

MSCert *Test Prep*

www.100K-Certified-Nurses.com

Presented By:
David W. Woodruff, MSN, RN, CNS



Checklist for Success

We will guarantee your success on the Med-Surg certification exam!

-- If you study the right things in the right ways --

Success Checklist:

- Attend the entire MSCert: Test Prep program (or use the entire A/V package).
- Study 5 hours per week for 90 days using the handout, pocket study guide, and flash cards.
- Use additional study guides for clarification.
- Identify areas of weakness that need additional study.
- Review the audio CDs (or online videos) of the topics you identified as requiring additional study.
- Participate in the Nurses' Success Network on-line study groups and post at least one comment or question per week.
Login at: www.Nurses-Success-Network.com
User: mscert
Password: advantage
- Achieve a passing grade of at least 80% on the "Challenge Exam" on-line at the Nurses' Success Network.
- Use the on-line resources recommended in the "Challenge Exam" results.

The MSCert: Test Prep is a 90-day program to guarantee your success on the certification exam. You must use this program and take the exam within 90 days of registering for the guarantee for us to assure your success.

Register for the guarantee on-line at :www.Nurses-Success-Network.com

Ed4Nurses

**Proven Systems
Guaranteed Results!**

MSCert: Test Prep Agenda

Day One:

0800-0830	Introduction and Test Overview
0830-1000	Pulmonary (18-22%) -Oxygenation, ventilation, and monitoring -6-Easy Steps to ABG Analysis -Asthma / COPD / Sleep apnea -Pulmonary embolism -Pneumonia -Pulmonary cancer -Pneumothorax, hemothorax, pleural effusion -Chest drainage
1000-1015	Break
1015-1145	Cardiovascular (14-16%): -Hemodynamics -Hypertension -Acute coronary syndromes -Congestive heart failure -Endocarditis -Cardiac arrhythmias / pacers / AICDs -Cardiovascular medications -Shock
1145-1245	Lunch (on your own)
1245-1415	Cardiovascular (cont)
1415-1430	Break
1430-1600	Musculoskeletal & Neurologic (9-11%): -Fractures and compartment syndrome -TIA, stroke, increased intracranial pressure -Neurologic assessment
1600	Adjourn

Day Two:

0800-1000	Gastrointestinal (18-22%): -GERD, GI bleed -Hepatitis -Pancreatitis -Gallbladder disease -Inflammatory bowel disease -Bowel obstruction / infarction -GI surgery
1000-1015	Break
1015-1115	Diabetes & Endocrine (11-13%) -Thyroid disorders -Diabetic emergencies -Diabetes insipidus, SIADH
1115-1145	Hematologic / Immunologic (8-10%): -Disorders of RBC, WBC, and platelet function -Sickle cell crisis
1145-1245	Lunch (on your own)
1245-1415	GU, Renal, Reproductive (11-13%): -UTI, stones, prostate dysfunction -Acute and chronic renal failure -Electrolyte disorders
1415-1430	Break
1430-1500	Supervision and coordination of care Emergency situations
1500-1600	What You Need to Know About <i>Standards of Care</i> -Legal, Ethical -The ANA Publications Strategies for Successful Completion of the Exam
1600	Adjourn

Program Description:

This two-day class is a comprehensive review of medical-surgical nursing, and will explore principles necessary for practice, comprehensive assessment techniques, and cutting-edge therapeutics. Use it as preparation for the certification exam through ANCC, or as a review of general medical-surgical practice. Content is taught on an advanced level and is designed for the experienced Med-Surg nurse. However, nurses new to Med-Surg will find the teaching methods easy to understand. Strategies for successful completion of the exam will be explored, as well as a review of the major topics and content covered in the exam.

Objectives:

1. Describe assessment findings of common electrolyte abnormalities.
2. Use 6 Easy Steps to Analyze ABGs
3. Describe assessment and treatment of hemodynamic instability
4. Explore the 3 major consequences of inflammation.
5. Plan care for the patient with compromised immunity.
6. Implement the best strategies for difficulty with coping.
7. Integrate pathophysiology of common conditions with assessments and interventions.
8. Review issues of health maintenance and promotion.
9. Interpret diagnostic tests for common patient conditions.
10. Plan care for a variety of conditions using research-tested interventions.
11. Recognize how issues of spirituality affect health.
12. Use a 5-point plan to manage staffing and assignments
13. Identify socioeconomic and cultural issues that affect care.
14. Describe how to integrate research into practice.
15. Explore legal and ethical issues that relate to patient care.
16. Describe how to integrate the ANA's *Standards of Clinical Nursing Practice* into your practice.

All material in MSCert: Test Prep © 2005-2006 Ed4Nurses, Inc. all rights reserved

Introduction and Test Overview

1. Why Become Certified?

A study conducted by the Nursing Credentialing Research Coalition found that certification has a dramatic impact on the personal, professional and practice outcomes of certified nurses. Overall, nurses in the study stated that certification enabled them to experience fewer adverse events and errors in patient care than before they were certified. Additional results revealed that certified nurses:

- expressed more confidence in detecting early signs of complications;
- reported more personal growth and job satisfaction;
- believed they were viewed as credible providers;
- received high patient satisfaction ratings;
- reported more effective communication and collaboration with other health care providers; and
- experienced fewer disciplinary events and work-related injuries.

2. What to Expect from “The Test”

ANCC	AMSN
Fees: \$320 non-member \$180 member of state nursing assoc.	Fees: \$300 non-member \$225 member:
Test dates: Year-round on computer	Test dates: May, Oct.
RN BC	CMSRN -- BSN not required
Requirements: RN license 2 years adult med-surg experience 2000 hours of clinical experience 3 CEUs in the last 3 years	Requirements: RN license 2 years adult med-surg experience 3000 hours of clinical experience

Exam is 200 questions (AMSN) 175 questions (AANC), with a 4 hour time limit

Passing score is around 71%

Certification is for 5 years.

Recertification can be by CEUs or re-testing. Cost of recertification is:

ANCC: \$290 non-member, \$160 member

AMSN: \$275 non-member, \$175 member

3. Testing Dates, Places and Times

American Nurses Credentialing Center
8515 Georgia Street, Suite 400
Silver Spring, MD 20910-3402
ANCC catalogs: 1-800-284-2378
E-mail: ANCC@ana.org
Web: <http://nursingworld.org/ancc/>

Please Note:

This is a focused 90-day program designed to assure your success on the ANCC or AMSN Med-Surg certification exam. You must register for the guarantee and complete the “Certification Checklist” within 90 days to be eligible for the guarantee.

You can do this!

- ✓ If you are qualified
- ✓ And you study the right stuff in the right way
 - ✓ You will pass!

I guarantee it!

Pulmonary (18-22%) ~40 Questions

1. The most effective way to mobilize respiratory secretions is:
 - a. Insure adequate fluid intake
 - b. Administer diuretics
 - c. Incentive spirometry
 - d. Administer bronchodilators

2. If your patient's SaO₂ has slowly dropped from 96% to 84% over the previous several hours, it could be a sign of:
 - a. Poor pulse oximetry placement
 - b. Change in condition
 - c. Sleep apnea
 - d. Inadequate oxygen supply

3. The breath sound that indicates collection of fluid in the small airways and is heard at the end of inspiration is called:
 - a. Wheezes
 - b. Rhonchi
 - c. Rales
 - d. Friction rub

4. Oxygen that is dissolved in the blood is:
 - a. SaO₂
 - b. pO₂
 - c. pCO₂
 - d. Oxyhemoglobin

5. In patients with respiratory dysfunction, the nurse's goal should be to:
 - a. Decrease pCO₂ concentration
 - b. Maintain pulse oxymetry at >93%
 - c. Balance ventilation and perfusion
 - d. Ensure that delivery meets consumption

6. Early warning signs of respiratory distress are:
 - a. Subjective dyspnea and increased respiratory rate
 - b. Chest pain and irregular pulse
 - c. Pleuretic chest pain and dyspnea
 - d. Hypoxemia and hypercapnia

7. The best intervention for maintaining respiratory function is:
 - a. Aerosol treatments
 - b. Percussion and vibration
 - c. Mechanical ventilation
 - d. Turning and positioning

8. A patient with a high serum CO₂ level and a low serum pH has which of the following disorders:
 - a. Metabolic alkalosis
 - b. Metabolic acidosis
 - c. Respiratory alkalosis
 - d. Respiratory acidosis

9. Evaluate the following ABG: pH 7.32, CO₂ 55, O₂ 125, HCO₃ 22, O₂ Sat 94%
 - a. Uncompensated metabolic acidosis
 - b. Uncompensated respiratory acidosis
 - c. Compensated respiratory acidosis
 - d. Compensated metabolic alkalosis

10. In the early stages of ARDS, your patient may exhibit which of the following ABG results:
 - a. pH 7.38, pCO₂ 55, pO₂ 82
 - b. pH 7.32, pCO₂ 50, pO₂ 62
 - c. pH 7.50, pCO₂ 25, pO₂ 52
 - d. pH 7.48, pCO₂ 55, pO₂ 42

11. In diabetic ketoacidosis, which of the following ABG results could be expected?
 - a. pH 7.38, pCO₂ 55, pO₂ 82, HCO₃ 31
 - b. pH 7.28, pCO₂ 32, pO₂ 99, HCO₃ 15
 - c. pH 7.50, pCO₂ 29, pO₂ 88, HCO₃ 22
 - d. pH 7.11, pCO₂ 55, pO₂ 42, HCO₃ 17

12. Patient teaching for the asthmatic should include instructions that:
 - a. Stressful situations should be avoided
 - b. All pets should be removed from the home
 - c. Exercise should be limited to once weekly
 - d. Upper respiratory infections can precipitate an attack

13. Patient teaching for the asthmatic who takes Azmacort (Triamcinolone) should include:
 - a. Instructions to continue therapy after symptoms resolve
 - b. Warnings not to mix with other stimulants
 - c. Directions on how to attach a inhalation spacer
 - d. Advise on high potassium foods to avoid

14. As you observe your patient using his inhalers this morning, you notice that he takes two puffs of his Flonase (fluticasone) before taking his Ventolin (albuterol) inhaler. Your patient should be instructed to:
- Stop taking the Flonase
 - Take the Ventolin first
 - Rinse his mouth after use
 - Check his peak flow first
15. Warning signs of a severe asthma attack include:
- Nocturnal bronchodilator use
 - Decrease in FEV₁
 - Daily inhaler use
 - Family history of COPD
16. The primary action of leukotriene inhibitors used to treat asthma is to:
- Decrease sputum production
 - Induce bronchodilation
 - Decrease inflammation
 - Increase oxygenation
17. Magnesium sulfate may be given to the asthmatic who:
- Looks toxic
 - Is unresponsive to traditional therapy
 - Has a FEV₁ of less than 60%
 - Is hypoxic
18. Chronic obstructive pulmonary disease (COPD) is characterized by:
- Airway overinflation and atelectasis
 - Airway smooth muscle degeneration
 - Bronchoconstriction of the terminal bronchi
 - Chronic CO₂ retention and hypoxia
19. In order to minimize complications of oxygen therapy for the patient with COPD, the nurse should:
- Monitor the patient's respiratory rate
 - Only give 2L by nasal cannula
 - Maintain the SaO₂ at 90%
 - Let the patient apply oxygen when necessary
20. Chronic bronchitis is a condition of:
- Airway hyperinflation
 - Over-inflation of the alveoli
 - Chronic lung destruction
 - Prolonged sputum production

21. High levels of CO₂ should be treated in the COPD patient who:
- Has a normal pH
 - Is hypoxic
 - Is acidotic
 - Has audible wheezes
22. The best indicator of pulmonary dysfunction in the COPD patient is:
- Pulse oximetry
 - Peak flow
 - Subjective dyspnea
 - Sputum production
23. Complications of sleep apnea include all of the following *except*:
- Hypertension
 - Congestive heart failure
 - Asthma
 - Daytime sleepiness
24. Bi-level positive airway pressure (BiPAP®) ventilation is used for the patient with sleep apnea who:
- Is unresponsive to diuretics
 - Has COPD
 - Takes sleeping pills
 - Sleeps in the prone position
25. Mr. Smith (57) is one-day post abdominal aortic aneurysm (AAA) repair. This morning he develops atrial fibrillation with subjective dyspnea. His heart rate is 121 and irregular but otherwise his vital signs are normal. What pulmonary complication is Mr. Smith suffering from?
- Pneumonia
 - ARDS
 - Shock lung
 - Pulmonary embolism
26. Any patient with respiratory distress and an unexplained tachycardia should be ruled out for:
- Myocardial Infarction
 - Pulmonary Embolism
 - ARDS
 - Pneumonia

27. Virchow's triad of risk factors for pulmonary embolism includes all of the following *except*:
- Venous stasis
 - Endothelial injury
 - Coagulopathy
 - Leukocytosis
28. Appropriate interventions for the patient with hospital-acquired pneumonia include:
- Assure adequate fluid intake, nasotracheal suction q 1-hour
 - Antibiotics, percussion and vibration
 - Turning, positioning, and ambulation
 - Saline lavage, CPAP
29. Nursing interventions that decrease the incidence of hospital-acquired pneumonia include:
- Placing gastric tubes through the nose
 - Brushing the patient's teeth
 - Administering systemic antibiotics
 - Keeping the patient NPO

The next 3 questions pertain to the following scenario:

Ms. Phage (86) is admitted to your floor with the diagnosis of urinary tract infection and urosepsis. Over the next three hours she develops respiratory distress, hypoxia and hypotension. On assessment you find her cold, pale, and anxious with rales scattered throughout her lung fields. Her pulse oximetry is 82% on room air.

B/P: 72/42, 144, 42

Temp: 40°C / 104°F

Urine output: 20cc since admission

30. Ms. Phage's respiratory distress is probably caused by:
- Pulmonary embolism
 - Asthma attack
 - Exacerbation of COPD
 - Acute respiratory distress syndrome
31. In treating Ms. Phage's hypoxia, which intervention should be a priority?
- Administering dopamine 5mcg/kg/min
 - Giving Tylenol 1000mg
 - Delivering 100% oxygen by face mask
 - Increasing IV fluids delivery to 200cc/hr

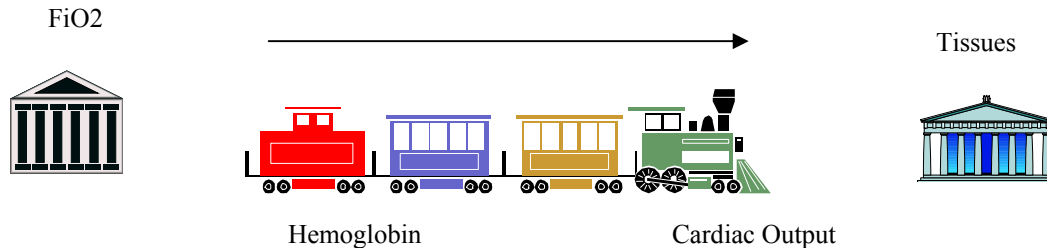
32. The complication that is most likely to occur in Ms. Phage is:
- Cardiac arrhythmia
 - Pressure sore development
 - Sundowning
 - Respiratory arrest

The following are individual questions:

33. Which action by the nurse would be most appropriate for a patient with lung cancer, who is on chemotherapy?
- Place the patient in a private room
 - Wear gloves when giving mouth care
 - Always wear a mask, gloves and gown
 - Use reverse isolation
34. A patient diagnosed with squamous cell carcinoma is at risk for which electrolyte disorder?
- Hypokalemia
 - Hypercalcemia
 - Hypophosphatemia
 - Hypernatremia
35. Your patient, Mr. Bulla, is suspected of having a hemothorax. During chest tube insertion which of the following would require preparation for emergency thoracotomy?
- Draining more than 500cc of blood from the pleural space
 - Painful insertion with respiratory distress
 - Immediate relief of symptoms
 - Removal of air from the pleural space
36. Twenty minutes after central line insertion, your patient develops respiratory distress and diminished chest excursion on the right side. As her nurse you should suspect:
- Air embolism
 - Pneumonia
 - Pulmonary embolism
 - Pneumothorax
37. Which of the following is a component of a properly functioning chest drainage system?
- Bubbling in the water seal
 - Tidaling in the collection chamber
 - Bubbling in the suction chamber
 - Tidaling in the suction chamber

38. The nurse's role during chest tube removal is to:
- Provide adequate analgesia
 - Clamp the tube
 - Suture the insertion site
 - Have the patient inhale during removal
39. It is OK to clamp a chest tube when:
- The lung is re-expanded and the physician orders it
 - The chest drainage system is full
 - You have to transport the patient to X-ray
 - The patient goes home
40. The major symptoms of Fat Embolism Syndrome (FES) are:
- Petechiae, hypoxia, pulmonary edema
 - Tachycardia, rales
 - Fever, purulent sputum
 - Chest pain and dyspnea

Principles of Oxygenation: The Ventilation Perfusion Train



The Ventilation : Perfusion Train

1. Station A: The lung
 - a. Pulmonary hygiene
 - b. Oxygen therapy
 - c. Ventilatory assistance

2. Cars on the Train: Hemoglobin
 - a. Prevent loss
 - b. "Tank up"
 - c. Prevent dilution
 - d. Replace

3. The locomotive: Cardiac output
 - a. Consider preexisting disease
 - b. Improve hemodynamics
 - i. Preload
 - ii. Contractility
 - iii. Afterload

4. Station B: Oxygen consumption
 - a. ↓ Activity
 - b. ↓ Fever

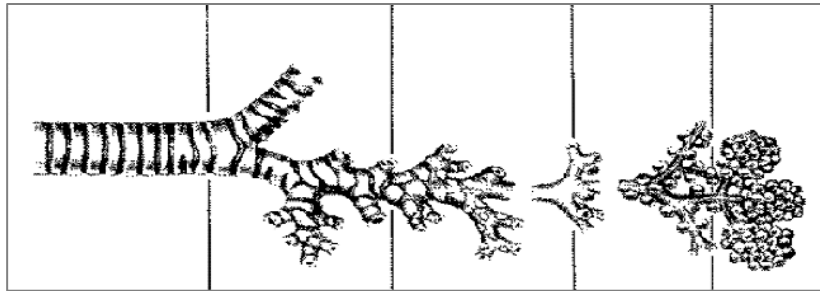
Assessment:

1. Inspection
 - a. Thoracic size & shape
 - b. Work of breathing

2. Palpation
 - a. Excursion
 - i. Symmetry
 - ii. Volume
 - b. Sensation

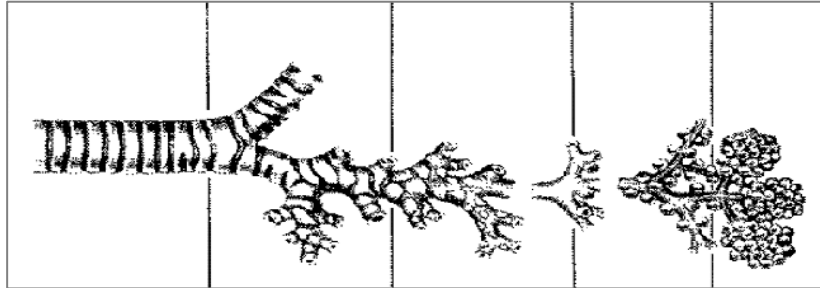
3. Percussion
 - a. Resonance
 - b. Diaphragm excursion

4. Auscultation
 - a. Normal sounds
 - b. Adventitious sounds
 - i. Wheezing: musical, whistling sound
 1. Expiration > inspiration
 2. From narrowed airways
 - a. Bronchoconstriction
 - b. Secretions



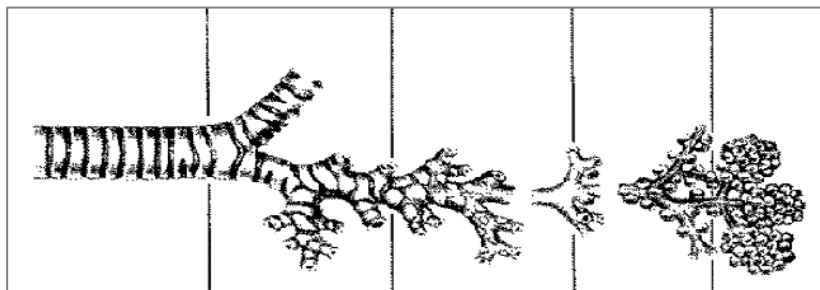
3. Interventions:
 - a. Bronchodilation
 - b. Hydration
 - c. Coughing

- ii. Rales: crackling sound
 1. End inspiration
 2. From collapsed or waterlogged alveoli
 3. Fine: beginning of fluid buildup
 4. Coarse: greater volume of fluid buildup



- 5. Interventions:
 - a. Manage fluids
 - i. Budget volume resuscitation
 - ii. Diuretics
 - b. Expectorate
 - i. Turn & position
 - ii. Deep breathing
 - iii. Forced expiration
 - iv. Vibration & percussion

- iii. Rhonchi: bubbling
 1. Inspiration > expiration
 2. Results from air bubbling past secretions in the airways

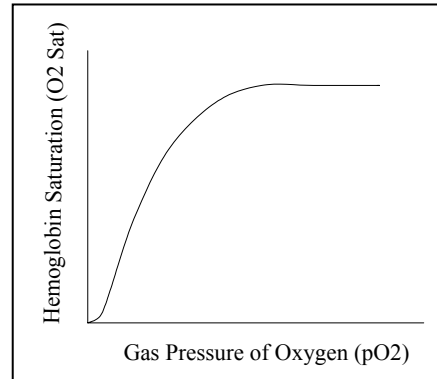


- a. Deep breathing
 - b. Coughing
 - c. Hydration
 - d. Mobilize
- iv. Friction rub: creaking, leathery sound
 1. End of inspiration and beginning of expiration
 2. From rubbing of inflamed pleural surfaces

Monitoring

1. Respiratory rate & rhythm
 - a. Work of breathing
 - b. Neurochemical control

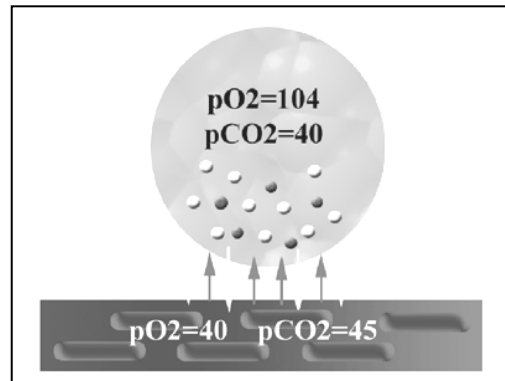
2. Pulse oximetry: what does it really tell us?
 - a. Therapeutic effectiveness
 - b. Changes in condition
 - c. Factors that ↓ accuracy
 - i. ↓ perfusion
 - ii. Placement
 - iii. Other compounds bound to hemoglobin
 - iv. Artifact



3. Arterial blood gases
 - a. Acid / base balance
 - b. Ventilation
 - c. Oxygenation

4. $pO_2:FiO_2$
 - a. Divide the pO_2 by the FiO_2
 - b. Assesses efficiency of the A/C membrane
 - c. May be ↓ in situations with O_2 sat. and pO_2 within normal range

5. Laboratory data
 - a. H&H
 - b. Electrolytes
 - c. Albumin
 - d. Lactic acid



FiO2 conversions

1L NC = 24%
2L NC = 28%
3L NC = 32%
4L NC = 36%

6-Easy Steps to ABG Analysis

1. Is the pH normal?
2. Is the CO₂ normal?
3. Is the HCO₃ normal?
4. Match the CO₂ or the HCO₃ with the pH
5. Does the CO₂ or the HCO₃ go the opposite direction of the pH?
6. Are the pO₂ and the O₂ saturation normal?

