Preoperative evaluation and preparation of patients with cardiac disease: the consultant's perspective

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I have no relevant disclosures for this talk
Objectives

As a result of participating in this educational opportunity the learner will be able to:

• Discriminate between patient cardiovascular conditions that are better managed by a consultant and those that can be managed by the anesthesiology care team
• Enumerate advantages and disadvantages of diagnostic tests used to evaluate patients for cardiovascular disease
• Explain how the cardiology consultant can work with the anesthesiology care team to provide an evaluation and management plan appropriate to the patient, procedure and anesthetic needs
1st important point:

ABSENCE OF EVIDENCE IS NOT EVIDENCE OF ABSENCE....
2nd Important Point

• According to 2014 ACC Perioperative Practice Guidelines:
  – Section 6: Choice of Anesthetic Technique and Agent:
    – 1. Use of either a volatile anesthetic agent or total intravenous anesthesia is reasonable for patients undergoing noncardiac surgery...
3\textsuperscript{rd} Important Point

• Always remember: If anything goes wrong, blame the Anesthesiologist....
WHAT, IF ANY, DIAGNOSTIC TESTING IS NEEDED?
Pre-anesthesia testing

• Key question: WILL THE RESULTS OF FURTHER TESTING CHANGE WHAT YOU DO?
• If the results of further testing will not alter management of the patient, i.e. the surgery will be performed no matter what, DO NOT DO THE TEST
  – Exception exists: Pre-operative echocardiography in a patient with risk factors, past history, symptoms or physical signs suggestive of CAD or significant valvular disease can provide valuable information to assist in guiding the intra- and perioperative management of the patient
  – It is also reasonable to presume that in the absence of a pre-operative echo, an intraoperative TEE may provide adequate diagnostic information to guide management.
Guideline for perioperative cardiovascular evaluation

• Most recent guideline for perioperative cardiovascular evaluation is:


• JACC, December 9, 2014
Patient characteristics that matter

- Age/Gender
- Cardiovascular diseases and risk factors including:
  - HTN; DM; Hyperlipidemia
  - CAD/angina (determine quality, frequency and character of the chest pain)
  - Prior MI/PCI/CABG
  - Significant valvular heart disease
  - Peripheral and/or central arterial disease / TIA / CVA / claudication; venous thromboembolic disease
  - Significant genetic/hereditary abnormalities – i.e. Marfans, Hypertrophic Cardiomyopathy
Other significant factors to consider

- Pulmonary disease such as reactive airways, obstructive or restrictive lung disease, etc.
- GI disease
- Renal disease
- Other Endocrine abnormalities
- Cancer
- Chronic infection or immune system abnormalities
- GU abnormalities; etc.
- Smoking history.
- Prior surgical history
- Pertinent Family History
What are the patient’s current symptoms?

- Particular emphasis on cardiovascular and pulmonary symptoms – although any prominent symptoms are relevant
- Physical abilities and limitations with particular attention as to what are the causes of the limitations?
- Are the patient’s symptoms consistent with CHF?
  - If so, what class of CHF?
  - CHF has impact on survival after noncardiac surgery, as reported in a retrospective study of CHF on outcome following noncardiac surgery; CHF with preserved LV EF was reported in a meta-analysis to predict better outcome after noncardiac surgery compared to CHF with reduced LV EF.
Key physical exam findings

• Does physical exam suggest significant cardiovascular abnormality?
• Edema or elevated jugular veins present?
• Lung auscultation: crackles?
• Heart auscultation pathologic murmur or gallop, etc.?
Medications matter

• Medications: Dosages and durations of usage
• Verification of the medication usage is critical but
  – However often quite difficult
  – It is quite likely that what is prescribed for a patient does not actually match with reality
ECG Evaluation

• Resting ECG:
  – Rhythm / conduction abnormality
  – Evidence of LVH
  – Evidence of infarct
  – Abnormal ST-T waves that may indicate ischemia, injury or electrolyte abnormalities.

