Cardiac Risk Assessment for Non- Cardiac Surgery

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Objectives

- ✓ To review preoperative cardiac evaluation and testing
- ✓ To review clinical risk assessment and risk assessment tools
- ✓ Learn how to reduce risk perioperatively in those at higher risk

Disclosures

Conflicts of Interest: None

Strength of Recommendation

Class of recommendation:

- **Class I:** Benefit >>> Risk, should be done or administered
- **Class IIa:** Benefit >> Risk, reasonable to do or administer
- **Class IIb:** Benefit ≥ Risk, consider doing or administering
- **Class III:** No benefit (or harm), not recommended or harmful

Level of Evidence:

- **Level A:** Data from multiple RCT or meta-analyses
- **Level B:** Data from single RCT or limited number of non-RCT
- **Level C:** Consensus opinion, case report, or standard of care only

CASE

Mr. Lee is a 66 year old male scheduled for sigmoidectomy for non-metastatic adenocarcinoma referred for evaluation of heart murmur, HTN, TIA, and diabetes.

Does he need preoperative cardiac risk assessment?

A) Yes

B) No

Clinical Risk Factors

Clinical Risk Factors

- Age >55
- Diabetes
- Cerebrovascular Disease
- Peripheral Vascular Disease
- Chronic Kidney Disease (creatinine> 2mg/dl)
- Coronary artery Disease
- Congestive Heart failure
- Moderate-severe valvular disease
- Significant arrhythmia

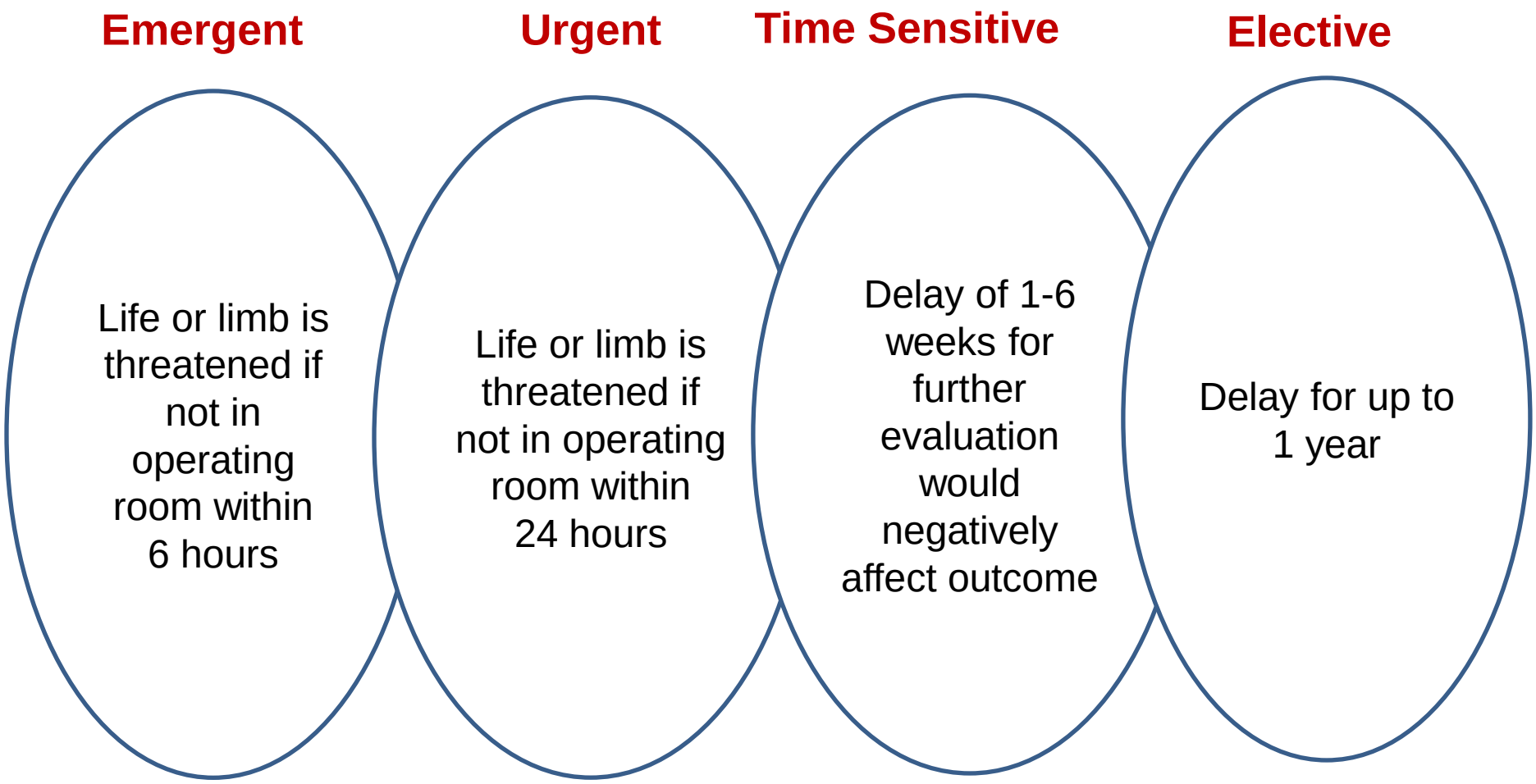
CASE

Mr. Lee is a 66 year old male scheduled for sigmoidectomy for non-metastatic adenocarcinoma referred for evaluation of heart murmur, HTN, TIA, and diabetes.

What is the urgency of the surgery?

