PREOPERATIVE CARDIAC RISK FOR NONCARDIAC SURGERY
Review of 2014 ACC/AHA Guidelines and Implications for Clinical Care

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ACOI Clinical Challenges in Inpatient Care
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Conflict of Interest

No relevant financial disclosures or conflicts of interests
Learning Objectives

• Become up to date on national professional guidelines for perioperative cardiac workup
• Understand levels of evidence and be able to apply them when ordering perioperative testing
• Review new pre-op cardiac evaluation algorithms
• Understand and apply the use of risk stratification calculators
Lecture Outline

• Review of evidence classifications
• Pre-operative cardiac evaluation algorithm
• Definition of high & low risk surgery
• Introduction to risk calculator
• Supplemental Preoperative Evaluation
• Coronary revascularization management
• Coronary stent management
• Perioperative therapy recommendations
• Controversies and future research.
The American Heart Association
Evidence-Based Scoring System

Classification of Recommendations

- **Class I:** Conditions for which there is evidence, general agreement, or both that a given procedure or treatment is useful and effective.

- **Class II:** Conditions for which there is conflicting evidence, a divergence of opinion, or both about the usefulness/efficacy of a procedure or treatment
  - **Class IIa:** Weight of evidence/opinion is in favor of usefulness/efficacy.
  - **Class IIb:** Usefulness/efficacy is less well established by evidence/opinion.

- **Class III:** Conditions for which there is evidence, general agreement, or both that the procedure/treatment is not useful/effective and in some cases may be harmful.

Level of Evidence

- **Level of Evidence A:** Data derived from multiple randomized clinical trials
- **Level of Evidence B:** Data derived from a single randomized trial or nonrandomized studies
- **Level of Evidence C:** Consensus opinion of experts

A quick review...from 2007!!

Figure 1. Stepwise Approach to Perioperative Cardiac Assessment for CAD

2014: Now, with color!!!
**Step 1:** In patients scheduled for surgery with risk factors for or known CAD, determine the urgency of surgery. If an emergency, then determine the clinical risk factors that may influence perioperative management and proceed to surgery with appropriate monitoring and management strategies based on the clinical assessment (see Section 2.1 for more information on CAD). (For patients with symptomatic HF, VHD, or arrhythmias, see Sections 2.2, 2.4, and 2.5 for information on evaluation and management.)

http://content/onlinejacc.org/
Step 2: If the surgery is urgent or elective, determine if the patient has an ACS. If yes, then refer patient for cardiology evaluation and management according to GDMT according to the UA/NSTEMI and STEMI CPGs (18, 20).
Step 3: If the patient has risk factors for stable CAD, then estimate the perioperative risk of MACE on the basis of the combined clinical/surgical risk. This estimate can use the American College of Surgeons NSQIP risk calculator (http://www.surgicalriskcalculator.com) or incorporate the RCRI (131) with an estimation of surgical risk. For example, a patient undergoing very low-risk surgery (e.g., ophthalmologic surgery), even with multiple risk factors, would have a low risk of MACE, whereas a patient undergoing major vascular surgery with few risk factors would have an elevated risk of MACE (Section 3).
Step 4: If the patient has a low risk of MACE (<1%), then no further testing is needed, and the patient may proceed to surgery (Section 3).

Step 5: If the patient is at elevated risk of MACE, then determine functional capacity with an objective measure or scale such as the DASI (133). If the patient has moderate, good, or excellent functional capacity (≥4 METs), then proceed to surgery without further evaluation (Section 4.1).

Step 6: If the patient has poor (<4 METs) or unknown functional capacity, then the clinician should consult with the patient and perioperative team to determine whether further testing will impact patient decision making (e.g., decision to perform original surgery or willingness to undergo CABG or PCI, depending on the results of the test) or perioperative care. If yes, then pharmacological stress testing is appropriate. In those patients with unknown functional capacity, exercise stress testing may be reasonable to perform. If the stress test is abnormal, consider coronary angiography and revascularization depending on the extent of the abnormal test. The patient can then proceed to surgery with GDMT or consider alternative strategies, such as noninvasive treatment of the indication for surgery (e.g., radiation therapy for cancer) or palliation. If the test is normal, proceed to surgery according to GDMT (Section 5.3).

