Managing Cardiac & Pulmonary Risk in the Surgical Patient

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Preoperative Evaluation Guidelines

Cardiac:

Pulmonary:
Preoperative Cardiac Evaluation

Is this patient at increased risk for perioperative cardiac complications?

Does the patient need further preoperative medical tests to clarify this risk?

What should be done to reduce the risk of cardiac complications?

Clinical Risk Prediction

70-y.o. man with progressive weakness due to cervical myelopathy need spinal decompression & fusion. He needs help with some ADLs and walks slowly with a cane.

He has stable coronary artery disease & HTN

He is an active smoker.

What increases this patient's risk for perioperative cardiac complications?
Question 1: What increases this patient’s risk for perioperative cardiac complications?

1. History of coronary disease
2. History of HTN
3. Current tobacco use
4. All of the above

Identifying Higher Risk Patients

Known cardiovascular disease predicts risk
Atherogenic risk factors (except diabetes) do not

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic heart disease</td>
<td>2.4</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>1.9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.8</td>
</tr>
<tr>
<td>History of Stroke or TIA</td>
<td>3.2</td>
</tr>
<tr>
<td>Poor functional status</td>
<td>1.8</td>
</tr>
</tbody>
</table>
Surgery Specific Risk

**High**
- Major aortic or peripheral vascular surgery
- Emergent major surgery
- Long cases w/ large fluid shifts or blood loss

**Intermediate**
- Carotid endarterectomy
- Head & Neck
- Abdominal & Thoracic
- Orthopedic

**Low**
- Endoscopic procedures
- Skin & Breast

Revised Cardiac Risk Index

**Predictors:**
- Ischemic heart disease
- Congestive heart failure
- Diabetes requiring insulin
- Creatinine > 2 mg/dL
- Stroke or TIA
- “High Risk” operation (intraperitoneal, intrathoracic, or suprainguinal vascular)

**Complications**

<table>
<thead>
<tr>
<th># of RCRI Predictors</th>
<th>All (%)</th>
<th>Serious (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.5%</td>
<td>0.4%</td>
</tr>
<tr>
<td>1</td>
<td>1.3%</td>
<td>1%</td>
</tr>
<tr>
<td>2</td>
<td>4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>≥ 3</td>
<td>9%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

All: MI, cardiac arrest, complete heart block, pulmonary edema

Serious: MI & cardiac arrest

New Cardiac Risk Prediction Tool

Derived from National Surgical Quality Improvement Program (NSQIP) database:
- > 400,000 patients in derivation & validation cohorts
- Wide range of operations
- “Complication” = 30-day incidence of MI & cardiac arrest

<table>
<thead>
<tr>
<th>Independent Predictors</th>
<th>1. Type of surgery</th>
<th>2. Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3. Serum creatinine &gt; 1.5 mg/dL</td>
<td>4. Functional status (dependency for ADLs)</td>
</tr>
<tr>
<td></td>
<td>5. American Society of Anesth (ASA) class</td>
<td></td>
</tr>
</tbody>
</table>

ASA Class (a brief digression)

American Society of Anesthesiologists Physical Classification

1. Healthy, normal
2. Mild systemic disease
3. Severe systemic disease
4. Severe systemic disease that is a constant threat to life
5. Moribund patient not expected to survive without surgery
70-y.o. with h/o CAD, HTN, undergoing cervical spine surgery. Needs help with some ADLs.

**Age 70**
**Cr < 1.5**
**ASA Class 3**
**Partially dependent**
**Spine surgery**

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**NSQIP Cardiac Risk Calculator**

Install this Calculator On Your Smartphone or iPad for Free

[Available on the App Store](#)
[Available on the Android Market](#)
[Get it at BlackBerry App World](#)

70-y.o. with h/o CAD, stroke, IDDM undergoing cervical spine surgery for progressive weakness.

