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Presented by:
David W. Woodruff, MSN, RN-BC, CNS, CEN
CEN Success

Seminar Description:
This unique two day program presents the content of the CEN exam in a question and answer format. In-depth explanations will be presented for rationale behind correct and incorrect answers, along with the theoretical underpinnings of essential concepts. This unique, informative and fun seminar is perfect for CEN preparation, or a comprehensive emergency nursing review.

Seminar Objectives:
1. Discuss strategies for successful completion of the CEN exam.
2. Describe common gynecological conditions in the emergency department.
4. Compare and contrast common GI emergencies.
5. Plan care for the patient suffering from abdominal trauma.
6. Distinguish characteristics of hypovolemic, cardiogenic, and distributive shock.
7. Explain hemodynamic changes that occur with shock.
9. Discuss treatment measures for genitourinary emergencies.
10. Describe clinical symptoms of electrolyte disturbances.
12. Evaluate the benefits of several treatment options for respiratory emergencies.
15. Analyze nursing interventions for increased intracranial pressure and head injuries.
16. Describe common orthopedic injuries in the emergency department patient.
17. Compare and contrast diabetic ketoacidosis and hyperosmolar, hyperglycemic syndrome.
18. Define professional practice issues for the emergency department nurse.
19. Identify common signs and symptoms of childhood diseases.
20. Describe common obstetrical emergencies.
21. Compare and contrast heat-related and cold-related systemic emergencies.
22. Discuss emergency management of cardiovascular disorders.
23. Identify population-specific issues in priority setting and triage.

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CEN Success Agenda

Day 1:

8:00 a.m.  Introduction and Test Overview

8:30 a.m.  Professional Issues (7) & Patient Care Management Tasks (9)
Legal and organizational issues, patient and family education, disaster management, clinical assessment, communication, organ donation, triage, population specific issues, interfacility stabilization and transport, patient confidentiality and consent.

9:45 a.m.  Break

10:00 a.m.  Psycho/Social Tasks (6)
Anxiety / panic disorders, SIDS, abuse, end of life issues, bipolar disorder, depression, acute dystonic reactions and suicide.

10:45 a.m.  Shock/ Multi-system Tasks (11)
Hypovolemia, cardiogenic, anaphylactic, septic, and neurogenic shock and multiple trauma.

12:00 p.m.  Lunch

1:00 p.m.  Cardiovascular Tasks (21)
Cardiac dysrhythmias, acute coronary syndrome, cardiac/pulmonary arrest, thromboembolic disease, pacemakers, pharmacology unique to cardiovascular disease, cardiac trauma, hypertensive crisis, Pericarditis, HF, cardiac tamponade, and 12-lead EKG.

2:15 p.m.  Break

2:30 p.m.  Cardiovascular Continued

3:00 p.m.  Respiratory Tasks (18)
Airway obstruction, asthma, bronchitis and upper airway infections, COPD, inhalation injuries, pneumonia, pulmonary embolus, RSV, bronchiolitis, pharmacology unique to respiratory conditions, flail chest, ventilation and respiratory trauma, BIPAP& CPAP, LMA & combitubes, management of chest tube drainage, pulsus paradoxus, ABG interpretation, peak flow, surgical airways, and end-tidal CO2.

4:30 p.m.  Adjourn
Day 2:

8:00 a.m.  Substance Abuse / Toxicological and Environmental Tasks (10)
          Cold injuries, burns, CO, cocaine, envenomation, OD, food poisoning, hallucinogens, submersion injury, DTs, and Wernicke Korsakoff syndrome.

9:00 a.m.  Medical Emergencies / Communicable Diseases (15)
          Blood dyscrasias, childhood diseases, DKA, HHS, hypoglycemia, renal failure, immunocompromise/ onocological and thyroid disorders.

9:45 a.m.  Break

10:00 a.m. Medical Emergencies (cont).

10:45 a.m. Gastrointestinal Tasks (9)
          GERD, ulcers, GI obstructions, GI bleeds, appendicitis, pancreatitis, abdominal trauma, GI pharmacology, intussusception and FAST.

11:30 a.m. Maxillofacial and Ocular Tasks (6)
          Dental emergencies, otitis, foreign body in the ear, facial fractures, epiglottitis/croup, conjunctivitis, orbital trauma, ocular pharmacology and epitaxis.

12:00 p.m. Lunch

1:00 p.m.  Neurological Tasks (15)
          Stroke/ TIA, skull fractures, spinal cord injuries, head injuries, neurological pharmacology, neurological assessment, spinal stabilization, GCS, NIHSS, seizures, ICH, chronic neurological disorders and management of increased ICP.

2:15 p.m.  Break

2:30 p.m.  Orthopedic Emergencies and Wound Management (13)
          Inflammatory conditions, fractures, pharmacology and devices unique to orthopedic conditions, lacerations, wound-related infections, foreign bodies, missile injuries, bites and stings, pharmacology related to wound management, and osteomyelitis.

3:30 p.m.  Obstetrical / Genitourinary and Gynecological Tasks (10)
          Vaginal bleeding, pregnancy related conditions, trauma in pregnancy, renal & genital trauma, renal calculi, sexual assault, PID, vaginal dysfunctions, pharmacology related to gynecological conditions, HELLP syndrome, UTI, testicular torsion, newborn resuscitation.

4:30 p.m.  Adjourn
Introduction and Test Overview

1. Why Become Certified?

A Study conducted by the Nursing Credentialing Research Coalition found that certification has a profound 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
- Experienced fewer disciplinary events and work-related injuries

2. Purpose of Certification from the Board of Certification for Emergency Nursing (BCEN):

The purpose of certification in emergency nursing is to provide a mechanism to regularly measure the attainment and simulated application of a defined body of emergency nursing knowledge.

The objectives of certification are to promote quality emergency nursing care by:

- Establishing the level of knowledge, requirements, and achievements necessary for certification in emergency nursing.
- Measuring that the attainment of a defined body of emergency nursing knowledge needed to function at the competent level is current.
- Encouraging participation in continuing education for emergency nursing.
- Promoting professional development and career advancement.
- Formally recognizing nurses who meet all requirements of the CEN examination.

3. What to expect from “The Test”

- Eligibility requirements include an unrestricted RN license in the U.S. There are no practice requirements, but the BCEN does recommend two years of experience in emergency nursing.
- Fees: $360.00 for non-member; $316.00 if you join or are a member of the Emergency Nurses Association.
- Exam is computer-based, 175 questions (150 are actually scored), with a 3-hour time limit.
- Approximately 75% of the 150 questions must be answered correctly to achieve a minimum passing score.
• Upon passing the exam, the applicant is a Certified Emergency Nurse (CEN) for a four-year term. Recertification is through examination, continuing education or internet-based testing, and the cost is $190.00 if you are an ENA member.

4. Testing Dates, Places & Times

Board of Certification for Emergency Nurses (BCEN)
P.O. Box 1023
Bedford Park, IL 60499-1023
Phone: 800-900-9659 ext. 2630
Email: BCEN@ena.org
Web: www.ena.org/bcen

Applied Measurement Professional Inc. (AMP)
8310 Nieman Road
Lenexa, KS 66214-1579
Phone: 800-345-6559
Email: info@goAMP.com
Web: www.goAMP.com

Over 100 testing centers nationwide

5. What to bring with you:
   a. Photo ID
      i. Driver’s license
      ii. State ID card
      iii. Military ID card
   b. Second ID without photo
   c. Verification letter from the BCEN
   d. Do not bring any personal items in with you; you will not be allowed to have them in the room while testing.

Please Note:
This is a focused 90-day program designed to assure your success on the CEN 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!
Patient Care Management (9) Professional Issues (7)

1. Which device is considered unacceptable for interfacility transfers by helicopter?
   a. MAST pants
   b. Glass IV bottles
   c. Inflatable splints
   d. Heimlich valves

2. Which of the following statements about tissue procurement from a donor is true?
   a. It can occur only if the donor is hemodynamically stable.
   b. It should occur before breathing has stopped.
   c. It should occur only if the patient was previously healthy.
   d. It can occur after death.

3. Teaching a patient with renal calculi the importance of increased fluid intake is an example of which type of learning?
   a. Affective
   b. Cognitive
   c. Psychomotor
   d. Social

4. What should the nurse tell the patient with acute pyelonephritis to do to prevent it from happening in the future?
   a. Teach the patient about the importance of wiping the perineum from front to back after bowel elimination
   b. Urinate every 4 hours
   c. Decrease water intake
   d. Decrease intake of calcium

5. The goal of disaster triage in the emergency department is to:
   a. Provide a detailed patient assessment
   b. Carry out the priority classifications as assigned at the scene
   c. Ensure each treatment area has an equal patient load
   d. Identify viable patients and get them to the correct treatment area

6. The emergency department is in disaster status. A mother brings in her 4 month-old child who is pulseless, and apneic. What level would you classify this patient according to the disaster triage protocol?
   a. Red
   b. Yellow
   c. Green
   d. Black
7. A client with asthma is given discharge instructions regarding asthma triggers. Which statement indicates the need for further teaching?
   a. “I should stay away from foods that may trigger my attacks.”
   b. “I should quit smoking.”
   c. “I should exercise only if it is cold outside.”
   d. “I will contact my physician if I develop an upper respiratory infection.”

8. Which intervention must be completed before transfer of a trauma patient?
   a. Suture all lacerations
   b. Ensure that a family member is available to go with the patient
   c. Ensure that the endotracheal tube is placed correctly and secured
   d. Attach the patient to your ER’s transport monitor

9. Pediatric or adult patients with language difficulty may not be able to describe their pain. Which of the following scales would you use to assess this patient’s pain level?
   a. Numeric rating scale
   b. Visual analog scale
   c. Faces scale
   d. Braden scale

10. A new research study shows that an intervention would help your patient. The best action to take would be:
    a. Implement the strategy, even though it is contrary to hospital policy
    b. Ask the physician to order the intervention
    c. Request a policy change from administration
    d. Bring the study results to the attention of the physician and administration

11. If you feel that one of your hospital’s policies is outdated and ineffective, the best action to take is to:
    a. Complain loudly about it
    b. Learn how to navigate the system to change it
    c. Tell your patients about it
    d. Ridicule it publicly on an internet discussion group

12. If the progressive-care nurse has questions about a patient’s response to therapy, it is his responsibility to:
    a. Seek the education to fully understand it
    b. Not let it bother him
    c. Ignore it, this is the physician’s realm
    d. Refuse to treat the patient

13. A float nurse is assigned to your unit. You can best support her by:
    a. Providing her with a brief orientation
    b. Telling her to call on you with any questions
    c. Giving her your policy manual
    d. Assigning her to the least acute patients
14. 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

15. During your triage assessment, you find that your patient takes the herbal preparation Ginseng daily. Your assessment should include:
   a. Assessing for hypotension
   b. Watching for bleeding
   c. Analyzing blood lipid levels
   d. Evaluating for depression

16. A nurse new to your unit is having trouble using your monitors. Your best response is to:
   a. Provide the operational manual for the monitor
   b. Assist her with the operation of the monitor
   c. Set up the monitor for her
   d. Answer her questions as she sets up the monitor
Triage

1. Comes from the French word *trier*, which means to sort or choose.
   a. Concept used in Napoleonic times when soldiers wounded in battle were sorted according to injury severity.

b. Types of Triage scales
   i. Leveled-triage
   ii. Manchester Triage Scale
   iii. Emergency Severity Index

c. The Process
   i. Across-the-room assessment
   ii. The Pediatric Assessment Triangle

iii. Triage Interview
   1. Establish a chief complaint
   2. Obtain a description of relevant signs and symptoms
   3. Perform a targeted history and examination
   4. Assign a patient severity rating

iv. Tools for triage assessment
   1. CIAMPEDS
      C = Chief Complaint
      I = Immunizations/Isolation
      A = Allergies
      M = Medications
      P = Past medical history, Parent concern
      E = Events leading to the illness/injury
      D = Diet/Diapers
      S = Symptoms
   2. W questions
3. PQRST
   P = Provocation and Palliation
   Q = Quality and Quantity
   R = Region and Radiation
   S = Severity and Scale
   T = Timing and Type of Onset

v. Documentation
   1. Clear, concise & support the assigned triage rating
   2. SOAPIE
      S = Subjective
      O = Objective
      A = Assessment
      P = Plan
      I = Intervention
      E = Evaluation

d. Emergency Medical Treatment and Active Labor Act (EMTALA)
   i. Federal law originally passes in 1985 in an effort to stop hospitals from “dumping” nonpaying patients on another facility.
   ii. Medical Screening Exam (MSE)
       1. Patient assessment process
       2. RN’s may perform MSE, but by protocol most facilities delegate this task to the physician, PA or NP.

e. Qualifications according to the ENA
   i. RN, with minimum of 6 months of emergency nursing experience
   ii. Formal triage education with a supervised preceptorship
   iii. ACLS, ENPC, TNCC, CEN (preferred)
Patient Assessment

1. Primary Assessment (Objective Assessment)
   a. Airway
      i. Is it patent?
      ii. Position the airway, maintain cervical spine immobilization.
      iii. Remove debris
      iv. Insert oropharyngeal or nasopharyngeal airway to maintain patency.
         1. Oropharyngeal airway is measured from the corner of the mouth to the tip of the ear lobe. (NEVER use in a conscious patient)
         2. Nasopharyngeal airway is measured from the tip of the nose to the ear lobe, using the largest size that will fit the patient’s nostril.
   b. Breathing
      i. Position patient to maximize ventilation
      ii. Provide supplemental oxygen
      iii. Auscultate breath sounds
      iv. Provide PPV or intubate if necessary
         1. Normal adult ETT size is 6.5 to 8
         2. Use Broselow Tape for Pediatric patients or the size of the patient’s little finger is an estimate.
            Uncuffed predicted tube size = (Age / 4) + 4
            Cuffed predicted tube size = (Age / 4 + 3
      v. Relieve tension pneumothorax.
         1. Insertion site is 3rd intercostal space, midclavicular line on the affected side.
         2. Insert directly over the 2nd rib
         3. Will need a Heimlich Valve or a Chest Tube
   iv. Institute therapy for bronchospasm or pulmonary edema.

Adventitious Breath Sounds

<table>
<thead>
<tr>
<th>Crackles (Rales)</th>
<th>Intermittent, nonmusical, heard on inspiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheezes</td>
<td>High-pitched, caused by blocked airflow, heard on exhalation or inspiration as block increases.</td>
</tr>
<tr>
<td>Rhonchi</td>
<td>Low-pitched, snoring or rattling, heard on exhalation and may clear with coughing.</td>
</tr>
<tr>
<td>Stridor</td>
<td>Loud, high-pitched, heard during inspiration</td>
</tr>
<tr>
<td>Pleural friction rub</td>
<td>Low-pitched, grating sound, heard on inspiration and expiration. Patient will c/o pain.</td>
</tr>
</tbody>
</table>
c. Circulation
   i. Initiate chest compressions, ACLS protocol if indicated
   ii. Treat dysrhythmias
   iii. Control bleeding
   iv. IV access
   v. IVF and Blood products if needed.
   vi. Auscultation of Heart Sounds
      a. S1- “lub”- best heard over the apex of the heart, occurs at the beginning of ventricular systole.
      b. S2- “dub”- best heard at the base of the heart, occurs at the end of ventricular systole.
      c. New S3: heart failure
      d. New S4: MI

2. Secondary Assessment
   a. General Observations
   b. Head & Face
   c. Neck
   d. Chest
   e. Abdomen
   f. Extremities
   g. Back
   h. Vital Signs
      i. Temperature- abnormally high or low should be confirmed with rectal.
      ii. Pulse- rate, quality, capillary refill, compared on each side of body.
      iii. Respiration- rate & work of breathing.
      iv. Oxygen Saturation- essential with respiratory complaints, altered LOC, serious illness or any abnormal vital signs.
      v. Blood Pressure- use correct size
         1. Systolic BP component of cardiac output
         2. Diastolic BP component of the vasculature
         3. Orthostatic Vital Signs:
            a. Obtained for syncope or dehydration
            b. BP & HR & symptoms after 1 min.
            c. BP & HR after 3 min.
            d. Positive test = Increase in HR > 30 bpm or dizziness or syncope develop.
      vi. Height, weight & head circumference- JCAHO requires head circumference under age 2 as appropriate.
3. History (Subjective Assessment)
   a. SAMPLE
      S = Signs/symptoms
      A = Allergies
      M = Medications
      P = Pertinent past history
      L = Last oral intake
      E = Events leading to injury/illness
   b. CAGE
      C = Cut down
      A = Annoyed
      G = Guilty
      E = Eye-opener
   c. Gender Neutral Questions
   e. Age-Specific Considerations

4. Systems Assessment
   a. Neurologic – GCS & Cranial Nerves
   b. ENT
   c. Cardiovascular
   d. Respiratory
   e. GI/GU
   f. Musculoskeletal
   g. Skin
   h. Hematologic
   i. Endocrine
   j. Immunologic

Legal Issues

1. Nurse Practice Acts- varies state to state
   a. Determines qualifications for entry into professional nursing
   b. Defines educational responsibilities
   c. Regulates advanced practice nurses

2. Confidentiality & HIPPA
   a. $50,000 and one year imprisonment
   b. Mandated reporting
      i. Child abuse
      ii. Death in ED and Death within 48 hours of hospital admit
      iii. Elder abuse
      iv. Elopement of psychiatric patients
      v. GSW/ Homicide/ stab wounds
      vi. Rape
      vii. Infectious outbreaks

Include:
- Patient’s chief complaint
- History of present illness
- PMH
- Current medication
- Family history
- Social history
- Review of systems
3. EMTALA & Interfacility Transfers
   a. Prevent “dumping”
   b. Ensure accepting facility has actually accepted the patient
   c. Send all medical records
   d. Obtain written consent for transfer
   e. Patient must be “stabilized” prior to transfer. If “unstable” benefits must outweigh the risks of transfer.

4. Types of law
   a. Civil Law- addresses injury to individuals and/or their property
   b. Criminal Law- addresses injury to society.

5. Professional Negligence
   a. Duty- established relationship between patient and healthcare worker
   b. Breach of Duty- patient complains that care was sub-standard
   c. Proximate Cause- proof that there was a breach of duty & that breach caused injury
   d. Injury- injury must be proven and occurred because of the negligence of the defendant.
Intrafacility & Interfacility Transport

1. Ensure patient safety - adequate supplies, oxygen, monitoring

2. Ground (ALS vs. BLS)

3. Air Transport (rotary vs. fixed wing)
   a. Definitive airway
   b. Chest Tubes
   c. Stable Hemodynamically
   d. Intravenous Access
   e. Foley catheter
   f. Normalize ICP
   g. C-spine precautions
   h. No air splints & no circumferential splints
   i. No hanging weights

Emergency Preparedness

1. Phases of Emergency Management

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
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<tbody>
<tr>
<td>Mitigation</td>
<td>Identify potential disasters. Assess vulnerability</td>
</tr>
<tr>
<td>Preparedness</td>
<td>Develop policies &amp; procedures to manage emergencies</td>
</tr>
<tr>
<td>Response</td>
<td>Implement P &amp; P in planning phase</td>
</tr>
<tr>
<td>Recovery</td>
<td>Design recovery activities get back to normal ASAP</td>
</tr>
</tbody>
</table>
2. Disaster Triage
   a. Red - critical patients
   b. Yellow - urgent patients
   c. Green - “walking wounded”
   d. Black - dead or imminent death

3. Disaster Management Teams
   a. Federal Emergency Management Agency (FEMA) - responsible for disaster management at all government levels
   b. National Disaster Medical Systems (NDMS) - Assists in the treatment and evacuation of patients at disaster scenes.
   c. Disaster Medical Assistance Teams (DMATS) - consists of medical professionals who respond to assist in the disaster.

4. Disaster Classifications
   a. Multi-patient incident = < 10 casualties
   b. Multiple-casualty incident = 100 or less (fires, biochemical accidents)
   c. Mass casualty = > 100 (earthquake, hurricane, explosions)
   d. Internal disaster = hospital partially or totally inoperable (power outage)

5. Weapons of Mass Destruction
   a. Recognize & Identify
   b. Decontaminate & Treat
      i. Explosives - primary, secondary & tertiary
      ii. Chemical - decontaminate, gross vs. technical
         1. Levels of PPE – Tyvec suit, gloves, a PAPR for highly contagious biological event

Patient and Family Education

1. Assessment - language barriers, educational level, anxiety

2. Learning goals & objectives - established by the nurse and the patient to meet the patient’s needs.

3. Patient education is the responsibility of the ED nurse according to state nurse practice acts and JCAHO, don’t wait until discharge.

4. Types of Learning
   a. Cognitive - require thinking and reasoning
   b. Affective - involves feelings & attitudes, takes more time to accomplish
   c. Psychomotor - requires coordination to complete a task
Your Questions:

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   a. __________________________________________________
   b. __________________________________________________
   c. __________________________________________________
   d. __________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   a. __________________________________________________
   b. __________________________________________________
   c. __________________________________________________
   d. __________________________________________________

3. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   a. __________________________________________________
   b. __________________________________________________
   c. __________________________________________________
   d. _________________________________________________
Psychological/ Social Issues (6)

1. When communicating with a family who is grieving the nurse should:
   a. Tell the family that the patient is “in a better place”
   b. Tell the family that “we did everything possible”
   c. Tell the family that the patient has “passed on”
   d. Use words such as dead and died

2. Which of the following statements in incorrect regarding advanced directives?
   a. An advanced directive is equivalent to a DNR order.
   b. An advanced directive is to encourage patients and families to understand & discuss treatment options.
   c. State law is the legal basis for advanced directives.
   d. An advanced directive is a means of documenting an individual’s wished regarding health care.

3. Which of the following may be an indication of child abuse?
   a. Multiple bruises in various stages of healing
   b. 2 cm forehead laceration
   c. Hematoma on the occiput
   d. Fractured ankle

4. Sudden Infant Death Syndrome (SIDS) is most common at what age?
   a. 2-3 years
   b. 2-4 weeks
   c. 2-4 months
   d. 6 months-1 year

5. Which of the following are signs and symptoms of post traumatic stress disorder (PTSD) following a crisis event?
   a. Anger & guilt
   b. Denial
   c. Alcoholism
   d. Flashbacks & recurring dreams

6. Which of the following is an appropriate outcome for a patient experiencing visual hallucinations from acute delirium?
   a. The patient states, “Thanks for removing the bugs from my bed.”
   b. The patient states, “The bugs on my bed aren’t real.”
   c. The patient states, “The bugs on my bed won’t hurt me.”
   d. The nurse sprays the patient’s room with “bug spray.”
Mental Health Assessment

1. Initial Assessment- determine need of emergent care
   a. Suicidal ideation/gestures
   b. Self-mutilation
   c. Poor impulse control/ violence
   d. Drug & ETOH abuse
   e. Homicidal ideation

2. Secondary Assessment
   a. Appearance
   b. Ability to participate in the interview
   c. Speech (rate, tone, fluency)
   d. Mood & affect
   e. Cognition & thought control
   f. Insight & judgment

General Approach to Mentally Disturbed Patient

✓ Attempt to establish a good rapport
   ✓ Use eye contact
   ✓ Appear relaxed
✓ Listen & validate the patient’s feelings
   ✓ Focus on chief complaint
✓ Speak clearly & honestly without using hospital jargon
✓ Expect safe behavior and communicate this clearly
   ✓ Take the patient seriously
✓ Ask for help if you feel unsafe

Acute Anxiety/Panic Attack

1. Signs & Symptoms
   a. Hyperactivity
   b. Dry mouth
   c. Tremors
   d. Chest pressure/ pain
   e. Choking sensation
   f. Impending doom
   g. Tachycardia/ tachypnea
   h. Sweating/ sweaty palms
   i. Hyperventilation
2. Levels of anxiety

<table>
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<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>Mild</td>
<td>Productive state, can benefit from information sharing about anxiety</td>
</tr>
<tr>
<td>Moderate</td>
<td>Can be productive but expends more energy, need directive-supportive relationship.</td>
</tr>
<tr>
<td>Serious</td>
<td>Usually nonproductive, nurse must take control of the situation, give direct commands in short, simple sentences and focus on intellectual functioning.</td>
</tr>
<tr>
<td>Severe</td>
<td>Crippling and may be contagious, isolate the patient, do not leave alone, and be supportive and firm.</td>
</tr>
<tr>
<td>Terror</td>
<td>Do-or-die situation, assume total responsibility for the patient.</td>
</tr>
</tbody>
</table>

3. Therapeutic Interventions
   a. Goal is self-control
   b. Provide support
   c. Keep calm and appear calm
   d. Encourage the patient to talk
   e. Direct toward reality
   f. Help patient identify anxiety source
   g. Avoid false reassurance
   h. Consider anti-anxiety medications
      i. Diazepam
      ii. Librium
      iii. Lorazepam
      iv. Klonopin

4. Obsessive-compulsive Disorder
   a. Obsessive- Pre-occupation with persistent, intrusive thoughts that cannot be dismissed.
   b. Compulsive- Repeated performance of rituals, designed to produce or prevent some event.