Step 7: If testing will not impact decision making or care, then proceed to surgery according to GDMT or consider alternative strategies, such as noninvasive treatment of the indication for surgery (e.g., radiation therapy for cancer) or palliation.

http://content/onlinejacc.org/
Figure 1. Stepwise Approach to Perioperative Cardiac Assessment for CAD

- Patient scheduled for surgery with known or risk factors for CAD* (Step 1)
  - Emergency: Yes
    - Clinical risk stratification and proceed to surgery
  - No
    - ACS† (Step 2)
      - Yes: Evaluate and treat according to GDMT†
      - No: Estimated perioperative risk of MACE based on combined clinical/surgical risk (Step 3)
        - Low risk (<1%) (Step 4)
          - No further testing (Class IIb, III)
          - Proceed to surgery
        - Elevated risk (Step 5)
          - Moderate or greater (≥4 METs) functional capacity
            - Moderate/Good (≥4–10 METs)
              - No further testing (Class IIa)
              - Proceed to surgery
            - Poor OR unknown functional capacity (<4 METs)
              - Will further testing impact decision making OR perioperative care? (Step 6)
                - Yes
                  - Pharmacologic stress testing (Class IIa)
                    - If normal
                      - Proceed to surgery according to GDMT OR alternate strategies (noninvasive treatment, palliation) (Step 7)
                    - If abnormal
                      - Coronary revascularization according to existing CPGs (Class I)
                - No
                  - Proceed to surgery

*See Sections 2.2, 2.4, and 2.5 for recommendations for patients with symptomatic HF, VHD, or arrhythmias.
†See UA/NSTEMI and STEMI CPGs (Table 2).

Colors correspond to the Classes of Recommendations in Table 1.

Procedure Type

**Low Risk**
- Combined surgical and patient characteristics predict a risk of major adverse cardiac event (MACE) < 1%
- Ex: Cataracts, plastics

**High Risk**
- Any procedure with MACE risk > 1%
- No longer distinguishes between intermediate and high risk because recommendations the same
- Risk can be lowered by less invasive approach (endovascular AAA)
- Emergency procedures increase risk
Definition of Timing of Surgery

Emergent
- Life or limb is threatened if not in operating room within 6 hours

Urgent
- Life or limb is threatened if not in operating room within 24 hours

Time-Sensitive
- Delay of 1-6 weeks for further evaluation would negatively affect outcome

Elective
- Delay for up to 1 year
POOR RISK MANAGEMENT
Jut not thinking it all the way through
Calculators for predicting perioperative cardiac morbidity

- **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

- **RCRI- Revised Cardiac Risk Index**

- **American College of Surgeons NSQIP Risk Calculator**
6 predictors of complications

Major cardiac complications included:
- Myocardial infarction
- Ventricular fibrillation
- Cardiac arrest
- Complete heart block
- Pulmonary edema

0-1 predictors = low risk
2+ = high risk

Revised Cardiac Risk Index

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

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%
Revised Cardiac Risk Index for Pre-Operative Risk

Estimates risk of cardiac complications after surgery.

**High-Risk Surgery**

- Intraperitoneal
- Intrathoracic
- Suprainguinal vascular

**History of ischemic heart disease**

- History of MI
- History of positive exercise test
- Current chest pain considered due to myocardial ischemia
- Use of nitrate therapy
- ECG with pathological Q waves

**History of congestive heart failure**

- Pulmonary edema, bilateral rales or S3 gallop
- Paroxysmal nocturnal dyspnea
- CXR showing pulmonary vascular redistribution

**History of cerebrovascular disease**

- Prior TIA or stroke

**Pre-operative treatment with insulin**

**Pre-operative creatinine >153 mmol/L**

0 points
Class 1 Risk
0.4%

Risk of Major Cardiac Event (see below)

