Is Your Patient Ready for Surgery?: Update on An Age Old Question

Disclosures

Conflicts of Interest: None

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Objectives

Learning Objectives:
- Review changes in latest guidelines for preoperative evaluation from prior guidelines
- Overview of airway complications
- Determine who needs preoperative cardiac risk assessment
- Outline the preoperative cardiac risk algorithm
- Review guidelines for preoperative cardiac testing
- Review guidelines for preoperative cardiac intervention
- Review guidelines for preoperative medical optimization

Resources

- American Colleges of Physicians (ACP)
- American College of Surgeons (ACS)
- American College of Chest Physicians (ACCP)
- American Society of Anesthesiologist (ASA)
- American College of Cardiology and American Heart Association (ACC/AHA)

Goals of Pre-operative Assessment

- Airway assessment
- Minimize risk and potential complications
- Risk assessment with informed and evidence-based decisions
- Alter/augment management to provide for optimal surgical outcome
- Strong evidence that it reduces morbidity and mortality (Hopkins 2009 > 13,000 patients)
- Improves patient experience and tempers anxiety
• Preoperative testing should be dictated by the patient’s clinical condition and abnormal findings on history or exam

• Preoperative testing is NOT INDICATED unless there is a specific reason to perform the test and the result will change management, or mitigate perioperative risk

ASA 2012

Is Pre-Operative Testing Expensive

• Yes,
  • It can wastes valuable resources (50% of consultant obtained unnecessary test)
  • It exposes patients to needless blood work and procedures
  • It can create anxiety for patients
  • It is costly…$30 billion/year (2007 $)
  • Results in unnecessary delay of surgery
  • It is still a problem—surgeons>anesthesiologists>preoperative directors

Katz, Anesth Analg 2011
Roizen, Anesthesiol Clin North Am 2013

When and Why Do We Test

The Usefulness of Preoperative Laboratory Screening

The usefulness of preoperative laboratory screening of medical patients was assessed in a prospective randomized, double-blind, placebo-controlled study. Patients undergoing noncardiac surgery were randomized to receive or not receive lab tests. The primary endpoint was the incidence of adverse events attributable to the tests, including unnecessary blood work, laboratory tests, and procedures. The study found that preoperative laboratory screening was not useful in identifying patients at increased risk for adverse events. In addition, the tests were costly and resulted in unnecessary delays in surgery. Therefore, preoperative laboratory screening is not recommended for use in all patients undergoing noncardiac surgery.

Kahn D, et al. JAMA 2011;305:1351-1361
2012 ASA Practice Advisory for Pre-anesthesia Evaluation

- To identify or verify a condition which could affect anesthetic care and surgical outcome
- Can the identified risk be mitigated?
  - Cardiac
  - Pulmonary/OSA
  - Anemia
  - Drugs
  - Bleeding, clotting, and bridging
  - DM
  - Smoking cessation
  - Other (liver, kidneys, endocrine)

From ASA Practice Advisory (2012)

<table>
<thead>
<tr>
<th>Test</th>
<th>Indications/Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG</td>
<td>CV disease, pulmonary disease; type and invasiveness of surgery</td>
</tr>
<tr>
<td>Cardiac Evaluation</td>
<td>CV risk; type and invasiveness of surgery; may include consultation with cardiologist</td>
</tr>
<tr>
<td>CXR</td>
<td>Smoking, recent URI, COPD &amp; cardiac disease</td>
</tr>
<tr>
<td>Pulmonary Evaluation</td>
<td>Balance risks and costs; type and invasiveness of surgery; asthma, COPD, scoliosis; may include consultation with pulmonologist</td>
</tr>
</tbody>
</table>
ASA Practice Advisory (2012)

<table>
<thead>
<tr>
<th>Test</th>
<th>Indications/Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin/Hematocrit</td>
<td>Type and invasiveness of surgery; liver disease; extremes of age; anemia, bleeding &amp; hematologic disorders</td>
</tr>
<tr>
<td>Coagulation studies</td>
<td>Bleeding disorders; renal or liver dysfunction; type and invasiveness of surgery; regional anesthetic techniques</td>
</tr>
<tr>
<td>Serum chemistries</td>
<td>Likely perioperative treatment; endocrine disorders; renal or liver dysfunction; use of certain medications or therapies</td>
</tr>
</tbody>
</table>