• ECG obtained during episodes of chest pain will be more sensitive in detecting myocardial ischemia or injury.
Exercise ECG - "Stress test"

- Duration of exercise/exercise tolerance:
  - 10 METS = good prognosis
  - A MET is a standard METABOLIC EQUIVALENT
  - It is a unit used to estimate the amount of oxygen used by the body during physical activity.
  - One MET is defined as the amount of oxygen consumed while sitting at rest and is equal to 3.5 ml/kg/min

- Symptoms: Chest pain, shortness of breath, dizziness, etc.

- BP and HR response; and note whether or not patient was on meds at time of stress test

- ST-T wave changes:
  - ST-T depressions are consistent with ischemia
  - Rarely may induce ST-T elevation which is consistent with injury
Stress Tests

• If combined with **nuclear imaging** - is there evidence of ischemia or infarct as assessed by comparing the stress and rest perfusion imaging?

• **Pharmacologic Stress test** – no information regarding exercise tolerance, BUT diagnostic ST changes with pharmacologic stress are specific for ischemia.
Sensitivity and Specificity of Exercise ECG testing

• A meta-analysis of studies involving over 24,000 patients (15,893 who had coronary angiography demonstrated CAD of at least one vessel with at least 50% stenosis and 8,181 who did not)
  – Concluded the sensitivity of exercise ECG testing to detect ischemia is 68±16% with specificity of 77±17%

• A meta-analysis of exercise ECG testing in women
  – Concluded the sensitivity of exercise ECG testing to detect ischemia is 61% (95% CI 54-68%) with specificity of 70 (95% CI 64-75%)
  – Kwok et al Am J Cardiol. 1999; 83:660-6
A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

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

Endorsed by the Society of Hospital Medicine

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Valvular Heart Disease

Class I

1. 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. *(Level of Evidence: C)*

2. 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 non-cardiac surgery is effective in reducing perioperative risk. *(Level of Evidence: C)*
Valvular Heart Disease

Class IIb

1. Elevated-risk elective noncardiac surgery with appropriate intraoperative and postoperative hemodynamic monitoring is reasonable to perform in patients with asymptomatic severe aortic stenosis. (Level of Evidence: B)
   – Elevated-risk elective noncardiac surgery with appropriate intraoperative and postoperative hemodynamic monitoring is reasonable in adults with asymptomatic severe MR. (Level of Evidence: C)

2. Elevated-risk elective noncardiac surgery with appropriate intraoperative and postoperative hemodynamic monitoring is reasonable in adults with asymptomatic severe aortic regurgitation and a normal left ventricular ejection fraction. (Level of Evidence: C)
Valvular Heart Disease

• Class Iib

1. 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. (Level of Evidence: C)
Other Clinical Risk Factors

Class I

1. Before elective surgery in a patient with a CIED, the surgical/procedure team and clinician following the CIED should communicate in advance to plan perioperative management of the CIED. *(Level of Evidence: C)*

2. Chronic pulmonary vascular targeted therapy (i.e., phosphodiesterase type 5 inhibitors, soluble guanylate cyclase stimulators, endothelin receptor antagonists, and prostanoids) should be continued unless contraindicated or not tolerated in patients with pulmonary hypertension who are undergoing noncardiac surgery. *(Level of Evidence: C)*
Other Clinical Risk Factors

Class IIa

1. Unless the risks of delay outweigh the potential benefits, preoperative evaluation by a pulmonary hypertension specialist before noncardiac surgery can be beneficial for patients with pulmonary hypertension, particularly for those with features of increased perioperative risk. *(Level of Evidence: C)*
Approach to Perioperative Cardiac Testing

Multivariate Risk Indices: Recommendations

• Class Iia

1. A validated risk-prediction tool can be useful in predicting the risk of perioperative MACE in patients undergoing noncardiac surgery. *(Level of Evidence: B)*
1. For patients with a low risk of perioperative MACE, further testing is not recommended before the planned operation. (*Level of Evidence: B*)
Stepwise Approach to Perioperative Cardiac Assessment: Treatment Algorithm
First decisions

• Emergency?
  – Assess risk factors
  – Go to the OR
  – DON’T stop for extra testing!

