

Idaho Transition Instructional Guidelines

Paramedic (Paramedic-2011)



Preparatory EMS Systems

Paramedic Education Standard

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

Transition Highlights

This section includes a more detailed discussion on patient safety issues, decreasing medical error, and required affective/behavioral characteristics.

Paramedic-Level Instructional Guideline

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

- I. IDAPA 16.01.07.075 Standards of Professional Conduct for EMS Personnel
 - 01. Method of Treatment.** EMS personnel must practice medically acceptable methods of treatment and must not endeavor to extend their practice beyond their competence and the authority vested in them by the medical director.
 - 02. Commitment to Self-Improvement.** EMS personnel must continually strive to increase and improve their knowledge and skills and render to each patient the full measure of their abilities.
 - 03. Respect for the Patient.** EMS personnel must provide all services with respect for the dignity of the patient, unrestricted by considerations of social or economic status, personal attributes, or the nature of health problems. (7-1-11)T
 - 04. Confidentiality.** EMS personnel must hold in strict confidence all privileged information concerning the patient except as disclosure or use of this information is permitted or required by law or Department rule. (7-1-11)T
 - 05. Conflict of Interest.** EMS personnel must not accept gratuities for preferential consideration of the patient and must guard against conflicts of interest.
 - 06. Professionalism.** EMS personnel must uphold the dignity and honor of the profession and abide by its ethical principles and should be familiar with existing laws governing the practice of emergency medical services and comply with those laws.
 - 07. Cooperation and Participation.** EMS personnel must cooperate with other health care professionals and participate in activities to promote community and national efforts to meet the health needs of the public.
 - 08. Ethical Responsibility.** EMS personnel must refuse to participate in unethical procedures, and assume the responsibility to expose incompetence or unethical conduct of others to the appropriate authority in a proper and professional manner.
- II. 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
 - c. Minimal interruptions
 - d. Organization and packaging of drugs
2. Individual
 - a. Reflection in action
 - b. Constantly question assumptions
 - c. Reflection bias
 - d. Use decision aids
 - e. Ask for help

Preparatory Research

Paramedic Education Standard

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

Transition Highlights

This section includes new, limited information on evidence based decision making and how to interpret research; the section on conducting research is gone.

Paramedic-Level Instructional Guideline

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

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

A. 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
- B. 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 a change in practice, adopt the new therapy allowing for unique patient needs.

Preparatory Workforce Safety and Wellness

Paramedic Education Standard

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

Transition Highlights

This section includes a brief discussion on safe lifting bariatric issues, neonatal isolettes and medical restraint.

Paramedic-Level Instructional Guideline

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

I. 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 lifesaving 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 and upkeep
 - 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

Preparatory Therapeutic Communication

Paramedic Education Standard

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

Transition Highlights

This section includes increased depth of cultural competence issues.

Paramedic-Level Instructional Guideline

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

- I. Principles of communicating with patients in a manner that achieves a positive relationship
 - A. 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. Realize that people may not share your explanations of the causes of their ill health, 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 called
 - x. Both the paramedic and the 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 first to determine whether the patient understands or speaks some English words or phrases
 - c) Bystanders, coworkers, or family members may be available 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 as soon as possible 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) Pointing to the area of the body to be examined before touching the patient is best
- g. Respect the patient's need for modesty and privacy at the scene and during transport

Preparatory Medical/Legal and Ethics

Paramedic Education Standard

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

Transition Highlights

This section includes new content on HIPPA; increased depth of discussion regarding advance directives; the term "end-of-life" was not previously used; there is an increased emphasis on end of life issues; increased depth and breadth on ethics.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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. Homicide
 - 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. 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
- V. 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
- VI. Ethical Tests and Decision Making
 - A. Do No Harm
 - B. In Good Faith
 - C. Patient's Best Interest