A) Elective
B) Time sensitive
C) Urgent
D) Emergent

Definition of “Timing of Surgery”



CASE

Mr. Lee is a 66 year old male scheduled for sigmoidectomy for non-metastatic adenocarcinoma referred for evaluation of heart murmur, HTN, TIA, and diabetes.

What is the risk of the surgery?

A) Low
B) Elevated
C) Intermediate
D) High

Risk of Surgery

Low Risk

- Combined surgical and patient characteristics predict a risk of major adverse cardiac event (MACE) < 1%

High Risk

- Any procedure with MACE risk > 1%
- No longer distinguishes between intermediate and high risk because recommendations are the same
- Risk can be lowered by less invasive approach
- Emergency procedures increase risk

Combined Patient/Surgical Risk

- Clinicians' understanding and assessment of surgery-specific risk is suboptimal
- No consistent, reliable system of categorizing "low-risk" surgery
- Newer risk calculators which combine surgical and patient risk predictors, may have superior predictive value

Calculation of Risk to Predict Perioperative Cardiac Morbidity

Risk of Surgery

- Class IIa:

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

- Class III: No benefit

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

Method of Pre op cardiac risk assessment

Clinical risk Indices

- Revised Cardiac Risk Index (RCRI)
- National Surgical Quality Improvement Program (NSQIP) risk scores

RCRI

- Only tool that is externally validated
- Not designed for or validated in ambulatory or low-risk surgery
- Cardiac outcomes: MI, cardiac death/VFib, pulmonary edema, complete heart block

1.History of ischemic heart disease

2. History of congestive heart failure

3. History of cerebrovascular disease (stroke or transient ischemic attack)

4. History of diabetes requiring preoperative insulin use

5. Chronic kidney disease (creatinine > 2 mg/dL)

6. Undergoing suprainguinal Vascular, intraperitoneal, or intrathoracic surgery

RCRI

Risk for cardiac death, nonfatal myocardial infarction, and nonfatal cardiac arrest:

- 0 predictors = 0.4%
- 1 predictor = 0.9%
- 2 predictors = 6.6%
- ≥3 predictors = >11%

ACS NSQIP Calculator

- Validated in single, but HUGE study set from NSQIP database
- **21 variables,** including functional status, ASA classification & surgical type (>1500 different types)
- Outperformed RCRI in discriminative power (esp. with vascular)
- Assesses mortality, cardiac & 8 other outcomes.
  Cardiac outcomes: 30-day MI and cardiac arrest
  Other Outcomes: PNA, VTE, ARF, return to OR, unplanned intubation, discharge to rehab/nursing home, surgical infection, UTI
- Predicts length of hospital stay

http://riskcalculator.facs.org/PatientInfo/PatientInfo

American College of Surgeons
Inspiring Quality: Highest Standards, Better Outcomes

ACS NSQIP®

Surgical Risk Calculator

Risk Calculator Homepage | About | FAQ | ACS Website | ACS NSQIP Website

Enter Patient and Surgical Information

Procedure 44140 - Colectomy, partial; with anastomosis [Clear]

Begin by entering the procedure name or CPT code. You may also search using two words (or two partial words) by placing a '+' in between, for example: "cholecystectomy+cholangiography"

[Reset All Selections]

Please enter as much of the following information as you can to receive the best risk estimates.
A rough estimate will still be generated if you cannot provide all of the information below.

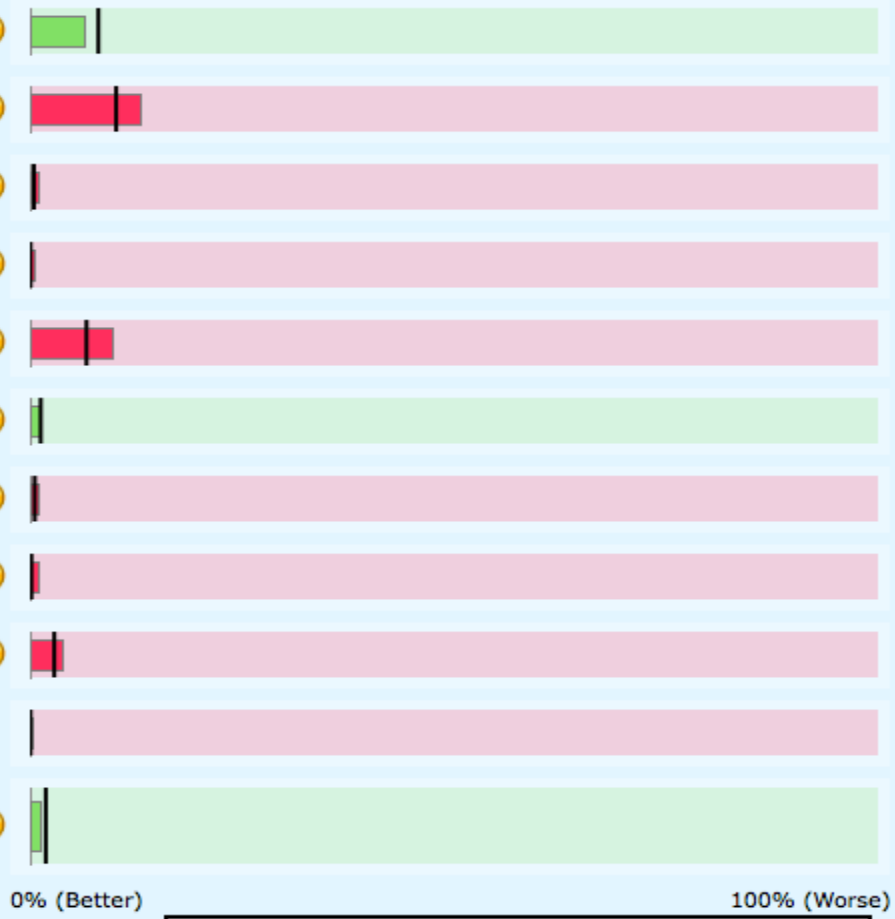
Age Group	Under 65 years	**Diabetes**	Oral
Sex	Female	**Hypertension requiring medication**	Yes
Functional status	Independent	**Previous cardiac event**	No
Emergency case	No	**Congestive heart failure in 30 days prior to surgery**	No
ASA class	I - Healthy patient		
Wound class	Clean/Contaminated	**Dyspnea**	None
Steroid use for chronic condition	No	**Current smoker within 1 year**	No
Ascites within 30 days prior to surgery	No	**History of severe COPD**	No
Systemic sepsis within 48 hours prior to surgery	None	**Dialysis**	No
		Acute Renal Failure	No
Ventilator dependent	No	**BMI Calculation: Height (in)**	68
Disseminated cancer	No	**Weight (lbs)**	140