• Acute coronary syndrome?
  – Not emergency surgery:
    – DON’T go to OR
    – Treat the ACS!
Next Decisions

• Calculate risk using a scoring system that includes medical and surgical risk factors

• If low risk: DON’T do more testing – go to the OR!
If score indicates elevated risk

- Assess functional status
- If moderate, good or excellent functional capacity: DON’T do more testing
If can’t assess functional status

- Will test results impact decisions or change perioperative care?
  - Yes: pharm stress test & Rx as indicated from that result
  - No: go to surgery or discuss palliation rather than operation
Supplemental Preoperative Evaluation

12-Lead Electrocardiogram

- **Class IIa**
  - Preoperative resting 12-lead electrocardiogram (ECG) is reasonable for patients with known coronary heart disease, significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease, except for those undergoing low-risk surgery. *(Level of Evidence: B)*

- **Class IIb**
  - Preoperative resting 12-lead ECG may be considered for asymptomatic patients without known coronary heart disease, except for those undergoing low-risk surgery. *(Level of Evidence: B)*

- **Class III: No Benefit**
  - Routine preoperative resting 12-lead ECG is not useful for asymptomatic patients undergoing low-risk surgical procedures. *(Level of Evidence: B)*
Assessment of Left Ventricular Function

• Class IIa
  1. It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of left ventricular (LV) function. *(Level of Evidence: C)*
  2. It is reasonable for patients with heart failure (HF) with worsening dyspnea or other change in clinical status to undergo preoperative evaluation of LV function. *(Level of Evidence: C)*

• Class IIb
  1. 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. *(Level of Evidence: C)*

• Class III: No Benefit
  1. Routine preoperative evaluation of LV function is not recommended. *(Level of Evidence: B)*
Exercise Testing

Class Ila

1. For patients with elevated risk and excellent (>10 metabolic equivalents [METs]) functional capacity, it is reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery. (*Level of Evidence: B*)
Exercise Testing

Class IIb

1. For patients with elevated risk and unknown functional capacity, it may be reasonable to perform exercise testing to assess for functional capacity if it will change management. *(Level of Evidence: B)*
   - Cardiopulmonary exercise testing may be considered for patients undergoing elevated risk procedures in whom functional capacity is unknown. *(Level of Evidence: B)*
   - For patients with elevated risk and moderate to good (≥4 METs to 10 METs) functional capacity, it may be reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery. *(Level of Evidence: B)*

2. For patients with elevated risk and poor (<4 METs) or unknown functional capacity, it may be reasonable to perform exercise testing with cardiac imaging to assess for myocardial ischemia if it will change management. *(Level of Evidence: C)*
Exercise Testing

Class III: No Benefit

1. Routine screening with noninvasive stress testing is not useful for patients at low risk for noncardiac surgery. *(Level of Evidence: B)*
Noninvasive Pharmacological Stress Testing Before Noncardiac Surgery

Class IIa

1. It is reasonable for patients who are at an elevated risk for noncardiac surgery and have poor functional capacity (<4 METs) to undergo noninvasive pharmacological stress testing (either dobutamine stress echocardiogram or pharmacological stress myocardial perfusion imaging) if it will change management.89–93 (Level of Evidence: B)
Noninvasive Pharmacological Stress Testing Before Noncardiac Surgery

Class III

1. Routine screening with noninvasive stress testing is not useful for patients undergoing low-risk noncardiac surgery. (Level of Evidence: B)
Preoperative Coronary Angiography

Class III: No Benefit

1. Routine preoperative coronary angiography is not recommended. *(Level of Evidence: C)*
Perioperative Therapy: Recommendations

Coronary Revascularization Before Noncardiac Surgery

• Class I
  1. Revascularization before noncardiac surgery is recommended in circumstances in which revascularization is indicated according to existing CPGs. *(Level of Evidence: C)* (See Table A in Appendix 3 for related recommendations.)

