Kansas Emergency Medical Services
Education Standards

Paramedic
Contents

Preparatory **EMS Systems (PR1)**  Page 5
Preparatory **Research (PR2)**  Page 13
Preparatory **Workforce Safety and Wellness (PR3)**  Page 16
Preparatory **Documentation (PR4)**  Page 20
Preparatory **EMS System Communication (PR5)**  Page 22
Preparatory **Therapeutic Communication (PR6)**  Page 24
Preparatory **Medical/Legal Ethics (PR7)**  Page 29
Preparatory **Anatomy and Physiology (PR8)**  Page 35
Preparatory **Medical Terminology (PR9)**  Page 59
Preparatory **Pathophysiology (PR10)**  Page 60
Preparatory **Life Span Development (PR11)**  Page 76
Preparatory **Public Health (PR12)**  Page 80
Pharmacology **Principles of Pharmacology (PR13)**  Page 82
Pharmacology **Medication Administration (PR14)**  Page 89
Pharmacology **Emergency Medications (PR15)**  Page 91
Airway Mgmt Restoration and Artificial Vent **Airway Management (AM1)**  Page 93
Airway Mgmt Restoration and Artificial Vent **Respiration (AM2)**  Page 97
Airway Mgmt Restoration and Artificial Vent **Artificial Ventilation (AM3)**  Page 103
Patient Assessment **Scene Size-Up (PA1)**  Page 105
Patient Assessment **Primary Assessment (PA2)**  Page 108
Patient Assessment **History-Taking (PA3)**  Page 110
Patient Assessment **Secondary Assessment (PA4)**  Page 120
Patient Assessment **Monitoring Devices (PA5)**  Page 132
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Assessment</td>
<td>Page 134</td>
</tr>
<tr>
<td>Medicine Medical Overview (MT1)</td>
<td>Page 135</td>
</tr>
<tr>
<td>Medicine Neurology (MT2)</td>
<td>Page 139</td>
</tr>
<tr>
<td>Medicine Abdominal and Gastrointestinal Disorders (MT3)</td>
<td>Page 143</td>
</tr>
<tr>
<td>Medicine Immunology (MT4)</td>
<td>Page 148</td>
</tr>
<tr>
<td>Medicine Infectious Disease (MT5)</td>
<td>Page 151</td>
</tr>
<tr>
<td>Medicine Endocrine Disorders (MT6)</td>
<td>Page 162</td>
</tr>
<tr>
<td>Medicine Psychiatric (MT7)</td>
<td>Page 164</td>
</tr>
<tr>
<td>Medicine Cardiovascular (MT8)</td>
<td>Page 167</td>
</tr>
<tr>
<td>Medicine Toxicology (MT9)</td>
<td>Page 199</td>
</tr>
<tr>
<td>Medicine Respiratory (MT10)</td>
<td>Page 206</td>
</tr>
<tr>
<td>Medicine Hematology (MT11)</td>
<td>Page 212</td>
</tr>
<tr>
<td>Medicine Genitourinary/Renal (MT12)</td>
<td>Page 215</td>
</tr>
<tr>
<td>Medicine Gynecology (MT13)</td>
<td>Page 220</td>
</tr>
<tr>
<td>Medicine Non-Traumatic Musculoskeletal Disorders (MT14)</td>
<td>Page 223</td>
</tr>
<tr>
<td>Medicine Diseases of the Eyes, Ears, Nose, and Throat (MT15)</td>
<td>Page 225</td>
</tr>
<tr>
<td>Shock and Resuscitation (ST1)</td>
<td>Page 228</td>
</tr>
<tr>
<td>Trauma Trauma Overview (ST2)</td>
<td>Page 239</td>
</tr>
<tr>
<td>Trauma Bleeding (ST3)</td>
<td>Page 243</td>
</tr>
<tr>
<td>Trauma Chest Trauma (ST4)</td>
<td>Page 250</td>
</tr>
<tr>
<td>Trauma Abdominal and Genitourinary Trauma (ST5)</td>
<td>Page 257</td>
</tr>
<tr>
<td>Trauma Orthopedic Trauma (ST6)</td>
<td>Page 262</td>
</tr>
<tr>
<td>Trauma Soft Tissue Trauma (ST7)</td>
<td>Page 267</td>
</tr>
<tr>
<td>Trauma Head, Facial, Neck, and Spine Trauma (ST8)</td>
<td>Page 273</td>
</tr>
</tbody>
</table>
Trauma Nervous System Trauma (ST10) Page 278
Trauma Special Considerations in Trauma (ST11) Page 283
Trauma Environmental Emergencies (ST12) Page 288
Trauma Multi-System Trauma (ST13) Page 294
Special Patient Populations Obstetrics (SP1) Page 298
Special Patient Populations Neonatal Care (SP2) Page 304
Special Patient Populations Pediatrics (SP3) Page 321
Special Patient Populations Geriatrics (SP4) Page 336
Special Patient Populations Patients with Special Challenges (SP5) Page 351
EMS Ops Principles of Safely Operating a Ground Ambulance (OP1) Page 365
EMS Operations Incident Management (OP2) Page 366
EMS Operations Multiple Casualty Incidents (OP3) Page 367
EMS Operations Air Medical (OP4) Page 368
EMS Operations Vehicle Extrication (OP5) Page 369
EMS Operations Hazardous Materials Awareness (OP6) Page 372
EMS Ops Mass Cal Incidents Due to Terrorism and Disaster (OP7) Page 373

Contents and abbreviations developed by Hutchinson Community College staff.
Preparatory
EMS Systems – PR1

Integrates comprehensive knowledge of EMS systems, safety/well being of the paramedic, medical/legal and ethical issues, which is intended to improve the health of EMS personnel, patients, and the community.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT and AEMT level PLUS the following material:

I. History of EMS

A. EMS Prior to World War I
   1. 1485 – Siege of Malaga, first recorded use of ambulance by military, no medical care provided
   2. 1800s – Napoleon designated vehicle and attendant to head to battle field
      a. 1860 – first recorded use of medic and ambulance use in the United States
      b. 1865 – first civilian ambulance, Commercial Hospital of Cincinnati, Ohio
      c. 1869 – First ambulance service, Bellevue Hospital in New York, NY
      d. 1899 – Michael Reese Hospital in Chicago operates automobile ambulance

B. EMS Between World War I and II
   1. 1900s – Hospitals place interns on ambulances, first real attempt at scene and transport care
   2. 1926 – Phoenix Fire Department enters EMS
   3. 1928 – First rescue squad launched in Roanoke, VA. Squad implemented by Julien Stanley Wise and named Roanoke Life Saving Crew
   4. 1940s
      a. Many hospital-based ambulance services shut down due to lack of manpower resulting from WWI
      b. City governments turn service over to police and fire departments
      c. No laws on minimum training
      d. Ambulance attendance became a form of punishment in many fire depts.

C. Post-World War II
   1. 1950s
      a. 1951 – Helicopters used during Korean War
      b. 1956 – Mouth-to-mouth resuscitation developed by Dr. Elan and Dr. Safar
      c. 1959 – First portable defibrillator developed at Johns Hopkins Hospital
   2. 1960s
      a. 1960 – LAFD puts medical personnel on every engine, ladder, and rescue company
         i. Lack of uniform laws and standards
         ii. Ambulances and equipment of poor quality
         iii. Communication lacking between EMS and hospital
         iv. Training of personnel lacking
         v. Hospitals used part time staff in ED
         vi. More people died in auto accidents than in Vietnam War
      c. 1966
         i. EMS Guidelines – Highway Safety Act, Standard 11
ii. Delivery of pre-hospital care using ambulances by Dr. Frank Pantridge in
Belfast, Ireland
d. 1967 -- AAOS creates “Emergency Care and Transportation of the Sick and Injured.”
First textbook for EMS personnel
e. 1968
i. Task Force of the Committee of EMS drafts basic training standards, results in
“Training of Ambulance Personnel and Others Responsible for Emergency Care
of the Sick and Injured at the Scene and During Transport” by Dunlop and Assoc.
ii. American Telephone and Telegraph reserves 9-1-1 for emergency use
f. 1969
i. Dr. Eugene Nagel launches Nation’s first Paramedic program in Miami.
ii. The Committee on Ambulance Design Criteria published “Medical
Requirements for Ambulance Design and Equipment.”

3. 1970s
a. 1970
i. Use of Helicopters in EMS explored
ii. National Registry of Emergency Medical Technicians established
b. 1971 -- The Committee on Injuries of the AAOS hosts national workshop on training
for EMTs
c. 1972
i. Department of Health, Education and Welfare directed by President Nixon to
develop new ways to organize EMS
ii. Departments of Defense and Transportation form helicopter evacuation service
iii. TV show “Emergency!” begins 8-year run
d. 1973
i. EMS Systems Act of 1973 passed
ii. Star of Life developed by DOT
iii. St. Anthony’s Hospital in Denver starts Nation’s first civilian aeromedical
transport service
e. 1974-1979
i. 1974
a) Department of Health, Education and Welfare published guidelines for
developing and implementing EMS Systems
b) Federal report discloses that less than half of ambulance personnel
completed DOT 81-hour course
ii. 1975
a) American Medical Association recognizes Emergency Medicine as
specialty
b) University of Pittsburgh and Nancy Caroline, M.D. awarded contract
for first EMT-Paramedic National Standard Curriculum
c) National Association of EMTs is formed
f. 1980s
i. 1983 - The EMS for Children Act passed
ii. 1985 – National Association of EMS Physicians formed
g. 1990s
i. 1990 – The Trauma Care System Planning and Development Act is passed
ii. 1991 – The Commission on Accreditation of Ambulance Services sets
standards and benchmarks for ambulances services

II. EMS Systems
A. Components of the EMS System
   1. Manpower --levels of EMS licensure
   2. Education/training
         i. National EMS Scope of Practice Model
         ii. National EMS Education Standards
         iii. National EMS Education Program Accreditation
         iv. National EMS Certification
   3. Communications
   4. Transportation
   5. Facilities
   6. Critical care units
   7. Use of public safety agencies
   8. Consumer participation
   9. Accessibility of Care
  10. Transfer of patients
      a. Integration with other professionals and continuity of care
         i. Medical personnel
         ii. Law enforcement
         iii. Emergency management
         iv. Home healthcare providers
         v. Other responders
  11. Standardized medical record-keeping
  12. Patients information and education
      a. Patient education
         i. Pre-incident
         ii. Post-incident
      b. Public education
         i. Role modeling
         ii. Community involvement
         iii. Leader activities
         iv. Community activities
         v. Prevention activities
  13. Independent review and evaluation
  14. Disaster linkage
  15. Mutual aid agreements

B. Chain of survival
   1. Bystander care
   2. Dispatch
   3. Response
   4. Prehospital care
   5. Transportation
   6. Emergency department care
   7. Definitive care
   8. Rehabilitation

C. Service Types
   1. Fire-based
   2. Third service
3. Private (for profit and nonprofit)
4. Hospital-based
5. Hybrid/other

D. Trauma Systems

E. Medical Direction
   1. Role of the EMS physician in providing medical direction
      a. Education and training of personnel
      b. Participation in personnel selection process
      c. Participation in equipment selection
      d. Development of clinical protocols
      e. Participate in quality improvement and problem resolution
      f. Provides direct input into patient care
      g. Interface between EMS providers and other health care agencies
      h. Advocacy within the medical community
      i. Serve as “medical conscience” of the EMS system (Advocate for quality patient care)

   2. Types of medical direction
      a. On-line/direct
      b. Off-line/indirect

   3. Benefits of medical direction
      a. On-line
      b. Off-line
         i. Prospective
         ii. Retrospective

III. Roles/Responsibilities/Professionalism of EMS Personnel

A. Roles and Responsibilities

B. Leadership/Affective Characteristics
   1. Attributes of professional
      a. Integrity
      b. Empathy
      c. Self–motivation
      d. Appearance and personal hygiene

   2. Confidence in skills and ability

   3. Communication
      a. Verbal
      b. Written

   4. Time management
   5. Teamwork and diplomacy
   6. Respect for patients, coworkers and other health care professionals
   7. Patient advocacy
   8. Careful delivery of service

C. Administration
   1. Record keeping and reporting
   2. Special project coordination and implementation
   3. Station duties
4. Interagency relationships/partnerships

D. Credentialing
   1. Licensure
   2. Certification
   3. National registration
   4. Reciprocity
      a. Maintenance of certification and licensure
         i. Personal responsibility
         ii. Continuing education
         iii. Skill competency verification
         iv. Criminal implications
         v. Fees

E. Less Traditional Roles
   1. Expanded scope of practice
   2. Paramedics in Other Settings
      a. Emergency departments
      b. Clinics
      c. Health departments
      d. Physicians office
      e. Interfacility transport
      f. Critical care transport
      g. Neonatal transport
      h. High-risk obstetric transport

F. Operational Responsibilities
   1. Preparation
   2. Response
   3. Scene assessment
   4. Patient assessment
   5. Management
      a. Following protocols
      b. Interacting with medical direction physician, as needed
   6. Appropriate disposition
      a. Disposition issues
         i. ED transport
         ii. Alternative destinations
         iii. Ground
         iv. Air
         v. Selection of the proper receiving facility
         vi. Requires knowledge of the receiving facilities
         vii. Hospital designation/categorization
         viii. Based on hospital resource capabilities
         ix. Clinical capabilities and specialty availability
         x. Transfer agreements
         xi. Payers and insurance systems
      b. Non-Transport
         i. Against medical advice
         ii. No assistance needed
iii. Transfer to other EMS
iv. Medical examiner investigations

7. Transfer of care
8. Documentation
9. Returning to service

G. Education
1. Education principles & practices
   a. National EMS Scope of Practice Model
   b. National EMS Education Standards
2. Paramedic education/accreditation
   a. National EMS Program Accreditation
   b. State accreditation
3. Patient education
   a. Pre-incident
   b. Post-incident
4. Public education
   a. Role modeling
   b. Community involvement
   c. Leader activities
   d. Community activities
   e. Prevention activities
5. Episodic/non-acute care activities
   a. Patient home assistance
   b. Social assistance
   c. Home health care assistance

H. Professionalism
1. Profession
2. Specialized body of knowledge or expertise
   a. Self-regulating
   b. Maintains standards
3. Professionals
   a. Education
   b. Follow standards of conduct and performance
   c. Adhere to code of ethics
4. Health care professional
   a. Conforms to the standards of health care professions
   b. Provides quality patient care
   c. Instills pride in the profession
   d. Strives for high standards
   e. Earns respect of others
   f. High societal expectations while on and off duty
   g. EMS personnel occupy positions of public trust
   h. Unprofessional conduct
   i. Commitment to excellence
   j. Image and behavior
      i. Paramedics represent a variety of people
         a) Self
         b) EMS agency
c) State/county/ district EMS offices
d) Peers

I. Affective characteristics
   1. Integrity
   2. Empathy
   3. Self-motivation
   4. Appearance and hygiene
   5. Self-confidence
   6. Time management
   7. Communication
      a. Verbal
      b. Written
   8. Teamwork and diplomacy
   9. Respect for patients, coworkers and other healthcare professionals
   10. Patient advocacy
   11. Careful delivery of service

IV. Quality Improvement
   A. System for continually evaluating and improving care
   B. Continuous quality improvement (CQI)
   C. Dynamic process

V. Patient Safety
   A. Significant—one of the most urgent health care challenges
   B. Incidence—IoM report “To Err is Human” up to 98,000 patients die due to medical errors
   C. High risk activities
      1. Hand off
      2. Communication issues
      3. medication issues
      4. airway issues
      5. dropping patients
      6. ambulance crashes
      7. spinal immobilization
   D. How errors happen
      1. skills-based failure
      2. rules-based failure
      3. knowledge-based failure
   E. Preventing Errors
      1. Environmental
         a. Clear protocols
         b. Light
2. Individual
   a. Reflection in action
   b. Constantly question assumptions
   c. Reflection bias
   d. Use decision aids
   e. Ask for help

c. Minimal interruptions
d. Organization and packaging of drugs
Preparatory Research – PR2

Integrates comprehensive knowledge of EMS systems, safety/well being of the paramedic, medical/legal and ethical issues, which are intended to improve the health of EMS personnel, patients, and the community.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Research Principles to Interpret Literature and Advocate Evidence-Based Practice

A. Introduction to Research
   1. Overview of research methodology
   2. Peer reviewed versus other publications
   3. Critically reviewing research articles
   4. Conceptual framework
   5. Limitations of research

B. Importance of Research in EMS
   1. Outcomes-based research
   2. New procedures, medications, and treatments
   3. Quality assurance
   4. Improved patient outcomes
   5. Professionalism
   6. Evidence-based medicine

C. Types of Research
   1. Quantitative
      a. Experimental
      b. Non-experimental
      c. Survey research
   2. Qualitative
      a. Characteristics
      b. Data collection methods
      c. Types of qualitative research
      d. Data analysis
         i. Summarizing
         ii. Interpreting

D. Ethical Considerations in Research
   1. Human research subject protection
      a. Uncoerced and voluntary participation
      b. Subjects must be fully informed of the risks and benefits
      c. Subjects must consent to participation
      d. Subjects have the right to withdraw at anytime
   2. Role of the Institutional Review Board (IRB)
   3. Conflicts of interest
   4. Accurate data reporting
5. Office of Human Research Protections
6. Food and Drug Administration

E. Literature Review
   1. Role in research
   2. Reference sources
      a. Peer reviewed literature
      b. Government sources
      c. Online literature search engines

F. Statistics
   1. Descriptive statistics
   2. Inferential statistics
   3. Sampling
      a. Population
      b. Parameter
      c. Sample
      d. Polling
      e. Sampling error
   4. Statistical significance

G. Relating Research to EMS
   1. National EMS Research Agenda
   2. Developing researchers
   3. Higher education institutions
   4. Research domains
      a. Clinical
      b. Systems
      c. Education
   5. Evidence-based research
      a. Research into practice
   6. Clinical studies
      a. Improvement in patient outcomes
   7. Educational studies
   8. Collaborative efforts
   9. Funding
      a. Public funding
      b. Corporate support
      c. Foundation support
      d. Federal Government
   10. Advancement of profession
   11. Research consortia
   12. Patient databases/data collection
      a. Hospitals
      b. EMS agencies
      c. Linking data
   13. Joining with hospitals
   14. Regulatory issues
      a. Waiver of informed consent in emergency circumstances
      b. Health Insurance Portability and Accountability Act
c. National assurance program
15. Establishing a research agenda/adherence to research agenda

H. Evidence-based decision making
1. Traditional medical practice is based on
   a. Medical knowledge
   b. Intuition
   c. Judgment
2. High-quality patient care should focus on procedures proven useful in improving patient outcomes
3. The challenge for EMS is the relative lack of prehospital research.
4. Evidence-based decision making technique
   a. Formulate a question about appropriate treatments
   b. Search medical literature for related research
   c. Appraise evidence for validity and reliability
   d. If evidence supports change in practice, adopt the new therapy allowing for unique patient needs.
Preparatory
Workforce Safety and Wellness – PR3

Integrates comprehensive knowledge of EMS systems, safety/well being of the paramedic, medical/legal and ethical issues, which are intended to improve the health of EMS personnel, patients, and the community.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Provider Safety and Well-Being

II. Standard safety precautions

A. Handwashing

B. Adherence to standard precautions/OSHA regulations

C. Safe operation of EMSpatient care equipment

D. Environmental control

E. Occupational health and bloodborne pathogens
   1. Immunizations
   2. Sharps

III. Personal Protective Equipment

IV. Stress Management

A. Types of stress reactions
   1. Acute stress reaction
   2. Delayed stress reaction
   3. Cumulative stress reaction

B. Stress management
   1. Change in lifestyle
   2. Balance in life
   3. Recognize response to family and friends
   4. Change in work environment
   5. Seek professional assistance

C. Dealing with death and dying
   1. Stages of death and dying
      a. Denial
      b. Anger
      3. Bargaining
      4. Depression
      5. Acceptance
V. Prevention of Work-Related Injuries

A. Vehicle restraint systems

B. Safe lifting techniques

C. Adequate sleep

D. Physical fitness and nutrition

E. Hazard awareness

F. Adherence to standard precautions/OSHA regulations

G. Disease transmission prevention -- communicable versus blood borne

VI. Lifting and moving patients

A. Lifting techniques
   1. Safety precautions
   2. Guidelines for lifting

B. Safe lifting of cots and stretchers.

C. Power lift or squat lift position

D. Power grip

E. Back in locked-in position

F. Carrying
   1. Precautions for carrying
   2. Guidelines for carrying
   3. Correct carrying procedure
   4. One-handed carrying technique
   5. Correct carrying procedure on stairs

G. Reaching
   1. Guidelines for reaching
   2. Application of reaching techniques
   3. Correct reaching for log rolls

H. Pushing and pulling guidelines
   1. Emergency move
      a. Indications
         i. Fire or danger of fire
         ii. Explosives or other hazardous materials
         iii. Other hazards at the scene
         iv. To gain access to other patients in a vehicle who need care
v. Patient's location or position, e.g., a cardiac arrest patient sitting in a chair or lying on a bed

b. Technique

2. Urgent Move

3. Indications
   a. Altered mental status
   b. Inadequate breathing
   c. Shock (hypoperfusion)
   d. Technique

4. Non-urgent moves
   a. Indication
      i. Direct ground lift (no suspected spine injury)
      ii. Extremity lift (no suspected extremity or back injuries)

5. Transfer of supine patient from bed to stretcher
   a. Direct carry
   b. Draw sheet method

I. Equipment

1. Stretchers/cots
   a. Types
      i. Wheeled stretcher
      ii. Portable stretcher
      iii. Stair chair
      iv. Bariatric stretcher
   b. Standard

2. Tracked systems
   a. Backboards
      i. Long
      ii. Short
         a) Traditional wooden device
         b) Vest type device
            i) Scoop or orthopedic stretcher
            ii) Flexible stretcher
   b. Bariatric stretcher
      i. Pneumatic or electronic stretchers
      ii. Neonatal Isoletes
   c. Maintenance - follow manufacturer's directions for inspection, cleaning, repair
   d. Patient positioning
      i. Unresponsive patient without suspected spine injury
      ii. A patient with chest pain or discomfort or difficulty breathing
      iii. A patient with suspected spine injury
      iv. Pregnant patient with hypotension
      v. A patient who is nauseated or vomiting
   e. Bariatric patients
      i. Patient size
      ii. Specialized equipment
         a) Stretchers
         b) Ambulances
            i) Ramps
ii) Winches
   c) Personnel considerations

VII. Disease Transmission

VIII. Wellness Principles

    A. Physical Wellbeing
       1. Physical fitness
          a. Cardiovascular endurance
          b. Muscle strength
          c. Muscle flexibility
       2. Sleep
       3. Disease prevention
       4. Injury prevention

    B. Mental Wellbeing
       1. Alcohol and drug issues
       2. Smoking cessation
       3. Stress Management
       4. Relationship issues
Preparatory Documentation – PR4

Integrates comprehensive knowledge of EMS systems, safety/well being of the paramedic, medical/legal and ethical issues, which are intended to improve the health of EMS personnel, patients, and the community.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Principles of medical documentation and report writing

A. Minimum Data Set
   1. Patient information gathered by the paramedic
   2. Administrative information/Response information

B. Prehospital Care Report
   1. Functions
   2. Uses
      a. Types
      b. Sections
   3. Special Considerations
      a. Confidentiality
      b. Distribution
      c. Health Information Portability and Accountability Act of 1996

C. Falsification Issues
   1. Willful falsification -- consequences
   2. Errors
      a. during documentation
      b. after submission
      c. electronic

D. Documentation of Patient Refusal
   1. Establishing competence
   2. Documenting competence
   3. Documenting partial, incomplete, or refused care
   4. Documentation of the complete, incomplete or refused assessment

E. Special Situations/Reports/Incident Reporting
   1. Multiple casualty incidents (MCI)
   2. Special reports
      a. interagency
      b. Legal reporting
      c. exposure
      d. injury
      e. Interfacility transfer

F. Reason for Transfer
G. Treatment Prior to Arrival

H. Full Assessment

I. Treatment Provided Enroute
   1. Scheduled
   2. Unanticipated

J. Condition on Arrival
   1. Reading a patient record
   2. Narrative styles
      a. Body systems documentation
      b. Body parts documentation
      c. Documenting the clinical impression/working diagnosis
      d. Documenting treatment and response
      e. Documenting transfer of patient care
Preparatory
EMS System Communication – PR5

Integrates comprehensive knowledge of EMS systems, safety/well being of the paramedic, medical/legal and ethical issues, which are intended to improve the health of EMS personnel, patients, and the community.

The Paramedic Instructional Guidelines in this section include all the topics and material at the AEMT level PLUS the following material:

I. EMS Communication System

A. System Components
   1. Base station
   2. Mobile radios (transmitter/receivers)
      a. Vehicular mounted device
      b. Mobile transmitters usually transmit at lower power than base stations (typically 20-50 watts)
      c. Typical transmission range is 10-15 miles over average terrain
   3. Portable radios (transmitter/receivers)
      a. Handheld device
      b. Typically have power output of 1-5 watts, limiting their range
   4. Repeater/base station
   5. Digital radio equipment
   6. Cellular telephones

B. Radio Communications
   1. Radio frequencies
   2. Response to the scene
      a. The dispatcher needs to be notified that the call was received
      b. Dispatch needs to know that the unit is en route
   3. Arrival at the scene – dispatcher must be notified
   4. Depart the scene
      a. Dispatcher must be notified
      b. Prolonged on scene times with absence of communications
   5. Arrival at the receiving facility or rendezvous point -- dispatcher must be notified
   6. Arrival for service after patient transfer -- dispatcher must be notified

II. Communicating with other health care professionals

A. Communication With Medical Control
   1. Medical control is at the receiving facility. Medical control is at a separate site
   2. Paramedics may need to contact medical control for consultation and to get orders for administration of medications
   3. Paramedics must be accurate
   4. After receiving orders for medication or procedure—repeat order back word for word
   5. Orders that are unclear or appear to be inappropriate should be questioned or clarified

B. Communication With Receiving Facilities
1. Patient reporting concepts
2. Arrival at the hospital
3. Leaving the hospital for the station

C. System Maintenance
1. Radio checks
2. Planning for failures

D. Phone/Wireless Communications

III. Team communication and dynamics

A. Source
1. Medium
2. Common symbols
3. Clear format
   a. Written
   b. Verbal
   c. Other symbols

B. Encoding

C. Message

D. Decoding

E. Receiver

F. Feedback
Preparatory

Therapeutic Communication – PR6

Integrates comprehensive knowledge of EMS systems, safety/well being of the paramedic, medical/legal and ethical issues, which are intended to improve the health of EMS personnel, patients, and the community.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Principles of communicating with patients in a manner that achieves a positive relationship

   A. Interpersonal Communication
      1. The paramedic should self-introduce at the start of any conversation
      2. Make and keep eye contact
      3. When practical, position yourself at a level lower than the patient or on the same level
      4. Be honest with the patient
      5. Use language the patient can understand and avoid medical jargon
      6. Be aware of your own body language
      7. Speak calmly, clearly, slowly and distinctly
      8. Use the patient’s proper name, either first or last, depending on the circumstances
      9. If a patient has difficulty hearing, speak clearly with lips visible
     10. Allow the patient enough time to answer a question before asking the next one
     11. Act and speak in a calm, confident manner

   B. Factors That Affect Communication
      1. Communication with hearing impaired, non-English speaking populations and use of interpreters—be positioned to address any of these special situations
      2. Internal factors for effective communication
         a. Accepting others as people
         b. Empathy
         c. Be a good listener
         d. Introduction
            i. Self
            ii. Partners/team
            iii. Patient introduction
      3. External factors for effective communication
         a. Privacy
         b. Interruptions
         c. Physical environment
            i. Lighting
            ii. Noises and outside interference
            iii. Distracting equipment
            iv. Distance
            v. Equal seating - eye level
         d. Dress
      4. Note-taking

   C. Interviewing Techniques
1. Types of questions used in interviewing
   a. Open-ended questions
   b. Closed or direct questions
   c. One question at a time
   d. Choose language the patient understands

2. Types of responses
   a. Facilitation
   b. Silence
   c. Reflection
   d. Empathy
   e. Clarification
   f. Confrontation
   g. Interpretation
   h. Explanation
   i. Summary

3. Traps of interviewing
   a. Providing false assurance or reassurance
   b. Giving advice
   c. Authority
   d. Using avoidance language
   e. Distancing
   f. Professional jargon
   g. Leading or biased questions
   h. Talking too much
   i. Interrupting
   j. Using “why” questions

4. Nonverbal skills
   a. Physical appearance
      i. Interviewer
      ii. Patient
   b. Posture and gestures
      i. Interviewer
      ii. Patient
      iii. Gestures
      iv. Facial expressions
      v. Eye contact
      vi. Voice
      vii. Touch

5. Developing patient rapport
   a. Put the patient and yourself at ease

6. Strategies to ascertain information
   a. Patients generally communicate in three ways
   b. Obtaining information on complaints
      i. Resistance
      ii. Shifting focus
      iii. Defense mechanisms
      iv. Distraction

7. Methods to assess mental status during the interview
   a. Observation
   b. Conversation
i. Orientation  
ii. Speech  
iii. Thinking  
iv. Attention  
v. Concentration  
vi. Comprehension  
vii. Remote, recent, and immediate memory  
viii. Affect  
ix. Autonomic responses  
x. Facial movements  
xii. Grooming movements  

8. Exploration is a method to review the patient’s internal experiences  
   a. Mood  
   b. Energy level  
   c. Content of thinking  

D. Dealing With Difficult Patients  
1. Patients unmotivated to talk  
   a. Most patients are more than willing to talk  
   b. Difficult interviews  
   c. Techniques to use  
      i. Start the interview in the normal manner  
      ii. Attempt to use open-ended questions  
      iii. Provide positive feedback  
      iv. Make sure the patient understands the questions  
      v. Continue to ask questions  
   d. Interviewing a hostile patient  
   e. Hearing impaired patients  
   f. Patients under the influence of street drugs or alcohol  
   g. Sexually aggressive patient  

E. Adjusting Communication Strategies  
1. Age  
   a. Infants  
   b. Preschoolers  
   c. School-age children  
      i. Use parent and caregiver  
      ii. Clear explanations  
      iii. Be honest  
   d. Adolescents  
   e. Adults  
   f. Geriatrics  
      i. Potential for visual deficit  
      ii. Potential for auditory deficit  
      iii. Obtain glasses and hearing aid  

2. Stage of development  
3. Patients with special needs  
4. Differing cultures  
   a. Enormous diversity in populations of all cultures
b. Diversity (a term once used primarily to describe "racial awareness") now refers to differences of any kind: race, class, religion, gender, sexual preference, personal habitat, and physical ability

c. Good health care depends on sensitivity toward these differences

d. Experiences of health and illness vary widely because of different beliefs, behaviors, and past experiences, and may conflict with the paramedic's learned medical practice

e. By revealing awareness of cultural issues, the paramedic will convey interest, concern, and respect

f. When dealing with patients from different cultures, remember the following key points:
   i. Individual is the "foreground"—the culture is the "background"
   ii. Different generations and individuals within the same family may have different sets of beliefs
   iii. Not all people identify with their ethnic cultural background
   iv. All people share common problems or situations
   v. Respect the integrity of cultural beliefs
   vi. People may not share your explanations of the causes of their illness, but may accept conventional treatments
   vii. You do not have to agree with every aspect of another's culture, nor does the person have to accept everything about yours for effective and culturally sensitive health care to occur
   viii. Recognize your personal cultural assumptions, prejudices, and belief systems and do not let them interfere with patient care
   ix. Introduce yourself and the way in which you want to be addressed
   x. Both paramedic and patient will bring cultural stereotypes to a professional relationship.
   xi. Ethnocentrism
   xii. Cultural imposition
   xiii. Space
      a) Intimate zone
      b) Personal distance
      c) Social distance
      d) Public distance
   xiv. Cultural issues
      a) Variety of space
      b) Accept the sick role in different ways
      c) Nonverbal communication may be perceived differently
      d) Asian, Native Americans, Indochinese, and Arabs may consider direct eye contact impolite or aggressive
      e) Touch
      f) Language barrier
   xv. Special considerations
      a) Regardless of the patient's cultural background, educational status, occupation, or ability to speak English, most patients will be anxious during an emergency event
      b) Attempt to communicate in English to determine whether patient understands or speaks English
      c) Bystanders, coworkers, or family members may be able to provide assistance
      d) If the patient does not speak or understand English, attempt to communicate with signs or gestures
e) Notify the receiving hospital ASAP to arrange for an interpreter
f) If time permits, all assessment procedures should be performed slowly and with the patient's permission

g) Be aware that "private space" is culturally defined
h) Point to the area of body to be examined before touching patient

g. Respect the patient's need for modesty and privacy at the scene and during transport
Preparatory
Medical/Legal and Ethics – PR7

Integrates comprehensive knowledge of EMS systems, safety/well being of the paramedic, medical/legal and ethical issues, which are intended to improve the health of EMS personnel, patients, and the community.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Consent/Refusal of Care

A. Consent to Care
   1. Nature of illness
   2. Treatment recommendations
   3. Risks and refusals
   4. Alternatives

B. Types of Consent
   1. Expressed consent – non-verbal
   2. Informed consent -- research
   3. Implied consent (emergency doctrine) and incapacitation
      a. Physical
      b. Mental
   4. Involuntary consent
      a. Mental Health
      b. Incarceration
   5. Minors
      a. Parental permission and In Loco Parentis emergency doctrines
      b. Emancipation
         i. Married
         ii. Armed Services
         iii. Independence – court decree
   6. Medical Restraint and Use of Force Doctrine
      a. Reasonable prevention of harm
         i. Suicide
         ii. Homocide
      b. Nonpunitive
   7. Legal complications related to consent
      a. Abandonment
      b. False imprisonment
      c. Assault
      d. Battery

C. Refusal of Care and/or Transportation
   1. Patient must be alert and oriented to person, place, and time
   2. Patient must be informed of the risks of refusing care (e.g., death)
   3. Patient must be informed if problems return/persist they should call EMS or see a physician
   4. Against medical advice
a. Due diligence
   i. Standard of care
   ii. Medical control
b. Documentation

II. Confidentiality

A. Obligation to Protect Patient Information

B. HIPAA

C. Responsibility Arising From Physician – Patient Relationship
   1. Assessment findings
   2. Treatments rendered

D. Privileged Communications
   1. Need to know
      a. Healthcare providers
   2. Education
   3. Legally mandated
      a. Child abuse reported
      b. Subpoena
   4. Third-party billing
   5. Release of medical information

E. Breach of Confidentiality
   1. Libel
   2. Slander

III. Advanced Directives

A. Patient Self-Determination Act
   1. Do not resuscitate (DNR)
   2. Living wills
   3. Durable power of attorney

IV. Tort and Criminal Actions

A. Basic Legal Concepts
   1. Judiciary system
      a. Origins of jurisprudence – common law
      b. Source of constitutional law
         i. Legislative
            a) Statutes
            b) Regulations
         ii. Administrative
            a) Regulatory policy
      c. The legal process
         i. Role of courts
            a) Court of original jurisdiction – trial by judge or jury
b) Appeals and precedents
d. Elements of a Civil Lawsuit
   i. Actionable Cause
   ii. Complaint
   iii. Investigation – discovery
      a) Dispositions
      b) Interrogatives
   iv. Trial
      a) Decision
      b) Settlement
   v. Appeal
e. Slander
f. Libel

B. Criminality
   1. Breaches of conduct
      a. Assault
      b. Battery
      c. Kidnapping
   2. Mandatory reporting requirements
      a. Abuse and assault
         i. Child abuse -- neglect
         ii. Elder abuse
         iii. Domestic Violence
      b. Criminality
         i. Sexual assault
         ii. Penetrating Trauma
            a) Gunshot
            b) Stab wounds
      c. Communicable diseases
         i. Reportable
         ii. Animal Bites

C. Civil Tort
   1. Concept of negligence
      a. Res ipsa loquitur
      b. Negligence per se
   2. Elements of negligence
      a. Duty to act
         i. Contractual
         ii. Duty undertaken
      b. Breach of duty
         i. Standard of care
         ii. Commission
            a) Malfeasance
            b) Misfeasance
         iii. Omission-- nonfeasance
      iv. False imprisonment
      v. Wrongful death
      vi. Abandonment
c. Proximate causation
d. Damages to plaintiff
   i. Physical -- e.g. lost earnings
   ii. Psychological – e.g., pain and suffering
   iii. Punitive
e. Defenses
   i. Good samaritan
   ii. Governmental immunity
   iii. Statute of limitations
   iv. Contributory negligence
f. Protection from liability
   i. Professionalism
   ii. Standard of care
   iii. Liability insurance

V. Statutory Responsibilities

A. Medical Practice Act
   1. Physician responsibilities – competency assurance
      a. Mandatory training
      b. Skill competency
      c. Run review
   2. Liability of the paramedic medical director
      a. On-line – direct supervision
      b. Off-line – protocols with standing orders under indirect supervision
   3. Borrowed Servant Doctrine – liability for actions of EMTs supervised by the paramedic

B. Medical Direction

C. Duty to Act
   1. Good samaritan
   2. Abandonment

VI. Mandatory Reporting

A. Legally Compelled to Notify Authorities
   1. Abuse
   2. Neglect
B. Arises From Special Relationship With Patient
C. Legal Liability for Failure to Report

VII. Health Care Regulation

A. Scope of Practice

B. Licensure
   1. Occupational regulation
   2. Practicing without a license
C. Certification
1. Non-governmental

D. Credentialing
   1. Jurisdiction-specific
   2. Medical control

VIII. Patient Rights/Advocacy

A. Patient Rights
   1. Non-judgmental care
      a. Civil rights -- discrimination
      b. Human rights
   2. Confidentiality
      a. Elements of confidential information
         i. Patient history
         ii. Assessment findings
         iii. Treatment rendered
      b. Release of information, requiring written permission
         i. Patient
         ii. Legal guardian
         iii. Legal substitution
      c. Limited release of information without permission
         i. Need to know -- Other healthcare providers
         ii. Legal mandate -- Subpoena
         iii. Third-party billing -- HIPAA
      d. Improper release of information
         i. Invasion of privacy — ridicule, notoriety or embarrassment
         ii. Defamation from libel or slander

B. Patient Advocacy
   1. EMTALA Regulations
   2. Shared Decision - making

IX. End of Life Issues

A. Limited Resuscitation
   1. Health Care Proxy
   2. Medical Orders for Life Sustaining Treatments (MOLST)

B. Withholding Resuscitation and “Obvious Death” Criteria

C. Termination of Resuscitation

D. Organ donation

X. Ethical Principles/Moral Obligations

A. Morals and Concepts of Right and Wrongs

B. Ethics
1. Branch of philosophy
2. Study of morality

C. Applied Ethics and Use of Ethical Values

D. Ethical Conflicts
   1. Futility of care: cardiac arrest in the wilderness
   2. Allocation of limited resources (Medical Rationing) such as use of triage
   3. Professional misconduct such as patient abuse
   4. Economic triage such as patient-dumping

XI. Ethical Tests and Decision Making

   A. Do No Harm
   B. In Good Faith
   C. Patient’s Best Interest

XII. Employment Law

   A. American With Disabilities Act
   B. Title VII – Civil Rights Act
   C. Amendments to Title VII
   D. Family Medical Leave Act
   E. Occupational Safety and Health Act
   F. Ryan White Act
Preparatory
Anatomy and Physiology – PR8

Integrates a complex depth and comprehensive breadth of knowledge of the anatomy and physiology of all human systems.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Anatomical Terms
   
   A. Anatomy
   
   B. Physiology
   
   C. Pathophysiology
   
   D. Homeostasis
   
   E. Specific body parts and areas
      1. Axillary
      2. Brachial
      3. Buccal
      4. Cardiac
      5. Cervical
      6. Cranial
      7. Cutaneous
      8. Deltoid
      9. Femoral
     10. Gastric
     11. Gluteal
     12. Hepatic
     13. Inguinal
     14. Lumbar
     15. Mammary
     16. Nasal
     17. Occipital
     18. Orbital
     19. Parietal
     20. Patellar
     21. Pectoral
     22. Perineal
     23. Plantar
     24. Popliteal
     25. Pulmonary
     26. Renal
     27. Sacral
     28. Temporal
29. Umbilical
30. Volar

II. Planes and sections of the body

   A. Frontal (coronal) Plane
   B. Sagittal Plane
   C. Midsagittal Plane
   D. Transverse Plane
   E. Cross-Section
   F. Longitudinal Section

III. Anatomical Topography

   A. Abdominal Quadrants and Regions
      1. Abdominal quadrants
         a. Right upper quadrant (RUQ)
         b. Left upper quadrant (LUQ)
         c. Right lower quadrant (RLQ)
         d. Left lower quadrant (LLQ)
      2. Abdominal regions
         a. Right hypochondriac
         b. Epigastric
         c. Left hypochondriac
         d. Right lumbar
         e. Umbilical
         f. Left lumbar
         g. Right iliac
         h. Hypogastric
         i. Left iliac

IV. Organ Systems

   A. Skeletal
   B. Muscular
   C. Respiratory
   D. Circulatory
   E. Nervous
   F. Integumentary
G. Digestive

H. Endocrine

I. Renal

J. Reproductive

K. Lymphatic System and Immune System

V. Anatomic Cavities

A. Dorsal
   1. Cranial cavity
   2. Spinal cavity

B. Ventral
   1. Thoracic cavity
   2. Abdominal cavity
   3. Pelvic cavity

VI. Organization

A. Atomic Level
   1. Matter,
   2. Element
   3. Atom
   4. Proton
   5. Neutron
   6. Electron
   7. Bonding
      a. Ionic
      b. Covalent
      c. Hydrogen bonds
   8. Chemical reactions
      a. Synthesis
      b. Decomposition

B. Chemical Level
   1. Carbohydrates
      a. Monosaccharides
      b. Disaccharides
      c. Oligosaccharides
      d. Polysaccharides
      e. Starches
      f. Glycogen
      g. Cellulose
      h. Fiber
   2. Lipids
      a. True fats
b. Triglycerides
c. Phospholipids
d. Steroids

3. Proteins
   a. Amino acids
   b. Peptide bonds
   c. Polypeptide

4. Enzymes -- Active Site Theory

5. Nucleic acids
   a. DNA
   b. RNA
   c. ATP

6. Trace Elements

VII. Cell Structure and Function

A. Cell Theory

B. Cellular Anatomy and Physiology
   1. Cell membrane
   2. Cytoplasm
   3. Nucleus and chromosomes
   4. Organelles
      a. Mitochondria
      b. Lysosomes
      c. Golgi apparatus
      d. Ribosomes
      e. Endoplasmic reticulum

C. Cellular Respiration
   1. Aerobic
   2. Anaerobic

D. Cellular Environment
   1. Water compartments
      a. Intracellular (ICF)
      b. Extracellular (ECF)
         i. plasma
         ii. lymph
         iii. interstitial fluid
         iv. specialized fluids
            a) synovial
            b) cerebrospinal
            c) aqueous humor
   2. Isotonic
   3. Hypotonic
   4. Hypertonic
   5. Acid and base
      a. pH scale
         i. Base
ii. Acid
b. Normal pH ranges of body fluids
c. Buffer system

E. Cellular Transport Mechanisms
  1. Diffusion
  2. Osmosis
  3. Facilitated diffusion
  4. Active transport
  5. Filtration
  6. Phagocytosis
  7. Pinocytosis

F. Cell Division
   1. Mitosis
   2. Meiosis
      a. Genetic code
      b. Protein synthesis
      c. Differentiation
      d. DNA fingerprinting
   3. Mutations

VIII. Tissue Level of Organization and Membranes

A. Epithelial tissue
   1. Simple squamous
   2. Stratified squamous
   3. Transitional
   4. Simple cuboidal
   5. Simple columnar
   6. Ciliated

B. Connective tissue
   1. Blood
   2. Areolar
   3. Adipose
   4. Fibrous
   5. Elastic
   6. Bone
   7. Cartilage

C. Muscle tissue
   1. Smooth
   2. Skeletal
   3. Cardiac

D. Neural tissue
E. Membranes
   1. Pleura
   2. Pericardial
3. Peritoneum-mesentery
4. Specialized connective tissue
   a. Superficial fascia
   b. Periosteum
   c. Perichondrium
   d. Synovial
   e. Deep fascia
   f. Meninges
   g. Fibrous pericardium

IX. Skeletal System

A. Functions

B. Classification of bones
   1. Long bones
      a. Diaphysis
      b. Epiphysis
      c. Marrow canal
      d. Yellow bone marrow
   2. Short bones
   3. Flat bones
   4. Irregular bones
   5. Joint surfaces
      a. Articular cartilage
      b. Periosteum

C. Embryonic skeleton maturation
   1. Bone matrix
   2. Osteoblasts
   3. Ossification – the production of bone matrix
   4. Fontanels
   5. Epiphyseal discs
   6. Osteoclasts
   7. Marrow canal

D. Bone growth and maintenance
   1. Heredity
   2. Nutrition
   3. Hormones
   4. Exercise – stress

E. Hormones involved in bone growth and maintenance
   1. Growth Hormone
   2. Thyroxine
   3. Insulin
   4. Parathyroid hormone
   5. Calcitonin
   6. Estrogen
   7. Testosterone
F. Major subdivision of the skeleton
   1. Axial skeleton
   2. Appendicular skeleton

G. Components
   1. Skull
      a. Cranial bones
         i. frontal
         ii. temporal
         iii. occipital
         iv. sphenoid
         v. ethmoid
      b. Sutures
      c. Facial bones
         i. mandible
         ii. condyloid joint
         iii. maxillae
      d. Paranasal sinuses and ciliated epithelium
      e. Mastoid sinuses
      f. Auditory bones
   2. Vertebral column
      a. Vertebrae
      b. Cervical vertebrae
         i. atlas
         ii. pivot joint
         iii. axis
      c. Thoracic vertebrae
      d. Lumbar vertebrae
      e. Sacrum
      f. Sacroiliac joints
      g. Coccyx
   3. Vertebral canal
      a. Discs
      b. Symphysis joints
   4. Rib cage
      a. 12 pairs of ribs
      b. Sternum
      c. Manubrium
      d. Body
      e. Xiphoid process
      f. True ribs
      g. False ribs
      h. Floating ribs
   5. Shoulder and Arm
      a. Scapula
      b. Clavicle
      c. Humerus
      d. Radius
      e. Ulna
f. Carpals
g. Metacarpals
h. Phalanges

6. Hip and Leg
   a. Hip bones
   b. Ilium
   c. Ischium
d. Pubis
e. Pubic bones
   f. Pubic symphysis
g. Acetabulum
   h. Femur
   i. Patella
   j. Tibia
k. Fibula
l. Tarsala
m. Calcaneus
n. Talus
   o. Metatarsals
   p. Phalanges

H. Classification of Joints
   1. Synarthrosis (immovable)
   2. Amphiarthrosis (slightly movable)
   3. Diarthrosis (freely movable)

I. Types of Joints
   1. Gliding joints
   2. Hinge joints
   3. Pivot joints
   4. Ball and socket joints
   5. Saddle joints
   6. Symphysis

J. Synovial Joints
   1. Articular cartilage
   2. Joint capsule
   3. Synovial membrane
   4. Synovial fluid
   5. Bursae

X. Muscular System

A. Gross Anatomy
   1. Muscle fibers
   2. Tendons
   3. Fascia
   4. Periosteum
   5. Origin
   6. Insertion
B. Microscopic Anatomy
   1. Myofibrils
   2. Myosin
   3. Actin
   4. Titin
   5. Troponin
   6. Tropomyosin
   7. Sarcoplasmic reticulum

C. Actions of Muscles
   1. Flexion
   2. Extension
   3. Adduction
   4. Abduction
   5. Pronation
   6. Supination
   7. Dorsiflexion
   8. Plantar flexion
   9. Rotation

D. Contraction of a Skeletal Muscle Fiber
   1. Nerve Impulse
      a. Polarization
      b. Depolarization
      c. Repolarization
      d. Action potential
   2. Neuromuscular junction and functions
      a. Axon terminal
      b. Synapse
   3. Structure of the sarcomere
   4. Sliding filament theory of muscle contraction and function
      a. Acetylcholine
      b. Calcium ions
      c. Myosin and actin
      d. Troponin and tropomyosin
      e. Cholinesterase
   5. Energy sources for muscle contraction
      a. ATP
      b. Creatinine phosphate
      c. Creatinine
      d. Glycogen
      e. Glucose
   6. Hemoglobin, myoglobin, oxygen debt, lactic acid, and recovery oxygen uptake
   7. Aerobic and anaerobic endurance and the relationship to muscle movement

E. Major Muscles of the Body
   1. Antagonistic
   2. Synergistic
XI. Respiratory System

A. General Function of the Respiratory System
   1. Upper respiratory tract
   2. Lower respiratory tract

B. Structure and Functions of the Nasal Cavities and Pharynx
   1. Nasal cavities
      a. Nose
      b. Nasal cavities
      c. Nasal septum
      d. Nasal mucosa
      e. Olfactory receptors
      f. Paranasal sinuses
   2. Pharynx
      a. Nasopharynx
      b. Soft palate
      c. Oropharynx
      d. Laryngopharynx

C. Structure and Function of the Larynx and the Speaking Mechanism
   1. Voice box
   2. Thyroid cartilage
   3. Epiglottis
   4. Vocal cords
   5. Glottis

D. Structure and Functions of the Trachea and Bronchial Tree
   1. Trachea
   2. Primary bronchi
   3. Bronchial tree
   4. Right and left main-stem bronchi
   5. Bronchioles

E. Lungs
   1. Location and function
   2. Pleural membranes
      a. Parietal pleura
      b. Visceral pleura
      c. serous fluid
   3. Hilus

F. Structure and Function of the Alveoli and Pulmonary Capillaries
   1. Surfactant

G. Mechanism of Breathing
   1. Mechanical ventilation
      a. Mechanism of inhalation
         i. inspiration
         ii. phrenic nerve
         iii. intercostal nerves
iv. respiration
v. ventilation/perfusion disturbance
vi. diaphragm
vii. external intercostal muscles
viii. internal intercostal muscles
ix. pressures
b. Changes in air pressure that occur within the thoracic cavity during respiration
   i. atmospheric
   ii. intrapleural
   iii. intrapulmonic
c. Role of the visceral and parietal pleura in respiration
d. Mechanics of exhalation

H. Explain the Diffusion of Gases in External and Internal Respiration

I. Discuss Pulmonary Volumes
   1. Tidal volume
   2. Minute respiratory volume (MRV)
   3. Inspiratory reserve volume
   4. Expiratory reserve volume
   5. Vital capacity
   6. Residual air volume

J. Physiological Dead Space and Lung Compliance

K. Oxygen and Carbon Dioxide Transport in the Blood

L. Nervous and Chemical Mechanisms That Regulate Respiration

M. Respiration Affect on pH of Certain Body Fluids

N. Respiration and Acid-Base Balance
   1. Respiratory acidosis and alkalosis
   2. Metabolic acidosis and alkalosis

XII. Circulatory

A. Blood
   1. Composition and function of blood
   2. Composition and function of blood plasma
      a. Amount
      b. Color
      c. pH
      d. Viscosity
      e. Plasma
         i. plasma proteins
         ii. prothrombin
         iii. fibrinogen
         iv. albumin
         v. globulins
3. Primary hemopoietic tissue
4. Function of red blood cells
5. Nutrients necessary for red blood cell production
6. Function of the following
   a. Stem cells
   b. Hemocytoblasts
   c. Normoblasts
   d. Reticulocyte
7. Red blood cell production in hypoxic state
8. Red blood cell and hemoglobin destruction
9. ABO group and Rh factor blood types
10. Types and function of white blood cells (leukocytes)
    a. Neutrophils
    b. eosinophils
    c. basophils
    d. lymphocytes
    e. monocytes
11. Platelets role in hemostasis
    a. Vascular spasm
    b. Platelet plugs
    c. Chemical clotting
12. Three stages of chemical blood clotting
13. Normal values in a complete blood count

B. The Heart
1. Location and features of the heart
   a. Mediastinum
   b. Pericardial membranes
   c. Fibrous pericardium
   d. Parietal pericardium
   e. Epicardium
2. Chambers of the heart
   a. Myocardium
   b. Endocardium
   c. Right and left atria
   d. Right and left ventricles
3. Valves of the heart and their function
   a. Tricuspid valve
   b. Bicuspid valve (mitral valve)
   c. Aortic valve
   d. Pulmonary semilunar valve
4. Cardiac cycle
5. Creation of heart sounds
   a. Papillary muscles
   b. Chordae tendinae
6. Coronary arteries
   a. Coronary circulation
7. Major blood vessels
8. Cardiac conduction pathway and its relationship to a normal electrocardiogram
   a. Pacemaker cells
b. Conduction cells
9. Stroke volume, cardiac output, and Starlings law of the heart
10. Nervous system regulation of the function of the heart

C. Blood Vessels and Circulation
1. Structure and function of the blood vessels, arteries, veins and capillaries
2. Arterial and venous anastomosis
3. Structure of capillaries
4. Exchange of gases that occurs at the capillary level
5. Mechanism that regulate blood flow through arteries, capillaries, and veins
6. Pathway and purpose of the pulmonary circulation
7. Pathway of the systemic circulation
8. Pathway and purpose of the hepatic portal circulation
9. Fetal circulation
10. Branches of the Aorta and their distributions
11. Major systemic arteries and the parts of the body they nourish
12. Major systemic veins and the parts of the body they drain of blood
13. Hemodynamics
   a. Blood pressure
      i. venous return
      ii. pulse pressure
      iii. peripheral resistance
   b. Factors that maintain systemic blood pressure
      i. heart rate and force of contraction
      ii. vessel elasticity
      iii. blood viscosity
      iv. hormones
      v. peripheral resistance
   c. Osmosis
   d. Diffusion
   e. Facilitated diffusion
   f. Active Transport
   g. Hydrostatic pressure
   h. Oncotic pressure
14. Regulation of blood pressure by the heart and kidneys
15. Medulla and autonomic nervous system regulation of the diameter of the blood vessels
16. Coordination of cardiac, vasomotor, and respiratory centers to control blood flow through the tissues

XIII. Nervous System

A. Basic Components
1. Neuron
   a. Axon
   b. Dendrites
   c. Myelin sheath
   d. Neurolemma
   e. Microglia
   f. Astrocytes
   g. Schwann cells
h. Neuroglia

2. Type of neurons
   a. Sensory
   b. Motor
   c. Interneurons

3. Nerves and Tracts
   a. Sensory nerves
   b. Motor nerves
   c. Mixed nerve
   d. Nerve tract (white matter)

4. Nerve Impulse
   a. Membrane potential and the conduction of an action potential
      i. polarization
      ii. depolarization
      iii. impulse transmission
      iv. salutatory conduction
   b. Impulse transmission at synapses

B. Central Nervous System
   1. Function of the spinal cord
   2. Spinal nerves and function
   3. Spinal cord reflexes
      a. Stretch reflexes
      b. Reflex arc
      c. Flexor reflexes
   4. Parts of the brain
      a. Ventricles
      b. Medulla
      c. Pons midbrain
      d. Cerebellum
      e. Hypothalamus
      f. Thalamus
      g. Cerebrum
      h. Frontal lobes
      i. Parietal lobes
      j. Temporal lobes
      k. Occipital lobes
      l. Basal ganglia
      m. Corpus callosum
   5. Meninges location and function
   6. Function of the blood-brain barrier
   7. Location and functions of the cerebrospinal fluid

C. Peripheral Nervous System
   1. Cranial nerves and function
      a. Olfactory nerves
      b. Optic nerves
      c. Oculomotor nerves
      d. Trochlear nerves
      e. Trigeminal nerves
f. Abducens nerves
g. Facial nerves
h. Vestibulocochlear nerves
i. Glossopharyngeal nerves
j. Vagus nerves
k. Accessory nerves
l. Hypoglossal nerves

2. Distribution pattern of spinal nerves
3. Sensory and motor pathways
   a. Sensory pathways
      i. posterior column pathway
      ii. spinothalamic pathway
      iii. spinocerebellar pathway
   b. Motor pathways
      i. pyramidal system
      ii. extrapyramidal system

4. Sympathetic division of the autonomic nervous system
5. Parasympathetic division of the autonomic nervous system
6. Effects of sympathetic and parasympathetic divisions of ANS on various organs of the body
   a. Eyes
   b. Skin
   c. Cardiovascular system
d. Adrenal glands
e. Respiratory system
f. Digestive system
g. Skeletal muscles
h. Urinary system
   i. Reproductive system

D. Sensory Function
   1. General purposes of sensations
   2. General sense and the special senses
      a. General senses
         i. pain
         ii. temperature
         iii. touch, pressure, position
         iv. chemical detection
      b. Special senses
         i. smell
         ii. taste
         iii. vision
         iv. hearing
         v. balance

   3. Parts of the sensory pathway and the general functions of each
      a. Receptors
      b. Sensory neurons
      c. Sensory tracts
      d. Sensory areas

   4. Characteristics of sensations
      a. Projection
i. phantom pain
b. Intensity
c. Contrast
d. Adaptation
e. After-image

5. Characteristics of cutaneous senses
   a. Free nerve endings
   b. Encapsulated nerve endings
   c. Neuropathy

6. Referred pain

7. Importance of proprioception or muscle sense

8. Pathways for the sense of taste
   a. Taste buds
   b. Chemoreceptors
   c. Transmission via the facial and glossopharyngeal nerves

9. Pathways for the sense of Smell
   a. Olfaction chemoreceptors
   b. Olfactory cranial nerves

10. Sensation of hunger and thirst
    a. Visceral sensations
    b. Hypothalamas receptors
    c. Water to salt proportion

11. Components of the eye and function
    a. Vision receptors
    b. Refracting system
    c. Eyelids
    d. Lacrimal apparatus
    e. Conjuctiva
       i. conjunctivitis
    f. Lacrimal glands
       i. tears
       ii. lysozome enzyme
    g. Lacrimal sac
    h. Nasolacrimal duct
    i. Eyeball
       i. orbit
       ii. extrinsic muscles
       iii. layers of the eyeball
          a) sclera
          b) cornea
          c) choroid layer
          d) ciliary body
          e) suspensory ligaments
          f) iris
          g) pupil
          h) lens
             i) cataracts
          i) retina
          j) rods
          k) macula area
l) macula lutea  
m) fovea  
n) ganglion neurons  
o) optic disc  
iv. cavities  
a) posterior cavity – vitreous humor  
b) anterior cavity  
   i) aqueous humor -- glaucoma  
   ii) canal of Schlemm  
v. physiology of vision  
a) refraction  
   i) nearsightedness – myopia  
   ii) farsightedness – hyperopia & presbyopia  
   iii) astigmatism  
   iv) strabismus  
   v) amblyopia  
b) rods and rhodopsin  
c) cones and color blindness  
d) optic nerve  
e) optic chiasma  
f) occipital lobes of cerebral cortex  
   i) binocular vision  
j. Components and function of the ear  
i. outer ear  
   a) auricle – pinna  
   b) ear canal  
ii. middle ear  
   a) eardrum – tympanic membrane  
   b) malleus  
   c) incus  
   d) stapes  
   e) oval window  
   f) eustachian tube  
iii. inner ear  
   a) bony labyrinth  
   b) membranous labyrinth  
   c) perilymph  
   d) endolymph  
   e) cochlea  
      i) medial canal  
      ii) organ of Corti  
      iii) round window  
      iv) utricle and saccule  
         (a) otoliths  
      v) Semicircular canals  
   f) process of hearing, vibration transmission and nerve impulse generation  
      i) deafness  
         (a) conduction deafness  
         (b) nerve deafness  
         (c) central deafness
g) physiology of equilibrium
   iv. proprioception
   v. arterial pressoreceptors and chemoreceptors

