

American College of Physicians – Colorado Chapter 2020 Annual Meeting

Ischemic Work-up in 2020 vis-à-vis High-Value Care

Who, Why, How, and When?

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Disclosures

➤ None

Objectives

- High-value care
- How to achieve high-value care in clinical practice
- Evaluation of patients with suspected angina pectoris
 - Patient selection
- Available modalities for ischemic workup
 - Emphasis on stress test modalities
- Indications and contraindications
- Choosing the right test
- Preoperative cardiovascular risk stratification

High-Value Care & Cardiac Imaging

- High-value care = healthcare outcomes per \$ spent
- Cardiac imaging has come under intense scrutiny as a contributor to rising (unnecessary) health care costs
- Drivers of increased utilization:
 - Provider-Related & Patient-Related Factors
- Potential ill effects of unwarranted testing
 - Patient anxiety
 - Unwarranted downstream testing
- CMS aimed to “bend the cost curve”
 - Payments cut by 33% between 2006 and 2010

Defining High-Value Care

- Goal:
 - The right test for the right patient at the right time
- So, the critical issue is not how many studies are done, but that they are done if and when the results will enhance patient care
 - *Not just lower cost, but higher value*
- Transformation of *Appropriate Care* terminology
 - Appropriate  *Appropriate Care*
 - Uncertain  *May Be Appropriate Care*
 - Inappropriate  *Rarely Appropriate Care*

Bending the Value Curve

- Appropriate Use Criteria
- ABIM's *Choosing Wisely*[®] Campaign
- ASNC's *Refer Wisely*[™] Campaign
- ACC's *Imaging in FOCUS*
- Decision Support Tools
 - Smartphone Apps
 - Clinical Care Pathways
 - Programs that link with EMR and provide integrated decision support at the point of order entry
- Or...,
 - *Consult a multimodality cardiac imager, or a cardiologist*

Web Resources



An initiative of the ABIM Foundation

NEWS

[Our Mission](#)

[Clinician Lists](#)

[For Patients](#)

[Getting Started](#)

[Success Stories](#)

Choosing Wisely®

Promoting conversations between patients and clinicians

The American Society for Clinical Pathology just released [a new list of five tests and procedures](#) related to screenings for stool pathogens, Hepatitis C and adrenal tumors.



FOCUS

Tools and Practice Support

+ [Advocacy at the ACC](#)

+ [Clinical Toolkits](#)

[Infographics](#)

[Mobile Apps](#)

+ [Practice Solutions](#)

- [Quality Programs](#)

[Anticoagulation Initiative](#)

[FOCUS](#)

[Heart House Roundtables](#)

[LDL: Address the Risk](#)

[Patient Navigator Program: Focus MI](#)

[Reduce the Risk: PCI Bleed](#)

[Succeed in Managing Cardiovascular Risk in Diabetes Initiative](#)

[Succeed in Managing Heart Failure Initiative](#)

[Succeed in Managing Heart Valve Disease Initiative](#)

[Surviving MI](#)



FOCUS is a quality initiative to guide and improve appropriate ordering of cardiovascular imaging and tests. Learn more at the links below.

▼ Resources and Related Tools

- [Coronary Revascularization AUC Poster | PDF](#)
- [Appropriate Use Criteria Brochure | PDF](#)
- [ICD Pocket Card | PDF](#)
- [Coronary Revascularization in Patients with SIHD Poster | PDF](#)
- [Stable Ischemic Heart Disease Pocket Card | PDF](#)
- [Peds Echo TTE Pocket Card | PDF](#)

Symptomatic (Sudden worsening of symptoms could represent ACS and should be referred to the ED)

No known IHD

Classification of chest pain

- Characteristics
 - Substernal chest pain
 - Brought on by exertion
 - Relieved with rest
- 0 or 1 characteristics = non-cardiac chest pain
- 2 characteristics = atypical chest pain
- 3 characteristics = typical chest pain/angina

Assess symptoms

Assess exercise capacity

| Age (years) | Sex | Typical/Definite Angina Pectoris | Atypical/Probable Angina Pectoris | Nonanginal Chest Pain |
|-------------|-------|----------------------------------|-----------------------------------|-----------------------|
| ≤39 | Men | Intermediate | Intermediate | Low |
| | Women | Intermediate | Very Low | Very Low |
| 40-49 | Men | High | Intermediate | Intermediate |
| | Women | Intermediate | Low | Very Low |
| 50-59 | Men | High | Intermediate | Intermediate |
| | Women | Intermediate | Intermediate | Low |
| >60 | Men | High | Intermediate | Intermediate |
| | Women | High | Intermediate | Intermediate |

- Low likelihood, can exercise
- Low likelihood, cannot exercise
- Intermediate likelihood, can exercise
- Intermediate likelihood, cannot exercise
- High likelihood, can exercise
- High likelihood, cannot exercise

| | ETT | CTA | MPI |
|--|-----|-----|-----|
| Low likelihood, can exercise | A | R | R |
| Low likelihood, cannot exercise | N/A | M | A |
| Intermediate likelihood, can exercise | A | M | A |
| Intermediate likelihood, cannot exercise | N/A | A | A |
| High likelihood, can exercise | M | M | A |
| High likelihood, cannot exercise | N/A | M | A |

Known IHD (MI, stent, bypass)

Assess symptoms

Review medical management

Consider antianginals

IHD medical management

- Aspirin
 - 81 mg daily is adequate
- Statins
 - Rosuvastatin - 20-40 mg
 - Atorvastatin - 40-80 mg
- Beta blockers
 - Not required for all patients
 - Needed if low LVEF (≤40% with heart failure) or recent MI
- Blood pressure control
- Glucose control
- Tobacco cessation
- Regular exercise

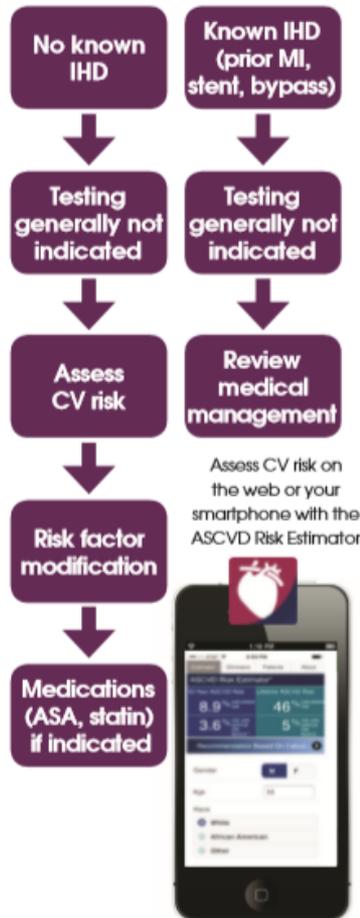
Antianginal drug management

- Beta blockers
 - Carvedilol - 25 mg bid
 - Metoprolol - 50 mg bid
 - Nitrates - goal dose >60 mg
- Calcium channel blockers
 - Amlodipine - 10 mg daily
 - Side effects: edema
- Nitrates
 - Short acting for acute symptoms
 - Long acting, prescribe ONCE daily
 - Goal dose >60 mg
 - Headache common side effect
- Ranolazine
 - For refractory angina
 - Monitor QT