• Class III: No Benefit
  1. It is not recommended that routine coronary revascularization be performed before noncardiac surgery exclusively to reduce perioperative cardiac events.97 *(Level of Evidence: B)*
Revascularization before Noncardiac Surgery

• If risk stratification prior to noncardiac surgery evaluation recommends coronary artery bypass graft surgery should undergo coronary revascularization before an elevated-risk surgical procedure

• The cumulative mortality and morbidity risks of both the coronary revascularization procedure and the noncardiac surgery should be weighed carefully in light of the individual patient’s overall health, functional status, and prognosis.
### Indications for preop revasc

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<th>CoR</th>
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<th>References</th>
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<td>UPLM or complex CAD</td>
<td>I—Heart Team approach recommended</td>
<td>C</td>
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<td>CABG and PCI</td>
<td>I—Calculation of the STS and SYNTAX scores</td>
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<td>UPLM*</td>
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**Proximal LAD artery disease**

| IIa—It is reasonable to choose CABG over PCI in patients with complex 3-vessel CAD (e.g., SYNTAX >22) who are good candidates for CABG
| IIb—Of uncertain benefit

**AD artery disease**

| IIa—Of uncertain benefit
| IIb—Of uncertain benefit

**LAD artery disease**

| IIa—With extensive ischemia
| IIb—Of uncertain benefit without extensive ischemia
| IIb—Of uncertain benefit

**ease**

| IIa—With LIMA for long-term benefit
| IIb—Of uncertain benefit

**al LAD artery involvement**

| IIa—Harm
| IIb—Harm
| IIb—Harm

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**al LAD artery involvement**

| IIa—Harm
| IIb—Harm
| IIb—Harm
## Indications for preop revascularization

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<tr>
<th>Category</th>
<th>Recommendation (Class)</th>
<th>Evidence Range</th>
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<td><strong>LV dysfunction</strong></td>
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<td></td>
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<tr>
<td>CABG Ila—EF 35% to 50%</td>
<td>B</td>
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</tr>
<tr>
<td>CABG Ilb—EF &lt;35% without significant left main CAD</td>
<td>B</td>
<td>187, 228–234</td>
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<tr>
<td>PCI</td>
<td>Insufficient data</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Survivors of sudden cardiac death with presumed ischemia-mediated VT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>PCI</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td><strong>No anatomic or physiological criteria for revascularization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>III: Harm</td>
<td>B</td>
</tr>
<tr>
<td>PCI</td>
<td>III: Harm</td>
<td>B</td>
</tr>
</tbody>
</table>
Performing PCI before noncardiac surgery

Should be limited to

• Patients with left main disease whose comorbidities preclude bypass surgery without undue risk and
• Patients with unstable coronary artery disease who would be appropriate candidates for emergency or urgent revascularization.
• Patients with ST-elevation MI or non–ST-elevation acute coronary syndrome benefit from early invasive management.
  – In such patients, in whom noncardiac surgery is time sensitive despite an increased risk in the perioperative period, a strategy of balloon angioplasty or bare-metal stent (BMS) implantation should be considered.
Timing of Elective Noncardiac Surgery in Patients With Previous PCI

Class I
1. Elective noncardiac surgery should be delayed 14 days after balloon angioplasty (Level of Evidence: C) and 30 days after BMS implantation. (Level of Evidence B)
2. Elective noncardiac surgery should optimally be delayed 365 days after drug-eluting stent (DES) implantation. (Level of Evidence: B)

Class IIa
1. 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. (Level of Evidence: C)

Class IIb*
1. 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. (Level of Evidence: B)
Timing of Elective Noncardiac Surgery in Patients With Previous PCI

Class III: Harm

1. Elective noncardiac surgery should not be performed within 30 days after BMS implantation or within 12 months after DES implantation in patients in whom dual antiplatelet therapy will need to be discontinued perioperatively. \(\text{Level of Evidence: B}\)

2. Elective noncardiac surgery should not be performed within 14 days of balloon angioplasty in patients in whom aspirin will need to be discontinued perioperatively. \(\text{Level of Evidence: C}\)
Perioperative Beta-Blocker Therapy

3 key findings after systematic review of available evidence were powerful influences:

1. The systematic review suggests that preoperative use of beta blockers was associated with a reduction in cardiac events in the studies examined, but few data support the effectiveness of preoperative administration of beta blockers to reduce risk of surgical death.