XIV. Integumentary System

   A. General Functions of the Integumentary System

   B. Layers and Functions of the Skin
      1. Epidermis
      2. Dermis
      3. Subcutaneous tissue

   C. Additional Skin Structures:
      1. Stratum corneum
      2. Stratum germinativum
      3. Melanocytes
      4. Melanin

   D. Cutaneous Senses

   E. Other Structures and Function
      1. Hair
      2. Nails
      3. Sebaceous glands
      4. Ceruminous glands
      5. Eccrine sweat glands

   F. Dermal Arterioles Response to Heat, Cold and Stress

   G. Structure and Function of Subcutaneous Tissue

   H. Skin Response to Injury and Repair Process

   I. Effects of the Aging Process on the Skin

XV. Digestive System

   A. General Function of the Digestive System and the Major Divisions
      1. Alimentary tube
      2. Accessory organs

   B. Accessory Organs of Digestion

   C. Mechanical and Chemical Digestion

   D. Structure and Function of the Teeth and Tongue

   E. Function of Saliva
F. Location and Function of the Pharynx and Esophagus

G. Mechanical and Chemical Breakdown of Food in the Mouth

H. Mechanics of Swallowing

I. Location, Structure, and Function of the Stomach, Small intestine, Liver, Gallbladder, and Pancreas

J. Four Layers of the Alimentary Canal
   1. Mucosa
   2. Submucosa
   3. External muscle layer
   4. Serosa

K. Absorption in the Large and Small Intestine

L. Function of the Normal Flora in the Colon

M. Peristalsis and Chime

XVI. Endocrine System

A. Function of the Endocrine System

B. Endocrine and Exocrine Glands

C. Endocrine Glands and the Hormones Secreted
   1. Prostaglandin
   2. Target organs
   3. Target tissue

D. Chemistry of Hormones
   1. Amines
   2. Proteins
   3. Steroids

E. Regulation of Hormone Secretion
   1. Positive and negative feedback mechanisms

F. Pituitary Gland
   1. Posterior pituitary gland
      a. Antidiuretic hormone (ADH)
      b. Osmoreceptors
      c. Oxytocin

G. Anterior Pituitary Gland
   1. Growth Hormone (GH)
   2. Thyroid-stimulating hormone (TSH)
   3. Adrenocorticotropic Hormone (ACTH)
   4. Prolactin
5. Follicle-stimulating hormone (FSH)
6. Luteinizing hormone (LH)

H. Thyroid Gland
1. Thyroxine (T4)
   a. goiter
   b. cretinism
   c. myxedema
   d. Graves’ disease
2. Triiodothyronine (T3)
3. Calcitonin

I. Parathyroid hormone (PTH) and calcitonin

J. Pancreas
1. Islets of Langerhans
   a. Alpha cells
   b. Beta cells
   c. Delta cells
2. Insulin
   a. Diabetes mellitus
   b. Hyperglycemia
   c. Hypoglycemia
3. Glucagon
4. Somatostatin

K. Relationship Between Insulin and Glucagon

L. Prostaglandins

M. Adrenal Glands
1. Adrenal medulla
   a. epinephrine
   b. norepinephrine
2. Adrenal Cortex
   a. Mineralocorticoids
      i. aldosterone
      ii. rennin-angiotensin mechanism
   b. Glucocorticoids
      i. cortisol
         a) gluconeogenesis
         b) anti-inflammatory effects -- histamine
   c. Sex hormones
      i. estrogen
      ii. progesterone
      iii. inhibin
      iv. testosterone
   d. Diseases of the adrenal cortex
      i. Addison’s disease
      ii. Cushings’s syndrome
N. How Protein Hormones and Steroid Hormones Exert Their Effects

O. Coordinated Physiological Responses Controlled by Hormones

P. Hormones That Are Especially Important to Normal Growth and Development

XVII. Renal System

A. Location and General Function of Each Organ in the Urinary System

B. Components of a Nephron and the Associated Blood Vessels

C. Process of Urine Formation
   1. Glomerular filtration,
   2. Tubular reabsorption
   3. Tubular secretion
   4. Kidney blood flow

D. Kidneys Function in Maintaining Normal Blood Volume and Pressure

E. Kidneys Maintenance of Normal Blood pH and Electrolyte Balance

F. Hormones That Affect Kidney Function
   1. Aldosterone
   2. Atrial natriuretic peptide (ANP)
   3. Antidiuretic hormone (ADH)
   4. Parathyroid hormone (PTH)

G. Urination Reflex and Voluntary Control

H. Characteristics of Normal Urine
   1. Amount
   2. Color
   3. Specific gravity
   4. pH
   5. constituents
   6. nitrogenous wastes

I. Water Compartments

J. Water Movement Between the Compartments

K. Water Entry and Exit in the Body

L. Water and Electrolyte Distribution in the Body

M. Basic Concepts Involved in the Control of Fluid and Electrolyte Regulation

N. Buffering Systems That Balance the pH of the Intracellular and Extracellular Fluids
XVIII. Reproductive System

A. Define the Following:
   1. Diploid
   2. Haploid
   3. Gamates
   4. Endometrium
   5. Genetic disease
   6. Homologous chromosomes
   7. Autosomes
   8. Sex chromosomes
   9. Genes
   10. Alleles
   11. Genotype
   12. Phenotype
   13. Homomzygous
   14. Heterozygous

B. Spermatogenesis and Oogenesis

C. Hormones Necessary for the Formation of Gamates

D. Essential and Accessory Reproductive Organs of the Male and Female

E. Structures That Constitute External Genitals in Both Sexes

F. Parts of the Sperm Cell

G. Life Cycle of an Oocyte

H. Menstrual Cycle in Terms of Changes in Hormone Levels and the Condition of the Endometrium

I. Major Developmental Changes During Gestation

J. Function and Structure of the Placenta and Umbilical Cord

K. Fetal Circulation/Respiration

L. Average Gestation Period

M. Stages of Labor

N. Physiologic Changes in Infant After Birth

XIX. Lymphatic and Immune System

A. Major Components and Functions of the Lymphatic System

B. Formation of Lymph Fluid
C. Lymph Vessels and Return to the Blood

D. Location and Function of Lymph Nodes and the Spleen

E. Lymphocytes

F. Immunity
   1. Antigens
   2. Antibodies

G. Innate Immunity
   1. Defensive cells
      a. Natural killer cells (NK cells)
      b. Basophils
      c. Mast cells
      d. Phagocytes
      e. Langerhans cells
   2. Chemical defenses
      a. Interferons
      b. Complement
      c. Inflammation
      d. Fever

H. Adaptive Immunity
   1. Cell-mediated
   2. Antibody mediated

I. Thymus
   1. Stem cells
   2. T lymphocytes – T cells

J. Humoral immunity and Cell Mediated Immunity

K. Development and Function of B Cells and T Cells

L. Acquired Immunity and Genetic Immunity

M. Vaccinations

N. Classifications of Microorganisms

O. Distribution of and Benefits of Normal Flora

P. Infectious Disease
   1. Methods by which infectious diseases are spread

XX. Nutrition, Metabolism and Body Temperature

A. Normal Range of Body Temperature
B. Homeostatic Mechanisms That Maintain a Constant Body Temperature

C. Metabolism, Catabolism, Anabolism, Basal Metabolic Rate, Kilo-Calories

D. Methods Heat is Generated and Lost in the Body
   1. Thyroxine
   2. Sympathetic stimulation
   3. Respiration
   4. Skeletal muscles
   5. Liver
   6. Food

E. Fever
   1. Cause
   2. Advantages
   3. Disadvantages

F. Hypothalamus Function as the Thermostat in the Body

G. Cell Respiration
   1. Byproducts
   2. Disposal of byproducts

H. Cellular Metabolism
   1. Metabolic roles of fats, glucose, and proteins
   2. Synthesis uses for glucose, amino acids and fats
   3. Metabolic rate and kilocalories
   4. Factors that affect metabolic rate

I. Functions of Vitamins, Minerals, and Other Important Nutrients
   1. Basic food groups
   2. Minerals, vitamins and water
   3. Significance of caloric value of foods
Preparatory
Medical Terminology – PR9

Integrates comprehensive anatomical and medical terminology and abbreviations into the written and oral communication with colleagues and other health care professionals.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Medical Terminology
   A. Importance
   B. Basic Rules and Elements
   C. Word Roots, Prefixes, and Suffixes
   D. Literal Meanings From Medical Terms Based on Word Construction
   E. Define Common Abbreviations and Interpret Common Symbols
   F. Body Structure
   G. Body Systems
Preparatory
Pathophysiology – PR10

Integrates comprehensive knowledge of pathophysiology of major human systems.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Introduction

A. Correlation of Pathophysiology With Disease Process
   1. Cells appear similar to multicellular “social” organism
   2. Cells communicate electrochemically
   3. Coordination of specific bodily functions
      a. Endocrine
      b. Exocrine
      c. Other coordinating receptors
         i. chemoreceptors
         ii. baroreceptors
         iii. adrenergic
         iv. others

II. Basic Cellular Review

A. Major Classes of Cells

B. Chief Cellular Functions
   1. Differentiation or maturation
   2. Perform one function or act in concert with other cells to perform a more complex task

C. Cellular Components
   1. Structure and function
   2. Three main components

D. Tissue Types
   1. Epithelial tissue
   2. Connective tissue
   3. Muscle tissue
   4. Nervous tissue

III. Alterations in Cells and Tissues

A. Cellular Adaptation
   1. Atrophy
   2. Hypertrophy
   3. Hyperplasia
4. Dysplasia
5. Metaplasia

B. Cellular Injury

1. Hypoxic injury
   a. Most common
   b. May result from
      i. Decreased amounts of oxygen
      ii. Loss of hemoglobin or hemoglobin function
      iii. Decreased number of red blood cells
      iv. Respiratory or cardiovascular system disease
      v. Loss of cytochromes

2. Chemical injury from agents such as:
   a. Poisons
   b. Lead
   c. Carbon monoxide
   d. Ethanol
   e. Pharmacological

3. Infectious injury
   a. Virulence or pathogenicity of microorganisms via
      i. Invading and destroying cells
      ii. Producing toxins
      iii. Producing hypersensitivity reactions
   b. Bacteria
      i. Survival and growth
      ii. Bacteria produce enzymes or toxins
         a) Toxins
            i) Exotoxins
            ii) Endotoxins
         b) Fever is caused pyrogens
         c) Inflammation
         d) Hypersensitivity
         e) Bacteremia or Septicemia
   c. Viruses
      i. Among the most common afflictions
      ii. Intracellular parasites
      iii. Protein coat (capsid)
      iv. Viruses do not produce exotoxins or endotoxins

4. Immunologic and inflammatory injury
   a. Cellular membranes
   b. Rapid leakage of potassium out of the cell and an influx of water

5. Injurious genetic factors
6. Injurious nutritional imbalances
7. Injurious physical agents

C. Manifestation of Cellular Injury

1. Cellular manifestations
2. Systemic manifestations

D. Cellular Death/Necrosis
IV. The Cellular Environment

A. Distribution of Body Fluids
   1. Intracellular fluid (ICF)
   2. Extracellular fluid (ECF)
      a. Interstitial fluid
      b. Intravascular fluid
      c. Other
   3. Total body water (TBW)

B. Aging and Distribution of Body Fluids
   1. birth
   2. Infancy
   3. Childhood
   4. Adulthood
   5. Elderly

C. Water Movement Between ICF and ECF
   1. Osmotic forces
   2. Role of sodium and potassium

D. Water Movement Between Plasma and Interstitial Fluid
   1. Osmotic forces within capillary bed
   2. Starling’s hypothesis
   3. Role of capillary and membrane permeability

E. Alterations in Water Movement – Edema
   1. Pathophysiology
      a. Increased capillary permeability
      b. Decreased oncotic pressure
      c. Increased capillary hydrostatic pressure
      d. Hydrostatic pressure
      e. Lymphatic vessel obstruction
   2. Clinical manifestations
      a. Local
      b. Generalized
   3. Evaluation and treatment

F. Water Balance and the Role of Electrolytes
   1. Water balance
      a. Role of antidiuretic hormone (ADH)
      b. Receptors
         i. osmoreceptors
         ii. volume sensitive receptors
         iii. baroreceptors
   2. Sodium and chloride balance
      a. Role and function of sodium as a cation
      b. Role and function of chloride as an anion
      c. Hormone regulation by aldosterone and natriuretic hormone
d. Role of renin-angiotensin system

3. Alterations in sodium, chloride, and water balance
   a. Isotonic alterations
      i. isotonic volume depletions
      ii. isotonic volume excesses
   b. Hypertonic alterations
      i. hypernatremia
      ii. water deficit
      iii. hyperchloremia
   c. Hypotonic alterations
      i. hyponatremia
      ii. water excess
      iii. hypochloremia

4. Alterations in potassium, calcium, phosphate, and magnesium balance
   a. Potassium
      i. hypokalemia
      ii. hyperkalemia
   b. Calcium and phosphate
      i. hypocalcemia
      ii. hypercalcemia
      iii. hypophosphatemia
      iv. hyperphosphatemia
   c. Magnesium
      i. hypomagnesemia
      ii. hypermagnesemia

G. Acid-base balances
   1. Hydrogen ion and pH
   2. Buffer systems
      a. Carbonic acid-bicarbonate buffering
      b. Protein buffering
      c. Renal buffering
      d. Other buffers
   3. Acid-based imbalances
      a. Metabolic acidosis
         i. pathophysiology
         ii. clinical presentation
         iii. evaluation and treatment
      b. Metabolic alkalosis (rare)
         i. pathophysiology
         ii. clinical presentation
         iii. evaluation and treatment
      c. Respiratory acidosis
         i. pathophysiology
         ii. clinical presentation
         iii. evaluation and treatment
      d. Respiratory alkalosis
         i. pathophysiology
         ii. clinical presentation
iii. evaluation and treatment

V. Genetics and Familial Diseases

A. Factors Causing Disease
   1. Genetic
   2. Environmental
      a. Microorganisms and immunologic exposures
      b. Personal habits and life-style
      c. Chemical substances
      d. Physical environment
      e. Psychosocial environment
   3. Age and gender
      a. Accumulative affects of both genetic and environmental factors
      b. Life-style, anatomic, or hormonal differences

B. Analyzing Disease Risk
   1. Disease rates
      a. Incidence rate
      b. Prevalence rate
      c. Mortality rate
   2. Risk factor analysis
      a. Causal risk factors
      b. Noncausal risk factors

C. Combined Effects and Interaction Among Risk Factors
   1. Familial disease tendency
   2. Aging and age-related disorders

D. Common Familial Disease and Associated Risk Factors
   1. Immunologic disorders
      a. Allergies
      b. Asthma
      c. Rheumatic fever
   2. Cancer
      a. Breast cancer
      b. Colorectal cancer
      c. Lung cancer
   3. Endocrine disorders
      a. Diabetes mellitus
         i. insulin-dependent diabetes mellitus
         ii. non-insulin dependent diabetes mellitus
   4. Hematologic disorders
      a. Drug-induces hemolytic anemia
      b. Hemophilia
      c. Hematochromatosis
   5. Cardiovascular disorders
      a. Long QT syndrome (autosomal dominant disorder)
      b. Cardiac myopathies
      c. Mitral valve prolapse
d. Coronary heart disease  
   i. family history and CHD risk  
   ii. genetic factors and predisposition  

e. Hypertension and stroke  

6. Renal disorders  
   a. Gout (uric acid accumulation)  
   b. Kidney stones  

7. Gastrointestinal disorders  
   a. Malabsorption disorders  
      i. lactose intolerance  
      ii. ulcerative colitis  
      iii. Crohn’s disease  
   b. Peptic ulcers  
   c. Gallstones  

8. Neuromuscular disorders  
   a. Huntington Disease  
   b. Muscular Dystrophy  
   c. Multiple Sclerosis  
   d. Alzheimer Disease  

9. Psychiatric disorders  
   a. Schizophrenia  
   b. Manic-depressive  

VI. Hypoperfusion  

A. Pathogenesis  
   1. Decreased cardiac output  
   2. Compensatory mechanisms  
      a. Catecholamine release  
         i. epinephrine and norepinephrine  
         ii. increase in systemic vascular resistance  
      b. Role of aldosterone, renin-angiotensin, and ADH  
         i. adequate or increased blood volume  
         ii. vasoconstriction increases systemic blood pressure  
      c. Shift of interstitial fluid  
      d. Splenic discharge  
   3. Increased preload, stroke volume, and heart rate  
      a. Increased myocardial oxygen demand  
      b. Systemic and pulmonary edema  
         i. dyspnea  
         ii. dusky skin color  
         iii. low blood pressure  
         iv. oliguria  
         v. impaired mentation  
      c. Decreased cardiac output and ejection fraction  
         i. decreased blood pressure  
         ii. decreased tissue perfusion
iii. impaired cellular metabolism

B. Types of Shock
1. Cardiogenic shock
   a. Defined
   b. Pathophysiology
   c. Evaluation and treatment
2. Hypovolemic shock
   a. Defined
   b. Pathophysiology
   c. Evaluation and treatment
3. Neurogenic shock
   a. Defined
   b. Pathophysiology
   c. Evaluation and treatment
4. Anaphylactic shock
   a. Defined
   b. Pathophysiology
   c. Evaluation and treatment
5. Septic shock
   a. Defined
   b. Pathophysiology
   c. Evaluation and treatment

C. Multiple Organ Dysfunction Syndrome (MODS)
1. Defined
   a. Progressive failure of two or more organ systems
   b. Occurs after severe illness or injury
   c. New diagnosis first described in 1975
   d. Mortality rate of 60%-90%
   e. Major cause of death following septic, traumatic, and burn injuries
2. Pathophysiology
   a. Injury or endotoxin release
   b. Vascular endothelial damage, neuroendocrine response, and release of inflammatory mediators
   c. Activation of complement, coagulation, and kallikrein/kinin systems
   d. Massive systemic immune/inflammatory and coagulation responses
   e. Vascular changes
      i. vasodilation
      ii. increase in capillary permeability
      iii. selective vasoconstriction
      iv. microvascular thrombi
   f. Maldistribution of systemic and organ blood flow
   g. Hypermetabolism
   h. Oxygen supply/demand imbalance
   i. Tissue hypoxia
     i. tissue hypoperfusion
     ii. exhaustion of fuel supply (i.e., atp, glucose, etc)
     iii. metabolic failure
     iv. lysosome breakdown
v. anaerobic metabolism  
vi. acidosis and impaired cellular function  
j. Organ dysfunction  
 i. decreased cardiac function and myocardial depression  
 ii. renal failure  
 iii. failure of smooth muscle of vascular system  
  a) release of capillary sphincters  
  b) vasodilation  

3. Clinical presentation—24 hours after initial resuscitation  
 a. Low-grade fever  
 b. Tachycardia  
 c. Dyspnea and adult respiratory distress syndrome (ARDS)  
 d. Altered mental status  
 e. Hyperdynamic state  
 f. Hypermetabolic states  
 g. Renal and liver failure (14-21 days)  
 h. Gastrointestinal and immune collapse (14-21 days)  
 i. Cardiovascular collapse and death (21-28 days)  

D. Cellular metabolism impairment  
 1. Oxygen impairment  
  a. Anaerobic metabolism  
  b. Increased lactate  
  c. Metabolic acidosis  
  d. Decreased oxygen affinity for hemoglobin  
  e. Decreased ATP  
  f. Changes in cellular electrolytes  
  g. Cellular edema  
  h. Release of lysosomal enzymes  
 2. Impaired glucose use  
  a. Increase serum glucose  
  b. Catecholamines, cortisol, growth hormone release  
  c. Increased gluconeogenesis, gluconeolysis, and lipolysis  

VII. Self-Defense Mechanisms  

A. Introduction—lines of defense  
  1. Anatomic barriers  
  2. Inflammatory response  
  3. Immune response  

B. Characteristics of the immune response  
  1. Natural versus acquired response  
  a. Natural or native immunity  
  b. Acquired immunity  
     i. active acquired immunity  
     ii. passive acquired immunity  
  2. Primary versus secondary immunity  
  a. Primary or initial immune response  
  b. Secondary or anamnesis immune response
3. Humoral versus cell-mediated immunity
   a. B-cell lymphocyte
   b. T-cell lymphocyte

C. Introduction of the immune response
   1. Antigens and immunogens
      a. Antigens
      b. Immunogen
      c. Tolerance
      d. Molecular size
         i. larger—proteins, polysaccharides, and nucleic acids
         ii. smaller—amino acids, monosaccharides, and fatty acids
         iii. hapten—smaller molecules which become immunogenic
   2. Histocompatibility antigens (HLA antigens)
      a. HLA complexes or major histocompatibility complexes (MHC)
      b. Role of HLA antigens
   3. Blood group antigens
      a. Rh system
      b. ABO system

D. Humoral immune response
   1. B-cell lymphocytes
      a. Formation
         i. lymphoid stem cell
         ii. generation of clonal diversity
         iii. clonal selection
         iv. activated B-cell
            a) immunoglobulin-secreting plasma cells
            b) memory cells
   2. Immunoglobulins
      a. Differences between immunoglobulins and antibodies
      b. Structure of immunoglobulin molecules
      c. Function of antibodies
         i. agglutination
         ii. precipitation
         iii. neutralization
            a) bacterial toxins
            b) viruses
            c) opsonization of bacteria
            d) activation of inflammatory processes
            e) classes of immunoglobulins
            f) antibodies as antigens
         iv. isotypic antigens
         v. allotypic antigens
         vi. idiotypic antigenic determinants
      d. Monoclonal antibodies
   3. Secretory immune system
      a. Mucosal-associated lymphoid tissue
         i. lacrimal glands
         ii. salivary glands
iii. bronchial-associated lymphoid tissue
iv. mammary-associated lymphoid tissue
v. gut-associated lymphoid tissue
vi. genital-associated lymphoid tissue
b. Circulates independently of other lymphocytes
i. mucosal-associated lymphoid tissue
ii. regional lymph nodes
iii. thoracic duct
iv. blood
c. First line of defense
d. Local rather than systemically

E. Cell-mediated immune response
1. T-cells
   a. Five types of mature T-cells
      i. memory cells
      ii. Td cells or lymphokine-producing cells
      iii. Tc cells or cytotoxic cells
      iv. Th cells or helper T-cells
      v. Ts cells or suppressor T-cells
   b. Proliferation and differentiation
2. Major effects of cell-mediated immune response
   a. Cytotoxicity
   b. Delayed hypersensitivity
   c. Memory
   d. Control

F. Cellular interactions in the immune response
1. Cytokines
   a. Lymphokines
   b. Monokines
2. Antigen processing, presentation, and recognition
   a. Antigen degradation
   b. Classes of histocompatible antigens (HLA)
   c. T-cell receptors
   d. Interleukin-1 (IL-1)
3. T-cell and B-cell differentiation
   a. T-cell differentiation
   b. B-cell differentiation
   c. Control of B and T-cell development

G. Fetal and neonatal immune function
1. Fetal immunological capabilities
   a. Immunologic responses
   b. Antibody capabilities
2. Antibody levels
   a. Umbilical cord blood
   b. Neonatal circulation
3. Trophoblasts
H. Aging and the immune response in elderly
   1. T-cell function
   2. Antibody production

VIII. Inflammation

   A. The acute inflammatory response
      1. Triggers
         a. Lethal cellular injury
         b. Non-lethal cellular injury
         c. Other microorganisms
      2. Response
         a. Vascular responses to inflammation
         b. Cellular responses to inflammation

   B. Mast cells
      1. Degranulation of vasoactive amines and chemotactic factors
         a. Stimulation of degranulation
            i. physical injury
            ii. chemical agents
            iii. immunological (IgE-mediated hypersensitivity)
         b. Vasoactive amines
            i. histamine
            ii. serotonin
         c. Chemotactic factors
            i. neutrophil
            ii. eosinophil
      2. Synthesis of leukotrienes and prostaglandins
         a. Leukotrienes or slow-reacting substances of anaphylaxis (SRS-A)
            i. composition
            ii. function
         b. Prostaglandins
            i. composition
            ii. function

   C. Plasma protein systems
      1. Complement system
         a. Structure and function
         b. Activation
            i. classic pathway
            ii. alternative pathway
      2. Clotting system
         a. Structure and function
         b. Activation
            i. extrinsic pathway
            ii. intrinsic pathway
      3. Kinin system
         a. Structure and function
         b. Activation -- Plasma kinin cascade
4. Control and interaction of the plasma protein system
   a. Reason for control
   b. Types of control
      i. antagonists
      ii. histamine control
      iii. interaction of control processes

D. Cellular components of inflammation
1. Functions of phagocytes
   a. Margination
   b. Diapedesis
   c. Exudation into inflamed tissue
   d. Process of phagocytosis
2. Polymorphonuclear neutrophils
   a. Predominance in early inflammatory response
   b. Role
3. Monocytes and macrophages
   a. Monocyte—young macrophage
      i. structure
      ii. role
   b. Macrophages
      i. structure
      ii. role
4. Eosinophils
   a. Structure
   b. Role

E. Cellular products
1. Interleukins (ILs)
   a. Interleukin-1
   b. Interleukin-2
2. Lymphokines
   a. Production
   b. Types and effects
      i. migration-inhibitory factor
      ii. macrophage-activation factor
3. Interferon
   a. Structure
   b. Actions and effects

F. Systemic responses of acute inflammation
1. Fever
   a. Activation
   b. Effects
2. Leukocytosis
   a. Activation
   b. Effects
3. Increase in circulating plasma proteins or acute-phase reactants
   a. Activation
   b. Effects
G. Chronic inflammation responses
1. Causes
   a. Unsuccessful acute inflammatory response
   b. Persistence of infection or antigen
2. Characteristics
   a. Persistence of acute inflammation response
   b. Neutrophil degranulation and death
   c. Lymphocyte activation
   d. Fibroblast activation
   e. Infiltration (pus)
   f. Tissue repair (scar)

H. Local inflammation responses
1. Vascular changes
   a. Vasodilation
   b. Increased capillary permeability
2. Exudation
   a. Functions
   b. Compositions

I. Phases of resolution and repair
1. Definitions
   a. Regeneration
   b. Repair
   c. Debridement
   d. Primary intention
   e. Secondary intention
2. Reconstruction phase
   a. Initial wound response
   b. Granulation
   c. Epithelialization
3. Maturation phase
   a. Completion of contraction, differentiation, and remodeling of scar tissue
   b. Disappearance of capillaries from scar tissue
4. Dysfunctional wound healing
   a. Dysfunction during the inflammatory response
   b. Dysfunction during the reconstruction phase
      i. impaired collagen synthesis
      ii. impaired epithelialization
      iii. wound disruption
      iv. impaired contraction

J. Aging and self-defense mechanisms
1. Newborn
2. Elderly

IX. Variances in Immunity and Inflammation

A. Hypersensitivity: allergy, autoimmunity, and isoimmunity
1. Definitions
   a. Hypersensitivity
   b. Allergy
   c. Autoimmunity
   d. Isoimmunity

2. Mechanisms of hypersensitivity
   a. Immediate versus delayed reactions
   b. IgE reactions
      i. role of IgE
      ii. mechanism of IgE
      iii. clinical indications
      iv. genetic predisposition
      v. IgE-mediated hypersensitivity tests
      vi. desensitization
   c. Tissue-specific reactions
      i. tissue-specific antigens
      ii. mechanisms
   d. Immune-complex mediated injury
      i. mechanisms
      ii. immune-complex disease
   e. Cell-mediated tissue destruction
      i. mechanisms
      ii. clinical instances

3. Targets of hypersensitivity
   a. Allergy
      i. allergens
      ii. neoantigen
   b. Autoimmunity
      i. breakdown of tolerance
      ii. original insult
      iii. genetic factors
   c. Isoimmunity
      i. transient neonatal diseases
      ii. transplant rejections and transfusion reactions

4. Autoimmune and isoimmune diseases
   a. Grave’s disease
   b. Rheumatoid arthritis
   c. Myasthenia gravis
   d. Immune thrombocytopenic purpura
   e. Isoimmune neutropenia
   f. Systemic lupus erythematosus (SLE)
   g. Rh and ABO isoimmunization

B. Immunity and inflammation deficiencies
   1. Congenital immune deficiencies
   2. Acquired deficiencies
      a. Nutritional deficiencies
      b. Iatrogenic deficiencies
      c. Deficiencies caused by trauma
      d. Deficiencies caused by stress
e. AIDS

3. Replacement therapies for immune deficiencies
   a. Gamma globulin therapy
   b. Transplantation and transfusion
   c. Gene therapy

X. Stress and Disease

A. Concepts of stress
   1. Triad of manifestation
   2. General adaptation syndrome (Selye)
      a. Alarm stage
      b. Resistance or adaptation stage
      c. Exhaustion stage
      d. Definition of physiological stress
   3. Psychologic mediators and specificity
      a. Psychologic factors effects on physiological responses to stress
      b. Pituitary gland and adrenal cortex sensitivity to emotional, psychologic and social influences
   4. Homeostasis as a dynamic steady state
      a. Definitions
         i. dynamic steady state
         ii. turnover
      b. Reaction of body to stressors

B. Stress responses
   1. Psychoneuroimmunologic response
      a. Interaction of consciousness, brain and CNS, and the body’s defense mechanisms
      b. Stress response
   2. Neuroendocrine regulation
      a. Catecholamines
         i. components
            a) epinephrine
            b) norepinephrine
         ii. physiologic actions of alpha and beta receptors
            a) alpha1
            b) alpha2
            c) beta1
            d) beta2
         iii. physiologic effects of catecholamines
            a) brain
            b) cardiovascular
            c) pulmonary
            d) muscle
            e) liver
            f) adipose tissue
            g) skin
            h) skeleton
            i) g.i. and g.u. systems
            j) lymphoid tissue
b. Cortisol
   i. source
   ii. primary effects of cortisol
      a) stimulation of glucogenesis
      b) formation of glycogen
      c) cortisol effects of cell-mediated immunity
   iii. other physiologic effects of cortisol
      a) protein metabolism
      b) digestive function
      c) urinary function
      d) connective tissue function
      e) muscle function
      f) bone function
      g) vascular system and myocardial function
      h) central nervous system function

c. Other hormones
   i. endorphins
   ii. growth hormone
   iii. prolactin
   iv. testosterone

d. Role of the immune system
   i. interaction of immune, nervous, and endocrine systems during a stress response
   ii. influence of stress response on immune system
   iii. relationship between stress and immune-related conditions and diseases
      a) cardiovascular
      b) muscles
      c) connective tissue
      d) pulmonary system
      e) immune system
      f) G.I. system
      g) G.U. system
      h) skin
      i) endocrine
      j) central nervous system

C. Stress, coping, and illness interrelationships
   1. Stress as interdependent processes
      a. Definition of physiologic stress and psychologic distress
      b. Effects of psychologic distress
      c. Relationship between distress and immune dysfunction
   2. Potential stress effects on
      a. Healthy individuals
         i. ineffective coping
         ii. effective coping
      b. Symptomatic individuals
         i. ineffective coping
         ii. effective coping
      c. Medical interventions
         i. ineffective coping
         ii. effective coping
Preparatory
Life Span Development – PR11

Integrates comprehensive knowledge of life span development.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Infancy (birth to 1 year)

   A. Physiological
      1. Vital signs
         a. Heart rate
         b. Respiratory
         c. Blood pressure
         d. Temperature ranges
      2. Weight
      3. Cardiovascular system
      4. Pulmonary system
      5. Renal system
      6. Immune system
      7. Nervous system
         a. Movements
         b. Reflexes
         c. Fontanelles
         d. Sleep
      8. Musculoskeletal system
         a. Bone growth
         b. Muscle weight
      9. Dental system
   10. Growth and development in infants -- Rapid changes over first year

   B. Psychosocial development
      1. Family processes-reciprocal socialization
         a. Scaffolding
         b. Attachment
         c. Trust versus mistrust
         d. Secure attachment
      2. Temperament
         a. Easy child
         b. Difficult child
         c. Slow to warm-up child
      3. Crying
         a. Basic cry
         b. Anger cry
         c. Pain cry
      4. Trust
      5. Situational crisis
II. Toddler (12 to 36 months) and pre-school age (3 to 5 years)

A. Physiological
   1. Vital signs
      a. Heart rate
      b. Respiratory rate
      c. Systolic blood pressure
      d. Temperature
   2. Weight
   3. Cardiovascular system
   4. Pulmonary system
   5. Renal system
   6. Immune system
   7. Nervous system
   8. Musculoskeletal system
   9. Dental system
   10. Elimination patterns -- Toilet training
   11. Sensory

B. Psychosocial
   1. Cognitive
   2. Play
   3. Sibling relationships
   4. Peer group functions
   5. Parenting styles and its effect on children
      a. Authoritarian parenting
      b. Authoritative parenting
      c. Permissive-indifferent parenting
      d. Permissive-indulgent parenting
   6. Divorce effects on child development
   7. Television
   8. Modeling

III. School age children (6 to 12 years)

A. Physiological
   1. Vital signs
      a. Heart rate
      b. Respiratory rate
      c. Systolic blood pressure
      d. Temperature
   2. Growth rate
   3. Bodily functions

B. Psychosocial
1. Families
2. Develop self-concept
3. Moral development
   a. Pre-conventional reasoning
   b. Conventional reasoning
   c. Post-conventional reasoning
   d. Individuals move through development at different paces

IV. Adolescence - (13 to 18 years)

A. Physiological
   1. Vital signs
      a. Heart rate
      b. Respiratory rate
      c. Blood pressure
      d. Temperature
   2. Growth rate
      a. Secondary sexual development occurs
      b. Endocrine changes
         i. female
         ii. male
      c. Reproductive maturity
      d. Muscle mass and bone growth
      e. Body fat
      f. Blood chemistry nearly equal to adult levels
      g. Skin toughens

B. Psychosocial
   1. Family
   2. Develop identity
   3. Ethical development

V. Early adulthood (20 to 40 years)

A. Physiological
   1. Vital signs
      a. Heart rate
      b. Respiratory rate
      c. Blood pressure
      d. Temperature

B. Psychosocial

VI. Middle adulthood (41 to 60 years)

A. Physiological
   1. Vital signs
      a. Heart rate
      b. Respiratory rate
      c. Blood pressure
d. Temperature
2. Varying degrees of degradation
3. Vision
4. Hearing
5. Cardiovascular health
   a. Cardiac output
   b. Cholesterol
6. Cancer
7. Weight control
8. Menopause

B. Psychosocial
   1. Social clock
   2. Approach to problems
   3. Empty-nest syndrome
   4. Often burdened by financial commitments

VII. Late adulthood (61 years and older)

A. Physiological
   1. Vital signs
      a. Heart rate
      b. Respiratory rate status
      c. Blood pressure
      d. Temperature
   2. Life span
   3. Life expectancy
   4. Cardiovascular function changes
      a. Blood vessels
      b. Heart
      c. Blood cells
   5. Respiratory system
   6. Endocrine system changes
   7. Gastrointestinal system
   8. Renal system
   9. Sensory changes
  10. Nervous system

B. Psychosocial
   1. Terminal drop hypothesis
   2. Wisdom attributed to age in some cultures
   3. Challenges
      a. Self worth
      b. Declining well being
      c. Financial burdens
Preparatory
Public Health – PR12

Applies fundamental knowledge of principles of public health and epidemiology including public health emergencies, health promotion, and illness and injury prevention.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level, PLUS the following material:

I. Basic Principles of Public Health

A. Role of public health
   1. Many definitions
   2. Public health mission and functions
   3. Public health differs from individual patient care
   4. Review accomplishments of public health
      a. Widespread vaccinations
      b. Clean drinking water and sewage systems
      c. Declining infectious disease
      d. Fluoridated water
      e. Reduction in use of tobacco products
      f. Prenatal care
      g. Others

B. Public health laws, regulations and guidelines

C. EMS interface with public health
   1. EMS is a public health system
      a. EMS provides a critical public health function
      b. Incorporate public health services into EMS system
      c. Collaborations with other public health agencies
   2. Roles for EMS in public health
      a. Health prevention and promotion
         i. primary prevention—preventing disease development
            a) vaccination
            b) education
         ii. secondary prevention—preventing complications and/or progression of disease
         iii. health screenings
      b. Disease surveillance
         i. EMS providers are first line care givers
         ii. patient care reports may provide information on epidemics of disease
   3. Injury prevention
      a. Safety equipment
      b. Education
         i. car seat safety
         ii. seat belt use
         iii. helmet use
         iv. driving under the influence
v. falls
vi. fire
vii. injury surveillance
Pharmacology
Principles of Pharmacology – PR13

Integrates comprehensive knowledge of pharmacology to formulate a treatment plan intended to mitigate emergencies and improve the overall health of the patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Medication Safety

II. Medication Legislation

   A. Pure Food and Drug Act
   B. Federal Food, Drug and Cosmetic Act
   C. Harrison Narcotic Act
   D. Controlled Substances Act
      1. Schedule I
      2. Schedule II
      3. Schedule III
      4. Schedule IV
      5. Schedule V
   E. Drug Enforcement Agency
   F. Development of Pharmaceuticals
      1. Food and Drug Administration approval process
      2. Special Considerations
         a. Pregnancy
         b. Pediatrics
         c. Geriatrics

III. Naming

   A. Chemical
   B. Generic
   C. Propriety/Trade
   D. Official
   E. Authoritative sources of drug information
      1. United States Pharmacopeia (USP)
      2. Physician's Desk Reference (PDR)
3. Drug Package Inserts
4. Drug Handbooks
5. AMA Drug Evaluation
6. Hospital Formulary (HF)

IV. Classifications

A. Body System

B. Class of Agent

C. Mechanism of Action
   1. Alkalinizing Agents
   2. Analgesics
   3. Antibiotics
   4. Anticonvulsant – Sedative
   5. Antihypertensives
   6. Beta – Agonists
   7. Beta-blockers
   8. Calcium Channel Blockers
   9. Corticosterioids
  10. Diuretics
  11. Dysrrhythmics
  12. Fibrinolytics
  13. Neuromuscular Blocking Agents
  14. Platelet Inhibitors
  15. Sympathomimetics
  16. Xanthines

D. Classifications by Body System
   1. Central Nervous System
      a. Autonomic Pharmacology
         i. cholinergics
         ii. anticholinergics
         iii. adrenergics
         iv. antiadrenergic
      b. Analgesics
      c. Anesthetics
      d. Paralytics
      e. Sedative/Hypnotic
      f. Anticonvulsants
      g. Stimulants
   2. Cardiovascular drugs
      a. Anti-dysrhythmia
      b. Cardiac Glycosides
      c. Antihypertensives
      d. Antianginal Drugs
      e. Antihyperlipidemia Drugs
      f. Antihistamine
   3. Drugs affecting the Blood
a. Anticoagulants
b. Fibrinolytics
c. Antihemophilic Agents
d. Platelet Inhibitors
e. Glycoprotein IIB/IIIA Receptor Blockers
f. Hemostatic Agents
g. Antihyperlipidemic Agents

4. Psychiatric Medications
   a. Neuroleptics
   b. Antidepressants
   c. Antimanic Drugs

5. Respiratory System
   a. Mucolytics
   b. Cholinergic Antagonists
   c. Sympathomimetics
   d. Xanthine Derivatives
   e. Cough Suppressants
   f. Nasal Decongestants
   g. Antihistamines

6. Endocrine System
   a. Drugs affecting the Pituitary Gland
      i. anterior pituitary hormones
      ii. posterior pituitary hormones
   b. Drugs affecting the Thyroid Gland
   c. Drugs affecting the Adrenal Cortex
      i. glucocorticoids
      ii. mineralocorticoids
      iii. adrenal steroid inhibitors
   d. Drugs affecting the Pancreas
      i. insulin preparations
      ii. oral hypoglycemic agents
      iii. hyperglycemic agents

7. Infectious Disease
   a. Anthelmintic Agents
   b. Antiparasitic Agents
   c. Antifungal Agents
   d. Antibiotics
   e. Antiviral

8. Immune System
   a. Immunosuppressants
   b. Immunomodulators

9. Gastrointestinal System
   a. Antacid
   b. Antiflatulents
   c. Digestants
   d. Antiemetics
   e. Emetic Agents
   f. H2 Receptor Antagonists
   g. Laxatives
   h. Antidiarrheals
i. Cholesterol Synthesis

10. Urinary System
   a. Diuretic Drugs

11. Reproductive System
   a. Contraceptives
   b. Replacement Hormone Therapies
   c. Erectile Dysfunction
   d. Oxytocics
   e. Premature Labor Inhibitors

12. Ophthalmic Drugs
   a. Antiglaucoma Agents
   b. Mydriatic Agents
   c. Antiinfective Agents
   d. Topical Anesthetic Agents

13. Neoplastic Diseases
   a. Alkylating Agents
   b. Antimetabolites
   c. Plant Alkaloids
   d. Antitumor antibiotic

14. Herbal Preparations

15. Over the Counter Medications

V. Schedules

   A. Controlled Substances Act
      1. Schedule I
      2. Schedule II
      3. Schedule III
      4. Schedule IV
      5. Schedule V

VI. Drug Storage and Security

   A. Factors affecting Drug Potency
      1. Temperature
      2. Light
      3. Moisture
      4. Shelf Life

   B. Controlled Substances
      1. Storage
      2. Accountability

VII. Phases of Medication Activity

VIII. Medication Interactions

   A. Intestinal Absorption

   B. Competition for Plasma Protein Binding
C. Biotransformation
D. Drug Metabolism
E. Renal Excretion
F. Drug – Drug Interaction

IX. Toxicity

X. Drug Terminology

A. Antagonism
B. Bolus
C. Contraindications
D. Cumulative Action
E. Depressant
F. Habituation
G. Hypersensitivity
H. Idiosyncrasy
I. Indication
J. Potentiation
K. Refractory
L. Side Effects
M. Stimulant
N. Synergism
O. Therapeutic action
P. Tolerance
Q. Untoward effect

XI. Sources of Drugs

A. Inorganic
   1. Minerals
B. Organic
   1. Extracts
   2. Alkaloids

C. Chemical

D. Genetic

E. Drug Forms
   1. Liquids
   2. Solids
   3. Gases

XII. Pharmacological concepts

A. Pharmacokinetics
   1. Absorption
      a. Solubility
      b. Bioavailability
      c. Mechanism of Absorption
         i. diffusion
         ii. osmosis
         iii. filtration
   2. Distribution
      a. Drug Reservoirs
         i. plasma protein binding
         ii. tissue binding
      b. Barriers to Drug Distribution
         i. blood Brain Barrier
         ii. placental Barrier
   3. Biotransformation
      a. First Pass Metabolism
      b. Active Metabolites
      c. Inactive Metabolites
   4. Metabolism and Excretion
      a. Organs of Elimination
         i. kidneys
         ii. intestine
         iii. lungs
         iv. exocrine glands
            a) sweat
            b) salivary
            c) mammary

B. Pharmacodynamics
   1. Mechanism of Action
      a. Drug Receptor Interaction
         i. agonists
         ii. antagonists
iii. affinity
iv. efficacy

b. Drug Enzyme Interaction

2. Medication Response Relationship
   a. Plasma Levels
   b. Biologic Half-life
   c. Therapeutic Threshold
   d. Therapeutic Index
   e. LD 50
   f. Factors Altering Drug Response
      i. age
      ii. sex
      iii. body mass index
      iv. pathologic state
      v. genetic factors
      vi. time of administration
      vii. psychological factors
      viii. predictable responses
         a) tolerance
         b) cross tolerance
      ix. iatrogenic responses
      x. drug allergy
      xi. anaphylactic reaction
      xii. delayed reaction ("serum sickness")
      xiii. hypersensitivity
      xiv. idiosyncrasy
      xv. cumulative effect
      xvi. drug dependence
      xvii. drug antagonism
      xviii. summation (addition or additive effect)
      xix. synergism
      xx. potentiation
      xxi. interference
      xxii. toxicity
Pharmacology
Medication Administration – PR14

Integrates comprehensive knowledge of pharmacology to formulate a treatment plan intended to mitigate emergencies and improve the overall health of the patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Routes of Administration

   A. Alimentary Tract
      1. Oral
      2. Sublingual
      3. Rectal

   B. Parenteral
      1. Topical
      2. Intradermal
      3. Subcutaneous
      4. Intramuscular
      5. Intravenous
         a. IV Bolus
         b. IV Piggyback
      6. Endotracheal
      7. Intraosseous
      8. Inhalational
      9. Intranasal

II. Administration of Medication to a Patient

   A. The “Rights” of Drug Administration
      1. Right Patient -- Prescribed to Patient
      2. Right Medication -- Patient Condition
      3. Right Route -- Patient Condition
      4. Right Dose -- Prescribed to Patient
      5. Right Time -- Within Expiration Date

   B. Drug Dose Calculations
      1. System of weights and measures
         a. Metric System
            i. prefixes
            ii. conversions
      2. Drug calculations
         a. Desired dose
         b. Concentration on hand
         c. Volume on hand
      3. Calculate
a. Volume-based bolus  
b. IV drip rate  
c. Weight-based IV bolus  
d. Weight-based IV drip  

C. Techniques of Medication Administration (Advantages, Disadvantages, Techniques)  
1. Peripheral Venous Cannulation  
2. Intraosseous  
3. Intramuscular (Manual)  
4. Subcutaneous (Manual)  
5. Aerosolized  
6. Nebulized  
7. Sublingual  
8. Intranasal  
9. Transtracheal  
10. Intravenous Push/Infusion  
11. Nasogastric  
12. Rectal  
13. Topical  
14. Accessing Implanted/Central Intravenous Port  

D. Reassessment  
1. Data -- Indications for Medication  
2. Action -- Medication Administered  
3. Response -- Effect of Medication  

E. Documentation  

III. Standardization of Drugs  

A. Techniques to assure purity and potency  

B. Generic Drugs  

IV. Medication Classifications  

A. Phelebotomy  
1. Procedure  

B. Transfusion  
1. Indications  
   a. Transfusion Reactions  
   b. Hemolytic Reaction  
   c. Fever Reaction
Pharmacology

Emergency Medications – PR15

Integrates comprehensive knowledge of pharmacology to formulate a treatment plan intended to mitigate emergencies and improve the overall health of the patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

The paramedic must know (complex depth) the names, mechanism of action, indications, contraindications, complications, routes of administration, side effects, interactions, dose, and specific administration considerations, for all emergency medications and intravenous fluids permitted by protocol.

I. Specific Medications

A. Activated Charcoal
B. Adenosine
C. Albuterol
D. Amiodarone
E. Amyl Nitrite
F. Aspirin
G. Atropine
H. Dextrose (50%, 25%, 10%)
I. Diazepam
J. Diltiazem
K. Diphenhydramine HCl
L. Dopamine
M. Epinephrine
N. Fentanyl
O. Glucagon
P. Glucose
Q. Intravenous Fluids
1. Dextrose 5% in Water
2. Normal Saline
3. Lactated Ringer’s

R. Ipratropium
S. Lidocaine
T. Lorazepam
U. Magnesium
V. Midazolam
W. Morphine
X. Naloxone

Y. Nitroglycerin
   1. Paste
   2. Spray
   3. Tablets

Z. Nitrous Oxide

AA. Oxygen
BB. Oxytocin
CC. Promethazine HCl
DD. Thiamine
Airway Management, Respiration, and Artificial Ventilation
Airway Management – AM1

Integrates complex knowledge of anatomy, physiology, and pathophysiology into the assessment to develop and implement a treatment plan with the goal of assuring a patent airway, adequate mechanical ventilation, and respiration for patients of all ages.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Airway Anatomy

A. Sinuses
   1. Frontal
   2. Sphenoid
   3. Ethmoid
   4. Maxillary

B. Upper Airway Tract
   1. Nose
   2. Mouth and Oral Cavity
   3. Jaw
   4. Pharynx
      a. Nasopharynx
      b. Oropharynx
      c. Hypopharynx
      d. Laryngopharynx
         i. Vallecula
            a) Pyriform Sinus

5. Larynx
   a. Cartilages
      i. epiglottis
      ii. arytenoid cartilage
         a) corniculate cartilage
         b) cuneiform cartilage
         c) posterior arytenoids
      iii. vocal cords
         a) false vocal cord
         b) true vocal cord
   iv. thyroid cartilage
   v. cricoid ring
      a) arch of cricoid cartilage
      b) lamina of cricoid cartilage
      c) cricothyroid membrane (ligament)

   b. Bone
      i. Hyoid bone
         a) Hyo-epiglottic ligament

C. Jugular notch
D. Lower Airway Tract
1. Trachea -- Spatial relationship to esophagus
2. Carina -- Angle of Louis
3. Bronchi
4. Lungs
   a. Bronchioles
      i. bronchial smooth muscle
      ii. beta-two adrenergic receptors
   b. Pulmonary cilia
   c. Alveoli -- Surfactant

E. Support Structures
1. Chest Cage
   a. Ribs
   b. Muscles of respiration
      i. intercostal muscles
      ii. diaphragm
   c. Pleura
      i. parietal pleura
      ii. visceral pleura
2. Phrenic nerve
3. Mediastinum

II. Airway Assessment

A. Purpose
   1. Identify inadequate airway
   2. Identify an unstable airway
   3. Identify potentially difficult airways

B. Procedure
   1. Gag Reflex
   2. Airway obstruction
      a. Soft tissue obstruction
      b. Foreign bodies
      c. Complete and incomplete
      d. Upper vs. Lower
   3. Work of breathing
   4. Laryngospasm
   5. Laryngeal edema
   6. Penetrating injuries

C. Anticipating the difficult airway
   1. Trauma/bleeding
   2. Vomiting
   3. History
   4. Mouth opening
   5. Mandibular length
   6. Mallampati classifications
7. Obstructions
8. Neck mobility
9. Facial hair

III. Techniques of assuring a patent airway

A. Manual airway maneuvers

B. Mechanical airway devices

C. Relief of Foreign Body Airway Obstruction
   1. Refer to current American Heart Association guidelines
   2. Removal of foreign body airway obstructions using direct laryngoscopy
      a. Purpose
      b. Indications
      c. Contraindications
      d. Complications
      e. Procedure
      f. Limitation

3. Airway suctioning
   a. Review and elaborate on upper airway suctioning from the EMR, EMT and AEMT
   b. Tracheobronchial Suctioning
      i. purpose
      ii. indications
      iii. contraindications
      iv. complications
      v. procedure
      vi. limitation

D. Blind insertion airway devices

E. Endotracheal intubation
   1. Direct laryngoscopy (visualized)
      a. Purpose
      b. Indications
      c. Contraindications
      d. Complications
      e. Procedure (including confirmation techniques)
      f. Limitations
   2. Non-visualized
      a. Nasal
         i. purpose
         ii. indications
         iii. contraindications
         iv. complications
         v. procedure (including confirmation techniques)
         vi. limitations
      b. Digital
         i. purpose
         ii. indications
iii. contraindications
iv. complications
v. procedure (including confirmation techniques)
vi. limitations
c. Lighted stylet
   i. purpose
   ii. indications
   iii. contraindications
   iv. complications
   v. procedure (including confirmation techniques)
   vi. limitations
d. Fiber optic (Shikaini Seeing Optical Stylet (SOS), Glide scope)
   i. purpose
   ii. indications
   iii. contraindications
   iv. complications
   v. procedure (including confirmation techniques)
   vi. limitations

F. Percutaneous cricothyrotomy
   1. Purpose
   2. Indications
   3. Contraindications
   4. Complications
   5. Procedure (including confirmation techniques)
   6. Limitations

IV. Consider age-related variations in pediatric and geriatric patients

   A. See Special Patient Populations section
Airway Management, Respiration, and Artificial Ventilation
Respiration – AM2

Integrates complex knowledge of anatomy, physiology, and pathophysiology into the assessment to develop and implement a treatment plan with the goal of assuring a patent airway, adequate mechanical ventilation, and respiration for patients of all ages.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Anatomy of the Respiratory System

A. Includes all airway anatomy covered in the Airway Management section

B. Additional Respiratory System Anatomy
   1. Chest Cage
      a. Ribs
      b. Muscles of respiration
         i. intercostal muscles
         ii. diaphragm
      c. Pleura
         i. parietal pleura
         ii. visceral pleura
   2. Phrenic nerve
   3. Mediastinum

II. Physiology of Respiration

A. Control of Respiration
   1. Nervous Control of Respiration
      a. Medulla oblongata
         i. ventral respiratory group
         ii. dorsal respiratory group
         iii. reticular activating system
      b. Innervation of the Respiratory Musculature
         i. spinal cord innervation
         ii. phrenic nerve
         iii. Hering Breuer reflex
   2. Conscious Control of Respiration
      a. Somatic nerves related to intercostal innervation
   3. Chemical Control of Respiration
      a. Chemoreceptors

B. Mechanics of Respiration
   1. Pulmonary Ventilation
      a. Movement of the Thoracic Wall
         i. vertical diameter
         ii. transverse diameter
iii. anteroposterior diameter  
b. Intrathoracic pressure gradients  
   i. Boyle’s Law  
   ii. inspiration  
   iii. expiration  
c. Phases of Ventilation  
   i. active phase  
   ii. passive phase  
d. Modes of Breathing  
   i. quiet breathing  
   ii. forced breathing  
e. Lung Volumes and Capacities  
   i. volumes  
      a) tidal volume  
      b) minute volume  
      c) residual volume  
      d) dead space volume  
   ii. capacities  
      a) total lung capacity  
      b) vital capacity  
   iii. maximum inspiratory force  
   iv. maximum expiratory force  
   v. significance of pulmonary volumes and capacities

2. Gas Exchange  
   a. Mixed gases in ambient air  
   b. Partial pressures  
      i. Henry’s Law  
      ii. PaO2  
      iii. PCO2  
   c. Oxygenation  
   d. Alveolar air versus atmospheric air  
   e. Respiration  
      i. internal versus external respiration  
      ii. diffusion of gases through respiratory membrane  
      iii. diffusion of gases from capillaries to cells  
         a) role of ATP in cellular function  
         b) aerobic metabolism  
         c) anaerobic metabolism

3. Gas Transport  
   a. Red Blood Cells  
      i. hemoglobin chemistry  
      ii. hematocrit  
   b. Oxygen-Hemoglobin dissociation curve

4. Ventilation perfusion ratio  
   a. Anatomical shunts  
   b. Blood flow across the alveoli

C. Blood volume circulation disturbances due to Cardiac, Trauma, Systemic Vascular Resistance  
1. Orthostatic hypotension  
2. Oncotic fluid pressure
3. Hydrostatic fluid pressure
4. Capacitance of the venules and veins

D. Cardiac output and the role in adequate circulation maintenance
1. Cardiac rate
   a. Tachycardia
   b. Bradycardia
2. Stroke volume
   a. End-diastolic volume
   b. Preload
3. Role of alpha stimulation in the heart
4. Role of beta stimulation in the heart
5. Atrioventricular Synchronization
6. Total peripheral Resistance
   a. Precapillary arterioles and smooth muscle effects of alpha and beta cholinergic receptors, hypoxia, acidosis, temperature changes, neural factors and catecholamines.
   b. Cell/tissue beds and disruptions of membrane integrity, enzyme systems and acid-base balance.