5. Post Traumatic Stress Disorder (PTSD)
   a. Reaction to witnessed or experience catastrophic event, such as war, rape, injury.
   b. Signs and Symptoms
      i. Flashbacks of the event
      ii. Psychogenic amnesia
      iii. Difficulty concentrating/ nightmares
      iv. Substance abuse
      v. Impaired relationships
6. Acute Grief / Bereavement
   a. Response to a significant loss
   b. Signs & Symptoms
      i. Shock, disbelief,
      ii. Emotional liability
      iii. Inability to concentrate
      iv. Anger, sadness, or guilt
      v. Anorexia or change in weight and/or appetite

7. Depression
   a. High prevalence and result in significant morbidity and mortality.
   b. Signs & Symptoms
      i. Feelings of worthlessness, loneliness, sadness
      ii. Guilt
      iii. Sleep disturbances
      iv. Suicidal ideation
      v. Diminished interest in usual activities with fatigue esp. in the morning
      vi. Psychotic symptoms in severe depression

**Acute Psychotic Disorders**

1. Bipolar Disorder
   a. Signs & Symptoms (Manic Stage)
      i. Elation that is unstable
      ii. Irritability or irrational anger
      iii. Pressured speech and/or signs of anxiety
      iv. Grandiose ideas
      v. Preoccupation with sex
      vi. Bright-colored clothing, overdone makeup
   b. Signs & Symptoms (Depressive Stage)- same as depression

2. Violent patient
   a. **Safety is the first priority**, requires rapid accurate assessment and diagnosis.
   b. Factors that increase risk:
      i. Psychological- anxiety, fear, inability to cope, history of physical or sexual abuse.
      ii. Organic- ETOH or drugs, medication side effects, delirium
      iii. Psychotic- delusional beliefs of persecution, “voices”, depression & acute suicidal and/or homicidal intent.
3. Therapeutic Interventions
   a. Approach the patient with an obvious show of force (group of people)
   b. Confiscate all potentially harmful objects
   c. Restraint as necessary
   d. Designate a patient liaison
   e. Speak in simple, direct, sentences
   f. Observe for suicidal or homicidal attempts.

**Acute Dystonic Reactions**

1. Extrapyramidal side effects
   a. Signs & Symptoms
      i. Dystonia (disordered tonicity of muscles), tremor
      ii. Akathisia (urge to move constantly)
      iii. Anxiety, depression, paranoia, slurred speech
      iv. Vital signs usually normal
   b. Common Medications that cause EPS
      i. Prochlorperazine (Compazine)
      ii. Chloroprazine (Thorazine)
      iii. Fluphenazine (Prolixin)
      iv. Haloperidol (Haldol)
      v. Droperidol (Inapsine)
   c. Treatment
      i. Medications
         1. Diphendydramine (Benadryl) or Cogentin
         2. Propanolol (Inderal) for akathesias
      ii. Inform the patient that this is usually completely reversible.

2. Neuroleptic Malignant Syndrome
   a. Signs & Symptoms
      i. Hyperthermia
      ii. Severe muscular rigidity
      iii. Autonomic instability
      iv. Change in LOC
      v. Diaphoresis
      vi. Leukocytosis
      vii. Rhabdomyolysis & renal failure
   b. Can occur within days or months of initiating an antipsychotic medication
   c. Treatment
      i. Stabilize BP
      ii. Normalize temp.
      iii. Correct hypoxia
      iv. Dantrium
Suicide Attempt

1. Assessment
   a. Gender
   b. Age
   c. Race/ethnic groups
   d. Marital status
   e. Family history
   f. Seasonal
   g. Other

2. Signs & Symptoms
   a. Feelings of worthlessness
   b. Restlessness, agitation
   c. GI complaints
   d. Fatigue, insomnia
   e. Actual attempt that was unsuccessful
   f. Chronic illness with little hope of improvement

3. Therapeutic Interventions
   a. Evaluate the problem with the patient
   b. Involve family and friends in the process
   c. Contract for safety
   d. Consider hospitalization if high threat

Abuse

1. Intimate Partner Violence (domestic violence)
   a. Occurs in all socioeconomic statuses, races, age groups, religions, educational, and sexual lifestyles.
   b. May be emotional, physical, psychological, sexual, or economical
   c. Signs & Symptoms
      i. Avoids eye contact
      ii. History of traumatic injuries inconsistent with explanation
      iii. Denies abuse but has unexplained injuries
      iv. Fear of returning home or concern for safety
      v. Injuries to hidden areas
      vi. Pregnancy
      vii. Complaints of chronic pain
      viii. Delay in treatment
   d. Treatment includes that of the injuries but also establishing a safety plan, & giving information of resources.
   e. Know your state and hospital policies regarding reporting.
2. Child Abuse
   a. Physical & Behavioral signs:

   **Red Flags**
   ✓ Multiple bruises in various stages of healing
   ✓ Desire to leave by a specific time
   ✓ Lack of direct eye contact when describing what happened
   ✓ Conflicting stories from the patient and caregiver
   ✓ Unexplained fractures/dislocations involving skull, ribs, or bones around joints (multiple spiral fractures)
   ✓ Unexplained burns to palms, soles of feet, buttocks or back
   ✓ Afraid to go home
   ✓ Avoids contact with parents and/or adults
   ✓ Cries excessively or sits and stares
   ✓ Extremely upset with others around them cry

   b. Mandated Reporting
**Elder Abuse and Neglect**

“Intentional actions that cause harm or create a serious risk of harm to a vulnerable elder by a caregiver or other person who stands in a trusted relationship to the elder.”

“Failure by a caregiver to satisfy the elder’s basic needs or to protect the elder from harm.”
-US National Academy of Sciences

**Risk factors for abuse:**
1. Shared living with the abuser
2. Dementia
3. Social isolation
4. Mental illness (patient and caregiver)

**Types of abuse:**
1. Physical
2. Emotional
3. Financial
4. Sexual
5. Neglect
6. Self-neglect

**Clinical Signs:**
1. Unexplained injuries
2. Delay in seeking treatment
3. History inconsistent with injury
4. Poor hygiene, dehydration, decubitus ulcers
5. Bruising, welts, lacerations in various stages of healing

**Strategies to decrease abuse and neglect** (from “Missing Voices” WHO)
1. Awareness and education
2. Intergenerational relationships
3. Training of professionals
4. Empowerment of elders
5. Role of the media
6. Recreation facilities
7. Structural solutions
8. Research

**Emergency management**
1. Admit patient to hospital
2. Court protective order
3. Safe house

_Caregiver stress_ is not a cause for abuse. Some caregivers are under incredible stress yet do not abuse. Others will abuse as they become stressed. Stress should be viewed as a trigger for abuse, rather than a cause.

Abuse rarely resolves – it usually escalates.
Your Questions:

1. ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   a. ___________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________

2. ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   a. ___________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________

3. ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   a. ___________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________
Shock / Multi-system Emergencies (11)

1. Initial treatment for hypovolemic shock includes:
   a. Vasopressors
   b. Volume resuscitation
   c. Stopping the loss
   d. Antibiotics

2. Death from multisystem trauma that occurs within minutes is usually caused by:
   a. Great vessel laceration
   b. Head injury
   c. Pelvic fracture
   d. Multisystem organ failure

3. A defining characteristic of septic shock that differentiates it from other types of shock is:
   a. Low blood pressure
   b. Wide pulse pressure
   c. Decreased urine output
   d. Tachycardia

4. The systemic inflammatory response syndrome (SIRS) can cause multi-organ dysfunction. The first organ to be involved is:
   a. The heart
   b. The lungs
   c. The brain
   d. The liver

5. A patient was the unrestrained driver in a single-car MVA. He has sustained a pelvic fracture, and left femur fracture. He is diaphoretic, pale and his vital signs on arrival are HR 140, RR 32, B/P 90/70. This patient is at risk for what type of shock?
   a. Cardiogenic
   b. Hypovolemic
   c. Septic
   d. Neurogenic

6. Which nursing diagnosis best describes a patient in septic shock with a CVP of 2 cm H2O?
   a. Impaired gas exchange
   b. Risk for impaired tissue perfusion
   c. Excess fluid volume
   d. Risk for deficient fluid volume
7. Which of the following is the correct initial bolus for fluid replacement in a pediatric patient?
   a. 30 ml/kg
   b. 100 ml/kg
   c. 10 ml/kg
   d. 20 ml/kg

8. Which of the following is a _not_ risk factor for cardiogenic shock?
   a. AMI
   b. Heart failure
   c. Intestinal obstruction
   d. Myocardial contusion

9. A patient is brought to the emergency department via ambulance. He was the unrestrained passenger of a motorcycle collision with a tree. He has a decreased LOC, his skin is warm and flushed, and his vital signs are HR 45, RR 18, BP 70/50, temp. 96.8 degrees F. This patient is at risk for which of the following types of shock?
   a. Cardiogenic
   b. Septic
   c. Anaphylactic
   d. Neurogenic

10. A mother brings her 4 month-old child to triage. She states that he has a history of vomiting & diarrhea for the past three days. Which of the following findings would indicate that the child is in the late stages hypovolemic shock?
    a. Tachycardia
    b. Inconsolability
    c. Urine output 4 ml/hr.
    d. Bradycardia

11. During the initial phase of resuscitation, which of the following IV fluids should be infused?
    a. NS
    b. ½ NS
    c. D5 ½ NS
    d. Hespan
Cardigenic Shock

A shock state where decreased cardiac output is the primary cause of the patient’s hypotension and tachycardia is called cardiogenic. Cardiogenic shock is a syndrome of progressive cardiac failure where cardiac output no longer provides enough oxygenation to the heart to maintain an adequate cardiac output. Compensatory mechanisms (sympathetic nervous system, rennin-angiotension system, and the aldosterone system) are activated and actually make the patient worse. The goal in treating cardiogenic shock is to increase oxygen supply to the heart to increase cardiac output.

1. Prevention
   a. Anticipate
      i. Complication of MI
      a. “Plug in the pump”
         i. Supplemental oxygen
         ii. Slow the heart down
            1. Increases diastolic filling time
            2. Decreases heart rate
         iii. Decrease stretch
   
2. Presentation
   a. Hypotension, tachycardia
   b. Narrow pulse pressure
   c. Fluid volume overload
      i. Positive I & O
      ii. Increased weight
      iii. Pulmonary edema
      iv. Jugular venous distension

3. Prompt action
   a. Balance the ventilation-perfusion train
   b. “Plug in the pump”
   c. Positive inotropes
Hemodynamics

Component | Factors affecting | Assessment
---|---|---
Preload | Fluid volume | I & O
 | | Weight
 | | Jugular veins
Contractility | Fluid volume, Oxygenation, Resistance | Heart rate
 | | Systolic blood pressure
 | | Organ perfusion:
 | | - Brain
 | | - Kidneys
 | | Peripheral perfusion
 | | - Capillary refill
 | | - Pulses
Afterload | Arterial vascular resistance | Diastolic blood pressure
 | | Skin temperature and color
Hypovolemic Shock

Results commonly from acute blood loss (20% of total volume), potentially life threatening. Reduced intravascular volume leads to decreased cardiac output and inadequate tissue perfusion. Tissue anoxia leads to lactic acidosis.

1. Prevention
   a. Anticipate
      i. GIB, internal or external hemorrhage
      ii. Intestinal obstruction
      iii. Acute pancreatitis
      iv. Ascites
      v. Dehydration from severe diarrhea, protracted vomiting, DI, inadequate fluid intake, excessive perspiration.
      vi. Pelvic and femur fractures
   b. Stop the loss
      i. Supplemental oxygen
      ii. IVF until definitive treatment
      iii. Estimate fluid loss

2. Presentation
   a. Pale, cold, clammy skin
   b. Decreased LOC
   c. Lack of tears in children
   d. Capillary refill > 2 seconds
   e. Rapid shallow respirations
   f. Low H & H
   g. Increased urine specific gravity (> 1.020)
   h. Urine sodium < 50 mEq/L
   i. Decreased pH & PaO2, increased PaCO2
   j. Occult blood
   k. Elevated serum K, NA, BUN
   l. Depressed fontanels in infants

3. Prompt Action
   a. Stop the loss
   b. Balance the ventilation perfusion train
   c. Infuse crystalloids and colloids
      i. NS or LR (use with massive bleeding)
      ii. Albumin or plasma expanders
      iii. Obtain type and crossmatch
      iv. Insert foley catheter assess urine output hourly
      v. Monitor hemodynamic parameters

Estimated blood Loss by Site of Injury
Pelvic fracture – 3000 mL
Femur fracture – 1000 mL
Tibial fracture – 650 mL
Intraabdominal injury - 2000 mL
Thoracic Injury - 2000 mL

Which one first?
1. Stop the loss
2. NS/LR while T&C
3. Platelets / FFP
4. RBCs
vi. Monitor oxygen saturation and ABG’s, anticipate need for intubation and mechanical ventilation if needed.
vii. Keep the patient warm

Hemodynamics in Hypovolemic Shock

Distributive Shock

Anaphylactic
A life-threatening antigen-antibody hypersensitivity reaction resulting from re-exposure to an antigen. Antigen exposure triggers the release of mediators that cause massive vasodilation, increased capillary permeability and redistribute fluid into interstitial spaces causing profound hypovolemia, pulmonary congestion, & vascular collapse. Angioedema may develop and cause airway obstruction.

1. Prevention
   a. Anticipate
      i. Rapidly progressing urticardia
      ii. Respiratory distress
      iii. Stated exposure to an allergen
      vi. Feeling of impending doom
      v. Abdominal pain
b. Common allergens
   i. Vaccines
   ii. PCN or other antibiotics
   iii. Sulfa
   iv. Local anesthetics
   v. Salicylates
   vi. IV contrast
   vii. Food proteins (legumes, nuts, berries, seafood, eggs)
   viii. Insect venom

2. Presentation
   a. Respiratory difficulty
      i. Stridor
      ii. Airway obstruction
      iii. Bronchospasm
      iv. Wheezing (may signal improved airflow or if wheezing decreased may signal bronchoconstriction)
   b. Hypoxia
   c. Hypotension
   d. Tachycardia
   e. Urticaria
   f. Angioedema
   g. Puritis
   h. Warm, dry skin late stages becomes cool and pale
      i. Abdominal pain and diarrhea
      j. Chest tightness
      k. Respiratory or Cardiac arrest

3. Prompt Action
   a. Support ABCs
      i. High flow oxygen
      ii. IV fluids
   b. Epinephrine
      i. IV- 0.1 to 0.5 ml of a 1:10,000 solution by SLOW IVP, for severe shock or airway obstruction.
      ii. Subcut- 0.2 to 0.3 mL of a 1:1,000 solution. (repeat)
      iii. Inderal for persistent epi-induced hypertension & tachycardia
   c. Nebulized bronchodilator (Albuterol) for bronchospasm
   d. Diphenhydramine (Benadryl) (histamine-1 blocker) & famotidine (Pepcid) (histamine-2 blocker) to decrease circulating histamine levels.
   e. Steroids (SoluMedrol) to limit the inflammatory response.
Septic Shock

1. Maldistribution of blood volume (massive vasodilation)
   a. Sepsis (most common)
   b. Anaphylactic
   c. Neurogenic
   d. Spinal

2. Hyperdynamic stage:
   a. Tachycardia, ↑ CO
   b. ↓ afterload
   c. Flushing
   d. Fever
   e. ↑ blood glucose

3. Shock stage
   a. ↑ HR, ↑ RR
   b. ↑ afterload
   c. Hypothermia
   d. ↓ organ perfusion

4. Sepsis stimulates the Systemic Inflammatory Response Syndrome (SIRS)

Sepsis Syndrome

Initiation  Inflammation  Organ Dysfunction

- Infection
- Injury
- Ischemia

Sepsis  Severe Sepsis  Septic Shock  MODS

1° Injury  SIRS  2° Injury

Lung
Kidney
Platelets
Liver
Heart
Brain

(c) 2007 Ed4Nurses, Inc.
5. Compensatory mechanisms activated r/t ↓ B/P

6. Treatment goals:
   a. “Fill” vascular space
   b. Prevent secondary organ damage
      i. Vasopressors
         1. Dopamine
         2. Levophed
         3. Neosynphrine
         4. Vasopressin
      ii. IV fluids
      iii. Colloids
      iv. Blood products
      v. Xigris

Hemodynamics in Sepsis
Neurogenic Shock

Neurogenic shock results from a loss of sympathetic tone which interferes with the body’s ability to vasoconstrict. It leads to an unopposed vagal response causing bradycardia and hypotension. Neurogenic shock is associated with spinal cord injuries above T6. It causes dilatation of the arterioles and venules, producing a relative hypovolemia and hypotension. In neurogenic shock the vascular volume remains in the vasculature but it has to travel through dilated vasculature, causing venous and arterial pooling.

1. Anticipate
   b. Can also occur with spinal anesthesia but is temporary
   c. Adrenergic-blocking agents (Cardura & Hytrin).

2. Presentation
   a. Bradycardia & warm, dry, flushed skin
   b. Hypotension (watch DBP dropping)
   c. Tachypnea
   d. Good pulses
   e. Pale, cool, clammy skin above the level of the lesion
   f. Poikilothermy (loss of temperature control)
   g. Priapism (persistent penile erection)
   h. Decreased LOC

3. Prompt Action
   a. Support A,B,C’s
   b. Supine position
   c. Spinal immobilization
   d. Give IVF, crystalloids
   e. Vasopressors
   f. Solumedrol (injury < 8 hours old)
   g. Atropine for symptomatic bradycardia
   h. Maintain normal body temperature

Multiple Trauma

Mechanism of Injury
1. Means by which energy is transferred for the environment to the patient.
   a. MVA- blunt trauma
   b. GSW & impalement injuries- penetrating trauma
2. Primary Survey
   a. A: Airway - remember C-spine
   b. B: Breathing
      i. High flow O2, non-rebreather mask
      ii. PPV
      iii. Confirm ETT placement
      iv. Treat thoracic injuries - cover sucking chest wounds, relieve tension pneumo, stabilize flail chest, insert CT
      v. Check oxygen saturation and ABGs.
   c. C: Circulation
      i. Bleeding - apply direct pressure to wounds, facilitate surgical management of internal bleeding
      ii. Pulses - palpate
      iii. Skin perfusion - assess color, temperature, check for diaphoresis, and capillary refill.
         1. Cap refill in children
      iv. Restore circulating blood volume
         1. Warmed IVF (adults 1-2 L bolus, children 20 ml/kg)
         2. 3 mL of crystalloid to replace 1 mL of blood loss
         3. If not hemodynamically stable after 2-3 L give blood.
   d. D: Disability
      i. AVPU
      ii. PERRL
      iii. Brief focused neuro assessment
         1. Behavior
         2. Speech
         3. Content
         4. Arousability
         5. Pupils

2. Secondary Survey
   a. F: Full set of Vitals, five interventions, family
      i. Include temp. & oxygen sat - use as baseline
      ii. Five Interventions
         1. EKG monitoring
         2. NG tube
         3. Foley
4. Send labs
   a. Type and cross
   b. CBC
   d. BMP
   e. UA
   f. HCG
   g. Tox screen and ETOH
   h. Clotting studies
   iii. Support family presence
b. G: Give comfort measures
   i. Treat pain & anxiety
c. H: History & Head-to-Toe Exam
   i. PMH, current medications
   ii. Mechanism, Injuries, Vital Signs, Treatment (MIVT)
   iii. Head- treat ICP
   iv. Face- CT scans- panoramic view of jaw
   v. Neck- Cross table c-spine (C1-T1)
   vi. Chest- PCXR, 12-lead, ABG
   vii. Abdomen- FAST, DPL, CT
   viii. Pelvis & extremities- CT scan, urethrogram, x-rays, splinting & wound care.
d. I: Inspect Posterior Surface
   i. Maintain c-spine, rectal exam, spinal CT
   ii. Maintain spinal immobilization until cleared, pad board.
Your Questions:

1. __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   a. _________________________________________________________________________
   b. _________________________________________________________________________
   c. _________________________________________________________________________
   d. _________________________________________________________________________

2. __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   a. _________________________________________________________________________
   b. _________________________________________________________________________
   c. _________________________________________________________________________
   d. _________________________________________________________________________

3. __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   a. _________________________________________________________________________
   b. _________________________________________________________________________
   c. _________________________________________________________________________
   d. _________________________________________________________________________
Cardiovascular Emergencies (21)

1. Which of the following is *not* an indication for thrombolytic therapy?
   a. An occluded AV fistula
   b. Non-Q-wave MI
   c. Peripheral arterial occlusion
   d. Acute Myocardial Infarction

2. Chest pain that is *not* relieved by rest & nitroglycerin is called:
   a. Variant angina
   b. Stable angina
   c. Unstable angina
   d. Prinzmetal’s angina

3. Coronary artery perfusion is dependent upon:
   a. Diastolic pressure
   b. Systolic pressure
   c. Afterload
   d. Systemic Vascular Resistance

4. The pathologic changes found on 12-lead EKG to indicate myocardial ischemia are:
   a. ST elevation
   b. ST segment depression
   c. Q wave formation
   d. ST segment depression and T wave inversion

5. Early symptoms of fluid overload and pulmonary edema are:
   a. Rales and hypoxia
   b. S3 heart sound and tachycardia
   c. Increased respiratory rate and subjective dyspnea
   d. ST-segment elevation in the chest leads

6. Which coronary artery supplies the AV node?
   a. Right coronary artery
   b. Coronary sinus artery
   c. Left anterior descending artery
   d. Nodal artery

7. An inferior wall infarction will show EKG changes in which EKG leads?
   a. V1 to V4
   b. V1, & AVL
   c. V5 & V6
   d. II, III, AVF
8. A thoracic aneurysm causes chest pain that:
   a. Radiates to the left arm
   b. Bores through to the back
   c. Is sharp and worse while reclining
   d. Is associated with diminished breath sounds

9. A patient presents to the emergency department with stabbing chest pain that is worse in the supine position, with fever and chills. This patient is probably suffering from:
   a. Myocardial infarction
   b. Pulmonary embolism
   c. Pericarditis
   d. Pneumothorax

10. Following an MVA, pericardial tamponade is suspected. Which of the following findings is consistent with traumatic tamponade?
    a. Muffled heart sounds
    b. Pericardiocentesis of 50 mL of blood
    c. ST-segment depression in the limb leads
    d. Rales on auscultation

11. The treatment priority for the rhythm below is:

   ![EKG Image]

   a. Cardiopulmonary resuscitation
   b. Lidocaine bolus
   c. Epinephrine infusion
   d. Synchronized cardioversion

12. 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

13. Which of the following is an absolute contraindication for thrombolytic therapy?
    a. Coumadin use
    b. Over age 75
    c. Severe hepatic disease
    d. Active bleeding
14. A patient presents to the emergency department and is diagnosed with a ruptured aorta. The nurse should prepare the patient for:
   a. Chest tube insertion
   b. Immediate endotracheal intubation
   c. CT scan
   d. Emergency surgery