Obtain free chronic angina tools for your patients at HelpThemSpeak.com

http://www.mdcalc.com/revised-cardiac-risk-index-for-pre-operative-risk/
ACS NSQIP Calculator

• 21 predictors of risk for major cardiac complications
• NSQIP MICA risk-prediction rule created in 2011
• 525 US hospitals participated
• > 1 million operations included
• Outperformed RCRI in discriminative power (esp. with vascular)
• Calculates risk of:
  • MACE, death, PNA, VTE, ARF, return to OR, unplanned intubation, discharge to rehab/nursing home, surgical infection, UTI
• Predicts length of hospital stay
• Limitations:
  • Not validated outside NSQIP
  • ASA status
  • Functional status/dependence
## Enter Patient and Surgical Information

**Procedure**

Begin by entering the procedure name or CPT code. One or more procedures will appear below the procedure box. You will need to click on the desired procedure to properly select it. You may also search using two words (or two partial words) by placing a `:` in between, for example: `cholecystectomy : cholangiography`.

**Reset All Selections**

### 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 estimates. A rough estimate will still be generated if you cannot provide all of the information below.

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<th>Previous cardiac event</th>
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<th>Dyspnea</th>
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<td>I - Healthy patient</td>
<td>None</td>
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<table>
<thead>
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<th>Wound class</th>
<th>Current smoker within 1 year</th>
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<td>Clean</td>
<td>No</td>
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<th>Steroid use for chronic condition</th>
<th>History of severe COPD</th>
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<th>Ascites within 30 days prior to surgery</th>
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<td>Height (in)</td>
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<table>
<thead>
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### Outcomes

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<th>Chance of Outcome</th>
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<td>Serious Complication</td>
<td>6%</td>
<td>Below Average</td>
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<td>Pneumonia</td>
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<td>Cardiac Complication</td>
<td>1%</td>
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<td>Surgical Site Infection</td>
<td>10%</td>
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<tr>
<td>Urinary Tract Infection</td>
<td>1%</td>
<td>Below Average</td>
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<tr>
<td>Venous Thromboembolism</td>
<td>1%</td>
<td>Above Average</td>
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<tr>
<td>Renal Failure</td>
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<td>Above Average</td>
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<tr>
<td>Return to OR</td>
<td>4%</td>
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<tr>
<td>Death</td>
<td>&lt;1%</td>
<td>Above Average</td>
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<tr>
<td>Discharge to Nursing or Rehab Facility</td>
<td>1%</td>
<td>Below Average</td>
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**Predicted Length of Hospital Stay:** 3.5 days
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<thead>
<tr>
<th>RCRI</th>
<th>ACS NSQIP Calculator</th>
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<tr>
<td>Creatinine &gt; 2</td>
<td>ARF</td>
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<td>H/o heart failure within 30 days</td>
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<td>DM</td>
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<td>Thoracic, Intra-abdominal, or vascular</td>
<td>CPT code</td>
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<td>H/o ischemic heart disease</td>
<td>Previous Cardiac event</td>
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<tr>
<td>H/o CVA or TIA</td>
<td>ASA status</td>
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<td></td>
<td>Age</td>
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<td>Wound class</td>
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<td>Steroid use</td>
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<td>HTN</td>
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<td>Previous MI</td>
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<td>Sex</td>
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<td>BMI</td>
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<td></td>
<td>Emergence</td>
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Supplemental Preoperative Evaluation

• Includes
  – ECG
  – Assessment of LV function
  – Exercise Stress Testing for Myocardial Ischemia and Functional Capacity
  – Pharmacological Stress Testing
    • Noninvasive
    • Radionuclide
    • DSE
  – Special Situations
Algorithm