Procedure: 44204 - Laparoscopy, surgical; colectomy, partial, with anastomosis

Risk Factors: Age: Under 65, Male, ASA III, Diabetes (oral), HTN, Obese (Class2)

Change Patient Risk Factors

Outcomes	Estimated Risk	Chance of Outcome
Serious Complication	6%	Below Average
Any Complication	13%	Above Average
Pneumonia	1%	Above Average
Cardiac Complication	1%	Above Average
Surgical Site Infection	10%	Above Average
Urinary Tract Infection	1%	Below Average
Venous Thromboembolism	1%	Above Average
Renal Failure	1%	Above Average
Return to OR	4%	Above Average
Death	<1%	Above Average
Discharge to Nursing or Rehab Facility	1%	Below Average



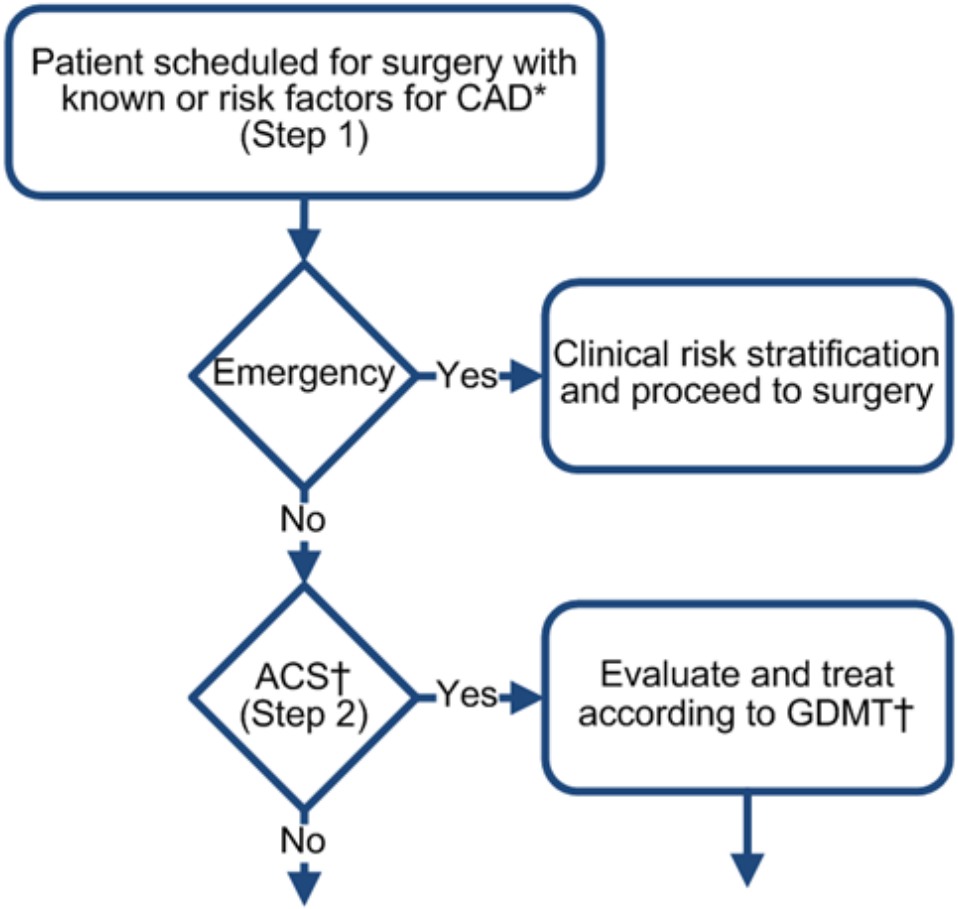
Predicted Length of Hospital Stay: 3.5 days

