Acute Respiratory Failure in the Acute Care Setting

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Disclosures:
I do not have any disclosures to reveal except that I am not a Pulmonologist.

OBJECTIVES:
1. Define and classify acute respiratory failure in the acute care setting.
2. Recognize the signs and symptoms of acute respiratory failure in hospitalized patients.
3. List the differential diagnosis for an acute exacerbation of COPD.
4. Discuss the role of oxygen therapy in the treatment of hypoxemic respiratory failure.
Definition:
• “Respiratory failure is a syndrome in which the respiratory system fails in one or both of its gas exchange functions: oxygenation and carbon dioxide elimination.”

Two main types: (can be acute vs chronic)
1. Hypoxemic: defined as a PaO2<60
   • “common form of respiratory failure.
   • Major threat to organ function
   • Usually develops acutely

Etiology:
• All forms of acute lung injury, Pleural effusions, “cardiogenic or non-cardiogenic pulmonary edema, pneumonia, and pulmonary hemorrhage.”

2. Hypercapnic: defined as a PaCO2>50; pH<7.3

Etiology:
• “drug overdose, neuromuscular disease, chest wall abnormalities, and severe airway disorders (e.g., asthma and chronic obstructive pulmonary disease (COPD)” (2015, Medscape). Respiratory muscle weakness; decreased respiratory effort; airway obstruction.
• Develops over minutes to hours

Continued:

Pathophysiology:
Any abnormality of the following: airways, alveoli, central nervous system (CNS), peripheral nervous system, respiratory muscles, and chest wall. Patients who have hypo-perfusion secondary to cardiogenic, hypovolemic, or septic shock often present with respiratory failure.
Epidemiology:
Incidence: 360,000 cases/yr
Mortality: 36% of patients die during their hospitalization

Mortality associated with various causes of Acute Respiratory Failure:
Those looked at closely:
1. ARDS: 40-45% ; >60yo have lower mortality; those who survive, 
   have some pulmonary dysfunction 1 or > years later
2. COPD: declined over the years from 26-10%
3. AE-COPD: 30%

Signs and Symptoms of Respiratory Failure:

**Hypoxia:**
- COPD pulse ox goal: 88-92%
- Coughing uncontrollably
- Tachypnea: RR>20-24bpm
- Use of accessory muscles w/work of breathing
- Panic/anxiety

**Hypercapnia:**
- Altered mental status
- Lethargy
- Snoring loudly
- Unable to arouse
- Respiratory depression: RR<12bpm
- Lack of chest rise
- CO2>45
According to the British Thoracic Society Guideline for oxygen therapy in patients with COPD:

“…data show that a titrated oxygen administration to achieve an oxygen saturation of between the 88% to 92% compared with higher saturations results in less respiratory acidosis and better outcome.”

Case study:

41yo WF, 35 weeks pregnant with a PMH significant for COPD, current tobacco smoker, asthma, severe arthritis requiring several Medrol packs/yr that has confined her to a wheelchair, DM II, HTN, and morbid obesity.

RRT called to her room for acute-onset dyspnea with hypoxia, on simple mask 02. She was on SOB in a panic. HR initially 145bpm, RR 30+, SBP 147, pulse ox 94%.

PE:

Anxious, having difficulty speaking r/t dyspnea/tachypnea; scattered wheezes throughout lung fields. No peripheral edema. No CP/JVD.

Scenario:

She was looking at the breakfast menu when she acutely became dyspneic. The RN was running for a nebulized treatment when the Team arrived. Her hypoxia improved with Albuterol 2.5mg/0.5ml nebulized while on simple mask 02. Her pulse ox came up to 97%; her tachypnea improved with calm reassurance and verbal prompting. Her HR normalized to 96bpm and she felt comfortable enough to lean back in the bed with the HOB up.
DDx:
• Hypertensive crisis: SBP was 140-150s, shouldn’t cause a crisis
• Pulmonary edema: not receiving IVFs, no peripheral edema
• Bronchospasm: was on steroids, Prednisone 30mg PO daily for her arthritis, scheduled neb txs
• Panic attack: possibly
• Pulmonary embolus: no risk factors; no Antiphospholipid Syndrome
• Beta Blocker for her HTN: yes, she was on Labetalol 400mg PO BID.

What do you want to do for her?
1. Albuterol 2.5mg/0.5ml nebulized now
2. ABG
3. CXR
4. EKG?
5. Pulmonology? Was already seeing during hospitalization
6. Change Beta Blocker to Calcium Channel Blocker; suggestions on any safe for pregnant females?

GOLD Initiative for AE-COPD:

DDx:
1. TI
2. CHF
3. Bronchiectasis
4. Obliterative Bronchiolitis
5. Asthma

Symptoms:
PaO2<60 and/or PaCO2>50 requires hospitalization; considered an exacerbation.
Management of AE-COPD:

1. CPAP/02 therapy: target Pa02 is 88-92%.
2. Bronchodilator therapy: SA-B2 agonists, INHL w/o SA-anticholinergics
3. Steroids: Prednisone 40mg PO/day x 5 days; Shortens recovery time, decreases hypoxemia by improving lung function, reduces risk of early relapse/treatment failure/length of hospital stay.
4. Antibiotics:
   - Indicated if increased volume/purulent sputum, mechanical ventilation required, and worsened dyspnea.

Asthma exacerbation Management:

1. SABA inhaled: repeat Q20min x 1hr
2. Oral corticosteroids: Prednisolone 1mg/kg, max 50mg
3. Oxygen therapy: goal Pa02 93-95%
4. If not responding, IV Magnesium Sulfate
5. CXR, ABGs, antibiotics NOT recommended for Asthma Exacerbations

The ever-popular sputum sample:

1. Used to detect/ID the presence of bacteria/fungi in sputum.
2. “The presence of normal upper respiratory tract flora should be expected in sputum culture. Normal respiratory flora include Neisseria catarrhalis, Candida albicans, diphtheroids, alpha-hemolytic streptococci, and some staphylococci.”
3. “Sputum specimens are observed for mucopurulent strands, leukocytes, and blood and culture results. The presence of normal upper respiratory tract flora should be expected in sputum culture.” (May 7, 2014)
4. “there is controversy about the diagnostic accuracy of many cultures of respiratory specimens.”
Rapid Sequence Intubation and the Oklahoma Board of Nursing:

OBN RSI Definition:
“Rapid-sequence intubation is defined as a technique where a potent sedative or induction agent is administered virtually simultaneously with a paralyzing dose of a neuromuscular blocking agent to facilitate rapid tracheal intubation.”

OBN Exclusionary Formulary:
- Etomidate (Amidate)  Exception: May be ordered ONLY for Rapid Sequence Intubation by an APRN who is appropriately certified, privileged, and credentialed.
- Midazolam (Versed)  Exception: May be ordered ONLY for Rapid Sequence Intubation by an APRN who is appropriately certified, privileged, and credentialed.

Questions? Discussion?