In order for our analysis to be effective, notes will have to be written next to the results on our lab slip. Alternately, the ABG results can be transcribed onto another paper for analysis (see example one below).

1. The first step in analyzing ABGs is to look at the pH. Normal blood pH is 7.4, plus or minus 0.05, forming the range 7.35 to 7.45. If blood pH falls below 7.35 it is acidic. If blood pH raises above 7.45, it is alkalotic. If it falls into the normal range, label what side of 7.4 it falls on. Lower than 7.4 is normal/acidic, higher than 7.4 is normal/alkalotic. Label it.
2. The second step is to examine the pCO₂. Normal pCO₂ levels are 35-45mmHg. Below 35 is alkalotic, above 45 is acidic. Label it.
3. The third step is to look at the HCO₃ level. A normal HCO₃ level is 22-26 mEq/L. If the HCO₃ is below 22, the patient is acidotic. If the HCO₃ is above 26, the patient is alkalotic. Label it.
4. Next match either the pCO₂ or the HCO₃ with the pH to determine the acid-base disorder. For example, if the pH is acidotic, and the CO₂ is acidotic, then the acid-base disturbance is being caused by the respiratory system. Therefore, we call it a respiratory acidosis. However, if the pH is alkalotic and the HCO₃ is alkalotic, the acid-base disturbance is being caused by the metabolic (or renal) system. Therefore, it will be a metabolic alkalosis.
5. Fifth, does either the CO₂ or HCO₃ go in the opposite direction of the pH? If so, there is compensation by that system. For example, the pH is acidotic, the CO₂ is acidotic, and the HCO₃ is alkalotic. The CO₂ matches the pH making the primary acid-base disorder respiratory acidosis. The HCO₃ is opposite of the pH and would be evidence of compensation from the metabolic system.
6. Finally, evaluate the PaO₂ and O₂ sat. If they are below limits there is evidence of hypoxemia.

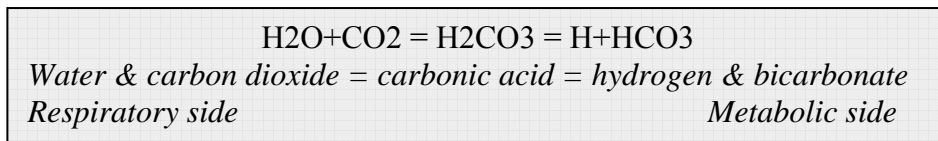
Normal Arterial Values (At sea level): **Range:**

pH	7.35-7.45
pCO ₂	35-45 mmHg
pO ₂	80-100 mmHg
O ₂ Saturation	95-100%
HCO ₃ -	22-26 mEq/L
Base Excess	+ or - 2

Compensation

The balancing component of the respiratory system is the dissolved carbon dioxide (CO₂) that is produced by cellular processes and removed by the lungs. The balancing component of the renal system is the dissolved bicarbonate (HCO₃) produced by the kidneys. The kidneys also help control pH by eliminating hydrogen (H⁺) ions. The way the two systems interact is through the formation of carbonic acid (H₂CO₃). Movement through the carbonic acid system is fluid and constant. What this means is that water (H₂O) can combine with CO₂ and form carbonic acid. If necessary, carbonic acid (H₂CO₃) can then break up to form hydrogen ions (H⁺) and bicarbonate (HCO₃). This balance works in both directions. By balancing back and forth, pH balance is achieved. The respiratory system balances pH by manipulating the CO₂ level. Increasing or decreasing respiratory rate does this. Faster and deeper breathing “blows off” more CO₂. Conversely, slower and shallower breathing “retains” more CO₂. The renal system balances pH by producing HCO₃ or by eliminating hydrogen ions (H⁺).

The renal system will reflect changes in metabolic activity within the body. For example, a patient in shock will undergo anaerobic metabolism, which produces lactic acid. The production of lactic acid will bind or use up available HCO₃ and will be manifested by a decrease in the HCO₃ level. Therefore, the HCO₃ level is an indicator of metabolic acid-base balance.



Balance must always be achieved by the opposing system. If an adult were on one side of a seesaw and a small child on the other, we would expect the child’s side of the seesaw to go up and the adult’s side to go down. We cannot make the child go down by adding another adult to the adult’s side. In the same way, our body regulates pH by using the opposite system to balance pH. So if the pH is out of balance because of a respiratory disorder, it will be the renal system that makes the corrections to balance the pH. Conversely, if the renal system is to blame for the pH disorder, the respiratory system will have to compensate. This process is called compensation. Compensation may not always be complete. Complete compensation returns the pH balance to normal. There are times when the imbalance is too large for compensation to return the pH to normal. This is called partial compensation.

System causing pH imbalance	Compensating system
Respiratory (pCO ₂)	Metabolic (HCO ₃)
Metabolic (HCO ₃)	Respiratory (pCO ₂)

B. Examples

Now let's try an example:

pH	7.25	Acidotic
PaCO ₂	58	Acidotic
PaO ₂	50	Low
O ₂ Saturation	84%	Low
HCO ₃ ⁻	25	Normal

➤ Match

- Step 1. The pH is acidotic
- Step 2. The CO₂ is acidotic
- Step 3. The HCO₃ is normal
- Step 4. The CO₂ matches the pH, therefore the imbalance is respiratory acidosis
- Step 5. The HCO₃ is normal, therefore there is no compensation
- Step 6. The PaO₂ and O₂ sat are low indicating hypoxemia

Number 1

Test	Value	Interpretation (mark as acidotic or alkalotic)
PH	7.20	
PaCO ₂	45	
PaO ₂	88	
O ₂ Saturation	95%	
HCO ₃ ⁻	17	

ABG Interpretation: _____

Number 2

Test	Value	Interpretation
PH	7.29	
PaCO ₂	55	
PaO ₂	75	
O ₂ Saturation	93%	
HCO ₃ ⁻	26	

ABG Interpretation: _____

Cause: _____

Treatment: _____

Number 3

Test	Value	Interpretation
pH	7.51	
PaCO ₂	32	
PaO ₂	106	
O ₂ Saturation	98%	
HCO ₃ ⁻	25	

ABG Interpretation: _____

Cause: _____

Treatment: _____

Number 4

Test	Value	Interpretation
pH	7.49	
PaCO ₂	40	
PaO ₂	95	
O ₂ Saturation	97%	
HCO ₃ ⁻	29	

ABG Interpretation: _____

Cause: _____

Treatment: _____

Number 5

Test	Value	Interpretation
pH	7.20	
PaCO ₂	25	
PaO ₂	92	
O ₂ Saturation	96%	
HCO ₃ ⁻	9	

ABG Interpretation: _____

Cause: _____

Treatment: _____

Number 6

Test	Value	Interpretation
pH	7.42	
PaCO ₂	18	
PaO ₂	178	
O ₂ Saturation	99%	
HCO ₃ ⁻	11	

ABG Interpretation: _____

Number 7

Test	Value	Interpretation
pH	7.35	
PaCO ₂	60	
PaO ₂	92	
O ₂ Saturation	96%	
HCO ₃ ⁻	32	

ABG Interpretation: _____

Number 8

Test	Value	Interpretation
pH	7.37	
PaCO ₂	33	
PaO ₂	86	
O ₂ Saturation	96%	
HCO ₃ ⁻	18	

ABG Interpretation: _____

Number 9

Test	Value	Interpretation
pH	7.36	
PaCO ₂	62	
PaO ₂	75	
O ₂ Saturation	94%	
HCO ₃ ⁻	34	

ABG Interpretation: _____

A. Base Excess

1. Measurement of total body bases:
 - a. Hemoglobin
 - b. Cl⁻, PO₄, SO₄
 - c. Albumin
2. Evaluates the magnitude of the metabolic component of the pH imbalance

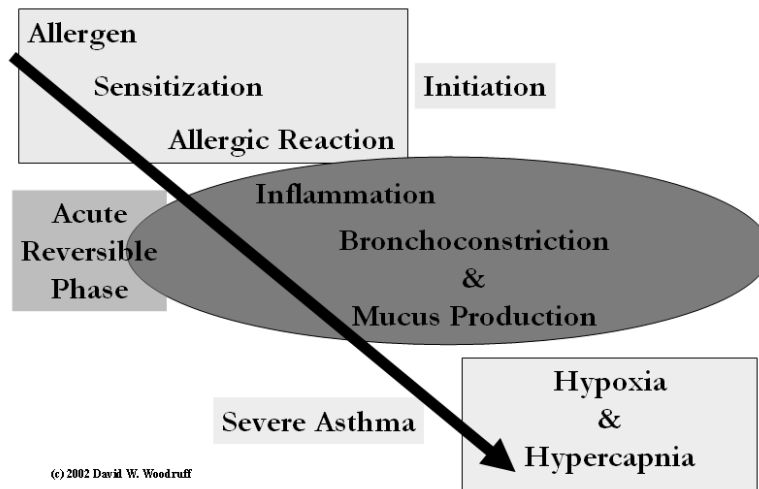
Normal: +2 to -2
Minimal: 3-5
Severe: 7-10

B. Anion Gap

AG = Na⁺ + K⁺ - (Cl⁻ + HCO₃⁻)
 (Major positive electrolytes – major negative electrolytes)
 Helps to determine the source of the metabolic acidosis
 Normal = 10-15 mEq/L
 High ratio = >15 mEq/L
 Low ratio = <10 mEq/L

High Ratio	Normal Ratio	Low Ratio
<ol style="list-style-type: none"> 1. Ketoacidosis 2. Lactic acidosis 3. Uremic acidosis 4. Poisonings 	<ol style="list-style-type: none"> 1. Diarrhea 2. Renal tubular acidosis 3. Volume resuscitation 	<ol style="list-style-type: none"> 1. Severe dilutional states 2. Hypoalbuminemia

Asthma



1. Circadian influence
 - a. Worst function around 3 am
 - b. Best function around 3 pm
2. Risk factors for death from severe asthma attacks
 - a. Previous severe asthma attacks
 - b. Hypercapnia
 - c. Airway hyper-reactivity
 - d. Long-term steroid therapy
 - e. Age
 - f. Noncompliance
 - g. Psychiatric illness
3. Warning signs of a severe asthma attack
 - a. Subjective increase in dyspnea
 - b. Increases in sleep disturbances
 - c. Increase in nocturnal bronchodilator use
 - d. Morning chest stiffness or heaviness
 - e. Increase in cough frequency or severity
 - f. Runny nose or sneezing bouts
4. Manifestations
 - a. Immediate bronchoconstriction (early-phase reaction)
 - b. Dyspnea, tachypnea (> 30 bpm)
 - c. Tachycardia (> 120 bpm)
 - d. Wheezing
 - e. Cough (sputum can be yellow due to eosinophils)
 - f. Accessory muscle use (retractions & nasal flaring in children)
 - g. Orthopnea
 - h. Diaphoresis
 - i. Pulsus paradoxus > 10 mmHg

- j. Hypoxia, hypercapnia will develop as the attack progresses
- k. Delayed airway obstruction, inflammation and hyper-responsiveness (late-phase reaction)
 - i. Symptoms may seem to relapse within 8-24 hours

5. Treatment

- a. Bronchodilators:
 - i. Beta-agonists
 - 1. Low dose 2.5mg every 20 minutes X3 (7.5mg)
 - 2. High dose 7.5mg every 20 minutes X3 (22.5mg)
 - 3. Intermittent dosing as effective as continuous infusion
 - ii. Anticholinergics
 - 1. Atrovent 0.5mg every 4-8 hours
 - iii. Steroids
 - iv. IV Magnesium
 - 1. Acts as a bronchodilator, ↓ inflammation
 - 2. Greatest effect in most severe cases
 - 3. 2 grams IV
- b. Antibiotics
 - i. Viral infections more common
 - ii. Get sputum sample and treat accordingly
 - iii. Strong link between sinus infections and asthma exacerbations
- c. Assisted ventilation
- d. Anxiety control
- e. The National Asthma Education Program
 - i. Patient education reduces ER visits and hospitalizations.
 - ii. Patients managed by allergists had fewer hospitalizations and ER visits than those managed by the primary physician.
- f. Immune modification
- g. Allergy control
- h. Patients exposed to cats and dogs in the first year of life had less incidence of asthma

COPD

1. Economic impact
 - a. More than 14 million Americans are affected to some degree
 - b. Second largest financial impact on the Social Security Disability system (second only to heart disease)
 - c. Forth leading cause of death
 - d. 45% have restrictions on their activity level

2. Etiology
 - a. Cigarette smoking (80-90%)
 - b. Air pollution
 - c. Occupation: Coal miners, firefighters
 - d. Genetic link?
 - e. Hyper-reactive airways
 - f. Alpha-1 antitrypsin deficiency

3. Review of pathophysiology
 - a. Emphysema: permanent enlargement of the terminal airspaces with destruction of their walls.
 - b. Chronic bronchitis: chronic, productive cough for more than 3 months in two consecutive years.
 - c. Inactivation of alpha-1 antitrypsin
 - i. Stimulation of alveolar macrophages to attract neutrophils (inflammation)
 - ii. Inhibits enzymes that synthesize and repair elastic fibers
 - iii. Destruction of the elastic fibers allows small airways to collapse
 - iv. Collapse of the small airways causes air-trapping
 - v. Inflammation occurs from deposits of irritant substances
 - vi. Proliferation of goblet cells
 - vii. Enlargement of mucous glands
 - viii. Smooth muscle hypertrophy
 - ix. Fibrosis
 - x. Breaks down alveolar walls, resulting in bulla

4. Manifestations
 - a. PFTs
 - b. Hypercapnia, hypoxia
 - c. Dyspnea
 - d. Fatigue
 - e. Productive cough with changes in amount or color or sputum
 - f. Wheezing
 - g. Paradoxical respirations
 - h. Change in mental status

5. Criteria for ICU admission
 - a. Respiratory muscle fatigue
 - b. Need for ventilatory assistance
 - c. Refractory hypoxemia
 - d. Respiratory acidosis (pH <7.30)
 - e. Cardiovascular instability

6. Pulmonary care
 - a. Bronchodilation
 - b. Beta2-agonist
 - c. Albuterol: beta2 smooth muscle relaxant
 - i. 4 puffs using MDI & spacer = 2.5mg via aerosol
 - ii. Some studies show no effect on airway resistance
 - iii. Only about 3% is deposited in the airways
 - iv. MDI q 30-60 min. until effective or side effects occur
 - v. Aerosol 2.5mg
 - d. Anticholinergic: inhibits vagal mediated smooth muscle contraction
 - i. Atrovent (ipratropium bromide)
 - ii. MDI 4 puffs or aerosol 0.5mg q 4-8 hours
 - e. Aminophylline: xanthine smooth muscle relaxant
 - i. ? bronchodilator effect
 - ii. Improves secretion clearance & diaphragm contractility
 - iii. Loading dose: 5-6 mg/kg
 - iv. Followed by a continuous infusion: 0.5mg/kg/hr
 - v. Therapeutic level: 8-12 mg/ml
 - f. Steroids: anti-inflammatory agent
 - i. 60-125 mg IV for 24 hours, then
 - ii. 60-80 mg P.O. tapering dose for 10-14 days
 - g. Antipyretics
 - i. Fever increases O₂ consumption and CO₂ production
 - ii. Can be as much as 10% for each degree Fahrenheit
 - h. Oxygen
 - i. Maintain PaO₂ >60mmHg
 - ii. Maintain O₂ Sat >90%
 - i. Maintain patency of the airway
 - i. Humidification of inspired gases
 - ii. Airway adjuncts
 - iii. Suctioning
 - j. Percussion, vibration, and postural drainage
 - k. Ambulation, turning & positioning, forced expiration, incentive spirometry

7. Assisted ventilation
 - a. If ↑ PCO₂ without ↓ pH, pt. is probably a CO₂ retainer
 - b. If ↑ PCO₂ with ↓ pH, pt. may require mechanical ventilation

8. Non-invasive: CPAP, BiPAP
 - a. Must be alert, cooperative, able to handle secretions, and stable
9. Mechanical ventilation
 - a. May be needed to rest the respiratory muscles
 - i. ↓ WOB
 - ii. ↓ Oxygen consumption
 - b. Improve gas exchange
 - c. Simplify suctioning
10. Antibiotics may be indicated for:
 - a. Change in sputum
 - b. To prevent complications
11. Lung-volume reduction surgery
12. Goals of therapy
 - a. Prevent disease progression
 - b. Relieve symptoms
 - c. Improve exercise tolerance
 - d. Improve health status
 - e. Prevent and treat exacerbations
 - f. Prevent and treat complications
 - g. Reduce mortality
 - h. Minimize side effects from treatment
13. Pulmonary rehabilitation

Internet sites:

Asthma:

Global initiative for asthma: www.ginasthma.com

American Lung Association: www.lungusa.org

COPD:

Global initiative for COPD: www.goldcopd.com

COPD Support: www.copd-support.org

COPD: www.ibreathe.com

American Lung Association: www.lungusa.org

Sleep apnea

1. Apnea during sleep for > 10 seconds that causes desaturation of oxygen
 - a. Usually several times an hour
 - b. Sleep → obstructive choking → arousal
2. Etiology:
 - a. Obstructive
 - i. Narrowing of the airways
 - b. Central
 - i. Lack of respiratory control during sleep
3. Precipitating factors:
 - a. Respiratory depressants:
 - i. Alcohol
 - ii. Antihistamines
 - iii. Sedatives
 - b. Sleeping supine
 - c. Upper respiratory infections
 - d. Allergies
4. Complications:
 - a. Hypertension
 - b. Congestive heart failure
 - c. Arrhythmias
 - d. Excessive daytime sleepiness
5. Interventions:
 - a. Elevate HOB
 - b. Sleep side-lying or prone
 - c. CPAP
 - d. BiPAP
 - i. Decreases cardiac work
 - ii. Helps with CO₂ retention
 - e. Surgery
 - i. When BiPAP is not helpful or not tolerated
 - ii. Severe CHF / pulmonary disease

Internet sites:

American Sleep Apnea Association: www.sleepapnea.org

Pulmonary Embolism

1. Sudden obstruction of the pulmonary vasculature → altered ventilation:perfusion
→ inflammation → edema.
2. Etiology (the great imposter)
 - a. Intrinsic / extrinsic
 - b. Primary thrombus / thromboembolism
 - c. Only 10-30% are correctly diagnosed
 - d. 30-50% of patients with VTE have silent PE
 - e. 90% of patients with PE have a pelvic or lower extremity VTE
3. Risk assessment: Virchow's triad
 - a. Venous stasis
 - b. Endothelial injury
 - c. Alteration in coagulation
4. Symptoms
 - a. Many are asymptomatic
 - b. Dyspnea
 - c. Pleuritic chest pain
 - d. Cough
5. Physical exam findings
 - a. Tachycardia
 - b. Rales
6. Diagnostic tests
 - a. VQ scan (89% sensitivity, 92% specificity)
 - b. Pulmonary angiography (the "gold standard")
 - c. Spiral CT
 - d. D-Dimer
 - e. Doppler-Ultrasound
7. Complications: Minimizing the risk
 - a. Prevention
 - b. Anticoagulant therapy
 - c. Invasive intervention
 - d. Thrombolytic therapy (t-PA)

Pneumonia

Brief Pathophysiology

1. Hospital-acquired (HAP) v. Community-acquired
2. Factors that lead to colonization of the respiratory tract
 - a. ↓ salivary flow rate
 - b. Poor oral hygiene
 - c. Systemic antibiotics
 - d. No oral fluids or food

3. How colonization takes place
 - a. Bacteria is transmitted to the patient (Tonsil-tip suction devices)
 - b. Bacteria grows on plaque on teeth
 - c. Normal flora in oral pharynx ↓ due to systemic antibiotics
 - d. Secretions migrate down trachea
 - e. Gastric acid ↓, does not kill bacteria

4. Risk factors
 - a. Advanced age
 - b. Pre-existing chronic disease
 - c. Immunosuppression
 - d. Medications
 - i. Steroids
 - ii. Antibiotic therapy
 - iii. Antacids
 - iv. Aerosol treatments
 - e. Mechanical ventilation
 - f. Endotracheal intubation / tracheostomy
 - g. Surgery

5. Symptoms
 - a. Dyspnea
 - b. Productive cough
 - c. Change in sputum amount and color
 - d. Fatigue, weakness, malaise
 - e. Friction rub

6. Signs (from the Eole Study: Montravers, et al. 2002)
 - a. Fever (average 38.5°C)
 - b. ↑ RR (average 30)
 - c. WBC > 10,000/mm³ (82%)
 - d. Evidence on CXR (80%)
 - e. Need for oxygen therapy (76%)
 - f. ↓ pO₂:FiO₂ (69%)
 - g. Intubation (46%)
 - h. Sputum production & abnormal breath sounds (64%)

7. Treatment:
 - a. Prevention
 - i. NIPPV
 - ii. Pulmonary hygiene
 - iii. Care of equipment
 - iv. Hydration
 - b. Antibiotics
 - c. Consider antibiotic rotation to prevent resistant nosocomial infections
 - d. Enteral feeding

