

Respiratory Failure

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Charlotte Buoni, DNP, MSN, RN, CCRN, CNE

Acute Respiratory Failure

- **Results from inadequate gas exchange**
 - **Insufficient O₂ transferred to the blood**
 - **Hypoxemia (*Oxygenation failure*)**
 - **Inadequate CO₂ removal**
 - **Hypercapnia (*Ventilation failure*)**

Gas Exchange Unit

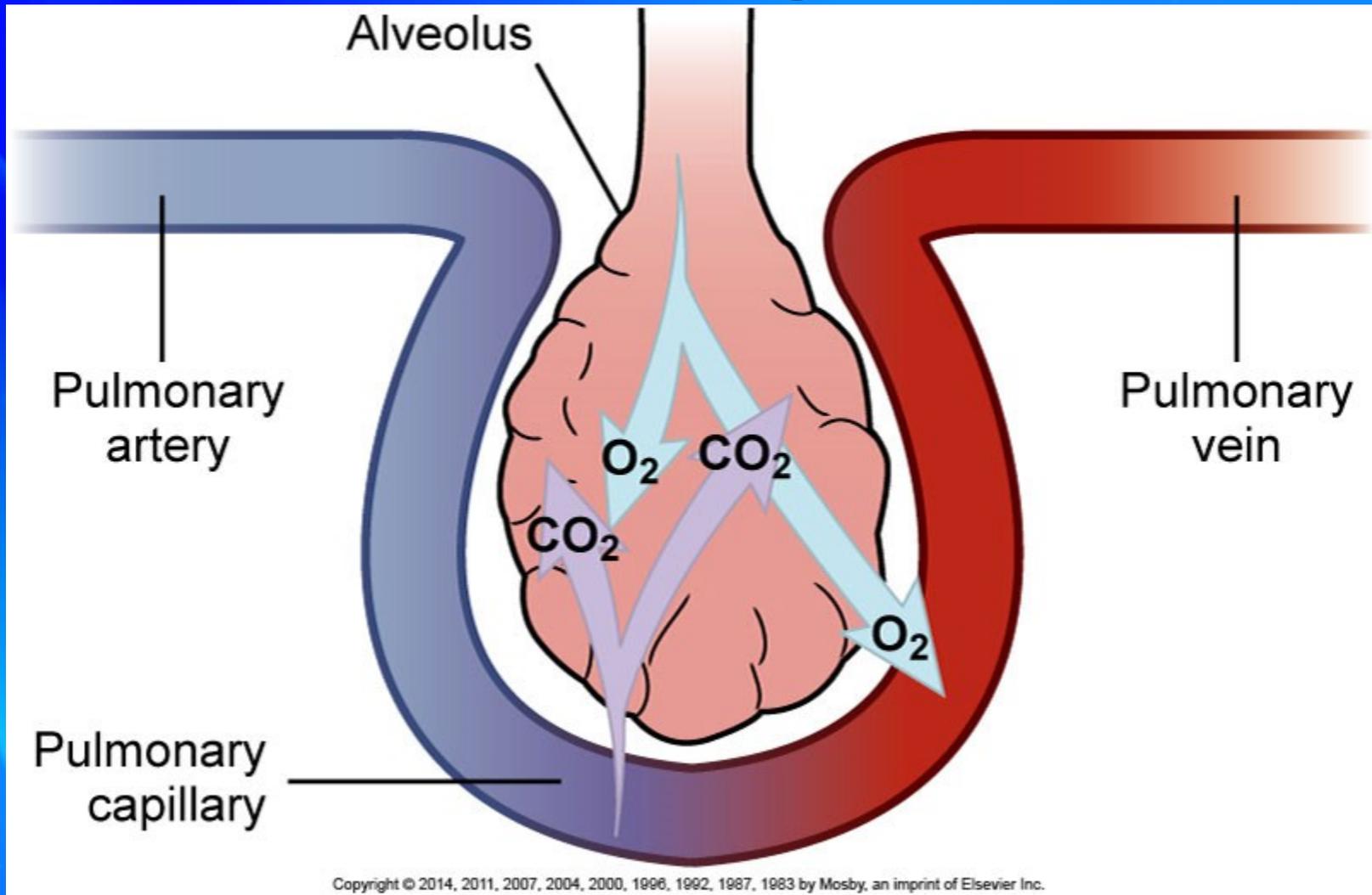


Fig. 68-1

Acute Respiratory Failure

- **Not a disease but a condition**
- **Result of one or more diseases involving the lungs or other body systems**
 - **Common causes listed by symptoms Table 67-1 p. 1589**
- **Classification:**
 - **Hypoxemic respiratory failure**
 - **Hypercapnic respiratory failure**