Figure 1. Stepwise Approach to Perioperative Cardiac Assessment for CAD

- Patient scheduled for surgery with known or risk factors for CAD (Step 1)
  - Emergency: Yes → Clinical risk stratification and proceed to surgery
  - No → ACST (Step 2)
  - Yes → Evaluate and treat according to GDMT†
  - No → Estimated perioperative risk of MACE based on combined clinical/surgical risk (Step 3)
    - Low risk (<1%) (Step 4)
    - Elevated risk (≥24 METs) functional capacity (Step 5)
      - Moderate or greater (≥24 METs) functional capacity
        - No further testing (Class IIa)
      - Moderate/Good (24–10 METs)
        - No or unknown
          - No further testing (Class IIb)
          - Pharmacologic stress testing (Class IIa)
      - Poor or unknown functional capacity (<4 METs)
        - Will further testing impact decision making or perioperative care? (Step 6)
          - Yes → Pharmacologic stress testing (Class IIa)
          - No → Proceed to surgery according to GDMT OR alternate strategies (noninvasive treatment or palliation) (Step 7)
        - Coronary revascularization according to existing CPGs (Class I)

†See Sections 2.2, 2.4, and 2.5 for recommendations for patients with symptomatic HF, VHD, or arrhythmias.
*See UA/NSTEMI and STEMI CPGs (Table 2).
Review of Evidence Classification

Classification of Recommendations

• **Class I**: Conditions for which there is evidence, general agreement, or both that a given procedure or treatment is useful and effective.

• **Class II**: Conditions for which there is conflicting evidence, a divergence of opinion, or both about the usefulness/efficacy of a procedure or treatment
  – **Class IIa**: Weight of evidence/opinion is in favor of usefulness/efficacy.
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• **Class III**: Conditions for which there is evidence, general agreement, or both that the procedure/treatment is not useful/effective and in some cases may be harmful.

Level of Evidence

• **Level of Evidence A**: Data derived from multiple randomized clinical trials

• **Level of Evidence B**: Data derived from a single randomized trial or nonrandomized studies

• **Level of Evidence C**: Consensus opinion of experts

Resting ECG

• **Reasonable (Class IIa)** – known CAD, significant arrhythmia, PVD, CVD, or other significant structural heart disease, *except for low-risk surgery* (LOE = B)

• **May be Considered (Class IIb)** – asymptomatic patients without known CAD, *except for low-risk surgery* (LOE = B)

• **No Benefit (Class III)** – for asymptomatic patients undergoing low-risk procedures (LOE = B)

• General consensus suggests that an interval of 1-3 months is adequate for stable patients
Assessment of LV Function

• Reasonable (Class IIa) – dyspnea of unknown origin (LOE=C)

• Reasonable (Class IIa) – known CHF with worsening dyspnea or other change in clinical status (LOE=C)

• May be Considered (Class IIb) – reassessment in stable patients with previously documented LV dysfunction if not assessed within 1 year (LOE=C)

• No Benefit (Class III) – routine preoperative evaluation (LOE=B)
Exercise Stress Testing for Ischemia and Functional Capacity

• **Reasonable (Class IIa)** – *to forego* further exercise testing with cardiac imaging and proceed to surgery in patient with elevated risk and excellent functional capacity (>10 METs) (LOE=B)

• **May be Considered (Class IIb)** – for patients with elevated risk and unknown functional capacity *if it will change management* (LOE=B)

• **May be Considered (Class IIb)** – *to forego* for patients with elevated risk and moderate to good FC (4-10 METs) (LOE=B)

• **May be Considered (Class IIb)** – for patients with elevated risk and poor (<4 METs) or unknown FC *if it will change management* (LOE=C)
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 (LOE=B)
Pharmacological Stress Testing

• Noninvasive
  – Reasonable (Class IIa) for patients at elevated risk and have poor FC (either DSE or pharm stress MPI) (LOE=B)
  – **No Benefit (Class III)** for routine screening for patients undergoing low-risk noncardiac surgery (LOE=B)
Special Situations

• If your patient has a resting ECG that impairs diagnostic interpretation
  – LBBB
  – LV hypertrophy with “strain pattern”
  – Digitalis effect

