Preoperative Pulmonary Evaluation: Truth and Fiction

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What are this patient’s risks?

72 yo M with history of HTN, hyperlipidemia, COPD, and CAD s/p balloon angioplasty in 1989 presents for right TKA for osteoarthritis. COPD well controlled on no oxygen. Drinks socially and smokes 1 PPD x 50 years.

Ortho has asked you to see him to evaluate his preoperative pulmonary risk prior to surgery.

Goals for Today

✓ Identify impact of postoperative pulmonary complications
✓ Recognize clinically important PPCs
✓ Identify patient related risk factors
✓ Identify procedure related risk factors
✓ Understand preoperative clinical evaluation
✓ Identify strategies to decrease risk
How Common Are PPCs?

✓ **Myth:** Thromboembolic and cardiovascular complications are more common than post-operative pulmonary complications.
✓ **Truth:** Rates of PPCs are similar to PCCs and more frequent than postoperative thromboembolic events.

Clinically Important PPCs

✓ Definition varies widely
✓ Currently defined as:
  ✓ Pneumonia
  ✓ Respiratory Failure/Prolonged Mechanical Ventilation
  ✓ Bronchospasm
  ✓ Atelectasis
  ✓ Exacerbation of Chronic Lung Disease
✓ Complications prolonging hospital stay or contribute to morbidity and mortality

Roadmap

✓ Clinically Important PPCs
✓ **Patient Related Risk Factors**
✓ Procedure Related Risk Factors
✓ Preoperative Clinical Evaluation
✓ Strategies to Decrease Risk of PPCs
Patient Related Risks

- Different than patient related cardiovascular preoperative risk factors
- Smoking
- Poor general health status
- Older age
- Obesity
- Chronic obstructive lung disease
- Asthma

Smoking

- **Myth:** Quitting smoking before surgery reduces rates of PPCs.
- **Truth:** Not exactly; risk decreases depending on duration of cessation.

Warner et. al.

- Prospective evaluation of 200 smokers prior to CABG
- Lower risk of PPCs in those with cessation > 8 wks vs current smokers
- Cessation < 8 wks had higher rates of PPC than current smokers (57% vs. 14.5%)

General Health Status

- American Society of Anesthesiologists (ASA) classification ≥ 2
  - Some functional limitation due to systemic disease
- Gerson et al.
  - Pts > 65 yo undergoing abdominal or nonresective thoracic surgery
  - Inability to exercise for ≥ 2 min to increase HR to 99 was the strongest predictor of PPCs
Age

✓ **Myth:** older pts have significantly increase risk for PPCs.
✓ **Truth:** Not exactly. Most studies looking at this did not control for comorbidities but in general, age > 60 yrs is associated with more PPCs.
✓ When data is stratified by ASA class (II-V), periop mortality is the same in all age groups.

Obesity

✓ **Myth:** Obesity increases the risk of PPCs.
✓ **Truth:** Obesity is not a significant risk factor for PPCs.
✓ Phillips et al. evaluated obese and non-obese patients after lap cholecystectomy and found no difference in PPCs.

Obstructive Lung Disease

✓ **Myth:** Any obstructive lung disease increases the risk of PPCs.
✓ **Truth:** Pts with COPD have increased risk depending on the type of complication and severity of disease. This is not true for asthma.
✓ Risk is greatest for those with symptoms at rest, airflow obstruction on exam, those without optimal exercise capacity.
Roadmap

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Surgical Site

- **Myth:** PPCs are patient dependent regardless of surgical site.
- **Truth:** Surgical site is the most predictive risk factor for evaluating PPCs.
- Risk increases as the incision approaches the diaphragm and when surgery lasts longer than 3 hours.

Anesthesia Type

- Liu and Wu, Anesthesia and Analgesia 2007
- Systematic Cochrane and Medline review
- Postoperative epidural analgesia reduces PPC
- Neuraxial blockade reduces risk of pneumonia, *59%* risk of respiratory depression
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Preoperative Studies: CXR

- **Myth**: Chest radiograph is of no utility in preoperative evaluation.
- **Truth**: Patients ≥ 50 yrs undergoing major surgery, those with known cardiopulmonary disease, and those with pulmonary symptoms suggesting underlying undiagnosed disease.

Preoperative Studies: PFTs

- **Myth**: Every patient needs PFTs prior to surgery with general anesthesia.
- **Truth**: Role of PFTs is controversial, general consensus that all candidates undergoing lung resection need them.
- PFTs selectively: those with tobacco use or shortness of breath undergoing CABG and upper abdominal surgery, those with unexplained SOB or pulm sxs.
Putting it all together

- Two well validated indices
- Pneumonia
- Post-operative respiratory failure
- Helpful tools to help stratify risk

<table>
<thead>
<tr>
<th>Preoperative Risk Factor</th>
<th>Postoperative PNA Point Value</th>
<th>Postoperative Resp. Failure Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of surgery</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>AAA</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>Thoracic</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Upper Abd</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>19-49</td>
<td>16</td>
<td>5</td>
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</table>

<table>
<thead>
<tr>
<th>Functional status</th>
<th>Total Points</th>
<th>Postoperative PNA Point Value</th>
<th>Postoperative Resp. Failure Point Value</th>
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<tbody>
<tr>
<td>Total dependent</td>
<td>15</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Partial dependent</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>COPD</td>
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<td>3</td>
<td>1</td>
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<tr>
<td>Emergency surgery</td>
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<td>1</td>
<td>-</td>
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<tr>
<td>Severe handoffs</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Severe infection</td>
<td>6</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Current smoker w/1 year</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Risk Indices for Predicting Postoperative PNA and Respiratory Failure

<table>
<thead>
<tr>
<th>Risk of PNA (Total Point Range)</th>
<th>Risk of Respiratory Failure (Total Point Range)</th>
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</thead>
<tbody>
<tr>
<td>(0-15) 0.24%</td>
<td>(0-10) 0.5%</td>
</tr>
<tr>
<td>(16-25) 1.19%</td>
<td>(11-19) 2.2%</td>
</tr>
<tr>
<td>(26-40) 4.0%</td>
<td>(20-27) 5.0%</td>
</tr>
<tr>
<td>(41-55) 9.4%</td>
<td>(28-40) 11.6%</td>
</tr>
<tr>
<td>(56-85) 15.8%</td>
<td>(&gt;80) 40.0%</td>
</tr>
</tbody>
</table>
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Decreasing Risk

- Preoperative
  - Smoking cessation >8 wks prior, treat airflow obstruction in COPD, asthma, begin pt education regarding lung expanding manuevars
- Intraoperative
  - Neuraxial analgesia, limit surgery to <3 hrs, laproscopic procedures when possible
- Postoperative
  - Deep breathing exercises and IS, epidural analgesia, intercostal nerve blocks

Wrap Up Key Points

- Identification of PPCs is part of overall preop evaluation
- PPCs include: PNA, atelectasis, bronchospasm, COPD exacerbation, ARDS, and respiratory failure
- Most important pt related factors: smoking, COPD, ASA class, poor exercise capacity
- Most important pt procedure related risk factors: site and type of surgery, type of anesthesia/analgesia
- Two well developed indices to help identify PPC risk
- Preoperative, intraoperative, postoperative strategies may decrease risk for PPCs
References