Brigham and Women's Hospital
Founding Member, Mass General Brigham

Board Review in Cardiology

Garrick C Stewart MD, MPH
Center for Advanced Heart Disease
Division of Cardiovascular Medicine
Brigham and Women's Hospital
Assistant Professor of Medicine
Harvard Medical School

Garrick Stewart, MD MPH

John Hopkins School of Medicine
Internal Medicine Residency then Cardiovascular Medicine and Advanced Heart Failure/Transplant Fellowships at BWH
Assistant Professor of Medicine, Harvard Medical School

- Clinical focus: Advanced HF, mechanical circulatory support, inflammatory heart disease
- Research focus: Patient selection for device therapy in HF

Disclosures

I have the following financial disclosures:

Advisory/Consulting Role: Procyrion, Inc.

Question #1

A 75-year-old man is admitted with heart failure. He has noted orthopnea and progressive fatigue over the past 6 months. He has a history of osteoarthritis in knees and carpal tunnel. Coronary artery calcium score was 0 last year. On exam, he appears chronically ill. His blood pressure is 90/75 mm Hg; heart rate is 100 bpm.

Numerous ecchymoses are scattered over his extremities. Jugular venous pressure 14cm. Carotid upstrokes are low volume. Both lung bases are dull. There is a soft holosystolic murmur. Summation gallop is present with prominent P_2. Ascites and hepatomegaly are present. 2+ edema and cold extremities are noted.

ECG shows diffusely low QRS voltages. Echocardiogram shows left ventricular ejection fraction (LVEF) 50% and septal and posterior walls measure 2 cm. N-terminal pro–B-type natriuretic peptide is 5000.

Question #1

Which of the following is the most likely cause of his heart failure?

A. Coronary artery disease
B. Cardiac amyloidosis
C. Thiamine deficiency
D. Constrictive pericarditis
E. Aortic stenosis

Answer #1

Which of the following is the most likely cause of his heart failure?

A. Coronary artery disease

B. Cardiac amyloidosis

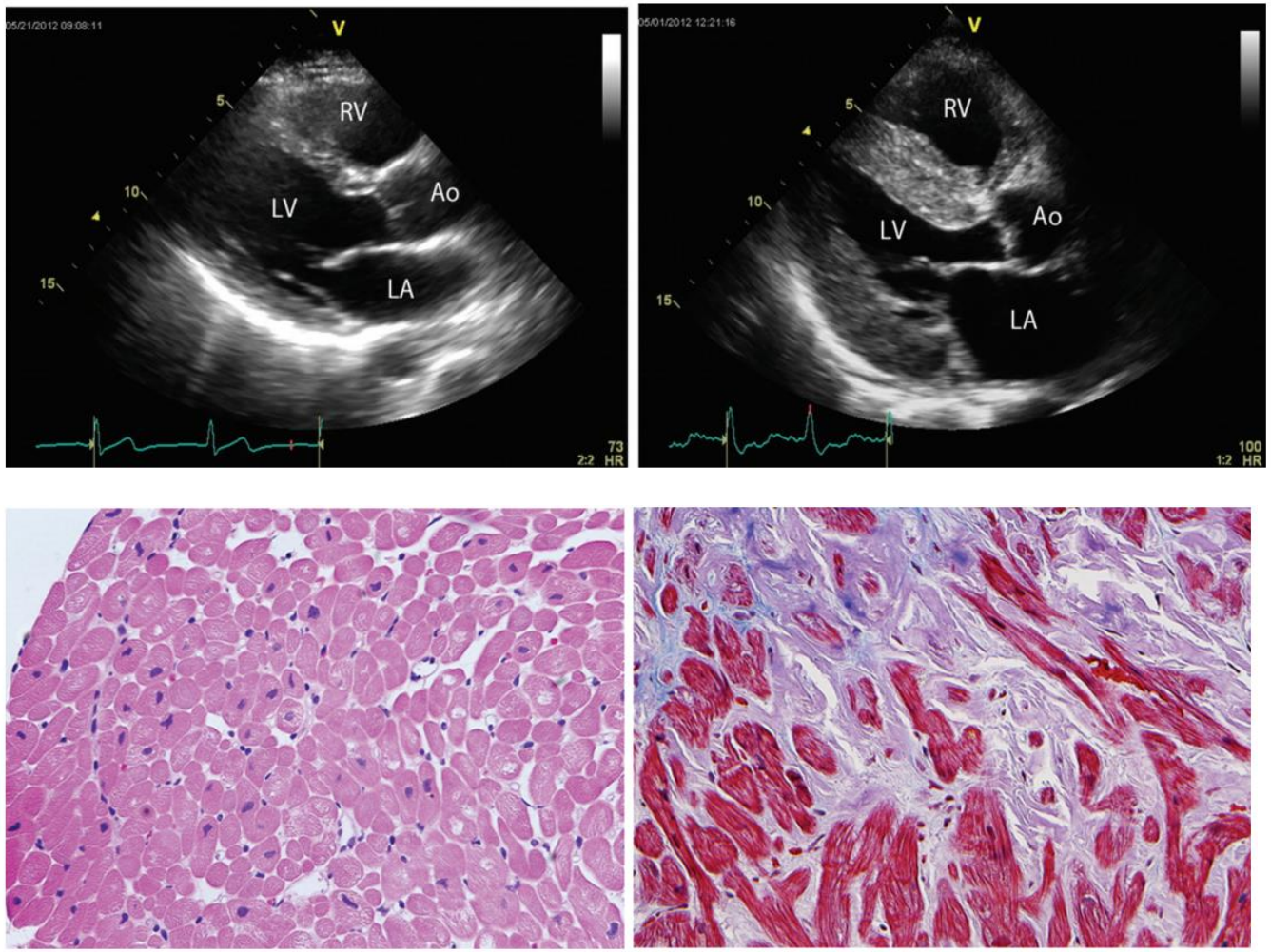
C. Thiamine deficiency

D. Constrictive pericarditis

E. Aortic stenosis

Cardiac Amyloidosis

Normal | **Amyloid**



Quarta et al. Circulation 2012; 126: e178-82.

Question #2

A 78-year-old man with bioprosthetic mitral valve replacement and 10-year history of diabetes mellitus presents with new onset atrial fibrillation with heart rate of 82 beats/minute and blood pressure of 156/96 mm Hg. Echocardiogram reveals LVEF 56%. Which of the following is a true statement?

A. Restoration of sinus rhythm reduces risk of stroke compared with rate control and anticoagulation

B. Warfarin has a lower risk of intracranial bleeding than apixaban

C. Apixaban should be started to reduce risk of stroke

D. The combination of aspirin and clopidogrel is equivalent to warfarin

E. Patient can be cardioverted now and complete 4 weeks of dabigatran

Answer #2

A 78-year-old man with bioprosthetic mitral valve replacement and 10-year history of diabetes mellitus presents with new onset atrial fibrillation with heart rate of 82 beats/minute and blood pressure of 156/96 mm Hg. Echocardiogram reveals LVEF 56%. Which of the following is a true statement?

A. Restoration of sinus rhythm reduces risk of stroke compared with rate control and anticoagulation

B. Warfarin has a lower risk of intracranial bleeding than apixaban

C. Apixaban should be started to reduce risk of stroke

D. The combination of aspirin and clopidogrel is equivalent to warfarin

E. Patient can be cardioverted now and complete 4 weeks of dabigatran

CHA_2DS_2-VASc Calculator for Guiding Antithrombotic Treatment in Atrial Fibrillation

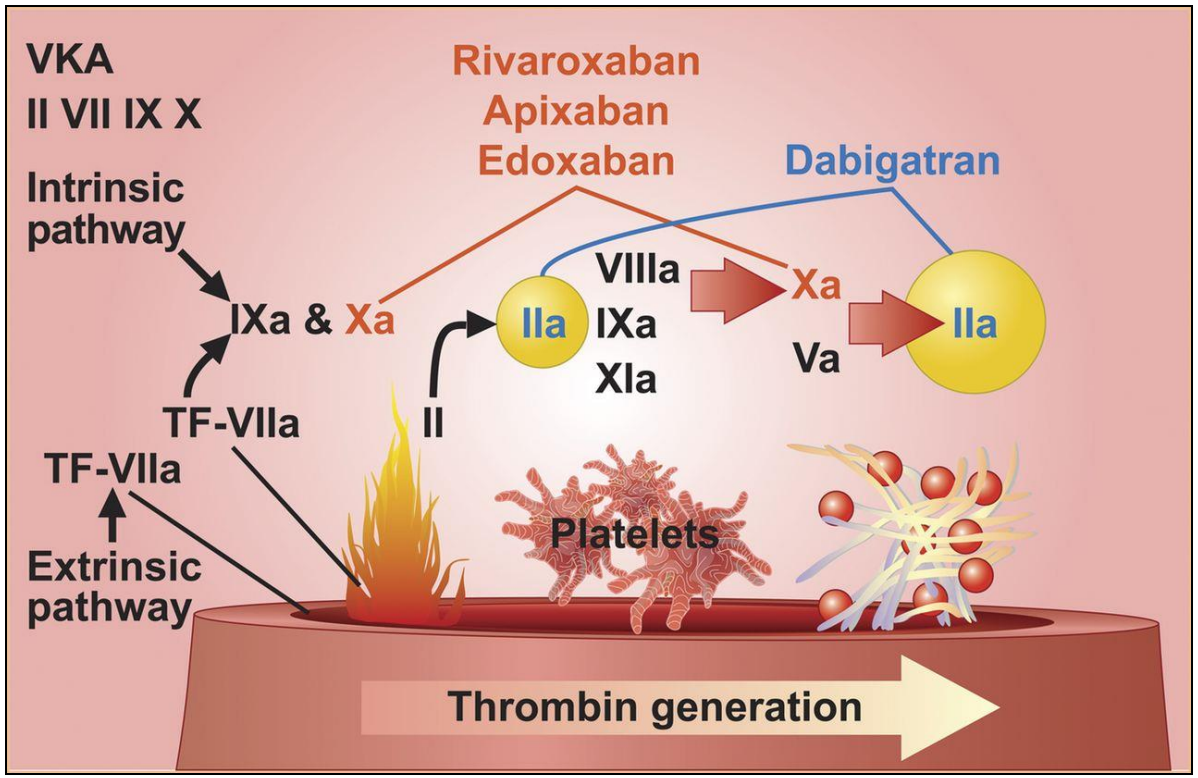
Criteria		Poss. Point
Congestive heart failure Signs/symptoms of heart failure confirmed with objective evidence of cardiac dysfunction	Yes No	+1
Hypertension Resting BP > 140/90 mmHg on at least 2 occasions or current antihypertensive pharmacologic treatment	Yes No	+1
Age 75 years or older	Yes No	+2
Diabetes mellitus Fasting glucose > 125 mg/dL or treatment with oral hypoglycemic agent and/or insulin	Yes No	+1
Stroke, TIA, or TE Includes any history of cerebral ischemia	Yes No	+2
Vascular disease Prior MI, peripheral arterial disease, or aortic plaque	Yes No	+1
Age 65 to 74 years	Yes No	+1
Sex **C**ategory (female) Female gender confers higher risk	Yes No	+1

Anticoagulation Indicated if Score ≥2

(Consider Anticoagulation if Score 1 in men, 2 in women)

January CT, et al. 2019 AHA/ACC/HRS Focused Update of the 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation. Circulation 2019: 140: e125-151.