Known IHD, Symptomatic

| | ETT | CTA | MPI |
|------------------------|-----|-----|-----|
| Known IHD, Symptomatic | M | M | A |

Asymptomatic



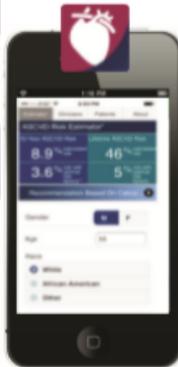
Risk factor modification: recommendations

- Physical activity
- Weight management
- Tobacco counseling
- Diet
 - Reduce intake of saturated fat (<7% of total calories); trans fatty acids (<1% of total calories); total cholesterol (<200 mg/dL)
 - Limit alcohol consumption
- Blood pressure control (<140/90 mm Hg)
- Patients with diabetes: HbA1C ≤7%

IHD medical management

- Aspirin
 - 81 mg daily is adequate
- Statins
 - Rosuvastatin - 20-40 mg daily
 - Atorvastatin - 40-80 mg daily
- Beta blockers
 - Not required for all patients
 - Needed if low LVEF (≤ 40% with heart failure) or recent MI
- Blood pressure control
- Glucose control
- Tobacco cessation
- Regular exercise

Assess CV risk on the web or your smartphone with the ASCVD Risk Estimator



Choosing Wisely

An initiative of the ABIM Foundation

Don't perform stress cardiac imaging or coronary angiography in patients without cardiac symptoms unless high-risk markers are present.

Don't perform radionuclide imaging as part of routine follow-up in asymptomatic patients.

Preoperative Assessment



Example METs

- 3-6 METs
 - Brisk walking >4 mph
 - Bicycling <10 mph
 - Dancing
 - Climb stairs
 - Yard chores
- > 6 METs
 - Push mower
 - Running
 - Heavy loads (>20 kg)
 - Aerobics

Surgical risk factors

1. Prior MI/CAD
2. Heart failure
3. Diabetes on insulin
4. CKD (Creat >2 mg/dL)
5. Stroke/TIA

Medical therapy

1. Control BP
2. Quit smoking
3. Control blood glucose

- 4 METs or No risks factors
- No symptoms <1 year after NL test
- Unknown METs + RFs Low risk surgery
- Unknown METs + RFs Intermediate risk surgery
- Unknown METs + RFs High risk surgery

| | ETT | CTA | MPI |
|--|-----|-----|-----|
| 4 METs or No risks factors | R | R | R |
| No symptoms <1 year after NL test | R | R | R |
| Unknown METs + RFs Low risk surgery | R | R | R |
| Unknown METs + RFs Intermediate risk surgery | M | R | M |
| Unknown METs + RFs High risk surgery | M | R | A |

Choosing Wisely

An initiative of the ABIM Foundation

Don't perform cardiac imaging as a pre-operative assessment in patients scheduled to undergo low- or intermediate-risk non-cardiac surgery.

Legend: A = appropriate, M = maybe appropriate, R = rarely appropriate, ETT = exercise treadmill test, CTA = computed tomography angiography, MPI = myocardial perfusion imaging

SUGGESTED READING:

- Fihn SD, et al. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the diagnosis and management of patients with stable ischemic heart disease. *Circulation*. 2012;126:e354-e471.
- Fleisher LA, et al. 2014 ACC/AHA Guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery. *J Am Coll Cardiol*. 2014;64:e77-137.
- Wolk MJ, et al. ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 multimodality appropriate use criteria for the detection and risk assessment of stable ischemic heart disease. *J Am Coll Cardiol*. 2014;63:380-406.

◀ PREVIOUS ARTICLE | THIS ISSUE | NEXT ARTICLE ▶

CLINICAL GUIDELINES | 17 MARCH 2015

Cardiac Screening With Electrocardiography or Myocardial Perfusion Imaging: A Guideline From the American College of Physicians

Roger Chou, MD; for the American College of Physicians *
 Article, Annals of Internal Medicine

High-Value Care Advice: Clinicians should not screen for cardiac disease in asymptomatic, low-risk adults with resting or stress electrocardiography, stress echocardiography, or stress myocardial perfusion imaging.

Are the Evidence-Based Recommendations for the Use of Cardiac Testing in Asymptomatic Adults?

Background: Cardiac screening in adults with resting or stress electrocardiography, stress echocardiography, or myocardial perfusion imaging can reveal findings associated with increased risk for coronary heart disease events, but inappropriate cardiac testing of low-risk adults has been identified as an important area of overuse by several professional societies.

What About Symptomatic Patients?

1. Estimate the pretest probability of CAD
 - Based on age, sex and chest pain characteristics
2. Using the pretest probability
 - PPV and NPV depend on pretest probability
3. Stress testing is most useful in patients with an *intermediate* pretest probability
 - Variably defined as 25-75% or 10-90%
4. Posttest probability
 - Pretest probability, along with the sensitivity and specificity of the test, can be used to determine the posttest probability of CAD

Estimating the pretest probability of CAD



Recents

Pretest Probability of CAD in symptomatic patients

Pretest pain

Pretest Probability of CAD

Pre-test probability of CAD (CAD consortium)

Determine pre-test probability of coronary artery disease in patients with chest pain.

Pre-test probability of CAD (CAD consortium)

Determine pre-test probability of coronary artery disease in patients with chest pain.

Pretest Probability of CAD

ECG: Corrected QT

Exercise Capacity (METs)

Duke Treadmill Score

HCM Risk-SCD

Assess risk of sudden cardiac death and need for ICD in hypertrophic cardiomyopathy

Geriatric-Sensitive Perioperative Cardiac Risk Index | GSCRI

Estimate risk of perioperative myocardial infarction or cardiac arrest in patients over 65

ACC/AHA CV Risk Calculator (2013)

Estimate 10-year risk for atherosclerotic cardiovascular disease

DAPT Score

Which patients should remain on dual anti-platelet therapy 1 year following coronary stent treatment?

Questions

Age?

Unanswered

Sex?

Unanswered

Chest pain?

Unanswered

Diabetes?

Unanswered

Hypertension?

Unanswered

Dyslipidemia?

Unanswered

Smoking history?

Unanswered

Coronary Calcium Score Available?

Unanswered

Coronary Calcium Score? (enter 0 if not done)

Unanswered

Results

Please answer all questions

Questions

Age?