ASA Classification

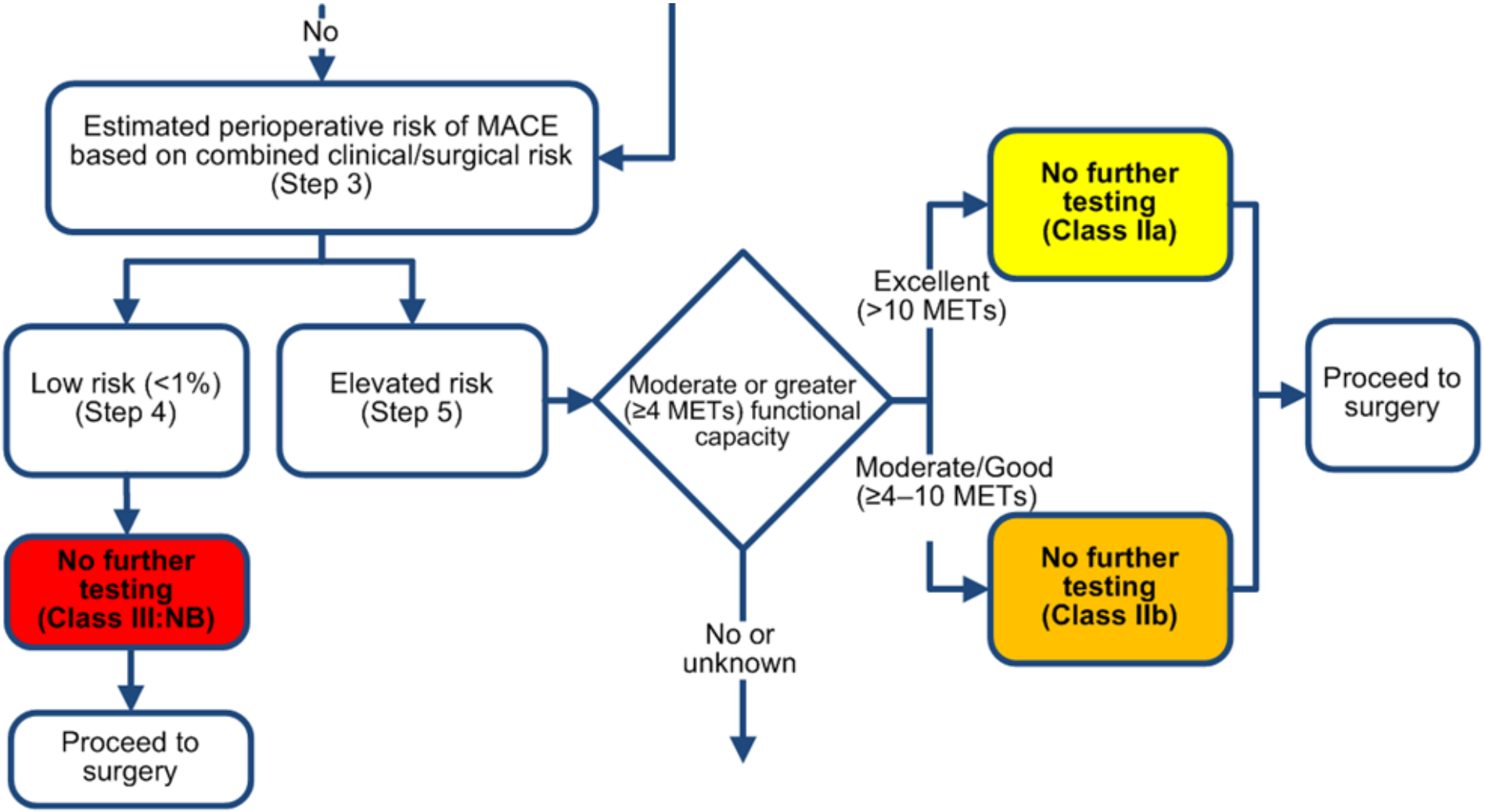
- First developed in 1960s
- Intended as a patient-specific assessment of risk independent of procedure type
- Consistently predictive of adverse outcomes
- Despite this, has wide inter-rater variability, even among anesthesiologists
- Updated with examples in 10/2014

Class	Definition	Examples, including, but not limited to:
ASA I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to): current **smoker**, social alcohol drinker, pregnancy, obesity (30 < BMI < 40), **well-controlled DM/HTN**, mild lung disease
ASA III	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): **poorly controlled DM or HTN**, COPD, morbid obesity (**BMI ≥40**), active hepatitis, alcohol dependence or abuse, implanted **pacemaker**, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of **MI, CVA, TIA, or CAD/stents**.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to): **recent (<3 months) MI, CVA, TIA, or CAD/stents**, ongoing cardiac ischemia or **severe valve dysfunction**, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis

Cardiac Risk Assessment Algorithm



Cardiac Risk Assessment Algorithm



- If the risk of MI/cardiac arrest is **<1%**, further testing has no benefit -> **proceed to the OR**

- If the risk of MI/cardiac arrest is **≥1%**, functional capacity is the next determination

- If patients can achieve **≥4 METs**, no further coronary evaluation is indicated

Functional Capacity

Duke Activity Status Index

- Assess functional capacity
- Metabolic equivalent task(MET)
- 1 MET = O2 3.5ml/kg/min (resting consumption of 70kg 40yr old man)

