

PREOPERATIVE EVALUATION

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No conflict of interests to disclose.



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OBJECTIVES

1. To review preoperative evaluation
2. To review issues in perioperative medication adjustment
3. To review preoperative testing
4. To review clinical risk assessment and risk assessment tools
5. To review the role of functional assessment
6. To determine who needs further cardiac testing
7. To determine who might benefit from perioperative beta blockers



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Case #1

65-year-old woman who presents to your office for a preoperative evaluation for cataract surgery.

- From the chart you see she has a history of well compensated CHF, coronary artery disease, HTN, and DM.
- She takes aspirin, glyburide, lisinopril, metformin, and metoprolol.
- Denies having chest pain, dyspnea, dizziness.
- She is not physically active.
- Her exam reveals no concerns.



What are your recommendations for this patient?

- Proceed to surgery without further testing
- Evaluate with cardiac stress testing
- Recommend against surgery



Case # 2

67-year-old woman with long-standing cervical radiculopathy sees you in your office to discuss the cervical spine surgery she is considering.

- She is worried about a perioperative complication because her father had a heart attack during colon surgery many years ago.
- PMH: DM 2, COPD, and CKD 3, TIA, H/O hysterectomy 5 years ago.
- Meds: Aspirin, formoterol, insulin 70/30, and lisinopril.



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- Blood pressure: 118/78 mm Hg; pulse: 86 beats/min
- Heart: S1 and S2 regular; no murmurs
- Lungs: clear, breath sounds are decreased at both bases
- Abdomen: soft, nondistended, and nontender
- Extremities: no peripheral edema
- HGBA1C 6.9% Creatinine 2.1 a month ago. These have been stable for the last year.
- A recent electrocardiogram was normal.



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She asks you about the risk for a complication during surgery like her father had.

- You are at a very low risk. I think it would be safe to have the surgery.
- You are at low risk. I think surgery will probably be safe.
- You are at moderate risk. I am somewhat concerned you could have a complication.
- You are at high risk. I am very concerned that you could have a complication.



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What would you like to do?

- Patient calls your clinic to tell you that she understands the elevated risks but would like to proceed with the surgery anyway.
- Order stress test
- Do not order stress test



Case #3

62 year old man, comes to see you in your office before a scheduled abdominal aortic aneurysm (AAA) repair. His AAA has been gradually increasing in size, and a vascular surgeon has recommended an elective open repair.

He is having no symptoms from his AAA. He reports no other symptoms, including chest pain, cough, shortness of breath, and syncope. He is mostly sedentary, being limited by severe osteoarthritis in his knees and hips. He can walk slowly on flat ground with only moderate pain but cannot climb steps.

In addition to osteoarthritis, he also has a history of diabetes, hypertension, and coronary artery disease.

His medications include aspirin, carvedilol, insulin glargine, lisinopril, metformin, and naproxen.



- His pulse is 64, and his blood pressure is 124/78.
- Heart: S1 and S2 regular; no murmurs
- Lungs: clear to auscultation b/l
- Abdomen: soft, nondistended, and nontender
- Extremities: no edema, his knees have significant crepitus and are painful with flexion and extension.
- His electrocardiogram shows old Q waves in the anterior leads with no new changes.



What do you recommend?

- Proceed with surgery without additional testing or management.
- Proceed with surgery with an increase of his beta-blocker dose.
- Perform stress test.
- Recommend against surgery.



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Preop History & Examination

- PSH & PMH especially cardiac or pulmonary.
- Experience with anesthesia.
- Medications including OTC and steroid use.
- Use of Aspirin & NSAIDs (should be d/c one week before surgery)
- Smoking and alcohol ,recreational drugs.
- Vaccination.
- Social support and need for assistance after discharge.
- Functional and nutritional assessment.



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Preop Cardiovascular risk stratification

- Step 1: Is there clinical need for emergency noncardiac surgery?
- Step 2: Does the planned surgery have a low cardiac risk?
- Step 3: Does the patient have good functional capacity without symptoms?
- Step 4: Does the patient have clinical risk factors?
- Step 5: Are there active cardiac conditions?