E. Buffer systems
1. Blood
2. Respiratory
3. Renal

III. Pathophysiology of Respiration

A. Pulmonary ventilation
1. Interruption of Nervous Control
   a. Drugs
   b. Trauma
   c. Muscular dystrophy
   d. Poliomyelitis
   e. Neuromuscular junction blocking agents
2. Structural Damage to the Thorax
3. Bronchoconstriction
4. Disruption of airway patency
   a. Infection
   b. Trauma/burns
   c. Foreign body obstruction
   d. Allergic reaction
   e. Unconsciousness (loss of airway tone)

B. Oxygenation

C. Respiration
1. External
   a. Deficiencies due to environmental factors
      i. Altitude
      ii. Closed environments
      iii. Toxic or poisonous environments
b. Carbon dioxide retention

2. Internal
   a. Pathology typically related to changes in alveolar - capillary gas exchange
   b. Typical disease processes
      i. emphysema
      ii. pulmonary edema
      iii. pneumonia
      iv. environmental/occupational exposure
      v. drowning

3. Cellular

D. Rapid ventilation, exhaustion, dead space air movement

E. Mechanical ventilation
   1. Moving noncompliant lungs

F. Breathing against an elevated diaphragm

G. Decreases in lung compliance such as pneumonia, emphysema, and trauma

H. Ventilation-perfusion mismatch
   1. Ventilation defects
      a. Pulmonary edema
      b. Pneumonia
      c. Atelectasis
      d. Obstruction due to mucus plugs
      e. Increased dead space ventilation due to emphysema
   2. Perfusion defects
      a. Pulmonary emboli
      b. Disruption of the normal chest architecture

I. Disruptions in oxygen transport associated with diminished oxygen carrying capacity
   1. Anemia
   2. Blood loss

J. Disruptions in effective circulation
   1. Shock
      a. Blood loss
      b. Diminished peripheral resistance
      c. Cardiac failure
   2. Emboli
   3. Increased capillary permeability

K. Disruptions at the cellular level
   1. Acid-base balance
   2. Poisons/toxins
   3. Blood sugar changes
   4. Hormone effects
   5. Drugs
   6. Hypoxia
IV. Assessment of Adequate and Inadequate Respiration

A. Capnometry/Capnography
   1. Purpose/definition
   2. Indications
   3. Contraindications
   4. Complications
   5. Procedure

V. Management of Adequate and Inadequate Respiration

A. Respiratory Compromise
   1. Assure an adequate airway
   2. Review supplemental oxygen therapy
   3. Continuous Positive Airway Pressure (CPAP)/Bi-Level Positive Airway Pressure (BiPAP)
      a. Definitions/Purpose
         i. CPAP – provides continuous positive airway pressure in spontaneously breathing patient
         ii. BiPAP – provides differential positive airway pressure in the spontaneously breathing patient.
            a) higher positive pressure during inspiration (e.g., 10 cm water pressure)
            b) lower positive pressure during expiration (e.g., 5 cm water pressure)
            c) Augments spontaneous breathing with positive pressure ventilation during inspiration
            iii. increase lung compliance
            iv. reduce alveolar collapse
            v. increase laminar airflow
            vi. decrease intubation rates
      b. Indications
         i. CHF/Acute pulmonary edema
         ii. COPD/Asthma
         iii. near drowning
         iv. similar equipment may be used for home treatment of sleep apnea
      c. Contraindications
         i. inability to tolerate the mask
      d. Complications
         i. requires adequate tidal volume
         ii. patient must be alert and follow instructions
         iii. patient must tolerate mask
         iv. gastric insufflation
         v. vomiting and aspiration risk
         vi. barotrauma
         vii. facial hair
         viii. dysmorphic faces
      e. Procedure
   4. Assisted positive pressure ventilations
      a. Purpose/definition
      b. Indications
      c. Contraindications
d. Complications

e. Procedure

VI. Supplemental Oxygen Therapy

A. Review and elaborate on the oxygen delivery devices used by EMRs, EMTs and AEMTs

B. Oxygen administration and the patient with hypercapnia

VII. Age-Related Variations in Pediatric and Geriatric Patients
Airway Management, Respiration, and Artificial Ventilation

Artificial Ventilation – AM3

Integrates complex knowledge of anatomy, physiology, and pathophysiology into the assessment to develop and implement a treatment plan to assure patent airway, adequate mechanical ventilation, and respiration for patients of all ages.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Comprehensive ventilation assessment
   A. Purpose
   B. Procedure
   C. Minute Volume
   D. Alveolar Volume
   E. Evaluating the effects of artificial ventilation
   F. Pulse oximetry
      1. Purpose
      2. Indications
      3. Contraindications
      4. Complications
      5. Procedure
   G. Blood gas analysis
      1. pH
      2. PaCO2
      3. PaO2
      4. Bicarbonate
      5. Base deficit
   H. Capnography Review
      1. Purpose
      2. Indications
      3. Contraindications
      4. Complications
      5. Procedure

II. Review of ventilation devices used by EMRs, EMTs and AEMTs
   A. Manual devices
      1. Purpose
      2. Indications
III. Assisting patient ventilations

A. Review of techniques used by EMRs, EMTs and AEMTs
   1. Purpose
   2. Indications
   3. Contraindications
   4. Complications
   5. Procedures

B. Review of the physiologic differences between normal and positive pressure ventilation

C. BiPAP/CPAP
   1. Purpose
   2. Indications
   3. Contraindications
   4. Complications
   5. Procedure

D. Positive End Expiratory Pressure (PEEP)
   1. Purpose
      a. provide positive airway pressure to prevent alveolar collapse at the end of expiration
      b. refers to positive pressure situations
      c. to increase lung compliance
   2. Indications
      a. hemodynamically stable patient receiving positive pressure ventilation
         i. COPD
         ii. CHF
         iii. drowning
      b. Patient transfer
   3. Contraindications
   4. Complications
      a. can diminish venous return
      b. can cause barotrauma
   5. Procedure

IV. AgeRelated Variations in Pediatric and Geriatric Patients
Patient Assessment  
Scene Size-Up – PA1

Integrates scene and patient assessment findings with knowledge of epidemiology and pathophysiology to form a field impression. This includes developing a list of differential diagnoses through clinical reasoning to modify the assessment and formulate a treatment plan.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Scene Safety

A. Common scene hazards
   1. Environmental
   2. Hazardous substances
      a. Chemical
      b. Biological
   3. Violence
      a. Patient
      b. Bystanders
      c. Crime scenes
   4. Rescue
      a. Motor-vehicle collisions
         i. extrication hazards
         ii. roadway operation dangers
      b. Special situations

B. Evaluation of the scene
   1. Is the scene safe?
      a. Yes -- establish patient contact and proceed with patient assessment.
      b. No -- is it possible to quickly make the scene safe?
         i. yes – assess patient
         ii. no -- do not enter any unsafe scene until minimizing hazards
      c. Request specialized resources immediately

II. Scene management

A. Impact of the environment on patient care
   1. Medical
      a. Determine nature of illness
      b. Hazards at medical emergencies
   2. Trauma
      a. Determine mechanism of injury
      b. Hazards at the trauma scene
   3. Environmental considerations
      a. Weather or extreme temperatures
      b. Toxins and gases
      c. Secondary collapse and falls
d. Unstable conditions

B. Addressing hazards

1. Protect the patient
   a. After making the scene safe for the paramedic, patient safety becomes the next priority
   b. If paramedic cannot alleviate conditions that represent health or safety threat to the patient, move the patient to a safer environment

2. Protect the bystanders
   a. Minimize conditions that represent a hazard for bystanders
   b. If the paramedic cannot minimize the hazards, remove the bystanders from the scene.

3. Request resources
   a. Request additional resources needed at the scene immediately.
      i. Multiple patients -- additional ambulances
      ii. Fire hazard -- fire department.
      iii. Traffic or violence issues -- law enforcement

4. Scan the scene for information related to
   a. Mechanism of injury
   b. Nature of the illness

C. Violence

1. Paramedics should not enter a scene or approach a patient if the threat of violence exits.
2. Park away from scene, wait for appropriate law enforcement officials to minimize the danger

D. Need for additional or specialized resources

1. A variety of specialized protective equipment and gear is available for specialized situations.
   a. Chemical and biological suits can provide protection against hazardous materials and biological threats of varying degrees.
   b. Specialized rescue equipment may be necessary for difficult or complicated extrications.
   c. Ascent or descent gear may be necessary for specialized rescue situations.
2. Only specially trained responders should wear or use the specialized equipment.

E. Standard precautions

1. Overview
   a. All blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents.
   b. Infection prevention practices that apply to all patients, regardless of suspected or confirmed infection status, in any healthcare delivery setting
   c. Universal precautions were developed for protection of healthcare personnel
   d. Standard precautions focus on protection of patients.

2. Implementation
   a. Use of standard precautions determined by anticipated blood, body fluid, or pathogen exposure.
      i. handwashing
      ii. gloves
      iii. gowns
      iv. masks
      v. protective eyewear

3. Personal Protective Equipment
a. Personal protective equipment includes clothing or specialized equipment that provides protection to wearer from substances that may pose a health or safety risk.
b. Wear PPE appropriate for the potential hazard
   i. steel-toe boots
   ii. helmets
   iii. heat-resistant outerwear
   iv. self-contained breathing apparatus
   v. leather gloves

F. Multiple patient situations
   1. Number of patients and need for additional support
      a. How many patients
      b. Does the dispatch suggest the need for additional support
      c. Protection of the patient
      d. Protection of bystanders
         i. remove
         ii. isolate
         iii. barricade
   2. Need for additional resources
      a. Incident Command System (ICS or IMS)
      b. Consider if this level of commitment is required
Patient Assessment
Primary Assessment – PA2

Integrates scene and patient assessment findings with knowledge of epidemiology and pathophysiology to form a field impression. This includes developing a list of differential diagnoses through clinical reasoning to modify the assessment and formulate a treatment plan.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Primary Survey/Primary Assessment

A. Initial General Impression - based on the patient’s age appropriate appearance
   1. Appears stable
   2. Appears stable but potentially unstable
   3. Appears unstable

B. Level of Consciousness
   1. Alert
   2. Responds to verbal stimuli
   3. Responds to painful stimuli
   4. Unresponsive - no gag or cough

C. Airway status
   1. Unresponsive patient
      a. Open the airway.
      b. Clear any obstructions
   2. Responsive patient - Is the patient talking or crying?
      a. If yes, assess for adequacy of breathing.
      b. If no, open airway.

D. Breathing status
   1. Patient responsive
      a. Breathing is adequate (rate and quality)
      b. Breathing is too fast (> 24 breaths per minute)
      c. Breathing is too slow (<8 breaths per minute)
      d. Breathing absent (choking)
   2. Patient unresponsive
      a. Breathing is adequate (rate and quality)
      b. Breathing is inadequate
      c. Breathing is absent

E. Circulatory status
   1. Radial pulse present (rate and quality)
      a. Normal rate
      b. Fast
      c. Slow
      d. Irregular rate
2. Radial pulse absent -- assess carotid pulse
3. Assess if major bleeding is present
4. Perfusion status
   a. Skin color
   b. Skin temperature
   c. Skin moisture
   d. Capillary refill (as appropriate)

F. Disability - Brief neurological evaluation

G. Exposure - Patient completely undressed

H. Identifying life threats

I. Assessment of vital functions

II. Integration of treatment/procedures needed to preserve life

III. Evaluating priority of patient care and transport

   A. Primary assessment: stable

   B. Primary assessment: potentially unstable

   C. Primary assessment: unstable
Patient Assessment
History Taking – PA3

Integrates scene and patient assessment findings with knowledge of epidemiology and pathophysiology to form a field impression. This includes developing a list of differential diagnoses through clinical reasoning to modify the assessment and formulate a treatment plan.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Components of the patient history

A. Overview
   1. Purpose
      a. Is a problem-based history in pre-hospital environment
      b. Emphasis is on:
         i. identifying life-threatening conditions that require immediate intervention
         ii. gives full attention to the needs of the moment
         iii. provides information leading to appropriate care for urgent, emergent and non-emergent patient
         iv. identifies potential for life-threats as well as existence of a current life threat
      c. Expanded history when appropriate
         i. opportunities for patient education
         ii. opportunities for service referral
   2. Communicating with the patient
      a. Factors influencing communication
      b. Language barriers
      c. Listening
      d. Techniques of questioning
         i. open ended questions
         ii. direct questions
         iii. leading questions

II. Interviewing Techniques

A. Setting the stage
   1. The environment
      a. Proper environment enhances communication
      b. Personal space
   2. Your demeanor and appearance
      a. Just as you are watching the patient, the patient will be watching you
      b. Messages of body language
   3. Note taking
      a. Difficult to remember all details
      b. Most patients are comfortable with note taking
         i. if concerns arise, explain your purpose
         ii. do not divert attention from the patient to take notes

B. Learning about the present illness
1. Greeting the patient  
   a. Greet by name  
   b. Avoid the use of unfamiliar or demeaning terms such as Granny or Honey, etc.
2. The patient’s comfort  
   a. Be alert to patient comfort levels  
   b. Inquire about the patient’s feelings
3. Opening questions  
   a. Find out why the patient is seeking medical care or advice  
   b. Use a general, open-ended question  
   c. Follow the patient’s leads  
      i. facilitation  
         a) your posture, actions or words should encourage the patient to say more  
         b) making eye contact or saying phrases such as “Go on” or “I’m listening” may help the patient to continue  
      ii. reflection  
         a) repetition of the patient’s words that encourage additional responses  
         b) typically does not bias story or interrupt the patient’s train of thought  
   iii. clarification  
   iv. empathetic responses  
   v. confrontation  
   vi. interpretation  
   vii. Asking about feelings
4. Getting more information  
   a. Attributes of a symptom  
      i. location  
         a) where is it  
         b) does it radiate  
      ii. quality  
      iii. severity  
         a) how bad is it  
         b) attempt to quantify the pain  
            i) 1 - 10 scale  
            ii) other scales  
   iv. timing  
      a) when did it start  
      b) how long does it last  
   v. the setting in which it occurs  
      a) emotional response  
      b) environmental factors  
   vi. factors that make it better or worse  
   vii. associated manifestations

C. Direct questions  
   1. To gather additional information, direct questions may be required  
   2. Should not be leading questions  
   3. Ask one question at a time  
   4. Use language that is (age) appropriate

D. Taking a history on sensitive topics
1. Alcohol and drugs
2. Physical abuse or violence
3. Sexual history

E. Taking a history in the trauma patient
1. Focuses on general underlying health
   a. Special emphasis on conditions contributing to morbidity and mortality in trauma
   b. Current medications
   c. Allergies
2. Special attention on

III. Components of the patient history

A. Chief complaint
   1. Brief statement of why the patient is seeking healthcare
   2. Should include what is wrong and why treatment is sought

B. Present problem
   1. Provides a full, clear, chronological account of the symptoms
      a. Onset
      b. provocation/palliation
      c. quality of pain and/or associated symptoms
      d. radiation of pain
      e. severity of pain symptoms
   2. State of health just prior to first onset of symptoms

C. Past medical history
   1. General state of health
      a. Current medications
      b. Allergies
   2. Childhood illnesses
   3. Adult illnesses
   4. Accidents and injuries
   5. Past surgery
   6. Hospitalization
   7. Physical disability due to previous illness or injury
   8. Emotional status

D. Family history or blood relatives with
   1. similar symptoms
   2. risk factor assessment of family diseases

E. Personal social history as it relates to illness risk factors
   1. smoking, drinking, drug use
   2. diet
   3. sexual habits
   4. occupation
   5. environment
   6. travel

F. Review of body systems
1. Questions should be selected based on patient’s chief complaint and present problem.
2. General symptoms
   a. Fever
   b. chills
   c. malaise
   d. fatigue
   e. night sweats
   f. weight variations
3. Skin, hair and nails
   a. Rashes
   b. itching
   c. sweating
4. Musculoskeletal
   a. Joint pain
   b. loss of motion
   c. swelling
   d. redness
   e. heat or deformity
5. Head and neck
   a. General: headache, loss of consciousness
   b. Eyes
      i. Visual acuity
      ii. Blurring
      iii. Diplopia
      iv. Photophobia
      v. Pain
      vi. changes in vision
      vii. flashing
   c. Ears
      i. Hearing loss
      ii. Pain
      iii. Discharge
      iv. Tinnitus
      v. vertigo
   d. Nose
      i. Sense of smell
      ii. Rinorrhea
      iii. Obstruction
      iv. Epistaxis
      v. postnasal discharge
      vi. sinus pain
   e. Throat and mouth
      i. Sore throat
      ii. Bleeding
      iii. Pain
      iv. dental issues
      v. ulcers
      vi. changes in taste sensation
   f. Endocrine
      i. thyroid enlargement
ii. temperature intolerance
iii. skin changes
iv. swelling of hands and feet
v. weight changes
vi. polyuria
vii. polydipsia
viii. polyphagia
ix. changes in body and facial hair
x. males:
  a) erectile dysfunction
  b) emissions
  c) testicular pain
xi. females:
  a) menstrual regularity
  b) last menstrual period
  c) dysmenorrhea
  d) discharge
e) bleeding,
f) pregnancies
g) contraception use
g. Chest and lungs
  i. Dyspnea
  ii. cough (productivity and description)
  iii. wheezing
  iv. hemoptysis
  v. TB status
h. Heart and blood vessels
  i. Chest pain
    a) Onset
    b) Duration
    c) Quality
d) Provocation
e) Palliation
  f) Palpitations
g) Orthopnea
  h) Edema
  i) past cardiac evaluation and tests
i. Hematologic
  i. Anemia
  ii. Bruising
  iii. fatigue
j. Lymph nodes
  i. Enlarging
  ii. Tenderness
k. Gastrointestinal
  i. Appetite
  ii. Digestion
  iii. Food allergies or intolerance
  iv. Heartburn
  v. Nausea or vomiting
vi. Diarrhea  

vii. Hematemesis  

viii. Bowel regularity  

ix. Stool changes  

x. Flatulence  

xi. Jundice  

xii. Past GI evaluation and tests.  

l. Genitourinary  

i. Dysuria  

ii. Pain (flank or suprapubic)  

iii. Frequency  

iv. Urgency  

v. Nocturia  

vi. Hematuria  

vii. Polyuria  

viii. STDs  

m. Neurologic  

i. Seizure  

ii. Syncope  

iii. Loss of sensation  

iv. Weakness  

v. Paralysis  

vi. Loss of coordination or memory  

vii. Twitches  

viii. Tremors  

n. Psychiatric  

i. Depression  

ii. Mood changes  

iii. Difficulty concentrating  

iv. Anxiety  

v. Suicidal or homicidal ideation  

vi. Irritability  

vii. Sleep disturbances  

viii. Fatigue on waking  

G. Clinical reasoning  

1. Requires knowledge of anatomy, physiology and pathophysiology to direct the questioning  
   a. Answers are analyzed as they are received  
   b. Questioning may allow you to think about associated problems and body systems  
   c. Clinical reasoning requires integrating the history with physical assessment findings  

2. Start with broad possibility of systems that could contribute to patient’s complaint  
   a. Consider chief complaint  
   b. Current symptoms  
   c. Past medical history  
   d. Identify any abnormal symptoms and physical findings  
   e. Analyze the findings by anatomical location  
   f. Interpret the findings in terms of pathological process  

3. Narrow possible systems involved  
   a. Develop a working hypothesis of the nature of the problem (differential diagnosis)
b. Test differential diagnosis list with questions/assessments relating to systems with similar types of signs/symptoms
c. Pay careful attention to signs/symptoms that do not fit with working differential diagnosis

H. Concluding questions
1. Wrapping up the history
2. Assuring that all the patients issues have been addressed

IV. Cultural Competence

A. Definition of culture

B. Developing cultural sensitivity

C. Impact of culture
   1. ethnic culture
   2. drugs
   3. poverty
   4. age

D. Definitions in cultural discussion

E. Questions specific to cultural impact
   1. what do you think caused your problem
   2. why do you think it started when it did

F. Cultural Orientations

G. Cultural impact on disease

H. Religious beliefs that impact patient care

I. Cultural characteristics related to health care

J. Dietary practices

K. Family relationships

V. Special challenges

A. Silence
   1. Silence is often uncomfortable
   2. Silence has meaning and many uses
      a. Patients may be collecting their thoughts, remembering details or deciding whether or not they trust you
      b. Be alert for nonverbal clues of distress
   3. Silence may be a result of the interviewer’s lack of sensitivity
B. Overly talkative patients
   1. Faced with a limited amount of time interviewers may become impatient
   2. Although there are no perfect solutions, several techniques may be helpful
      a. Give the patient free reign for the first several minutes
      b. Summarize frequently

C. Patients with multiple symptoms

D. Anxious patients
   1. Anxiety is natural
   2. Be sensitive to nonverbal clues

E. Reassurance
   1. It is tempting to be overly reassuring
   2. Premature reassurance blocks communication

F. Anger and hostility
   1. Understand that anger and hostility are natural
   2. Do not get angry in return

G. Intoxication
   1. Be accepting not challenging
   2. Do not attempt to have the patient lower their voice or stop cursing; this may aggravate them

H. Crying
   1. Crying, like anger and hostility may provide valuable insight
   2. Be sympathetic

I. Depression
   1. Be alert for signs of depression

J. Confusing behaviors or histories
   1. Be prepared for the confusion and frustration of varying behaviors and histories
   2. Be alert for mental illness, delirium or dementia

K. Limited intelligence
   1. Do not overlook the ability of these patients to provide you with adequate information
   2. Be alert for omissions

L. Language barriers
   1. Take every possible step to find a translator
      a. Appropriateness of the translator
      b. Confidentiality issues
   2. A few broken words are not an acceptable substitute

M. Hearing problems
   1. Very similar to patients with a language barrier
   2. If the patient can sign, make every effort to find a translator
N. Blind patients
   1. Be careful to announce yourself and to explain who you are and why you are there

O. Talking with family and friends
   1. Some patients may not be able to provide you with all information
   2. Try to find a third party who can help you get the whole story

VI. Integration of therapeutic communication, history taking techniques, patient presentation and assessment findings -- Development of field impression

VII. Treatment Plan -- Modify initial treatment plan

VIII. Age-related considerations

   A. Pediatrics
      1. History may be taken from parent or responsible adult
         a. Every effort must be made to include the child
         b. Explore the underlying fears that may not be expressed by the parents or child
         c. Evaluate the relationship of the child to the caregiver
      2. Present problem or illness
      3. Past medical history
         a. General health evaluation varies dependent on the child’s age
            i. Neonates and infants
               a) Maternal health during pregnancy
                  i) specific maternal
                  ii) medications, hormones, vitamins
                  iii) drug use
               b) Birth
                  i) duration of pregnancy
                  ii) location of birth
                  iii) labor conditions
                  iv) delivery complications
                  v) condition of infant at birth
                  vi) birth weight
               c) Neonatal period
                  i) congenital anomalies
                  ii) jaundice, vigor, evidence of illness
                  iii) feeding issues
                  iv) developmental landmarks
               d) School age
                  i) grades, performance, problems
                  ii) dentition
                  iii) growth
                  iv) sexual development
                  v) illnesses
                  vi) Immunizations
               e) Adolescents
                  i) consider questioning patient in private
                  ii) risk taking behaviors
                  iii) self esteem issues
iv) rebelliousness
v) drug, alcohol use
vi) sexual activity

b. Family history
   i. Maternal gestational history
   ii. Deceased siblings

c. Personal and Social history
   i. Personal status
   ii. Home conditions

d. Review of Systems
   i. Skin: lesions
   ii. Ears: otitis media
   iii. Nose: snoring, mouth breathing, allergies
   iv. Teeth: dental history

B. Geriatrics
   1. Sensory issues (hearing/vision) may require interview at eye level so patient can read lips
   2. The interview may need to be slowed down if the patient is stable
   3. Multiple underlying chronic illnesses may confound the history
   4. Disease symptoms may be less dramatic in the older patient
   5. All symptoms may be vague and non-specific
   6. Multiple pharmaceutical therapies may lead to:
      a. Iatrogenic illnesses
      b. Accidental overdose or adverse drug interaction
   7. Consider inclusion of a functional assessment during systems review in elderly patient with apparent disability

C. Functional Assessment:
   1. Mobility
   2. Upper extremity function
   3. Instrumental activities of daily living (IADL)
   4. Activities of daily living
Patient Assessment
Secondary Assessment – PA4

Integrates scene and patient assessment findings with knowledge of epidemiology and pathophysiology to form a field impression. This includes developing a list of differential diagnoses through clinical reasoning to modify the assessment and formulate a treatment plan.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Techniques of Physical Examination

A. Major Body Systems

B. Major Anatomical Regions

II. Physical examination techniques will vary from patient to patient depending on the chief complaint, present illness, and history

A. The appropriate assessment of the patient depends on
   1. the stability of the patient
   2. the complaint
   3. the history
   4. ability to communicate
   5. the potential for unrecognized illness

B. Not all aspects of the physical assessment will be used on all patients

III. Physical examination – approach and overview

A. Examination techniques
   1. Examination techniques
      a. Inspection
      b. Palpation
         i. hand and finger techniques
            a) fingertips
            b) palmar hand surface
            c) ulnar hand surface
            d) dorsal hand surface
         ii. light
         iii. deep
      c. percussion
         i. technique
         ii. percussion notes
      d. auscultation
         i. locations
         ii. findings
   2. Measurement of vital signs
3. Height and weight estimation

B. General Approach
   1. Examine the patient systematically
   2. Examine the patient in the most appropriate environment available
      a. Consider issues of privacy, comfort
      b. Most appropriate position for best assessment techniques
   3. Place special emphasis on areas suggested by the present illness and chief complaint
   4. Most patients view physical exam with apprehension/anxiety – feel vulnerable/exposed
   5. Maintain professionalism throughout physical exam while displaying compassion towards your patient

C. Overview of a comprehensive examination
   1. The categories of a physical exam includes
      a. Mental status
      b. General survey
      c. Vital signs

IV. Mental Status

A. Appearance and behavior
   1. Assess for level of consciousness
      a. Alertness
      b. Response to verbal stimuli
      c. Response to touch or shake of shoulder (tactile)
      d. Response to painful stimuli
      e. Unresponsive
   2. Measurement tools for assessment of mental status
   3. Observe posture and motor behavior
      a. Pace
      b. Range
      c. Character
      d. Appropriateness of movement
      e. Possible findings
         i. Normal
         ii. abnormal
            a) restlessness
            b) agitation
            c) bizarre postures
            d) immobility
            e) involuntary movements
   4. Dress, grooming, and personal hygiene
      a. Kept
b. Unkempt

5. Facial Expression
   a. Anxiety
   b. Depression
   c. Elation
   d. Anger
   e. Fear
   f. Withdrawn
   g. Sadness
   h. Pain

6. Manner, affect, and relation to person and things

B. Speech and language
   1. Assess
      a. Quantity
      b. Rate
      c. Loudness
      d. Fluency
      e. Appropriateness
      f. Possible findings
         i. aphasia
         ii. dysphonia
         iii. dysarthria
         iv. changes with mood disorders

C. Mood
   1. Assess
      a. Nature
      b. Intensity
      c. Duration
      d. Stability of abnormal mood
      e. Suicidal ideation
      f. Possible findings

D. Thought and perceptions
   1. Assess thought processes
      a. Logic
      b. Relevance
      c. Organization
      d. Coherence of thought
      e. Possible findings
         i. loosening of associations
         ii. flight of ideas
         iii. incoherence
         iv. confabulation
         v. blocking
         vi. transference
   2. Assess thought content
      a. Unusual thoughts
      b. Unpleasant thoughts
c. Possible findings
   i. suicidal ideation
   ii. homicidal
   iii. obsessions
   iv. compulsions
   v. delusions
   vi. feelings of unreality

3. Assess perceptions
   a. Unusual
   b. Hearing things
   c. Seeing things
   d. Possible findings
      i. illusions
      ii. hallucinations

E. Assess insight and judgment
   1. Insight into illness
   2. Level of judgment in making decisions or plans
   3. Possible findings
      a. Recognition or denial of mental cause of symptoms
      b. Bizarre, impulsive, or unrealistic judgment

F. Memory and attention
   1. Assess orientation
      a. Time
      b. Person
      c. Place
      d. Disorientation
   2. Assess attention
      a. Digit span
      b. Serial sevens
      c. Spelling backwards
   3. Assess remote memory (i.e., birthdays)
   4. Assess recent memory (i.e., events of the day)
   5. Assess new learning ability (recall of your name)

V. Techniques of Physical Exam: General Survey

A. Introduction
   1. Wide range of “normal”
   2. Repetitive examination of multiple patients needed to establish one’s own baseline knowledge

B. Physical findings in relation to development
   1. Age
   2. Sexual development
   3. Weight
   4. Height

C. Body Structure
1. Symmetry
2. Body build
3. Physical fitness
4. Posture

D. Level of consciousness
1. AVPU
2. Level of orientation

E. Skin signs
1. Color
2. Temperature
3. Condition
4. Texture
5. Hydration

F. Age variation
1. Pediatric variation
2. Geriatric variation

VI. Vital Signs

A. Introduction
1. Vital Signs as baseline measurement of function
   a. Respiration
   b. Circulation
   c. Perfusion
2. Position patient in normal position for accurate readings

B. Respiration
1. Respiratory rate
   a. Visualize
   b. Expose as necessary
2. Respiratory depth
3. Respiratory effort

C. Circulation
1. Pulse rate
2. Pulse rhythm
   a. Predictable
   b. Adjust timing for irregularity
3. Pulse strength
4. Pulse location
   a. Common locations
   b. Relation to perfusion

D. Perfusion
1. Blood pressure
   a. Equipment size
   b. Placement of cuff
c. Position of patient
d. Position of arm

2. Methods of measurement
   a. Auscultation
   b. Palpation

3. Oxygen saturation
4. Capnography
5. Capillary refill
6. Oral mucosal color

VII. Examination by anatomical region or system

A. Skin, hair and nails
   1. Review of anatomy and physiology
   2. Review of related history
   3. Relevant past medical history
   4. Relevant family history
   5. Relevant personal and social history
   6. Age-related pertinent history and findings
      a. Examination and Findings
         i. skin
         ii. common lesions
         iii. characteristics
         iv. exudates
         v. patterns
         vi. correlation to disease processes
      b. Hair
         i. inspection
         ii. palpation
      c. Nails
         i. inspection
         ii. common nail changes
         iii. correlation to disease processes
   7. Infants and children
      a. normal changes related to birth
      b. related to underlying systemic conditions
   8. Adolescents
   9. Pregnancy
      a. Pigmentation changes
      b. Striae gravidarum
   10. Geriatrics
      a. Changes associated with aging
      b. Changes due to immobility
   11. Common abnormalities

B. Lymphatic System
   1. Review of anatomy and physiology
   2. Review of related history
      a. Relevant past medical history
      b. Relevant family history
c. Age-related pertinent history and findings

3. Examination and Findings
   a. Inspection and palpation of lymph nodes
   b. Head and Neck
   c. Axillae
   d. Other lymph nodes

4. Associated findings
5. Infants and children
6. Common abnormalities
7. Documentation terminology

C. Head and Neck
   1. Review of anatomy and physiology
   2. Review of related history
      a. Present problem
      b. Past medical history
      c. Personal and social history
      d. Family history
   3. Examination and findings
      a. Head and Face
         i. inspection
         ii. palpation
      b. Neck
         i. inspection
         ii. palpation
   4. Infants and children
      a. Findings related to birth and development
      b. Head Control
      c. Symmetry
   5. Common abnormalities
      a. Adults
      b. Infants
   6. Documentation terminology

D. Eyes
   1. Review of anatomy and physiology
   2. Review of related history
      a. Present problem
      b. Past medical history
      c. Personal and social history
      d. Family history
   3. Examination and findings
      a. Visual acuity
      b. External examination
      c. Extraocular Muscles
      d. Ophthalmoscopic examination
   4. Common abnormalities
   5. Infants and Children
      a. Ethnic variation
      b. Newborn variations
c. Congenital changes

E. Ears, Nose, Throat, Neck
1. Review of anatomy and physiology
2. Review of related history
   a. Present problem
   b. Past medical history
   c. Family history
3. Examination and findings
   a. Ear
      i. external ear
      ii. otoscopic examination
      iii. tympanic membrane finding
      iv. hearing
   b. Nose
      i. external nose
      ii. nasal cavity
      iii. lips
      iv. buccal mucosa, teeth and gums
      v. tongue
      vi. oropharynx
   c. Sinuses
   d. Infants and Children
4. Documentation terminology

F. Chest and Lungs
1. Review of anatomy and physiology
2. Review of related history
   a. Present problem
   b. Past medical history
   c. Family history
   d. Personal and social history
3. Examination and Findings
   a. Inspection of chest
   b. Evaluation of Respiration
      i. terminology
      ii. patterns of respiration
      iii. signs of obstruction
   c. Palpation
      i. deformity
      ii. crepitation
      iii. tactile fremitus
      iv. chest expansion
   d. Percussion
      i. percussion techniques
      ii. percussion tones
   e. Auscultation
      i. characteristics of normal breath sounds
      ii. adventitious breath sounds
         a) dry versus moist
b) continuous versus intermittent
c) course versus fine
  iii. crackles
  iv. rhonchi
  v. wheezes
  vi. other sounds
f. Vocal resonance
  i. bronchophony
  ii. egophony
  iii. whispered pectoriloquy
g. Common causes of adventitious sounds and noisy breathing
h. Variations of age in children, infants, and older patients
i. Common abnormalities found in chest examination
j. Findings related to common disease processes
k. Documentation terminology

G. Heart and blood vessels
  1. Review of anatomy and physiology
  2. Review of related history
     a. Present problem
     b. Past medical history
     c. Personal and social history
     d. Family history
     e. Risk factors
  3. Examination and findings
     a. Heart
        i. Inspection
        ii. Palpation
           a) Apical pulse
           b) Thrills
           c) Heaves
           d) Carotid pulse
        iii. Percussion
        iv. Auscultation
           a) Basic heart sounds
           b) Splitting
              i) identification
              ii) significance
           c) Extra heart sounds
              i) identification
              ii) significance
           d) Murmurs
              i) identification
              ii) significance
              iii) high output states
     b. Peripheral arteries
        i. Location of palpable arteries
        ii. Pulse characteristics
        iii. Significance of findings
        iv. Amplitude scale
v. Auscultation
   a) Indication
   b) Findings
vi. Assessment of occlusion
   c. Hypertension Classification
d. Peripheral Veins
   i. Jugular venous pressure
      a) Findings
      b) Significance
   ii. Venous obstruction
e. Thrombosis
f. Edema
g. Newborn and infant
   i. Cardiovascular findings associated with birth
   ii. Assessment for insufficiency

h. The older patient

4. Common abnormalities of the heart and blood vessels

5. Documentation terminology

H. Abdomen

1. Review of anatomy and physiology

2. Review of related history
   a. Present problem
   b. Past medical history
c. Personal and social history
d. Family history
e. Risk factors

3. Examination and findings
   a. Preparation
      i. patient positioning
      ii. landmarks
   b. Inspection
      i. skin
         a) lesions
         b) venous patterns
         c) scars
      ii. symmetry
      iii. shape
      iv. size
v. herniation
   vi. distention
   vii. movement
   c. Auscultation
      i. bowel sounds
      ii. bruits
   d. Percussion
      i. percussion tones
      ii. liver span
      iii. other organs
      iv. gastric bubble
e. Palpation
   i. technique
   ii. expected findings
   iii. identification of masses
   iv. liver palpation techniques
   v. gallbladder
   vi. spleen
   vii. kidney
f. Common abnormalities
g. Findings related to common disease processes
h. Common conditions causing abdominal pain
i. Findings in peritonitis
4. Infants and children
   a. Umbilical cord
   b. Abdominal herniation
   c. Auscultation and percussion
d. Palpation
5. Older patients
6. Documentation terminology

I. Genitalia
   1. Female - see Special Populations; Obstetrical and Medical Emergencies; Gynecological
   2. Male
      a. Review of anatomy and physiology
      b. Review of related history
         i. present problem
         ii. past medical history
         iii. personal and social history
      c. Examination and Findings
         i. inspection and palpation
         ii. lesions
         iii. priapism
         iv. hernia
d. Common abnormalities
e. Documentation terminology

J. Anus, Rectum
   1. Review of anatomy and physiology
   2. Review of related history
      a. present problem
      b. past medical history
      c. personal and social history
d. family history
   3. Examination and findings
   4. Common abnormalities
   5. Documentation terminology

K. Musculoskeletal system
   1. Review of anatomy and physiology
   2. Review of related history
a. Present problem
b. Past medical history
c. Personal and social history

3. Examination and Findings
   a. Inspection
   b. Palpation
   c. Range of Motion
   d. Muscle strength
   e. Specific joint assessment

4. Specific landmarks in child development

5. Older patients
   a. Mobility changes
   b. Joint and muscle changes
   c. Muscle mass reduction

6. Common abnormalities

L. Neurological System
   1. Review of anatomy and physiology
   2. Review of related history
      a. Present problem
      b. Past medical history
      c. Personal and social history
   3. Examination and Findings
      a. Cognitive Abilities
      b. Cranial Nerve assessment
      c. Proprioception and Cerebellar function
         i. coordination and fine motor skills
         ii. balance
      d. Sensory function
         i. primary
         ii. cortical
      e. Reflexes
   4. Examination of the non-responsive patient
      a. Posturing
      b. Painful stimulus response
   5. Infants and children
      a. Newborn reflexes
      b. Activity levels
   6. Older patients
      a. Changes associated with aging
   7. Common abnormalities

VIII. Modifying the assessment for the patient with a life threatening emergency

A. Head to toe approach

B. Primary before Secondary
   1. Secondary medical assessment order
   2. Secondary trauma assessment order (see Trauma)
Patient Assessment
Monitoring Devices – PA5

Integrates scene and patient assessment findings with knowledge of epidemiology and pathophysiology to form a field impression. This includes developing a list of differential diagnoses through clinical reasoning to modify the assessment and formulate a treatment plan.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Continuous ECG monitoring
   A. Purpose
   B. Indication
      1. Patient’s presenting with cardiac-related signs/symptoms or potential signs/symptoms of illnesses with cardiac impact
      2. Used as advanced monitoring in pre-hospital care
   C. Procedure
   D. Limitation
   E. Interpretation (see Medical Emergency: Cardiology)

II. 12-Lead ECG Interpretation
   A. Purpose
      1. Shorten door to treatment time
      2. May assist in field care of patient with pharmacological intervention
   B. Indication
   C. Procedure
   D. Interpretation (see Medical Emergency: Cardiology)

III. Carbon Dioxide Monitoring
   A. Capnometry (Colorimetric)
      1. Purpose
      2. Indication
      3. Procedure
      4. Limitation
         a. Essentially a “yes/no” confirmation of device placement
         b. Rapidly becomes inactivated with use, must be periodically replaced for continuous monitoring
   B. Capnography
1. Purpose
2. Indication
3. Procedure
4. Limitation
5. Interpretation (See Medical Emergency: Respiratory)

IV. Basic Blood Chemistry

A. Blood glucometer
   1. Purpose
   2. Indication
      a. Known diabetic
      b. Unconscious patient, for unknown reason
      c. General malaise/weakness, for unknown reason
   3. Procedure
   4. Limitation
      a. Appropriateness of use
      b. Accuracy of reading

B. Cardiac biomarkers
   1. Purpose
   2. Indication
      a. Cardiac patients
      b. Patient’s presenting with signs and symptoms of stroke
   3. Procedure
   4. Limitation
      a. Appropriateness of use
      b. Accuracy of reading

C. Other blood analyses
   1. CHEM-7
   2. BNP
   3. Arterial blood gases (ABGs)

V. Other Monitoring Devices

A. As additional monitoring devices become recognized as “standard of care” in out-of-hospital setting, those devices should be incorporated into primary education of those who will be expected to use them.
Patient Assessment
Reassessment – PA6

Integrates scene and patient assessment findings with knowledge of epidemiology and pathophysiology to form a field impression. This includes developing a list of differential diagnoses through clinical reasoning to modify the assessment and formulate a treatment plan.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. How and When to Reassess

II. Patient Evaluation: Reassessment

A. Chief complaint
   1. Evaluate severity of chief complaint following treatment
   2. Monitor associated symptoms

B. Examination

C. Re-evaluate prioritization based on information

D. Modify treatment plan as necessary based on reassessment

III. Documentation

IV. Age-related Considerations

A. Pediatrics

B. Geriatrics
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Assessment Factors

A. Scene safety

B. Environment

C. Chief complaint
   1. Primary reason for EMS response
   2. Verbal or non-verbal
   3. Possibly misleading

D. Life threatening conditions

E. Non-life threatening conditions

F. Distracting injuries

G. Tunnel vision

H. Patient cooperation

I. EMT attitude

II. Major components of the patient assessment

A. Standard Precautions

B. Scene Size-Up

C. General Impression

D. Initial Assessment -- airway, ventilation, respiration and circulation

E. SAMPLE history
   1. Importance of a thorough history
      a. Primary component of the overall assessment of the medical patient
      b. Requires a balance of knowledge and skill to obtain a thorough and accurate history
      c. Helps to ensure the proper care will be provided for the patient.
   2. Unresponsive patient
a. May be obtained from evidence at the scene  
  i. pill containers  
  ii. medical jewelry  
  iii. family members  
  iv. bystanders

3. Responsive patient  
   a. Obtained directly from the patient  
   b. Focused on the patient’s chief complaint  
   c. Additional history may be obtained from evidence at the scene  
      i. pill containers  
      ii. medical jewelry  
      iii. family members  
      iv. bystanders

4. OPQRST Mnemonic for evaluation of pain  
   a. O – Onset  
      i. focuses on what the patient was doing when the problem began.  
      ii. question(s): What were you doing when the problem began?  
   b. P – Provoke  
      i. focuses on what might provoke the problem for the patient.  
      ii. question(s): Does anything you do make the problem better or worse?  
   c. Q – Quality  
      i. focuses on the patients own description of the problem.  
      ii. questions  
         a) can you describe your pain/discomfort?  
         b) what does it feel like?  
         c) is it sharp? dull?  
         d) is it steady or does it come and go?  
   d. R - Region/Radiate  
      i. focuses on the specific area of the pain/discomfort.  
      ii. questions  
         a) can you point where you feel the pain/discomfort the most?  
         b) does the pain/discomfort radiate to any other areas of your body?  
   e. S – Severity  
      i. focuses on the severity of the pain/discomfort.  
      ii. questions  
         a) on a scale of 0 to 10, with 10 being the worst pain you have ever felt,  
            how would you rate your pain right now?  
         b) how would you rate your pain when it first began?  
         c) has there been any change since it first began?  
   f. T – Time  
      i. focuses on the duration of the problem/pain/discomfort.  
      ii. question(s): When did your problem/pain/discomfort first begin?

F. Baseline vital signs

G. Secondary assessment  
   1. May not be appropriate to perform a complete secondary assessment on all medical patients  
   2. Designed to identify any signs or symptoms of illness that may not have been revealed during  
      the initial assessment.  
      a. Head/scalp
i. pain
ii. shunt

b. Face
   i. pain
   ii. symmetry of facial muscles

c. Eyes
   i. pupil size
   ii. equality and reactivity to light
   iii. pink moist conjunctiva

d. Ears
   i. pain
   ii. drainage

e. Nose
   i. pain
   ii. nasal flaring

f. Mouth
   i. foreign body
   ii. loose dentures
   iii. pink & moist mucosa

g. Neck
   i. pain
   ii. accessory muscle use
   iii. jugular vein distention
   iv. medical jewelry
   v. stoma

h. Chest
   i. pain
   ii. equal rise and fall
   iii. guarding
   iv. breath sounds
   v. retractions
   vi. scars

i. Abdomen
   i. pain
   ii. rigidity
   iii. distention
   iv. scars

j. Pelvis/genital
   i. pain
   ii. incontinence

k. Arms
   i. pain
   ii. distal circulation
   iii. sensation
   iv. motor function
   v. track marks
   vi. medical jewelry

l. Legs
   i. pain
   ii. distal circulation
iii. sensation
iv. motor function
v. track marks
vi. medical jewelry
m. Back
  i. pain
  ii. scars

H. Continued assessment

III. Forming a Field Impression

A. Formation of differential diagnosis
   1. Integration of history and physical assessment findings
   2. Past experience
   3. “Gut instinct”

B. Differentiation of the underlying cause of the patient’s condition from other possible causes

C. Patient presentation often leads to a recognizable pattern common to multiple conditions with similar presentations

D. Assess for clues to determine minor differences in patient presentation

E. Determine field differential diagnosis based on available information

F. Realize the differential diagnosis may change as the patient condition changes or additional information becomes available
Medicine
Neurology – MT2

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction—overview of neurological conditions
   A. Epidemiology,
   B. Pathophysiology

II. Central Nervous System
   A. Brain
   B. Spinal cord
   C. Autonomic and peripheral nervous systems

III. Neurological assessment- normal and abnormal findings
   A. General Appearance
   B. Speech
   C. Skin
   D. Posture/Gait
   E. Mental Status
   F. Mood, thought, perception, judgment, memory and attention
   G. Cranial nerve assessment
   H. Glasgow coma scale

IV. General management considerations
   A. Airway, ventilation, respiration, circulation
   B. Emotional support
   C. Transport decisions
V. Neurological conditions

A. Altered mental status
   1. AEIOUTIPS
   2. Assessment findings and symptoms for AMS
   3. Pharmacological and nonpharmacological management

B. Stroke, intracranial hemorrhage, and Transient Ischemic Attacks (TIA)
   1. Incidence, mortality, morbidity, complications
   2. Types
      a. Occlusive stroke
         i. embolic
         ii. thrombotic
      b. Hemorrhagic
   3. Transient ischemic attack
   4. Assessment findings and symptoms
      a. Stroke assessment scales/scores
      b. Stroke alerts/protocols
   5. Pharmacologic and non-pharmacologic management
      a. Consistent with current ILCOR consensus statement

C. Seizures
   1. Incidence, mortality, morbidity, complications
   2. Types
      a. Generalized
         i. tonic – clonic
         ii. absence
         iii. pseudo seizures
      b. Partial
         i. simple partial
         ii. complex partial
      c. Status epilepticus
   3. Assessment findings and symptoms
   4. Pharmacologic and non-pharmacologic management

D. Headache
   1. Types
      a. Tension
      b. Sinus
      c. Migraine
      d. Cluster
      e. Headache as symptom
   2. Assessment findings and symptoms
   3. Pharmacologic and non-pharmacologic management

E. Dementia
   1. Alzheimer’s
   2. Pick’s disease
   3. Huntington’s disease
4. Creutzfeldt-Jakob disease
5. Wernicke’s encephalopathy
6. Assessment findings and symptoms
7. Pharmacologic and non-pharmacologic management

F. Central nervous system neoplasm
   1. Brain tumors
   2. Spinal tumors
   3. Incidence, mortality, morbidity, complications
   4. Assessment findings and symptoms
   5. Pharmacologic and non-pharmacologic management

G. Demyelinating Neurological Disorders
   1. Multiple Sclerosis
   2. Guillain-Barré Syndrome

H. Parkinson’s disease
   1. Incidence, mortality, morbidity, complications
   2. Assessment findings and symptoms
   3. Pharmacological and nonpharmacological management

I. Cranial nerve disorders
   1. Trigeminal neuralgia
   2. Hemifacial spasm
   3. Acoustic neuroma
   4. Glossopharyngeal neuralgia
   5. Vertigo
   6. Ménière's disease
   7. Disorders of the facial nerve
   8. Assessment findings and symptoms
   9. Prehospital implications

J. Movement disorders—dystonia
   1. Assessment findings and symptoms
   2. Pharmacologic and non-pharmacologic management

K. Neurological infections/inflammation
   1. Encephalitis
   2. Meningitis
   3. Assessment findings and symptoms
   4. Pharmacologic and non-pharmacologic management

L. Spinal Cord Compression

M. Hydrocephalus

N. Wernicke’s Encephalopathy

VI. Age-related variations
A. Pediatrics
   1. Epidemiology
   2. Anatomic and physiologic differences in children
   3. Pathophysiology
   4. Causes of altered mental status in children
   5. Assessment
      a. History
      b. Physical findings
   6. Meningitis
   7. Febrile seizures
   8. Altered mental status
   9. Ventricular shunts
      a. Infection
      b. Malfunction
      c. Hydrocephalus
   10. Management

B. Geriatrics- stroke risk high in this age group

VII. Communication and documentation

VIII. Transport decisions

IX. Patient education and prevention of complications or future neurological emergencies.
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

A. Epidemiology
   1. Incidence
   2. Mortality/morbidity
   3. Risk factors
   4. Prevention strategies

II. General pathophysiology, assessment and management

A. Pathophysiology of abdominal pain
   1. Bacterial contamination
   2. Chemical irritation
   3. Types of abdominal pain
      a. Somatic pain
      b. Visceral pain
      c. Referred pain

B. Assessment findings
   1. Focused history
      a. Onset
      b. Provoking factors
      c. Quality
      d. Region/radiation
      e. Severity
      f. Time
      g. Previous history of same event
      h. Nausea/vomiting
      i. Change in bowel habits/stool
         i. Constipation
         ii. Diarrhea
      j. Weight loss
      k. Last meal
      l. Chest pain
      m. Signs or symptoms of shock
      n. ECG abnormalities
   2. Focused physical examination
      a. Appearance, Posture
      b. Level of consciousness
c. Apparent state of health, skin color
d. Inspect abdomen
e. Auscultate abdomen
f. Percuss abdomen
g. Palpate abdomen

3. Assessment tools

C. Management/ treatment plan
   1. Airway and ventilatory support
      a. Maintain an open airway
      b. High-concentration oxygen
   2. Circulatory support
      a. IV fluid administration based on assessment for fluid loss
      b. Medication administration
   3. Pharmacologic interventions for pain management
   4. Non-pharmacologic interventions
      a. Nothing by mouth
      b. Monitor level of consciousness
      c. Monitor vital signs
      d. Position of comfort
      e. Nasogastric tube if indicated
   5. Transport consideration-- gentle but rapid transport
   6. Psychological support

III. Specific Injuries/ illness: causes, assessment findings and management for each condition

A. Upper gastrointestinal bleeding
   1. Ulcerative diseases
      a. Peptic ulcer disease
      b. Pathophysiology
      c. Patient history
      d. Erosive gastritis
   2. Esophagogastric varices
   3. Other causes

B. Lower gastrointestinal bleeding
   1. Common causes
      a. Non-life threatening
         i. hemorrhoids
            a) presentation
            b) prehospital implications
         ii. anal fissures
            iii. other
      b. Potentially life-threatening
         i. diverticulitis
         ii. other

C. Liver Diseases
   1. Hepatitis -- See infectious disease
   2. Cirrhosis
a. Pathophysiology
b. Signs and symptoms
c. Prehospital implications

3. Hepatic encephalopathy
   a. Pathophysiology
   b. Signs and symptoms
   c. Prehospital implications

D. Infectious Disorders
   1. Pathophysiology
   2. Signs and symptoms
      a. Fever
      b. Ascites
      c. Abdominal pain characteristics
      d. Hemodynamic instability
      e. Pharmacologic and non-pharmacologic interventions
   3. Peritonitis
   4. Gastroenteritis
      a. Causative organisms
         i. rotavirus, Norwalk virus, and many others
         ii. parasites
            a) protozoa giardia lamblia
            b) crypto sporidium parvum
            c) cyclosporidium cayetensis
         iii. contracted via fecal-oral transmission, contaminated food and water
         iv. cyclosporidium reported to be contracted by swimming in contaminated waters
      b. Bacteria
         i. Escherichia coli
         ii. Klebsiella pneumoniae
         iii. enterobacter
         iv. campylobacter jejuni
         v. vibrio cholera
         vi. shigella
         vii. salmonella
      c. Prehospital management

E. Ulcerative Disorders

F. Irritable bowel syndrome
   1. Pathophysiology
   2. Signs and symptoms
   3. Prehospital implications

G. Inflammatory bowel disease
   1. Ulcerative colitis
      a. Pathophysiology
   2. Crohn’s disease
      a. Pathophysiology
      b. Signs and symptoms
      c. Prehospital implications
3. Cholecystitis and Biliary Tract Disorders  
   a. Pathophysiology  
   b. Signs and symptoms  
   c. Prehospital implications  
4. Pancreatitis  
   a. Pathophysiology  
   b. Signs and symptoms  
   c. Pharmacologic and non-pharmacologic  
5. Appendicitis  
   a. Pathophysiology  
   b. Signs and symptoms  
   c. Prehospital implications  
   d. Prehospital management  
6. Diverticulitis  
   a. Pathophysiology  
   b. Signs and symptoms  
   c. Prehospital management  

H. Bowel obstruction  
1. Definition  
2. Small Bowel Obstruction  
   a. Causes  
      i. adhesions  
      ii. cancer  
      iii. Crohn’s disease  
      iv. others  
   b. Pathophysiology  
   c. Morbidity and mortality  
   d. Signs and symptoms  
   e. Prehospital management  
3. Large Bowel Obstruction  
   a. Causes  
      i. cancer  
      ii. diverticulitis  
      iii. volvulus  
   b. Pathophysiology  
   c. Morbidity and mortality  
   d. Signs and symptoms  
   e. Prehospital management  

I. Hernias  
1. Definition  
2. Causes  
3. Locations  
4. Signs and symptoms  
5. Incarcerated hernia  
   a. Signs and symptoms  
   b. Prehospital management  

J. Rectal foreign body obstruction
1. Pass from upper GI tract
   a. Gall stones
   b. Fecaliths
   c. Swallowed foreign objects
2. Introduced from anus
3. Signs and symptoms
   a. Pain
   b. Signs of infection
4. Management
   a. Pain management
   b. Transport for evaluation and removal

K. Rectal Abscess

L. Mesenteric Ischemia

IV. Consider age-related variations

A. Pediatrics
   1. Epidemiology
   2. Anatomic and physiologic differences in children
   3. Pathophysiology
      a. Embryology of the GI tract
      b. Vomiting mechanism
      c. Electrolyte complications of gastroenteritis and pyloric stenosis
      d. GI bleeding
   4. Assessment
      a. History
      b. Physical findings
   5. Vomiting
      a. Gastroenteritis
      b. Malrotation
      c. Pyloric stenosis
   6. Lower GI Bleeding
   7. Gastrostomy tube dysfunction
   8. Neonatal Jaundice
   9. Management

B. Geriatrics
   1. AAA more common
   2. May not exhibit rigidity or guarding
   3. Abdominal pain related to cardiac conditions

V. Communication and documentation

VI. Transport decisions

VII. Patient education and prevention
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

   A. Incidence, morbidity, mortality of common or major immune system disorders
   
   B. Collagen vascular disease
   
   C. Allergic reaction and anaphylaxis
   
   D. Hypersensitivity
   
   E. Transplant disorders

II. Pathophysiology

   A. Immunity
      1. Natural
      2. Acquired
   
   B. Immune response
      1. Humoral
      2. Cell-mediated
   
   C. Allergic reaction
      1. Antigens
      2. Antibodies
      3. Mast cells and basophils
      4. Histamine, leukotrienes, histamine and other mediators
      5. Local reactions
      6. Systemic reactions

III. Assessment

   A. Mild allergic reaction
      1. Cutaneous
      2. Other
   
   B. Moderate allergic reaction
      1. Upper airway
      2. Lower airway
3. Cardiovascular
4. Cutaneous
5. Gastrointestinal
6. Neurological

C. Severe allergic reaction/ anaphylaxis
1. Upper airway
2. Lower Airway
3. Cardiovascular
4. Cutaneous
5. Gastrointestinal
6. Neurological

IV. Anaphylactoid Reaction

V. Managing an allergic reaction

A. Provide treatment specific to assessment findings and severity of reaction

B. Remove allergen if possible

C. Protect the airway -- Consider intubation

D. Ventilate if needed

E. IV access
   1. Fluid administration
   2. Medication administration

F. Pharmacologic interventions
   1. Oxygen
   2. Epinephrine
   3. Antihistamines
   4. Corticosteroids
   5. Vasopressors
   6. Beta agonists
   7. Magnesium sulfate
   8. Bronchodilators

VI. Collagen vascular disease

A. Systemic lupus erythmatosis
   1. Effects on body
      a. Cutaneous effects
      b. Musculoskeletal
      c. Pleural
      d. Pericardial
      e. Neurologic
      f. Hematologic
   2. Prehospital implications
B. Scleroderma
   1. Effects on body
      a. Renal
      b. Cardiovascular
   2. Prehospital implications

VII. Transplant-related problems

A. Types of solid organ transplant

B. Assessment considerations

C. Common complications related to immunosuppression
   1. Infection
   2. Rejection
   3. Drug toxicity
      a. Cyclosporine
         i. interacts with many other drugs
         ii. renal toxicity
      b. Azathioprine
         i. neutropenia
         ii. hepatic and gastrointestinal effects
      c. Corticosteroids

VIII. Consider age-related variations in pediatric and geriatric patients

IX. Communication and documentation

X. Transport decisions

XI. Patient education and prevention
Medicine
Infectious Diseases – MT5

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Public health principles and agencies responsible for public health

   A. Demographic

   B. Epidemiology diseases
      1. Endemic
      2. Epidemic
      3. Pandemic

II. Pathophysiology of Infectious Disease

   A. Infectious agents
      1. Bacteria
      2. Viruses
      3. Fungi
      4. Protozoa
      5. Helminths (worms)

   B. Factors that affect agent’s ability to cause disease

   C. Chain of infection
      1. Infectious agent
      2. Reservoir
      3. Portal of entry
      4. Mode of transmission
         a. Direct contact
         b. Droplet
         c. Vector
      5. Portal of exit
      6. Factors that affect susceptibility

   D. Body’s response
      1. Barriers
         a. External
            i. flora
            ii. skin
            iii. gastrointestinal system
            iv. respiratory system
            v. genitourinary system
b. Internal barriers
   i. inflammatory response
   ii. immune response
   iii. limited to specific

E. Stages of infectious disease
   1. Latent
   2. Incubation period
   3. Communicability period
   4. Disease period

III. Standard Precautions, personal protective equipment, and cleaning and disposing of equipment and supplies.

   A. Principles of standard precautions
   
   B. Current hand washing guidelines
   
   C. Current recommendations for standard precautions
   
   D. Current recommendations for cleaning or sterilization of equipment
   
   E. Current recommendations for disposing of contaminated linens and supplies including sharps

IV. Specific diseases and conditions

   A. HIV and AIDS
      1. Incidence, morbidity, mortality, risk factors, modes of transmission
      2. Pathophysiology
      3. Body systems affected
      4. Progression of disease including opportunistic infections
      5. Healthcare worker susceptibility and transmission
      6. Assessment findings and symptoms
         a. Often asymptomatic
         b. Non-specific febrile illness
         c. Sore throat, fatigue
         d. Swollen spleen and lymph glands
         e. Weight loss
         f. Opportunistic infections
      7. Management for a patient with HIV or AIDS-related conditions
         a. Prehospital care is supportive
         b. Manage airway and support ventilation
         c. IV if needed
         d. Respiratory isolation if coughing
      8. Immunization and treatment of exposure

   B. Hepatitis
      1. Introduction--Pathophysiology, incidence, types, causes, risk factors, methods of transmission, complications
      2. General assessment findings and symptoms
         a. Asymptomatic
b. Non-specific febrile illness
c. Light-colored stools
d. Dark urine
e. Fatigue
f. Nausea/vomiting
g. Abdominal pain/tenderness
h. Jaundice
i. Fulminant acute hepatitis

3. Treatments for exposure/prevention; immunizations

4. Types
   a. Hepatitis A
   b. Hepatitis B
   c. Hepatitis C
   d. Hepatitis D
   e. Hepatitis E
   f. Hepatitis G
g. Other

5. Management for a patient with hepatitis
   a. Prehospital care is supportive
   b. Manage airway and support ventilation
c. IV if needed

C. Pneumonia
   1. Introduction--Pathophysiology, incidence, risk factors, methods of transmission, complications
   2. Etiologic agents/ causative organisms
      a. Bacterial
      b. Viral
c. Fungal
   3. General assessment findings and symptoms
      a. Chills, high-grade fevers, chest pain with respirations, tachypnea, and dyspnea
      b. Signs of respiratory distress
      c. Productive cough—yellow or green
      d. Signs of dehydration
      e. Breath sounds
         i. diminished breath sounds
         ii. localized adventitious sounds
            a) crackles
            b) wheezes
      f. Percussion
   4. General management for a patient with pneumonia
      a. Airway and ventilatory support
      b. Administer oxygen
      c. Initiate intravenous therapy
      d. Consider pharmacologic interventions related to presenting signs and symptoms
e. Treatments for exposure; immunizations

D. Meningitis
   1. Types
      a. Meningococcal meningitis
1. Neisseria meningitidis
   i. onset rapid, high mortality rate
   ii. petechial rash
b. Streptococcus pneumoniae (bacteria)
c. Hemophilus influenza type B (bacteria)
d. Viruses (causes syndromes aseptic meningitis)

2. Meningococcal meningitis
   a. Introduction--Pathophysiology, incidence, types, causes, risk factors, methods of transmission, complications
   b. General assessment findings and symptoms
      i. altered mental status
      ii. fever, chills
      iii. photophobia
      iv. joint pain
      v. nuchal rigidity
         a) Kernig’s sign
         b) Brudzinski’s sign
      vi. seizures
      vii. projectile vomiting
      viii. headache
      ix. septic shock
      x. rash
      xi. disseminated intravascular coagulation
c. Infants and children
   i. infants--fever, vomiting, irritability, and lethargy
   ii. bulging fontanelle
   iii. older children, positive Kernig’s and Brudzinski’s signs may be found

3. General management for a patient with meningitis
   a. Standard precautions
   b. Airway and ventilatory support
   c. Administer oxygen
   d. Initiate IV
   e. Pharmacologic management
      i. seizures
      ii. shock
   f. Rapid transport
   g. Post-exposure prophylaxis

E. Tuberculosis
   1. Introduction--Pathophysiology, incidence, causes, risk factors, methods of transmission, complications
   2. General assessment findings and symptoms
      a. Initially a subclinical infection
      b. Indications of acute illness
         i. cough
         ii. fever
         iii. night sweats
         iv. weight loss
         v. fatigue
         vi. hemoptysis
3. Management for a patient with tuberculosis
   a. Supportive care
   b. Airway and ventilatory support as needed
   c. High-concentration oxygen
   d. Respiratory barriers
      i. Paramedic N-95 or HEPA mask
      ii. mask on patient
      iii. ensure ventilation in ambulance
4. Post-exposure prophylaxis

F. Tetanus
   1. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of transmission, incubation, complications
   2. General assessment findings and symptoms
      a. Muscular tetany
         i. jaw
         ii. neck muscles
         iii. abdominal rigidity may be the first sign in children
         iv. facial muscles
      b. Weakness, myalgias, muscle cramps
      c. Dysphagia, hydrophobia, drooling
      d. Respiratory failure
   3. General management for a patient with tetanus
      a. Supportive
      b. Airway and support ventilation
      c. Administer oxygen
      d. Establish intravenous
      e. Pharmacologic
   4. Post-exposure considerations
   5. Immunization

G. Viral diseases
   1. Chickenpox
      a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of transmission, complications
      b. General assessment findings and symptoms
         i. respiratory symptoms, malaise and low-grade fever
         ii. rash--small red spots then raised blisters on a red
         iii. fluid-filled vesicles then dry into scabs
      c. Patient management for a patient with chickenpox
         i. supportive
         ii. isolation
      d. Post-exposure considerations
      e. Vaccines
   2. Mumps
      a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of transmission, complications
      b. General assessment findings and symptoms
         i. fever,
ii. swelling and tenderness of salivary glands, especially parotid
c. General management for a patient with mumps
   i. supportive
   ii. isolation
d. Post-exposure considerations
e. Immunization

3. Rubella
   a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of
      transmission, complications
   b. General assessment findings and symptoms
      i. fever and flu symptoms, followed by
      ii. red maculopapular rash
   c. General management for a patient with rubella
      i. supportive
      ii. isolation
d. Post-exposure considerations
e. Immunization

4. Measles
   a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of
      transmission, complications
   b. General assessment findings and symptoms
      i. prodrome - conjunctivitis, swelling of the eyelids, photophobia, high fevers,
         hacking cough, and malaise
      ii. small, red-based lesions with blue-white centers in the mouth, called Koplik’s
         spots
      iii. generalized rash
   c. General management for a patient with measles
      i. supportive
      ii. isolation
d. Post-exposure considerations
e. Immunization

5. Pertussis (Whooping cough)
   a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of
      transmission, complications
   b. General assessment findings and symptoms
      i. cough paroxysms are violent, sometimes without an intervening inhalation
      ii. high pitched whooping sound or crowing
      iii. clear mucus, vomiting
   c. General management for a patient with pertussis
      i. supportive
      ii. isolation
d. Post-exposure considerations
e. Immunization

H. Other viral diseases
1. Influenza
   a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of
      transmission, complications
   b. General assessment findings and symptoms
      i. upper respiratory illness-type symptoms
ii. cough is often severe and protracted
iii. fever and body aches
c. General management for a patient with influenza
   i. patient treatment is supportive
   ii. IV fluids if dehydrated
d. Immunization and treatment of exposure

2. Mononucleosis
   a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of transmission, complications
   b. General assessment findings and symptoms
      i. fever, sore throat, oropharyngeal discharges,
      ii. lymphadenopathy (especially posterior cervical), and splenomegaly
      iii. lack of energy
c. General management for a patient with mononucleosis
   i. patient treatment is supportive
   ii. IV fluids if dehydrated
d. Immunization and treatment of exposure

3. Herpes simplex virus type I
   a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of transmission, complications
   b. General assessment findings and symptoms
      i. cold sores and fever blisters, which are generally found on the lips, face, conjunctiva, or oropharynx
      ii. newborns may get meningoencephalitis
      iii. aseptic meningitis in adults
c. General management for a patient with herpes simplex type I
   i. supportive care
   ii. IV fluids if dehydrated
d. Immunization and treatment of exposure
   i. highly contagious
   ii. antiviral medication

4. Hantavirus
   a. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of transmission, complications
   b. General assessment findings and symptoms
      i. onset of illness is non-specific
      ii. fever, malaise, aches, and generalized pains
      iii. headache, nausea/vomiting, abdominal pain,
      iv. diarrhea, cough, and weakness
      v. respiratory distress , severe dyspnea, dizziness, chest and back pain
      vi. respiratory failure, pulmonary edema
c. General management for a patient with Hantavirus

I. Sexually transmitted diseases
   1. Introduction-- Pathophysiology, incidence, causes, risk factors, methods of transmission, complications for common sexually transmitted diseases
   2. General management for a patient with sexually transmitted diseases
   3. Specific conditions, general assessment findings, symptoms
      a. Syphilis
      b. Gonorrhea
c. Chlamydia
d. Herpes simplex virus type 2 (genital herpes)
e. Scabies and Lice
f. Lyme disease

J. Gastroenteritis
1. Pathophysiology, incidence, causes, risk factors, methods of transmission, complications for gastroenteritis caused by an infectious agent
   a. Rotavirus
   b. Parasites
   c. Bacteria
   d. Other
2. General assessment findings and symptoms for patients with gastroenteritis caused by an infectious agent
3. General management for a patient with gastroenteritis caused by an infectious agent
4. Antiemetic
5. IV for fluid replacement

K. Drug resistant bacterial conditions
1. Pathophysiology, incidence, causes, risk factors, methods of transmission, complications for a patient with a drug resistant bacterial condition
2. General assessment findings and symptoms for patients with a drug resistant bacterial condition
3. General management for a patient with a drug resistant bacterial condition
4. Common conditions
   a. MRSA – methycillin resistant staphylococcus aureus
   b. VRSA – vancomycin resistant staphylococcus aureus
   c. VRE -- Vancomycin Resistant Enterococcus
   d. Other

L. Fungal infections
1. Pathophysiology, incidence, causes, risk factors, methods of transmission, complications for a patient with a fungal infections
2. General assessment findings and symptoms for a patient with fungal infections
3. General management for a patient with fungal infections

M. Rabies
1. Definition:
2. Epidemiology
3. Prognosis:
   a. Good, if treated with early post-exposure prophylaxis
   b. Fatal when signs and symptoms appear
4. Transmission
   a. Infected saliva of a host is passed to an uninfected animal.
   b. Bite with virus-containing saliva of an infected host.
      i. raccoons
      ii. skunks
      iii. foxes
      iv. coyotes
      v. insectivorous bats
c. Contamination of mucous membranes (i.e., eyes, nose, mouth), aerosol transmission
d. Corneal transplantations.

