Respiratory Pathophysiology

• Montana Hospital Association
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ICD-10-CM/PCS Respiratory

• ICD-10-CM
  – Chapter 10 – J00-J99
  – Chapter 18 – R04-R09
• ICD-10-PCS
  – 0B1-0BY
  – 090-09W (Sinus = part of Ear, Nose, Sinus)

Objectives

• Coding-focused

Review of Respiratory system anatomy and physiology

• Focus on the medical knowledge requirements of ICD-10-CM/PCS coding

• Review of ICD-10-CM Ch10
  – Organization
  – Guidelines (minimal)
  – COPD
  – Acute Respiratory Failure
  – Influenza
  – Excludes1 and Excludes2 notes
  – Combination and Multiple coding (External causes)
S&S in Respiratory System

- Dyspnea / SOB
- Orthopnea
- Apnea
- Tachypnea
- Wheezing, Stridor, Rales, Rhonchi
- Coughing
  - Sputum/mucus
  - Hemoptyisis
- Nasal Discharge
- Chest Pain
- Hypoxemia
  - Barrel chest
  - Cyanosis
  - Clubbing
- Hiccups

Noises

- Rale (Fr: rattle)
  - Crackling, clicking, bubbling, rattling sound during inspiration
  - Fluid in a bronchus
  - Dry, Fine, Coarse
- Rhonchus (Gr: snore)
  - Dry rattling (snoring) in throat or bronchus
  - Partial obstruction of large airways
- Stridor (L: harsh sound)
  - High-pitched crowing sound (inhaling and/or exhalting)
  - Obstruction of air passageway
  - Trachea/throat
- Wheeze (AS: to hiss)
  - High-pitched Sounds during exhalation
  - Produced by narrowed airways

Respiratory-related chest pain

- Asthma
- Bronchitis
- Costochondritis (MS chapter)
- Pneumothorax
- Pulmonary embolism (circ Chapter)
- Pulmonary HTN (circ Chapter)
Respiratory Diseases/Conditions

- Requested
  - Asthma
  - COPD
  - Respiratory Chest pain
    - Pleurisy
  - Infections (Pneumonia)

- ICD-10-CM Ch 10
  - Many combination codes
  - Multiple coding
  - Extensive use of
    - Excludes1 notes
    - Excludes2 notes

Asthma (Gr: panting)

Definition of Asthma

- AKA – bronchial asthma
- Chronic condition (allergic/non-allergic)
  - Affects 5-10% of children
  - Leading cause of childhood illness
  - Males 2 times more likely before puberty
- Exposure to allergen when hypersensitive
  - Bronchospasm - Muscular constriction of bronchi
  - Mucosal lining swells (edema)
  - Mucus thickens, can form plugs

Two types of Asthma

- **Extrinsic or atopic asthma**
  - type I IgE-mediated hypersensitivity reaction to foreign antigens.
  - Begins in childhood - respiratory tract mast cells are sensitized to a substance extrinsic to body.
  - Clinical examples: pollen, food, animal dander

- **Intrinsic or non-atopic asthma**
  - non-immune reaction
  - Clinical examples: aspirin, virus, stress, exercise.

Asthma

- Death rate has increased 8%/yr since 1980s
- Genetic predisposition (100+ genes)
  - Gene/environment interaction
- Prenatal risk factors
  - Maternal smoking
- New-onset asthma in adults
  - Occupational basis

S&S of Asthma

- Extreme SOB
- Dyspnea (difficulty breathing)
- Wheezing (expiratory)
- Rhonchi
- Anxiety
- Sitting, leaning forward with hands on knees
  - Uses ALL respiratory muscles
- Coughing (mild, dry, then mucus producing)
- Pale, moist skin (mild)
- Cyanosis of nail beds and lips (more severe)
Asthma triggers

- Individual
- Major (Most common)*
  - 2nd/3rd hand smoke
  - Dust mites
  - Outdoor air pollution
    - Smoke, etc.
  - Cockroaches
  - Pets
  - Mold

- Other Triggers
  - Allergies
  - Infections (flu, colds, RSV, sinus)
  - Some chemicals/medicines
  - Acid reflux
  - Strenuous physical exercise
  - Bad weather, thunderstorms, etc.
  - High humidity OR cold, dry air
  - Some foods and food additives
  - Strong emotional states

Status Asthmaticus

- Life-threatening form of asthma
- Progressively worsening reactive airways
- Unresponsive to usual appropriate therapy
- Leads to pulmonary insufficiency