15. A patient suffering from an acute myocardial infarction is given Morphine and Nitroglycerin. The emergency department nurse understands that these medications have which of the following effects?
   a. Vasoconstriction & preload reduction
   b. Preload & afterload reduction
   c. Pain control & increase afterload
   d. Decreased afterload & increase preload

16. Which blood test is most indicative of cardiac damage?
   a. CMP
   b. CBC
   c. CK
   d. Troponin-I

17. Which of the following medications is not considered a positive inotrope?
   a. Digoxin
   b. Dopamine
   c. Epinephrine
   d. Lopressor

18. The primary function of drug therapy with beta-blockers in heart failure is to:
   a. Increase blood pressure
   b. Block compensatory mechanisms
   c. Increase urine output
   d. Decrease arrhythmias

19. 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

20. 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
21. 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
Electrocardiogram (ECG)

1. 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:
            a. Atropine, epinephrine
            b. 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, flecanide
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:
         a. Atropine
         b. 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
I. 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

Internet resources:
The EKG Site: www.the-ekg-site.com
American Heart Association: www.americanheart.org
Heart Failure Society of America: www.hfsa.org
5 Steps to 12-Lead Interpretation

1. Assess regularity and speed
2. Look for signs of infarction
3. Present in >1 lead, but not all?
4. Assess associated conditions
5. Correlate with clinical condition

1. 12-Lead EKG
   a. Best evidence in first 3 hours after symptom presentation
   b. Normal EKG is associated with ↓ risk
   c. Poor sensitivity for MI (40-50%)

2. Changes in Acute MI
   a. LBBB or left ventricular strain
   b. Hyperacute T-waves
   c. T-wave inversion
   d. ST-segment elevation: (GUSSI-1 criteria)
      i. > 1mm in limb leads
      ii. >2 mm in precordial leads
   e. Q-waves: .04 sec and ½ the height of the R-wave

3. S-T analysis
   a. Measure at 0.04 sec. after the J-point
   b. Compare to baseline
   c. S-T segment elevation and peaked T-waves over ischemic zone
   d. Other leads may have reciprocal S-T segment depression

Reciprocal changes occur when we are looking through the myocardium to see the problem. For example, if a patient has a posterior wall MI, reciprocal changes will be seen in the anterior leads (looking through the front to see the back). Reciprocal changes are mirror-image or opposite changes. Instead of ST-segment elevation, we get ST-segment depression.
Localizing the injury

a. Anterior MI (LCD, LAD) V3, V4
   i. Associated symptoms:
      1. Sinus tachycardia
      2. SA blocks
      3. Pulmonary edema
   ii. Complications:
      1. High risk of sudden death
      2. 2° & 3° AV-block
      3. BBB
      4. Ventricular aneurysm
      5. Outflow obstruction
      6. Heart failure

b. Inferior MI (RCA) II, III, aVF
   i. Associated symptoms:
      1. Bradycardia
      2. Hypotension
   ii. Complications:
      1. 1° AV-block
      2. Papillary muscle rupture
      3. Mitral insufficiency
      4. RV infarct
c. Lateral (LCA, Circumflex) V5, V6, I, aVL
   i. Associated symptoms:
      1. Ventricular dysrhythmias
   ii. Complications:
      1. Transient AV-blocks
      2. Heart failure
      3. Late aneurysm

d. Septal V1, V2
   i. Associated symptoms:
      1. Sinus tachycardia
      2. Atrial fibrillation
   ii. Complications:
      3. Septal rupture

e. Posterior (LCA, Circumflex, RCA)
   i. Pathologic R-waves V1 – V4
   ii. ST depression in V1, V2
   iii. Associated symptoms:
      1. Sinus bradycardia
      2. Junctional rhythms
   iv. Complications:
      3. Mitral insufficiency
      4. Heart failure
f. RV Infarct
   i. Suspect with Inferior MI
   ii. Incidence is about 40% in IWMI
   iii. V4R
   iv. Associated symptoms:
       1. Hypotension
       2. JVD
       3. Clear lungs
   v. Complications:
       1. Right-sided heart failure
       2. Atrial fibrillation
       3. Tricuspid insufficiency

Pattern of EKG Changes in MI

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>AVR</th>
<th>V1</th>
<th>V4</th>
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<tr>
<td>I</td>
<td>AVF</td>
<td>V3</td>
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<td>II</td>
<td>AVL</td>
<td>V2</td>
<td>V5</td>
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<tr>
<td>III</td>
<td>AVR</td>
<td>V1</td>
<td>V4</td>
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Inferior  
Lateral  
Septal  
Anterior
Acute Coronary Syndromes

For years, patients would present to the Emergency Department with chest pain and be admitted with the diagnosis of rule-out myocardial infarction while serial EKGs and cardiac enzyme studies were completed. Due to the nature of cardiac enzyme release from the injured heart muscle, it takes hours for these lab levels to reach diagnostic levels and many of these patients were admitted to the hospital for a 23-hour observation. Because most of these patients have symptoms from a cardiac cause, the more descriptive term Acute Coronary Syndrome (ACS) was coined.

2. Prevention
   a. Maintain cardiac O2
      i. Plug in the pump
   b. Anticipate cardiac dysfunction
      i. Atherosclerosis

3. Presentation
   a. Chest pain
   b. Respiratory distress
   c. Nausea / vomiting
   d. Diaphoresis
   e. EKG changes
      i. ST depression, T inversion – ischemia
      ii. ST elevation – injury
      iii. Q-waves – necrosis
   f. Enzymes
      i. CPK-MB
      ii. Troponin
      iii. Myoglobin

4. Treatment
   a. Balance the V:P train
   b. Restore myocardial O2
      i. ↑ diastolic time
      ii. Decrease heart rate and stretch
      iii. Administer oxygen
      iv. Vasodilate:
         1. Nitroglycerine
         2. Morphine
      v. ASA 162-325 mg (chewed)
   vi. Anticipate revascularization
      1. Fibrinolysis
      2. Percutaneous coronary interventions

Absolute Contraindications
- Any prior intracranial hemorrhage
- Known structural cerebral vascular lesion
- Known malignant intracranial neoplasm
- Ischemic stroke within 3 months EXCEPT acute ischemic stroke within 3 hours
- Suspected aortic dissection
- Active bleeding or bleeding diathesis
- Significant closed head trauma or facial trauma within 3 months

Relative Contraindications
- Hx of severe, poorly-controlled HTN
- Severe uncontrolled HTN on presentation
- History of prior ischemic stroke >3 months, dementia, or known intracranial pathology not covered in contraindications
- Traumatic or prolonged CPR or major surgery (<3 weeks)
- Recent (2 to 4 weeks) internal bleeding
- Noncompressible vascular punctures
- Pregnancy
- Active peptic ulcer
- Current use of anticoagulants: the higher the INR, the higher the risk of bleeding
Hemodynamics:

Preload

Afterload

Venous Capacitance
70%

Hemodynamic Assessment

<table>
<thead>
<tr>
<th>Component</th>
<th>Factors affecting</th>
<th>Assessment</th>
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<tbody>
<tr>
<td>Preload</td>
<td>Fluid volume</td>
<td>I &amp; O</td>
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<tr>
<td></td>
<td></td>
<td>Weight</td>
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<td></td>
<td></td>
<td>Jugular veins</td>
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<tr>
<td>Contractility</td>
<td>Fluid volume</td>
<td>Heart rate</td>
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<tr>
<td></td>
<td>Oxygenation</td>
<td>Systolic blood pressure</td>
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<tr>
<td></td>
<td>Resistance</td>
<td>Organ perfusion:</td>
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<td></td>
<td></td>
<td>- Brain</td>
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<tr>
<td></td>
<td></td>
<td>- Kidneys</td>
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<td></td>
<td></td>
<td>Peripheral perfusion:</td>
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<td></td>
<td></td>
<td>- Capillary refill</td>
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<td></td>
<td></td>
<td>- Pulses</td>
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<tr>
<td>Afterload</td>
<td>Arterial vascular resistance</td>
<td>Diastolic blood pressure</td>
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<td></td>
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<td>Skin temperature and color</td>
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Heart Failure

Heart failure (HF) is the progressive decompensation of cardiac function over time. It is precipitated by MI, cardiomyopathies, valvular dysfunction, or chronic tachycardia. Disease of the heart stimulates compensatory mechanisms, which cause further stress and decompensation and account for the progressive nature of HF. If these compensatory mechanisms are left unchecked, heart failure will progress from being mildly annoying to total disability and death.

1. Maintain adequate cardiac output
   a. Oxygen supply
   b. Decrease cardiac workload

2. Presentation
   a. Progressive decrease in cardiac output
   b. Tachycardia
   c. Hypotension
      i. Narrow pulse pressure
      ii. JVD
   d. Diaphoresis
   e. Pallor
   f. Back up of fluid
      i. Rales
      ii. Pulmonary edema
      iii. Peripheral edema

3. Treatment
   a. Increase oxygen supply
      i. Supplemental oxygen
   b. Decrease oxygen demand
      i. Decrease heart rate and stretch
      ii. Decrease afterload
   c. Positive inotropes
   d. Block compensatory mechanisms

### The 7 Guideline Recommended Therapies:
1. ACE inhibitors / ARBs
2. Beta-blockers
3. Aldosterone antagonists
4. Anticoagulation for a-fib
5. Implantable defibrillators
6. Cardiac resynchronization therapy
7. HF education practices

<table>
<thead>
<tr>
<th>Right-sided</th>
<th>Left-sided</th>
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<tbody>
<tr>
<td>Peripheral edema</td>
<td>Pulmonary edema</td>
</tr>
<tr>
<td>Jugular venous distension</td>
<td>Hypotension</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>S3 heart sound</td>
</tr>
<tr>
<td></td>
<td>Tachycardia</td>
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Pericarditis

An infectious or inflammatory condition of the thin sac that surrounds the heart, pericarditis results in fluid accumulation in the sac that can squeeze the heart and cause cardiac tamponade. The source of the inflammation can be autoimmune, drug induced or caused by a variety of infectious agents. Most are caused by viral infections or are idiopathic. Pericarditis that occurs 2-5 days after myocardial infarction is called Dressler’s Syndrome.

1. Etiology
   a. Suspect in patients with recent viral URI
   b. Assess for Post-MI

2. Presentation
   a. Fever, chills
   b. ↑ WBC
   c. Friction rub
   d. Chest pain
      i. Severe, sharp, substernal
      ii. Worse in the supine position
      iii. Radiates to neck and shoulder & left scapula
   e. EKG changes (in every lead):
      i. ST-segment depression
      ii. Normalization
      iii. ST-segment elevation
   f. Echocardiography

3. Treatment
   a. NSAIDs
   b. Steroids
   c. Pain control
   d. Watch for tamponade!
Cardiac Tamponade

As little as 50ml of fluid, that forms acutely, can cause tamponade, decreased cardiac output, and cardiac arrest. Cardiac tamponade is a squeezing of the heart muscle by fluid that rapidly forms in the pericardial sac.

1. Etiology
   a. Assess for post-trauma
   b. Beware of in pericarditis

2. Presentation
   a. Beck’s Triad
      i. Hypotension (narrowed pulse pressure)
      ii. Jugular venous distention
      iii. Muffled heart sounds
   b. Dyspnea
   c. Tachycardia
   d. Chest pain
   e. Pulsus paradoxus
   f. Pulseless electrical activity
   g. CXR

3. Treatment
   a. Increase oxygen supply
   b. Decrease demand
   c. Hemodynamics
      i. Maintain filling pressures
      ii. Positive inotropes
   d. Pericardiocentesis
Hypertensive Crisis

Diastolic blood pressure > 120 mmHg

1. Anticipate
   a. Pre-existing HTN
   b. Renal disease
   c. Scleroderma
   d. Drug abuse
   e. Pre-eclampsia, eclampsia
   f. Head injury
   g. Autonomic dysreflexia
   h. Tumors

2. Diagnostics
   a. CBC
   b. Electrolytes
   c. Urine
      1) Blood
      2) Casts
   d. EKG
   e. CXR

3. Presentation
   a. Chest pain
   b. Headache
   c. Decreased mental status
   d. Diuresis

4. Treatment
   a. Sodium Nitroprusside
   b. Apresoline
   c. Vasotec
   d. Brevibloc
   e. Labetolol

5. Limit Complications
   a. MI, HF
   b. Stroke, ICH
   c. Aortic dissection
Trauma

1. Blunt: myocardial contusion
   a. RV primary site
   b. Labs
   c. Treat pain
   d. Ventricular rupture, tamponade, CA thrombosis, valve dysfunction, conduction defects, HF, shock, emboli

2. Penetrating
   a. Puncture of the heart, mediastinum, with sharp object
   b. Etiology: violence, industrial accident, sports, explosion, crush injury
   c. Pathophysiology: loss of blood, tamponade
   d. Presentation: visible wound, bleeding, hypotension, tamponade
   e. Management:
      i. Control hemorrhage
      ii. OR
      iii. Monitor for complications
          1. Hemorrhagic shock
          2. Tamponade
          3. Hemothorax
          4. Pneumothorax
   f. Diagnosis
      i. CBC, EKG, CXR, aortogram, CT scan
   g. Overall Management
      i. Control bleeding
      ii. Control BP
      iii. Prepare for exploratory thorocotomy
      iv. Monitor for complications
          1. Hemorrhagic shock
          2. Cardiac tamponade
          3. Hemothorax
          4. False aneurysm
3. Tamponade
   a. Etiology
      i. Post MI
      ii. Iatrogenic causes
      iii. Post CPR
      iv. Anticoagulation
      v. Rupture of great vessels
      vi. Aortic aneurysms
      vii. Infection
   b. Pathophysiology
      i. Accumulation of fluid
      ii. Decreased contractility
      iii. Decreased stroke volume, CO, LV function, RV function, shock
   c. Presentation
      i. BECK’s TRIAD
         a. Tachycardia, muffled heart sounds, hypotension & narrowed PP
      ii. Hemodynamics
   d. Diagnosis
      i. CXR
      ii. EKG
      iii. Echo or TEE
      iv. CT fluoroscopy
   e. Management
      i. ABC’s
      ii. Circulating blood volume
      iii. Inotropes
      iv. Pericardiocentesis
      v. Pericardial window
      vi. Emergency Thorocotomy
Cardiac Medications: Anti-arrhythmics

Electrical energy conducts through the heart by changing the flow of sodium, potassium, and calcium in and out of heart cells. Manipulating the flow of these electrolytes will change the conduction characteristics of the heart. Antiarrhythmics change electrical conduction through the heart by manipulating electrolytes.

Class I Anti-arrhythmics: Na+ Channel Blockers

By blocking sodium influx into the cardiac cell, Class I anti-arrhythmics decrease the speed of firing and reloading of the heart. These drugs work well in suppressing ventricular arrhythmias. Some examples include: Lidocaine (Xylocaine), Flecainide (Tambocor), Quinidine (Cardioquin), and Procainamide (Procan, Pronestyl).

It is necessary for sodium to rush into the cardiac cell in order to cause firing (depolarization), and a risk of using Class I anti-arrhythmics is that sodium inflow will be too slow and cause blocks in conduction (AV-blocks), or even asystole. Heart rate and blood pressure should be monitored. Remember that in order for this medication to work effectively, electrolytes levels have to be maintained in normal limits.

Beta-Blockers as Class II Anti-arrhythmics and Antihypertensives

Beta-blockers, as the name implies, block the beta adrenergic system. This is the sympathetic nervous system (SNS), and is composed of both alpha and beta adrenergic receptors. Most beta-blockers block both to some extent, with the intended result of causing vasodilation and slowing the heart. These actions are helpful to overcome the negative effects of the SNS in the patient with heart failure, but may lead to hypotension and bradycardia. The major effects of the SNS are outlined below.
The SNS is helpful in increasing cardiac output in times of crisis (fight or flight response). However, the SNS can be activated inappropriately in patients with cardiac dysfunction due to a low cardiac output state; in this condition the SNS makes cardiac output worse by increasing heart rate and causing vasoconstriction. It’s like turning up the rate on the IV pump and kinking the tubing when the pump reads “low battery.” It doesn’t help, and in fact makes the patient worse.

As an anti-arrhythmic, B-blockers decrease the automaticity of cardiac cells by decreasing the SNS effect of cardiac stimulation. They are most effective against atrial and supraventricular tachyarrhythmias where decreasing the automaticity of the SA and AV nodes is effective in controlling the arrhythmia.

The sympathetic nervous system is also responsible for increasing blood glucose and stimulating bronchodilation. Blocking the SNS can result in hypoglycemia in diabetics and bronchoconstriction in asthmatics.

Examples of beta-blockers include: propranolol (Inderal), metoprolol (Lopresor), and esmolol (Brevibloc).

**Class III Anti-arrhythmics: K+ Channel Blockers**

Potassium flows into the cardiac cells during the reloading (repolarization) process. Blocking potassium channels slows the reloading process and decreases the rapid ventricular response in life-threatening ventricular arrhythmias and refractory atrial arrhythmias.

Slowing potassium influx into cardiac cells will cause the heart to slow and the strength of contraction to diminish; these effects can worsen heart failure and cardiogenic shock. Examples of Class III anti-arrhythmics include: amiodarone (Cordarone), and sotalol (Betapace).

Amiodarone is considered to be superior to lidocaine or bretylium in suppressing lethal ventricular arrhythmias.
Calcium-Channel Blockers as Class IV Anti-arrhythmics and Antihypertensives

Calcium-channel blockers block calcium uptake into cells. Calcium is necessary for contraction of the heart and blood vessels. Therefore, administering calcium-channel blockers will lead to vasodilation and lowered blood pressure, and slowing of the heart rate. Examples of Class IV antiarrhythmics include: diltiazem (Cardizem), and verapamil (Isoptin, Calan).

Diuretics

Diuretics stimulate the kidneys to excrete more fluid by wasting sodium. The kidneys also control electrolyte levels by constant filtration. Giving diuretics will therefore cause wasting of water and electrolytes.

The desired effects of diuretics are to decrease total water volume in the body. A hemodynamic assessment must be made on any patient to determine where the extra fluid is, and how much is in excess. In addition, every attempt should be made to keep intake from exceeding output that leads to fluid overload again requiring more diuretic therapy.

Nitrates

Nitrates convert to nitrous oxide in the bloodstream and cause a direct vasodilatory effect. You can think of them as being topical in their action. As nitrates flow through the bloodstream, they cause an effect on the vasculature that leads to vasodilation. So everywhere the nitrate goes, it does this. Nitrates are not selective, they will cause vasodilation everywhere.

Vasodilation will increase blood flow through atherosclerotic vessels and improve perfusion to those areas, but may cause venous pooling of blood leading to hypotension and decreased blood flow to the brain. Watch for hypotension, tachycardia, dizziness, and syncope.
Your Questions:

1. ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   a. __________________________________________________________
   b. __________________________________________________________
   c. __________________________________________________________
   d. __________________________________________________________

2. ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   a. __________________________________________________________
   b. __________________________________________________________
   c. __________________________________________________________
   d. __________________________________________________________

3. ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   a. __________________________________________________________
   b. __________________________________________________________
   c. __________________________________________________________
   d. __________________________________________________________
Respiratory Emergencies

1. The most common EKG changes that occur during pulmonary embolus are:
   a. Q-waves in AVR and Lead I
   b. Tachycardia and atrial fibrillation
   c. Bradycardia and ST-segment depression
   d. High-degree AV blocks

2. How does the D-Dimer lab test help to diagnose pulmonary embolism (PE)?
   a. A positive test indicates PE
   b. A negative test rules out PE
   c. A positive test rules out PE
   d. A negative test indicates PE

3. Diaphragm rupture is most likely to occur from which of the following events?
   a. Fall from a height
   b. Motor-vehicle accident
   c. Gunshot wound
   d. Pulmonary embolism with infarction

4. Your patient, Mr. Winston comes to the Emergency Department (ED) with an exacerbation of COPD. He is hypoxic and hypercapnic. He does not wish to be intubated and mechanically ventilated. What criteria are necessary to initiate bilevel positive-pressure ventilation (BiPAP)?
   a. Must be able to slow his breathing down and not fight the machine
   b. Must be able to maintain his own airway
   c. Must be less than 75 years-old
   d. Must quit smoking first

5. When assessing a patient with multiple trauma who may have a ruptured diaphragm, it is important to know that most ruptures occur:
   a. To the left lung
   b. Above the diaphragm
   c. Days after the injury
   d. Bilaterally

6. The most common etiology for Acute Respiratory Distress Syndrome (ARDS) is:
   a. Sepsis
   b. Multiple trauma
   c. Pancreatitis
   d. Shock
7. Your patient Mr. Jones is admitted to the emergency department with acute pulmonary edema. His pO2 is 48, and his pCO2 is 57. Vital signs: B/P-158/90, P-122, RR-36. The most appropriate initial intervention is:
   a. Bi-level positive airway pressure (BiPAP)
   b. Continuous positive airway pressure (CPAP)
   c. Pressure-control ventilation
   d. Inverse-ratio ventilation

8. What intervention is most appropriate for the asthma patient who develops hypoxia and hypercapnia:
   a. 100% oxygen by non-rebreather mask
   b. CPAP
   c. BiPAP
   d. Mechanical ventilation

9. 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:
   a. Air embolism
   b. Pneumonia
   c. Pulmonary embolism
   d. Pneumothorax

10. Which of the following is a component of a properly functioning chest drainage system?
    a. Bubbling in the water seal
    b. Tidaling in the collection chamber
    c. Bubbling in the suction chamber
    d. Tidaling in the suction chamber

11. Magnesium sulfate may be given to the asthmatic who:
    a. Looks toxic
    b. Is unresponsive to traditional therapy
    c. Has a FEV₁ of less than 60%
    d. Is hypoxic

12. Your patient, Mr. Bulla, is suspected of having a hemothorax. During chest tube insertion which of the following would require preparation for emergency thoracotomy?
    a. Draining more than 500ml of blood from the pleural space
    b. Painful insertion with respiratory distress
    c. Immediate relief of symptoms
    d. Removal of air from the pleural space
13. 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

14. Bronchiolitis is a respiratory condition that is most commonly caused by what organism and affects what population?
   a. RSV, infants
   b. E-coli, adolescents
   c. Influenza, school-age children
   d. Herpes, toddlers

15. It is important to assess for adequate circulation to the hand before drawing an arterial blood gas from the radial artery. Allen’s Test assesses the adequacy of:
   a. The brachial artery
   b. The radial artery
   c. The ulnar artery
   d. The palmar artery

16. To measure peak flow during an asthma attack, ask you patient to:
   a. Inhale as deeply and rapidly as possible
   b. Take shallow rapid breaths
   c. Measure normal tidal volume for one minute
   d. Blow out as hard as they can

17. Your patient, Mr. Swan, is a 26 year-old with a spontaneous tension pneumothorax. He is rapidly becoming hemodynamically unstable and hypoxic. What is the most appropriate immediate intervention for Mr. Swan?
   a. Insertion of two large-bore IVs
   b. Needle thoracotomy
   c. Intubation
   d. Chest compressions

18. The proper placement for an emergency needle thoracotomy is:
   a. Forth intercostal space, mid-axillary line
   b. Below the xiphoid process
   c. Below the clavicle on the right side
   d. Mid-clavicular line, 2nd intercostal space
Respiratory Emergencies

To assure proper perfusion in your patients, you must maintain a properly-functioning pulmonary system. Decreases in pulmonary function interrupt the oxygen delivery process and will make it necessary to over-do other interventions to maintain tissue perfusion.

The process of delivering oxygen to the tissues is outlined below using the ventilation-perfusion train concept.