2. Consistent and clear associations exist between beta-blocker administration and adverse outcomes, such as bradycardia and stroke.

3. These findings were quite consistent even when the DECREASE studies in question or POISE (Perioperative Ischemic Evaluation Study) were excluded. Stated alternatively, exclusion of these studies did not substantially affect estimates of risk or benefit.
Perioperative Beta-Blocker Therapy

Class I
1. Beta blockers should be continued in patients undergoing surgery who have been on beta blockers chronically. (*Level of Evidence: B*)

Class IIa
1. It is reasonable for the management of beta blockers after surgery to be guided by clinical circumstances, independent of when the agent was started. (*Level of Evidence: B*)
Perioperative Beta-Blocker Therapy

• Class IIb

1. In patients with intermediate- or high-risk myocardial ischemia noted in preoperative risk stratification tests, it may be reasonable to begin perioperative beta blockers. *(Level of Evidence: C)*
   - In patients with 3 or more RCRI risk factors (eg, diabetes mellitus, HF, coronary artery disease, renal insufficiency, cerebrovascular accident), it may be reasonable to begin beta blockers before surgery. *(Level of Evidence: B)*
   - 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. *(Level of Evidence: B)*

2. 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. *(Level of Evidence: B)*
Perioperative Beta-Blocker Therapy

Class III: Harm

1. Beta-blocker therapy should not be started on the day of surgery. *(Level of Evidence: B)*
Periop Beta Blockade: comments

• If well tolerated, continuing beta blockers in patients who are currently receiving them for longitudinal reasons, particularly when longitudinal treatment is provided according to GDMT, such as for MI, is recommended.

• This is consistent with SCIP CARD-2 as of November 2013.

• Particular attention should be paid to the need to modify or temporarily discontinue beta blockers as clinical circumstances (eg, hypotension, bradycardia, bleeding) dictate
Periop Beta Blockade: comments

- If risks and benefits of perioperative beta blocker use appear to be favorable in patients who have intermediate- or high-risk myocardial ischemia noted on preoperative stress testing.
- Decision to begin beta blockers should be influenced by whether a patient is at risk for stroke and whether the patient has other relative contraindications (such as uncompensated HF).
- Observational data suggest that patients appear to benefit from use of beta blockers in the perioperative setting if they have ≥3 RCRI risk factors.
- It may be reasonable to begin beta blockers long enough in advance of the operative date that clinical effectiveness and tolerability can be assessed. Starting the medication 2 to 7 days before surgery may be preferred, but few data support the need to start beta blockers >30 days beforehand.
Perioperative Statin Therapy

Class I
1. Statins should be continued in patients currently taking statins and scheduled for noncardiac surgery. *(Level of Evidence: B)*

Class IIa
1. Perioperative initiation of statin use is reasonable in patients undergoing vascular surgery. *(Level of Evidence: B)*

Class IIb
1. Perioperative initiation of statins may be considered in patients with clinical indications according to GDMT who are undergoing elevated-risk procedures. *(Level of Evidence: C)*
Other meds

Alpha-2 Agonists
• Class III: No Benefit
• 1. Alpha-2 agonists for prevention of cardiac events are not recommended in patients who are undergoing noncardiac surgery. *(Level of Evidence: B)*

Angiotensin-Converting Enzyme Inhibitors
• Class IIa
1. Continuation of angiotensin-converting enzyme inhibitors or angiotensin-receptor blockers perioperatively is reasonable. *(Level of Evidence: B)*
2. If angiotensin-converting enzyme inhibitors or angiotensin-receptor blockers are held before surgery, it is reasonable to restart as soon as clinically feasible postoperatively. *(Level of Evidence: C)*
Antiplatelet Agents

Class I

1. In patients undergoing urgent noncardiac surgery during the first 4 to 6 weeks after BMS or DES implantation, dual antiplatelet therapy should be continued unless the relative risk of bleeding outweighs the benefit of the prevention of stent thrombosis. (Level of Evidence: C)