5. Incubation

6. Signs and Symptoms
   a. Autonomic instability
   b. Dysphagia
   c. Hydrophobia
   d. Paresis
   e. Parethesia
   f. Progressive worsening of neurologic signs is characteristic of rabies and should be
considered as a positive indicator for rabies

7. Treatment
   a. Clean wound and treat injuries associated with injury first
   b. Consider potential for infection with all potential exposures
      i. saliva of infected animals
      ii. central nervous system of infected animals
   c. Early post exposure prophylaxis

8. Documentation
   a. Type of exposure
      i. bite
      ii. mucosal
      iii. scratch
      iv. unknown
   b. Duration of exposure if non-bite

N. Scabies/Lice
1. Scabies
   a. Definition: infestation of the skin with the microscopic mite Sarcoptes scabei.
   b. Epidemiology
      i. prevalence - infestation is common, found worldwide, and affects people of all
         races and social classes.
      ii. spread-skin-to-skin contact between people, such as in hospitals, institutions,
         child-care facilities, and nursing homes
      iii. lifespan of mite
         a) 24-72 hours away from a host
         b) female can live one month on host
   c. Signs and Symptoms:
      i. pimple-like irritations
      ii. burrows or rash of the skin
      iii. intense itching
      iv. sores on the body caused by scratching
   d. Onset of Signs and Symptoms
      i. 4-6 weeks in patient never having had them before
      ii. several days for second exposure
   e. Treatment

2. Lice
   a. Definition: infestation of the skin under the hair on people’s head, bodies, or pubic
      areas.
   b. Types
      i. pediculus humanus capitis (head louse)
ii. pediculus humanus corporis (body or clothes louse)
iii. pthirus pubis (crab louse or pubic louse)
c. Epidemiology
d. Spread by close person to person contact
   i. move by crawling, cannot fly or hop
   ii. pubic lice spread by sexual contact
e. Life-span
   i. 24-48 hours away from a host
   ii. 30 days on a host
   iii. females lay 8 nits per day
f. Signs and Symptoms
   i. itching
   ii. appearance of nits
   iii. appearance of lice
g. Treatment:
   i. pediculicides for head lice
   ii. 1% permethrin or a mousse containing pyrethrins and piperonyl butoxide for pubic lice

O. Lyme Disease
   1. Originally identified in Lyme, Ct, now most cases in North and Northeast
   2. Caused by the bacteria borrelia burgdorferi, spread by ticks
      a. Phase I
         i. large circular lesions
         ii. muscle and joint pain
         iii. fever, malaise, fatigue
         iv. swollen lymph nodes
         v. headache
         vi. diffuse erythema
         vii. conjunctivitis and periorbital edema
      b. Phase II (weeks to months later)
         i. pericarditis
         ii. myocarditis
         iii. AV conduction problems
         iv. meningoencephalitis
         v. cranial, peripheral neuropathies
      c. Phase III
         3. Antibiotic treatment during phase I prevents progression

P. Antibiotic Resistant Infections
   1. Epidemiology
   2. Pathophysiology
   3. Psychosocial impact
   4. Reporting requirements
   5. Prognosis
   6. Assessment
   7. Management

V. Consider age-related variations in pediatric and geriatric patients
VI. Communication and documentation for a patient with a communicable or infectious disease

VII. Transport decisions including special infection control procedures.

VIII. Patient and family teaching regarding communicable or infectious diseases and their spread.

IX. Legal requirements regarding reporting communicable or infectious diseases/conditions

   A. Exposure of health care provider
      1. Current recommended treatment modalities and follow up
      2. Prevention of exposure or immunizations/vaccines

   B. Required reporting to the health department or other health care agency
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Overview of endocrine conditions

A. Anatomy and Physiology-- Endocrine Glands
   1. Thyroid
   2. Hypothalamus
   3. Pineal
   4. Thymus
   5. Pituitary
   6. Parathyroids
   7. Adrenals
   8. Pancreas
   9. Ovary
   10. Testis

B. Hormones
   1. Cortisol
   2. Aldosterone
   3. Estrogen
   4. Progesterone
   5. Testosterone
   6. Insulin
   7. Parathyroid hormone

II. Pathophysiology, causes, Incidence, morbidity, and mortality, assessment findings, management for endocrine conditions

A. Pancreas disorders--Diabetes mellitus--
   1. Insulin—relationship with glucose
   2. Pathophysiology of diabetes
      a. Long-term complications
      b. Impact on prehospital assessment
   3. Diabetes
      a. Type 1 (formerly known as Juvenile or Type I)
      b. Type 2 (formerly known as adult-onset or Type II)
      c. Gestational
   4. Drugs to manage diabetes
      a. Insulins
         i. Types
         ii. Delivery methods
b. Oral agents
   i. Classes
   ii. Risks of hypoglycemia
   iii. Drug interactions
c. Other hypoglycemic agents
d. Drugs to treat hypoglycemia
5. Diabetic ketoacidosis
6. Hyperglycemic Hyperosmolar nonketotic coma
7. Hypoglycemia
   a. Pathophysiology
   b. Signs and Symptoms
   c. Management
      i. Pharmacologic
      ii. Non-pharmacologic
8. Other disorders of pancreas

B. Thyroid disorders
   1. Hyperthyroidism
   2. Hypothyroidism
   3. Myxedema
   4. Thyroid storm
   5. Thyrotoxicosis
   6. Grave’s disease

C. Adrenal disorders
   1. Addison disease
   2. Cushing syndrome

D. Other endocrine disorders

III. Consider age-related variations

A. Pediatric
   1. Usually Type 1 diabetes;
   2. Late stages of hyperglycemia may have cerebral edema
   3. Prone to seizures;
   4. Prone to dehydration
   5. Congenital adrenal hyperplasia
   6. Panhypopituitarism
   7. Inborn errors of metabolism

B. Geriatric
   1. Can mask signs and symptoms of myocardial infarction;
   2. Prone to dehydration and infections

IV. Communication and documentation
V. Transport decisions
VI. Patient education and prevention
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction
   A. Prevalence
   B. Medical legal considerations
   C. Safety

II. Pathophysiology
   A. Biological/Organic
   B. Environment
      1. Psychosocial
      2. Socio-cultural
   C. Injury and illness
   D. Substance-related
      1. Abuse
      2. Dependence
      3. Intoxication
      4. Medication non-compliance

III. Understanding Behavior
   A. Normal
   B. Abnormal
   C. Overt
   D. Violent

IV. Acute psychosis
   A. Pathophysiology
      1. Related to mental illness
      2. Organic psychosis
B. Signs and symptoms

C. Prehospital management
   1. Non-pharmacologic
   2. Pharmacologic

V. Agitated delirium
   A. Pathophysiology
   B. Risk factors
   C. Signs and symptoms
   D. Management

VI. Specific Behavioral/Psychiatric Disorders
   A. Cognitive Disorders
   B. Thought Disorders
      1. Schizophrenia
      2. Psychosis
   C. Mood Disorders
      1. Bipolar
      2. Depression
   D. Neurotic disorders
   E. Substance-Related Disorders/Addictive behavior
   F. Somatoform Disorders
   G. Factitious Disorders
   H. Fastidious Disorders
   I. Impulse Control Disorders
   J. Personality Disorders
   K. Suicide
   L. Patterns of Violence, Abuse, and Neglect

VII. Assessment findings for behavioral/psychiatric patients
   A. Mental Status Exam (MSE)
1. consciousness
2. orientation
3. activity
4. speech
5. thought
6. memory
7. affect and mood
8. perception)

B. Physiological changes

C. Medical/social history

D. Consider if patient is danger to self and/or others

E. Consider medical causes of acute crises

VIII. Providing Empathetic and Respectful Management

A. Communication techniques

B. Crisis intervention skills

C. Use of force/restraints (chemical, physical, tasers

IX. Medications

A. Pharmacodynamics of prescribed medications for behavioral/psychiatric disorders
   1. Amphetamines
   2. Antidepressants
   3. Antipsychotic
   4. Phenothiazines

B. Problems associated with non-compliance

C. Emergency use

X. Consider age-related variations in pediatric and geriatric patients

XI. Communication to medical facility and documentation

XII. Transport decisions
Medicine
Cardiovascular – MT8

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Anatomy of the Cardiovascular System

   A. Location
      1. Layers
         a. Myocardium
         b. Endocardium
         c. Pericardium
            i. visceral (epicardium)
            ii. parietal
            iii. pericardial fluid
      2. Chambers
         a. Atria
         b. Ventrices
      3. Valves
         a. Atrioventricular (AV) valves
            i. tricuspid (right)
            ii. mitral (left)
         b. Semilunar valves
            i. pulmonic (right)
            ii. aortic (left)
      4. Papillary muscles
      5. Chordae tendineae
      6. Myocardial blood supply
         a. Arteries
            i. Left coronary artery
               a) Anterior descending artery (LAD)
                  i) distribution to the conduction system
                  ii) distribution to the left and right ventricles
               b) Circumflex artery
                  i) distribution to the conduction system
                  ii) distribution to the left ventricle
                  iii) distribution to the left atrium
            ii. Right coronary artery
               a) Posterior descending artery
                  i) distribution to the conduction system
                  ii) distribution to left and right ventricles
               b) Marginal artery
i) distribution to the conduction system
ii) distribution to the right ventricle
iii) distribution to the right atrium

b. Veins
   i. Coronary sinus
   ii. Great cardiac vein

7. Conduction system
   a. Sinoatrial node
   b. Atrioventricular node
   c. Atrioventricular bundle (Bundle of His)
   d. Bundle branches
      i. left anterior fascicle
      ii. left posterior fascicle
      iii. right
   e. Purkinje network
   f. Internodal and interatrial pathways
      i. Atrioventricular node
      ii. Left Atrium (Bachmann’s bundle)
      iii. Middle internodal tract (Wenckebach’s tract)
      iv. Posterior internodal tract (Thorel’s tract)
   g. Anatomical tracts that bypass the atrioventricular node
      i. considered possible conduction routes that account for anomalous
         atrioventricular conduction (Wolff-Parkinson-White syndrome, Lown-Ganong-
         Levine syndrome)
         a) James fibers
         b) Mahaim fibers
         c) accessory bundle of Kent

8. Vascular system
   a. Aorta
      i. ascending
      ii. thoracic
      iii. abdominal
   b. Arteries
   c. Arterioles
   d. Capillaries
   e. Venules
   f. Veins
   g. Vena cava
      i. superior
      ii. inferior
   h. Venous return (preload)
      i. skeletal muscle pump
      ii. thoracoabdominal pump
      iii. respiratory cycle
      iv. gravity
      v. effects of IPPB, PEEP, CPAP and BiPAP on venous return
   i. Systemic vascular resistance and capacitance (afterload)
   j. Pulmonary veins

II. Physiology
A. Cardiac cycle
1. Consists of systole and diastole of atria and ventricles
2. Cycle occurs in about 0.8 seconds and 70-80 cycles/minute average
3. Events that occur in 1 cardiac cycle:
   a. Atrial systole
      i. AV valves open and SL valves closed
      ii. ventricles relaxed
      iii. preceded by P wave on ECG
   b. Isovolumetric contraction
      i. between start of ventricular systole and opening of SL valves
      ii. ventricular volume remains constant
      iii. onset coincides with R wave on ECG
      iv. first heart sound heart (S1)
         a) caused by ventricles contracting and closure of cuspid valves
         b) “lubb” sound
   c. Ejection -- Initial, shorter, rapid ejection followed by longer phase of reduced ejection
      i. Residual volume of blood remains in ventricles following ejection phase
      ii. Residual volume increases in states of heart failure
   d. Isovolumetric relaxation
      i. period between closure of SL valves and opening of AV valves
      ii. ventricles are relaxing
      iii. second heart sound heard during this phase (S2)
         a) caused by closure of SL valves
         b) “dubb” sound
   e. Rapid ventricular filling
   f. Reduced ventricular filling (diastasis)

B. Cardiac output
1. Heart rate X stroke volume
   a. Starling’s law
   b. Contractility

III. Electrophysiology

A. Characteristics of myocardial cells
1. Automaticity
2. Excitability
3. Conductivity
4. Contractility

B. Electrical potential
1. Action potential – important electrolytes
   a. Sodium
   b. Potassium
   c. Calcium
   d. Chloride
   e. Magnesium
2. Excitability
   a. Thresholds
b. Depolarization
c. Repolarization
   i. relative refractory period
   ii. absolute refractory period

3. Neurotransmitters
   a. Acetylcholine
      i. effects on myocardium
      ii. effects on systemic blood vessels
   b. Cholinesterase
      i. effects on myocardium
      ii. effects on systemic blood vessels

C. Autonomic nervous system relationship to cardiovascular system
   1. Medulla
   2. Carotid sinus and baroreceptor
      a. Location
      b. Significance
   3. Parasympathetic system
      a. Inhibitory
      b. Vagal release of acetylcholine
   4. Sympathetic system
      a. Stimulatory
      b. Release of norepinephrine
      c. Alpha receptors
      d. Beta receptors
         i. inotropic effect
         ii. dromotropic effect
         iii. chronotropic effect

IV. Epidemiology

A. Incidence
   1. Prevalence of cardiac death outside of a hospital
   2. Prevalence of prodromal signs and symptoms
   3. Increased recognition of the need for early reperfusion

B. Morbidity/mortality
   1. Reduced with early recognition
   2. Reduced with early access to the EMS system

C. Risk factors
   1. Age
   2. Family history
   3. Hypertension
   4. Lipids
      a. Hypercholesterolemia
      b. LDL/HDL ratios
   5. Gender
   6. Smoking
   7. Carbohydrate intolerance
D. Possible contributing risks
   1. Diet
   2. Gender
   3. Obesity
   4. Oral contraceptives
   5. Sedentary living
   6. Personality type
   7. Psychosocial tensions

E. Prevention strategies
   1. Early recognition
   2. Education
   3. Alteration of life style

V. Primary survey for cardiovascular assessment

A. Level of responsiveness

B. Airway
   1. Patent
   2. Debris, blood

C. Breathing
   1. Absent
   2. Present
   3. Rate and depth
      a. Effort
      b. Breath sounds
         i. characteristics
         ii. significance

D. Circulation
   1. Pulse
      a. Absent
      b. Present
         i. Pulse deficit
         ii. Pulsus paradoxus
         iii. Pulsus alternans
   2. Skin
      a. Color
      b. Temperature
      c. Moisture
      d. Turgor
      e. Mobility
      f. Edema
   3. Blood pressure

VI. History and physical/ SAMPLE format
A. Chief complaint

B. Pain
   1. OPQRST
      a. Onset/ origin
         i. pertinent past history
         ii. time of onset
      b. Provocation
         i. exertional
         ii. non-exertional
      c. Quality
      d. Region/ radiation
      e. Severity
      f. Timing
         i. duration
         ii. worsening or improving
         iii. continuous or intermittent
         iv. at rest or with activity

C. Dyspnea
   1. Continuous or intermittent
   2. Exertional
   3. Non-exertional
   4. Orthopneic

D. Cough
   1. Dry
   2. Productive

E. Related signs and symptoms
   1. Level of consciousness
   2. Diaphoresis
   3. Restlessness, anxiety
   4. Feeling of impending doom
   5. Nausea/ vomiting
   6. Fatigue
   7. Palpitations
   8. Edema
      a. Extremities
      b. Sacral
   9. Headache
   10. Syncope
   11. Behavioral change
   12. Anguished facial expression
   13. Activity limitations
   14. Trauma

F. Past medical history
   1. Coronary artery disease
   2. Atherosclerotic heart disease
a. Abnormal lipid metabolism or excessive intake or saturated fats and cholesterol
b. Subendothelial accumulation of fatty streaks
c. Altered endothelial function
d. Disruption of endothelium
e. Formation of mature fibrous plaque
f. Resultant diseases:
   i. angina
   ii. previous MI
   iii. hypertension
   iv. congestive heart failure

3. Valvular disease
4. Aneurysm
5. Pulmonary disease
6. Diabetes
7. Renal disease
8. Vascular disease
9. Inflammatory cardiac disease
10. Previous cardiac surgery
11. Congenital anomalies
12. Current/past medications
   a. Prescribed
      i. compliance
      ii. non-compliance
   b. Borrowed
   c. Over-the-counter
   d. Home remedies
   e. Recreational
13. Allergies
14. Family history
   a. Stroke, heart disease, diabetes, hypertension
   b. Age at death
15. Known cholesterol levels

VII. Secondary survey for cardiovascular assessment

A. Inspection
   1. Tracheal position
   2. Neck veins
      a. Appearance
      b. Pressure
      c. Clinical significance
   3. Thorax
      a. Configuration
      b. A-P diameter
      c. Movement with respirations
   4. Epigastrium
      a. Pulsation
      b. Distention
      c. Clinical significance
B. Auscultation
   1. Neck
      a. Normal
      b. Abnormal
   2. Breath sounds
      a. Depth
      b. Equality
      c. Adventitious sounds
         i. crackles/rales
         ii. wheezes/rhonchi
            a) gurgling
            b) frothing (mouth and nose)
         i) blood tinged
         ii) foamy
   3. Heart sounds
      a. Auscultatory sites
      b. Identify S1, S2
      c. Identify abnormal sounds (S3, S4)

C. Palpation
   1. Areas of crepitus or tenderness
   2. Thorax
   3. Epigastrium
      a. Pulsation
      b. Distention

VIII. Electrocardiographic (ECG) monitoring

   A. Electrophysiology and wave forms
      1. Origination
      2. Production
      3. Relationship of cardiac events to wave forms
      4. Intervals
         a. Normal
         b. Clinical significance
      5. Segments

   B. Leads and electrodes
      1. Electrode
      2. Leads
         a. Anatomic positions
         b. Correct placement
      3. Surfaces of heart and lead systems
         a. Inferior
         b. Left lateral
         c. Anterior/ posterior
      4. Artifact

   C. Standardization
1. Amplitude
2. Height
3. Rate
   a. Duration
   b. Wave form
   c. Segment
   d. Complex
   e. Interval

D. Wave form analysis
1. Isoelectric
2. Positive
3. Negative
4. Calculation of ECG heart rate
   a. Regular rhythm
      i. ECG strip method
      ii. "300"/triplicate method
   b. Irregular rhythm
      i. ECG strip method
      ii. "300"/triplicate method

E. Lead systems and heart surfaces
1. ECG rhythm analysis
   a. Value
   b. Limitations
2. Heart surfaces
   a. Inferior
   b. Left lateral
   c. Precordial
3. Acute signs of ischemia, injury and necrosis
   a. Rationale
      i. possible early identification of patients with acute myocardial infarction for intervention (thrombolysis PTCA)
      ii. the role of out-of-hospital 12-lead ECG is not universally available but is appropriate in most EMS settings with proper medical oversight
   b. Advantages/ disadvantages
   c. ST segment elevation
      i. height, depth and contour
      ii. ST (acute changes)
         a) anterior wall -- significant ST elevation in V1- V4 may indicate anterior involvement
         b) inferior wall -- significant ST elevation in II, III and aVF may indicate inferior involvement
      iii. ST segment depression in eight or more leads
      iv. ST segment elevation in aVR and V1
   d. Q waves
      i. depth, duration and significance
         a) greater than 5 mm, greater than .04 seconds
         b) may indicate necrosis
         c) may indicate extensive transient ischemia
F. Cardiac arrhythmias

1. Approach to analysis
   a. P wave
      i. configuration
      ii. duration
      iii. atrial rate and rhythm
   b. P-R (P-Q) interval
   c. QRS complex
      i. configuration
      ii. duration
      iii. ventricular rate and rhythm
   d. S-T segment
      i. contour
      ii. elevation
      iii. depression
   e. Q-T interval
      i. duration
      ii. implication of prolongation
   f. Relationship of P waves to QRS complexes
      i. consistent
      ii. progressive prolongation
      iii. no relationship
   g. T waves
   h. U waves

2. Interpretation of the ECG
   a. Origin of complex
   b. Rate
   c. Rhythm
   d. Clinical significance

3. Arrhythmia originating in the sinus node
   a. Sinus bradycardia
   b. Sinus tachycardia
   c. Sinus arrhythmia
   d. Sinus arrest

4. Arrhythmias originating in the atria
   a. Premature atrial complex
   b. Atrial (ectopic) tachycardia
   c. Re-entrant tachycardia
   d. Multifocal atrial tachycardia
   e. Atrial flutter
   f. Atrial fibrillation
   g. Atrial flutter or atrial fibrillation with junctional rhythm
   h. Atrial flutter or atrial fibrillation with pre-excitation syndromes

5. Arrhythmias originating within the AV junction
   a. First degree AV block
   b. Second degree AV block
      i. Type I (Wenkebach)
      ii. Type II/ infranodal (Classical)
   c. Complete AV block (third degree block)
6. Arrhythmias sustained or originating in the AV junction
   a. AV nodal re-entrant tachycardia
   b. AV reciprocating tachycardia
      i. narrow
      ii. wide
   c. Junctional escape rhythm
   d. Premature junctional complex
   e. Accelerated junctional rhythm
   f. Junctional tachycardia

7. Arrhythmias originating in the ventricles
   a. Idioventricular rhythm
   b. Accelerated idioventricular rhythm
   c. Premature ventricular complex (ventricular ectopic)
      i. R on T phenomenon
      ii. paired/couples
      iii. multiformed
      iv. frequent uniform
   d. "Rule of bigeminy" pertaining to precipitating ventricular arrhythmias
   e. Ventricular tachycardia
      i. monomorphic
      ii. polymorphic (including torsades de pointes)
   f. Ventricular fibrillation
   g. Ventricular standstill
   h. Asystole

8. Abnormalities originating within the bundle branch system
   a. Incomplete or complete
   b. Right bundle branch block
   c. Left bundle branch block

9. Differentiation of wide QRS complex tachycardia
   a. Potential causes
      i. supraventricular tachycardia with bundle branch block
      ii. accessory pathways
   b. Differentiation
      i. physical evaluation
         a) Cannon “A” waves
         b) vary intensity of first heart tone
         c) beat to beat changes in blood pressure
      ii. ECG differences
         a) aberration as a result of premature atrial complex
            i) identify PAC in previous ST segment or T wave
            ii) sudden change in rate with bundle branch aberration
            iii) concealed retrograde conduction
            iv) right bundle branch refractoriness - may be time dependent
            v) compare with previous ECG, when available
         b) RBBB aberration - V1 - positive
            i) biphasic lead I with a broad terminal S-wave
            ii) triphasic QRS in V4
         c) LBBB aberration - V1 - negative
            i) monophasic notched lead I
            ii) slurred, notched or RSr’ in lead V4, V5, or V6
d) Concordant precordial pattern
   i) totally negative precordial pattern is diagnostic of ventricular tachycardia
   ii) totally positive precordial pattern is suggestive of ventricular tachycardia
e) Preexisting BBB prior to onset of tachycardia (by history)
iii. Other considerations
   a) When in doubt:
      i) cardioversion when hemodynamic state is compromised or changing as evidenced by CNS changes
      ii) never use verapamil
      iii) if hemodynamic state is stable – consider lidocaine
   b) Pitfalls
      i) age is not a differential
      ii) slower rates may present with stable hemodynamic
      iii) preexisting BBB prior to onset of the tachycardia
   c) Regularity
      i) monomorphic V-tach and SVT are usually very regular and SVT frequently is faster
      ii) polymorphic V-tach is irregular

10. Pulseless electrical activity
   a. Electrical mechanical dissociation
   b. Mechanical impairments to pulsations/ cardiac output
   c. Other possible causes
11. Other ECG phenomena
   a. Accessory pathways
   b. Preexitation phenomenon
   c. Aberration versus ectopy
12. ECG changes due to electrolyte imbalances
   a. Hyperkalemia
   b. Hypokalemia
13. ECG changes in hypothermia

IX. Management of the patient with an arrhythmia

A. Assessment
   1. Symptomatic
   2. Hypotensive
   3. Hypoperfusion
   4. Mechanical
   5. Vagal maneuvers - if the heart rate is too fast
   6. Stimulation - If heart rate is too slow
   7. Cough

B. Pharmacological interventions
   1. Gases
   2. Sympathomimetic
   3. Anticholinergic
   4. Antiarrhythmic
   5. Beta blocker
a. Selective
b. Non-selective

6. Vasopressor
7. Calcium channel blocker
8. Purine nucleoside
9. Platelet aggregate inhibitor
10. Alkalining agents
11. Cardiac glycoside
12. Narcotic/ analgesic
13. Diuretic
14. Nitrate
15. Antihypertensive

C. Electrical interventions
1. Purpose
2. Methods
   a. Synchronized cardioversion
   b. Defibrillation
   c. Cardiac pacing
      i. Implanted pacemaker functions
         a) Characteristics
         b) Pacemaker artifact
         c) ECG tracing of capture
         d) Failure to sense
            i) ECG indications
            ii) clinical significance
         e) Failure to capture
            i) ECG indications
            ii) clinical significance
         f) Failure to pace
            i) ECG indications
            ii) clinical significance
         g) Pacer-induced tachycardia
            i) ECG findings
            ii) clinical significance
            iii) refer to ILCOR Consensus for treatment
      ii. Transcutaneous pacing
         a) Criteria for use
            i) bradycardia
               (a) patient is hypotensive/hypoperfusing with CNS involvement
               (b) refer to ILCOR Consensus for treatment
            ii) second degree av block
               (a) patient is hypotensive/hypoperfusing with CNS involvement
               (b) refer to ILCOR Consensus for treatment
            iii) complete AV block
               (a) patient is hypotensive/hypoperfusing with CNS involvement
               (b) refer to ILCOR Consensus for treatment
d. Set-up
   i. placement of electrodes
   ii. rate and milliampere (mA) settings
   iii. pacer artifact
   iv. capture
   v. failure to sense
      a) causes
      b) implications
      c) interventions
   vi. failure to capture
      a) causes
      b) implications
      c) interventions
   vii. failure to pace
      a) causes
      b) implications
      c) interventions
   viii. hazards
   ix. complications

D. Transport
   1. Indications for rapid transport
   2. Indications for no transport required
   3. Indications for referral

E. Support and communications strategies
   1. Explanation for patient, family, significant others
   2. Communications and transfer of data to the physician

X. Acute coronary syndrome

A. Epidemiology

B. Precipitating causes
   1. Atherosclerosis
   2. Vasospastic (Prinzmetal's)

C. Morbidity/ mortality
   1. Not a self-limiting disease
   2. Chest pain may dissipate, but myocardial ischemia and injury can continue
   3. A single anginal episode may be a precursor to myocardial infarction
   4. May not be cardiac in origin
   5. Must be diagnosed by a physician
   6. Related terminology
      a. Defined as a brief discomfort, has predictable characteristics and is relieved promptly - no change in this pattern
      b. Stable
         i. occurs at a relative fixed frequency
         ii. usually relieved by rest and/ or medication
      c. Unstable
i. occurs without fixed frequency
ii. may or may not be relieved by rest and/or medication

d. Initial - first episode
e. Progressive - accelerating in frequency and duration
f. Preinfarction angina
   i. pain at rest
   ii. sitting or lying down

7. Differential diagnoses
   a. Cholecystitis
   b. Acute viral pericarditis or any other inflammatory cardiac disease
   c. Aneurysm
d. Hiatal hernia
e. Esophageal disease
f. Gastric reflux
g. Pulmonary embolism
h. Peptic ulcer disease
i. Pancreatitis
j. Chest wall syndrome
k. Costochondritis
l. Acromioclavicular disease
m. Pleural irritation
n. Respiratory infections
o. Aortic dissection
p. Pneumothorax
q. Dyspepsia
r. Herpes zoster
s. Chest wall tumors
t. Chest wall trauma

D. Primary survey findings
   1. Airway/breathing
      a. Labored breathing may or may not be present
   2. Circulation
      a. Peripheral pulses
         i. quality
         ii. rhythm
      b. Peripheral perfusion
         i. changes in skin (color, temperature and moisture)

E. History of the present illness/SAMPLE history
   1. Chief complaint
      a. Typical - sudden onset of discomfort, usually of brief duration, lasting three to five
         minutes, maybe 5 to 15 minutes; never 30 minutes to 2 hours
      b. Typical - usually relieved by rest and/or medication
      c. Epigastric pain or discomfort
      d. Atypical
   2. Denial
   3. Contributing history
      a. Initial recognized event
      b. Recurrent event
c. Increasing frequency and/or duration of event

F. Secondary survey findings
   1. Airway
   2. Breathing
      a. May or may not be labored
      b. Breath sounds
         i. may be clear to auscultation
         ii. may be congested in the bases
   3. Circulation
      a. Alterations in heart rate and rhythm may occur
      b. Peripheral pulses are usually not affected
      c. Blood pressure may be elevated during the episode and normalize afterwards
      d. ECG Devices
         i. monitor
         ii. transmission
         iii. documentation
         iv. computerized pattern identification
         v. pitfalls
         vi. common errors
      e. Findings
         i. ST segment changes are often not specific
         ii. arrhythmias and ectopy may not be present

G. Management
   1. Position of comfort
   2. Refer to ILCOR Consensus for treatment
   3. ECG
      a. Whenever possible, and scene time is not delayed, record and transmit 3-lead and/or 12-lead ECG during pain, since ECG may be normal during the pain-free period
      b. Measure, record and communicate ST segment changes
   4. Indications for Rapid Transport
      a. Sense of urgency for reperfusion
      b. No relief with medications
      c. Hypotension/hypoperfusion with CNS involvement
      d. Significant changes in ECG
   5. No transport
      a. Patient refusal
      b. Referral

H. Support and communications strategies
   1. Explanation for patient, family, significant others
   2. Communications and transfer of data to the physician

XI. Acute myocardial infarction/Angina

   A. Epidemiology

   B. Precipitating causes (as with angina)
1. Atherosclerosis  
2. Persistent angina  
3. Occlusion  
4. Non-traumatic  
   a. Recreational drugs  
5. Trauma  

C. Morbidity/ mortality  
1. Sudden death  
2. Extensive myocardial damage  
3. May result in ventricular fibrillation  

D. Primary survey findings  
1. Airway/ breathing  
2. Circulation  
   a. Peripheral pulses  
      i. quality  
      ii. rhythm  
   b. Peripheral perfusion  
      i. changes in skin  
         a) color  
         b) temperature  
         c) moisture  

E. History of the present illness/SAMPLE history  
1. Chief complaint  
   a. Typical onset of discomfort, usually of long duration, over 30 minutes  
   b. Typically unrelieved by rest and/or nitroglycerin preparation  
   c. Epigastric pain or discomfort  
   d. Atypical  
2. Contributing history  
   a. First time  
   b. Recurrent  
   c. Increasing frequency and/or duration  
3. Denial  

F. Secondary survey findings  
1. Airway  
2. Breath sounds  
   a. May be clear to auscultation  
   b. Congestion in bases may be present  
3. Circulation  
   a. Skin  
      i. pallor during the episode  
      ii. temperature may vary  
      iii. diaphoresis is usually present  
   b. Alterations in heart rate and rhythm may occur  
   c. Peripheral pulses are usually not affected  
   d. Blood pressure may be elevated or lowered  
   e. ECG findings
i. ST segment elevation
   a) height, depth and contour
   b) ST changes
   c) ST segment depression in reciprocal leads

ii. Q waves
   a) depth, duration and significance
   b) greater than 5 mm, greater than .04 seconds
   c) may indicate necrosis
   d) may indicate extensive transient ischemia

iii. ECG Rhythm analysis
   a) criteria for patient selection for rapid transport and reperfusion
   b) value
   c) signs of acute ischemia, injury, and necrosis
   d) criteria for patient selection for rapid transport and reperfusion
      i) time of onset of pain
      ii) location of ischemia and infarction
      iii) ST segment elevation
   e) cardiac arrhythmias
      i) sinus tachycardia with or without ectopy
      ii) narrow or wide QRS complex tachycardia
      iii) sinus bradycardia
      iv) heart blocks
      v) ventricular fibrillation
      vi) pulseless electrical activity (PEA)
      vii) asystole (confirmed in a second lead)

G. Management
   1. Position of comfort
   2. Refer to ILCOR Consensus for treatment
   3. Transport
      a. Criteria for rapid transport
         i. no relief with medications
         ii. hypotension/ hypoperfusion
         iii. significant changes in ECG
            a) ectopy
            b) arrhythmias
      b. ECG criteria for rapid transport and reperfusion
         i. time of onset of pain
         ii. ECG rhythm abnormalities
   4. Indications for “no transport”
      a. Refusal
      b. No other indications for no-transport
   5. Support and communications strategies
      a. Explanation for patient, family, significant others
      b. Communications and transfer of data to the physician

XII. Heart failure

   A. Epidemiology
   B. Precipitating causes
1. Left-sided failure  
2. Right-sided failure  
3. Myocardial infarction  
4. Pulmonary embolism  
5. Hypertension  
6. Cardiomegaly  
7. High output failure  
8. Low output failure  

C. Related terminology  
1. Preload  
2. Afterload  
3. Congestive heart failure  
4. Chronic versus acute  
   a. First time event  
   b. Multiple events  

D. Morbidity/ mortality  
1. Pulmonary edema  
2. Respiratory failure  
3. Death  

E. Primary survey  
1. Airway/ breathing  
2. Circulation  
   a. Peripheral pulses  
      i. quality  
      ii. rhythm  
   b. Peripheral perfusion  
      i. changes in skin (color, temperature and moisture)  

F. History of the present illness/SAMPLE history  
1. Chief complaint  
   a. Progressive or acute SOB  
   b. Progressive accumulation of edema  
   c. Weight gain over short period of time  
   d. Episodes of paroxysmal nocturnal dyspnea  
   e. Prescribed medication history  
      i. Compliance  
      ii. Non-compliance  
      iii. Borrowed  
      iv. Over-the-counter  
      v. Home remedies  
   f. Home oxygen use  

G. Secondary survey findings  
1. Level of consciousness  
   a. Unconscious  
   b. Altered levels of consciousness  
2. Airway/ breathing  
   a. Dyspnea
b. Productive cough
c. Labored breathing
   i. most common, often with activity
   ii. paroxysmal nocturnal dyspnea (PND)
   iii. tripod position
   iv. adventitious sounds
   v. retraction

3. Circulation
   a. Heart rate/ rhythm
      i. any tachycardia with ectopy
      ii. any bradycardia with ectopy
      iii. atrial arrhythmias
   b. Changes in skin
      i. color
      ii. temperature
      iii. moisture
   c. Peripheral pulses
      i. quality
      ii. rhythm
   d. Edema
      i. pitting versus non-pitting
      ii. extremities
         a) localized in ankles
         b) to the midcalf
         c) to the knees
         d) obliteration of pulses
      iii. ascites
      iv. sacral

H. Complications
   1. Pulmonary edema (signs and symptoms)
      a. Tachypne
      b. wheezing/rhonchi
      c. crackles/rales at both bases
      d. frothy sputum
      e. elevated jugular venous pressure
      f. pulsus paradoxus
      g. rapid "thready" pulse
      h. pulsus alternans
      i. cyanosis in advanced stages
      j. abnormalities of apical pulse
         i. due to displaced cardiac apex
         ii. abnormal bulges

I. Management
   1. Position of comfort
   2. Refer to ILCOR Consensus for treatment
   3. Transport
      a. Refusal
      b. No other indications for no-transport
J. Support and communications strategies
   1. Explanation for patient, family, significant others
   2. Communications and transfer of data to the physician

XIII. Non-Traumatic Cardiac tamponade

A. Pathophysiology
   1. Defined as impaired diastolic filling of the heart caused by increased intrapericardiac pressure

B. Precipitating causes
   1. Gradual onset with neoplasm or infection
   2. Acute onset with infarction
   3. Trauma
      a. Can occur with CPR
      b. Penetrating injury
      c. Non-penetrating injury
   4. Secondary to renal disease
   5. Hypothyroidism

C. Morbidity/ mortality

D. Primary survey
   1. Airway/ breathing
   2. Circulation
      a. Peripheral pulses
         i. quality
         ii. rhythm
      b. Peripheral perfusion
         i. Skin color
         ii. Temperature
         iii. Moisture

E. History of the present illness/SAMPLE history (consider precipitating causes listed above)

F. Secondary survey
   1. Airway/ breathing
      a. Dyspnea
      b. Orthopnea
   2. Circulation
      a. Pulse rate and rhythm
      b. Chest pain
      c. Tachycardia
      d. Ectopy
      e. Elevated venous pressures (early sign)
      f. Decreased systolic pressure (early sign)
      g. Narrowing pulse pressure (early sign)
      h. Pulsus paradoxus
      i. Heart sounds normal early on, progressively faint or muffled
      j. ECG changes
i. low voltage QRS and T waves
ii. ST elevation or non-specific T wave changes
iii. electrical alternans of PQRST
iv. usually inconclusive - should not be used as a diagnostic tool

G. Management
1. Airway management and ventilation
2. Refer to ILCOR Consensus for treatment
3. Rapid transport for pericardiocentesis

H. Support and communications strategies
1. Explanation for patient, family, significant others
2. Communications and transfer of data to the physician

XIV. Hypertensive emergencies

A. Epidemiology

B. Precipitating causes
1. History of hypertension
2. Non-compliance with medication or any other treatment
3. Toxemia of pregnancy

C. Morbidity/ mortality
1. Hypertensive encephalopathy
2. Stroke

D. Primary examination
1. Airway/ breathing
2. Circulation
   a. Peripheral pulses
      i. quality
      ii. rhythm
   b. Peripheral perfusion
      i. changes in skin color
      ii. changes in skin temperature
      iii. changes in skin moisture

E. History of the present illness/SAMPLE history (consider precipitating causes listed above)
1. Chief complaint
2. Medication history
   a. Prescribed
      i. compliance
      ii. non-compliance with medication or treatment
   b. Borrowed
   c. Over-the-counter
   d. Home remedies
3. Home oxygen use

F. Secondary survey
1. Airway
2. Circulation
   a. Pulse
   b. Vital signs
3. Diagnostic signs/ symptoms
   a. General appearance
   b. Level of consciousness
      i. unconscious
      ii. altered level of consciousness
      iii. responsive
   c. Skin color
   d. Skin hydration
   e. Skin temperature
   f. Peripheral pulses
   g. Edema
   h. Paroxysmal nocturnal dyspnea
   i. Labored breathing (SOB)
   j. Orthopnea
   k. Vertigo
   l. Epistaxis
   m. Tinnitus
   n. Changes in visual acuity
   o. Nausea/vomiting
   p. Seizures
   q. Lateralizing signs
   r. ECG findings

G. Management
   1. Position of comfort
   2. Airway and ventilation
   3. Refer to ILCOR Consensus for treatment
   4. Rapid transport
      a. Refusal
      b. No other indications for no transport

H. Support and communications strategies
   1. Explanation for patient, family, significant others
   2. Communications and transfer of data to the physician

XV. Cardiogenic shock

A. Pathophysiology

B. Precipitating causes
   1. Myocardial infarction
   2. Age
   3. Trauma

C. Primary survey
   1. Airway/ breathing
2. Circulation
   a. Peripheral pulses
      i. quality
      ii. rhythm
   b. Peripheral perfusion
      i. changes in skin color
      ii. changes in skin temperature
      iii. changes in skin moisture

D. History of the present illness/SAMPLE history (consider precipitating causes listed above)
   1. Chief complaint

2. Medication history
   a. Prescribed
      i. compliance
      ii. non-compliance
   b. Borrowed
   c. Over-the-counter
   d. Home remedies

E. Secondary survey
   1. Critical findings
      a. Unconscious
      b. Altered levels of consciousness
      c. Airway
         i. dyspnea
         ii. productive cough
         iii. labored breathing
            a) paroxysmal nocturnal dyspnea (PND)
            b) tripod position
            c) adventitious sounds
            d) retraction
      d. ECG rhythm analysis
         i. any tachycardia
         ii. atrial arrhythmias
         iii. ectopics
      e. Changes in skin
         i. color
         ii. temperature
         iii. moisture
      f. Peripheral pulses
         i. quality
         ii. rhythm
      g. Edema
         i. pitting versus non-pitting
         ii. extremities
         iii. obliteration of pulses
         iv. sacral

F. Management
1. Position of comfort
2. Refer to ILCOR Consensus for treatment
3. Transport
   a. Refusal
   b. No other indications for no transport

G. Support and communications strategies
   1. Explanation for patient, family, significant others
   2. Communications and transfer of data to the physician

XVI. Cardiac arrest

A. Pathophysiology

B. Precipitating causes
   1. Trauma
   2. Medical conditions (for example)
      a. End stage renal disease
      b. Hyperkalemia with renal disease

C. Primary survey critical findings
   1. Unresponsive
   2. Apneic
   3. Peripheral pulses absent
   4. Heart rate/ rhythm
      a. Ventricular fibrillation
      b. ventricular tachycardia
      c. asystole
      d. PEA

D. History of the present illness/SAMPLE history (consider precipitating causes listed above)
   1. Witnessed event
   2. Witnessed by EMS personnel
   3. Bystander cardiopulmonary resuscitation (CPR)
   4. Time from discovery to activation of CPR
   5. Time from discovery to activation of EMS
   6. Past medical history

E. Management
   1. Related terminology
      a. Resuscitation - to provide efforts to return spontaneous pulse and breathing to the patient in full cardiac arrest
      b. Survival - patient is resuscitated and survives to hospital discharge
      c. Return of spontaneous circulation (ROSC) - patient is resuscitated to the point of having pulse without CPR; may or may not have return of spontaneous respirations; patient may or may not go on to survive
   2. Indications for WITHHOLDING resuscitation efforts
   3. Advanced airway management and ventilation
   4. Circulation
   5. IV therapy as appropriate
6. Refer to ILCOR Consensus for treatment
7. Rapid transport

F. Support and communications strategies
   1. Explanation for patient, family, significant others
   2. Communications and transfer of data to the physician

G. Termination of resuscitation efforts
   1. Inclusion criteria (for example)
      a. 18 or older
      b. Arrest is presumed cardiac in origin and not associated with a condition potentially responsive to hospital treatment (for example - hypothermia, drug overdose, toxicologic exposure, etc.)
      c. Endotracheal intubation has been successfully accomplished and maintained
      d. Standard advanced cardiac life support (ACLS) measures have been applied throughout the resuscitative effort
      e. On-scene ALS resuscitation efforts have been sustained for 25 minutes or the patient remains in asystole through four rounds of appropriate ALS drugs
      f. Patient has a cardiac rhythm of asystole or agonal rhythm at the time the decision to terminate is made and this rhythm persists until the arrest is actually terminated
      g. Victims of blunt trauma in arrest whose presenting rhythm is asystole, or who develop asystole while on scene
   2. Exclusion criteria - for example
      a. Under the age of 18 years
      b. Etiology for which specific in-hospital treatment may be beneficial
      c. Persistent or recurrent ventricular tachycardia or fibrillation
      d. Transient return of pulse
      e. Signs of neurological viability
      f. Arrest was witnessed by EMS personnel
      g. Family or responsible party opposed to termination
   3. Criteria NOT to be considered as inclusionary or exclusionary
      a. Patient age - for example, geriatric
      b. Time of collapse prior to EMS arrival
      c. Presence of a non-official do-not-resuscitate (DNR) order
      d. "Quality of life" valuations
   4. Procedures (according to local protocol)
      a. Direct communication with medical oversight
         i. medical condition of the patient
         ii. known etiologic factors
         iii. therapy rendered
         iv. family present and apprised of the situation
         v. communicate any resistance or uncertainty on the part of the family
         vi. maintain continuous documentation to include the ECG
         vii. mandatory review after the event
            a) grief support (according to local protocol)
               i) EMS assigned personnel
               ii) community agency referral
            b) law enforcement (according to local protocol)
               i) on-scene determination if the event/ patient requires assignment of the patient to the medical examiner
ii) on-scene law enforcement communicates with attending physician for the death certificate
iii) if there is any suspicion about the nature of the death, or if the physician refuses or hesitates to sign the death certificate
iv) no attending physician is identified (the patient will be assigned to the medical examiner)

XVII. Vascular disorders

A. Epidemiology
   1. Trauma
   2. Non-traumatic
   3. Precipitating causes
      a. Atherosclerosis
      b. Aneurysm
         i. atherosclerotic
         ii. dissecting
         iii. infections
         iv. congenital
      c. Marfan's syndrome
      d. Inflammation
         i. arterial
         ii. peripheral arterial atherosclerotic disease
      e. Occlusive disease
         i. trauma
         ii. thrombosis
         iii. tumor
         iv. embolus
         v. idiopathic
      f. Venous thrombosis
         i. phlebitis
         ii. varicose veins

B. Morbidity/ mortality
   1. Pulmonary occlusion
   2. Cerebral occlusion
   3. Mesenteric occlusion
   4. Hypoperfusion state
   5. Death

C. Primary survey
   1. Airway/ breathing
   2. Circulation (distal to or over the affected area)
      a. Pain
      b. Pallor
      c. Pulselessness
      d. Paralysis
      e. Paresthesia
   3. Skin
      a. Pallor or mottled distal to or over the affected area
b. Skin temperature may vary

D. History of the present illness/SAMPLE history (consider precipitating causes listed above)
   1. Chief complaint
      a. Sudden or gradual onset of discomfort
      b. May be localized
      c. Pain
         i. chest, abdominal or involved extremity
            a) sudden or gradual
            b) radiating or localized
            c) claudication
         ii. relief with rest or not
   2. Contributing history
      a. Initial recognized event
      b. Recurrent event
      c. Increasing frequency and/or duration of event

E. Secondary survey
   1. Airway
   2. Breath sounds
      a. May be clear to auscultation
   3. Circulation
      a. Alterations in heart rate and rhythm may occur
      b. Peripheral pulses absent or diminished over the affected extremity
      c. Blood pressure
      d. Bruit over affected vessel(s)
      e. Skin
         i. may be cool reflecting diminished circulation to the affected area or extremity
         ii. may be moist or dry reflecting diminished circulation to the affected area or extremity
      f. ECG findings may be non contributory

F. Management
   1. Position of comfort
   2. Refer to ILCOR Consensus for treatment
   3. Transport
      a. Indications for rapid transport
         i. no relief with medications
         ii. hypotension/ hypoperfusion
      b. No transport
         i. refusal
         ii. relief and refusal

G. Support and communications strategies
   1. Explanation for patient, family, significant others
   2. Communications and transfer of data to the physician

XVIII. Aortic Aneurysm/Dissection
A. Thoracic

B. Abdominal

XIX. Thromboembolism

A. Arterial Occlusion

B. Venous Thrombosis

XX. Congenital Heart Disease

A. Pulmonary Stenosis
   1. Stenosis of pulmonary valve
   2. Increased Resistance to Outflow
   3. Elevates Right Ventricular Pressure
   4. Limits pulmonary blood flow

B. Septal Defects
   1. Atrial -- Blood from left atrium passes into right atrium
   2. Ventricular -- Blood from left ventricle passes into right ventricle

C. Patent Ductus Arteriosus
   1. Ductus Arteriosus fails to close during embryonic development
   2. Blood flow continuously from aorta through ductus into the pulmonary artery
   3. Increases workload of left ventricle

XXI. Valvular Heart Disease

A. Stenosis

B. Regurgitation

XXII. Coronary Artery Disease

A. Atherosclerosis

B. Intravascular Lesion
   1. Coronary Vasospasm
      a. Reduced blood flow
      b. Decreased oxygen delivery to myocardium
      c. May be drug induced (cocaine)
   2. Plaque rupture
      a. Vasoconstriction
      b. Platelet Adherence
      c. Thrombus formation
         i. partial occlusion
         ii. complete occlusion

XXIII. Infectious Diseases of the Heart
A. Result from intravascular contamination by pathogen
   1. Endocarditis
   2. Pericarditis
   3. Myocarditis

B. Damages heart valves

C. Damages heart muscle

D. Embolizes

XXIV. Cardiomyopathy
   A. Dilated
   B. Hypertrophic

XXV. Specific Hypertensive Emergencies
   A. Accelerated and Malignant Hypertension
   B. Hypertensive Encephalopathy
   C. Intracranial Hemorrhage
   D. Acute Left Ventricular Failure
   E. Acute Cardiac Ischemia
   F. Acute Aortic Dissection
   G. Eclampsia

XXVI. Infectious Diseases of the Heart
   A. Epidemiology
      1. Incidence
      2. Morbidity and mortality
      3. Risk factors
         a. Injection drug use
         b. Recent dental surgery
         c. Permanent central venous access lines
         d. Prior valve surgery
         e. Weakened valves
      4. Prevention strategies
   B. Pathophysiology
      1. Chronic versus acute
         a. First time event
         b. Multiple events
2. Involvement
   a. Heart Muscle
   b. Heart Valves
   c. Heart lining

C. Specific Disease
   1. Endocarditis
   2. Pericarditis
   3. Rheumatic Fever
   4. Scarlet Fever

D. Assessment
   1. Primary exam
   2. Secondary exam

E. Management (refer to ILCOR consensus treatment)
   1. Initial general therapy
   2. Management of arrhythmias
   3. Adjunctive prehospital therapy

F. Consider age-related variations for pediatric and geriatric patients

XXVII. Congenital Abnormalities and Age-Related Variations

A. Epidemiology
   1. Incidence
   2. Morbidity and mortality
   3. Risk factors
   4. Prevention strategies

B. Pathophysiology
   1. Causes
      a. Genetic mutations
      b. Environmental insults
         i. maternal rubella
         ii. maternal ingestion of alcohol
         iii. maternal ingestion of drugs or certain medications
   2. Altered embryonic development of heart structures
      a. Visible
      b. Microscopic
   3. Malformations lead to altered cardiac function and hemodynamics

C. Specific Diseases
   1. Left to right shunt
      a. Coarctation of the aorta (CoA)
      b. Atrial septal defect (ASD)
      c. Ventricular septal defect (VSD)
      d. Patent ductus arteriosus (PDA)
      e. Truncus arteriosus
      f. Congestive heart failure
2. Valvular and vascular lesions
   a. Tricuspid atresia
   b. Hypoplastic left heart syndrome (HLHS)
   c. Tetralogy of Fallot (ToF)
3. Transposition
   a. Transposition of the great arteries (TGA)
   b. Total anomalous pulmonary venous return (TAPVR)
4. Congenital Arrhythmias
   a. Heart Blocks
   b. Supraventricular tachycardia

D. Assessment
   1. Primary exam
   2. Secondary exam

E. Management (refer to ILCOR consensus treatment)
   1. Initial general therapy
   2. Management of arrhythmias
   3. Adjunctive prehospital therapy

XXVIII. Integration

A. Apply pathophysiological principles to the assessment of a patient with cardiovascular disease

B. Formulation of field impression; decisions based on:
   1. Primary examination
   2. History of the present illness/SAMPLE history
   3. Secondary examination

C. Develop and execute a patient management plan based on field impression
   1. Initial management
      a. Airway support
      b. Ventilation support
      c. Circulation support
      d. Non-pharmacological interventions
      e. Pharmacological interventions
      f. Electrical interventions
   2. Re-assessment
   3. Transport criteria
      a. Appropriate mode
      b. Appropriate facility
   4. Non-transport criteria
   5. Advocacy
   6. Communications
   7. Prevention
   8. Documentation
   9. Quality assurance
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Epidemiology of toxicology emergencies

   A. Review of epidemiology of poisoning
      1. Local
      2. Regional
      3. National

   B. National Resources for Poisoning
      1. National Poison Control Center
      2. National Courses in Toxicology
      3. Centers for Disease Control and Prevention (CDC)

   C. Types of toxicological emergencies
      1. Unintentional poisoning
         a. Dosage errors
         b. Idiosyncratic reactions
         c. Childhood poisoning
         d. Environmental exposure
         e. Occupational exposures
      2. Drug/ alcohol abuse
      3. Intentional poisoning/ overdose
         a. Chemical warfare
         b. Assault/ homicide
         c. Suicide attempts

   D. Pharmacokinetics

   E. Routes of absorption
      1. Ingestion
      2. Inhalation
      3. Injection
      4. Absorption

   F. Poisoning by ingestion
      1. Examples
      2. Anatomy and physiology review
         a. Absorption
         b. Distribution
      3. Assessment findings
4. General management considerations

G. Poisoning by inhalation
1. Examples
2. Anatomy and physiology review
   a. Absorption
   b. Distribution
3. Assessment findings
4. General management considerations

H. Poisoning by injection
1. Examples
   a. Intravenous drug abuse
   b. Venomous bites and stings
2. Anatomy and physiology review
   a. Absorption
   b. Distribution
3. Assessment findings
4. General management considerations

I. Poisoning by absorption
1. Examples
2. Anatomy and physiology review
   a. Absorption
   b. Distribution
3. Assessment findings
4. General management considerations