Unanswered

Sex?

Unanswered

Chest pain?

Unanswered

Diabetes?

Unanswered

Hypertension?

Unanswered

Dyslipidemia?

Unanswered

Smoking history?

Unanswered

Coronary Calcium Score Available?

Unanswered

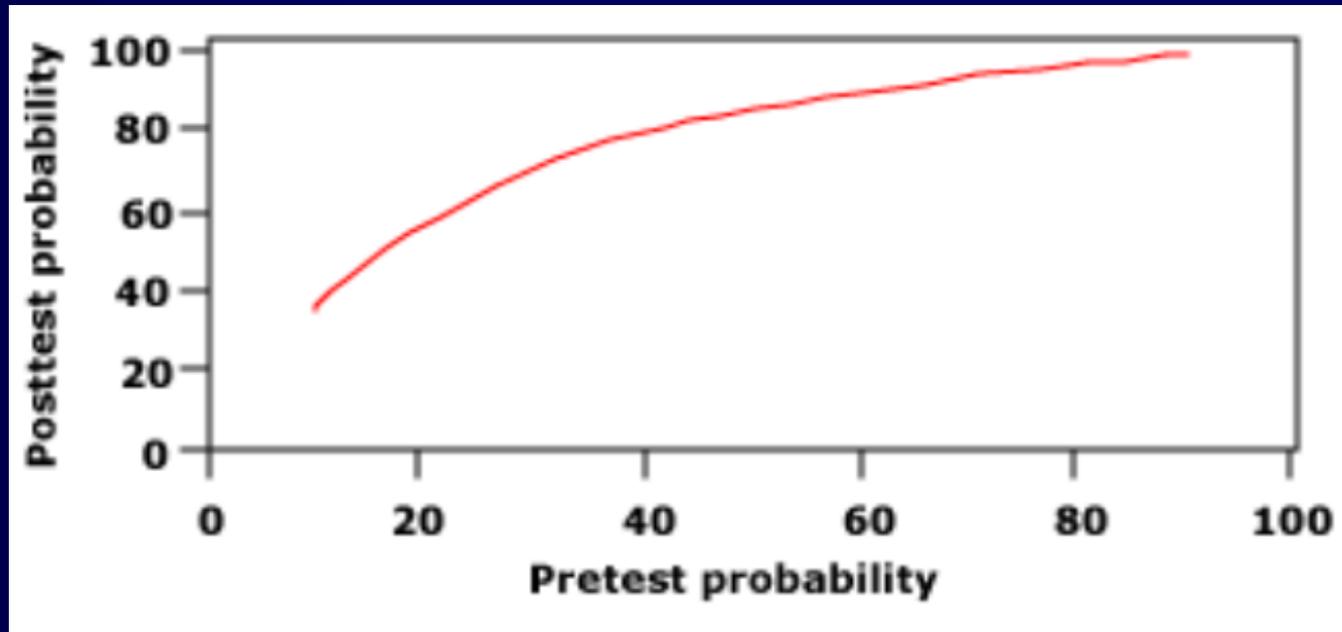
Coronary Calcium Score? (enter 0 if not done)

Unanswered

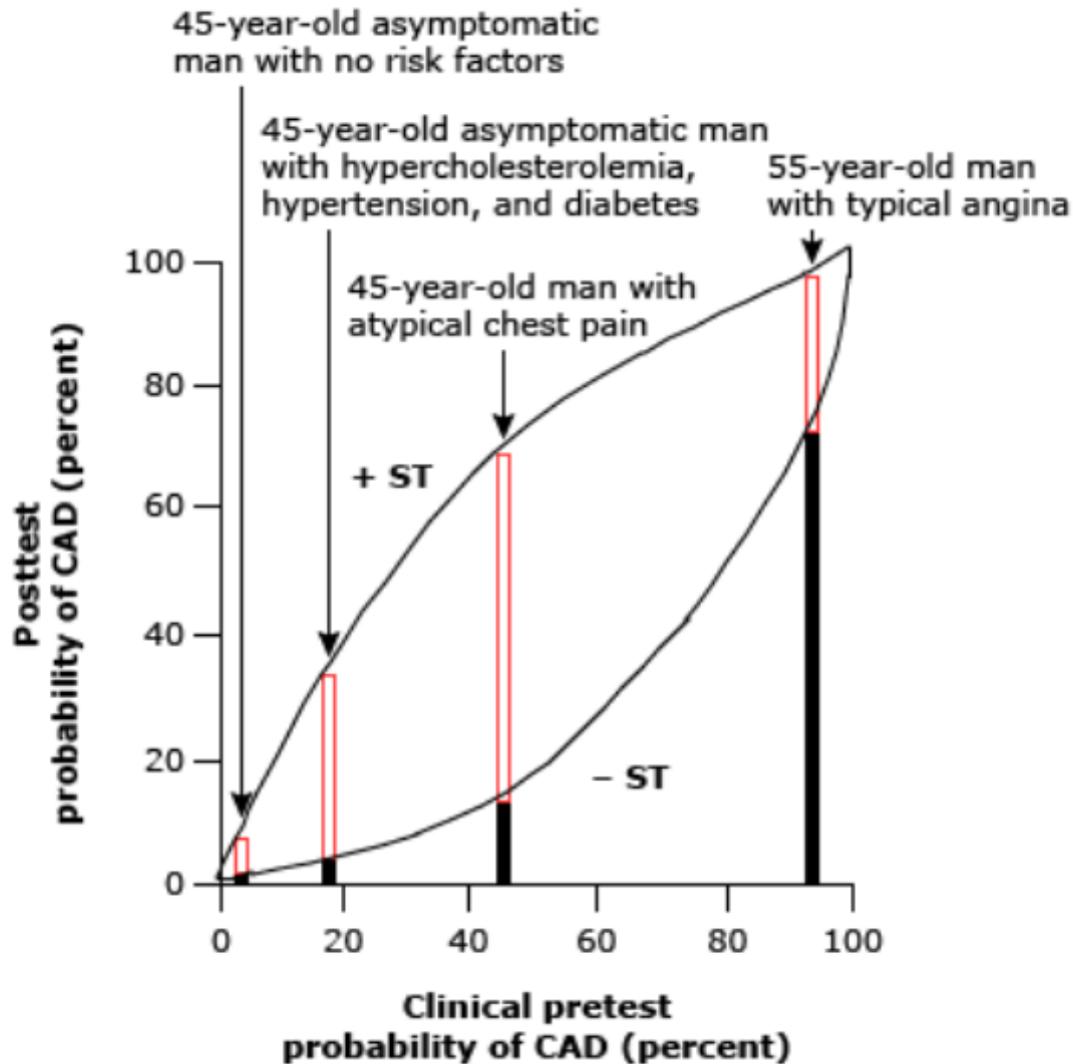
Results

Please answer all questions

Estimated Positive Predictive Value of Exercise Stress Test



Bayes Theorem in Action



Modalities for Ischemic Work-up

- Exercise: treadmill (usually) or recumbent bike
 - With ECG monitoring (ETT)
 - With Imaging
 - Echocardiography (ESE)
 - Myocardial perfusion imaging (SPECT MPI)
- Pharmacological: always with imaging
 - Dobutamine
 - Echocardiography (DSE), MPI, or cardiac MRI
 - Vasodilator Agents (dipyridamole, adenosine, etc.)
 - SPECT MPI
 - PET \pm myocardial blood flow quantification