Direct Oral Anticoagulants



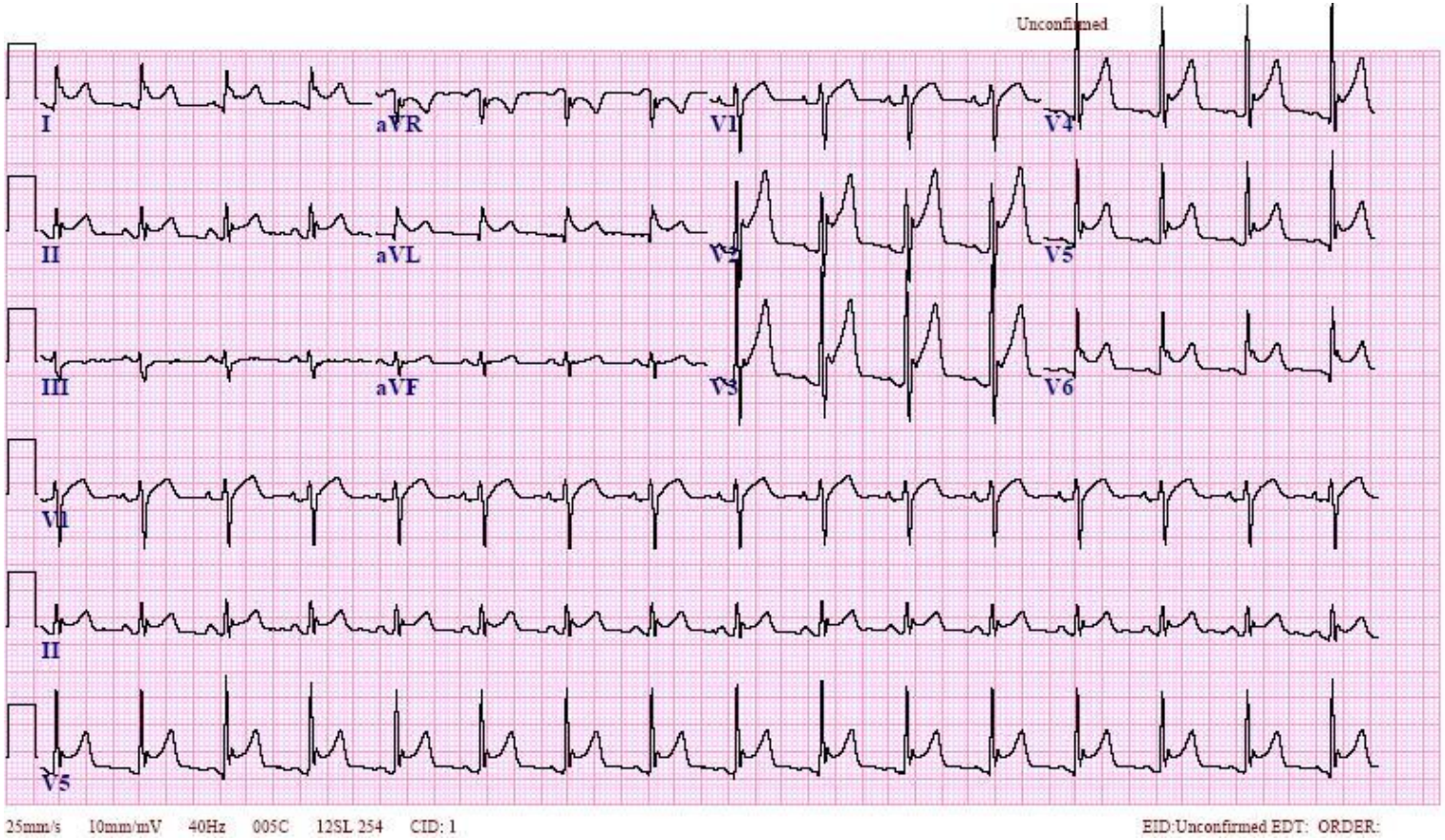
Nonvalvular Atrial Fibrillation: AF in the absence of moderate to severe mitral stenosis or mechanical heart valves.

Direct Oral Anticoagulants should not be used in “valvular” atrial fibrillation, in such cases vitamin K antagonists (e.g. warfarin) should be used

Fontana et al. Eur Heart J 2014; doi:10.1093/eurheartj/ehu027

Question #3

A 42 year old man presents with several days of sharp substernal chest pain that is relieved by sitting forward. He had a similar presentation two years ago. Physical exam reveals flat neck veins, regular rhythm, friction rub and clear lung fields. A 12-lead ECG is obtained:



Question #3

Randomized, placebo-controlled trials have shown which of the following agents to be beneficial in the treatment of this condition when added to NSAIDs?

A. Infliximab
B. Colchicine
C. Corticosteroids
D. Cyclophosphamide
E. Metoprolol

Answer #3

Randomized, placebo-controlled trials have shown which of the following agents to be beneficial in the treatment of this condition when added to NSAIDs?

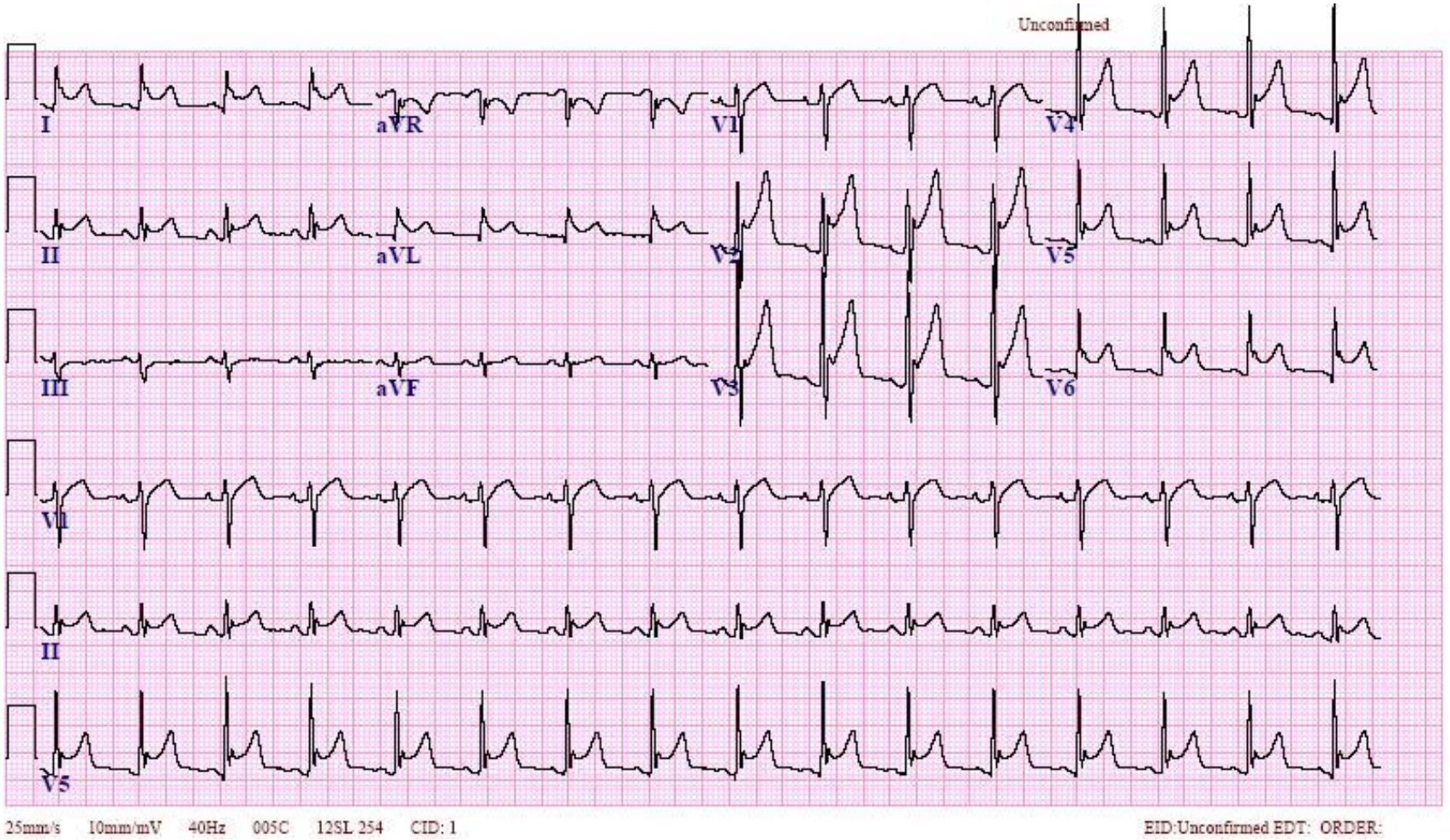
A. Infliximab

B. Colchicine

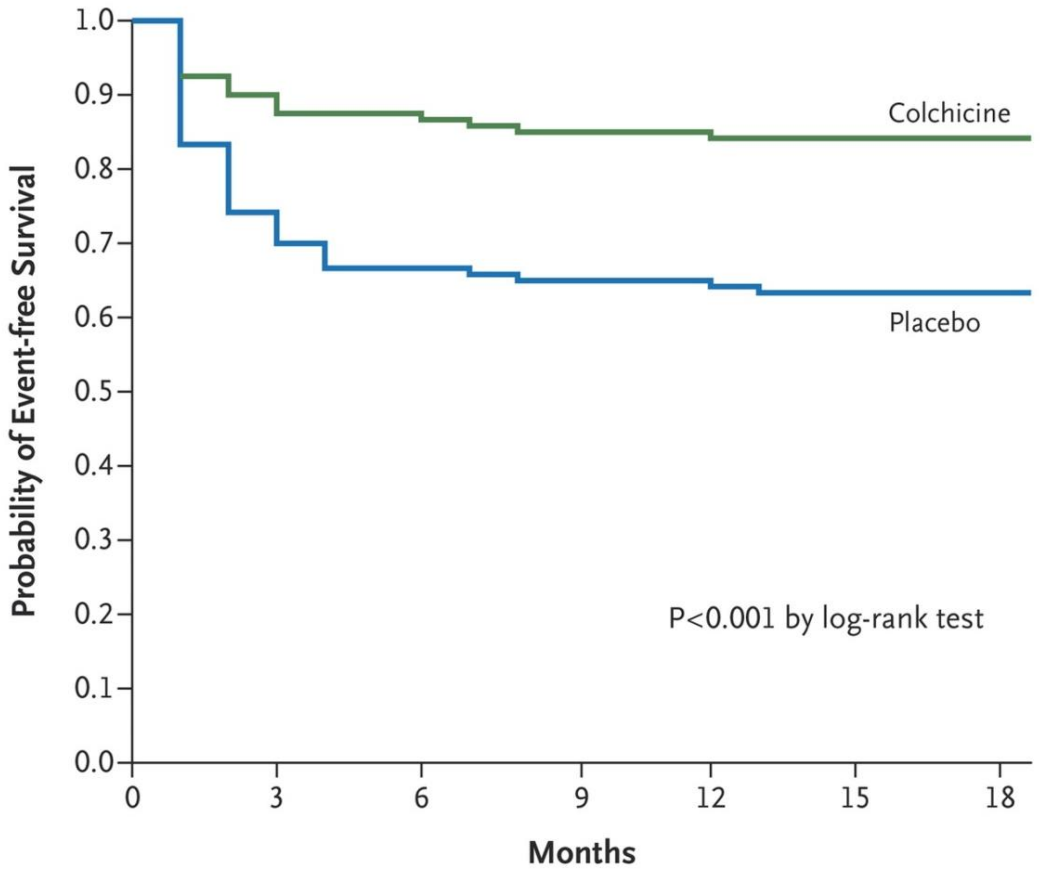
C. Corticosteroids

D. Cyclophosphamide

E. Metoprolol


Unconfirmed
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
VI
II
V5
25mm/s 10mm/mV 40Hz 005C 12SL 254 CID: 1
EID:Unconfirmed EDT: ORDER:

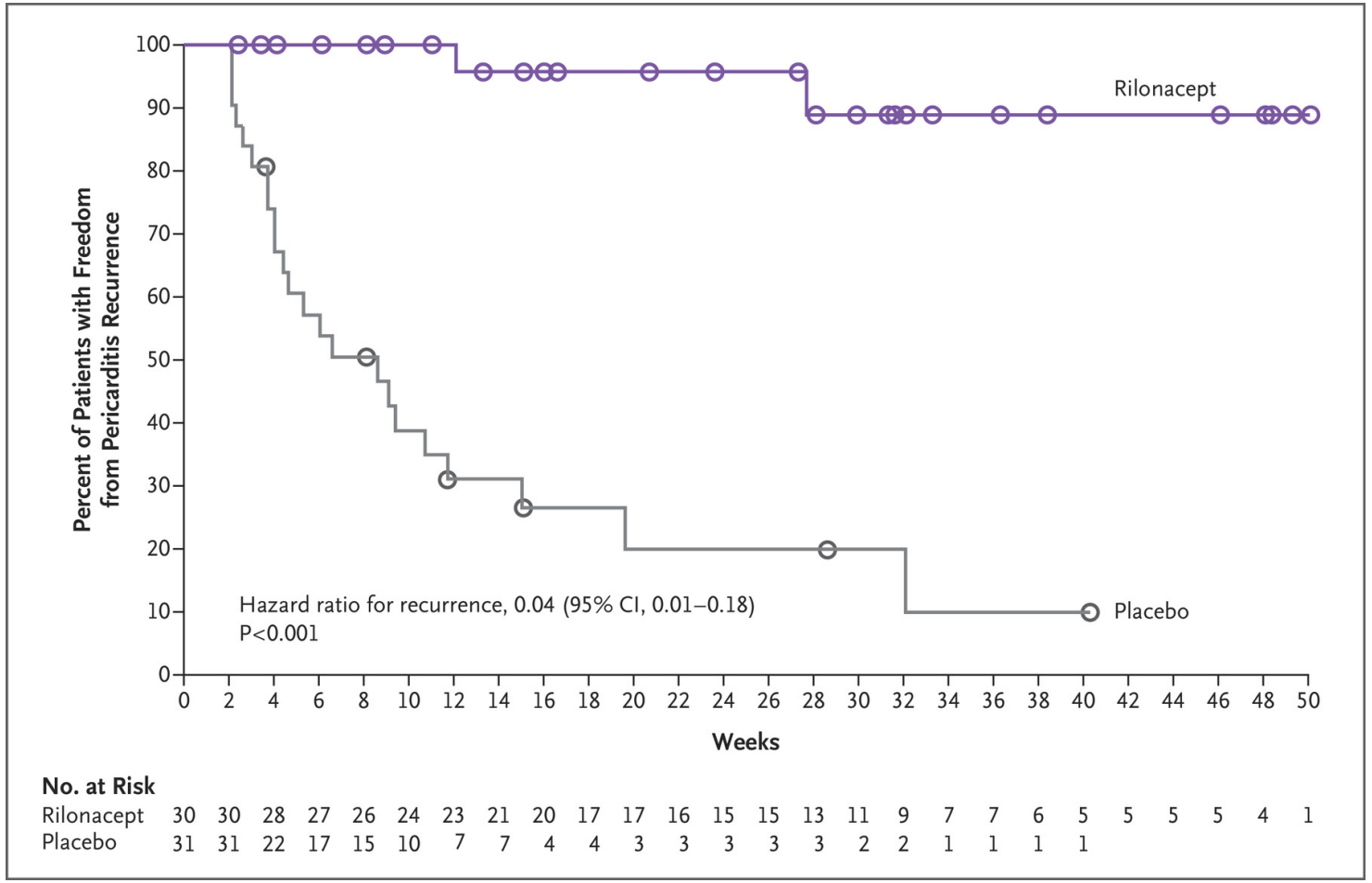
Survival Free of Incessant or Recurrent Pericarditis



No. at Risk							
Colchicine	120	105	105	102	102	98	89
Placebo	120	87	80	78	78	75	69

Imazio M et al. N Engl J Med 2013;369:1522-1528.