Anatomy and Physiology

Paramedic Education Standard

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

Transition Highlights

This section includes more comprehensive coverage. Programs should evaluate their current Anatomy and Physiology program to see how much upgrade they need to reach a comprehensive and complex understanding, especially in the cardiovascular, respiratory and neurological systems.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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. Fontanel
 - 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. manible
 - 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. Tarsals
 - 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 the 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 the sympathetic and parasympathetic divisions of the 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. Conjunctiva
 - 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. Adrenocorticotrophic 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. Cushing'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. Gametes
 - 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 Gametes

- 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

Public Health Public Health

Paramedic Education Standard

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

Transition Highlights

This section includes greater emphasis on public health issues.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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 the 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

Paramedic Education Standard

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

Transition Highlights

Programs should evaluate their current pharmacology program to see how much upgrade they need to reach a comprehensive and complex understanding

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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. Corticosteroids
 10. Diuretics
 11. Dysrhythmics
 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. mineralcorticoids
 - 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

Paramedic Education Standard

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

Transition Highlights

Programs should evaluate their current pharmacology program to see how much upgrade they need to reach a comprehensive and complex understanding

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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

Paramedic Education Standard

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

Transition Highlights

This list represents medications commonly used in numerous EMS systems and is a minimum list that all paramedics should know. States and programs are encouraged to add to the list, but should not delete. This list may become dated quickly.

Paramedic-Level Instructional Guideline

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

The paramedic must know (to a complex depth) the names, mechanism of action, indications, contraindications, complications, routes of administration, side effects, interactions, dose, and any specific administration considerations, for all of the following emergency medications and intravenous fluids. Individual training programs have the authority to add any medication used locally by paramedic.

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

Paramedic Education Standard

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.

Transition Highlights

Confusion exists about the differences between oxygenation, ventilation, and respiration. The *Education Standards* were organized to attempt to highlight the differences between the concepts. There is a greater emphasis on ventilation and respirations and the importance of artificial ventilation. Research suggests that EMS can make a difference in this area.

Paramedic-Level Instructional Guideline

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

- I. 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 the upper airway suctioning material from the EMR, EMT and AEMT levels
 - 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

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

- A. See Special Patient Populations section

Airway Management, Respiration, and Artificial Ventilation

Respiration

Paramedic Education Standard

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.

Transition Highlights

Confusion exists about the differences between oxygenation, ventilation, and respiration. The *Education Standards* were organized to attempt to highlight the differences between the concepts. There is a greater emphasis on ventilation and respirations and the importance of artificial ventilation. Research suggests that EMS can make a difference in this area.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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 innervations

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, effects of hypoxia, acidosis, temperature changes, neural factors and catecholamines.
 - b. Cell and 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 – device to provide continuous positive airway pressure in the spontaneously breathing patient
- ii. BiPAP – device to provide 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 patient's 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

Paramedic Education Standard

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.

Transition Highlights

Confusion exists about the differences between oxygenation, ventilation, and respiration. The *Education Standards* were organized to attempt to highlight the differences between the concepts. There is a greater emphasis on ventilation and respirations and the importance of artificial ventilation. Research suggests that EMS can make a difference in this area.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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
3. Contraindications
4. Complications
5. Procedures

B. Mechanical devices

1. Purpose
2. Indications
3. Contraindications
4. Complications
5. Procedures

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

Paramedic Education Standard

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.

Transition Highlights

This section includes re-emphasis on scene safety.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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

Patient Assessment

Primary Assessment

Paramedic Education Standard

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.

Transition Highlights

This section includes new terminology that more closely mimics other health care professionals.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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

Secondary Assessment

Paramedic Education Standard

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.

Transition Highlights

This section includes new terminology that more closely mimics other health care professionals and is more thorough than the previous curriculum.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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 that the provider should be familiar with 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) fingertip
 - 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
 - a. Respirations
 - b. Pulse
 - c. Blood pressure
 - d. Pupils
 - e. Pulse Oximetry
 - f. Temperature
 - g. Pain level
 - 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. Keep in mind that most patients view a physical exam with apprehension and anxiety – they feel vulnerable and exposed
 - 5. Maintain professionalism throughout the 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
 - a. Review of anatomy and physiology
 - b. Review of related history
 - i. present problem
 - ii. past medical history
 - iii. personal and social history
 - iv. family history
 - c. Examination and findings
 - d. Common abnormalities
 - e. 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 Reassessment

Paramedic Education Standard

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.

