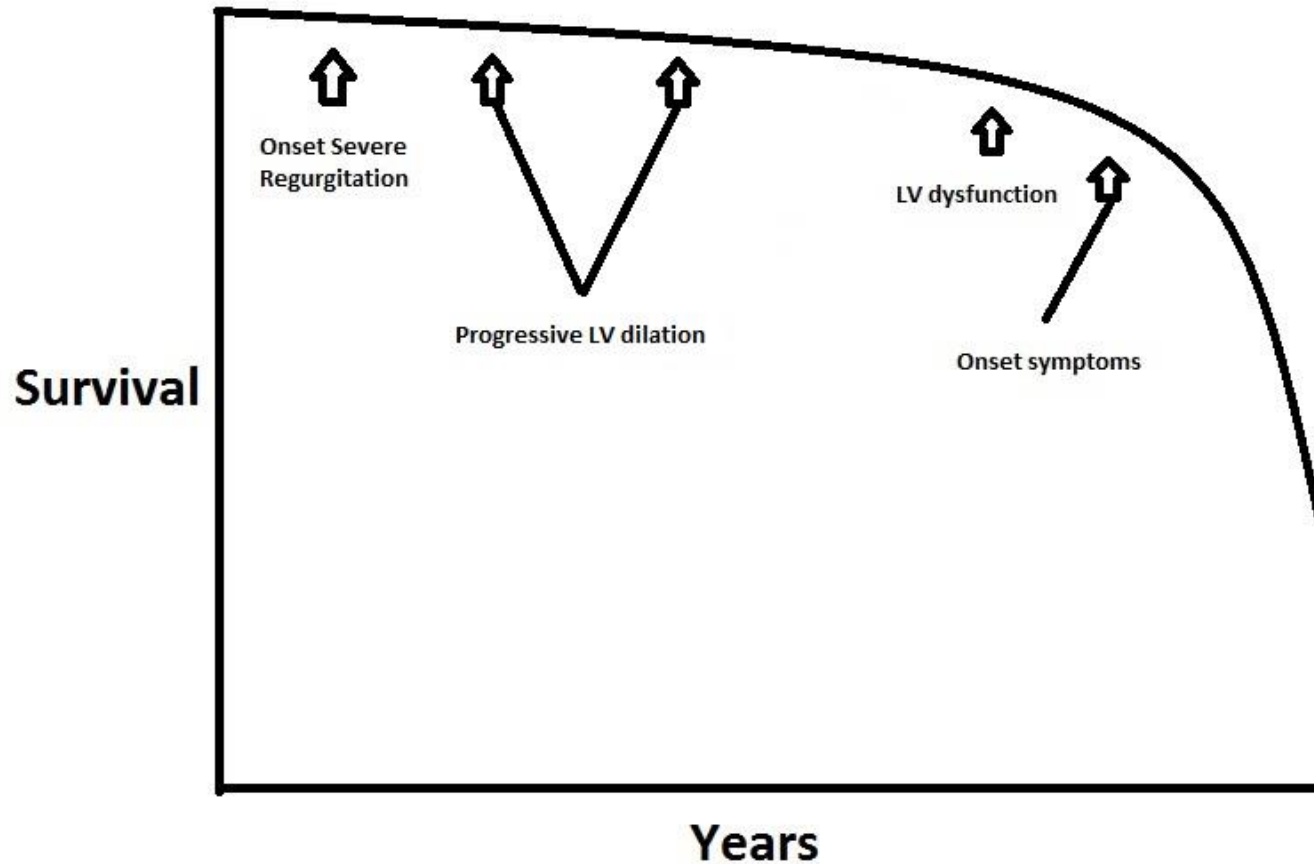
Ascending Aortic

- Degenerative
- Type A dissection
- Marfan Syndrome
- Inflammatory
 - Ankylosing Spondylitis
 - Psoriatic Arthritis
 - Reiter's Syndrome
 - Behcet's Syndrome
- Giant cell arteritis