II. Toxic syndromes (Toxidromes) including drugs of abuse

A. Introduction--Pathophysiology, incidence, toxic agents, risk factors, methods of transmission, complications

B. Cholinergics
1. Common causative agents - pesticides (organophosphates, carbamates) and nerve agents (Sarin, Soman)
2. S/S for patients with exposure to cholinergics
   a. Headache, dizziness, weakness, nausea
   b. SLUDGE (salivation, lacrimation, urination, defecation, GI Upset, Emesis)
   c. Bradycardia, wheezing, bronchoconstriction, myosis, coma, convulsions
   d. Diaphoresis, seizures
3. Management for a patient with exposure to cholinergics
   a. Decontamination
   b. Airway and ventilation and circulation
   c. Pharmacological
      i. atropine
      ii. pralidoxime chloride (2-PAM)
      iii. diazepam
      iv. activated charcoal
   d. Non-pharmacological
C. Anticholinergic
1. Common causative agents
2. S/S for patients with exposure to anticholinergics
   a. Delirium, Flushed Skin, Dilated Pupils, Urinary Retention
   b. Memory Loss, Seizures
3. Management for a patient with exposure to anticholinergics
   a. Airway and ventilation
   b. Pharmacological
   c. Non-pharmacological

D. Marijuana and cannabis compounds
1. Common causative agents
2. S/S for patients with exposure/use of cannabis
3. Management for a patient with exposure to cannabis
   a. Airway and ventilation and circulation
   b. Pharmacological
   c. Non-pharmacological

E. Sympathomimetics/Stimulates
1. Common causative agents
   a. Cocaine
   b. Methamphetamine
   c. Ecstasy
   d. ICE
   e. Other
2. S/S for patients with exposure to/use of Sympathomimetics/Stimulates
   a. Agitated delirium
   b. Hypertensive emergencies
   c. Psychosis/ seizures
   d. Malignant Hyperthermia
   e. Cardiac damage
3. Management for a patient with exposure to/use of Sympathomimetics/Stimulates
   a. Airway and ventilation and circulation
   b. Pharmacological/Sedation/restraint
   c. Non-pharmacological

F. Barbiturates/sedatives/ hypnotics
1. Common causative agents
2. S/S for patients with exposure to/use of Barbiturates/sedatives/ hypnotics
   a. Respiratory depression/ respiratory arrest
   b. Hypotension
   c. CNS
3. Management for exposure to/use of Barbiturates/sedatives/hypnotics
   a. Airway and ventilation and circulation
   b. Pharmacological
   c. Non-pharmacological

G. Hallucinogens
1. Common causative agents
   a. lysergic acid diethylamide (LSD)
   b. phencyclidine (PCP)
   c. peyote, mushrooms, jimson weed, mescaline
   d. Other
2. S/S for patients with exposure to/use of Hallucinogens
   a. CNS and behavioral
   b. Chest pain
3. Management for a patient with exposure to/use of Hallucinogens
   a. Airway and ventilation and circulation
   b. Pharmacological/sedation/restraint
   c. Non-pharmacological

H. Opiates
1. Common causative agents
   a. heroin, morphine, methadone
   b. codeine, meperidine, propoxyphene
   c. fentanyl, lortab, oxycontin
   d. other
2. S/S for patients with exposure to/use opiates
   a. CNS—Euphoria, decreased level of consciousness, sedation
   b. Hypotension
   c. Respiratory depression/arrest
   d. Nausea, Pinpoint pupils
   e. Seizures and Coma
3. Management for a patient with exposure to/use of opiates
   a. Airway and ventilation and circulation
   b. Pharmacological/sedation/restraint
   c. Non-pharmacological

I. Huffing Agent (Halogenated Hydrocarbons)
1. Common causative agents
2. S/S for patients with exposure to/use of Huffing agents
   a. Cardiovascular collapse and Ventricular arrhythmias
   b. Seizure
   c. Psychosis
3. Management for a patient with exposure to/use of huffing agents
   a. Airway and ventilation and circulation
   b. Pharmacological/sedation/restraint
   c. Non-pharmacological

III. Alcoholism

   A. Introduction—Epidemiology, risk factors, morbidity/mortality complications

   B. Pathophysiology of long term and acute alcohol abuse and withdrawal
      1. End organ damage
         a. Brain
         b. Liver
         c. Heart
d. Bone
e. Pancreas

2. S/S for patients with acute and chronic alcohol abuse and withdrawal
3. Management for a patient with acute and chronic alcohol abuse and withdrawal
   a. Airway and ventilation and circulation
   b. Pharmacological/restraint
   c. Non-pharmacological

IV. Poisonings and exposures

   A. Chemicals
      1. Agents
         a. Cyanide
         b. Solvents
         c. Carbon monoxide
         d. Alcohols
         e. Hydrocarbons
         f. Caustics
         g. Metals
         h. Hydrogen Fluoride
         i. Hydrogen Sulfide
         j. Oxides of Nitrogen
         k. Ammonia
         l. Chlorine
      2. S/S for patients with chemical poisoning/exposure
      3. Management for a patient with chemical poisoning/exposure
         a. Airway and ventilation and circulation
         b. Pharmacological
         c. Non-pharmacological

V. Household Poisons
   A. Pesticides
      1. Organophosphates
      2. Carbamates
      3. Warfarins
      4. Pyrethrums (Raid)
   B. Household Cleaning poisonings
      1. Bleach
      2. Cleaning agents
      3. Pine oil products
   C. Poisonous Plants
      1. China Berry
      2. Foxglove
      3. Mistletoe
      4. Dieffenbachia
      5. Others
   D. S/S for patients with poisoning/exposure to household poisons
E. Management for a patient with chemical poisoning/exposure to household poisons
   1. Airway and ventilation and circulation
   2. Pharmacological
   3. Non-pharmacological

VI. Medication overdose-- Introduction--Pathophysiology, incidence, toxic agents, risk factors, complications

   A. Cardiac medications
   B. Psychiatric medications
   C. Non-prescription pain medications including Salicylates and Acetaminophen
   D. Other
   E. S/S for patients with medication overdose
   F. Management for a patient with medication overdose
      1. Airway and ventilation and circulation
      2. Pharmacologic
      3. Non-pharmacologic

VII. General Treatment modalities for Poisonings

   A. Facilitated Airway Control
   B. Respiratory Support
   C. Circulation Support

   D. Antidote Therapy
      1. Methylene Blue
      2. Cyanide Antidotes
      3. Physostigmine
      4. Alkalization and Sodium Bicarbonate
      5. Atropine and Pralidoxime (2-PAM)
      6. Narcan
      7. Sedatives
      8. Solu-medrol, decadron
      9. Beta Agonist
      10. Ipecac
      11. Haldol
      12. Glucagon
      13. Flumazenil
      14. Dinercapel
      15. Digibind
      16. Calcium Gluconate
      17. Activated Charcoal
E. Decontamination

VIII. Communication and documentation for patients with toxicological emergencies

IX. Transport decisions with toxicological emergencies

X. Age-related variations for pediatric and geriatric patients

XI. Patient education and prevention of toxicological emergencies and drug and alcohol abuse
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

A. Epidemiology
   1. Mortality/ morbidity
   2. Risk factors
      a. Intrinsic factors which increase the risk of developing respiratory disease
         i. genetic predisposition
         ii. associated cardiac or circulatory pathologies
         iii. stress
      b. Extrinsic factors which increase the risk of developing respiratory disease
         i. smoking
         ii. environmental pollutants

B. Anatomy and physiology review
   1. Global physiology of the pulmonary system
      a. Function
      b. Physiology
         i. ventilation
         ii. diffusion
         iii. perfusion
   2. Anatomy of the pulmonary system
      a. The upper airway
         i. functions
         ii. structures
            a) nose
            b) pharynx
            c) larynx
      b. The lower airway
         i. functions
         ii. structures
            a) trachea
            b) bronchi
            c) bronchioles
            d) cilia
      c. The gas exchange interface
         i. functions
         ii. structures
            a) alveoli
            b) interstitial space
c) pulmonary capillary bed
d. The chest wall
   i. functions
   ii. structures
      a) diaphragm is the major muscle of respiration
      b) intercostal muscles
      c) accessory muscles
      d) pleural space
e. The neurologic control of breathing
   i. functions
   ii. structures
      a) medulla
      b) phrenic nerve innervate the diaphragm
      c) spinal nerves (thoracic levels) innervate the intercostal
      d) Hering-Breuer reflex prevents overinflation

II. General system pathophysiology, assessment and management

A. Pathophysiology
   1. Specific conditions
      a. Ventilation
         i. upper airway obstruction
            a) trauma
            b) epiglottitis
            c) laryngotracheobronchitis
            d) abscess
            e) foreign body obstruction
            f) inflammation of the tonsils
         ii. lower airway obstruction
            a) trauma
            b) obstructive/restrictive lung diseases
               i) emphysema
               ii) chronic bronchitis
            c) mucous accumulation
            d) reactive airway disease
               i) smooth muscle spasm including asthma
            e) airway edema
         iii. chest wall impairment
            a) spontaneous pneumothorax
            b) pleural inflammation and effusion
            c) neuromuscular diseases (such as muscular sclerosis or muscular dystrophy)
      b. Diffusion
         i. inadequate oxygen concentration in ambient air
         ii. alveolar pathology
            a) asbestosis, other environmental lung diseases
            b) blebs/ bullae associated with chronic obstructive lung disease
            c) inhalation injuries
         iii. interstitial space pathology
         iv. adult respiratory distress syndrome (ARDS)
v. submersion/drowning

c. Perfusion
   i. inadequate blood volume/ hemoglobin levels
      a) hypovolemia
      b) anemia
   ii. impaired circulatory blood flow

B. Assessment Findings
1. Scene size-up
   a. Pulmonary complaints may be associated with exposure to a wide variety of toxins, including carbon monoxide, toxic products of combustion, or environments that have deficient ambient oxygen (such as silos, enclosed storage spaces etc.)
   b. It is critical to assure a safe environment for all EMS personnel before initiating patient contact

2. Initial assessment -- signs of life threatening respiratory distress
   a. Alterations in mental status
   b. absent alveolar breath sounds
   c. cyanosis
   d. audible stridor/grunting respirations
   e. 1-2 word dyspnea
   f. tachycardia > 130 beats/ minute
   g. pallor and diaphoresis
   h. presence of retractions/ use of the accessory muscles
   i. nasal flaring

3. Focused history and physical examination
   a. Chief complaint
      i. dyspnea
      ii. chest pain
      iii. cough
         a) productive
         b) non-productive
         c) hemoptysis
      iv. wheezing
   v. signs of infection
      a) fever/ chills
      b) increased sputum production

b. History
   i. previous experiences with similar/identical symptoms
   ii. known pulmonary diagnosis
   iii. history of previous intubation
   iv. medication history
      a) current medications
      b) medication allergies
      c) pulmonary medications
         i) sympathomemetic
         ii) corticosteroid
         iii) chromolyn sodium
         iv) methylxanthines (theophyllin preparations)
         v) antibiotics
         vi) other
d) cardiac-related drugs

v. history of the present episode

vi. exposure/ smoking history

c. Physical exam

i. general impression
   a) position
   b) mentation
   c) ability to speak
   d) respiratory effort
   e) color

ii. vital signs
   a) pulse
      i) tachycardia is a sign of hypoxemia and the use of sympathomimetic medications
      ii) in the face of a pulmonary etiology, bradycardia is an ominous sign of severe hypoxemia and imminent cardiac arrest
   b) blood pressure
   c) respiratory rate
      i) the respiratory rate is not a very accurate indicator of respiratory status unless it is very slow
      ii) trends are essential in evaluating the chronic patient

d) respiratory patterns
   i) eupnea
   ii) tachypnea
   iii) Cheyne-Stokes
   iv) central neurogenic hyperventilation
   v) Kussmaul
   vi) ataxic (Biot’s)
   vii) apneustic
   viii) apnea

iii. head/ neck
   a) pursed lip breathing
   b) use of accessory muscles
   c) sputum
   d) jugular venous distention

iv. chest
   a) signs of trauma
   b) barrel chest
   c) retractions
   d) symmetry
   e) breath sounds
      i) normal
      ii) abnormal

v. extremities
   a) peripheral cyanosis
   b) clubbing
   c) carpopedal spasm

d. Diagnostic testing
i. pulse oximetry
ii. peak flow
iii. end-tidal carbon dioxide assessment
   a) capnometry
   b) capnography

C. Management
   1. Airway and ventilation
   2. Circulation—intravenous therapy
   3. Pharmacological
   4. Non-pharmacological -- Continuous positive airway pressure
   5. Monitoring and devices used in pulmonary care
      a. Pulse oximetry
      b. Peak flow
      c. Capnometry or capnography
      d. Other
   6. Transport considerations

III. Specific illness/injuries: causes, assessment findings and management for each condition

A. Acute/ adult respiratory distress syndrome

B. Chronic obstructive airway diseases
   1. Asthma
   2. Chronic bronchitis
   3. Emphysema

C. Pneumonia

D. Pulmonary edema
   1. High pressure (cardiogenic)
      a. Acute myocardial infarction
      b. Chronic hypertension
      c. Myocarditis
   2. High permeability (non-cardiogenic)
      a. Acute hypoxemia
      b. Drowning
      c. Post-cardiac arrest
      d. Post shock
      e. High altitude exposure
      f. Inhalation of pulmonary irritants
      g. Adult respiratory distress syndrome (ARDS)

E. Pulmonary thromboembolism

F. Neoplasms of the lung

G. Pertussis

H. Cystic fibrosis
I. Upper respiratory infection

J. Spontaneous pneumothorax

K. Hyperventilation syndrome

IV. Consider age-related variations

A. Pediatric
   1. Anatomic and physiologic differences in children
   2. Pathophysiology
      a. Respiratory distress
      b. Respiratory failure
      c. Respiratory arrest
   3. Upper airway obstruction
      a. Croup
      b. Foreign body aspiration
      c. Bacterial tracheitis
      d. Epiglottitis
      e. Tracheostomy dysfunction
   4. Lower airway disease
      a. Asthma
      b. Bronchiolitis
      c. Pneumonia
      d. Foreign body lower airway obstruction
      e. Pertussis
      f. Cystic fibrosis
      g. Bronchopulmonary dysplasia

V. Communication and documentation for patients with a respiratory condition or emergency

VI. Transport decisions

VII. Patient education and prevention of complications or future respiratory emergencies.
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

A. Epidemiology
   1. Incidence
   2. Morbidity/mortality

B. Anatomy and physiology review
   1. Blood
   2. Plasma
   3. Blood-forming organs
   4. Normal red cell production, function and destruction
   5. Normal white cell production and function
   6. The inflammatory process
   7. Immunity
      a. Cellular immunity
      b. Humoral immunity
      c. Autoimmune diseases
   8. Blood groups
   9. Hemostasis
      a. Vascular components
      b. Coagulation mechanisms

II. General assessment findings and symptoms

A. Level of consciousness

B. Skin

C. Visual disturbances

D. Gastrointestinal

E. Skeletal

F. Cardiorespiratory

G. Genitourinary

III. General management for a patient with a hematological condition or emergency
A. Airway, ventilation, and circulation

B. Pharmacological

C. Non-pharmacological

D. Transport considerations

E. Psychological/communication strategies

IV. Sickle Cell Disease

A. Definition, pathophysiology, epidemiology, mortality and morbidity
   1. Types of emergent presentations
      a. Vaso-occlusive crisis
         i. description
         ii. signs and symptoms
         iii. implications
      b. Acute chest syndrome
         i. description
         ii. signs and symptoms
         iii. implications
      c. Acute splenic sequestration syndrome (pediatric)
         i. description
         ii. signs and symptoms
         iii. implications
   2. Patient management
      a. Administer high-concentration oxygen
      b. Initiate IV therapy—administer IV fluids to hydrate
      c. Maintain normothermic
      d. Rest
      e. Pain management

V. Hematological conditions

A. Definitions, Pathophysiology, epidemiology, mortality and morbidity, and complications

B. Specific assessment findings and symptoms

C. Specific management considerations

D. Conditions
   1. Sickle Cell Crisis
   2. Anemia
      a. types
      b. hemolytic
      c. Sickle cell
   3. Leukopenia
   4. Thrombocytopenia
5. Leukemia
6. Lymphomas
7. Polycythemia
8. Disseminated intravascular coagulopathy
9. Hemophilia
10. Hemophilia A, deficiency in factor VIII
11. Hemophilia B, deficiency in factor IX
12. Multiple myeloma
13. Homostatic Disorders

VI. Blood Transfusion Complications

A. Hemolytic
B. Febrile
C. Allergic
D. Transfusion-related lung injury
E. Circulatory overload
F. Bacterial infection

VII. Consider age-related variations in pediatric and geriatric patients

VIII. Patient education and prevention
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

A. Review of genitourinary System
   1. General anatomy
      a. Structure of the kidneys, ureters, bladder, and urethra
      b. Structure and function of the nephron
   2. Functions of the urinary system
      a. Regulating water and electrolytes
      b. Regulating acid-base
      c. Excreting waste products and foreign chemicals
      d. Regulating arterial blood pressure
      e. Producing red blood cells
      f. Producing glucose

II. Renal Diseases

A. Overview of renal conditions
   1. Pathophysiology
      a. Prerenal- Decreased blood flow to kidneys
      b. Intrarenal-Disease or damage within the kidneys
      c. Postrenal- Blockage to urine collecting system
   2. Incidence, morbidity, and mortality
      a. Acute renal failure
         i. definition
         ii. causes
      b. Chronic renal failure
         i. definition
         ii. causes
      c. End Stage Renal Disease (ESRD)

B. Assessment findings and symptoms for renal failure
   1. Acute
      a. Reduced or no urinary output
      b. Excessive urinary output at night
      c. Lower extremity swelling
      d. Neuropathies of hands and feet
      e. Anorexia
      f. Altered mental status
      g. Metallic taste in mouth
h. Tremors or seizures  
i. Easy bruising or prolonged bleeding  
j. Flank pain  
k. Tinnitus  
l. Hypertension  
m. Abdominal pain or discomfort

2. Chronic renal failure  
a. Headache  
b. Weakness  
c. Anorexia  
d. Vomiting  
e. Increased urination  
f. Rusty of brown-colored urine  
g. Increased thirst  
h. Hypertension  
i. Pruritis

3. End stage renal disease  
a. Confusion  
b. Altered levels of consciousness  
c. Shortness of breath  
d. Peripheral edema  
e. Chest pain  
f. Bone pain  
g. Pruritis  
h. Nausea, vomiting, diarrhea  
i. Bruising  
j. Muscle twitching, tremors, seizures  
k. Hallucinations

C. Dialysis  
1. Hemodialysis  
a. Shunt  
b. Fistula  
c. Graft  
d. Blood filtered through dialysate

2. Peritoneal dialysis

3. Special considerations for hemodialysis patients  
a. Obtaining B/P  
b. IV site, blood draw

4. Complications/Adverse effects of dialysis  
a. Hypotension  
b. Muscle cramps  
c. Nausea/Vomiting  
d. Disequilibrium syndrome  
e. Hemorrhage especially from access site  
f. Air embolism  
g. Myocardial ischemia  
h. Infection at access site  
i. Electrolyte imbalance

5. Missed dialysis treatment
a. Hyperkalemia with associated ECG changes
b. Weakness
c. Pulmonary edema
d. Uremic frost

D. Management for a patient with acute renal condition, chronic renal conditions with acute exacerbations or dialysis problems, or end stage renal disease.
   1. Management
      a. ABCs, support ventilation, intubate if necessary
      b. Stop bleeding from shunt as needed
      c. IV— restrict fluids or give fluids based
      d. Pharmacological interventions

III. Urinary System Conditions

A. Urinary retention—pathophysiology, incidence, causes
   1. Assessment findings and symptoms
      a. Unable to urinate
      b. Bladder enlargement/distention
      c. Lower abdominal pain
      d. Delirium, especially in elderly
   2. Management
      a. Primarily supportive
      b. Transport
      c. IV KVO if abdominal pain
      d. Insert catheter if local medical director approval

B. Urinary tract infection (UTI)-- pathophysiology, incidence, causes
   1. Urinary bladder infection (cystitis)
   2. Pyelonephritis
   3. Assessment findings and symptoms
      a. Burning sensation or pain when urinating
      b. Increased urgency and frequency of urination
      c. Cloudy or rust-colored urine
      d. Unusual or foul odor to urine
      e. Febrile in pyelonephritis
      f. Back or flank pain in pyelonephritis
      g. Blood in urine
      h. abdominal pain--suprapubic
   4. Management
      a. Primarily supportive, IV if febrile or abdominal pain
      b. Transport

C. Renal calculi (kidney stones) - pathophysiology, incidence, causes.
   1. Assessment findings and symptoms
      a. Severe flank or back pain
      b. Abdominal pain
      c. Pain may radiate to pelvis, groin, or genitals
      d. Increased urgency of urination
      e. Painful urination
f. Blood in urine
g. Febrile
h. Skin pale and clammy
2. Management
   a. IV fluids
   b. Transport in position of comfort
   c. Pain analgesia as needed
      i. Narcotics
      ii. Nitrous oxide
      iii. May be drug seeking

D. Acid base disturbances - pathophysiology, incidence, causes.
   1. Assessment findings and symptoms
   2. Management

E. Fluid and electrolyte - pathophysiology, incidence, causes.
   1. Assessment findings and symptoms
   2. Management

F. Infection - pathophysiology, incidence, causes.
   1. Assessment findings and symptoms
   2. Management

IV. Male genital tract conditions

A. Review of male reproductive system anatomy and physiology.

B. Blunt trauma to external genitalia
   1. Assessment findings and symptoms
      a. Scrotum or penis - swollen and tender
      b. Severe pain
      c. Blood at tip of penis
   2. Management
      a. Control bleeding
      b. Cold compress
      c. Assess and treat for shock or pelvic fracture

C. Epididymitis or orchitis - pathophysiology, incidence, causes
   1. Assessment findings and symptoms
      a. Swelling and pain in the scrotum
      b. Enlarged testes
      c. Swollen groin on affected side
      d. Testicular pain that worsens with bowel movement
      e. Fever
      f. Urethral discharge
   2. Prehospital management
      a. Supportive
      b. Analgesics may be needed

D. Fournier’s gangrene - pathophysiology, incidence, causes
1. Assessment findings and symptoms
   a. Crepitus of skin
   b. Gray-black color of tissues
   c. Drainage of pus from tissues
   d. Fever
   e. Scrotal Pain

2. Management
   a. Prompt transport to emergency department
   b. Assess and treat for shock

E. Structural conditions
   1. Phimosis or paraphimosis-- pathophysiology, incidence, causes
      a. Assessment findings and symptoms
      b. Management
         i. may apply cold compresses
         ii. prompt transport to facility
   2. Priapism- pathophysiology, incidence, causes
      a. Assessment findings and symptoms
      b. Management of priapism
         i. pain control
         ii. may need surgical intervention
   3. Benign prostate hypertrophy (BPH)- pathophysiology, incidence, causes
   4. Testicular masses-- pathophysiology, incidence, causes
   5. Testicular torsion-- pathophysiology, incidence, causes
      a. Assessment findings and symptoms
         i. sudden onset of severe pain in one testis
         ii. may occur with or without blunt trauma
         iii. swelling on one side of scrotum
         iv. testicular lump
         v. blood in semen
      b. Management
         i. prompt transport
         ii. care and comfort
         iii. analgesics to control pain

V. Consider age-related variations for pediatric and geriatric patients

VI. Communication and documentation

VII. Transport decisions

VIII. Patient education and prevention
Medicine  
Gynecology – MT13

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction
   
   A. Female reproductive system anatomy review
      1. External genitalia
      2. Internal organs and structures

II. Physiology
   
   A. Menstrual and ovarian cycles
      1. Proliferative phase
      2. Secretory phase
      3. Menstrual phase
      4. Menopause

III. Symptoms and Assessment findings
   
   A. Abdominal pain or vaginal pain
   B. Vaginal bleeding
   C. Vaginal discharge
   D. Fever
   E. Nausea and vomiting
   F. Syncope

IV. General management
   
   A. Protect privacy and modesty
   B. Communication techniques
   C. Consider pregnancy and/or sexually transmitted diseases
   D. Oxygen and IV fluids if needed

V. Vaginal Bleeding
A. Anatomy and physiology
B. Epidemiology
C. Pathophysiology
D. Psychosocial impact
E. Assessment findings/presentation
F. Prognosis
G. Management
   1. Pharmacological
   2. Non-pharmacological

VI. Sexual Assault
A. Anatomy and physiology,
B. Epidemiology
C. Pathophysiology
D. Psychosocial impact
E. Assessment findings/presentations
F. Prognosis
G. Management
   1. Pharmacological
   2. Non-pharmacological

VII. Infection (including Pelvic inflammatory disease, Bartholin’s abscess, and vaginitis/vulvovaginitis)
A. Pathophysiology
B. Assessment findings/presentation
C. Prehospital Management

VIII. Ovarian cyst and ruptured ovarian cyst
A. Pathophysiology
B. Assessment findings/presentation
C. Prehospital Management
IX. Ovarian torsion
   A. Pathophysiology
   B. Assessment findings/presentation
   C. Prehospital Management

X. Endometriosis
   A. Pathophysiology
   B. Assessment findings/presentation
   C. Prehospital Management

XI. Dysfunctional uterine bleeding
   A. Pathophysiology
   B. Assessment findings/presentation
   C. Prehospital Management

XII. Prolapsed uterus
   A. Pathophysiology
   B. Assessment findings/presentation
   C. Prehospital Management

XIII. Vaginal foreign body
   A. Pathophysiology
   B. Assessment findings/presentation
   C. Prehospital Management

XIV. Age-related variations
   A. Pediatrics—menarche could be cause of bleeding
   B. Geriatrics—menopausal women can get pregnant

XV. Communication and documentation

XVI. Transport decisions
Medicine
Non-Traumatic Musculoskeletal Disorders – MT14

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

   A. Epidemiology
      1. Incidence
      2. Morbidity/mortality

   B. Anatomy and physiology review
      1. Bones
      2. Muscles
      3. Tendons and ligaments
      4. Articulating surfaces—joints, bursa, disc, etc

II. General assessment findings and symptoms

   A. Pain or tenderness
   B. Swelling
   C. Abnormal or Loss of movement
   D. Sensation changes
   E. Circulatory changes
   F. Deformity

III. General Management for a patient with a common or major non-traumatic musculoskeletal disorder.

   A. Airway, ventilation, and circulation
   B. Pharmacological
   C. Non-pharmacological
   D. Transport considerations
   E. Psychological/ communication strategies

IV. Non-traumatic musculoskeletal conditions
A. Bony abnormalities (including Osteomyelitis and Tumors)
   1. Epidemiology
   2. Anatomy, physiology, and pathophysiology
   3. Assessment
   4. Prehospital Management

B. Disorders of the spine (including disc disorders, low back pain (cauda equine syndrome, sprain, strain)
   1. Epidemiology
   2. Anatomy, physiology, and pathophysiology
   3. Assessment
   4. Prehospital Management

C. Joint abnormalities (including Arthritis (Septic, Gout, Rheumatoid, Osteoarthrosis) and slipped capital femoral epiphysis)
   1. Epidemiology
   2. Anatomy, physiology, and pathophysiology
   3. Assessment
   4. Prehospital Management

D. Muscle abnormalities (Myalgia/myositis, Rhabdomyolysis)
   1. Epidemiology
   2. Anatomy, physiology, and pathophysiology
   3. Assessment
   4. Prehospital Management

E. Overuse syndromes (including Bursitis, Muscle strains, Peripheral nerve syndrome, Carpal tunnel syndrome, Tendonitis)
   1. Epidemiology
   2. Anatomy, physiology, and pathophysiology
   3. Assessment
   4. Prehospital Management

F. Soft tissue infections (Fascitis, Gangrene, Paronychia, Flexor tenosynovitis of the hand)

V. Consider age-related variations in pediatric and geriatric patients

   A. Pediatric--slipped femoral epiphysis juvenile arthritis

   B. Geriatric--osteoporosis

VI. Patient education and prevention
Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression and implement a comprehensive treatment/disposition plan for a patient with a medical complaint.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

A. Epidemiology
   1. Incidence
   2. Morbidity/mortality

B. Anatomy and physiology review
   1. Eye
   2. Ear
   3. Nasal bones and nasopharynx
   4. Mouth, oral cavity, oropharynx, larynx

II. General assessment findings and symptoms

A. Pain or tenderness

B. Swelling

C. Abnormal or Loss of movement

D. Sensation changes

E. Circulatory changes

F. Deformity

G. Visual or hearing changes

H. Airway compromise

III. General Management

A. Airway, ventilation, and circulation

B. Pharmacological

C. Non-pharmacological

D. Transport considerations
E. Psychological/ communication strategies

IV. Diseases of the eyes, ears, nose, and throat.

A. Definitions, Pathophysiology, epidemiology, mortality and morbidity, and complications

B. Specific assessment findings and symptoms

C. Specific management considerations

D. Conditions

1. Eye
   a. Burn of eye and adnexa
   b. Conjunctivitis
   c. Corneal abrasions
   d. Foreign body
   e. Inflammation of the eyelid
      i. chalazion
      ii. hordeolum
   f. Glaucoma
   g. Hyphema
   h. Iritis
      i. Papilledema
   j. Retinal detachment and defect
   k. Cellulitis of orbit

2. Ear
   a. Foreign body
   b. Impacted cerumen
   c. Labyrinthitis
   d. Meniere’s disease
   e. Otitis external and media
   f. Perforated tympanic membrane

3. Nose
   a. Epistaxis
   b. Foreign body
   c. Rhinitis
   d. Sinusitis

E. Oropharynx/throat

1. Dentalgia and dental abscess
2. Diseases of oral soft tissue/ Ludwig’s angina
3. Foreign body
4. Epigottitis
5. Laryngitis
6. Tracheitis
7. Oral candidiasis
8. Peritonsillar abscess
9. Pharyngitis/tonsillitis
10. Temporomandibular joint disorders
V. Consider age-related variations in pediatric and geriatric patients

   A. Pediatric--foreign bodies of ears and nose common ear infections common, epiglottis more common in children

VI. Patient education and prevention
Shock and Resuscitation
Shock and Resuscitation – ST1

Integrates comprehensive knowledge of causes and pathophysiology into the management of cardiac arrest and peri-arrest states.

Integrates a comprehensive knowledge of the causes and pathophysiology into the management of shock, respiratory failure or arrest with an emphasis on early intervention to prevent arrest.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Ethical Issues in Resuscitation

A. Ethics Foundation
   1. Patient Autonomy
      a. Advance Directives
      b. Surrogate Decision Makers
   2. Principles of Futility

B. Withholding Resuscitation Attempts
   1. Irreversible death
   2. Do Not Resuscitate Orders

C. Withdrawing Resuscitation
   1. Termination of Resuscitation Efforts

D. Providing Emotional Support for Family

E. Organ and Tissue Donation

II. Pre-Morbid Conditions

A. Healthy Patient (Adult)
   1. Coronary Syndromes (conduction abnormalities, atherosclerosis)
      a. Modifiable Risk Factors
      b. Non-modifiable risk factors
   2. Drowning
   3. Electrocution
   4. Electrolyte Imbalance
   5. Hypothermia
   6. Toxic Exposure
   7. Drug Toxicity
   8. Pulmonary Embolus

B. Unhealthy Patient (Adult)
   1. Congestive Heart Failure (CHF)
   2. Renal Failure
3. Uncontrolled Hypertension
4. Uncontrolled Diabetes
5. Obesity
6. Electrolyte Imbalance
7. Drug Toxicity
8. Stroke (CVA)

III. Anatomy and physiology review

A. Respiratory system
   1. Review Anatomy and Physiology Section at Paramedic level.

B. Cardiovascular system
   1. Review Anatomy and Physiology Section at Paramedic level.

IV. Physiology of normal blood flow

A. Generally speaking, the heart pumps blood out of the left ventricle, around the circulatory system and back to the right side of the heart.

B. The negative intrathoracic pressure created by normal ventilation assists venous return.
   1. With every breath, muscle contractions in the chest and diaphragm reduce the pressure within the lungs and chest cavity.
   2. When the airway is open, air rushes from the higher-pressure zone outside the body into the low-pressure zone inside the chest.
   3. The great vessels also enter the chest from above and below.
   4. That same low pressure created within the chest during inspiration sucks blood into the cavity and right atrium.

V. Physiology of blood flow during CPR

A. Heart Pump Theory
   1. Heart is squeezed through direct compression between the sternum and the spinal column.
   2. Pressure is increased within the chambers of the heart
      a. Blood flows from higher pressure chambers to lower pressured vessels and organs
      b. Heart valves prevent retrograde flow

B. Thoracic Pump Theory
   1. Compression of the sternum during CPR
      a. Raises the pressure in the entire chest cavity
      b. Pressure in the extrathoracic spaces remains low
   2. After establishing the pressure gradient
      a. Venous collapse prevents a backflow of blood
      b. Open arteries allow forward flow out of the chest
      c. Epinephrine (and other vasopressors) helps those arteries to remain open

C. Harder and faster compressions increase the pressure to a greater degree

D. Negative Intrathoracic Pressure
1. Since patients in cardiac arrest are not breathing, they do not produce negative inspiratory pressure to assist the circulatory system.

2. During CPR, some negative pressure develops in the chest as the sternum and ribs rebound to their normal position during the decompression or relaxation phase.
   a. When a greater amount of negative pressure can be achieved in the chest, a greater amount of blood will be returned to the heart
   b. Then with the next compression, a greater amount will be forced to the lungs and other vital organs.

3. If the chest is not allowed to fully recoil during CPR, venous return may be critically decreased.

VI. Cardiac Arrest

A. Epidemiology

B. Pathophysiology
   1. If the heart stops contracting, no blood will flow.
   2. The body cannot survive when the heart stops.
      a. Organ damage begins quickly after the heart stops.
      b. Brain damage
         i. begins 4-6 minutes after the patient suffers cardiac arrest.
         ii. becomes irreversible in 8-10 minutes.
   3. General reasons for the heart to stop beating
      a. Sudden death and heart disease
      b. Breathing stops, especially in infants and children
      c. Medical emergencies
      d. Trauma

VII. Resuscitation

A. System components to maximize survival
   1. Early access
      a. Public education and awareness
         i. rapid recognition of a cardiac emergency
         ii. rapid notification before CPR starts - "phone first"
      b. 911-pre-arrival instructions and dispatcher directed CPR
   2. Early CPR
      a. Lay public
         i. family
         ii. bystanders
      b. Emergency Medical Responders
   3. Early defibrillation
   4. Early advanced care

B. Basic Cardiac Life Support (Refer to current American Heart Association guidelines)
   1. Adult CPR and foreign body airway obstruction
   2. Child CPR and foreign body airway obstruction
   3. Infant CPR and foreign body airway obstruction
   4. Neonatal sequence

C. Alternative CPR Techniques (i.e. Interposed Abdominal Compression)
D. Airway Control and Ventilation
   1. Airway Adjuncts
      a. Basic adjuncts
      b. Advanced adjuncts (as defined by Scope of Practice)
         i. role of advanced airways in resuscitation
         ii. endotracheal intubation
         iii. alternatives to endotracheal intubation
   2. Ventilation
      a. Hazards of over-ventilation
      b. Devices to assist ventilation

E. Chest compressions
   1. Factors which decreases effectiveness
      a. Compression that are too shallow
      b. Slow compression rate
      c. Sub-maximum recoil
      d. Frequent interruptions
   2. Devices to assist circulation
      a. Active compression-decompression CPR
      b. Impedance threshold device
      c. Mechanical piston device
      d. Load-distributing band or vest CPR

VIII. Automated external defibrillation (Refer to current American Heart Association guidelines)
   A. Adult sequence
   B. Child sequence
   C. Infant sequence
   D. Special situations
      1. Pacemaker/Implanted cardioverter/defibrillator
      2. Wet victims
      3. Transdermal medication patches

IX. Advanced Life Support - Refer to the current American Heart Association guidelines
   A. Electrical therapies
      1. Manual defibrillation
      2. Synchronized cardioversion
      3. Transcutaneous pacing
   B. Intravenous access
   C. Arrest rhythms
      1. Ventricular fibrillation/pulseless ventricular tachycardia
      2. Pulseless electrical activity
      3. Asystole
D. Non-arrest rhythms
   1. Bradycardia
   2. Tachycardia

X. Special arrest and peri-arrest situations - Refer to the current American Heart Association guidelines

A. Electrolyte abnormalities
   1. Epidemiology
   2. Pathophysiology
   3. Specific electrolytes
      a. Potassium
      b. Sodium
      c. Magnesium
      d. Calcium
   4. Modifications to management

B. Toxic exposure
   1. Epidemiology
   2. Pathophysiology
   3. Specific problems
      a. Respiratory arrest
      b. Bradycardia
      c. Tachycardia
      d. Hypertension
      e. Acute coronary syndrome
      f. Impaired conduction
      g. Shock
      h. Cardiac arrest
   4. Modifications to management

C. Drowning
   1. Epidemiology
   2. Pathophysiology
   3. Modifications to management

D. Hypothermia
   1. Epidemiology
   2. Pathophysiology
   3. Modifications to management

E. Near-Fatal Asthma
   1. Epidemiology
   2. Pathophysiology
   3. Modifications to management

F. Anaphylaxis
   1. Epidemiology
   2. Pathophysiology
   3. Modifications to management
G. Traumatic cardiac arrest
   1. Epidemiology
   2. Pathophysiology
   3. Modifications to management

H. Cardiac arrest associated with pregnancy
   1. Epidemiology
   2. Pathophysiology
   3. Modifications to management

I. Electric shock and lightning strikes
   1. Epidemiology
   2. Pathophysiology
   3. Modifications to management

XI. Postresuscitation support - Refer to the current American Heart Association guidelines

   A. Return of spontaneous circulation (ROSC)
      1. Temperature regulation -- Induced hypothermia
      2. Glucose control
      3. Organ specific support
         a. Respiratory system
         b. Cardiovascular system
         c. Central nervous system

XII. Shock

   A. Definition

   B. Anatomy and physiology review

   C. Essential components for normal perfusion
      1. Functioning pump
         a. Stroke volume
            i. preload
            ii. afterload
            iii. Starling’s Law
         b. Cardiac output
         c. Blood pressure
            i. mean arterial pressure
            ii. pulse pressure
         d. Baroreceptors
         e. Nervous control of heart
            i. sympathetic nervous system
            ii. parasympathetic nervous system
      2. Adequate volume
         a. Formed elements
         b. Plasma
      3. Intact container/vessels
a. Arteries  
b. Arterioles  
c. Capillary beds  
d. Sphincters  
e. Venules  
f. Veins  
g. Capacity of each vessel  
h. Sympathetic nervous system control of each vessel  
i. Blood flow controlled by cellular tissue demands  
j. Sphincter control  

D. Tissue hypoperfusion  
1. Inadequate fluid volume  
2. Inadequate pump  
3. Inadequate container size  

E. Physiologic response to shock  
1. Cellular  
   a. Fick principle  
   b. Waste removal  
   c. Aerobic metabolism/glycolosis  
   d. Anaerobic metabolism  
2. Cardiovascular system implications  
   a. Preload  
   b. Afterload  
   c. Cardiac Output  
   d. Peripheral vascular resistance/systemic vascular resistance  
   e. Blood pressure  
   f. Mean arterial pressure  
   g. Pulse pressures  
   h. Starling’s Law  
   i. Chemoreceptors  
   j. Baroreceptors  
3. Sympathetic nervous system and endocrine implications  
   a. Epinephrine  
   b. norepinephrine  
4. Kidneys  
   a. Renin  
   b. Angiotensin  
   c. Aldosterone mechanism  
5. Pituitary gland and hypothalmus  
   a. Arginine aasopressin (AVP)  
   b. Adrenocorticotropic hormone cortisol system (ACTH)  
   c. Somatotropin  
6. Pancreas  
   a. Insulin  
   b. Glucagon  
7. Spleen
8. Osmosis

F. Stages of shock
   1. Compensated shock
   2. Decompensated shock
   3. Irreversible shock

G. Specific types of shock
   1. Hypovolemic
      a. Hemorrhage classifications
         i. hemostasis
         ii. vascular phase
         iii. platelet phase
         iv. coagulation phase
         v. factors affecting clotting/coagulation
      b. Stages of hemorrhage
         i. Class I
         ii. Class II
         iii. Class III
         iv. Class IV
   2. Distributive
      a. Neurogenic
      b. Anaphylactic
      c. Septic
      d. Psychogenic (vasovagal)
   3. Cardiogenic
      a. Intrinsic causes
         i. heart muscle damage
            a) physiology
            b) signs/symptoms
            c) assessment
            d) management
         ii. dysrhythmia
            a) physiology
         iii. myocardial insufficiency
            a) signs/symptoms
            b) assessment
            c) management
         iv. valvular disruption
            a) physiology
            b) signs/symptoms
            c) assessment
            d) management
      b. Extrinsic causes
         i. cardiac tamponade
         ii. tension pneumothorax
   4. Obstructive/mechanical
      a. Cardiac tamponade
      b. Tension pneumothorax
      c. Pulmonary emboli
5. Respiratory

H. Complications of Shock
1. Acute renal failure
2. Acute adult respiratory distress syndrome
3. Hematologic failure
4. Hepatic failure
5. Multiple Organ Dysfunction Syndrome (MODS)
   a. Sepsis
   b. Acute Respiratory Distress Syndrome (ARDS)
   c. Death of organs
   d. Death of organism
6. Disseminated Intravascular Coagulation (DIC)

I. Patient Assessment
1. Scene size-up
2. Perform a primary assessment
3. Obtain a relevant history
4. Perform a secondary assessment
5. Perform a reassessment

J. Management
1. Manual in-line spinal stabilization, as needed
2. Comfort, calm, and reassure the patient
3. Do not give food or drink
4. Airway control
5. Breathing
   a. Assist ventilation, as needed
   b. Oxygen administration (high concentration)
6. Circulation
   a. Attempt to control obvious external bleeding
   b. Patient position
   c. Keep patient warm - attempt to maintain normal body temperature
7. Pneumatic anti-shock garment (PASG) application
8. Fluid resuscitation
   a. Controllable external hemorrhage
   b. Uncontrollable external hemorrhage
   c. Internal hemorrhage
9. Consider medications, as needed
10. Begin transport at the earliest possible moment
11. Treat any additional injuries that might be present

K. Devices to assist circulation
1. Impedance Threshold Device

XIII. Age-related variations

A. Pediatrics
1. Common causes of shock
a. Trauma  
b. Fluid loss  
c. Neurological injury  
d. Anaphylaxis  
e. Heart disease  
f. Chest wall injury  

2. Presentation  
a. Cardiovascular  
b. Skin signs  
c. Mental status  
d. Decreased fluid output  
e. Vital signs  

3. Anatomical and physiologic implications  
a. Unreliable indicators  
b. Indicators of shock  
   i. smaller absolute volume loss  
   ii. tachycardia for age  
   iii. weak distal pulses  
   iv. delayed capillary refill time  
   v. cool mottled extremities  
   vi. altered mental status  

4. Management  
a. Inline spinal stabilization, as needed  
b. Suction, as needed  
c. High concentration oxygen  
d. Control bleeding  
e. Positioning  
f. Maintain body temperature  
g. Fluid replacement  
h. Transport  

B. Geriatrics  
1. Assessment  
a. Body system changes affecting presentation of shock  
   i. nervous system  
   ii. cardiovascular  
      a) difficulty tolerating hypotension from hemorrhage  
      b) beta-blocker and calcium channel blockers can alter physiologic  
         response to hemorrhage  
   iii. respiratory  
   iv. integumentary  
   v. renal  
   vi. gastrointestinal  
b. Vital signs changes  
   i. altered mental status  
      a) sudden onset  
      b) other causes  
   ii. hypoxia  
c. Airway  
   i. decreased cough reflex
ii. cervical arthritis
iii. loose dentures

d. Breathing
   i. higher resting respiratory rate
   ii. lower tidal volume
   iii. less elasticity/compliance of chest wall

e. Circulation
   i. higher resting heart rate
   ii. irregular pulses

f. Skin
   i. dry, less elastic
   ii. cold
   iii. fever, not common
   iv. hot

2. Management
   a. In-line spinal stabilization
   b. Suction, as needed
   c. High flow oxygen
   d. Control bleeding
   e. Positioning
   f. Maintain body temperature

3. Transport
Trauma
Trauma Overview – ST2

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Identification and Categorization of Trauma Patients
   
   A. Entry-level students need to be familiar with:
      1. National Trauma Triage Protocol

II. Incidence/significance of Trauma
   
   A. Mortality -- Incidence of death
   
   B. Morbidity -- New cases where death is not an outcome, nonfatal injury
   
   C. Years of Life Lost -- Subtract age of death from life expectancy
   
   D. Deaths due to trauma in the United States
      1. All external causes of mortality
      2. Motor-Vehicle Crashes
      3. Pedestrian
      4. Motorcycle
      5. Falls
      6. Mechanical forces (struck by object, machinery)
      7. Drowning
      8. Electrical current
      9. Intentional self harm
      10. Assaults (firearms)

III. Trauma System
   
   A. Components -- Hospital categorizations
   
   B. Levels and qualifications
   
   C. Transport considerations

IV. Types of Injury
A. Blunt Trauma
   1. Non-bleeding
   2. Multiple forces and conditions can cause blunt trauma

B. Penetrating trauma
   1. High velocity
   2. Medium velocity
   3. Low velocity

V. Trauma Assessment

A. Major components of the patient assessment
   1. Standard Precautions
   2. Scene Size-up
   3. General Impression
   4. Mechanism of Injury
   5. Primary Assessment
   6. Baseline Vital Signs
   7. History
   8. Secondary Assessment
   9. Re-Assessment

B. Mechanism of Injury (MOI)
   1. Significant MOI (including, but not limited to)
      a. Multiple body systems injured
      b. Vehicle crashes with intrusion
      c. Falls from heights
      d. Pedestrian versus vehicle collision
      e. Motorcycle crashes
      f. Death of an occupant in the same vehicle
   2. Non-Significant MOI (including, but not limited to)
      a. Isolated trauma to a body part
      b. Falls without loss of consciousness (adult)
      c. Falls without loss of consciousness (pediatric)
   3. Pediatric Considerations
      a. Falls >10 feet without loss of consciousness
      b. Falls <10 feet with loss of consciousness
      c. Bicycle collision
      d. Medium to high-speed vehicle collision (>25 mph)
   4. Re-evaluating the MOI
   5. Special Considerations
      a. Spinal precautions must be initiated as soon as practical based on the MOI.
      b. Log roll supine patient on side to allow for an assessment of the posterior body.

C. Primary Survey
1. Airway
   a. Clear airway; chin-lift, suction, finger sweep
   b. Protect airway
      i. decrease LOC, bleeding is ET without neck movement
      ii. surgical airways
2. Breathing
   a. Assess ventilation capability
   b. Oxygenation, 100%
   c. Check thorax and neck
      i. deviated trachea
      ii. tension pneumothorax
      iii. chest wounds and chest wall motion
      iv. sucking chest wound
      v. neck and chest crepitation
      vi. multiple broken ribs
      vii. fractured sternum
   d. Listen for breath sounds
      i. re-check any et tube placement
      ii. hemopneumothorax
   e. Circulation
      i. apply pressure to sites of external exsanguinations
      ii. establish two large bore IVs
         a) fluid bolus
         b) consider IO
         c) consider catheter site location
      iii. assess blood volume status
      iv. radial and carotid pulse locations, B/P determination
      v. jugular venous filling
      vi. quality of heart tones
   f. Beck’s triad present?
   g. Hypovolemia
   h. Disability
      i. brief neurological exam
      ii. pupil size and reactivity
      iii. limb movement
      iv. Glasgow Coma Scale
   i. Exposure
      i. completely remove all clothes
      ii. logroll as part of inspection

D. Secondary Assessment - Head-to-toe physical exam (Review)
   1. Head/scalp – symmetry
   2. Face – symmetry of facial muscles
   3. Eyes – pupil size, equality and reactivity to light, pink moist conjunctiva
      a. Adie’s pupil
      b. Oculomotor nerve paralysis
      c. Horner’s syndrome
      d. One eye blindness
      e. Deviations of the eye – paralytic strabismus
   4. Ears – drainage, tympanic membrane rupture
5. Mouth – foreign body, loose/broken teeth, blood, pink and moist mucosa
6. Nose – drainage, singed nostrils, nasal flaring
7. Neck – accessory muscle use, tracheal deviation, jugular vein distention, medical jewelry, stoma, subcutaneous emphysema
8. Chest – equal rise/fall, guarding, paradoxical movement, breath sounds, scars, heart sounds
   a. Pulse types
      i. small, weak pulses
      ii. large, bounding pulses
      iii. bisferiens pulse
      iv. pulsus alternans
      v. bigeminal pulse
      vi. paradoxical pulse
   b. Location of lung fields in the chest for auscultation
   c. Location of normal bronchovesicular and bronchial breath sounds in chest and the meaning of abnormal locations.
   d. Role of hyperresonance and tympany in percussion of the chest
9. Abdomen – guarding, rigidity, distention, scars, wounds
10. Pelvis/genital – incontinence, stability
11. Arms – distal circulation, sensation, motor function, medical jewelry
12. Legs – distal circulation, sensation, motor function, medical jewelry
13. Back – guarding, paradoxical movement, scars

E. Secondary Assessment
   1. Rapid Method
   2. Modified secondary assessment

VI. Role of Documentation in Trauma

A. Topical Anatomy

B. Scenario sections of Patient Care Reports
   1. Mechanism of Injury with specifics
   2. Response time
   3. Time on scene
   4. Initial findings
   5. Changes in assessment findings
   6. Care provided
   7. Important negative findings
   8. Recreate the scene
   9. Bystander care provided prior to arrival
   10. A complete report is essential and will be referred to by hospital personnel

VII. Trauma Scoring Scales

VIII. Trauma Center Designations

IX. Transfer of patients to the most appropriate hospital
Trauma
Bleeding – ST3

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Incidence

   A. Mortality and morbidity
   
   B. Populations at risk

II. Anatomy and function

   A. Respiratory system
   
   B. Circulatory system
   
   C. Central nervous system
      1. Autonomic nervous system
      2. Peripheral nervous system

III. Pathophysiology

   A. Review knowledge from previous levels
   
   B. Centers around
      1. Failure to deliver nutrients to tissues
      2. Failure to excrete metabolic waste products
      3. Failure to excrete carbon dioxide
   
   C. Organ involvement in shock
      1. Heart
         a. Four chambers functioning properly
         b. Autonomic innervation in balance
         c. Cardiac Output and blood pressure homeostasis
            i. cardiac output
            ii. arterial blood pressure
            iii. stroke volume
               a) preload
               b) afterload
               c) contractility
      
      2. Blood vessels
a. Arteries
   i. role of autonomic nervous system
   ii. arterial oxygen content
b. Veins
   i. role of capacitance
   ii. role of precapillary sphincters
c. Capillaries
d. Balance of hydrostatic pressure and oncotic pressure

3. Blood
   a. Delivery of nutrients – oxygen, glucose, proteins, fats, electrolytes
      i. red blood cells
      ii. plasma
      iii. hematocrit
      iv. hemoglobin
      v. oxyhemoglobin dissociation curve
      vi. leukocytes
      vii. platelets
b. Excretion of waste products -
c. Oxygen delivery
   i. role of heart rate
   ii. role of stroke volume
   iii. role of hemoglobin concentration
   iv. role of arterial oxygen saturation

4. Cellular metabolism
   a. Glycolysis
   b. Krebs cycle
   c. Electron transport

D. Classifications of Shock
1. Respiratory failure
   a. Obstruction – airway, embolism
   b. Chest wall movement
   c. Diffusion failure – ARDS
   d. Toxic Exposures – Carbon monoxide, cyanide
2. Hypovolemic
   a. External
   b. Internal
   c. Third space loses – fractures, thermal burns
3. Vascular failure
   a. Central nervous system loss
   b. Sepsis
   c. Anaphylaxis
4. Cardiac failure
   a. Intrinsic
   b. Extrinsic
      i. cardiac tamponade
      ii. tension pneumothorax

E. Compensatory Mechanisms in Shock
1. Respiratory Compensation
a. Baroreceptors
b. Chemoreceptors

2. Sympathetic Nervous System
   a. Alpha receptors
   b. Beta receptors
   c. Role of shunting

3. Neuroendocrine Response
   a. ACTH
   b. Aldosterone
   c. Renin
   d. Vasopressin
   e. ADH

4. Fluid shifts in shock

F. Decompensation in Shock
   1. Life effects
      a. Age
      b. Physical fitness
      c. Alcohol use
      d. Medications
   2. Irreversible shock
   3. Blood loss in shock
      a. 750 cc’s in healthy people is well tolerated (15%)
      b. up to 30% more significant
         i. tachycardia
         ii. anxiety
         iii. narrow pulse pressure
      c. greater than 30%
         i. hypotension
         ii. pronounced tachycardia
         iii. confusion
      d. more than 40%

G. Complications of Shock
   1. Acute Respiratory Distress Syndrome (ARDS)
      a. Seen 24-48 hours after insult/injury
      b. Loss of alveolar and capillary wall integrity
      c. Treated with PEEP
   2. Acute Renal Failure
      a. Damage to renal tubules
      b. Failure to excrete products of metabolism
   3. Multiple Organ Failure Syndrome (MOFS)

IV. Assessment consideration in Shock

A. Review knowledge from previous levels

B. Scene size-up
   1. Assure personal safety
a. Hazard awareness  
b. Traffic safety  
c. Ambulance placement strategy  
d. Mood of bystanders  
e. Vehicle stability  

2. Number of patients present  

3. Significant MOI (including, but not limited to)  
   a. Multi-systems trauma  
   b. Ejection from vehicle  
   c. Fall >20 feet without loss of consciousness  
   d. Fall <20 feet with loss of consciousness  
   e. Vehicle roll-over  
   f. High-speed vehicle collision  
   g. Vehicle vs. pedestrian collision  
   h. Motorcycle collision  
   i. Significant external blood loss (>1000cc)  
   j. Penetrations of the head, chest, abdomen or pelvis  
   k. Unresponsive or altered mental status with suspected traumatic origin  
   l. Death or major injury of another occupant in same vehicle  

4. Crime scene considerations  

5. Scene time consideration -- not exceed 10 minutes  

6. Airway  
   a. Foreign Body Obstructions  
   b. Airway integrity  
      i. structural damage  
      ii. edema  
      iii. airway movement over trachea  

7. Ventilation  
   a. Breathing patterns  
      i. tracheal tugging  
      ii. diaphragmatic movement  
      iii. Cheyne-Stokes  
      iv. CNS involvement  
   b. Chest  
      i. wall integrity  
      ii. breath sound assessment  
   c. Jugular vein assessment  

8. Circulation  
   a. Cardiac output assessment  
      i. presence of pulse  
      ii. location of pulse -- estimation to blood pressure  
   b. Skin color and temperature  
      i. color  
      a) role of vasoconstriction and color  
      b) role of hypovolemia vs circulatory stasis  
   c. Hemorrhage  
      i. rapid detection and control of external hemorrhage  
      a) role of patient position
b) role of lighting (night)
c) patient movement after insult

ii. internal causes
a) MOI
b) restlessness
c) chest considerations
d) abdominal considerations
e) extremity consideration
d. Other causes of shock
i. vascular resistance
ii. pump failure

9. Vital signs
a. Respiratory rate considerations
b. Pulse rate considerations
c. Blood pressure considerations

10. Disability
a. Rapid neurological considerations
i. alert
ii. stimuli
iii. unresponsive
iv. posturing
a) decorticate
b) decerebrate
v. pupil assessment considerations
vi. pulse, sensory and motor considerations

V. Shock Management strategies and considerations

A. Scene safety

B. Body substance isolation precautions

C. Restore Tissue oxygenation
1. Airway – open throughout care
   a. Manual maneuvers (in line considerations)
   b. Unconscious patient airway considerations
   c. Definitive airway considerations
2. Ventilation – adequate minute volume
   a. Hyperventilation contraindicated
   b. Monitor via oxygenation level
3. Oxygenation –
   a. Maintain SaO2 between 90% and 92%
   b. Small drops in SaO2 below 90% shift oxyhemoglobin curve dramatically
   c. Unable to maintain +90% - investigate cause (tension pneumothorax)

4. Field impression of cause
   a. Assess mechanism of injury/illness
   b. Complete rapid patient assessment
      i. immobilization techniques
      ii. exposure of patient
c. Determine cause of Shock
   i. use proper treatment plan based upon cause
      a) hypovolemic (bleeding, burns, dehydration)
      b) respiratory failure
      c) cardiac failure
   ii. vascular failure (anaphylaxis)
5. Transport decision
   a. Based upon cause of shock
      i. cause of shock rarely definitively treated in the field
      ii. specialty centers
         a) trauma
         b) burns
         c) cardiac
         d) stroke
6. Improve stroke volume
   a. Control external hemorrhage
   b. Improve preload -- intravenous therapy
      i. 20 m – 30 mL/Kg
      ii. Fluid bolus
      iii. Large bore, short length catheter
      iv. Monitor patient response to therapy
      v. Do not overhydrate patients
         a) Hemodilution
         b) Platelet agglutination
   vi. Fluid choice
      a) Types of fluid (Refer to American College of Surgeons guidelines)
         i) Advantages
         ii) Disadvantages
         iii) Role of hydrostatic pressure
         iv) Role of colloid oncotic pressure
      b) Blood substitute products
      c) Blood administration in the field
   c. Afterload considerations -- systemic vascular resistance
   d. Temperature considerations
      i. external environmental considerations – blankets
      ii. internal considerations

VI. Bleeding considerations

A. Physiology and Pathophysiology
   1. Review knowledge from previous levels
   2. Products and characteristics of blood
   3. Blood clotting
   4. Arterial bleeding
   5. Venous bleeding
   6. Location of bleeding
      a. External
      b. Internal
         i. head
         ii. chest
B. Assessment of Bleeding

C. Management considerations in bleeding

D. Review knowledge from previous levels
Trauma
Chest Trauma – ST4

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Incidence of chest trauma
   A. Morbidity/mortality
   B. Prevention strategies

II. Traumatic Aortic Disruption
   A. Pathophysiology
      1. Review knowledge from previous levels
      2. Role of deceleration and speed as MOI
         a. Events regarding the ligamentum arteriosum
         b. Rupture of descending aorta at the isthmus
      3. Partial tear
         a. Bleeding in the left chest
         b. Role of tunica intima and tunica adventitia in prevention of complete tear
         c. Expanding hematoma may compress esophagus or laryngeal nerve
      4. Complete tear – fatality likely on arrival
   B. Specific Assessment considerations
      1. Review knowledge from previous levels
      2. Mechanism of Injury
         a. High index of suspicion necessary for survival
         b. Rapid deceleration
      3. High percent have no signs of external chest trauma
      4. Hypotension
      5. Signs of Shock
      6. Chest pain – tearing in nature
      7. Suspicion raises with chest wall injury
      8. Unusual pulses or blood pressure in upper extremities
      9. Voice changes
         a. Hoarseness
         b. Stridor
      10. Difficulty swallowing
   C. Management considerations
      1. Review knowledge from previous levels
      2. AVO management
      3. High index of suspicion based upon MOI
4. Do not overhydrate
5. Do not use pressor agents

