The Consultant's Job…

Cardiac Pre-Operative Evaluation

ACC 2014 Guidelines

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September 8, 2017

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KPN Heart & Vascular

Objectives of Conference

- Understand “Cardiac Clearance” for noncardiac surgery
- Apply Guidelines for pre-operative evaluation
- Who needs a stress test?
- Who needs a cath?
- Who can go to surgery?

Case #1

65 year old female for pre-op eval for knee replacement

- HTN, HLP, DM, Obesity
- No known CAD or CHF
- Takes several daily 15 minute walks, although recently more limited due to knee pain
- Normal physical exam otherwise

Pre-Op Cardiac Evaluation
Potentially many facets

- Coronary atherosclerosis
  - Myocardial ischemia
- Heart failure
  - Systolic
  - Diastolic
- Arrhythmia
  - Chronic
  - Pacemaker/ICD
  - Peri-operative
- Valvular disease
- Anticoagulation & Antiplatelet issues
- Congenital heart disease

Why assess patients pre-operatively?

- Identify patients at risk for cardiac complications peri-operatively
  - Myocardial infarction
  - Arrhythmia
  - CHF
- Intervene to reduce the cardiac risk

Why assess patients pre-operatively? CAD

- Peri-op MI poses risk for mortality
  - 15,133 patients >50 years old having noncardiac surgery requiring overnight hospital stay
    - 11.6% had an isolated peak troponin T value of ≥0.02ng/mL
    - 1.9% (95% CI 1.9-2.1%) 30-day mortality rate with elevated troponin T values

Devereaux PJ, Chan MT, Alonso-Coello P, et al. Association between postoperative troponin levels and 30-day mortality among patients under-going noncardiac surgery. JAMA. 2012;307:2295–304

Why assess patients pre-operatively? CHF

- CHF is worse than CAD
  - Cohort study of 38,047 consecutive patients
  - 30-day postoperative **mortality** rate for patients with history of cardiac risk factors
    - 9.3% nonischemic HF
    - 9.2% ischemic HF
    - 6.4% atrial fibrillation (AF)
    - 2.9% CAD

Van Diepen S., Bakal JA, McAlister FA, et al. Mortality and readmission of patients with heart failure, atrial fibrillation, or coronary artery disease undergoing noncardiac surgery: an analysis of 38 047 patients. Circulation. 2011;124:289–96.

The Old Ways of Pre-op Eval

- 1947 – Dripps; assigned physical class to patients prior to anesthesia
  - 1. A healthy patient.
  - 2. A patient with mild systemic disease.
  - 3. A patient with a severe systemic disease that limits activity, but is not incapacitating.
  - 4. A patient with an incapacitating systemic disease that is a constant threat to life.
  - 5. A moribund patient who is not expected to survive 24 hours with or without an operation.

  - Note: In the event of an emergency operation, precede the number with an E.

1977 Goldman

Criterion	Points
History	
Age>70	5
MI in past 6 months	10
Physical Exam	
3rd Heart sound or JVD	11
Important Aortic stenosis	3
EKG	
Rhythm other than sinus or PAC's	7
>5 PVC's per minute at any time	7
General status	
Hypoxia, renal failure, LFT abnormality	3
Operation	
Intraperitoneal, aortic, or intrathoracic	3
Emergency	4
Total	53

1986 Detsky

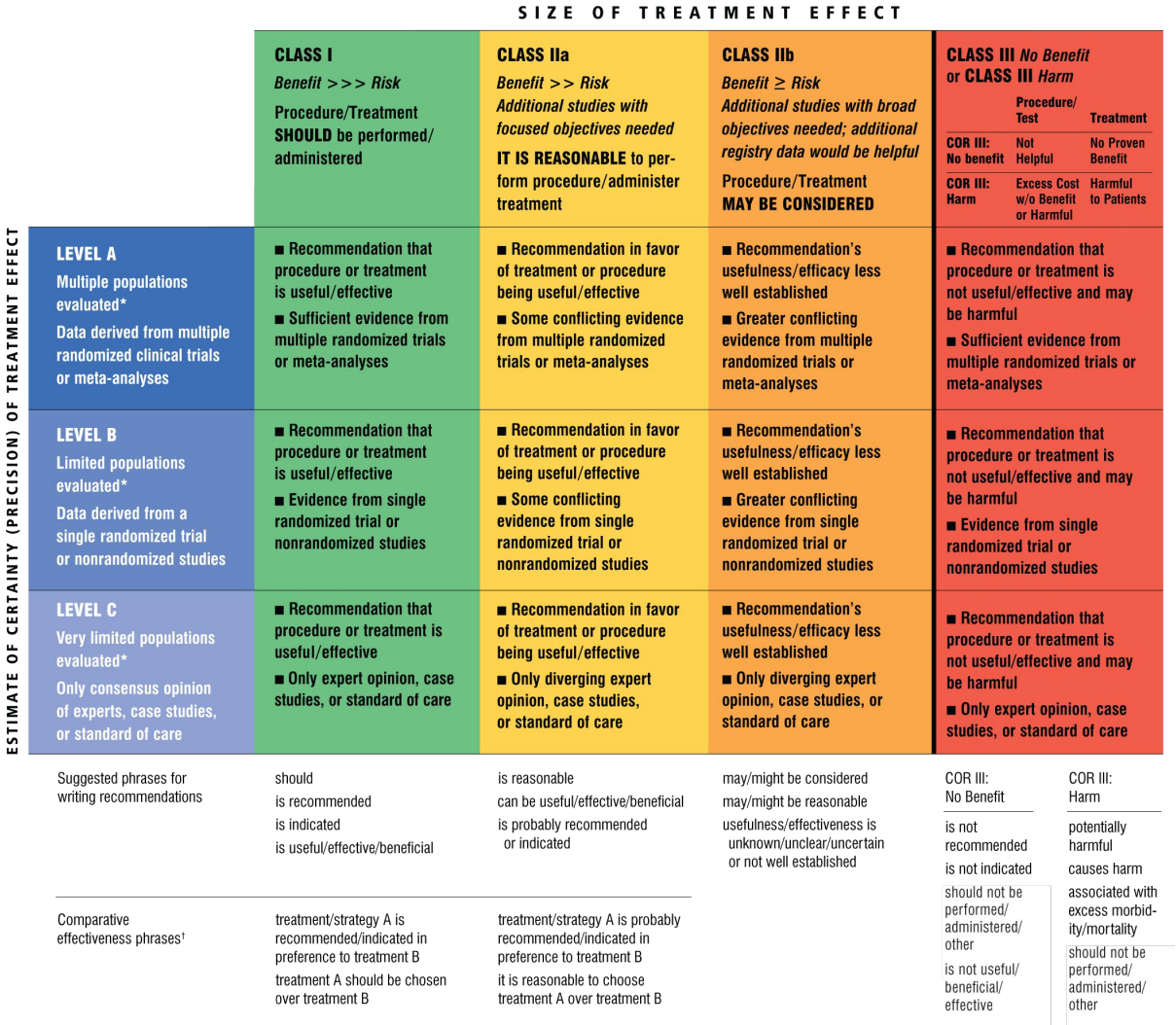
- Modified Goldman
- Even more complicated than Goldman

ACC Guidelines

- 2002
  - Stepwise evaluation of patient
  - Simplified decision making
- 2007, 2014
  - Even simpler decision making

Fleisher LA, Beckman JA, Brown KA, Calkins H, Chaikof E, Fleischmann KE, Freeman WK, Froehlich JB, Kasper EK, Kersten JR, Riegel B, Robb JF. ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). J Am Coll Cardiol 2007;50:1707–32.