Echocardiographic Determination of Severe AR

- AR color jet dimension/LVOT diameter $> 60\%$
- Flow reversal in proximal descending thoracic aorta (holodiastolic)
- Regurgitant volume $> 60\text{mL}$
- Regurgitant fraction $> 55\%$

AR Natural History



Indications for Surgery

- Symptoms of CHF
- LV dysfunction
 - LV EF < 55%
 - LV dilation → ESD > 50mm

Aortic Stenosis

- Supravalvular
 - Level of obstruction Aorta
 - Single discrete narrowing associated with Elfin Facies

Aortic Stenosis

- Subvalvular
 - 10% of patient with AS
 - Discrete ridge
 - Tunnel stenosis
 - Frequently accompanied by AR
 - Treatment requires resection of ridge to prevent AR

Aortic Stenosis

- Valvular
 - < 30 years congenital – unicuspid/bicuspid
 - 40 – 60 years – calcified bicuspid
 - 40 – 60 years – rheumatic
 - > 70 – degenerative

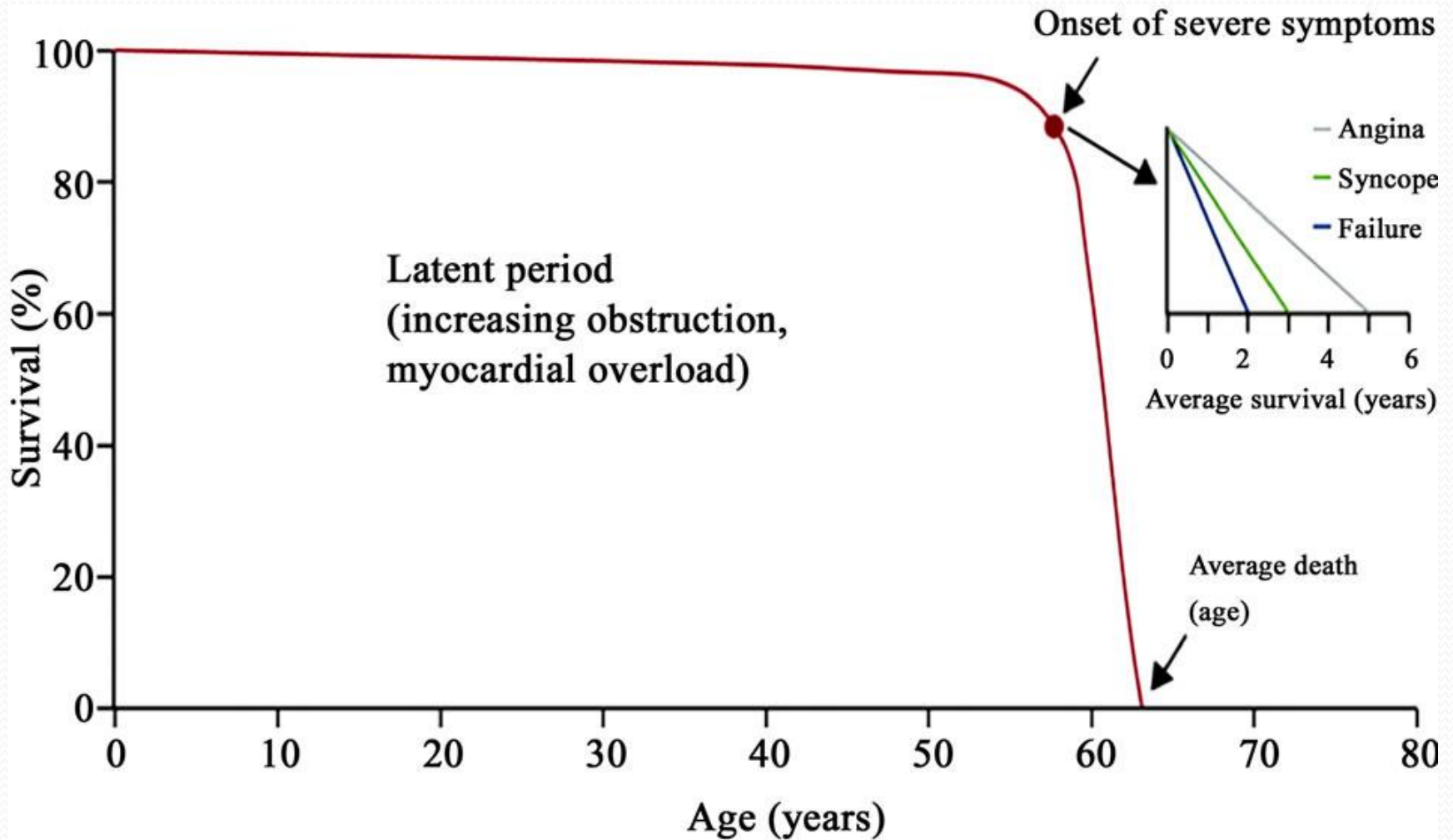
Aortic Stenosis

Severity	Mean Gradient (mmHg)	AVA (cm ²)
Mild	< 25	> 1.5
Moderate	25 - 40	1 – 1.5
Severe	> 40	< 1.0

Aortic Stenosis

- Symptoms of severe aortic stenosis
 - Angina
 - Syncope
 - CHF

Natural History of AS



Aortic Stenosis

- Treatment
 - AVR
 - Open
 - TAVR
 - Delivery method → transfemoral, apical, minithoractomy

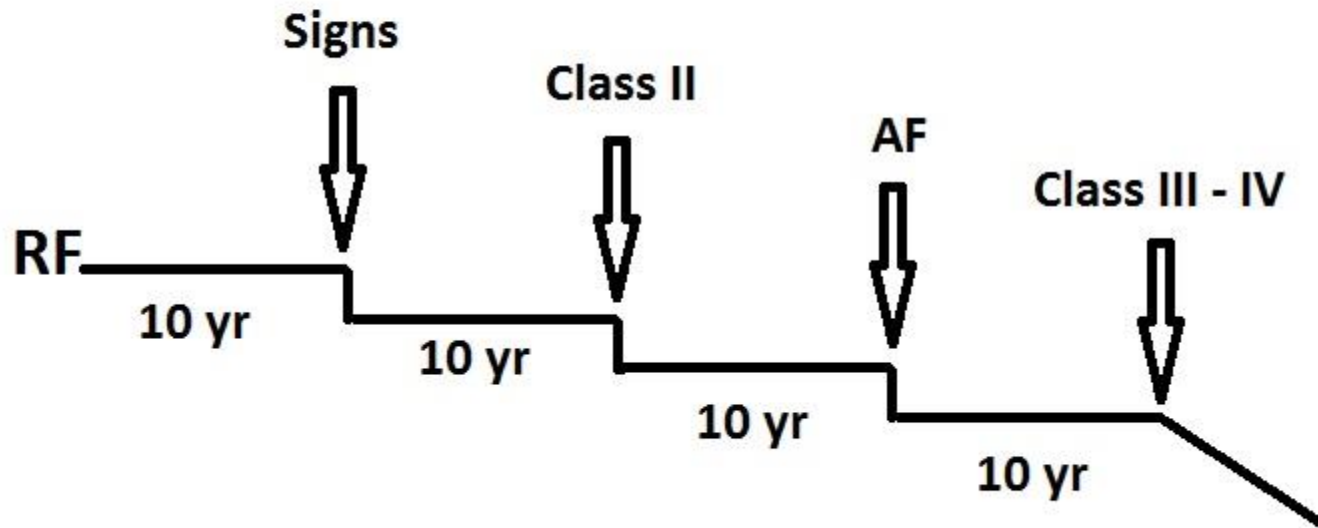
Mitral Stenosis

- Etiology
 - Almost always rheumatic
- Symptoms
 - Dyspnea, PND, orthopnea
 - Hemoptysis
 - Palpitations
 - Emboli
- Diagnosis
 - Echo is the gold standard

Mitral Stenosis

Severity	Mean Gradient (mmHG)	MVA (cm ²)
Mild	< 5	> 1.5
Moderate	5 – 10	1 – 1.5
Severe	> 10	< 1.0