III. Pulmonary Contusions

A. Pathophysiology
   1. Review knowledge from previous levels
   2. Blunt trauma with associated injuries (rib fractures)
   3. Capillary leakage into alveoli prevents gas exchange
   4. Decrease lung compliance
   5. V/Q mismatch
   6. Slowly developing process
   7. Diffuse vs localized

B. Assessment considerations
   1. Review knowledge from previous levels
   2. Respiratory distress symptoms
   3. Hemothysis
   4. Chest pain from blunt trauma
   5. Cough
   6. rales or rhonchi
   7. Hypoxia
   8. High index of suspicion based on MOI

C. Management Considerations
   1. Review knowledge from previous levels
   2. AVO
   3. IV fluid administration – over hydration is contraindicated (see Trauma: Bleeding)

IV. Blunt Cardiac Injury

A. Pathophysiology
   1. Review knowledge from previous levels
   2. May not have histological findings - heart is “stunned”
   3. Cardiac arrhythmias occur
   4. Heart Failure may occur
      a. Review of right sided heart failure
      b. Review of left-sided heart failure

B. Assessment considerations
   1. Review knowledge from previous levels
   2. High index of suspicion with anterior blunt chest trauma
   3. Clinical signs vary due to injury location in heart – vessels, muscle mass or conduction system
   4. Tachycardia
   5. May not exhibit external chest discoloration
   6. Chest pain – retrosternal (MI type pain)

C. Management Considerations
   1. Review knowledge from previous levels
   2. High index of suspicion
3. AVO
4. Limit fluids if signs of heart failure are present
   a. lung crackles
   b. Jugular venous distension
5. Be prepared for deteriorations in patients with rapid or irregular pulses

V. Hemothorax

A. Pathophysiology
   1. Review knowledge from previous levels
   2. Tears in lung parenchyma
   3. Penetrating wounds – puncture great vessels or heart
   4. Intercostal vessel wounds
   5. Internal mammary artery wounds
   6. Clotting in the chest may release fibrolysins – continue bleeding process
   7. Loss of circulating blood in vessels

B. Specific Assessment considerations
   1. Review knowledge from previous levels
   2. Shock
   3. Unequal breath sounds
   4. Dullness on percussion
   5. JVD assessment
      a. Flat with hypovolemia
      b. Distended if increased intrathoracic pressure

C. Specific Management consideration
   1. Review knowledge from previous levels
   2. AVO
   3. Fluid bolus and continued hypovolemia assessment (see Trauma: Bleeding)
   4. Rapid transport to appropriate facility

VI. Pneumothorax

A. Open
   1. Pathophysiology
      a. Review knowledge from previous levels
      b. Open wound to the chest wall
      c. Underlying organ and vessel injuries
      d. Fracture of chest wall structure
      e. Hypoxia
      f. Loss of lung adhesion to chest wall due to loss of surface tension collapse of lung
   2. Specific Assessment considerations
      a. Review knowledge from previous levels
      b. AVO assessment
      c. Chest Assessment
         i. inspection
         ii. auscultation
         iii. percussion
      d. Subcutaneous emphysema
e. Hypovolemia signs
f. Pulsus paradoxus
g. Cardiac dysrhythmia
   i. may be irregular pulse
   ii. may be ventricular tachycardia/Vfib in pulseless patient
3. Specific Management considerations for penetrating chest trauma
   a. Review knowledge from previous levels
   b. Management may vary depending upon organs injured in the chest
   c. Airway
   d. Ventilation
      i. inspect chest
      ii. excessive pressure ventilation can cause tension pneumothorax
e. Oxygenation
f. Pneumothorax complications
g. Dysrhythmia treatment

B. Simple
1. Pathophysiology
   a. Review knowledge from previous levels
   b. Defect in chest wall allow air to enter pleural space
   c. Most common from gunshot wound
   d. Some low velocity wounds self-seal not allow atmospheric air into the chest but air from inspiration into the chest can occur in the same patient
   e. If chest wall hole is 2/3 size of trachea, more air will enter from the atmosphere – sucking sound will be present
   f. With large holes air enters both the trachea and the hole rapidly collapsing the lung
   g. Delayed or improper treatment will lead to tension pneumothorax with large open wounds
2. Specific Assessment considerations
   a. Review knowledge from previous levels
   b. Airway
   c. Ventilation
      i. cover large (2/3 size of trachea) open wound immediately – nonporous dressing
      ii. positive pressure ventilation will aggravate condition
d. Oxygenation
e. Unequal breath sounds
3. Specific Management considerations
   a. Review knowledge from previous levels
   b. Small simple pneumothorax is well tolerated in young and fit individuals
   c. Consider removing dressing if signs and symptoms of tension pneumothorax develop – may need to open the wound

C. Tension
1. Pathophysiology
   a. Review knowledge of previous levels
   b. Formation of one-way valve – air from either lungs or atmosphere
   c. Increased pleural pressure – shift of mediastinal structures to contralateral side – causes kinking of great veins decreasing cardiac output
d. May be closed – untreated rupture of alveolar sac
e. May be open – penetrating trauma – injury to bronchus or bronchi
2. Specific Assessment considerations
   a. Review knowledge of previous levels
   b. Severe respiratory distress
   c. Jugular vein distention
   d. Deviation of the trachea – difficult to assess
   e. Tachycardia
   f. Narrow pulse pressure
   g. Absent breath sounds on affected side
   h. Unequal chest rise
   i. Pulsus paradoxus

3. Specific Management considerations
   a. Review knowledge of previous levels
   b. Fluid infusion may not affect blood pressure and pulse due to great vessel compression

VII. Cardiac Tamponade

   A. Pathophysiology
      1. Review knowledge from previous levels
         a. Penetrating trauma – rare in blunt
         b. Right ventricle most penetrated
      2. Blood in the pericardial sac
         a. Perforation of heart muscle
         b. Amount of blood dependent in where blood originates
            i. left ventricle
            ii. coronary artery
            iii. venous blood
      3. Knife wounds more frequently cause
      4. Pericardial laceration seals and hemorrhage fills the sac
      5. Sac is not elastic – no stretching
      6. Small amounts (55cc) can cause reduction in cardiac output
      7. Increased sac pressure puts pressure on coronary arteries

   B. Specific Assessment considerations
      1. Review knowledge from previous levels
         a. Jugular vein distention – increase in CVP
         b. Increased diastolic pressure
         c. Narrowed pulse pressure
      2. Beck’s triad
         a. Increased venous pressure – JVD
         b. Decreased blood pressure – hypotension
         c. Muffled heart tones – unreliable

   C. Specific Management considerations in cardiac tamponade
      1. Review knowledge from previous levels
      2. AVO
      3. Rapid IV fluid bolus
      4. Rapid Transport for pericardiocentesis

VIII. Rib fractures
A. Pathophysiology
B. Assessment
C. Management

IX. Flail Chest
A. Pathophysiology
B. Assessment
C. Management

X. Commotio cordis
A. Pathophysiology
B. Assessment
C. Management

XI. Tracheobronchial disruption
A. Pathophysiology
B. Assessment
C. Management

XII. Diaphragmatic rupture
A. Pathophysiology
B. Assessment
C. Management

XIII. Traumatic asphyxia
A. Pathophysiology
B. Assessment
C. Management

XIV. Pediatric considerations in chest trauma
A. Review of anatomical differences
B. Review of physiological differences
C. Review of differences in mechanism of injury

D. Specific management considerations
   1. Airway management (see AVO: Pediatric considerations)
   2. Fluid replacement (see Trauma: Bleeding: Pediatric considerations Respiratory distress symptoms
   3. Hemoptysis
   4. Chest pain from blunt trauma
   5. Cough
   6. rales or rhonchi
   7. Hypoxia
   8. High index of suspicion based on MOI

E. Management Considerations
   1. Review knowledge from previous levels
   2. AVO
      a. PEEP is best
      b. Ventilator support in later stages
   3. Intubation if indicated
   4. Proper IV fluid administration – over hydration is contraindicated

F. Geriatric considerations in chest trauma
Trauma
Abdominal and Genitourinary Trauma – ST5

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Incidence

A. Morbidity/Mortality

B. Prevention strategies

II. Vascular injury

A. Pathophysiology
   1. Review knowledge from previous levels
   2. Injuries may be blunt or penetrating
   3. Structures
      a. Abdominal aorta
      b. Mesenterics – superior and inferior
      c. Renal artery
      d. Gonadal arteries
      e. Gastric artery
      f. Splenic artery
      g. Hepatic artery
      h. Iliac arteries
      i. Hepatic portal system
      j. Inferior venae cavae
   4. Internal bleeding – related to which and how many blood vessels injured
   5. Potential bleeding space in the abdomen
   6. Length time from injury to surgery
   7. Often masked by other injuries

B. Special Assessment Findings
   1. Review knowledge from previous levels
   2. High level of suspicion with MOI
   3. Solid organs injured with blunt trauma – liver spleen
   4. Patient history of the injury pattern/cause
   5. Seat belts – proper use of – in rapid deceleration
   6. Entrance and Exit wounds
   7. Abdominal tenders in four quadrants
   8. Lower rib tenderness
   9. Guarding
   10. Presence of lower pulses
   11. Kehr’s sign
12. Use of ultrasound

C. Special management considerations
   1. Review knowledge from previous levels
   2. AVO
   3. Hypotension treatment – fluid bolus
   4. Recognition of injury – others may mask
   5. Rapid transport
   6. Use of PASG
   7. Do not hemodilute patients – disrupts clot formation

III. Solid and hollow organ injuries

   A. Pathophysiology
      1. Review knowledge from previous levels
         a. Solid organs
            i. liver
               a) review functions of the liver
               b) difficult to control hemorrhage in surgery
               c) require massive blood transfusions in surgery
            ii. spleen
               a) largest lymphoid organ in body
               b) review functions of the spleen
               c) blood cell reservoir
            iii. kidney
               a) review functions of kidney
               b) classification or renal injury
            iv. abdominal vessels
            v. pancreas
         b. Hollow organs
            i. stomach
            ii. small bowel
            iii. large bowel
            iv. urinary bladder
            v. gallbladder
               a) review ph of fluids in hallow organs
               b) review presence of bacteria in hallow organs
      c. Review co-morbidity of abdominal diseases and abdominal trauma

   B. Special Assessment Findings
      1. Review knowledge from previous levels
      2. Findings relate to
         a. Solid vs hollow organ
         b. Comorbid injures that may mask
         c. Time since injury
         d. Vascularity of organ
         e. Blunt vs penetrating trauma
         f. How the organ is or is not attached to the abdominal wall
         g. Size of the insult
      3. Splenic and liver injuries have classifications
4. Patient history surrounding MOI is important
5. Inspection of the abdomen is critical
6. Stability of the pelvis
7. Seat belt use and fit across abdomen
8. Kehr’s sign
9. Abdominal tenderness

C. Special management considerations
1. Review knowledge from previous levels
2. AVO
3. Circulation
4. High index of suspicion
5. Rapid transport
6. Role of ultrasound
7. Changes with repeated assessments

IV. Blunt vs. Penetrating Abdominal Injury

A. Pathophysiology
1. Review knowledge from previous levels
2. Hole in abdominal wall
3. Underlying solid and hollow organs is major concern
4. Route for infection
5. Cavitation
6. Abdominal wall bleeding

B. Special Assessment Findings
1. Review knowledge from previous levels
2. Most patients with penetrating abdominal injury have underlying organ injuries
3. Inspection
   a. Entrance and exit wounds
   b. Lacerations
   c. Discoloration of skin
   d. Distention
4. Palpation
   a. Accomplished by quadrant – start furthest away from injury
   b. Blood will not cause immediate peritonitis
   c. Chemical peritonitis may be abrupt from stomach acids
   d. Bacterial peritonitis may take hours to develop
5. Patient affect
   a. Quiet, non-complaining patients may have severe injuries
   b. Lots of patient movement indicates less chance for peritonitis
   c. Hypovolemia changes LOC
6. Referred pain to shoulder
7. Large amounts of intra-abdominal bleeding may occur without much external evidence
8. Field ultrasound
9. Hematuria
10. Grey-Turner’s sign – flank discoloration
11. Rectal bleeding

C. Special management considerations
1. Review knowledge from previous levels
2. AVO
3. Circulation
4. Cover exposed bowel with sterile saline dressings
5. Field ultrasound

V. Evisceration

A. Pathophysiology
   1. Review knowledge from previous levels
   2. Open injury to abdominal wall which allows protrusion of abdominal contents
   3. Strangulation of bowel by abdominal wall
   4. Loss fluid and temperature regulation of exposed bowel

B. Special Assessment Findings
   1. Review knowledge from previous levels
   2. Exposed bowel – may be large or small
   3. Bowel protrudes with increase in abdominal pressure – cough
   4. Maybe recent post-surgical patient at home – cough, straining

C. Special management considerations
   1. Review knowledge from previous levels
   2. AVO
   3. Circulation
   4. Pain relief considerations
   5. Cover bowel with sterile saline gauze
   6. Patient may find relief with knee bent
   7. Avoid coughing

VI. Retroperitoneal injury

A. Pathophysiology

B. Special Assessment Findings

C. Special management considerations

VII. Injuries to external genitalia

A. Pathophysiology
   1. Male
      a. Scrotum
         i. holds large volumes of blood or fluids
         ii. blunt, penetrating or crushing injury
      b. Penis
         i. blunt, penetration or crushing injury
         ii. amputation
         iii. urethra penetration
   2. Female

B. Special Assessment Findings
1. Male external genitalia
   a. Pain
   b. Swelling
2. Female
   a. Pain
   b. Bleeding
   c. Clues of sexual assault
   d. History of foreign object penetration
3. Review knowledge from previous levels

C. Special management considerations
   1. Review knowledge from previous levels
   2. Male
      a. Treat amputations as with other amputations
      b. Do not relieve pressure in scrotum
      c. Do not remove impaled objects
      d. Provide pain management
      e. Ice to reduce swelling
      f. Emotional support
   3. Female
      a. Control external hemorrhage
      b. Emotional considerations in assault/rape
      c. Do not remove impaled objects
      d. Reporting requirements with assault
      e. Review sexual assault at lower levels

VIII. Age-related variations
   A. Pediatrics
   B. Geriatrics
Trauma
Orthopedic Trauma – ST6

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Incidence

A. Morbidity/Mortality
   1. Upper extremity
   2. Lower extremity

B. Prevention

II. Pediatric fractures

A. Pathophysiology
   1. Review previous knowledge
   2. Types of fractures
      a. Epiphyseal – at bone growth plate
      b. Greenstick – incomplete fracture from bending bone
      c. Torus – buckling of cortex of bone
   3. Immature growth of bones
   4. Growth plates at end of bones and complications of epiphyseal fractures

B. Special assessment findings
   1. Review previous knowledge
   2. MOI – assess for abuse
   3. Motor, sensory, pulse assessment distal to injury
   4. Child/parent interaction
   5. Age differences and reaction to trauma
   6. Assess for comorbidity

C. Special management considerations
   1. Review previous knowledge
   2. AVO
   3. Transport with family members
   4. Consent issues when family not present, injury not serious
   5. Inform family, teachers, guardians of transport location
   6. Immobilization the same as adults
   7. Ice will reduce swelling

III. Tendon lacerations/transection/rupture (Achilles and patellar)

A. Pathophysiology
1. Review previous knowledge
2. Physiology of tendons
3. Achilles Tendon rupture
4. Patellar - knee
   a. Twisting of the knee in sports activities
   b. Anterior cruciate ligament
   c. Posterior cruciate ligament
   d. Lateral collateral ligament
   e. Medial collateral ligament
   f. Compression injury – direct blow to knee
   g. Lateral and medial sprains – abnormal twisting
   h. Torsion injuries – feet fixed in one direction while body is moving in different direction
   i. Hyperextension – knee extended beyond normal straight leg position
5. Shoulder
   a. Sternoclavicular sprain – direct blow or twisting of posteriorly extended arm
   b. Rotator cuff injuries – acute/chronic – deltoid muscle involvement – violent pull on arm, abnormal rotation, or fall on outstretched arm which tears or ruptures tendons

B. Special assessment findings
   1. Review previous knowledge
   2. Muscle weakness
   3. Pain
   4. Edema
   5. Loss of range of motion

C. Special management considerations
   1. Review previous knowledge
   2. Ice
   3. Elevation
   4. Sensory, motor function
   5. Inspection
   6. palpation – symmetry with other limbs
   7. tests to determine if mobility is normal or abnormal
   8. Assess as soon after injury as possible
   9. Psychological support
   10. Immobilization if necessary
   11. Support of other allied health professions – athletic trainers

IV. Open fractures

A. Pathophysiology
   1. Review previous knowledge
   2. Bone disruption with opening in the skin
   3. Role of osteoblasts
   4. Method of fracture healing
      a. Bleeding at site
      b. Hematoma forms fibrous network
      c. Invasion of osteoblasts
      d. Callus formation – new bone built up, dead bone removed
e. Remodeling
5. Osteomyelitis
6. Fat embolism

B. Special assessment findings
   1. Review previous knowledge
   2. Open wounds over any injured bone
   3. Bone involvement – does not have to be sticking out to be open
   4. Motor, sensory, distal pulse/circulation evaluation

C. Special management considerations
   1. Review previous knowledge
   2. Control bleeding
      a. External
      b. Internal
   3. Prevent infection
   4. Immobilization techniques
      a. Traction control hemorrhage by apply pressure on internal bleeding within muscles wrapped by muscle sheaths.
      b. Align in anatomical position
   5. Comorbidity – multi-system trauma

V. Closed fractures

A. Pathophysiology
   1. Review previous knowledge
   2. Closed fractures contribute to internal vascular or never injuries
   3. Muscle spasms surrounding fracture cause bone ends to rub
   4. Fat embolism

B. Special assessment findings
   1. Review previous knowledge
   2. Edema
   3. Pain
   4. Motor, sensory, distal circulation
   5. Isolated fracture – focus assessment and management
   6. Comorbidity with multi-system trauma

C. Special management considerations
   1. Review previous knowledge
   2. Immobilization techniques
      a. Unique depending bone fractured

VI. Dislocations

A. Pathophysiology
   1. Review previous knowledge
   2. Joint involvement
      a. Elbow – fall on outstretched arm, radius and ulna forced backward
      b. Fingers – hit on fingers, forced upward away from palm
c. Hip – force along long axis of femur
   i. posterior – femur shaft is adducted and flexed (more common to the two)
   ii. anterior – flexed, adducted and internally rotated

d. Humerous head – forced out of articular capsule, fall with inward rotation and
   abduction of an arm

e. Knee – foot planted, outward displacement with patella stable in place

f. Shoulder joint – maintained in place by ligaments, impact drives acromion downward
   away from clavicle which sustains its position

g. Wrist – wrist is in a hyperextended position

3. Joint moved beyond its normal limits
4. Subluxations – partial dislocation
5. Luxations – complete dislocation

B. Special assessment findings
   1. Loss of limb function
   2. Deformity – almost always present
   3. Immediate swelling and point tenderness
   4. Review previous knowledge

C. Special management considerations
   1. Review previous knowledge
   2. Figure 8 splinting for shoulders (sternoclavicular joint)
   3. Sling and swath for acromioclavicular joint
   4. Elbow splinted in position found if distal circulation present
   5. Wrist – padded board or pillow splint with sling and swath
   6. Hip – position found with blankets or pillows for comfort
   7. Knee – true emergency – position found unless distal circulation compromised, then
      anatomical alignment
   8. Ice to reduce swelling
   9. Elevation
   10. Pain relief

VII. Compartment syndrome

A. Pathophysiology
   1. Review previous knowledge
   2. Locally increased pressure compromises local circulation and neuromuscular function
   3. Occur with crush injuries
   4. Burns
   5. Tight casts as part of fracture management
   6. Occlusion of arterial blood supply
   7. Snake bites
   8. Rhabdomyolysis

B. Special assessment findings
   1. Review previous knowledge
   2. Severe limb pain
   3. Muscle compartment extremely tight
   4. Decreased sensation to touch
   5. Paresthesia
   6. Loss of distal circulation
7. Paralysis

C. Special management considerations
   1. Review previous knowledge
   2. Removal of plaster casts
   3. Elevation
   4. Ice
   5. Rapid transport to appropriate facility
   6. Treatment of acidemia
   7. Treatment of Rhabdomyolysis
   8. Pain Management
Trauma
Soft Tissue Trauma – ST7

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Incidence of soft tissue injury
   A. Mortality/morbidity

II. Anatomy and Physiology of soft tissue injury
   A. Layers of the skin
   B. Function of the skin

III. Pathophysiology of wound healing
   A. Hemostasis
   B. Inflammation phase
   C. Epithelialization
   D. Neovascularization
   E. Collagen synthesis

F. Alteration of wound healing
   1. Anatomic factors
   2. Concurrent drug use
   3. Medical conditions/disease
   4. High risk wounds

G. Abnormal scar formation
   1. Keloid
   2. Hypertrophic scar formation
   3. Wounds requiring closure
      a. Cosmetic regions
      b. Gaping wounds
      c. Wounds over tension lines/areas
         i. static tension
         ii. dynamic tension
      d. Degloving injury
      e. Ring injury
f. Skin tearing

IV. Wounds

A. Avulsions
   1. Pathophysiology
      a. Description – shearing force causes tissue to completely separated from base, and either lost or left with a flap.
      b. Depth influences amount of bleeding
      c. Secondary infection
      d. Wound healing process
      e. Scar tissue and its function/ability
   2. Special assessment finding
      a. Lost soft tissue
      b. Skin “flap” which can be returned to anatomical position
      c. Contaminated wounds
      d. Serosanguineous drainage
   3. Special management considerations
      a. Control hemorrhage
      b. Ice to area
      c. Wound cleaning techniques
      d. Long term care vs emergent care

B. Bite Wounds
   1. Pathophysiology
      a. Types
         i. animal
            a) dog may cause any time of soft tissue injury
            b) elderly and young most susceptible to infection
            c) cat bites, more infectious, Pasteurella multocida
         ii. human
            a) may cause any time of soft tissue wound
            b) most frequently the hand
            c) secondary infection due to delay in treatment
            d) multiple types of bacteria may cause the infection
         iii. insect
            a) spider bites
               i) black widow
               ii) brown recluse
            b) fire ants
            c) wasps
            d) bees
            e) tick bites
            f) scorpion stings
         iv. rabies
   2. Special assessment finding
      a. Animal
         i. note time since bite
         ii. type of animal
      b. Human
i. cause of wound
ii. location
iii. presence of infection due to delayed in seeking treatment

c. Insect
i. black widow
ii. brown recluse
iii. fire ants
iv. tick bites
   a) woods, parks (know the area where bites occur)
   b) Look for tick attached to the skin
   c) febrile illness present
   d) bulls eye rash seen with Lyme disease
   e) Rocky Mountain spotted fever
   f) know tick bite prevention strategies

3. Special management considerations
   a. Animal
      i. scene safety – assure animal secured
      ii. control hemorrhage
      iii. clean wound
      iv. report type of animal bite
   b. Human
      i. cause of bite
      ii. abuse, neglect and reporting responsibilities
   c. Insect
      i. spider bites
      ii. fire ants
         a) remove victim and crew from ant mounds
         b) brush off ants
         c) supportive care
      iii. tick bites
         a) inspect for ticks when suspicious
         b) pull tick straight out of skin with tweezers
         c) do not crush the tick when removing
         d) likely needs specialized hospital care if severely ill
         e) supportive care

C. Lacerations

1. Pathophysiology
   a. Tears in the skin
   b. Multiple causes
   c. Bleeding affected by location, type of blood vessels injured
   d. Underling soft tissue involvement – tendons, ligaments
   e. Underlying organ involvement – bones, body cavities, organs
   f. Review bleeding and shock

2. Special assessment finding
   a. Review previous knowledge
   b. Consider the location on the body and tissues injured
   c. Consider loss of function of the tissue
   d. Consider role of infection for delayed treatment

3. Special management considerations
a. Review previous knowledge  
b. Review hemorrhage control procedures  

D. Puncture wounds  
1. Pathophysiology  
   a. Considerations around depth of wound  
   b. Considerations on type and speed of object that punctured the skin  
   c. Consideration around infection  
   d. Considerations on injury to underlying organs and tissues  
   e. Considerations on location of the puncture  
   f. Considerations about the size of the hole the object leaves in the body  
   g. Most bleeding is internal  

2. Special assessment finding  
   a. Mechanism of injury  
   b. Inspect the wound, do not probe  
   c. Know underlying complications  
   d. Infection problems when patient did not seek care  
   e. Role to edema  

3. Special management considerations  
   a. Role of tetanus antitoxin  
   b. Infection prevention  
   c. Wound management  
   d. Supportive care  

V. Burns  

A. Electrical  
1. Pathophysiology  
   a. Ohm’s Law – role of voltage and resistance  
   c. Body tissues vary in type of resistance to current  
   d. Electrical current follows path of least resistance  
   e. Severity influenced by  
      i. type of voltage of circuit  
      ii. amperage of current  
      iii. resistance of the body  
      iv. pathway of the current  
      v. duration of the current  
   f. Types of injury  
      i. thermal due to burning of clothing, etc  
      ii. arc-type – causes high skin temperature leading to burns  
      iii. electrical injury – as it travels through body it heats up causing tissue necrosis with entrance and exit wounds  

2. Special assessment finding  
   a. Review previous knowledge  
   b. Cardiac arrest  
   c. Neuromuscular injuries  
      i. peripheral nerve deficit  
      ii. muscle coordination and strength  
   d. Spinal cord involvement/injury
3. Special management considerations
   a. SCENE SAFETY
   b. Cardiac arrest management
   c. Cervical spine protection
   d. IV fluids if hypotension is present
   e. Transport to appropriate facility

B. Chemical
   1. Pathophysiology
      a. Many sources may cause burn
      b. Alkali exposure – produces
         i. liquefaction necrosis
         ii. breakdown of protein and collagen
         iii. saponification of fats
         iv. dehydration of tissues
         v. thrombosis of blood vessels
         vi. deep penetrating injury
         vii. little pain
         viii. typically are cleaners – oven, fertilizers, industrial
      c. Acids
         i. cause coagulation necrosis and immediate pain
         ii. frequently doesn’t injure deeper tissues
         iii. amount of damage depends on concentration of agent, quality of the agent,
              length of exposure, depth of penetration.
      d. Organic compounds
   2. Special assessment finding
      a. Skin damage will depend on agent, length of exposure, BSB
      b. Know the agent
      c. Read the label
      d. Seek consultation with poison center
   3. Special management considerations
      a. Use protective clothing/equipment when necessary
      b. Flush with copious amounts of water
      c. Alkalis may require several hours of irrigation
      d. Do not use neutralizing agents

C. Thermal
   1. Pathophysiology
      a. Heat absorbed exceeds capacity to dissipate it
      b. Depth will depend on time of contact and source
      c. Age variances with burns
      d. Severity depends on
         i. burn agent
         ii. burn circumstances
         iii. location of the burn on the body
         iv. age of the patient
         v. concomitant injuries
         vi. preexisting injuries
      e. Epidermis injured
      f. Epidermis and varying layers of dermis
g. Burn extends into subcutaneous tissue possibly including bone and muscle tissue
h. Burns and burn effect on other body systems
   i. cardiovascular involvement
   ii. pulmonary involvement
   iii. renal involvement
   iv. GI involvement
   v. hematological involvement
   vi. endocrine involvement

2. Special assessment finding
   a. Superficial partial thickness burn
   b. Moderate-deep partial thickness
      i. red, moist surface, with extreme sensitivity (pain) to any stimuli
      ii. formation of blisters is very common
      iii. in partial thickness burns, the deeper the burn the more painful.
      iv. have intact deep pressure sensation
      v. color of deep partial thickness burns may be deceptive
   c. Full thickness
      i. white, waxy appearance
      ii. charred/parched tan appearance
      iii. black appearance
      iv. skin dry, hard
      v. lack of sensation or pain
      vi. skin is incapable of self-regeneration
   d. Review percent of body surface burn estimation methods for adults, children and infants
   e. Lund and Browder chart and BSB
   f. Classification Systems
      i. minor burn
      ii. moderate burn
      iii. major burn

3. Special management considerations
   a. Review previous knowledge
   b. AVO
   c. Patient with greater than 20% BSB need fluid resuscitation
   d. Parkland Burn Formula
   e. Signs of adequate fluid resuscitation
   f. Signs of inadequate fluid resuscitation
   g. Pain management

VI. High-pressure injection wounds

   A. Pathophysiology
   B. Special assessment finding
   C. Special management considerations
Trauma
Head, Facial, Neck, and Spine Trauma – ST8

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

   A. Incidence
      1. Head injury
      2. Brain injury
      3. Face injury

   B. Mechanisms of Injury
      1. Motor vehicle crashes
      2. Sports
      3. Falls
      4. Penetrating trauma
      5. Blunt trauma

   C. Morbidity and Mortality

   D. Categories of Injury
      1. Coup
      2. Contrecoup
      3. Diffuse axonal injury (DAI)
      4. Focal

   E. Causes of brain injury
      1. Direct/primary
      2. Indirect/secondary/tertiary

   F. Associated Injuries
      1. Airway compromise
      2. Cervical spine injury

   G. Prevention

II. Unstable Facial Fractures

   A. Pathophysiology
      1. Categories of Unstable Facial Fractures
         a. Le Fort I - Fracture separates hard palate and lower maxilla from remainder of skull
         b. Le Fort II - Fracture separates nasal and lower maxilla from facial skull and remainder of cranial bones
c. Le Fort III (craniofacial disjunction) - Fracture separates entire midface from cranium.
2. Blunt trauma to the facial area most frequent cause

B. Specific assessment considerations
1. Facial instability
2. Epistaxis
3. Edema
4. Pain

C. Specific management considerations
1. Simple airway maneuvers are difficult
2. Intubation is method of choice for airway protection
3. Ventilation without intubation is difficult
5. Bleeding into the oral cavity; suction
6. Cricothyroidotomy if indicated
7. Soft tissue bleeding

III. Orbital Fractures

A. Pathophysiology
1. Blunt trauma to eye causes increased pressure to globe of eye. Pressure causes weakest area (orbital floor) to give way, causing herniation of orbital contents (inferior oblique muscle entrapment) into maxillary sinus.

B. Specific assessment considerations
1. Mechanism of injury
2. Sports injury (balls)
3. enophthalmos
4. impaired ocular mobility
5. diplopia
6. infraorbital hypoesthesia

C. Specific management considerations
1. Assess for other injuries
2. Patching both eyes
3. Ice to reduce edema

IV. Perforated tympanic membrane

A. Pathophysiology
1. Pressure trauma – diving, water skiing
2. Direct blows
3. Explosion or barotraumas
4. Foreign objects

B. Specific assessment considerations
1. hemorrhagic otorrhea
2. hearing loss
C. Specific management considerations
   1. Supportive care

V. Skull fractures

A. Pathophysiology (fracture without brain injury)
   1. Linear
   2. Depressed
   3. Basilar
   4. Location and type of fracture is important
   5. Suspicion of underlying brain injury

B. Specific assessment considerations
   1. LOC
   2. Hemorrhage control
      a. Depressed skull fractures may require circumferential digital pressure to control open skull fracture bleed
   3. Fracture lines that cross the middle meningial artery can be serious
   4. Underlying hematoma size can be significant
   5. CSF leakage

C. Specific management considerations
   1. Spinal cord precautions
   2. AVO
      a. High flow oxygen
      b. Adequate ventilation (not hyperventilation)
      c. No nasal airways of any kind for basilar skull fractures
   3. Document neurological assessment
   4. Transport to appropriate facility
   5. Monitor vital signs
   6. Supportive care

VI. Penetrating neck trauma (non-cord involvement)

A. Pathophysiology
   1. Blunt
   2. Penetrating
   3. Upper airway passages
   4. Larynx
   5. Vascular supply to brain
   6. Upper GI system
   7. Epiglottis

B. Specific assessment considerations
   1. Changes in voice
   2. Subcutaneous emphysema
   3. Equal carotid pulse strength
   4. Dysphagia
   5. Hemorrhage
   6. Hemoptysis
7. Tracheal ring fracture

C. Specific management considerations
   1. Hemorrhage control (digital for carotid artery puncture)
   2. Intubation to protect the airway
   3. Voice rest (limited history)

VII. Laryngeotracheal injuries

A. Pathophysiology
   1. Trauma directly to structures
   2. Edema
   3. Hemorrhage

B. Specific assessment considerations
   1. Swelling
   2. Voice changes
   3. hemoptysis
   4. subcutaneous emphysema
   5. structural irregularity

C. Specific management considerations
   1. AVO
      a. Airway obstruction common
      b. May need surgical airway
   2. Supportive multi-system care

VIII. Spine trauma (non-CNS involvement)

A. Pathophysiology

B. Specific assessment considerations
   1. Pain
   2. Point tenderness
   3. Neurologically intact/normal

C. Specific management considerations
   1. Spinal immobilization
      a. Seated
      b. Standing
   2. AVO
   3. Supportive multi-system care

IX. Mandibular fractures

A. Pathophysiology

B. Specific assessment considerations
   1. Malocclusion of the teeth
   2. Pain
3. Point tenderness
4. Ecchymosis on the floor of the mouth

C. Specific management considerations
   1. AVO
   2. Non-use of nasal airways
   3. Ice
   4. Monitor closely
Trauma
Nervous System Trauma – ST10

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Incidence
   A. Morbidity/mortality
   B. Prevention strategies

II. Cauda equine syndrome
   A. Pathophysiology
      1. Cauda equine is spinal nerves descending at end of spinal cord. Not part of the cord, but a series of nerves that appears like a tail at the end of the spinal cord.
      2. The syndrome results from trauma to the lower back
   B. Special assessment considerations (signs and symptoms are never root dependent)
      1. weakness of lower muscles (depended upon which nerve root is injured)
      2. loss of reflexes
      3. hyperesthesia and later anesthesia in groin
      4. incontinence
      5. sexual dysfunction
   C. Special management considerations

III. Nerve root injury (To be reviewed for inclusion later)
   A. Pathophysiology
   B. Special assessment considerations
   C. Special management considerations

IV. Peripheral nerve injury
   A. Pathophysiology
      1. Trauma damages a nerve, or nerve group between the ganglion and its intervention point.
      2. Damage causes muscle or sections of the muscle not to function properly
      3. Damage causes sensation on the skin to be lost
   B. Special assessment considerations
      1. MOI
a. Fracture
b. Laceration involving nerve pathway
c. Penetrating trauma
d. Pressure (weight against a nerve pathway)

2. Anesthesia
3. Numbness
4. Muscle weakness

C. Special management considerations
   1. Immobilize in anatomical position
   2. Reduce swelling

V. Traumatic brain injury

A. Pathophysiology
   1. Brain is very oxygen dependent
   2. Brain has very limited oxygen storing capacity
   3. Loss of blood flow for 5-10 seconds causes unconsciousness
   4. Low PacO2 causes vasodilation
   5. High PacO2 causes vasoconstriction
   6. Coup injury to the brain
   7. Contrecoup injury to the brain
   8. Primary brain injury
   9. Secondary brain injury
   10. Center of consciousness (reticular activating system)
   11. Coma
   12. Posturing (decerebrate, decorticate)
   13. Normal intracranial pressure (2 – 12 mmHg)
   14. Cushing’s triad (increased blood pressure, decreased pulse and irregular respirations)
   15. Brain herniation
      a. Uncal herniation
      b. Central herniation syndrome
      c. Cerebellar herniation
   16. Skull fractures
      a. Linear
      b. Depressed
      c. Open
      d. Basilar
   17. Concussion
   18. Diffuse axonal injury
   19. Contusion
   20. Cerebral lacerations
   21. Epidural hematoma
   22. Subdural hematoma
      a. acute
      b. chronic
   23. Subarachnoid hemorrhages
   24. Intracerebral hematomas
   25. Penetrating Brain trauma
B. Specific assessment considerations
1. LOC
2. AVO
3. Spinal Concerns
4. Vital sign irregularities
5. Posturing
6. Pupil reactions
7. CSF presence
8. Cranial nerve damage signs
9. Bilateral strength of muscle groups
10. Doll’s eyes
11. Coma assessment
12. Neurological exam
   a. LOC
   b. Pupil function
   c. Peripheral Sensory/Motor
   d. Reflexes

C. Special management considerations
1. AVO with spinal precautions/immobilization
   a. Neuromuscular blocking agents
   b. Surgical airways with massive facial trauma
   c. Ventilate/assist to maintain PaO2 of 90mmHg
2. MOI
   a. Blunt
   b. Penetrating
3. History
   a. Amnesia
   b. Retrograde amnesia
4. Vital signs
   a. Cheyne-Strokes
   b. Cushing’s triad
5. Pharmacological agents
6. Seizure precautions/treatment
7. Volume replacement in multi-system trauma
8. Role of Hypothermia
9. Role of neuroprotective agents
10. Role of steroids

VI. Spinal cord injury

A. Pathophysiology
1. Mechanism of injury
   a. Axial loading
   b. Flexion
   c. Hyperflexion
   d. Hyperrotation
   e. Lateral bending
   f. Distraction
   g. Cord concussion
h. Cord contusion  
i. Cord compression  
j. Laceration

2. Complete cord lesions
3. Incomplete cord lesions  
a. Brown-Sequard’s syndrome – penetrating trauma  
b. Anterior cord syndrome – pressure/damage on anterior spinal cord  
c. Central cord syndrome – contusion to cord, hyperextension or flexion mechanisms.

4. Neurogenic shock  
a. Loss of control between injury site and brain  
b. Vasodilation  
c. Loss of balance between parasympathetic and sympathetic nervous systems

5. Paralytic ileus

B. Special assessment considerations  
1. Dermatome assessment  
2. Complete  
a. No pain below injury site  
b. No sensation to pressure below injury site  
c. No feeling of sensation below injury site  
d. No movement below injury site
3. Incomplete  
a. Brown-Sequard  
i. signs on one side of body  
ii. ipsilateral motor loss  
iii. ipsilateral loss of proprioception  
iv. contralateral loss of pain and temperature sensation  
b. Anterior  
i. loss of voluntary and reflex motor activity  
ii. loss of pain and temperature sensation  
iii. preservation of proprioception, vibratory sense, and ability to sense light pressure  
c. Central Cord  
i. changes mainly effect upper extremities  
ii. loss of feeling in upper extremities but presence in lower extremities  
iii. paresis often more pronounced distally in upper extremities than proximal

C. Special management considerations  
1. Spinal immobilization  
2. AVO  
3. Pharmacological agents (anti-inflammatory)  
4. Dermatome assessment and anatomical regional effects with spinal injury.

VII. Spinal shock

A. Pathophysiology  
1. Loss of control between injury site and brain  
2. Vasodilation  
3. Loss of balance between parasympathetic and sympathetic nervous systems  
4. Lasts 7 to 20 days
5. Autonomic hyperreflexia

B. Special assessment considerations
   1. Flaccid muscles
   2. Paralysis
   3. Absence of sensation
   4. Hypotension
   5. Hypothermia

C. Special management considerations
   1. AVO
   2. IV bolus
   3. Vasopressor considerations
   4. Pharmacological assistance
Trauma
Special Considerations in Trauma – ST11

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Trauma in Pregnancy

A. Incidence
   1. Mortality/morbidity
   2. Risk factors
   3. Prevention

B. Pathophysiology
   1. Exhibit responses different due to physiologic changes during pregnancy
   2. Mother
      a. Blood volume changes
      b. Respiratory changes
      c. GI and intra-abdominal changes
   3. Fetus
   4. Fetal death caused by
      a. Maternal loss – trauma leading to shock
      b. Abruptio placentae – need high index of suspicion
   5. Abdominal injuries
   6. Pelvic fracture
   7. Traumatic arrest
   8. Seat belt injuries
   9. Sexual assault

C. Special Considerations in assessment
   1. Increased heart rate is not an early sign of hypovolemic shock
   2. Significant blood loss may not be reflective of usual signs of shock
   3. RR less than 20 should not be considered adequate ventilation
   4. Loss of landmarks for chest compressions in arrest
   5. MOI and signs of abruption placentae
   6. Estimate gestational age of baby
   7. Palpate uterine fundus
   8. Attempt to listen to fetal heart tones – 4 o’clock position, about 2” from mother umbilicus

D. Special considerations in management
   1. Airway, Breathing, and Circulation
   2. Maternal management
   3. Fetal Assessment

II. Pediatric Trauma
A. Unique Pediatric Aspects of Trauma
   1. Most common is motor vehicle-related
   2. Blunt trauma most prevalent MOI
   3. Intentional injuries
   4. Suicide in adolescents
   5. Children in trauma more rapidly decompensate
   6. Child abuse causes trauma
   7. Strong catecholamine capabilities

B. Pathophysiology
   1. Head – most common injured
      a. Larger than adults
      b. Large occiput flexes head compromising airway
      c. Suture flexibility in very young
      d. Newborns and infants can become hypotensive with head injuries
   2. Spine
      a. SCIWORA
   3. Chest
      a. Very compliant – injury requires great force
      b. Commotio cordis – sudden impact of blunt force to chest resulting in cardiac dysfunction, even death
   4. Abdomen
      a. Larger solid organs
      b. Weak abdominal muscles
   5. Musculoskeletal
      a. Epiphyseal plate
      b. Bones heal faster

C. Special Considerations in assessment
   1. Airway, Breathing, and Circulation
      a. Small mouth and airways, easy obstructed
      b. Use of sniffing position
      c. Large tongue in infant makes ET more difficult
      d. Mainstem intubation precautions
   2. Circulation
      a. Hypotension appears late, use other signs of inadequate circulation
      b. Inadequate oxygenation cause bradycardia
      c. Capillary refill may be helpful
      d. LOC may indicate inadequate circulation
      e. B/P estimated as $80 + 2 \times \text{the age}$
      f. Appropriate B/P cuff size
      g. $80\text{ml/kg}$ blood loss can cause shock
   3. Head
      a. Very vascular, even scalp laceration can cause shock
      b. Falls less than 5 feet are significant
      c. Beware of shaken baby syndrome
      d. GCS less than 8 means increased ICP
   4. Chest
a. Significant internal injury can be present without any external signs
b. Tension-pneumothorax is difficult to evaluate

5. Abdomen
   a. Spleen most common injured
   b. Cullen’s sign
   c. Kehr’s sign

6. Musculoskeletal Trauma

D. Special considerations in management
   1. Airway, Breathing, and Circulation (improper management is the most common cause of preventable pediatric death)
      a. Intubation complications
      b. High-concentration oxygen and saturation
      c. Proper endotracheal tube size considerations
      d. Nasotracheal intubation is contraindicated
   2. Circulation
      a. IV’s at 20ml/Kg bolus
      b. IO if no damage in lower extremity
   3. Head
      a. Elevate during transport
      b. Seizure precautions
   4. Spinal –
      a. adequate size C-collars are important
      b. padding with immobilization
   5. Abdomen
   6. Extremity
   7. Transportation

III. Geriatric Trauma

A. Unique Geriatric Aspects of Trauma

B. Pathophysiology
   1. Most changes occur after age 80 if the patient is in general good health
   2. Respiratory
      a. Chest wall less compliant
      b. Less vital capacity
      c. Decrease in ciliary action
   3. Cardiovascular
      a. Heart rate and stroke volume decrease
      b. Dysrhythmia changes
   4. Neurological system
      a. Neuron mass reduction
      b. Velocity of impulses
      c. Mentation changes
      d. Thermoregulation changes
   5. Gastrointestinal
   6. Renal
   7. Musculoskeletal
   8. Integumentary
9. Immune

C. Special considerations in assessment
   1. History
      a. Unreliable historian’s
      b. Mentation, dementia
      c. Family members as historians
   2. Decreased tolerance to heat loss

D. Special considerations in management
   1. Airway, Breathing, and Circulation
      a. Mask seal
      b. Cervical kyphosis
      c. Oxygen saturation can quickly deteriorate
   2. Circulation
      a. Over hydration in patient with cardiac history

E. Specific injuries/diseases management
   1. Shock
   2. Head injuries
   3. Musculoskeletal injuries
   4. Burns
   5. Abuse

IV. Cognitively impaired patient

A. Unique challenges with cognitive impaired patients
   1. ability of individual to communicate complaints
   2. unreliable historian’s
   3. unusual presentation of common disorders
   4. reduced pain threshold
   5. consent to treat complications
   6. most commonly mental retardation (IQ less than 70)
   7. 1 to 2.5% of population has mental retardation
   8. Autism – differences in social, communication skills and ability to purposefully shift attention
      (may become agitated with touch)

B. Special considerations in assessment
   1. Level of development
      a. 5 or 6th grade level is common
      b. use open-ended questions to assess development
      c. particular difficulty with time and causality concepts
      d. use a high function concept and have them repeat it back
   2. Use family and caregivers as part of history gathering
      a. How does patient normally communicate?
      b. How aware are they of environment?
      c. What are usual motor skills and level of activity?
      d. What are the patient’s usual sleep pattern and appetite?
   3. Assess/determine hearing and sight problems
   4. Take vital signs when patient is calm
5. Typically helpful to have a caregiver present during physical exam

C. Special considerations in management
   1. Treatment is the same
   2. Suspect common disorders in the age population
      a. Injuries
      b. Infections
      c. Seizures
      d. Delirium
      e. Psychiatric disorders
      f. GI disorders
Trauma

Environmental Emergencies – ST12

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Incidence

A. Morbidity/Mortality

B. Risk Factors
   1. Pediatric considerations
   2. Geriatric considerations
   3. Fitness/Body Mass Index
   4. Age
   5. Gender
   6. Medical conditions
   7. Medications
   8. Hydration

C. Prevention
   1. Personal Protection Equipment (PPE)
   2. Climate acclimatization
   3. Policies/procedures for work conditions
   4. Hydration with food, beverage, electrolyte replacement
   5. Measuring heat stress index
      a. Wet-bulb globe temperature (humidity)
      b. Dry bulb temperature (radiant)
      c. Black globe temperature (ambient)
   6. Minimize fatigue
   7. Muscular strength and endurance training

II. Submersion incidents

A. Pathophysiology
   1. Near drowning
      a. Patient survives 24 hours after submersion incident (asphyxiation)
      b. Wet drowning
      c. Dry drowning
      d. Hypoxia causes the chain of events toward death
      e. Post-submersion syndrome

B. Special Assessment considerations
1. Diving emergencies
   a. Signs of bends occur with 15 minutes to 12 hours after surfacing
   b. Signs of bends
      i. happens in patients with a recent diving history
      ii. pain in joints
      iii. fatigue
      iv. weakness
   c. B/P cuff over affected joint
2. Near drowning
   a. Apnea to cardiac arrest
   b. Post-submersion syndrome
   c. Injury prevention participation

C. Special management considerations
   1. Diving
      a. Rapid transport to decompression facility
      b. 100% oxygen administration
   2. Near-drowning

III. Temperature-related illness

A. Pathophysiology
   1. Heat Illness
      a. Heat physiology
         i. conduction
         ii. convection
         iii. radiation
         iv. evaporation
         v. thermosensors
         vi. central nervous system function
         vii. thermoregulatory effectors
      b. Predisposing factors for heat illness
      c. Fever vs hyperthermia
      d. Thermometry
      e. Heat cramps
         i. brief, muscle cramps of fatigued muscles
         ii. related to electrolyte imbalance in muscles
      f. Heat syncope
         i. mostly seen in elderly
         ii. blood in periphery to increase heat loss causes inability to compensate/control blood pressure when standing
      g. Prickly Heat
      h. Heat exhaustion
         i. Water depletion
         ii. Salt depletion
      i. Heat Stroke
         i. malfunction of sodium pump in thermoregulatory cells
         ii. exact temperature which causes in unknown but near 112F
         iii. damage is dependent on multiple factors
iv. failure to perfuse skin with heated core blood dramatically increases rate of heat storage
v. loss of sweating mechanism does not cause heat stroke

2. Cold-related illness
   a. Frost bite
   b. Accidental hypothermia

B. Special Assessment considerations
   1. Heat Illness
      a. Prickly heat, gland ducts can become infectious
      b. Heat exhaustion
         i. variable and nonspecific
         ii. weakness, fatigue, headache, impaired judgment, vertigo
         iii. moderately elevated core temperature
      c. Heat stroke
         i. prolonged heat stress/exhaustion
         ii. signs of CNS dysfunction (coma, seizures, delirium)
         iii. hot, dry skin
         iv. tachycardia
         v. often under diagnosed due to lack of presence of classic symptoms

2. Frostbite
   a. Pathophysiology
      i. freezing injury cascade
      ii. microvasoconstriction and local fluid shifting
      iii. temperature in local area drops below 0°C
      iv. ice forms outside the cell causing osmotic disequilibrium
      v. cells function lost
      vi. freezing of circulation fluids
      vii. anaerobic function of cells, pressure on cells, thrombus in local tissues, ischemia to necrosis
   b. Predisposing factors
   c. Types during local tissue freezing
      i. frostnip
      ii. chilblains
      iii. trench foot

3. Accidental hypothermia
   a. Due to submersion or prolonged exposure to cold temperatures
   b. Risk is high for young/elderly patients who cannot generate heat
   c. Vasoconstriction produces peripheral tissue ischemia
   d. Continued drops in temperature causes hypothalamic center to stimulate shriving
   e. Continued cold, vasoconstriction lost then vasodilation occurs with loss of core heat to the periphery
   f. At 85°F individual becomes stuporous, cardiac output drops, cerebral blood flow decreased
   g. At 78 degrees V-fib and cardiovascular collapse are common

C. Special management considerations
   1. Heat Illness
      a. Heat cramps
         i. IVs of salt containing solutions
ii. oral intake of electrolyte solutions

2. Heat Syncope
   a. Lay victim flat
   b. Keep people moving in heated environments

3. Heat exhaustion
   a. IV therapy
   b. Cool environment

4. Heat stroke
   a. Initial cooling
   b. Ice water or ice application
   c. Fanning of patient who is wet with cold/ice water
   d. Supportive care for seizures, electrolyte imbalance
   e. IV therapy
   f. Sedation if agitated

5. Frostbite
   a. Consider re-warming only if potential to re-freeze does not exist
   b. Remove wet clothing
   c. Move to warm environment
   d. Re-warm, tepid water immersion of extremity, usually requires 10-30 minute immersion
   e. Pain relief medications are essential with re-warming

6. Accidental hypothermia
   a. AVO
      i. consider intubation if no gag reflex
   b. Circulation
      i. cardiac monitor
      ii. IV insertion, fluid challenge, warm fluids
      iii. CPR if indicated
   c. Passive re-warming techniques
   d. Active re-warming techniques

IV. Bites and Envenomations

A. Injuries of concern
   1. Spider bites
   2. Snake bites
   3. Hymenoptera (bees, wasps, ants, yellow jackets)

B. Pathophysiology of bites and envenomations
   1. Spider bites (black widow)
      a. Inject neuro toxins, designed to digest its prey
      b. Toxin plays role in function of acetylcholine in nerve impulse transmission
   2. Snake bites
      a. Toxins effect blood and nervous system both at the bite site and systemically
      b. Many toxins cause the patients cells to release bradykinins, histamines, and serotonin
      c. Patient age and size cause different effects
      d. Amount of toxin injected has effect (often none at all)
      e. Initial 6 – 8 hours care is essential
   3. Hymenoptera
      a. Cause allergic reactions in sensitized (allergic) people
b. Often leads to anaphylactic response

C. Signs and Symptoms
   1. Spider bite (black widow)
      a. Localized swelling initially
      b. Chest or abdominal pain depending on bite site
      c. Dangerous in children, may be fatal
   2. Rattlesnake bite
      a. Time of bite to care is important
      b. Pain at site
      c. Edema
      d. Progressive weakness
      e. Nausea and vomiting
      f. Seizures
      g. Vision problems
      h. Changes in LOC
   3. Bee, Wasp, and other stings
      a. Pain at site
      b. Swelling
      c. Signs of allergic reaction
      d. Signs of anaphylaxis

D. Unique management considers of bites and stings
   1. Spider bite (black widow)
      a. Ice pack to area of bite
      b. Clean wound with soap and water
      c. Transport immediately with supportive care
   2. Rattlesnake bite
      a. Note time of bite to transport
      b. Slow venous return, place venous constricting bands
      c. Keep patient calm
      d. Immobilize extremity
      e. Clean bite site with soap and water
      f. Identify snake if possible
   3. Bees, wasps, and other stings
      a. Quickly remove stinger or venom sac
      b. If anaphylaxis develops follow protocol

V. Electrical injury – Lightening strikes

A. Pathophysiology
   1. Similar to electrical burns
   2. MOI
      a. Direct strike
      b. Side flash “splash”
      c. Ground current or step voltage
      d. Blunt trauma
      e. Contact
   3. Major problem is cardiorespiratory arrest (massive DC countershock)
   4. May cause head trauma, cardiac damage, burns, extremity vasospasm, paresis or paresthesias.
B. Special Assessment considerations
   1. Scene safety
   2. Assess for cardiac arrest

C. Special management considerations
   1. AVO
   2. Cardiac arrest management
   3. Burn wound care
   4. Transport

VI. High altitude illness

A. Pathophysiology

B. Special Assessment considerations
   1. Vary depending on speed of ascent and time at elevation
      a. Headache, anorexia, nausea, fatigue, dizziness, difficulty sleeping
   2. HAPE (high altitude pulmonary edema)
   3. High altitude retinal hemorrhage

C. Special management considerations
   1. Reduce altitude as fast as possible
   2. Mild cases are self limited
   3. Moderate, aspirin, acetaminophen,
   4. Severe requires diuretics, oxygen, steroids
   5. Prevention is best, many patients take acteazolamide
Trauma
Multi-System Trauma – ST13

Integrates assessment findings with principles of epidemiology and pathophysiology to formulate a field impression to implement a comprehensive treatment/disposition plan for an acutely injured patient.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Kinematics of trauma

A. Definition
   1. Looking a trauma scene and attempting to determine what injuries might have resulted
   2. Kinetic energy – function of weight of an item and its speed.
   3. Blunt trauma
      a. Objects collide during crashes
         i. car with object
         ii. victim with part of car
         iii. organs collide inside body
      b. Unbelted drivers and front seat passengers suffer multi-system trauma due to multiple collisions of the body and organs
      c. Direction of the force has impact on type of injury
         i. frontal impacts
         ii. rear impacts
         iii. side impacts
         iv. rotational impacts
         v. roll-overs
   4. Deceleration Injuries
   5. Penetrating Trauma
      a. Types of bullets have affect
         i. distance from shooter
         ii. size of bullet
         iii. fragmentation
         iv. cavitation
      b. Energy levels have effect
         i. low energy -- stabbings
         ii. medium energy -- handguns and some rifles
         iii. high energy -- military weapons
      c. Organs stuck have effect
         i. head
         ii. chest
         iii. abdomen
         iv. extremities

II. Multi-System Trauma

A. Definition
   1. Almost all trauma effects more than one system
2. Typically a patient considered to have “multi-trauma” has more than one major system or organ involved
   a. Examples:
      i. head and spinal trauma
      ii. chest and abdominal trauma
      iii. chest and multiple extremity trauma
3. Multi-trauma treatment will involve a team of physicians to treat the patient such as neurosurgeons, thoracic surgeons, and orthopedic surgeons
4. Multi-trauma has a high level of morbidity and mortality

B. The golden principles of out of hospital trauma care
   1. Safety of patient and rescue personnel
   2. Determination of additional resources
   3. Kinematics
      a. Mechanism of injury
      b. High index of suspicion
   4. Identify and manage life threats
   5. Airway management while maintaining cervical spinal immobilization
   6. Support ventilation and oxygenation
   7. Control external hemorrhage
   8. Basic shock therapy
      a. Maintain normal body temperature
      b. Splint musculoskeletal injuries
   9. Maintain spinal immobilization on long board
      a. Standing patients
      b. Sitting patients
      c. Rapid transport considerations
      d. Prone patients
      e. Supine patients
   10. Transportation considerations
      a. Golden period
      b. Closest appropriate facility
      c. ‘Platinum 10 Minutes’
   11. Obtain medical history
   12. Secondary survey after maintenance of life threats
   13. “Do No Further Harm”

C. Critical Thinking in multi-system trauma care
   1. Airway, ventilation and oxygenation are key elements to success
      a. Airways must be opened and clear throughout care
      b. Adequate ventilation must occur
      c. Oxygenation in multi-system trauma is high concentrations of oxygen
   2. Oxygenation can not occur when patients are bleeding profusely
      a. Stop arterial bleeding rapidly
      b. Consider use of tourniquets in emergent, hostile or multiple patient situations where bleeding is considerable
   3. Sequence of treating patients
      a. Not all treatments are linear. At times care must be adjusted depending on the needs of the patient.
      b. Example:
i. control arterial bleeding in an awake patient first
ii. much care can be done en route

4. Rapid transport is essential
   a. The definitive care for multi-system trauma is surgery which cannot be done in field
   b. On scene time is critical and should not be delayed
   c. Rapid extraction is an important consideration
   d. Use of ALS intercept and air medical resources in a multi-trauma patient should be highly considered
   e. Early notification of hospital resources is essential once rapidly leaving the scene
   f. Transport to the appropriate facility is critical

5. Backboards

6. Documentation and Reporting
   a. EMTs are the eyes and ears of the physicians
   b. EMTs need to re-create the scene
   c. Important kinematics and mechanisms of injury are important to trauma teams
   d. Changes in vital signs or assessment findings while en route are critical to report and document

7. Personal safety
   a. Most important when arriving on scene, and throughout care, an injured EMT cannot provide care
   b. Be sure to assess your environment
      i. passing automobiles
      ii. hazardous situation
      iii. hostile environments
      iv. unsecured crime scenes
      v. suicide patients who may become homicidal

8. Experience
   a. Newly licensed paramedics who have not seen many multi-system trauma patients need to stick with the basics of life saving techniques
   b. Do not develop “tunnel” vision by focusing on patients who complain of lots of pain and are screaming for your help while other quiet patients who may be hypoxic or bleeding internally cannot call out for help because of decreases in level of consciousness
   c. Be suspicious at trauma scenes, sometimes an obvious injury is not the critical cause one the potential for harm.
   d. Trauma care is a leading cause of death of young people. It is essential you keep important care principles in mind when providing care.