>10 METs	Excellent
7-10	Good
4-7	Moderate
≤ 4	Poor

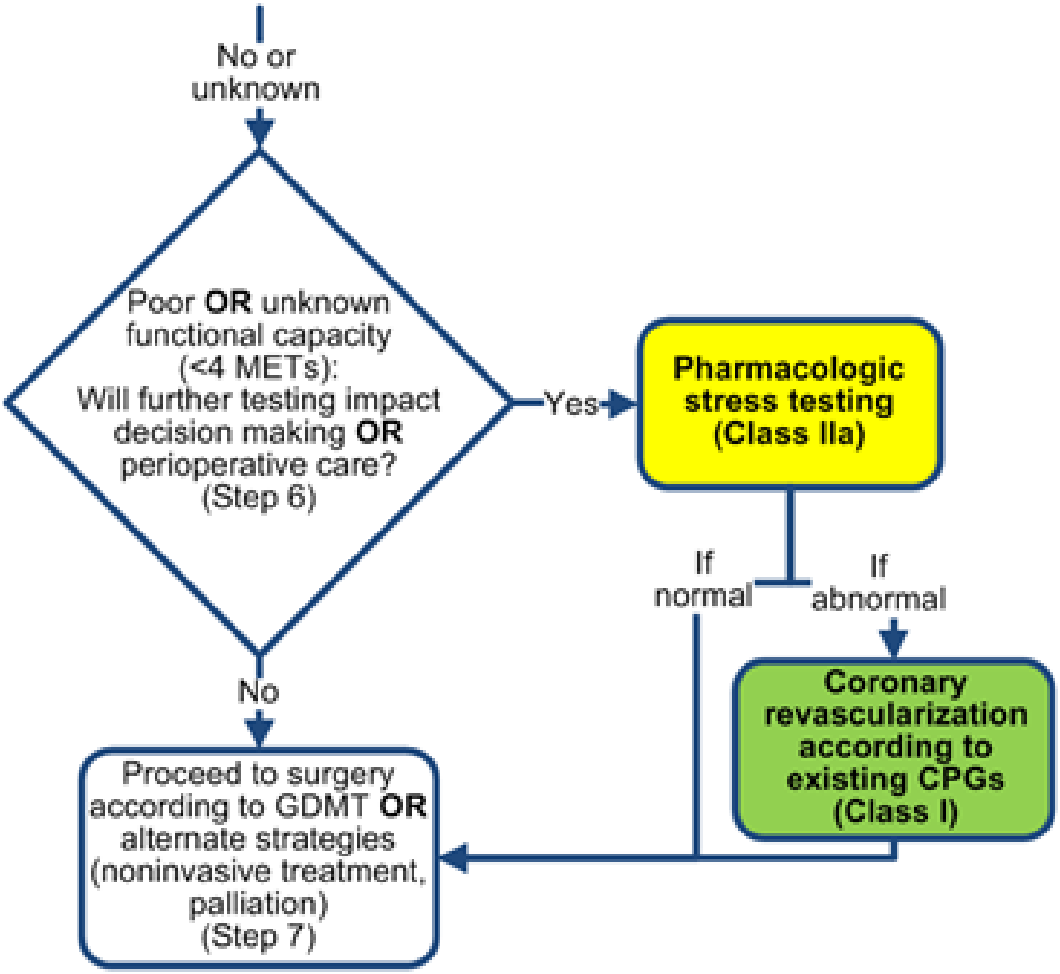
1 MET

- Can you take care of self?
- Eat, dress, use toilet?
- Walk indoors in house?
- Walk a block or two on level at 2-3 mph?
- Do light housework like dusting or dishes?

4 METs

- 4 METs
  Climb a flight of stairs, walk up hill?
  Walk on level at 4 mph?
  Run a short distance?
  Heavy housework
  Golf, bowling, dancing, doubles tennis
- >10 METs
  Swimming, singles tennis
  football, basketball

Cardiac Risk Assessment Algorithm



Supplemental Preoperative Evaluation

CASE

Mr. Lee is a 66 year old male scheduled for sigmoidectomy for non-metastatic adenocarcinoma referred for evaluation of heart murmur, HTN, TIA, and diabetes. He is only able to walk around the house, but without cardiac symptoms.

Does he need an ECG?

A) Yes

B) No

Supplemental Preoperative Evaluation

- ECG
- Echocardiography
- Exercise testing +/- imaging
- Noninvasive pharmacological stress testing
- Coronary angiography
- (Insufficient evidence for CT coronary angiogram)

Indications for ECG

Reasonable: Class IIa-B

- Known CAD
- Significant arrhythmia
- PAD
- Stroke (CVA/TIA)
- Major structural heart disease

May be considered: Class IIb-B

- Asymptomatic patient without CAD (+ cardiac risk factors)

No Benefit: Class III-B

- Low risk surgery <1% MACE

CASE

Mr. Lee is a 66 year old male scheduled for sigmoidectomy for non-metastatic adenocarcinoma referred for evaluation of heart murmur, HTN, TIA, and diabetes. He is only able to walk around the house, but without cardiac symptoms. Exam reveals III/VI systolic murmur at apex radiating to axilla & clear lungs. No prior echocardiogram done.

Does he need an echocardiogram?

A) Yes

B) No

Assessment of LV Function

Should be done: Class I-C

- Clinically suspected moderate-severe valvular disease if no study <1 year, or if change in clinical status

Reasonable: Class IIa-C

- Unknown cause of dyspnea (or new Dx of clinically suspected HF)
- Known HF with worsening dyspnea

May be considered: Class IIb-C

Known LV dysfunction in stable patient with study >1 year ago

No Benefit: Class III-B

- Routine preoperative screening
- Low risk surgery <1% MACE

CASE

Mr. Lee is a 66 year old male scheduled for sigmoidectomy for non-metastatic adenocarcinoma referred for evaluation of heart murmur, HTN, TIA, and diabetes. He is only able to walk around the house, but without cardiac symptoms. Exam shows apical murmur and clear lungs. EKG shows sinus rhythm & non-specific ST changes.

Does he need a stress test?

A) Yes

B) No

When Would I Do Stress Test

"It's not looking good. His pulse is up to 202 just from getting out of the chair and stepping on to the treadmill."