• Concomitant stress imaging with TTE or MPI may be appropriate

• Pharm stress MPI is suggested for LBBB
<table>
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<th>COR</th>
<th>LOE</th>
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<td>IIa</td>
<td>B</td>
<td>(137-139)</td>
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<td>Preoperative resting 12-lead ECG may be considered for asymptomatic patients,</td>
<td>IIb</td>
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<td>(37, 138-140)</td>
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<td>except for low-risk surgery</td>
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<td>Routine preoperative resting 12-lead ECG is not useful for asymptomatic patients</td>
<td>III</td>
<td>No Benefit</td>
<td>B</td>
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<td>For patients with elevated risk and poor or unknown functional capacity it</td>
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<tr>
<td>Routine screening with noninvasive stress testing is not useful for low-risk</td>
<td>III</td>
<td>No Benefit</td>
<td>B</td>
</tr>
<tr>
<td>noncardiac surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Coronary Revascularization Management

- **Class I:**
  1. Revascularization before noncardiac surgery is recommended in circumstances in which revascularization is indicated according to existing CPGs. (Appendix 3)

- **Unprotected Left Main Disease**
- **3 Vessel CAD with or without proximal LAD Disease**
- **2 Vessel Disease with Proximal LAD Disease**
- **1 Vessel Disease with Proximal LAD disease**

- **Class III: No Benefit/Harm**
  1. It is not recommended that routine coronary revascularization be performed before noncardiac surgery to reduce perioperative cardiac events
Perioperative Percutaneous Coronary Intervention (PCI)

• Performing PCI before noncardiac surgery should be limited to:
  – Patients with Left Main disease who can’t get bypass surgery without undue risk
  – Patients with unstable CAD who are candidates for emergent or urgent revascularizations (NSTEMI, STEMI)

• CARP Trial (Coronary Artery Revascularization Prophylaxis)
  – Showed no difference in perioperative and long term cardiac outcomes with or without preoperative CABG or PCI in patients with CAD
  – Exception: Left Main Disease, LVEF < 20%, Severe AS

Timing of Elective Non Cardiac Surgery after PCI

• **Class I:**
  1. Elective noncardiac surgery should be delayed:
     • 14 days after balloon angioplasty
     • 30 days after BMS implantation
  2. Elective noncardiac surgery should optimally be delayed:
     • 365 days after drug-eluting stent (DES) implantation

• **Class IIa**
  1. 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.
Timing of Elective Non Cardiac Surgery after PCI

• **Class IIb***
  1. 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

• **Class III: No Benefit/Harm**
  1. Elective noncardiac surgery should not be performed:
     • Within *30 days* after BMS implantation if dual antiplatelet therapy needs to be discontinued
     • Within *12 months* after DES implantation if dual antiplatelet therapy needs to be discontinued
     • Within *14 days* of balloon angioplasty if aspirin needs to be discontinued
Choosing Appropriate PCI Intervention

- **Urgent Surgery**
  - Consider CABG combined with noncardiac surgery

- **Surgery 2-6 weeks with high bleeding risk**
  - Consider balloon angioplasty with provisional BMS

- **Surgery in 1-12 months**
  - Consider BMS and 4-6 weeks of ASA and P2Y12 inhibitor with continuation of ASA perioperatively

- **Surgery > 12 Months or low bleeding risk**
  - PCI and DES with prolonged aspirin and P2Y12 platelet receptor-inhibitor
Antiplatelet Agent Recommendations

• Class I

1. **Urgent Non Cardiac Surgery 4-6 weeks after BMS or DES**
   • Continue DAPT unless RR of bleeding outweighs benefit of preventing stent thrombosis

2. **Patient with coronary stent & surgical procedure mandates discontinuation of P2Y12 platelet receptor inhibitor**
   • Continue aspirin perioperatively, re-start P2Y12 platelet receptor inhibitor ASAP after surgery

3. **Obtain a consensus between surgeon, anesthesiologist, cardiologist & patient to weigh RR of bleeding versus preventing stent thrombosis when deciding perioperative antiplatelet management**
Antiplatelet Agent Recommendations