III. Specific injuries related to multi system trauma

A. Blast injuries
   1. Types of Blast Injuries (explosions)
      a. Blast waves
      b. Blast winds
      c. Ground shock
      d. Heat
   2. Pathophysiology
      a. Blast waves when the victim is close to the blast cause disruption of major blood vessels, rupture of major organs, and lethal cardiac disturbances
      b. Blast winds and ground shock can collapse buildings cause trauma
   3. Signs/symptoms
a. Hollow organs are injured first
b. Multi-system injury sign and symptom patterns
   i. lungs
   ii. heart
   iii. major blood vessels
4. Management considerations in blast injuries
   a. Multi-system trauma care
   b. Immediate transport to appropriate facility
   c. Multi-casualty care
Special Patient Population
Obstetrics – SP1

Integrates assessment findings with principles of pathophysiology and knowledge of psychosocial needs to formulate a field impression and implement a comprehensive treatment/disposition plan for patients with special needs.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

A. Anatomy and physiology review of the female reproductive system
   1. uterus
   2. cervix
   3. ovaries
   4. vagina
   5. breasts

B. Female reproductive cycle
   1. female hormones
      a. estrogen
      b. progesterone
      c. prostaglandins
   2. neurohormonal basis
   3. ovarian cycle
   4. menstrual cycle

C. Cultural values affecting pregnancy

D. Special considerations of adolescent pregnancy

II. Physiology

A. Normal anatomical, physiological, and psychological changes in pregnancy
   1. reproductive system
   2. respiratory system
   3. cardiovascular system
   4. gastrointestinal system
   5. urinary tract
   6. skin, hair, and eyes
   7. musculoskeletal system
   8. metabolism
   9. endocrine
      a. system
      b. hormones in pregnancy
   10. psychological

B. Identify normal events of pregnancy
C. Conception and fetal development
   1. ovulation
   2. fertilization
   3. implantation
   4. fetal circulatory system
   5. embryonic stage
   6. fetal stage

D. Development and functions of the placenta
   1. placental circulation
   2. placental functions
   3. transfer of gases
   4. transport of nutrients
   5. hormone production
   6. protection

III. General system physiology, assessment, and management of the obstetrical patient.

A. Premonitory signs of labor
   1. lightening
   2. Braxton Hicks
   3. cervical changes
   4. bloody show
   5. rupture membrane
   6. other

B. Stages of labor and delivery
   1. first stage
      a. latent
      b. active
      c. transition
   2. second stage
      a. spontaneous birth
      b. positional changes of the fetus
         i. descent
         ii. flexion
         iii. internal rotation
         iv. extension
         v. restitution
         vi. external rotation
         vii. expulsion
   3. third stage
      a. placental separation
      b. placental delivery
   4. maternal response to labor
      a. cardiovascular
      b. respiratory
      c. renal
      d. gastrointestinal
e. immune system
f. pain
5. fetal response to labor
   a. heart rate
   b. acid-base status
   c. hemodynamic
   d. sensation

C. Assessment of the Pregnant Patient
   1. airway, breathing, circulation
   2. initial assessment
   3. SAMPLE history
   4. vital signs
   5. obstetrical history
   6. physical examination
   7. evaluating gestational age
      a. fundal measurement
      b. calculating estimated date of birth
   8. fetal movement
   9. fetal heart tones
   10. deep tendon reflexes
   11. inspect for crowning

D. Management of a normal delivery obstetrical patient
   1. Treatment modalities
      a. oxygen
      b. non-pharmacological intervention
         i. positioning
         ii. IV access
         iii. cardiac monitor
      c. pharmacological interventions
         i. fluids
         ii. analgesia

E. Postpartum Care
   1. assessment of fundus
   2. quality of lochia
   3. signs of hemorrhage

IV. Complications Related to Pregnancy

A. Abuse

B. Substance abuse

C. Supine hypotensive disorder

D. Diabetes mellitus
   1. pathophysiology
   2. assessment
3. management

E. Various cardiac disorders
   1. pathophysiology
   2. assessment
   3. management

F. Bleeding Related to Pregnancy: pathophysiology, assessment, complications, management
   1. abortion
      a. elective abortion
      b. spontaneous abortion
      c. threatened
      d. imminent
      e. complete
      f. incomplete
      g. missed
      h. habitual
      i. septic
   2. Ectopic pregnancy

G. Placental problems: pathophysiology, assessment, management
   1. abruption placenta
   2. placenta previa

H. Hyperemesis gravidum
   1. pathophysiology
   2. assessment
   3. management

I. Hypertensive disorders: pathophysiology, assessment, management
   1. pregnancy induced hypertension
   2. preeclampsia
   3. eclampsia

J. Rh sensitization

K. Infections
   1. HIV
   2. TORCH
      a. toxoplasmosis
      b. rubella
      c. cytomegalovirus
      d. herpes
   3. urinary tract
   4. vaginal
   5. Sexually Transmitted Infections
      a. candidiasis
      b. trichomoniasis
      c. bacterial vaginosis
      d. chlamydial infection
e. gonorrhea  
f. syphilis  
g. human papilloma virus

V. High Risk Pregnancy: pathophysiology, assessment, complications, management

A. precipitous labor and birth  
B. post term pregnancy  
C. meconium staining  
D. fetal macrosomia  
E. multiple gestation  
F. intrauterine fetal death  
G. amniotic fluid embolism  
H. hydramnios  
I. cephalopelvic disproportion

VI. Complications of Labor: pathophysiology, assessment, complications, management

A. premature rupture of membranes  
B. preterm labor  
C. uterus rupture  
D. fetal distress

VII. Complications of Delivery: pathophysiology, assessment, complications, management

A. cephalic presentation
   1. occiput – posterior  
   2. face  
   3. brow  
   4. military  
B. breech
   1. frank  
   2. incomplete  
   3. complete  
   4. transverse  
C. shoulder dystocia  
D. nuchal cord
E. prolapse of cord

F. Postpartum Complications: pathophysiology, assessment, complications, management
   1. inverted uterus
   2. hemorrhage
      a. early
         i. uterine atony
         ii. lacerations
         iii. retained placental fragments
      b. late
   3. embolism
   4. Post partum depression
Special Patient Population
Neonatal Care – SP2

Integrates assessment findings with principles of pathophysiology and knowledge of psychosocial needs to formulate a field impression and implement a comprehensive treatment/disposition plan for patients with special needs.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Introduction

A. Newborn
   1. A recently born infant; usually considered the first few hours of life

B. Neonate
   1. Considered the first 28 days of life

II. General pathophysiology, assessment and management

A. Epidemiology
   1. Incidence
      a. Approximately 6% of deliveries require life support
      b. Incidence of complications increases as birth weight decreases
   2. Morbidity/ mortality
      a. Neonatal mortality risk can be determined based on birth weight and gestational age
      b. Resuscitation is required for about 80% of who weigh less than 1500 grams at birth
   3. Risk factors
      a. Antepartum factors
         i. multiple gestation
         ii. inadequate prenatal care
         iii. mother’s age <16 or >35
         iv. history of perinatal morbidity or mortality
         v. post-term gestation
         vi. drugs/ medications
         vii. toxemia, hypertension, diabetes
         viii. perinatal infections
         ix. known fetal malformations/“high risk” OB patient
      b. Intrapartum factors
         i. premature labor
         ii. meconium-stained amniotic fluid
         iii. rupture of membranes greater than 18 hours prior to delivery
         iv. use of narcotics within four hours of delivery
         v. abnormal presentation
         vi. prolonged labor or precipitous delivery
         vii. prolapsed cord
         viii. bleeding
   4. Treatment strategies
a. Preparation of resuscitation equipment
b. Determine appropriate destination

B. Pathophysiology

1. Transition from fetal to neonatal circulation
2. Respiratory system must suddenly initiate and maintain oxygenation
3. Infants are very sensitive to hypoxia
4. Permanent brain damage will occur with hypoxemia
5. Apnea in newborns
   a. Primary
   b. Secondary

6. Congenital anomalies
   a. diaphragmatic hernia
   b. choanal atresia
   c. Pierre Robin syndrome
   d. Cleft lip
   e. Other craniofacial Defects
   f. Spina bifida
   g. Exposed abdominal contents
      i. Intact omphalocele
      ii. Non intact omphalocele
   h. Other common conditions

C. Assessment of the newborn

1. Time of delivery
2. Normal/ abnormal vital signs
3. Airway and ventilation
   a. Respiratory rate
   b. Respiratory effort
4. Circulation
   a. Heart rate
   b. Color/ cyanosis
      i. normal
      ii. central versus peripheral
      iii. mucosal membranes
   c. End organ perfusion
      i. compare strength of central pulses versus peripheral
      ii. capillary refill
5. APGAR
   a. Appearance - skin color
      i. completely pink - 2
      ii. body pink, extremities blue - 1
      iii. blue, pale - 0
   b. Pulse rate
      i. above 100 - 2
      ii. below 100 - 1
      iii. absent - 0
   c. Grimace - irritability
      i. cries - 2
ii. grimaces - 1  
iii. no response - 0  

d. Activity - muscle tone  
i. active motion - 2  
ii. some flexion of extremities - 1  
iii. limp - 0  

e. Respiratory - effort  
i. strong cry - 2  
ii. slow and irregular - 1  
iii. absent - 0  

D. Treatment  
1. Prior to delivery, prepare environment and equipment  
2. During delivery, suction mouth and nose as head delivers  
3. After delivery  
a. Airway and ventilation  
i. drying  
   a) head and face  
   b) body  
ii. warming  
   a) appropriate techniques  
   b) minimize heat loss via head  
iii. position  
iv. suction  
   a) technique  
      i) mouth first, than nares  
      ii) nasal suctioning is a stimulus to breathe  
   b) equipment  
      i) bulb suction  
      ii) suction catheters  
      iii) meconium aspirator  
v. stimulation  
   a) flicking soles of feet  
   b) stroking back  
vi. blow-by oxygen  
   a) never withhold oxygen  
   b) oxygen should be warmed  
   c) use when  
      i) newborn is cyanotic and  
      ii) heart rate > 100 and  
      iii) adequate respiratory rate and effort  
   d) 5 liters/ minute maximum  
      i) complications due to hypothermia  
      ii) direct rather than tangential flow on face  
   e) appropriate techniques  
vii. oral airways - rarely used for neonates  
   a) necessary to keep mouth open for ventilation  
   b) bilateral choanal atresia  
   c) Pierre Robin syndrome  
   d) macroglossia
e) craniofacial defects affecting airway

viii. bag-valve-mask
   a) mask characteristics
      i) appropriate size
      ii) minimize dead-space
   b) bag characteristics
      i) pop-off valve should be disabled
      ii) risk of pneumothorax with excessive pressures
      iii) initial breath may require high pressures
   c) use when
      i) apneic
      ii) inadequate respiratory rate or effort
      iii) heart rate less than 100
   d) technique
      i) initial ventilations require higher pressure to expand lungs
      ii) rate

ix. intubation
   a) indications
      i) prolonged positive pressure ventilation
      ii) bag and mask ventilations ineffective
      iii) tracheal suctioning required
      iv) diaphragmatic hernia suspected
      v) craniofacial defects that impede ability to maintain airway.
   b) technique
      i) suction equipment
      ii) laryngoscope
      iii) blades-straight
         (a) #1- full term
         (b) #0- preterm
      iv) endotracheal tubes -- 2.5 to 4.0 mm id
      v) shoulder roll
      vi) adhesive tape
   c) confirmation
      i) visualization
         (a) tube passing through the cords
         (b) chest expansion with ventilation
      ii) auscultation
         (a) laterally and high on the chest wall
         (b) epigastric region
      iii) patient improvement
      iv) EtCO2
      v) pulse oximetry
   d) PEEP

x. gastric decompression
   a) abdominal distention is impeding ventilation
   b) presence of diaphragmatic hernia
   c) tracheo-esophageal fistula

b. Circulation
   i. vascular access
      a) indications
i) to administer fluids
   ii) to administer medications
b) peripheral vein cannulation
c) intraosseous cannulation
   ii. chest compression (with assisted BVM ventilation) Refer to current ILCOR/AHA guidelines
c. Pharmacological
   i. bradycardia
   ii. low blood volume
   iii. respiration depression secondary to narcotics
   iv. metabolic acidosis
   v. hypoglycemia
d. Non-pharmacological
   i. temperature control
   ii. positioning
e. Transport consideration
   i. rapid transportation of the distressed infant
   ii. position newborn on their side to prevent aspiration
   iii. adequate securing of ETT
f. Psychological support/communication strategies

III. Specific situations

A. Meconium stained amniotic fluid
   1. Epidemiology
      a. Incidence
         i. may occur either in utero or intrapartum
         ii. mostly in post-term and small-for-gestational-age newborns
      b. Morbidity/mortality
         i. high mortality
         ii. hypoxemia
         iii. aspiration pneumonia
         iv. pneumothorax
         v. pulmonary hypertension
      c. Risk factors
         i. fetal distress during labor and delivery
         ii. post-term infants
         iii. thin particulate meconium versus thick
   2. Anatomy and physiology review
   3. Pathophysiology
      a. Hypoxia or physiologic cause
      b. Aspiration of meconium stained amniotic fluid
         i. Complete airway obstruction
            a) Atelectasis
            b) right-to-left shunt across the foramen ovale
         ii. Incomplete airway obstruction
            a) Ball valve type obstruction
            b) developing pneumothorax
            c) chemical pneumonitis
      c. Patient deterioration
i. hypoxia
ii. hypercapnia
iii. acidosis

4. Assessment findings
   a. Thin and watery
   b. Thick and particulate

5. Management considerations for thick or particulate meconium
   a. Airway and ventilation
      i. do not stimulate the infant to breathe
      ii. tracheal suction under direct visualization
         a) airway is clear
         b) infant breathes on own
         c) bradycardia
      iii. ventilate with 100% oxygen
   
   b. Circulation
   c. Pharmacological
   d. Non-pharmacological
      i. needle decompression may be required
      ii. hypothermia prevention
   e. Transport consideration
      i. identify facility to handle high-risk newborn
   f. Psychological support/ communication strategies
      i. do not discuss "chances of survival" with family
      ii. explain what is being done for the newborn

B. Apnea in the neonate
1. Epidemiology
   a. Incidence
   b. Morbidity/ mortality
   c. Risk factors
      i. prematurity
      ii. in newborn, prolonged or difficult labor and delivery
      iii. drug exposure
      iv. maternal Infection

2. Anatomy and physiology review
3. Pathophysiology
   a. Usually due to hypoxia or hypothermia
   b. May be due to other causes
      i. narcotics or central nervous system depressant
      ii. airway and respiratory muscle weakness
      iii. oxyhemoglobin dissociation curve shift
      iv. septicemia
      v. metabolic disorder
      vi. central nervous system disorders

4. Assessment findings
   a. Failure to breathe spontaneously after stimulation
   b. Respiratory pauses greater than 20 seconds

5. Management considerations
   a. Airway and ventilation
      i. stimulate the baby to breathe
a) flicking the soles of the feet
b) rubbing the back

ii. ventilate with BVM
a) disable pop-off valve
b) subsequent ventilations with minimal pressure to cause chest rise

iii. suction as needed

iv. intubation
a) indications
   i) HR<60 with adequate BVM ventilation and chest compressions
   ii) prolonged positive-pressure ventilations
   iii) prolonged apnea
   iv) central cyanosis despite adequate ventilations
   v) craniofacial defects which impede airway control/maintenance
b) complications
   i) tube dislodgement
   ii) tube occlusion by mucous or meconium
   iii) pneumothorax
   iv) use of LMA as alternative means of airway control

b. Circulation
   i. monitor heart rate continuously
   ii. circulatory access
      a) peripheral iv
      b) intraosseous

c. Pharmacological
   i. consider narcotic antagonists if narcotic administered within 4 hours of delivery
   ii. NO narcotic antagonist should be utilized if mother is a drug abuser
   iii. consider dextrose (D10) administration if hypoglycemic
   iv. consider fluid bolus

d. Non-pharmacological

e. Transport consideration

f. Psychological support/ communication strategies
   i. relatively good outcome if treated early and aggressively
   ii. explain what is being done for the infant

C. Diaphragmatic hernia in the neonate
  1. Epidemiology
     a. Incidence
     b. Morbidity/ mortality
     c. Risk factors
  2. Anatomy and physiology review
  3. Pathophysiology
     a. Abdominal contents are displaced into the thorax
     b. Heart may be displaced
  4. Assessment findings
     a. Little to severe distress
     b. May have cyanosis unresponsive to ventilations
        i. may be difficult to ventilate at “normal” airway pressures
        ii. may have associated hypoplastic lung on involved side.
iii. if significant prenatal shift in mediastinum, may have pulmonary hypoplasia on contralateral side.

c. Scaphoid (flat) abdomen
d. Bowel sounds heard in chest
e. Heart sounds displaced to right

5. Management considerations

a. Airway and ventilation
   i. assure adequate oxygen
   ii. place an orogastric tube and apply low, intermittent suction
   iii. endotracheal intubation may be necessary
   iv. exercise caution if needle decompression

b. Circulation -- monitor heart rate continuously
c. Pharmacological -- none indicated for primary problem
d. Non-pharmacological -- surgical repair required
e. Transport consideration -- identify facility to handle high-risk newborn
f. Psychological support/communication strategies

D. Bradycardia in the neonate

1. Epidemiology

   a. Incidence
      i. most commonly caused by hypoxia
      ii. increased intracranial pressure
      iii. hypothyroidism
      iv. acidosis
      v. congenital AV node block in infants of mothers with lupus

   b. Morbidity/ mortality
      i. minimal risk if hypoxia is corrected quickly
      ii. risk level relative to underlying causation if not due to hypoxia

   c. Risk factors
      i. treatment via pharmacological measures alone
      ii. prolonged suction or airway instrumentation
      iii. vagal stimulation from inadequately secured ETT movements
      iv. vagal effect of ventilation not synchronized to respiratory effort.

2. Anatomy and physiology review

3. Pathophysiology -- Primarily caused by hypoxia

4. Assessment findings

   a. Assess upper airway for obstruction
      i. secretions
      ii. tongue and soft tissue positioning
      iii. foreign body

   b. Assess patient for hypoventilation

   c. Palpate umbilical stump or brachial artery

5. Management considerations

   a. Airway and ventilation
      i. suction
      ii. positive pressure ventilation with 100% oxygen
      iii. endotracheal intubation

   b. Circulation
      i. HR <100 -- BVM ventilation with 100% oxygen and reassess
      ii. HR <60 -- begin chest compressions
iii. HR 60-80, not responding to ventilations with BVM-begin chest compressions
iv. discontinue chest compressions when heart rate reaches 100

c. Pharmacological -- epinephrine
d. Non-pharmacological -- maintain temperature
e. Transport consideration -- identify facility to handle high-risk newborn
f. Psychological support/ communication strategies

E. Premature infants
1. Epidemiology
   a. Incidence
      i. born prior to 37 weeks gestation
      ii. weight ranges from .6-2.2 kg
      iii. often related to comorbidity
         a) trauma
         b) neonatal sepsis
         c) maternal Infection
            i) UTI
            ii) chorioamnionitis
            iii) illness resulting in dehydration
d) congenital Anomalies
   i) genetic disorders
   ii) congenital malformations
      (a) congenital heart defect
      (b) spina bifida
   iii) placental insufficiency
   iv) oligohydramnios
   v) polyhydramnios
e) previous premature deliveries
   i) incompetent cervix
   ii) relative large fetal size
f) multiple gestation
g) eclampsia
   i) pre-eclampsia
   ii) pregnancy Induced hypertension

b. Morbidity/ mortality
   i. healthy premature infants >1700 g have survivability and outcome
      approximately that of full-term infants
   ii. respiratory suppression
   iii. hypothermia risk
   iv. head/ brain injury
      a) hypoxemia
      b) change in blood pressure
      c) intraventricular hemorrhage
d) fluctuations in serum osmolarity

c. Risk factors

2. Anatomy and physiology review
3. Pathophysiology (retinopathy of prematurity)
   a. result of long term oxygen use
   b. extreme prematurity
   c. should not be a factor in short term management
d. hypoxemia causes irreparable brain damage

4. Assessment findings
   a. Degree of immaturity determines the physical characteristics
      i. maternal dates
         a) ultrasound exam
         b) calculated expected date of confinement (EDC)
      ii. Dubowitz scale
      iii. size for gestational age
   b. Generally a large trunk and short extremities
   c. Skin is transparent and less wrinkles
   d. Less subcutaneous fat

5. Management considerations
   a. Attempt resuscitation if the infant has any sign of life
   b. Airway and ventilation
      i. suction
      ii. assure adequate oxygenation
   c. Circulation -- chest compressions if indicated
   d. Pharmacological -- epinephrine
   e. Non-pharmacological -- maintain body temperature
   f. Transport consideration -- transport to facility with special services for low birth weight newborns
   g. Psychological support/ communication strategies

F. Respiratory distress/ cyanosis in the neonate
   1. Epidemiology
      a. Incidence
         i. prematurity is the single most common factor
         ii. occurs most frequently in infants less than 1200 grams and 30 weeks gestation
         iii. multiple gestations increase risk
         iv. prenatal maternal complications increase risk
      b. Morbidity/ mortality
         i. premature infants have a immature central respiratory control center
         ii. easily affected by environmental or metabolic changes
      c. Risk factors
   2. Anatomy and physiology review
      a. Fetal versus neonatal circulation
         i. closure of ductus arteriosus
         ii. ductal dependent lesions
   3. Pathophysiology
      a. Lung or heart disease
      b. Primary pulmonary hypertension
      c. CNS disorders
      d. Mucus obstruction of nasal passages
      e. Spontaneous pneumothorax
      f. Meconium aspiration
      g. Amniotic fluid aspiration
      h. Lung immaturity
      i. Pneumonia
      j. Shock and sepsis
      k. Metabolic acidosis
1. Diaphragmatic hernia
m. Tracheoesophageal Fistula
n. Can lead to cardiac arrest

4. Assessment findings
   a. Tachypnea
   b. Paradoxical breathing
   c. Periodic breathing
   d. Intercostal retractions
   e. Nasal flaring
   f. Expiratory grunt
   g. Choking/gagging/cyanosis with feeding

5. Management considerations
   a. Airway and ventilation
   b. Circulation
   c. Pharmacological
   d. Non-pharmacological -- maintain normal body temperature
   e. Transport consideration
   f. Psychological support/ communication strategies

G. Seizures in the neonate

1. Epidemiology
   a. Incidence -- occur in a very small percentage of all newborns
   b. Morbidity/ mortality -- represent relative medical emergencies, usually sign of underlying abnormality
   c. Risk factors – multiple prolonged, frequent seizures may result in metabolic changes and cardiopulmonary difficulties

2. Anatomy and physiology review
   a. Degree of myelinization will affect manner of seizure presentation/observed clinical signs

3. Pathophysiology
   a. Types of seizures
      i. subtle seizure
         a) eye deviation
         b) blinking
         c) sucking
         d) swimming movements of the arms
         e) pedaling movements of the legs
         f) apnea
      ii. tonic seizure
         a) tonic extension of the limbs
         b) less common, flexion of upper extremities and extension of lower extremities
         c) more common in premature infants, especially in those with intraventricular hemorrhage
      iii. multi focal seizure
         a) clonic activity in one extremity
         b) randomly migrates to another area of the body
         c) occur primarily in full-term infants
      iv. focal clonic seizure
         a) clonic localized jerking
b) occur in both full-term and premature infants
v. myoclonic seizure
   a) flexion jerks of the upper or lower extremities
   b) may occur singly or in a series of repetitive jerks

b. Causes
   i. hypoglycemia
   ii. other
      a) hypoxic-ischemic encephalopathy
      b) intracranial hemorrhage
      c) metabolic disturbances
      d) meningitis or encephalopathy
      e) developmental abnormalities
      f) drug withdrawal
   iii. seizure imitators
      a) gastro esophageal reflux disease (GERD)
      b) choking episode
      c) tremors
      d) myoclonic jerks

4. Assessment findings
   a. Decreased level of consciousness
   b. Seizure activity
   c. Apnea/bradycardia

5. Management considerations
   a. Airway and ventilation
   b. Circulation
   c. Pharmacological
      i. consider D10 for hypoglycemia
      ii. consider anticonvulsant
      iii. consider benzodiazepine for status epilepticus
   d. Non-pharmacological -- maintain normal body temperature
   e. Transport consideration -- identify facility to handle high-risk newborn
   f. Psychological support/ communication strategies

H. Fever in the neonate

1. Epidemiology
   a. Incidence
      i. rectal temperature > 100.4 F (38.0 degrees C)
      ii. average normal temperature - 99.5 degrees F 37.5 degrees C)
   b. Morbidity/ mortality
      i. limited ability to control body temperature
      ii. limited ability to respond to infection
   c. Risk factors
      i. dehydration may contribute to hyperthermia
      ii. maternal infection prior to delivery

2. Anatomy and physiology review

3. Pathophysiology
   a. Increased use of glucose to maintain normal body temperature
   b. Anaerobic metabolism results due to a lack of glucose

4. Assessment findings
   a. Mental status changes (irritability/ somnolence)
b. Decreased intake
c. Caretaker history
d. Feels warm
e. Observe patient for rashes, petechiae
f. Term newborns will produce beads of sweat on brow but not over rest of body
g. Premature infants will have no visible sweat
h. Increased work of breathing
i. Apnea
j. Decreased perfusion/capillary refill prolonged
k. Mottled appearance

5. Management considerations
   a. Airway and ventilation
   b. Circulation
   c. Pharmacological -- administration of antipyretic agent questionable in prehospital care
d. Non-pharmacological
   e. Transport consideration
   f. Psychological support/communication strategies

I. Hypothermia in the neonate
   1. Epidemiology
      a. Incidence -- body temperature drops below 35 degrees C
      b. Morbidity/mortality -- infants may die of cold exposure at temperatures adults find comfortable
      c. Risk factors (need to be controlled)
         i. Evaporation
         ii. Conduction
         iii. Convection
         iv. Radiation
   2. Anatomy and physiology review
   3. Pathophysiology -- Increased surface-to-volume relation makes newborns extremely sensitive to environmental conditions, especially when wet after delivery
      a. Can be an indicator of sepsis in the neonate
      b. Increased metabolic demand can cause metabolic acidosis, pulmonary hypertension and hypoxemia
   4. Assessment findings
      a. Pale color
      b. Cool to touch, particular in extremities
      c. Cyanosis of the extremities
      d. Respiratory distress
      e. Apnea
      f. Bradycardia
      g. Central cyanosis
      h. Irritability initially
      i. Lethargy in late stage
      j. Generally do not shiver
   5. Management considerations
      a. Airway and ventilation
      b. Circulation
      c. Pharmacological
         i. D10 if hypoglycemic
ii. warm IV fluids
d. Non-pharmacological
   i. environmental conditions should be 24 to 26.5 degrees C
   ii. warm hands prior to touching patient
e. Transport consideration -- identify facility to handle high-risk newborn
f. Psychological support/communication strategies

J. Hypoglycemia in the neonate
1. Epidemiology
   a. Incidence
      i. blood glucose concentration should be determined on all sick infants
      ii. may be due to inadequate glucose intake or increased utilization of glucose
   b. Morbidity/mortality
c. Risk factors
   i. asphyxia
   ii. toxemia
   iii. smaller twin
   iv. CNS hemorrhage
   v. sepsis
   vi. infant of diabetic mother
   vii. large or small for gestational age

2. Anatomy and physiology review
3. Pathophysiology
   a. A blood glucose screening test less than 45 mg/dl indicates hypoglycemia
   b. Glycogen stores are sufficient to meet glucose requirements for 8 to 12 hours
   c. Body releases counter-regulatory hormones including glucagon, epinephrine, cortisol
      and growth hormone
   d. Hormones may cause symptoms of hyperglycemia that last for several hours
   e. Increased fetal insulin level due to maternal hyperglycemia

4. Assessment findings
   a. Twitching or seizures
   b. Limpness
   c. Lethargy
   d. Poor feeding
   e. Decreased suck
   f. Eye-rolling
   g. High pitched cry
   h. Apnea
   i. Irregular respirations
   j. Cyanosis

5. Management considerations
   a. Airway and ventilation
   b. Circulation
   c. Pharmacological -- administer D10
   d. Non-pharmacological -- maintain normal body temperature
   e. Transport consideration -- identify facility to handle high-risk newborn
   f. Psychological support/communication strategies

K. Vomiting in the neonate
1. Epidemiology
a. Incidence
   i. persistent vomiting is a warning sign
   ii. vomiting mucus, maybe blood streaked, in first few hours of life is common
b. Morbidity/ mortality
   i. vomiting in first 24 hours of life suggests obstruction in upper digestive tract or increased intracranial pressure
   ii. vomitus containing dark blood is usually a sign of a life-threatening illness
   iii. bilious vomiting indicative of obstruction in proximal portion of duodenum
      a) Malrotation with volvulus
      b) Jejunal atresia
c. Risk factors
   i. aspiration of vomitus can cause respiratory insufficiencies airway obstruction
   ii. fluid and electrolyte imbalances due to vomiting
      a) dehydration
      b) hyponatremia
      c) hypokalemia
      d) hypochloremic metabolic alkalosis
2. Anatomy and physiology review
3. Pathophysiology
   a. Vomiting of non-bile-stained fluid
      i. anatomic or functional obstruction at or above the first portion of duodenum
      ii. gastroesophageal reflux
   b. Vomiting of bile-stained fluid
4. Assessment findings
   a. Distended stomach
   b. Infection
   c. Increased ICP
   d. Drug withdrawal
   e. Temperature instability
   f. Apnea/bradycardia
   g. Abdominal tenderness /guarding/rebound
   h. High pitched or absent bowel sounds
5. Management considerations
   a. Airway and ventilation
      i. maintain a patent airway
      ii. suction/ clear vomitus from airway
      iii. assure adequate oxygenation
   b. Circulation -- bradycardia may be caused by vagal stimulus
   c. Pharmacological -- fluid administration may be required
   d. Non-pharmacological
      i. provide supportive measures
      ii. consider nasogastric/orogastric tube to decompress stomach/reduce emesis or vagal effects of distension
   e. Transport consideration
      i. place infant on side
      ii. identify facility to handle high-risk newborn
6. Psychological support/ communication strategies
   a. Explain what is being done for the infant

L. Diarrhea in the neonate
1. Epidemiology
   a. Incidence
   b. Morbidity/ mortality
      i. severe cases can cause dehydration
      ii. bacterial or viral infection may be involved
   c. Risk factors
2. Anatomy and physiology review
3. Pathophysiology
   a. Gastroenteritis
   b. Necrotizing Enterocolitis
   c. Lactose intolerance
   d. Phototherapy
   e. Neonatal abstinence syndrome
   f. Thyrotoxicosis
   g. Cystic fibrosis
   h. Allergic Process
4. Assessment findings
   a. Loose stools
   b. Decreased urinary output
   c. Signs of dehydration
5. Management considerations
   a. Airway and ventilation
   b. Circulation
   c. Pharmacological -- fluid therapy may be indicated
   d. Transport consideration -- identify facility to handle high-risk newborn
   e. Psychological support/ communication strategies

M. Common birth injuries in the newborn
1. Epidemiology
   a. Incidence
   b. Morbidity/ mortality
      i. birth trauma
      ii. anoxic injuries
   c. Risk factors
      i. precipitous delivery
      ii. shoulder dystocia
      iii. breech delivery
2. Anatomy and physiology review
3. Pathophysiology
   a. Cranial injuries
      i. Molding of the head and overriding of the parietal bones
      ii. Erythema, abrasions, ecchymosis and subcutaneous fat necrosis can occur with forceps delivery
      iii. Subconjunctival and retinal hemorrhage
      iv. Subperiosteal hemorrhage
      v. Fracture of the skull
   b. Intracranial hemorrhage
   c. Spine and spinal cord -- Spinal cord injury without radiological abnormality (SCIWORA)
   d. Peripheral nerve injury
i. Brachial plexus
ii. Sciatic nerve
iii. Peroneal nerve
e. Liver contusion or fracture
f. Rupture of the spleen
g. Adrenal hemorrhage
h. Fracture
   i. Clavicle
   ii. Extremities
i. Hypoxia-ischemia
j. Umbilical cord tear

4. Assessment findings
a. Diffuse, sometimes ecchymotic, edematous swelling of the soft tissues of the scalp
b. Paralysis below the level of spinal cord injury
c. Paralysis of the upper arm with or without paralysis of the forearm
d. Diaphragmatic paralysis
e. Movement on only one side of the face when the newborn cries
f. Does not move arm freely on side of fractured clavicle
g. Lack of spontaneous movement of the affected extremity
h. Hypoxia
i. Shock
j. Hemorrhage

5. Management considerations
a. Airway and ventilation
b. Circulation
c. Pharmacology
d. Non-pharmacological
e. Transport consideration -- Identify facility to handle high-risk newborn
f. Psychological support/ communication strategies
Special Patient Population  
Pediatrics – SP3

Integrates assessment findings with principles of pathophysiology and knowledge of psychosocial needs to formulate a field impression and implement a comprehensive treatment/disposition plan for patients with special needs.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Pediatric Anatomical Variations and Assessment

A. Head compared to an adult’s
   1. Compared to the body, the head is proportionally larger in size
   2. The head contributes a larger portion of the body’s surface area than in adults
   3. Anterior and posterior fontanelles open
      a. Anterior closes by 1 year
      b. Posterior closes by 3-4 months
   4. Implications for the health care provider
      a. Higher proportion of blunt trauma involves the head
      b. Cover an infant’s head to prevent excessive heat loss
      c. Properly placing infant in “sniffing position” to open airway may require a towel or roll under shoulders
      d. Examine fontanelle in infants
         i. Bulging fontanelle in ill-appearing, non-crying infant suggests increased intracranial pressure
         ii. Sunken fontanelle in an ill-appearing infant suggests dehydration

B. Airway compared to an adult’s
   1. Much smaller in diameter and shorter in length
   2. Infant’s tongues take up more room in the oropharynx
   3. The jaw is proportionally smaller
   4. Infants are nasal breathers
   5. The vocal cords are higher (C 2-3) and more anterior
   6. In children younger than 10 years, narrowest part of the airway is below vocal cords at non-distensible cricoid cartilage
   7. Tracheal cartilage is softer and more collapsible
   8. Epiglottis in infants and toddlers is long, floppy, narrow, and extends at 45-degree angle into airway
   9. Implications for the health care provider
      a. Suction to clear nares of infants in respiratory distress cannot be overemphasized
      b. Smaller airways are more easily obstructed by
         i. Flexion or hyperextension
         ii. Particulate matter
         iii. Soft tissue swelling (injury, inflammation)
      c. Posterior displacement of the tongue may cause airway obstruction
      d. Differences in intubation technique
i. More delicate tissues require a gentler touch
ii. Straight blades are more useful for direct visualization of cords
iii. Lifting large, floppy epiglottis with end of a straight laryngoscope blade will help expose vocal cords
iv. Under 10 years of age, the narrowest part of airway is below vocal cords, therefore uncuffed tubes are used
v. Appropriate endotracheal tube selection is estimated based upon age
vi. Securing endotracheal tube at appropriate depth is crucial, one centimeter of movement can mean a right mainstem intubation or unplanned extubation

C. Chest and lungs compared to an adult’s
   1. Ribs are more cartilaginous and pliable
   2. Less overlying muscle and fat to protect ribs and vital organs
   3. Young children breathe primarily with the diaphragm; chest muscles are immature and fatigue easily
   4. Lung tissue is more fragile
   5. Mediastinum (the heart and major vessels) is more mobile within the chest
   6. Thin chest wall allows for easily transmitted breath sounds
   7. Implications for the health care provider
      a. Infants/children are dependent on effective diaphragmatic excursion for adequate ventilation; a distended abdomen may not allow for this
      b. Rib fractures are less common; but when present represent significant force generally accompanied by multi-system injury
      c. Elastic thorax may result in significant underlying organ injury despite a fairly normal appearing external exam
      d. Pulmonary contusions are more common
      e. Lungs more prone to pneumothorax from excessive pressures during bag-valve ventilation
      f. Mobility of mediastinal structures makes children more sensitive to tension pneumothorax and flail chest
      g. Pneumothoraces and esophageal intubations are often missed due to ease with which breath sounds are transmitted all over the thorax through the thin chest wall

D. Abdomen compared to an adult’s
   1. Less developed abdominal muscles offer less protection
   2. Abdominal organs are situated more anteriorly and are less protected by ribs
   3. Liver and spleen are proportionally larger
   4. Implications for the health care provider
      a. Seemingly insignificant forces can cause serious internal injury; therefore abdominal pain after trauma should be taken seriously
      b. Liver, spleen, and kidneys are more frequently injured
      c. Multiple organs injured more commonly

E. Extremities compared to adult’s
   1. Bones are softer
   2. Injuries to the growth plates of long bones may result in poor bone growth
   3. Open growth plates are weaker than ligaments and tendons
   4. Growth plates generally disappear 2 years after girls have their first menstrual cycle; for boys usually by mid to late high school
   5. Implications for the health care provider
a. Immobilize any “sprain” or “strain” as it is more likely a fracture
b. Angle slightly away from the growth plate when inserting an intraosseous needle

F. Skin and body surface area compared to an adult’s
   1. Thinner with less subcutaneous fat
   2. Larger surface area to body mass
   3. Implications for the health care provider
      a. Skin is more easily, quickly, and deeply burned
      b. Larger surface area means larger losses of fluid and heat
      c. Be diligent about preventing core hypothermia (even in a burn patient)
      d. Hypothermia can limit resuscitative efforts and interfere with body’s ability to clot

G. Respiratory system compared to an adult’s
   1. Tidal volume of breaths is smaller (10-15 mL/kg)
   2. Higher oxygen demand per kilogram of body weight (2 times that of an adult)
   3. Smaller lung oxygen reserves
   4. Implications for the health care provider
      a. Higher oxygen demand with less reserves means hypoxia develops rapidly with apnea or ineffective bagging
      b. When ventilating pediatric patients, bag-valve should have no less than 450-500 mL volume
      c. Err on using larger bag-valve for ventilating pediatric patient; regardless of size of bag-valve used for ventilation, should only use enough force to make chest rise slightly to limit potential pneumothorax
      d. Higher oxygen demand and metabolic rate mean infants/children generally become symptomatic from inhaled toxins earlier than adults

H. Nervous system and spinal column compared to an adult’s
   1. Continually evolves throughout childhood allowing them to develop new abilities
   2. Brain tissue is more fragile and prone to bleeding from injury
   3. The subarachnoid space is relatively smaller offering less cushioning to the brain
   4. The brain requires nearly twice the cerebral blood flow as does an adult’s
   5. Brain and spinal cord are less well protected by a thinner skull and spinal column
   6. Spinal column
      a. The ligaments and joint capsules of the vertebrae are more flexible
      b. Vertebral bodies are wedged anteriorly and can slide forward with flexion
   7. Implications for the health care provider
      a. Large cerebral blood flow requirement makes children with head injuries extremely susceptible to hypoxia; hypoxia and hypotension in child with head injury can cause damage as serious as the initial injury itself
      b. Less cushioning by subarachnoid space means head momentum more likely to result in bruising and damage to the brain
      c. Spinal cord injuries are less common in pediatrics, but more frequently occur with normal appearing x-rays; this phenomenon is referred to as SCIWORA (spinal cord injury without radiographic abnormalities)
      d. Cervical spine injuries are more commonly ligamentous injuries rather than secondary to broken vertebrae
      e. Weaker neck supports relatively heavier head and flexes more easily with trauma, cervical spine injuries sustained are usually higher (C1-3)
f. When in doubt about presence of cervical spine injury, assume the worst and maintain immobilization of child’s head and neck

I. Metabolic differences compared to an adult
1. Infants and children have limited glucose stores
2. Infants and children are prone to hypothermia due to increased body surface area
3. Newborns and infants less than 1 month are the most susceptible to hypothermia
4. Implications for the healthcare provider
   a. Keep the infant or child warm during treatment and transport
   b. Make sure to cover the head (not the face, though) to minimize heat loss
   c. Always check blood glucose levels, especially in children who are having a seizure or are lethargic on your exam
   d. In newborns in particular hypothermia is a “killer” and can predispose them to spontaneous head bleeds
   e. Newborns who are requiring difficult, prolonged resuscitation after delivery, should not be overwarmed, as this can worsen their neurologic outcome

II. Growth and Development

A. Infancy
1. Birth-2 months
   a. Physical development
      i. Begin to better control gazing at faces, turning their heads, and sucking
      ii. Sleep accounts for up to 16 hours a day; only half of that is at night
      iii. Infants have a relatively large surface area which predisposes them to hypothermia
   b. Cognitive development
      i. Crying is the only way infants communicate
      ii. Crying peaks at 6 weeks to 3 hours a day; by 3 months it drops to 1 hour
      iii. Infants cry for obvious reasons such as hunger and needing to be changed
      iv. When obvious reasons for crying have been addressed, persistent crying can be a sign of significant illness
   c. Emotional development
      i. Trust develops as infants learn that parents take care of their urgent needs
      ii. Infants whose crying is responded to in a timely manner by parents cry less at 1 year and have decreased aggression at 2
   d. Implications for the healthcare provider
      i. Persistent crying or irritability in a 0-2 month old can be a symptom of serious bacterial infections such as meningitis, supraventricular tachycardia (SVT), physical abuse, intussusception, cardiac problems, corneal abrasions, or electrolyte disturbances
      ii. Though infants sleep a lot, they should be arousable; inability to arouse a baby should be considered an emergency
      iii. Be diligent about keeping babies warm and dry to limit hypothermia
      iv. Infants do not develop head control until closer to 6 months, so when handling a baby, make sure to support the head and neck well
      v. Stressful time for parents adjusting to eating, sleeping, and crying cycle; may be complicated by post-partum depression, which can be a risk factor for abuse.
2. 2-6 months

a. Physical development
   i. Begin voluntarily smiling and increasing eye contact
   ii. Both hands begin to be used to examine objects
   iii. 70% of babies sleep through the night by 6 months
   iv. Intentional rolling over begins
   v. Begin to hold their heads up

b. Cognitive development
   i. Increased awareness of what is going on around them
   ii. Begin to explore their own bodies

c. Emotional development
   i. Develop distinctive facial expressions of joy, anger, fear, surprise, etc.
   ii. Begin actively seeking attention

d. Implications for the health care provider
   i. Persistent crying/irritability can be symptom of serious bacterial infections
      such as meningitis, SVT, physical abuse, intussusception, cardiac problems,
      corneal abrasions, or electrolyte disturbances
   ii. Infants do not typically roll until around 3-4 months; a history of an infant less
      than that age rolling himself off of a bed or table and sustaining major injuries
      may indicate abuse
   iii. Infants of this age begin to identify and respond to facial expressions;
       approach them with a smile or funny face and a happy, soft spoken voice
   iv. By 6 months, babies should make eye contact; no eye contact in a sick infant
       could be a sign of significant illness or depressed mental status

3. 6-12 months

a. Physical development
   i. Begin to sit without support
   ii. Develop a pincer grasp; everything goes to the mouth
   iii. Begin to crawl
   iv. Begin getting teeth and eating soft foods

b. Cognitive development
   i. Begin babbling and by 12 months learn their first word
   ii. Develop “object consistency;” they do not forget that something exists just
       because you take it away
   iii. Interested in what objects do and what objects fit where

c. Emotional development
   i. Development of “separation anxiety” from parents and start of tantrums
   ii. Sense of autonomy around feeding as they begin to eat finger foods

d. Implications for the health care provider
   i. Persistent crying/irritability can be symptom of serious bacterial infections such
      as meningitis, SVT, physical abuse, intussusception, cardiac problems, corneal
      abrasions, or electrolyte disturbances
   ii. Infants explore objects with their mouths which greatly increases risk of
       foreign body aspiration; do not give children exam gloves to play with
   iii. Separation anxiety is best dealt with by keeping child and parent together as
       much as possible during evaluation and involving parent in treatment if
       appropriate; if possible, interact first with parent to build trust with infant
   iv. Increased mobility of crawling and walking brings exposure to physical dangers
B. Toddler years
   1. 12-18 months
      a. Physical development
      b. Cognitive development
         i. Imitation of older children and parents
         ii. Make-believe play
         iii. Understand more than what they can express
         iv. Know major body parts
         v. Know 4-6 words
      c. Emotional development
      d. Implications for the health care provider
         i. Persistent crying/irritability can be a symptom of serious bacterial infections such as meningitis, SVT, physical abuse, intussusception, cardiac problems, corneal abrasions, or electrolyte disturbances
         ii. Front teeth come in before molars, children may bite off large pieces of food and not be able to grind them up before swallowing, increasing the risk of food aspiration; do not give children exam gloves to play with
         iii. Separation anxiety is best dealt with by keeping child and parent together as much as possible during evaluation and involving parent in treatment if appropriate; interact first with parent to build trust with infant
         iv. With increased mobility comes exposure to physical dangers and injury
         v. Talk to child during assessment even if conversation is one-sided
         vi. Distracting a child with a flashlight or toy may increase one’s chances of getting a good physical exam
   2. 18-24 months
      a. Physical development
         i. Improved gait and balance
         ii. Begin to run and climb
         iii. Head begins to grow more slowly than the body
      b. Cognitive development
         i. Begin to understand cause and effect
         ii. Start to use “tools”
         iii. Play with dolls
         iv. Begin to label objects
         v. 10-15 words becomes 100 by 24 months
      c. Emotional development
         i. Increasing clinginess with parents
         ii. Attachment to a special object, like a blanket
      d. Implications for the health care provider
         i. Persistent crying or irritability can be a symptom of serious bacterial infections such as meningitis, SVT, physical abuse, intussusception, cardiac problems, corneal abrasions, or electrolyte disturbances
         ii. Front teeth come in before molars, which means children may bite off large pieces of food and not be able to grind them up before swallowing, increasing risk of food aspiration; do not give children exam gloves to play with
         iii. Separation anxiety is best dealt with by keeping child and parent together as much as possible during evaluation and involving parent in treatment if appropriate; if possible, interact first with parent to build trust with infant
         iv. With increased mobility comes exposure to physical dangers and injury
         v. Talk to the child during the assessment even if the conversation is one-sided
vi. Distracting a child with a flashlight or toy may increase one’s chances of getting a good physical exam

vii. Allow child to hold objects of importance like blanket, stuffed animal or doll

viii. With head beginning to grow at a slower rate than body, children no longer require shoulder rolls limiting flexion of neck when bag-valve-mask ventilating or intubating

ix. Children begin to relate cause and effect, painful procedures make lasting impressions; be considerate by limiting painful procedures and adequately treating pain

3. Preschool years (2-5 years)
   a. Physical development
      i. Bodies become leaner
      ii. Develop 20/20 vision by age 4
      iii. Have all their teeth by 3
      iv. They perfect normal walking and running
      v. Begin throwing, catching, kicking
      vi. Generally establish left or right handedness
      vii. Toilet training

   b. Cognitive development
      i. Most rapid increase in language
      ii. Magical thinking
      iii. Rules tend to be absolute
      iv. Irrational fears

   c. Emotional development
      i. Learn what are acceptable behaviors
      ii. Have tantrums around control issues
      iii. Modesty develops

   d. Implications for the health care provider
      i. Avoid procedures on the dominant hand or arm
      ii. Rapid increase in language skills means they will understand much of what you say if simple terms are used
      iii. Respect patient’s modesty and cover them up after physical exam
      iv. Foreign body airway obstruction risk continues to be high
      v. Offer choices to patient if appropriate (i.e., Should I listen to your front first or your back?)
      vi. Do not waste time trying to use logic to convince preschoolers; they are concrete thinkers.; avoid frightening or misleading comments
      vii. Appealing to their magical thinking may allow you to do more (eg., This magic smoke will help you breathe better [nebulizer])
      viii. Preschoolers tend to hold rules true for all situations; if they have been told that no one should look at their genitals, they will not understand why it is OK for the health care worker to do so

4. Middle Childhood years (6-12 years)
   a. Physical development
   b. Cognitive development
      i. Begin to think logically
      ii. Life centers around school
c. Emotional development  
   i. Popularity and peer pressure become very important  
   ii. Children with chronic illness or disabilities begin to be very self-conscious  
   iii. Children begin to understand that death is final  

d. Implications for the health care provider  
   i. With patients loosing baby teeth and getting adult teeth, must be particularly careful when intubating  
   ii. School aged children can understand simple explanations for illness and treatments  
   iii. Be honest about procedures which will cause them discomfort  
   iv. Give children some sense of control by giving choices if possible  
   v. Be honest, reassure appropriately  
   vi. Respect the patient’s modesty and cover them up after the physical exam  
   vii. Asking about school will often allow patients to warm up to you faster

5. Adolescence (12-20 years)  
   a. Physical development -- Puberty begins  
      i. Girls first develop breasts around 8-13 years; menstruation start between 9-16  
      ii. Boys first develop increase in testicle size around 10  
   b. Cognitive development  
      i. Acquire the ability to reason  
      ii. Do not see possibilities as real things which could happen to them  
      iii. Develop morals  
   c. Emotional development  
      i. Self-conscious about body image  
      ii. Begin to understand who they are and begin to be comfortable with that  
      iii. Relationships generally transition from mostly same sex ones to those involving the opposite sex  
   d. Implications for the health care provider  
      i. Explain things clearly and honestly as you would to an adult  
      ii. Give the patient choices when appropriate  
      iii. Respect the patient’s modesty and cover them up after the physical exam  
      iv. Be honest about procedures which will cause them discomfort  
      v. Address adolescents’ concerns and fears about lasting effects of injuries (especially cosmetic) and if appropriate, reassure them  
      vi. Adolescence is tumultuous effect of hormonal surges, emotions, and peer pressure; which place children at risk for substance abuse, self-endangerment, pregnancy, and dangerous practices including sexual

III. Pediatrics: Specific Pathophysiology, Assessment, and Management

A. Respiratory Compromise  
   1. Introduction  
      a. Epidemiology  
      b. Anatomic and physiologic differences in children  
   2. Pathophysiology  
      a. Respiratory distress  
      b. Respiratory failure  
      c. Respiratory arrest
3. Assessment
   a. History (age, previous symptoms, choking episode, underlying disease, contacts who are sick, prematurity)
   b. Physical findings (mental status, respiratory rate, pulse oximetry, capnometry, work of breathing, color, heart rate, degree of aeration, presence of stridor or wheezes)

4. Upper airway obstruction
   a. Croup
   b. Foreign body aspiration
   c. Bacterial tracheitis
   d. Epiglottitis
   e. Tracheostomy dysfunction

5. Lower airway disease
   a. Asthma
   b. Bronchiolitis -- Respiratory Syncytial Virus (RSV) is common cause
      i. Highly contagious
      ii. Most common in infants under one year
      iii. Infections usually occur epidemically in the winter

6. Pneumonia

7. Foreign body lower airway obstruction

8. Pertussis

9. Cystic fibrosis

10. Bronchopulmonary dysplasia (BPD)
    a. Chronic lung disease usually occurs in infants born prematurely, treated with positive pressure ventilation and high oxygen concentrations
    b. Recurrent respiratory infections and exercise induced bronchospasm are complications
    c. Management
        i. Airway positioning (chin lift, jaw thrust)
        ii. Airway adjuncts (nasopharyngeal and oropharyngeal airways)
        iii. Oxygen
        iv. Inhaled medicationsbronchodilators (albuterol, ipratropium, racemic epinephrine)
        v. Oral and intramuscular medications corticosteroids (prednisolone, dexamethasone)
        vi. Assisted ventilation (bag mask, CPAP, BiPAP, endotracheal intubation, cricothyroidotomy)

B. Non Cardiogenic Shock
   1. Introduction
      a. Epidemiology
      b. Anatomic and physiologic differences in children
   2. Pathophysiology (compensated vs. decompensated)
      a. Hypovolemic
      b. Distributive (septic, neurogenic, anaphylactic)
   3. Assessment
      a. History (fever, vomiting, diarrhea, urine output, fluid intake, blood loss, allergic symptoms, burns, accidental ingestion)
      b. Physical findings (heart rate, blood pressure, capillary refill, color, petechiae, mental status, mucous membranes, skin turgor, face/lip/tongue swelling)
4. Management
   a. Intravenous isotonic crystalloid for all types
   b. Septic: in-hospital antibiotics for presumed bacterial sepsis
   c. Anaphylactic: subcutaneous epinephrine, intravenous antihistamines
      (diphenhydramine, ranitidine), and intravenous steroids
   d. Consider pressors for ongoing decompensated shock

C. Cardiac
1. Introduction
   a. Epidemiology
   b. Anatomic and physiologic differences in children
2. Pathophysiology
   a. Shock in children (compensated vs. decompensated)
   b. Cardiogenic vs. noncardiogenic shock
3. Assessment
   a. History (age, sweating while feeding, cyanotic episodes, difficulty breathing, syncope,
      prior cardiac surgery, poor weight gain)
   b. Physical findings (heart rate, blood pressure, capillary refill, color, mental status,
      cardiac murmurs/rubs/gallops, pulse oximetry, 4 extremity blood pressures)
   c. Bedside testing (rhythm strip)
4. Congestive heart failure
   a. Myocarditis
   b. Cardiomyopathy
   c. Congenital heart disease as underlying cause
5. Congenital heart disease
   a. Cyanotic Disease (brief overview)
      i. Hypoplastic left heart syndrome (HLHS)
      ii. Tricuspid atresia
      iii. Transposition of the great arteries (TGA)
      iv. Tetralogy of Fallot (ToF)
      v. Total anomalous pulmonary venous return (TAPVR)
      vi. Truncus arteriosus
   b. Noncyanotic Disease (brief overview)
      i. Coarctation of the aorta (CoA)
      ii. Atrial septal defect (ASD)
      iii. Ventricular septal defect (VSD)
      iv. Patent ductus arteriosus (PDA)
6. Arrhythmias
   a. Fast pulse
      i. Sinus tachycardia
      ii. Supraventricular tachycardia (SVT)
      iii. Ventricular tachycardia, with a pulse
   b. Slow pulse
      i. Sinus bradycardia
      ii. 2nd or 3rd degree heart block
   c. Absent pulse
      i. Asystole
      ii. Ventricular fibrillation/Pulseless ventricular tachycardia
      iii. Pulseless electrical activity (PEA)
7. Management
   a. Congestive Heart Failure and Congenital Heart Disease
      i. Oxygen (caution with ductal dependent systemic flow due to pulmonary stent)
      ii. Use of prostaglandin for ductal dependent cardiac lesions
      iii. Use of furosemide diuretic for fluid overload
      iv. Cautious use of IV fluids if cardiogenic shock suspected
   b. Arrhythmias
   c. Vagal maneuvers for SVT (recommended vs. unacceptable)
   d. Pharmacologic indications
   e. Chest compressions
   f. Defibrillation, synchronized cardioversion, and transcutaneous pacing
   g. Interventions for other causes of PEA

D. Neurologic
   1. Introduction
      a. Epidemiology
      b. Anatomic and physiologic differences in children
   2. Pathophysiology
      a. Causes of altered mental status in children (trauma, toxins, infection, electrolyte or glycemic imbalance, intussusception, seizure, uremia, intracranial bleed, intracranial mass)
      b. Hydrocephalus
      c. Epidural and subdural hematomas
      d. Pathophysiology of seizures
      e. Increased intracranial pressure and cerebral perfusion pressure
   3. Assessment
      a. History (age, fever, vomiting, photophobia, headache, prior seizures, extremity shaking, staring episodes, trauma, ataxia, ingestions, oral intake, bloody stool, urine output, baseline developmental level)
      b. Physical findings (vital signs, photophobia, nuchal rigidity, GCS, palpation of ventricular shunt, full neurologic exam)
   4. Meningitis
   5. Seizures
      a. Afebrile
      b. Febrile
      c. Status epilepticus
   6. Hydrocephalus
   7. Closed head injury
      a. Epidural hematoma
      b. Subdural hematoma
      c. Fractures
   8. Ventricular shunts
      a. Infection
      b. Malfunction
   9. Management
      a. Seizures
         i. Oxygen for prevention of brain hypoxia
         ii. Benzodiazepines
         iii. Other antiepileptic drugs (fosphenytoin, phenobarbital, pentobarbital)
b. Altered Mental Status
   i. Assess for need to protect airway
   ii. Consider reversal agents for toxin ingestion
   iii. Assess and intervene for increased intracranial pressure
c. Increased Intracranial Pressure
   i. Medications for intubation (thiopental, etomidate, lidocaine, non-depolarizing muscle relaxants)
   ii. ICP lowering medications (benzodiazepines, barbiturates, mannitol)
   iii. Other ICP lowering techniques (mannitol, elevation of head, hyperventilation)

E. Endocrinology
   1. Introduction
      a. Epidemiology
      b. Anatomic and physiologic differences in children
   2. Pathophysiology
      a. Glucose metabolism
      b. Diabetic ketoacidosis and cerebral edema in children
      c. Cortisol deficiency
   3. Assessment
      a. History (polyuria, polydipsia, weight loss, visual changes, poor feeding, abnormal odors, growth delays)
      b. Physical findings (heart rate, blood pressure, mucous membranes, mental status, virilization, frontal bossing, blindness)
      c. Bedside testing (blood sugar)
   4. Hyperglycemia
   5. Congenital adrenal hyperplasia
      a. Panhypopituitarism
      b. Inborn errors of metabolism
   6. Management
      a. Hyperglycemia
         i. Cautious fluid resuscitation due to risk of cerebral edema
         ii. Insulin administration
      b. Hypoglycemia
         i. Dextrose dosing in children
         ii. Use of D10 in children with metabolic disease
         iii. Administration of stress dose steroids for cortisol deficiency

F. Hematologic/Oncologic/Immunologic
   1. Introduction
      a. Epidemiology
      b. Anatomic and physiologic differences in children
   2. Pathophysiology
      a. Hemoglobin and disrupted oxygen carrying capacity
      b. Blood clotting (platelets, coagulation factors)
      c. Tumor lysis syndrome (basic overview)
      d. Immune dysfunction and infection risk
   3. Assessment
      a. History (chest pain, weakness, abdominal pain, extremity pain, trauma, bleeding, swollen joints, swollen glands, fever, bruising)
b. Physical findings (all vital signs, lung sounds, extremity tenderness, signs of active bleeding, bruises, joint swelling, lymphadenopathy, capillary refill)
c. Bedside testing (blood sugar)
d. Inspection of indwelling catheters for possible infection

4. Sickle cell disease
   a. Acute chest syndrome
   b. Splenic sequestration
   c. Stroke
   d. Vaso-occlusive crises
   e. Priapism

5. Bleeding disorders
   a. Thrombocytopenia
   b. Hemophilia
   c. Von Willebrand’s Disease

6. Leukemia/Lymphoma

7. Immunocompromised
   a. Neutropenia
   b. Immunosuppressive medication

8. Management
   a. Sickle cell disease
      i. IV hydration (caution with fluid sensitivity)
      ii. Pain control with NSAIDs and opiates
   b. Bleeding disorders
      i. Isotonic fluid resuscitation for blood loss
      ii. Maneuvers to control active bleeding
   c. Leukemia/Lymphoma
      i. Hydration with NaHCO3 for possible tumor lysis syndrome
   d. Immunocompromise
      i. Isotonic fluid resuscitation for possible sepsis
      ii. Antibiotics for possible sepsis

G. Gastrointestinal

1. Introduction
   a. Epidemiology
   b. Anatomic and physiologic differences in children

2. Pathophiology
   a. Embryology of the GI tract
   b. Vomiting mechanism
   c. Electrolyte complications of gastroenteritis and pyloric stenosis
   d. GI bleeding

3. Assessment
   a. History (blood or bile in emesis, diarrhea, age, gender, constipation, fever, medications, tolerance of gastrostomy tube feeds, prematurity, blood type incompatibility, epistaxis, liver disease)
   b. Physical findings (heart rate, blood pressure, mucous membranes, icterus, capillary refill, blood in nares, abdominal distention or mass, hepatomegaly, pallor, anal fissure)
   c. Inspection of gastrostomy tube

4. Vomiting
   a. Gastroenteritis
   b. Malrotation
c. Pyloric stenosis

5. GI Bleeding
   a. Upper GI bleed ((swallowed maternal blood, Mallory-Weiss tear, swallowed nasopharyngeal blood, gastritis, gastric ulcer, esophageal varices)
   b. Lower GI bleed
   c. Neonatal (swallowed maternal blood, anal fissure, necrotizing enterocolitis, malrotation, Hirschsprung’s disease, coagulopathy)
      i. Infants/Toddlers (allergic colitis, infectious enteritis, intussusception, Meckel’s diverticulum, GI duplication)
      ii. School age (infectious enteritis, juvenile polyps, hemolytic uremic syndrome, Henoch Schonlein purpura)
      iii. Adolescents (infectious diarrhea, juvenile polyps, inflammatory bowel disease)
   d. Gastrostomy tube dysfunction

6. Neonatal Jaundice
   a. Physiologic
   b. Pathologic

7. Management
   a. Bowel rest (for vomiting and GI bleed)
   b. IV hydration
   c. Replacement of G-tube if dislodged or dysfunctional

H. Toxicologic
   1. Introduction
      a. Epidemiology
      b. Nontoxic exposures
      c. Role of the Poison Control Center
   2. Assessment
      a. History (time of ingestion/exposure, amount ingested, abnormal symptoms, bottles/containers available)
      b. Physical findings (all vitals, airway/breathing/circulation)
   3. Ingestion
      a. Specific toxidromes (anticholinergics, cholinergics, opiates, benzodiazepines, sympathomimetics, beta-blockers, calcium channel blockers, salicylate, tricyclic antidepressants)
      b. Caustic substances
   4. Inhalation
   5. Management
      a. Decontamination
      b. topical irrigation for skin and eye exposures
      c. dilution
      d. gastric emptying (no role for ipecac; indications for gastric lavage)
      e. inert binding (activated charcoal; single and multi-dose)
      f. catharsis (sorbitol or magnesium citrate)
      g. whole bowel irrigation
      h. antidotes
      i. diuresis (mannitol and sodium bicarbonate)
      j. dialysis and hemoperfusion
      k. oxygen and bronchodilators for inhalation injuries
IV. Abuse and Neglect

A. Introduction
   1. Epidemiology
   2. Definitions of abuse (physical, emotional, sexual) and neglect

B. Assessment
   1. Elements in the history or scene concerning for abuse or neglect
   2. Assessing the caregiver’s behavior
   3. Physical findings concerning for abuse or neglect
   4. Benign findings often confused for physical or sexual abuse

C. Management
   1. Role of the prehospital professional (scene assessment, assessment of the caregiver, communication with the caregiver, documentation, reporting suspected abuse/neglect, safely transporting one or more injured children)
   2. Role of Child Protective Services (CPS)
   3. Role of Medical Examiner and law enforcement

V. Sudden Infant Death Syndrome

A. Introduction
   1. Definition of SIDS
   2. Definition of ALTE
   3. Epidemiology and Risk Factors

B. Assessment
   1. Cardiopulmonary status
   2. Clinical signs of death
   3. Evaluation for other signs of abuse

C. Management
   1. Local EMS criteria for death in the field
   2. Notification of appropriate authorities
   3. Controversy over transport after failed advanced life support
   4. Caregiver support
Special Patient Population
Geriatrics – SP4

Integrates assessment findings with principles of pathophysiology and knowledge of psychosocial needs to formulate a field impression and implement a comprehensive treatment/disposition plan for patients with special needs.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Normal and Abnormal Changes associated with aging
   A. Normal changes associated with aging primarily occur due to deterioration of organ systems;
   B. Pathological changes in the elderly are sometimes difficult to discern from normal aging changes.