Asthma diagnosis

- PE
- Chest x-rays (usu. Normal, except severe
- Pulmonary functions studies
- Allergy tests
- CBC w/diff leukocyte count
  - Inc. eosinophil count, elev. IgE level
- Peak flowmeter to monitor
- Peak expiratory flow value indicates degree of airway obstruction
Asthma tx

- Avoidance of triggers
- Desensitization
- Education
  - Deep breathing, posture, relaxation techniques
- Medications
  - Bronchodilators
  - Anti-inflammatories
  - Mucolytics

ARDS (Shock Lung)

- Adult Respiratory Distress Syndrome
- Severe pulmonary congestion/edema
  - Acute respiratory distress
  - Hypoxemia
  - Hypercapnia
  - Acidemia

- Following (24/48 hrs)
  - Trauma
  - Septicemia
  - Shock
  - Insult to lungs/body

- Lungs
  - Hemorrhagic
  - Wet / Boggy
  - Congested
  - Unable to diffuse
- Atelctasis

Common ARDS Insults

- Severe trauma
- Pneumonia
- Fulminating sepsis
- Aspiration (Gastric)
- Hypovolemic shock
- Near-drowning
- Cardio-pulmonary bypass

- 12-48 hours after
  - Alveoli fill with exudate
  - They collapse after expiration
  - Less gas exchange
ARDS Symptoms

- Sudden and severe dyspnea
- Rapid, shallow respirations
- Inspirations
  - Intercostal & suprasternal retractions (inward)
  - Cyanosis or mottled skin
- Rales, Rhonchi, Wheezes may occur
- NO improvement with $O_2$

ARDS Tx

- NO cure
- Supportive interventions only
- Correct underlying cause is attempted
- O2, suctioning
- Mechanical ventilation
- PEEP (Positive end-expiratory pressure)
- IV - nutrition and cautious hydration
- 60-75% of patients recover

Atelectasis (Gr: incomplete expansion)

- Airless or collapsed pulmonary tissue
- Due to incomplete expansion of lobules/segments
- Partial/complete collapse of lung

http://www.radiology.co.uk/srs/kuytons/collapse/t1.htm
Atelectasis S&S

- Hypoxemia
- Dyspnea
  - Mild to severe
- Substernal retraction
- Cyanosis
- Diaphoresis
- Tachycardia
- Anxiety
- Chest x-ray may show mediastinal shift **toward** collapse

Atelectasis Etiology

- Obstruction in bronchial tree
- Mucus plug, FB, Cancer
- Plural effusion
- Lack of deep breathing following surgery
- Prolonged inactivity
- NB
  - Prematurity, hyaline membrane disease
  - Narcotics during labor (across placenta)
  - Mucus plug, Lack of surfactant

Atelectasis Diagnosis/Tx

- **Diagnosis**
  - Chest x-rays
  - H&P
    - Diminished breath sounds, Dull percussion
  - CT scan of chest
  - Bronchoscopy if FB
- **Treatment**
  - Preventative (surgery)
    - Early ambulation
    - Deep breathing
    - Coughing
  - Suctioning
  - Spirometry
  - Antibiotics (if infection)
Bronchiectasis

- Irreversible, permanent
- Dilation/distortion of 1+ bronchi
- Caused by destruction of walls
  - Muscular and Elastic

Bronchiectasis

- Develops over many years
- Usually bilateral
- In lower lobes
- S&S
  - Chronic cough
  - Purulent, foul-smelling sputum in large amounts (Classic sign)
  - Hemoptysis
  - Dyspnea
  - Wheezing
  - Fever
  - General malaise
  - Halitosis

Bronchiectasis Etiologies

- Repeated wall damage
- Recurrent airway infections
- Pneumonia, TB
- Corrosive gas inhalation
- Bronchial obstruction
- Complication of pertussis or measles
- Immune deficiency
Bronchiectasis Dx and Tx

- Diagnosis
  - Difficult in early stages
  - H&P
  - Chest x-rays
  - CT scan (high-resolution)
  - Bronchoscopy
  - Sputum culture
  - PFTs

- Treatment
  - Antibiotics
  - Bronchodilators
  - Avoiding irritants
    - Smoking
    - Pollution
  - Surgery to remove affected part of lung
    - When much hemoptysis

Bronchitis, acute

- Inflammation of mucosal lining of bronchi
- Cough – deep, persistent, productive
- Sputum – deep yellow to gray
- Other S&S
  - SOB, wheezing, slight temperature, rales
  - Pain in upper chest, can be increased w/cough
- Lasts about one week
  - cough can last 2-3 weeks

Acute Bronchitis

- S&S worse in winter
- Cold, damp weather or pollution worsen
- Part of general URI
  - Viral or bacterial nasopharyngeal infection
  - Allergens predisposing factor
- Diagnosis
  - Chest x-rays, PFTs, ABGs, sputum analysis
Acute Bronchitis Tx