   – In patients who have received coronary stents and must undergo surgical procedures that mandate the discontinuation of P2Y12 platelet receptor–inhibitor therapy, it is recommended that aspirin be continued if possible and the P2Y12 platelet receptor–inhibitor be restarted as soon as possible after surgery. (Level of Evidence: C)

2. 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 with that of stent thrombosis. (Level of Evidence: C)

Class IIb

1. 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. (Level of Evidence: B)

Class III: No Benefit

1. Initiation or continuation of aspirin is not beneficial in patients undergoing elective noncardiac noncarotid surgery who have not had previous coronary stenting (Level of Evidence: B), unless the risk of ischemic events outweighs the risk of surgical bleeding. (Level of Evidence: C)
Class I

1. Patients with implantable cardioverter-defibrillators who have preoperative reprogramming to inactivate tachytherapy should be on cardiac monitoring continuously during the entire period of inactivation, and external defibrillation equipment should be readily available. Systems should be in place to ensure that implantable cardioverter-defibrillators are reprogrammed to active therapy before discontinuation of cardiac monitoring and discharge from the facility. *(Level of Evidence: C)*
Anesthetic Consideration and Intraoperative Management: Recommendations

6.1. Choice of Anesthetic Technique and Agent

• Class IIa

1. Use of either a volatile anesthetic agent or total intra-venous anesthesia is reasonable for patients undergoing noncardiac surgery, and the choice is determined by factors other than the prevention of myocardial ischemia and MI. *(Level of Evidence: A)*

2. Neuraxial anesthesia for postoperative pain relief can be effective in patients undergoing abdominal aortic surgery to decrease the incidence of perioperative MI. *(Level of Evidence: B)*

Class IIb

1. Perioperative epidural analgesia may be considered to decrease the incidence of preoperative cardiac events in patients with a hip fracture. *(Level of Evidence: B)*
Intraoperative Management

Class IIa

1. The emergency use of perioperative transesophageal echocardiogram is reasonable in patients with hemodynamic instability undergoing noncardiac surgery to determine the cause of hemodynamic instability when it persists despite attempted corrective therapy, if expertise is readily available. *(Level of Evidence: C)*

Class IIb

1. Maintenance of normothermia may be reasonable to reduce perioperative cardiac events in patients undergoing noncardiac surgery. *(Level of Evidence: B)*
   - Use of hemodynamic assist devices may be considered when urgent or emergency noncardiac surgery is required in the setting of acute severe cardiac dysfunction (i.e., acute MI, cardiogenic shock) that cannot be corrected before surgery. *(Level of Evidence: C)*

2. The use of pulmonary artery catheterization may be considered when underlying medical conditions that significantly affect hemodynamics (i.e., HF, severe valvular disease, combined shock states) cannot be corrected before surgery. *(Level of Evidence: C)*
Intraoperative Management

Class III: No Benefit

1. Routine use of pulmonary artery catheterization in patients, even those with elevated risk, is not recommended. *(Level of Evidence: A)*
   - Prophylactic intravenous nitroglycerin is not effective in reducing myocardial ischemia in patients undergoing noncardiac surgery. *(Level of Evidence: B)*

2. The routine use of intraoperative transesophageal echocardiogram during noncardiac surgery to screen for cardiac abnormalities or to monitor for myocardial ischemia is not recommended in patients without risk factors or procedural risks for significant hemodynamic, pulmonary, or neurological compromise. *(Level of Evidence: C)*
Surveillance and Management for Perioperative MI: Recommendations

Class I
1. Measurement of troponin levels is recommended in the setting of signs or symptoms suggestive of myocardial ischemia or MI. *(Level of Evidence: A)*
2. Obtaining an ECG is recommended in the setting of signs or symptoms suggestive of myocardial ischemia, MI, or arrhythmia. *(Level of Evidence: B)*

Class IIb
1. The usefulness of postoperative screening with troponin levels in patients at high risk for perioperative MI but without signs or symptoms suggestive of myocardial ischemia or MI, is uncertain in the absence of established risks and benefits of a defined management strategy. *(Level of Evidence: B)*
2. 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. *(Level of Evidence: B)*
1. 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. *(Level of Evidence: B)*
Future Research Directions

• Current recommendations for perioperative cardiovascular evaluation and management for noncardiac surgery are based largely on clinical experience and observational studies, with few prospective RCTs.

