Respiratory Stressors
Part II
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NR 33
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Case Study
CK is a 71yo male with c/o chills and cough who was evaluated by his PMD, now presents to the ED stating “my doctor told me that I have pneumonia”.

Overview of Pneumonia (PNU)
Acute infection of the lung involving:
- Interstitial spaces
- Alveoli
- Bronchioles
Two Types
- Community-acquired (CAP)
- Hospital-acquired (nosocomial) (HAP)

Pathophysiology of PNU
- Invading organism (bacterial or viral) overrides host defenses of lung
- resulting infiltration of inflammatory factors cause edema of affected alveoli
- alveolarcapillary membrane become route for transfer of microbes into bloodstream
  - can result in septicemia: systemic multiplication of microorganism aka ‘blood poisoning’
- extension in pleura space
  - can lead to empyema

Incidence and Etiology
- In 2005:
  - The 3rd most common cause of death for age>85
  - 1.3 million emergency room visits in 2000
  - 34.7 million ER visits in 2005
  - 63,548 deaths recorded in the United States in 2000 vs. 60,207 in 2005
- Major etiological agents:
  - bacterial: streptococcus is most common, pneumoccoal 25-35% of all CAP cases
  - viral : 50% of cases, less common in adults
  - mycoplasma : 15-20% of adult cases and higher in children

More facts re: PNU
- Ranks 6th among all disease categories as a cause of death
- Cost to the U.S. in 2000 $5 billion dollars in 2000 and 40.2 billion in 2005
- Most common types of microorganisms are 6B, 23F, 14, 9V, 19A, 19F; all are in the pneumococcal vaccine.
- The most common, lethal nosocomial infection
  (Merck, 2000)
  - Cause nosocomial PNU: aspiration secondary to oral secretions
    - and then gastric contents!!!!

Predisposing factors
**Table 34-3**

- Upper respiratory viral infections
  - Influenza
- Alcoholism
- Institutionalization
- Cigarette smoking
- Heart failure
- COPD

**Coexisting conditions**

- Age extremes
- Debilitated states
- Immunocompromised states
- Compromised consciousness
  - CVA
- Dysphagia
- Exposure to transmissible agents.

**Clinical Manifestations—Pneumonia**

- Cough, fever, chills most common symptoms
- Sputum production and pleuritic pain
- Tachypnea and signs of consolidation
  - Crackles with bronchial breath sounds.
- Wheezing
- Dullness to percussion
- Egophony
- Hypoxemia

**Signs of dehydration**

- Hypotensive, orthostatic changes
- Rapid, weak pulse
- Impending shock

**Concept Map of PNU**

**Lab/Diagnostics**

- Evaluation of oxygenation
  - Pulse Ox < 90 with apparent distress ⇒ requires ABGs
- Evaluation of infection:
  - Chest XRAY: presence of infiltrate or increased density
  - CBC: leukocytosis
  - Sputum C/S and Gram Stain: + microorganism growth
  - BLOOD C/S x2 if T > 101: + microorganism growth
- Evaluation of hydration
  - VS measurements including orthostatics
  - Metabolic panel

**Nursing Diagnosis/Collaborative Problems**

- Potential for: Sepsis
- Potential for: Hypoxemia
- Ineffective airway clearance
- Impaired gas exchange
- Deficient Fluid Volume
Potential for: Paralytic ileus
Activity Intolerance
Pain
Hyperthermia
Risk for Ineffective Therapeutic Regimen

Medical management of PNU
● Antibiotics according to C & S
● Supplemental O2 if hypoxemia present
● Bronchodilator therapy with bronchial involvement
● Adequate hydration to replace losses
● Speech pathology/ swallow evaluation - consult in any client with suspected aspiration

Let us look @ CK's orders
● If in questioning-you come to find out CK is allergic to PCN-Can you give Ceftriaxone??
● What are you going to do????
● Would you obtain the sputum C&S and urine C&S or give the ATB first??

Let us look @ CK's orders

What teaching points need to be integrated into the plan of care?

Severe Acute Respiratory Distress Syndrome (SARS)
● Number of cases in U.S. as of 7/3 was 325. Mortality was 8%. Other countries much higher.
● Caused by a coronavirus
  ● Attacks respiratory cells and causes an acute inflammatory response
  ● Spread by airborne droplets

Case Study Approach
● Correlate to Case Study #9 Chapter 2
● Complete the case study in groups to increase your knowledge base.