Applying Classification of Recommendations and Levels of Evidence



SIZE OF TREATMENT EFFECT

ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT

	CLASS I *Benefit >>> Risk* Procedure/Treatment **SHOULD** be performed/ administered	CLASS IIa *Benefit >> Risk* *Additional studies with focused objectives needed* **IT IS REASONABLE** to perform procedure/administer treatment	CLASS IIb *Benefit ≥ Risk* *Additional studies with broad objectives needed; additional registry data would be helpful* Procedure/Treatment **MAY BE CONSIDERED**	CLASS III *No Benefit* or CLASS III *Harm* COR III: No benefit — Procedure/Test: Not Helpful — Treatment: No Proven Benefit COR III: Harm — Procedure/Test: Excess Cost w/o Benefit or Harmful — Treatment: Harmful to Patients
LEVEL A Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	■ Recommendation that procedure or treatment is useful/effective ■ Sufficient evidence from multiple randomized trials or meta-analyses	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Sufficient evidence from multiple randomized trials or meta-analyses
LEVEL B Limited populations evaluated* Data derived from a single randomized trial or nonrandomized studies	■ Recommendation that procedure or treatment is useful/effective ■ Evidence from single randomized trial or nonrandomized studies	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Evidence from single randomized trial or nonrandomized studies
LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	■ Recommendation that procedure or treatment is useful/effective ■ Only expert opinion, case studies, or standard of care	■ Recommendation in favor of treatment or procedure being useful/effective ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation's usefulness/efficacy less well established ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Only expert opinion, case studies, or standard of care
Suggested phrases for writing recommendations	should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	COR III: No Benefit is not recommended is not indicated should not be performed/ administered/ other is not useful/ beneficial/ effective COR III: Harm potentially harmful causes harm associated with excess morbidity/mortality should not be performed/ administered/ other
Comparative effectiveness phrases†	treatment/strategy A is recommended/indicated in preference to treatment B treatment A should be chosen over treatment B	treatment/strategy A is probably recommended/indicated in preference to treatment B it is reasonable to choose treatment A over treatment B		

A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Although randomized trials are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

*Data available from clinical trials or registries about the usefulness/ efficacy in different subpopulations, such as sex, age, history of diabetes, history of prior myocardial infarction, history of heart failure, and prior aspirin use.

†For comparative effectiveness recommendations (Class I and IIa; Level of Evidence A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

Guideline Recommendations

- Strength of Recommendations
  - Class 1 - Should be done
  - Class 2A - Reasonable to be done
  - Class 2B - May be considered
  - Class 3 - No benefit, or Harm
- Level of Evidence
  - Level A - multiple RCT's or meta-analysis
  - Level B - Single RCT or nonrandomized trials
  - Level C - Expert consensus, case studies, "Standard of Care"

History & Physical

- History
  - What surgery?
  - Cardiac history and risk factors
- Physical
  - Neck – JVD, carotid bruits
  - Heart - 3rd or 4th heart sound, rhythm
  - Lungs – crackles
  - Extremities – edema, pulses

Clinical Risk Factors:

High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

Conditions requiring further investigation

Table 2. Active Cardiac Conditions for Which the Patient Should Undergo Evaluation and Treatment Before Noncardiac Surgery (Class I, Level of Evidence: B)

Condition	Examples
Unstable coronary syndromes	Unstable or severe angina* (CCS class III or IV)†
	Recent MI‡
Decompensated HF (NYHA functional class IV; worsening or new-onset HF)	
Significant arrhythmias	High-grade atrioventricular block
	Mobitz II atrioventricular block
	Third-degree atrioventricular heart block
	Symptomatic ventricular arrhythmias
	Supraventricular arrhythmias (including atrial fibrillation) with uncontrolled ventricular rate (HR greater than 100 beats per minute at rest)
	Symptomatic bradycardia
	Newly recognized ventricular tachycardia
Severe valvular disease	Severe aortic stenosis (mean pressure gradient greater than 40 mm Hg, aortic valve area less than 1.0 cm^2, or symptomatic)
	Symptomatic mitral stenosis (progressive dyspnea on exertion, exertional presyncope, or HF)

*According to Campeau (9).

†May include "stable" angina in patients who are unusually sedentary.

‡The American College of Cardiology National Database Library defines recent MI as more than 7 days but less than or equal to 1 month (within 30 days).

CCS indicates Canadian Cardiovascular Society; HF, heart failure; HR, heart rate; MI, myocardial infarction; NYHA, New York Heart Association.

Risk of Surgical Procedure

Table 4. Cardiac Risk* Stratification for Noncardiac Surgical Procedures

Risk Stratification	Procedure Examples
Vascular (reported cardiac risk often more than 5%)	Aortic and other major vascular surgery
	Peripheral vascular surgery
Intermediate (reported cardiac risk generally 1% to 5%)	Intraperitoneal and intrathoracic surgery
	Carotid endarterectomy
	Head and neck surgery
	Orthopedic surgery
	Prostate surgery
Low† (reported cardiac risk generally less than 1%)	Endoscopic procedures
	Superficial procedure
	Cataract surgery
	Breast surgery
	Ambulatory surgery

*Combined incidence of cardiac death and nonfatal myocardial infarction.
†These procedures do not generally require further preoperative cardiac testing.

Routine Pre-op EKG?

- A routine pre-operative EKG is generally recommended (Class 1 or 2a) in pt with
  - No clinical risk factors for cholecystectomy
  - 1 clinical risk factor for breast biopsy
  - Known CAD for thoracic surgery
  - History of Stroke for cataract surgery

Routine Pre-op EKG?

- A routine pre-operative EKG is generally recommended (Class 1 or 2a) in pt with
  - No clinical risk factors for cholecystectomy
  - 1 clinical risk factor for breast biopsy
  - Known CAD for thoracic surgery
  - History of Stroke for cataract surgery

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.	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

Routine Pre-op EKG

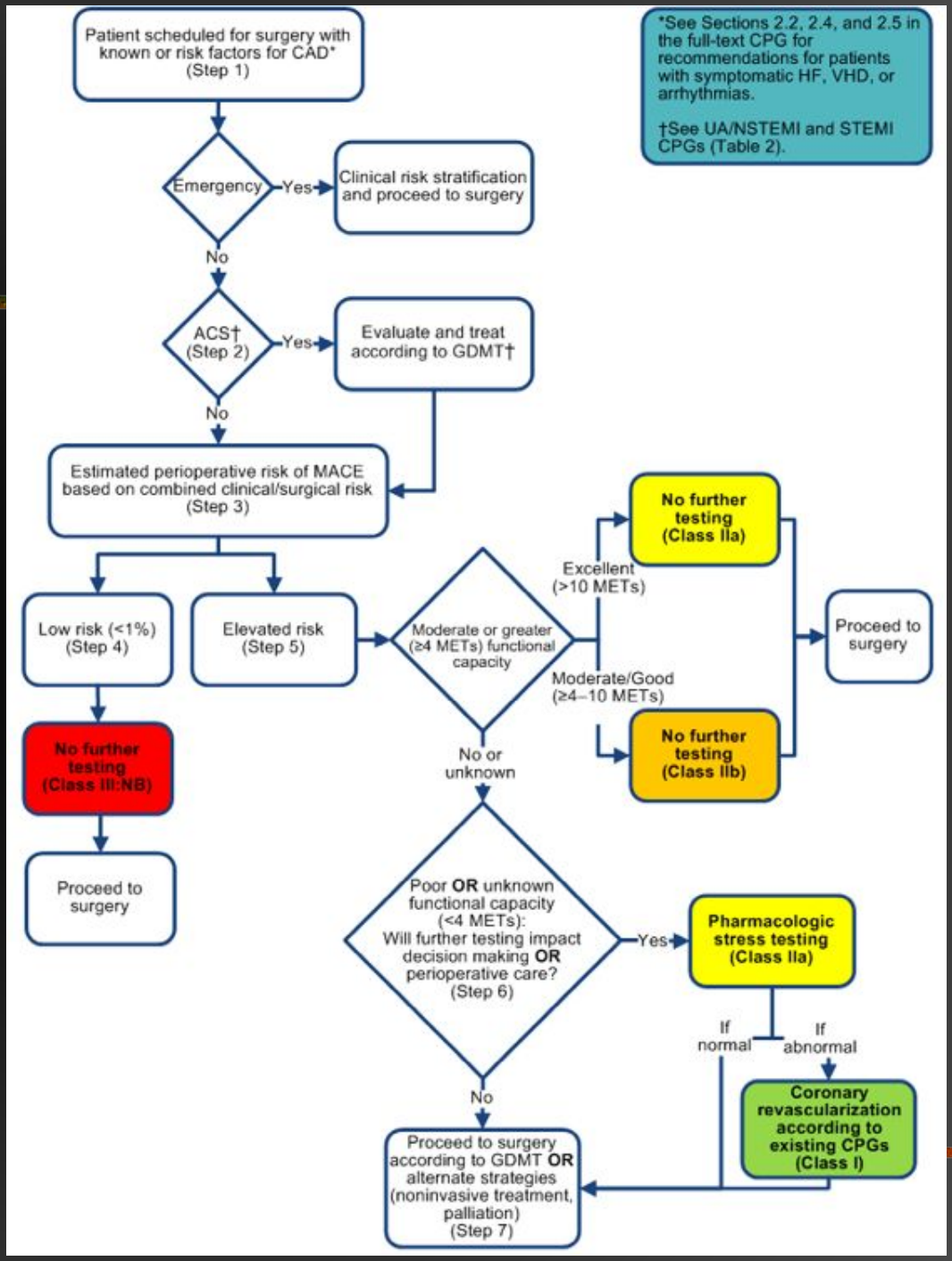
- Class 2A
  - EKG reasonable for intermediate or high risk surgeries with
    - Known CAD
    - Significant arrhythmia
    - Cerebrovascular disease
  - Other significant structural heart disease
- Class 2B
  - Consider EKG except for low risk surgery
- Class 3
  - Routine EKG not recommended for low risk surgery