Modalities for Ischemic Work-up

- Coronary CT angiography (CCTA) \pm fractional flow reserve (CT-FFR) *
- Coronary calcium score *
 - Free (qualitative) information available in any patient with a chest CT scan – *Look at the images!*
- Coronary angiography *
- Cardiopulmonary exercise stress test *
- Viability *
 - Cardiac MRI (likely best)
 - SPECT MPI
 - Echo

* **Not discussed here**

Indications for Stress Testing

- Ischemic Work-up
 - Patients without known CAD: Diagnosis of CAD
 - Patients with known CAD:
 - Diagnosis of new or progressive CAD
 - Risk stratification
 - Guiding revascularization
- Select patients with newly diagnosed severe LV systolic dysfunction or wall motion abnormalities *
- Most should undergo coronary angiography
- Select post-MI patients who were managed medically *

* **Best deferred to cardiologist**

Indications for Stress Testing

- Assessment of exercise capacity
- Exercise prescription
- Valvular heart disease: Hemodynamic stress test *
- Select patients with specific arrhythmias *
- Assessment of chronotropic competence
- Prior to prescribing class 1C antiarrhythmic drugs *
- Syncope (rarely indicated)
- Pre-operative risk stratification (occasionally indicated)
- Select professions (pilots, CDL, firefighters, etc.)

** Best deferred to cardiologist*

Contraindications to Exercise Stress Test

Absolute

- Acute MI (within 3 day)
- Unstable angina
- Unstable arrhythmias
- Unstable hemodynamics
- Acute endocarditis
- Symptomatic severe AS
- Decompensated HF
- Acute pulmonary embolism
- Acute myocarditis / pericarditis
- Acute aortic dissection
- Inability to exercise safely

Relative

- Known left main disease
- Moderate-severe AS with uncertain Sx
- Tachyarrhythmias with uncontrolled V-rate
- High-degree AV block
- HOCM with significant resting LVOT obstruction
- Recent stroke / TIA
- Inability to cooperate
- Severe HTN (>200/110 mmHg)
- Uncorrected medical issues

Contraindications to Vasodilators

- Active wheezing / severe bronchospastic disease
- Hypotension (SBP <90 mmHg)
- 2nd or 3rd degree AV block or sinus node dysfunction without a functioning pacemaker
- Unstable or acute coronary syndrome
- Seizures

Contraindications to Dobutamine

- Recent MI (within 3 days)
- Unstable angina
- Sustained or frequent ventricular arrhythmias
- Atrial fibrillation with RVR [or even without...]
- Acute aortic dissection
- Significant LV outflow obstruction
- Severe hypertension (SBP >180 mmHg)
- [Large aortic aneurysm]

Choosing A Stress Test

- Clinical indication / question to be answered
- Can the patient exercise adequately?
 - Walk 5 minutes on flat surface, go up 2 flights of stairs
- Is the resting ECG suitable for ETT?
 - Left bundle branch block
 - Ventricular-paced rhythm
 - LVH with secondary repolarization abnormalities
 - Resting ST-segment depression ≥ 1 mm
 - Ventricular pre-excitation
 - Digoxin effect on baseline ECG
- Body habitus / lung disease (prior image quality)

