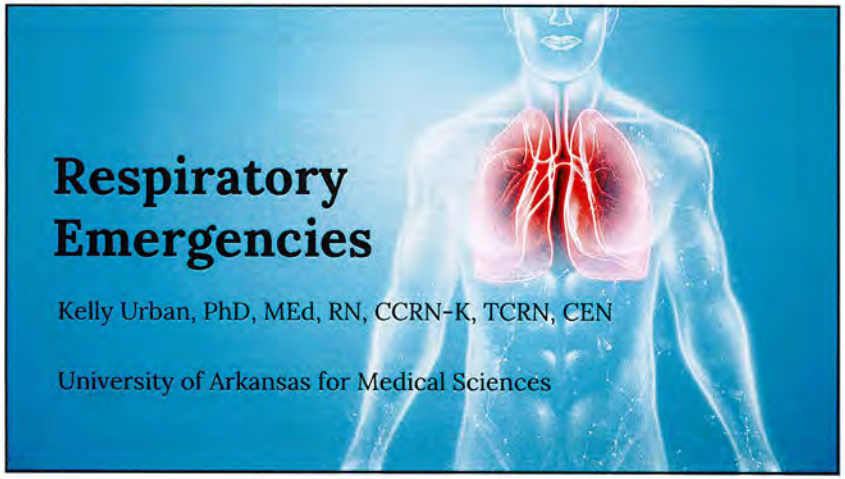
CEN Review Course Agenda

Day 1						
	Format: Description Presentation Treatment					
Unit #	**Topic**	**Item #**	**Duration**	**Start time**	**End time**	**speaker**
1	Neuro	3	120	800	1000	Dr. Kelly Urban UAMS
	Break		10	1000	1010	
4	Cardiovascular	1	90	1010	1140	Lynnette Flynn - AHH
	Lunch			1140	1215	
3	Ocular	6B	45	1215	1300	Dr. David Warner - UAMS
2	Maxillofacial	6A	45	1300	1415	Lynnette Flynn - AHH
	Break		15	1415	1430	
10	Orthopedic	6C	60	1430	1530	Traci Motes APRN
6	Gastrointestinal	4A	60	1530	1630	Lynnette Flynn - AHH
Q&A						
Day 2						**August 9th Wed**
5	Respiratory	2	120	800	1000	Dr. Kelly Urban - UAMS
	Break		15	1000	1015	
8	Gynecology	4C	60	1015	1115	Dr. Kelly Urban UAMS
	Lunch		45	1115	1200	
9	Obstetrical	9	60	1200	1300	Dr. Kelly Urban UAMS
	Break		15	1300	1315	
11	Wound	6D	75	1315	1445	Dr. Kelly Urban UAMS
	Break		15	1445	1500	
7	Genitourinary	4B	60	1500	1600	Lynnette Flynn
Q&A			10	1600	1630	
Day 3						**August 10th Thurs**
12	Psych/Social	5A	60	800	900	Lynnette Flynn
	Break					
13	Medical Emergencies	5B	120	910	1110	Patti Esmail - SVI
	Lunch		35	1110	1145	
14	Environmental	7A	60	1145	1245	Jeremy Stogner - UAMS
15	Toxicological	7B	60	1245	1345	Jeremy Stogner - UAMS
	Break			1345	1400	
16	Communicable Diseases	7C	45	1400	1445	Jeremy Stogner - UAMS
	Break					
17	Professional issues	8	75	1500	1615	Dr. Kelly Urban UAMS
Q&A			15	1615	1630	



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Respiratory Examination Outline – 18 Ques

- Aspiration
- Asthma
- Chronic obstructive pulmonary disease (COPD)
- Infections
- Inhalation injuries
- Obstruction
- Pleural effusion
- Pneumothorax
- Noncardiac pulmonary edema
- Pulmonary embolus
- Respiratory distress syndrome
- Respiratory trauma
- Pulmonary hypertension

2

Important Respiratory Concepts

- ABG Interpretation
- Air Flow Measurements
- Age Related Considerations
- Respiratory Emergencies

3

ABG Review – Summary of Normal Values

pH	**7.35 – 7.45**
PaO_2	**80 – 100 mmHg**
$PaCO_2$	**35 – 45 mmHg**
HCO_3	**22 – 26 mEq/L**
Base Excess (BE)	**-2 - +2**
SaO_2	**95% - 98%**

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ABG Disorder Causes

Respiratory Acidosis	Respiratory Alkalosis	Metabolic Acidosis	Metabolic Alkalosis
• Obstructive Lung Disease (COPD, sleep apnea) • Oversedation, head trauma, anesthesia, or reduced function of respiratory center • Neuromuscular disorders • Chest Trauma (pneumothorax, flail chest) • Inappropriate mechanical ventilation	• Hypoxemia • Nervousness and anxiety • Pulmonary Embolus • Pulmonary Edema • Response to respiratory stimulants (salicylates, theophylline, catecholamines) • Inappropriate mechanical ventilation • Compensation for metabolic acidosis • Pregnancy	• Diabetic ketoacidosis • Starvation • Renal failure • Lactic Acidosis • Poisoning: salicylates, ethylene glycol, methyl alcohol, paraldehyde • Diarrhea	• Caused by a loss of nonvolatile acid or increase in HCO3 • Gastric loss of acid (vomiting, prolonged gastric suctioning) • HCO3 during cardiac arrest • Baking soda, antacids • Massive blood transfusion – citrate – lactate - bicarbonate • Increased excretion of H+, K+, and Cl – due to: diuretics, Cushing's syndrome, corticosteroids, aldosteronism

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ABG Review

Primary Disorder	Cause	Compensation	Effect on ABGs
Metabolic Acidosis	•Excess nonvolatile acids •Bicarbonate deficiency	Rate & depth of respirations increase → eliminates additional CO2	↓ pH ↓ HCO3 ↓ PaCO2
Metabolic Alkalosis	•Bicarbonate excess	Rate & depth of respirations decrease → retaining CO2	↑ pH ↑ HCO3 ↑ PaCO2
Respiratory Acidosis	•Retained CO2 & excess carbonic acid (Hypoventilation)	Kidneys conserve bicarbonate to restore carbonic acid : bicarbonate ratio 1:20	↓ pH ↑ PaCO2 ↑ HCO3
Respiratory Alkalosis	•Loss of CO2 & deficient carbonic acid (Hyperventilation)	Kidneys excrete bicarbonate and conserve H+ to restore carbonic acid : bicarbonate ratio	↑ pH ↓ PaCO2 ↓ HCO3

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Airflow Measurement Terminology

Pulmonary function test	Instrument	Measures	Function
Spirometry	Spirometer	Forced vital capacity (FVC)	Volume of air that is exhaled after maximum inhalation
		Forced expiratory volume (FEV)	Volume of air exhaled in one breath
		Forced expiratory flow, 25–75 percent	Air flow in the middle of exhalation
		Peak expiratory flow (PEF)	Rate of exhalation
		Maximum voluntary ventilation (MVV)	Volume of air that can be inspired and expired in 1 minute
		Slow vital capacity (SVC)	Volume of air that can be slowly exhaled after inhaling past the tidal volume
		Total lung capacity (TLC)	Volume of air in the lungs after maximum inhalation
		Functional residual capacity (FRC)	Volume of air left in the lungs after normal expiration
		Residual volume (RV)	Volume of air in the lungs after maximum exhalation
		Total lung capacity (TLC)	Maximum volume of air that the lungs can hold
		Expiratory reserve volume (ERV)	The volume of air that can be exhaled beyond normal exhalation
Gas diffusion	Blood gas analyzer	Arterial blood gases	Concentration of oxygen and carbon dioxide in the blood

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Age Considerations

Pediatrics

- Ribs more compliant, mediastinum thinner
- Infants – nose breathers
- Respiratory Distress symptoms – grunting, head bobbing
- Respiratory distress is primary cause of cardiac arrest in infants/children

Geriatrics

- Decreased vital capacity
- ECG is mandatory because acute coronary syndrome can present with dyspnea
- Aspiration mortality 40-70% - significant cause of pulmonary morbidity
- PNA leading cause of infectious death in older adults

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Respiratory emergencies including:

- Aspiration
- Asthma
- COPD
- Infections
- Inhalation injuries
- Obstruction
- Pleural effusion
- Pneumothorax
- Noncardiac pulmonary edema
- Pulmonary embolus
- Respiratory distress syndrome
- Respiratory trauma
- Pulmonary hypertension

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A patient presents from a long-term care facility where the staff reports an altered mental status. On assessment, the nurse notes crackles, cough, and the presence of gastrostomy tube. Based on the information present, what should the nurse anticipate as the diagnosis?

a. Urinary tract infection
b. Aspiration pneumonia
c. Pleural effusion
d. Bronchitis

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Aspiration

- The inhalation of foreign material into the airways beyond the vocal cords.
- Usually occurs in patients with altered level of consciousness, dysphagia, or impaired cough reflex.
- It can be categorized as aspiration pneumonitis or aspiration pneumonia.
  - Aspiration pneumonitis is a chemical injury after aspiration of gastric contents.
  - Aspiration pneumonia is an infectious process secondary to aspiration of orogastric contents colonized with bacteria.

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Aspiration

Diagnostic Factors
- Intractable cough
- Fever
- Dyspnea
- Wheezing

Risk Factors
- Decreased LOC
- Increased severity of illness
- General anesthesia
- Age > 70 years

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What clinical manifestation would be expected in a patient diagnosed with bronchitis?

a. Infiltrates on their chest radiograph

b. Dry cough initially that develops into a productive cough

c. Wheezing on physical exam

d. Course crackles on physical exam

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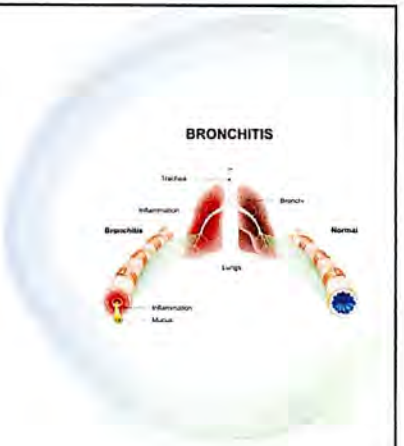
Acute Bronchitis

- Inflammation of bronchi and/or trachea
  - Due to irritation of bronchial mucosa (pollen, smoking, inhalation of irritating substances)
- Commonly seen following upper respiratory tract infection (secondary infection may also occur)
- More common in men, occurs more frequently during winter



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Acute Bronchitis

Signs/Symptoms
- Dyspnea/wheezing
  - Rhonchi that may clear after coughing
- Cough (initially dry then productive)
- Slight tachypnea
- Use of accessory muscles
- Prolonged expiratory phase
- Sputum: thin and clear to thick and purulent

Diagnostic Procedures
- CBC
- Serum chemistries
- Sputum examination
- Chest Xray
- PFTs

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Acute Bronchitis

Interventions
- Supplemental O2 as needed
- IV access
- Position patient to facilitate breathing
- Postural drainage
- Education
  - Removal of environmental irritants
  - Increase oral fluids to liquefy secretions

Administer Medications as Ordered
- Analgesics (non-narcotic)
- Antipyretics
- Bronchodilators
- Expectorants and antitussives
- Corticosteroids
- Anxiolytics

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Which of the following is the BEST description of bronchiolitis?

