MedEdPrep

Study Guide

EMT & AEMT
Exam Preparation

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Section 1 — How to Use This Study Guide

Scope of Practice

Callouts showing what EMTs vs AEMTs can do at each certification level

Emergency Mindset

Critical thinking pearls that separate good providers from great ones

Application Checks

Realistic scenarios at the end of each section—answers in Appendix A

Cross-References

Links to related sections help you see the big picture

Recommended Study Path

1. Read section content carefully
2. Answer the end-of-section quiz question
3. Check your answer in Appendix A
4. Review weak areas and proceed to next section

1.1 Study Tips for Success

Study Strategy

- Schedule 15–20 minute daily review sessions
- Focus on weak areas first when you're freshest
- Know your scope; EMTs should preview AEMT concepts

Active Learning

- Test yourself; cover answers before checking
- Understand WHY, not just the correct answer
- Connect concepts across sections

1.2 What This Guide Really Is

This guide has been in the hands of EMS students for years. Long before MedEdPrep existed, it helped hundreds pass the NREMT. What you're holding now is the revised version—streamlined, sharpened, and built with one goal: to give you what most of us never had when we were starting out.

Here's how to see it:

It is a roadmap. It condenses the bulk of the textbook into clear, focused sections. Each page is designed to highlight what matters most and to give you realistic ways to apply it.

It isn't a shortcut. Reading alone won't get you there. Mastery comes from testing yourself, finding your weak spots, and working through them.

Why is this free? Because we remember what it was like to grind through EMS classes with limited tools. We want you to have better.

Your next step is simple:
Read, test yourself, and when you hit something that doesn't click—don't get stuck. Jump into our Discord and ask. That's where the conversation happens, and where you'll find the support that can carry you through.

When you see the value in these pages, bring it full circle on the MedEdPrep website. That's where the quizzes, analytics, and simulations show you exactly how you'll perform when it matters.

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MedEdPrep Comprehensive Study Guide

Additional Resources

MedEdPrep.com | Comprehensive EMS Study Guide

Section 2 — EMS Systems

2.1 Understanding Your Authority

2.1.1 Scope of Practice

- Defines the core skills that each EMS provider level is authorized to perform.

EMT Capabilities:

- Insert Oral and Nasopharyngeal Airways (OPAs/NPAs).
- Monitor and record vital signs.
- Assist patients with their own prescribed medications.
- Provide spinal immobilization and perform CPR.

AEMT Capabilities:

- Perform supraglottic airway insertion.
- Initiate IV and IO access.
- Administer medications via nebulized, subcutaneous (SQ), intramuscular (IM), sublingual (SL), intranasal (IN), IV/IO push routes.
- Execute all EMT-level skills.

Scope of Practice: Stop & Compare

EMT: Basic airway management (OPA/NPA), vital signs, assist with patient medications.

AEMT: Advanced airway insertion, IV/IO access, medication administration via multiple routes.

Paramedic: Intubation, surgical procedures, comprehensive medication protocols, advanced cardiac interventions.

2.2 How the System Supports You

2.2.1 Emergency Medical Dispatch (EMD)

- Advanced 911 systems enhance response by providing dispatcher access to caller location and callback numbers, especially for cellular calls.

2.2.2 Medical Direction

Medical Director: Authorizes EMS providers to deliver field care.

Medical Control:

- **Off-line (Indirect):** Includes protocols, standing orders, and training.
- **On-line (Direct):** Real-time communication via radio or phone with a physician.

2.3 Ensuring Quality Care

2.3.1 Continuous Quality Improvement (CQI)

- An ongoing process focused on quality assurance (QA) and enhancing care through routine performance evaluation.

2.3.2 Prevention in EMS

Primary Prevention

- Proactive strategies aimed at preventing events before they occur.
- **Examples:** Vaccinations to prevent disease spread.