Cancer of the Respiratory Tract

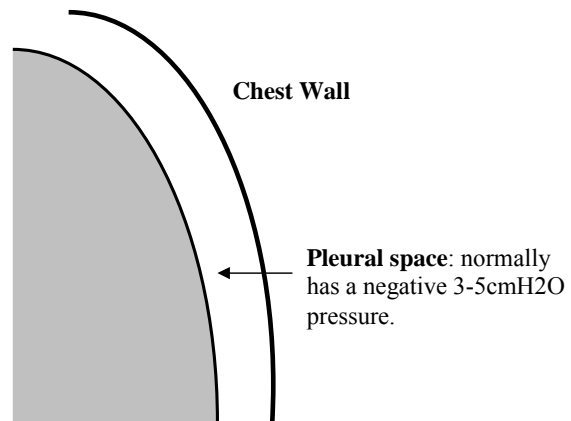
1. Laryngeal Cancer
 - a. Diagnostics
 - i. Laryngoscopy
 - b. Symptoms
 - i. Neck pain
 - ii. Hoarseness
 - iii. Difficulty with swallowing, talking
 - iv. Lymph node enlargement
 - c. Treatment
 - i. Radiation therapy
 - ii. Laryngectomy
 - d. Lung Cancer
 - i. Types:
 1. Adenocarcinoma
 2. Large-cell
 3. Small-cell
 4. Squamous cell
 - ii. Diagnostics
 1. CXR
 2. CT scan
 3. Bronchoscopy
 4. Sputum
 - iii. Symptoms
 1. Dyspnea
 2. Weight loss
 3. Enlarged lymph nodes
 4. Adventitious breath sounds
 - iv. Treatment
 1. Chemotherapy
 2. Radiation therapy
 3. Lobectomy

Common sites of metastasis:

Primary Tumor	Metastasis
Lung	Multiple sites, including brain
Breast	Bone, lungs
Sarcoma	Lung
Colorectal	Liver, lung
Testicular	Lung, liver
Prostate	Bone, lung, liver

Problems of Integrity of the Pleural Space

1. Pneumothorax
 - a. Air in the pleural space
2. Hemothorax
 - a. Blood in the pleural space
3. Pleural Effusion
 - a. Fluid in the pleural space
4. Empyema
 - a. Infected fluid in the pleural space
5. Diagnostics
 - a. CXR
 - b. CT scan
6. Treatment
 - a. Thoracentesis
 - b. Chest tube



7. Principles of a Properly-functioning Chest Drainage System
 - a. Gentle bubbling in the suction control
 - b. Tidaling in the water seal
 - c. No bubbling in the water seal
 - d. Consistency in drainage



Cardiovascular (14-16%) ~32 Questions

1. The most accurate measure of cardiac output is:
 - a. Systolic blood pressure
 - b. Diastolic blood pressure
 - c. Heart rate
 - d. Urine output

2. Preload is best assessed by:
 - a. Urine output
 - b. Peripheral edema
 - c. Jugular veins
 - d. Blood pressure

3. What factors can the nurse manipulate to decrease oxygen consumption?
 - a. Cardiac output
 - b. Oxygen delivery
 - c. Fever and activity
 - d. Hemoglobin level

4. Right-sided heart failure may result in:
 - a. Ascites
 - b. Pulmonary edema
 - c. Peripheral edema
 - d. Orbital edema

5. A patient, aged 73, has a potassium level of 3.0 mEq/L. Which of the following medications should the nurse question:
 - a. Digoxin
 - b. Dilantin
 - c. Demerol
 - d. Diltiazem

6. Your diabetic patient is to receive Tenormin (Atenolol) this morning. As her nurse you should assess which lab value:
 - a. Glucose
 - b. Potassium
 - c. Calcium
 - d. Magnesium

7. Mr. Horth is receiving Lasix (furosemide) for fluid retention. Which of the following complications of therapy should the nurse monitor for:
 - a. Thromboembolism
 - b. Hyperkalemia
 - c. Volume overload
 - d. Hypercalcemia

8. Which of the following variables affects cardiac output directly?
 - a. Preload
 - b. Stroke volume
 - c. Afterload
 - d. Resistance

9. Hypertensive crisis is identified by a diastolic blood pressure greater than 120 mmHg. The best medication for initial treatment of hypertensive crisis is:
 - a. Nitroprusside
 - b. Apresoline
 - c. Vasotec
 - d. Brevibloc

10. Coronary artery perfusion is dependent upon:
 - a. Diastolic pressure
 - b. Systolic pressure
 - c. Afterload
 - d. Systemic vascular resistance

11. Chest pain that is *not* relieved by rest and nitroglycerine is called:
 - a. Variant angina
 - b. Stable angina
 - c. Unstable angina
 - d. Prinzmetal's angina

12. The best diagnostic test to use to evaluate cardiac status during the first three hours of chest pain is:
 - a. Cardiac enzymes
 - b. Hemoglobin level
 - c. Electrocardiograph
 - d. Cardiac catheterization

13. Heart failure caused by the inability to fully relax is called:
 - a. Systolic
 - b. Diastolic
 - c. Biventricular
 - d. Complete

14. The primary function of drug therapy with beta-blockers in heart failure is to:
- Increase blood pressure
 - Block compensatory mechanisms
 - Increase urine output
 - Decrease arrhythmias
15. Early symptoms of fluid overload and pulmonary edema are:
- Rales and hypoxia
 - S₃ heart sound and tachycardia
 - Increased respiratory rate and subjective dyspnea
 - ST-segment elevation in the chest leads
16. The most common cause for the development of a new S₃ heart sound is:
- Cardiac tamponade
 - Papillary muscle rupture
 - Congestive heart failure
 - Myocardial infarction
17. The new onset of a S₄ heart sound in a patient complaining of chest pain indicates:
- Congestive heart failure
 - Myocardial infarction
 - Pulmonary embolism
 - Thoracic aneurysm
18. The most likely complications of myocardial infarction are:
- Cardiogenic shock and arrhythmia
 - Congestive heart failure and edema
 - Atrial fibrillation and nausea
 - Chest pain and dizziness

The next 3 questions pertain to the following scenario:

Shortly after admission to your floor, Mr. Johnson, 52, begins complaining of substernal chest pain that radiates to his left arm and jaw. He relates a history of angina and intermittent substernal chest pain for the past three weeks. Mr. Johnson also has a strong family history of myocardial disease.

Current medications include:

Inderal 80mg qd

Cardizem CD 120mg qd

On examination, he is diaphoretic and dyspneic. Lungs are clear and heart sounds reveal the presence of a S₃ heart sound. Chest x-ray is normal, and initial vital signs are as follows:

B/P 136/98

HR 120

RR 28

Temp 37°C (98.6°F)

The following orders are received:

IV D5W TKO

Morphine sulfate 4mg IVP

O₂ 6 lpm by nasal cannula

Foley catheter

Labs: cardiac panel

tPA bolus and infusion

Heparin 20,000u/500cc D5W @ 1000u/hr

19. The presence of an S₃ heart sound in Mr. Johnson indicates:
 - a. Myocardial infarction
 - b. Arrhythmia
 - c. Papillary muscle rupture
 - d. Congestive heart failure

20. Administration of morphine sulfate to Mr. Johnson will increase his cardiac output by:
 - a. Controlling his pain
 - b. Improving myocardial oxygen
 - c. Lessening his anxiety
 - d. All of the above

21. Mr. Johnson should be monitored for which complication of tPA therapy?
 - a. Reperfusion
 - b. Arrhythmias
 - c. Bleeding
 - d. Vascular occlusion

The following are individual questions:

22. Which condition would stimulate renin production?
 - a. Increased blood supply to the renal tubules
 - b. Decreased blood pressure
 - c. Decreased sympathetic output
 - d. Increased sodium concentration

23. Calcium-channel blockers have which of the following functions?
 - a. Increase vascular tone
 - b. Increase velocity of AV conduction
 - c. Decrease cardiac oxygen consumption
 - d. Increase cerebral oxygenation

24. Subacute bacterial endocarditis (SBE) is usually caused by:
 - a. Dental procedures
 - b. Normal valves
 - c. IV drug abuse
 - d. Prosthetic valves

25. The valve most often affected by infective endocarditis is:
 - a. Mitral
 - b. Aortic
 - c. Tricuspid
 - d. Pulmonic

26. While taking vital signs on your patient, you find a heart rate of 144 that is irregular. Blood pressure is 132/76. The most likely arrhythmia associated with these findings is:
 - a. Sinus arrhythmia
 - b. Atrial fibrillation
 - c. Accelerated junctional
 - d. Ventricular tachycardia

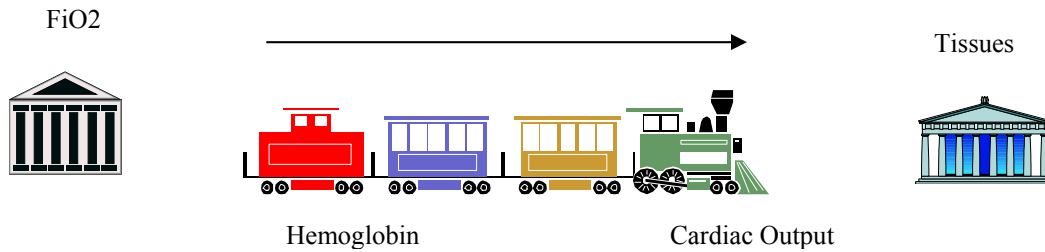
27. Failure to capture is a complication of pacemakers that may be caused by:
 - a. Lead maturation
 - b. Lead displacement
 - c. Dead battery
 - d. Open circuit

28. Automatic implantable cardio-defibrillators (AICDs) may be initiated in the treatment of:
 - a. Frequent PVCs
 - b. Atrial fibrillation
 - c. Narrow-complex SVT
 - d. Symptomatic VT

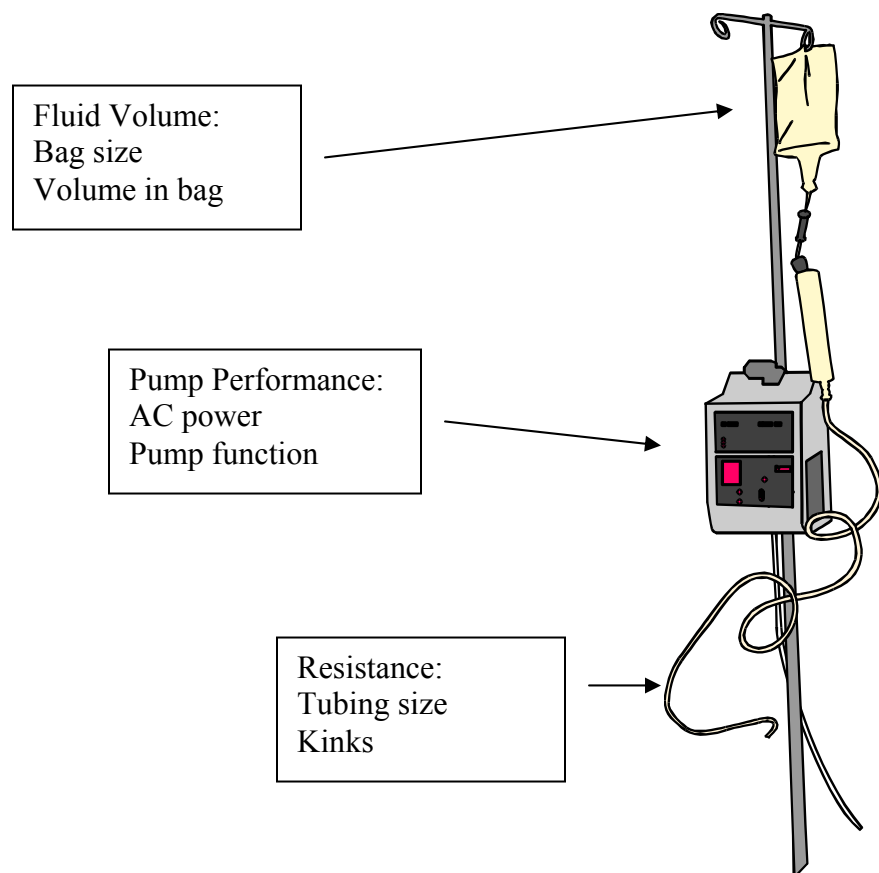
29. The primary purpose of obtaining blood cultures in the septic patient is:
- To diagnose sepsis
 - To guide therapy
 - To evaluate the level of response
 - To determine a source
30. A defining characteristic of septic shock that differentiates it from other types of shock is:
- Low blood pressure
 - Wide pulse pressure
 - Decreased urine output
 - Tachycardia
31. Ms. Hart is complaining of chest pain, shortness of breath, and diaphoresis. She rapidly becomes hypotensive and tachycardic. She is most probably suffering from:
- Cardiogenic shock
 - Hypovolemic shock
 - Septic shock
 - Neurogenic shock
32. Oxygen therapy is recommended for all patients with Acute Coronary Syndrome (ACS) for the first 6 hours after they become stable. The goal of oxygen therapy in ACS is to:
- Keep oxygen saturation at 100%
 - Balance oxygen supply and demand
 - Reduce workload on the heart
 - Prevent pulmonary edema

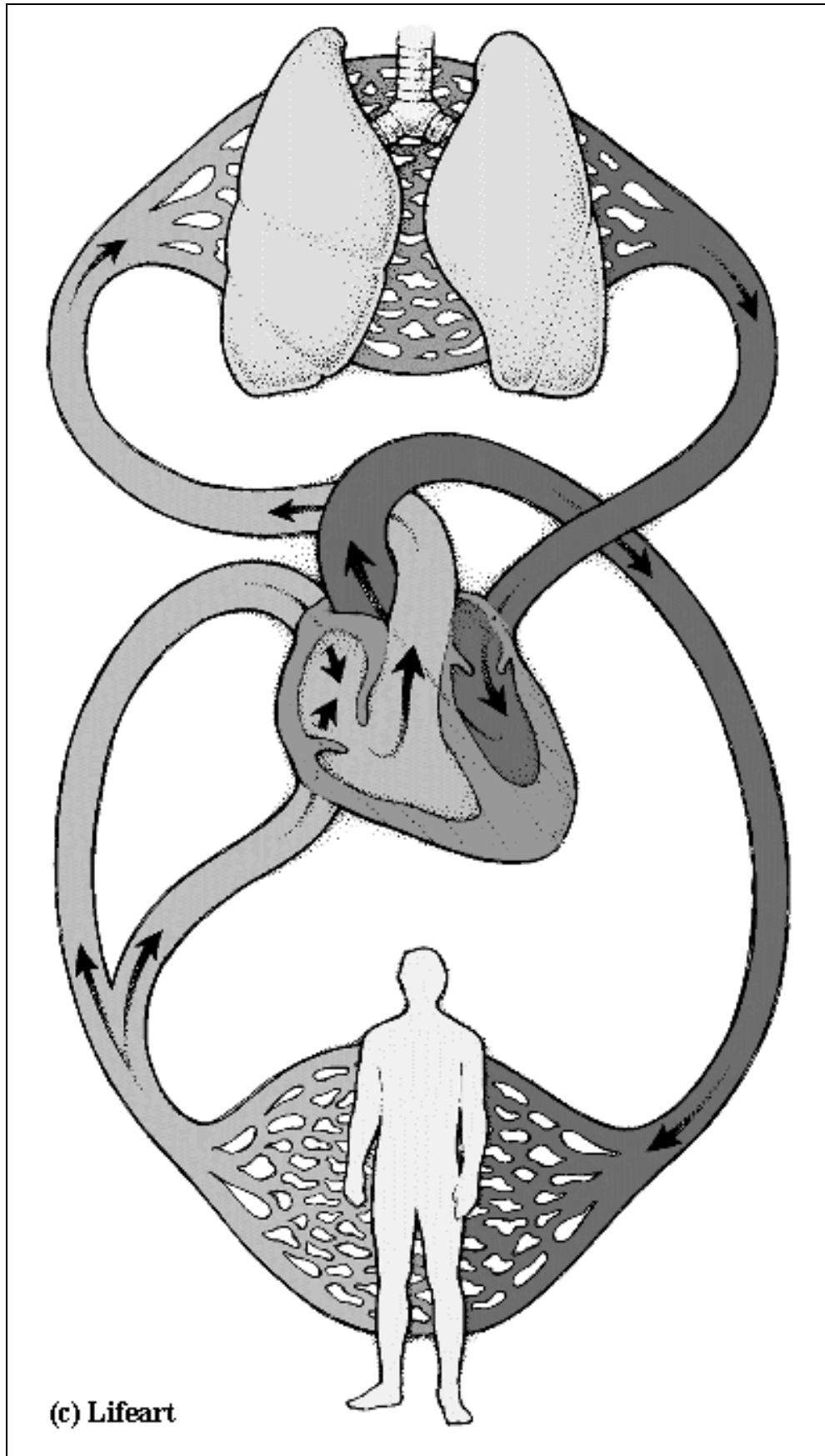
Hemodynamics

Principles of tissue oxygenation



Hemodynamics made simple





Hemodynamic modification

1. Manage fluid volume
 - a. Circulating volume
 - i. Decreasing
 1. Diuretics
 2. Increase renal blood flow
 - ii. Increasing
 1. IV fluids
 2. Blood products
 3. Colloids
 - b. Venous capacitance
 - i. Vasodilators (↓ preload)
 - ii. Vasopressors (↑ preload)
2. Improve cardiac output
 - a. Increase cardiac oxygenation
 - i. Increase oxygen supply
 - ii. Increase coronary blood flow
 - b. Vasodilate
 - c. ↑ diastolic filling time
 - d. Decrease cardiac workload
 - i. Stretch
 - ii. Heart rate
 - e. Increase force of contraction
 - i. Stretch
 - ii. Inotropes
3. Afterload modification
 - a. Sympathetic nervous system stimulation
 - i. Decreasing
 1. Block SNS
 2. Increase cardiac output to ↓ stimulus
 - ii. Increasing
 1. Alpha & beta adrenergic stimulators
 2. Arterial vascular tone
 - a. Decreasing
 - i. Arterial vasodilation
 - b. Increasing
 - i. Vasopressors

Hypertensive Crisis

Diastolic blood pressure >120 mmHg

1. Etiology
 - a. Pre-existing hypertension (most common)
 - b. Renal disease
 - c. Scleroderma
 - d. Illicit drugs
 - e. Pre-eclampsia, eclampsia
 - f. Head injury
 - g. Autonomic dysreflexia
 - h. Tumors

2. Symptoms
 - a. Chest pain
 - b. Headache
 - c. Decreased mental status
 - d. Diuresis

3. Diagnostics
 - a. CBC
 - b. Electrolytes
 - c. Urine
 - i. Blood
 - ii. Casts
 - d. EKG
 - e. Chest x-ray

4. Treatment
 - a. Sodium nitroprusside
 - b. Apresoline
 - c. Vasotec
 - d. Brevibloc
 - e. Labetalol

5. Complications
 - a. MI, CHF
 - b. Stroke, cerebral bleed
 - c. Aortic dissection

Acute coronary syndromes

1. Acute Coronary Syndromes
 - a. Angina
 - i. Stable
 - ii. Unstable
 - iii. Variant
 - b. Myocardial Infarction
 - i. Q-wave
 - ii. Non-Q wave
 - iii. STEMI
 - c. Diagnostics
 - i. EKG
 - ii. Cardiac enzymes
 - iii. Risk factor analysis
 - iv. Echocardiogram
 - v. Cardiac catheterization
 - d. Best Management Principles
 - i. Balance ventilation:perfusion train
 - ii. Medications
 1. Nitrates
 2. Beta-blockers
 3. ACE inhibitors
 4. Risk reduction
 5. Anticoagulation
 - iii. Angioplasty and stent placement

2. Congestive Heart Failure
 - a. Type
 - i. Systolic
 - ii. Diastolic
 - b. Diagnostics
 - i. Hemodynamic assessment
 - ii. EKG
 - iii. BNP
 - c. Best Management Principles
 - i. Diuretics
 - ii. Nitrates
 - iii. Anticoagulation
 - iv. Beta-blockers
 - v. ACE-inhibitors

Endocarditis

Infection of the endocardium (inner lining) of the heart that covers the valves and contains the purkinje fibers.