ASA Practice Advisory (2012)

<table>
<thead>
<tr>
<th>Test</th>
<th>Indications/Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinalysis</td>
<td>Prosthetic implants; urologic procedures; presence of urinary tract symptoms</td>
</tr>
<tr>
<td>Pregnancy test</td>
<td>Offered to patients of childbearing age and for whom the result would alter the patient’s management</td>
</tr>
<tr>
<td>Timing</td>
<td>6 months, provided patient condition is stable; earlier with changes or when updated results may guide therapies</td>
</tr>
</tbody>
</table>

What NOT to Do!

- Routinely order lab work in the stable patient that has a normal value within the last 4 months of > 2000 patient evaluated there was a .04% change (Mahgese, et al 2009)
- Routinely order ECG – on asymptomatic or high risk patient undergoing low risk surgery (ACC/AHA 2014)
- Routinely order CXR - meta-analysis > 14,000 patients 10% abnormal and .1% changed management (Andrus, et al 2003)
- Routinely start beta blockers - within 48 hours of surgery (ACC/AHA 2014)
- Routinely bridge anticoagulation - ACCP 2012
- Routinely stop DAPT - (ACC/AHA 2014)
“Surgery is equivalent to being hit by a truck; only the wounds are tidier.”

History of Anesthesia

- Ether synthesized in 1540 by Cordus
- Ether used as anesthetic in 1842 by Dr. Crawford W. Long
- Ether publicized as anesthetic in 1846 by Dr. William Morton
- Chloroform used as anesthetic in 1853 by Dr. John Snow
Adjuncts

- Endotracheal tube discovered in 1878
- Local anesthetic with cocaine in 1885
- Thiopental first used in 1934
- Curare first used in 1942 – opened the "Age of Anesthesia"

Simpson and Queen Victoria

Principles of General Anesthesia

- Minimizing the potentially harmful direct and indirect effects of anesthetic agents and techniques
- Sustaining physiologic homeostasis during surgical procedures
- Improving post-operative outcomes
ASA Physical Status Classification

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I Normal healthy patient</td>
<td></td>
</tr>
<tr>
<td>II Patient with mild systemic</td>
<td></td>
</tr>
<tr>
<td>disease; no functional</td>
<td></td>
</tr>
<tr>
<td>limitations</td>
<td></td>
</tr>
<tr>
<td>III Patient with severe systemic</td>
<td></td>
</tr>
<tr>
<td>disease; some functional</td>
<td></td>
</tr>
<tr>
<td>limitations</td>
<td></td>
</tr>
<tr>
<td>IV Patient with severe systemic</td>
<td></td>
</tr>
<tr>
<td>disease that is a constant</td>
<td></td>
</tr>
<tr>
<td>threat to life; functionality</td>
<td></td>
</tr>
<tr>
<td>incapacitated</td>
<td></td>
</tr>
<tr>
<td>V Moribund patient who is not</td>
<td></td>
</tr>
<tr>
<td>expected to survive without</td>
<td></td>
</tr>
<tr>
<td>the operation</td>
<td></td>
</tr>
<tr>
<td>VI Brain-dead patient whose</td>
<td></td>
</tr>
<tr>
<td>organs are being removed for</td>
<td></td>
</tr>
<tr>
<td>donor purposes</td>
<td></td>
</tr>
<tr>
<td>E Add “E” to any case (1-5) ,</td>
<td></td>
</tr>
<tr>
<td>if the procedure is an</td>
<td></td>
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<tr>
<td>emergency</td>
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</tbody>
</table>

Definitions of Urgency

- **Emergency.** Threat to life or limb if not treated surgically; time for no – minimal clinical evaluation, typically < 6 hrs
- **Urgent.** Usually a threat to life or limb if not treated surgically; time for limited clinical evaluation, typically 6-24 hrs
- **Time-sensitive.** Delaying surgery, 1-6 weeks, will have negative impact on patient outcome
- **Elective.** The procedure may be delayed up to one year