Mitral Stenosis – A Disease of Plateaus



Mitral Stenosis

- Treatment
 - Percutaneous Mitral Balloon Valvotomy
 - Class II, III, IV symptoms
 - Low calcium score
 - Pliable valves
 - No calcium in commissures
 - (Contraindications for valvuloplasty MR > 2+ & LA thrombus)
 - Asymptomatic patients
 - PAP > 60 mmHg
 - New onset A-Fib
 - MVR
 - Class III or IV symptoms
 - Nonpliable valves
 - Severe stenosis

Endocarditis Prophylaxis

- Patients with congenital heart disease
 - Unrepaired cyanotic congenital heart disease (including shunts & conduits)
 - Completely repaired congenital heart defect during the first 6 months after the procedure
 - Repaired congenital heart disease with residual defects of the site or adjacent to the site of the prosthetic patch or device
- Patients with prosthetic cardiac valves
- Patients with previous IE
- Cardiac transplant recipients with valve regurgitation due to valvular insufficiency

Palpitations – Arrhythmias

Regular Rhythm Narrow QRS Complex Tachycardia

- Sinus tachycardia
- Atrial tachycardia
- Atrial flutter w/ fixed conduction
- AVNRT
- AVRT concealed accessory pathway

Irregular Rhythm Narrow QRS Complex Tachycardia

- MAT
- Atrial flutter w/ variable block
- Atrial fibrillation

Regular Rhythm Wide QRS Complex Tachycardia

1. AVRT manifest accessory pathway
- Ventricular tachycardia

Irregular Rhythm Wide QRS Complex Tachycardia

1. Any of the above with preexisting BBB or physiological BBB
- Ventricular Fibrillation

Palpitations – Arrhythmias

- Diagnostic Procedures
 - Holter monitor
 - Real time telemetry monitoring/event monitoring
 - Implantable loop recorders
 - Electrophysiological testing
- Treatment
 - Medical treatment
 - Ablation
 - AICD

Atrial Fibrillation

- Paroxymal AF → AF that terminates spontaneously or intervention within 7 days of onset
- Persistent AF → Continuous AF that is sustained > 7 days
- Long Lasting Persistent AF → Continuous AF > 12 month duration
- Permanent AF → Patient and clinician make a joint decision to stop further attempts to restore and/or maintain sinus rhythm
- Nonvalvular AF → AF in the absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve, or mitral valve repair

Treatment of Atrial Fibrillation

Classification	Medication
1 – Sodium Channel Blockers	A: Quinidine, Procainamide, Disopyramide B: Lidocaine, Mexilitine C: Flecainide, Propafenone
2 – Beta Blockers	Metoprolol
3 – Potassium Channel Blockers	Sotalol, Amiodarone, Dofetilide, Dronedarone
4 – Calcium Channel Blockers	Diltiazem

Antiarrhythmic Medications

Medication of Choice	Lone AF	Decrease LVEF/CHF	CAD (normal EF)	Hypertrophic Cardiomyopathy
1 st line	Flecainide Propafenone Dronedaron	Amiodarone Dofetilide	Sotalol Amiodarone Dronedaron	Amiodarone Sotalol
2nd line	Sotalol Class 1A Amiodarone		Dofetilide Class 1A	Disopyramide
Avoid		Class 1C Dronedaron	Class 1C	

Atrial Fibrillation

CHA₂DS₂-VASc

2009 Birmingham Schema Expressed as a Point-Based Scoring System

Risk Factor	Score
C ongestive heart failure/LV dysfunction	1
H ypertension	1
A ge ≥ 75 y	2
D iabetes mellitus	1
S troke/TIA/TE	2
V ascular disease <i>(prior myocardial infarction, peripheral artery disease, or aortic plaque)</i>	1
A ge 65-74 y	1
S ex category <i>(i.e. female gender)</i>	1

LV = left ventricular; TE = thromboembolism

Total Score	Anticoagulation Therapy Options
0 (low stroke risk)	No antithrombotic therapy (or aspirin 75 – 325 mg daily)
1 (moderate)	Either DOAC or warfarin at INR of 2.0 – 3.0
> or = 2 (high)	Either DOAC or warfarin at INR 2.0 – 3.0