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EKG:

- Not useful for low-risk surgical procedures.
- Reasonable for patients with CAD, significant arrhythmia, peripheral arterial disease, or other significant heart disease.
- 24 hr Holter: not recommended unless patient has syncope or significant bradycardia or tachycardia that was not previously evaluated.

Echo:

- Routine preoperative evaluation of LV function is not recommended
- Reassessment of LV function in clinically stable patients with previously documented LV dysfunction may be considered if there has been no assessment within a year.



Stress Testing:

- No study has shown that interventions performed consequent to the results of the test improves outcomes.

Preoperative cardiac catheterization:

- With the exception of patients with an acute coronary syndrome, myocardial revascularization prior to non cardiac surgery to improve perioperative outcomes of non cardiac surgery is not recommended.
- Pharmacologic therapy holds more promise than coronary revascularization for the reduction of major adverse perioperative cardiac events that might complicate non cardiac surgery.




Clinical Risk factor assessment:

- Combined with functional status and type of surgery to predict perioperative risk.
- Recent MI (≤ 6 weeks), unstable angina, decompensated CHF, significant arrhythmias, severe valvular disease – Cards consult.
- Previous MI (> 6 weeks ago), mild stable angina, compensated CHF, diabetes mellitus Stress test if high-risk procedure or patient has low functional capacity; consider assessment of left ventricular function (i.e., echocardiography)
- Rhythm other than normal sinus rhythm, abnormal ECG, history of stroke, advanced age, low functional capacity- Stress test if high-risk procedure and patient has low functional capacity




- HTN : no specific guidelines. Manage per ACC/AHA criteria.
- Ventricular arrhythmias do not require special therapy if clinically stable.
- Communicate with Cardiology and surgeon if pacemaker/AICD present.
- PVC's and non sustained ventricular tachycardia are risk factors for the development of intraoperative and postoperative arrhythmias, but they are not associated with an increased risk of nonfatal MI or cardiac death in the perioperative period.




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- Pulmonary risk : Poorly defined.
- FEV1<1.5 = increased pulmonary complications
 - FEV1<1.0 = likely prolonged intubation
- Consider ABG if CO₂ retention, COPD, restrictive lung disease
- Smoking cessation, does timing matter ?
- Hematologic: h/o bleeding/thrombosis risk, h/o transfusion reaction.
- Endocrine: DM, thyroid, adrenal disease.
 - If ≥2wks. steroids in past year, give stress dose steroids (HC 100mg IV q8H)
- ID: cancel elective surgery when acute infectious illness present.



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- Renal: creatinine > 2.0mg/dl associated with increased risk.
- Neurologic: cerebrovascular disease associated with increased risk.
- Obesity : instructions for incentive spirometry
- Malnutrition : if malnutrition is severe, consider postponing surgery and providing preoperative supplementation



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Risk estimation models:

- Risk models estimate the risk based on :
- History
- Physical examination
- EKG
- Type of surgery
- **Revised cardiac risk index (RCRI)**
- **College of Surgeons National Surgical Quality Improvement Program (NSQIP) risk model**



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RCRI (Revised Cardiac Risk Index)

1. High-risk type of surgery (examples include vascular surgery and any open intraperitoneal or intrathoracic procedures)
2. History of ischemic heart disease
3. History of heart failure
4. History of cerebrovascular disease
5. Diabetes mellitus requiring treatment with insulin
6. Preoperative serum creatinine >2.0 mg/dL



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Surgical Risk Calculator

Enter Patient and Surgical Information

Procedure:

Are there other potential appropriate treatment options? Other Surgical Options Other non-operative options None

Please enter as much of the following information as you can to receive the best risk estimate. At least one item will still be generated if you cannot provide all of the information below.

Age group: <input type="text" value="Under 55 years"/>	Diabetes: <input type="text" value="None"/>
Sex: <input type="text" value="Male"/>	Hyperlipidemia requiring medication: <input type="text" value="No"/>
Functional status: <input type="text" value="Independent"/>	Previous cardiac event: <input type="text" value="No"/>
Emergency case: <input type="text" value="No"/>	Concurrent heart failure in 90 days prior to surgery: <input type="text" value="No"/>
ASA class: <input type="text" value="Healthy patient"/>	Diagnosis: <input type="text" value=""/>
Reason for elective procedure: <input type="text" value=""/>	Current anticoagulation (if any): <input type="text" value=""/>
Whether within 90 days prior to surgery: <input type="text" value=""/>	History of stroke (CVA): <input type="text" value=""/>
Systemic anticoagulation within 90 days prior to surgery: <input type="text" value=""/>	Stroke: <input type="text" value=""/>
Ventilator dependence: <input type="text" value=""/>	Acute Renal Failure: <input type="text" value=""/>
Disorganized cancer: <input type="text" value=""/>	BMI Calculation: <input type="text" value=""/>
	Weight lbs: <input type="text" value=""/>
	Weight kg: <input type="text" value=""/>