1. Lung ventilation and perfusion
   a. Three step process
      i. Alveoli (FiO2)
      ii. Interstitial space
      iii. Capillary network

2. Oxygen binding
   a. pO₂
   b. Oxyhemoglobin
   c. Normalize pH and body temp. to maximize O₂ saturation

3. Hemoglobin
   a. Maximize available Hb

4. Cardiovascular system (hemodynamics)
   a. Preload
   b. Cardiac output
   c. Afterload

5. Oxygen consumption
   a. Factors that ↑ consumption
   b. Interventions to ↓ consumption
      i. Manage activity and body temp.
      ii. Balance V:P train to maximize delivery
Pulmonary Embolism (PE)

a. Prevention
   i. Compress the calf
      a. Ambulation
      b. SCDs / PAS
   ii. VTE prophylaxis

b. Presentation
   i. Virchow’s Triad:
      a. Venous stasis
      b. Endothelial injury
      c. Alterations in coagulation
   ii. Signs and symptoms (PIOPED)
      a. Tachycardia
      b. Rales
      c. Dyspnea
      d. Pleuretic chest pain
      e. Cough
   iii. Diagnostic tests
      a. D-Dimer
      b. Venous ultrasound
      c. CT / VQ

c. Treatment
   i. Identification
   ii. Oxygenation
   iii. Assess and support hemodynamics
   iv. Anticipate thrombolytics
Acute Respiratory Distress Syndrome (ARDS)

a. Prevention: (look for risk factors)
   i. Sepsis (most common)
   ii. Aspiration (2nd most common)
   iii. Pneumonia
   iv. Pulmonary trauma
   v. Multiple trauma
   vi. Shock
   vii. Multiple transfusions
   viii. DIC
   ix. Acute hemorrhagic pancreatitis

b. Presentation
   i. Agitation
   ii. Dyspnea, tachypnea
   iii. Profound hypoxemia
   iv. ↑ peak inspiratory pressures
   v. Fine, diffuse crackles, diminished BS
   vi. Diffuse, bilateral “white out” on chest x-ray
   vii. Acute respiratory alkalosis, hypoxemia on ABGs
   viii. Differential diagnosis from cardiogenic pulmonary edema

c. Treatment
   i. Reverse underlying pathophysiology
   ii. Budget fluid resuscitation
   iii. Block mechanism of a-c membrane injury
   iv. Maximize oxygen delivery
   v. Consider alternatives to MV
   vi. Limit complications
Pulmonary Edema

a. Prevention
   i. Hydrostatic pressure (PAOP > 18 mmHg)
      a. Fluid overload
      b. ↓ CO
      c. ↑ Afterload
   ii. Osmotic pressure
      d. Hyponatremia
      e. Hypoalbuminemia
   iii. Capillary permeability
      f. Sepsis
      g. SIRS

b. Presentation
   i. Volume overload
      h. + I & O
      i. ↑ Weight
      j. JVD
   ii. ↑ RR, with subjective dyspnea
   iii. Rales
   iv. Hemodynamic collapse

c. Prompt action
   i. Preload modification
      k. Manage fluid volume
         i. Diuretics
         ii. Increase renal blood flow
         iii. ↓ Venous capacitance
   ii. Improving cardiac output
      l. Increase cardiac oxygenation
      m. Vasodilate
      n. ↑ diastolic filling time
      o. Decrease cardiac workload
      p. Increase force of contraction
   iii. Afterload modification
      q. Block SNS
      r. Increase cardiac output to ↓ stimulus
      s. Arterial vasodilation
**Pneumothorax**

a. Prevention
   i. Limit positive-pressure ventilation
      a. Mechanical ventilation
      b. NIPPV
   ii. Instructional techniques for central line insertion
      a. Significant ↓ in incidence
   iii. CXR after central line insertion
      a. Prompt identification

b. Presentation
   i. Dyspnea
   ii. Hypoxemia
   iii. Decreased breath sounds on affected side
   iv. Decreased chest excursion
   v. X-ray, CT scan

c. Prompt action
   i. Observation
   ii. Chest drainage
      a. Chest tube
      b. Thoracic catheter
      c. Needle thoracotomy for tension pneumothorax
      d. McSwain dart
   iii. Pain control
   iv. Oxygen

**Components of a properly functioning chest drainage system:**
- Gentle bubbling in the suction chamber
- No bubbling in the water seal
- Gentle rising and falling in the water seal with respiration
**Pneumonia**

a. Prevention
   i. Look for 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
      ii. Hand washing
      iii. Mouth care
      iv. Care of equipment
      v. ↑ HOB >30°

b. Presentation
   i. Fever (average 38.5°C)
   ii. ↑ RR (average 30)
   iii. WBC > 10,000/mm3 (82%)
   iv. Evidence on CXR (80%)
   v. Need for oxygen therapy (76%)
   vi. ↓ pO2:FiO2 (69%)
   vii. Intubation (46%)
   viii. Sputum production & abnormal breath sounds (64%)

c. Treatment
   i. Pulmonary hygiene
   ii. Antibiotics
   iii. Consider antibiotic rotation to prevent resistant nosocomial infections
   iv. Enteral feeding
Ruptured Diaphragm:

1. Fairly well protected
2. Most often injured by penetrating trauma of the lower chest
3. 15% of patients with stab wounds
4. 46% of patients with GSW
5. Associated injuries with blunt trauma
   a. Pelvic fractures in 40%
   b. Splenic rupture in 25%
   c. Liver laceration in 25%
   d. Thoracic aortic tear in 5-10%
6. Manifestations
   a. Have a high degree of suspicion in pts. with trauma to the abdomen or as high as T4
   b. Chest pain
   c. Dyspnea
   d. Peristalsis heard in the chest
   e. Difficulty passing an NG tube
   f. Persistent air leak from a chest tube
7. Diagnostics
   a. CXR
   b. Evidence on exploratory lap
8. Treatment
   a. Herniation can occur weeks to years later
   b. Therefore, surgical repair is necessary
9. Complications
   a. Intra-abdominal hypertension increases risk of herniation
CPAP & BiPAP

1. Ventilator Terminology
   a. Tidal volume (TV): Volume of air passing into and out of the lungs with each normal breath usually set at 10cc/kg (IBW).
   b. Inspiratory reserve: Maximal inspiration
   c. Expiratory reserve: Maximal expiration
   d. Residual volume: Volume that cannot be exhaled, where most gas exchange occurs.
   e. Fraction of inspired air (FiO2): Percentage of oxygen delivered in inspired air.
   f. I:E Ratio: Inspiratory:Expiratory Ratio
   g. Peak airway pressure: Maximum pressure in airways.
   h. PaO2: Partial pressure of oxygen dissolved in the blood.
   i. PaCO2: Partial pressure of carbon dioxide dissolved in the blood.
   j. SaO2: Percentage of hemoglobin saturated with oxygen.

2. Hemodynamic effects:
   a. Decreased venous return to the heart
   b. Decreased cardiac output
   c. Increased afterload

Pediatric Endotracheal Tube Size:
Predicted Size Tube = (Age / 4) + 4
or
ETT ID = 2 + (body length (cm)/30)
Continuous Positive Airway Pressure (CPAP)

d. Positive pressure at end-expiration to prevent alveolar collapse
e. Increases residual volume
f. Improves gas exchange

3. Bilevel Positive Airway Pressure (BiPAP)

a. CPAP with additional inspiratory pressure
b. Improves gas exchange
c. Decreases work of breathing

End-tidal carbon dioxide monitoring

i. Approximates arterial carbon dioxide levels
ii. Can detect early respiratory failure
iii. PCO2 – PetCO2 = physiologic dead space
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 acidotic. If blood pH rises 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/acidotic, 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 acidotic. 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 normal there is evidence of hypoxemia.

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

<table>
<thead>
<tr>
<th></th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.35-7.45</td>
</tr>
<tr>
<td>pCO2</td>
<td>35-45 mmHg</td>
</tr>
<tr>
<td>pO2</td>
<td>80-100 mmHg</td>
</tr>
<tr>
<td>O2 Saturation</td>
<td>95-100%</td>
</tr>
<tr>
<td>HCO3-</td>
<td>22-26 mEq/L</td>
</tr>
<tr>
<td>Base Excess</td>
<td>+ or - 2</td>
</tr>
</tbody>
</table>
Compensation

The component of the respiratory system that balances the pH is the dissolved carbon dioxide (CO2) that is produced by cellular processes and removed by the lungs. The component of the renal system that balances the pH 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 system works in both directions. By balancing back and forth, a normal pH is achieved. The respiratory system balances the pH by increasing or decreasing the respiratory rate, thereby manipulating the CO2 level. Fast and deep breathing “blows off” CO2. Conversely, slow and shallow breathing “retains” 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.

\[
\text{H2O} + \text{CO2} = \text{H2CO3} = \text{H}^+ + \text{HCO3} \\
\text{Water & carbon dioxide} = \text{carbonic acid} = \text{hydrogen & bicarbonate} \\
\text{Respiratory side} \quad \text{Metabolic side}
\]

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 opposing 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.
Now let’s try an example:

<table>
<thead>
<tr>
<th>pH</th>
<th>7.27</th>
<th>Acidotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCO2</td>
<td>53</td>
<td>Acidotic</td>
</tr>
<tr>
<td>PaO2</td>
<td>50</td>
<td>Low</td>
</tr>
<tr>
<td>O2 Saturation</td>
<td>84%</td>
<td>Low</td>
</tr>
<tr>
<td>HCO3-</td>
<td>24</td>
<td>Normal</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Interpretation (mark as acidotic or alkalotic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.28</td>
<td></td>
</tr>
<tr>
<td>PCO2</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>PaO2</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>O2 Saturation</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>HCO3-</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

ABG Interpretation: ________________________________________________

Cause: ___________________________________________________________

Treatment: _______________________________________________________

Number 2

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.33</td>
<td></td>
</tr>
<tr>
<td>PCO2</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>PaO2</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>O2 Saturation</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>HCO3-</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

ABG Interpretation: ________________________________________________

Cause: ___________________________________________________________

Treatment: _______________________________________________________
### Number 3

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.51</td>
<td></td>
</tr>
<tr>
<td>PCO2</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>PaO2</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>O2 Saturation</td>
<td>99%</td>
<td></td>
</tr>
<tr>
<td>HCO3-</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

ABG Interpretation: ________________________________

Cause: ______________________________________________

Treatment: ____________________________________________

### Number 4

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.49</td>
<td></td>
</tr>
<tr>
<td>PCO2</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>PaO2</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>O2 Saturation</td>
<td>96%</td>
<td></td>
</tr>
<tr>
<td>HCO3-</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

ABG Interpretation: ________________________________

Cause: ______________________________________________

Treatment: ____________________________________________

### Number 5

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.10</td>
<td></td>
</tr>
<tr>
<td>PCO2</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>PaO2</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>O2 Saturation</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>HCO3-</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

ABG Interpretation: ________________________________

Cause: ______________________________________________

Treatment: ____________________________________________
Number 6

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.42</td>
<td></td>
</tr>
<tr>
<td>PCO₂</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>PaO₂</td>
<td>178</td>
<td></td>
</tr>
<tr>
<td>O₂ Saturation</td>
<td>99%</td>
<td></td>
</tr>
<tr>
<td>HCO₃⁻</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

ABG Interpretation: ________________________________________________

Cause: ___________________________________________________________

Treatment: _______________________________________________________

Additional Acid-Base Diagnostics

1. Base Excess (BE)

   The base excess evaluates the magnitude of the metabolic component of the pH imbalance. It measures all of the components of the metabolic system that balance the pH. In our blood gas analysis, we used the bicarbonate to evaluate the metabolic acid-base balance. Bicarbonate fluctuates to accommodate fluctuations that cannot be controlled by other body bases such as the hemoglobin and albumin. Base excess weighs all of these bases and determines overall metabolic acid-base balance.

   | Normal: +2 to -2 | <0 = Base deficit / Acidosis |
   | Minimal: 3-5     | >0 = Base excess / Alkalosis |
   | Severe: 7-10     |                          |

2. Anion Gap (AG)

   The difference between the major positive electrolytes (ions) and the major negative electrolytes (ions) in the body is called the anion gap. The formula is AG = Na⁺ + K⁺ - (Cl⁻ + HCO₃⁻). A venous CO₂ level can be substituted for the HCO₃⁻. A patient who has the following lab values would have an AG of 19.

   Na⁺ 140
   K⁺ 4.0
   Cl⁻ 100
   CO₂ 25
   AG = 140 + 4 – (100+25)
   AG = 19
The value of the AG is to determine the source of a metabolic acidosis. If our patient in the example above has hypotension and has received fluid boluses this morning, and is also suffering from diarrhea, it might be difficult to determine the source of her metabolic acidosis. Hypotension, IV fluid administration, and diarrhea all cause metabolic acidosis. Her AG of 19 is consistent with a wide-ratio anion gap, and is probably the result of hypotension and the resulting lactic acidosis.

A normal-ratio anion gap is 10-15 mEq/L. See table below for causes of metabolic acidosis for normal, high, and low-ratio anion gaps.

<table>
<thead>
<tr>
<th>High Ratio</th>
<th>Normal Ratio</th>
<th>Low Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Lactic acidosis</td>
<td>2. Renal tubular acidosis</td>
<td>2. Hypoalbuminemia</td>
</tr>
<tr>
<td>4. Poisonings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On the Internet:
ABG Case Studies: [www.ed4nurses.com/abgs.htm](http://www.ed4nurses.com/abgs.htm)
The ABG Site: [www.the-abg-site.com](http://www.the-abg-site.com)
Asthma / COPD

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

How to Use a Peak Flow Meter

Slide the marker all the way to zero
Stand up.
Take a big breath with your mouth open.
Hold the meter in one hand.
Keep your fingers away from the numbers.
Quickly close your lips firmly around the tube.
Do not put your tongue in the hole.
Blow one time as fast and hard as you can.
The marker will go up and stay up.
Do not touch the marker.
Find the number where the marker stopped.
Write the number on a piece of paper or on a chart.
h. Diaphoresis
i. ↓ FEV1 may reach 30-35% of personal best
j. ↓ FEV1:FVC
k. Pulsus paradoxus > 10 mmHg
l. ↑ PAP due to vasoconstriction and alveolar overdistention
m. Shunt develops
n. Hypoxia, hypercapnia will develop as the attack progresses
o. 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. Anticholenergics
      1. 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
   i. BiPAP 5 – 7.5 cmH2O
   ii. Oral intubation is recommended
      1. Asthmatics frequently have sinusitis
   iii. Sedation with Propofol may induce bronchodilation
   iv. Avoid paralytic agents: can cause myopathies
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
Bronchiolitis

Lower respiratory tract infection causes airway inflammation, mucous formation, and airway hyperactivity.

1. Infants
2. RSV (respiratory syncytial virus)
3. May be a precursor to later asthma
4. Risk factors for severe illness:
   a. Very young
   b. Premature infants
   c. Chronic lung disease
   d. Congenital heart disease
   e. Immunodeficiency
   f. Previous mechanical ventilation
5. Assessment
   a. Tachyplea, apnea possible in infants
   b. Tachycardia
   c. Fever
   d. Grunting, nasal flaring, retractions
   e. Wheezing
   f. Dehydration
   g. History of URI symptoms: runny nose, cough, with progressive dyspnea
6. Treatment
   a. O2 if hypoxic
   b. Antibiotics
   c. Bronchodilators
   d. Inhaled steroids
   e. Ribavirin (Virazole) anti-viral
   f. Fluids

*Pediatric Respiratory Distress*
- Nasal flaring
- Sternal retractions
- Tripoding
- Use of accessory muscles
- Tachypnea
- Cyanotic
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
      i. ↑TLC
      ii. ↑FRC
      iii. ↓FEV1 to <1L
   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
Your Questions:

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Substance Abuse / Toxicological and Environmental Emergencies (10)

1. A target Bull’s-eye rash (erythema migrans) is characteristic of which of the following illnesses:
   a. Rocky Mountain Spotted Fever
   b. Lyme’s disease
   c. Black widow spider bite
   d. Copperhead bite

2. A patient is brought to the Emergency Department after ingestion of Acetaminophen approximately 1 hour ago. When can the nurse expect to draw a blood acetaminophen level according to the nomogram for acetaminophen overdose?
   a. 2 hours
   b. 3 hours
   c. 10 hours
   d. On arrival

3. A father brings his 6 year-old son to triage. The child is complaining of abdominal pain, vomiting, and bloody diarrhea. He states that they ate lunch at a local burger joint last evening and the patient started to complain during the night. He finally brought the patient in when he noticed the bloody diarrhea. As the nurse you expect that this child is at risk for which of the following:
   a. Hemolytic Uremic Syndrome
   b. HELLP syndrome
   c. DKA
   d. HHS

4. A patient is brought to the emergency room after partying all night and snorting a large amount of drugs according to his friends. The patient is very anxious, he has mydriasis, and his friends thought he had a seizure. Vital signs are as follows: HR 128 bpm, RR 24, BP 170/104 mm Hg, temperature 101 F. As his nurse you would suspect this patient may have overdosed on:
   a. Cocaine
   b. Methamphetamine
   c. LSD
   d. All of the above

5. Mr. Jones took 100 tablets of Percocet in a suicide attempt. As his nurse, you should know that treatment of ingested poisoning includes:
   a. Managing the ABCs and administering activated charcoal
   b. Administering ipecac
   c. Hyperbaric oxygen
   d. Prompt transport to a poison control center
6. In the initial resuscitation of burns, which treatment is the priority?
   a. Fluid volume replacement
   b. Administration of antibiotics
   c. Management of airway
   d. All of the above

7. When administering sodium bicarb IVP in a patient who has ingested a tricylic antidepressant, the nurse should monitor its effectiveness by evaluating which of the following:
   a. Neurologic status
   b. Pulmonary status
   c. Acid-base balance
   d. Cardiovascular status

8. A 43 y/o man is brought to the emergency department after sustaining second and third degree burns on his chest, back, and head. He weighs 76 kg. According to the Parkland Formula for fluid resuscitation the nurse determines that the patient will need approximately how much IVF in the first 8 hours?
   a. 2 L NS or LR
   b. 5 L D5W or LR
   c. 5 L NS or LR
   d. 10 L NS or D5 ½ NS

9. Your patient is admitted after prolonged exposure to the cold. His temperature is 88°F. To prevent rewarming shock you should:
   a. Warm the patient over 24-48 hours
   b. Allow him to rewarm at room temperature
   c. Warm the core first
   d. Place the patient in a tepid water bath

10. Your patient is suspected of ingesting large quantities of narcotics and is currently stuporous. The appropriate drug and dose to reverse the effects of narcotic overdose is:
    a. Naloxone 0.4-2 mg IV
    b. Romazicon 0.2 mg over 15 minutes IV
    c. N-acetylcysteine 140 mg/kg IV push
    d. Atropine 1-2 mg IV
Substance Abuse

Ingested

1. Emesis
   a. Serious aspiration risk
2. Gastric lavage
   a. 500-3000cc
3. Activated charcoal
   a. 50-100 grams
4. Specific antidotes
   a. Narcan for opiates
   b. Atropine for organophosphates
   c. Methylene blue for methemoglobinemia
   d. Acetylcystine for acetaminophen
5. Support
   a. Cardiovascular
   b. Pulmonary
   c. Valium or Phenobarbital for seizures
   d. Mannitol and dexamethasone for ↑ ICP

1. Alcohol
   a. Delirium Tremens- associated with withdrawal, potentially fatal
   b. Lorazepam (Ativan) 1-2 mg or chlordiazepoxide (Librium) 25-50 mg PO or IM
   c. Haloperidol (Haldol) 5-10 mg PO or IM to prevent self-harm
   d. Thiamine 100 mg 3 X a day, folic acid 1 mg, and a daily multivitamin.

2. Cocaine
   a. Strong CNS stimulant, AMI may occur up to 14 days after use, readily crosses the placenta and is excreted in breast milk for up to 36 hours after use.
   b. Signs & Symptoms of use:
      i. DVT
      ii. MI
      iii. CNS disturbances (HA, seizures, CVA)
      iv. “Crack lung”
      v. Obstetrical (abortion, placental abruption)
      vi. Renal failure/ rhabdomyolysis
      vii. Mydrias (dilated pupils)
      viii. Perforated nasal septum
   d. Treatment is symptomatic

 Signs and Symptoms
 ✓ Anxiety
 ✓ Agitation
 ✓ Tremors
 ✓ Elevated vital signs
 ✓ Visual hallucinations
3. Heroin
   a. Most abused, most rapid acting of the opiates, derived from morphine, can be injected, sniffed, snorted, ingested, or smoked.
   b. Signs & Symptoms
      i. Red or raw nostrils
      ii. Scars or track marks/ collapsed veins
      iii. Infectious diseases (HIV, Hep b & c)
      iv. Skin abscesses
      v. Miosis (pinpoint pupils)
      vi. CNS depression
   c. Treatment
      i. Gastric lavage, charcoal if ingested
      ii. Narcan

4. Amphetamines
   a. Synthetic sympathomimetic drugs that stimulate the CNS, can be taken orally, snorted, injected or smoked.
   b. Common amphetamines:
      i. Caffeine
      ii. Crystal Meth “ice”
      iii. Dextroamphetamine
      iv. Ritalin
      v. Ecstasy
   c. Signs and Symptoms
      i. Same as cocaine, but last longer
   d. Treatment
      i. Same as cocaine, manage airway, treat hypertension, manage hyperthermia.
      ii. May give benzos to control anxiety

5. Inhalants
   a. Common among teenagers, “huffing, bagging, wanging” agents include:
      i. Glue
      ii. Hairspray
      iii. Gasoline
      iv. Paint thinner
      v. Oven cleaners
      vi. Nail polish remover
      vii. Aerosolized whip cream
      viii. Felt tipped pens
   b. Signs and Symptoms
      i. Anxiety, irritability
      ii. Nausea
      iii. Red or runny nose
      iv. Slurred speech
      v. Cardiotoxic & neurotoxic effects
      vi. V fib “sudden sniffer’s death”
c. Treatment
   i. ACLS
   ii. Determine agent
   iii. Treat symptoms, no known antidote
   iv. Replace electrolytes, bicarb as needed

6. Salicylate
   a. Aspirin, affects GI mucosa, coagulation, and acid-base balance
      i. Peak level @ 2-4h after ingestion, or 6-10h with EC ASA.
      ii. Toxic dose 200-300 mg/kg, lethal is > 500 mg/kg.
   b. Signs & Symptoms
      i. N/V, dehydration
      ii. Tinnitus
      iii. Increased RR and depth, increased temp, increased HR (Classic signs)
      iv. GI bleed
   c. Treatment
      i. NS or D5 with hypoglycemia
      ii. Lavage, charcoal (multidose)
      iii. Monitor hypoglycemia
      iv. Monitor ABGs
      v. Dialysis for severe ingestion
      vi. Repeat levels every 6 – 12 hours

7. Acetaminophen
   a. Tylenol, leading cause of poisoning deaths in the US, rapidly absorbed in GI tract, metabolized by the liver, causes hepatic necrosis. Hepatotoxicity seen following ingestion of > 140 mg/kg (80 kg person = 17 extra strength Tylenol)
   b. Signs and Symptoms (depends on time of ingestion):
      i. Nausea, vomiting anorexia
      ii. RUQ pain
      iii. Elevated LFTs
      iv. Hypoglycemia
      v. Jaundice
      vi. Coagulopathies
      vii. Metabolic acidosis and coma
   c. Treatment
      i. Treat via nomogram, draw serum acetaminophen levels 4 hours from time of ingestion.
      ii. Lavage if dose > 7.5 mg/kg or > 140 mg/kg in children, charcoal
      iii. Antidote (N-acetylcysteine, Mucomyst)- 140mg/kg orally mixed with juice or soda, or via NGT initial loading then 70 mg/ kg every 4 hours for a total of 17 doses.
         ✓ IV is considered off-label, but is done; dose is the same except for a total of 12 doses.
8. Calcium Channel Blockers
   a. Prescribed to prevent the influx of calcium through the calcium channels in cardiac and vascular smooth muscle (Calcium Causes Contraction). Reduce HR, metabolized by the liver, protein-bound (not dialyzable); Calan, Cardizem, Dilacor.
   b. Signs & Symptoms
      i. Hypotension
      ii. Conduction abnormalities (AVB, bradycardia)
      iii. Confusion, alt. LOC
      iv. N/V
      v. Hyperglycemia, lactic acidosis
   c. Treatment
      i. ACLS
      ii. NS or LR
      iii. EKG monitor and 12 lead EKG
      iv. Lavage or charcoal
      v. Whole- bowel irrigation with sustained release
      vi. Calcium- with small dose of ingestion
      vii. Atropine- for bradycardia, pacing for AVB
      viii. Glucagon
      ix. Catecholamines- dopamine, levophed for hypotension