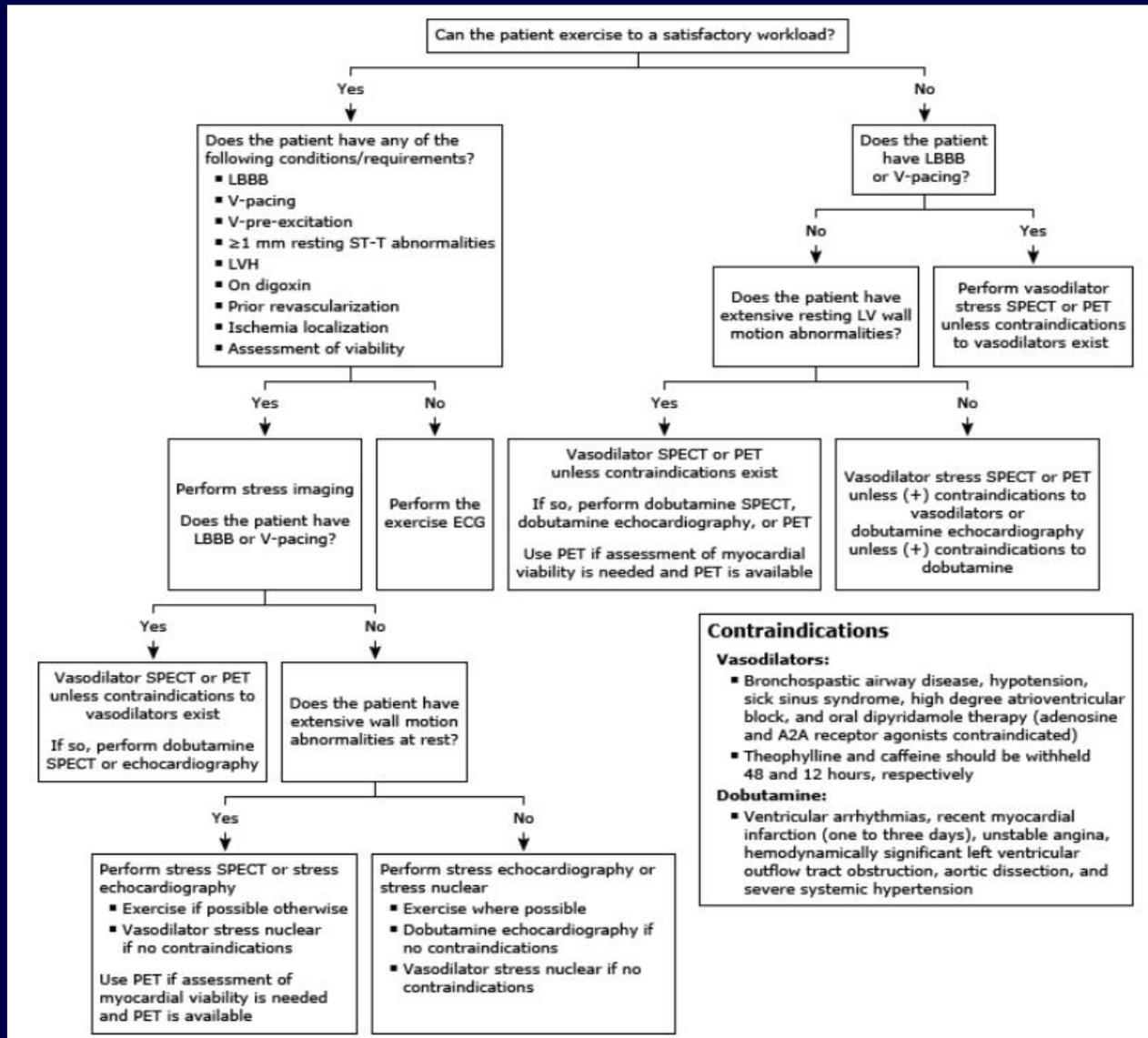
Choosing A Stress Test

- Known CAD / prior revascularization
 - In the absence of new symptoms <5 years after CABG or <2 years after PCI, stress testing is rarely appropriate
- Pre-test probability
- Local expertise
- Test performance
 - MPI more sensitive, echocardiography more specific
- Cost
- Potential adverse effects of the test
- Contraindications, including ongoing symptoms

Choosing A Stress Test

- Nearly all patients who are anticipated to exercise to a satisfactory workload should undergo an exercise stress test rather than a pharmacologic stress test
- Some patients who can exercise may benefit from an imaging modality (MPI or echocardiography)
 - e.g., known CAD / prior revascularization
- Vasodilator MPI tends to be better for patients with:
 - Baseline LBBB or ventricular-paced rhythm
 - Marked LV dyssynchrony
 - Baseline regional wall motion abnormality
 - Atrial fibrillation

Choosing A Stress Test



Proposed Guidance for Handling Patient with Chest Pain

| Chest Pain | Troponin | ECG | Action |
|------------|----------|-------------------|--------------------|
| - | Normal | Normal | Stress Test |
| +/- | Normal | Abnormal, stable | Stress Test |
| +/- | Normal | Abnormal, dynamic | Consult Cardiology |
| +/- | Abnormal | +/- | Consult Cardiology |

Medications & Stress Test

- β -Blockers / Calcium-channel blockers
- Methylxanthines
 - Theophylline
 - Caffeine
- Diabetes management
 - A 2-4 hour fast is required

Opportunities for Improving Value

- Stress test referral with no ECG performed
- Stress test referral with uncontrolled HTN
 - For exertional dyspnea!
- Pre-operative risk stratification before low-risk surgery
- Stress test referral when the results do not change management
- Low-risk patients or those with normal ECG referred for nuclear stress test
- Not consulting patient's cardiologist before ordering stress test

Pre-operative Cardiovascular Risk Stratification

CLINICAL PRACTICE GUIDELINE

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery



A Report of the American College of Cardiology/American Heart Association
Task Force on Practice Guidelines

Developed in Collaboration With the American College of Surgeons, American Society of
Anesthesiologists, American Society of Echocardiography, American Society of Nuclear Cardiology,
Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions,
Society of Cardiovascular Anesthesiologists, and Society of Vascular Medicine

Endorsed by the Society of Hospital Medicine

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Evidence Review Committee Chair

Estimation of Peri-Op Risk

"Always make things as simple
as possible,...
but never more so."

- Albert Einstein

Does this patient need a stress test?

- DS, a 74 y/o M due for revision of R-THA due to prosthesis recall
- PMH
 - CAD w/ h/o acute anterior STEMI in 2002
 - LHC 03/2002
 - LAD occluded proximally, s/p BMS x 2 to proximal & distal LAD
 - LCx: anomalous origin from RCA, patent
 - RCA: 40-50% lesion in mid-vessel
 - ICM w/ LVEF = 15-20%
 - Chronic, stable systolic heart failure, stage C, NYHA class I
 - s/p single chamber ICD in 2010; no shocks ever
 - HTN, Hyperlipidemia, Hypothyroidism – all under excellent control
 - He works on his farm and is able to move 50-60 lbs bales of hay for a couple of hours without symptoms:

“I just can’t do it as fast as I used to.”

The Purposes of Pre-Op Evaluation

- 1) NOT to “get medical clearance”
- 2) To assess perioperative risk to inform
 - a) the decision to proceed
 - b) the choice of surgery (or alternative therapies)
- 3) To determine the need for changes in management
 - a) Changes in medical therapy
 - b) Need for further cardiovascular tests / interventions
 - c) Recommendations for postoperative monitoring
- 4) To identify cardiovascular conditions or risk factors that require longer-term management

Individualizing Care

- Complexity of managing patients with multiple comorbid conditions
- Guidelines define practices that meet the needs of most, but not all, patients
 - *Guidelines do not replace clinical judgment*
- Clinicians should engage the patient to participate in selecting interventions on the basis of the their values and preferences
 - *There are circumstances in which deviations from these CPGs are appropriate*