Transition Highlights

This section includes new terminology that more closely mimics other health care professionals and is more thorough than the previous curriculum.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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

Patient Assessment History-Taking

Paramedic Education Standard

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.

Transition Highlights

This section includes new terminology that more closely mimics other health care professionals..

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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 the urgent, emergent and non-emergent patient requesting care
 - iv. identifies the potential for life-threats as well as the 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 the 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) dysmenorrheal
 - 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 use of knowledge of anatomy, physiology and pathophysiology to direct the questioning
 - a. Answers are analyzed as they are received
 - b. Results of questioning may allow you to think about associated problems and body systems
 - c. Clinical reasoning requires integrating the history with the 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 and assessments relating to systems with similar types of signs and symptoms
 - c. Pay careful attention to the signs and symptoms that do not fit with the 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 use this to collect their thoughts, remember details or decide 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 and vision) may require paramedic to 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 the systems review in the 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 Monitoring Devices

Paramedic Education Standard

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.

Transition Highlights

This section includes capnography, chemistry analysis, arterial blood gas interpretation.

Paramedic-Level Instructional Guideline

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

I. Continuous ECG monitoring

A. Purpose

B. Indication

1. Patient's presenting with cardiac-related signs and symptoms or potential signs and 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, therefore 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 the “standard of care” in the out-of-hospital setting, those devices should be incorporated into the primary education of those who will be expected to use them in practice.

1. State regulatory processes may elect to expand, delete or modify from the monitor devices in this section.

Medicine

Medical Overview

Paramedic Education Standard

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.

Transition Highlights

This section includes emphasis on pathophysiologic basis and updated destination decisions for some medical conditions such as stroke and acute coronary syndrome.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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 with one finger 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

Paramedic Education Standard

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.

Transition Highlights

This section includes more detailed information on stroke assessment and management.

Paramedic-Level Instructional Guideline

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

I. 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

Medicine

Abdominal and Gastrointestinal Disorders

Paramedic Education Standard

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.

Transition Highlights

This section includes a new section on mesenteric ischemia, rectal foreign body obstructions and rectal abscess.

Paramedic-Level Instructional Guideline

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

I. 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

Medicine

Immunology

Paramedic Education Standard

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.

Transition Highlights

This section includes new content.

Paramedic-Level Instructional Guideline

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

I. Anaphylactoid Reaction

II. 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

III. 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

Medicine

Infectious Disease

Paramedic Education Standard

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.

Transition Highlights

This section includes updated infectious disease information, for example methicillin-resistant *Staphylococcus aureus* (MRSA), hepatitis, and Acquired Immune Deficiency Syndrome (AIDS) update; should include a discussion on cleaning and sterilizing equipment and decontaminating the ambulance.

Paramedic-Level Instructional Guideline

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

- I. 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

- II. 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
 - i. neisseria meningitidis
 - ii. onset rapid, high mortality rate
 - iii. 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 1
 - 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. Paresthesia
 - 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 neuro 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 scabiei*.
 - 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. phthirus 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

VII. Transport decisions including special infection control procedures.

Medicine

Endocrine Disorders

Paramedic Education Standard

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.

Transition Highlights

This section includes increased level of detail on diabetes.

Paramedic-Level Instructional Guideline

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

- I. 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

Medicine Psychiatric

Paramedic Education Standard

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.

Transition Highlights

This section includes new material on excited delirium. Other psychiatric conditions are re-categorized with an increase in depth and breadth.

Paramedic-Level Instructional Guideline

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

I. Acute psychosis

- A. Pathophysiology
 - 1. Related to mental illness
 - 2. Organic psychosis
- B. Signs and symptoms
- C. Prehospital management
 - 1. Non-pharmacologic
 - 2. Pharmacologic

II. Agitated delirium

- A. Pathophysiology
- B. Risk factors
- C. Signs and symptoms
- D. Management

III. 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

Medicine

Cardiovascular

Paramedic Education Standard

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.