Case #1

65 year old female for pre-op eval for knee replacement

- HTN, HLP, DM, Obesity
- No known CAD or CHF
- Takes several daily 15 minute walks, although recently more limited due to knee pain
- Normal physical exam otherwise
- **EKG - Class 2B recommendation**

2014 ACC Guidelines



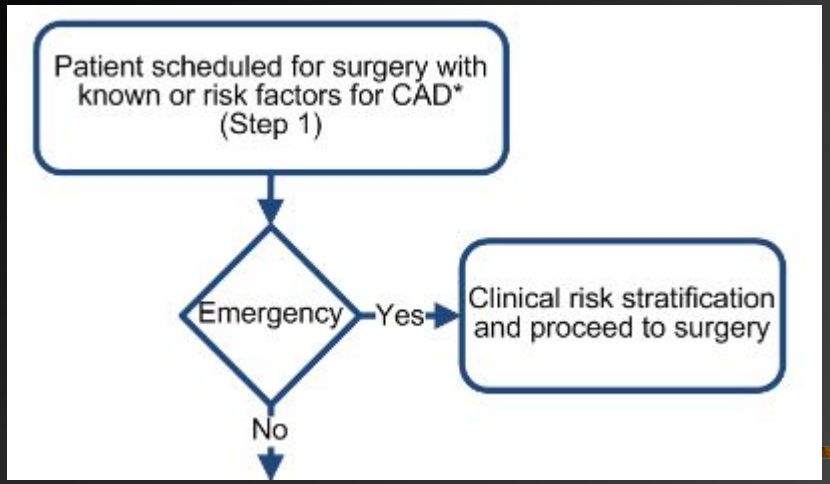
Case #2

85 year old female for pre-op eval for hip fracture after mechanical fall

- Heart murmur; echo shows severe Aortic Stenosis
- HTN
- No known CAD or CHF
- Low physical function level, but no chest pain, unusual shortness of breath, syncope
  - Was able to walk with walker down the hall at ECF
- Physical Exam otherwise unremarkable

Step 1

- Identify patients with symptomatic
  - Congestive Heart Failure
  - Valvular Heart Disease
  - Arrhythmia
- Is this emergency surgery?
  - If yes, go to the OR



Clinical Risk Factors

Valvular Heart Disease

Recommendations	COR	LOE
It is recommended that patients with clinically suspected moderate or greater degrees of valvular stenosis or regurgitation undergo preoperative echocardiography if there has been either 1) no prior echocardiography within 1 year or 2) a significant change in clinical status or physical examination since last evaluation.	I	C
For adults who meet standard indications for valvular intervention (replacement and repair) on the basis of symptoms and severity of stenosis or regurgitation, valvular intervention before elective noncardiac surgery is effective in reducing perioperative risk.	I	C

Clinical Risk Factors

Aortic Stenosis

Recommendation	COR	LOE
Elevated-risk elective noncardiac surgery with appropriate intraoperative and postoperative hemodynamic monitoring is reasonable to perform in patients with asymptomatic severe AS.	IIa	B

Mitral Stenosis

Recommendation	COR	LOE
Elevated-risk elective noncardiac surgery using appropriate intraoperative and postoperative hemodynamic monitoring may be reasonable in asymptomatic patients with severe mitral stenosis if valve morphology is not favorable for percutaneous mitral balloon commissurotomy.	IIb	C

Clinical Risk Factors

Aortic and Mitral Regurgitation

Recommendations	COR	LOE
Elevated-risk elective noncardiac surgery with appropriate intraoperative and postoperative hemodynamic monitoring is reasonable in adults with asymptomatic severe MR.	IIa	C
Elevated-risk elective noncardiac surgery with appropriate intraoperative and postoperative hemodynamic monitoring is reasonable in adults with asymptomatic severe AR and a normal LVEF.	IIa	C

Significant Valvular Disease Aortic/Mitral Stenosis/Regurgitation

- Class 1 Recommendations
  - For moderate or worse stenosis/regurgitation
    - Echocardiogram If no echo in 1 year or there has been a change in clinical status in past year
  - If patient meets usual indications for valve intervention, do it prior to surgery

Severe Valve Stenosis

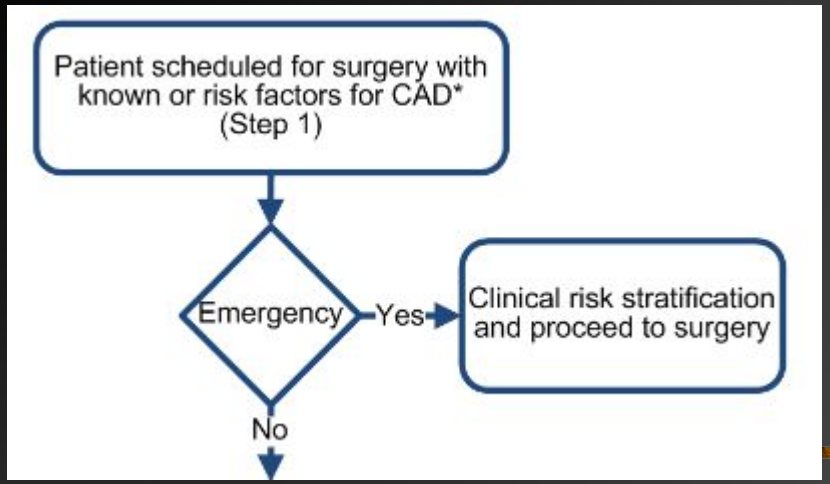
- Aortic Stenosis
  - Class 2A - ok to proceed with surgery (with appropriate monitoring) for asymptomatic severe AS
- Mitral Stenosis
  - Class 2B - If not amenable to balloon valvuloplssty, ok to proceed with surgery
- These are increased risk procedures!