Procedure Risk

- **High 5%**
  - Aortic, major vascular, peripheral vascular
- **Intermediate 1-5%**
  - Intraperitoneal, transplant, carotid, head & neck, hip, spine, intrathoracic, major urologic
- **Low 1%**
  - Dental, endoscopic, endocrine, breast, cataract, gyne, reconstructive, knee, minor urologic
Dying During Anesthesia

- Child Birth 5-10 /100,000 (.005-.01%)
- Hysterectomy 120-160/100,000 (.12-.16%)
- Cholecystectomy 500-1400/100,000 (.15-1.5%)

GETA 10-20/100,000 (.01-.16%)  
ASA 2012

Evaluation for Surgical Readiness

It's All About the “A”
- Airway assessment
- History of difficult intubation
- Head and neck examination for airway evaluation
- Face
- Oral cavity
Its Not All Fun and Games

Predicting A Difficult Airway

- Difficult for the Bag Valve Mask
  - presence of a beard
  - BMI of > 26 kg/m²
  - history of snoring
  - endentulousness
  - >55 years old

With > 2 of these factors there will be significant difficulty to bag with a 75% sensitivity and specificity

Langeron, Prediction of BVM Complications, Anesthesia 2007

Predictors of Difficult Intubation

The LEMON Law:

L - Look externally
  - Short neck
  - Full dentition
  - Facial trauma
  - Receding mandible

Evaluate the 3-3-2 rule

- The opening of the mouth should accommodate 3 fingers

- The distance from the jaw to the hyoid should be 3 fingerbreaths

- The distance from the floor of the mouth to the thyroid cartilage should be 2 fingerbreaths

M = Mallampati Classification

< 3 has a 95% first try success

O = Obstruction

-- blood in airway

-- expanding hematoma

-- edema in the oral cavity

-- foreign body

-- laryngeal edema
• **N=** Neck mobility
  --in-line stabilization

  -- collar intubations have > 5mm movement at c56

  -- >75 years have 30% loss of neck excursion

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### Orotracheal Intubation

- Adult tube size ~ 6-8 mm
- Most adults tracheas are ~15 cm long and the tube usually extrudes 5-7 cm from the mouth ~21-23 cm at the teeth
- Blades: MacIntosh or Miller
- Suction
- High flow oxygen

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### Airway Challenges
Airway Challenges

Difficult Intubation

- Mouth opening less than 3 cm.
- Limitation of neck movement
- Micrognatia
- Macroglossia
- Protusion of teeth
- Short neck
- Morbid obesity
Morbid Obesity

The Outcome is Obvious

“There Must Be A Plan B”
Complications of Intubation

- Right mainstem intubation
- Esophageal intubation
- Bradycardia/hemodynamic instability
- Dental trauma
- Failure to secure the airway

Glidescope

- Videolaryngoscopy
- Pros:
  - Minimizes neck movement
  - Good at visualizing glottis when neck unable to be moved or mouth unable to be opened wide
- Cons:
  - Difficult to pass tube
  - Availability

Fiberoptic Intubation

- Pros:
  - Good visualization
  - Minimal neck motion
- Cons:
  - Availability
  - Operator dependent
  - Relatively slow
Are You In???

- The verification is more important than the intubation itself.
- Direct visualization – “I saw the cords”
- Auscultation
- CXR – time-limited
- Pulse oximetry – some limitations
- End-tidal CO2 – GOLD STANDARD

Laryngospasm

Causes:
- Irritant-GERD
- Stimulation of ETT
- Smaller airways

Treatment/Intervention:
- Treat GERD
- Steroids/epinephrine
- PPV
- Surgical airway

What’s Wrong Here?
Securing Devices

Is This Secure?

The 2014 ACC-AHA Guidelines for Perioperative Cardiovascular Evaluation (Noncardiac Surgery)
Strength of Recommendation

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

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

Case

Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx.

Does she need preoperative cardiac risk assessment?
A) Yes
B) No

Who Needs Preoperative Cardiac Risk Assessment?