A. a bacterial infection with a sudden onset accompanied by decreased breath sounds
B. a bacterial infection with a sudden onset resulting in inflammation of the epiglottis
C. a viral infection with a rapid onset accompanied by barking cough
D. a viral infection with a slow onset causing lower respiratory tract inflammation

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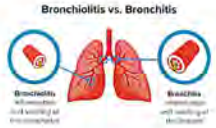
Bronchiolitis



Etiology/Pathophysiology

- Lower respiratory tract infection (RSV cause for 90% cases in children)
- Characterized by an inflammatory obstruction of the airway (bronchi and bronchioles)
- Airway obstruction leads to trapping, high resistance, and atelectasis

Assessment

- Tachypnea
- Tachycardia
- Elevated temp
- Grunting, nasal flaring, intercostal/suprasternal retractions
- Wheezing

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Bronchiolitis Treatment

- ABCs
- Humidified oxygen is SPO2 < 94%
- IVs
- Pharmacologic Therapy
  - Anticholinergics: inhibit smooth muscle contraction (useful if having significant bronchospasmodic episodes)
  - Antibiotics: if bacterial infection is suggested
  - Adrenergics: may relieve reversible bronchospasm by relaxing smooth muscles of bronchi
  - Corticosteroids: may be useful in patients with history of reactive airway disease
  - Ribavirin: nucleoside analogue that inhibits viral replication

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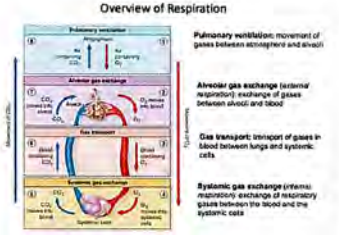
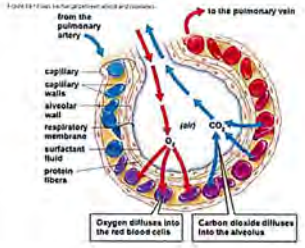
Overview of Respiration/Gas Exchange





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Respiratory Failure

Syndrome in which the respiratory system fails in 1 or more of its gas exchange functions

- Hypoxemia
  - Most common (defined as PaO2 < 60 mmHg)
  - Diseases of lung which involve fluid filling or collapse of alveoli
- Hypercapnia
  - Defined as PaCO2 > 50 (non-chronic)
  - Inadequate air flow (hypoventilation)

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What is the primary purpose of extracorporeal membrane oxygenation (ECMO) in a patient with acute respiratory distress syndrome (ARDS)?

a. To circumvent the damaging effects of mechanical ventilation
b. To maintain oxygen levels while allowing the lungs to rest
c. To provide hemodynamic support
d. To prevent respiratory failure

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Acute Respiratory Distress Syndrome (ARDS)

- Clinical syndrome of lung injury with hypoxic respiratory failure
- Typically caused by intense pulmonary inflammation that develops following an insult

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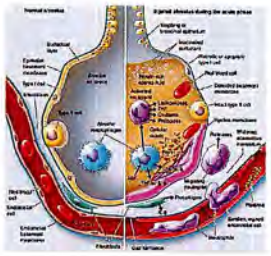
Physiologic Effects of Inflammatory Response

- SIRS response
- Uncontrolled release of inflammatory mediators
- Vasodilation
- ↑ microvascular permeability
- Cellular activation adhesion
- Coagulation



ARDS is the manifestation of SIRS within the lungs

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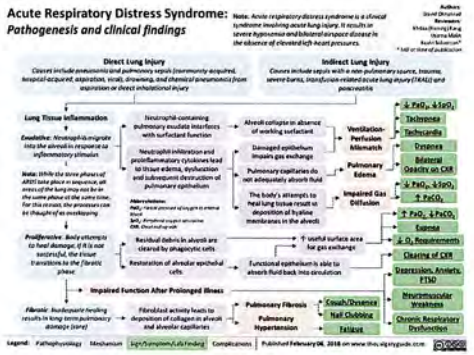
ARDS Pathophysiology



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Diagnostic Procedures

Signs/Symptoms

- Tachypnea/Tachycardia at rest
- Progressive refractory hypoxemia
- CXR – bilateral pulmonary infiltrates
- Cyanosis
- Hypotension
- Use of accessory muscles

Diagnostic Procedures

- History/Physical
- Laboratory
  - ABG
- Imaging
  - Chest x-ray or CT chest
  - Echo

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Berlin Definition – ARDS

Timing	Within 1 week of a known clinical insult of new/worsening respiratory symptoms		
Chest Imaging (x-ray or CT)	Bilateral opacities – not fully explained by effusions, lobar/lung collapse, or nodules		
Origin of Edema	Respiratory failure not fully explained by cardiac failure or fluid overload		
Oxygenation	Mild	Moderate	Severe
	P/F Ratio 201-300 (PEEP ≥ 5 cmH2O)	P/F Ratio 101-200 (PEEP ≥ 5 cm H2O)	P/F Ratio ≤ 100 (PEEP ≥ 5 cm H2O)

P/F Ratio: Relationship of amount of additional oxygen to create a specific PaO_2

- PaO_2/FiO_2
- Normal > 300

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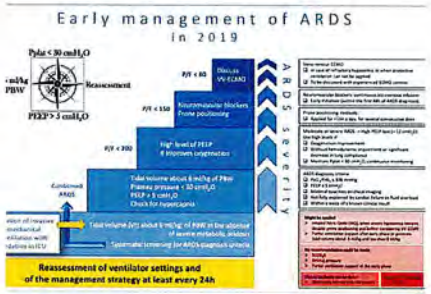
ARDS Treatment/Management Goals

- Maintain oxygenation – PaO2 55-80 mmHg or SPO2 88-95%
- Lung Protective Ventilation (to prevent vent complications)
  - Tidal Volume (4-8 ml/kg predicted body weight – typically 4-6)
  - Plateau Pressure < 30 cm H_2O
- Non-invasive Ventilation Strategies
- Maintain neutral or net-negative fluid balance in hemodynamically stable patients
  - CVP 4-8 mmHg
  - Urine Output > 0.5 ml/kg
  - Adequate cardiac output



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Which of the following will be found in a patient with a severe asthma exacerbation?

A. expiratory or absent wheezing
B. prolonged inspiratory respirations
C. infiltrates on the chest radiograph
D. a loose and barking productive cough

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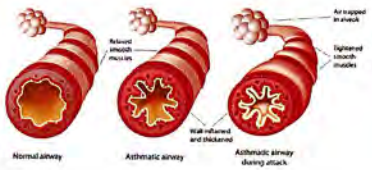
Asthma

- Chronic, reversible obstructive pulmonary disease
- Caused by airway inflammation, bronchospasm (airway hyper-responsiveness) to stimuli, and mucus plugging (resulting in airway remodeling)



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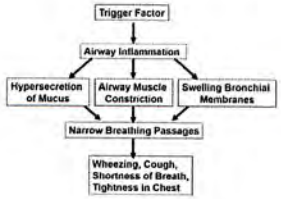
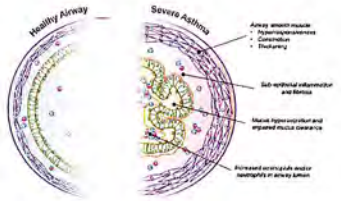
Asthma Pathophysiology





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Classification of Asthma Severity

	Days with Symptoms	Nights with Symptoms	PEF or FEV1	PEF Variability
Step 1: Mild intermittent	Up to 2/week	Up to 2/month	80% or greater	< 20%
Step 2: Mild persistent	3-6/week	3-4/month	80% or greater	20-30%
Step 3: Moderate persistent	Daily	5/month or more	> 60% to < 80%	> 30%
Step 4: Severe persistent	Continual	Frequent	Up to 60%	> 30%

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Asthma Clinical Presentation

- Extreme dyspnea – forcing air out of lungs
  - Prolonged expiratory phase
- Wheezing
  - On expiration
  - As disease progresses: wheezing on inspiration
- Harsh coughing
- Restlessness
- Inability to speak in complete sentences
- Use of accessory muscles
- Pallor/cyanosis (late sign)

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Asthma Diagnostic Procedures

- Labs: CBC, CMP
- ABGs
  - May initially be normal or respiratory alkalosis
  - Later – respiratory acidosis with hypoxemia and hypercarbia
- Objective Measure of Airflow Obstruction (spirometry, peak flow meter)
  - Decreased expiratory flow rate /peak flow (PEF)
  - Decreased forced vital capacity(VC) and forced expiratory volume (FEV1)
  - Increased functional residual capacity (FRC) and Residual volume (RV)
- Sputum Cultures
- CXR: initially may be normal, then may show hyperinflation, lowered diaphragm

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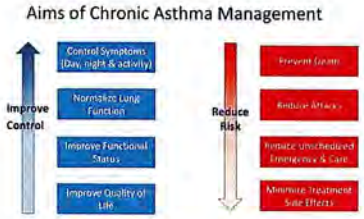
Asthma Management

- Quick Relief (rescue): as needed for rapid, short-term symptom relief during an asthma attack
- Long-term asthma control



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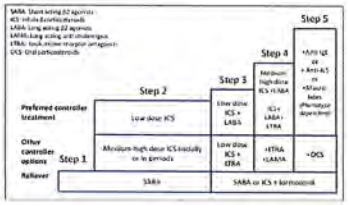
Asthma Management

4 Strategies for Outpatient Management (long-term)

1. Objective Measures of Lung Function
2. Environmental Control Measures & Avoidance of Risk Factors
3. Comprehensive Pharmacologic Therapy
4. Patient Education

Patient Education:
- Allergens/precipitating factors avoidance
- Medication – purpose, route, dose, side effects
- Importance of hydration
- Use of home nebulizers and controlled breathing information
- Importance of smoke-free environment



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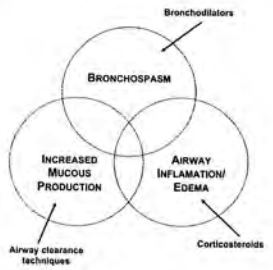
Interventions for Asthma in ED



- Airway
  - Prepare for advanced airway management
  - Position patient to facilitate maximum ventilation
  - Assist with removal of secretions
- Breathing
  - Provide supplemental oxygen as needed (High-flow oxygen)
- Circulation
  - Establish IV access
- Administer medications as ordered
  - RSI medications
  - Bronchodilators (short-acting beta agonists, magnesium sulfate)
  - Rescue medications (short-acting beta agonists, anticholinergics, corticosteroids)

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Status Asthmaticus

- Acute, severe, and prolonged asthma exacerbation
- Life-threatening emergency
- Bronchospasm does NOT respond to conventional therapy
  - Worsening hypoxemia → respiratory acidosis → respiratory arrest

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Chronic obstructive pulmonary disease (COPD) is diagnosed by:

a. Arterial blood gas
b. Chest radiograph
c. Pulmonary function tests
d. 6-minute walk test

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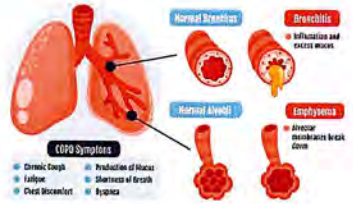
Chronic Obstructive Pulmonary Disease (COPD)

- Characterized by chronic or recurrent airflow obstruction
- Irritants/diseases/genetic factors cause bronchial mucosa edema and smooth muscle contraction resulting in increased airway resistance



Risk Factors
- Smoking
- Environmental pollution
- Occupational exposure to chemicals
- Tuberculosis
- Aging
- Heredity

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COPD – Comparison of Chronic Obstructive Bronchitis and Emphysema

Chronic Obstructive Bronchitis

- "Blue Bloater"
- Productive Cough
- Stocky Build
- Onset 40-50 yr
- Normal RR
- Hypoxemia
- Increased PaCO2
- Cyanosis
- Polycythemia
- Corpulmonale (x-ray – cardiomegaly)
- Peripheral Edema
- Risk for PE

Emphysema

- "Pink Puffer"
- Cough uncommon
- Thin
- Onset 50-70 yr
- Tachypnea (PaCO2 usually low or normal until end stage)
- PaO2 normal or slightly low
- Barrel chest
- Accessory muscle use
- Leans forward while sitting
- Pursed-lip breathing
- Hyperresonance on percussion
- Lung overinflation, diaphragm low

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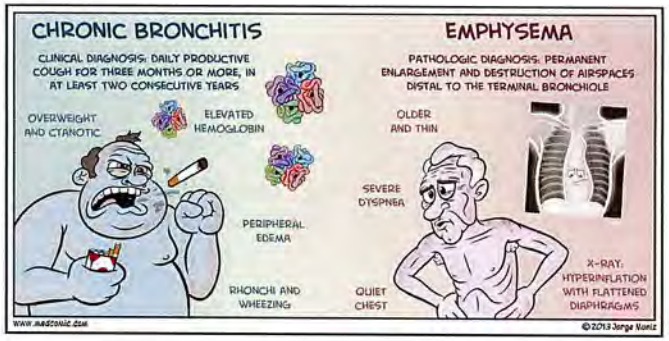
COPD



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COPD – Diagnostic Procedures

- ABGs: hypoxemia, hypercarbia
- CBC with differential:
  - Secondary polycythemia (due to chronic hypoxemia)
  - Increased hematocrit
- BNP: help to differentiate btwn COPD and heart failure
- Sputum: culture and sensitivity
  - Mucoid sputum – stable chronic bronchitis
  - Purulent sputum – exacerbation
- Chest x-ray: hyperinflation, flattened diaphragm, increased retrosternal air space, and long, narrow heart shadow
- PFT measurements: essential for diagnosis and assessment of severity of disease

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COPD Interventions

- ABCs
- Supplemental O2 (CPAP or BPAP?)
- IV access
- Position patient to facilitate breathing
- Cardiac/Pulse ox monitoring
- Administer medications as ordered:
  - Beta-adrenergic agonist and anticholinergic agent combinations
  - Bronchodilators (long acting)
  - Mucolytic agents
  - Anti-inflammatory drugs (inhaled and oral steroids)
  - Antibiotics
  - Helox (controversial)
  - Antidepressants
  - Nicotine patches

Patient Education

- Stop Smoking
- Optimal Body Positioning for air exchange
- Small, frequent meals
- Exercise
- Coughing/Deep-breathing exercises
- Hydration
- Medication Compliance

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A patient with a history of heart failure presents with shortness of breath, cough, and pleuritic chest pain. The nurse also notes crackles throughout the lung fields and 3+ edema to the bilateral lower extremities. A chest radiograph reveals small abnormal collections of fluid at the lateral lung bases. What is the most appropriate response by the nurse to the patient?