- Usually viral, so symptoms are tx
- Aspirin, fluids, vaporizer/humidifier
- Bronchodilator inhaler
- Cough suppressant
- Anti-biotic IF 2ndary bacterial infection

- AVOID primary causative factors
  - Smoking, pollutants, recurrent resp. infections

Bronchitis, Chronic

- Inflammation of mucosal lining of bronchi
  - Persists and worsens
- Mild – slight cough in mornings
- Aggravated with URIs (colds, flu)
- Obstructive/asthmatic symptoms appear
- Dyspnea (coughing, SOB)
- Diminished expansion of chest
  - Rales and wheezing
- Constant, worse; in cold, damp, pollution

Chronic Bronchitis Dx & Tx

- Diagnosis
  - H&P
  - R/O other diseases
  - Chest x-rays
  - PFTs
  - ABGs
  - Sputum analyses
  - Guarded prognosis

- Treatment
  - Based on disease stage
  - Prompt tx of acute inf.
  - Low-flow O₂ tx
  - Postural drainage
  - Percussion
  - Aerosolized corticosteroids
  - NO smoking
  - Avoid crowds
COPD (COLD)

- Chronic Obstructive Pulmonary Disease
  - Progressive, irreversible
- Signs and Symptoms
- Pathophysiology
  - Chronic Bronchitis
  - Emphysema

COPD

- Includes several obstructive lung diseases
  - Asthma
  - Bronchiectasis
  - Chronic bronchitis
  - Cystic fibrosis (genetic)
  - Emphysema

- Pneumoconiosis (occupational dust inhalation)
  - Fibrosis (stiff tissue)
  - Asbestosis
    - most common – Libby, MT
  - Anthracosis
    - black lung
  - Silicosis
    - stone/metal dust
  - Can affect family members of workers

COPD

- Regardless of cause of obstruction
- Same consequences

- Inability to ventilate lungs easily =
- Ineffective exchange of gases =
- Diminished response to elevated CO₂
Costochondritis (M94.0)

- AKA chest wall pain, costosternal syndrome, costosternal chondrodynia
- Pain w/coughing, deep breathing, exertion
- Tietze syndrome =
  - costochondritis + swelling
- Inflammation of cartilage bet. ribs & sternum
- Can mimic AMI or other heart conditions

Costochondritis Etiology

- Often unknown; possible causes include
  - Fibromyalgia - could be a symptom
  - Infection - in the costosternal joint; between ribs
  - Injury - blow to the chest
  - Physical strain - Heavy lifting, strenuous exercise
  - URI.
  - Pain from other areas of body – referred pain
- Most common in females, 40+

Emphysema (Gr: blowing)

- Destructive alveolar wall changes
- Permanent enlargement of alveoli spaces
- Alveolar septa are destroyed
- Interferes with breathing and gas exchange

http://imglib.lbl.gov/ImgLib/COLLECTIONS/LUNG_STRUCTURE/.tour/pores.html
Emphysema S&S

- Decreased area for gas exchange = dyspnea
- S&S onset is insidious (gradual)
  - Dyspnea, tachypnea, wheezing
  - Cough slight or not present
  - Must use accessory muscles to force trapped air out

- Barrel chest
- Pursed lips

- More females dx than males since 2000
- Most common cause of death from respiratory disease
- 4th leading cause of death in US

Barrel Chest

- Late sign of emphysema

http://www.wrongdiagnosis.com/bookimages/8/2495.png

Emphysema Etiology

- Smoking is major risk factor (up to 85%)
  - Childhood 2nd-hand
- 3 major types
  - Localized (distal acinar, paraseptal)
  - Centrilobular (centriacinar)
    - Most common, usu. caused by smoking
  - Panlobular (panacinar)
- Repeated respiratory tract infections
- Pollution
  - Ozone, sulfur dioxide, nitrogen oxides, occupational
- Familial tendency (2%)
  - alpha1-antitrypsin enzyme deficiency
- POOR prognosis
Emphysema Dx and Tx

**Diagnosis**
- H&P
- PFT
  - Increased tidal volume
  - Increased residual vol.
  - Decreased vital capacity
- Chest x-rays
  - Depressed diaphragm
  - Translucent lungs
- Blood gases
  - Increased CO₂

**Treatment**
- Avoid smoke and other irritants
- Avoid exposure to RTI
- Flu vaccinations
- Low flow O₂
- Meds
- Pulmonary rehab
- Surgery
  - Experimental
  - Lung reduction
  - Lung transplantation