Severe Aortic and Mitral Regurgitation

- Class 2A - ok to proceed to surgery if asymptomatic (and normal EF for AR)

Step 1

- Identify patients with symptomatic
  - Congestive Heart Failure
  - Valvular Heart Disease
  - Arrhythmia
- Is this emergency surgery?
  - If yes, go to the OR



Case #2

85 year old female for pre-op eval for hip fracture after mechanical fall

- Heart murmur; echo shows severe Aortic Stenosis
- HTN
- No known CAD or CHF
- Low physical function level, but no chest pain, unusual shortness of breath, syncope
  - Was able to walk with walker down the hall at ECF
- Physical Exam otherwise unremarkable
- **Class 2A - Reasonable to proceed to surgery at increased cardiac risk**

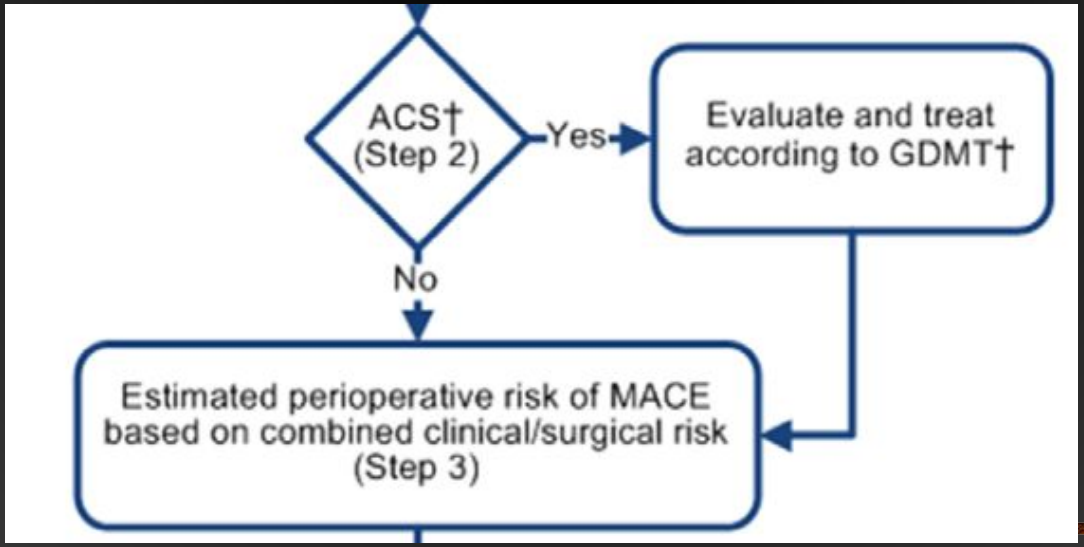
Case #3

55 year old male pre-op for routine endoscopy

- HTN, HLP
- Family history of CAD
- Physical exam unremarkable

Step 2

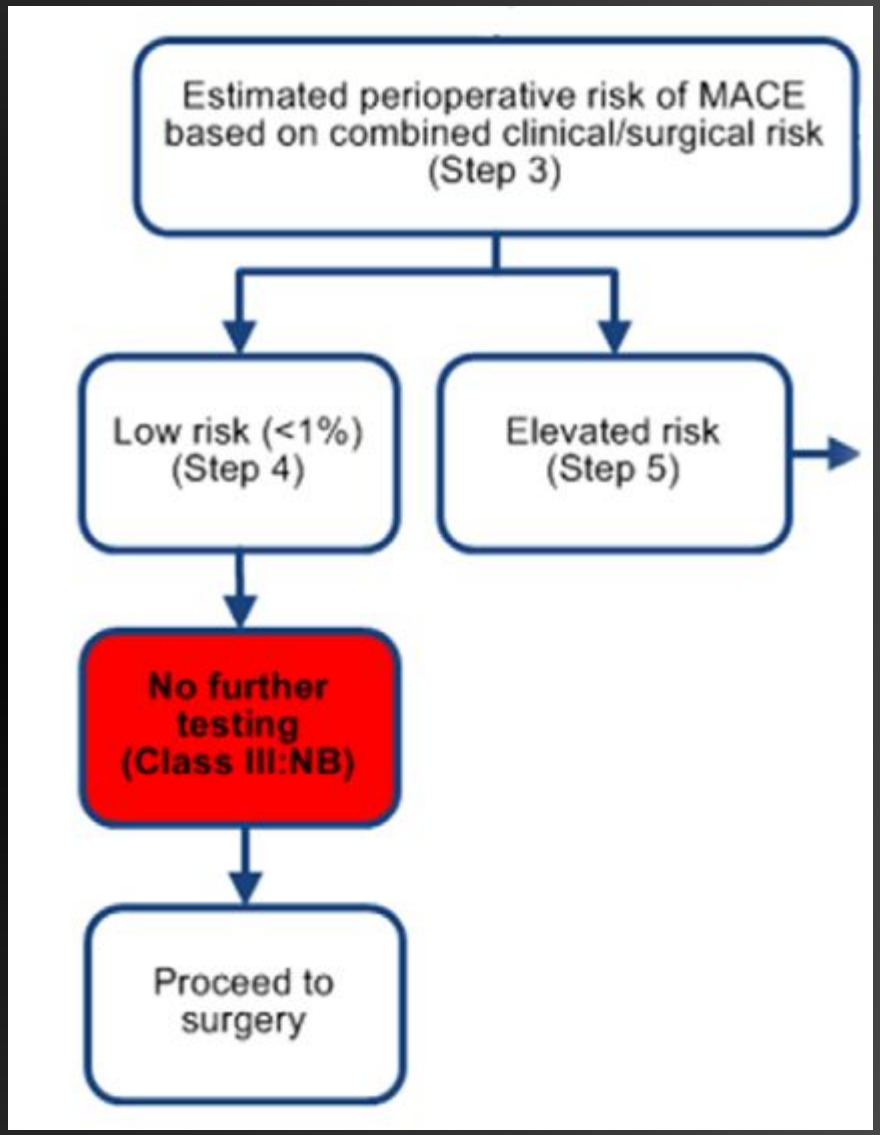
- Is there an acute coronary syndrome?
  - Unstable Angina
  - STEMI
  - Non-STEMI



Step 3/4

- Is this low risk?
  - RCRI 0 or 1
    - Proceed to Surgery

- Alternative risk calculators
- American College of Surgeons NSQIP MICA
- American College of Surgeons NSQIP Surgical Risk Calculator



Revised Cardiac Risk Index RCRI

- 4315 Patients >50 years old undergoing elective non-cardiac surgery
  - 2893 assigned to derivation cohort
    - 56 (2%) had major cardiac complication
  - 6 risk factors identified
    - high-risk type of surgery
    - history of ischemic heart disease
    - history of congestive heart failure
    - history of cerebrovascular disease
    - preoperative treatment with insulin
    - preoperative serum creatinine >2.0 mg/dL

Lee TH, Marcantonio ER, Mangione CM, et al. Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. Circulation 1999;100:1043–9. doi:10.1161/01.CIR.100.10.1043

Revised Cardiac Risk Index RCRI

- Risk of Major cardiac complications based on RCRI Score
  - Myocardial infarction
  - Pulmonary edema
  - Ventricular fibrillation or primary cardiac arrest
  - Complete heart block

High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

	Derivation Cohort (2893)	Validation Cohort (1422)
0	0.5%	0.4%
1	1.3%	0.9%
2	4%	7%
3 or more	9%	9%

Lee TH, Marcantonio ER, Mangione CM, et al. Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. Circulation 1999;100:1043–9. doi:10.1161/01.CIR.100.10.1043

Case #3

55 year old male pre-op for routine endoscopy

- HTN, HLP
- Family history of CAD
- Physical exam unremarkable
- **Low risk procedure without active cardiac condition (RCRI = 0) - proceed to surgery**

Clinical Risk Factors:

High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

Case #4

Clinical Risk Factors:

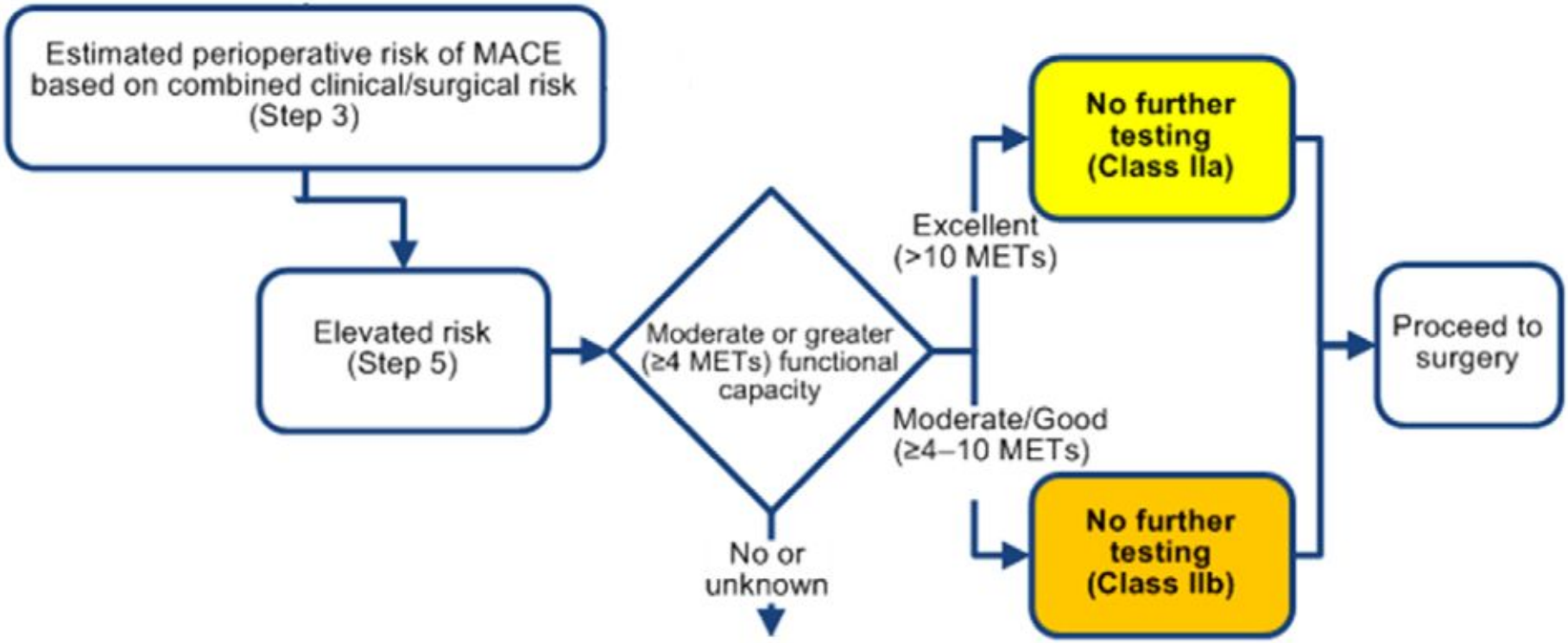
High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

60 year old male pre-op for cholecystecomy

- Coronary stent 2 years ago for unstable angina
- Class 1 compensated diastolic CHF
- HTN, HLP
- Physical exam unremarkable
- Exercises on treadmill 4 times a week, 20 minutes at a time (3.5mpH) without Chest pain or shortness of breath

Step 5

If Functional Status is good (>=4 METS), go to OR



Assessing Activity Level
Duke Activity Score Index (DASI)

Table 4. 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

Duke Activity Status Index

(DASI) = sum of “Yes” replies

VO2peak = (0.43 x DASI) + 9.6

VO2peak ÷ 3.5 ml/kg/min = METS

Assessing Activity Level

	CAN YOU ...
1 MET	Take care of yourself? Eat, dress, or use the toilet? Walk indoors around the house? Walk a block or two on level ground at 2-3 mph (3.2-4.8 kph)?
4 METs	Do light work around the house such as dusting or washing dishes? Climb a flight of stairs or walk up a hill? Walk on level ground at 4 mph (6.4 kph)? Run a short distance? Do heavy work around the house such as scrubbing floors or lifting or moving heavy furniture? Participate in moderate recreational activities such as golf, bowling, dancing, doubles tennis, or throwing a baseball or football?
>10 METs	Participate in strenuous sports such as swimming, singles tennis, football, basketball, or skiing?

Braunwald 10th ed

Case #5

Clinical Risk Factors:

High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

60 year old male pre-op for cholecystecomy

- Coronary stent 2 years ago for unstable angina
- Class 1 compensated diastolic CHF
- HTN, HLP
- Physical exam unremarkable
- Exercises on treadmill 4 times a week, 20 minutes at a time (3.5mpH) without Chest pain or shortness of breath
- **RCRI = 2, but moderate/good functional status. Proceed to surgery**

Case #6

80 year old female pre-op for lower extremity bypass

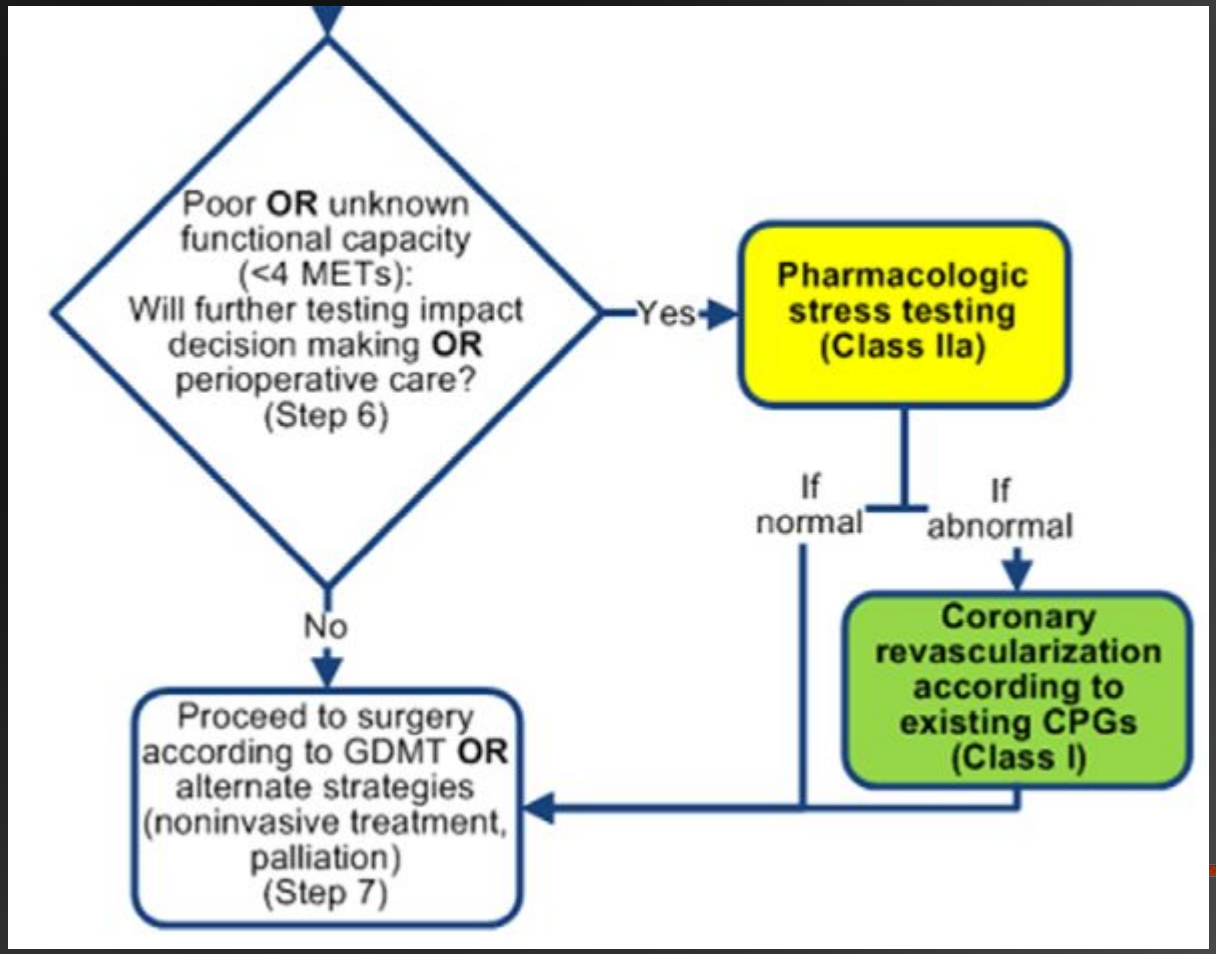
- Severe peripheral vascular disease
- Active smoking
- Coronary stent 2 years ago for NSTEMI
- Diabetes on Insulin
- History of TIA 5 years ago
- Low level of function
- No active chest pain
- Chronic Shortness of breath (COPD)

Clinical Risk Factors:

High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

Step 6/7

- Poor or Unknown METS with risk >1%
- Will Stress testing change your management?