9. Tricylic Antidepressants
   a. Onset of action is rapid, and symptoms may peak in 60 minutes, poorly dialyzed, and long elimination half-life.
   b. Signs and Symptoms
      i. Anticholinergic effects- dilated pupils, dry mouth & skin, fever, tachycardia, anxiety, confusion, purposeless movements.
      ii. N/V
      iii. Tachydysrhythmias
      iv. Hypotension
      v. Seizures
   c. Treatment
      i. ACLS
      ii. gastric lavage, charcoal (multi-dose)
      iii. EKG monitoring
      iv. Bicarb
      v. IVF, Catecholamines for hypotension
      vi. Valium or Ativan for seizures

10. Carbon Monoxide
    a. Emitted from gas, charcoal, oil, wood
    b. Brain and heart most affected
    c. Symptoms:
       i. Low-level exposure
          ✓ Shortness of breath
          ✓ Mild nausea
Mild headache

ii. Moderate-level exposure
   ✓ Headache
   ✓ Nausea
   ✓ Light-headedness
   ✓ Dizziness

iii. High-level exposure
   ✓ Death within minutes

d. Treatment
   i. Oxygen (reduces COHb half-life from 4-5 hours to 1 hour)
   ii. Hyperbaric oxygen therapy (↓ half-life to <30 minutes)

11. Cyanide
   a. Results from occupational exposure, homicidal ingestion, smoke inhalation of plastics, herbs, or NTP.
   b. Signs & Symptoms
      i. Tachycardia, bradycardia, asystole
      ii. Hypotension
      iii. HA, drowsiness, seizures, coma
      iv. Increased RR, or apnea
   c. Treatment
      i. 100% O2 via NRB
      ii. ACLS
      iii. Cont. EKG monitoring
      iv. Valium or Ativan for seizures
      v. Lavage or charcoal for ingested
      vi. Decontaminate skin with water
      vii. Sodium nitrate
      viii. Protect yourself from vomit and topical exposure

12. Food poisoning
   a. Bacterial contamination most common, d/t improper food handling, causative agents include: Staph aureas, Salmonella, E-coli (undercooked meats), Clostridium, Campylobacter, Bacillus cereus.
   b. Signs & Symptoms
      i. N/V/D, dehydration
      ii. Fever or hypothermia
      iii. HA
      iv. Hemolytic Uremic Syndrome (HUS) w/ E-coli
   c. Treatment
      i. PO fluids if tolerated
      ii. IVF for dehydration
      iii. Send stool cultures
      iv. Antibiotics depending on sample results
13. Pesticides (Organophosphates)
   a. Bind acetylcholinesterase, produces cholinergic crisis, absorbed orally, dermal, or inhaled.
   b. Signs & Symptoms
      i. Sweating, papillary constriction, excessive salivation
      ii. Wheezing, respiratory failure
      iii. Tachycardia, hypertension
      iv. Muscle fasciculations, twitching paralysis
   c. Treatment
      i. Decontaminate to prevent continued absorption and protect yourself from exposure.
      ii. ACLS
      iii. IVF and catecholamines for hypotension
      iv. Treat bradycardia with Atropine also will treat excessive salivation
      v. Pralidoxime (Protopam)- IV
      vi. Education to prevent re-exposure

Burns

1. Types:
   a. Thermal
   b. Electrical
   c. Chemical
   d. Radiation

2. Zone of injury

3. Assessment
   a. Rule of nines
   b. Classification
      i. First degree
      ii. Second degree
      iii. Third degree

4. Complications
   a. Intra-abdominal hypertension
   b. Pulmonary injury
      a. Smoke inhalation
      b. CO intoxication
      c. Airway burns
   c. Fluid volume deficit (Parkland formula)
      i. First 24 hours
         (1) 4 ml LR / %TBSA / kg
         (2) ½ volume in 1st eight hours
         (3) ¼ volume next eight hours
         (4) ¼ volume last eight hours
      ii. Second 24 hours
         (1) D5W with 40 mEq KCl to maintain normal electrolyte balance
         (2) Plasma or albumin to maintain hemodynamic balance
d. Infection
   i. Burn dressing
   ii. Antibiotics

e. Electrolyte imbalances

5. Pain Control

**Cold Related & Submersion Injuries**

1. Hypothermia
   a. Defined as core body temperature < 35 degrees C (95 F), severe hypothermia occurs at core < 32.2 C (90 F) and aggressive internal warming should start at 30 C or 86 F. Hypothermia slows cellular activity, will see decreased RR causing hypoxia and acidosis. Infants more prone - decreased body fat and inability to shiver, Elderly more prone - medications, decreased body fat, & cardiac changes from aging, homelessness, poor nutrition and exposure to the environment.

   b. Signs & Symptoms (based on core body temp)
      i. Alt. LOC
      ii. Hypotension
      iii. Shivering
      iv. Cyanosis with muscle rigidity, a-fib
      v. Rewarming shock: rearm skin before core – massive vasodilation
      vi. Coma, v fib (with excessive stimulation)
      vii. J-waves (Osborne waves)- “hypothermic hump” < 32 degrees C
      viii. Cardiac arrest

   c. Treatment (based on core body temp)
      i. ACLS
         1. Avoid endotracheal intubation to prevent excessive stimulation and Vfib
         2. No chest compressions in pulseless patients who have PEA
         3. V fib- won’t respond unless rewarmed, limit until core > 28 C
      ii. IVF
      iii. Rewarming- core is key to prevent rewarming shock
      iv. Core -
         1. Warmed, humidified oxygen
         2. Warmed IVF
         3. Warmed gastric lavage
         4. Peritoneal lavage
         5. Pleural or mediastinal irrigation
         6. ECMO
         7. Blood rewarming
      v. Correct electrolyte imbalances
      vi. Watch medication administration, poorly absorbed.
2. Frostbite
   a. Results when ice crystals form in the cells of the tissue exposed. With injury the inflammatory process is activated causing increased capillary permeability.
   b. Superficial-
      i. Involves easily exposed areas
   c. Deep-
      i. Caused cellular injury & death
   d. Signs & Symptoms
      i. Local burning, numbness, tingling, whitish, waxy skin color with superficial.
      ii. Blisters, edema of entire extremity, black necrosis and gangrene with deep/late findings
   e. Treatment
      i. Prevent further heat loss
      ii. Warm water with frostbite and warm oral fluids
      iii. Protect area and avoid pressure
      iv. Tetanus prophylaxis
      v. Escharotomy with severe vascular compromise
      vi. Amputation

3. Decompression Sickness (Bends)
   a. Occurs with deep sea diving, on rapid ascent the dissolved nitrogen doesn’t have time to reabsorb, nitrogen bubbles form in the blood & tissues.
   b. Signs & Symptoms (may depend on severity)
      i. SOB, crepitus, cough
      ii. HA
      iii. visual changes
      iv. Alt. LOC, seizures
      v. Joint soreness
   c. Treatment
      i. 100% O2 via NRB mask
      ii. IVF
      iii. Hyperbaric chamber
      iv. Analgesics for pain relief
      v. Heliox to shrink bubbles
## Envenomination

<table>
<thead>
<tr>
<th>Agent</th>
<th>Signs &amp; Symptoms</th>
<th>Treatment</th>
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<tbody>
<tr>
<td><strong>Snakes</strong> – pit vipers, elaptide (coral snakes, cobras), true vipers (puff aders), sea snakes, boon slangs</td>
<td><strong>Depend on species, size of snake, location &amp; depth of bite, number of bites</strong>&lt;br&gt;- Common:&lt;br&gt;- Edema&lt;br&gt;- Pain&lt;br&gt;- Petechia&lt;br&gt;- Tissue necrosis&lt;br&gt;- Tachycardia&lt;br&gt;- Tachypnea, dyspnea&lt;br&gt;- Hypotension&lt;br&gt;- N/V&lt;br&gt;- Syncope&lt;br&gt;- Miosis&lt;br&gt;- Muscle twitching&lt;br&gt;- Parathesias&lt;br&gt;- Pulmonary edema&lt;br&gt;- Seizures&lt;br&gt;- Hemorrhage&lt;br&gt;- Paralysis&lt;br&gt;- Renal failure&lt;br&gt;- Hypovolemic shock</td>
<td>ACLS&lt;br&gt;- Immobilize &amp; remove constrictive clothing&lt;br&gt;- Lab studies: CBC, TxC, PT, PTT, INR, D-dimer&lt;br&gt;- Cleanse the wound&lt;br&gt;- Tetanus&lt;br&gt;- Analgesics for pain&lt;br&gt;- Antivenom- specific to snake involved, 4 hours within exposure, may trigger allergic reactions</td>
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<td><strong>Black widow</strong> – found in secluded, damp areas, all US states, except Alaska</td>
<td><strong>Venom is neurotoxic.</strong>&lt;br&gt;- N/V&lt;br&gt;- Parethesia&lt;br&gt;- HA&lt;br&gt;- Weakness &amp; syncope&lt;br&gt;- Chest, back, abd pain&lt;br&gt;- Hypertension&lt;br&gt;- Elevated temp&lt;br&gt;- Resp. distress&lt;br&gt;- Seizures&lt;br&gt;- Shock</td>
<td>ACLS&lt;br&gt;- Ice to area&lt;br&gt;- Control pain and muscle spasms&lt;br&gt;- Calcium gluconate is of no benefit</td>
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<tr>
<td><strong>Brown Recluse</strong> – Found in the south, found in dark, undisturbed areas, most active at night</td>
<td>Bluish ring, with local edema, bleb formation.&lt;br&gt;- Erythema, blistering, &amp; pain&lt;br&gt;- Local ischemia progresses to tissue necrosis&lt;br&gt;- Eschar formation&lt;br&gt;- Fever, chills, N/V, malaise, arthralgias, joint pain, Petechia, seizures, coma, renal failure, hemolysis</td>
<td>ACLS&lt;br&gt;- Ice to area&lt;br&gt;- No antidote&lt;br&gt;- Dapsone&lt;br&gt;- Lab Studies, CBC, BMP, coags&lt;br&gt;- Skin grafting</td>
</tr>
<tr>
<td><strong>Scorpion</strong> – Found in warm climates, cool evenings, night hours,</td>
<td><strong>Venom is neurotoxic</strong>&lt;br&gt;- Same as black widow</td>
<td>Treat symptoms&lt;br&gt;- Antidote is very limited not FDA approved&lt;br&gt;- Tetanus</td>
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Your Questions:

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Medical Emergencies (15)

1. Mr. Smith was involved in a motor-vehicle accident and is experiencing hematuria. The best diagnostic test to evaluate renal trauma is:
   a. Ultrasound
   b. Computed tomography (CT)
   c. Intravenous pyelogram (IVP)
   d. Angiography

2. Which of the following is not an etiology of acute renal failure (ARF)?
   a. Sepsis
   b. Shock
   c. Bladder tumor

3. Treatment for Sickle Cell Crisis includes:
   a. Oxygen and fluids
   b. Heparin and coumadin
   c. Platelet transfusion
   d. Interferon

4. The altered mental status in a patient in HHS results from:
   a. Hyperosmolality of plasma
   b. Intracerebral dehydration
   c. Severe osmotic diuresis from hyperglycemia
   d. Intravascular dehydration

5. After treating the high glucose level in diabetic ketoacidosis (DKA), what other electrolyte may need to be corrected?
   a. Calcium
   b. Sodium
   c. Phosphorus
   d. Potassium

6. 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

7. Which of the following would indicate a positive tilt test?
   a. Decrease in pulse of 30 bpm
   b. Increase in pulse of 30 bpm & syncope
   c. Syncope and increase in RR of 4 bpm
   d. Syncope and decrease in SBP of 40 mmHg
8. A patient is discharged with the initial stages of Tuberculosis. The nurse determines that the patient understands the discharge instructions when the patient states:
   a. “I will avoid close contact with others by sleeping in my own bedroom.”
   b. “I will take the medication as prescribed until they are complete.”
   c. “I will call the doctor if I have a fever, or coughing up blood.”
   d. All of the above

9. A 20 year-old college student presents to the emergency department complaining of headache, fever, and general malaise. On exam the nurse notes that the patient has a petechial rash. The nurse understands that this patient needs to be placed in which of the following types of isolation:
   a. Contact
   b. Droplet
   c. Universal
   d. Reverse

10. The “cardinal sign” of SIADH is?
    a. Hyponatremia
    b. Urinary output of 10 liters/day
    c. Hypotension
    d. Systemic edema

11. In a patient who is not eating, how much potassium should be given in the IV fluids to prevent hypokalemia?
    a. 20 mEq
    b. 40 mEq
    c. 60 mEq
    d. 100 mEq

12. The ion responsible for maintaining intracellular fluid balance is:
    a. Sodium
    b. Calcium
    c. Potassium
    d. Magnesium

13. Treatment of hypernatremia includes:
    a. Diuretics
    b. Rehydration with 0.9% NS
    c. Free water replacement
    d. ADH administration

14. A common assessment finding in idiopathic thrombocytopenic purpura (ITP) would be the presence of:
    a. Elevated WBC
    b. Elevated PT/PTT
    c. Decreased platelet count
    d. Decreased hemoglobin
15. Ms. Mayo just returned from a mission trip to a developing country and is now complaining of abdominal cramps, bloating, nausea and watery diarrhea. What is the most likely cause of Ms. May’s symptoms?
   a. Giardiasis infection
   b. Irritable bowel disease
   c. Laxative abuse
   d. Motion sickness

**Diabetic Ketoacidosis (DKA)**

1. **Etiology:**
   a. “Tight” glucose control
   b. Frequent glucose monitoring

2. **Presentation:**
   a. Glucose 150-600 mg/dL
   b. Onset in hours
   c. Type I
   d. Na, K
   e. Ketones, BUN/creatinine
   f. Serum osmolality
   g. Metabolic acidosis from ketosis
   h. WBC’s
   i. N/V, abdominal pain
   j. Polyphagia, polydipsia, polyuria
   k. Dehydration
   l. Tachycardia, orthostatic hypotension
   m. Kussmaul’s breathing
   n. Lethargy progressing to coma

3. **Treatment:**
   a. Identify and treat cause
   b. Insulin
   c. Correct fluid volume deficit
   d. Replace electrolytes
   e. Correct acid-base balance
   f. Maintain safety
   g. Treat infection

4. **Complications:**
   a. CV
   b. Neurologic
   c. Renal
Hyperosmolar Hyperglycemic Syndrome (HHS)

1. Etiology:
   a. Dehydration
   b. Disease that limit access to water:
      i. Stroke
      ii. Hemorrhage
      iii. Acute myocardial infarction
   c. Drugs:
      i. Diuretics
      ii. Beta-blockers
      iii. H₂ blockers
      iv. Dialysis
   d. Incidence is slightly higher than that of DKA
   e. Mortality 10-20%

2. Presentation:
   a. Tachycardia, orthostatic hypotension, volume deficit, shock
   b. Glucose 600-2000 mg/dL
   c. Onset in days
   d. Lethargy → CNS depression → Coma → Seizures
   e. ↓ Na, K
   f. Serum osmolality > 320 mOsm/dL
   g. Metabolic acidosis from hypotension

3. Treatment:
   a. ABC’s
   b. Identify cause
   c. Correct fluid deficit
   d. Normalize serum glucose
   e. Correct electrolyte imbalance
   f. Safety
   g. Monitor for complications
Hypoglycemia

Glucose level <50 mg/dL

1. Etiology:
   a. Inadequate diet
   b. Too much insulin
   c. Stress
   d. Infection
   e. Sepsis
   f. Exercise
   g. Drug-induced:
      i. ACE-inhibitors
      ii. Alcohol
      iii. Tricyclic antidepressants
      iv. Herbals
         1. Echinacea
         2. Ginseng

2. Presentation:
   a. Central nervous system
      i. Headache
      ii. Confusion
      iii. Personality changes
   b. Cardiovascular system
      i. Palpitations
   c. GI symptoms
      i. Hunger
      ii. Nausea
      iii. Belching
   d. Adrenergic symptoms
      i. Sweating
      ii. Anxiety
      iii. Tremors

3. Treatment:
   a. Administer glucose, complex carbohydrates
   b. Glucagon: inhibits glycogen formation, favors glucose release into the bloodstream

Tight glucose control can lead to more frequent incidents of hypoglycemia. Carefully monitor the blood glucose when giving insulin.
Thyroid storm

1. What is thyroid storm?
   a. Life threatening emergency that is almost always fatal if left untreated
   b. Uncontrolled hypermetabolic state
   c. Presents with:
      i. Fever >38.5, often > 40C
      ii. Tachycardia, SVT, A-fib (most common)
      iii. Hypertension
      iv. Severe agitation, seizures, coma
      v. Hepatomegaly
      vi. Hypotension > Shock > death
      vii. ↓ TSH, Normal T4, and ↑ T3
      viii. Elevations in LFTs

2. How is it different from other thyroid disorders?

<table>
<thead>
<tr>
<th>Disease</th>
<th>Description</th>
<th>TSH</th>
<th>T3</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyroid storm</td>
<td>Severe hypermetabolic state</td>
<td>↓</td>
<td>↑</td>
<td>Norm</td>
</tr>
<tr>
<td>Graves disease</td>
<td>Autoimmune hyperthyroidism</td>
<td>↓</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Thyroiditis</td>
<td>Inflammation-induced hypothyroidism</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
</tr>
</tbody>
</table>

3. Prevention:
   a. Untreated or inadequately treated hyperthyroidism
   b. Precipitating factors:
      i. Infection
      ii. Surgery
      iii. Trauma
      iv. Pregnancy and labor
      v. Embolism
      vi. Adrenergic drugs
      vii. DKA

4. 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.
5. Prompt Action:
   a. Balance ventilation-perfusion train
   b. IV fluids (dextrose for high metabolism)
   c. Decrease sympathetic nervous system activation
      i. Propranolol (Inderal)
         1. 160 mg PO in 4 divided doses
         2. 1 mg slow IV push q4h
   d. Propylthiouracil (PTU) 900-1200mg/day PO
   e. Iodine 15 gtt SSKI PO 3-4 times/day
   f. Sodium iodine 1 gram IV drip over 24h
   g. Corticosteroids:
      i. Hydrocortisone 100-300 mg IV/IM q 8-12h
      ii. Dexamethasone 2mg PO q6h
   h. Correct fluid & electrolyte disorders
   i. Control fever
      i. Cooling blanket
      ii. Acetaminophen (ASA can ↑ T3 & T4 levels)
   j. Surgical ablation of the thyroid

6. Complications?
   a. Cardiovascular collapse and death
   b. Multisystem dysfunction
   c. Neurologic dysfunction
Adrenal Insufficiency

1. Prevention:
   a. Insufficient secretion of adrenal hormones
      i. Primary (rare)
         1. Autoimmune
         2. Infection
      ii. Secondary
         1. Corticosteroid cessation / withdrawal

2. Presentation:
   a. Weakness
   b. Hyperpigmentation of skin
   c. Weight loss
   d. Hypotension
   e. Bradycardia

3. Diagnostic tests:
   a. Thyroid function tests
   b. Adrenocorticotropic hormone stimulation test
      i. Baseline cortisol and ACTH levels
      ii. Cosyntropin (synthetic ACTH) 250mcg IV/IM
      iii. Repeat cortisol levels q30-60 minutes
      iv. Cortisol levels should rise in response to administration of ACTH

4. Prompt Action:
   a. Volume replacement
   b. Correct electrolytes
      i. Hyponatremia (most common)
      ii. Hypoglycemia
      iii. Hyperkalemia
      iv. Hypercalcemia (least common)
   c. Hydrocortisone 100mg IVP q6h.

Glucocorticoids:
↑ Blood glucose levels
Break down ketones
↑ RBC & platelet levels
Anti-inflammatory effects
Acute Renal Failure: Sudden loss of renal function

1. Etiology:
   a. Count the “hits”
   b. Maintain perfusion
   c. Decrease additional damage:
      i. Sepsis
      ii. Nephrotoxic drugs
      iii. Volume depletion

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

Acute Renal Failure is a secondary disease. Therefore mortality is about 40%
3. Phases:
   a. Oliguria
      i. Sudden onset of oliguria
      ii. Symptoms resemble CRF
         1. Nausea & Vomiting
         2. Drowsiness, confusion, coma
         3. GI bleeding
         4. Asterixis
         5. ↑K+, ↓Na+, acidosis
         6. Cardiac arrhythmias
         7. Kussmaul’s respirations
         8. Hypervolemia
         9. Edema
         10. HTN
      iii. Treatment:
         1. Dialysis
         2. Renal diet
         3. Fluid restriction
   b. Diuretic (10-15 days)
      i. Indicates that nephrons are healing
      ii. UO ↑ to 4-5 liters/day
      iii. Unable to concentrate urine or filter wastes
      iv. Can have excessive excretion of K+ and Na+
      v. Manifestations
         1. Hypovolemia
         2. Hypotension
         3. Electrolyte imbalances
   c. Recovery (lasts 4-6 months)
      i. BUN, Cr slowly return to normal

\[
\text{Estimated Cr} (\text{mL/min}) = \frac{(140 - \text{age})(\text{weight in kg})}{72 \times \text{serum Cr in mg/dL}}
\]

(multiply value by 0.85 in women)
d. Treatment:
   i. Hemodialysis
   ii. Continuous renal replacement therapy
      1. CAVHD
      2. CVVHD
   iii. Renal diet
   iv. Fluid restriction

4. What you need to know
   a. ARF causes a sudden change in homeostasis that leads to more symptoms than seen in CRF.
   b. ARF is secondary to another disease process and can result in 40% mortality.
   c. Creatinine clearance identifies level of renal function
   d. BUN / Cr identifies level of renal dysfunction
   e. Daily dialysis may be necessary to prevent complications associated with rapid fluid and electrolyte changes.