Estimated risk of perioperative myocardial infarction or cardiac arrest: **0.72%**

www.qxmd.com/calculate-online/cardiology/gupta-perioperative-cardiac-risk

Other findings:
- Excellent performance (AUC = 0.88)

Caveats:
- Didn’t look at all possible variables (e.g., TTE, stress test)

**Which Prediction Tool is Better?**

<table>
<thead>
<tr>
<th></th>
<th>RCRI</th>
<th>NSQIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>~4000</td>
<td>~400,000</td>
</tr>
<tr>
<td># of hospitals</td>
<td>1</td>
<td>&gt; 200</td>
</tr>
<tr>
<td>Currency of data</td>
<td>'89 –'94</td>
<td>'07 – '08</td>
</tr>
<tr>
<td>Screen for MI?</td>
<td>CK-MB, ECG</td>
<td>No</td>
</tr>
</tbody>
</table>

Which to choose?
- 2014 ACC/AHA guideline endorses both tools
- Personal practice: use NSQIP when quantifying risk
ACC/AHA: When is Risk Excessive?

- Unstable coronary syndromes
  - Recent MI with post-infarct ischemia
  - Class III or IV angina
- Decompensated CHF
- Significant arrhythmia
  - High grade atroventricular block
  - Symptomatic ventricular arrhythmia
  - Supraventricular arrhythmia with uncontrolled rate
- Severe valve disease (e.g., critical aortic stenosis)

Severe or unstable cardiac disease that requires urgent evaluation & treatment, regardless of planned surgery
Utility of Stress Testing

A 63 y.o. man will undergo a Whipple procedure for newly diagnosed pancreatic cancer. He had a remote myocardial infarction, diabetes, and HTN. He has not had chest pain in the past year.

Meds: lovastatin, atenolol, glyburide, benazepril, ASA
PEx: BP=115 / 70 HR=60; normal heart & lung exam
ECG: NSR, LVH, otherwise normal

Should this patient receive further preoperative tests?

Question 2:

63 y.o. man s/f Whipple procedure. Remote MI, long-standing diabetes & HTN. No chest pain.

Should this patient receive further preoperative tests?
1. Go to O.R. without further testing
2. Noninvasive stress test
Noninvasive Stress Testing

Predictive value:
• Mainly studied in vascular surgery patients
• Strong negative predictive value ~ 98% (neg LR = 0.1 - 0.2)
• Weak positive predictive value ~ 10 - 20% (pos LR = 2 - 3)
• Adds little information to lower risk patients
• More useful for cases with increased risk

Stress Tests: More Useful in Patients at Higher Risk

Pretest Probability = 1%  (e.g. TKA)
• Positive Test:  Posttest probability = 2 - 3%
• Negative Test:  Posttest probability = 0 - 1%

Pretest Probability = 10%  (e.g. AAA repair)
• Positive Test:  Posttest probability = 18-25%
• Negative Test:  Posttest probability = 2%
770 vascular patients with 1 or 2 of following:
- Age > 70
- MI
- angina
- CHF
- DM
- stroke / TIA
- Cr > 1.8

No stress test (n = 384)
- 30-day CV
- Death or MI
- 1.8%

Stress test (n = 386)
- 352 with no or limited ischemia
- 1.1%
- 34 with extensive ischemia (9%): 12 had PCI or CABG
- 15%
- 2.3%

Poldermans et al. JACC, 2006

2014 ACC/AHA Guideline

Low Clinical Risk?
(< 1% or RCRI = 0 or 1)
- yes
  - Go to OR
- no
  - Functional Capacity?
    - > 4 METs
      - Go to OR
      - 2a if > 10 METs
      - 2b if 4-10 METs
    - < 4 METs or ?
      - no
  - Go to OR or consider alternative approach
    - yes
      - Will stress test result change management?
        - Obtain pharmacologic stress test
          - 2a
You diagnose a 63 y.o. man with resectable pancreatic cancer. He has known coronary disease. P-Mibi & angiography last year showed mild inferior reversibility and a 75% RCA lesion and normal LVEF. He did not receive PCI.