A. "Diuretic therapy may help relieve some of the fluid accumulated throughout your body."

B. "You will possibly need urgent dialysis to pull some of the fluid that is built up."

C. "A thoracentesis will likely need to be performed to withdraw the fluid in your chest cavity."

D. "There is no specific treatment for your symptoms at this time."

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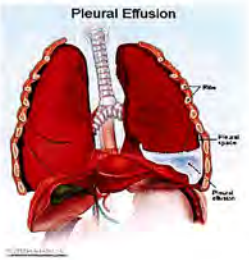
Pleural Effusion

- Collection of excess fluid (> 15 ml) in the pleural space
- May result from:
  - Increased subpleural capillary pressure (heart failure) – most common
  - Decreased capillary oncotic pressure (liver/renal failure)
  - Inflammatory conditions (infections such as PNA)
  - Impairment/obstruction of lymphatic flow

Fluid Appearance:
- Hemorrhagic
- Chylous (white/thick)
- Purulent (empyema)



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Pleural Effusion

PMH (Predisposing Factors)
- CV Disease/PE (esp. heart failure)
- Bacterial Pneumonia
- Malignant Disease (lung, breast)
- Tuberculosis
- Pancreatitis
- Abdominal surgery (subphrenic or hepatic abscess)

Assessment
- Tachypnea
- Anxious
- Use of accessory muscles
- Dullness to percussion
- Breath sounds diminished to absent over effusion

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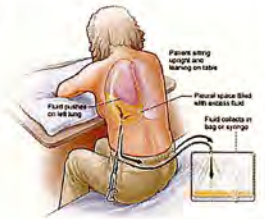
Pleural Effusion - Diagnostics

- CBC with differential (elevated WBC possible)
- Chest xray: lat decubitus more reliably detects smaller pleural effusions
- Sonography: identify location for thoracentesis
- Chest CT, spiral CT
- Thoracentesis for fluid analysis
- ECG



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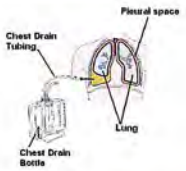
Pleural Effusion - Interventions



- ABCs
- O2 as needed
- IV access
- Cardiac/Pulse ox monitoring
- Treat underlying cause
- Assist with thoracentesis procedure/chest tube placement
- Pleurodesis
- Medications
  - Analgesics
  - Antibiotics

49

A patient arrives via emergency medical services and is confused, febrile, and tachypneic, with the presence of crackles in the right lower lobe on auscultation of the lung fields. What medication would the nurse identify as the most appropriate to treat the underlying disease process?

A. Levofloxacin
B. Albuterol sulfate
C. Normal saline
D. Acetaminophen

50

Community Acquired Pneumonia (CAP)

- One of most common infectious illnesses and major cause of M/M (2-4 million cases annually)
- Inflammation of lung parenchyma resulting from tissue invasion by inhaled, aspirated, or bloodborne pathogens.
  - Once pathogen reaches the alveoli and begins to replicate, fluids and anti-inflammatory cells enter the alveolar spaces to attack the infection, thereby causing the symptoms and x-ray signs of pna.
- Severity can range from mild to life-threatening
- Most common pathogens are viral (60-90%) although bacterial are the most common cause of deaths.

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CAP - Pathogens

	Streptococcus pneumonia	Staphylococcus aureus	Klebsiella pneumonia	Pseudomonas aeruginosa	Haemophilus influenza
Risk Factors	Immunosuppression Alcoholism Cardiopulmonary disease Diabetes	Drug abuse Immunosuppression Complication of flu	Male Alcoholism > 50 years old Cardiopulmonary disease Diabetes Aspiration	Alcoholism Nosocomial infection Immunosuppression Diabetes	Alcoholism > 50 yrs old Cardiopulmonary disease Immunosuppression Diabetes
Signs/ Symptoms	Malaise, sore throat, chills/fever, cough, rust-colored sputum, chest pain, vomiting, abd pain, dyspnea, tachypnea, tachycardia, diminished breath sounds, rales	Fever/chills, cough, chest pain, purulent sputum, tachypnea, tachycardia, rales, rhonchi	Fever, cough, hemoptysis, dyspnea, tachypnea	Fever, cough, hemoptysis, dyspnea, tachypnea	Low-grade fever, dyspnea, slight tachycardia, tachypnea (slight)
Diagnostic Findings	↑ WBC with left shift, pleural infiltrates	↑ WBC , lower lobe infiltrates, possible pleural effusion or abscess	↑ or ↓ WBC, pleural infiltrates with consolidation, pleural abscess or effusion	↑ WBC with left shift, lower pleural infiltrates	↑ WBC, lower pleural infiltrates, pleural effusion
Treatment (typical)	Macrolides Doxycycline Fluoroquinolones	Fluoroquinolones Vancomycin (if drug resistant)	3rd-generation cephalosporins + aminoglycosides	Cefepime Primaxin Meropenum Zosyn + Cipro	Macrolides 2nd or 3rd generation Cephalosporins

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CAP Interventions

- ABCs
- O2 as needed (RSI/vent support if impeding respiratory failure, CPAP/BPAP, Hi-flow oxygen)
- IV access
- Advanced airway management as needed
- Position patient to facilitate breathing
- Cardiac/Pulse ox monitoring
- Medications:
  - Antibiotics
  - Bronchodilators
  - Antipyretics

53

A patient arrives complaining of dyspnea and mild right-sided chest pain that began last evening and now increases with exertion. The patient states that 3 days ago, they sustained an injury to their right lower leg. The patient has a previous history of deep vein thrombosis that occurred 15 years ago. Which test should the nurse anticipate as being the most beneficial in finding the diagnosis for this patient?

a. Complete blood count
b. D-dimer
c. Comprehensive metabolic panel
d. B-type natriuretic peptide

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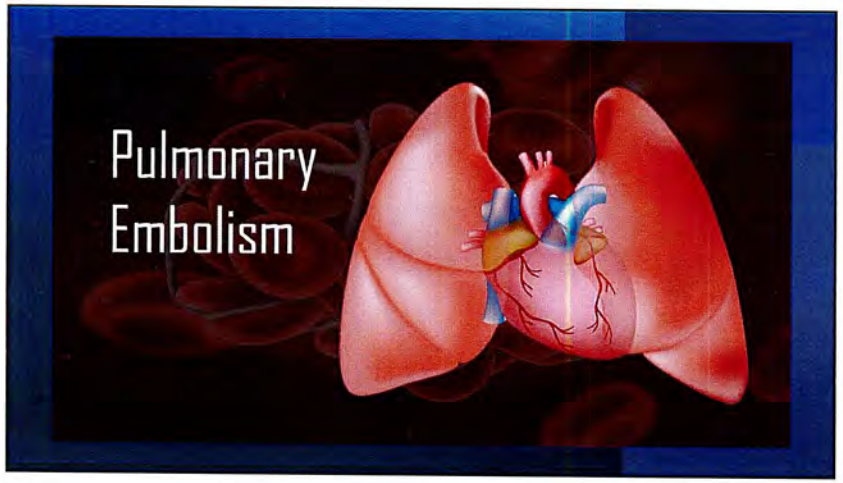
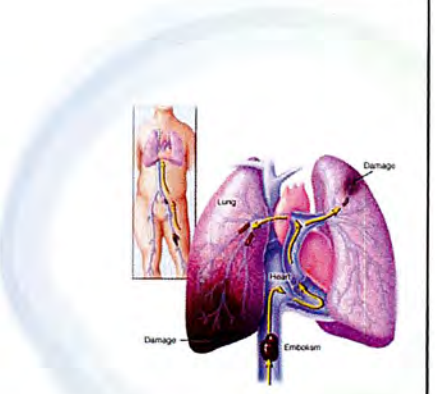


55

Pulmonary Embolus

- Free-floating Thrombus: material that travels to the vascular system in the lungs where it lodges and occludes a vessel
- Can be blood clots, tumor cells, cardiac vegetation, fat, amniotic fluid, air, or nitrogen
- Causes partial or total occlusion of pulmonary artery vessel – infarction
- Affected area of the lung is ventilated but inadequately perfused



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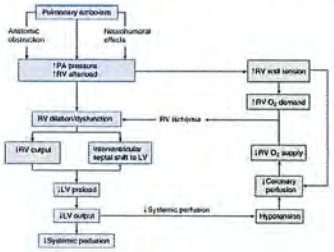
Effects of PE

Histamine and prostaglandin are released → bronchoconstriction and pulmonary vasoconstriction → alveolar hypoventilation and intrapulmonary shunting



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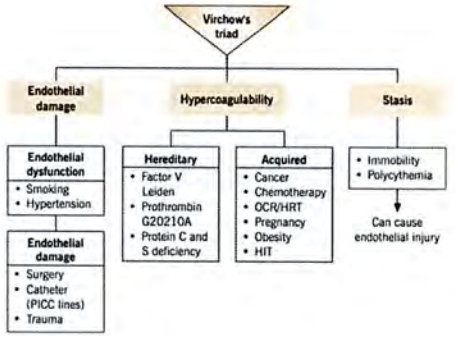
PE Risk Factors



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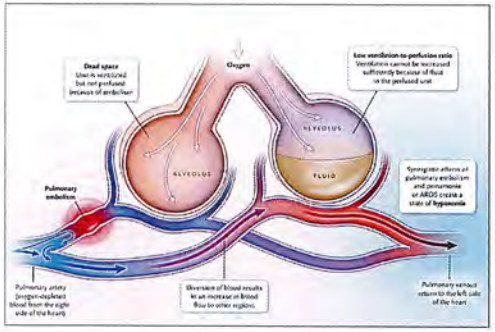
Ventilation/Perfusion Mismatch



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PE Clinical Presentation - Submassive

- Sudden onset of dyspnea at rest or with exertion (may be only symptom), Orthopnea
- Chest discomfort/pleuritic pain
- Flu-like symptoms
- Restlessness, apprehension
- Tachypnea/tachycardia
- Fever
- Scattered rales
- Cough
- Hemoptysis
- Can be asymptomatic (silent PE)

60

PE Clinical Presentation - Massive

- Sudden death
- Shock/hypotension
- Impending doom
- Tachypnea, severe dyspnea, cyanosis
- Rales, hemoptysis
- Tachycardia, perspiration, JVD

61

PE Diagnostics

- Hx of precipitating factors
- Labs
  - CBC with differential (normal or increased leukocytes)
  - Erythrocyte sedimentation rate (elevated)
  - Fibrin split products (increased fibrin degradation products)
  - D-Dimer (more specific test for fibrin split products; + if > 500 ng/mL)
- ABG's – non-specific
- CXR – non-specific – may show atelectasis 24-72 hours after insult
- Vitals –(HR up, RR up, BP down) – non- specific
- Lung sounds – maybe rales (crackles)

62

PE Diagnostics Continued

- V/Q scan – non-invasive, suggestive, not definitive
  - Important to use when multi-detector CT angiography unavailable
- Venous Doppler – not definitive - tells if DVT is present
- D-dimer – not definitive – tells if by-products of a clot are present
- Echo – dilated RV – massive PE (McConnell's Sign)
- Pulmonary angiography – definitive (invasive)
- **CT Angiography – definitive (non-invasive)**
- ECG – nonspecific ST-segment and T-wave abnormalities most common findings
  - Tall, peaked P waves, right axis deviation, right bundle branch block

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64

PE Treatment

- ABCs
- O2 as needed
- IV access
- Cardiac/Pulse ox monitoring
- Medications:
  - Heparin, low-molecular-weight heparin
  - Fibrinolytics
  - Analgesia

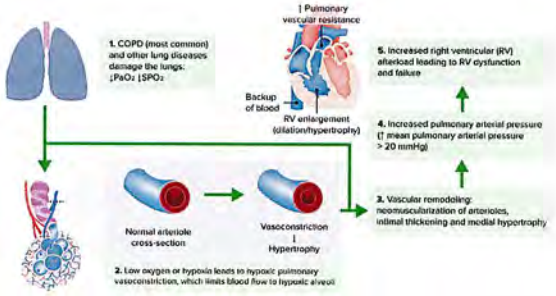
65

A patient with a history of chronic obstructive pulmonary disease (COPD) presents with shortness of breath, distended jugular veins, abdominal pain, and dependent extremity edema. What is the suspected cause for these symptoms?