Coronary Revascularization Prior to Noncardiac Surgery

Recommendations	COR	LOE
Revascularization before noncardiac surgery is recommended in circumstances in which revascularization is indicated according to existing CPGs.	I	C
It is not recommended that routine coronary revascularization be performed before noncardiac surgery exclusively to reduce perioperative cardiac events.	III: No Benefit	B

Revascularization Prior to Elective Non-Cardiac Surgery

- If indicated, CABG should be done prior to elective non-cardiac surgery
- PCI before noncardiac surgery
  - Patients with left main disease whose comorbidities preclude bypass surgery without undue risk
  - Patients with unstable CAD who would be appropriate candidates for emergency or urgent revascularization
    - Consider Balloon Angioplasty or Bare-Metal Stent

Timing of Elective Noncardiac Surgery in Patients With Previous PCI

Recommendations	COR	LOE
Elective noncardiac surgery should be delayed 14 days after balloon angioplasty…	I	C
…and 30 days after BMS implantation	I	B
Elective noncardiac surgery should optimally be delayed 365 days after DES implantation.	I	B
In patients in whom 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.	IIa	C

Timing of Elective Noncardiac Surgery in Patients With Previous PCI (cont'd)

Recommendations	COR	LOE
Elective noncardiac surgery after DES implantation may be considered after 180 days if the risk of further delay is greater than the expected risks of ischemia and stent thrombosis.	IIb*	B
Elective noncardiac surgery should not be performed within 30 days after BMS implantation or within 12 months after DES implantation in patients in whom DAPT will need to be discontinued perioperatively.	III: Harm	B
Elective noncardiac surgery should not be performed within 14 days of balloon angioplasty in patients in whom aspirin will need to be discontinued perioperatively.	III: Harm	C

*Because of new evidence, this is a new recommendation since the publication of the 2011 PCI CPG

Timing of Surgery After Revascularization

- Class 1
  - 14 Days after Balloon Angioplasty
  - 30 Days after Bare Metal Stent
  - 365 Days (Optimally) after Drug Eluting Stent
- Class 2b
  - 180 days after DES if waiting would increase risk

Case #6

80 year old female pre-op for lower extremity bypass

- Severe peripheral vascular disease
- Active smoking
- Coronary stent 2 years ago for NSTEMI
- Diabetes on Insulin
- History of TIA 5 years ago
- Low level of function
- No active chest pain
- Chronic Shortness of breath (COPD)
- **Would stress testing change your management????**

Clinical Risk Factors:

High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

Case #7

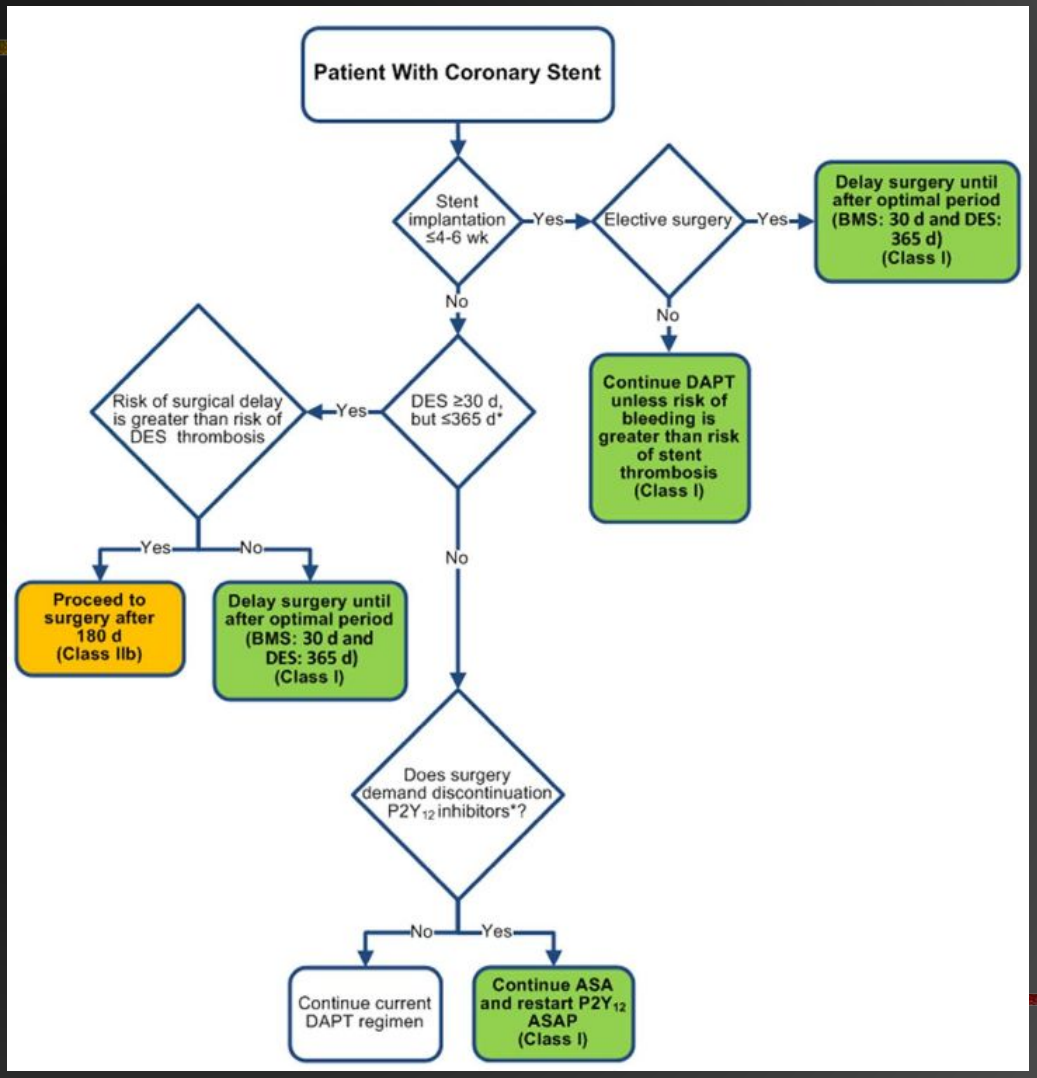
60 year old male pre-op cholecystecomy

- Drug eluting stent 6 months ago for NSTEMI
- Smoker, quit 6 months ago
- HTN, HLP
- Has been on Aspirin & Clopidogrel since stent
- Good functional capacity, no angina

Clinical Risk Factors:

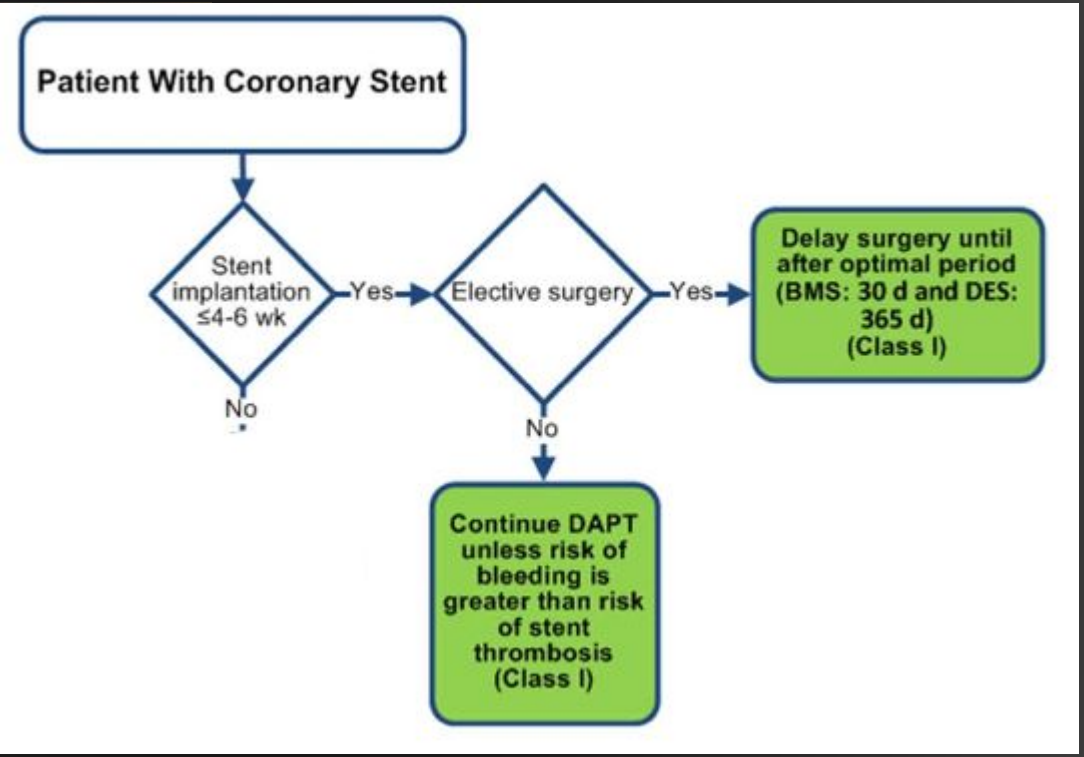
High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