1. Incidence
 - a. Males 3X > females
 - b. > 50 years
 - c. Mitral valve prolapse (30% in younger patients)
 - d. Rheumatic heart disease (<20%)
 - e. Calcific aortic stenosis (50% in older patients)
2. Etiology:
 - a. Subacute bacterial endocarditis (SBE)
 - i. Dental procedures
 - ii. GU or GI tract
 - iii. Abnormal valves
 - b. Acute bacterial endocarditis
 - i. Normal valves
 - c. Prosthetic valvular endocarditis
 - i. Within 1 year of valve replacement
 - ii. After pacemaker or AICD placement
 - d. Right-sided endocarditis
 - i. IV drug abuse
 - ii. Catheter-related infections (CVC, PA cath)
3. Clinical presentation
 - a. Develops on:
 - i. Mitral (most common)
 - ii. Aortic
 - iii. Tricuspid
 - iv. Pulmonary (rare)
 - b. Fever
 - c. Fatigue, night sweats, anorexia
 - d. Weight loss
 - e. Back pain
 - f. Embolism
 - i. MI
 - ii. CVA
4. Diagnosis
 - a. Blood cultures
 - i. 5% will not have positive cultures
 - ii. May take 4 days to grow some organisms
 - b. Murmur
 - i. Aortic insufficiency murmur (most common)
 - c. Widened pulse pressure
 - d. Transesophageal echocardiography (TEE)

- i. Detects >90% of vegetations
- 5. Management
 - a. Untreated endocarditis is always fatal
 - b. Antibiotics
 - c. Valvular repair if heart failure present
- 6. Complications
 - a. Heart failure
 - b. Emboli
 - c. Sepsis

Arrhythmias

- a. Normal Sinus Rhythm (NSR)
 - i. Characteristics
 1. Rate: 60-100
 2. Regular
 3. P-wave precedes QRS
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. None necessary

- b. Sinus Tachycardia (ST)
 - i. Characteristics
 1. Rate: >100
 2. Regular
 3. P-wave precedes QRS
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. Treat the underlying condition
 - a. Fever
 - b. Anxiety
 - c. Pain
 - d. Dehydration
 - e. Hypoxemia

- c. Sinus Bradycardia (SB)
 - i. Characteristics
 1. Rate: <60
 2. Regular
 3. P-wave precedes QRS
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. If symptomatic:
 - f. Atropine, epinephrine
 - g. Pacer

- d. Atrial Flutter
 - i. Characteristics
 1. Rate: 60-150
 2. Regular
 3. Several F-waves precede QRS
 4. Narrow complex
 5. All complexes look the same

- ii. Treatment
 1. Slow rate: Digoxin, Verapamil, Diltiazem
 2. Convert: Amiodarone, sotalol, flecainide

- e. Atrial Fibrillation (A-fib)
 - i. Characteristics
 1. Rate: varies
 2. Irregular
 3. Several f-waves precede QRS
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. Cardioversion
 2. Slow rate: Digoxin, Verapamil, Diltiazem
 3. Convert: Amiodarone, sotalol, flecainide
 4. Anticoagulation

- f. Paroxysmal Atrial Tachycardia (PAT)
 - i. Characteristics
 1. Rate: 140-250
 2. Regular
 3. P-wave precedes QRS
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. Vagal maneuvers
 2. Adenosine, beta-blockers, verapamil
 3. Cardioversion

- g. Junctional Rhythm
 - i. Characteristics
 1. Rate: 40-60 (accelerated 60-100)
 2. Regular
 3. P-wave absent or inverted
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. If symptomatic:
 - a. Atropine
 - b. Pacer

- h. First-degree AV Block
 - i. Characteristics
 1. Rate: 60-100
 2. Regular
 3. P-wave precedes QRS: long PR-interval

4. Narrow complex
5. All complexes look the same
- ii. Treatment
 1. None necessary
 2. Watch for progression to greater block
- i. Second-degree AV Block
 - i. Characteristics
 1. Rate: varies
 2. Irregular
 3. P-wave precedes QRS
 4. Narrow complex, but some dropped
 5. All complexes look the same
 - ii. Treatment
 1. D/C digoxin
 2. Pacer
- j. Second-degree AV Block (Wenckebach)
 - i. Characteristics
 1. Rate: varies
 2. Irregular
 3. P-wave precedes QRS: PR-interval becomes progressively longer, until a QRS is dropped.
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. D/C digoxin
 2. If symptomatic:
 - c. Atropine
 - d. Pacer
- k. Third-degree AV Block
 - i. Characteristics
 1. Rate: <60
 2. Regular
 3. No coordination between P-wave and QRS
 4. Narrow complex
 5. All complexes look the same
 - ii. Treatment
 1. Atropine
 2. Pacer
 3. ACLS
- l. Ventricular Tachycardia (V-tach)
 - i. Characteristics

1. Rate: 100-220
 2. Regular
 3. No P-waves
 4. Wide complex
 5. All complexes look the same
- ii. Treatment
1. With pulse:
 - a. Stable:
 - i. Lidocaine
 - ii. Amiodarone
 - iii. Procainamide
 - iv. Sotalol
 - b. Unstable:
 - i. Cardioversion
 - ii. Lidocaine, procainamide
 2. Pulseless:
 - a. Defibrillate
 - b. CPR
 - c. Epinephrine
- m. Ventricular Fibrillation (V-fib)
- i. Characteristics
 1. Rate: none detectable
 2. Irregular
 3. No P-wave or QRS
 4. Wide, bizarre, chaotic complexes
 5. Complexes look different
 - ii. Treatment
 1. Defibrillation
 2. CPR
 3. Epinephrine
 4. Lidocaine, amiodarone, procainamide, magnesium

- n. Asystole
 - i. Characteristics
 1. Rate: none
 2. Flat line
 3. P-waves may be present
 4. QRS complexes absent
 5. No electrical or mechanical activity
 - ii. Treatment
 1. CPR
 2. Epinephrine, atropine
 3. Pacer

- o. Pulseless Electrical Activity (PEA)
 - i. Characteristics
 1. Rate: varies
 2. May be regular or irregular
 3. P-waves may be present
 4. QRS complex present
 5. No detectable pulse or B/P with electrical activity
 - ii. Treatment
 1. CPR
 2. Epinephrine
 3. Atropine
 4. Correct mechanical cause

Resources:

McPhee, A. T. (ed) (1997). *EKG Interpretation made incredibly easy!* Springhouse, PA: Springhouse.

Internet:

The EKG Site: www.the-ekg-site.com

EKGs Online: www.ekgonline.com

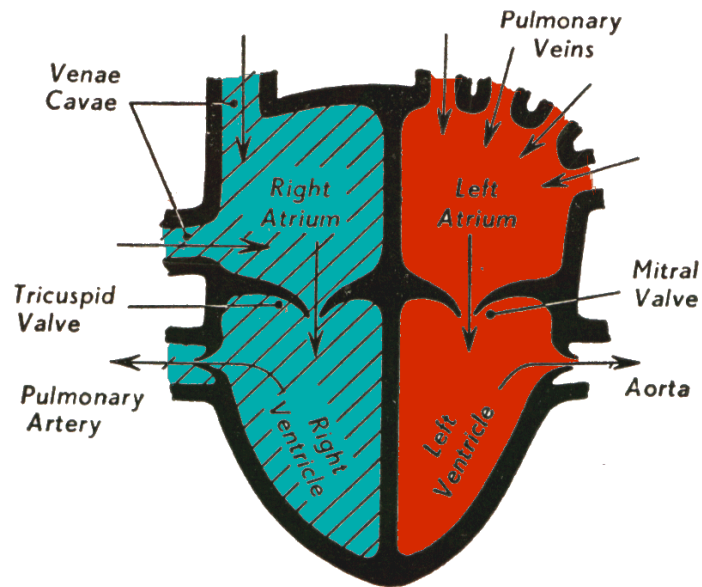
American Heart Association: www.americanheart.org

Heart Failure Society of America: www.hfsa.org

Valvular Disease

1. Stenosis
 - a. Narrowing of the valve
 - b. Restricts forward flow

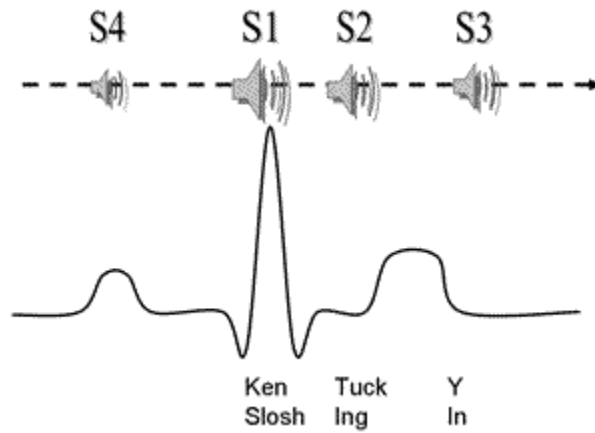
2. Regurgitation (insufficiency)
 - a. Insufficient closure
 - b. Allows backward flow



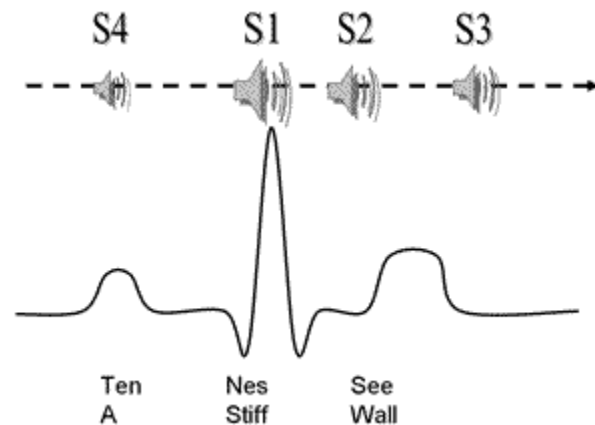
Tricuspid, Pulmonic	Mitral, Aortic
↓ Cardiac output Back up into systemic circulation -Peripheral edema -Hepatomegaly -Jugular venous distention	↓ Cardiac output Back up into pulmonary circulation -Pulmonary edema S ₃

Review of Heart Sounds

1. Normal
 - a. S1:
 - i. Closing of mitral and tricuspid valves
 - b. S2:
 - i. Closing of pulmonic and aortic valves
2. Adventitious
 - a. S3
 - i. Indicates \uparrow filling pressures
 - ii. Occurs with CHF



- b. S4
 - i. Resistance to ventricular filling
 - ii. Occurs with MI



3. Order:
 - i. S4, S1, S2, S3

Drug	Classification	Major Effects	Indications for use	Nursing Considerations
Nitroglycerine (Tridil)	Nitrate vasodilator	Vasodilation Predominant venodilator	Angina Perioperative HTN CHF MI	Use glass bottles Monitor VS carefully Use infusion pump for IV administration
Digoxin (Lanoxin)	Antiarrhythmic Positive inotrope	Decreases conduction velocity Increases CO	CHF A-fib, A-flutter PAT	Record apical HR before administering Administer IV dose over at least 5 minutes ↓ dose in elderly Hypokalemia
Furosemide (Lasix)	Loop diuretic	Inhibits reabsorption of sodium and chloride Diuretic	CHF HTN Edema Hypercalcemia	↓ electrolytes Hypovolemia Thromboembolism Cardiac arrest (IV)
Norvasc Cardizem Cardene Procardia Calan	Calcium channel blockers	Vasodilation Slow AV conduction ↑ coronary bloodflow	HTN Angina SVT	Half-life ↑ in elderly B-blockers ↑ effect ↑ digoxin level Monitor QT interval
Tenormin Normodyne Lopressor Corgard Inderal	Beta-blockers	Oppose sympathetic stimulation Slow HR ↓ cardiac contractility ↓ B/P	HTN Angina MI	Contraindicated in asthma ↑ insulin effect
Capoten Vasotec Monopril Zestril Accupril	ACE-inhibitors	Vasodilation ↓ angiotensin conversion	HTN CHF	Hyperkalemia “First dose syncope”

Shock

Hypovolemic

1. Low circulating volume
 - a. Negative I&O
 - b. Weight
 - c. Flat jugular veins
 - d. Tenting skin
2. Tachycardia
3. Narrow pulse pressure
4. Cold, clammy skin

Cardiogenic

1. EKG changes
2. Low cardiac output
3. Tachycardia
4. Fluid volume overload
5. Narrow pulse pressure
6. Tachypnea

Septic Shock

1. Signs of infection
 - a. Fever
 - b. WBC
 - c. Drainage / sputum
2. Warm, flushed skin
3. Wide pulse pressure
4. Symptoms of volume depletion

Type	Pulse Pressure	Volume
Hypovolemic	Narrow	Low
Cardiogenic	Narrow	High
Septic	Wide	Low

Musculoskeletal & Neurologic (9-11%) 20 Questions

1. A primary cause of hemothorax is:
 - a. Rib fractures
 - b. Lacerated aorta
 - c. Liver laceration
 - d. Lacerated pulmonary parenchyma

2. Buck's traction is used for the patient with a hip fracture to:
 - a. Increase mobility
 - b. Decrease muscle spasms
 - c. Provide internal fixation
 - d. Minimize calcium loss

3. Your patient in Buck's traction needs to be repositioned toward the head of the bed. You should:
 - a. Release the weights, reposition him, and reapply the weights
 - b. Have another nurse lift the weights with the patient
 - c. Maintain the same level of traction during repositioning
 - d. Add extra weight during repositioning

4. Treatment of a flail chest includes stabilization with:
 - a. A rib belt to hold the chest tight
 - b. Rods and pins during surgery
 - c. A large pillow taped to the chest
 - d. Tape applied to the affected side

5. Continuous passive motion (CPM) devices are used after knee arthroplasty to improve range of motion. In order to get the maximal benefit from CPM, the nurse should:
 - a. Raise the head of the bed no more than 15 degrees
 - b. Elevate the foot of the bed for maximal extension
 - c. Apply CPM only after visiting hours
 - d. Leave the device on 24 hours a day

6. The major symptoms of Fat Embolism Syndrome (FES) are:
 - a. Petechiae, hypoxia, pulmonary edema
 - b. Tachycardia, rales
 - c. Fever, purulent sputum
 - d. Chest pain and dyspnea

The next 3 questions pertain to the following scenario:

Ms. Lippit has a fractured radius and is placed in an arm cast. She is complaining of severe pain in her forearm and hand. On exam, her fingers are cool, pale, and numb.

7. The most likely cause for Ms. Lippit's symptoms are:
 - a. Thromboembolus
 - b. Bleeding
 - c. Compartment syndrome
 - d. Fat embolism syndrome

8. Appropriate actions by the nurse for Ms. Lippit's condition include:
 - a. Elevating the extremity
 - b. Notifying the physician
 - c. Administering pain medication
 - d. All of the above

9. When bi-valving a cast for compartment syndrome, the cast is cut:
 - a. Medially and laterally
 - b. Anteriorly and posteriorly
 - c. At both ends
 - d. Circumferentially at the middle

The following are individual questions:

10. Following laminectomy, the nurse will institute spine precautions that include:
 - a. Touching the toes to improve spine flexibility
 - b. Logrolling for bed mobility
 - c. Deep knee bends
 - d. Lifting weights over the head to improve spine strength

11. Which three major components of the neurological system does the Glasgow Coma Scale test?
 - a. Eye opening, speech patterns, cranial nerves
 - b. Cranial nerves, orientation, arousal
 - c. Eye opening, orientation, arousal
 - d. Peripheral pulses, pupils, speech

12. Seizure precautions include:
 - a. Inserting a bite block into the patient's mouth
 - b. Raising and padding the side rails
 - c. Administering valium
 - d. Keeping the patient NPO

13. Which of the following statements best describes transient ischemic attacks (TIAs)?
- Damage and symptoms resolve
 - Damage and symptoms are permanent
 - Damage is permanent, but symptoms resolve
 - Damage is permanent, there are no symptoms
14. The best indicator of changes in neurological function in the alert patient is:
- Changes in behavior
 - Disorientation
 - Unresponsiveness
 - Pupil changes
15. The best indicator of intracranial pressure changes in a patient who is already unconscious is:
- Systolic blood pressure
 - Diastolic blood pressure
 - Heart rate
 - Pupil changes
16. Intracranial pressure can be decreased in a comatose patient by:
- Maintaining a well-lit room
 - Frequent nasotracheal suctioning
 - Administering morphine sulfate
 - Elevating the head of the bed
17. One of the major goals in treating a patient with Alzheimer's disease is to:
- Maintain his safety
 - Increase functional ability
 - Maintain ideal body weight
 - Improve his self-care ability
18. A patient who develops a headache that is sudden and explosive is probably suffering from:
- Intracerebral bleeding
 - Increased intracranial pressure
 - Migraine
 - Ruptured aneurysm

19. Jim is admitted to your floor for observation after a head injury. He was struck in the temporal area and had an immediate and brief loss of consciousness. On admission he is alert and oriented, but is now unresponsive. Jim is most likely suffering from:
- a. Epidural bleeding
 - b. Cerebral edema
 - c. Concussion
 - d. Ischemic stroke
20. Autonomic dysreflexia can result in:
- a. Hypovolemia
 - b. Hypokalemia
 - c. Hypertension
 - d. Hypercalcemia

Fractures

Disruption of the bone matrix resulting in deformity and loss of skeletal support.

1. Types
 - a. Simple: stable, closed, non-displaced
 - b. Compound: open
 - c. Comminuted: fracture in two or more places
2. Priorities:
 - a. Spine
 - b. Head, ribs, pelvis
 - c. Extremities
3. Special Situations:
 - a. Rib fractures:
 - i. Pain
 - ii. Atelectasis
 - iii. Pneumonia
 - iv. Pneumothorax / hemothorax
 - b. Pelvic fractures
 - i. Bleeding, hypotension
 - ii. Concomitant injuries
 - iii. Immobility
 - c. Femur fractures
 - i. Pain
 - ii. Muscle spasm
 - iii. Shortening and rounding of thigh
 1. Bleeding
 2. Neurovascular injury
4. Treatment:
 - a. Immobilization
 - i. Splint / cast
 - ii. Abductor for hip fractures
 - iii. Fixation for pelvic fractures
 - b. Traction
 - i. Realigns bone ends until ORIF
 - ii. Decreases muscle spasm
5. Complications:
 - a. Blood loss and hypovolemic shock
 - b. Neuro-vascular impairment
 - c. Prolonged immobility

Fat Embolus Syndrome (FES)

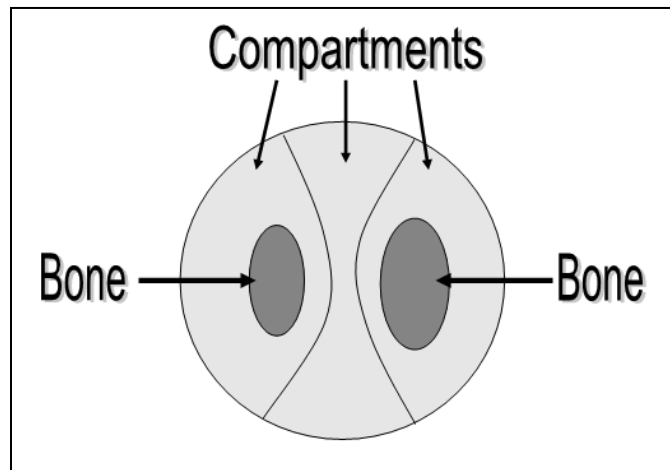
1. Risks:
 - a. Long-bone fractures
 - b. Hip replacement surgery
2. Lipid distribution causes ARDS-like syndrome
3. Onset within 24-48 hours
4. Symptoms:
 - a. Major:
 - i. Axillary / subconjunctival petechiae
 - ii. Hypoxia
 - iii. CNS depression
 - iv. Pulmonary edema
 - b. Minor:
 - i. Tachycardia
 - ii. Fever
 - iii. Retinal fat emboli
 - iv. Urinary fat globules
 - v. ↓ platelet count / HCT
 - vi. ↑ ESR
 - vii. Fat globules in sputum

Compartment Syndrome

Compartment syndrome can occur in any area of the body that contains a compartment:

- Arms
- Legs
- Hand
- Abdomen
- Buttocks

Swelling develops within a compartment and compresses the vasculature, causing ischemia, further injury and increased swelling.



Compartment pressures are generally very low (4-6 mmHg), when they reach 30 mmHg, intervention is necessary. For full recovery, fasciotomy must be performed within 6 hours.

1. Diagnosis:
 - a. Severe pain out of proportion to the injury
 - b. Tense skin
 - c. Decreased pulses
 - d. Pallor, cyanosis
 - e. Elevated serum myoglobin
2. Treatment
 - a. Administer O₂
 - b. Keep limb level with the thorax
 - c. IV fluids
 - d. Fasciotomy

Who's at risk?

Patients with:

Long-bone fractures
High-energy trauma
Penetrating injuries
Venous injury
Crush injuries

Patients on:

Anticoagulants

TIA's

1. Vascular events that result in temporary, focal neurological findings
2. Characteristics:
 - a. Maximal dysfunction within 5 minutes
 - b. Resolve within 15 minutes (may persist for 24 hours)
 - c. If resolution occurs within 21 days termed: Reversible Ischemic Neurological Deficit (RIND).
3. Etiology:
 - a. Cardiac & atherosclerotic plaques
 - b. Arterial obstruction
 - c. Arterial inflammation
 - d. Hematologic abnormalities
4. May be a precursor to stroke

Ischemic Stroke

1. Risk factors
 - a. Hypertension
 - b. Cardiac disease, hyperlipidemia
 - c. TIA's, previous stroke
 - d. Diabetes
 - e. Asymptomatic carotid bruit
 - f. Oral contraceptives
2. Types:
 - a. Thrombotic
 - 1) Atherosclerotic vessel narrowing
 - 2) TIAs may precede
 - b. Lacunar
 - 1) Thrombus occurs in small arteries of the deep gray or white matter
 - 2) Occurs frequently in pts. with HTN
 - c. Embolic
 - 1) Accounts for 20% of ischemic strokes
 - 2) Carotids
 - 3) Cardiac origin:
 - i. A-fib
 - ii. Diseased heart valves
 - iii. Infectious endocarditis
 - iv. Cardiomyopathy
 - d. Perioperative
 - 1) CABG
 - i. 8% focal neuro deficits
 - ii. 10% diffuse encephalopathy
 - iii. 50-80% cognitive deficits
 - 2) Hypotension

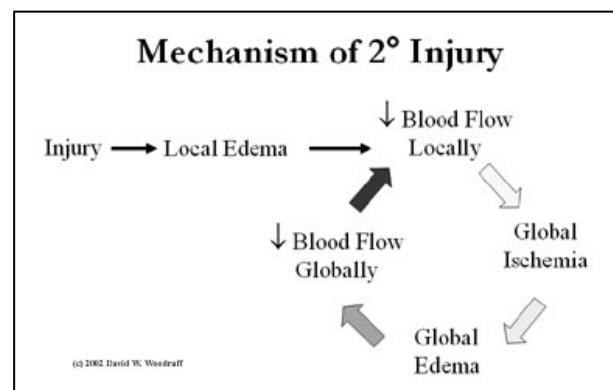
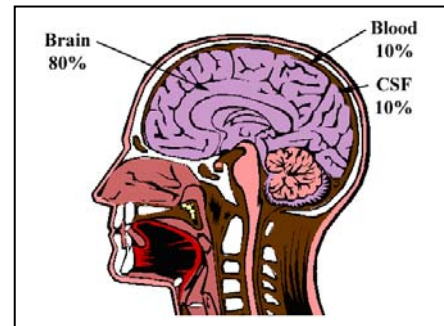
Increased Intracranial Pressure

A. Causes

1. Vasogenic Edema
 - a. Disruption of blood/brain barrier
 - b. Allows fluid and proteins to “leak” into brain tissue
 - c. Etiology:
 - (1) Trauma
 - (2) Ischemia
 - (3) Tumor
 - (4) Infection
 - (5) Brain abscess

2. Cytotoxic Edema
 - a. Hypoxic injury causes intracellular swelling
 - b. Etiology:
 - (1) Trauma
 - (2) Cerebral hemorrhage
 - (3) Hypo-osmolar states