Transition Highlights

This section includes increased emphasis on anatomy, physiology and pathophysiology; acute coronary syndrome, 12-lead interpretation and updated information on heart failure.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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. Ventricles
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 heard (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 system blod 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 redognition 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. 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. arial 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/ couplets
 - 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. Preexcitation phenomenon
 - c. Aberration versus ectopy
- 12. ECG changes due to electrolyte imbalances
 - a. Hyperkalemia
 - b. Hypokalemia
- 13. ECG changes in hypothermia

VI. 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

VII. 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-complicance
 - 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

Medicine Toxicology

Paramedic Education Standard

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.

Transition Highlights

This section includes over-the-counter medication toxicology.

Paramedic-Level Instructional Guideline

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

- I. 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. Assessment findings and symptoms for patients with medication overdose
 - F. Management for a patient with medication overdose
 - 1. Airway and ventilation and circulation
 - 2. Pharmacologic
 - 3. Non-pharmacologic

Medicine

Respiratory

Paramedic Education Standard

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.

Transition Highlights

This section includes more in-depth evaluation of a patient with respiratory problems.

Paramedic-Level Instructional Guideline

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

- I. 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

II. 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

Medicine

Hematology

Paramedic Education Standard

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.

Transition Highlights

This section includes new section on blood transfusion reactions.

Paramedic-Level Instructional Guideline

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

I. 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. Homestatic Disorders

II. Blood Transfusion Complications

- A. Hemolytic
- B. Febrile
- C. Allergic
- D. Transfusion-related lung injury
- E. Circulatory overload

F. Bacterial infection

Medicine

Genitourinary/Renal

Paramedic Education Standard

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.

Transition Highlights

This section includes increased level of detail of this organ system and urinary catheter management (not insertion).

Paramedic-Level Instructional Guideline

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

I. 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

Medicine

Non-traumatic Musculoskeletal Disorders

Paramedic Education Standard

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.

Transition Highlights

This section includes new information at this level.

Paramedic-Level Instructional Guideline

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

I. Anatomy and physiology review

1. Bones
2. Muscles
3. Tendons and ligaments
4. Articulating surfaces—joints, bursa, disc, etc

II. 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, Osteoarthritis) 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)

Trauma

Trauma Overview

Paramedic Education Standard

Applies fundamental knowledge to provide basic and selected advanced emergency care and transportation based on assessment findings for an acutely injured patient.

Transition Highlights

The Field Triage Decision Scheme was added to this section.

Paramedic-Level Instructional Guideline

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

I. Identification and Categorization of Trauma Patients

A. Entry-level students need to be familiar with the National Trauma Triage Protocol

1. Centers for Disease Control and Prevention. Guidelines for Field Triage of Injured Patients: Recommendations of the National Expert Panel on Field Triage. MMWR 2008;58 RR-1:1-35.

2. <http://cdc.gov/fieldtriage> contains the National Trauma Triage Protocols and additional instructional materials.

Trauma Bleeding

Paramedic Education Standard

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.

Transition Highlights

This section includes an increased level of detail.

Paramedic-Level Instructional Guideline

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

I. 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 losses – 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)

II. 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

III. 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 agualtion
 - 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

IV. 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
 - iii. abdomen
 - iv. extremities

B. Assessment of Bleeding

C. Management considerations in bleeding

D. Review knowledge from previous levels

Trauma

Chest Trauma

Paramedic Education Standard

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.

Transition Highlights

This section includes an increased level of detail. Programs should evaluate their current trauma program to see how much upgrade they need to reach a comprehensive and complex understanding.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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. Hemoptysis
 - 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 fibrolyns – 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 tensioncollapse 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

Paramedic Education Standard

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.

Transition Highlights

This section includes an increased level of detail. Programs should evaluate their current trauma program to see how much upgrade they need to reach a comprehensive and complex understanding.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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
8. Internal venous bleeding may be more severe because arterial bleeds can occlude the lumen of the artery.

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 hollow organs

- b) review presence of bacteria in hollow 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 injuries 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 solid and hollow organ injuries (cover elsewhere)
 - 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

Paramedic Education Standard

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.