Novel Therapies for Recurrent Pericarditis: Interleukin-1 trap (Rilonacept)



Klein AL, et al NEJM 2021; 384:31-41.

Question #4

A 64 year old woman with chronic systolic heart failure, EF 25%, in NYHA Class 2, and 3 prior HF hospitalizations presents for a routine visit. She is euvolemic with heart rate 66bpm in sinus rhythm, BP 102/62. She is on carvedilol 25mg bid, sacubitril-valsartan 49-51mg bid, and eplerenone 25mg daily. Creatinine is 1.2mg/dL, potassium 4.1. What is the most appropriate next step to reduce cardiovascular death and HF hospitalization?

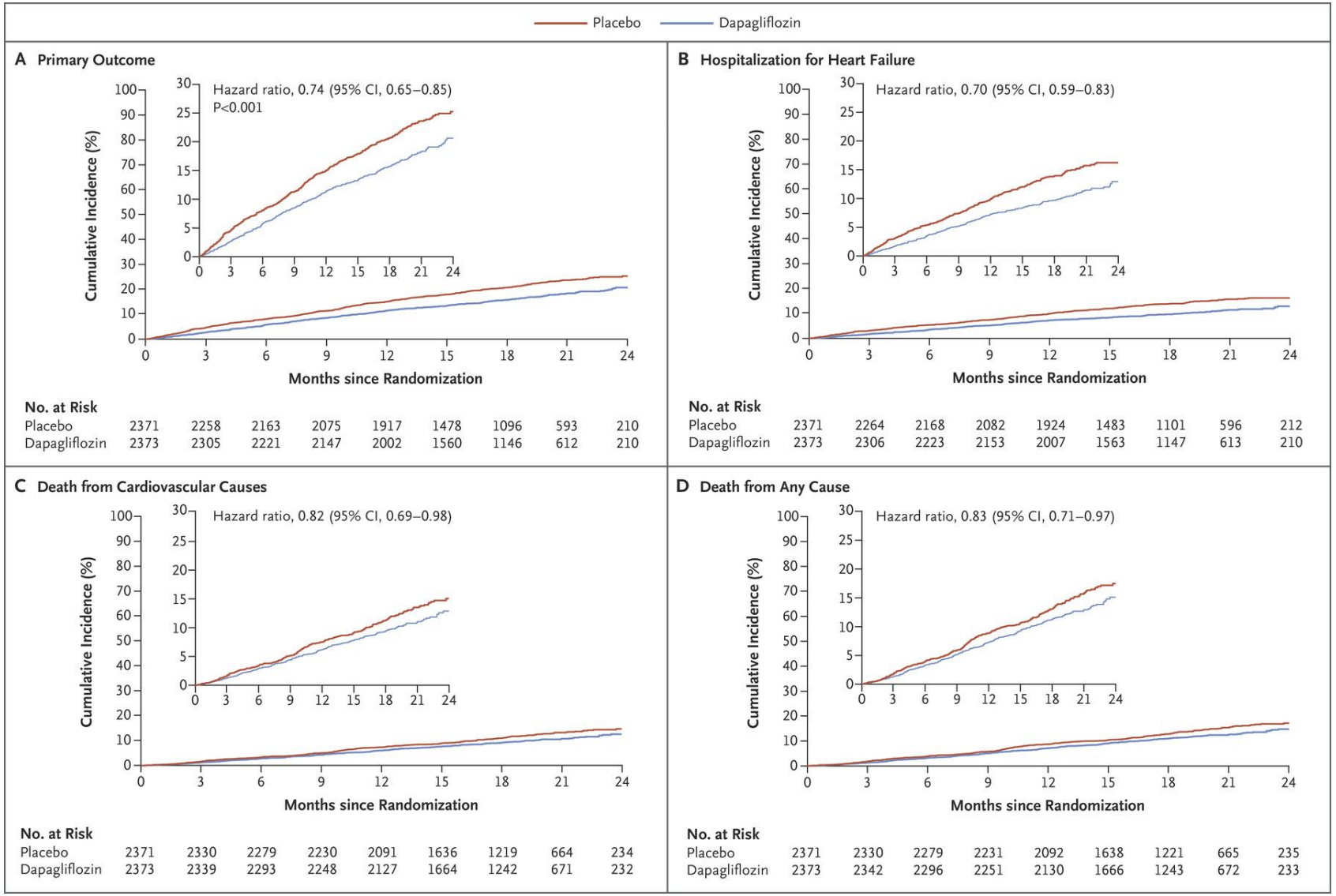
A. Transition from eplerenone to spironolactone 25mg daily
B. Start digoxin 0.125mg every other day
C. Start ivabridine 5mg bid
D. Start dapagliflozin 10mg daily
E. Refer to cardiac rehabilitation

Answer #4

A 64 year old woman with chronic systolic heart failure, EF 25%, in NYHA Class 2, and 3 prior HF hospitalizations presents for a routine visit. She is euvolemic with heart rate 66bpm in sinus rhythm, BP 102/62. She is on carvedilol 25mg bid, sacubitril-valsartan 49-51mg bid, and eplerenone 25mg daily. Creatinine is 1.2mg/dL, potassium 4.1. What is the most appropriate next step to reduce cardiovascular death and HF hospitalization?

A. Transition from eplerenone to spironolactone 25mg daily
B. Start digoxin 0.125mg every other day
C. Start ivabridine 5mg bid
D. **Start dapagliflozin 10mg daily**
E. Refer to cardiac rehabilitation

DAPA-HF Trial



McMurray JJV et al. *N Engl J Med*. 2019; 381: 1995-2008.

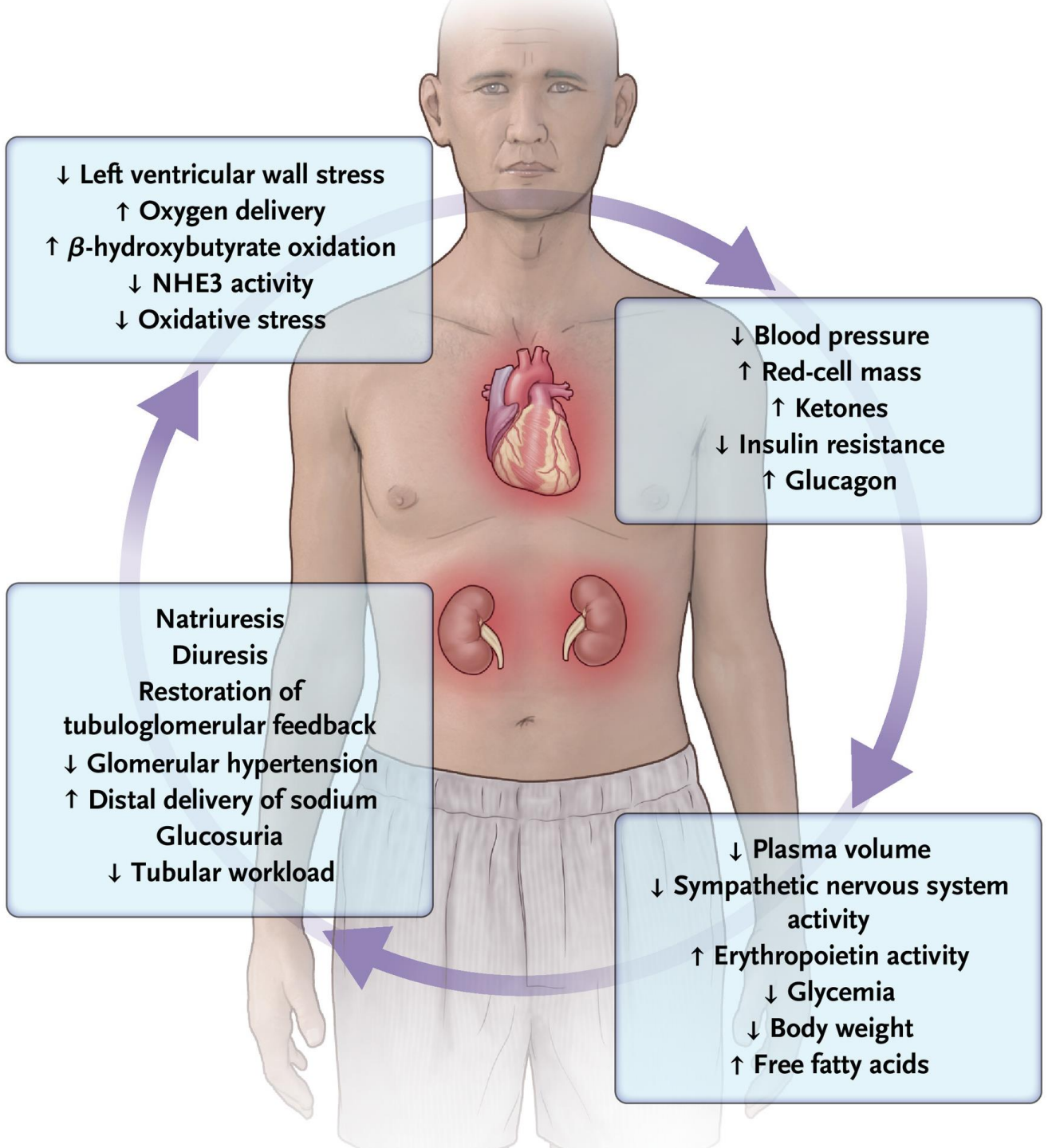
2022 HF Guideline Update

COR	LOE	Recommendation
1	A	1. In patients with symptomatic chronic HFrEF, SGLT2i are recommended to reduce hospitalization for HF and cardiovascular mortality, irrespective of the presence of type 2 diabetes.[1,2]
Value Statement: Intermediate Value (A)		2. In patients with symptomatic chronic HFrEF, SGLT2i therapy provides intermediate economic value.[3,4]

Heidenreich PA, al. *J Am Coll Cardiol*. 2022 79 (17) e262-421

SGLT2 Inhibitors:
Proposed Mechanism

Benefits regardless of EF!



Braunwald, E. N Engl J Med 2022; 386:2024-2034

Question #5

A 55 year-old woman presents for a new patient visit to establish primary care. She reports a history of osteoarthritis of the knees, but takes no prescription medications. She has a normal exam, except for a resting blood pressure of 158/98mmHg in both arms after a period of repose. Repeat BP a week later is 154/96mmHg.

Fill in the blanks: A ***normal*** blood pressure is ____, and this patient has Stage ____ hypertension.

A. <140/90 - Stage 1

B. <130/80 - Stage 1

C. <130/80 - Stage 2

D. <120/80 - Stage 1

E. <120/80 - Stage 2

Answer #5

A 55 year-old woman presents for a new patient visit to establish primary care. She reports a history of osteoarthritis of the knees, but takes no prescription medications. She has a normal exam, except for a resting blood pressure of 158/98mmHg in both arms after a period of repose. Repeat BP a week later is 154/96mmHg.

Fill in the blanks: A ***normal*** blood pressure is ____, and this patient has Stage ____ hypertension.