Nursing Care of Clients Experiencing Chronic Airway Limitations of COPD

Distinguishing Between Emphysema & Chronic Bronchitis
● Emphysema
  ● Destruction of alveoli and loss of elastic recoil of lung
  ● Overdistended alveoli called bullae
  ● Result in hyperinflation of lung and decreased gas exchange

● Chronic Bronchitis
  ● Inflammation of bronchioles causing mucous gland hypertrophy and hyperplasia
  ● Excess sputum production with chronic airflow reduction, mucous plugs block gas exchange increase infection

Incidence & Etiology
● 16 million people had COPD in 1994, whereas 11.6 million were diagnosed in 2005 (Probably the result of under diagnosing)
● Prevalence, incidence, & mortality increase with age
  ● In 2004 118,171 Americans died from COPD
- Cigarette smoking and/or exposure to smoke/irritants which is the primary risk factor
- Air pollution
- Family history of $\alpha_1$-antitrypsin
  ($\alpha_1$-antiprotease inhibitor) deficiency

24 **Complications of COPD**
- Hypoxemia and acidosis
- Respiratory tract infections
- Right sided heart failure (Cor Pulmonale)
- Cardiac dysrhythmias

25 **Chronic bronchitis aka Blue Bloater**
- **Pathogenesis**
  - Excessive production of mucus
  - Chronic cough that lasts 3 mos/year
  - Particularly after a night's sleep
  - Thick, purulent sputum-breeding ground for m/o’s
  - Result of prolonged exposure to respiratory irritants
    - Tobacco, air pollution, toxic fumes, dust
  - Resulting in chronic inflammation → swelling and thickening in bronchioles and enlarged mucus-producing glands → scarring and damage to mucociliary lining of resp. tract eventually leading to destruction of small airways.

Advanced disease - right sided heart failure and chronic severe hypoxia → Cor Pulmonale

26 **Emphysema aka Pink Puffer**
- **Pathogenesis**
  - Enlarged distal air spaces and destruction of alveoli
    - Centrilobular - correlated with tobacco smoke
    - Panlobular - familial tendency

  **Clinical manifestations**
  - Increasing breathlessness.....breathless @ rest
  - Prolonged expiratory phase in resp cycle
  - Chronically malnourished
  - Barrel chest, pursed breathing opens distal airways

  Progressive, incurable disease
demise secondary to: resp acidosis-coma, heart failure, massive pneumothorax

27 **Lab/Diagnostics**
- ABGs (50-50 Club)
  - Hypercarbia, hypoxemia
  - Hypercarbia seen in advanced COPD (also known as CO2 retainers)
  - May be stable
    - ABG will show full compensation
  - May be unstable:
    - Respiratory acidosis with partial compensation

28 **Lab/Diagnostics**
- Chest X-ray shows hyperinflation and flattening of diaphragm

29 **Lab/diagnostics**
● EKG
  ● right ventricular enlargement ✓ cor pulmonale

● CBC
  ● Polycythemia (abnormal ♦ # RBC)

● PFTs
  ● decreased FEV1 and VC
  ● increased residual volume due to air trapping

31 Medical Management of COPD
● Oxygen therapy PaO2>55-60
  ● minimal amount in clients with chronic hypercarbia to maintain hypoxic drive

● Bronchodilator therapy
  ● inhaled prep preferred to minimize systemic effect
  ● atrovent is preferred adjunct to beta agonists

● Anti-inflammatories
  ● corticosteroids

32 Medical Management of COPD continues.....
● Mucolytics
  ● acetylcysteine (mucomist) inhaler
  ● guaifenesin elixir
  ● cough suppressant are avoided

● Hydration up to 3 liters/day

● Smoking cessation

● Nutrition recommendations to prevent malnutrition

33 Medical Management of COPD still continues.....
● Antibiotics in acute exacerbations
● Pulmonary rehabilitation
● Prevention of respiratory infection
● Surgical interventions
  ● Lung reduction surgery
  ● lung transplantation
  ● in case of α₁-antitrypsin (α₁-antiprotease inhibitor) deficiency