Transition Highlights

This section includes an increased level of detail. Programs should evaluate their current trauma program to see how much upgrade they need to reach a comprehensive and complex understanding.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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 tendon injuries – acute or chronic – deltoid muscle involvement – violent pull on arm, an 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 nerve 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

Head, Facial, Neck, and Spine Trauma

Paramedic Education Standard

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.

Transition Highlights

This section includes an increased level of detail about neck, eye, oral and brain injuries; emphasizes the harm of over ventilation in most situations.

Paramedic-Level Instructional Guideline

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

I. 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 the nasal and lower maxilla from the facial skull and remainder of the cranial bones
- c. Le Fort III (craniofacial disjunction) - Fracture separates the entire midface from the 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
4. Manual in-line intubation
5. Bleeding into the oral cavity; suction
6. Cricothyroidotomy if indicated
7. Soft tissue bleeding

II. Orbital Fractures

A. Pathophysiology

1. Blunt trauma to the eye causes increased pressure to the globe of the eye. The pressure causes the weakest area (orbital floor) to give way, causing herniation of orbital contents (inferior oblique muscle entrapment) into the 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

III. 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

IV. 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 an open skull fracture bleed
3. Fracture lines that cross the middle meningeal 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

V. 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)

VI. 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

VII. 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

VIII. 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

Paramedic Education Standard

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.

Transition Highlights

This section includes more detailed information on brain anatomy; emphasizes the harm of hyperventilation; references the Brain Trauma Foundation; and increased emphasis on neurological assessment.

Paramedic-Level Instructional Guideline

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

I. 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

Trauma

Special Considerations in Trauma

Paramedic Education Standard

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.

Transition Highlights

This section includes new and increased emphasis content.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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 the 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 the age
 - f. Appropriate B/P cuff size
 - g. 80ml/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 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 patten 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

Paramedic Education Standard

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.

Transition Highlights

Same breadth and depth as the AEMT level.

Paramedic-Level Instructional Guideline

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

Trauma

Multi-System Trauma

Paramedic Education Standard

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.

Transition Highlights

This section includes new material and a discussion of kinematics and blast injury. Critical thinking skills are emphasized.

Paramedic-Level Instructional Guideline

The Paramedic Instructional Guidelines in this section include all the topics and material at the 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, some rifles

- iii. high energy -- military weapons
- c. Organs stuck have effect
 - i. head
 - ii. chest
 - iii. abdomen
 - iv. extremities

II. Multi-System Trauma

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 cannot 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 can not be done in the 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 can not 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 AEMTs 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 can not 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 Populations

Obstetrics

Paramedic Education Standard

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.

Transition Highlights

This section includes new information on hyperemesis gravidarum.

Paramedic-Level Instructional Guideline

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

- I. Complications Related to Pregnancy
 - A. Hyperemesis gravidum
 - 1. pathophysiology
 - 2. assessment
 - 3. management

Special Patient Populations

Neonatal Care

Paramedic Education Standard

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.

Transition Highlights

This section includes much more detail throughout.

Paramedic-Level Instructional Guideline

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

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 via graphs based on birth weight and gestational age
- b. Resuscitation is required for about 80% of the 30,000 babies 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 adequate 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 (in addition to assisted ventilation with BVM) 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) heart rate less than 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 four 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 some degree 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. heart rate less than 100 -- BVM ventilation with 100% oxygen and reassess
 - ii. heart rate less than 60 -- begin chest compressions
 - iii. heart rate between 60 and 80 but not responding to assisted 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 weighing greater than 1700 g have a 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 a 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
 - l. 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 as they are usually a sign of an underlying abnormality
 - c. Risk factors -- prolonged and frequent multiple seizures may result in metabolic changes and cardiopulmonary difficulties
2. Anatomy and physiology review
- a. Degree of myelination 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 commonly, flexion of the upper extremities and extension of the 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, petechia
 - f. Term newborns will produce beads of sweat on their brow but not over the rest of their 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 is questionable in the prehospital setting
 - 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, occasionally blood streaked, in the first few hours of life is not uncommon
 - b. Morbidity/ mortality
 - i. vomiting in the first 24 hours of life suggests obstruction in the 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) Jejeunal atresia
 - c. Risk factors
 - i. aspiration of vomitus can cause respiratory insufficiencies or obstruction of the airway
 - 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 the 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 or 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 With Out 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 Populations

Pediatrics

Paramedic Education Standard

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.