A. <140/90 - Stage 1

B. <130/80 - Stage 1

C. <130/80 - Stage 2

D. <120/80 - Stage 1

E. <120/80 - Stage 2

AHA/ACC Categories of Blood Pressure in Adults*

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	*or*	80–89 mm Hg
Stage 2	≥140 mm Hg	*or*	≥90 mm Hg

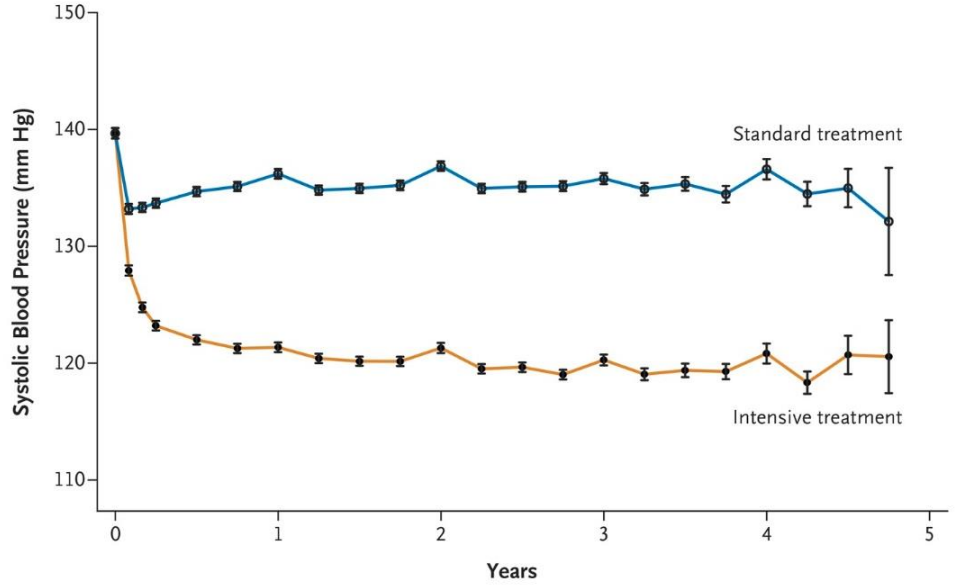
*individuals with SBP and DBP in two categories should be classified in higher category
For example 138/95 = Stage 2

Whelton PK et al. J Am Coll Cardiol 2018; 71:2199-2269

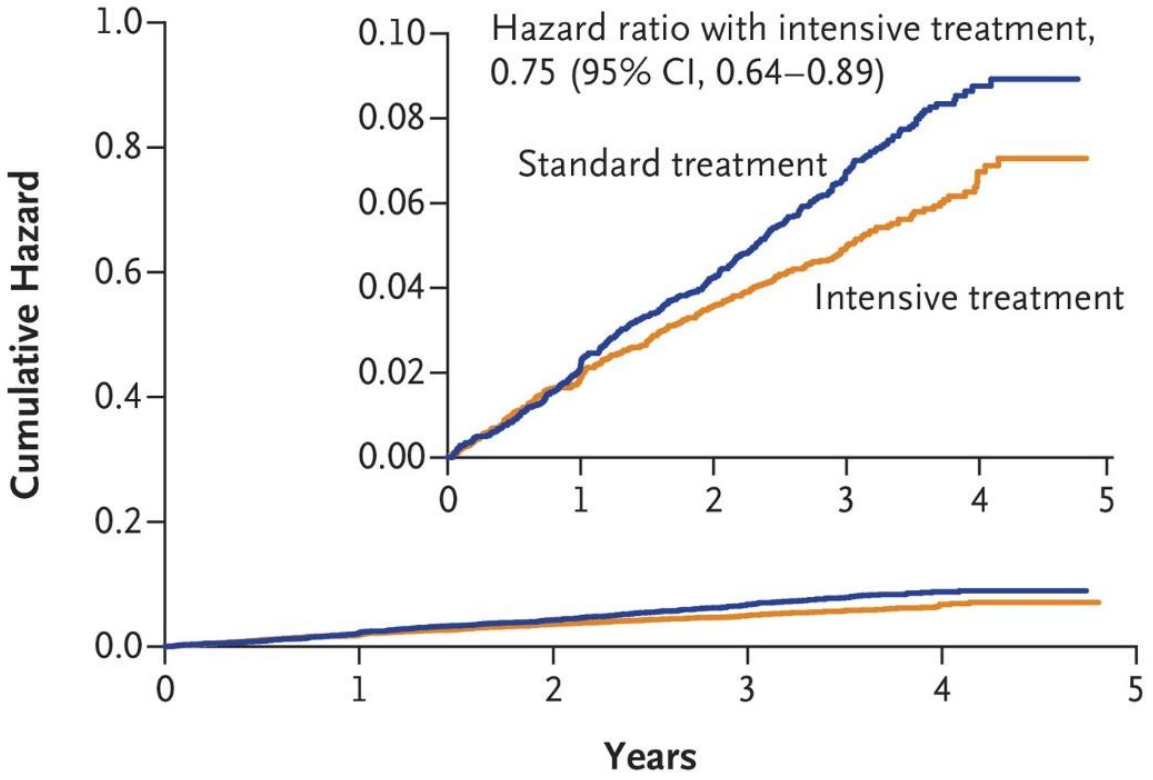
SPRINT

Target SBP <140mmHg vs. <120mmHg

n=9361, >50 yo, BP >130/80
Non-diabetic but at risk for CVD



No. with Data										
Standard treatment	4683	4345	4222	4092	3997	3904	3115	1974	1000	274
Intensive treatment	4678	4375	4231	4091	4029	3920	3204	2035	1048	286
Mean No. of Medications										
Standard treatment	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
Intensive treatment	2.3	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0



N Engl J Med 2015; 373:2103-2116

BP Thresholds for and Goals of Pharmacologic Therapy

Clinical Condition (s)	BP Threshold mm Hg	BP Goal mm Hg
General		
Clinical CVD or 10 year ASCVD risk ≥ 10%	≥130/80	<130/80
No clinical CVD and 10 year ASCVD risk <10%	≥140/90	<130/80
Older persons (≥65 years of age; non-institutionalized, ambulatory, community-living adults)	≥130 (SBP)	<130 (SBP)
Specific Comorbidities		
Diabetes mellitus	≥130/80	<130/80
Chronic kidney disease	≥130/80	<130/80
Chronic kidney disease post-renal transplantation	≥130/80	<130/80
Heart failure	≥130/80	<130/80
Stable ischemic heart disease	≥130/80	<130/80
Secondary stroke prevention	≥140/90	<130/80
Peripheral arterial disease	≥130/80	<130/80

Whelton PK et al. J Am Coll Cardiol 2018; 71:2199-2269

Question #6

A 62 year old man with a history of hypertension, migraine headaches and prostate cancer s/p prostatectomy 2 years ago presents to PCP for routine follow up shortly after returning from a summer vacation to Portugal. He is noted on exam to have swelling of his right leg below the knee without tenderness, palpable cord or skin changes. Laboratories reveal Cr 1.2mg/dL and D-dimer 800ng/mL. Ultrasound exam reveals thrombus in the posterior tibial and peroneal veins without extension into the popliteal. What is the most appropriate next step in management?

A. Follow up ultrasound in 2 weeks
B. Warfarin (INR 2-3) for 3 months
C. Apixaban 10mg bid x 7d then 5mg bid for 3 months
D. Inferior vena cava filter
E. Rivaroxaban 20mg daily x 6mos

Answer #6

A 62 year old man with a history of hypertension, migraine headaches and prostate cancer s/p prostatectomy 2 years ago presents to PCP for routine follow up shortly after returning from a summer vacation to Portugal. He is noted on exam to have swelling of his right leg below the knee without tenderness, palpable cord or skin changes. Laboratories reveal Cr 1.2mg/dL and D-dimer 800ng/mL. Ultrasound exam reveals thrombus in the posterior tibial and peroneal veins without extension into the popliteal. What is the most appropriate next step in management?

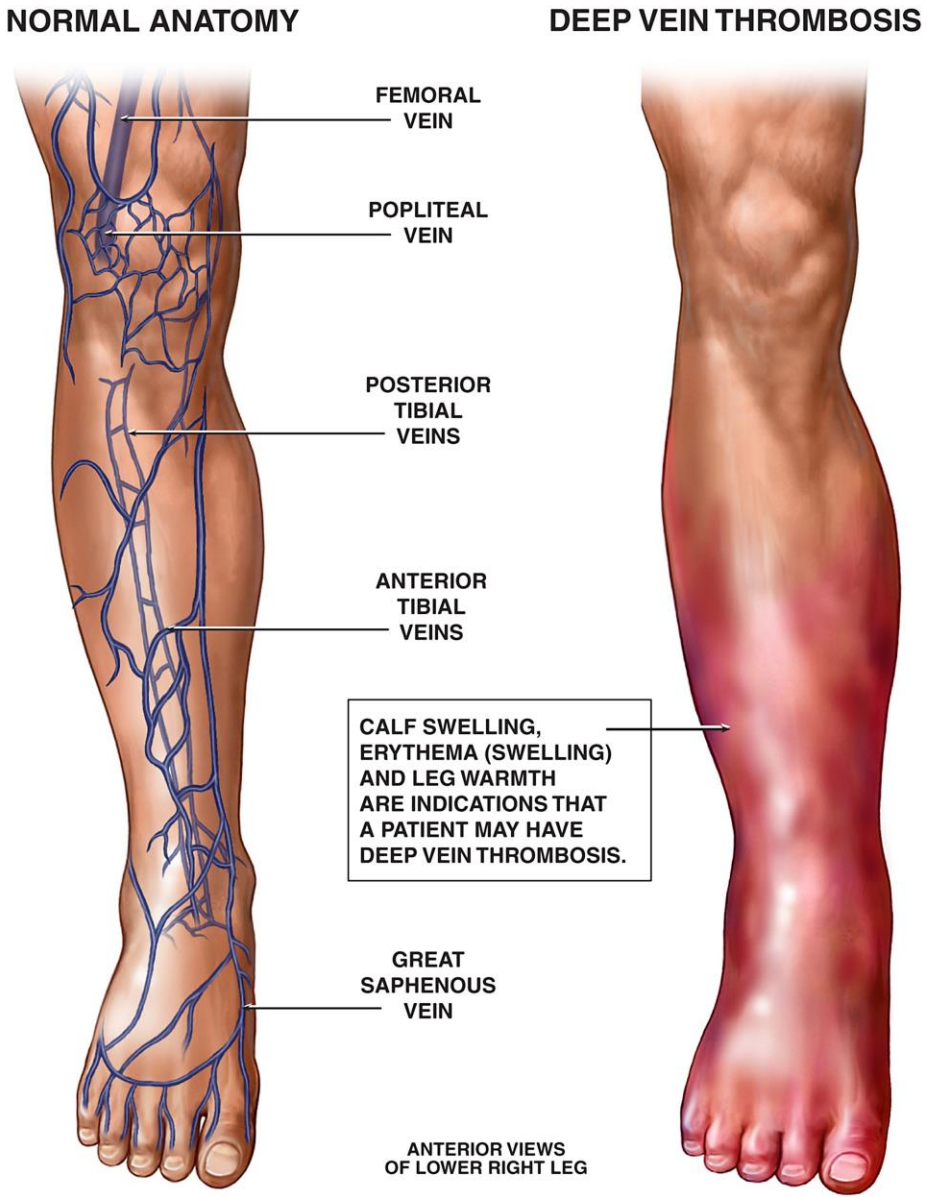
A. Follow up ultrasound in 2 weeks

B. Warfarin (INR 2-3) for 3 months

C. Apixaban 10mg bid x 7d then 5mg bid for 3 months

D. Inferior vena cava filter

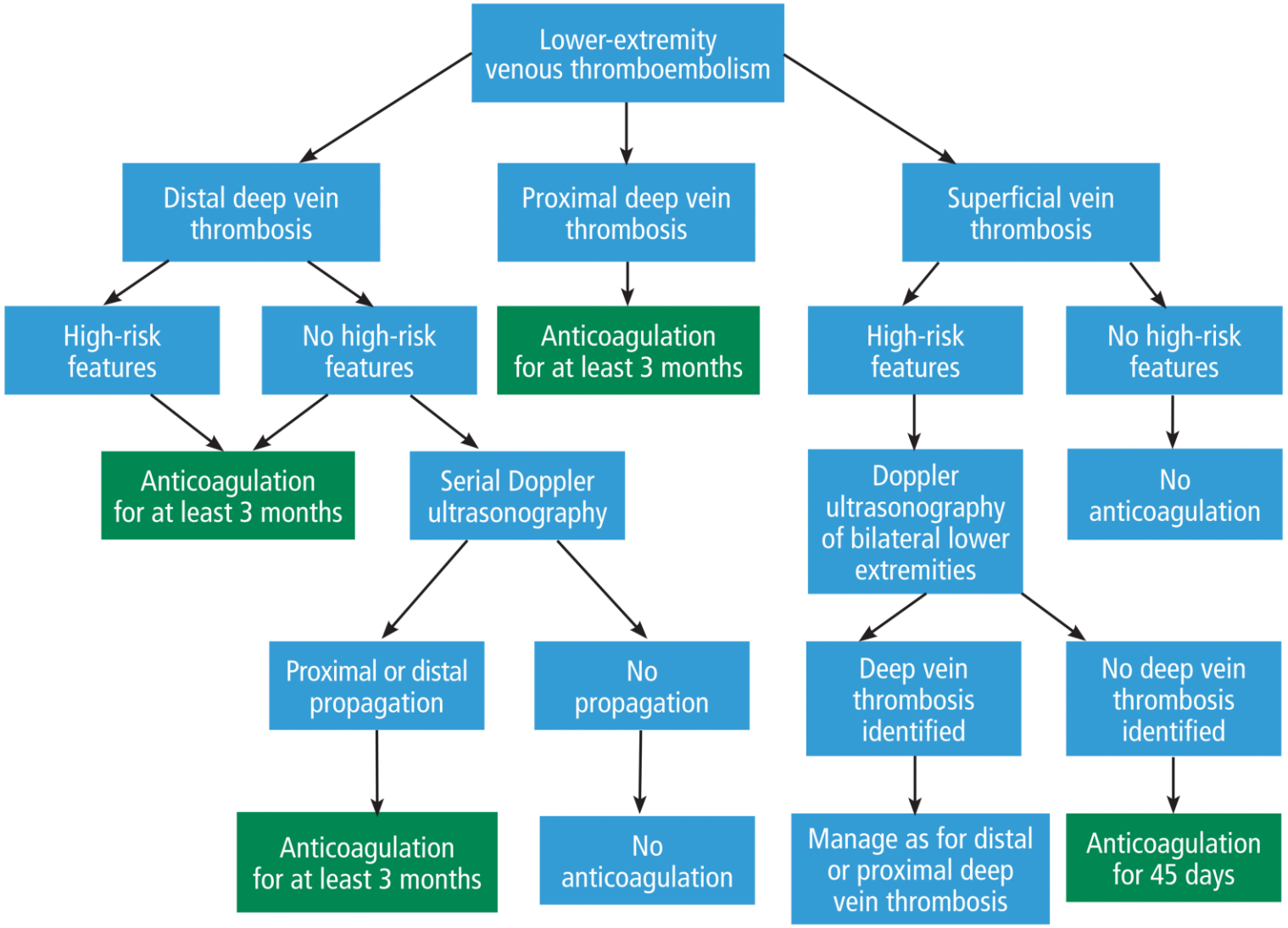
E. Rivaroxaban 20mg daily x 6mos



Considerations:

Proximal or Distal?