• **Class IIb**
  Non-emergent/Non-urgent, Non Cardiac surgery:
  • If patients have not had previous stenting, you may continue aspirin perioperatively when the risk of potential increased cardiac events outweighs the risk of bleeding

Antiplatelet Management Perioperatively

Patient With Coronary Stent

Stent implantation ≤4-6 wk

Yes

Elective surgery

No

Delay surgery until after optimal period (BMS: 30 d and DES: 365 d) (Class I)

Risk of surgical delay is greater than risk of DES thrombosis

Yes

DES ≥30 d, but ≤365 d

No

Continue DAPT unless risk of bleeding is greater than risk of stent thrombosis (Class I)

Yes

Delay surgery until after optimal period (BMS: 30 d and DES: 365 d) (Class I)

No

Does surgery demand discontinuation P2Y12-inhibitors?

No

Continue current DAPT regimen

Yes

Continue ASA and restart P2Y12 ASAP (Class I)
<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coronary revascularization before noncardiac surgery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revascularization before noncardiac surgery is recommended when indicated by existing CPGs</td>
<td>I</td>
<td>C</td>
<td>(25, 26)</td>
</tr>
<tr>
<td>Coronary revascularization is not recommended before noncardiac surgery exclusively to reduce perioperative cardiac events</td>
<td>III: No Benefit</td>
<td>B</td>
<td>(116)</td>
</tr>
<tr>
<td><strong>Timing of elective noncardiac surgery in patients with previous PCI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noncardiac surgery should be delayed after PCI</td>
<td>I</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Noncardiac surgery should be delayed 365 d after DES implantation</td>
<td>I</td>
<td></td>
<td>(234-237)</td>
</tr>
<tr>
<td>A consensus decision as to the relative risks of discontinuation or continuation of antiplatelet therapy can be useful</td>
<td>IIa</td>
<td>C</td>
<td>N/A</td>
</tr>
<tr>
<td>Elective noncardiac surgery after DES implantation may be considered after 180 d</td>
<td>IIb*</td>
<td>B</td>
<td>(234, 238)</td>
</tr>
<tr>
<td>Elective noncardiac surgery should not be performed in patients in whom DAPT will need to be discontinued perioperatively within 30 d after BMS implantation or within 12 mo after DES implantation</td>
<td>III: Harm</td>
<td>B</td>
<td>(231-237, 239)</td>
</tr>
<tr>
<td>Elective noncardiac surgery should not be performed within 14 d of balloon angioplasty in patients in whom aspirin will need to be discontinued perioperatively</td>
<td>III: Harm</td>
<td>C</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Perioperative beta-blocker therapy

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level</th>
<th>Evidence</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue beta blockers in patients who are on beta blockers chronically</td>
<td>I</td>
<td>B SRT</td>
<td>(242-248)</td>
</tr>
<tr>
<td>Guide management of beta blockers after surgery by clinical circumstances</td>
<td>IIa</td>
<td>B SRT</td>
<td>(241, 248, 251)</td>
</tr>
<tr>
<td>In patients with intermediate- or high-risk preoperative tests, it may be reasonable to begin beta blockers</td>
<td>IIb</td>
<td>C SRT</td>
<td>(225)</td>
</tr>
<tr>
<td>In patients with ≥3 RCRI factors, it may be reasonable to begin beta blockers before surgery</td>
<td>IIb</td>
<td>B SRT</td>
<td>(248)</td>
</tr>
<tr>
<td>Initiating beta blockers in the perioperative setting as an</td>
<td>IIb</td>
<td>B SRT</td>
<td>(242, 248, 257)</td>
</tr>
</tbody>
</table>

An approach to reduce perioperative risk is of uncertain benefit in those with a long-term indication but no other RCRI risk factors.

It may be reasonable to begin perioperative beta blockers long enough in advance to assess safety and tolerability, preferably >1 d before surgery.

Beta-blocker therapy should not be started on the d of surgery.