Known CAD:
- History of MI
- Angina-type chest pain relieved with NTG
- EKG with pathological Q waves
- Abnormal non-invasive cardiac stress test or coronary angiogram
- Prior coronary intervention or CABG

Risk Factors for CAD:
- Age >55
- Diabetes
- Stroke (CVA/TIA)
- Heart failure
- Moderate-severe valvular disease
- Significant arrhythmia
Case
Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx.

What is the urgency of the surgery?
A) Elective
B) Time sensitive
C) Urgent
D) Emergent

Urgency of Surgery
There is a new sense of urgency:
- **Emergent**: Life or limb threat if no surgery <6 hours
- **Urgent**: Life or limb threat if no surgery within 6 - 24 hours
- **Time Sensitive**: Delay of surgery for >6 weeks will negatively affect outcome
- **Elective**: Surgery could be delayed up to 1 year without harm

Case
Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx.

What is the risk of the surgery?
A) Low
B) Elevated
C) Intermediate
D) High
### Low Risk for Surgery

<table>
<thead>
<tr>
<th>Procedural Risk</th>
<th>Patient Risk Factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast surgery</td>
<td>no unstable cardiac conditions:</td>
</tr>
<tr>
<td>Herniorrhaphy</td>
<td>Recent MI (&lt;1-6 months)</td>
</tr>
<tr>
<td>Superficial/Derm procedures</td>
<td>Class III-IV angina (&lt;4 METs)</td>
</tr>
<tr>
<td>Cosmetic surgery</td>
<td>Decompensated HF &lt; 1 week</td>
</tr>
<tr>
<td>Oral surgery</td>
<td>Unstable arrhythmia</td>
</tr>
<tr>
<td>Endoscopic/angiographic</td>
<td>Severe-critical valvular disease</td>
</tr>
</tbody>
</table>

### Risk of Surgery

A new risk emerges:
- Risk: combined surgical and patient risk factors to predict major adverse cardiac event (MACE) = ACS, MI, HF, unstable arrhythmia, death
- Low: <1% MACE
- Elevated: >1% MACE

Simplified risk assessment reflects management decisions:
- Low risk: no intervention
- Elevated risk: optimize or cancel
- For greater accuracy, use validated clinical risk predictors

### Does Risk Assessment Change Management?

Will risk stratification affect the patient's decision to proceed with surgery? If yes, then accurate risk assessment is needed.
Cardiac Risk Stratification: RCRI Criteria

**Revised Cardiac Risk Index (RCRI) Criteria**

- Compensated CHF = OR 4.3
- Known coronary artery disease = OR 3.8:
  - angina or CP ↓ with NTG
  - remote MI > 3 - 6 months
  - EKG: pathological Q waves
  - abnormal stress test
  - abnormal cardiac cath
  - prior CABG or PCI
  - Hx TIA or CVA = OR 3
  - Intra-abdominal or high risk surgery = OR 2.6
  - DM requiring insulin = OR 1
  - Renal insufficiency, Cr > 2 = OR 0.9

0 RCRI = <1% mortality
1-2 RCRI = 2-7% mortality
3-4 RCRI = 9-18% mortality
≥5 RCRI = >32% mortality

BNP & CRP improve RCRI accuracy


**RCRI – Revised Cardiac Risk Index**

<table>
<thead>
<tr>
<th>Revised Cardiac Risk Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. History of ischemic heart disease</td>
</tr>
<tr>
<td>2. History of congestive heart failure</td>
</tr>
<tr>
<td>3. History of cerebrovascular disease (stroke or transient ischemic attack)</td>
</tr>
<tr>
<td>4. History of diabetes requiring preoperative insulin use</td>
</tr>
<tr>
<td>5. Chronic kidney disease (creatinine &gt; 2 mg/dL)</td>
</tr>
<tr>
<td>6. Undergoing suprainguinal vascular, intraperitoneal, or intrathoracic surgery</td>
</tr>
</tbody>
</table>

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 = >13%

Cardiac Risk Stratification: NSQIP 21 Questions

ACS NSQIP calculator: http://riskcalculator.facs.org/

Cardiac Risk Stratification: Role of Cardiac Testing

When is it indicated?
- Surgery: non-emergent, elevated risk procedure
- Patient: suspected moderate-severe valvular heart disease or unstable cardiac conditions
- Unknown or poor functional capacity
- Testing will change management
- Patient may decline surgery
- Preoperative coronary intervention is needed