3. Interstitial Edema
 - a. Increased CSF production or decreased removal
 - b. Etiology:
 - (1) Infection
 - (2) Cerebral aneurysm rupture
 - (3) Brain tumor



B. Evidence of cerebral edema (increased ICP)

1. Signs / symptoms
 - a. Decreased level of consciousness
 - b. Alterations in thought process
 - c. Headache, nausea, vomiting, sensory loss, paresthesias
 - d. Motor loss, paralysis
 - e. Pupil changes
 - f. Alteration in body temperature
 - g. Seizures
 - h. Cushing triad:
 - (1) ↑ systolic blood pressure, with widening pulse pressure
 - (2) Bradycardia
 - (3) Altered respiratory rate and rhythm
2. Assessment scales

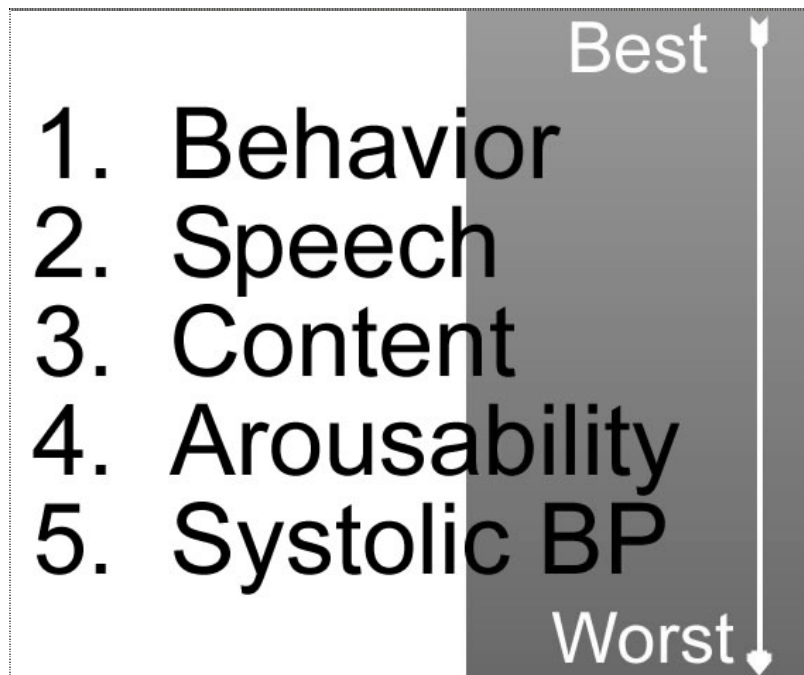
C. Multisystem effects of increased intracranial pressure

1. Gastrointestinal bleeding
2. EKG abnormalities
 - a. T-wave changes
 - b. S-T elevation / depression
 - c. Q-waves
 - d. Arrhythmias

Cerebral Perfusion Pressure
CPP=MAP-ICP
Normal: 60-100

D. Assessment:

- a. Quick 5-point Neuro Check



- E. Medical & nursing interventions
1. Maintain cerebral perfusion
 2. Decreasing intracranial pressure
 1. Oxygenation
 - a. Supply and demand
 2. Hyperventilation
 - a. Effects are temporary
 - b. Must be sustained
 3. Steroids
 - a. ↓ inflammation
 4. Mannitol
 - a. ↓ volume
 - b. Neuroprotective effect
 5. Decreasing metabolic activity
 - a. ↓ temp
 - b. ↓ activity
 3. Controversies in intracranial pressure release

1. Treatment
 - a. Restore blood flow
 - i. Thrombolytics
 - ii. Anticoagulants
 - iii. Angiography
 - b. Maintain oxygenation
 - i. ↑ FiO₂ / PO₂
 - ii. ↑ CO
 - iii. ↓ VO

Headache: Is it an early warning sign?

Headaches can occur in a number of neurologic conditions. Complete assessment must be done prior to treatment, and a focused neurological assessment must be done frequently to rule-out decompensation.

Conditions that cause headache:

- Stroke
- Aneurysm
- Bleeding
- Swelling

Watch for: sudden, severe headache; headache associated with seizure; headache accompanied by confusion or loss of consciousness; headache following a blow on the head; headache associated with pain in the eye or ear; persistent headache in a person who was previously headache free; recurring headache in children; headache associated with fever; headache that interferes with normal life

Internet sites:

The Brain Attack Coalition: www.stroke-site.com

National Institute of Neurological Disorders and Stroke: www.ninds.nih.gov

American Association of Neuroscience Nurses: www.aann.org

Gastrointestinal (18-22%) 40 Questions

1. The most common cause of upper GI bleeding is:
 - a. Peptic ulcer disease
 - b. Esophageal varices
 - c. AV malformation
 - d. Gastric tumor

2. Tearing of the gastric-esophageal juncture is called:
 - a. Mallory-Weiss
 - b. Gastroesophageal reflux
 - c. Pittenham
 - d. Blakemore

3. Patients receiving chemotherapy may develop gastrointestinal bleeding due to:
 - a. Increased acid production
 - b. Decreased mucosal blood flow
 - c. Increased acid reuptake
 - d. Decreased cell renewal

4. The medication that blocks the function of the proton pump in producing stomach acid is:
 - a. Zantac (ranitidine)
 - b. Prilosec (omeprazole)
 - c. Carafate (sucralfate)
 - d. Octreotide (sandostatin)

5. Lab values suspicious of *gastrointestinal* bleeding include:
 - a. Increased BUN, increased creatinine
 - b. Decreased BUN, increased RBC count
 - c. Increased BUN, decreased HCT
 - d. Decreased HCT, decreased Hb

6. Definitive therapy for GI bleeding consists of:
 - a. NG drainage and administering Pepcid 20 mg IV
 - b. Blood pressure control with beta-blockers
 - c. Decreasing GI secretions with Octreotide
 - d. Endoscopy, angiography, or surgery

7. Bleeding from esophageal varices carries a very high mortality due to:
 - a. High pressure in the portal circulation
 - b. Erosion of clots by gastric secretions
 - c. Lack of tamponade from surrounding tissue
 - d. All of the above

8. Which of the following characteristics is most important to consider when assessing for the possibility of complications of GI bleeding:
 - a. Previous cardiac disease
 - b. Tachycardia
 - c. Melena
 - d. Coffee ground appearance of emesis

9. Pain from pancreatitis is best managed with:
 - a. Morphine sulfate
 - b. Demerol
 - c. Aspirin
 - d. Toradol

10. Ranson's criteria for acute pancreatitis includes assessment of variables indicating the spread of disease to other organs and the extent of damage involved. Ranson's criteria is helpful to determine:
 - a. Mortality
 - b. Family history
 - c. Treatment options
 - d. Etiology

11. Ecchymosis around the umbilicus indicative of peritoneal bleeding is called
 - a. Chvostek's sign
 - b. Grey Turner's sign
 - c. Cullen's sign
 - d. Trousseau's sign

12. Major complications of acute pancreatitis include:
 - a. Hypovolemic and septic shock
 - b. Weight loss and dehydration
 - c. Hepatic encephalopathy
 - d. Gallstones

13. Pulmonary complications of acute pancreatitis may include:
 - a. Adult Respiratory Distress Syndrome (ARDS)
 - b. Elevation of the diaphragm and bilateral basilar rales
 - c. Atelectasis, especially of the left base
 - d. All of the above

14. Patient teaching for the patient with chronic pancreatitis should include instructions to avoid:
 - a. Fatty foods
 - b. Alcohol
 - c. Exercise
 - d. Stressful situations

15. Bowel infarction caused by which of the following conditions carries the greatest risk of complications:
- Arterial occlusion
 - Venous occlusion
 - Arterial and venous occlusion
 - Non-occlusive disease
16. Bowel infarction from a strangulated hernia is best treated with:
- Embolectomy
 - Angiography
 - Manual release
 - Bowel resection
17. Hyperactive bowel sounds and diarrhea are signs of what phase of bowel obstruction:
- Premature
 - Early
 - Late
 - Fulminant
18. NG drainage is essential in bowel obstruction to help prevent which complication(s):
- Nausea and vomiting
 - Aspiration
 - Diarrhea
 - Constipation
19. Which complication is the highest priority for the patient with a bowel obstruction?
- Hypovolemia
 - Hypertension
 - Aspiration
 - Diarrhea
20. The most common cause of bowel perforation is:
- Peptic ulcer perforation
 - Diverticular perforation
 - Penetrating trauma
 - Ruptured appendicitis
21. Mortality from bowel perforation and the resulting peritonitis is caused by:
- Hypovolemic shock
 - Systemic inflammation
 - Corrosive action of gastric acids
 - Intra-abdominal pressure

22. Signs of peritonitis include:
- Rigid, “board-like” abdomen
 - High-pitched “tinkling” bowel sounds
 - Diarrhea
 - Colicky abdominal pain
23. The surgical procedure that is used to treat pancreatic cancer is:
- Whipple procedure
 - Roux-en-Y
 - Gastric bypass
 - Esophago-gastrectomy
24. While providing patient teaching for the patient with Hepatitis A, it is important to stress that the route of transmission of Hepatitis A is:
- Bloodborne
 - Airborne
 - Sexual activity
 - Oral-fecal
25. A healthcare worker who gets Hepatitis B from a needle stick needs additional teaching when she states:
- “I’ll need to eat a low-protein diet”
 - “I should avoid taking Tylenol”
 - “My partner needs to wear a condom during sexual intercourse”
 - “When I recover, I should have long-term immunity to Hepatitis B”
26. Hepatic encephalopathy is caused by an excess of:
- Potassium
 - Ammonia
 - Lactulose
 - Aminotransferases
27. Nursing interventions for the patient with hepatic failure include:
- Restrict protein in diet
 - Avoid use of narcotics, sedatives and tranquilizers
 - Administer lactulose and neomycin
 - All the above
28. In a patient with alcoholic cirrhosis, ascites may develop as a result of:
- Increased serum osmolality
 - Over-production of albumin
 - Increased aldosterone production
 - Antidiuretic hormone (ADH) suppression

29. The primary function of the gallbladder is to:
- a. Produce gastric enzymes
 - b. Conjugate bilibubin
 - c. Store bile
 - d. Break down fats
30. Gallbladder disease may result in stones composed primarily of:
- a. Protein
 - b. Calcium
 - c. Bilirubin
 - d. Cholesterol
31. Which of the following patients is at the highest risk for developing gallbladder disease?
- a. 18 year-old woman on birth control pills
 - b. 30 year-old man on NSAIDs
 - c. 40 year-old man with alcoholism
 - d. 60 year-old woman on diuretics

The next 3 questions pertain to the following scenario:

Ms. Cambridge is a 34 year-old with complaints of abdominal pain with bloody-watery diarrhea for several days. Over the past few weeks she has lost 10 pounds due to a loss of appetite. Her vital signs are:

B/P 100/70
HR 110
RR 24
Temp 38.5°C (101.3°F)

32. While obtaining a history from Ms. Cambridge it is important to ask about:
- IV drug abuse
 - Family history
 - Previous atherosclerotic disease
 - NSAID use
33. A nursing priority for Ms. Cambridge will be:
- Administering IV fluids
 - Diet teaching to avoid spicy foods
 - Emergency laparotomy
 - Insertion of an NG tube
34. The most likely cause for Ms. Cambridge's symptoms is:
- Upper GI bleed
 - Pancreatitis
 - Irritable bowel syndrome
 - Bowel obstruction

The following are individual questions:

35. A characteristic of Crohn's disease that differentiates it from ulcerative colitis is:
- Patchy, deep lesions
 - Continuous, superficial lesions
 - Elimination of disease with surgery
 - Primary lesions in the rectum
36. Toxic megacolon may result from ulcerative colitis and lead to:
- Peritonitis
 - Nausea
 - GI bleeding
 - Strictures

37. Chronic watery diarrhea can lead to which acid / base abnormality?
- Respiratory acidosis
 - Respiratory alkalosis
 - Metabolic acidosis
 - Metabolic alkalosis
38. Which of the following would be a sign of dumping syndrome after gastroplasty?
- Blood in the urine
 - Diarrhea
 - Bradycardia
 - Constipation
39. Symptoms of dumping syndrome can be minimized by encouraging a diet that is:
- High in fiber
 - Low in fat
 - Avoids most sugars
 - Low in residue
40. Assessment of the patient with an NG tube should include assessing for which complication?
- Sinus infection
 - Gastric perforation
 - Bowel obstruction
 - Aspiration

GI Bleeding

1. Etiology
 - a. Peptic Ulcer Disease (55%)
 - b. Esophageal varices (14%)
 - c. Arteriovenous malformations (6%)
 - d. Mallory-Weiss tears (5%)
 - e. Tumors & erosions (4% each)
 - f. Other (12%)

Drug	Mechanism of injury
Caffeine	↑ acid production
Vasopressors	↓ mucosal blood flow
ASA, alcohol, indomethacin, steroids	H ⁺ back diffusion
Corticosteroids	↓ mucous secretion
Chemotherapy, steroids	↓ cell renewal

2. Prevention:
 - a. Helicobacter pylori
 - b. NSAIDS
 - c. Stress
 - d. Esophageal varices
 - e. GI prophylaxis
 - i. H₂ receptor antagonists
 - ii. Sucralfate
 - iii. Omeprazole
3. Early Detection
 - a. Bloody nasogastric aspirate (10-15% false negative)
 - b. Hemoglobin / Hematocrit
 - c. Melena / occult blood monitoring
 - d. Nausea / vomiting / hyperactive bowel sounds
 - e. Coagulation abnormalities
 - f. Shock
4. Treatment:
 - a. ICU admission
 - b. Management of coagulopathies
 - c. Blood product replacement
 - d. Hemodynamic support
 - e. Gastric acid reduction
 - f. Endoscopy
 - g. Angiography
 - h. Surgery

Pancreatitis

1. Etiology
 - a. Alcoholism
 - b. Biliary tract disease
 - c. Drugs
 - i. Thiazides
 - ii. Acetaminophen
 - iii. Tetracycline
 - iv. Oral contraceptives
 - d. Infection
 - e. Hyperlipidemia, hypertriglyceridemia
 - f. Structural abnormalities of bile or pancreatic ducts

2. Pathogenesis
 - a. Pancreatic enzyme release → edema → necrosis
 - b. Inflammation → third spacing → septic shock
 - c. Autodigestion → bleeding → hypovolemic shock

 - d. Symptoms
 - i. Abdominal pain
 1. ↑ after eating or alcohol ingestion
 2. Severe, persistent, penetrating
 3. Radiates to back or neck
 - ii. Fever
 - iii. Nausea / Vomiting without ↓ pain
 - iv. Sweating

 - e. Ranson's Criteria
 - i. On admission
 1. Age > 55 years
 2. WBC > 16
 3. Glucose > 200
 4. LDH > 350
 5. SGOT > 250
 - ii. During first 24 hours
 1. HCT ↓ > 10%
 2. BUN ↑ > 5 mg/dl
 3. Ca⁺⁺ < 8
 4. pO₂ < 60 mmHg
 5. Base deficit ↑ > 4
 6. Fluid sequestration > 6L

- f. Physical exam
 - i. Appears acutely ill
 - ii. Tachycardia, tachypnea, hypotension
 - iii. ↑ temperature
 - iv. LUQ abdominal tenderness with guarding
 - v. ↓ or absent bowel sounds
 - vi. Signs of dehydration
 - vii. Signs of necrosis (50% mortality)
 - 1. Grey Turner's sign
 - 2. Cullen's sign

- g. Diagnostic tests
 - i. Labs
 - 1. ↑ Serum and urine amylase
 - 2. ↑ Lipase
 - 3. Amylase:creatinine clearance ratio
 - 4. ↑ Glucose
 - ii. Ultrasound

- h. Treatment
 - i. NPO
 - ii. NG drainage
 - iii. IV fluids
 - iv. Pain relief
 - 1. Demoral or Dilaudid
 - 2. Morphine may cause biliary colic or spasms of the sphincter of Oddi

 - v. Antibiotics for necrotizing pancreatitis
 - vi. TPN nutrition (low lipids)

- i. Complications
 - i. Death from cardiovascular instability:
 - 1. Septic shock
 - 2. Hypovolemic shock
 - ii. Infection
 - iii. Pseudocyst
 - 1. Collection of blood, necrotic tissue, inflammatory debris encapsulated in fibrotic tissue
 - iv. Respiratory failure / ARDS
 - v. Pleural effusion
 - vi. Renal failure 2° to hypovolemia

Bowel infarction

1. Pathogenesis
 - a. Acute mesenteric ischemia (AMI)
 - b. Insufficient blood flow due to:
 - i. Arterial occlusion
 - ii. Venous occlusion
 - iii. Non-occlusive processes

2. Symptoms
 - a. Pain
 - b. N/V
 - c. Bloody diarrhea
 - d. Hypovolemia
 - e. Metabolic acidosis

3. Diagnostic tests
 - a. Labs:
 - i. ↑ H/H
 - ii. ↑ Amylase
 - iii. ↑ WBC
 - b. KUB
 - c. CT or MRI
 - d. Ultrasound
 - e. Guaiac stools

4. Treatment
 - a. Medical
 - i. Volume replacement
 - ii. Correct underlying condition
 - iii. Improve mesenteric blood flow
 - iv. NG tube
 - v. ATB

 - b. Surgical
 - i. Bowel resection
 - ii. Embolectomy
 - iii. Revascularization

5. Complications
 - a. Perforation
 - b. Strictures
 - c. Infection

Bowel Obstruction

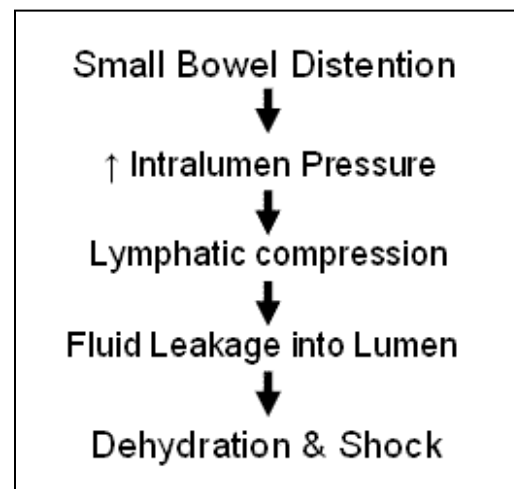
1. Obstruction of the small bowel
 - a. Partial or complete
 - b. Simple or strangulated
2. Etiology:
 - a. Post-operative adhesions (60%)
 - b. Malignancy
 - c. Crohn's disease
 - d. Hernia
3. Assessment:
 - a. Pain: crampy and intermittent
 - i. Short-duration with vomiting: proximal
 - ii. Long-duration, progressive in nature: distal
 - b. Nausea, vomiting
 - c. Fever
 - d. Tachycardia
4. Diagnostic tests:
 - a. CXR
 - b. KUB (sensitivity 75%, specificity 53%)
 - c. CT (sensitivity 93%, specificity 100%)
 - d. Ultrasound (sensitivity 89%, specificity 100%)
5. Treatment:
 - a. Simple / partial
 - i. NG drainage
 - ii. Antibiotics
 - iii. IV fluids
 - b. Simple complete / strangulated
 - i. NG drainage
 - ii. Antibiotics
 - iii. IV fluids
 - iv. Surgical intervention
6. Complications:
 - a. Sepsis
 - b. Abscess
 - c. Aspiration

Early:

- Hyperactive bowel sounds
- Diarrhea

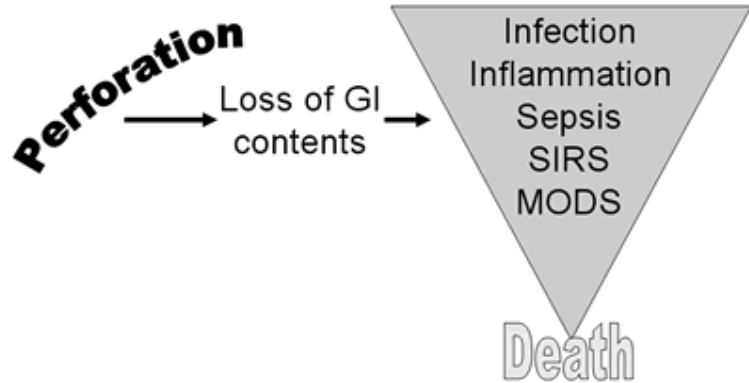
Late:

- Hypoactive bowel sounds
- Constipation



Bowel Perforation

1. Puncture or erosion of the GI tract.
 - a. Free, with spillage of GI contents
 - b. Contained, no spillage
2. Etiology
 - a. Abdominal trauma
 - i. Penetrating / blunt (more common in children)
 - b. Ingestion of aspirin, NSAIDs, or steroids
 - c. Appendicitis
 - d. Ulcerative colitis
 - e. Bowel infarction
 - f. Endoscopy
 - g. Laparoscopy



3. Assessment:
 - a. Peptic ulcer perforation:
 - i. Sharp, sudden, severe pain
 - ii. Rigid, “board-like” abdomen
 - iii. Shoulder pain
 - iv. Hiccup
 - v. Vomiting is rare
 - b. Perforated diverticulitis, ruptured appendicitis
 - i. Low abdominal pain
 - ii. Pain precedes vomiting by 3-4 hours
4. Diagnostic tests:
 - a. ↑ WBC, ↑ HCT (third-spacing)
 - b. KUB
 - c. Ultrasound
 - d. CT
5. Treatment:
 - a. IV fluids
 - b. NPO
 - c. NG suction
 - d. Surgery
 - e. Perioperative antibiotics
6. Complications:
 - a. Abscess
 - b. GI bleeding
 - c. Obstruction
 - d. Sepsis

Bowel sounds are absent in generalized peritonitis.