### Perioperative statin therapy

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue statins in patients currently taking statins</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Perioperative initiation of statin use is reasonable in patients undergoing vascular surgery</td>
<td>IIa</td>
<td>B</td>
</tr>
<tr>
<td>Perioperative initiation of statins may be considered in patients with a clinical risk factor who are undergoing elevated-risk procedures</td>
<td>IIb</td>
<td>C</td>
</tr>
</tbody>
</table>

### Alpha-2 agonists

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha-2 agonists are not recommended for prevention of cardiac events</td>
<td>III: No Benefit</td>
<td>B</td>
</tr>
</tbody>
</table>

### ACE inhibitors

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuation of ACE inhibitors or ARBs is reasonable perioperatively</td>
<td>IIa</td>
<td>B</td>
</tr>
<tr>
<td>If ACE inhibitors or ARBs are held before surgery, it is reasonable to restart as soon as clinically feasible postoperatively</td>
<td>IIa</td>
<td>C</td>
</tr>
</tbody>
</table>
### Antiplatelet agents

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Grade</th>
<th>Evidence</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue DAPT in patients undergoing urgent noncardiac surgery during the first 4 to 6 wk after BMS or DES implantation, unless the risk of bleeding outweighs the benefit of stent thrombosis prevention</td>
<td>I</td>
<td>C</td>
<td>N/A</td>
</tr>
<tr>
<td>In patients with stents undergoing surgery that requires discontinuation P2Y(<em>{12}) inhibitors, continue aspirin and restart the P2Y(</em>{12}) platelet receptor–inhibitor as soon as possible after surgery</td>
<td>I</td>
<td>C</td>
<td>N/A</td>
</tr>
<tr>
<td>Management of perioperative antiplatelet therapy should be determined by consensus of treating clinicians and the patient</td>
<td>I</td>
<td>C</td>
<td>N/A</td>
</tr>
<tr>
<td>In patients undergoing nonemergency/nonurgent noncardiac surgery without prior coronary stenting, it may be reasonable to continue aspirin when the risk of increased cardiac events outweighs the risk of increased bleeding</td>
<td>IIb</td>
<td>B</td>
<td>(298, 306)</td>
</tr>
<tr>
<td>Initiation or continuation of aspirin is not beneficial in patients undergoing elective noncardiac noncarotid surgery who have not had previous coronary stenting</td>
<td>III: No Benefit</td>
<td>B</td>
<td>(298)</td>
</tr>
</tbody>
</table>

### Perioperative management of patients with CIEDs

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Grade</th>
<th>Evidence</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with ICDs should be on a cardiac monitor continuously during the entire period of inactivation, and external defibrillation equipment should be available. Ensure that ICDs are reprogrammed to active therapy</td>
<td>I</td>
<td>C</td>
<td>(336)</td>
</tr>
</tbody>
</table>
BETA-ADRENERGIC BLOCKERS

• Much controversy and concern
• Have been associated with increased risk for postoperative stroke and bradycardia
• Timing of therapy very important
• Still indicated for appropriate clinical situations
• Do not suddenly stop therapy and continue use in patients already taking preoperatively.
ANESTHESIA CONCERNS

• LOW RISK WITH LOCAL ANESTHESIA
• TYPE OF ANESTHESIA IN HIGH RISK PATIENTS HAS NOT SHOWN BENEFIT OF REGIONAL OVER GENERAL ANESTHESIA
• PREOPERATIVE DISCUSSION WITH ANESTHESIA CAN BE HELPFUL.
CARDIAC IMPLANTABLE ELECTRONIC DEVICES (CIEDS)
Sample Case

- 62 male veteran being evaluated prior sigmoidectomy 2/2 non-metastatic adenocarcinoma
- 118 kg, BMI 43
- PMH: HTN, HLD, non-obstructive CAD, CHF with recent hospitalization, COPD, NIDDM
- PSH: 40 PYH, quit ‘11
- Lives with family who help with ADLs. Minimal exercise tolerance, stops every other block when walking 2/2 fatigue
- EKG in NSR
- Labs wnl
References


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

• http://www.mdcalc.com/revised-cardiac-risk-index-for-pre-operative-risk/