<http://riskcalculator.facs.org>

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Surgery-Related Risk of Perioperative Cardiac Complications

High risk:

- Emergency surgery
- Anticipated increased blood loss
- Aortic or peripheral vascular surgery

Intermediate risk:

- Abdominal or thoracic surgery
- Head and neck surgery
- Carotid endarterectomy
- Orthopedic surgery
- Prostate surgery

Low risk

- Breast surgery
- Cataract surgery
- Superficial surgery
- Endoscopy / Colonoscopy.
- Dental procedure



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Functional assessment (MET)

Functional status can be expressed in metabolic equivalents (1 MET is defined as 3.5 mL O₂uptake/kg per min, which is the resting oxygen uptake in a sitting position).

1 MET	≥4 METs	>10 METs
<ul style="list-style-type: none"> • Take care of self 	<ul style="list-style-type: none"> • Climb 1 flight stairs or walk up a hill 	<ul style="list-style-type: none"> • Participate in strenuous sports including below:
<ul style="list-style-type: none"> • Eat/dress/use toilet 	<ul style="list-style-type: none"> • Walk on level ground at 4 mph 	<ul style="list-style-type: none"> • Singles tennis
<ul style="list-style-type: none"> • Walk indoors around house 	<ul style="list-style-type: none"> • Run a short distance 	<ul style="list-style-type: none"> • Football
<ul style="list-style-type: none"> • Walk 1-2 blocks on level ground at 2-3 mph 	<ul style="list-style-type: none"> • Scrubbing floors/moving heavy furniture 	<ul style="list-style-type: none"> • Basketball
<ul style="list-style-type: none"> • Dusting/wash dishes (some classify this as 1-4 METs) 	<ul style="list-style-type: none"> • Golf, bowl, dance, doubles tennis, throw baseball or football 	<ul style="list-style-type: none"> • Skiing

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Medication Management

- Antihypertensives : Hold diuretics if there is a concern of hypotension or fluid loss, continue ACE-I & ARBs
- Oral hypoglycemics: hold on day of surgery.
- Insulin: Consider reducing once daily basal insulin by 20%. Hold prandial insulin.
- Statins: Continue if taking before, consider starting if elevated CV risk or undergoing vascular surgery.
- Sedatives: Hold 24 hours before the procedure.
- Aspirin: Continue in those with coronary stents and if risk of cardiac events outweighs the bleeding risk.



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Perioperative Beta blockers

- Do not start beta blockers preoperatively in patients without strong indications, as they may increase the risk of death and stroke.
- If used, long-acting beta blockers preferable over short-acting
- Continue if already on them.
- For patients scheduled for non cardiac surgery who should have been started on beta blocker for an appropriate indication (eg, heart failure, angina, hypertension, after MI), *avoid starting a beta blocker preoperatively, particularly if the time between initiation and surgery is less than two to four hours.*



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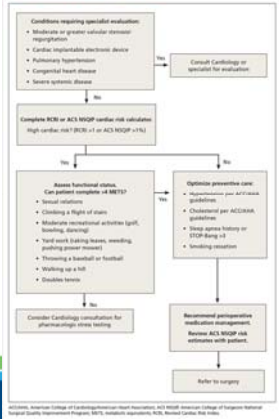
Dual antiplatelet (DAPT) recommendations.