- Symptoms of cardiac disease AND non-urgent surgery
- MACE risk ≥1%, poor functional capacity, elective surgery AND clear plan for how results will be used

When Would I NOT Stress Test

- Coronary evaluation within past year AND no cardiac symptoms since
  - ✓ Coronary angiography without significant obstructive CAD
  - ✓ Coronary CT angio without significant obstructive CAD
  - ✓ Stress test with no ischemia
- Coronary revascularization within past year AND no cardiac symptoms since

Exercise Stress Testing for Ischemia and Functional Capacity

Reasonable: Class IIa-B

- To forego further exercise testing with cardiac imaging and proceed to surgery in patient with elevated risk and excellent functional capacity (>10 METs)

May be Considered: Class IIb-B

- For patients with elevated risk and unknown functional capacity or poor (<4 METs), if it will change management
- To forego for patients with elevated risk and moderate to good FC (4-10 METs)

Exercise Stress Testing for Ischemia and Functional Capacity

No Benefit: Class III

- Routine screening with noninvasive stress testing for patient at low risk for noncardiac surgery

Exercise or Pharmacological Stress Test?

Choice of stress:

- Patient's ability to exercise
- Baseline EKG (i.e. BBB or paced)

Choice of drug:

- Adenosine and Dipyridamole cause bronchospasm, transient AV block, hypotension, and are inhibited by xanthine use
- Dobutamine causes elevated BP and/or HR, increasing ischemia, and is inhibited by beta-blocker
- Regadenoson is contraindicated in high grade AV block or sinus node dysfunction

Indications for Preoperative Coronary Angiogram

No Benefit: Class III-C

- Routine preoperative screening
- Consider only if it will change management & elevated risk surgery
- Indication is the same as non-preoperative setting

Some Considerations if Abnormal:

- Will delay from PCI or CABG increase risk of surgical condition?
- Can surgery be done safely with anti-platelet therapy?

Perioperative Percutaneous Coronary Intervention (PCI)

- Indications are the same as for nonsurgical patients

–Symptomatic

–Asymptomatic

✓ Left main ≥50% stenosis

✓ LAD ≥70% stenosis with severe ischemia on stress testing

✓ ≥70% stenosis in 3 major coronary vessels

✓ ≥70% stenosis in 2 major coronary vessels with severe ischemia on stress testing

- For these indications, intervention reduces mortality in the general setting

Perioperative Therapy

Timing of Elective Non Cardiac Surgery after PCI

- **Class I:**

Elective noncardiac surgery should be delayed:

- ✓ 14 days after balloon angioplasty
- ✓ 30 days after BMS implantation
- ✓ 365 days after drug-eluting stent (DES)implantation

- **Class IIa**

When noncardiac surgery is required:

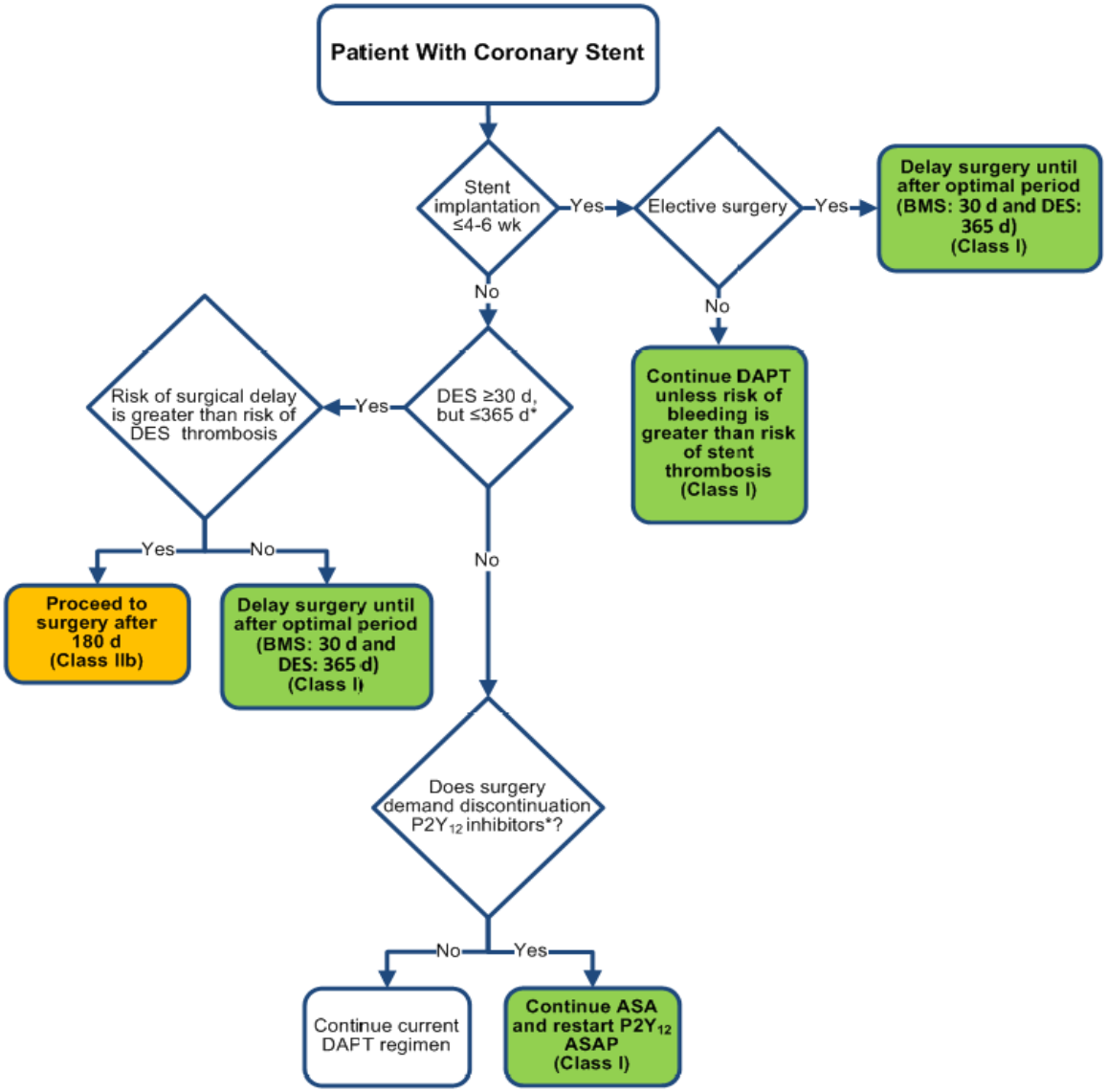
A consensus decision among treating clinicians as to the relative risks of surgery and discontinuation or continuation of antiplatelet therapy can be useful.