A. Cor pulmonale
B. Pneumonia
C. Pneumothorax
D. Blood clot

66

Cor Pulmonale



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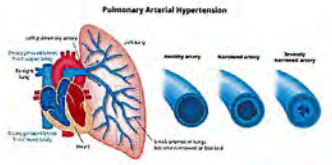
Pulmonary Hypertension

- Results from restricted flow through the pulmonary arterial circulation
  - Leads to ↑ pulmonary vascular resistance (PVR) → ultimately right heart failure
  - Predominant cause: loss of vascular luminal volume from vascular remodeling, excessive cell proliferations, ↓ apoptosis



Hemodynamic Definition:

- Mean PAP > 20 mmHg
- PAOP < 15 mmHg
- PVR > 240 dynes

68

Pulmonary Hypertension Treatment

Drugs used for treatment of pulmonary arterial hypertension (Group 1)		
		Comment
Calcium channel blockers	e.g., Amlodipine	Only IPAH, if vasoreactivity testing is positive
Endothelin receptor antagonists	Ambrisentan	
	Bosentan	Hepatic toxicity; mainly replaced by Macitentan
	Macitentan	
Phosphodiesterase type 5 inhibitors (NO pathway)	Sildenafil Tadalafil	Both: no combination with NO donors and guanylate cyclase stimulators
Guanylate cyclase stimulators (NO pathway)	Riociguat	No combination with NO donors and phosphodiesterase type 5 inhibitors; *also approved for Group 4 (CTEPH)*
Prostacyclin analogues	Epoprostenol (intravenous)	
	Iloprost (inhaled)	
	Treprostinil (subcutaneous)	Intravenous, if the subcutaneous form is not tolerated
Prostacyclin IP receptor agonists	Selexipag (oral)	Approved in the EU since May 2016

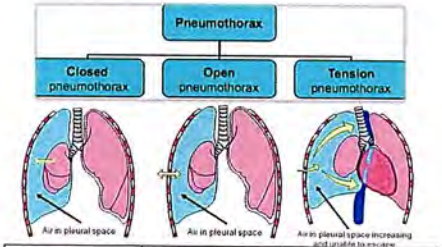
69

An unresponsive patient arrives via emergency medical services following a motor vehicle collision. Initial assessment reveals absent breath sounds and bruising on the left side of the chest, a deviated trachea, and the appearance of cyanosis. What should the nurse suspect?

a. Tension pneumothorax
b. Rupture of the diaphragm
c. Flail chest
d. Right mainstem bronchial intubation

70

Pneumothorax

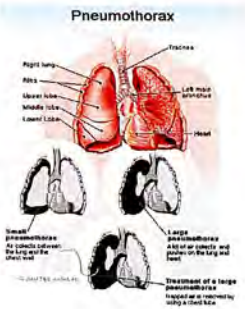


The pleural cavity pressure is < the atmospheric pressure	The pleural cavity pressure is = the atmospheric pressure	The pleural cavity pressure is > the atmospheric pressure

71

Pneumothorax (Simple & Open)

- Simple or open
- Mechanism: Simple–blunt; open–penetrating
- Assessment findings
  - Decreased or absent breath sounds
  - Dyspnea, tachypnea
  - Tachycardia
  - Subcutaneous emphysema
  - Sucking chest wound
- Interventions
  - Depends on severity



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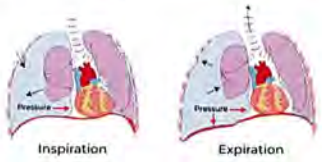
Tension Pneumothorax

- Life threatening
- Assessment findings
  - Severe respiratory distress
  - Diminished or absent breath sounds on injured side
  - Hypotension
  - Distended neck, head, and upper extremity veins
  - Tracheal deviation (late sign)
  - Cyanosis (late sign)



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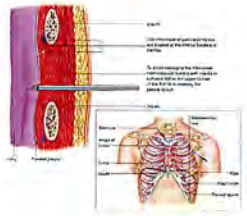
Tension Pneumothorax

- Interventions
  - Immediate needle decompression
    - 14-gauge needle
    - Second intercostal space, midclavicular line
    - Placement controversies
  - Prepare for chest tube



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Management of Pneumothorax

- Small closed
  - monitor closely
  - maybe supplemental O2
  - Restrict activity
- Small closed symptomatic
  - O2
  - needle puncture
  - Heimlech valve
- Moderate or large/open or closed
  - O2, chest-tube to underwater seal or suction
- Tension
  - Immediate chest tube
  - O2 or vent

75

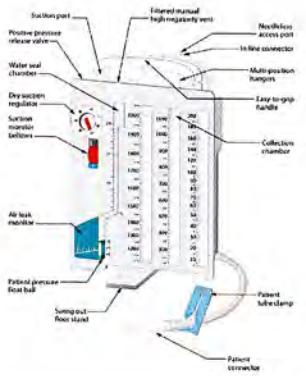
While transferring a patient with a chest tube, the drainage system falls and breaks. What is the priority intervention at this time?

a. Insert the end of the chest tube into sterile water
b. Clamp the chest tube 3 cm from the insertion point
c. Remove the chest tube and cover with an occlusive dressing
d. Elevate the end of the chest tube and cover with a gloved finger

76

Chest Drainage (Chest Tubes)

- Sterile Tube inserted into pleural space and connected to drainage system
- 3 Chambers:
  - Collection chamber
  - Water-seal chamber
  - Wet/Dry suction control chamber



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Nursing Care

- Maintain Closed drainage system
- Avoid kinks in tubing
- Maintain correct fluid level with minimal bubbling required
- Watch for bubbling in underwater seal with expiration only
- Never clamp chest tube without specific MD order
- Assess chest tube insertion site – there should be no fluid leaking from around the site or sounds of air leaking

78

Management of Pneumothorax

- Recurrent Spontaneous
  - Treat immediate problem
  - For long term intervention, will need pleurodesis

79

Respiratory Trauma – Pulmonary Contusions

Etiology/Pathophysiology

- Damage to the lung parenchyma, resulting in localized edema and hemorrhage.
- Etiology: Blunt trauma (deceleration) or high-velocity missile

Assessment Findings/Treatment

- Dyspnea
- Ineffective cough, often hemoptysis
- Possible chest wall contusion or abrasions
- Decreased pulmonary compliance = Increased Airway Pressure
- PaO2/FIO2 ratio continues to decrease, Hypoxia/Respiratory Acidosis

Treatment:

- Decrease pulmonary shunting
- Administer oxygen (use lowest FiO_2)
- Increase FRC with PEEP
- Increase effective compliance with diuretics
- Improve oxygenation
- Limit fluids

80

A patient arrives via emergency medical services after sustaining burns to the face, neck, and chest from a fire. The patient is alert and has a productive cough of carbonaceous sputum. What is the priority intervention to perform?

a. Prepare for intubation

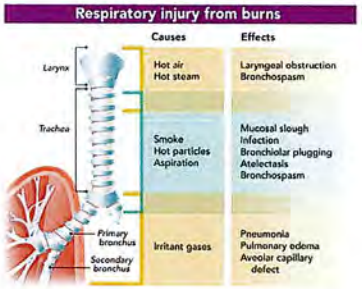
b. Obtain a full set of vital signs

c. Monitor continuous pulse oximetry

d. Remove all clothing and jewelry

81

Inhalation Injury



- 2 requirements for inhalation injury diagnosis:
  - Exposure to combustible agent
  - Signs of exposure to smoke in lower airway (below vocal cords) confirmed by bronch

82

Inhalation Injury Grade

Grade	Injury Severity	Signs and Symptoms
0	No injury	• Absence of carbonaceous deposits, erythema, edema, bronchorrhea, or obstruction
1	Mild injury	• Minor or patchy areas of erythema • Carbonaceous deposits in proximal or distal bronchi
2	Moderate injury	• Moderate degree of erythema • Carbonaceous deposits • Bronchorrhea • With or without compromise of bronchi
3	Severe injury	• Severe inflammation with friability • Copious carbonaceous deposits • Bronchorrhea • Bronchial obstruction
4	Massive injury	• Evidence of mucosal sloughing, necrosis, endoluminal obliteration

83

Airway Management

Signs of Inhalational Injury	Indications for Intubation
• Erythema or swelling of oropharynx on direct visualization • Full thickness or deep dermal burns to face, neck, or upper torso • Singed nasal hair • Hoarse voice • Stridor • Carbonaceous sputum or carbon particles in oropharynx	• History of flame burns or burns in an enclosed space • Change in voice, with hoarseness or harsh cough • Stridor, tachypnea, or dyspnea

84

Inhalation Injury Treatment

Table 6. Pharmacologic Treatment for Inhalation Injuries

Pharmacologic Modality	Effect
Nitric oxide	Decreases microvascular permeability by decreasing pulmonary vascular pressures and by decreasing the endovascular damage by reactive oxygen species. Also improves oxygenation by decreasing ventilation-perfusion mismatch
Albuterol	Decreases peak inspiratory pressures, improves pulmonary compliance, decreases shunt fraction, and increases the arterial to alveolar oxygen gradient
Inhaled epinephrine	Bronchodilatory effect along with a vasoconstrictive effect to reduce mucosal edema
Aerosolized antithrombin	Decreases the degree of airway obstruction in an ovine model of cutaneous and inhalation burn (Prospective human data not available.)

Adapted from: Palmieri TW, et al. Inhalation burn injury in children. *Pediatric Anesthesia* 2009;19(Suppl. 1):147-154.

85

Signs of Carboxyhaemoglobinaemia

COHb levels	Symptoms
0-10%	Minimal (normal level in heavy smokers)
10-20%	Nausea, headache
20-30%	Drowsiness, lethargy
30-40%	Confusion, agitation
40-50%	Coma, respiratory depression
>50%	Death

**Oxygen saturation will be normal

86

Carboxyhaemoglobinaemia Treatment

- 100% oxygen (until asymptomatic or COHb < 10%)
  - Decreases the CO ½ life to 1 hour (normal ½ life is 4 hours when breathing room air)
- Monitor cardiac rhythm and COHb level
  - Hypoxic dysrhythmias
- Hyperbaric chamber may be required for carbon monoxide poisoning resistant to oxygen or for pregnant patients

87

Questions?

88

A patient presents with audible wheezing and has an oxygen saturation of 88% on room air. The patient reports eating shrimp for lunch. It would be a PRIORITY for the nurse to administer

A. diphenhydramine.
B. albuterol.
C. oxygen.
D. epinephrine.

89

A patient who sustained major trauma has a blood pressure of 84/56 mm Hg, a heart rate of 124 beats/min, and respirations of 42 breaths/min. Breath sounds are absent on the left side, the trachea is deviated to the right, and the left thigh is deformed. The nurse should FIRST prepare to assist with

A. pericardiocentesis.
B. chest tube insertion.
C. application of a traction splint.
D. needle decompression.

90

After an occlusive dressing has been applied to a patient's open chest wound, the nurse should assess for

A. dullness on the injured side
B. increased work of breathing
C. stridorous respirations
D. tracheal deviation toward the injured side

91

A patient presents with dyspnea, tachycardia, elevated temperature and petechiae on the upper half of the body. The nurse should suspect

A. pulmonary embolism.
B. tension pneumothorax.
C. fat embolism.
D. malignant hyperthermia.

92

A patient who is trembling, sweating, and hyperventilating is having an anxiety attack. Arterial blood gas analysis is likely to show which of the following?

A. HCO3-level > 26 mEq/L
B. PaCO2 < 35 mm Hg
C. pH < 7.35
D. oxygen saturation < 96%

93

A nebulized bronchodilator is administered to a 6-year-old child with severe asthma. Treatment may be deemed effective if the patient has

A. an increased peak expiratory flow rate.
B. diminished breath sounds bilaterally.
C. a respiratory rate that has decreased to 14 breaths/min.
D. a prolonged expiratory phase.

