

Post-Operative Respiratory Management: the Case for Non-Invasive Ventilation

Discussion

Post-operative pulmonary complications pose a major challenge in the PACU. As a result of baseline disease, surgical exposure and anesthetic management, pulmonary complications are common and are associated with significant post-operative morbidity and mortality. Non-invasive ventilation (CPAP and BIPAP) has emerged as a widely available treatment strategy for patients in respiratory distress. In this presentation, we will present a brief review of acute respiratory failure and discuss recent data examining the potential uses for non-invasive ventilation in the post-operative period.

Learning Objectives

- 1) Discuss physiology and goals for non-invasive ventilation (NIV)
- 2) Discuss the patient interfaces and various modes for NIV
- 3) Outline the risks and benefits of NIV and describe the predictors of success and failure
- 4) Examine the specific indications and supporting literature for post-operative NIV
 - a) COPD
 - b) Pulmonary edema
 - c) Pneumonia, Asthma, DNI
 - d) Prevention of post-operative respiratory failure
 - e) Treatment of post-operative respiratory failure

Outline

I. History of NIV

- a. 1700s bellows devices used for resuscitation of drowning victims
- b. Early 1900s "Iron Lung" for treatment of Polio
- c. Modern NIV developed in 1980s and in common use in 1990s

II. Risk and Benefits of NIV

- a. Benefits – Avoids Intubation, decreased infection, decreased need for sedation/analgesia, decreased length of stay and mortality, easier to wean, reduces afterload and increases CO
- b. Risks – Delayed Intubation, decreased clearance of secretions and risk of aspiration

III. Goals and Physiology of NIV

- a. Improve Oxygenation - decreased atelectasis and improved FRC
- b. Improve Ventilation and Respiratory Acidosis - improved compliance and increased tidal volume
- c. Decrease Work of Breathing - unload respiratory muscles and improve dyspnea

IV. Patient Interfaces

- a. Facemask – improved oxygenation and ventilation

- b. Nasal Mask – improved acceptance (less claustrophobia and improved communication) and improved clearance of secretions

V. Modes – CPAP vs BIPAP

a. CPAP

- i. Uniform pressure during inspiration and expiration
- ii. May be better tolerated by patients
- iii. Similar improvement in oxygenation, but decreased improvement in ventilation and WOB compared to BIPAP

b. BIPAP

- i. Biphasic pressure (higher during inspiration, lower during expiration)
- ii. May be less well tolerated compared to CPAP
- iii. Similar improvement in oxygenation, but improved ventilation and WOB compared to CPAP as above

VI. Predictors of Success/Failure

- a. Improvement in O₂/CO₂ within 2 hours
- b. Decreased respiratory rate
- c. Small air leak
- d. Good coordination/cooperation with NIV

VII. Indications for NIV

- a. COPD – best evidence to date, Grade IA
- b. Cardiogenic Pulmonary Edema – very strong evidence, Grade IA
- c. Pneumonia – results conflicting, possible harm
 - i. Likely related to volume, viscosity, and ability to clear secretions
- d. Asthma – limited evidence, but likely beneficial given strong COPD benefit
- e. DNI – valuable adjunct for strict DNI or DNR patients
- f. Post-operative Respiratory Failure
 - i. Occurs in 5-10% of high risk thoracic and abdominal surgery cases
 - ii. Most commonly related to atelectasis
 - iii. Prevention of Respiratory Failure – moderate level of evidence to support use of prophylactic NIV in high-risk postoperative patients
 - iv. Treatment of Respiratory Failure- moderate level of evidence to support use in multiple patient populations (cardiac, thoracic, abdominal surgery)

VIII. Indicators of Failed NIV

- a. No improvement or stabilization of O₂/CO₂ in 2 hours
- b. Worsening tachypnea or increased work of breathing
- c. Declining mental status or agitation
- d. Inability to clear secretions
- e. Inability to tolerate mask or ventilator