

# **Respiratory Failure**

**N202, 2022**

**Charlotte Buoni, MSN, RN, CCRN, CNE**

# Acute Respiratory Failure

- **Results from inadequate gas exchange**
  - **Insufficient O<sub>2</sub> transferred to the blood**
    - **Hypoxemia** \_\_\_\_\_
  - **Inadequate CO<sub>2</sub> removal**
    - **Hypercapnia** \_\_\_\_\_

# Gas Exchange Unit

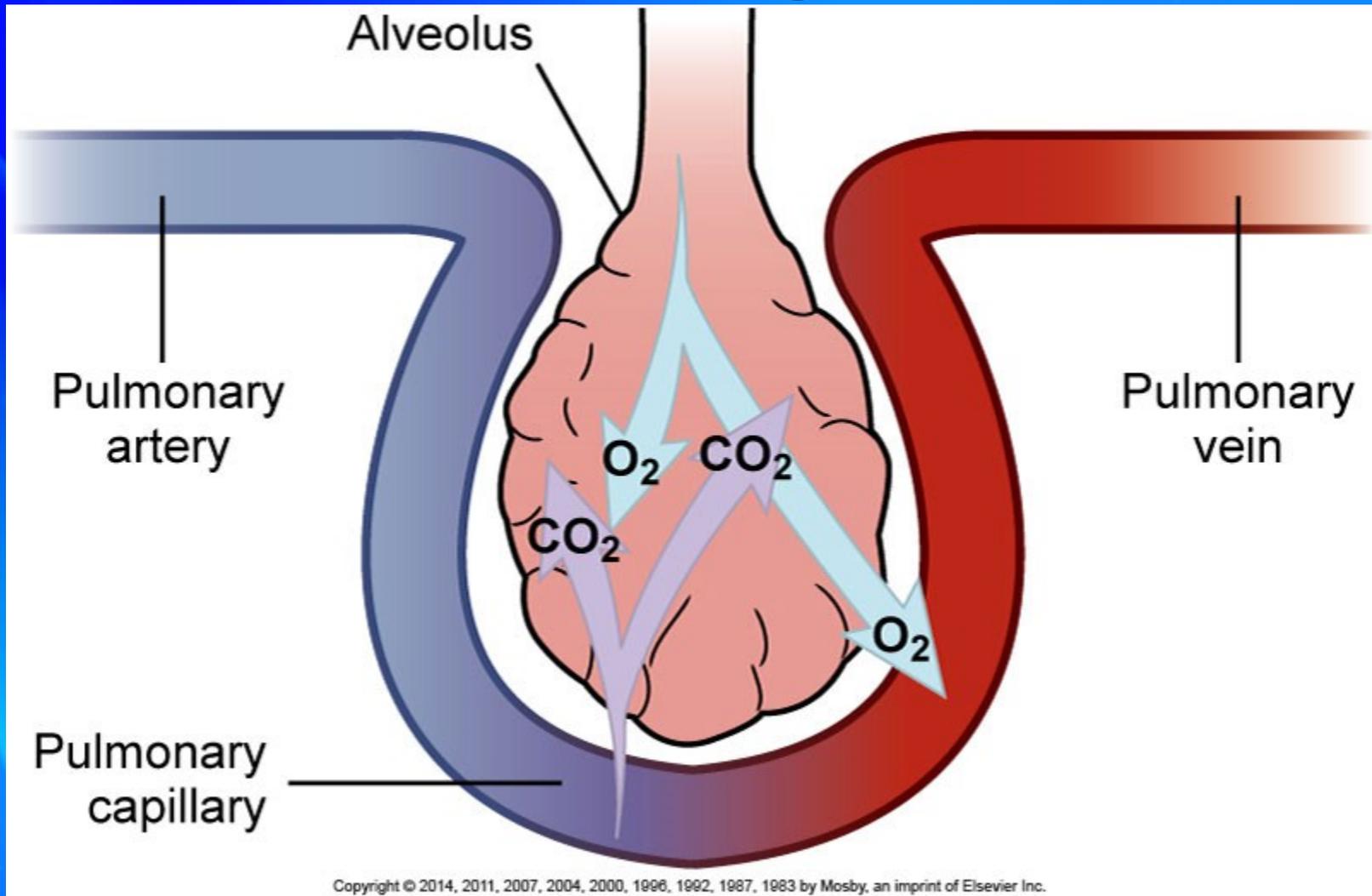


Fig. 68-1

# **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)

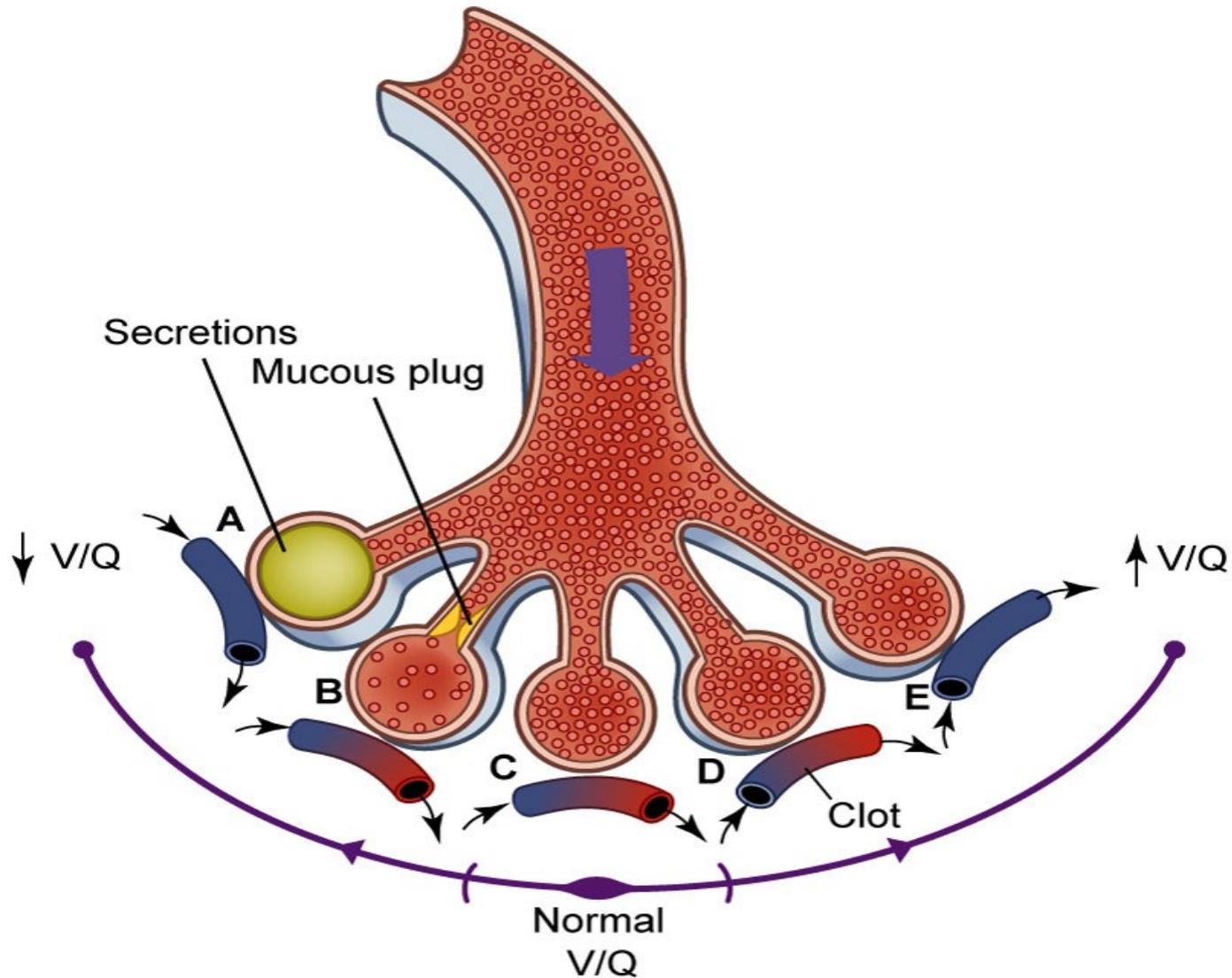
Chronic  
(several  
days or  
longer)

# **Hypoxemic Respiratory Failure**

## **Etiology and Pathophysiology**

- **Causes:**
  - 1. Ventilation-perfusion (V/Q) mismatch**
    - 1. Shunt**
    - 2. Deadspace**
  - 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**

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

- Severe emphysema\*\***
- Recurrent pulmonary emboli\*\***
- Pulmonary fibrosis, ILD\*\***
- ARDS**

