The Latest and Greatest in Reducing Pulmonary Complications

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Disclosures

• Nothing to disclose
Information Sources

• ACS/NSQIP Best Practices
  - Prevention of Postoperative Pulmonary Complications

• Surgical Clinics of North America
  - Postoperative Pulmonary Complications: Pneumonia and Acute Respiratory Failure
Objectives

• General Introduction

• Review Risk Factors for PPC
  - Patient Related
  - Procedure Related

• Review Potential Interventions
PREVENTION OF POSTOPERATIVE PULMONARY COMPLICATIONS

BEST PRACTICES Guidelines

ACS NSQIP
Post-Operative Pulmonary Complications (PPC)

- Literature cites atelectasis, bronchitis, pneumonia, exacerbation of COPD, pulmonary edema
- UHC/QAP PSI 11 Post-op Respiratory Failure: prolonged ventilation and unplanned re-intubation
- ACS/NSQIP captures pneumonia, unplanned re-intubation, prolonged ventilation (> 48 hours)
- PPC are at least as prevalent as cardiac complications and contribute significantly to overall postoperative morbidity
- Clinicians focus more on the detection and prevention of perioperative cardiac complications than PPC
Post-Operative Pulmonary Complications (PPC)

- Patients with 1 or more PPC have higher overall costs (approximately $50,000/PPC)
- Associated with longer length of stay
- Increased risk for readmission
- Higher 30-day mortality
- Identification patients at increased risk for PPC
- Develop preoperative and postoperative measures to help decrease the risk of PPC
Risk Factors for PPC: Patient Related

- Advanced Age
- Elevated ASA class
- CHF
- Functional Dependence
- COPD
- Weight Loss/Malnourishment
- Smoking
- EtOH abuse
- Impaired Mental Status

Good Evidence
Fair Evidence

Risk Factors for PPC: Patient Related

- Diabetes
- Obesity
- Asthma
- Sleep Apnea
- Corticosteroid Use
- HIV Infection
- Arrhythmia
- Poor Exercise Capacity

Risk Not Increased

Insufficient Evidence

The Attributable Risk of Smoking on Surgical Complications

Mary T. Hawn, MD, MPH,*† Thomas K. Houston, MD, MPH,‡§ Elizabeth J. Campagna, MS, Laura A. Graham, MPH,* Jasvinder Singh, MD,*∥ Michael Bishop, MD,**∥∥ and William G. Henderson, PhD¶
Smoking and Surgical Complications

- Large retrospective cohort analysis of 393,794 patients undergoing elective surgery in VA system
- Patients stratified into 3 groups:
  - Current Smoker
  - Prior Smoker
  - Never Smoker
- Current Smoker > Prior Smoker > Never Smoker
- Odds of a complication similar across specialty
- Dose dependent increase in pulmonary complications with greater pack years

Perioperative Pulmonary Outcomes in Patients with Sleep Apnea After Noncardiac Surgery

Stavros Memtsoudis, MD, PhD,* Spencer S. Liu, MD,* Yan Ma, PhD,† Ya Lin Chiu, MS,† J. Matthias Walz, MD,† Licia K. Gaber-Baylis, BA,† and Madhu Mazumdar, PhD†
Sleep Apnea (SA) and Pulmonary Complications

• Determine if SA is an independent risk factor for PPC in patients undergoing orthopedic and general surgery

• National Inpatient Sample data from 1997 – 2007

• Identified 2,610,441 orthopedic and 3, 441,262 general surgery procedures (2.5% and 1.4% respectively had SA)

• Patients matched using propensity scoring methodology

• Orthopedic and General Surgery Patients with SA developed PPCs more commonly than matched controls

Memtsoudis S et al. Anesth Analg 2011
Risk Factors for PPC: Procedure Related

• Vascular Surgery
• AAA Repair
• Thoracic Surgery
• Abdominal Surgery
• Neurosurgery
• Head and Neck Surgery
• General Anesthesia
• Emergency Procedure
• Procedure Length


Good Evidence

Fair Evidence
Preventive Strategies

Preoperative
• Optimize poorly controlled asthmatics
• Inspiratory muscle training
• Selective PFT/Pulmonary Medicine consultation in high risk patients

Postoperative
• Lung expansion therapy
• Selective NGT decompression
• Optimize postoperative pain control; PCA versus prn analgesics
Special Considerations

- Smoking cessation
- Preoperative pulmonary physiotherapy in high risk patients
- Perioperative epidural use for appropriate Thoracic and Abdominal procedures
- Short acting neuromuscular blockade agents
- ICU protocols to enhance weaning/extubation
- Operative approach
  - Laparoscopic vs. Laparotomy
  - Thoracoscopic vs. Thoracotomy
Smoking Cessation and PPC
SYSTEMATIC REVIEW

Wound Healing and Infection in Surgery: The Pathophysiological Impact of Smoking, Smoking Cessation, and Nicotine Replacement Therapy

A Systematic Review

Lars Tue Sørensen, MD

Short-term preoperative smoking cessation and postoperative complications: a systematic review and meta-analysis

Arrêt à court terme du tabagisme en préopératoire et complications postopératoires: revue systématique de la littérature et méta-analyse

Jean Wong, MD · David Paul Lam, BSc · Amir Abrishami, MD · Matthew T. V. Chan, MBBS · Frances Chung, MBBS
Smoking Cessation and PPC