Chronic Renal Failure: Progressive loss of renal function

1. Etiology:
   1. Diabetes
   2. Hypertension
   3. Glomerulonephritis

2. Presentation:
   a. Decreased renal reserve
      i. ↓ number of functional nephrons
   b. Renal insufficiency
      i. Asymptomatic ↑ in BUN / Cr.
   c. Renal failure
      i. Symptomatic ↑ in BUN / Cr.
   d. End-stage renal disease
      i. Severe ↑ BUN / Cr.
      ii. Chronic dialysis is needed

3. Bricker hypothesis
   a. Intact nephrons hypertrophy to compensate for diseased nephrons

4. Signs and symptoms of oliguria

5. Treatment:
   a. Hemodialysis
   b. Peritoneal dialysis
   c. Renal diet
   d. Fluid restriction
   e. Medications
Drug-induced Nephrotoxicity

1. Definition of drug-induced nephrotoxicity
   a. Damage to the kidneys from:
      i. Decreased blood flow (pre-renal)
      ii. Direct nephron injury (intrinsic)
      iii. Obstruction (post-renal)

2. Mechanisms of toxicity
   a. Prerenal
      i. Reduced volume or pressure to kidney
         1. Diuretics
         2. Radiocontrast dye
         3. Immunosuppressive agents
         4. NSAIDs
         5. ACE inhibitors (helpful and harmful)
      ii. Prevention:
         1. Volume depletion
         2. Renal artery stenosis
      iii. Presentation:
         1. Oliguria
         2. ↓ FeNA
         3. ↑ urine osmolality
      iv. Prompt Action:
         1. Discontinue medication
   b. Intrinsic
      i. Direct nephron injury
         1. Oxygen free radical injury
         2. Calcium toxicity
      ii. Drugs: (partial list)
         1. Aminoglycoside antibiotics
         2. Other antibiotics
         3. Antiepileptics
         4. Amphotericin B
         5. Cisplatin
         6. Radiocontrast dyes
         7. Statins
         8. Streptokinase
         9. NSAIDs & COX-2 inhibitors
         10. Cocaine
         11. Intravenous immunoglobulins

Injury Risk:
- High concentrations of drug
- Volume depletion
- HIV infection
- Underlying renal

Internist’s Quartet:
1. Radiocontrast dye
2. Aminoglycosides
3. NSAIDs
4. ACE inhibitors
iii. Prevention:
   1. High doses (damage is often dose-dependent)
   2. Volume depletion
iv. Presentation:
   1. Urine volume normal initially
   2. Oliguria ensues
   3. ↑ FeNA
   4. ↑ Eosinophils
v. Prompt Action:
   1. Discontinue drug
   2. NS 150-250 mL/hour
   3. Plasmaphoresis for TTP

c. Obstructive
   i. Prevention:
      1. Crystal formation in the tubules or ureters
         a. Acyclovir
         b. Sulfonamides
         c. Methotrexate
         d. Indinavir
         e. Triamterene
   ii. Presentation:
      1. ↓ Urine volume
      2. UA – RBCs, WBCs, crystals
   iii. Prompt Action:
      1. Discontinue drug
      2. Volume replacement
      3. Urine alkalinization

3. General Treatment Tips:
   a. Assess for underlying risk
      i. Number of “hits” on the kidney
      ii. Risks for chronic renal dysfunction
      iii. Number of toxic drugs
      iv. Length of therapy
   b. Stop offending drug
   c. Ensure adequate fluid volume
   d. Dialysis
   e. CVVHD

-----------------------------
Non-ionic radiocontrast agents (Isovue, Omnipaque) may cause less damage than ionic agents.
Hematology

1. Functions:
   a. Medium for transport of O\textsubscript{2} and CO\textsubscript{2} and nutrients
   b. Maintains hemostasis
   c. Maintains internal environment
   d. Immune
   e. Inflammation
   f. Stress Response
      i. Impaired skin barrier or irritated mucous membrane
      ii. Impaired gag, cough or swallow
      iii. Increased gastric pH, colonization = aspiration
      iv. Acute Stress Reactions
         1. Catabolism
         2. Decreased healing
         3. Inhibit immune response
         4. Inflammatory Response
   g. Hemostasis
      i. Termination of bleeding
      ii. Vascular response
      iii. Platelet response
      iv. Coagulation
         1. Platelets
         2. Thrombocytopenia
         3. HITT response

Disseminated Intravascular Coagulation (DIC)

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

DIC
Initiation
Platelets
Perfusion
Clotting
Bleeding
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 or 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

**Leukemia’s**

<table>
<thead>
<tr>
<th>Acute</th>
<th>Incidence</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Lymphocytic (ALL)</td>
<td>Age 2-4</td>
<td>Anemia, Bleeding, Infection, ↓ RBC, H&amp;H, ↑ WBC, Joint and bone pain</td>
</tr>
<tr>
<td>Acute Myelogenous (AML)</td>
<td>Age 12-20</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Chronic</th>
<th>Incidence</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Lymphocytic (CLL)</td>
<td>Age 50-70</td>
<td>↑ WBC, ↓ RBC, Enlarged spleen,</td>
</tr>
<tr>
<td>Chronic Myelogenous (CML)</td>
<td>Age 30-50</td>
<td>Hepatomegaly, Swollen glands</td>
</tr>
</tbody>
</table>

   a. Diagnostics
      i. Bone marrow aspiration
   b. Treatment
      ii. Chemotherapy
      iii. Stem cell transplant
      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)
### Childhood Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Transmission</th>
<th>Signs &amp; Symptoms</th>
<th>Diagnostics</th>
<th>Interventions</th>
<th>D/C instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken Pox</td>
<td>Droplet &amp; contact</td>
<td>Fever, HA, malaise, pruritus, purulent vesicular rash</td>
<td>CBC, BMP CXR if resp. involvement</td>
<td>Droplet &amp; contact isolation, Symptomatic care, Acyclovir, Antihistamines, antipyretics</td>
<td>Rest, medications, skin care, hydration</td>
</tr>
<tr>
<td>Monkeypox</td>
<td>Reportable disease, droplet &amp; contact</td>
<td>HA, myalagias, fever, swollen lymph nodes, popular rash</td>
<td>CBC, BMP</td>
<td>Antipyretics, hydration, treatment of secondary infections</td>
<td>Hydration, antipyretics, skin care, wash all linens and clothes in hot water, &amp; separate from others.</td>
</tr>
<tr>
<td>Measles</td>
<td>Nasal secretions, droplet</td>
<td>Conjunctivitis, Dry cough, fever, joint pain, Koplik’s spots</td>
<td>CBC, may have leucopenia, viral cultures, CXR if suspected pneumonia</td>
<td>Antipyretics, antihistamines, hydration, nutrition, airborne precautions</td>
<td>Hydration, antipyretics, antihistamines for pruritus</td>
</tr>
<tr>
<td>Mumps</td>
<td>Viral transmission, droplet &amp; saliva</td>
<td>Parotitis, fever, URI, malaise</td>
<td>Throat cultures, spinal tap, urine cultures, CBC may have leukocytosis, amylase</td>
<td>Droplet precautions, analgesics, steroids if orchitis develops, supportive care</td>
<td>Hydration, antipyretics, nutrition, rest</td>
</tr>
<tr>
<td>Pertussis (Whooping cough)</td>
<td>Airborne, contact</td>
<td>Coryza, fever, “whooping cough”, more frequent @ night</td>
<td>Nasopharyngeal culture with Dacron swab</td>
<td>Oxygen, IVF, EES, Clarithromycin</td>
<td>Reportable disease, pertussis vaccine</td>
</tr>
</tbody>
</table>
Mononucleosis

1. Etiology
   a. Caused by Epstein Barr virus
   b. Common in adolescents
   c. Symptoms increase in the elderly

2. Transmission
   a. Saliva
   b. Blood transfusions (less common)

3. Signs & Symptoms
   a. Fever
   b. Exhaustion and fatigue
   c. Hepatomegaly, splenomegaly
   d. Sore throat, cervical lymphadenopathy

4. Diagnostics
   a. CBC
   b. Mono-spot

5. Interventions
   a. IVF
   b. Analgesics
   c. Antipyretics

6. Prevention
   a. Standard precautions
   b. Avoid close contact with infected persons, esp. with saliva

7. D/C
   a. Hydration
   b. Analgesics
   c. Antipyretics
   d. Avoid abdominal trauma d/t enlarged liver & spleen
Your Questions:

1. __________________________________________________
   __________________________________________________
   __________________________________________________
   a. __________________________________________________
   b. __________________________________________________
   c. __________________________________________________
   d. __________________________________________________

2. __________________________________________________
   __________________________________________________
   __________________________________________________
   a. __________________________________________________
   b. __________________________________________________
   c. __________________________________________________
   d. __________________________________________________

3. __________________________________________________
   __________________________________________________
   __________________________________________________
   a. __________________________________________________
   b. __________________________________________________
   c. __________________________________________________
   d. __________________________________________________
Gastrointestinal Emergencies (9)

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

2. Octreotide is often used to control bleeding from esophageal varices. The primary action of Octreotide is to:
   a. Increase platelet aggregation
   b. Increase clotting factors
   c. Decrease venous return
   d. Decrease blood flow

3. 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

4. Which therapy would be the most appropriate for the patient with alcoholic cirrhosis and an acute change in mental status?
   a. Kayexalate 30 g PO
   b. Regular insulin 10 u IV
   c. Lactulose 30 g PO
   d. Mannitol 25%, 70 g IV

5. Which of the following laboratory findings is most specific for pancreatitis?
   a. Leukocytosis
   b. Elevated serum and urinary amylase
   c. Hyperglycemia and hypokalemia
   d. Decreased serum albumin and total protein

6. Which of the following pathophysiologies is true regarding intussusception in infants?
   a. The intestines twist on their own.
   b. The patient becomes constipated and ruptures the bowel.
   c. The proximal bowel invaginates into the distal bowel.
   d. The appendix ruptures causing peritonitis.
7. Which of the following is a common assessment finding in a patient with cholecystis?
   a. Cullen’s sign
   b. Chvostek’s sign
   c. Rovsing’s sign
   d. Murphy’s sign

8. A 25 y/o gentleman presents to the emergency department with c/o pain in his left shoulder. He states the he was playing football, and he dove for a pass landing on a large rock in the yard. He is guarding his abdomen and states that it is very painful. The nurse should expect which of the following diagnostics studies to be obtained?
   a. FAST
   b. MRI
   c. Amylase level
   d. Cystogram

9. Which of the following symptoms is consistent with pyloric stenosis?
   a. Pain in the periumbilical area that localizes in the RLQ
   b. Colicky pain in the abdomen
   c. Projectile vomiting in an infant that is 2-5 weeks old
   d. Currant jelly stools with bloody mucus
**GI Bleed**

**Etiology:**
1. Peptic Ulcer Disease (55%)
2. Esophageal varices (14%)
3. Arteriovenous malformations (6%)
4. Mallory-Weiss tears (5%)
5. Tumors & erosions (4% each)
6. Other (12%)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Mechanism of injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caffeine</td>
<td>↑ acid production</td>
</tr>
<tr>
<td>Vasopressors</td>
<td>↓ mucosal blood flow</td>
</tr>
<tr>
<td>ASA, alcohol, indomethacin, steroids</td>
<td>H+ back diffusion</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>↓ mucous secretion</td>
</tr>
<tr>
<td>Chemotherapy, steroids</td>
<td>↓ cell renewal</td>
</tr>
</tbody>
</table>

**Prevention:**
1. Helicobacter pylori
   a. **Pathogenesis**
      i. Transmitted by fecal-oral route
      ii. Renders mucosa vulnerable to acid damage
      iii. Inflammatory response
   b. **Treatment** (80-90% eradication rate)
      i. Antibiotics
      ii. Antisecretory agent

2. NSAIDS
   a. Affects local and systemic prostaglandin inhibition
   b. Majority are uncomplicated and asymptomatic

3. Stress
   a. Common cause of UGI bleeding (1.5% of all ICU pts.)
   b. Higher mortality than pts. admitted with 1° dx. Of UGI bleeding
   c. Independent risk factors:
      i. Respiratory failure
      ii. Coagulopathy
4. Esophageal varices
   a. Secondary to portal hypertension
   b. Bleeding stops spontaneously in >50% of cases
   c. Mortality 70-80% in those who continue bleeding
   d. Treatment
      i. Blood pressure management
         1. Propanolol, nadolol
      ii. Vasopressin, NTG
      iii. Octreotide
         1. ↓ gastrin production
         2. Local vasoconstriction
      iv. Esophageal balloon tamponade (Blakemore / Linton tubes)
      v. Injection sclerotherapy
      vi. Variceal band ligation (↓ rebleeding rate, mortality)
      vii. Transjugular intrahepatic portosystemic shunt (TIPS)
         1. ↓ portal pressure
         2. Complications:
            a. ↑ encephalopathy
            b. Shunt occlusion and rebleeding
            c. Shunt migration

5. GI prophylaxis
   a. H₂ receptor antagonists
      i. Block gastric acid output by blocking histamine receptors
   b. Sucralfate
      i. Inhibits pepsin secretion
   c. Proton pump inhibitors
      i. Inhibits Hydrogen ion formation regardless of source of stimulation
   d. ↑ risk of pneumonia in mechanically ventilated patients (???) ↑ risk of aspiration

Early Detection
1. Bloody nasogastric aspirate (10-15% false negative)
2. Hemoglobin / Hematocrit
3. Melena / occult blood monitoring
4. Nausea / vomiting / hyperactive bowel sounds
5. Coagulation abnormalities
6. Shock
7. Risk scoring for intervention:
   a. Hemoglobin
   b. Systolic B/P
   c. Syncope / melan
   d. Tachycardia
   e. Cardiac disease
   f. Hepatic disease
Management of Acute Crises

1. ICU admission
   a. Aspiration is a major risk with active bleeding

2. Management of coagulopathies

3. Blood product replacement (most transfusion physicians recommend only component therapy)
   a. PRBCs (to HCT of 30)
   b. FFP
   c. Platelets

4. Hemodynamic support
   a. Fluids
   b. Vasopressors
   c. Monitoring

5. Gastric acid reduction
   a. H2 blockers
   b. Proton pump inhibitors

6. Endoscopy
   a. Diagnostic intervention of choice
   b. Allows treatment

7. Angiography
   a. Cauterization

8. Surgery
   a. Gastric resection
   b. Shunt surgery
   c. Liver transplantation

Internet sites:
American Gastroenterological Association: www.gastro.org
American College of Gastroenterology: www.acg.gi.org
Society of Gastroenterology Nurses and Associates: www.sgna.org
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

Small Bowel Distention
↓
↑ Intralumen Pressure
↓
Lymphatic compression
↓
Fluid Leakage into Lumen
↓
Dehydration & Shock
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.
Acute Pancreatitis

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

2. Pathogenesis
   a. Edema
   b. Necrosis
   c. Hemorrhage
   d. Pancreatic enzyme release
   e. Inflammation
      i. Enzymes and toxins enter the peritoneum
      ii. ↑ permeability of blood vessels, third spacing
      iii. Enzymes enter systemic circulation ↑ capillary permeability
      iv. Shock from ↓ circulating volume

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

4. Physical exam
   a. Appears acutely ill
   b. Tachycardia, tachypnea, hypotension
   c. ↑ temperature
   d. LUQ abdominal tenderness with guarding
   e. ↓ or absent bowel sounds
   f. Signs of dehydration
   g. Signs of necrosis (50% mortality)
      i. Grey Turner’s sign
      ii. Cullen’s sign
5. Diagnostic tests
   a. Labs
      i. ↑ Serum and urine amylase
      ii. ↑ Lipase
      iii. Amylase:creatinine clearance ratio
      iv. ↑ Glucose
      v. ↓ Calcium 2° to ↓ albumin

Ranson’s Criteria

<table>
<thead>
<tr>
<th>On Admission</th>
<th>During 1st 24 hours</th>
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<tbody>
<tr>
<td>Age &gt; 55</td>
<td>HCT ↓ &gt;10%</td>
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<tr>
<td>WBC &gt; 16</td>
<td>BUN ↑ &gt; 5mg/dl</td>
</tr>
<tr>
<td>Glucose &gt; 200</td>
<td>Ca++ &lt; 8</td>
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<tr>
<td>LDH &gt;350</td>
<td>pO2 &lt;60 mmHg</td>
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<tr>
<td>SGOT &gt;250</td>
<td>Base deficit ↑ &gt; 4</td>
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<tr>
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<td>Fluid sequestration &gt; 6L</td>
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</tbody>
</table>

> 3 criteria require supportive care
> 7 are critically ill with close to 100% mortality

6. Treatment
   a. NPO
   b. NG drainage
      i. Does not decrease pancreatic enzyme secretion
      ii. Helpful in managing:
          1. Vomiting, gastric distension, ileus
          2. Aspiration from ↓ mental status
   c. IV fluids
   d. Pain relief
      i. Demoral or Dilaudid
      ii. Morphine may cause biliary colic or spasms of the sphincter of Oddi
   e. Antibiotics for necrotizing pancreatitis
      i. Imipenem
      ii. Ciprofloxin
      iii. Cefotaxime
   f. TPN nutrition (low lipids)

7. Complications
   a. Death from cardiovascular instability
   b. Infection
   c. Pseudocyst
      i. Collection of blood, necrotic tissue, inflammatory debris encapsulated in fibrotic tissue
   d. Hypovolemic shock
   e. Respiratory failure / ARDS
   f. Pleural effusion
   g. Renal failure 2° to hypovolemia
Abdominal Trauma

1. Esophagus
   a. Penetrating injury more common than blunt
   b. Early diagnosis is important, gastric acid erodes tissues, and contaminates the wound
   c. Mortality is as high as 27%, mostly due to infection
   d. Areas at risk for injury
      i. At the cricoid cartilage
      ii. At the arch of the aorta
      iii. As it passes through the diaphragm
   e. Manifestations
      i. Look for abrasions, contusions, lacerations
      ii. Pain
      iii. Fever
      iv. Dysphagia
      v. Bloody emesis
      vi. Mediastinal crepitus
   f. Diagnosis
      i. CXR, KUB
      ii. Esophagogram
   g. Treatment
      i. NG decompression
      ii. Surgical repair
   h. Leaks are common

2. Diaphragm
   a. Fairly well protected
   b. Most often injured by penetrating trauma of the lower chest
   c. 15% of patients with stab wounds
   d. 46% of patients with GSW
   e. Manifestations
      i. Have a high degree of suspicion in pts. with trauma to the abdomen or as high as T4
      ii. Chest pain
      iii. Dyspnea
      iv. Peristalsis heard in the chest
      v. Difficulty passing an NG tube
      vi. Persistent air leak from a chest tube
   f. CXR
   g. Evidence on exploratory lap
   h. Treatment
      i. Herniation can occur weeks to years later
      ii. Therefore, surgical repair is necessary
   i. Complications
      i. Intra-abdominal hypertension increases risk of herniation
3. Stomach
   a. Most is penetrating
   b. Accounts for about 19% of abdominal injuries
   c. Can result from CPR
   d. Good prognosis with prompt recognition and treatment
   e. Manifestations
      i. Epigastric pain and tenderness
      ii. Peritonitis
      iii. Bloody drainage from NG
      iv. Abdominal free air
   f. Treatment
      i. NG tube
      ii. Surgical resection
      iii. H$_2$-blockers
   g. Complications
      i. Peritonitis
      ii. Intra-abdominal abscess
      iii. Gastric fistula
      iv. Prolonged healing or breakdown of the repair may result in contamination or hemorrhage

4. Liver: size and location make it vulnerable to injury
   a. Most common abdominal organ to be injured
   b. Highest mortality with direct blunt trauma (about 70%) and shotgun injuries: (10-15% from hemorrhage)

<table>
<thead>
<tr>
<th>Liver Injury Scale</th>
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<tr>
<td>Grade</td>
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   c. Manifestations
      i. Have a high degree of suspicion with patients with persistent unexplained hypotension
      ii. Evidence of peritonitis with bile leakage
      iii. RUQ pain or tenderness
   d. CXR
   e. Diagnostic peritoneal lavage may be helpful
   f. CT is preferred, if stable
   g. Treatment
      i. If bleeding is small, serial CT scans
      ii. Liver resection is indicated if:
         1. Bleeding is extensive, or on-going
         2. Signs of sepsis
         3. Deterioration of liver function tests
h. Complications
   i. Uncontrolled hemorrhage
   ii. Sepsis
   iii. Decreased albumin
   iv. Hypoglycemia
   v. Drug toxicity
   vi. Bleeding from loss of clotting factors
i. Post-operative follow-up
   i. Labs:
      1. Coagulation profile
      2. Ammonia level
      3. Liver profile
      4. Serum protein and glucose
      5. Replace blood products as needed
   ii. Major complications secondary to liver damage
      1. Blood loss
      2. PRBCs, platelets, FFP
      3. Assess for DIC
      4. Pulmonary insufficiency
      5. Atelectasis, pleural effusion, pneumonia are common
         a. Related to position of the liver, pleural irritation, and pain
      6. Infection
      7. Tissue debris, necrosis, bile
      8. Abscess or sepsis
      9. Assess for signs of infection
     10. CT for abscess formation
     11. Lactulose for ammonia

5. Spleen: most commonly injured organ in blunt trauma
   a. Isolated splenic injury occurs in about 20% of all cases and is associated with a very low mortality
   b. Overall mortality 11%, with associated injury 25%
   c. Assessment
      i. LUQ injury
      ii. Pain or tenderness
      iii. Ballance’s sign: dullness to percussion that disappears with position change
   d. Manifestations
      i. Graded from I to V depending on injury severity
      ii. KUB may show changes in splenic outline
      iii. CT scan
      iv. Fractures of ribs 8-10 associated with a 20% chance of injury
      v. ↑ WBC, ↓ H/H
      vi. Hypovolemia, shock
e. Treatment
   i. Localized bleeding control to preserve spleen, if damage is superficial and localized
   ii. Partial splenectomy, when wound is deep
   iii. Splenectomy, when blood supply is interrupted, spleen is destroyed, or hemorrhage cannot be stopped

f. Complications
   i. OPSI: Overwhelming Postsplenectomy Infection: due to loss of immune actions of the spleen
   ii. Hemorrhage
   iii. Infection, abscess

6. Pancreas: mostly from penetrating wounds
   a. Associated with multi-organ injury
   b. Pancreatic enzymes may not elevate due to inactivation during injury
   c. Manifestations
      i. Mechanism of injury
      ii. Epigastric pain & tenderness
      iii. ↑ amylase, lipase
      iv. Nausea, vomiting
   d. Treatment
      i. Drainage of enzymes
      ii. Surgical repair
      iii. Wound drainage
   e. Complications (due to inadequate drainage during surgery)
      i. Pseudocyst
      ii. Abscess

7. Bowel
   a. Penetrating, blunt or shearing trauma
   b. Duodenal and Ileum Injuries
   c. Rarely single organ injuries
   d. Alkalinity of contents produces immediate irritation
   e. Often difficult to diagnose since contents are sterile, peritonitis does not occur immediately
   f. Fever, jaundice, bowel obstruction, abdominal pain, edema
   g. Graded I-V by severity
   h. Octreotide to decrease secretions
   i. Complications
      i. Sepsis with MODS and duodenal fistula can be lethal

The American Gastroenterological Association: [www.gastro.org](http://www.gastro.org)
8. Small Bowel
   a. Look for contusions, wounds over abdomen
   b. Abdominal pain and tenderness
   c. ↓ bowel sounds
   d. Hypovolemia
   e. Delayed rupture is possible
   f. CT scan, KUB for free air
   g. Treatment is surgical intervention
   h. Fluid / nutrition deficiency common post-op
   i. Fistula formation is possible post-op

9. Abdominal assessment
   a. History
      i. Prior surgeries
      ii. Nutritional deficits
      iii. Absorption problems
   b. Inspection
   c. Auscultation
   d. Percussion
   e. Palpation
   f. Diagnostic studies
      i. X-rays
      ii. CT
      iii. Arteriography
      iv. Diagnostic Peritoneal Lavage

10. Intra-abdominal Hypertension
    a. Caused by fluid volume resuscitation
    b. Results in renal dysfunction and respiratory compromise
    c. Measured in bladder with T-piece catheter
    d. Hypertension is defined as >18 mmHg
    e. Temporary abdominal closure reduces abdominal pressure and improves lung dynamics, but does not improve renal function or oxygenation.
Your Questions:

1. ______________________________________________________

_____________________________________________________

_____________________________________________________

a. __________________________________________________

b. __________________________________________________

c. __________________________________________________

d. __________________________________________________

2. ______________________________________________________

_____________________________________________________

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a. __________________________________________________

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3. ______________________________________________________

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_____________________________________________________

a. __________________________________________________

b. __________________________________________________

c. __________________________________________________

d. __________________________________________________
Maxillofacial & Ocular Emergencies (6)

1. A patient presents to the emergency department complaining of a fever, difficulty breathing, and pain in his mouth. His vital signs are as follows: HR 100, RR 26, B/P 130/80, temp. 101.3° F. You ask the patient to open his mouth for inspection and you notice that his tongue is deviated upward and backward. Which of the following nursing diagnoses would be primary for this patient?
   a. Pain related to infection
   b. Potential for airway obstruction related to secretions
   c. Hemodynamic instability related to vital signs
   d. Hypovolemia

2. A patient is being discharged after being diagnosed with conjunctivitis. Which of the following statements indicates the patient understands the discharge instructions?
   a. “I need to avoid activities that will increase my eye pressure such as bending at the waist and coughing.”
   b. “I can wear my contact lenses during the day but I need to remove them at night.”
   c. “I should wipe from front to back when urinating.”
   d. “I should change my pillowcases daily until the infection is healed.”