- **Class IIb**

Elective noncardiac surgery after drug eluting stent implantation may be considered:

- ✓ After 180 days if the risk of further delay is greater than risks of ischemia and stent thrombosis

Antiplatelet Management



Antiplatelet Management

- When possible and especially when surgery is necessary prior to optimal delay, continue dual antiplatelet therapy (DAPT) through surgery

- When continuing DAPT is not possible, continue aspirin (81 mg) through surgery

Perioperative Beta-Blocker Therapy

Class I-B:

May be safely continued if tolerated as chronic therapy

Class IIa-B:

- May be continued postoperatively if clinically safe (SBP>100, HR>55, no acute anemia or Hgb >10)

Class IIb-B:

- ≥3 RCRI Criteria
- <3 RCRI with primary long-term indication (CAD, HF, HTN)
- Start >1 day preoperatively

Class IIb-C:

- Intermediate-high risk ischemia seen on preoperative testing

Class III-B:

- Do not initiate on day of surgery

Indications for Perioperative Statin

Class I-B:

- Continue if chronically using

Class IIb-C:

- Consider initiating if undergoing high risk procedure with clinical indications for per GDMT

Class IIa-B:

- Initiate for vascular surgery

Indications for perioperative ACEI

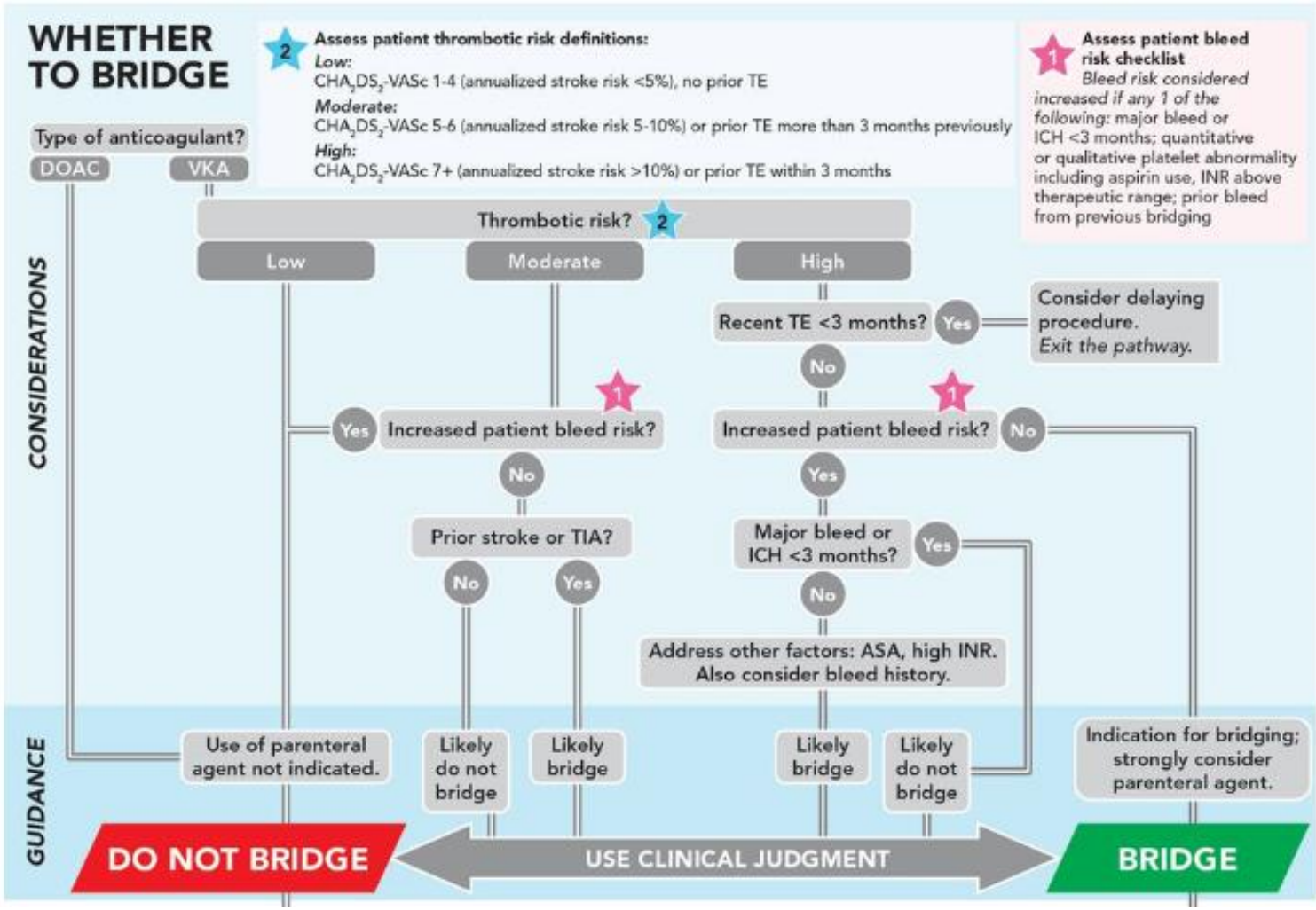
Class II A-B

- Continuation of Angiotensin converting enzyme inhibitors (ACEI) or angiotensin receptor blockers (ARB) perioperatively is reasonable