VKA
II VII IX X

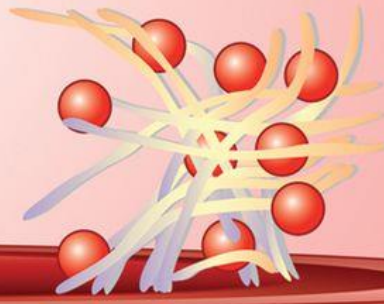
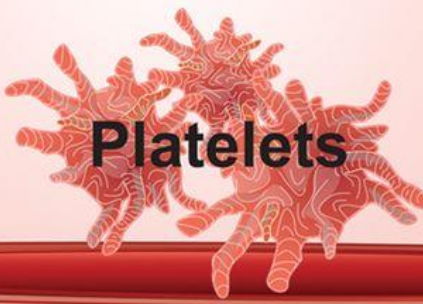
Rivaroxaban
Apixaban
Edoxaban

Dabigatran

Intrinsic pathway

Extrinsic pathway

IXa & Xa
TF-VIIa



Thrombin generation



Major Bleeding

- Involves major organ including central nervous system bleeding (intracranial or epidural), pericardial, intraocular, retroperitoneal, intra-articular, intramuscular with compartment syndrome
- Clinically overt bleeding with a drop in hemoglobin of at least 2 g/dl
- Requires transfusion of at least 2 units
- Requires surgical correction
- Requires intravenous vasoactive agents

Clinically Relevant Non-Major Bleeding

Clinically overt bleeding that does not satisfy criteria for major bleeding but requires:

- hospitalization or increased level of care, or
- prompt physician guided medical or surgical treatment, or
- a change in antithrombotic therapy

Minor Bleeding

- Self-terminating
- Does not require an office visit
- No hospitalization or treatment by a health care professional

Step 1 Review

- Stop anticoagulation and antiplatelet therapy
- Review time of last dose of anticoagulant
- Review medications including aspirin, P2Y₁₂ inhibitors, NSAIDs, P-gp inhibitors, CYP3A4 inhibitors
- Assess for comorbid conditions, check for evidence of cardiac decompensation
- Order baseline laboratory parameters including CBC with platelets, renal function tests, PT, aPTT
- Maintain organ perfusion
 - Volume resuscitation
 - Pressors
- Identify source of bleeding
- Evaluate for transfusion

Step 2 Remove

- Gastric lavage for recent Ingestion (DOACs)
- Oral charcoal
- Dialysis (dabigatran)

Step 3 Repair

Assess need for Surgery

Step 4 Reverse

Vitamin K antagonists

- Vitamin K
- Consider FFP for poor hemodynamic condition
- 4-factor prothrombin complex concentrate
- Platelet transfusion (for thrombocytopenia or if patients received antiplatelets)

Direct acting oral anticoagulants

- Consider 4 factor prothrombin complex concentrate
- Platelet transfusion (for thrombocytopenia or if patient received antiplatelets)