How do I manage a patient who just had a stent?



Stent less than 4-6 weeks ago?

- Prefer to delay surgery
- If unable to delay, then prefer to continue DAPT



Perioperative Therapy

Antiplatelet Agents

Recommendations	COR	LOE
In patients undergoing urgent noncardiac surgery during the first 4 to 6 weeks after BMS or DES implantation, DAPT should be continued unless the relative risk of bleeding outweighs the benefit of the prevention of stent thrombosis.	I	C
In patients who have received coronary stents and must undergo surgical procedures that mandate the discontinuation of $P2Y_{12}$ platelet receptor–inhibitor therapy, it is recommended that aspirin be continued if possible and the $P2Y_{12}$ platelet receptor–inhibitor be restarted as soon as possible after surgery.	I	C
Management of the perioperative antiplatelet therapy should be determined by a consensus of the surgeon, anesthesiologist, cardiologist, and patient, who should weigh the relative risk of bleeding versus prevention of stent thrombosis.	I	C

Antiplatelet Agents (cont'd)

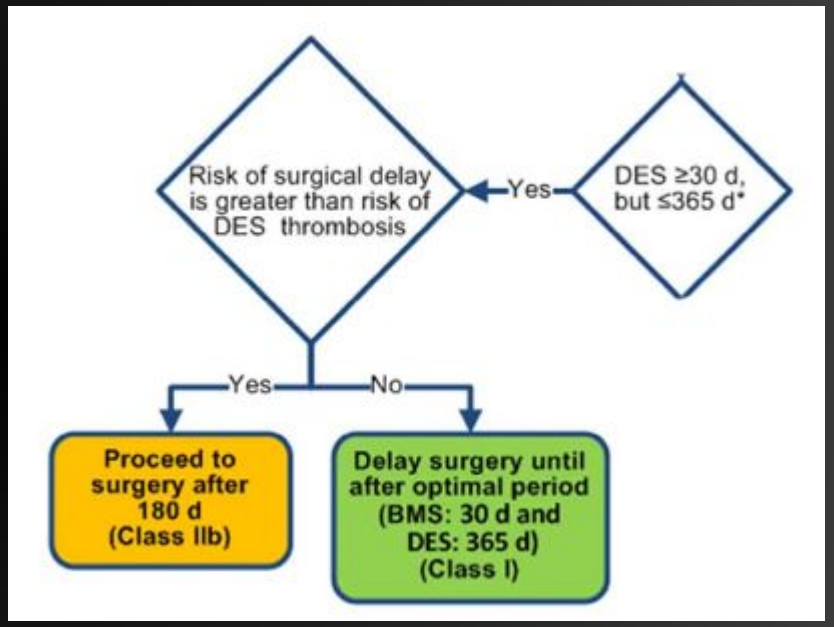
Recommendations	COR	LOE
In patients undergoing nonemergency/nonurgent noncardiac surgery who have not had previous coronary stenting, it may be reasonable to continue aspirin when the risk of potential increased cardiac events outweighs the risk of increased bleeding.	IIb	B
Initiation or continuation of aspirin is not beneficial in patients undergoing elective noncardiac noncarotid surgery who have not had previous coronary stenting,…	III: No Benefit	B
…unless the risk of ischemic events outweighs the risk of surgical bleeding.		C

How do I manage antiplatelets?

- Class 1
  - Continue Dual Antiplatelet Therapy (DAPT) for 4-6 weeks after stent (unless bleeding risk outweighs benefits
  - If $P2Y_{12}$ inhibitor is stopped prior to surgery, restart it ASAP after surgery
- Class 2b
  - In patient without prior stent, continue aspirin peri-operatively if benefit exceeds bleeding risk

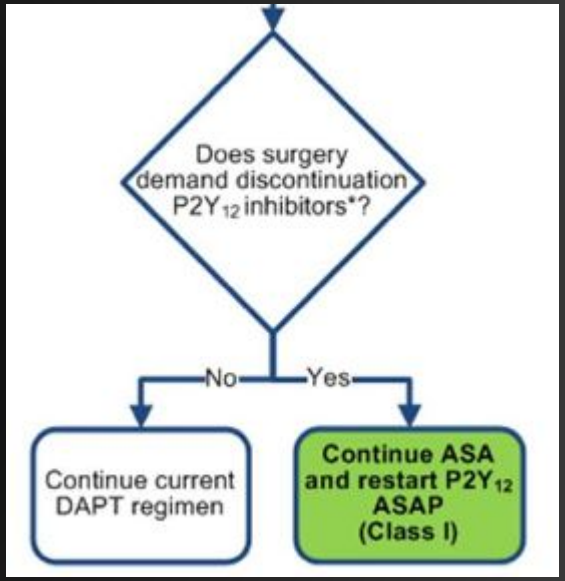
Stent 1 month - 1 year ago?

- Prefer to wait
  - 30 days for BMS
  - 365 days for DES
- OK to proceed after 180 days



Stent over 1 year old?

- If you have to stop $P2Y_{12}$ inhibitor, then continue aspirin and restart it after surgery



Case #7

Clinical Risk Factors:

High-risk surgery
Hx ischemic heart dz
Hx CHF
Hx CVA/TIA
Hx Insulin
Creatinine >2.0 mg/dL

60 year old male pre-op cholecystecomy

- Drug eluting stent 6 months ago for NSTEMI
- Smoker, quit 6 months ago
- HTN, HLP
- Has been on Aspirin & Clopidogrel since stent
- Good functional capacity, no angina
- **Class 2B - OK to proceed with surgery at 180 days**
  - Prefer to continue clopidogrel, but reasonable to hold if bleeding risk is high
  - Continue aspirin peri-operatively

Who gets pre-operative Beta Blocker?

- Which is a Class 1 or 2A situation for pre-operative Beta Blocker?
  - On Beta-Blocker 2 clinical risk factors, for cataract
  - Beta-blocker naïve
    - No known CAD
      - B-blocker naïve, 1 clinical risk factor, for AAA
      - B-blocker naïve, 0 clinical risk factors, for AAA
      - B-blocker naïve, 2 clinical risk factors, for carotid endarterectomy
    - Known CAD (either ischemic or stable) for AAA
    - Known CAD (either ischemic or stable) for gallbladder

Who gets pre-operative Beta Blocker?