GI Surgeries:

1. Whipple (Pancreaticoduodenectomy)
 - a. Used for:
 - i. Resectable pancreatic cancer
 - ii. Pancreatic cancer
 - iii. Chronic pancreatitis
 - b. Removal of:
 - i. Head of the pancreas
 - ii. Duodenum
 - iii. Part of the common bile duct
 - iv. Gallbladder
 - v. Sometimes a portion of the stomach
 - c. Complications:
 - i. Peritonitis
 - ii. Sepsis, SIRS, MODS
 - iii. Pancreatic fistula
 - iv. Uncontrolled blood sugar in diabetics

2. Esophago-gastrectomy
 - a. Used for:
 - i. Esophageal cancer
 - b. Removal of:
 - i. Part of the esophagus
 - ii. Part of the stomach
 - iii. Anastomose with intestine
 - c. Complications:
 - i. Anastomotic leak
 - ii. Stricture formation
 - iii. Diarrhea

3. Gastric bypass (Roux-en-Y)
 - a. Used for:
 - i. Surgical treatment of obesity
 - b. Bypass of:
 - i. Part of the stomach
 - ii. Duodenum
 - c. Complications:
 - i. Dumping syndrome
 - ii. Peritonitis
 - iii. Gallstones
 - iv. Nutritional deficiency

Hepatitis

1. Etiology
 - a. Viral hepatitis
 - b. Acetaminophen overdose
 - i. Chronic alcohol use increases susceptibility
 - c. Alpha₁-antitrypsin deficiency
 - d. Autoimmune disease

2. Diagnostic testing
 - a. CBC
 - b. PT
 - c. AST / ALT
 - d. Bilirubin
 - e. Ammonia
 - f. Glucose
 - g. Lactate

3. Symptoms
 - a. Jaundice
 - b. ↓ level of consciousness
 - c. Ascites
 - d. Hypotension & tachycardia (SIRS)

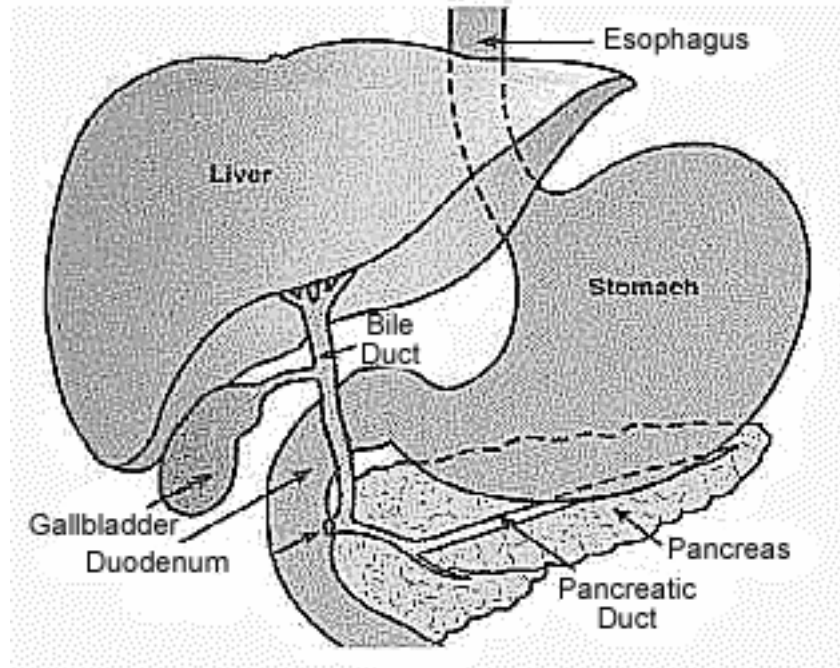
4. Management
 - a. Supportive:
 - i. ↑ ICP: mannitol
 - ii. Renal failure: dialysis
 - iii. Coagulopathy: platelets, FFP
 - b. Liver transplant

Gallbladder disease

The gallbladder is a small reservoir that holds and concentrates bile before releasing it into the intestine. Stones are an accumulation of materials that cause temporary or permanent obstruction when released into the bile duct:

- Cholesterol
- Bilirubin
- Calcium

Women > men
Incidence ↑ with age



Cholecystitis: acute inflammation and infection of the gallbladder.

1. Symptoms
 - a. 70% are asymptomatic
 - b. Pain:
 - i. Right upper quadrant
 - ii. Epigastric
 - iii. Radiates to the scapula
 - c. Fever
 - d. Nausea / vomiting
2. Diagnostic tests:
 - a. Right upper quadrant ultrasound
3. Treatment:
 - a. Cholecystectomy
 - i. Open
 - ii. Laparoscopic

Inflammatory Bowel Disease

Crohn's Disease	Ulcerative Colitis
Anywhere in digestive tract	Colon and rectum
Patchy, deep ulcerations	Continuous, superficial lesions
Surgery provides temporary relief	Surgery may eliminate disease

1. Manifestations:
 - a. Chronic diarrhea
 - b. Abdominal pain & cramping
 - c. Blood in stool
 - d. Anorexia
 - e. Weight loss
 - f. Fever

2. Etiology
 - a. Autoimmune
 - b. Genetic
 - c. Environmental

3. Risk factors
 - a. Age: highest incidence in 15-35
 - b. More common in whites of European descent
 - c. Family history
 - d. Urban and industrialized areas

4. Diagnostic tests:
 - a. ↓ H/H, ↑ WBC
 - b. Barium enema
 - c. Colonoscopy

5. Treatment:
 - a. Anti-inflammatory drugs:
 - i. Sulfasalazine (Azulfidine)
 - ii. Mesalamine (Asacol, Rowasa)
 - iii. Balsalazide (Colazal)
 - iv. Corticosteroids
 - b. Immunosuppressive agents
 - i. Azathioprine (Imuran)
 - ii. Methotrexate (Rheumatrex)
 - iii. Cyclosporine (Sandimmune)
 - c. Antibiotics
 - i. Metronidazole (Flagyl)
 - ii. Ciproflaxin (Cipro)

- d. Others:
 - i. Pain medications
 - ii. Antidiarrheals
 - iii. Iron, B-12 supplementation

- 6. Complications:
 - a. Obstruction
 - b. Ulcers, fistulas
 - c. Anal fissure
 - d. Malnutrition
 - e. Toxic megacolon (in ulcerative colitis)
 - i. Ileus → swelling → rupture → peritonitis

- 7. Patient teaching:
 - a. Diet:
 - i. Limit dairy products
 - ii. Avoid problem foods (gassy, spicy, caffeine, alcohol)
 - iii. Experiment with fiber and proteins
 - iv. Eat small meals and drink plenty of water
 - b. Stress
 - c. Coping skills

Resources:

McCance, K.L. & Huether, S. E. (1998). Pathophysiology: The biologic basis for disease in adults and children. St. Louis: Mosby.

Brolin RE (2002). Bariatric surgery and long-term control of morbid obesity. JAMA, 288(22): 2793–2796.

American Gastroenterological Association: www.gastro.org

Diabetes & Endocrine (11-13%) 24 Questions

1. Nursing care for the patient with hypoglycemia may include which of the following:
 - a. Administering D50 IV push
 - b. Giving skim milk to the alert patient
 - c. Providing additional nutrients with a meal
 - d. All of the above

2. An example of a *rapid-acting* insulin is:
 - a. Novolog
 - b. Ultralente
 - c. NPH
 - d. Regular

3. Rapid-acting insulin will start working in 15 minutes. What is the peak of rapid-acting insulin?
 - a. 30-60 minutes
 - b. 60-90 minutes
 - c. 90-120 minutes
 - d. 120-240 minutes

4. Which profile most closely resembles that of Ultralente insulin?
 - a. Onset 10-15 minutes, peak 60-90 minutes
 - b. Onset 30-60 minutes, peak 1-3 hours
 - c. Onset 90-120 minutes, peak 4-12 hours
 - d. Onset 4 hours, peak 8-24 hours

5. Development of diabetic neuropathy can be discouraged by:
 - a. Eating a low-fat diet
 - b. Quitting smoking
 - c. Drinking plenty of fluids
 - d. Increasing intake of iron-rich foods

6. Ms. Root is an insulin-dependent diabetic who is taking the herbal preparation St. John's Wort for depression. What complication should the nurse monitor for?
 - a. Hypertension
 - b. Hypokalemia
 - c. Hyperglycemia
 - d. Insulin shock

7. The best diagnostic test for monitoring long-term glucose control is:
 - a. Fasting blood glucose
 - b. Hemoglobin A₁C
 - c. Serum insulin level
 - d. Finger stick glucose

8. A patient that is newly diagnosed with diabetes should be closely monitored when taking which cardiac medications:
 - a. Calcium-channel blockers
 - b. Beta-blockers
 - c. Statins
 - d. Aspirin

9. Ms. Long is taking Acarbose (Precose) for Type-II diabetes. She should be instructed that Acarbose works by:
 - a. Reducing gluconate production
 - b. Inhibiting glucose's effects
 - c. Stimulating insulin production
 - d. Blocking absorption of carbohydrates

10. The primary cause of thyroid storm is:
 - a. Increased salt intake
 - b. Inadequately treated hyperthyroidism
 - c. Poor glucose control
 - d. Central nervous system deregulation

11. A major nursing concern for the patient with thyroid storm is:
 - a. Hypotension and shock
 - b. Hyperglycemia
 - c. Hypothermia
 - d. Bradycardia

12. Hypoparathyroidism can result in:
 - a. Hyperkalemia
 - b. Hyperglycemia
 - c. Hypophosphatemia
 - d. Hypocalcemia

13. Following thyroidectomy, what additional equipment should be kept at the bedside?
 - a. Enteral feeding pump
 - b. Bite block
 - c. Tracheostomy tray
 - d. Chest drainage

The next 3 questions pertain to the following scenario:

Ms. Lispro is a 65 year-old Type-II diabetic, who is admitted from the local nursing home. She has been ill for the past week with nausea, vomiting, diarrhea, and a fever. On admission she is dehydrated and hypotensive. Her blood glucose is found to be 1200 mg/dl. Her vital signs are:

B/P 77/52

HR 146

RR 32

Temp 39°C (102.2°F)

14. What is the most likely cause for Ms. Lispro's high glucose level?
 - a. Insulin shock
 - b. Diabetic ketoacidosis
 - c. Hyperosmolar hyperglycemic syndrome
 - d. Adrenal insufficiency

15. The treatment priority for Ms. Lispro is:
 - a. Administering insulin
 - b. Fever reduction
 - c. Administering IV fluids
 - d. Diet teaching

16. The nurse understands that Ms. Lispro needs additional teaching about her illness when she states:
 - a. "I could have avoided this by eating less candy"
 - b. "Maintaining my fluid intake is important for me"
 - c. "All the vomiting and diarrhea caused this"
 - d. "As a diabetic, dehydration could be deadly for me"

The following are individual questions:

17. The patient with diabetic ketoacidosis (DKA) has:
 - a. Insulin resistance
 - b. Insulin deficiency
 - c. Glucose resistance
 - d. Glucose deficiency

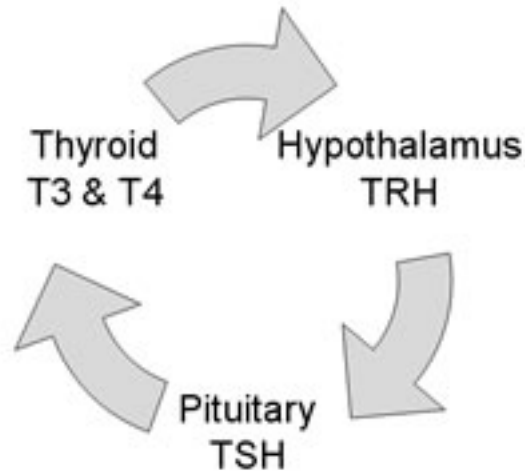
18. Mr. Saccharide has a blood glucose of 400 mg/dl this morning along with lethargy and deep gasping respirations. His arterial blood gas shows:
pH : 7.28, CO₂: 30, HCO₃: 14

His most likely problem is:

- a. Diabetes insipidus
 - b. Diabetic ketoacidosis
 - c. Hyperglycemic hyperosmolar syndrome
 - d. Hypoglycemia
19. Treatment of metabolic acidosis from diabetic ketoacidosis consists of:
- a. Insulin administration
 - b. Bicarbonate administration
 - c. Low salt diet
 - d. Fluid volume resuscitation
20. The syndrome of inappropriate anti-diuretic hormone (SIADH) is caused by:
- a. Insufficient ADH release
 - b. Excessive aldosterone release
 - c. Insufficient aldosterone release
 - d. Excessive ADH release
21. The “cardinal sign” of SIADH is?
- a. Hyponatremia
 - b. Urinary output of 10 liters/day
 - c. Hypotension
 - d. Systemic edema
22. A treatment priority for diabetes insipidus (DI) is:
- a. Fluid restriction
 - b. Insulin administration
 - c. Volume replacement
 - d. Sodium restriction
23. In diabetes insipidus, the patient will have:
- a. Increased urine output with decreased concentration
 - b. Increased urine output with increased concentration
 - c. Decreased urine output with decreased concentration
 - d. Decreased urine output with increased concentration
24. Which method of glucose control is associated with fewer complications and lower mortality in surgical patients?
- a. Sliding-scale insulin
 - b. Intermittent insulin administration
 - c. Insulin drip
 - d. Oral antidiabetic agents

Thyroid disorders

1. What does the thyroid do?
 - a. Hypothalamus produces thyroid releasing hormone (TRH)
 - b. Pituitary produces thyroid stimulating hormone (TSH)
 - c. Thyroid produces thyroxine (T3) and triiodothyronine (T4)
 - i. In the presence of iodine and tyrosine
 - d. Most thyroid disorders occur due to a defect in this regulating system
 - e. If the thyroid is stimulated to produce more hormones, hypertrophy may occur and the patient will develop a goiter.



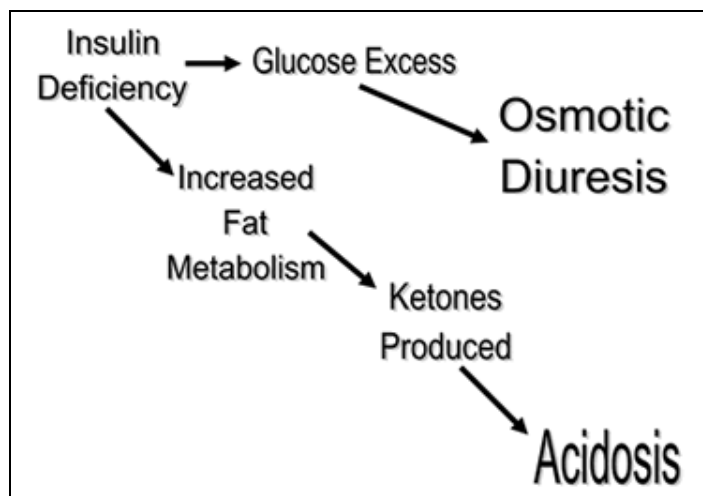
The Hypothalamic-Pituitary-Thyroid Axis

Disease	Description	TSH	T3	T4
Thyroid storm	Severe hypermetabolic state	↓	↑	Norm
Graves disease	Autoimmune hyperthyroidism	↓	↑	↑
Thyroiditis	Inflammation-induced hypothyroidism	↓	↓	↓

Diabetic emergencies

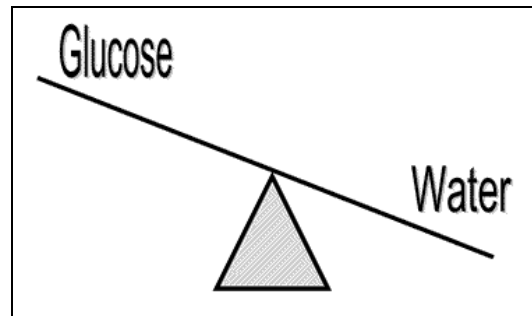
1. Hypoglycemia
 - a. Glucose level
 - i. <60 mg/dL
 - b. Etiology
 - i. Inadequate diet
 - ii. Too much insulin
 - iii. Stress
 - iv. Infection
 - v. Exercise
 - c. Symptoms
 - i. Change in mental status
 - ii. Sweating
 - d. Treatment
 - i. Administer glucose, complex carbohydrates

2. Diabetic Ketoacidosis
 - a. Glucose level
 - i. 150-600 mg/dL
 - ii. Onset in hours
 - iii. Type I
 - b. Etiology
 - i. Poor medical control
 - ii. Stress
 - iii. Infection
 - c. Symptoms
 - i. Changes in mental status
 - ii. Warm, dry skin
 - iii. Fruity breath odor
 - iv. Kussmaul's respirations
 - v. Nausea / vomiting
 - d. Treatment
 - i. Insulin
 - ii. Fluids



3. Hyperosmolar, Hyperglycemic Syndrome

- a. Glucose level
 - i. >800 mg /dL
 - ii. Onset in days
 - iii. Type II
- b. Etiology
 - i. Dehydration
- c. Symptoms
 - i. Shock
 - ii. Decreased level of consciousness
 - iii. Kussmal's respirations
- d. Treatment
 - i. Fluids
 - ii. Insulin



4. Insulin types:

Type	Onset	Peak	Duration
Rapid-acting Humalog, Novolog	10-15 min	60-90 min	3-4 hours
Short-acting Regular	0.5-1 hour	1-3 hours	4-6 hours
Intermediate-acting NPH, Lente	1.5-2 hours	4-12 hours	18-24 hours
Long-acting Ultralente	4 hours	8-24 hours	24-28 hours
Constant-acting Lantus R	Immediate	Constant	24 hours

It may be necessary to ↓ insulin dose if the patient is started on beta-blockers

Resources:

McCance, K.L. & Huether, S.E. (1998). *Pathophysiology: The biologic basis for disease in adults and children*. St. Louis: Mosby.

American Diabetes Association: www.diabetes.org

Diabetes Insipidus

1. Etiology
 - a. Neurogenic
 - b. Nephrogenic
 - c. Psychogenic
2. Clinical Presentation
 - a. Polyuria
 - b. Thirst
 - c. Fatigue
 - d. Dehydration
 - e. Neurologic
 - f. Urine Specific Gravity
 - g. Serum Sodium
 - h. BUN ↑
 - i. Serum Osmolality
 - j. Serum ADH level
 - k. Water Deprivation Test
3. Diagnostic
 - a. Serum Na
 - b. BUN
 - c. ↑ Serum Osmolality
4. Management
 - a. Detect clinical indications of DI
 - b. Monitor urine output, wt, serum labs, hypovolemia
 - c. Correct fluid deficit
 - d. Hypotonic solutions

Disorder	Serum Sodium	Serum Osmolality	Urine Osmolality
Volume Overload	↓	↓	↓
SIADH	↓	↓	↑
Dehydration	↑	↑	↑
Diabetes Insipidus	↑	↑	↓

Syndrome of Inappropriate Anti-diuretic Hormone (SIADH)

1. Etiology
 - a. Neurogenic
 - b. Ectopic tumor
 - c. Nephrogenic
 - d. Pulmonary
 - e. Hypoxia, stress

2. Clinical Presentation
 - a. Oliguria: urine output less than 0.5 ml/kg/hr
 - b. Urine Specific Gravity: > 1.030
 - c. Clinical indications of overhydration
 - d. Anorexia, N+V, diarrhea
 - e. Dyspnea and pulmonary edema
 - f. HA, personality changes, altered LOC
 - g. Seizures
 - h. Muscle weakness or cramps
 - i. Serum Na <120mEq/liter
 - j. BUN ↑↑
 - k. Serum osmolality ↑↑
 - l. Serum ADH level ↑↑ if neurogenic

3. Treatment
 - a. Detect SIADH
 - b. Monitor urine output, specific gravity
 - c. Treat cause
 - d. Surgery to remove malignancy
 - e. Demeclocycline, phenytoin, lithium to inhibit the effect of ADH on the renal tubule
 - f. DC causative drugs
 - g. Correct fluid volume excess
 - h. Correct electrolyte imbalance
 - i. Institute seizure precautions

Hematologic / Immunologic (8-10%) 18 Questions

1. The nurse is caring for a 32-year-old experiencing organ rejection after a kidney transplant. Which of the following signs will the patient exhibit?
 - a. Decreased BUN/Creatinine
 - b. Increased transaminase level
 - c. Increased urine output
 - d. Increased BUN/Creatinine

2. A primary chemical mediator in anaphylactic reaction is?
 - a. Myocardial Depressant Factor
 - b. Histamine
 - c. Complement
 - d. Interferon

3. Disseminated intravascular coagulation (DIC) can be caused by:
 - a. Pregnancy
 - b. Sepsis
 - c. Urinary tract infection
 - d. Heparin administration

4. Which of the following laboratory diagnostic findings will most likely be seen in DIC?
 - a. PT and PTT prolonged
 - b. Fibrinogen increased
 - c. Platelet count increased
 - d. D-dimer normal

5. The beneficial effects of heparin in DIC are thought to be due to its:
 - a. Stimulating effect on platelet manufacture
 - b. Neutralizing of free-circulating thrombin
 - c. Antifibrinolysin activity
 - d. Inhibition of platelet factor XII release

6. The patient with DIC needs additional teaching if she states:
 - a. "I could have trouble with my liver from this disease"
 - b. "I could develop blood clots in my legs"
 - c. "I will let you know if I find any new bruising on my body"
 - d. "I can never take aspirin again"

13. Diagnosis of AIDS is made when the patient has:
- WBC count greater than 22
 - Recurrent fever
 - CD4 and T-cell counts < 200
 - CD4 / CD8 ratio of 1
14. Chronic Lymphocytic Leukemia (CLL) may cause which of the following lab value alterations?
- Increased WBC
 - Increased RBC
 - Increased platelet count
 - Decreased WBC
15. Signs of Non-Hodgkin's Lymphoma include:
- Fever, swollen glands, night sweats, weight loss
 - Recurrent infections
 - Chest pain, nausea and vomiting
 - Abdominal pain and chills
16. A patient with sickle cell disease starts complaining of chest pain and shortness of breath. He is most likely suffering from:
- Myocardial infarction
 - Acute chest syndrome
 - Pulmonary embolism
 - Muscle spasm
17. Treatment for Sickle Cell Crisis includes:
- Oxygen and fluids
 - Heparin and coumadin
 - Platelet transfusion
 - Interferon
18. Which of the following is a major risk factor for the development of skin breakdown:
- Blood pressure of 128/66
 - Fever of 39°C (102.2°F)
 - High-protein diet
 - Age of 58 years

Hematology

Red Blood Cell Count

1. Rule of threes
 - a. $\text{RBC} \times 3 = \text{Hb}$
 - b. $\text{Hb} \times 3 = \text{HCT}$
2. Anemia
 - a. Insufficient production of RBCs
 - b. Destruction of RBCs

$\text{Hb} \times 3 > \text{HCT} = \text{over-hydration}$
 $\text{Hb} \times 3 < \text{HCT} = \text{dehydration}$