Meds: lovastatin, atenolol, benazepril, ASA
PEx: BP=115 / 70 HR=60; normal CV & lung exam

Should this patient have PCI or CABG?

Question 3:

63 y.o. man with CAD undergoing Whipple procedure. His P-Mibi showed mild inferior reversibility. Angiogram showed a 75% RCA lesion and normal LVEF.

1. Consult general surgeon for planned operation
2. Consult cardiac surgeon for potential CABG
3. Consult invasive cardiologist for possible PCI
**CARP Trial: Coronary Artery Revascularization Prophylaxis**

510 patients undergoing vascular surgery
- At least 1 vessel with 70% occlusion
- Excluded left main dz, AS, or LVEF < 20%

**Choice of CABG or PCI plus Medical management**

**Medical management alone**

1° Endpoint: Long-term mortality
2° Endpoint: MI, Stroke, Limb loss, Dialysis

**McFalls, et al. NEJM, 2004**

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**CARP: Complications After CABG or PCI**

<table>
<thead>
<tr>
<th>Complication</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>1.7%</td>
</tr>
<tr>
<td>MI</td>
<td>5.8%</td>
</tr>
<tr>
<td>Reoperation</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

CARP: Outcomes After Vascular Surgery

<table>
<thead>
<tr>
<th></th>
<th>Revascularized (n=225)</th>
<th>Med Mgt Only (n=237)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death before surgery</td>
<td>10 (4%)</td>
<td>1</td>
</tr>
<tr>
<td>Death &lt; 30 days post-op</td>
<td>7 (3%)</td>
<td>8 (3%)</td>
</tr>
<tr>
<td>Postoperative MI</td>
<td>26 (12%)</td>
<td>34 (14%)</td>
</tr>
<tr>
<td>Long-term mortality (2.7 yrs after randomization)</td>
<td>70 (22%)</td>
<td>67 (23%)</td>
</tr>
</tbody>
</table>

p = NS for all comparisons


Beware of Coronary Stents

<table>
<thead>
<tr>
<th>Risk Factor for Cardiac Mortality (192 patients having surgery after stenting)</th>
<th>Cardiac Death</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RF +</td>
</tr>
<tr>
<td>Early Surgery</td>
<td></td>
</tr>
<tr>
<td>Bare-metal stent &lt; 4 wk</td>
<td>13%</td>
</tr>
<tr>
<td>Drug-eluting stent &lt; 3-6 mo</td>
<td></td>
</tr>
<tr>
<td>Antiplatelet drugs held for surgery</td>
<td>5.5%</td>
</tr>
<tr>
<td>Antiplatelet drugs held &amp; early surgery (versus continued therapy &amp; early surgery)</td>
<td>31%</td>
</tr>
</tbody>
</table>

Schouten O, et al. JACC, 2007
2014 ACC/AHA Guidelines for PCI

- Avoid PCI if upcoming surgery that requires stopping dual antiplatelet therapy (DAPT)
- Highest thrombosis risk in first 4-6 weeks (BMS or DES)
- Optimal delay in elective surgery after PCI:
  - Balloon angioplasty: 14 days
  - Bare metal stent: 30 days
  - Drug eluting stent: 12 months
- 6 months delay after DES may be acceptable if risk of further delay outweighs risk of thrombosis
- Continue DAPT (esp. ASA) unless bleeding risk precludes

Beta-blockers

A 75 y.o. woman with diabetes and HTN will undergo revision of an infected knee arthoplasty. Denies cardiac history or symptoms. She is not on a beta-blocker.

Her examination and ECG are unremarkable.

Should this patient be started on a beta-blocker?
Question 4:

75 y.o. woman with stable coronary disease and HTN will undergo hip fracture repair. Not currently on β-blocker.

Should this patient be started on a beta-blocker now?