The Overarching Theme

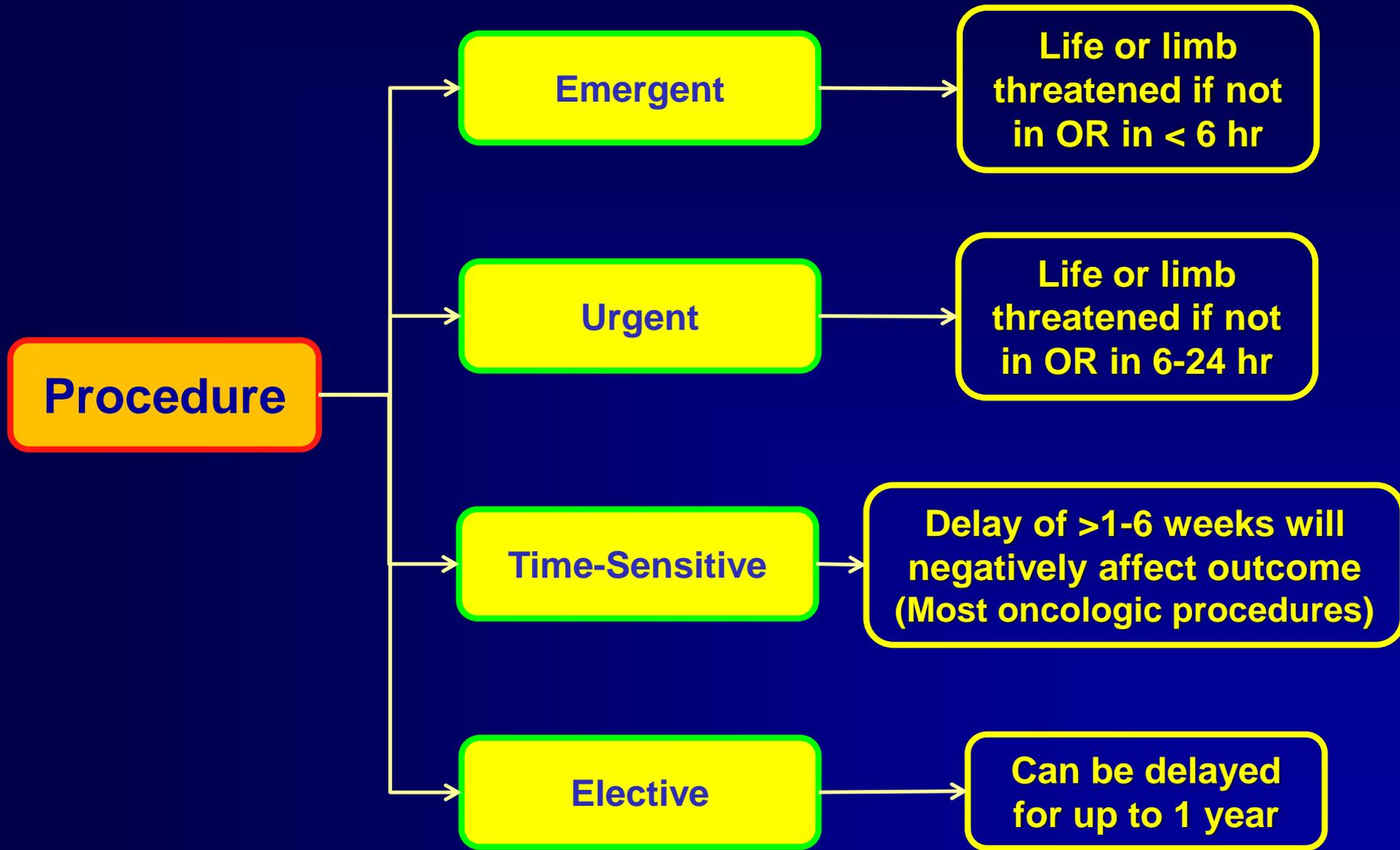
- Communication among all parties is key
 - i.e., surgeon, anesthesiologist, consultants, **the patient, and the primary caregiver**
- To promote patient engagement and facilitate shared decision making
 - Must provide **clear, understandable information** about perioperative cardiovascular risk in the context of the overall risk of surgery
- Preoperative revascularization (PCI or CABG) is rarely necessary just to get a patient through surgery
 - Only if indicated independent of the need for surgery

Out With the Old...

- Risk Categories
 - Low Risk: risk of MACE $<1\%$
 - Elevated Risk: risk of MACE $\geq 1\%$
 - *“Intermediate Risk” Is No More!*
- Order a test only if the result may change patient care
 - *Easier said than done!*
- Guideline-Directed Medical Therapy (GDMT)
 - Consult other Clinical Practice Guidelines (CPG's)

Urgency of the Procedure

Urgency of the Procedure



Risk Calculators

Recommendations

A validated risk-prediction tool can be useful in predicting the risk of perioperative MACE in patients undergoing noncardiac surgery.

For patients with a low risk of perioperative MACE, further testing is not recommended before the planned operation.

| COR | LOE |
|------------------------|----------|
| IIa | B |
| III: No Benefit | B |
| | |

Revised Cardiac Risk Index (RCRI)

- aka. “*Lee Criteria*”
- Based on 6 risk factors; each worth 1 point:
 - High-risk Surgery
 - Ischemic Heart Disease
 - Heart Failure
 - Stroke or TIA
 - Diabetes (insulin-requiring)
 - Renal insufficiency (serum creatinine >2.0 mg/dL)
- **RCRI <2 = Low-risk**
- May underestimate risk in major vascular surgery
- *There is an App for that!* **Calculate by Qx**

RCRI: Procedure-Specific CV Risk

- **Low-risk**

- Endoscopic Procedures
- Superficial Procedures
 - Cataract Surgery
 - Breast Surgery
 - Skin Surgery
- Ambulatory Surgery