• Benefit with cessation of at least 4 weeks
  - PPC reduction at 4 weeks
  - Wound healing complications 3-4 weeks
• Shorter duration does not seem to carry higher complications
• Older literature suggesting longer period of cessation and higher complications with shorter cessation
• Surgery is a “Teachable Moment”; Take advantage!
Preop Chest Physiotherapy and PPC
Preoperative Intensive Inspiratory Muscle Training to Prevent Postoperative Pulmonary Complications in High-Risk Patients Undergoing CABG Surgery
A Randomized Clinical Trial

Hulzebos et al. 2006  JAMA 296:1851-8157
Preop Chest Physiotherapy and PPC

- Single blind randomized prospective trial
  - Impact of Inspiratory Muscle Training (IMT) on PPC
  - High risk CABG patients
- IMT at least 2 weeks of IS, education on inspiratory and expiratory breathing exercises
- Train 6 days on own and 1 day w/ RT
- Both groups received similar post-op interventions
- Intervention significantly reduced PPC and hospital LOS
Epidural Analgesia and PPC
Epidural anaesthesia and analgesia and outcome of major surgery: a randomised trial

John R A Rigg, Konrad Jamrozik, Paul S Myles, Brendan S Silbert, Phillip J Peyton, Richard W Parsons, Karen S Collins, for the MASTER Anaesthesia Trial Study Group*
Epidural Analgesia and PPC

• Randomized prospective trial of 915 patients
• Primary endpoints included death at 30 days and 8 major post surgical categories of morbidity
• Complication rates for epidural were low
• Postoperative pain scores lower in epidural group
• Only postoperative complication impacted significantly was “respiratory failure”
• Strongly consider perioperative epidural analgesia in high risk patients undergoing complex surgery
Residual Neuromuscular Blockade

- More common with the use of longer acting paralytic agents
- Associated with increased adverse events in the PACU
- Also associated with increased risk for PPC
- Recommendations are to use short acting neuromuscular blockade agents
- Make sure patient completely reversed before extubation
Practical Considerations

- Establish multidisciplinary group
- Carefully review your data to insure integrity and acceptance by clinicians
Kubler-Ross: Five Stages of Grief

- Denial
- Anger
- Bargaining
- Depression
- Acceptance
Bornstein-Sweeney: Five Stages of “Data” Grief

- Denial – “THAT DATA IS WRONG!”
- Anger – “You are out to get me!”
- Bargaining – “Yes the data might be true but my patients are different”
- Depression – “I can’t believe we are this bad”
- Acceptance – “Let’s use this as an opportunity to get better”
Practical Considerations

- Establish multidisciplinary group
- Carefully review your data to insure integrity and acceptance by clinicians
- Define “hot spots” in your patients
- Develop your interventions; Do not reinvent the wheel
  - Personnel and resource requirements
  - Keep it simple
The Power of the National Surgical Quality Improvement Program—Achieving A Zero Pneumonia Rate in General Surgery Patients

Pascal R Fuchshuber, MD, PhD, FACS; William Greif, MD, FACS; Chantal R Tidwell, RN; Michael S Klemm, MD; Cheryl Frydel, RRT; Abdul Wall, MD, FACP; Efren Rosas, MD; Molly P Clopp, RN, MS, MBATM
Practical Considerations

• Establish multidisciplinary group

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• GET STARTED!!!

• Track results
| Measure               | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YTD | Target |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--------|
| Total patients       | 161 | 131 | 188 | 154 | 160 | 117 | 161 | 173 | 92  | 176 | 144 | 149 | 1806| 26   | 2.0%  |
| Mortality-30 Day     | 0   | 0   | 3   | 1   | 0   | 1   | 6   | 6   | 4   | 2   | 2   | 1   | 26  | 2.0% |
| Morbidity-30 Day     | 36  | 41  | 43  | 49  | 42  | 39  | 42  | 44  | 29  | 52  | 42  | 31  | 490 | 15.7% |
| Inpatients           | 115 | 98  | 128 | 125 | 124 | 90  | 125 | 127 | 65  | 124 | 104 | 101 | 1326| 13   | 6.1%  |
| Surgical Site Infection | 11  | 11  | 11  | 13  | 13  | 18  | 6   | 12  | 12  | 18  | 22  | 13  | 160 | 6.1%  |
| Pneumonia            | 6   | 2   | 4   | 6   | 2   | 2   | 3   | 3   | 2   | 4   | 4   | 1   | 39  | 2.3%  |
| Unplanned Intubation | 9   | 7   | 5   | 9   | 0   | 5   | 10  | 4   | 3   | 8   | 1   | 2   | 63  | 2.2%  |
| DVT/PE               | 2   | 0   | 1   | 0   | 2   | 1   | 0   | 0   | 1   | 0   | 2   | 11  | 14% | 13.0% |
| Vent> 48 Hours       | 7   | 6   | 8   | 10  | 4   | 8   | 6   | 4   | 11  | 5   | 3   | 78  | 2.7% | 3.5% |
| Acute Renal Failure  | 2   | 2   | 1   | 2   | 0   | 2   | 2   | 1   | 1   | 3   | 1   | 17  | 1.3% |
| UTI                  | 4   | 1   | 5   | 6   | 6   | 3   | 3   | 3   | 1   | 4   | 1   | 1   | 2.3% | 2.2% |
| Cardiac Comp         | 1   | 3   | 0   | 3   | 0   | 3   | 4   | 3   | 1   | 3   | 2   | 4   | 27  | 1.3% |
Thank You