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

Cardiac Risk Assessment Algorithm

Steps 1 - 3: Steps 4 - 7:

MACE = major adverse cardiac event
MET = metabolic equivalent time
GDMT = guideline directed medical therapy
CPG = clinical practice guideline
Stepwise Approach to CAD

- Step 1: Determine urgency of surgery
- Step 2: Determine whether patient has an acute coronary syndrome
- Step 3: Stratify risk
  -- NSQIP or RCRI
- Step 4: Low risk
  -- No further testing
  -- Proceed to surgery
- Step 5: Elevated risk – determine functional capacity
  -- If ≥ 4 METs, no further testing necessary
- Step 6:
- Step 7:

Stepwise Approach to CAD

- Step 5: Elevated risk – determine functional capacity
  -- If ≥ 4 METs, no further testing necessary, proceed with surgery
- Step 6: If < 4 METs or METs unknown, determine whether further testing will impact decision making
  -- If yes, test; revascularize if indicated
- Step 7: Proceed with surgery according to guideline-directed medical therapy or alternate strategies
Comparing Previous and Current Guidelines

### 2007 ACC‐AHA Guideline:
1. Known CAD, cardiac symptoms, and/or exam findings
2. Urgency of surgery
   - If emergent, proceed with medical optimization
3. Treat unstable cardiac conditions
4. Proceed if low risk surgery
5. Proceed if ≥4 METs
6. Clinical risk (RCRI) if ≥4 METs or ≥
7. Cardiac testing if change in management based on RCRI & vascular surgery if RCRI not zero
8. Medical optimization & risk assessment

### 2014 ACC‐AHA Guideline:
1. Known CAD or risk factors
2. Urgency of surgery (time sensitive)
   - If emergent, proceed with hemodynamic monitoring
   - If not emergent, proceed with medical optimization
3. Clinical risk (any tool +/‐ BNP) for MACE
4. Proceed if surgery and medical risk factors indicate low risk <1% MACE
5. Assess METs if elevated risk surgery
   - >10 METs, proceed [Class IIa]
   - 4‐10 METs, proceed [Class IIb]
6. Cardiac testing if change in management
7. Medical optimization & risk assessment

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**Case**

Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house, but without cardiac symptoms.

Does she need an EKG?
A) Yes
B) No

---

**Indications for EKG**

<table>
<thead>
<tr>
<th>Class III‐B (No Benefit, Not Indicated):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk surgery &lt;1% MACE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class IIb‐C Recommendation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative EKG useful as baseline</td>
</tr>
<tr>
<td>Q waves, ST changes, long QRS, LVH, &amp; BBB may be predictive</td>
</tr>
<tr>
<td>Obtain EKG &lt;3 months if indicated &amp; patient is stable [UCC guide &lt;6m]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class IIb‐B Indication:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic patient without CAD (+ cardiac risk factors)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class IIa‐B Indication:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known CAD</td>
</tr>
<tr>
<td>Significant arrhythmia</td>
</tr>
<tr>
<td>PAD</td>
</tr>
<tr>
<td>Stroke (CVA/TIA)</td>
</tr>
<tr>
<td>Major structural heart disease</td>
</tr>
</tbody>
</table>
Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house. Exam reveals 6/6 systolic murmur at apex radiating to axilla & clear lungs. No prior echocardiogram done.

Does she need an echocardiogram?
A) Yes
B) No

Indications for Echocardiogram

Class IIIb-C Indication:
- Known LV dysfunction in stable patient with study >1 year ago

Class IIIa-C Indication:
- Unknown cause of dyspnea (or new D of clinically suspected HF)
- Known HF with worsening dyspnea

Class IIIb-B Recommendation:
- EF <30-35% predictive of MACE but no better than clinical prediction
- High specificity but poor sensitivity

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

Case

Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house, but without symptoms. Exam shows apical murmur and clear lungs.