94

A 3-year-old child who has acute respiratory distress is admitted to the emergency department. The child is sitting forward and drooling, and the neck is extended. These findings support the diagnosis of

A. croup.
B. bronchiolitis.
C. epiglottitis.
D. aspiration of a foreign body.

95

A nurse is assessing a patient who is tachycardic and tachypneic. The patient has recently traveled cross country on an airplane. The nurse should be MOST concerned that the patient may have:

A. pneumonia
B. a pleural effusion
C. a pneumothorax
D. a pulmonary embolism

96

A patient has an open pneumothorax secondary to a gunshot injury. What is the proper sequence of steps in management?

A. Obtain baseline vital signs, initiate an IV of lactated Ringer's solution, and place the patient on the unaffected side.
B. Apply an occlusive dressing to the wound, check for a pulse, and initiate an IV of normal saline solution.
C. Initiate an IV of lactated Ringer's solution, check for a pulse, and place the patient on the affected side.
D. Initiate an IV of normal saline solution, apply an occlusive dressing to the wound, and prepare for intubation.

97

A patient is being treated for an acute exacerbation of chronic obstructive pulmonary disease. An improvement in the patient's condition is indicated if the patient is

A. able to cough up thick, yellow sputum.
B. able to speak in uninterrupted sentences.
C. using pursed-lip breathing techniques.
D. maintaining the tripod position.

98

Obstetrical & Gynecological Emergencies

CEN Review Course
Questions/Rationales

1

A young woman presents with a complaint of heavy, bright red vaginal bleeding for the past 2 months. She complains of feeling tired with mild dizziness and lightheadedness when she tries to exercise. Vital signs are normal, hemoglobin is 9.4 g/dL, and the pregnancy test is negative. A bimanual pelvic exam has been performed. The nurse should prepare the patient for a(n):

A. Immediate exploratory laparotomy
B. Transfusion of packed red blood cells
C. Pelvic or transvaginal ultrasound
D. Endometrial ablation

Rationale: Because the patient is not pregnant, a vaginal exam should be performed. Ultrasonography can be used to examine the status of the endometrium. Endometrial hyperplasia, endometrial carcinoma, endometrial polyps, and uterine fibroids can be identified easily by this technology.

2

Which of the following findings suggests that a patient may have a ruptured ovarian cyst?

A. Sharp abdominal pain
B. Intermittent abdominal pain
C. Thick yellow vaginal discharge
D. Bloody vaginal discharge

Rationale: The pain associated with a ruptured ovarian cyst is characterized as sharp and constant rather than intermittent. There is usually no associated vaginal discharge.

3

A young female presents stating that she may have been sexually assaulted the night before. She states she was at a nightclub and awoke this morning in an unfamiliar place. She complains of vaginal soreness and bruising of her labia. Which statement made by the patient would further suggest to the nurse that a sexual assault may have been drug-facilitated?

A. "I woke up this morning and had nausea and vomiting."
B. "I had one drink and then cannot recall the events of the evening."
C. "When I woke up this morning, I could not find my underwear."
D. "I remember having a lot of drinks and then don't remember much after that."

Rationale: Drug-facilitated sexual assault drugs such as flunitrazepam (Rohypnol), ketamine, and gamma-hydroxybutyric (GHB) can be added to drinks without changing the color, flavor, or odor of the beverage. Alcohol-induced amnesia is associated with excessive alcohol use, not one serving of alcohol.

4

A patient diagnosed with a Chlamydia trachomatis vaginal infection should also be screened for which of the following associated sexually transmitted diseases?

A. Human papillomavirus (HPV)
B. Bacterial vaginosis
C. Canddiasis
D. Gonorrhea

Rationale: Gonorrhea is caused by the organism N. gonorrheae, a gram-negative organism. Coinfection with chlamydia and gonorrhea is common and the 2 infections should be treated concomitantly.

5

A 26-year-old female presents with sudden onset of right lower abdominal pain, followed by a syncopal episode and heavy vaginal bleeding. Which of the following potential diagnoses is the highest probability?

A. Ruptured ectopic pregnancy
B. Pelvic inflammatory disease (PID)
C. Ruptured ovarian cyst
D. Acute exacerbation of endometriosis

Rationale: Early symptoms and signs of ectopic pregnancy include pelvic pain, vaginal bleeding, and cervical motion tenderness. Syncope and hemorrhagic shock can occur with rupture. This is a high-risk condition and, when suspected, should be given a high priority.

6

A 32-week pregnant patient is involved in a motor vehicle collision. On arrival, the patient is complaining of severe abdominal pain. Blood is noted on the sheets around the patient's lower extremities, and on assessment, the nurse determines the patient is bleeding vaginally. High-flow oxygen is administered via face mask. Which of the following would be the next intervention to perform?

A. Insert 2 large-caliber intravenous catheters
B. Perform a type and cross-match
C. Initiate continuous fetal monitoring
D. Prepare the patient for a cesarean section

Rationale: The patient likely has a placental abruption as a result of the motor vehicle collision and requires insertion of 2 large-caliber intravenous catheters for the immediate administration of intravenous crystalloid fluid to prevent hypovolemia.

7

A patient in the 30th week of pregnancy presents with complaints of headache and swelling of the hands an face. Blood pressure is 154/92 mmHg. Which of the following medications should be anticipated for this patient?

A. Labetalol (Normodyne)
B. Furosemide (Lasix)
C. Acetaminophen (Tylenol)
D. Magnesium sulfate

Rationale: This patient is exhibiting signs and symptoms of preeclampsia. Magnesium sulfate is given to decrease the seizure threshold in a patient who has preeclampsia. Labetalol should not be administered because, although the blood pressure of 140/90 is considered hypertension, lowering the diastolic pressure to less than 90-100 mmHg may result in placental hypoperfusion and lead to fetal distress.

8

Which of the following laboratory results would be suggestive of the development of HELLP syndrome?

A. Decreased platelet count
B. Decreased liver enzymes
C. Elevated potassium level
D. Increased magnesium level

Rationale: HELLP is a life-threatening complication of pregnancy whose defining characteristics are hemolysis, elevated liver enzymes, and low platelet count. The development of hemolysis leads to activation of the coagulation cascade, causing consumption of the patient's platelets.

9

Which of the following assessment findings would place a patient at risk for preterm labor?

A. Increased maternal body mass
B. Smoking during pregnancy
C. Previous full-term birth
D. Maternal age between 30 and 35 years

Rationale: Smoking during pregnancy is a common risk factor associated with premature birth and poor fetal outcomes. Women with low body mass are at increased risk of premature birth. Women younger than 18 years and older than 40 years are more likely to experience premature labor.

10

Approximately 10 minutes after the vaginal delivery of a full-term neonate, the nurse observes a sudden gush of vaginal bleeding. Which of the following events would be the highest possibility for this new manifestation?

A. Uterine rupture has occurred
B. A cervical tear occurred during delivery
C. The placenta has separated from the uterine wall
D. Delivery of an unanticipated second neonate is imminent

Rationale: Approximately 10 minutes after the birth of the infant, the patient enters the 3rd stage of labor, placental delivery. This stage is preceded by a sudden gush of blood from the vagina as the placenta separates from the uterine wall.

11

Following the emergency home delivery of a full-term infant, a soft, boggy uterus is noted in the mother. For which of the following diagnoses is this patient at highest risk?

A. Postpartum infection
B. Placenta previa
C. Eclampsia
D. Postpartum hemorrhage

Rationale: A soft, boggy uterus is the assessment finding for uterine atony. Uterine atony is the most common cause of a significant postpartum hemorrhage. The nurse should perform manual massage of the uterus to help expel retained clots and restore uterine tone.

12

A patient who is breastfeeding presents complaining of fever and right-sided breast redness and tenderness. In addition to antibiotic therapy, which of the following should be included in the discharge instructions for this patient?

A. Avoid hand-expressing or using a mechanical breast pump
B. Have the baby nurse from the unaffected breast only
C. Stop breastfeeding, and supplement feedings with formula until the infection clears
D. Apply a warm compress to the breast before breastfeeding

Rationale: Warm compresses or a hot shower will help alleviate symptoms associated with mastitis and facilitate milk flow. Emptying the breast is an important component in the management of mastitis.

13

The nurse is caring for a patient who has an ectopic pregnancy. The patient has stable vital signs and states that she has an appointment with her obstetrical physician tomorrow. The nurse should prepare the patient for

A. Administration of Rh immune globulin (RhoGAM)
B. Admission to the operating room
C. A repeat ultrasound examination
D. Administration of methotrexate

Rationale: Methotrexate (Folex) administration is optimal in a hemodynamically stable patient who can follow up with their physician. Admission to the operating room is not indicated since the patient is hemodynamically stable. The patient has already been diagnosed, so there is no indication for a repeat ultrasound. Rh immune globulin (RhoGAM) would only be indicated if the patient has vaginal bleeding and is Rh negative.

14

The nurse is caring for a patient who is 2 days postpartum, is hypertensive and complaining of a severe headache. The nurse should prepare to administer

A. Magnesium sulfate
B. methylergonovine maleate (Methergine)
C. acetaminophen
D. oxytocin (Pitocin)

Rationale: The patient is experiencing symptoms of preeclampsia, the primary treatment for which is magnesium sulfate, along with blood pressure management.

15

The triage nurse is called to assist a laboring patient in their vehicle. The significant other states that the baby's head delivered just before arrival, but the shoulders seem to be preventing complete delivery. The nurse recognizes which of the following as the PRIORITY intervention for the neonate?

A. Perform the initial APGAR score
B. Suction the mouth, then the nose
C. Gently pull light pressure on the posterior shoulder
D. Clamp the umbilical cord 4-5 cm from the umbilicus

Rationale: When a neonate delivers quickly, the nurse should prioritize drying and warming the infant and then suctioning if needed. For a baby that requires an assisted and longer delivery, the baby's mouth and then nose may be suctioned to prevent aspiration of amniotic fluid and blood. Clamping the cord should not occur until the baby is delivered OR if the cord is pulled tightly and the practitioner feels it is better to clamp and cut the cord after delivery of the head than to risk other complications. The APGAR score should be performed after full delivery of the neonate. If assisting with delivery of the shoulders, the anterior shoulder should be delivered first, followed by the posterior shoulder.

16

A patient who is at 36 weeks gestation and has eclampsia is receiving a magnesium infusion. Signs and symptoms of magnesium toxicity include

A. Hypertension
B. Hypoxemia
C. Hyperreflexia
D. Hallucinations

Rationale: Magnesium is a smooth muscle relaxer; therefore, the patient should be monitored for respiratory depression. Hyperreflexia, hallucinations, and hypertension are all signs of magnesium deficiency. Hypoxemia would be a sign of respiratory depression.

17

WOUND EMERGENCIES

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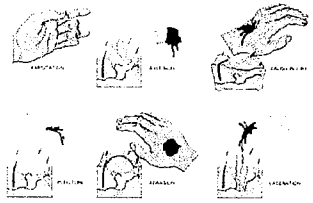
1

COURSE OUTLINE

- Avulsions and degloving injuries
- Wound infections
- Injection injuries
- Lacerations
- Penetrating injuries
- Frost Bite
- Wound bleeding



2

AGE-RELATED CONSIDERATIONS

PEDIATRICS

- Major heat loss can occur in young children left unclothed for a period of time (large body surface area)
- High metabolic rate and low glycogen stores in infants can lead to hypoglycemia during stress
- Child maltreatment should always be considered

GERIATRICS

- Reduced elasticity of skin, decreased subcutaneous fat layer, and reduced perfusion
- Capillary fragility can lead to large ecchymosis
- Increased risk of infection and reduced healing ability
- Increased risk of skin breakdown

3

WHICH OF THE FOLLOWING INTERVENTIONS WOULD THE NURSE ANTICIPATE IN THE CARE OF THE PATIENT WITH AN AVULSION WOUND TO THE SCALP?