High Risk or Low Risk?



High Risk Features for Proximal Extension

- Thrombus extension into or close to (eg, within 1 to 2 cm) the proximal popliteal vein
- Unprovoked DVT
- D-dimer 500 ng/mL
- Extensive thrombosis involving multiple veins (eg, >5 cm in length, >7 mm in diameter)
- Persistent/irreversible risk factors such as active cancer or prolonged immobility
- Prior DVT or PE
- Inpatient status
- Coronavirus disease 2019 (COVID-19)

Ziyadeh et al. Cleveland Clinic Journal of Medicine April 2024, 91 (4) 229-235

Question #7

A 33-year old female presents to the emergency room at 25-weeks gestation with progressive dyspnea (now at rest), orthopnea, and fatigue. She has no prior medical problems. Physical exam is notable for opening snap after S2 with a I/IV diastolic murmur heard best in left lateral decubitus position. HR is 108 beats/min and BP is 130/84 mm Hg. She receives oxygen, IV furosemide, and diltiazem. Echocardiogram demonstrates mitral valve area of 0.5 cm^2 and normal left ventricular ejection fraction. Which is the best approach for management?

A. Refer for mitral valve clip
B. Start lisinopril
C. Balloon valvotomy
D. Immediate Cesarean section
E. Start digoxin

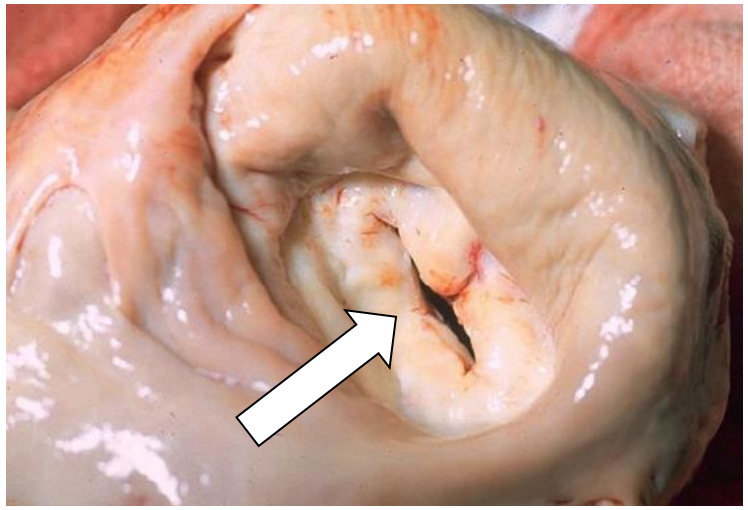
Answer #7

A 33-year old female presents to the emergency room at 25-weeks gestation with progressive dyspnea (now at rest), orthopnea, and fatigue. She has no prior medical problems. Physical exam is notable for opening snap after S2 with a I/IV diastolic murmur heard best in left lateral decubitus position. HR is 108 beats/min and BP is 130/84 mm Hg. She receives oxygen, IV furosemide, and diltiazem. Echocardiogram demonstrates mitral valve area of 0.5 cm^2 and normal left ventricular ejection fraction. Which is the best approach for management?

A. Refer for mitral valve clip
B. Start lisinopril
C. Balloon valvotomy
D. Immediate Cesarean section
E. Start digoxin

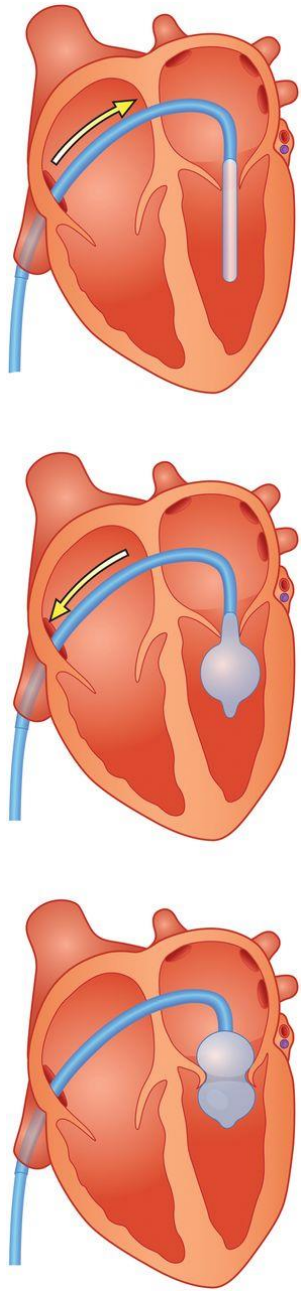
Mitral stenosis

- Left-sided heart failure symptoms
- Hemoptysis, right-heart failure, hoarseness
- 10-20 years post-rheumatic fever
- Echocardiogram useful to determine therapies
- Exclude atrial myxoma



Mitral stenosis in pregnancy

- NYHA Class III and IV—Treat with percutaneous valvotomy before delivery
- Judicious use of diuretics and beta-blockers for milder forms of mitral stenosis
- Propranolol (classic) vs. cardio-selective (e.g., atenolol, metoprolol) - Beware of bradycardia and hypoglycemia in newborn
- Avoid ACE-inhibitors



Maisano F. Eur Heart J 2014; 35: 1575-7.

Question #8

A 48-year old man with history of hypertension presents to emergency room with acute chest pain radiating to back with hypotension and a new, large left effusion on chest x-ray. Systolic blood pressure differs in both arms by 22 mm Hg. Appropriate steps in management include:

A. Treat with sodium nitroprusside alone
B. Start a loop diuretic alone
C. Refer for urgent thoracentesis
D. Refer for urgent surgical repair for proximal dissection
E. Narcotics for pain relief alone

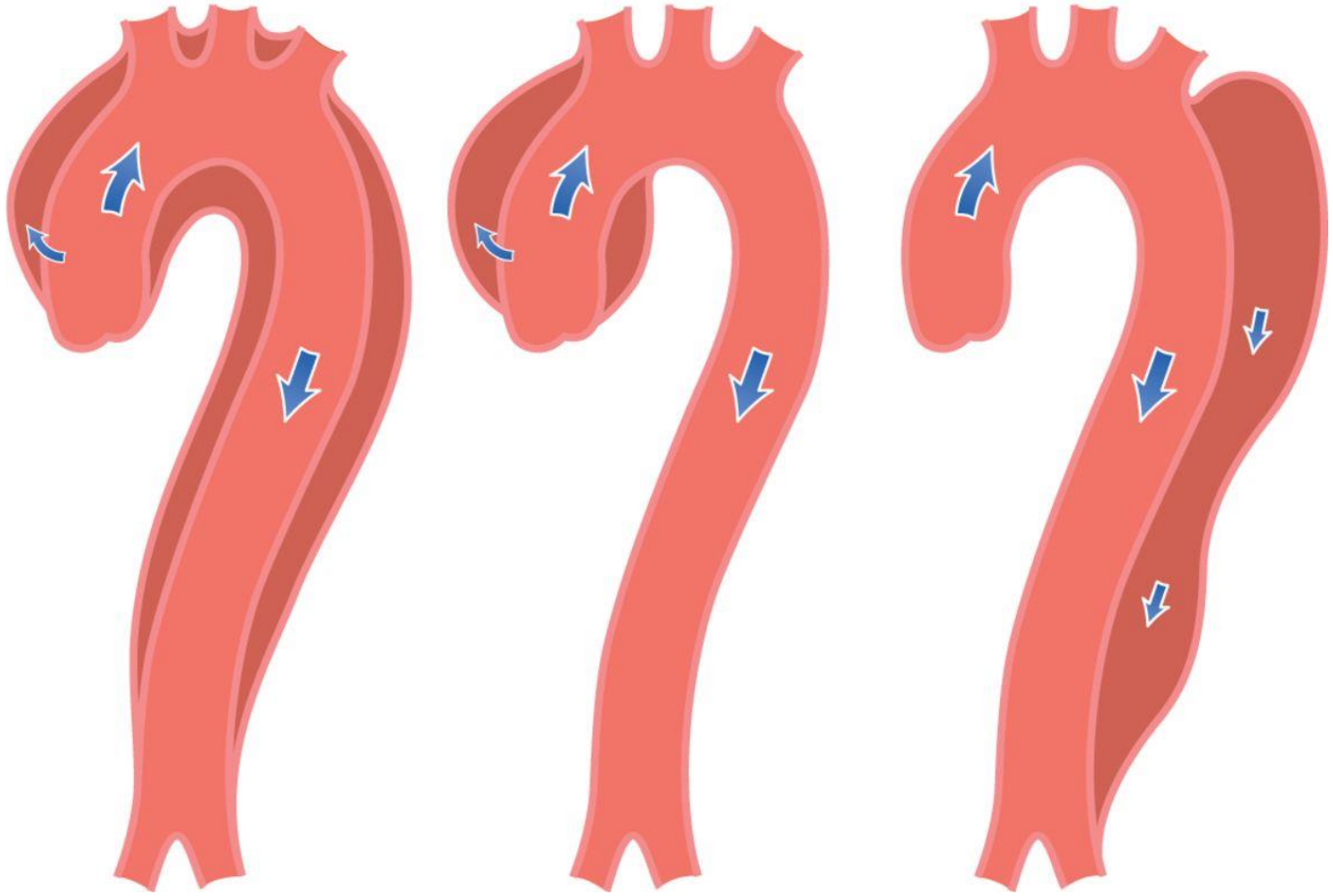
Answer #8

A 48-year old man with history of hypertension presents to emergency room with acute chest pain radiating to back with hypotension and a new, large left effusion on chest x-ray. Systolic blood pressure differs in both arms by 22 mm Hg. Appropriate steps in management include:

A. Treat with sodium nitroprusside alone
B. Start a loop diuretic alone
C. Refer for urgent thoracentesis
D. Refer for urgent surgical repair for proximal dissection
E. Narcotics for pain relief alone

Aortic Dissection

De Bakey	Type I	Type II	Type III
Stanford	Type A	Type A	Type B



European Heart Journal 2014; 35:2873-2926

Code Aorta: Acute Management of Aortic Dissection

- Stabilization and pain relief
- Combination of sodium nitroprusside *and* beta-blocker to reduce BP and wall stress
- Immediate surgery for life threatening complications
- Urgent confirmation of dissection (CT, Echo, MRI)
- Distal dissections are often in older patients and associated with CAD