Emphysema Medications

- Bronchodilators (treat assoc. bronchitis and/or asthma)
  - Beta₂ agonists
    - Ventolin and Proventil (albuterol)
    - Brethine (terbutaline sulfate)
    - Alupent (metaproterenol sulfate)
    - Serevent (salmeterol)
    - Foradil (formoterol)
  - Anti-cholinergic
    - Atrovent (ipatropium bromide)
  - Theophylline (seldom used)
    - Theodur, Slo-bid, Uniphyll, Theo-24
- Corticosteroids
  - Emphysema w/ Bronchitis
  - Oral or inhaled
- Expectorants
- Antibiotics
- Oxygen

Hanta viruses (B33.4)

- Sin Nombre (No Name)
  - Deer mice in Montana
    - Urine, saliva (bites), droppings
    - Breathing in contaminated dust
- Hantavirus Pulmonary Syndrome (HPS)
  - 38% death rate
- MT 1993+ 29 cases of hantavirus w/8 deaths
- Beaverhead, Big Horn, Cascade, Custer, Flathead, Gallatin, Glacier, Lewis and Clark, Madison, Missoula, Phillips, Powell, Sanders, Stillwater, Sweetgrass, Toole, Valley, and Yellowstone
Hanta virus S&S

- Appear 1 – 5 weeks after contact
- Fever (101° to 104°F) does NOT respond to medication
- Muscle (big muscles) and body aches
- Chills
- Cough (usually dry)
- Nausea, vomiting and diarrhea
- Fatigue
- SOB, then rapid respiratory failure - 4-10 days

Hanta virus Dx & Tx

- Diagnosis
  - H&P
  - Exposure to rodents
- Treatment
  - Supportive (ICU)
    - Earlier the better

Influenza

- Acute, highly contagious, viral respiratory infection
- Spread by coughing
- Many strains
  - A, B, C
  - H0N1, H2N2, H3N2, etc.
- Patients may die w/in 48 hours
Influenza

• Three categories of virus

• Type A
  – Most serious
  – Infects humans and animals - including birds, pigs, horses, whales, and seals

• Type B
  – Usually only in Humans

• Type C
  – Least serious
  – Usually only in Humans

Avian Influenza (Bird Flu) (H5N1)

• Type A influenza
  – most serious

• Tx
  – may be sensitive to
  – oseltamivir (Tamiflu)
  – zanamivir (Relenza)
  – both neuraminidase inhibitors

H1N1 (Swine) Flu

• Type A virus
  – most serious

• AKA
  – swine-origin influenza A
  – swine influenza A (H1N1)
  – influenza A/California/H1N1
  – swine origin influenza virus
  – North American flu
  – influenza A (H1N1)

• Tx - sensitive to
  – oseltamivir (Tamiflu)
  – zanamivir (Relenza)
  – both neuraminidase inhibitors
Influenza S&S

• Sudden fever
• Chills
• Headache, back and muscle pain
• Cough, runny nose, sore throat
• Sneezing, N&V, hoarseness, diarrhea
• Complications following flu
  – Bronchopneumonia, neuritis, otitis media, pleurisy

Influenza Dx & Tx

• Diagnosis
  – Similar to cold
  – Duration of S&S
  – Epidemics in winter and early spring
  – Severity of S&S
• Throat culture

• Symptomatic Treatment
  – Bedrest
  – Analgesics
  – Antipyretics
  – Antibiotics IF 2ndary inf.
    • Staph, strep, pneumococcus

Annual Vaccinations to prevent

Pleural Effusion (Hydrothorax)

• Fluid in the chest cavity
• Due to
  – CHF, TB, pneumonia
• Asymptomatic OR
• Dyspnea and chest or pleuritic pain
• Chest x-ray confirms dx
• Tx
  – Thoracentesis to drain
  – Underlying cause
Pleurisy (Pleuritis)
- Inflammation of pleural membranes
- Usually secondary to other diseases/infections
- Injury
- Tumor
- 2 types (Wet and Dry)
  - Increased pleural fluid compresses lung with dyspnea (wet)
  - Decreased pleural fluid; layers rub together (dry)
- Congested and edematous

Pleurisy S&S
- Sharp, needlelike pain
- Increasing with coughing or inspiration
- Cough
- Fever/Chills
- Shallow rapid breathing

Pleurisy Dx & Tx
- Diagnosis
  - H&P
  - Pleural rub on auscultation of lungs
  - X-rays
- Treatment
  - Underlying cause
  - Antibiotics
  - Analgesics
  - Splinting chest
  - Deep breathing exercises
- May leave permanent adhesions, restricting lung expansion
Break Time

Fluid Exchanges