What is her functional capacity?
A) Unknown
B) <4 METs
C) 4-10 METs
D) >10 METs

### Functional Capacity

<table>
<thead>
<tr>
<th>Poor:</th>
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</thead>
<tbody>
<tr>
<td>1 MET = ADLs (3.5 mL O2/Kg/min)</td>
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<tr>
<td>2 METs = walk around house</td>
<td></td>
</tr>
<tr>
<td>3 METs = walk 1-2 blocks, carry 5-10 lbs</td>
<td></td>
</tr>
<tr>
<td>4 METs = light yard/house work (sweep)</td>
<td></td>
</tr>
<tr>
<td>5 METs = climb 1 floor stairs, lift &gt;20 lbs, walk &gt;4 blocks</td>
<td></td>
</tr>
<tr>
<td>6 METs = heavy yard/house work (mow)</td>
<td></td>
</tr>
<tr>
<td>7 METs = golf, bowling, dance, carry 10 lbs, walk uphill or &gt;2 mile</td>
<td></td>
</tr>
<tr>
<td>8 METs = carry weight upstairs, move heavy furniture</td>
<td></td>
</tr>
<tr>
<td>9 METs = bike at moderate pace, jump rope</td>
<td></td>
</tr>
<tr>
<td>10 METs = bike uphill, brisk swim, jog quickly</td>
<td></td>
</tr>
<tr>
<td>Excellent:</td>
<td></td>
</tr>
<tr>
<td>&gt;10 METs = sustained fast run, competitive sport</td>
<td></td>
</tr>
</tbody>
</table>


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**Case**

Ms. Dianne Young is a 56-year-old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house, but without symptoms. Exam shows apical murmur and clear lungs. EKG shows sinus rhythm & non-specific ST changes.

Does she need a stress test?

A) Yes  
B) No

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**Indications for Exercise Stress Testing**

<table>
<thead>
<tr>
<th>Class III-B (No Benefit, Not Indicated):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Routine preoperative screening for low risk surgery &lt;1% MACE</td>
<td></td>
</tr>
</tbody>
</table>

If it will change management & elevated risk surgery, then:

Class IIb-C Indication:

• <4 METs functional capacity, stress test with imaging may help

Class IIb-B Indication:

• Unknown functional capacity, exercise stress test (no imaging) may help

• 4-10 METs functional capacity, stress test not needed

Class III-B Indication:

• >10 METs functional capacity, stress test not needed

---
Indications for Pharmacological Stress Testing

If it will change management & elevated risk surgery, then:
Class IIa-B Indication:
- <4 METs functional capacity, then dobutamine echocardiogram or pharmacological nuclear stress test is helpful
  - Drug:
    - Dipyridamole (Persantine)
    - Adenosine (Adenocard)
    - Regadenoson (Lexiscan)
  - Nuclear Agent:
    - Thallium-201 (Mibi)
    - Technetium-99m (Cardiolite or Sestamibi)
- Moderate to large reversible defect predicts increased risk of MACE
- Fixed defect is not predictive

Case

Ms. Dianne Young is a 56-year-old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house, but without symptoms. Exam shows apical murmur and clear lungs. EKG shows sinus rhythm & non-specific ST changes. She prefers chemotherapy to surgery if she is very high risk for surgery but does not want to consider CABG. Will a stress test change management?
A) Yes
B) No

Case

Ms. Dianne Young is a 56-year-old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house, but without symptoms. Exam shows apical murmur and clear lungs. EKG shows sinus rhythm & non-specific ST changes. What type of stress test should she get?
A) Exercise only
B) Exercise with imaging
C) Dobutamine echocardiogram
D) Pharmacological nuclear
Exercise or Pharmacological Stress Test?

Choice of stress:
- Patient’s ability to exercise
- Baseline EKG (i.e. BBB or paced)

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

Preoperative Testing
Positive Predictive Value

Case

Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house, but without symptoms. Exam shows apical murmur and clear lungs. Dob Echo shows RWMA in mid/distal LAD & LCx distribution. She does not want to consider CABG.