Question #9

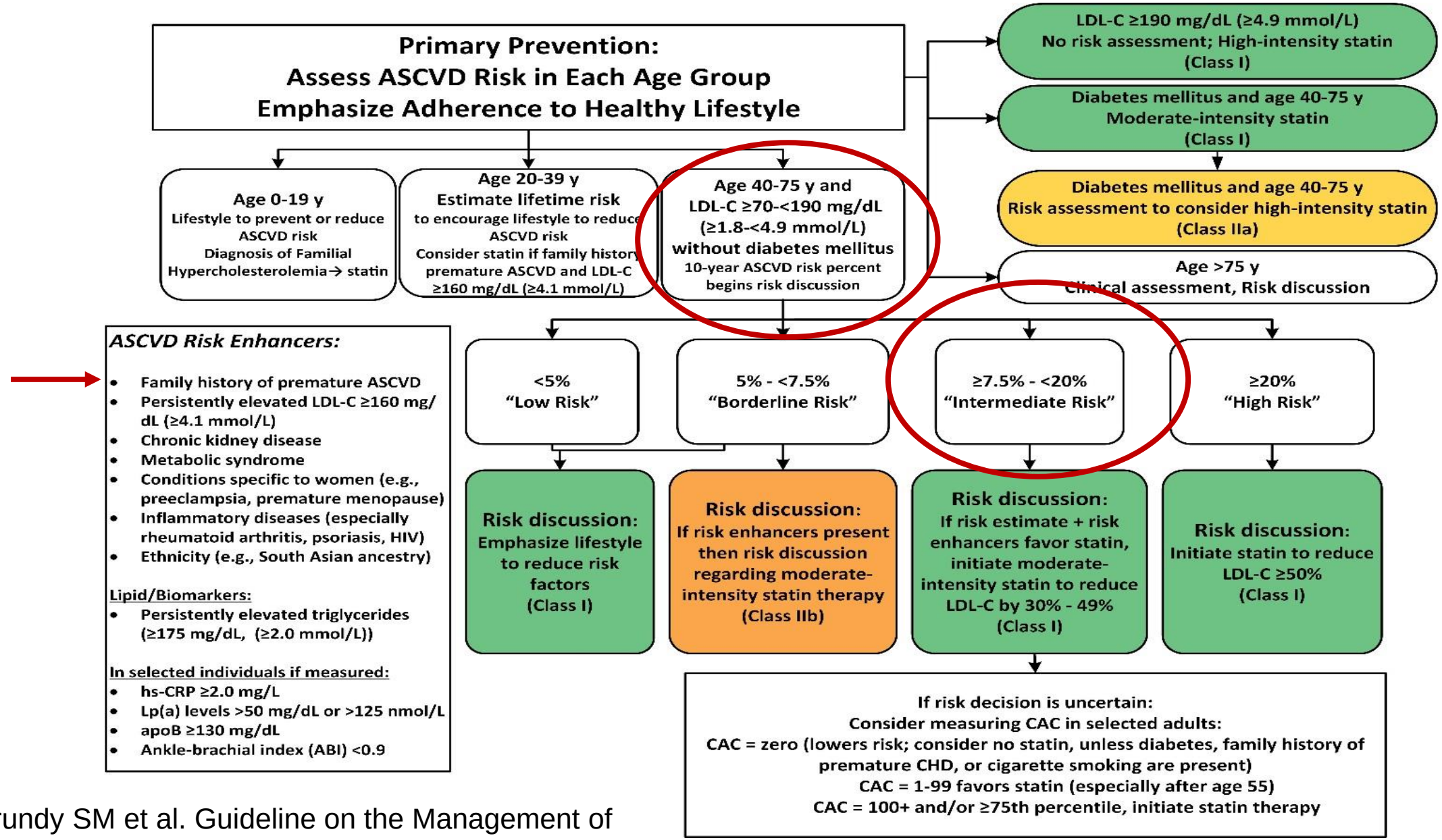
50 year old white male (included for ASCVD score) with hypertension on lisinopril presents for a new visit. He does not take an aspirin or a statin. He does not have a regular exercise routine and is a lifelong nonsmoker. No history of diabetes. Father had an MI at age 50. On exam heart rate 75bpm, BP 128/70 mmHg. BMI of 27 kg/m^2. Total Cholesterol 220, LDL 160, HDL 41, ASCVD 10-year risk estimated to be 9%. In addition to lifestyle changes, what therapy would you recommend?

A. Lovastatin 2.5mg daily
B. Evolocumab 140mg every two weeks
C. Fish oil 1000mg twice daily
D. Ezetimibe 10mg daily
E. Simvastatin 20mg daily

Answer #9

50 year-old white male (included for ASCVD score) with hypertension on lisinopril presents for a new visit. He does not take an aspirin or a statin. He does not have a regular exercise routine and is a lifelong nonsmoker. No history of diabetes. Father had an MI at age 50. On exam heart rate 75bpm, BP 128/70 mmHg. BMI of 27 kg/m^2. Total Cholesterol 220, LDL 160, HDL 41, ASCVD 10-year risk estimated to be 9%. In addition to lifestyle changes, what therapy would you recommend?

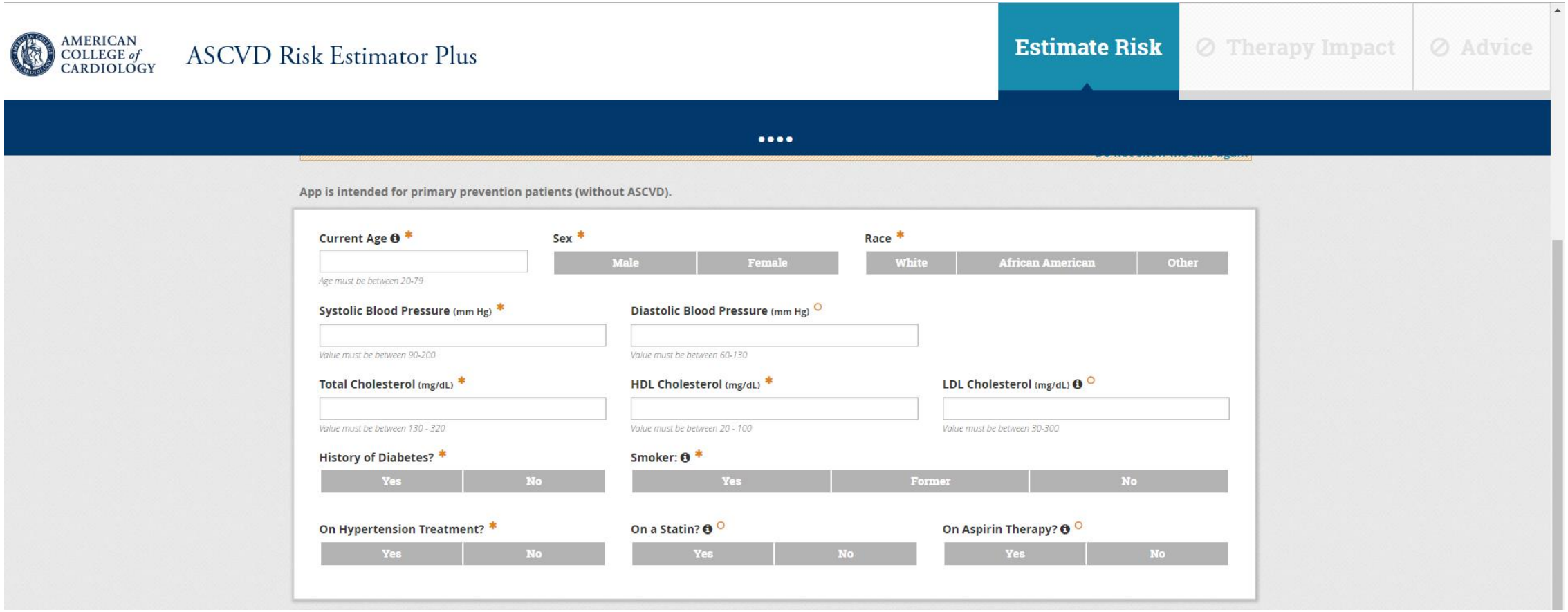
A. Lovastatin 2.5mg daily
B. Evolocumab 140mg every two weeks
C. Fish oil 1000mg twice daily
D. Ezetimibe 10mg daily
E. **Simvastatin 20mg daily**



Grundy SM et al. Guideline on the Management of Blood Cholesterol, Journal of the American College of Cardiology (2018)

Atherosclerotic CV Disease Risk Estimator

http://tools.acc.org/ASCVD-Risk-Estimator-Plus



Statin Therapy

	High Intensity	Moderate Intensity	Low Intensity
LDL-C lowering	≥50%	30%–49%	<30%
	Atorvastatin (40 mg) 80 mg Rosuvastatin 20 mg (*40 mg)*	Atorvastatin 10 mg (20 mg) Rosuvastatin (5 mg) 10 mg Simvastatin 20–40 mg	Simvastatin 10 mg
		Pravastatin 40 mg (80 mg) Lovastatin 40 mg (80 mg) Fluvastatin XL 80 mg Fluvastatin 40 mg BID Pitavastatin 1–4 mg	Pravastatin 10–20 mg Lovastatin 20 mg Fluvastatin 20–40 mg

Grundy SM et al. Guideline on the Management of Blood Cholesterol, Journal of the American College of Cardiology (2018)

Question #10

A 79-year-old man returns for a follow-up visit after anterior myocardial infarction 2 months ago complicated by heart failure with EF 25%. On maximal GDMT, he currently has no symptoms of heart failure and completed 11min on a Bruce ETT prior to cardiac rehab. A follow-up echocardiogram reveals an improved left ventricular ejection fraction to 34% today. QRS duration is 96msec. There is no NSVT on ambulatory monitoring. What would you do next?

A. Consider ICD only if he becomes symptomatic (NYHA 2 or 3)

B. Refer for cardiac resynchronization pacemaker

C. Repeat echocardiogram in another month to see if LVEF improves prior to implanting ICD

D. Consider cardiac MRI to assess LVEF

E. Educate patient about the contraindication of ICD due to his age

Answer #10

A 79-year-old man returns for a follow-up visit after anterior myocardial infarction 2 months ago complicated by heart failure with EF 25%. On maximal GDMT, he currently has no symptoms of heart failure and completed 11min on a Bruce ETT prior to cardiac rehab. A follow-up echocardiogram reveals an improved left ventricular ejection fraction to 33% today. QRS duration is 96msec. There is no NSVT on ambulatory monitoring. What would you do next?

A. Consider ICD only if he becomes symptomatic (NYHA 2 or 3)

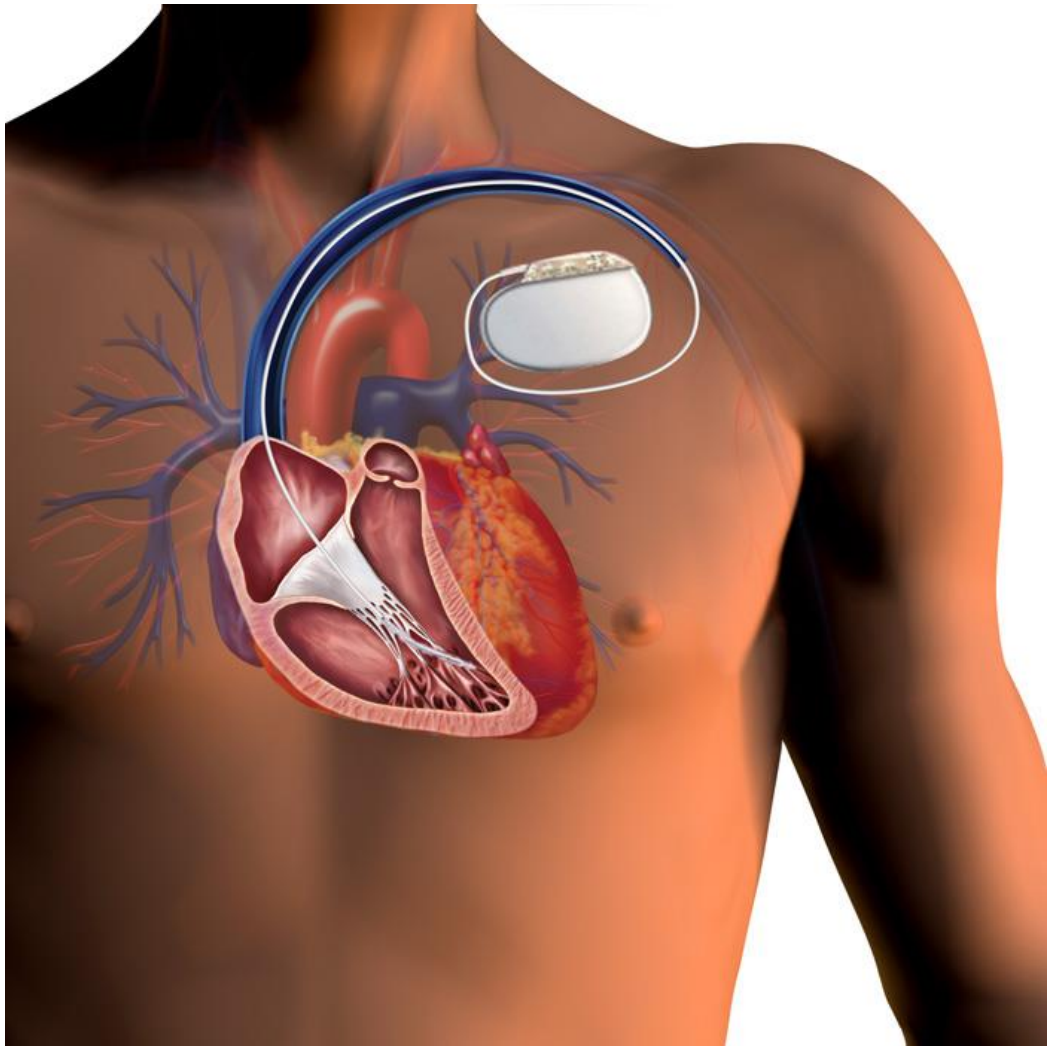
B. Refer for a cardiac resynchronization pacemaker

C. Repeat echocardiogram in another month to see if LVEF improves prior to implanting ICD

D. Consider cardiac MRI to assess LVEF

E. Educate patient about the contraindication of ICD due to his age

Recommendations for Primary Prevention of SCD in Patients With Ischemic Heart Disease References that support the recommendations are summarized in Online Data Supplement 21.		
COR	**LOE**	**Recommendations**
I	A	1. In patients with LVEF of 35% or less that is due to ischemic heart disease who are at least 40 days' post-MI and at least 90 days postrevascularization, and with NYHA class II or III HF despite GDMT, an ICD is recommended if meaningful survival of greater than 1 year is expected.[S7.1.2-1,S7.1.2-2]
I	A	2. In patients with LVEF of 30% or less that is due to ischemic heart disease who are at least 40 days' post-MI and at least 90 days postrevascularization, and with NYHA class I HF despite GDMT, an ICD is recommended if meaningful survival of greater than 1 year is expected.[S7.1.2-2,S7.1.2-3]
Value Statement: High Value (LOE: B-R)		3. A transvenous ICD provides high value in the primary prevention of SCD particularly when the patient's risk of death due to a VA is deemed high and the risk of nonarrhythmic death (either cardiac or noncardiac) is deemed low based on the patient's burden of comorbidities and functional status.[S7.1.2-4]
I	B-R	4. In patients with NSVT due to prior MI, LVEF of 40% or less and inducible sustained VT or VF at electrophysiological study, an ICD is recommended if meaningful survival of greater than 1 year is expected.[S7.1.2-5]



Al-Khatib, SM et a. Circulation 2018; 138:e272-391.