34 Nursing Diagnoses/Collaborative Problems
  CAN YOU IDENTIFY THE DEFINING CHARACTERISTICS?
  Impaired gas exchange
  Ineffective breathing pattern
  Ineffective airway clearance
  Altered nutrition
  Anxiety
  Activity intolerance
  High risk for infection

35 Nursing Diagnoses/Collaborative Problems
  Can you identify the defining characteristics/signs and symptoms when present?
Potential for: Hypoxemia
Potential for: Right-sided heart failure
Potential for: Pneumothorax
Potential for: Respiratory acidosis
Risk for ineffective therapeutic regimen management (See table 30-11 page 552)

36 Nursing Interventions for COPD Clients (Table 33-9, pg. 601)
- Can you implement a plan?
  - Airway management
  - Cough enhancement
  - Oxygen therapy
  - Energy management

37 Discharge Planning: Oxygen therapy at home
- Patient teaching
  - Electrical hazards
  - Smoking hazards
  - Safety strategies with portable oxygen
  - Maintenance of mucosal integrity
    - Identify risks of petroleum based lubricants

38 Test your nursing knowledge. What would you do if...?
- Your client becomes anxious?
- Chest is hyperresonant to percussion on right side?
- Client eats only 20% of meals?
- Neck veins are distended and dependent edema is noted?
- pH is 7.36, PCO2 is 52, HCO3 29 with PaO2 of 51?
- Client is unable to participate in breathing exercises?
- Asks you “what are pursed lip breathing exercises anyway?”
- Your client has ten visitors in the room while he or she is trying to eat lunch and they insist on seeing the dressing change to a wound immediately?

39 Chronic Bronchitis
- Hinders airflow and gas exchange 2° mucous plugs and infection → narrowed airways
- Results in hypoxemia and hypercarbic states (Sound familiar)
- In 2005 Estimated 8.9 million Americans were diagnosed with Chronic Bronchitis
- Now interventions and desired outcomes are essentially the same emphysema

40 Distinguishing Between Emphysema & Chronic Bronchitis
- Emphysema
  - Destruction of alveoli and loss of elastic recoil of lung
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41 Tuberculosis (TB)
- Caused by Mycobacterium
- Inflammatory, communicable disease
- Common in lungs, although may occur in other areas of the body
Exposure to causative organism—Mycobacterium.
World Health Organization estimated that there were 8.8 million new cases of active TB and approximately 1.6 million deaths results from TB in 2005 worldwide. (The AIDS epidemic is most likely the cause of this)

Tuberculosis: Infection vs. Disease

Infection
- infected with M. Tuberculosis
- no evidence of disease
- can not transmit disease
- treatment is given to clients who are at high risk for progressing to disease
- PPD positive without active disease

Disease
- infected with M. Tuberculosis
- has signs and symptoms of disease
- can transmit disease
- requires multidrug therapy to treat disease

Incidence
- In 2006 total number of new cases was 13,767. Which reflects the 10th consecutive year of decreased number of cases in the U.S.
- Over 50% of the new TB cases were in foreign-born persons.
- In 2004 662 people died of TB
- 3% of cases are drug resistant

Pathophysiology of TB
- Microorganism = Mycobacterium tuberculosis in alveoli
- Host = Susceptible individual
- Inflammation $\rightarrow$ infection $\rightarrow$ Ab released $\rightarrow$ fibrosis/calcification $\rightarrow$ exudate formation leads to necrosis $\rightarrow$ liquefaction of caseous material $\rightarrow$ leads to cavitation

- Incubation period approx 4-12 weeks because with infection and lesion present on CXR or + PPD

Assessment –
Subjective data
- Fatigue
- Weakness – energy loss
- Pain – "knife-like @ ACW"
- Anorexia
- Weight loss
- Night sweats
- May be symptom free-
- found on screening
Weight loss
Night sweats
May be symptom free-
found on screening

Assessment –
Objective data
Night sweats, chills
Fever – low grade, late afternoon
Tachycardia
Productive persistent cough,
Hemoptysis
Crackles @ bases, asymmetrical lung expansion, dullness on percussion
Hoarseness

Antitubercular agents for infection and disease
EMB = ethambutol
INH = isoniazid
PZA = pyrazinamide
RFB = rifabutin
RIF = rifampin
SM = streptomycin