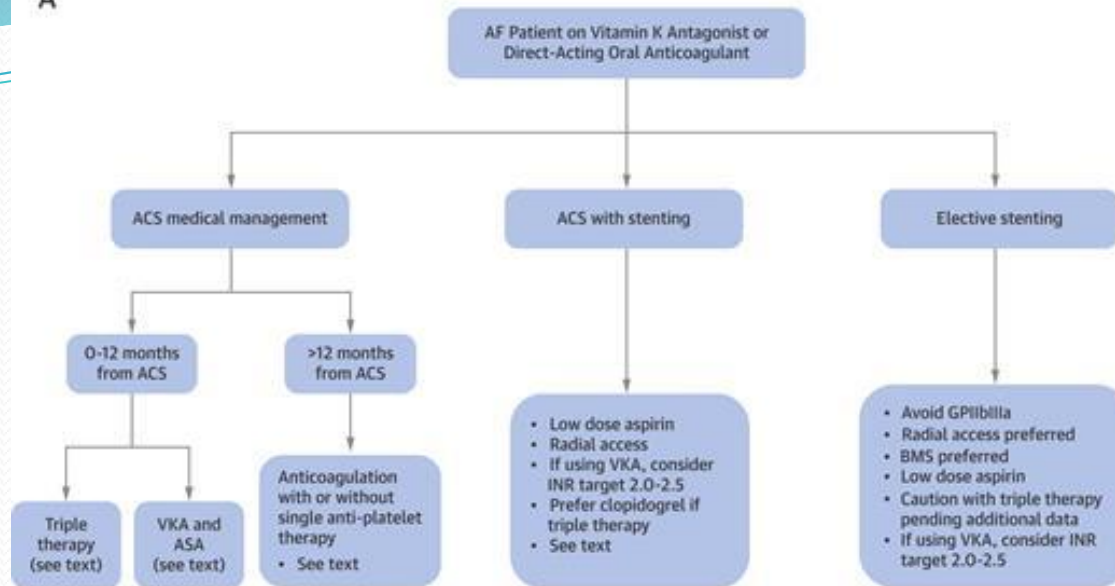
Laboratory Testing for Anticoagulation Activity

- Dabigatran concentration
 - Dilute TT
 - ECT (Ecarin clotting time)
 - ECA (Ecarin chromogenic assays)
 - Prolonged aPTT → indicates anticoagulation effect of Dabigatran
- Rivaroxaban, Apixaban, Edoxaban (Savaysa)
 - Anti Xa activity
 - Calibration of anti factor XA assays with specific Fxa inhibitors is recommended
 - Prolonged PT indicates anticoagulation effect of FXa inhibitors

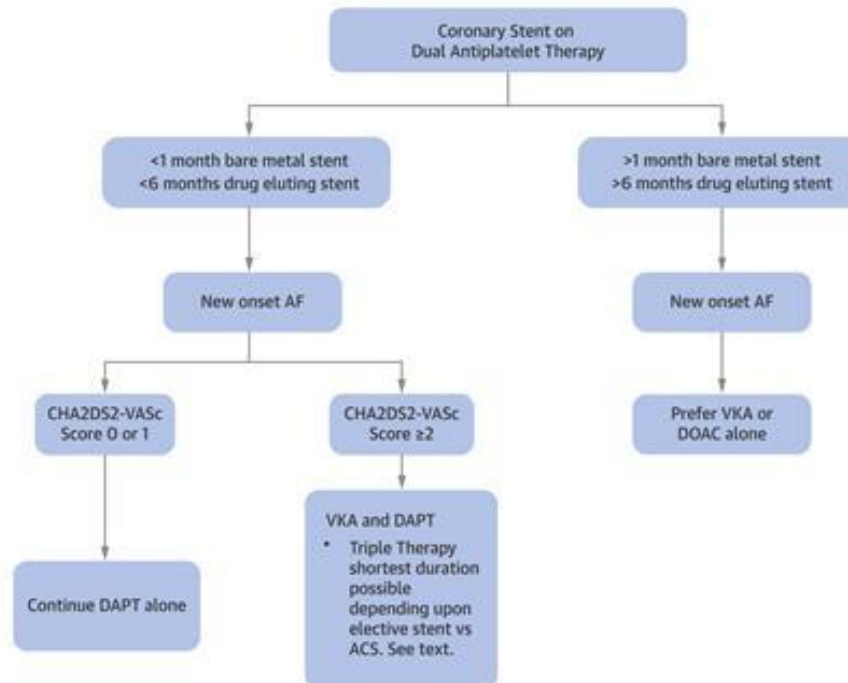
Reversal of Anticoagulation Effect

- Dabigatran (Pradaxa)
 - Idarucizumab (Praxbind) – two consecutive IV infusion of 2.5g (total 5g)
 - Indication
 - emergency surgery
 - life threatening or uncontrolled bleeding situations