Question #11

A 72-year old man with a history of severe mitral regurgitation from anterior leaflet prolapse with a LVEF of 50% with LVEDD 59 mm presents for a second opinion. Dyspnea occurs when walking up one flight of stairs and he is otherwise healthy and BP in clinic today is 128/78mmHg. Which is the ***best*** option for management?

A. Refer for mitral valve surgery

B. Refer for percutaneous MitraClip

C. Follow serial echocardiograms and plan surgery when LVEF decreases below 35%

D. Start ACE-inhibitor to attenuate the progression of LV dilatation

E. Refer for cardiac resynchronization to reduce mitral regurgitation

Answer #11

A 72-year old man with a history of severe mitral regurgitation from anterior leaflet prolapse with a LVEF of 50% with LVEDD 59 mm presents for a second opinion. Dyspnea occurs when walking up one flight of stairs and he is otherwise healthy and BP in clinic today is 128/78mmHg. Which is the ***best*** option for management?

A. Refer for mitral valve surgery

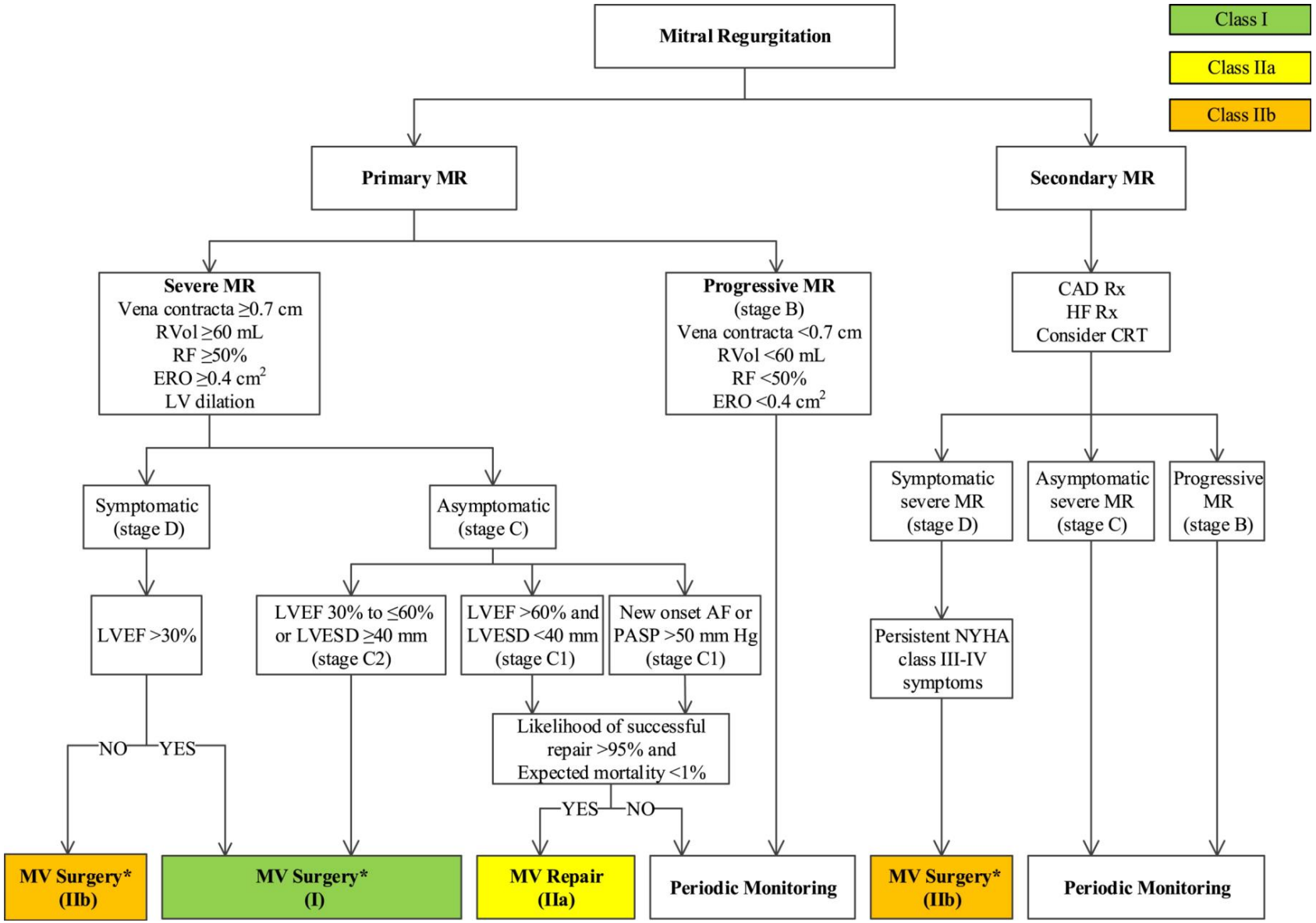
B. Refer for percutaneous MitraClip

C. Follow serial echocardiograms and plan surgery when LVEF decreases below 35%

D. Start ACE-inhibitor to attenuate the progression of LV dilatation

E. Refer for cardiac resynchronization to reduce mitral regurgitation

Recommendations for Mitral Valve Surgery in Severe Primary Mitral Regurgitation



J Am Coll Cardiol. 2014;63(22):e57-e185

Question #12

A 38-year-old female attorney has experienced palpitations over past 2 years. The episodes are not associated with dizziness, syncope, or diaphoresis. She is otherwise healthy, and examination is normal with exception of heart rate 108 beats/minute which increases to 128 beats/minute with standing and when she presents to an audience. An electrocardiogram reveals sinus tachycardia and is otherwise normal. Stress reduction and caffeine reduction did not change symptom burden.

What is the best treatment for these palpitations?

A. Dofetilide
B. Propranolol
C. Radiofrequency Ablation
D. Amiodarone
E. Nifedipine

Answer #12

A 38-year-old female attorney has experienced palpitations over past 2 years. The episodes are not associated with dizziness, syncope, or diaphoresis. She is otherwise healthy and examination is completely normal with an exception of heart rate of 108 beats/minute which increases to 128 beats/minute with standing and when she presents to an audience. An electrocardiogram reveals sinus tachycardia and is otherwise normal. Stress reduction and caffeine reduction did not change symptom burden.

What is the best treatment for these palpitations?

A. Dofetilide

B. Propranolol

C. Radiofrequency Ablation

D. Amiodarone

E. Nifedipine

Interventions and Indications

	Drugs	*Actions*
Class I	Quinidine Procainamide Disopyramide Lignocaine Mexiletine Flecainide Propafenone	Block fast sodium current (hence slow conduction)
Class II	β-adrenoceptor blockers	Block effects of catecholamines
Class III	Amiodarone Sotalol	Prolong action potential and hence refractoriness by blocking K^+ current
Class IV	Verapamil Diltiazem	Block cardiac calcium channel

Beta-adrenergic blocker (Class II)

-Sinus tachycardia

-Situational palpitations

-Rate control AF/AFL

Dofetilide (Class III)

-Blockade of the cardiac ion channel carrying the rapid component of the delayed rectifier potassium currents

-Atrial fib/flutter

Amiodarone (Class III)

-Paroxysmal atrial fib/flutter

-PSVT

-Sustained VT

Radiofrequency Ablation

-Treatment for atrial fib/flutter

-Pulmonary vein isolation

-Atrial tachycardia

Question #13

A 69-year old woman with history of mitral valve prolapse with mild-moderate mitral regurgitation. She is asymptomatic and has a past medical history of controlled hypertension and dyslipidemia without history of endocarditis. She is scheduled for a dental extraction next week. *What is the best recommendation for endocarditis prophylaxis?*

A. Amoxicillin 2 grams orally 1 hour before procedure

B. Clindamycin 600 mg orally 1 hour before procedure

C. Ampicillin 2 grams IV 30 minutes before procedure

D. All are acceptable options

E. None of the above

Answer #13

A 69-year old woman with history of mitral valve prolapse with mild-moderate mitral regurgitation. She is asymptomatic and has a past medical history of controlled hypertension and dyslipidemia without history of endocarditis. She is scheduled for a dental extraction next week. *What is the best recommendation for endocarditis prophylaxis?*

A. Amoxicillin 2 grams orally 1 hour before procedure

B. Clindamycin 600 mg orally 1 hour before procedure

C. Ampicillin 2 grams IV 30 minutes before procedure

D. All are acceptable options

E. None of the above

Endocarditis Prophylaxis

Endocarditis Prophylaxis Class IIa

- Prosthetic cardiac valves
- Previous bacterial endocarditis
- Unrepaired cyanotic congenital heart disease (CHD)
- Completely repaired cyanotic CHD using prosthetic material or within 6 months of catheter intervention
- Repaired CHD with residual defect or adjacent to site of a prosthetic patch
- Cardiac transplantation with valve regurgitation due to structurally abnormal valve

No longer recommended:

- Acquired valvular dysfunction (RHD)
- Hypertrophic cardiomyopathy
- MVP with valvular regurgitation/thickened leaflets

For Penicillin/Amoxicillin Allergic patients:

Clindamycin no longer recommended for dental prophylaxis

Now cephalexin, doxycycline, azithromycin

Circulation. 2021;143:e72–e227

Question #14

A 45-year-old woman presents to the emergency room following a motor vehicle accident in which she was wearing a seatbelt. She noted mild dizziness while driving and awakens finding herself on the side of the road. Past medical history is notable for asthma and cutaneous sarcoidosis. She takes hydroxychloroquine 200mg daily and albuterol inhalers. Physical exam is remarkable for mild facial lacerations.

What is the most likely cause of this event?

A. Hypoxemia
B. Epilepsy
C. Hysterical fainting
D. Neurocardiogenic syncope
E. Ventricular tachycardia

Answer #14

A 45-year-old woman presents to the emergency room following a motor vehicle accident in which she was wearing a seatbelt. She noted mild dizziness while driving and awakens finding herself on the side of the road. Past medical history is notable for asthma and cutaneous sarcoidosis. She takes hydroxychloroquine 200mg daily and albuterol inhalers. Physical exam is remarkable for mild facial lacerations.

What is the most likely cause of this event?

A. Hypoxemia

B. Epilepsy

C. Hysterical fainting

D. Neurocardiogenic syncope

E. Ventricular tachycardia

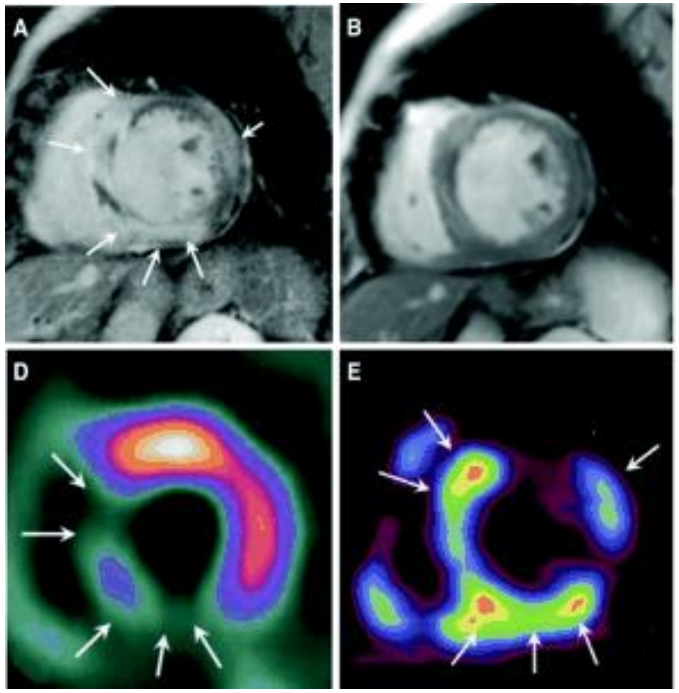
History Essential to Delineate Syncope Etiology