Transition Highlights

This section includes much more detail throughout.

Paramedic-Level Instructional Guideline

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

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 an infant in "sniffing position" to open the airway may require a towel or roll under the shoulders
 - d. Examine fontanelle in infants
 - i. Bulging fontanelle in a 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* the vocal cords at the non-distensible cricoid cartilage
7. Tracheal cartilage is softer and more collapsible

8. The epiglottis in infants and toddlers is long, floppy, narrow, and extends at a 45-degree angle into airway
9. Implications for the health care provider
 - a. Suctioning to clear the nares of infants in respiratory distress can not 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 the cords
 - iii. Actually lifting the large, floppy epiglottis with the end of a straight laryngoscope blade will help expose the vocal cords
 - iv. Because in children younger than 10 years, the narrowest part of the airway is *below* the vocal cords, uncuffed tubes are used
 - v. Appropriate endotracheal tube selection is estimated based upon age
 - vi. Securing the endotracheal tube at the appropriate depth is crucial since changes in even one centimeter 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 their diaphragms; their 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 and 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 a significant force generally accompanied by multi-system injury
 - c. The 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 while bag-mask ventilating
 - 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 the 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 periods; in boys it is 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 the body's ability to clot properly
- 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 that hypoxia develops rapidly with apnea or ineffective bagging
 - b. When ventilating a pediatric patient, the bag should have *no less than* 450-500 mL volume
 - c. Err on using a larger bag for ventilating the pediatric patient; regardless of the size of the bag used for ventilation, one should only use enough force to make the chest rise slightly to limit Pneumothorax
 - d. Higher oxygen demand and metabolic rate mean that infants and children generally become symptomatic from inhaled toxic exposures prior to 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. The large cerebral blood flow requirement makes children with head injuries extremely susceptible to hypoxia; hypoxia and hypotension in a child with a head injury can cause ongoing damage as bad as the initial injury itself
 - b. Less cushioning by the subarachnoid space means that head momentum is more likely to result in bruising and damage to the brain
 - c. Though spinal cord injuries are less common in pediatrics, they 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 when present are more commonly ligamentous injuries rather than secondary to broken vertebrae
 - e. Since the weaker neck supports a relatively heavier head and therefore flexes more easily with trauma, cervical spine injuries sustained are usually higher (C1-3)
 - f. When in doubt about the presence of a cervical spine injury, assume the worst and maintain immobilization of the 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 health care 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. Have a very low threshold for checking blood glucose levels, especially in children who are having a seizure or are lethargic on your exam
 - d. Newborns particularly need to be kept warm; hypothermia is a "killer" and can predispose them to spontaneous head bleeds
 - e. However, newborns who are requiring a 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 of this age whose crying is responded to timely by parents have been shown to cry less at 1 year and have decreased aggression at 2
- d. Implications for the health care 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. This is a particularly stressful time for parents adjusting to the eating, sleeping, and crying cycle; sometimes this is complicated by post-partum depression, too, 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 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. Infants do not typically roll until around 3-4 months; a history of an infant less than that 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 their parents and the 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 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. Infants explore objects with their mouths which greatly increases the risk of foreign body aspiration; do not give children exam gloves to play with
 - iii. Separation anxiety is best dealt with by keeping the child and parent together as much as possible during evaluation and involving the parent in the treatment if appropriate; if possible, interact first with the parent to build trust with infant
 - iv. With the increased mobility of crawling and walking comes 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 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. The front teeth come in before the molars, which means that children may bite off large pieces of food and then 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 the child and parent together as much as possible during evaluation and involving the parent in the treatment if appropriate; if possible, interact first with the 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