RBC Indices

MCV Size	MCH Color	Disease
N	N	Blood Loss
↓	N	Renal Failure
↑	N	Folate, Vit B12 Deficiency
↓	↓	Iron Deficiency

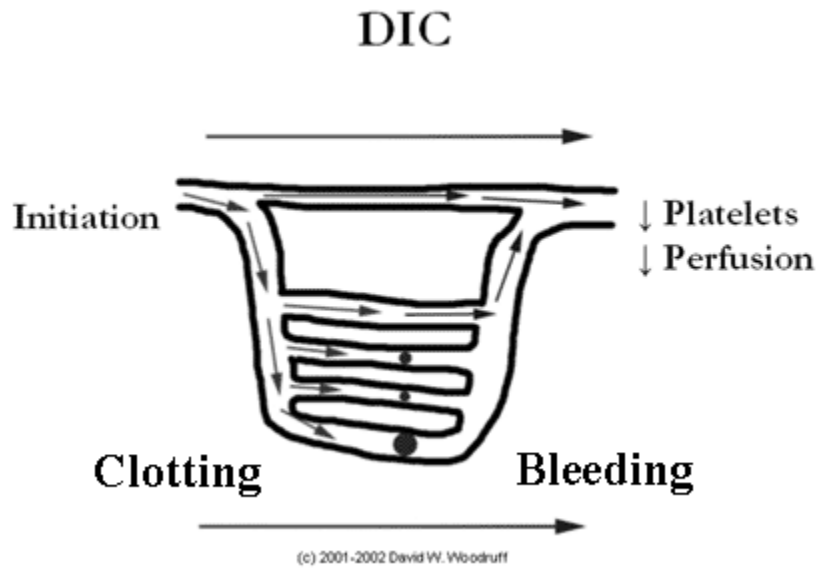
} Chronic Disease

(c) 2003 David W. Woodruff

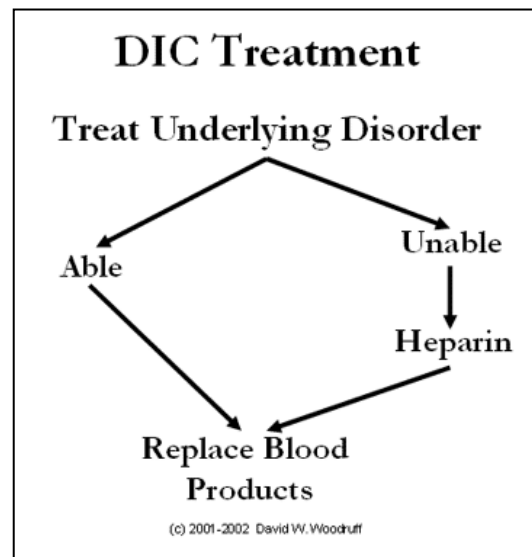
3. Polycythemia
 - a. Dehydration
 - b. Overproduction
 - i. Smoking
 - ii. Lung disease
 - iii. High altitude
 - iv. Renal, liver cancer
 - c. Can produce sluggish blood flow and clotting

Disseminated Intravascular Coagulation (DIC)

1. Definition
2. Factors Triggering DIC
3. Etiology:
 - a. Bleeding
 - b. Trauma
 - c. Sepsis
 - d. Abrupto Placenta



4. Clinical Presentation
 - a. Bleeding
 - b. Signs of Thrombosis
 - c. Clinical Presentation
 - i. Petechiae
 - ii. Ecchymosis
 - iii. Purpura
 - d. Labs in DIC
 - i. Platelets
 - ii. PTT
 - iii. PT
 - iv. Fibrinogen
 - v. FDP/FSP
 - vi. D-dimer
 - vii. Antithrombin III



5. Medical Management
 - a. Maintain ABC's
 - b. Careful of oral and mucosal bleeding
 - c. Treat stimuli
 - d. Correct hypovolemia, hypotension, hypoxia, and acidosis
 - e. Stop microclotting to maintain perfusion
 - f. Stop Bleeding
 - g. Stop Thrombosis
 - h. Administer IV Heparin
 - i. Plasmapheresis
 - j. Nursing Management
 - k. Nursing Care of the Bleeding Patient
 - l. Blood Products
 - i. PRBC's
 - ii. Platelets
 - iii. FFP
 - iv. Cryoprecipitate

6. Complications of DIC
 - a. Mortality
 - b. Hypovolemic Shock
 - c. Acute Renal Failure
 - d. Infection
 - e. Acute Respiratory Distress Syndrome
 - f. Stroke
 - g. GI dysfunction

7. Nursing
 - a. Administer Vitamin K and Folic Acid
 - b. Treat Ischemic Pain
 - c. Maintain skin integrity

Acquired Immunodeficiency Syndrome (AIDS)

1. Etiology
 - a. HIV, CD4 retrovirus
 - b. High-risk groups
 - i. High-risk sexual behavior
 - ii. Infected sex partners
 - iii. IV drug users
 - iv. Recipients of blood products before 1985
 - c. Pathophysiology
 - i. Invasion and destruction of T4 (helper) cells
 - ii. Incubation 6 months to 10 years
 - iii. Decreased immune response
 - iv. Opportunistic infection

2. General principles for management
 - a. Universal precautions
 - b. Protect from infection
 - c. Inflammatory response will be muted

Transplantation

Criteria for organ transplantation

1. Recipient criteria
 - a. End-stage organ disease
 - b. Absence of:
 - i. Infection
 - ii. Malignancy
 - iii. Other failing organs
 - iv. Substance abuse

1. Donor criteria
 - a. Free of sepsis, cancer, prolonged hypotension
 - b. Free of communicable disease

1. General patient care
 - a. Support transplanted organ
 - i. Heart Transplant
 - ii. Lung
 - iii. Liver
 - iv. Pancreas
 - v. Kidney
 - b. Watch for signs of infection
 - i. May be ↓ due to ↓ immune response

Leukemia's

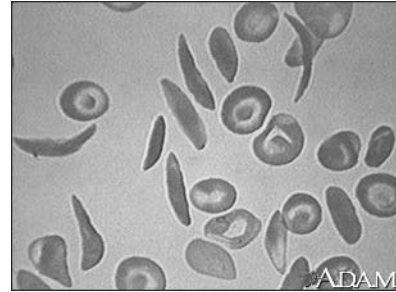
Acute	Incidence	Characteristics
Acute Lymphocytic (ALL)	Age 2-4	Anemia, Bleeding, Infection, ↓ RBC, H&H, ↑ WBC, Joint and bone pain
Acute Myelogenous (AML)	Age 12-20	

Chronic	Incidence	Characteristics
Chronic Lymphocytic (CLL)	Age 50-70	↑ WBC, ↓ RBC, Enlarged spleen, Hepatomegaly, Swollen glands
Chronic Myelogenous (CML)	Age 30-50	

- a. Diagnostics
 - i. Bone marrow aspiration
 - b. Treatment
 - ii. Chemotherapy
 - iii. Stem cell transplant
 - iv. Transfusion
3. Multiple Myeloma
- a. Plasma cells invade bone marrow, and lymph system
 - b. Bones become weak and painful
 - c. Diagnostics
 - i. X-rays
 - ii. Bone marrow aspiration
 - iii. Hypercalcemia
 - d. Treatment
 - i. Chemotherapy
 - ii. Interferon
 - iii. Bone marrow transplantation
 - iv. Plasmapheresis
 - v. Management of Hypercalcemia
4. Non-Hodgkin's Lymphoma
- a. Malignant neoplasm of the lymphatic system
 - b. Results in overgrowth of premature and ineffective cells
 - c. Diagnostics
 - i. Fever, swollen glands, night sweats, weight loss
 - d. Treatment
 - i. Chemotherapy
 - ii. Radiation therapy
 - iii. Stem cell transplant

Sickle-Cell Crisis

1. Etiology
 - a. More common in black males
 - b. Presence of Hemoglobin S
2. Precipitating factors
 - a. Dehydration
 - b. Stress or strenuous exercise
 - c. Infection
 - d. Fever
 - e. Bleeding
 - f. Acidosis
 - g. Hypoxia (smoking)
 - h. Cold weather
 - i. Pregnancy
3. Presentation
 - a. Bone crisis
 - i. Long bone pain
 - b. Acute chest syndrome
 - i. Chest pain
 - ii. Dyspnea
 - iii. Tachycardia
 - iv. Bloody sputum
 - v. Pulmonary fibrosis
 - c. Abdominal crisis
 - i. Sudden, constant abdominal pain
 - ii. Not usually associated with N/V/D
 - d. Joint crisis
 - i. Stiff, painful joints
 - e. Jaundice, bruising, blood in urine may occur with any
4. Management
 - a. Oxygen
 - b. Fluids
 - c. Folic acid
 - d. Hydroxyurea (Hydrea)
 - e. Pain control
 - i. Mild: Tylenol or NSAIDs
 - ii. Moderate: Codeine, Oxycodone
 - iii. Severe: Morphine, Dilaudid
 - f. Transfusion
5. Complications
 - a. Renal dysfunction
 - b. Stroke
 - c. Blindness
 - d. Infection (spleen becomes clogged)



GU, Renal, Reproductive (11-13%) 20 Questions

1. A herbal preparation that may be helpful to control “hot flashes” in post-menopausal women is:
 - a. Ginko
 - b. Black cohosh
 - c. Echinacea
 - d. St. John’s Wort

2. Your patient is post transurethral laser prostatectomy (TURP). He would demonstrate an understanding of his procedure if he stated:
 - a. “I can’t have sexual relations for six weeks”
 - b. “I should limit my walking”
 - c. “I need to follow-up for repeat lab tests”
 - d. “I should drink 6-8 glasses of water a day”

3. The most common infecting organism in urinary tract infection (UTI) is:
 - a. Escherichia coli
 - b. Chlamydia
 - c. Mycoplasma
 - d. Enterococcus faecium

4. Ms. Hill is diagnosed with a urinary tract infection. She will need additional teaching if she states:
 - a. “I should drink plenty of fluids”
 - b. “I can avoid this in the future by avoiding sexual intercourse”
 - c. “I should avoid scented douches”
 - d. “I should shower instead of taking tub baths”

The next 3 questions pertain to the following scenario:

Ms. Hurthle is a 57 year-old s/p lung transplant patient. She presents with a five-day history of fever and foul smelling urine. She is diagnosed with a UTI and urosepsis. On her second day of admission Ms. Hurthle develops decreased urine output and cloudy urine. Her vital signs are:

B/P: 110/55

HR: 105

RR: 22

Temp: 37.5°C (99.5°F)

5. The most likely cause for Ms. Hurthle's symptoms are:
 - a. Urinary tract infection
 - b. Glomerulonephritis
 - c. Polycystic kidney disease
 - d. Acute renal failure

6. The best diagnostic test to confirm the diagnosis is:
 - a. Renal ultrasound
 - b. Chest x-ray
 - c. Blood cultures
 - d. Urinalysis

7. Treatment for Ms. Hurthle should include administering:
 - a. Penicillin
 - b. Kayexelate
 - c. Amphogel
 - d. Calcium-channel blockers

The following are individual questions:

8. Acute renal failure differs from chronic renal failure in that it:
 - a. Results in higher BUN levels
 - b. Has a higher mortality rate
 - c. Requires peritoneal dialysis
 - d. Is associated with diabetes

9. The best dialysis schedule for the patient with acute renal failure is:
 - a. Every other day
 - b. Weekly
 - c. Daily
 - d. Bi-weekly

10. The IV solution D5W is:
 - a. Hypertonic
 - b. Isotonic
 - c. Hypotonic
 - d. Clonic-tonic

11. The primary etiology of hyperphosphatemia is:
 - a. Over-replacement
 - b. Hypercalcemia
 - c. Renal failure
 - d. Hypoalbuminemia

12. Hyperphosphatemia is best treated with:
 - a. Insulin
 - b. Amphogel
 - c. Kayexelate
 - d. Low-calcium diet

13. Bradycardia, tremors and twitching muscles are associated with which electrolyte disorder?
 - a. Hypokalemia
 - b. Hyperkalemia
 - c. Hypophosphatemia
 - d. Hyperphosphatemia

14. Mr. Patch is admitted for management of his congestive heart failure. His potassium level is 3.0 mg/dl this morning. What would be an appropriate response from the nurse?
 - a. Increase his fluid intake
 - b. Limit his activity
 - c. Obtain a 12-lead EKG
 - d. Encourage him to eat dark vegetables and oranges

15. After treating hyperglycemia with IV insulin and fluid resuscitation, which electrolyte should be rechecked?
 - a. Potassium
 - b. Chloride
 - c. Sodium
 - d. Phosphate

16. Seizures and laryngeal spasm are a potential complication of which electrolyte disorder?
 - a. Hyperkalemia
 - b. Hypocalcemia
 - c. Hyperglycemia
 - d. Hypophosphatemia

17. Treatment for hypercalcemia includes:
- Fluids and diuretics
 - Amphogel
 - Kayexelate
 - Dialysis
18. Hyponatremia is usually associated with:
- Fluid overload
 - Dehydration
 - Diuresis
 - Over-administration of normal saline
19. During the diuretic phase of acute renal failure your patient may need:
- Fluid restrictions
 - Electrolyte replacement
 - Peritoneal dialysis
 - Vasodilators
20. Which of the following is not an etiology of acute renal failure (ARF)?
- Sepsis
 - Shock
 - Bladder tumor
 - Hypertension

Renal & Urinary Tract Disorders

1. Acute Renal Failure: Sudden loss of renal function
 - a. Etiology:
 - i. Pre-renal
 1. Most common outside the ICU
 2. Etiology
 - a. Low cardiac output
 - b. Shock
 - c. Renal artery stenosis
 3. ↓ blood flow to kidneys, ↓ pressure in renal artery, ↓ forces favoring filtration, ↓ GFR
 4. Kidney's response is vasoconstriction
 5. End result is ischemic damage to kidney
 - ii. Intra-renal
 1. Most common in the ICU
 2. Causes
 - a. Glomerulonephritis
 - b. Antibiotics
 - c. Myoglobinemia
 - d. SLE, Diabetes
 3. Direct damage to glomerulus
 - iii. Post-renal
 1. Rare
 2. Causes
 - a. Urethral calculi
 - b. BPH
 - c. Urethral stricture
 - d. Bladder cancer
 - e. Neurogenic bladder
 3. Partial obstruction = ↑ forces opposing filtration = ↓ GFR
 4. Total obstruction = compression and necrosis

Acute Renal Failure is a secondary disease. Therefore mortality is about 40%

b. Phases:

i. Oliguria

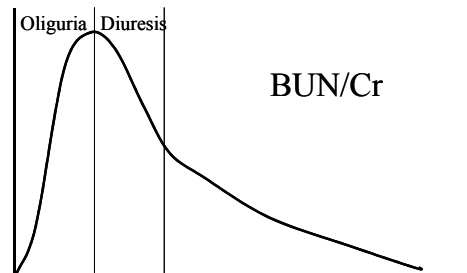
1. Sudden onset of oliguria
2. Symptoms resemble CRF
 - a. Nausea & Vomiting
 - b. Drowsiness, confusion, coma
 - c. GI bleeding
 - d. Asterixis
 - e. $\uparrow K^+$, $\downarrow Na^+$, acidosis
 - f. Cardiac arrhythmias
 - g. Kussmal's respirations
 - h. Hypervolemia
 - i. Edema
 - j. HTN
3. Treatment:
 - a. Dialysis
 - b. Renal diet
 - c. Fluid restriction

ii. Diuretic (10-15 days)

1. Indicates that nephrons are healing
2. UO \uparrow to 4-5 liters/day
3. Unable to concentrate urine or filter wastes
4. Can have excessive excretion of K^+ and Na^+
5. Manifestations
 - a. Hypovolemia
 - b. Hypotension
 - c. Electrolyte imbalances

iii. Recovery (lasts 4-6 months)

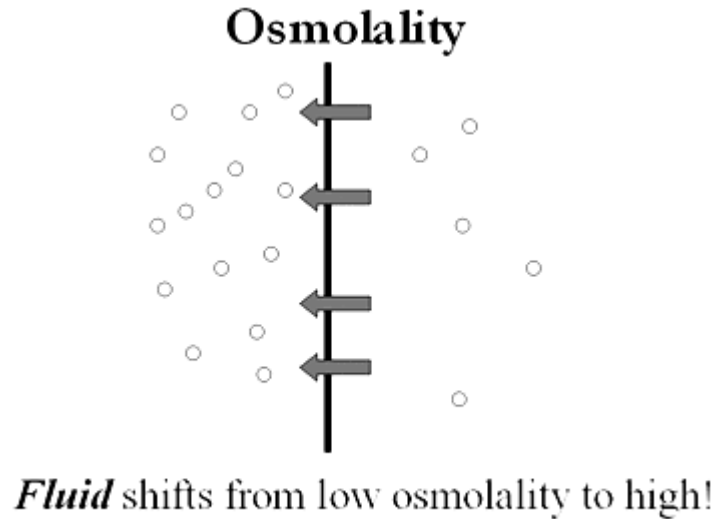
1. BUN, Cr slowly return to normal



- iv. Treatment:
 - 1. Hemodialysis
 - 2. Continuous renal replacement therapy
 - a. CAVHD
 - b. CVVHD
 - 3. Renal diet
 - 4. Fluid restriction
- c. What you need to know
 - i. ARF causes a sudden change in homeostasis that leads to more symptoms than seen in CRF.
 - ii. ARF is secondary to another disease process and can result in 40% mortality.
 - iii. Creatinine clearance identifies level of renal function
 - iv. BUN / Cr identifies level of renal dysfunction
 - v. Daily dialysis may be necessary to prevent complications associated with rapid fluid and electrolyte changes.
- 2. Chronic Renal Failure: Progressive loss of renal function
 - a. Etiology:
 - i. Diabetes
 - ii. Hypertension
 - iii. Glomerulonephritis
 - b. Stages:
 - i. Decreased renal reserve
 - 1. ↓ number of functional nephrons
 - ii. Renal insufficiency
 - 1. Asymptomatic ↑ in BUN / Cr.
 - iii. Renal failure
 - 1. Symptomatic ↑ in BUN / Cr.
 - iv. End-stage renal disease
 - 1. Severe ↑ BUN / Cr.
 - 2. Chronic dialysis is needed
 - c. Bricker hypothesis
 - i. Intact nephrons hypertrophy to compensate for diseased nephrons
 - d. Signs and symptoms of oliguria
 - e. Treatment:
 - i. Hemodialysis
 - ii. Peritoneal dialysis
 - iii. Renal diet
 - iv. Fluid restriction
 - v. Medications

Sodium

1. Most important ion in maintaining extracellular fluid balance
2. Balance is controlled by CNS & endocrine systems
3. Imbalance will result in fluid shifts and edema or dehydration



(c) 2001-2002 David W. Woodruff

4. Maximum daily sodium load is 400 mEq/day (NS @125ml/hr provides 465 mEq/day)
 1. **Hyponatremia** is more common
 - a. Etiology:
 - i. Most common:
 1. Overhydration with D5W
 2. Post-op fluid replacement
 3. Heart failure
 4. Cirrhosis
 5. Hyperglycemia
 - ii. Other etiology:
 1. Excessive water ingestion
 2. Vomiting, diarrhea, third-spacing (if replaced with hypotonic solutions)
 - b. Assessment:
 - i. Assess I&O, daily weights
 - ii. Watch for edema or skin tenting
 - iii. Monitor neurologic status
 - c. Treatment:
 - i. Treat underlying disorder

- ii. Replace sodium and water
 - 1. Mild: $\text{Na}^+ < 120$
 - a. Asymptomatic
 - b. Treat underlying cause
 - 2. Moderate: $\text{Na}^+ < 115$
 - a. CNS depression
 - b. Replace with NS, fluid restriction
 - 3. Severe: $\text{Na}^+ < 110$
 - a. Coma, seizures, death
 - b. Replace with NS or 3% saline

Be careful! His Na^+ should not \uparrow by $> 1 \text{ mEq/hr}$, or 10 mEq/day !

- 1. ***Hypernatremia*** has 40-60% mortality
 - a. Etiology:
 - i. Insensible losses
 - 1. Osmotic diuresis
 - 2. Mannitol
 - 3. Diabetic ketoacidosis (DKA)
 - 4. Hyperglycemic hyperosmotic syndrome (HHS)
 - 5. Diabetes insipidus (lack of response to ADH)
 - b. Assessment:
 - i. The primary symptom is thirst
 - ii. Central nervous system (CNS) depression
 - iii. Look for fluid imbalance!
 - c. Treatment:
 - i. Water replacement
 - ii. Oral
 - iii. D5W
 - 1. If duration $< 24^\circ$, replace over 24°
 - 2. If duration $> 24^\circ$, replace over 48°

Note: When IV solution D5W (5% dextrose in water) is given to a patient, the dextrose is metabolized, leaving just the water.

- 1. What you need to know:
 - a. Sodium is responsible for water balance
 - b. $\downarrow \text{Na}^+$ is most common
 - c. $\downarrow \text{Na}^+$ results in edema
 - d. Edema to the brain can be deadly!

ELECTROLYTES:
It is more important how fast the level became abnormal,
rather than how abnormal it is.