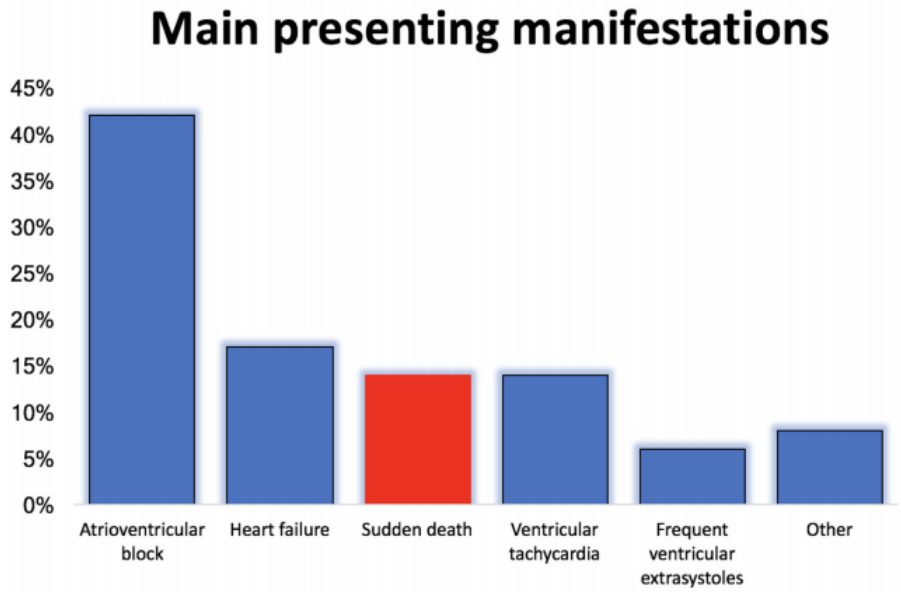
Event	Classic scenario
Cardiac syncope	- Rapid onset without aura; clear sensorium - History of CAD, LV dysfunction
Bradyarrhythmias	- History of conduction disease, heart transplant
Neurological syncope	- Preceded by aura; clouded sensorium - Incontinence, tongue biting, seizure activity
Hysterical fainting	- Not accompanied by change in pulse, blood pressure, or skin color - Paresthesias of hands/face, hyperventilation - Dyspnea, signs of anxiety

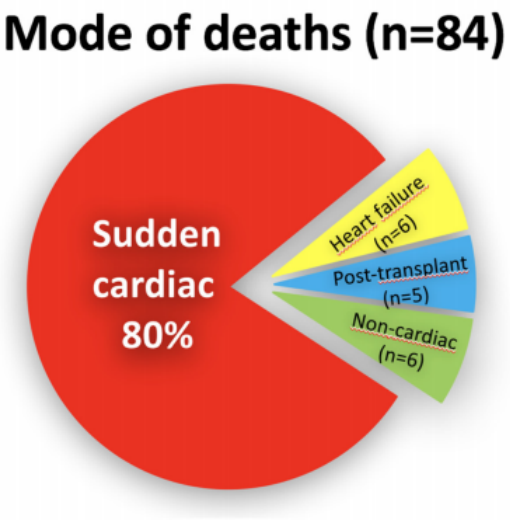
Cardiac Sarcoidosis and Arrhythmia

Cardiac MRI

Cardiac PET/CT







Tadamura F et al. Circulation 2006; 113:e771-3.

Ekstrom, et al. Eur Heart J 2019; 40: 3121-3128

Question #15

A 52-year old male presents to clinic for perioperative evaluation prior to elective cholecystectomy. He works full time in construction while also exercising by walking ~40 minutes several times per week in his hilly neighborhood. Past medical history is notable for hypertension, hypercholesterolemia, and a myocardial infarction 3 years ago. What is the best management?

A. Coronary angiography prior to surgery
B. Perform cholecystectomy only if emergency
C. Stress test with MIBI or echocardiogram
D. Proceed with surgery and ensure beta-blocker use
E. Stress test without imaging

Answer #15

A 52-year old male presents to clinic for perioperative evaluation prior to elective cholecystectomy. He works full time in construction while also exercising by walking ~40 minutes several times per week in his hilly neighborhood. Past medical history is notable for hypertension, hypercholesterolemia, and a myocardial infarction 3 years ago. What is the best management?

A. Coronary angiography prior to surgery
B. Perform cholecystectomy only if emergency
C. Stress test with MIBI or echocardiogram
D. Proceed with surgery and ensure beta-blocker use
E. Stress test without imaging

AHA/ACC Guidelines 2014

Major predictors requiring intensive management and may lead to delay/cancellation of surgery

- **Unstable coronary syndromes** including unstable or severe angina or recent MI

- **Decompensated HF** including NYHA functional class IV or worsening or new-onset HF

- **Significant arrhythmias** including high grade AV block, symptomatic ventricular arrhythmias, supraventricular arrhythmias with ventricular rate >100 bpm at rest, symptomatic bradycardia, and newly recognized ventricular tachycardia

- **Severe heart valve disease** including severe aortic stenosis or symptomatic mitral stenosis

Other clinical predictors that warrant careful assessment of current status

- History of ischemic heart disease
- History of cerebrovascular disease
- History of compensated heart failure or prior heart failure
- Diabetes mellitus
- Renal insufficiency

Fleisher et al. JACC 2014; 62:e77-e137.

Functional Capacity Can Risk Stratify

Metabolic Equivalent (MET) = amount of oxygen consumed at rest, 3.5 mg/kg/min^2

Estimates of Metabolic equivalents (METs)

Can take care of self, such as eat, dress, or use the toilet (1-2 MET).

Can walk up a flight of steps or a hill (4 METs).

Can do heavy work around the house such as scrubbing floors or lifting or moving heavy furniture (between 4 and 10 METs).

Can participate in strenuous sports such as swimming, singles tennis, football, basketball, and skiing (>10 METs).

≥4 METs Very Reassuring for Low Perioperative CAD Risk

Fleisher et al. JACC 2014; 62:e77-e137.

Question #16

An 45-year old man presents to the emergency room with dyspnea. His blood pressure was 228/110 mm Hg and the remainder of the physical examination was only notable for faint crackles. Which of the following findings are characteristics of a hypertensive crisis?

A. Retinal hemorrhages

B. Microangiopathic hemolytic anemia

C. Azotemia and proteinuria

D. Pulmonary edema and jugular venous distension

E. All are characteristics of hypertensive crisis

Answer #16

An 45-year old man presents to the emergency room with dyspnea. His blood pressure was 228/110 mm Hg and the remainder of the physical examination was only notable for faint crackles. Which of the following findings are characteristics of a hypertensive crisis?

A. Retinal hemorrhages

B. Microangiopathic hemolytic anemia

C. Azotemia and proteinuria

D. Pulmonary edema and jugular venous distension

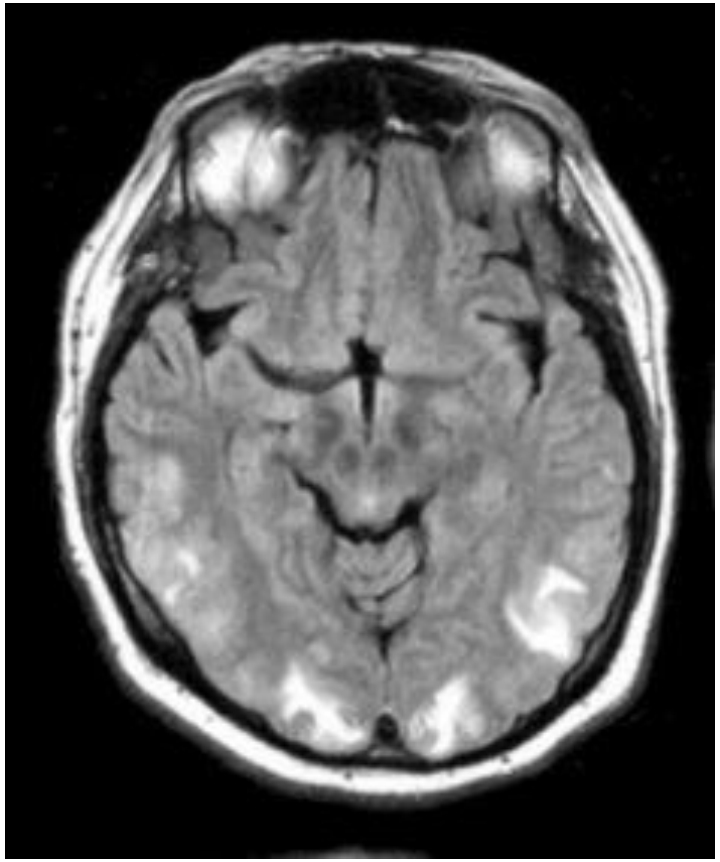
E. All are characteristics of hypertensive crisis

Features of Hypertensive Crisis

- Renal insufficiency with proteinurea
- Hematuria
- Azotemia
- Microangiopathic hemolytic anemia
- Heart failure
- Nausea and vomiting

Hypertensive encephalopathy

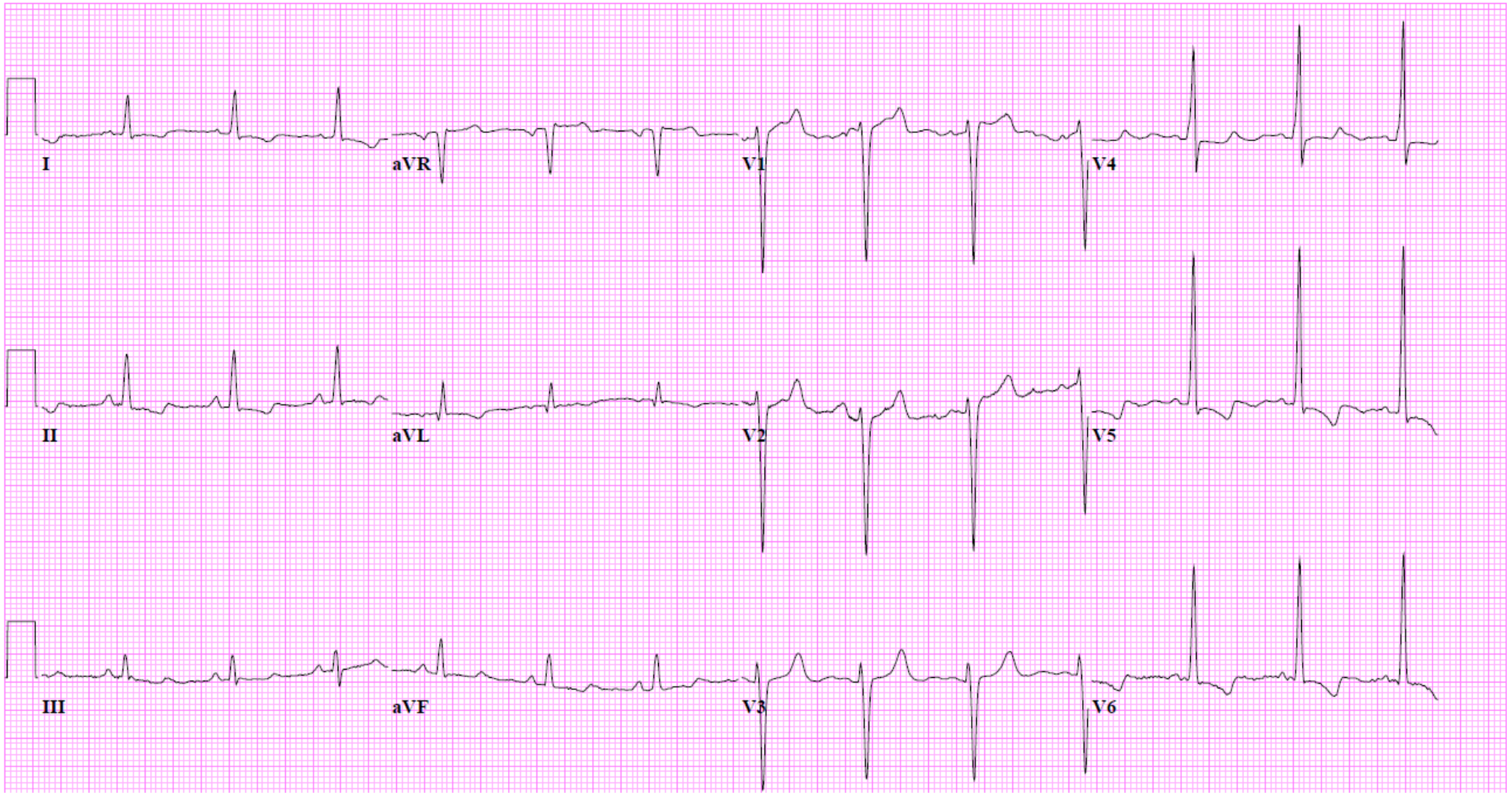
- Confusion, irritability, headaches, stupor, neurologic deficits, seizures, coma
- Sudden rise in BP causes acute damage to blood vessels
- Not always present with malignant hypertension
- Failure of cerebral autoregulation causing excess cerebral blood flow and damage to the wall leading to increased vascular permeability



Reversible Posterior Leukoencephalopathy

Question #17

Please review the following ECG:



Question #17

Each of the following statements about this ECG finding

is true EXCEPT:

A. Exercise stress testing should include imaging

B. This can represent end-organ damage from systemic hypertension

C. Repolarization will normalize with exercise

D. Can be seen with both eccentric and concentric ventricular remodeling

E. This ECG is diagnostic for left ventricular hypertrophy

Question #17

Each of the following statements about this ECG finding is true EXCEPT:

A. Exercise stress testing should include imaging

B. This can represent end-organ damage from systemic hypertension

C. Repolarization will normalize with exercise

D. Can be seen with both eccentric and concentric ventricular remodeling

E. This ECG is diagnostic for left ventricular hypertrophy

Thank You