**Hypoxemia present during exercise \*\***

# Diffusion Limitation

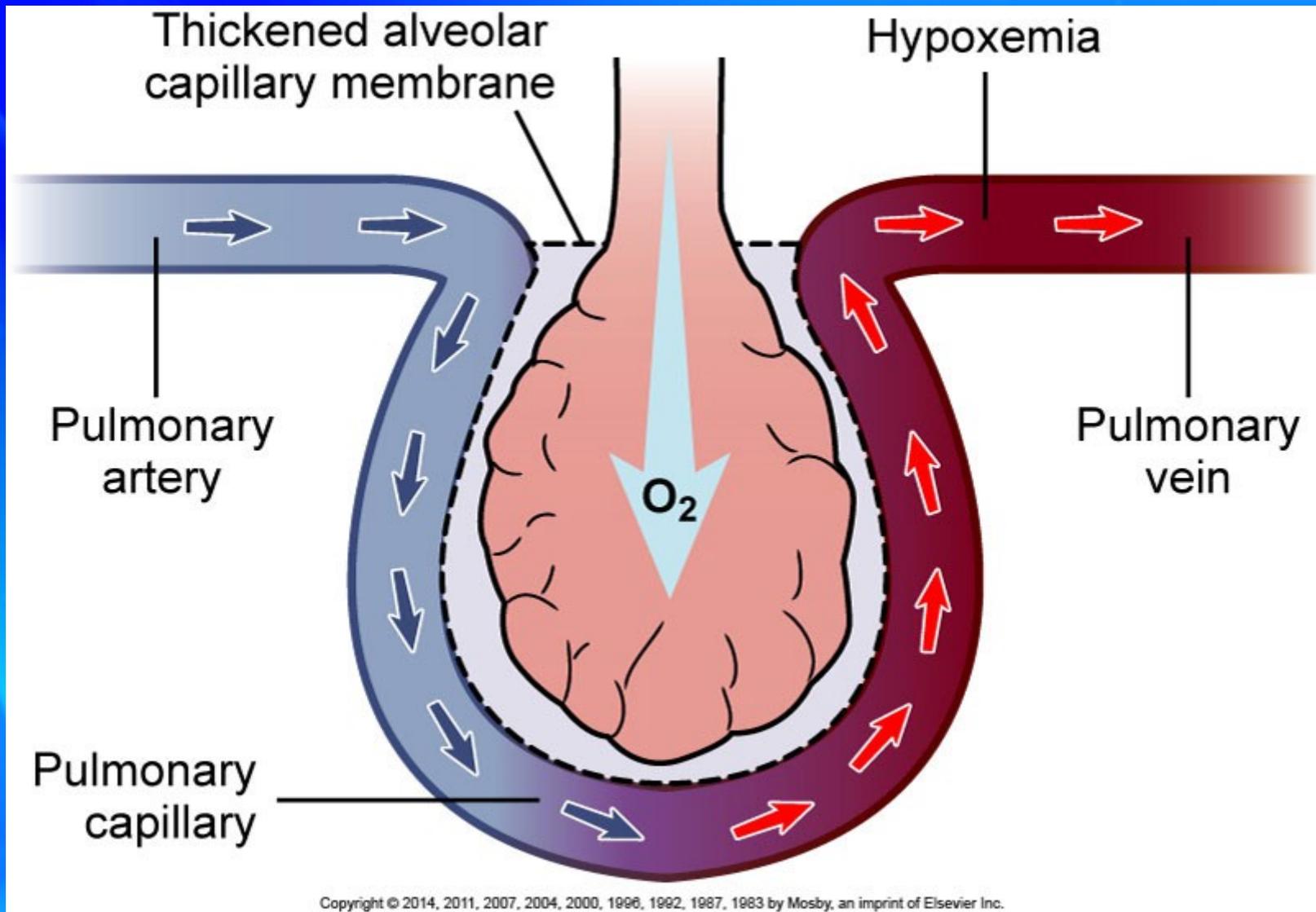


Fig. 68-5

# **HYPERCAPNIC RESPIRATORY FAILURE**

- **Imbalance between ventilatory supply (*maximum ventilation pt. can sustain without respiratory muscle fatigue*) and demand (*amt. of ventilation to keep PaCO<sub>2</sub> WNL*)**