3. Which of the following is true regarding a score of 20/40 on the Snellen chart?
   a. The patient cannot read any of the letters on the Snellen chart.
   b. The patient can read what the normal eye can read when standing at 20 feet.
   c. The patient can read what the normal eye can read when standing at 40 feet and has missed two letters.
   d. The patient can only read 40 % of the time with reading glasses.

4. A 75 y/o gentleman presents to triage complaining of sudden blindness in one eye. He has a past medical history of HTN and does not take his prescribed medication. The nurse suspects that the patient is suffering from which of the following:
   a. Corneal ulcer
   b. Blepharitis
   c. Keratitis
   d. Retinal artery occlusion

5. A patient calls the emergency room and asks to speak with a nurse. He states that he was hit in the mouth by a limb while cutting down a tree and it knocked out one of his teeth. Which of the following statements would the nurse tell the patient?
   a. “Put the tooth in saline solution or milk and come to the closest emergency department.”
   b. “Put the tooth in water and follow up with your dentist in the morning.”
   c. “Wrap the tooth in a towel and come to the emergency department when you get a chance.”
   d. “Put it back in your mouth. It should heal on it’s own in a few days.”
6. A father presents to the emergency department with his 4 y/o son. He states that the child has had a “runny nose, low grade fever, and a hoarse voice for the last two days. Tonight he woke up with a loud ‘barking’ cough and he couldn’t breathe.” Which of the following treatments would the nurse anticipate administering?
   a. Cool, humidified oxygen
   b. Corticosteroids
   c. Racemic epinephrine
   d. All of the above
Dental Emergencies

Avulsed Tooth

a. Medical emergency must be reimplanted within 30 minutes for best chance of survival.
b. Partially avulsed should be repositioned and stabilized.
c. Held by the crown, rinsed but not scrubbed, and placed in milk, saline solution, or Hank’s solution (balanced salt solution).
d. Administer antibiotics and tetanus prn.

Ocular trauma

1. Hyphema
   a. Presentation
      i. Etiology- bleeding into the anterior chamber of the eye from blunt or penetrating trauma.
   b. Treatment
      i. Raise HOB 30-45 degrees if spine cleared
      ii. Patch affect eye with rigid eye shield
      iii. Avoid NSAIDs and ASA
      iv. Admit if IOP is elevated or hyphema involving more than 1/3 of the anterior chamber.

2. Corneal abrasion
   a. Presentation
      i. Etiology- scratch on the surface of the epithelium of the cornea from a foreign body, or improperly fitting contact lenses, fingernail.
      ii. Signs & Symptoms- report of eye trauma, sensation of “something in my eye”, decreased visual acuity, pain, tearing, redness.
      iii. Diagnosis- fluorescein staining with slit lamp exam.
   b. Treatment
      i. Irrigate the eye if foreign body is visible
      ii. Instill topical anesthetic before assisting with removal
      iii. Teach patient proper technique for instillation of antibiotic eye drops or ointment.
      iv. Provide tetanus prophylaxis
3. Chemical Burns
   a. Presentation
      i. Etiology - results from splashing or spraying hazardous materials into the eye.
         1. Alkaline - high pH, most severe damage, lye, cement, lime & ammonia.
         2. Acidic - low pH, less severe damage, sulfurous acid, Hydrochloric acid, nitric acid, acetic acid, chromic acid.
      ii. Signs & Symptoms - pain, irritation, inability to keep eyes open, blurred vision, sensation of something in the eye.
   b. Treatment
      i. Irrigate continuously with normal saline solution until pH of conjunctival sac is consistently 7
      ii. Fluoroscein staining to evaluate extent of the injury
      iii. Topical antibiotic and cycloplegics
      iv. Tetanus prophylaxis
      v. Refer to ophthalmologist with significant corneal damage

4. Ruptured globe
   a. Presentation
      i. Etiology - severe penetrating trauma, ophthalmologic emergency.
      ii. Signs & Symptoms - vision loss, pain, vitreous humor leakage from the eye, diplopia & endophthalmos
      iii. Diagnosis - CT scan of eye or MRI (contraindicated with metal impalement)
   b. Treatment
      i. Analgesia & sedation
      ii. Minimize manipulation of eye
      iii. Rigid shield without underlying patch
      iv. PO antibiotics
      v. Surgical consult

5. Orbital Fracture
   a. Presentation
      i. Etiology - break in the orbital floor and rim, can lead to vision impairment or injury to the globe. Caused by direct blunt trauma to the eye.
      ii. Signs & Symptoms - ecchymosis of the eyelid, pain, difficulty blinking, possible CSF rhinorrhea, subconjunctival hemorrhage.
         1. TIDES mnemonic -
            a. Trismus (lockjaw)
            b. Infraorbital hyperesia
            c. Diplopia
            d. Epitaxis
            e. Symmetry

Orbital Fracture occurs when the direct injury causes a significant rise in IOP, the floor of the orbit breaks.
2. **Blowout fracture** - periorbital ecchymosis, sunken eye, upward gaze, diplopia.
   
   **iii. Diagnosis** - facial x-rays, CT

b. **Treatment**
   
   i. Assess for other facial or head trauma
   
   ii. Visual acuity
   
   iii. Ice and elevate the head
   
   iv. Avoid Valsalva maneuver, coughing, and nose-bleeding
   
   v. Ophthalmological referral

6. **Retinal Detachment**
   
   a. **Presentation**
      
      i. **Etiology** - outer retinal pigment epithelium splits from the neural retina, creating subretinal space that fills with fluid called subretinal fluid.
         
         1. Myopia
         2. Cataract surgery
         3. Trauma or inflammation
         4. DM

      ii. **Signs & Symptoms**
         
         1. Floaters
         2. Light flashes
         3. Sudden, painless vision loss, “curtain over the eye”
         4. Wavy or watery vision

      iii. **Diagnosis**
         
         1. Visualization of gray or opaque retina.

b. **Treatment**
   
   i. Restrict eye movement, BR, sedation, with bilateral eye patching
   
   ii. Cryotherapy
   
   iii. Avoid Valsalva maneuver, coughing and nosebleeding
   
   iv. Surgery

**Otic Emergencies**

1. **Ruptured Tympanic Membrane**
   
   a. **Presentation**
      
      i. **Etiology** - results from blunt, penetrating, or blast trauma, skull fractures ear infections, diving injuries or airplane travel.

      ii. **Signs & Symptoms**
         
         1. Sudden, sharp ear pain
         2. Blood or fluid in ear canal
         3. Hearing impairment
         4. Tinnitus & vertigo

      iii. **Diagnosis** - otoscopic evaluation
b. Treatment
   i. Analgesia
   ii. Antibiotics with ear infection
   iii. Large lacerations may require surgical repair
   iv. Avoid water in the ear while healing
   v. Instruct patients not to put instruments in the ear.

2. Acute Otitis Media
   a. Presentation
      i. Etiology- “swimmer’s ear”, inflammation of the external auditory canal and auricle.
      ii. Signs & Symptoms
          1. Swelling and redness of the ear
          2. Pain
          3. Impaired hearing
          4. Fever & malaise
          5. Possible exudate
      iii. Diagnosis- otoscopic evaluation
   b. Treatment
      i. Antibiotics & analgesics
      ii. Protect ear canal from moisture
      iii. May apply moist heat for comfort
Epistaxis

a. Presentation
   i. Etiology- nosebleed, anterior nasal septum in children (less severe), posterior septum in adults (more severe).
      1. Trauma
      2. Polyps
      3. Vascular abnormalities
      4. Acute or chronic infections
      5. Dry mucous membranes
   ii. Signs & Symptoms
      1. Bleeding from nostrils
      2. Bilateral bleeding suggests blood dyscrasia or severe trauma
      3. PMH: anticoagulants, HTN, ASA use, Hodgkin’s disease, or blood dyscrasias
   iii. Diagnosis- facial x-rays if fracture suspected, CBC, coag, direct nasal examination

b. Treatment
   i. Anterior bleeds-topical vasoconstrictors (cocaine, epi), direct pressure, cautery, & packing
   ii. Posterior bleeds- nasal packing, epistaxis balloons, drug therapy to treat underlying conditions.
   iii. Surgical ligation or embolization
   iv. Cold compress or ice collar, direct pressure, head in upright position compressing nostrils

Facial Fractures

1. Mandibular Fracture
   a. Presentation
      i. Etiology- most common facial fractures, open fractures associated with intraoral bony fragments, bleeding around teeth
   ii. Signs & Symptoms
      1. Malocclusion of the teeth
      2. Trismus (lockjaw)
      3. Edema, ecchymosis
      4. Point tenderness
   iii. Diagnosis
      1. Clinical exam
      2. Facial CT
      3. Panoramic x-ray
b. Treatment
   i. Maintain airway
   ii. Ice to area
   iii. Analgesics
   iv. Closed or open reduction
   v. Instruct patients to carry wire cutters at all times
   vi. Brush teeth and wires several times per day
   vii. Maintain nutrition with high-calorie, high-protein liquids

2. Maxillary Fractures
   a. Presentation
      i. Etiology- blunt trauma, classified by Rene LeFort
         1. LeFort I- horizontal fracture, transverse detachment of the entire maxilla above the teeth at the level of the nasal floor
         2. LeFort II- pyramidal fracture, involves a triangular segment of the midportion of the face and nasal bones.
         3. LeFort III- craniofacial dysjunction, complete separation of the cranial attachments from the facial bones
      ii. Signs & Symptoms
         1. Malocclusion of the teeth
         2. Epitaxis
         3. Facial edema & ecchymosis
         4. Subconjunctival hemorrhage with LeFort II & III
         5. Cerebrospinal fluid rhinnorhea with LeFort II & III
         6. Infraorbital paresthesia with LeFort II & III
         7. “Dish face” with LeFort III
      iii. Diagnosis
         1. Mechanism of injury
         2. Clinical exam
         3. Facial & head CT
         4. CXR to R/O tooth aspiration
   b. Treatment
      i. Maintain airway
      ii. Cricothyrotomy if oral intubation is not possible
      iii. Analgesics
      iv. Cold packs to face
      v. IV antibiotics for open Fx
      vi. Neurosurgical consult for cerebrospinal rhinnorhea
      vii. Reduction and internal fixation
Epiglottitis

a. Presentation
   i. Etiology - epiglottis is inflamed, upper airway burns, Haemophilus influenza type B
   ii. Signs & Symptoms
       1. Abrupt onset of symptoms
       2. More common in adults now due to HIB vaccine
       3. History of URI
       4. Fever (>103.1), sore throat, drooling, dysphagia
       5. Inspiratory stridor
       6. Absent cough
       7. Neck extended, chin extended, insist on sitting position
   iii. Diagnosis
       1. History and clinical exam
       2. Soft tissue x-rays show massive epiglottal swelling “thumb shape”

b. Treatment
   i. High flow oxygen
   ii. Emergent endotracheal intubation
   iii. Keep child calm, crying stimulates laryngospasm & airway obstruction
   iv. Don’t look in the child’s mouth
   v. Delay invasive diagnostic tests
   vi. Cryothrytotomy if unable to obtain ETT
   vii. Antibiotics & corticosteroids

Croup (laryngotracheobronchitis)

a. Children age 6-36 months
b. Parainfluenza virus type I, or other flu strains
c. Nasopharynx, larynx, trachea become inflamed causing exudates and swelling of vocal cords
d. Symptoms:
   i. Stridor
   ii. Hoarseness
   iii. “Barking” cough
   iv. Fever
   v. URI for 1-2 days
   vi. Restless, lethargy
   vii. Tachycardia, tachypnea
   viii. Retractions
e. Treatment:
   i. Cool, humidified oxygen
   ii. Racemic epi
   iii. Corticosteroids
Your Questions:

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   a. _________________________________________________
   b. _________________________________________________
   c. _________________________________________________
   d. _________________________________________________

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   a. _________________________________________________
   b. _________________________________________________
   c. _________________________________________________
   d. _________________________________________________

3. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   a. _________________________________________________
   b. _________________________________________________
   c. _________________________________________________
   d. _________________________________________________
Neurological Tasks (15)

1. Brief loss of consciousness, followed by a lucid period, followed by a secondary loss of consciousness is characteristic of which traumatic brain injury?
   a. Subdural hematoma
   b. Subarachnoid hemorrhage
   c. Epidural hemorrhage
   d. Concussion

2. The most common cause of subarachnoid hemorrhage is:
   a. Aneurysms
   b. Coagulopathies
   c. Trauma from falls
   d. Ischemia

3. Which of the following statements best describes transient ischemic attacks (TIAs)?
   a. Damage and symptoms resolve
   b. Damage and symptoms are permanent
   c. Damage is permanent, but symptoms resolve
   d. Damage is permanent, there are no symptoms

4. The best indicator of changes in neurological function in the alert patient is:
   a. Changes in behavior
   b. Disorientation
   c. Unresponsiveness
   d. Pupil changes

5. The most sensitive indicator of changes in intracranial pressure in patients who are unresponsive is:
   a. Change in systolic blood pressure
   b. Change in pupil response
   c. Blood glucose levels
   d. Response of the cranial nerves

6. The most important indicator of cerebral perfusion is:
   a. Cerebral perfusion pressure
   b. Intracranial pressure
   c. Blood pressure
   d. Wedge pressure

7. Nursing measures to decrease intracranial pressure include:
   a. Raising the HOB to 30°
   b. Limiting PEEP, and Vt
   c. Decreasing agitation
   d. All of the above
8. A 25 y/o male presents to triage complaining of “neck pain, and numbness and tingling in his left arm.” He states that he was swinging on a tree limb, lost his grip, and fell backwards striking his head on the ground. He decided to come to the ER after “my friend yelled at me to get treated.” Which of the following interventions would the nurse anticipate immediately?
   a. Rapid takedown, with spinal immobilization via long board and hard c-collar
   b. Application of a foam collar and treatment with acetaminophen
   c. Application of a Philadelphia collar and allow the patient to wait in the waiting room
   d. Inform the patient that he probably has carpal tunnel syndrome and to follow up with a hand specialist

9. The ambulance brings a patient into the trauma bay who was the unrestrained driver of a two car MVA. He has a suspected basilar skull fracture with Battle’s sign and positive otorrhea. The assessment findings are as follows: eye opening only to deep sternal rub, incomprehensible speech, and abnormal flexion. What would the nurse determine the Glasgow Coma Score to be on this patient?
   a. 2/2/6- total 10
   b. 1/1/1- total 3
   c. 2/2/3- total 7
   d. 4/5/6- total 14

10. Which of the following interventions would the nurse anticipate as a priority in the unresponsive head trauma patient?
   a. Intubation
   b. NGT insertion
   c. TPA administration
   d. Packing of the ears and nose

11. Which of the following is the correct dosage for fibrinolytic therapy in acute ischemic stroke?
   a. Started within 3 hours of symptom onset, 0.9 mg/kg IV, maximum dose of 90 mg, bolus 10% given over 1 minute, remainder over 60 minutes.
   b. Started within 6 hours of symptom onset, 9 mg/kg IV
   c. Started within 3 hours of symptom onset, 0.9 mg/kg IV bolus
   d. Started within 6 hours of symptom onset, 0.9 mg/kg IV, maximum dose 90 mg, bolus 10% given over 1 minute, remainder over 2 hours

12. Which of the following is consistent with signs and symptoms of Guillain-Barre Syndrome?
   a. Weak eye muscles, visual changes, & diplopia
   b. Asymmetrical paralysis
   c. Ascending symmetrical paralysis
   d. Dull, tight, constricting pain in the head
13. A patient presents to the emergency department complaining of severe, unilateral, throbbing pain in the front and side of his head. You palpate this area and note that it causes severe discomfort to the patient. What type of headache would you expect from this presentation?
   a. Vascular headache
   b. Migraine headache
   c. Tension headache
   d. Temporal arteritis

14. Which of the following is an abnormal finding when assessing for pronator drift in a patient with a suspected stroke?
   a. One arm does not move or drifts downward
   b. Both arms drift downward
   c. Both arms do not move at all
   d. The patient tells you they are too tired to hold their arms out for 10 seconds.

15. Myasthenic crisis is treated with which of the following medications?
   a. Tensilon
   b. Edrophonium chloride
   c. Neostigmine
   d. Epinephrine
Neurologic Emergencies

TIAs

1. Etiology:
   a. Cardiac & atherosclerotic plaques
   b. Arterial obstruction
   c. Arterial inflammation
   d. Hematologic abnormalities

2. Presentation:
   a. Vascular events that result in temporary, focal neurological findings
   b. Characteristics:
      i. Maximal dysfunction within 5 minutes
      ii. Resolve within 15 minutes (may persist for 24 hours)
      iii. If resolution occurs within 21 days termed: Reversible Ischemic Neurological Deficit (RIND).

3. Treatment:
   a. May be a precursor to stroke

Ischemic Stroke

1. Etiology:
   a. Hypertension
   b. Cardiac disease, hyperlipidemia
   c. TIA’s, previous stroke
   d. Diabetes
   e. Asymptomatic carotid bruit
   f. Oral contraceptives

2. Presentation:
   a. Thrombotic
      i. Atherosclerotic vessel narrowing
      ii. TIAs may precede
   b. Lacunar
      i. Thrombus occurs in small arteries of the deep gray or white matter
      ii. Occurs frequently in pts. with HTN
   c. Embolic
      i. Accounts for 20% of ischemic strokes
      ii. Carotids
      iii. Cardiac origin:
         1. A-fib
         2. Diseased heart valves
         3. Infectious endocarditis
         4. Cardiomyopathy
   e. Perioperative
      i. CABG
Intracranial Bleeds

1. Etiology:
   a. Monitor clotting, coags
   b. Protect from injury

2. Presentation:
   a. Subdural
      i. Acute (first 48 hours)
      ii. Subacute (2 days to 2 weeks)
      iii. Chronic (after 2 weeks)
   b. Epidural
      i. Usually arterial
      ii. LOC, followed by lucid period, followed again by LOC
   c. Subarachnoid
      i. Ruptured aneurysm

Hunt-Hess Classification of Subarachnoid Hemorrhage

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>I</td>
<td>Asymptomatic</td>
</tr>
<tr>
<td>II</td>
<td>Mild cranial nerve dysfunction</td>
</tr>
<tr>
<td>III</td>
<td>Mild focal deficit, lethargy, confusion</td>
</tr>
<tr>
<td>IV</td>
<td>↓ LOC, hemiparesis, abnormal posturing</td>
</tr>
<tr>
<td>V</td>
<td>Deep coma, posturing</td>
</tr>
</tbody>
</table>

d. Intracerebral
   i. Slow developing
   ii. Progressive ↓ in LOC
   iii. Poor prognosis
Increased Intracranial Pressure

1. Vasogenic Edema
   a. Disruption of blood/brain barrier
   b. Allows fluid and proteins to “leak” into brain tissue
   c. Etiology:
      i. Trauma
      ii. Ischemia
      iii. Tumor
      iv. Infection
      v. Brain abscess

2. Cytotoxic Edema
   a. Hypoxic injury causes intracellular swelling
   b. Etiology:
      i. Trauma
      ii. Cerebral hemorrhage
      iii. Hypo-osmolar states

3. Interstitial Edema
   a. Increased CSF production or decreased removal
   b. Etiology:
      i. Infection
      ii. Cerebral aneurysm rupture
      iii. Brain tumor
Presentation:
1. Signs / symptoms
   a. Decreased level of consciousness
   b. Alterations in thought process
   c. Headache, nausea, vomiting
   d. Sensory loss, paresthesias
   e. Motor loss, paralysis
   f. Pupil changes
   g. Alteration in body temperature
   h. Seizures

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

Treatment:
1. ↓ ICP
2. Balance oxygen supply and demand using the Ventilation-Perfusion Train
Medical & nursing interventions

1. Cerebral perfusion
   a. Thrombolytics
   b. Anticoagulants
   c. Angiography

2. Oxygenation
   a. Supply and demand
      i. \( \uparrow \text{FiO}_2 / \text{PO}_2 \)
      ii. \( \uparrow \text{CO} \)
      iii. \( \downarrow \text{VO} \)

3. Hyperventilation
   a. Effects are temporary
   b. Must be sustained

4. Steroids
   a. \( \downarrow \) inflammation

5. Mannitol
   a. \( \downarrow \) volume
   b. Neuroprotective effect

6. Decreasing metabolic activity
   a. \( \downarrow \) temp
   b. \( \downarrow \) activity

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<tr>
<th>Vasodilation</th>
<th>Vasoconstriction</th>
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<tr>
<td>( \downarrow \text{B/P} )</td>
<td>( \uparrow \text{B/P} )</td>
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<tr>
<td>( \uparrow \text{CO}_2 )</td>
<td>( \downarrow \text{CO}_2 )</td>
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<tr>
<td>( \downarrow \text{O}_2 )</td>
<td>( \uparrow \text{O}_2 )</td>
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<tr>
<td>( \downarrow \text{pH} )</td>
<td>( \uparrow \text{pH} )</td>
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</table>

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

1. Prevention:
   a. Bleeding
   b. Infection
   c. Ischemia
   d. Electrolyte disorders

2. Precipitating factors:
   a. Stress
   b. Sleep deprivation
   c. Fever
   d. Alcohol or drug withdraw

3. Presentation:
   a. Types:
      i. Partial
      ii. Complex partial
      iii. Generalized
   b. Phases:
      i. Aura
      ii. Sensory or motor
      iii. Post-ictal

4. Prompt Action:
   a. Precautions
      i. Bed low and locked
      ii. Pad side rails
      iii. Airway, oxygen and suction at bedside
   b. Management of the seizure
      i. Protect patient from injury
      ii. Maintain airway
      iii. Documentation
      iv. Antiepileptic medications
         1. Valium
         2. Dilantin
         3. Phenobarbital
         4. Propofol
         5. Tegretol
         6. Valproate
   c. Post-ictal care
      i. Neuro check
      ii. Support airway and breathing
      iii. Monitor EKG
      iv. Assess for cause
Spinal Cord Injuries

1. Prevention
   a. Etiology- trauma, hyperextension, hyperflexion, rotational twisting with shearing forces, vertebral compression.
      i. Types of trauma- diving, MVA, falls, sports injuries, or penetrating from GSW or stab wounds.
   b. Signs & Symptoms-
      i. Look for history of trauma, neoplasms, or infection that would cause a spinal abscess; will depend on the area of the lesion
      ii. Muscle spasm/ back pain that worsens with movement
      iii. Sensory loss
      iv. Ecchymosis, pain, edema, guarding or crepitus over area
      v. Loss of reflexes
      vi. Loss of rectal tone
      vii. Mouth breathing from lesions above the diaphragm
         1. Complete- all tracts are disrupted, complete & permanent loss.
         2. Incomplete (Central cord syndrome)- typically C-spine
            Motor deficits more pronounced in the upper extremities
         3. Incomplete (Anterior cord syndrome) - loss of motor function below the level of the injury
         4. Brown-Sequard- hemisection of the cord is damaged, most common from penetrating trauma, ipsilateral paralysis below the level of the injury, ipsilateral loss of some types of sensation below the level of the injury, contralateral loss of pain & temperature below the level of the injury.
   c. Diagnosis-
      i. Spinal x-rays
      ii. CT scan & MRI
      iii. Neurological evaluation

2. Treatment
   a. Immediate immobilization to stabilize spine and prevent further damage
      C-spine using hard c-collar and head blocks, or skeletal traction
   b. ACLS
   c. Establish baseline neuro status
   d. Vasopressors for hypotension
   e. Methylprednisolone if within 8 hours of injury
   f. Foley cath to prevent bladder distention
   g. NG tube for gastric emptying
   h. Keep patient warm
   i. Watch for Neurogenic shock
Skull Fractures

1. Presentation
   a. Etiology- trauma, depends on type
      i. Linear- non-displaced, usually associated with minimal neuro deficits
      ii. Depressed- bony fragments are displaced towards the brain which may cause compression or laceration
      iii. Basilar – fractures to the base of the skull; occur in the anterior, middle or posterior fossa
   b. Signs & Symptoms- depends on underlying brain trauma
      i. Raccoon eyes- anterior fossa basilar skull fractures; periorbital ecchymosis
      ii. Anosia- loss of smell d/t first cranial nerve involvement
      iii. Pupil abnormalities- second and third cranial nerve involvement
      iv. CSF rhinorrhea & otorrhea
      v. Battle’s sign- ecchymosis over the mastoid bone
      vi. Facial paralysis- occur with middle fossa basilar skull fractures
   c. Diagnosis-
      i. CT scan & MRI- swelling and intracranial hemorrhage
      ii. CT may show a fracture

2. Treatment
   a. Establish baseline neuro status
   b. Do not pack ears or nose with CSF drainage
   c. Avoid- nasal intubation, NG tube, nasal cannula
   d. Antibiotics
   e. Anticonvulsants
Your Questions:

1. ______________________________________________________
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   ______________________________________________________
   a. _________________________________________________
   b. _________________________________________________
   c. _________________________________________________
   d. _________________________________________________

2. ______________________________________________________
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   c. _________________________________________________
   d. _________________________________________________

3. ______________________________________________________
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   ______________________________________________________
   a. _________________________________________________
   b. _________________________________________________
   c. _________________________________________________
   d. _________________________________________________
Orthopedic and Wound Management Tasks (13)

1. A patient presents to the emergency department with a Nightstick fracture of the right arm. Which of the following is the patient at greatest risk for?
   a. Joint Effusion
   b. Compartment Syndrome
   c. Fat Embolism Syndrome
   d. Hypovolemic shock

2. A patient arrives via ambulance to the emergency department after suffering from a traumatic amputation of his left mid-forearm. Bleeding is minimal and his vital signs are stable. Which of the following interventions is the priority for this patient?
   a. Placement of a tourniquet to control bleeding
   b. Obtaining x-rays
   c. Planning for reimplantation
   d. Caring for the severed part

3. Which of the following is the primary nursing diagnosis for a patient with compartment syndrome?
   a. Acute pain
   b. Knowledge deficit
   c. Anxiety
   d. Impaired tissue perfusion

4. Which of the following statements would indicate to the nurse that the patient needs more discharge teaching regarding care of his sprained ankle?
   a. “I should rest my ankle on a pillow above my heart.”
   b. “I need to apply ice.”
   c. “I should take Ibuprofen or Tylenol as I need it for pain.”
   d. “If my ankle starts to throb, I need to apply a warm compress.”