Does she need a cardiac catheterization?
A) Yes
B) No
Indications for Preoperative Coronary Angiogram

Class III-C (No Benefit, Not Indicated):
- Routine preoperative screening

If it will change management & elevated risk surgery, then:
Class IIb-C Indication:
- CT coronary angiography is lower risk than invasive angiogram, but insufficient evidence
- Indication is the same as non-preoperative setting (refer to Cardiologist)

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

Class III-B (Harm, Not Indicated):
- Candidate for CABG & poor PCI anatomy

Indications for Preoperative PCI

Class III-C (No Benefit, Not Indicated):
- Routine preoperative revascularization

Class III-B (Harm, Not Indicated):
- Candidate for CABG & poor PCI anatomy

If it will change management & elevated risk surgery, then:
Class IIb-C Indication per PCI CPG
- DES: surgery >180 days if urgent

Class IIa-C Recommendation:
- Hold anti-platelet therapy if risk of bleeding > risk of MACE

Class I-B Recommendations:
- PTCA without stent: delay 14 days
- BM stent: delay 30 days
- DES: delay 360 days
- Continue dual anti-platelet therapy within above time frames

Indications for Preoperative CABG

Class III-C (No Benefit, Not Indicated):
- Routine preoperative revascularization

If it will change management & elevated risk surgery, then:
Class I-B Indication:
- Significant LM disease
- Complex CAD
- Significant disease with proximal LAD
- Survivor of sudden death

Class IIb-C Indication:
- 2-vessel disease without proximal LAD and extensive ischemia
- 1-vessel disease with proximal LAD
- 1-vessel disease with EF 35 - 50%

Class IIa-B Indication:
- 2-vessel disease without extensive ischemia
- 1-vessel disease without proximal LAD and EF>35%
Case

Ms. Dianne Young is a 56 year old woman scheduled for tumor debulking and resection of ovarian mass for suspected ovarian cancer, referred for evaluation of heart murmur, arrhythmia, HTN, TIA, and diabetes. No other PMHx. She is only able to walk around the house, but without symptoms. Exam shows apical murmur and clear lungs. Cardiac cath was not done. 

What medical optimization is indicated?
A) Beta-blocker
B) Statin
C) Alpha-2 agonist
D) Anti-platelet

Beta-Blocker Controversy

<table>
<thead>
<tr>
<th>Beta-blocker benefit: DECREASE Trials</th>
<th>Beta-blocker harm: POISE Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Lead researcher discredited and data not used</td>
<td>* Clinically unsound study, but good methodology &amp; large study</td>
</tr>
</tbody>
</table>

Perioperative Beta-Blocker & Morbidity/Mortality

![Graph showing perioperative beta-blocker effects with p-values](image-url)
Indications for Beta-Blocker to Reduce MACE

Class III-B (Not Indicated):
• Do not initiate on day of surgery

if elevated risk surgery:

Class IIb-C Indication:
• Intermediate-high risk ischemia seen on preoperative testing

Class IIb-B Indication:
• ≥3 RCRI with primary long-term indication (CAD, HF, HTN)
• Start ≥1 day preoperatively

Class IIa-B Recommendation:
• May be continued postoperatively if clinically safe (SBP>100, HR>55, no acute anemia or Hgb >10)

Class I-B Recommendation:
• May be safely continued if tolerated as chronic therapy

Perioperative Beta-Blocker & Mortality

Perioperative beta-blocker use reduces death among high-risk but not low-risk patients

Propensity-matched cohort

<table>
<thead>
<tr>
<th>RCRI score</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.00 (0.98-1.02)</td>
</tr>
<tr>
<td>1</td>
<td>1.31 (1.18-1.45)</td>
</tr>
<tr>
<td>2</td>
<td>1.62 (1.45-1.82)</td>
</tr>
<tr>
<td>≥3</td>
<td>1.92 (1.70-2.17)</td>
</tr>
</tbody>
</table>


Perioperative Beta-Blockers & Statins

Fig 3: Benefits of perioperative statin and beta-blocker regimens. Regimes are defined by the number of clinical risk factors: no risk factors = no betablocker and no statin; beta-blocker only = beta-blocker, no statin; statin only = statin, no beta-blocker; combination of statin and beta-blocker. Dashed line = control; solid line = perioperative warfarin or clopidogrel. (A, odds and hazard ratio 1.92, 1.17, 0.61, 0.42, 0.01).
RCRI Criteria & Beta-Blockers