Potassium

1. Acquired in diet, excreted in urine, must be replaced daily
 - a. Major intracellular cation (positive electrolyte)
 - b. Functions:
 - i. Maintains osmotic pressure inside cells
 - ii. Maintains electrical potential
 - iii. Maintains acid/base balance
 - iv. Participates in metabolism

2. *Hyperkalemia*

- a. Common causes:
 - i. Renal failure
 - ii. Over-replacement
 - iii. Cell damage / shift out of cells
 - iv. Acidosis
 - v. Hemolysis
 - vi. Sepsis
 - vii. Chemotherapy
 - viii. Spironolactone administration
- b. Manifestations
 - i. Bradycardia
 - ii. Tremors, twitching
 - iii. Nausea / vomiting
 - iv. EKG changes:
 - v. ↑ K⁺ suppresses the SA node, enhances T-wave
 1. Peaked T-waves
 2. Flattened P-wave
 3. Blocks
 4. PVCs, ventricular arrhythmias
- c. Treatment
 - i. Get rid of it
 1. Kayexelate
 2. Dialysis
 - ii. Move it into storage
 1. Insulin / glucose (effect lasts 2-4 hours)
 2. Limit ingestion of more
 3. Low K⁺ diet

3. **Hypokalemia** (aLKylosis is associated with a Low K)

a. Common causes:

- i. Poor intake is the primary cause
- ii. Renal loss
- iii. Diuretics
- iv. Renal tubular acidosis
- v. Gent, Ampho
- vi. GI loss
- vii. Vomiting
- viii. Diarrhea
- ix. Shift into cells
- x. Excessive insulin administration in DKA
 - 1. Recheck the K⁺ level after normalizing the glucose!
- xi. Alkalosis

b. Manifestations

- i. Tachycardia
- ii. Hypotension
- iii. Flaccid muscles
- iv. EKG changes:
 - 1. Flattened T-waves
 - 2. Peaked P-wave
 - 3. PVCs, ventricular arrhythmias

c. Treatment

- i. Oral replacement is preferable (allows slower equilibration with intracellular compartment)
- ii. IV: no faster than 20mEq/hour
- iii. High potassium foods:

High potassium foods	Low potassium foods
Fruits: Bananas, Oranges, Cantaloupe, Dried fruits	Fruits: Apples, Berries, Grapes, Pears
Vegetables: Broccoli, Celery, Dark greens	Vegetables: Beets, Cabbage, Carrots, Corn, Cucumber, Lettuce, Onions, Peas
Other: Bran, Coffee / Tea, Nuts / seeds, Ice cream	Other: Rice, Noodles, Bread

- a. What you need to know:
 - i. Patients who are not eating require 40 mEq of K⁺ / day
 - ii. If your patient's K⁺ is low, it may require 200-300 mEq to adequately replace the lost stores of K⁺
 - iii. Most hyperkalemia is due to ↓ renal function
 - iv. **AL**Kalosis is associated with a **L**ow **K**⁺
 - v. Decreased urine output (for any reason) can ↑ K⁺ levels
 - vi. Potassium controls internal cellular pH balance and water levels.
 - vii. Alterations in potassium cause:
 - 1. Decreased cellular function
 - 2. Arrhythmias

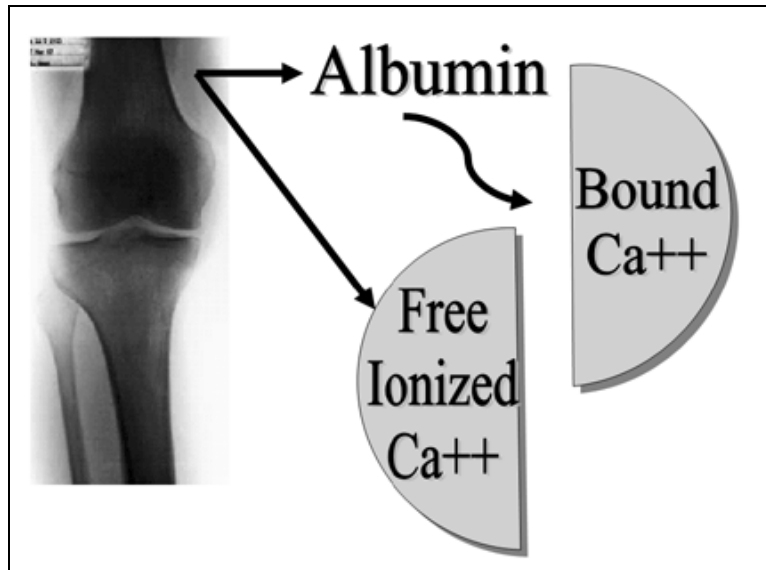
- b. How to use it:
 - i. If your patient's urine output ↓, look for hyperkalemia
 - ii. Most patients aren't ingesting enough K⁺, watch for low K⁺
 - iii. Re-evaluate K⁺ after treating blood glucose levels

TESTING IMPLICATIONS:

Opening and closing the fist with a tourniquet in place ↑ K⁺ level
↓ K⁺ can lead to digoxin toxicity

Calcium

1. Ionized (active fraction)
2. Inactive fraction (bound to albumin)
3. Adjusted calcium
 - a. $[(4-\text{Alb}) \times 0.8] + \text{Calcium} = \text{Adjusted calcium}$
 - b. Assumes that Ca^{++} , albumin and pH are normal.



4. Essential for the functioning of:
 - a. Neuromuscular activity
 - b. Integrity of cell membrane
 - c. Cardiac activity
 - d. Blood coagulation
 - e. Increases in PTH, $\uparrow \text{Ca}^{++}$ level

5. *Hypercalcemia*

- a. Etiology:
 - i. Hyperparathyroidism
 - ii. Paget's disease
 - iii. Excessive Vitamin D intake
 - iv. Bedrest
- b. Manifestations
 - i. Anorexia, nausea, vomiting
 - ii. Coma
 - iii. ARF
 - iv. Flaccid muscles
 - v. Ventricular arrhythmias and cardiac arrest

- c. Treatment
 - i. Fluids / lasix
 - ii. Oral or IV Phosphate

6. Hypocalcemia

- a. Etiology:
 - i. Surgical Hypoparathyroidism
 - ii. Malabsorption
 - iii. Acute pancreatitis
 - iv. Renal failure
 - v. Vitamin D deficiency
 - vi. Hypoalbuminemia
 - vii. Excessive administration of citrated (banked) blood

7. Manifestations

- a. Laryngeal spasm
- b. Seizures & muscle cramps
- c. Hypotension
- d. Hyperactive reflexes
- e. Trousseau's sign
- f. Chvostek's sign
- g. Prolonged QT interval

Chvostek's sign:

- Tap the facial nerve just below the temple
- Twitch of the lip or nose is a positive sign

Trousseau's sign

- Contraction of the hand or fingers when arterial flow is occluded for 5 minutes.

8. Treatment

- a. Oral route is safer
- b. IV: 10-20 mL of 10% calcium gluconate over 5-10 minutes
- c. Monitor EKG during treatment

9. Implications:

- a. Ionized calcium level is inversely proportional to serum pH
- b. Serum Ca⁺⁺ levels should be assessed in conjunction with serum albumin levels

Magnesium

1. Intracellular enzymatic reactions and utilization of ATP
2. CNS transmission
3. Cardiovascular tone

4. *Hypermagnesemia*

- a. Etiology
 - i. Renal disease
 - ii. Hypercalcemia
 - iii. Adrenal insufficiency
- b. Manifestations
 - i. Flushing and hypotension
 - ii. Hypotension & bradycardia
 - iii. Respiratory depression
 - iv. Hypoactive reflexes
 - v. CNS depression
- c. Treatment
 - i. IV calcium: 10-20 mL of a 10% calcium gluconate
 - ii. Mechanical ventilation
 - iii. Temporary pacemaker
 - iv. Dialysis



5. *Hypomagnesemia*

- a. Etiology
 - i. CRF
 - ii. Pancreatitis
 - iii. Hepatic cirrhosis
 - iv. GI losses
 - v. Alcoholism
 - vi. Treatment of DKA
- b. Manifestations
 - i. Increased reflexes
 - ii. + Trousseau's sign
 - iii. + Chvostek's sign
 - iv. Tachycardia
 - v. EKG changes:
 1. PR & QT prolongation
 2. Widened QRS
 3. ST depression
 4. T-wave inversion

- c. ↓ K+, ↓ Ca++, ↓ PO4
- d. Treatment:
 - i. Dietary replacement
 - ii. IV magnesium acts as a vasodilator (expect flushing and hypotension)
 - iii. Acute hypomagnesemia
 - 1. 1-2 grams over 60 minutes
 - 2. During a code for VT/VF
 - 3. 1-2 grams IV push (over 1-2 minutes)

A 24-hour urine magnesium level may be helpful in assessing deficiency

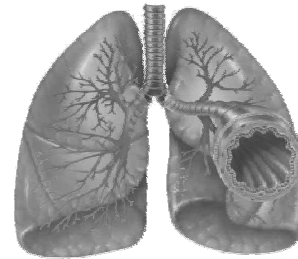
Phosphorus

1. Phosphorus is an important part of all body tissue
2. Phosphate has a marked diurnal variation; therefore single measurements are of little use.
3. Mostly stored intracellularly
4. Phosphate is cleared by the kidney; therefore renal function must be monitored as well.

5. *Hyperphosphatemia*

a. Etiology

- i. Renal failure
- ii. High PO₄ intake
- iii. Chemotherapy
- iv. Lactic acidosis



b. Manifestations

- i. Most often is asymptomatic
- ii. Numbness, tingling of hands and mouth
- iii. Muscle spasms
- iv. Precipitation of Ca⁺⁺ salts can lead to hypocalcemia

c. Treatment

- i. Treat underlying disorder
- ii. Phosphate-binding agents (Amphogel)
- iii. IV fluids
- iv. D50 & insulin
- v. Dialysis

6. *Hypophosphatemia*

a. Etiology

- i. Refeeding syndrome (refeeding after severe malnutrition)
- ii. Calcium and magnesium deficiency
- iii. Acute respiratory disorders
- iv. Alcoholism
- v. DKA, insulin administration

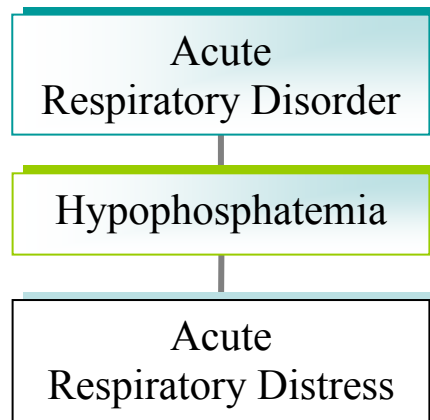
b. Manifestations

- i. Hemolysis & anemia
- ii. Muscle pain & weakness
- iii. Respiratory muscle weakness
- iv. ↓ LOC, paresthesias

c. Treatment

- i. Treat the primary disorder
- ii. Nutrition

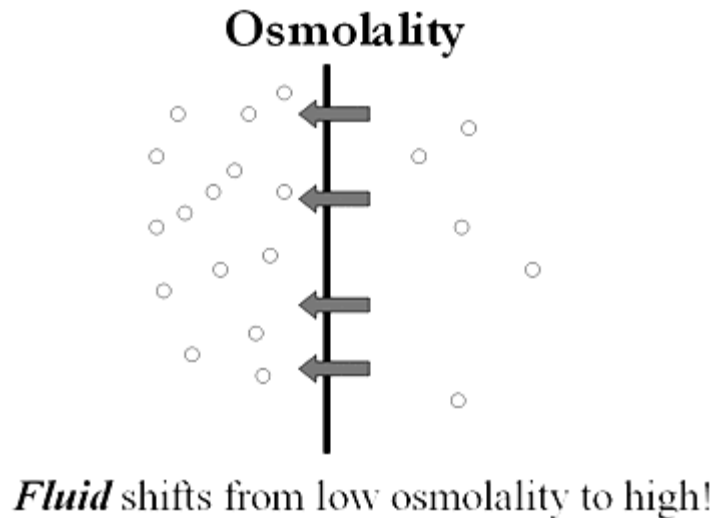
iii. Oral or IV replacement



Sudden ↑ in serum PO₄ level during treatment can cause hypocalcemia
Introduce nutrition gradually to the malnourished patient
Phosphorus levels are inversely related to Ca⁺⁺ levels

Osmolality

1. Defines force or “pull” of fluids through a membrane
2. Blood osmolality is normally 280-300 mOsm/kg H₂O
3. $\text{Osmolality} = 2 \times \text{Na} + \text{Glu} / 18 + \text{BUN} / 2.8$
4. Higher osmolality = greater “pull” of fluids
5. Lower osmolality = less “pull” of fluids



(c) 2001-2002 David W. Woodruff

References:

Clochesy, J.M., Breu, C., Cardin, S., Rudy, E.B., & Whittaker, A.A. (1996). *Critical Care Nursing*. Philadelphia: Saunders.

Guyton, A.C. & Hall, J.E. (1996). *Textbook of medical physiology*. 9th Ed. Philadelphia: W.B. Saunders.

Metheny, N.M. (1996). *Fluid and electrolyte balance*. 3rd Ed. Philadelphia: Lippincott.

Internet:

American Nephrology Nurses Association: www.anna.inurse.com

Renal World: www.renalworld.com

National Kidney Foundation: www.kidney.org

Osteoporosis Online: www.osteoporosis.ca

Lab Tests Online: www.labtestsonline.org

Supervision and Coordination of Care: 3 Questions

1. You are asked to float to a unit you are unfamiliar with. Your responsibility to that unit will be to:
 - a. Provide care at the level of the regular employees on that unit
 - b. Provide basic nursing care that is consistent with your licensure
 - c. Provide care that is consistent with your units standards
 - d. Provide only the care that you wish to

2. One of your colleagues is having difficulty with a patient's family. As a professional nurse, you should:
 - a. Offer to take the assignment
 - b. Suggest active listening techniques
 - c. Tell her to ignore the family
 - d. Talk to the family yourself

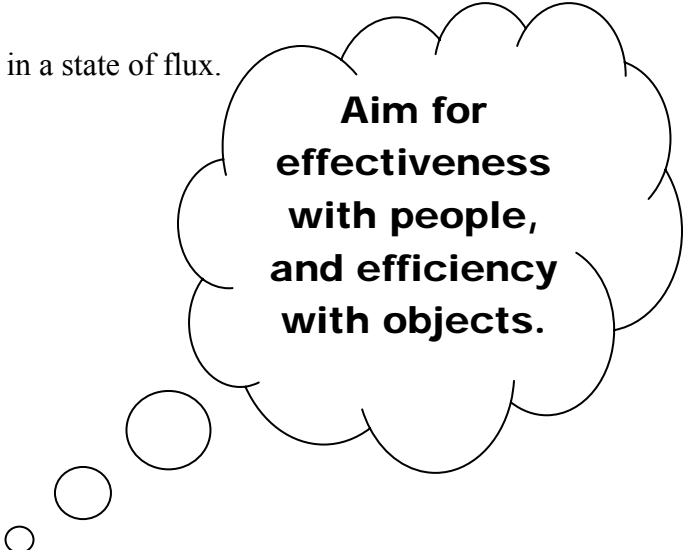
3. Members of the nursing staff are developing written patient education materials for a group of patients with diverse reading abilities. It would be *most effective* for the staff to:
 - a. Design individual handouts for each patient
 - b. Develop a computer-based education series.
 - c. Write the materials at a fourth-grade reading level.
 - d. Limit text and provide color pictures.

The 5-Point Plan for Staffing and Assignments:

1. Use Resources Effectively
 - a. Identify strengths in your team
 - b. Delegate specifically
 - c. Approach supervisors with specific requests
 - d. Focus on what you do best
 - e. Enlist champions
 - f. Take care of yourself
 - g. Take care of your team!
2. Communication (is the *key*)
 - a. Request specific information
 - b. Communicate the plan
 - c. Keep communication open
 - i. Listen first!
 - ii. Respond kindly
3. Stay in Touch
 - a. Designate reporting times
 - b. “Touch base” with the team
 - c. Convey confidence in your team
4. Reassess
 - a. Is the assignment effective?
 - b. How can it be more effective?
 - c. Who is the best person to implement the change?
5. Reorganize
 - a. Don’t force the assignment
 - b. Reorganize as necessary
 - c. Staffing & acuity is always in a state of flux.

The 5-Point Plan

1. Use Resources Effectively
2. Communication
3. Stay in Touch
4. Reassess
5. Reorganize



Aim for
effectiveness
with people,
and efficiency
with objects.

Special Situations

Special Needs Populations

1. Children on the Med-Surg Floor
 - a. Kids are not “little adults”
 - b. Less respiratory reserve
 - c. Rare cardiovascular events
 - d. Vomiting and diarrhea can lead to dehydration
 - e. Dehydration can rapidly develop into shock
 - f. Treatment is usually weight-based

Causes of Hemodynamic Instability in Children:

- Cardiac arrest: respiratory arrest
- Shock: dehydration

2. The Dying Patient
 - a. Needs to know:
 - i. Nurse cares
 - ii. Nurse is available
 - b. Wants to be comfortable
 - i. Pain
 - ii. Respiratory distress
 - c. Wants support
3. Kubler-Ross Stages of Grief
 - a. Denial
 - b. Anger
 - c. Bargaining
 - d. Depression
 - e. Acceptance

Emergency Situations

1. Respiratory Arrest
 - a. Airway
 - i. Methods of control:
 1. Oral
 2. Endotracheal tube
 3. Laryngeal mask
 - ii. Suction
 1. One dedicated suction just for the airway
 - iii. Position
 1. Jaw thrust
 - b. Breathing
 - i. Assisted with ambu bag
 - ii. Assisted with ventilator
2. Cardiac Arrest
 - a. BCLS
 - i. Airway control
 - ii. CPR
 - iii. Monitoring
 - b. ACLS
 - i. Airway control
 - ii. Assisted ventilation
 - iii. Chest compressions
 - iv. Defibrillation
 - v. Medications

ACLS Resources on the Internet:

ACLS Net: www.acls.net

ACLS Online: www.aclsonline.us

Practice ACLS: www.mdchoice.com/cyberpt/acls

ACLS Palm Pilot Software: www.palmgear.com (search for ACLS)

What You Need to Know About Standards of Care: 3 Questions

1. The ANA Code of Ethics states that:
 - a. Nurses have a responsibility to society
 - b. The nursing process includes assessment
 - c. Incompetent nurses must not care for a patient
 - d. Nurses must use the nursing process

2. In error, you give your patient a medication that was meant for another patient. Your best response would be to:
 - a. Ignore the error, it probably won't hurt him
 - b. Tell the physician, but not the patient
 - c. Tell the patient about the error, chart it, and consult with the physician
 - d. Call pharmacy and ask for an antidote

3. The role of the staff nurse in research is:
 - a. Preparing research proposals
 - b. Identifying research questions
 - c. Testing theories
 - d. Statistical analysis

The ANA Publications (full-text available from ANA)

1. ANA Standards of Practice
 - a. Minimum acceptable standards of nursing practice
 - b. Defines nursing process
 - i. Assessment
 - ii. Planning
 - iii. Intervention
 - iv. Evaluation
 - c. States that nurses use the nursing process
 - d. Often referred to in court of law

2. ANA Code of Ethics
 - a. Patient must be treated with dignity and respect
 - b. Incompetent nurses

3. Social Policy Statement
 - a. Defines nursing responsibility to society

Internet:

American Nurses Association: www.nursingworld.org

Strategies for Successful Completion of the Exam

1. Study
 - a. Where
 - i. Test your study area
 - ii. Have a backup
 - b. When
 - i. Morning is best
 - ii. Review before bed
 - c. How
 - i. Memorization is fine for numbers
 - ii. Concepts and ideas need to be integrated to be remembered
2. Review to further organized concepts and ideas
 - a. Immediate
 - i. Make your own flash cards after you read.
 1. Put into your own words
 2. Helps to identify the key points
 3. Increases comprehension and memory
 - b. Later
 - i. Repetition
 - ii. Relationships
3. Apply
 - a. Flash cards
 - b. Case studies
 - c. Best of all – use it!
4. Take the test
 - a. Rest
 - i. Plan for adequate rest
 - ii. Don't work the night before
 - iii. Don't cram!
 - b. Eat
 - i. Eat light and eat right
 - ii. Avoid fatty foods
 - c. Relax
 - i. Caring for 10 Med-Surg patients is much harder than this!
 - d. Apply what you've learned
 - i. Relate questions to your experience, but not too tightly

Success on the Certification Exam

- Read the question carefully
- If the most logical answer is readily apparent, choose it
- If not, re-read the question and start eliminating obviously wrong answers
- Then narrow the remainder down to what makes the most sense

You will have 1 minute, and 12 seconds for each question, use that time wisely.

Your action plan:

Action	Started	Completed
Decide which test to take		
When?		
Register		
Request time off		
Get study materials		
Emergency planning		
Study guide #1		
Study guide #2		
Study guide #3		

Areas to study:

Where will you study:

When will you study:

What study aids do you plan to get?

Where will you get them?

How will you test your progress?

Planning:

	Plan
Who will cover on-call/emergencies?	
Who will work the night before the test?	
Who will manage the kids/pets?	
When will you shop for healthy foods?	
Who will you get to care for ill kids, pets, or husbands/wives?	
What will you do if the car doesn't start?	
What if you get a flat tire?	
What will you do if traffic is bad?	
What alternate routes are available to the testing site?	
When do you need to go to bed the night before?	
What will you eat the morning of the exam?	
What content will you study the night before the exam?	
Will you need a hotel room the night before the exam?	
How will you pace yourself during the exam?	
How will you reward yourself for preparing and taking the exam?	

Cramming:

The night before the exam it is OK to study subjects that need memorization, or to briefly review your notes. Don't start a new topic or study difficult content. It is generally not a good idea to study the day of the exam.

Relaxation Tips the Day of the Exam:

- Slow, deep breathing is relaxing and restores oxygen to the brain.
- Gentle stretching or walking stimulates circulation and increases oxygen delivery to the brain.
- Listen to music that you like
- Avoid ingesting alcohol, cold medications, or unusual amounts of caffeine.
- Proper preparation will clear your mind of unnecessary details the day of the exam!

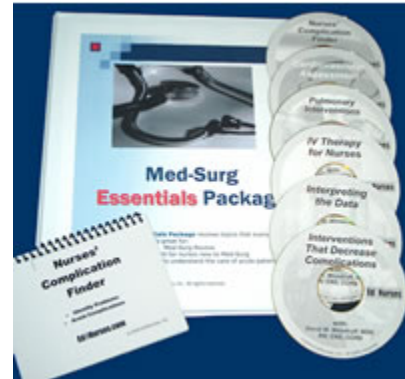
Find more certification resources at:
www.ed4nurses.com/certification.htm

Thanks for attending “MSCert: Test Prep”!

Additional resources are available from Ed4Nurses, Inc. that will help you prepare for the exam:

Medical-Surgical Nursing **Essentials** Program

Med-Surg Essentials is a unique program that explores common nursing challenges and shows you the best way to anticipate problems and avoid complications.



Medical-Surgical Nursing **Mastery** Program

Med-Surg Mastery will give you a strong foundation, while integrating tips, timesavers, and stories about real nurses who make a difference in their patient's lives.



The Full Med-Surg Curriculum

Buy the Essentials and the Mastery Packages together and kick your career into high gear!



Seminars4Nurses.com