A



B



Procedures Amenable to Uninterrupted Therapeutic Warfarin

- Endoscopy
- Biopsies
- Endovascular interventions
- Percutaneous coronary interventions
- Cardiac electrophysiology studies and ablations
- Cardiac device implantation (pacemakers, defibrillators, loop recorders)
- Cataract surgery
- Dermatologic surgery
- Dental extractions
- Epidural anesthetics and likely other interventional pain management techniques
- Minor noncardiac surgeries
- Total knee arthroplasty
- Arthroscopic surgery

Bridging Anticoagulation – Key Points

- OAC should not be interrupted for procedures with low bleeding risk
- Patients at highest risk for thromboembolism without excessive bleeding risk should consider bridging. Conversely, those at low risk for TE should not be bridged.
- Intermediate risk cases should be managed by individually considering patient and procedure-specific risks for bleeding and TE.

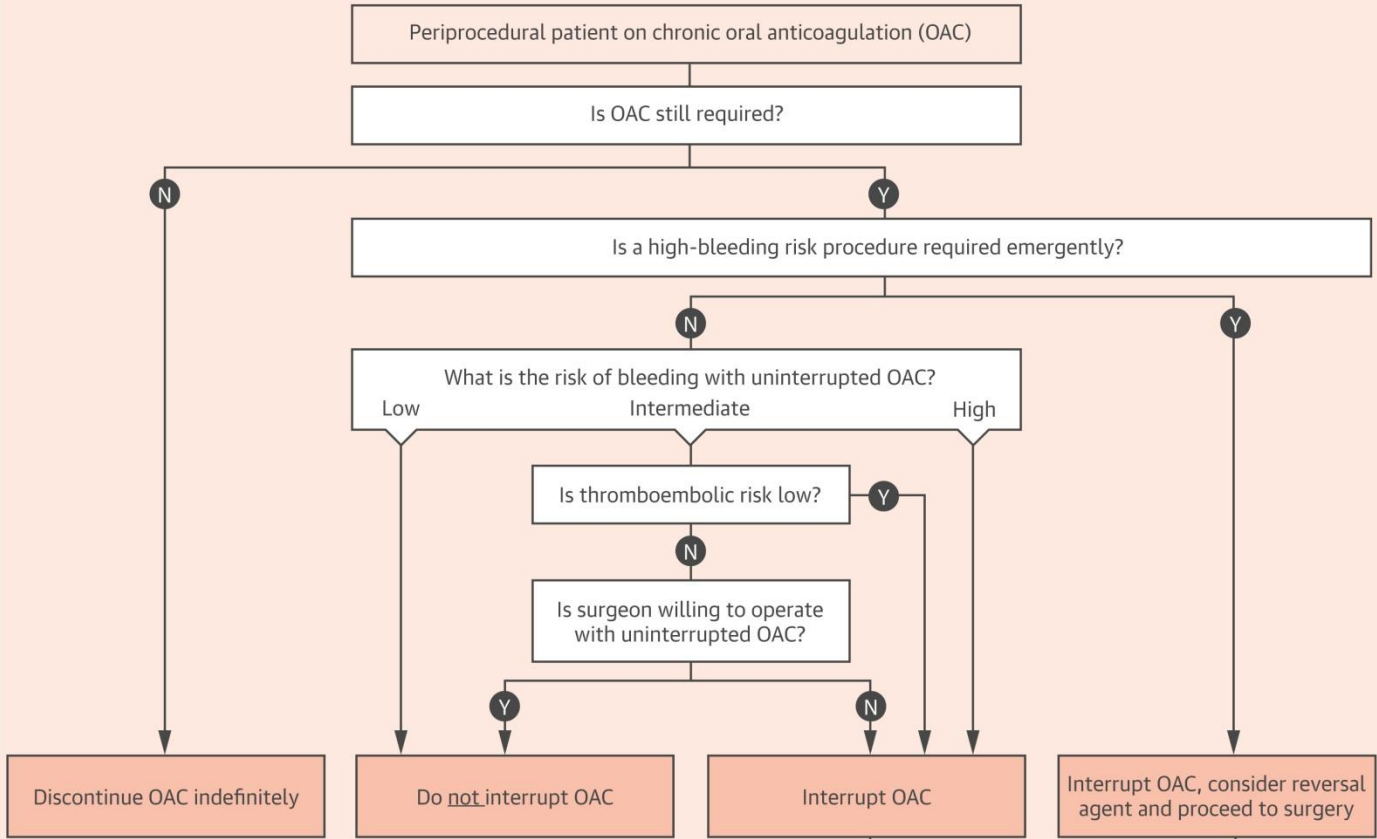
Bridging Anticoagulation

- Patient specific bleeding risk should be assessed
 - Bleed MAP scores
 - Bleed – prior bleeding
 - Mechanical mitral valve
 - Active cancer
 - Low platelet count
- Consider bridging
 - Unacceptably high TE risk
 - Active or recent arterial TE
 - Mechanical mitral valve
- When bridging is deemed necessary, more conservative bridging strategies should be entertained
 - Low dose heparin
 - Post procedure heparin only
 - Delayed initiation of post procedure heparin
 - Early transitioning off on heparin as the INR approaches 2.0