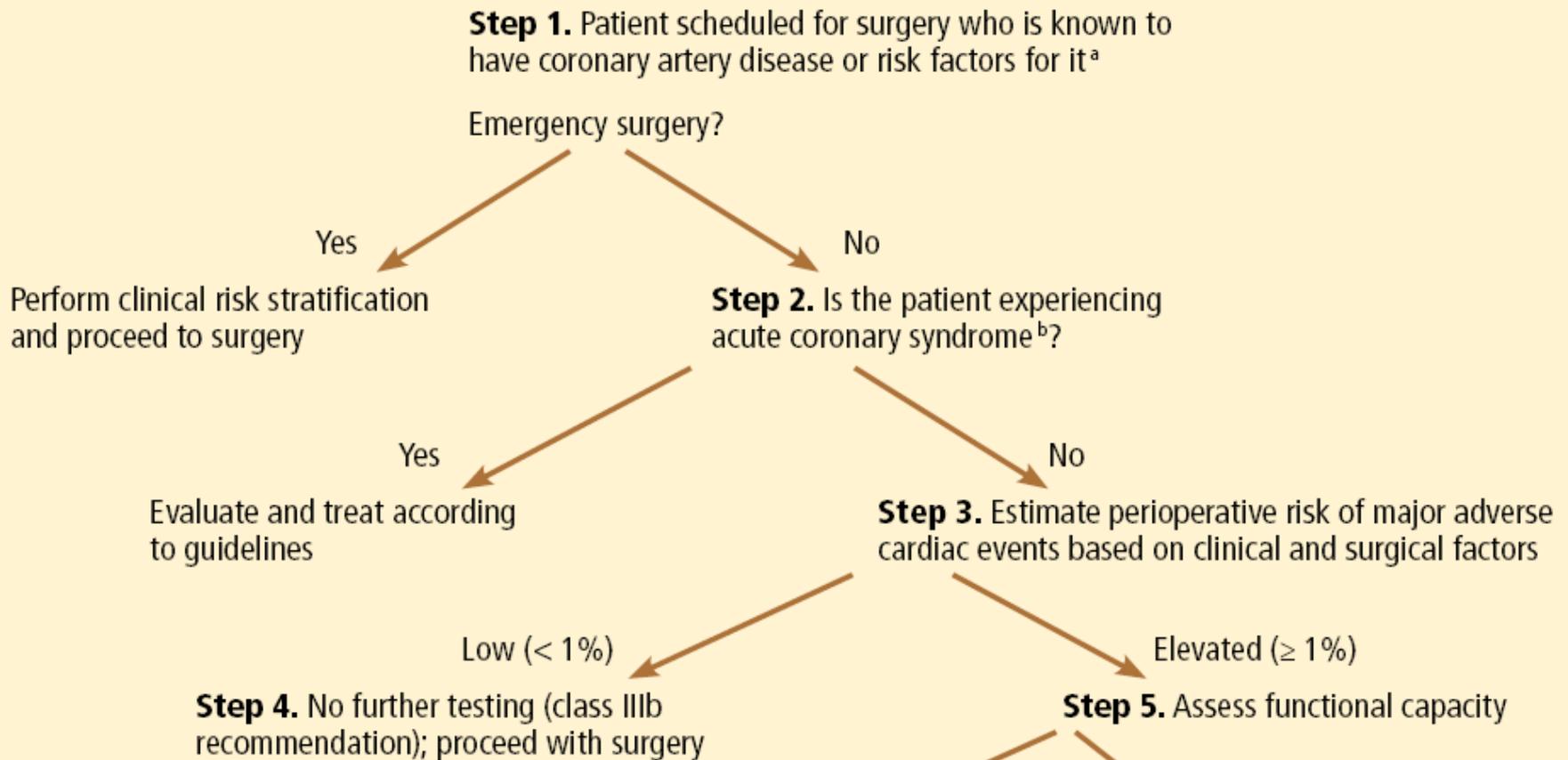
- **High-risk**

- Supra-inguinal Vascular Surgery
- Intraperitoneal Surgery
- Intrathoracic Surgery

Other Calculators

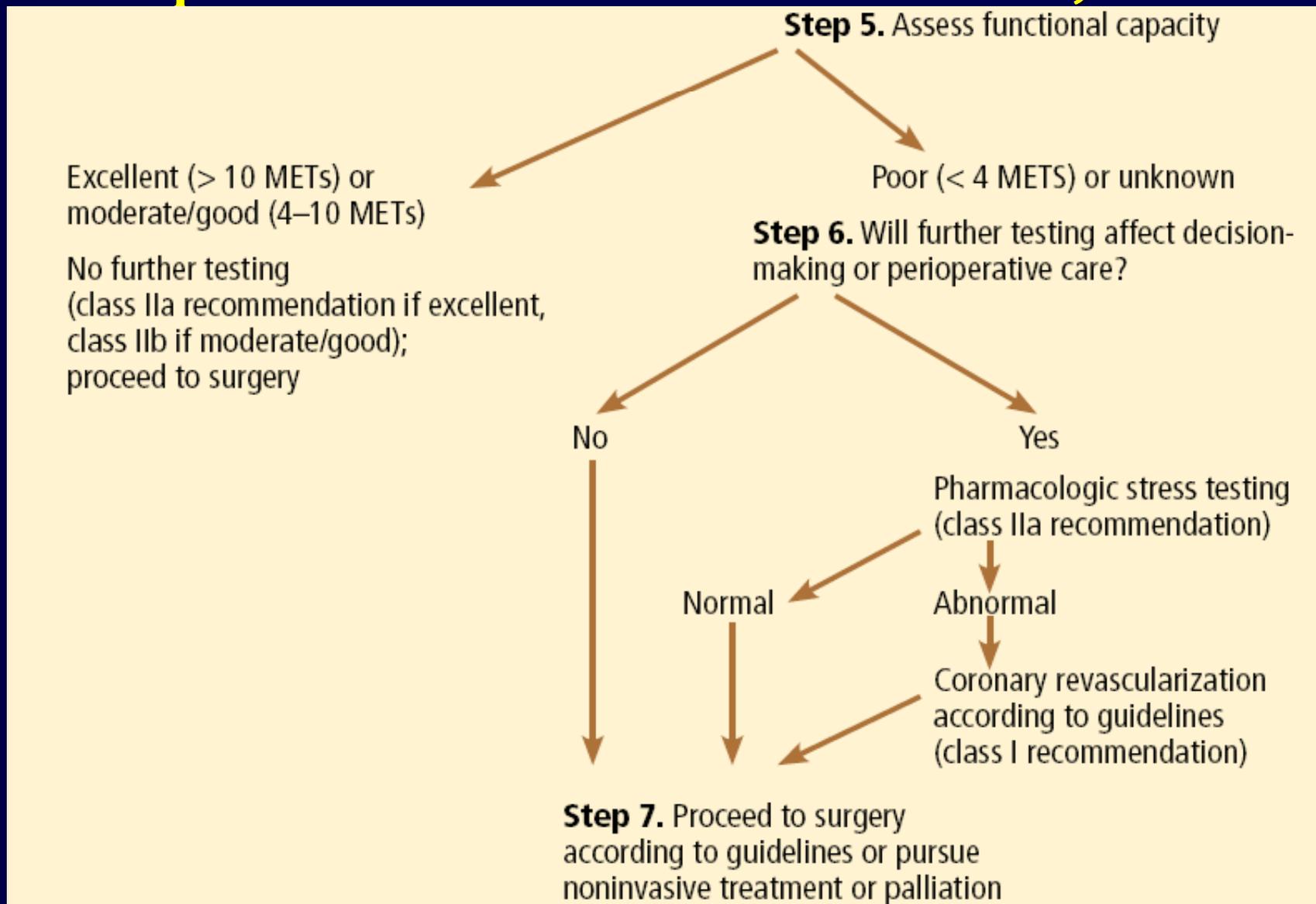
- American College of Surgeons' National Surgical Quality Improvement Program Myocardial Infarction and Cardiac Arrest (**MICA**)
 - aka. “*Gupta Cardiac Risk*”
 - Validated in only one center
 - Also available on *Qx Calculate*
- American College of Surgeons' National Surgical Quality Improvement Project (**ACS NSQIP**)
 - Based on CPT codes
 - Cumbersome: 21 patient-specific variables
 - Yet to be validated outside ACS NSQIP database

The 2014 ACC-AHA Guidelines for Perioperative Assessment of CAD



Continued on the next slide...

The 2014 ACC-AHA Guidelines for Perioperative Assessment of CAD, Cont'd



What's New in the Algorithm?

- “Active cardiac conditions” are no more!
 - Unstable coronary syndrome, decompensated heart failure, significant arrhythmias, severe valvular disease
 - Instead, the new version specifically asks about acute coronary syndrome (and recommends GDMT for it)
 - A footnote directs readers to other CPG's
- Exercise Capacity
 - Moderate to Good (4 -10 METs)
 - Excellent (>10 METs)
 - Both categories proceed to surgery
 - “Excellent” gets a stronger recommendation to proceed

Duke Activity Status Index

| Activity | Weight |
|---|-------------|
| Can you... | |
| 1. take care of yourself, that is, eating, dressing, bathing, or using the toilet? | 2.75 |
| 2. walk indoors, such as around your house? | 1.75 |
| 3. walk a block or 2 on level ground? | 2.75 |
| 4. climb a flight of stairs or walk up a hill? | 5.50 |
| 5. run a short distance? | 8.00 |
| 6. do light work around the house like dusting or washing dishes? | 2.70 |
| 7. do moderate work around the house like vacuuming, sweeping floors, or carrying in groceries? | 3.50 |
| 8. do heavy work around the house like scrubbing floors or lifting or moving heavy furniture? | 8.00 |
| 9. do yardwork like raking leaves, weeding, or pushing a power mower? | 4.50 |
| 10. have sexual relations? | 5.25 |
| 11. participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football? | 6.00 |
| 12. participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing? | 7.50 |



*Helping Cardiovascular Professionals
Learn. Advance. Heal.*

Reproduced with permission from Hlatky et al.