1. Oh yeah, definitely
2. Probably
3. Probably not
4. Are you crazy? No!

- 111 patients undergoing vascular surgery
- All had ischemic potential on dobutamine echo
- Randomized to beta-blocker started 2 weeks preop

Cardiac Mortality & Nonfatal MI (%)

<table>
<thead>
<tr>
<th>Days after Surgery</th>
<th>Standard Care</th>
<th>Bisoprolol</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

POISE: Biggest β-blocker Trial

**Patients:** 8351 pts with s/f major noncardiac surgery

- CAD, CHF, CVA/TIA, CKD, DM, or high-risk surgery
- Not already taking β-blocker

<table>
<thead>
<tr>
<th>1st dose</th>
<th>2nd dose</th>
<th>3rd &amp; daily dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoprolol XL</td>
<td>Metoprolol XL</td>
<td>Metoprolol XL</td>
</tr>
<tr>
<td>100 mg*</td>
<td>100 mg*</td>
<td>200 mg*^</td>
</tr>
</tbody>
</table>

* Study drug held for SBP < 100 or HR < 50
^ Daily dose reduced to 100 mg if persistent bradycardia or hypotension

**Outcome:** 30-day cardiac mortality, nonfatal arrest or MI


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POISE: Results

Metoprolol XL:
- Reduced cardiac events (mostly nonfatal MI)
- Increased risk of stroke & total mortality

DECREASE-IV

**Patients:** 1066 pts with estimated 1-6% risk of postoperative cardiac complications, undergoing elective non-CV surgery

**Treatment:**
1. Bisoprolol 2.5 mg daily started at randomization;
   -- dose titrated in hospital by 1.25 - 2.5 mg daily;
   -- maximum 10 mg daily;
   -- target heart rate = 50-70 with SBP >100
2. Fluvastatin XL 80 mg daily
3. Bisoprolol + Fluvastatin
4. Double placebo

- Drugs started median 34 days prior to surgery

**Outcome:** 30-day cardiovascular mortality or nonfatal MI


**DECREASE-IV Results**

Bisoprolol-treated patients had fewer complications

Trend towards benefit with statins

No safety issues
Meta-analysis of β-blocker trials
- Reduces perioperative MI (mostly asymptomatic)
- Increase in mortality & strokes

Practice & Guideline Changes
- Uncertain benefit vs. risk, even in high risk patients
- Avoid fixed dose (non-titrated) perioperative β-blockade
- Avoid starting on day of surgery


2014 ACC / AHA Guideline for β-blockers

Definite indications to continue if… (Helps)
- Already using β-blocker to treat angina, HTN, arrhythmia

Reasonable to consider initiation if… (Maybe)
- High clinical risk (RCRI score ≥ 3)
- Ischemia seen on preoperative stress test
- Compelling indication for long-term beta-blockade

Avoid initiation… (Harms)
- On day of surgery
Take Home Points

Use a validated clinical prediction tool:
• RCRI is easy to use & has become the “new standard”
• NSQIP tool may be more broadly applicable

Reserve stress testing for highest risk patients:
• Elevated risk AND poor functional status
• Only do stress test if results will change management (e.g., cancel, delay, or modify surgery)

Take Home Points

Beware perioperative coronary revascularization:
• Indications are the same as for non-surgical patients
• Delay surgery 4-6 weeks after BMS and 12 months after DES (maybe 6 months if time sensitive)

Beta-blockers:
• Carefully weigh benefits & risks of starting β-blockers in higher risk pts
• If starting, do so cautiously > 1 day prior to surgery
Preoperative Pulmonary Evaluation

Is this patient at increased risk for perioperative pulmonary complications?

Does the patient need further preoperative medical tests to clarify this risk?

What should be done to reduce the risk of pulmonary complications?
Pulmonary Risk Prediction

A 65 y.o. man is to undergo repair of an abdominal aortic aneurysm. He has COPD and continues to smoke. He denies change in cough, or worsening of his chronic dyspnea when walking uphill.

Exam: Resp Rate 20 O2 sat 95% RA
Lungs: prolonged expiration, no wheeze

What do you recommend for this patient?