• The GWC recommends that future research on perioperative evaluation and management span the spectrum from RCTs to regional and national registries to focus on patient outcomes.
Practical Applications of the Guidelines

Evaluate some patients
Case 1

• 71 year old man presented to the ED from an assisted living facility after fall.
• Left hip fracture –> CT scan revealed impacted fracture at the junction of the left femoral head and neck –
• CT scan also revealed 4.7cm x 4.7 cm left common femoral artery pseudoaneurysm.
• Very poor historian. No apparent syncope related to his fall – was trying to get up from his wheel chair when he fell. Unable to move due to severe pain.
• No past hx of known coronary disease.
• Pmh: HTN, CVA, DVT, GERD, lipids, PAD – with hx of aorto-bifemoral bypass in the past (pt had no recollection of this); + smoker – still smoking 1ppd
• Meds: amlodipine 5, 121 81, atorvastatin 40, calcium, vit d, citalopram, donepezil, hydralazine 50 q8, metoprolol 25 bid, pantoprazole 40, daily, tamsulosin 0.4 qhs.
• Vascular surgery determined that the vascular abnormality was an anastomotic pseudoaneurysm.
• Urgent consult requested for pre-op evaluation
Case 1: echo findings
Case 2

• 68 year old man referred for consultation - pre-op non-cardiac surgery
  – Consult request: “Requesting referral for further evaluation and treatment recommendations for severe dilation of LA seen in ECHO.
  – Hx of atrial fibrillation, HTN, CAD, lipids, compensated liver cirrhosis”

• Echo Report:
  – Mildly dilated LV
  – Low-normal to mildly depressed LV systolic function; Estimated EF 50 +/-5%
  – Severely dilated LA; RA size is probably normal
  – Probably normal RV size and systolic function
  – Mildly dilated aortic root and ascending aorta
  – Unable to estimate RV systolic pressure
  – No significant valvular disease.
Case 2

- Coronary angiography performed 1.5 years prior
  - performed due to (+) TMET (TMET ordered for exertional dyspnea)→ 3.7 METS, no chest pain, +dyspnea, 1 mm horizontal ST segment depression
    - Mild non-obstructive coronary artery disease
    - 45% mid LAD stenosis
    - Medical management recommended
Case 2

• Consult/Evaluation:
• 68 year old – No chest pain or dyspnea. No palpitations, no orthopnea or PND, no bleeding (on warfarin for atrial fibrillation). Cirrhosis – secondary to ETOH (continues to consume ETOH)
• PMH: Atrial fibrillation, HTN, hyperparathyroidism, alcoholic cirrhosis, PTSD/anxiety, impaired fasting glucose, Barrett’s esophagus with esophagitis
• Meds: Lasix, 20 daily prn, lisinopril 40 daily, atenolol 12.5 daily, Coumadin ad, omeprazole 20, asa 81, gabapentin 300 qhs
• BP 121/87; HR 97; RR 18
• Lungs clear, hrt irreg irreg without sig murmur, no edema
• Labs Na 139, K 4.7, BUN 11, Cr 0.93, Glu 114, Alb 4.0, WBC 5.58, Hgb 15.9, Plts 124, Chol 167, HDL 50, LDL 101
Case 2: echo findings
Case 3

• 62 year old man with recent diagnosis of Stage IV adenosquamous lung carcinoma.
• Has received radiation therapy and is beginning IV chemotherapy
• Pt has COPD and chronic dyspnea but no change in symptoms; No hx of CAD or chest pain
• No edema
• Other PMH: GERD, PUD with Hx of UGI bleed in 2011, HTN, ETOH dependence
• HR 103 BP 116/68
• ECG – sinus tachy, right atrial enlargement.
• Portacath procedure cancelled by IR physician pending cardiology consult
Case 3: echo findings