A. Trim wound edges that are gray or dusky in appearance
B. Prepare for suturing by local injection of lidocaine with epinephrine
C. Cleaning and debridement of the devitalized tissue
D. Application of a wet-to-dry dressing

4

AVULSIONS & DEGLOVING INJURIES

- Full-thickness tissue loss that prevents wound edge approximation
- Immediate problem - hemostasis
  - *Small wounds heal by secondary intention*
  - *Large areas may require split-thickness grafting*
- Degloving - severe avulsion
  - *Full-thickness skin pulled away from body with resulting devasculanzation of the skin*
  - *Potential damage to underlying tissue*

5

AVULSIONS & DEGLOVING INJURIES TREATMENT

- IV access
- Elevate affected part
- Apply sterile, saline-soaked gauze to area
- Apply steady pressure to decrease blood loss
- Cleanse wound with antiseptic soap and irrigate throroughly

6

ANTISEPTIC SOLUTIONS

- Betadine
  - *Wound cleanser - 1% concentration*
- Nonionic detergents (Pluronic F-68, Shur-Clens)
- Hydrogen peroxide
  - *Should not be used on wounds after initial cleaning*
- Hexachlorophene
  - *Never use scrub solution in open wounds*
- Alcohols
  - *No role in routine care*
- Phenols
  - *Can cause extensive tissue necrosis and systemic toxicity*

7

AVULSIONS & DEGLOVING INJURIES TREATMENT

SMALL/LARGE AVULSIONS

- Apply product for bleeding control (if large)
- Apply petrolatum or Xeroform gauze or other nonadhering material
- Apply pressure dressing
- Apply layered dressing
- Apply metal protector, if indicated

DEGLOVINGS

- Realign soft tissue to prevent further damage
- Cover with sterile dressing
- Assist with hospital admission for debridement and grafting

8

AVULSIONS & DEGLOVING INJURIES PHARMACOLOGIC TREATMENT

- Local/regional anesthetic
- Non-narcotic analgesics
- Narcotics
- Antibiotics
- Tetanus immunization (DTaP)

Human tetanus immune globulin (TIG) is recommended if a patient is not adequately immunized. It provides passive immunity for 1 month.

9

PATIENT EDUCATION

- Encourage all individuals to maintain current TDaP immunization status
- Maintain adequate drainage through use of warm saline solution soaks
- Continue specific wound care measures as indicated
- Take mild analgesic, if needed
- Observe for signs of continuing infection
- Observe for side effects of administered vaccine
- Return or make an appointment for follow-up care

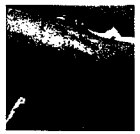
10

A PATIENT PRESENTS TO TRIAGE WITH A LACERATION TO THE MIDDLE PHALANX OF THE PALMER SIDE OF THE INDEX FINGER FROM A KITCHEN KNIFE. BLEEDING HAS BEEN CONTROLLED. AFTER EXAMINING THE PATIENT FOR POSSIBLE TENDON INJURY, THE NURSE ANTICIPATES PREPARING THE PATIENT FOR WOUND CLOSURE BY FIRST:

A. Cleansing and irrigating the wound
B. Administering intravenous antibiotics
C. Assisting with infiltration with lidocaine and epinephrine
D. Administering an opioid analgesic

11

LACERATIONS



- Open wounds that result from sharp or blunt trauma to the skin
- May be superficial (only penetrate epidermis) or extend past the dermis into fascia and muscle (involves underlying structures)
- Stages of repair:
  - *At time of injury - immediate vasospasm and clot formation*
  - *Within 6 hours - inflammatory phase takes place and continues for up to 3 days*
  - *After 1st 24 hours - waterproof covering develops*
  - *6 hours to 1 month - epithelial cell growth*

Goals of wound management:
- restore function
- repair tissue integrity
- minimize risk of infection

12

THE NURSE IS DISCHARGING A PATIENT WHO HAD A FACIAL LACERATION SUTURED. THE PATIENT'S ACCURATE UNDERSTANDING OF THE DISCHARGE INSTRUCTIONS IS INDICATED WHEN THEY STATE:

A. "I will return in 3-5 days to have the sutures removed."

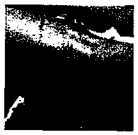
B. "I will return in 6-7 days to have the sutures removed."

C. "I will return in 10-14 days to have the sutures removed."

D. "I will return in 7-10 days to have the sutures removed."

13

LACERATIONS – PRIMARY CLOSURE



- Suture, Staples, Skin glue, Tape

Suture Removal

Location	Timing
Face	3-5 days
Scalp	7-10 days
Trunk	7-10 days
Arms/Legs	10-14 days
Joints	14 days

Goals of wound management:
- restore function
- repair tissue integrity
- minimize risk of infection

14

PENETRATING INJURIES

- Stab wounds, gunshot wounds, other high-pressure wounds
- Bullet wounds - bony, neurovascular, and soft tissue injuries remote from projectile's path
- Forensic considerations
  - *Appropriate reporting to law enforcement agencies*
  - *Careful documentation of patient's condition with accurate description of injury*
  - *Careful removal of clothing (not cutting through areas of "evidence"*
  - *Appropriate handling and disposition of bullets and weapons*
  - *Minimize handling of bullets to prevent loss of evidence on bullet (do NOT use metal forceps)*

15

WHICH OF THE FOLLOWING PATIENTS SHOULD RECEIVE RABIES PROPHYLAXIS

A. The patient with a bite from a pet cat

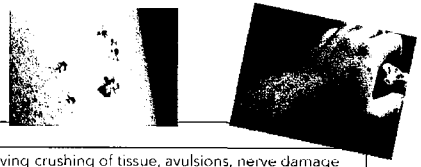
B. The patient with a bite from a pet dog

C. The patient who may or may not have been bitten by a bat in the house

D. The patient who may or may not have been bitten by a guinea pig

16

BITES



Type of Bite	Description
Dog	• Tend to be deep involving crushing of tissue, avulsions, nerve damage • Larger wounds allow bacteria to exit → decreasing incidence of infection compared to other bites
Cat	• Smaller puncture wounds traps bacteria increasing rate of infections • Infection often follows ~ 12 hours after bite
Human	• high infection rates (typically 1-2 days after bite) • Low possibility of transmitting Hep B, C, and HIV • Cause ovoid shaped bruise 1-1.6 inches in diameter • Teeth marks over knuckles from "punching someone" are associated with fractures of the 3rd & 5th metacarpal, osteomyelitis, and joint infection
Bats	• Bats are common carriers of rabies

17

FROSTBITE

- Occurs when exposure to cold → tissue freezes → ice crystals form
- Vasoconstriction ↓ perfusion and injury to epithelial layer of blood vessels – thrombus
- Classified by depth/tissue type
  - *Partial thickness: red and swollen*
  - *Deep partial thickness: blisters*
  - *Full thickness: total skin necrosis (blackening of skin and eschar formation)*
- Initial Treatment:
  - *Quickly rewarm the affected part 15-30 minutes (luke warm water)*
  - *Do NOT warm and let refreeze*
  - *Avoid friction or rubbing*
  - *Aspirin (or other NSAID) can help ↓ risk of thrombus formation*

18

HIGH PRESSURE DEVICE WOUNDS

- High pressure devices can include: paint gun, grease gun
- If the device triggers releasing foreign matter into the wound, it may travel deep into the tissue separating fascial planes and causing compartment syndrome
- Damage results from:
  - *Direct insult*
  - *Chemical inflammation*
  - *Ischemia from compressed blood vessels*
  - *Secondary infection*
- Requires high triage prioritization and potential surgical intervention

12 hours after injury

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PENETRATING INJURIES TREATMENT

- ABCs
- Supplemental oxygen (as needed)
- IV access
- Prepare for/assist with medical interventions
  - *Control local bleeding*
  - *Cleanse and irrigate skin around wound with mild antiseptic solution*
  - *Assist with debriding, irrigating, removal of missile, packing, and closing procedures as needed*
  - *Apply appropriate dressing*
  - *Assist with possible hospital admission*

20

A PATIENT WHO SUSTAINED A GUNSHOT WOUND IS BLEEDING FROM THE ARM. AFTER APPLYING A PRESSURE DRESSING, THE NURSE SHOULD NEXT EVALUATE

A. presence of bleeding at the dressing.

B. development of fever.

C. presence of pain.

D. changes in neurovascular status.

21

WOUND BLEEDING

- Stop the Bleeding

22

OPEN WOUNDS ASSESSMENT

Always suspect injury to organs underlying injured soft tissues

Assess for:

- *Bleeding severity*
- *Amputations or avulsions*
- *Open wounds to chest or neck that may require an occlusive dressing*
- *Open wounds to abdomen that may have caused an evisceration of abdominal organs*

Impaled Objects:
- Do NOT remove the object
- Manually stabilize object
- Expose area
- Control bleeding
- Bandage with bulky dressing to help with stabilization of object

23

GENERAL WOUND CARE STRATEGIES

- Imbedded objects should be left in place as they may be tamponading underlying bleeding
- Hair removal around wounds is discouraged. If needed, use scissors or clippers. (Do NOT shave!)
- Copious amounts of normal saline should be used to irrigate wounds
- Low pressure irrigation (bulb syringe) may be sufficient to remove large contaminants
- High pressure irrigation works best for smaller contaminants and bacteria
- Avoid using lidocaine with epi on digits, penis, ears, tip of nose, avulsions, or grossly contaminated wounds

24

WOUND CLOSURE

Type of Closure	Description	Purpose
Primary	Immediate wound closure	Clean wounds with minimal tissue loss
Secondary	Wounds are allowed to close on their own over time	Clean wounds with significant tissue loss
Tertiary	Wound closure is delayed for a period of time	Wounds with significant bacterial contamination

25

GENERAL WOUND MANAGEMENT – PATIENT EDUCATION

Goals of wound management:
- restore function
- repair tissue integrity
- minimize risk of infection

- Elevate affected part for 48 hours (to minimize pain and swelling)
  - *Above level of the heart; wear sling when appropriate*
- Apply heat or ice, as directed
- Wound care instructions:
  - *Keep wound and dressing clean and dry*
  - *Soap and water 2 times a day*
  - *Keep covered for 1st 24 hours*
- Change dressing if wet or soiled
- Observe for local redness, swelling, warmth, discharge, or development of fever
- Take medications according to directions
- Return or make appointment for follow-up care as indicated
- Sutures to be removed as directed by provider
- Use sunblock over wound for at least 6 months

26

WOUND INFECTION

RISK FACTORS

- Injury more than 8-12 hours old
- Contamination with devitalized tissue, foreign matter, saliva, or stool
- Blunt (crush) mechanism
- Presence of subcutaneous sutures
- Type of repair: risk greatest with sutures > staples > tape
- Anesthesia with epinephrine
- High velocity missile injuries

SIGNS/SYMPTOMS

- Redness
- Increasing pain
- Swelling
- Fever
- Red streaks progressing up an extremity

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WOUND INFECTIONS

- Staphylococcus aureus
- Pasteurellosis
- Cat-scratch fever
- Wound botulism
- Gas gangrene
- Tetanus
- Group A Streptococcus

28

STAPHYLOCOCCUS AUREUS

- Gram + bacteria
- Associated with most skin infections
- Usually localized abscesses in superficial subcutaneous tissues
- Infection may become systemic
- MRSA

29

PASTEURELLOSIS

- Pasteurella multocida
- Necrotizing infection associated with animal bites, especially cats
- Progresses to cellulitis, osteomyelitis, sinusitis, pleuritis

30

CAT-SCRATCH FEVER

- Origin possibly Afipia felis or Bartonella henselae
- Associated with cat or dog scratches
- Regional or local lymphadenitis, fever, self-limiting

31

WOUND BOTULISM

- Anaerobic Clostridium botulinum
- Associated with crush injuries or major trauma
- Incubation period: 4-14 days
- Symptoms:
  - *Weakness*
  - *Blurred vision*
  - *Difficulty speaking/swallowing*
  - *Dry mucous membranes*
  - *Dilated fixed pupils*
  - *Progressive muscular paralysis*

32

GAS GANGRENE

- Anaerobic Clostridium perfringens
- History of intestinal or gallbladder surgery or minor trauma to old scar containing spores
- Incubation period: 1 day to 6 weeks
- Symptoms:
  - [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
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  - [illegible]
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  - [illegible]

33

WHICH PATIENT WOULD BE LEAST LIKELY TO REQUIRE A TETANUS BOOSTER SHOT?