Question 5:
65 y.o. man is s/f repair of an AAA. He has COPD and smokes. No change in cough or usual chronic dyspnea.

What do you recommend for this patient?

1. Obtain PFTs
2. Quit smoking first
3. Screen for sleep apnea
4. Incentive spirometry after surgery
Pathophysiology of Postoperative Pulmonary Complications

Normal

Tidal Breathing

Closing Volume

Decreased FRC

- Incisional pain
- Anesthesia
- Supine position

Abnormally high Closing Volume

- Age
- COPD
- Smoking

Procedure Related Risk Factors

<table>
<thead>
<tr>
<th>Surgical Site</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurosurgery</td>
<td>2.5</td>
</tr>
<tr>
<td>Head &amp; Neck</td>
<td>2.2</td>
</tr>
<tr>
<td>Aortic</td>
<td>6.9</td>
</tr>
<tr>
<td>Thoracic</td>
<td>4.2</td>
</tr>
<tr>
<td>Abdominal</td>
<td>3.0</td>
</tr>
<tr>
<td>Vascular</td>
<td>2.1</td>
</tr>
<tr>
<td>Emergency surgery</td>
<td>2.2</td>
</tr>
<tr>
<td>Prolonged surgery</td>
<td>2.3</td>
</tr>
<tr>
<td>General anesthesia</td>
<td>1.8</td>
</tr>
</tbody>
</table>
### Patient Related Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 60 - 69</td>
<td>2.3</td>
<td>Good</td>
</tr>
<tr>
<td>Age 70 - 79</td>
<td>5.6</td>
<td>Good</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>2.9</td>
<td>Good</td>
</tr>
<tr>
<td>COPD</td>
<td>2.4</td>
<td>Fair</td>
</tr>
<tr>
<td>Cigarette smoking</td>
<td>1.4</td>
<td>Fair</td>
</tr>
<tr>
<td>Dependence in ADLs</td>
<td>1.6</td>
<td>Fair</td>
</tr>
<tr>
<td>Unplanned weight loss</td>
<td>1.6</td>
<td>Fair</td>
</tr>
<tr>
<td>Heavy alcohol use</td>
<td>1.2</td>
<td>Fair</td>
</tr>
</tbody>
</table>

### Effect of Comorbidity on Risk

**American Society of Anesthesiologists Classification**

- Class I: no systemic disease
- Class II: mild systemic disease
- Class III: severe systemic disease
- Class IV: systemic disease that is a constant threat to life

ASA Class \( \geq \) II vs. Class I: Odds ratio = 4.9
ASA Class \( \geq \) III vs. Class I or II: Odds ratio = 3.1
Respiratory Failure Prediction Tool

- Derived from National Surgical Quality Improvement Program (NSQIP) database:
  - > 400 K patients in derivation & validation cohorts
  - Wide range of operations
  - “Respiratory Failure” = on vent > 48 hrs or reintubation

<table>
<thead>
<tr>
<th>Independent Predictors</th>
<th>1. American Society of Anesth (ASA) class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Functional status (dependency)</td>
</tr>
<tr>
<td></td>
<td>3. Type / location of surgery</td>
</tr>
<tr>
<td></td>
<td>4. Emergency surgery</td>
</tr>
<tr>
<td></td>
<td>5. Preoperative sepsis or SIRS</td>
</tr>
</tbody>
</table>


Emergency surgery? No
ASA Class 3 (severe systemic)
Function/dependency Independent
Surgery type Aortic
Sepsis or SIRS? No
Emergency surgery?  
No

ASA Class  
3 (severe systemic)

Function/dependency  
Independent

Surgery type Aortic

Sepsis or SIRS? No

Estimated risk of postoperative respiratory failure: 6.7 %

Respiratory Failure Prediction Tool

Other findings:  
• Excellent performance (AUC = 0.9)  
• Respiratory failures strongly predicts mortality (25% vs. 1%)