Respiratory failure

Hypoxemic
(Oxygenation failure)
 $\text{PaO}_2 \leq 60$ mm Hg on
60% oxygen

Acute
(minutes
to hours)

Chronic
(several
days or
longer)

Hypercapnic
(Ventilatory failure)
 $\text{PaCO}_2 > 45$ mm Hg
and $\text{pH} < 7.35$

Acute
(minutes
to hours)

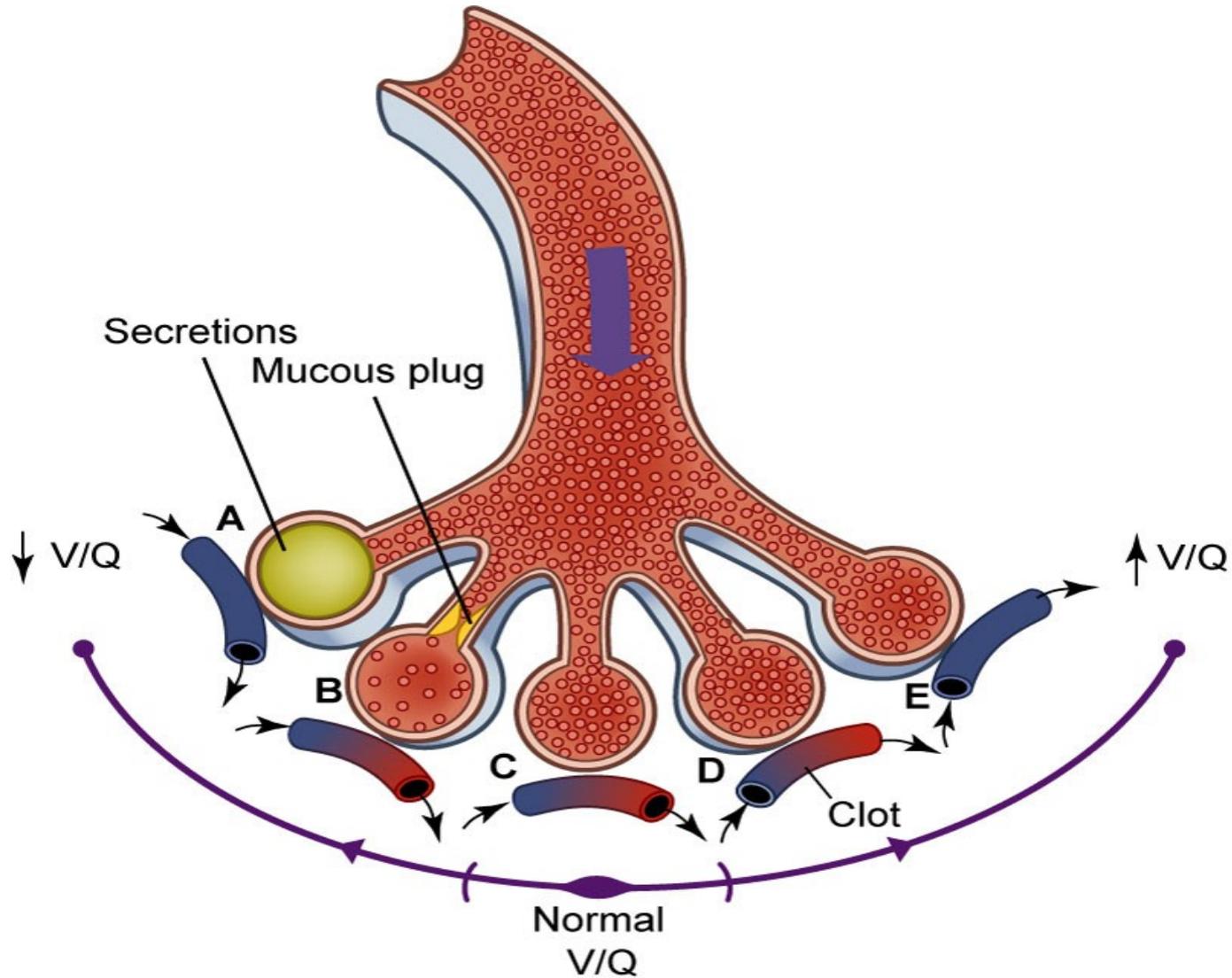
Chronic
(several
days or
longer)