A. The 70-year-old patient with burns on the leg
B. The 13-year-old patient with a facial laceration
C. The 24-year-old patient who stepped on a nail
D. The 35-year-old female who sustained a laceration to the hand

34

TETANUS

- Anaerobic Clostridium tetani
- Organism found in soil and in human and animal intestines
- Entry to body through break in skin
- Incubation period: 2 days to several months (mean is 6-14 days)

35

TETANUS

PRODROMAL SYMPTOMS

- Restlessness
- Headache
- Muscle Spasms
- Pain (initially in back, neck, or face)
- Low back pain

PROGRESSION OF DISEASE

- Extreme stiffness
- Tonic spasms of voluntary muscles
- Exaggerated reflex activity
- Generalized convulsions
- Respiratory depression

36

GROUP A STREPTOCOCCUS

- Found in throat and on skin
- May cause life-threatening disease
- Necrotizing fasciitis, streptococcal toxic shock syndrome

37

A PATIENT WHO HAS REPEATEDLY BEEN PLACED ON BIPAP DEVELOPS A DEEP OPEN WOUND ACROSS THE BRIDGE OF THE NOSE FROM THE MASK. THE NURSE DOCUMENTS THIS WOUND AS A(N):

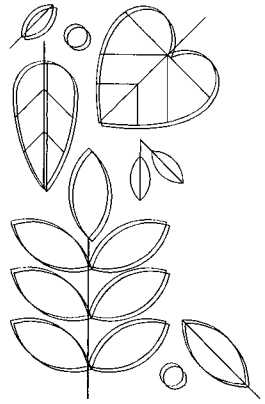
A. Stage 1 pressure injury
B. Stage 2 pressure injury
C. Stage 4 pressure injury
D. Unstageable pressure injury

38

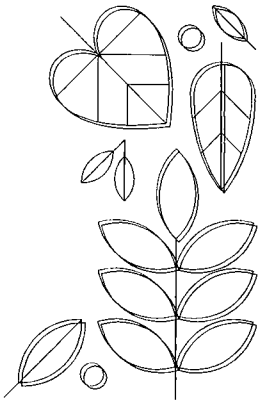
PRESSURE INJURIES

Pressure Injury Stage	Description
Stage 1	• Intact skin with nonblanchable redness of a localized area, usually over a bony prominence • Darkly pigmented skin may not have visible blanching; its color may differ from that of the surrounding area
Stage 2	• Partial-thickness loss of dermis presenting as a shallow, open ulcer with a red/pink wound bed, without slough • May also present as an intact or open/ruptured serum-filled blister
Stage 4	• Full-thickness tissue loss with exposed bone, tendon, or muscle
Unstageable	• Loss of full-thickness skin and tissue, and the extent of the tissue damage cannot be determined because the area is obscured by the presence of eschar or sloughing

39



PRACTICE QUESTIONS



40

IMMEDIATE INTERVENTION FOR A PATIENT WHO HAS A LARGE DERMAL AVULSION INJURY OF THE ARM SHOULD FOCUS ON

A. preventing infection.
B. minimizing the loss of mobility.
C. controlling hemorrhage.
D. minimizing scarring.

41

WHICH SOLUTION IS BEST WHEN COVERING AN OPEN ORTHOPEDIC INJURY IN MOIST DRESSINGS?

A. iodine-based solutions
B. hydrogen peroxide
C. normal saline
D. chlorhexidine

42

WOUND EMERGENCIES

Kelly Urban, PhD, MEd, RN, CCRN-K, TCRN, CEN

University of Arkansas for Medical Sciences

1

WHICH OF THE FOLLOWING INTERVENTIONS WOULD THE NURSE ANTICIPATE IN THE CARE OF THE PATIENT WITH AN AVULSION WOUND TO THE SCALP?

A. Trim wound edges that are gray or dusky in appearance

B. Prepare for suturing by local injection of lidocaine with epinephrine

C. Cleaning and debridement of the devitalized tissue

D. Application of a wet-to-dry dressing

Rationale: Avulsion injuries are at risk for wound infection, so cleansing, irrigation, and debridement are appropriate treatments. Skin edges of the avulsed segment should be approximated and should not be trimmed. Lidocaine with epinephrine are contraindicated due to the vasoconstriction action of the epinephrine. A sterile saline-soaked dressing may be applied after hemostasis and infection control are initiated.

2

A PATIENT PRESENTS TO TRIAGE WITH A LACERATION TO THE MIDDLE PHALANX OF THE PALMER SIDE OF THE INDEX FINGER FROM A KITCHEN KNIFE. BLEEDING HAS BEEN CONTROLLED. AFTER EXAMINING THE PATIENT FOR POSSIBLE TENDON INJURY, THE NURSE ANTICIPATES PREPARING THE PATIENT FOR WOUND CLOSURE BY FIRST:

A. Cleansing and irrigating the wound

B. Administering intravenous antibiotics

C. Assisting with infiltration with lidocaine and epinephrine

D. Administering an opioid analgesic

Rationale: Remove visible contamination and dried blood by using a 4x4 sponge and cleansing agent. Irrigation may also be done for deep wounds. Request the physician or advanced practice provider to administer local anesthesia prior to cleaning if needed. Lidocaine with epinephrine is contraindicated for distal areas because of its vasoconstrictive effects.

3

THE NURSE IS DISCHARGING A PATIENT WHO HAD A FACIAL LACERATION SUTURED. THE PATIENT'S ACCURATE UNDERSTANDING OF THE DISCHARGE INSTRUCTIONS IS INDICATED WHEN THEY STATE:

A. "I will return in 3-5 days to have the sutures removed."

B. "I will return in 6-7 days to have the sutures removed."

C. "I will return in 10-14 days to have the sutures removed."

D. "I will return in 7-10 days to have the sutures removed"

Rationale: Facial sutures should be removed 3-5 days after they are placed.

4

WHICH OF THE FOLLOWING PATIENTS SHOULD RECEIVE RABIES PROPHYLAXIS

A. The patient with a bite from a pet cat

B. The patient with a bite from a pet dog

C. The patient who may or may not have been bitten by a bat in the house

D. The patient who may or may not have been bitten by a guinea pig

Rationale: Bats are a common carrier of rabies. Rabies prophylaxis is recommended when someone has either been exposed to a bat or bitten by a bat. Patients may not be aware that they have been bitten in their sleep, and the bite may not be big. Waking up with a bat in the bedroom requires rabies prophylaxis. Domestic dogs and cats are usually vaccinated against rabies.

5

A PATIENT WHO SUSTAINED A GUNSHOT WOUND IS BLEEDING FROM THE ARM. AFTER APPLYING A PRESSURE DRESSING, THE NURSE SHOULD NEXT EVALUATE

A. presence of bleeding at the dressing.

B. development of fever.

C. presence of pain.

D. changes in neurovascular status.

6

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A. presence of bleeding at the dressing

B. development of fever.

C. presence of pain.

D. changes in neurovascular status.

RATIONALE
A gunshot wound is a missile injury. Bullet wounds may cause neurovascular, bony, and soft-tissue injuries remote from the projectile path. There is a potential for occult neurovascular injury, especially in high-velocity injuries to the arm. After the intervention of applying a pressure dressing, signs of circulation should be reassessed. Alterations in the neurovascular status indicate further complications. Fever would generally not be seen immediately following an injury upon arrival in the emergency department. Unless there is indication of hemorrhage, a normal amount of bleeding is expected following the initial application of a pressure dressing. Reassessment of any interventions associated with airway, breathing, circulation, and treating underlying conditions related to disease or injury determines the priorities of care.

7

WHICH PATIENT WOULD BE LEAST LIKELY TO REQUIRE A TETANUS BOOSTER SHOT?

A. The 70-year-old patient with burns on the leg

B. The 13-year-old patient with a facial laceration

C. The 24-year-old patient who stepped on a nail

D. The 35-year-old female who sustained a laceration to the hand

Rationale: Burns and puncture wounds break the skin integrity. These patients must have current tetanus immunization. Pregnancy is not a contraindication. An adolescent patient does not require a tetanus booster if up to date on vaccinations. The current vaccination schedule requires children to receive a tetanus booster between 11 and 12 years of age.

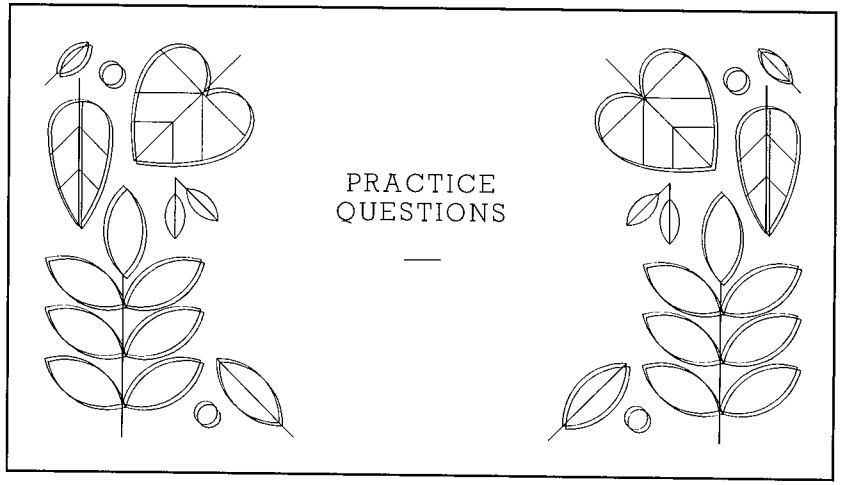
8

A PATIENT WHO HAS REPEATEDLY BEEN PLACED ON BIPAP DEVELOPS A DEEP OPEN WOUND ACROSS THE BRIDGE OF THE NOSE FROM THE MASK. THE NURSE DOCUMENTS THIS WOUND AS A(N):

A. Stage 1 pressure injury
B. Stage 2 pressure injury
C. Stage 4 pressure injury
D. Unstageable pressure injury

Rationale: Stage 4 pressure injury is defined as a full-thickness tissue loss with exposed bone, tendon, or muscle. The bridge of the nose lacks subcutaneous tissue.

9



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A. preventing infection.
B. minimizing the loss of mobility.
C. controlling hemorrhage.
D. minimizing scarring.

RATIONALE
Avulsions are characterized by full-thickness tissue loss that prevents wound approximation. Hemostasis is the immediate problem. Immediate intervention should focus on controlling bleeding. The distractors are incorrect because controlling hemorrhage needs to occur prior to the ongoing preventive care associated with minimizing scarring, loss of mobility, and preventing infection.

11

WHICH SOLUTION IS BEST WHEN COVERING AN OPEN ORTHOPEDIC INJURY IN MOIST DRESSINGS?

A. iodine-based solutions
B. hydrogen peroxide
C. normal saline
D. chlorhexidine

RATIONALE
Soft tissue absorbs some of the solution causing additional injury, therefore, normal saline is best.

12

Genitourinary

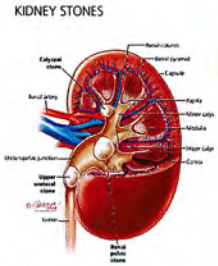
CEN Review/Course Aug 2023

1

Renal Calculi

Definition:

- Kidney stones that lead to renal colic
- 80% are calcium stones
- Size doesn't correlate to pain



Manifestations:

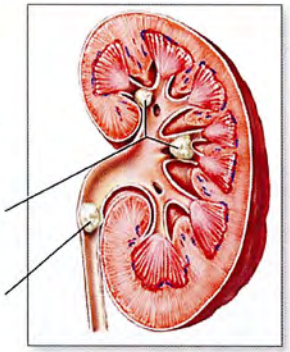
- Sudden onset severe colicky flank pain
- Restlessness
- Tenderness to costovertebral angle
- Urinary urgency, frequency, dysuria, hematuria
- N/V
- Diaphoresis, low grade fever

2

Renal Calculi

Assessment:

- Urinalysis shows hematuria
- BUN, Creatinine
- Helical CT
- Assess for bruits, pulsatile masses
- R/O aortic, iliac aneurysms



Interventions

- Strain urine
- IV fluids
- Opioids
- Antiemetics
- NSAIDs if normal kidney function
- Possible admission for definitive treatment

A.D.A.M.