- Which is a Class 1 or 2A situation for pre-operative Beta Blocker?
  - On Beta-Blocker 2 clinical risk factors, for cataract (1)
  - Beta-blocker naïve (2B at best)
    - No known CAD
      - B-blocker naïve, 1 clinical risk factor, for AAA
      - B-blocker naïve, 0 clinical risk factors, for AAA
      - B-blocker naïve, 2 clinical risk factors, for carotid endarterectomy
    - Known CAD (either ischemic or stable) for AAA
    - Known CAD (either ischemic or stable) for gallbladder

Peri-operative Beta Blockers Still an Enigma

- Small initial trials (mid 1990's to early 2000's) showed benefit of peri-operative beta blockers
  - Reduced post-op cardiac complications
- Subsequent trials (early/mid 2000's) showed no benefit
- Meta-analysis (2005) suggested harm
- POISE (2008)
  - Beta Blockers reduced cardiac risks
  - But increased other risks
    - Stroke
    - Death from non-cardiac complications

ACC 2014

Devereaux PJ, Yang H, Yusuf S, et al. Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial): a randomized controlled trial. Lancet. 2008;371:1839–47.

Perioperative Therapy

Perioperative Beta-Blocker Therapy

Recommendations	COR	LOE
Beta blockers should be continued in patients undergoing surgery who have been on beta blockers chronically.	I	B^{SR}
It is reasonable for the management of beta blockers after surgery to be guided by clinical circumstances, independent of when the agent was started.	IIa	B^{SR}
In patients with intermediate- or high-risk myocardial ischemia noted in preoperative risk stratification tests, it may be reasonable to begin perioperative beta blockers.	IIb	C^{SR}
In patients with 3 or more RCRI risk factors (e.g., diabetes mellitus, HF, CAD, renal insufficiency, cerebrovascular accident), it may be reasonable to begin beta blockers before surgery.	IIb	B^{SR}

These recommendations have been designated with a SR to emphasize the rigor of support from the ERC's systematic review. See the ERC systematic review report, "Perioperative beta blockade in noncardiac surgery: a systematic review for the 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery" for the complete evidence review on perioperative beta-blocker therapy.

Perioperative Beta-Blocker Therapy (cont'd)

Recommendations	COR	LOE
In patients with a compelling long-term indication for beta-blocker therapy but no other RCRI risk factors, initiating beta blockers in the perioperative setting as an approach to reduce perioperative risk is of uncertain benefit.	IIb	B^{SR}
In patients in whom beta-blocker therapy is initiated, it may be reasonable to begin perioperative beta blockers long enough in advance to assess safety and tolerability, preferably more than 1 day before surgery.	IIb	B^{SR}
Beta-blocker therapy should not be started on the day of surgery.	III: Harm	B^{SR}

These recommendations have been designated with a SR to emphasize the rigor of support from the ERC's systematic review. See the ERC systematic review report, "Perioperative beta blockade in noncardiac surgery: a systematic review for the 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery" for the complete evidence review on perioperative beta-blocker therapy.

Beta Blockers peri-operatively Still an Enigma

- Class 1
  - Continue Beta Blockers in patients already on Beta Blockers
- Class 2A
  - Use beta blockers peri-operatively guided by clinical circumstances
- Class 2B
  - Start Beta Blockers on patients with intermediate or high risk ischemia on pre-operative testing
  - Start Beta Blockers in patients with 3 or more risk factors
  - Start Beta Blockers if there is a compelling long term indication
  - Start Beta Blockers more than 1 day before surgery
- Class 3
  - Don’t start Beta Blockers on the day of surgery

Pre-operative Statin?

- In which patients is a statin recommended (Class 1 or 2A) pre-operatively
  - Already taking a statin, for basal cell removal
  - Statin naïve, 1 clinical risk factor, for gallbladder
  - Statin naïve, for carotid endarterectomy
  - Statin naïve, no clinical risk factors, for colon resection

Pre-operative Statin?

- In which patients is a statin recommended (Class 1 or 2A) pre-operatively
  - Already taking a statin, for basal cell removal
  - Statin naïve, 1 clinical risk factor, for gallbladder (2B recommendation)
  - Statin naïve, for carotid endarterectomy
  - Statin naïve, no clinical risk factors, for colon resection

Perioperative Therapy

Perioperative Statin Therapy

Recommendations	COR	LOE
Statins should be continued in patients currently taking statins and scheduled for noncardiac surgery.	I	B
Perioperative initiation of statin use is reasonable in patients undergoing vascular surgery.	IIa	B
Perioperative initiation of statins may be considered in patients with clinical indications according to GDMT who are undergoing elevated-risk procedures.	IIb	C

Alpha-2 Agonists

Recommendation	COR	LOE
Alpha-2 agonists for prevention of cardiac events are not recommended in patients who are undergoing noncardiac surgery.	III: No Benefit	B

Who gets a Statin?

- Class 1
  - If already on a statin, continue taking it
- Class 2A
  - Initiate statin for patients undergoing vascular surgery
- Class 2B
  - Consider statin if otherwise indicated by guidelines for elevated risk procedure

Why stress and cath so few patients?

- CARP

CARP
Coronary Artery Revascularization Prophylaxis

- VA study of 510 patients undergoing vascular surgery
  - 33% Abdominal aortic aneurysm
  - 67% Lower extremity arterial occlusive disease
- Avg age 66 years, significant but stable CAD
  - Randomized to revascularization vs. med management
    - 59% PCI; 41% CABG
- Surgery delayed 54 days (vs 18 days) for revascularization

Outcome	Revasc-ularization	Medical Management
Postop MI	11.6%	14.3%
30-day mortality	3.1%	3.4%
2.7-year mortality	22%	23%

Edward O. McFalls, M.D., Ph.D., Herbert B. Ward, M.D., Ph.D., Thomas E. Moritz, M.S., Steven Goldman, M.D., William C. Krupski, M.D., * Fred Littooy, M.D., Gordon Pierpont, M.D., Steve Santilli, M.D., Joseph Rapp, M.D., Brack Hattler, M.D., Kendrick Shunk, M.D., Ph.D., Connie Jaenicke, R.N., B.S.N., Lizy Thottapurathu, M.S., Nancy Ellis, M.S., Domenic J. Reda, Ph.D., and William G. Henderson, Ph.D. Coronary-Artery Revascularization before Elective Major Vascular Surgery. N Engl J Med 2004;351:2795-804.

Other Peri-operative measures

- ACE Inhibitors
  - Class 2A - Either continue them peri-operatively or restart them ASAP after surgery
- Prophylactic Nitroglycerin – Class 3 (No Benefit)
- Swan-Ganz - Probably not
  - Class 2b - Consider when significant hemodynamics cannot be corrected prior to surgery (Shock, heart failure, severe valvular disease)
  - Class 3 - Routine use not recommended
- Clonidine (alpha 2 agonist) - Class 3 (No Benefit)

Intraoperative and Postoperative Monitoring

- Class 2A
  - Intraoperative and postoperative ST-segment monitoring can be useful to monitor patients with known CAD or those undergoing vascular surgery, with computerized ST-segment analysis, when available, used to detect myocardial ischemia during the perioperative period. *(Level of Evidence: B)*
- Class 2B
  - Intraoperative and postoperative ST-segment monitoring may be considered in patients with single or multiple risk factors for CAD who are undergoing noncardiac surgery. *(Level of Evidence: B)*

Surveillance of post-op MI

- Class 1
  - Postoperative troponin measurement is recommended in patients with ECG changes or chest pain typical of acute coronary syndrome. *(Level of Evidence: C)*
- Class 2B
  - The use of postoperative troponin measurement is not well established in patients who are clinically stable and have undergone vascular and intermediate-risk surgery. *(Level of Evidence: C)*
- Class 3
  - Postoperative troponin measurement is not recommended in asymptomatic stable patients who have undergone low-risk surgery. *(Level of Evidence: C)*

Conclusion

- Risk stratification important
- Address risk factors as possible
- Coronary revascularization is not generally the optimal way to reduce operative risk

References

- Fleisher LA, Fleischmann KE, et. al. 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. J Am Coll Cardiol. 2014 Dec 9;64(22):e77-137. doi: 10.1016/j.jacc.2014.07.944. Epub 2014 Aug 1
- Mann, D. L., Zipes, D. P., Libby, P., Bonow, R. O., & Braunwald, E. (2015). Braunwald's heart disease: A textbook of cardiovascular medicine (Tenth edition.). Philadelphia, PA: Elsevier/Saunders.