- Defer non-emergent noncardiac surgery for at least six months, irrespective of stent type.
- Prior to six months, surgery for at least three months after bare metal or drug-eluting stent placement.
- For most patients undergoing noncardiac surgery who are taking DAPT after PCI with stenting because they have not reached the recommended minimum duration of such therapy, we suggest continuing DAPT, as opposed to stopping it prior to surgery.
- In patients for whom the risk of bleeding is likely to exceed the risk of a perioperative event due to the premature cessation of DAPT, **we attempt to continue aspirin alone**



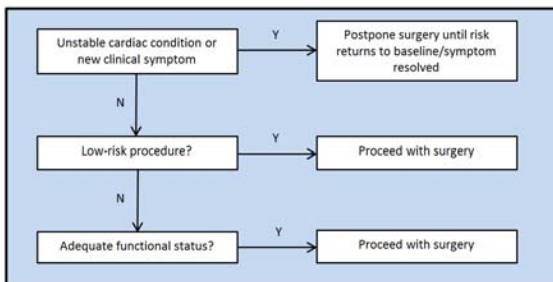
- In patients for whom a bleeding complication could be catastrophic, such as patients undergoing neurosurgical, prostate, or posterior eye procedures, **stopping both antiplatelet agents might be reasonable.**
- For patients taking DAPT after PCI with balloon angioplasty who are scheduled to undergo elective noncardiac surgery, wait at least 14 days after PCI.

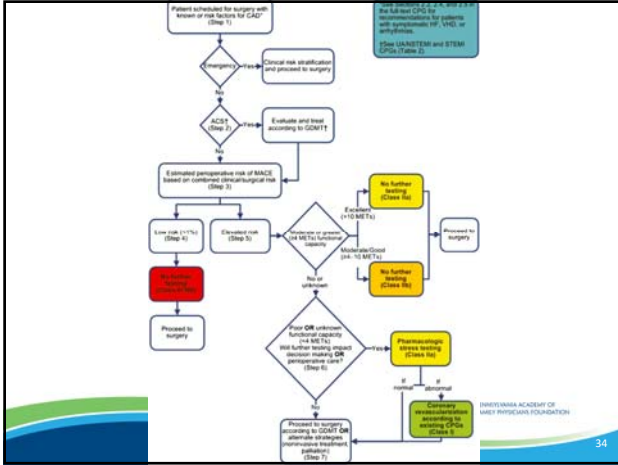
FIGURE 1
Preoperative evaluation algorithm¹⁻⁴



1. ACC/AHA, American College of Cardiology/American Heart Association; 2. ACS NSQIP, American College of Surgeons National Surgical Quality Improvement Program; 3. B2M, Bleeding Risk; 4. METS, maximal exercise tolerance test score.

Putting it altogether






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- Order stress test
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Stress testing is not indicated in asymptomatic patients with good functional capacity.

- Stress testing should be done only if it is likely to change management. In most patients with good functional status, stress testing is not likely to change management.
- If she were planning to undergo high-risk surgery rather than intermediate-risk surgery, some experts would consider ordering cardiac stress testing.



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Choose wisely !

- Don't perform routine electrocardiography (ECG) screening as part of pre-operative or pre-procedural evaluations for asymptomatic patients with low perioperative risk of death or myocardial infarction.
- Avoid echocardiograms for preoperative/perioperative assessment of patients with no history or symptoms of heart disease.
- Don't obtain baseline diagnostic cardiac testing (trans-thoracic/esophageal echocardiography – TTE/TEE) or cardiac stress testing in asymptomatic stable patients with known cardiac disease (e.g., CAD, valvular disease) undergoing low or moderate risk non-cardiac surgery.



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Low functional status => further assessing with stress test (vs patient #2 had good functional capacity)

- It reveals a large reversible defect. Patient subsequently undergoes coronary angiography, which demonstrates 60% narrowing of his left main coronary artery. After a multidisciplinary team meeting and discussion with the patient, he undergoes a percutaneous coronary intervention with placement of a bare metal stent and begins receiving clopidogrel (in addition to his aspirin).
- His vascular surgeon decides to delay his surgery for 2 months until his clopidogrel can be safely withheld for the surgery. He completes the surgery at that time without any adverse events and recovers well.



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Revascularization?

- Revascularization is recommended preoperatively when it would be indicated anyway, not simply to reduce perioperative risk.
- If this surgery were not elective, the same reasoning about stress testing would not apply. If he needed an AAA intervention urgently, for example, proceeding to surgery without stress testing would be recommended.



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Thank you!

Questions or Comments



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