3

Renal Calculi

Assessment

- Urinalysis shows hematuria
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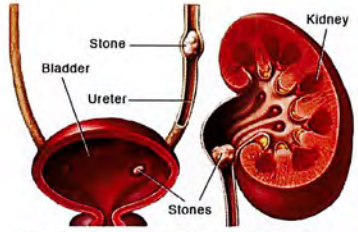


Interventions

- Strain urine
- IV fluids
- Opioids
- Antiemetics
- NSAIDs if normal kidney function
- Possible admission for definitive treatment

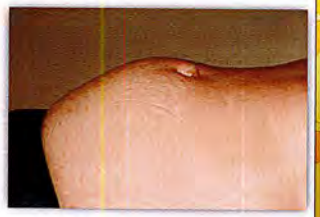
4

Urinary Retention

Inability to completely empty bladder

Causes:

- Urethral strictures
- Enlarged prostate
- Blood clots, renal calculi, bladder calculi
- Neurogenic bladder
- Pelvic organ prolapse
- Multiple sclerosis
- Side effect of PNS agents and OTC cold medications



Manifestations:

- Lower abdominal discomfort
- Bladder distention

5

Urinary Retention

Inability to completely empty bladder

Assessment:

- Ultrasound bladder scan

Interventions:

- Insert indwelling catheter
- Consider a Coude' catheter for a history of BPH
- Determine cause, treat as appropriate

6

Urinary Tract Infections

Definition

- Primarily affects bladder (acute cystitis)
- Most common organize – E. Coli

Clinical Manifestations:

- Women
  - Higher risk than men
  - Shorter urethras
  - New sexual partner
- Men
  - Incomplete bladder emptying
  - Enlarged prostate

- Dysuria, burning, urgency, frequency, nocturia
- Suprapubic pressure or low back pain
- Urine may be cloudy and foul-smelling
- Possible low-grade fever
- Urinary retention in males
- Altered mental status may be the only symptom in elderly

7

Urinary Tract Infections

Assessment

- Urinalysis
  - Hematuria
  - WBCs
  - Positive leukocyte esterase
  - Nitrite
- CBC with diff

Interventions:

- Antibiotics
  - Trimethoprim and sulfamethoxazole
  - Nitrofurantoin
  - Ciprofloxacin
- Pain management
  - NSAIDs
  - Phenazopyridine

Urosepsis

- Elderly, diabetics, Immunocompromised at high risk
- Present atypically, altered mental status

Discharge Teaching:

- Encourage fluid intake
- Phenazopyridine will turn urine bright orange

8

Acute Pyelonephritis

Definition

- Inflammation or infection of kidneys
- More common in women
- Can lead to urosepsis

Causes

- Unusually bacterial
- Mechanical obstruction that prevents urine flow
- Can be upstream from a UTI and ascend downstream from an infection in the blood

Manifestations

- Severe flank or back pain at costovertebral angle
- Flank tenderness
- Fever chills headache
- N/V diarrhea
- SX of lower UTI
- Pyuria, hematuria, bacteriuria

9

Acute Pyelonephritis

Assessment

- Urinalysis
- Urine cultures
- BUN
- Creatinine
- Renal ultrasound

Interventions

- Encourage fluids
- Bed rest as needed
- Drainage via nephrostomy tube
- Broad-spectrum antibiotics

10

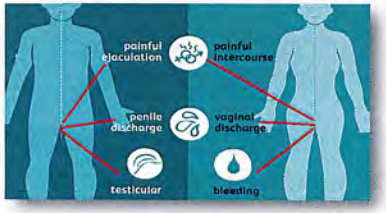
Chlamydia

Definition:

- Caused by Chlamydia trachomatis
- Most common bacterial STI
- Frequently concurrent with gonorrhea

Clinical manifestations

- 75% of all Chlamydial infections are asymptomatic
- Cervicitis
- PID
- Endometriosis
- Salpingitis



Assessment

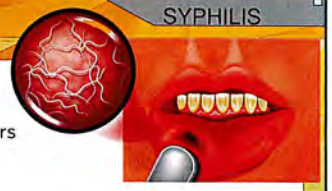
- Cervical, uterine cultures
- Test for other STIs
- Encourage testing of partners

Interventions

- Antibiotics – Azithromycin PO QD or Doxycycline x 7D

11

Syphilis



Definition:

- Caused by Treponema pallidum
- More common in females and drug abusers

Clinical manifestations

- Primary
  - Painless ulcer or chancre on mouth or anogenital area
- Secondary
  - 4-10 weeks after primary infection
  - Myalgia
  - Lymphadenopathy
  - Flu-like symptoms
  - Rason on palms of heads and soles of the feet
- Tertiary
  - 2-19 years after initial symptoms in untreated patients
  - Psychosis, delirium, dementia

12

Syphilis

Assessment

- Venereal disease research lab test (VDRL), rapid plasma regain (RPR) test
- Suspect if sexually active with genital ulcer or rash
- Consider testing for other STIs

Interventions

- Antibiotics
  - Penicillin IM once
  - Doxycycline x 14 D
  - Tetracycline x 14 D

13

Gonorrhea

Definition

- Caused by Neisseria gonorrhoeae
  - Second most common cause of STI in the US
  - Leading cause of cervicitis, PID in females; urethritis in males
  - Can cause infertility, ectopic pregnancy, chronic pelvic pain

Clinical manifestations

- S&S of UTI
- Mucoid discharge from cervix or penis
- Men may be asymptomatic

Assessment

- Gonorrhea, chlamydia cultures
- Consider testing for syphilis and other STIs

Interventions:

- Antibiotics:
  - Ceftriaxone IM once, Cefixime PO once
  - A cephalosporin IM plus azithromycin PO once
  - Doxycycline x 7D

14

Herpes Simplex

Definition

- Viral infection
  - Chronic, incurable STI with remissions and exacerbations

Clinical manifestations

- Painful vesicles, ulcerations on genitalia
- Fever
- Malaise
- Myalgia
- Lymphadenopathy
- Dysuria
- ~70% of those infected are asymptomatic

Interventions:

- Antiviral therapy

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Discharge Teaching STIs

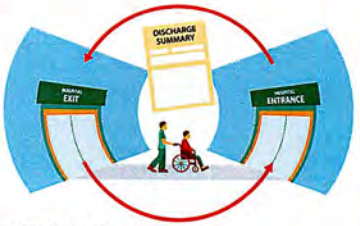
Take meds as prescribed

Follow up with PCP

Consistently use condoms

Inform sexual partners

Treat past sexual partners



Chlamydia

- No intercourse for at least 7D after treatment

Herpes

- Avoid intercourse during outbreaks
- Increased risk of transmission to fetus
- C-section recommended

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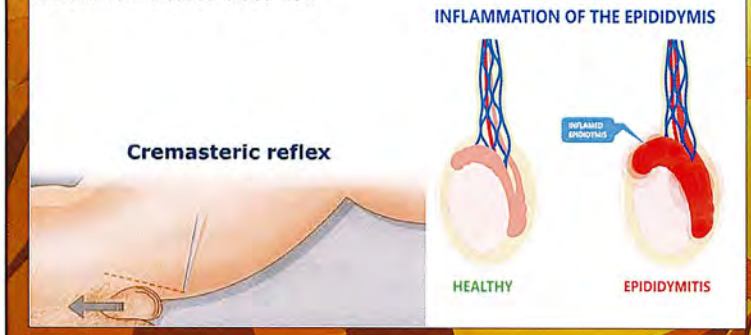
Acute Epididymitis

Cremasteric reflex: when the inner thigh is stroked the cremaster muscle contracts raising the ipsilateral testis (this reflex is intact with epididymitis)

US shows increased blood flow



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Testicular Torsion

- Urological emergency
- Can occur in infants; rare > 30 Y
- Cremasteric reflex is absent
- US shows ischemia

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Table 1: Acute Epididymitis and Testicular Torsion

Components	Acute Epididymitis	Testicular Torsion
Condition	Most common cause of intrascrotal inflammation	Twisting of testicle or spermatic cord, causing strangulation
Onset	Gradual	Sudden
Pain	• Mild to severe • Usually unilateral	• Severe, unilateral • Tenderness, swelling, erythema
Cause	Infection (*Chlamydia trachomatis* and *Neisseria gonorrhoeae*)	• Congenital abnormality • Undescended testicle • Cold weather • Sexual activity
Common age	Sexually active postpubertal males	Males aged 12–18
Ureteral discharge	Yes	No
Scrotal elevation	May decrease pain	Often worsens pain
Assessment	• Scrotal ultrasound • Ureteral smear, urinalysis, urine culture	• Cremasteric reflex • Doppler ultrasound
Interventions	• Antibiotics • Treat symptoms	• Manual detorsion • Urological consult • Immediate surgical repair

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Priapism

Definition:

- Urological emergency
- Prolonged, painful erection
- Can occur at any age
- More common with ages 5-10 (sickle cell) and 20-50 years

Causes

- Spinal cord injury
- Tumors
- Sickle cell disease
- Meds for ED

Assessment:

- Penile Doppler
- Arteriography
- CBC if suspect malignancy

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Priapism

Clinical Manifestations:

- Vaso-occlusive
  - Persistent, painful erection
  - Lasts more than 4 hours
- Non-ischemic
  - Erect but non-tender

Interventions:

- Analgesia, sedation
- Injection of epi, phenylephrine, pseudoephedrine or terbutaline into penis
- Irrigation of corpora with normal saline
- Urologic consult

21

Phimosis/Paraphimosis

Definition:

- Phimosis
  - Inability to fully retract foreskin over glans penis
- Paraphimosis
  - Retracted foreskin becomes entrapped, occluding blood flow to glans

Clinical manifestations: (paraphimosis)

- Swollen, painful, edematous glans
- Tight ring of skin behind glans
- Discolored, necrotic areas
- History if increasing difficulty advancing foreskin

Interventions:

- Manual reduction
- Small incision made with local anesthesia
- Encourage consideration of circumcision or dorsal slit
- NSAIDS, antibiotics as needed

22

Acute Prostatitis

Definition:

- Inflammation of prostate gland

Common Causes

- Bacterial infection that has ascended via ureter or refluxed from bladder
- Associated with acute cystitis

Clinical manifestations:

- Sudden onset of dysuria, malaise
- Urinary frequency, urgency
- Perineal pain
- Lower abdominal, penile, or suprapubic discomfort
- Fever, chills
- Hematospermia

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Acute Prostatitis

Assessment:

- Urinalysis
- Hematuria
- Cultures
- Elevated PSA (prostate-specific antigen) possible
- Boggy, extremely tender prostate

Interventions:

- Analgesia
- Indwelling catheter may be indicated
- Antibiotics
  - Fluoroquinolones
- Encourage fluid intake

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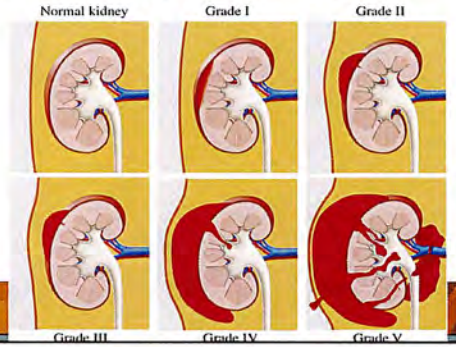
Renal Trauma

Causes:

- Blunt trauma including MVC and/or fall associated with lower rib fractures or spinous processes
- Penetrating trauma
- In patients with abdominal trauma, about10% have kidney injuries

Types:

- Laceration
- Contusion
- Vascular injury



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Renal Trauma

Clinical manifestations:

- Abd., flank or back pain with tenderness
- Flank ecchymosis
- Hematuria
  - 66% have frank hematuria

Interventions

- Stable
  - Bed rest
  - Observation
  - Increased fluid intake
- Surgical intervention
  - Lacerations associated with *hemorrhage or* uterine extravasation

26

Urethral/Bladder Trauma

Causes:

- Straddle injuries
- Genital trauma
- Foreign bodies

Associated with:

- Full bladder
- Pelvic fractures
- Pediatric patients

Clinical manifestations:

- Inability or difficulty voiding
- Suprapubic, perineal, or genital pain with voiding
- Blood at urinary meatus
- Hematuria
- Signs of hypovolemia
- Lower abdominal or peritoneal hematomas
- Bladder distension

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Urethral/Bladder Trauma

Assessment:

- Reports a "pop" after blow to bladder
- Pelvic fracture with bony fragment that can puncture bladder
- Cystogram
- Lack of urine from indwelling urinary catheter

Interventions:

- Analgesia, antibiotics
- DO NOT catheterize if suspected transection
- Catheter for 7-10 D (placed by urologist)
- Surgical intervention
  - Hemodynamic instability
  - Renal pedicle damage
  - Most bladder, urethral injuries

28

Penile Fracture

Definition:

- Rupture of tunica albuginea or corpus cavernosa of penile shaft due to torque

Causes

- During sexual activity
- Direct trauma or fall

Manifestations

- Report of "pop" at time of injury
- Penile pain and immediate loss of erection
- Bright red blood from urethra
- Ecchymosis
- Edema

Assessment:

- Penile doppler

Interventions

- Surgical repair within 24-36 hours of injury
- If no loss of erection, supportive measures (ice, NSAIDs)