Hypoxemic Respiratory Failure

Etiology and Pathophysiology

- **Causes:**
 - 1. Ventilation-perfusion (V/Q) mismatch**
 - 1. Shunt**
 - 2. Dead Space**
 - 2. Diffusion limitation**

Range of V/Q Relationships



Hypoxemic Respiratory Failure

Etiology and Pathophysiology

1. V/Q mismatch (Shunt & Dead Space)

- Pneumonia**
- Asthma**
- Atelectasis**
- Pulmonary embolus**
- Pain**
- COPD – (↑ secretions in airway)**

Hypoxemic Respiratory Failure

Etiology and Pathophysiology

2. Diffusion limitation = gas exchange compromised by processes that thicken or destroy the capillary membrane

- Severe emphysema**
- Pulmonary fibrosis/ ILD**
- ARDS**

Diffusion Limitation

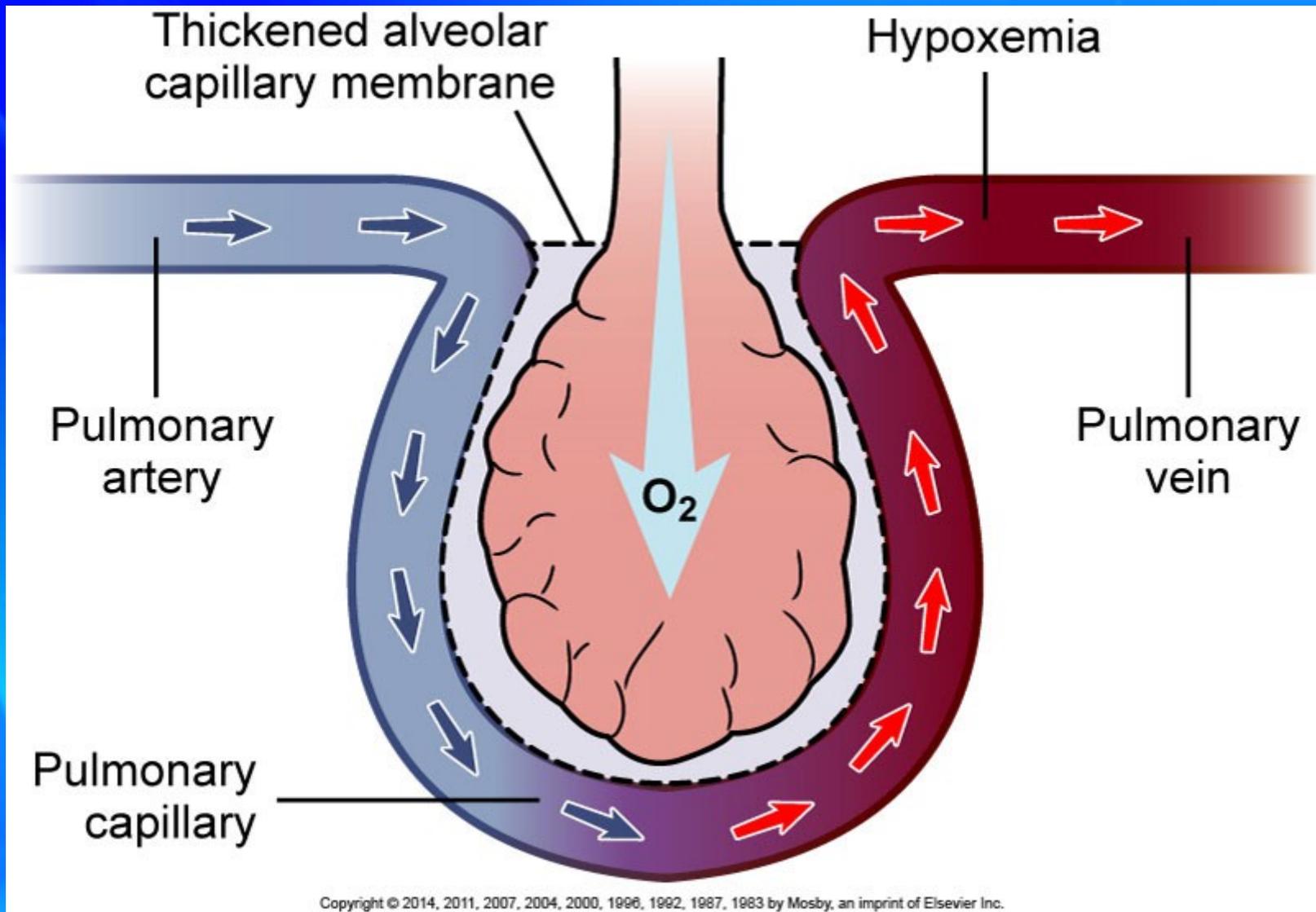


Fig. 68-5

HYPERCAPNIC RESPIRATORY FAILURE

- **Imbalance between ventilatory supply (*maximum ventilation pt. can sustain without respiratory muscle fatigue*) and demand (*amt. of ventilation to keep $PaCO_2$ WNL*)**

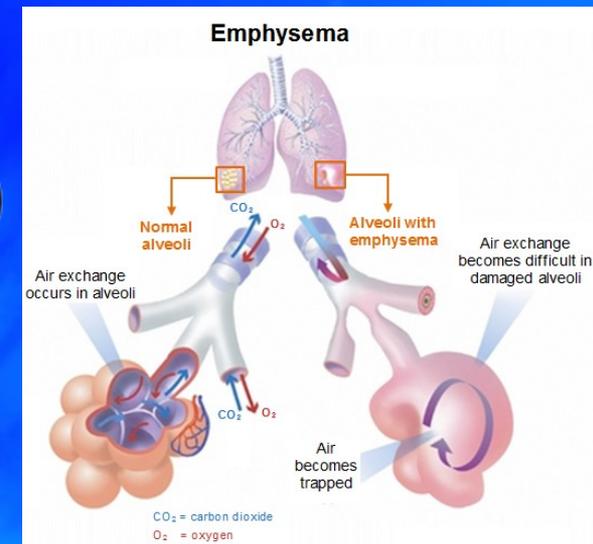