Class II A-C

- If ACEI/ARB are held before surgery, it is reasonable to restart as soon as clinically feasible post operatively

Bridging Anticoagulation



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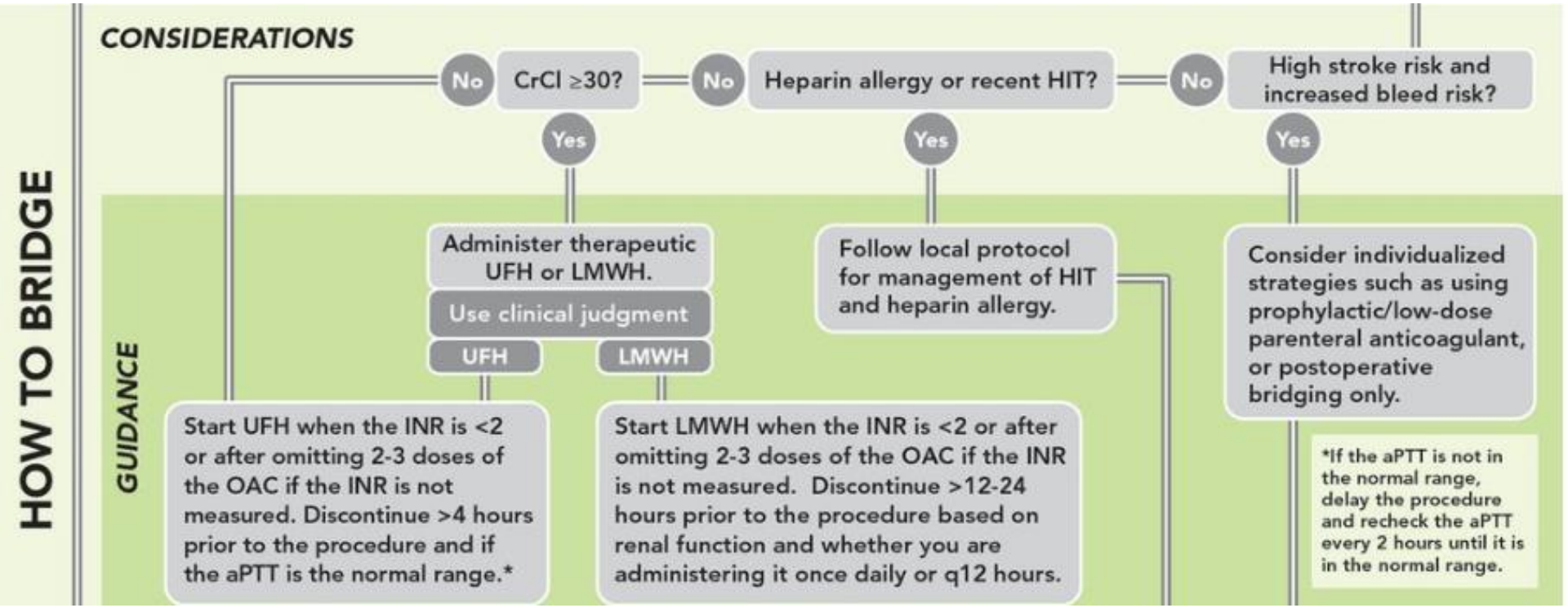

Perioperative Surveillance

Class I:

- Measurement of troponin levels is recommended in the setting of signs or symptoms suggestive of myocardial ischemia or MI.

- Obtaining an ECG is recommended in the setting of signs or symptoms suggestive of myocardial ischemia, MI, or arrhythmia.

Class IIb:

- The usefulness of postoperative screening with ECGs in patients at high risk for perioperative MI, but without signs or symptoms suggestive of myocardial ischemia, MI, or arrhythmia, is uncertain in the absence of established risks and benefits of a defined management strategy

Class III:

- Routine postoperative screening with troponin levels in unselected patients without signs or symptoms suggestive of myocardial ischemia or MI is not useful for guiding perioperative management

A 57-year-old during preop for THR mentions increasing angina. Stress test is positive; he then undergoes placement of a drug-eluting stent in his RCA. When should his elective total hip replacement be rescheduled?

A. In 4-6 weeks
B. In 3 months
C. In 6 months
D. In 1 year

57 year old woman is scheduled to undergo a laparoscopic cholecystectomy tomorrow. She has a h/o IDDM-2, also taking metformin, with good glucose control, and a resting heart rate of 60bpm. She walks 1 mile daily without any problem. Which of the following is the best recommendation for her pre-operatively?

A. Proceed to surgery
B. Begin beta-blockade, titrating to effect
C. Order a cardiac stress test
D. Consult cardiology for angiography

Which of the following valvular lesions carries the greatest risk of postoperative cardiac complications ?

A. Severe Mitral Regurgitation
B. Severe Aortic Stenosis
C. Severe Pulmonary Stenosis
D. Severe Tricuspid Regurgitation
E. All equally confer high risk because in severe category

Summary

- Evaluate urgency of surgery
- Evaluate for unstable cardiac conditions: ACS, recent MI, ADHF, moderate-severe valvular disease, significant arrhythmias
- Use RCRI criteria
- If elevated risk, are METS $\geq$4?
- If not, stress test if it changes Management
- Medically optimize the patient

Did a preop today

Didn’t use the word “clearance”