5. A Colle’s fracture is a result of which of the following mechanisms?
   a. Fall onto the shoulder
   b. Jumping from a building and landing on the feet
   c. Direct blow to the leg
   d. Fall on outstretched hand

6. What is the most likely complication of abrasions?
   a. Severe bleeding
   b. Infection
   c. Contracture
   d. Embolism
7. Which of the following is not one of the five P’s for assessing neurovascular status following an extremity injury?
   a. Pallor
   b. Pain
   c. Pulses
   d. PEA

8. A 28 y/o male patient was brought to the emergency department following a two car MVA. He was the unrestrained driver. He complains of point tenderness in the iliac spine. The nurse also notices swelling and ecchymosis of the right thigh. The nurse understands that the patient’s signs and symptoms are suggestive and which type of fracture?
   a. Hip
   b. Pelvis
   c. Femur
   d. Thoracic spine

9. This patient’s vital signs are HR 130, RR 22, BP 88/60. Which nursing diagnosis is the priority for this patient?
   a. Risk for impaired tissue perfusion
   b. Hypovolemia
   c. Impaired gas exchange
   d. All of the above

10. Compression fractures most commonly occur in which area of the body?
    a. Ankle
    b. Hip
    c. Spine
    d. Femur

11. A 84 y/o patient presents to the emergency department after a fall at the nursing facility. The nurse notices on arrival that the patient’s right leg is abducted and shorter than the left leg. What type of fracture is suspected in this patient?
    a. Hip
    b. C-spine
    c. Ankle
    d. Lumbar spine

12. Which of the following diagnostic studies is the highest priority in a patient with a pelvic fracture?
    a. UA
    b. Type and crossmatch
    c. Blood sugar
    d. CBC
13. Your patient suffered a hymenoptera sting and is experiencing hives, abdominal pain and shortness of breath. What is the nursing priority?
   a. Remove the stinger
   b. Protect the airway
   c. Administer corticosteroids
   d. Early ambulation
Fractures & Dislocation

Dislocations are injuries that occur at the articulation of two or more bones, causing the bones to move out of their anatomically correct position. Dislocations may also include associative soft tissue and vascular or nerve injury.

Fractures is an interruption in the community and stability of the bone. Classified by the five general divisions:
- Anatomic location
- Direction of fracture lines
- Relationship of fragments to each other
- Stability
- Associated soft tissue injury

Nerve Entrapment Syndromes

Caused by compression of a peripheral nerve as it traverses a closed compartment. Due to overuse of an extremity, repetitive use of the extremity and occupational or athletic stresses
1. Pronator syndrome- entrapment at the forearm
2. Carpal tunnel syndrome- entrapment at the elbow
3. Tarsal tunnel syndrome- compression of the medial tibial nerve at the media Malleolus
4. Signs & Symptoms
   i. Pain along the nerve pathway
   ii. Pain that may radiate to the shoulder
   iii. Paresthesia, numbness
   iv. Limited ROM
   v. Atrophy of the surrounding muscle, extremity weakness
   vi. Phalen’s sign- flex the wrist for one minute. Test is positive if flexion causes paresthesias in the nerve’s distribution.
   vii. Tinel’s sign- Percussion of the median nerve causes pain and paresthesias in the nerve’s distribution.
5. Treatment
   i. Avoid aggravating activities
   ii. Splint the wrists in a neutral or slightly extended position
   iii. Local steroid injections
   iv. EMG
   v. Surgical repair
<table>
<thead>
<tr>
<th>Location</th>
<th>Causes</th>
<th>Signs &amp; Symptoms</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acromioclavicular</td>
<td>Direct blow to the point of the shoulder</td>
<td>Severe pain, point tenderness, inability to raise the arm across the chest</td>
<td>Reduction ASAP, open reduction</td>
</tr>
<tr>
<td>Shoulder</td>
<td>Anterior-fall on outstretched arm Posterior- rare</td>
<td>Decreased ROM, deformity</td>
<td>Closed reduction; should occur immediately to prevent neurovascular compromise</td>
</tr>
<tr>
<td>Elbow</td>
<td>Fall on extended arm</td>
<td>Pain with movement, decreased ROM, deformity</td>
<td>Relocation with surgical repair</td>
</tr>
<tr>
<td>Wrist</td>
<td>FOOSH</td>
<td>Pain with movement, Deformity</td>
<td>Support in position of comfort, closed reduction</td>
</tr>
<tr>
<td>Hand or Finger</td>
<td>FOOSH or direct trauma</td>
<td>Pain, deformity, swelling, inability to move joint</td>
<td>Support in position of comfort, reduction</td>
</tr>
<tr>
<td>Hip</td>
<td>MVA, falls</td>
<td>Hip or knee pain, pain that radiates to the groin, inability to move leg. (anterior) hip flexed, adducted &amp; internally rotated (posterior) hip flexed abducted and externally rotated</td>
<td>Support in position of comfort, surgical reduction</td>
</tr>
<tr>
<td>Knee</td>
<td>MVA, sports injury</td>
<td>Severe pain, deformity, gross swelling, inability to move joint</td>
<td>Splint in position of comfort, immediate reduction</td>
</tr>
<tr>
<td>Ankle</td>
<td>MVA, associated with a fracture</td>
<td>Swelling, deformity, pain, inability to move joint</td>
<td>Possible surgical reduction, crutches</td>
</tr>
</tbody>
</table>
Traumatic Amputations

1. Presentation
   a. Etiology - industrial injuries, MVA.
   b. Care of the stump
      i. Control bleeding by direct pressure, elevation. DO NOT use clamps or tourniquets unless bleeding cannot be controlled by another means.
      ii. Remove gross debris, do not scrub or use cleaning solutions
      iii. Apply a splint
      vi. X-ray
      vii. Antibiotics
      viii. Tetanus & prepare pt. for surgery
   c. Care of amputated part
      i. Attempt to locate the severed part
      ii. Using sterile gloves, remove gross debris
      iii. Wrap in sterile gauze for small parts, towel or clean sheet for limbs.
      iv. Rinse with saline, do not use water, do not soak.
      v. Place plastic bag and seal shut.
      vi. Never place directly on ice

Compartment Syndrome

Develops when the pressure in the muscle compartment exceeds the intraarterial hydrostatic pressure; causing collapse of capillaries, and venules, which leads to ischemia & tissue necrosis.

1. Presentation
   a. Etiology-
      i. Prolonged use of PAS garments
      ii. Skeletal traction
      iii. Crush injuries
      iv. Burns, frost bit
      v. Envenomation
      vi. Fractures, contusions
      vii. Extravasation of fluids into a fascial muscle compartment

   b. Signs & Symptoms
      i. Seven P’s:
         1. Pain
         2. Parathesia
         3. Paralysis
         4. Pallor
         5. Pulse
         6. Polar
         7. Puffiness
c. Diagnosis
   i. Urine myoglobinuria (late sign)
   ii. Renal failure (late sign)
   iii. Compartment pressures > 30 mmHg

2. Treatment
   a. Remove constrictive dressings, casts, and splints
   b. Do not elevate – level with the heart
   c. Do not apply ice
   d. Emergent fasciotomy and surgical debridement
**Osteomyelitis**

Infection of the bone

1. Presentation
   a. Etiology
      i. Direct contamination from open fractures
      ii. Penetrating wounds
      iii. Surgical procedures
      vi. Most common organism is Staph aureus
   b. Signs & Symptoms
      i. Fever
      ii. Pain
      iii. Edema, Erythema
      iv. Purulent drainage
   c. Diagnosis
      i. Clinical assessment
      ii. Elevated ESR
      iii. Elevated WBC

2. Treatment
   a. Immobilize extremity
   b. Culture drainage
   c. IV antibiotics
   d. Surgical debridement

**Brush Up on Wound Care Basics**

1. Abrasions
2. Lacerations
3. Incisions
4. Punctures
5. Bee stings
Your Questions:

1. ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   a. ______________________________________________________________
   b. ______________________________________________________________
   c. ______________________________________________________________
   d. ______________________________________________________________

2. ________________________________________________________________
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   a. ______________________________________________________________
   b. ______________________________________________________________
   c. ______________________________________________________________
   d. ______________________________________________________________
Obstetrical / Genitourinary and Gynecological Tasks (10)

1. Which of the following is not a sign or symptom of fetal distress?
   a. Fetal HR >160 or <100
   b. Decreased fetal movement
   c. No beat to beat variability is present
   d. Vaginal bleeding

2. A young woman presents to the emergency department who is 28-weeks pregnant. She was a restrained passenger in a two car MVA. She is complaining of abdominal tenderness, back pain, “contractions,” and vaginal bleeding. Which of the following is the priority intervention for this patient?
   a. Pelvic examination
   b. Quantitative HCG
   c. Oxygen therapy and IVF bolus
   d. Fetal heart tones

3. A mother presents to triage with her 13 year-old son. She states that he woke up crying, and complaining of severe pain in his lower abdomen, nausea, and vomiting. On exam the patient’s testicle is elevated on the right side. Vital signs are as follows: HR 130, RR 26, BP 100/68, temp 98.5 F. The nurse suspects which of the following diagnosis for this patient?
   a. Epididymitis
   b. Testicular torsion
   c. Pyelonephritis
   d. Urinary tract infection

4. Which of the following is not a sign or symptom of an ectopic pregnancy?
   a. Shoulder pain
   b. Sudden onset of unilateral pelvic pain
   c. Uterine contractions
   d. Hypovolemic shock

5. HELLP Syndrome is a variant of severe preeclampsia and is characterized by which of the following?
   a. Hemolysis, elevated liver enzymes, low platelet count
   b. Hemolysis, elevated liver enzymes, placenta previa
   c. Hypovolemia, elevated liver enzymes, low platelet count
   d. None of the above
6. A patient presents to triage, who is 34-weeks pregnant. She is complaining of vaginal bleeding for the last few hours that is bright red. She denies pain at this time. The nurse suspects which of the following diagnosis?
   a. Abruptio placenta
   b. Placenta Previa
   c. Ectopic pregnancy
   d. Pyleonephritis

7. Which of the following is not a sign or symptom of renal trauma?
   a. Cullen’s sign
   b. Grey–Turner’s sign
   c. Flank pain
   d. Hematuria

8. A 28 y/o female, 26-weeks pregnant, presents to triage complaining of a severe headache. Vital signs are as follows: BP 160/98, HR 96, RR 18, temp 98.6 F. The patient has pitting edema in her lower extremities and protein is noted on her dipstick urine. Which of the following diagnosis would the nurse suspect:
   a. Hypertension
   b. Migraine
   c. Temporal Arteritis
   d. Preeclampsia

9. Hyperemesis gravidarum typically occurs from weeks 8-12 of pregnancy. What acid-base abnormality can result from hyperemesis?
   a. Respiratory acidosis
   b. Metabolic alkalosis
   c. Respiratory alkalosis
   d. Metabolic acidosis

10. Which of the following is a basic principle of evidence collection from a patient who has been sexually assaulted?
    a. Maintain chain of evidence
    b. Seal and initial all specimens
    c. Dry moist samples and place them a separate, labeled envelope
    d. All of the above
Renal Stones

1. Gravel-like collections of chemicals:
   i. Too much chemical
   ii. Relative lack of substances to inhibit crystals
   iii. Excessive excretion of chemical

2. Calcium (75-85%)
   i. Loss from bones:
      1. Hyperparathyroidism
      2. Inflammatory bowel disease
      3. Bone metastasis
   ii. Oxalate: binds calcium

3. Struvite (magnesium, ammonium, phosphate) (10-20%)
   i. Urinary-tract infections

4. Uric acid (5-10%)
   i. Dehydration
   ii. Acidotic concentrated urine

5. Prevention:
   i. Urinary stasis
   ii. Acidotic urine
   iii. Immobilization

6. Presentation:
   i. PAIN
      1. Severe, colicky flank pain
      2. Radiates to the groin
   ii. Urinary obstruction
      1. Urgency
      2. Frequency
      3. Difficulty producing a stream
   iii. Hematuria

7. Diagnostics:
   i. KUB
   ii. IVP (intravenous pyelogram)
   iii. CT (gold standard)

High Oxylate Foods:
1. Nuts
2. Tea
3. Chocolate
4. Beets
5. Rhubarb
6. Wheat bran
8. Prompt Action:
   i. Pain control
   ii. Stones <4mm usually pass spontaneously
   iii. Stones > 4mm
      1. Increase fluid intake
      2. Extra-corporeal Shockwave Lithotripsy
      3. Cystoscopy / ureteoscopy
      4. Surgical removal
         a. Multiple, large stones, or saddle stones

9. Complications:
   i. Renal scarring
   ii. Renal failure
**Glomerulonephritis**

Inflammatory proliferation of renal tissue in response to recent infection or systematic inflammatory disease.

1. Presents as a syndrome of:
   a. Hematuria
   b. Proteinuria
   c. Hypertension, edema
   d. Decreased renal function

2. Prevention:
   a. Group-A streptococcus (most common)
   b. Other bacteria
   c. Viral
   d. Fungal

3. Presentation:
   a. Hematuria, proteinuria, oliguria
   b. Hypertension, edema, dyspnea
   c. Decreased renal function
   d. Fever, weakness, abdominal pain
   e. UA:
      i. Dark, concentrated
      ii. RBCs, protein
   f. ↑ BUN, Cr.

4. Treatment:
   a. Antibiotics
   b. Restrict fluids
   c. Diuretics
   d. Supportive therapy for failing organs

5. Complications:
   a. Chronic renal failure (rare)
   b. Hypertensive damage to CNS, eyes
**Testicular Torsion**

Twisting of the testicle or the spermatic cord causing strangulation of the blood supply to the testicles.

1. **Presentation**
   a. **Etiology**-
      i. 85% occurs in boys ages 12-18, infants also susceptible. Emergent condition, failure to correct results in ischemia and necrosis.
   b. **Signs & Symptoms**-
      i. Sudden, severe unilateral scrotal pain, followed by swelling and erythema.
      ii. N/V
      iii. Tense scrotal mass
      iv. High-riding testicle
      v. Pain increases with testicle elevation

2. **Diagnosis**
   a. Doppler ultrasonography
   b. Scintillation scan

3. **Treatment**
   a. Urgent urological evaluation
   b. Immediate surgical exploration
   c. Bedside detorsion may be attempted.

**Epididymitis**

Infection / inflammation of the epididymis

1. **Presentation**
   a. **Etiology**-
      i. Sexual contact – STD’s chlamydia & gonorrhea
      ii. Rare in prepubital boys
      iii. History of cystoscopic exam, prostate surgery or bladder catheterization
   b. **Signs & Symptoms**
      i. Gradual onset of mild to moderate scrotal pain that is usually unilateral
      ii. Progressive scrotal swelling
      iii. Dysuria
      iv. Elevated temperature
      v. Scrotal warmth, tenderness, and erythema
c. Diagnosis
   i. Scrotal ultrasound
   ii. Urethral culture & gram stain
   iii. Urine culture

2. Treatment
   a. Scrotal elevation to reduce pain
   b. Antibiotic therapy with Ciprofloxacin, or ceftriaxone & doxycycline if Chlamydia or gonorrhea infection present
   c. Increase PO intake

Complications of Pregnancy

Ectopic Pregnancy
Occurs when a fertilized egg implants outside the endometrial cavity, usually in the fallopian tube.

1. Presentation
   a. Etiology-
      i. Around 6-weeks gestation
      ii. Late or irregular period
   b. Signs & Symptoms
      i. Abnormal vaginal bleeding
      ii. Sudden severe onset of the unilateral pelvic pain
      iii. Positive pregnancy test
      iv. Sensation that bowel movement would relieve pain
      v. Kehr’s sign (left shoulder pain) with rupture
      vi. Signs of hemorrhagic shock
   c. Diagnosis
      i. HCG
      ii. CBC
      iii. Pelvic ultrasound

2. Treatment
   a. High flow oxygen
   b. IVF
   c. Antibiotics
   d. RhOGAM if mother is Rh negative
   e. Prepare surgery if rupture is suspected
   d. IM Methotrexate for unruptured ectopic pregnancy
**Preeclampsia**

Milder form of pregnancy induced hypertension (PIH). Multisystem disorder associated with hypertension, proteinuria, edema, & central nervous system irritability.

1. **Presentation**
   a. **Etiology**
      i. Second leading cause of maternal mortality
      ii. Coagulation and liver function abnormalities can present
   b. **Signs & Symptoms**
      i. SBP > 140 mmHg or DBP > 90 mmHg
      ii. Or increase in SBP > 30 mmHg with a DBP increase > 15 mmHg above the first trimester baseline
      iii. Albuminuria
      iv. Oliguria
      v. Edema of the face, hands and sacrum
      vi. Weight gain of 2 lbs or more per week
      vii. Visual changes, HA, nausea
      viii. Increased deep tendon reflexes with clonus
   c. **Diagnosis**
      i. 2+ albuminuria on urine specimen
      ii. Clinical assessment findings as above

2. **Treatment**
   a. Urgent obstetric consultation
   b. Supportive care
   c. Hydralazine or Labetalol IV for HTN
   d. Magnesium Sulfate IV to prevent seizures
   c. Admit to OB

**Eclampsia**

Preeclampsia that has progressed to the convulsive phase. HELLP syndrome may develop. HELLP syndrome is characterized by Hemolysis, Elevated Liver enzymes, Low Platelet count.

1. **Presentation**
   a. Etiology (same as PIH) – delivery is the only cure
   b. **Signs & Symptoms**
      i. Same as PIH
      ii. Generalized seizures
      iii. Significantly elevated BP (SBP 140-200) DBP > 90
      iv. Decreased fetal HR, particularly during seizures
2. Treatment
   a. Maintain patent airway
   b. High flow oxygen
   c. Place pt. in left lateral decubitus position
   d. 4-6 mg IV bolus of magnesium sulfate over 15 minutes, then maintenance drip at 1-3 mg/hr.
   e. Hydralazine or Labetalol IV for HTN
   f. Monitor BP, HR, RR and deep tendon reflexes
   g. Admit to high risk OB
   h. Anticipate C-section depending on gestational age

**Placenta Previa**
Implantation of the placenta in the lower uterine segment, over the internal os. As the fetus grows the area thins and bleeds.

1. Presentation
   a. Etiology
      i. 1 in every 200 births
      ii. Categorized based on the extent of the internal cervical os involvement
      iii. Potentially life-threatening hemorrhage and fetal loss
   b. Signs & Symptoms
      i. Sudden *painless* bright red bleeding (usu. After 7 months)
      ii. Maternal hemorrhagic shock may develop
   c. Diagnosis
      i. Ultrasound
      ii. No vaginal exam until US has confirmed the placenta location

2. Treatment
   a. IV bolus of LR or NS
   b. CBC, Type and crossmatch with Rh
   c. Left lateral decubitus position
   d. Anticipate C-section delivery
**Abruptio Placenta**

Rupture of the small vessels cause separation of the placenta from the uterine wall, this inhibits the oxygen supply and nutrients to the fetus.

1. Presentation
   a. Etiology
      i. If separation occurs at the placental margin, vaginal bleeding will be present. Separation at placental center = no bleeding
      ii. Maternal and fetal death can occur
   b. Signs & Symptoms
      i. Backache
      ii. Painful uterine contractions
      iii. Uterine rigidity
      iv. Sudden, colicky abdominal pain
      v. Frank, dark red vaginal bleeding or bleeding noted on US
      vi. Maternal hemorrhagic shock
      vi. Fetal heart tones may be absent
      vi. Small, concealed bleeds may be asymptomatic
   c. Diagnosis- Ultrasound

2. Treatment
   a. NRB
   b. IV bolus LR or NS
   c. Consider transfusion with crossmatched blood
   d. CBC, Type and Cross with Rh
   e. Measure and reassess fundal height
   f. Rapid transport to OR if fetal viability or maternal shock present
   g. Continuous electronic fetal monitoring if not delivered immediately

**Trauma in Pregnancy**

Primary survey is the same as other trauma patients. Secondary assessment should include ultrasound examination to identify gestational age, fetal injuries, and cardiac activity. Initiate of continuous electronic fetal monitoring with > 20 weeks gestation.

1. Signs and Symptoms of fetal distress
   a. FHR > 160 or < 110
   b. FHT
   c. Decelerations
   d. No beat-to-beat variability
   e. Decreased fetal movement is noted by the mother.
2. Treatment
   a. Administer oxygen by tight-fitting face mask at 10-15 L/min
   b. Position the patient on her left side or displace the uterus to the let with a wedge under the right hip. Even patients on a backboard can be tilted readily.
   c. IVF LR or NS
   d. Consider emergent c-section
Your Questions:

1. ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   a. __________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________

2. ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   a. __________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________

3. ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   a. __________________________________________
   b. __________________________________________
   c. __________________________________________
   d. __________________________________________
Certification Exam Planner

- 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

Your action plan:

<table>
<thead>
<tr>
<th>Action</th>
<th>Started</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>When will you take the test?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Register</td>
<td></td>
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<tr>
<td>Request time off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Get study materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study guide #1</td>
<td></td>
<td></td>
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<tr>
<td>Study guide #2</td>
<td></td>
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</tr>
<tr>
<td>Study guide #3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:

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

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.100K-Certified-Nurses.com
Thanks for attending “CEN: Test Prep”!

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

**The Critical Care Skills Package**

High-acuity patients often bring along critical care equipment like ventilators, central lines, pacemakers and chest tubes. Proper management of these patients is vital to prevent complications.

**The Critical Care Essentials Package**

Critically ill patients are everywhere these days – on the med-surg floor, in the ICU, the PACU, the ED, even long-term care! A good working knowledge of these essential concepts is indispensable.

**The Critical Care Mastery Package**

Critical Care 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.