HYPERCAPNIC RESPIRATORY FAILURE

- **4 main categories:**
 - **Airway / alveolar abnormalities**
 - **CNS abnormalities**
 - **Chest wall abnormalities**
 - **Neuromuscular conditions**

Hypercapnic Respiratory Failure

Etiology and Pathophysiology

- **Airways and alveoli**
 - Asthma
 - COPD/emphysema/chronic bronchitis
 - Cystic fibrosis
- (Refer again to table 67-1)



Hypercapnic Respiratory Failure

Etiology and Pathophysiology

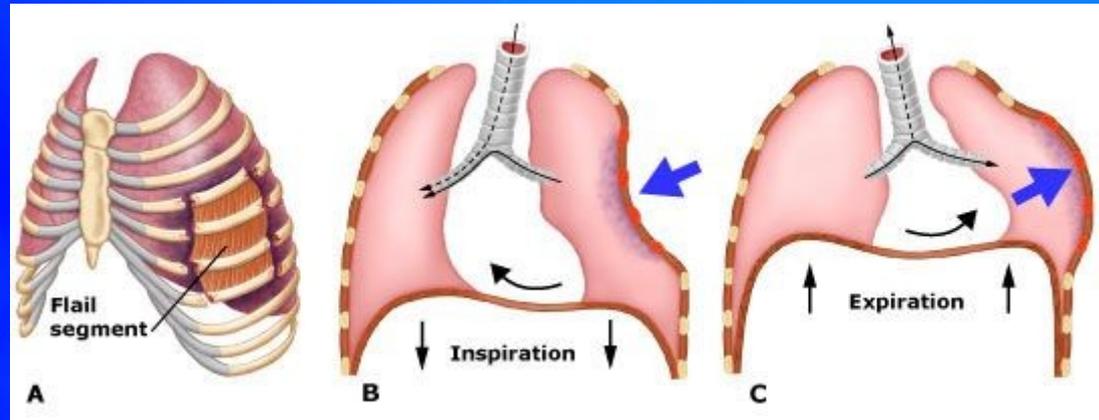
- **Central nervous system = suppression of drive to breathe**
 - **Drug overdose**
 - **Brainstem infarction**
 - **Spinal cord injuries**



Hypercapnic Respiratory Failure

Etiology and Pathophysiology

- **Chest wall**
 - Flail chest
 - Fractures
 - Mechanical restriction
 - Muscle spasm
 - Spinal configuration
 - Morbid Obesity



Hypercapnic Respiratory Failure

Etiology and Pathophysiology

- **Neuromuscular conditions**
 - **Muscular dystrophy**
 - **Multiple sclerosis**
 - **Guillain-Barre Syndrome**



Spot check!