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. The front teeth come in before the molars, which means that children may bite off large pieces of food and then 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 the child and parent together as much as possible during evaluation and involving the parent in the treatment if appropriate; if possible, interact first with the 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 a child to hold objects of importance to them like a blanket, stuffed animal or doll
- viii. With the head beginning to grow at a slower rate than the body, children begin no longer requiring shoulder rolls limiting flexion of the neck when bag-valve-mask ventilating or intubating
- ix. As 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. The rapid increase in language means they will understand much of what you say if simple terms are used
- iii. Respect the patient's modesty and cover them up after the physical exam
- iv. Foreign body airway obstruction risk continues to be high
- v. Offer choices to the patient if appropriate (i.e., Should I listen to your front first or the 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 privates, they will not understand why it is OK all of a sudden for the health care worker to do that
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 losing baby teeth and getting adult teeth, one 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. Reassure children that everything is going to be all right, if appropriate, and that they are not going to die
 - 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; periods start between 9-16
 - ii. Boys first develop increase in testicle size which typically starts 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 with 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 the lasting effects of their injuries (especially cosmetic) and if appropriate, reassure them that everything is going to be all right
 - vi. Adolescence is the tumultuous effect of hormonal surges, emotions, and peer pressure; these place children at risk for substance abuse, self-endangerment, pregnancy, and dangerous sexual practices

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, preceding symptoms, choking episode, underlying disease, sick contacts, prematurity)
 - b. Physical findings (mental status, respiratory rate, pulse oximetry, capnometry, work of breathing, color, heart rate, degree of aeration, presence of stridor or wheeze)
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 that usually occurs in infants born prematurely and 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 medications bronchodilators (albuterol, ipratropium, racemic epinephrine)
 - v. Oral and intramuscular medications (prednisolone, dexamethasone) Corticosteroids
 - 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 pPressors 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 steal)
 - 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. Hypoglycemia
 - a. Congenital adrenal hyperplasia
 - b. Panhypopituitarism
 - c. 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. Pathophysiology
 - 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 Populations

Geriatrics

Paramedic Education Standard

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.

Transition Highlights

This section includes new content regarding Herpes zoster.

Paramedic-Level Instructional Guideline

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

- I. Specific conditions that occur more frequently in the elderly
 - A. Herpes Zoster- a highly contagious virus that is manifested by a painful rash that affects the ganglion of a nerve and appears along the affected nerve pathway.

Special Patient Populations

Patients With Special Challenges

Paramedic Education Standard

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.

Transition Highlights

This section includes new content on bariatrics.

Paramedic-Level Instructional Guideline

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

I. 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

EMS Operations

Multiple Casualty Incidents

Paramedic Education Standard

Knowledge of operational roles and responsibilities to ensure patient, public, and personnel safety.

Transition Highlights

This section references Center for Disease Control (CDC) Field Triage Division Scheme: The National Trauma Triage Protocol.

Paramedic-Level Instructional Guideline

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 National EMS Education Standards and Instructional Guidelines for each personnel level.

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

EMS Operations

Mass Casualty Incidents Due to Terrorism and Disaster

Paramedic Education Standard

Knowledge of operational roles and responsibilities to ensure patient, public, and personnel safety.

Transition Highlights

This section includes all new content.

Paramedic-Level Instructional Guideline

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 National EMS Education Standards and Instructional Guidelines for each personnel level.

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

EMS Operations Incident Management

Paramedic Education Standard

Knowledge of operational roles and responsibilities to ensure patient, public, and personnel safety.

Transition Highlights

ICS and federal requirements added to this section.

Paramedic-Level Instructional Guideline

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 National EMS Education Standards and Instructional Guidelines for each personnel level.

I. Establish and Work Within the Incident Management System

A. Entry-Level Students Need to Be Certified in

1. ICS-100: Introduction to ICS (<http://training.fema.gov/emiweb/is/is100b.asp>), or equivalent

2. FEMA IS-700: NIMS, An Introduction (<http://training.fema.gov/EMIWeb/is/is700.asp>)

B. This Can Be Done as a Co requisite or Prerequisite or as Part of the Transition Course

EMS Operations

Hazardous Materials Awareness

Paramedic Education Standard

Knowledge of operational roles and responsibilities to ensure patient, public, and personnel safety.