What Else Is New?

- What if the patient cannot exercise to at least 4 METs?
 - Would further testing affect care? (*A new consideration!*)
 - If yes, discuss with patient and perioperative team
 - Alternatives to the original planned surgery?
 - Is the patient willing to undergo revascularization?
 - If so, pharmacologic stress testing is recommended
 - Previously, only the RCRI score and the type of surgery (vascular vs. non-vascular) were taken into account
 - The new algorithm also suggests considering alternative strategies, including palliation

Preoperative Cardiac Tests Before Non-Cardiac Surgery

Class of Recommendations and Levels of Evidence

CLASS I

Benefit >>> Risk

**Should
Do It**

CLASS IIa

Benefit >> Risk

**Could
Do It**

CLASS IIb

Benefit \geq Risk

**May
Consider**

CLASS III *No Benefit*
or **CLASS III** *Harm*

**Don't
Do It!**

or Harmful

LEVEL A

Multiple populations
evaluated*

Data derived from multiple
randomized clinical trials
or meta-analyses

LEVEL B

Limited populations
evaluated*

Data derived from a
single randomized trial
or nonrandomized studies

LEVEL C

Very limited populations
evaluated*

Only consensus opinion
of experts, case studies,
or standard of care

Supplemental Preoperative Evaluation

The 12-Lead ECG

| Recommendations | COR | LOE |
|---|-----------------|-----|
| Preoperative resting 12-lead ECG is reasonable for patients with known coronary heart disease , significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease, except for those undergoing low-risk surgery . | IIa | B |
| Preoperative resting 12-lead ECG may be considered for asymptomatic patients without known coronary heart disease, except for those undergoing low-risk surgery . | IIb | B |
| Routine preoperative resting 12-lead ECG is not useful for asymptomatic patients undergoing low-risk surgical procedures. | III: No Benefit | B |



*Helping Cardiovascular Professionals
Learn. Advance. Heal.*



Supplemental Preoperative Evaluation

Assessment of LV Function

| Recommendations | COR | LOE |
|---|-----------------|-----|
| It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of LV function. | IIa | C |
| It is reasonable for patients with HF with worsening dyspnea or other change in clinical status to undergo preoperative evaluation of LV function. | IIa | C |
| Reassessment of LV function in clinically stable patients with previously documented LV dysfunction may be considered if there has been no assessment within 1 yr. | IIb | C |
| Routine preoperative evaluation of LV function is not recommended. | III: No Benefit | B |



*Helping Cardiovascular Professionals
Learn. Advance. Heal.*



Supplemental Preoperative Evaluation

Exercise Stress Testing for Myocardial Ischemia and Functional Capacity

| Recommendations | COR | LOE |
|---|-----|-----|
| For patients with elevated risk and excellent (>10 METs) functional capacity, it is reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery . | IIa | B |
| For patients with elevated risk and unknown functional capacity , it may be reasonable to perform exercise testing to assess for functional capacity if it will change management . | IIb | B |
| For patients with elevated risk and moderate to good (≥4 METs to 10 METs) functional capacity, it may be reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery . | IIb | B |



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Supplemental Preoperative Evaluation

Exercise Stress Testing for Myocardial Ischemia and Functional Capacity

| Recommendations | COR | LOE |
|--|-----------------|-----|
| For patients with elevated risk and poor (<4 METs) or unknown functional capacity , it may be reasonable to perform exercise testing with cardiac imaging to assess for myocardial ischemia if it will change management . | IIb | C |
| Routine screening with noninvasive stress testing is not useful for patients at low risk for noncardiac surgery. | III: No Benefit | B |



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Supplemental Preoperative Evaluation

Noninvasive Pharmacological Stress Testing Before Noncardiac Surgery

| Recommendations | COR | LOE |
|---|-----------------|-----|
| It is reasonable for patients who are at an elevated risk for noncardiac surgery and have poor functional capacity (<4 METs) to undergo noninvasive pharmacological stress testing (either DSE or pharmacological stress MPI) if it will change management . | IIa | B |
| Routine screening with noninvasive stress testing is not useful for patients undergoing low-risk noncardiac surgery. | III: No Benefit | B |



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The only two RCTs (CARP and DECREASE V) evaluating prophylactic coronary revascularization before non-cardiac surgery found no difference in either short-term or long-term outcomes.

Back to Our Case

How it was handled... (10/14/2013)

- *“Patient is at higher than average risk for the proposed surgery due to medical problems.”*
- *“Patient accepts the risks of procedure and wishes to proceed with procedure as scheduled.”*
- *“Pt may proceed with surgery pending completion and review of the following tests and cardiology consultation:”*
 - *ECG (last ECG on 11/12/2010)*
 - *CBC with diff, BMP, TSH, U/A*
 - *Echocardiogram (last study on 05/27/2010)*
 - *LexiScan SPECT MPI (last study on 07/28/2010)*
 - *Cardiology consultation*

What happened next...

- **SPECT MPI:**
 - Enlarged left ventricle with marked global hypokinesis
 - Large, fixed left ventricular perfusion defects
 - Ischemia in LCx territory
- **LHC:**
 - LM: 20-30%
 - LAD: 40-50% proximal ISR, 50% mid lesion
 - LCx: 90% ostial OM1 lesion
 - RCA: 80% lesion at the crux
- **CABG x 3:** LIMA>>LAD, SVG>>OM, SVG>>R-PDA + LV lead
- Post-Op A. Fib, s/p TEE-guided DCCV, started on warfarin
- Cardiogenic shock, refractory to vasopressors
- Transferred to OSF for LVAD on 11/08/2013

What happened next...

- CentriMag extracorporeal VAD
 - Post-Op CVA
 - VAD thrombosis
 - VAD was removed, drive lines clamped & left in place
- Returned to Carle on 11/19/2013, moribund
 - DC'd to SNF on BB & ACE-I in stable condition 01/09/2014
 - Made remarkable recovery in rehab
- Drive lines removed at BJH in April 2014
- Re-hospitalized on 05/19/2014 with weakness and INR = 5.8
 - AMS after admission; subdural hematoma on head CT
 - Passed away on 05/22/2014

**“Medicine is an art of uncertainty
and a science of probability.”**

- Sir William Osler

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