Caveat:  
• Didn’t look at all possible variables (e.g., OSA, PFTs)
Screening for OSA

STOP:
• Snoring
• Tired during day
• Observed Apnea
• Pressure (hypertension)

Presence of 2 or more features:
• 78% PPV for sleep apnea
• Associated with RR ~2.5 for pulmonary complication


Predictive Value of Spirometry

<table>
<thead>
<tr>
<th>Study</th>
<th>Surgery</th>
<th>RR associated with abnormal spirometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Svensson, 1991</td>
<td>Aortic</td>
<td>1.5 (0.9 - 2.1)</td>
</tr>
<tr>
<td>Kispert, 1992</td>
<td>Vascular</td>
<td>3.8 (1.5-10.1)</td>
</tr>
<tr>
<td>Kroenke, 1993</td>
<td>Abd. &amp; Thoracic</td>
<td>1.4 (0.9-2.1)</td>
</tr>
<tr>
<td>Kocabas, 1996</td>
<td>Upper Abdominal</td>
<td>1.7 (0.9-3.3)</td>
</tr>
<tr>
<td>Bando, 1997</td>
<td>Cardiac</td>
<td>1.0 (0.5-2.2)</td>
</tr>
<tr>
<td>Jacob, 1997</td>
<td>CABG</td>
<td>0.9 (0.6-1.3)</td>
</tr>
</tbody>
</table>

Smetana, NEJM 1997
Can Spirometry Identify Patients with Prohibitive Risk?

Studies of 107 surgical patients with severe COPD (FEV$_1$ < 50% predicted):
  • 6% overall mortality

Patients with cor pulmonale, CO$_2$ retention, or FEV$_1$ ≤ 450 mL still had acceptable surgical mortality rates.\(^2\)

1. Kroenke, Arch Int Med 1992
2. Various

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Effect of Smoking Cessation

<table>
<thead>
<tr>
<th>Time since quitting</th>
<th>Complication Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never quit</td>
<td>50%</td>
</tr>
<tr>
<td>Less than 2 weeks</td>
<td>45%</td>
</tr>
<tr>
<td>2 - 4 weeks</td>
<td>40%</td>
</tr>
<tr>
<td>4 - 8 weeks</td>
<td>35%</td>
</tr>
<tr>
<td>8 or more weeks</td>
<td>30%</td>
</tr>
<tr>
<td>Nonsmokers</td>
<td>25%</td>
</tr>
</tbody>
</table>

\(p < .001\)

Warner, Anesthesiology 1984
Preoperative Smoking Cessation Counseling

RCTs of Preoperative Smoking Cessation Counseling:
1. 120 patients undergoing arthroplasty in 6-8 weeks
2. 60 patients undergoing colorectal resection in 2-3 weeks

Intervention: Smoking cessation counseling & offer free nicotine replacement products

Outcomes: Postop complications, especially wound related (e.g., dehiscence, infection, hematoma)

Smoking Cessation 6-8 Weeks Before TKA or THA

Moller et al. Lancet, 2002
Smoking Cessation 2-3 Weeks Before Colorectal Surgery

ACP: Postoperative Interventions to Reduce Risk

Lung expansion maneuvers:
- Deep breathing exercises
- Incentive spirometry
- Chest physiotherapy
- CPAP
- IPPB
- Some studies show maneuvers reduce complications
- No clear evidence one intervention better than others
## Take Home Points

### Patient related risks:
- Elderly
- COPD
- Severe medical comorbidity
- Functionally dependent or generally debilitated

### Procedure related risks:
- Thoracic surgery
- Abdominal surgery
- Emergency surgery
- Prolonged surgery > 3 hrs
- General anesthesia

### Preoperative PFTs:
- Should not be done routinely & not to risk stratify
- Consider spirometry to evaluate unexplained symptoms

### Risk Reduction:
- Patients at increased risk for pulmonary complications should receive lung expansion maneuvers
- Smoking cessation likely beneficial but may require two months lead time to be effective
Thank You

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