PPD skin testing
Protein derivative of TB
Response read 48-72 hours later
Placement on inner forearm (FA)

5 mm induration
Positive reaction for HIV + pt or client with + CXR

10 mm induration
Positive reaction for pt from endemic nation, nsg home or low socioeconomic status

15 mm induration
Positive result in all other pt / general public

Screening for TB Infection in HIV Positive Clients
Positive PPD results
Induration of 5 mm or more in a client who is HIV positive indicates TB infection

False Negative results
Immunosuppression associated with AIDS can result in a false negative reading
Very recent infection or overwhelming TB disease can produce false negative results
Anergy testing may be performed to confirm false negative results

False Positive results
Infection with mycobacterium other than mycobacteria tuberculosis
Recent BCG vaccination

Screening Tests (cont)
PPD / Mantoux test

Sputum for AFB x3
3 consecutive days

Xray to assess or r/o infiltration cavity
Diagnosis of TB Disease

- History
  - Productive, prolonged cough (duration of >= 3 weeks), pleuritic chest pain and hemoptysis.
  - Systemic symptoms of TB include fever, chills, night sweats, appetite loss, weight loss, and easy fatigability
- PE
  - Cannot be used to confirm or rule out TB ALONE !!!!!
- Chest XRAY
  - In HIV-positive persons, almost any abnormality on a chest radiograph may indicate TB.
    ..........OR may even appear entirely normal.
- Sputum culture
  - Culture examinations should be done on all specimens, regardless of AFB smear results........ R/O infection.

Nursing dx for TB

- Ineffective airway clearance r/t productive cough aeb......
- Impaired gas exchange r/t asymmetrical lung expansion aeb....... 
- Pain
- Body image disturbance
- Social isolation
- Knowledge deficit

Nursing implementation

Goal – reduce spread of infection
  How do you accomplish this?
  Are there specific disease precautions?

Goal – promote nutrition

Goal – promote increased self esteem

Goal – health teaching

Evaluation

- Complies with med regimen
- Lists desired effects/side effects of med
- Gains wt
- negative sputum cx
- Retains 'role' in family
- No complications
  ie. No hemorrhage, spread of bacillus, resp failure, med resistance

Client/Family Teaching

- Instruct client to report adverse reactions
- Teach client s/s of ineffective therapy and relapses
- Teach strategies to minimize infection transmission
  - Cough / sneeze into tissue -- dispose of immed !!
  - social interaction -- wear mask in public
    Particulate air respirator for care providers
    -explain importance of negative-pressure room
Remember for HC personnel - yearly PPD tests !!

**Treatment for TB Disease**

- Principles of therapy
  - Induction phase
    - 4 drug therapy for 2 months
  - Continuation phase (after induction)
    - 2 drug therapy for 4 months

Directly Observed Therapy (DOT) should be employed for suspected noncompliance.......therefore strict adherence is a must!

Multiple drug regimens destroys the m/o quickly.... Reducing the emergence of MDR organisms!

**Drug-drug interactions**

- INH, RFB, PZA, EMB
  - Rifabutin is contraindicated with hard-gel saquinavir and delavirdine.
  - 20%-25% increase in the dose of PIs or NNRTI's might be necessary.
  - Patient should be monitored carefully for RFB drug toxicity (arthralgia, uveitis, leukopenia) if RFB is used concurrently with PIs or NNRTI's.
  - Evidence of decreased antiretroviral drug activity should be assessed periodically with HIV RNA levels.
  - No contraindication exists for the use of RFB with NRTI's.
  - RFB dosing may need to be increased or decreased with concurrent use of nelfinavir, indinavir, amprenavir, or ritonavir, or efavirenz. (protease inhibitors)

**Drug-drug interactions**

- INH, SM, PZA, EMB
  - Can be used concurrently with antiretroviral regimens that include PIs, NRTI's, and NNRTI's.
- INH, RIF, PZA, EMB or SM
  - NRTI's may be administered concurrently with RIF.
  - If RIF is used with a client on antiretroviral therapy, the CDC site should be accessed to verify concurrent use of agents prior to administration

**Nursing Practice in the Management of Infection**

- Identify infection control measures to reduce transmission of infection.
- Explain “best practice interventions” in the performance of “transmissions-based precautions” and the organisms targeted for transmission control.
- Compare and contrast local and systemic complications of infection management.