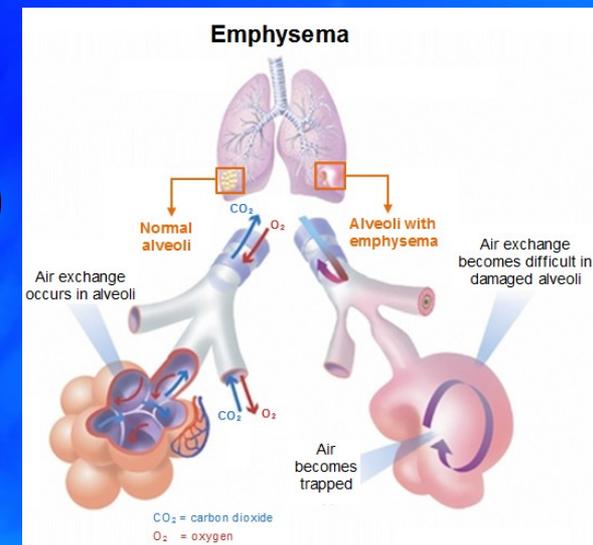
# **HYPERCAPNIC RESPIRATORY FAILURE**

- **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**

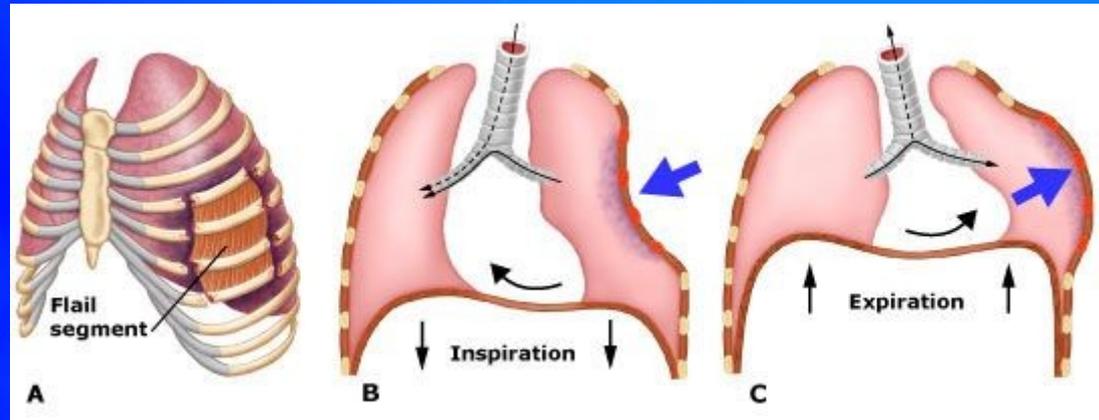
- **Central nervous system = suppression of drive to breathe**
  - **Drug overdose**
  - **Brainstem infarction**
  - **Spinal cord injuries**



# 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 O<sub>2</sub>)**
  - Inability to use O<sub>2</sub> delivered (ph ↓)**

### **Consequences of hypoxemia & hypoxia**

- **Metabolic acidosis & cell death ( ↑ lactic acid, sepsis)**
- **Decreased cardiac output**
- **Impaired renal function**
- **GI alteration**

# **Respiratory Failure**

## **Clinical Manifestations**

- **Sudden or gradual onset**
- **A sudden ↓ in PaO<sub>2</sub> or rapid ↑ in PaCO<sub>2</sub> 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**

**(Refer to table 67-2, p. 1592)**

# **Respiratory Failure**

## **Clinical Manifestations**

### *Specific*

- **Dyspnea \*\***
- **Decreased or rapid rate with shallow breathing pattern**
  - **Pursed lip breathing**
  - **Decreased SpO<sub>2</sub>**
  - **Tachypnea,**
  - **Cyanosis (late)**
  - **Retractions**
  - **Change in I:E ratio**
  - **Decreased V<sub>T</sub>, V<sub>E</sub>**



# Spot check!

## Respiratory Failure

### Diagnostic Studies:

- Vital signs & SpO<sub>2</sub>
- H&P exam
- ABG's
- Chest x-ray
- ECG
- CBC
- Blood & sputum cultures (if indicated)
- Electrolytes
- ScvO<sub>2</sub>



# **Acute Respiratory Failure**

## **Nursing and Collaborative Care**

- **Focused Nursing Assessment**
  - **Past health history**
  - **Medications**
  - **Surgery**
  - **Functional health patterns**
  - **Objective physical findings**



# N101 Refresher

- Refer to your material on the respiratory system from N101 to help you with the following slides

# Acute Respiratory Failure

## Nursing and Collaborative Care

- **Nursing Diagnoses**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

# Acute Respiratory Failure

## Nursing and Collaborative Care

### Planning

– Overall goals: (refers to EO's)

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

# **Acute Respiratory Failure**

## **Nursing and Collaborative Care**

- **Respiratory Therapy**

# Acute Respiratory Failure

## Nursing and Collaborative Care

- **Drug Therapy**

- Relief of bronchospasm

- \_\_\_\_\_

- Reduction of airway inflammation

- \_\_\_\_\_

- Reduction of pulmonary congestion

- \_\_\_\_\_

# **Acute Respiratory Failure**

## **Nursing and Collaborative Care**

- **Drug Therapy (cont'd)**
- **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**