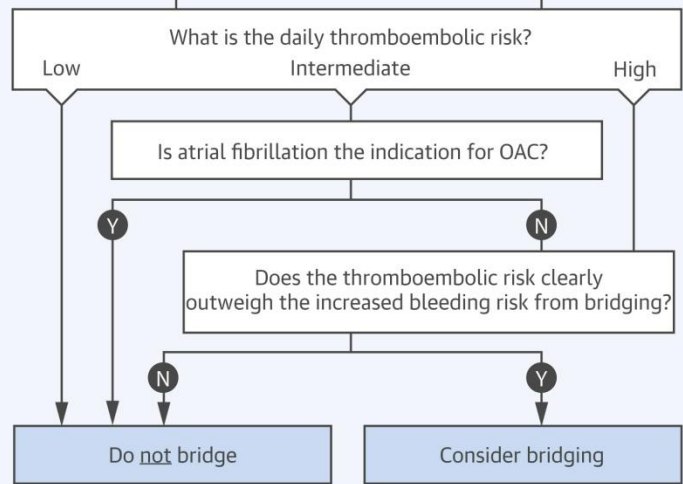
ACCP'S SUGGESTED RISK STRATIFICATION FOR PERIOPERATIVE THROMBOEMBOLISM

RISK CATEGORY	MECHANICAL HEART VALVE	ATRIAL FIBRILLATION	VENOUS THROMBOEMBOLISM
<p>HIGH (> 10%/yr risk of ATE or >10%/mo risk of VTE)</p>	<p>Any mechanical MV Older aortic valve Recent stroke/TIA(< 6/12)</p>	<p>CHADS score of 5 or 6 Recent stroke/TIA (<3mo) Rheumatic valvular heart dis</p>	<p>Recent VTE(<3mo) Severe thrombophilia</p>
<p>Moderate (4%-10%/yr risk of ATE Or 4-10%/mo risk of VTE)</p>	<p>Bileaflet aortic valve and 1 of the following : AF, prior stroke/TIA,HPT,DM,heart failure ,age >75yr</p>	<p>CHADS score of 3-4</p>	<p>VTE within 3-12mo Recurrent VTE Active cancer Nonsevere thrombophilia</p>
<p>Low (< 4%/yr risk of ATE or < 2%/mo risk of VTE)</p>	<p>Bileaflet aortic valve without AF and no other risk factor for stroke</p>	<p>CHADS score of 0-2 and no prior stroke /TIA</p>	<p>Single VTE within past 12mo and no other risk factor</p>

DECISION TO INTERRUPT OAC



DECISION TO BRIDGE WITH ANTICOAGULANTS



Sudden Cardiac Arrest

- Statistics

- More than 500,000 cases of cardiac arrest occur yearly in the United States
- Less than 15% of individuals survive
- Almost 1/3 of individuals who go into cardiac arrest will have CPR performed on them by a bystander
- About 90% of cardiac arrest cases occur at home

Sudden Cardiac Arrest – How to Respond

- Call 911
- Get an AED if available
- If the person is not breathing, begin cardiopulmonary resuscitation (CPR)
 - Follow ABCD
- Use the AED as soon as it arrives