Transition Highlights

This section includes a new requirement.

Paramedic-Level Instructional Guideline

Information related to the clinical management of the patient exposed to hazardous materials is found in the clinical sections of the National EMS Education Standards and Instructional Guidelines for each personnel level.

- I. Risks and Responsibilities of Operating at a Hazardous Material or Other Special Incident
 - A. Entry-Level Students Need to Be Certified in one of the following:
 - 1. Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, 29 CFR 1910.120 (q)(6)(i) -First Responder Awareness Level*
 - 2. Other courses may qualify to meet this requirement. Contact the Idaho EMS Bureau for more details.
 - B. This Can Be Done as a Co requisite or Prerequisite or as Part of the Transition Course

*There are a number of sources for this training. Michigan State University is offering this training program at no cost to agencies in the public sector for a limited time. Visit http://www.saferesponse.com/sub_page/hazmat_main.htm for more details.

EMS Operations

Extrication Awareness

Paramedic Education Standard

Knowledge of operational roles and responsibilities to ensure patient, public, and personnel safety.

Transition Highlights

This section includes a new requirement.

Paramedic-Level Instructional Guideline

The intent of this section is to provide an overview of vehicle extrication to ensure EMS personnel and patient safety during extrication and so those who respond to motor vehicle accidents will be able to function safely as part of a “Rescue Team” as directed by the Incident Commander. 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 EMS Education Standards and Instructional Guidelines for each personnel level.

I. Establish and Work Within State Extrication Awareness Training

A. Entry-Level Students Need to Complete

1. Idaho Extrication Awareness training course (details available at www.idahoems.org)
2. Idaho Emergency Services Training (EST) - Extrication Operations Course

B. This Can Be Done as a Co requisite or Prerequisite or as Part of the Transition Course

II. Extrication Awareness Training Must Include the Following:

A. Introduction

B. What is Extrication

C. Scene Size-up

1. Scene Security
2. Incident Management System (IMS)
3. Collision Forces
4. Fire Protection
5. Resource Identification/Activation
6. Special Situations

D. Vehicle Systems

E. Vehicle Stabilization and Gaining Access

F. Patient(s) Care

Psychomotor Skills

Paramedic Education Standard

Safely and effectively perform all psychomotor skills within the National EMS Scope of Practice Model AND state Scope of Practice at this level.

Transition Highlights

This section highlights psychomotor skills removed from the Scope of Practice and includes new content for skills added to the Scope.

Paramedic-Level Instructional Guideline

The intent of this section is to provide an overview of skills or intervention changes between the Idaho License levels based on the old Idaho Standard Curriculum (ISC) and the new license levels based on the 2011 Idaho EMS Curriculum (IEC).

For more information on Idaho Scope of Practice changes, visit the Idaho EMS Physician Commission website at www.emspc.dhw.idaho.gov for the Draft 2012-1 EMSPC Future Scope of Practice grid which highlights changes between the old scope and new 2012 EMSPC Scope.

- I. Skills or interventions added
 - A. Airway / Ventilation / Oxygenation
 - 1. BiPAP
 - 2. CPAP
 - 3. PEEP
 - B. Vascular Access / Fluids
 - 1. IV Fluid infusion – Maintenance of Medicated Fluids
 - C. Technique of Medication Administration
 - 1. Inhaled – patient administered (nitrous oxide)
 - 2. IV Piggyback
 - D. Miscellaneous
 - 1. Blood Chemistry Analysis
 - E. Pharmacological interventions
 - 1. Maintenance of Blood Administration
- II. Skills or interventions removed
 - A. Cricothyrotomy – Surgical (remains as Critical Care Optional Module)
 - B. Pacing – Permanent/ICD (remains as Critical Care Optional Module)
 - C. Central Line – Placement (remains as Critical Care Optional Module)
 - D. Umbilical – Initiation (remains as Critical Care Optional Module)
 - E. Venous Blood Sampling – Obtaining (remains as Critical Care Optional Module)