Hypoxemic or Hypercapneic?

1. Pneumonia?
2. Pulmonary embolism?
3. Brainstem injury?
4. Pain?
5. Heart failure?
6. ARDS?
7. Overdose?
8. COPD?

Respiratory Failure

Tissue Oxygen Needs

- **Major threat is the inability of the lungs to meet the oxygen demands of the tissues**
 - **Inadequate tissue delivery (↓ Hgb or O₂)**
 - **Inability to use O₂ delivered (ph ↓)**

Consequences of hypoxemia & hypoxia

- **Metabolic acidosis & cell death (↑ lactic acid, sepsis)**
- **End-organ failure: brain, heart, kidneys, GI, etc.**

Respiratory Failure

Clinical Manifestations

- **Sudden or gradual onset**
- **A sudden ↓ in PaO₂ or rapid ↑ in PaCO₂ is a serious condition (bronchospasm)**
- **When compensatory mechanisms fail, respiratory failure occurs**
- **Signs may be specific or nonspecific**

Respiratory Failure

Clinical Manifestations

Nonspecific

1. **-Restlessness**
2. **-Change in level of consciousness, confusion**
3. **-Cool, clammy skin**
4. **-Dysrhythmias**
5. **-Tachycardia and hypertension**
6. **-Fatigue**
7. **-Progressive somnolence**

Hypoxemia? Hypercapnia? Both?
(Refer to table 67-2, p. 1592)

Respiratory Failure

Clinical Manifestations

Specific

- **Dyspnea ****
- **Decreased or rapid RR with shallow breathing pattern**
 - **Pursed lip breathing**
 - **Decreased SpO₂**
 - **Cyanosis (late)**
 - **Retractions**
 - **Change in I:E ratio**



Respiratory Failure

Assessment & Diagnostics

Diagnostic Studies:

- Vital signs & SpO₂
- Subj/Obj data
- ABG's
- Chest x-ray
- CBC
- Blood & sputum cultures (if indicated)



Acute Respiratory Failure

Nursing and Collaborative Care

- **Focused Nursing Assessment**
 - **Elicit what is new? Any changes?**
 - **Past health history**
 - **Medications**
 - **Surgery**
 - **Functional health patterns**
 - **Objective physical findings**

Acute Respiratory Failure

Nursing and Collaborative Care

- **Nursing Diagnoses/Priority Problems:**
- **Impaired gas exchange**
- **Ineffective airway clearance**
- **Ineffective breathing pattern**
- **Anxiety**

Acute Respiratory Failure

Nursing and Collaborative Care

- **Planning**
 - **Overall goals: (refers to EO's)**
 - VS
 - **Breath sounds**
 - **SpO₂**
 - **No dyspnea**
 - **Effective cough**
 - **ABGs***

Acute Respiratory Failure

Nursing and Collaborative Care

- Oxygen therapy
 - Non-invasive (cannula, masks, oximizer)
- Positive pressure ventilation
 - Non invasive - positive pressure ventilation
CPAP/BiPAP/Vapotherm
 - Invasive - Intubation mechanical ventilation
- Mobilization of secretions
 - Effective coughing and positioning
 - Hydration & humidification
 - Chest physical therapy
 - Airway suctioning
 - Ambulation/activity

Acute Respiratory Failure

Nursing and Collaborative Care

- **Drug Therapy**
 - Relief of bronchospasm
 - Reduction of airway inflammation
 - Reduction of pulmonary congestion
 - Treatment of pulmonary infection
 - Reduction of anxiety, pain, & agitation

Acute Respiratory Failure

Nursing and Collaborative Care

- **Medical Supportive Therapy & Nutrition**
 - **Treat the underlying cause**
 - **Maintain adequate cardiac output and hemoglobin concentration**
 - **Maintain protein and energy stores**
 - **Enteral or parenteral nutrition**
 - **Supplements**

Acute Respiratory Failure

Gerontologic Considerations

- **Reduced ventilatory capacity**
- **Alveolar dilation**
- **Diminished elastic recoil**
- **Decreased chest wall compliance**
- **Smoking**
- **Poor nutritional status**

Acute Respiratory Failure

Gerontologic Considerations

- Less available physiologic reserve**
 - Cardiovascular**
 - Respiratory**
 - Autonomic nervous system**
- Vulnerable to delirium**