**RCRI Criteria:**
- CHF*
- CAD*
- CVA/TIA
- DM
- RF
- Major surgery

**Indications for Perioperative Statin**

- **If elevated risk surgery:**
  - **Class IIb-C Indication:**
    - Consider initiating if undergoing high risk procedure
  - **Class IIA-B Indication:**
    - Initiate for vascular surgery
  - **Class I-B Indication:**
    - Continue if chronically using RCRI-based indication was discarded with DECREASE data

**Indications for Perioperative Antiplatelet**

- **Class III-C Indication:**
  - Consider if risk of coronary ischemia outweighs bleeding
- **Class III-B (No Benefit, Not Indicated):**
  - Initiating in non-coronary stent patient
- **Class I-C Indication:**
  - Continue for coronary stent or PTCA per stent guidelines
Antiplatelet Therapy

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balloon angioplasty</td>
<td>Delay surgery for 14 days</td>
</tr>
<tr>
<td>Bare-metal intracoronary stent</td>
<td>Delay surgery for 30 days</td>
</tr>
<tr>
<td>Drug eluting stent</td>
<td>Delay surgery 1 year</td>
</tr>
</tbody>
</table>

Always try to continue DAPT, if not, at least continue aspirin. Discuss with cardiology and surgery to balance risks.

Medications to Hold

- ACEI D05
- ARB D05
- Diuretics continue
- Oral hypoglycemics D05
- Short acting insulins D05
- Non-peaking insulins check glucose D05 > 100 % dose < 100 hold
- Insulin pump remains at basal rate
- Phenetermine 3 day hold
- Suboxone 7 day hold
- NSAIDS (1/2 life differ)
- Supplements >48 hours
- ASA > 3 days
- NOACS difference (1/2 life differ)
- Coumadin 4-5 days
- DAPT

Additional Considerations

Moderate-Severe Valvular Heart Disease:
Class I-C Recommendation:
- Obtain echocardiogram if clinically suspected and none <1 year or change in symptoms
- Replace or repair valve for elective surgery

Aortic Stenosis:
- Elevated risk surgery can be performed with hemodynamic monitoring in asymptomatic patients if not candidate for intervention (Class IIa-B)
- TVAR is option for high risk patients [Class IIIb-C]

Mitral Stenosis:
- Elevated risk surgery can be performed with hemodynamic monitoring in asymptomatic patients if not candidate for intervention [Class IIIb-C]
# Additional Considerations

**Arrhythmias:**
- Asymptomatic PVCs, couplets, NSVT did not increase MACE and require no therapy
- Ventricular arrhythmias caused by structural heart disease should be treated
- High-grade AV block or sinus node dysfunction may require pacing
- Beta-blocker can be used in BBB or bifascicular block
- SVT should be rate-controlled
- Anticoagulation for A-fib should be adjusted perioperatively

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# Smoking and DOS

- **Nicotine**
  - Ganglionic stimulant; Half life: 40-60 minutes
- **Carbon monoxide**
  - Decreases O₂ transport; Half life: 130-190 minutes
- Smokers have higher rate of pulmonary complications
- **Smoking Cessation**
  - Any amount helps
  - 12 hrs – begins to decrease effects of nicotine and CO
  - 8 weeks – improvement in pulmonary mechanics

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# Alcohol and Drugs

- Do not let personal feelings interfere with questions
- Ask about current & past use of alcohol or drugs and patterns of use
- These flow easily after questions about caffeine & cigarettes
- Do you drink alcohol?
- Do you use marijuana? Cocaine? Heroin? Amphetamines? (ask about each one by name)
- Prescription drugs such as sleeping pills? Diet pills? Painkillers?
Summary Recommendation for 2014 Guideline

Guidelines are used if easy
- Evaluate urgency of surgery
- Evaluate for unstable cardiac conditions: ACS, recent MI, ADHF, moderate-severe valvular disease, significant arrhythmias
- Use RCRI (easy) criteria; +/- EKG
- If elevated risk, are METS ≥4?
- If not, stress test if it changes Tx
- Medically optimize: beta-blocker based on RCRI/indication, statin, continue antiplatelet if stent
- Estimate risk

Questions ?????