   C. Cardiovascular
      1. Inability to tolerate cardiovascular dysfunction of any kind
      2. Inability to increase rate and cardiac output
      3. Degeneration of valves
      4. Degeneration of conduction system
      5. More likely to have dysrhythmias
      6. Stroke volume decreases
      7. Vessel walls loose elasticity and are less flexible

   D. Respiratory
      1. Loss of elastic recoil in the chest wall
      2. Diminished respiratory muscle strength and endurance
      3. Loss of alveoli
      4. Reduction in oxygen and carbon dioxide exchange
      5. Inability to increase rate of respiratory effort
      6. Decreased cough reflex
      7. Decreased ability of cilia to move mucus upward

   E. Neurovascular
      1. Atrophy of the brain tissue
         a. Cognitive and short-term memory effects
         b. Delayed verbal response
      2. Deterioration of the nervous system function in controlling
         a. Rate and depth of breathing
         b. Heart rate
         c. Blood pressure
         d. Hunger and thirst
         e. Temperature
         f. Sensory perception – including audio, visual, olfactory, touch and pain
      3. Delayed reflexes and response times
      4. Impaired balance

   F. Gastrointestinal
1. Dental problems
2. Decrease in saliva
3. Poor sphincter muscle tone
4. Heartburn, and acid reflux
5. Decrease in hydrochloric acid in the stomach
6. Alterations in absorption of nutrients
7. Slowing peristalsis causing constipation
8. Rectal sphincter weakens with increased incidence of fecal incontinence
9. Liver function decreases with increased potential for drug toxicity

G. Genitourinary
1. Reduction in renal function due to decreased blood flow and tubule degeneration
2. Decreased bladder capacity
3. Decline in sphincter muscle control causing incontinence
4. Decline in voiding senses and nighttime voiding
5. In males benign prostatic hypertrophy

H. Endocrine
1. Increase in incidence of diabetes
2. Increase in secretion of antidiuretic hormone causing fluid imbalance
3. Decreased production of estrogen causing osteoporosis

I. Musculoskeletal
1. Atrophy of muscles
2. Degenerative changes and loss of bone
3. Loss of strength
4. Degenerative changes in joints
5. Loss of elasticity in ligaments and tendons
6. Thinning of cartilage and thickening of synovial fluid

J. Integumentary
1. Atrophy of the epidermis, hair follicles, and sweat glands
2. Lessened skin turgor
3. Tenting present even when patient is hydrated
4. Nails become thin and brittle
5. Increased healing time
6. Pigment changes
7. Decreased elasticity
8. Hair loss
9. Reduction of subcutaneous tissue
10. Skin easily torn

II. Sensory changes
   A. Vision
1. Decreased visual acuity -- inability to accommodate
2. Inability to differentiate colors
3. Decreased night vision
4. Decreased tear production
5. Development of cataracts
6. Disease processes
a. Glaucoma  
b. Macular degeneration  
c. Retinal detachment

B. Hearing  
   1. Presbycusis  
   2. Inability to hear high frequency sounds  
   3. Use of hearing aids

C. Pain Perception -- inability to differentiate hot from cold

III. Pharmacokinetic change

A. Physiological changes that impact pharmokinetics  
   1. Decrease in amount of body water  
   2. Decrease in muscle mass  
   3. Increase in body fat  
   4. Renal function deterioration  
   5. Liver function deterioration  
   6. Altered distribution of drugs

B. Implications of altered pharmacokinetics  
   1. Increased drug sensitivity  
   2. Increased adverse drug reactions  
   3. Increased drug toxicity  
   4. Dosages should possibly be decreased

C. Difficulty in compliance of drug therapy  
   1. Lack of money to purchase  
   2. Complicated drug regime  
   3. Forgetfulness “did I take it or not”  
   4. Difficulty opening containers  
   5. Directions for use not understood  
   6. Other

IV. Polypharmacy

A. Multiple chronic diseases mean multiple medications

B. Drug dosages may not have been adjusted for multiple meds

C. Drug interactions may cause problems

D. Consider polypharmacy as a reason for problems

V. Psychosocial and economic aspects

A. Demographics and “graying of America”

B. Psychosocial issues
VI. Specific conditions that occur more frequently in the elderly

A. Myocardial infarction
   1. Patient will usually have atypical chest pain or NO pain
   2. May present with only dyspnea, acute confusion (delirium), syncope, weakness or nausea and vomiting

B. Congestive Heart Failure
   1. A frequent condition of elderly
   2. May present with dyspnea, orthopnea, or mental status alteration
   3. Peripheral edema is frequently present in elderly patients with or without failure and may signify a variety of conditions
   4. Fluid balances are sometimes difficulty to achieve

C. Aortic Dissection

D. Syncope
   1. May have a variety of causes, usually cardiac or neurological
   2. Causes to consider
      a. Vasopressor use
      b. Orthostatic hypotension
      c. Transient reduction in blood flow to the brain due to cardiac output drop for any reason
      d. TIA
      e. Vasovagal syncope

E. Hypertension

F. Pneumonia
   a. Presentation can include dyspnea, congestion, altered mental status, or abdominal pain.
   b. Fever may be absent

G. Pulmonary Embolism
   a. Should be considered in any elderly patient with acute dyspnea
   b. Common after hip fracture

H. Asthma

I. Emphysema and chronic bronchitis

J. Stroke.

K. Transient Ischemic Attacks (TIA)

L. Alzheimer’s Disease
   1. Definition
      a. Stages
      b. Diagnosis
c. Prognosis

2. Epidemiology
   a. Population
   b. early onset

3. Pathophysiology
   a. Plaques
   b. Tangles

4. Signs and Symptoms
   a. Memory
   b. Learning
   c. Judgment
   d. Language
   e. Tasks

5. Personality changes
   a. Apathy
   b. Irritability
   c. Depression
   d. Agitation
   e. Psychosis

6. Normal day-to day living
   a. Problems associated with management
   b. Patient violence
   c. Patient verbal abuse
   d. Fearful patient

7. Management
   a. Communication
   b. Slow clear instructions
   c. Distraction from agitation
   d. Other
   e. Treat symptomatically
   f. Consider co-illnesses
   g. Consider medication reactions

8. Alzheimer’s treatment
   a. Cholinesterase inhibitors
   b. Antipsychotics
   c. Antidepressants

M. Dementia
1. Definition

2. Causes of dementia
   a. Alzheimer’s disease
   b. Multi-infarct dementia
   c. Drug toxicity
   d. Emotional disorders
   e. Metabolic and endocrine disorders
   f. Brain tumor
   g. Brain trauma
   h. Infections
   i. Major depression Parkinson’s disease
   j. Huntington’s chorea
k. Alzheimer’s Disease—most common form of dementia
   i. Pathophysiology
   ii. Stages
   iii. Paramedic assessment and interactions

3. Associated signs and symptoms
   a. Progressive loss of cognitive function; short and long-term memory problems
   b. Loss of attention span
   c. Loss of communication skills
   d. Inability to perform daily routines
   e. Easily lost
   f. Angers easily

4. Problems associated with management of patient with dementia
   a. Poor historian; impaired judgment
   b. Inability to vocalize areas of pain and current symptoms
   c. Unable to follow commands
   d. Anxiety over movement out of home or current establishment
   e. Anxiety and fear of treatment of current medical problems

N. Delirium- a sudden change in behavior, consciousness, or cognitive processes generally due to a reversible physical ailment.
   1. Mortality rates
   2. Evaluation of pathophysiology through history, possible risk factors, and current medications
      a. Intoxication or withdrawal from alcohol
      b. Withdrawal from sedatives
      c. Vitamin deficiencies
      d. Urinary tract infections/ bowel obstructions
      e. Cardiovascular disease
      f. Hyper/hypoglycemia
      g. Psychiatric disorders
      h. Malnutrition
      i. Dehydration
      j. Environmental emergencies
      k. Depression
      l. Fever
      m. Current medications: anticholinergic medications

3. Associated signs and symptoms
   a. Onset of minutes, hours, days
   b. Disorganized thoughts: inattention, memory loss, disorientation
   c. Hallucinations
   d. Delusions
   e. Reduced level of consciousness

4. Possible changes in physical assessment
   a. Changes in peripheral, core and neurovascular perfusion
   b. Changes in response of pupils
   c. Changes in response to motor tests
   d. Dysrhythmias
   e. Adventitious breath sounds

5. Assessment tools
   a. Neurological examination of cranial nerves, motor and sensory function
   b. Blood pressures
c. Evaluation of limb lead ECG
d. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
e. Auscultation of heart to detect irregular, muffled, or extra heart tones
f. Auscultation of breath sounds to detect adventitious noises
g. Capnography
h. Evaluation of glucose

6. Treatment
   a. Airway, ventilatory and circulatory support
   b. Oxygen with adjuncts appropriate to patient condition
   c. Venous access
d. ECG monitoring
e. Treatment to correct reversible causes of hypoglycemia, D50 IV, glucagon, or naloxone with suspected drug overdose
f. Evaluation of patient treatment through reassessment

O. Gastrointestinal bleeding- caused by disease processes, inflammation, infection and obstruction of upper and lower gastrointestinal tract.
   1. Evaluation of pathophysiology through history, possible risk factors, and current medications.
      a. Peptic ulcer disease
      b. Esophageal varices
c. Stomach cancer
d. Esophageal cancer
e. Diverticulitis
   f. Bowel obstruction
g. Smoking
   h. Alcohol/ Cirrhosis of the Liver
   i. Medications in use: nonsteroidal anti-inflammatory drugs, warfarin
   2. Associated signs and symptoms
      a. Hematamesis
      b. Bilious vomitus
c. Melena
d. Dyspepsia
e. Hepatomegaly
      f. Jaundice
g. Constipation, diarrhea
   h. Agitation, inability to find a comfortable position
   i. Dizziness
   3. Possible changes in physical assessment
      a. Changes in peripheral, core and neurovascular perfusion
      b. Pale or yellow, thin skin, frail musculoskeletal system
c. Peripheral, sacral and periorbital edema
d. Hypertension
e. Fever
   f. Tachycardia
g. Dyspnea
   4. Assessment tools
      a. Evaluation of limb lead ECG
      b. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
c. Blood pressures
d. Auscultation of heart to detect irregular, muffled, or extra tones
e. Auscultation of breath sounds to detect adventitious noises
f. Auscultation of bowel sounds; palpation of abdomen

5. Treatment:
   a. Airway, ventilatory and circulatory support
   b. Oxygen with adjuncts appropriate to patient condition
   c. Venous access- care should be taken to avoid use of indwelling fistulas or shunt unless necessary in cardiac events.
   d. Dysrhythmia management according to current ACLS standards or area protocol
   e. Evaluation of patient treatment through reassessment
   f. Definitive care of renal patients is dialysis.
   g. Fever
   h. Tachycardia
   i. Tachypnea
   j. Diffuse tenderness on palpation of abdomen, with distention, guarding, or masses; upon auscultation high pitched noises
   k. Hypovolemia

6. Assessment tools
   a. Evaluation of limb lead ECG
   b. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
   c. Blood pressures, lying, sitting, and standing noting any decrease of 10 mm/Hg or more
   d. Pulses, lying, sitting, and standing noting any increase of 10 beats per minute or more higher as the patient moves to an upright position
   e. Auscultation of heart to detect irregular, muffled, or extra tones
   f. Auscultation of breath sounds to detect adventitious noises, or foreign bodies
   g. Auscultation of bowel sounds; palpation of abdomen

7. Treatment:
   a. Management of Upper GI bleeds is not dependent upon the identifying the underlying cause; however, assessment and history are the key to successful treatment of this emergent life threatening illness.
   b. Airway, ventilatory and circulatory support
   c. Oxygen with adjuncts appropriate to patient condition
   d. Venous access- depending on patient presentation it may be necessary to place two large bore IVs
   e. Dysrhythmia management according to current ACLS standards or area protocol
   f. Evaluation of patient treatment through reassessment

P. Biliary disease is disorders of the liver and gallbladder.
   1. Evaluation of pathophysiology through history, possible risk factors, and current medications.
      a. Liver disease
      b. Congestive heart failure
      c. Gallstones
      d. Cholecystitis
      e. Medications that cause adverse affects on the liver
   2. Associated signs and symptoms
      a. Jaundice
      b. Fever
      c. Right upper quadrant pain, radiating to upper back and shoulder
      d. Vomiting
   3. Possible changes in physical assessment
      a. Changes in peripheral, core and neurovascular perfusion
b. Pale or yellow, warm skin
c. Fever
d. Tachycardia
e. Tachypnea due to pain in the abdomen
f. Diffuse tenderness in right upper quadrant on palpation of abdomen, guarding

4. Assessment tools
   a. Evaluation of limb lead ECG
   b. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
   c. Blood pressures
   d. Auscultation of heart to detect irregular, muffled, or extra tones
   e. Auscultation of breath sounds to detect adventitious noises
   f. Auscultation of bowel sounds; palpation of abdomen

5. Treatment:
   a. Airway, ventilatory and circulatory support
   b. Oxygen with adjuncts appropriate to patient condition
   c. Venous access
   d. Dysrhythmia management according to current ACLS standards or area protocol
   e. Evaluation of patient treatment through reassessment

Q. Chronic Renal Failure- the inability of the kidneys to excrete waste, concentrate urine, or control electrolyte balance in the body.

   1. Evaluation of pathophysiology through history, possible risk factors, and current medications.
      a. Diabetes
      b. Congenital disorders
      c. Pyelonephritis
      d. Hypertension
      e. Autoimmune disorders
      f. Glomerulonephritis
      g. Medications that damage the kidneys: antibiotics, nonsteroidal anti-inflammatory drugs, anticancer drugs

   2. Associated signs and symptoms
      a. Hypertension
      b. Headache
      c. Anxiety
      d. Fatigue
      e. Anorexia
      f. Vomiting
      g. Increased voiding of brown colored urine
      h. Confusion
      i. Seizures
      j. Musculoskeletal pain

   3. Possible changes in physical assessment
      a. Changes in peripheral, core and neurovascular perfusion
      b. Pale or yellow, thin skin, frail musculoskeletal system
      c. peripheral, sacral and periorbital edema
      d. Hypertension
      e. Fever
      f. Tachycardia
      g. Dyspnea

4. Assessment tools
a. Evaluation of limb lead ECG
b. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
c. Blood pressures
d. Auscultation of heart to detect irregular, muffled, or extra tones
e. Auscultation of breath sounds to detect adventitious noises
f. Auscultation of bowel sounds; palpation of abdomen

5. Treatment:
   a. Airway, ventilatory and circulatory support
   b. Oxygen with adjuncts appropriate to patient condition
c. Venous access- care should be taken to avoid use of indwelling fistulas or shunt unless necessary in cardiac events.
d. Dysrhythmia management according to current ACLS standards or area protocol
e. Evaluation of patient treatment through reassessment
f. Definitive care of renal patients is dialysis.

R. Urinary Tract Infection
   1. Evaluation of pathophysiology through history, possible risk factors, and current medications.
      a. Diabetes
      b. Prostatitis
c. Cystocele
d. Urethrocele
e. Kidney obstruction
f. Indwelling foley catheters
g. Medications used- immunosuppressive and chemotherapy

2. Associated signs and symptoms
   a. Urinary frequency and urgency
   b. Dysuria
c. Hematuria
d. Nausea, vomiting, and diarrhea
e. Anorexia
f. Shortness of breath
g. Fever
h. Hypothermia

3. Possible changes in physical assessment
   a. Changes in peripheral, core and neurovascular perfusion
   b. Diaphoresis, pale, cool, skin
c. Hypotension
d. Fever
e. Tachycardia

4. Assessment tools
   a. Evaluation of limb lead ECG
   b. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
c. Blood pressures
d. Auscultation of heart to detect irregular, muffled, or extra tones
e. Auscultation of breath sounds to detect adventitious noises
f. Auscultation of bowel sounds; palpation of abdomen

5. Treatment:
   a. Airway, ventilatory and circulatory support
   b. Oxygen with adjuncts appropriate to patient condition
c. Venous access
d. Supportive care
e. Evaluation of patient treatment through reassessment of disease

S. Endocrine
1. Diabetes Mellitus- inability of the pancreas to produce a sufficient amount of insulin causing hyperglycemia.
   a. Classification:
      i. Type I diabetes is insulin dependent (IDDM)
      ii. Type II diabetes is non-insulin dependent (NIDDM)
   b. Evaluation of pathophysiology through history, possible risk factors, and current medications.
      i. Insulin deficiency
      ii. Hyperglycemia: plasma levels >200 mg/dl, fasting levels >126 mg/dl
      iii. Ketoacidosis
      iv. Medications used: short-acting and long-acting insulin
   c. Associated signs and symptoms
      i. Polyuria
      ii. Polydipsia
      iii. Polyphagia
      iv. Anorexia
      v. Nausea, vomiting
      vi. Neuropathy and paresthesia
   d. Possible changes in physical assessment
      i. Changes in peripheral, core and neurovascular perfusion
      ii. Diaphoresis, pale skin, poor skin turgor; pale, dry, oral mucosa, furrowed tongue
      iii. Hypotension
      iv. Hypoglycemia/Hyperglycemia
      v. Tachycardia
      vi. Fever
   e. Assessment tools
      i. Evaluation of limb lead ECG
      ii. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
      iii. Blood pressures
      iv. Blood glucose levels
      v. Distal pulses
      vi. Auscultation of heart to detect irregular, muffled, or extra tones
      vii. Auscultation of breath sounds to detect adventitious noises
      viii. Temperature
      ix. Capnography
   f. Treatment
      i. Airway, ventilatory, and circulatory support
      ii. Oxygen with adjuncts appropriate to patient condition
      iii. Venous access
      iv. Correction of hypoglycemia with D50 IV
      v. Treatment of hyperglycemia with fluids
      vi. Evaluation of patient treatment through reassessment

2. Diabetic Ketoacidosis-a diabetic complication of IDDM that occurs when patient becomes hyperglycemic. Causing cells to burn fat, which causes the body to create ketones and ketoacids.
a. Evaluation of pathophysiology through history, possible risk factors, and current medications.
   i. Non-compliance in medication use
   ii. Recent myocardial infarction, stroke, infection, or anorexia
   iii. Insulin pump use
   iv. Medications used: short-acting insulin, long-acting insulin, metaformin
b. Associated signs and symptom
   i. Altered level of consciousness
   ii. Visual disturbances
   iii. Fruity or foul odor to breath (acetone halitosis)
   iv. Weight loss
   v. Polyuria
   vi. Polydypsia
   vii. Polyphagia
   viii. Abdominal pain
   ix. Nausea and vomiting
c. Possible changes in physical assessment
   i. Changes in peripheral, core and neurovascular perfusion
   ii. Warm, flushed skin, (even though patient may be hypothermic) poor skin turgor; pale, dry, oral mucosa, furrowed tongue
   iii. Kussmaul respirations
   iv. Hyperglycemia
   v. Tachycardia
d. Assessment tools
   i. Evaluation of limb lead ECG
   ii. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
   iii. Blood pressures
   iv. Blood glucose levels
   v. Distal pulses
   vi. Auscultation of heart to detect irregular, muffled, or extra tones
   vii. Auscultation of breath sounds to detect adventitious noises
   viii. Temperature
   ix. Capnography
e. Treatment
   i. Airway, ventilatory, and circulatory support
   ii. Oxygen with adjuncts appropriate to patient condition
   iii. Venous access
   iv. Treatment of hyperglycemia with fluids
   v. Evaluation of patient treatment through reassessment
3. Nonketotic Hyperglycemic-Hyperosmolar Coma – a diabetic complication of NIDDM in elderly. Unlike DKA resulting high blood glucose levels do not cause ketosis, but lead to osmotic diuresis, and shift of fluid to intravascular space, resulting in dehydration.
   a. Evaluation of pathophysiology through history, possible risk factors, and current medications.
   i. Type II diabetes (NIDDM)
   ii. Non-compliance of medicines
   iii. Hypothermia
   iv. Heat Stroke
   v. Infections
   vi. Cardiac disease
vii. Pancreatitis
viii. Stroke
ix. Medications

b. Associated signs and symptoms
i. Hyperglycemia
ii. Polydipsia
iii. Dizziness
iv. Confusion
v. Altered mental status
vi. Seizures

c. Possible changes in physical assessment
i. Changes in peripheral, core and neurovascular perfusion
ii. Warm, flushed skin, poor skin turgor; pale, dry, oral mucosa, furrowed tongue
iii. Hypotension and shock
iv. Tachycardia
v. Blood glucose levels greater than 500 mg/dl

d. Assessment tools
i. Evaluation of limb lead ECG
ii. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
iii. Blood pressures
iv. Blood glucose levels
v. Distal pulses
vi. Auscultation of heart to detect irregular, muffled, or extra tones
vii. Auscultation of breath sounds to detect adventitious noises
viii. Temperature
ix. Capnography

e. Treatment
i. Airway, ventilatory, and circulatory support
ii. Oxygen with adjuncts appropriate to patient condition
iii. Venous access may necessitate 2 large bore IVs
iv. Treatment of hyperglycemia with judicious use of fluid boluses
v. Evaluation of patient treatment through reassessment

4. Hypothyroidism-destruction of thyroid tissue over time causing insufficient amount of thyroid hormone in blood. Myxedema coma is premorbid consequence of hypothyroidism in elderly caused by recent history of surgery, hypothermia, infection, hypoglycemia, and sedative use.
 a. Evaluation of pathophysiology through history, possible risk factors, and current medications.
   i. Anemia
   ii. Congestive heart failure
   iii. Hyponatremia
   iv. Medications used: Levothyroxines
b. Associated signs and symptoms
i. Cold intolerance
ii. Fatigue
iii. Weight gain
iv. Poor cognitive function
v. Scaly dry skin and hair loss
vi. Peripheral and facial edema
vii. Altered mentation
viii. Depression, paranoia
c. Possible changes in physical assessment
   i. Changes in peripheral, core and neurovascular perfusion
   ii. Bradycardia
   iii. Respiratory failure or arrest
   iv. Hypercarbia
   v. Changes in blood glucose levels
   vi. Non-pitting or pitting edema

d. Assessment tools
   i. Evaluation of limb lead ECG
   ii. Interpretation of 12 lead ECG for signs of ischemia, injury or anomalies
   iii. Blood pressures
   iv. Blood glucose levels
   v. Auscultation of heart to detect irregular, muffled, or extra tones
   vi. Capnography and pulse oximetry

e. Treatment
   i. Airway, ventilatory, and circulatory support
   ii. Oxygen with adjuncts appropriate to patient condition; may necessitate aggressive management
   iii. Venous access
   iv. Correction of hypoglycemic levels with D50
   v. *Dysrhythmia management according to current ACLS standards or area protocol
   vi. Evaluation of patient treatment through reassessment

T. Inflammatory arthritis

U. Osteo

1. Osteoporosis—is a bone disease that decreases bone density.
   a. Type I osteoporosis seen in post menopausal women due to decline in estrogen, most commonly causes radial and hip fractures. Type II occurs in men and women over fifty, causes hip and vertebral fractures that can eventually result in dorsal kyphosis.
   b. Evaluation of pathophysiology through history, possible risk factors, and current medications.
      i. Genetics
      ii. Smoking
      iii. Exercise habits
      iv. Diets poor in calcium and vitamin D
      v. Gastrointestinal disorders
      vi. Hormones
      vii. Body type and weight
      viii. Steroids
      ix. Anticonvulsants
      x. Alcohol

2. Osteoarthritis—a progressive disease from repetitive trauma to joints causing destruction of cartilage. Commonly strikes the hands, knees, hips, and spine.
3. Rheumatoid Arthritis—autoimmune disorder that affects joints. RA causes inflammation of joints, resulting in pain and instability of the joints.

V. Immunological system anatomical and physiological changes, and pathophysiology

1. Immunological changes in the elderly
a. Aging of the thymus and reduction of T-cells
b. Reduced leukocyte activity
c. Increased production of autoantibodies

2. Changes in immune system of elderly make them more prone to infections and exacerbations of chronic disease processes. Infections compounded by inability of hypothalamus, may not produce a fever in the face of an immunologic insult such as a viral, bacterial, or occult infection.

W. Pressure Ulcers—the decay of body tissue due to pressure on a site. Results in lack of blood supply and oxygen to the tissues.
   1. Evaluation of pathophysiology through history and possible risk factors
      a. Brain or spinal cord injury
      b. Neuromuscular disorders
      c. Acute illness that results in loss of mobility
      d. Nutritional problems
      e. Fecal or urinary incontinence
   2. Areas of concern
      a. Lower legs
      b. Sacrum
      c. Greater trochanter
      d. Buttocks
   3. Stages of Ulcer
      a. Nonblanching erythema
      b. Blisters
      c. Ulcer exposing fat and fascia
      d. Ulcer exposing muscle or bone
   4. Management is at the BLS level

X. Herpes Zoster—highly contagious virus that is manifested by painful rash affecting ganglion of a nerve and appears along the affected nerve pathway.
Special Patient Population
Patients with Special Challenges – SP5

Integrates assessment findings with principles of pathophysiology and knowledge of psychosocial needs to formulate a field impression and implement a comprehensive treatment/disposition plan for patients with special needs.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Abuse and neglect

A. Introduction
   1. Epidemiology
   2. Definitions of abuse (physical, emotional, sexual) and neglect

B. History
   1. Social
   2. Financial
   3. Ethical
   4. Other

C. Assessment
   1. Elements in the history or scene concerning for abuse or neglect
   2. Assessing the caregiver’s behavior
   3. Physical findings concerning for abuse or neglect
   4. Benign findings often confused for physical or sexual abuse

D. Management
   1. Role of the prehospital professional (scene assessment, assessment of caregiver, communication with caregiver, documentation, reporting suspected abuse/neglect, safely transporting one or more injured children)
   2. Role of Child/Adult Protective Services
   3. Role of Medical Examiner and law enforcement

E. Legal aspects
   1. Abuse
   2. Neglect
   3. Assault
   4. Sexual assault

F. Risk profile of abuse victim

G. Risk profile of the abuser/assailant

H. Documentation
   1. Empirical -- Non judgmental
   2. Subjective -- Patient/other description
a. Use quotes
b. Identify the resource
c. Avoid judgment of potential abuser/assailant

3. Objective
   a. Observations
   b. Descriptions
   c. Time frame

II. Homelessness/Poverty

A. Advocate for patient rights and appropriate care

B. Identify facilities that will treat regardless of payment

C. Prevention strategies will likely be absent, increasing the probability of disease

D. Familiarity with assistance resources offered in community

E. Estimated 41 million Americans and one-third of people living in poverty have no health insurance, and insurance coverage held by many others would not carry them through a catastrophic illness

F. Financial challenges for health care can quickly result from loss of a job and depletion of savings

G. Financial challenges combined with medical conditions requiring uninterrupted treatment (e.g., TB, HIV/AIDS, diabetes, hypertension, mental disorders) or that occur in presence of unexpected illness/injury, can deprive patient of basic health care services

H. Poor health is closely associated with homelessness, where rates of chronic or acute health problems are extremely high

I. Special considerations
   1. People with financial challenges are often apprehensive about seeking medical care
   2. When caring for a patient with financial challenges who is concerned about the cost, explain the following:
      a. Patient's ability to pay should never be a factor in obtaining emergency health care
      b. Federal law mandates that quality, emergency health care be provided, regardless of patient's ability to pay
      c. Payment programs for health care services are available in most hospitals
      d. Government services are available to assist patients in paying for health care
      e. Free (or near-free) health care id available through local, state, and federally-funded organizations
   3. In cases where no life-threatening condition exists, counsel the patient about alternative facilities for health care that do not require ambulance transport for emergency department evaluation
   4. Consider providing approved list of alternative health care sites (e.g., a minor-emergency center or health clinic) that provide medical care at less cost than those charged by emergency departments

III. Bariatric Patients
A. Definition

B. Risk factors:
   1. Caloric intake that exceeds calories burned
   2. Low basal metabolic rate
   3. Genetic predisposition for obesity

C. Associated with an increased risk for the following:
   1. Hypertension
   2. Stroke
   3. Heart disease
   4. Diabetes
   5. Some cancers
   6. Injury

D. Long-term health effects

E. Special considerations

F. Patient handling issues
   1. to prevent back injuries
   2. to position the patient to breathe

IV. Technology Assisted/Dependent

A. Ventilation devices

B. Apnea monitoring/Pulse Oximetry

C. Long term vascular access devices

D. Dialysis shunts

E. Nutritional support (i.e. gastric tubes)

F. Elimination diversion

V. Hospice Care and Terminally Ill

A. What is hospice?
   1. Comfort care vs. curative care
   2. Terminally ill as verified by physician
   3. Typically cancer, heart failure, Alzheimer’s disease, AIDS

B. EMS Intervention

C. DNR (do not resuscitate) orders

VI. Tracheostomy care/Dysfunction
A. Tracheostomy: surgical opening from the anterior neck into the trachea

B. Consists of
   1. Stoma
   2. Outer cannula
   3. Inner cannula

C. Routine care
   1. Keep stoma clean and dry
   2. Change outer cannula as needed
   3. Suction as needed

D. Acute care

VII. Technology Assisted Patients

A. Profile of patients requiring adaptive devices

B. Adaptive devices
   1. Positive pressure ventilation devices
      a. CPAP/BiLevel
      b. Ventilators
      c. other
   2. Negative pressure ventilation devices
      a. Ventilators
      b. Phrenic nerve stimulators
      c. Diaphragm pacers
   3. Apnea monitoring/Pulse Oximetry
   4. Airways -- Tracheostomy tubes
   5. Long term vascular access devices
      a. Midlines
      b. PICC lines
      c. Central lines
      d. Implanted ports
      e. Other
   6. Medication administration systems
   7. Ventricular assist devices
   8. CerebroSpinal Fluid (CFS) shunts
   9. Hemodialysis
   10. Peritoneal dialysis
   11. Nutritional support
      a. Gastric
      b. Jejuneum
   12. Elimination
      a. Intestinal diversion
      b. Urinary diversion
   13. Braces
   14. Mobility
   15. Wounds
      a. Closures
b. Drains

16. Other

C. Assessment

D. Management approach

VIII. Pediatrics Developmental Disabilities

A. Impaired or insufficient development of brain that causes inability to learn at usual rate (developmental delay)

B. Causes include the following:
   1. Unsatisfactory parental interaction
   2. Severe vision or hearing impairment
   3. Mental retardation
   4. Brain damage
   5. Severe diseases of body organs and systems
   6. Congenital anomalies

C. Signs of developmental delay
   1. Walking upright
   2. Fine hand-eye coordination
   3. Listening, language, and speech
   4. Social interaction

D. Accommodations that may be necessary when providing patient care include allowing adequate time for obtaining history taking, performing assessment and patient management procedures, and preparing the patient for transport

E. Down Syndrome
   1. Features of the patient with Down syndrome:
      2. Cellular etiology
         a. Results in a triplet of chromosomes 21
         b. Extra number 21 chromosome
         c. Increased maternal age
         d. Family history of Down syndrome
   3. Special considerations
      a. Life expectancy
      b. Caregiver interactions
      c. Common associated disorders
      d. Cognitive ability of the downs patient

F. Autism
   1. Features of the patient with Autism:
   2. Etiology
   3. Special considerations
      a. Caregiver interactions
      b. Cognitive ability of the autistic patient
IX. Emotionally impaired

A. People with emotional impairments include those with the following:
   1. Neurasthenia (nervous exhaustion)
   2. Anxiety neurosis
   3. Compulsion neurosis
   4. Hysteria

B. Special considerations
   1. Signs and symptoms that may result from emotional impairment
   2. Complete history and examination
   3. Prehospital Management
   4. Emotionally/mentally impaired (EMI)
      a. IQ assessment as:
         i. Mild (IQ 50 to 70)
         ii. Moderate (IQ 35 to 59)
         iii. Profound (IQ less than 20)
      b. Causes of mental retardation
         i. Genetic conditions
            a) Phenylketonuria
            b) Chromosomal disorder
            c) Fragile X syndrome
         ii. Problems during pregnancy
            a) Use of alcohol or other drugs by the mother
            b) Use of tobacco
            c) Illness and infection
         iii. Problems at birth
            a) Brain injury
            b) Prematurity
            c) Low birth weight
         iv. Problems after birth
            a) Childhood diseases
            b) Injury
            c) Exposure to lead, mercury, and other environmental toxins
         v. Poverty and cultural deprivation
            a) Malnutrition
            b) Disease-producing conditions
            c) Inadequate medical care
            d) Environmental health hazards
            e) Lack of stimulation
      c. Special considerations

X. Physical Needs/Challenges

A. Hearing Impairments
   1. Deafness
      a. Etiology
      b. Types of deafness
      2. Sensorineural deafness
3. Hearing impairments
   a. Prolonged exposure to loud noise
   b. Disease (e.g., Meniere's disease)
   c. Tumors
   d. Medications
   e. Viral infections
   f. Natural degeneration of the cochlea and/or labyrinth in old age
   g. Auditory process deficits
   h. Auditory dyssynchrony
   i. Conductive hearing loss
   j. Mixed hearing loss
   k. Sensorineural hearing loss

4. Special considerations
   a. Use of hearing aids

B. Visual Impairments
   1. Normal vision
   2. Visual impairments
      a. Cataracts
      b. Degeneration of the eyeball, optic nerve, or nerve pathways
      c. Disease (e.g., diabetes, hypertension)
      d. Eye or brain injury
      e. Infection (e.g., CMV, HSV, bacterial ulcers)
      f. Vitamin A deficiency in children in living in poor countries
      g. Glaucoma
      h. Myopia
      i. Hyperopia
      j. Amblyopia
      k. Optic nerve atrophy
      l. Optic nerve hypoplasia
      m. Retinal diseases
      n. Retinopathy
      o. Cortical visual impairment
      p. Strabismus

3. Special considerations

C. Speech impairments
   1. Speech impairments include disorders of language, articulation, voice production, or fluency (blockage of speech), all of which can lead to inability to communicate effectively
   2. Speech
      a. Language disorders.
      b. Language learning disabilities.
      c. Language processing disorders.
      d. Semantic-pragmatic disorders.
      e. Articulation disorders.
      f. Phonological process disorders.
      g. Motor speech diso

D. Paraplegia/Quadriplegia
   1. Define Paraplegia
2. Define Quadriplegia
3. Causes:
   a. Motor vehicle crash
   b. Sports injury
   c. Fall
   d. Gunshot wound
   e. Medical illness
4. Paraplegia and quadriplegia are accompanied by loss of sensation and possible loss of urinary and/or bowel control
5. Special considerations
   a. Patients with extremity and trunk paralysis may require accommodations
   b. Assessment
      i. Patient may have an external device to stabilize the spine
      ii. Ostomies
         a) Trachea
         b) Bladder
         c) Colon
      iii. Priapism may be present in some male patients
   c. Transport
   d. Additional manpower may be needed to move special equipment/prepare patient for transport
   e. Normal pressure may not be recognized in patients with paraplegia/quadriplegia

XI. Patients with Communicable Diseases

A. Overview
   1. Exposure to some infectious diseases can pose a significant health risk to EMS providers
   2. It is important to ensure personal protection on every emergency response
   3. Required precautions will depend on mode of transmission and pathogen's virulence
      a. In some cases gloves will provide for necessary protection
      b. In other cases, respiratory barriers will also be indicated

B. Special considerations
   1. Some infectious diseases (e.g., AIDS) will take toll on emotional well-being of affected patients, their families, and loved ones
   2. Psychological aspects of providing care to these patients include an emphasis on the following:
      a. Recognizing each patient as an individual with unique health care needs
      b. Respecting each person's personal dignity
      c. Providing considerate, respectful care focused upon the person's individual needs

XII. Terminally Ill Patients

A. Overview
   1. Paramedics will care for terminally ill patients
   2. They will often be emotionally-charged encounters that will require a great deal of empathy and compassion for the patient and his or her loved ones
   3. If summoned to assess late stages of patient's terminal illness or change in patient's condition, gather complete history and ask patient or family about advance directives and appropriateness of resuscitation procedures
4. Hospice Care—the goal of hospice care is comfort during the end of a terminal illness

B. Special considerations
   1. Care of a terminally ill patient will often be primarily supportive and limited to calming and comfort measures, and perhaps transport for physician evaluation
   2. Pain assessment and management are important in caring for these patients
      a. Attempt to gather a complete pain medication history
      b. Examine the patient for presence of transdermal drug patches or other pain-relief devices
   3. Following assessment of patient's vital signs, level of consciousness, and medication history, medical direction may recommend administration of analgesics or sedatives to ensure patient's comfort

XIII. Mental Needs/Challenges

A. Mental illness refers to any form of psychiatric disorder

B. Psychoses
   1. Comprises a group of mental disorders in which the individual loses contact with reality
   2. Thought to be related to complex biochemical disease that disorders brain function
   3. Examples
      a. Schizophrenia
      b. Bipolar disorder (manic-depressive illness)
      c. Organic brain disease

C. Neuroses
   1. Refers to diseases related to upbringing and personality in which the person remains "in touch" with reality
   2. Neurotic symptoms generally do not limit work or social activity and tend to fluctuate in intensity with stress
   3. Examples
      a. Depression
      b. Phobias
      c. Obsessive-compulsive behavior

D. Special considerations
   1. Recognizing patient who is mentally challenged may be difficult, especially when caring for mildly neurotic patients whose behavior may be unaffected
   2. Patients with more serious disorders may present with signs/symptoms consistent with mental illness
   3. When obtaining the patient history, do not be hesitant to ask about:
      a. History of mental illness
      b. Prescribed medications
      c. Compliance with prescribed medications
      d. Concomitant use of alcohol or other drugs

E. If patient appears paranoid or shows anxious behavior, ask patient's permission before beginning any assessment or performing any procedure
   1. Once rapport and trust established, care should proceed in same manner as for patient who does not have mental illness (unless the call is related specifically to the mental illness)
F. These patients experience illness and injury like all other patients

XIV. Specific Challenges Created by Chronic Conditions

A. Arthritis
1. Inflammation of a joint, characterized by pain, stiffness, swelling, and redness
2. Has many forms and varies widely in its effects
3. Two common forms:
   a. Osteoarthritis results from cartilage loss/wear and tear of joints (common in elderly patients)
   b. Rheumatoid arthritis is an autoimmune disorder that damages joints and surrounding tissues
4. Special considerations
5. Assessment
   a. Decreased range of motion/mobility may limit physical examination
   b. Be sure to solicit current medications before considering administration of medications
6. Management and transportation strategies
7. Consider the patient's limited mobility
8. Equipment (e.g., backboards, splints) must be adjusted to "fit patient" (not vice versa) by supplying adequate padding to fill all voids

B. Cancer
1. Group of diseases that allow an unrestrained growth of cells in one or more body organ or tissue
2. Malignant tumors most commonly develop in major organs, e.g., lungs, breasts, intestine, skin, stomach, and pancreas, but may also occur in cell-forming tissues of bone marrow, and in the lymphatic system, muscle, or bone
3. Special considerations
4. Signs and symptoms depend on the cancer's primary site of origin
5. Many cancer patients take anticancer drugs and pain medications through surgically implanted ports (e.g., Mediports)
6. Transdermal skin patches that contain analgesic agents are common

C. Cerebral Palsy (CP)
1. General term for nonprogressive disorders of movement and posture
2. Results from damage to fetal brain during last trimester of pregnancy, during birth, during newborn period, or in early childhood
3. Causes
   a. Most common cause is cerebral dysgenesis (abnormal cerebral development) or cerebral malformations
   b. Less common causes include the following:
      i. Fetal hypoxia
      ii. Birth trauma
      iii. Maternal infection
      iv. Kernicterus (excessive fetal bilirubin, associated with hemolytic disease)
      v. Postpartum encephalitis, meningitis, or head injury
4. Produces abnormal stiffness and contraction of groups of muscles
5. Child may be categorized as having one of the following conditions:
   a. Diplegia—affecting all four limbs, the legs more severely than the arms
b. Hemiplegia—affecting limbs on one side of body only; arm usually more severely than the leg
c. Quadriplegia—affecting all four limbs severely; not necessarily symmetrically
d. Athetosis—producing involuntary writhing movements
e. Ataxia—producing a loss of coordination and balance
f. Hearing defects, epilepsy, and other CNS disorders commonly present with the disease
g. Special considerations
   i. Weakness
   ii. Paralysis
   iii. developmental delay
6. Some children with mild CP attend regular schools
7. Those with more severe forms of disease never learn to walk or effectively communicate, and require lifelong skilled nursing care

D. Cystic Fibrosis (CF) (mucoviscidosis)
1. Inherited metabolic disease of lungs and digestive system that manifests itself in childhood
2. Caused by a defective recessive gene inherited from each parent
3. Predisposes the individual to chronic lung infections
   a. Pancreas of a patient with CF fails to produce the enzymes required for the breakdown of fats and their absorption from the intestine
   b. These alterations in metabolism cause classic symptoms of CF that include the following:
      i. Pale, greasy-looking, and foul-smelling stools (often noticeable soon after birth)
      ii. Persistent cough and breathlessness
      iii. Lung infections that often develop into pneumonia, bronchiectasis, and bronchitis
   c. Other features of the disease include stunted growth and sweat glands that produce abnormally salty sweat
   d. In some cases, the child with CF may fail to thrive
   e. Special considerations
      i. Older patients (and parents of children) with CF are generally aware of their disease
      ii. Some may be oxygen-dependent and will require respiratory support/suctioning to clear airway of mucus and secretions
      iii. Expect a lengthy history and physical exam due to the nature of the disease and associated medical problems
      iv. Some patients will have received heart and lung transplants, and may require transfer to specialized medical facilities for treatment
      v. If parents are unaware of possibility of CF in presence of signs and symptoms described, paramedic should advise physician at receiving hospital of his or her suspicions

E. Multiple Sclerosis (MS)
1. Progressive and incurable autoimmune disease of CNS, scattered patches of myelin in brain and spinal cord are destroyed
2. Cause of MS is unknown; however, it may have a heritable or viral component
3. Usually begins early in adult life. May develop and progress continually or may become active for a brief time, and then resume years later
4. Symptoms vary with the affected areas of the CNS and may include:
   a. Brain involvement
b. Fatigue
c. Vertigo
d. Clumsiness
e. Muscle weakness
f. Slurred speech
g. Ataxia
h. Blurred or double vision
i. Numbness, weakness or pain in the face
j. Tingling, numbness, or feeling of constriction in any part of the body
k. Extremities that feel heavy and become weak
l. Spasticity
m. Incontinence
n. Symptoms may occur singly or in combination, and may last several weeks to several months
o. Some patients become disabled, bedridden, and incontinent early in middle life
p. Disabled patients often suffer painful muscle spasms, constipation, urinary tract infection, skin ulcerations, and mood swings
q. Disease is managed with medications, physical therapy, and counseling
r. Special considerations
   i. Some patients may be difficult to examine and may be unable to provide a complete medical history due to the nature of their illness
   ii. Allow extra time for patient assessment and to prepare the patient for transport
   iii. Respiratory support may be indicated in severe cases

F. Muscular Dystrophy
   1. Inherited muscle disorder that results in a slow but progressive degeneration of muscle fibers
   2. Classified according to the following:
      a. Age that symptoms first appear
      b. Rate at which the disease progresses
      c. Way in which it is inherited
   3. Muscular dystrophy is incurable
   4. Most common form of the disease is Duchenne muscular dystrophy
      a. Caused by a sex-linked, recessive gene that affects only males
      b. Rarely diagnosed before 3 years of age
      c. Signs and symptoms include
         i. Child slow in learning to sit up and walk
         ii. Unusual gait
         iii. Curvature of the spine
         iv. Muscles that become bulky as they are replaced by fat
         v. Eventually, most children will be unable to walk
      d. Many do not live past their teens due to chronic lung infections and congestive heart failure
   5. Special considerations
   6. Young children will be relatively easy to examine and prepare for transport
   7. Older patients may require additional manpower and resources to assist with moving the patient to the ambulance
   8. Respiratory support may be indicated in severe cases

G. Poliomyelitis (polio)
   1. Infectious disease caused by poliovirus hominis
2. Virus is spread through direct/indirect contact with infected feces and by airborne transmission.
3. Incidence has declined since the Salk and Sabin vaccines were made available in the 1950s.
4. Signs/symptoms of polio in both nonparalytic and paralytic forms include the following:
   a. Fever
   b. Malaise
   c. Headache
   d. Intestinal upset
5. Often, people with the nonparalytic form of polio recover completely.
6. In paralytic form, extensive paralysis of muscles of the legs and lower trunk can occur.
7. Special considerations
   a. Caring for a patient with paralytic polio who has respiratory paralysis may require
      advanced airway support to ensure adequate ventilation.
   b. If the lower body is paralyzed, urinary catheterization may be indicated.
   c. Additional resources and manpower may be needed to prepare the patient for transport.

H. Previously head-injured patients
1. Traumatic brain injury can result from many mechanisms of trauma.
2. These injuries can affect many cognitive, physical, and psychological skills.
   a. Cognitive deficits of language and communication, information processing, memory,
      and perceptual skills are common.
   b. Physical deficit can include ambulation, balance and coordination, fine motor skills,
      strength, and endurance.
   c. Psychological status also is often altered.
3. Special considerations
   a. Depending on the patient's area of brain injury, obtaining a history and performing
      assessment and patient care procedures may be very difficult.
   b. Some patients may require restraint.
   c. Family members and other caregivers should be:
      i. Involved in managing the patient (when appropriate).
      ii. Interviewed to determine if patient's actions/responses are "normal" for patient.
      iii. Expect to spend additional time at the scene to provide care to these patients.

I. Spina Bifida
1. Congenital defect in which part of one or more vertebrae fails to develop, leaving part of the
   spinal cord exposed.
2. Condition ranges in severity from minimal evidence of a defect to severe disability.
3. In severe cases, legs of some children may be deformed with partial or complete paralysis and
   loss of sensation in all areas below the level of the defect.
4. Associated abnormalities may include:
   a. Hydrocephalus with brain damage.
   b. Cerebral palsy.
   c. Epilepsy.
   d. Mental retardation.
5. Special considerations
   a. Because of the varying degrees of spina bifida, prehospital care will need to be tailored
      to the patient's specific needs.
   b. Some patients will require no special accommodations.
   c. Others will need extended on-scene time for assessment and management, and perhaps
      additional resources and manpower to prepare the patient for transport.
J. Myasthenia Gravis
1. Autoimmune disorder in which muscles become weak and tire easily
2. Damage occurs to muscle receptors that are responsible for transmitting nerve impulses, commonly affecting muscles of the eyes, face, throat, and extremities
3. Rare disease that can begin suddenly or gradually
4. Can occur at any age, but usually appears in women between age 20 and 30, and in men between 70 and 80 years of age
5. Classic signs and symptoms include:
   a. Drooping eyelids, double vision
   b. Difficulty in speaking
   c. Difficulty in chewing and swallowing
   d. Difficult extremity movement
   e. Weakened respiratory muscles
6. Affected muscles become worse with use, but may recover completely with rest
7. May be exacerbated by infection, stress, medications, and menstruation
8. Can often be controlled with drug therapy to enhance transmission of nerve impulses in muscles
9. Special considerations
   a. Accommodations required for care vary based on the patient's presentation
   b. In most cases, supportive care and transport will be all that is required
   c. In the presence of respiratory distress, measures should be taken to ensure adequate airway and ventilatory support
Knowledge of operational roles and responsibilities to ensure safe patient, public, and personnel safety.

The Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level. The intent of this section is to give an overview of emergency response to ensure EMS personnel, patient, and other’s safety during EMS operations. This does not prepare the entry level student to be an experienced and competent driver. Information related to the clinical management of the patient during emergency response is found in the clinical sections of the Kansas EMS Education Instructional Guidelines and the Kansas Scope of Practice Psychomotor Skills Guidelines for each personnel level.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT levels.
EMS Operations
Incident Management – OP2

Knowledge of operational roles and responsibilities to ensure safe patient, public, and personnel safety.

Information related to the clinical management of the patient within components of the Incident Management System (IMS) is found in the clinical sections of the Kansas EMS Education Instructional Guidelines and the Kansas EMS Scope of Practice Psychomotor Skills Guidelines for each personnel level.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT levels.

I. Establish and Work Within the Incident Management System

A. Entry-Level Students Need to Be Certified in
   1. ICS-100: Introduction to ICS, or equivalent
   2. FEMA IS-700: NIMS, An Introduction

B. This Can Be Done as a Co requisite or Prerequisite or as Part of the Entry-Level Course
Knowledge of operational roles and responsibilities to ensure safe patient, public, and personnel safety.

The intent of this section is to give an overview of operating during a multiple casualty incident when a multiple casualty incident plan is activated. Information related to the clinical management of the patients during a multiple casualty incident is found in the clinical sections of the Kansas EMS Education Instructional Guidelines and the Kansas EMS Scope of Practice Psychomotor Skills Guidelines for each personnel level.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT levels.
EMS Operations
Air Medical – OP4

Knowledge of operational roles and responsibilities to ensure safe patient, public, and personnel safety.

The intent of this section is to give an overview of operating safely in and around a landing zone during air medical operations and transport. Information related to the clinical management of the patients during air medical operations is found in the clinical sections of the Kansas EMS Education Instructional Guidelines and the Kansas EMS Scope of Practice Psychomotor Skills Guidelines for each personnel level.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT level PLUS the following material:

I. Medical Risks/Needs/Advantages

A. Risks
   1. Aircraft crash
   2. Usually more severe restrictions on the number of caregivers for the patient.

B. Needs
   1. Patient’s condition would benefit by decreasing transport interval
   2. Patient requires time-sensitive assessment or intervention not available at local facility.
   3. Patient is located in area not accessible by ground EMS team or ambulance.

C. Advantages
   1. Decreased transport interval if transport distance is extreme
   2. Availability of highly trained medical crews
   3. Availability of specialized medical equipment
Knowledge of operational roles and responsibilities to ensure safe patient, public, and personnel safety.

The intent of this section is to give an overview of vehicle extrication to ensure EMS personnel and patient safety during extrication operations. This does not prepare the entry-level student to become a vehicle extrication expert or technician. Information related to the clinical management of the patient being cared for during vehicle extrication is found in the clinical sections of the Kansas EMS Education Instructional Guidelines and the Kansas EMS Scope of Practice Psychomotor Skills Guidelines for each personnel level.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT levels.

I. Safe Vehicle Extrication

A. Role of EMS in Vehicle Extrication
   1. Provide patient care
   2. Perform simple extrication

B. Personal Safety
   1. First priority for all EMS personnel
   2. Appropriate personal protective equipment for conditions
   3. Scene size-up

C. Patient Safety
   1. Keep them informed of your actions
   2. Protect from further harm

D. Situational Safety
   1. Control traffic flow
      a. Proper positioning of emergency vehicles
         i. upwind/uphill
         ii. protect scene
      b. Use of lights and other warning devices
      c. Setting up protective barrier
      d. Designate a traffic control person
   2. 360-degree assessment
      a. Downed electrical lines
      b. Leaking fuels or fluids
      c. Smoke or fire
      d. Broken glass
      e. Trapped or ejected patients
      f. Mechanism of injury
   3. Vehicle stabilization
      a. Put vehicle in “park” or in gear
      b. Set parking brake
      c. Turn off vehicle ignition
d. Cribbing/Chocking


e. Move seats back and roll down windows

f. Disconnect battery or power source

g. Identify and avoid hazardous vehicle safety components
   i. seat belt pretensioners
   ii. undeployed air bags
   iii. other

4. Unique hazards
   a. Alternative-fuel vehicles
   b. Undeployed vehicle safety devices
   c. HAZMAT

5. Evaluate the need for additional resources
   a. Extrication equipment
   b. Fire suppression
   c. Law enforcement
   d. HAZMAT
   e. Utility companies
   f. Air medical
   g. Others

6. Extrication considerations
   a. Disentanglement of vehicle from patient
   b. Multi-step process
   c. Rescuer-intensive
   d. Equipment-intensive
   e. Time-intensive
   f. Access to patient
      i. simple
         a) try to open doors
         b) ask patient to unlock doors
         c) ask patient to lower windows
      ii. complex
         iii. tools
            a) hand
            b) pneumatic
            c) hydraulic
            d) other

E. Determine Number of Patients (implement local multiple casualty incident protocols if necessary)

II. Use of Simple Hand Tools

   A. Hammer

   B. Center Punch

   C. Pry Bar

   D. Hack Saw

   E. Come-Along
III. Special Considerations for Patient Care

A. Removing Patient
   1. Maintain manual cervical spine stabilization
   2. Complete primary assessment
   3. Provide critical interventions

B. Assist With Rapid Extrication

C. Move Patient, Not Device

D. Use Sufficient Personnel

E. Use Path of Least Resistance
Knowledge of operational roles and responsibilities to ensure safe patient, public, and personnel safety.

Information related to the clinical management of the patient exposed to hazardous materials is found in the clinical sections of the Kansas EMS Education Instructional Guidelines and the Kansas EMS Scope of Practice Psychomotor Skills Guidelines for each personnel level.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT levels.

I. Risks and Responsibilities of Operating in a Cold Zone at a Hazardous Material or Other Special Incident

   A. Entry-Level Students Need to Be Certified in:

   B. This Can Be Done as a Co requisite or Prerequisite or as Part of the Entry-Level Course
EMS Operations
Mass Casualty Incidents due to Terrorism and Disaster – OP7

Knowledge of operational roles and responsibilities to ensure safe patient, public, and personnel safety.

The intent of this section is to give an overview of operating during a terrorist event or during a natural or manmade disaster. Information related to the clinical management of patients exposed to a terrorist event is found in the clinical sections of the Kansas EMS Education Instructional Guidelines and the Kansas EMS Scope of Practice Psychomotor Skills Guidelines for each personnel level.

The Paramedic Instructional Guidelines in this section include all the topics and material at the EMR, EMT, and AEMT levels.

I. Risks and Responsibilities of Operating on the Scene of a Natural or Man-Made Disaster

A. Role of EMS
   1. Personal safety
   2. Provide patient care
   3. Initiate/operate in an incident command system (ICS)
   4. Assist with operations

B. Safety
   1. Personal
      a. First priority for all EMS personnel
      b. Appropriate personnel protective equipment for conditions
      c. Scene size-up
      d. Time, distance, and shielding for self-protection
      e. Emergency responders are targets
      f. Dangers of the secondary attack
   2. Patient
      a. Keep them informed of your actions
      b. Protect from further harm
      c. Signs/symptoms of biological, nuclear, incendiary, chemical and explosive (B-NICE) substances
      d. Concept of “greater good” as it relates to any delay
      e. Treating terrorists/criminals
   3. 360-degree assessment and scene size-up
      a. Outward signs and characteristics of terrorist incidents
      b. Outward signs of a weapons of mass destruction (WMD) incident
      c. Outward signs and protective actions of biological, nuclear, incendiary, chemical, and explosive (B-NICE) weapons
   4. Determine number of patients (implement local multiple-casualty incident [MCI] protocols as necessary)
   5. Evaluate need for additional resources

6. EMS operations during terrorist, weapons of mass destruction, disaster events
a. All hazards safety approach
b. Initially distance from scene and approach when safe
c. Ongoing scene assessment for potential secondary events
d. Communicate with law enforcement at the scene of an armed attack
e. Initiate or expand incident command system as needed
f. Perimeter use to protect rescuers and public from injury
g. Escape plan and a mobilization point at a terrorist incident

7. Care of emergency responders on scene
   a. Safe use of an auto injector for self and peers
   b. Safe disposal of auto injector devices after activation