Secondary Prevention

- Mitigation strategies to reduce severity after an event occurs.
- **Examples:** Helmets and guardrails, which reduce injury impact rather than prevent the event itself.

Application Check: EMS Systems

Scenario: A 52-year-old patient is found unconscious with agonal respirations. Their spouse says "Don't resuscitate him - he wouldn't want this!" but has no documentation. Following established EMS protocols, what determines your course of action?

- A) Withhold care based on family's verbal wishes
- B) Apply implied consent and begin treatment
- C) Contact medical control for permission to treat
- D) Wait for legal documentation before proceeding

See Appendix A for answers and explanations.

Section 3 — Safety and Wellness

3.1 Understanding Disease Threats

3.1.1 Infectious Disease

- A medical condition caused by the growth and spread of harmful organisms in the body.

3.1.2 Communicable Disease

- A disease that can spread from one person or species to another.
- Not all infectious diseases are communicable, but all communicable diseases are infectious.

3.1.3 Pathogen

- A microorganism capable of causing disease in a host.
- **Host:** The person infected by the pathogen.

3.2 How Disease Spreads

3.2.1 Transmission Methods

- **Direct Contact:** Disease spread through direct physical contact.
    - Example: Contacting an open wound without gloves, leading to exposure to bloodborne pathogens like hepatitis.
- **Indirect Contact:** Spread of infection via an inanimate object.
- **Airborne Transmission:** Spread through droplets or dust in the air.
    - Examples: Coughing or sneezing.
- **Foodborne Transmission:** Disease spread via contaminated food or water.
- **Vector-borne Transmission:** Spread through animals or insects that carry pathogens.
    - Examples: Rabies (via bites) and Lyme disease (via ticks).

3.3 Protecting Yourself and Others

3.3.1 Standard Precautions

Measures to prevent contact with patients' germs, including:

- Wearing gloves, masks, and eye protection as needed.
- Washing hands thoroughly after patient contact or using hand sanitizer if washing isn't possible.
- For tuberculosis (TB), place a surgical mask on the patient and wear an N95/HEPA respirator yourself.

3.3.2 Exposure Protocol

- If exposed to infectious material, report immediately to the designated safety officer.
- Ensure immediate decontamination by washing hands or using hand sanitizer.

3.3.3 Sharps Safety

- Dispose of all sharps immediately after use in designated sharps containers to prevent needlestick injuries.

3.3.4 Personal Protective Equipment (PPE)

- Use PPE, such as gloves, masks, eye protection, and gowns, based on the nature of patient interaction and potential exposure risks.

3.3.5 Jump Bag

- Contains essential supplies for initial care in the first 5 minutes of a call, ensuring readiness to handle critical tasks quickly.

Scope of Practice: PPE & Safety

EMT: Basic PPE selection, standard precautions, scene safety assessment.

AEMT: All EMT responsibilities plus exposure protocol coordination.

All Levels: Mandatory reporting of exposures and following decontamination protocols.

Emergency Mindset: Your Safety First

- No patient is worth your life—assess scene safety before entering.
- PPE is non-negotiable—assume every patient has infectious disease.
- When in doubt about safety, call for additional resources.

Application Check: Safety and Wellness

Scenario: Responding to a patient with productive cough and fever in a homeless shelter. The patient states they have been coughing for 3 weeks with night sweats. Other residents report similar symptoms. What BSI precautions are essential?

- A) Standard mask and gloves only
- B) Full hazmat suit due to multiple sick patients
- C) N95 respirator and standard precautions
- D) Standard gloves and surgical mask only

See Appendix A for answers and explanations.

Section 4 — CPR

4.1 When and Why CPR

4.1.1 Purpose of CPR

- To maintain circulation and oxygenation during cardiac arrest until advanced care is available.
- When checking for a pulse, do so for at least 5 seconds but no longer than 10.

4.2 High-Quality CPR Technique

4.2.1 Key Components of High-Quality CPR

Compression Depth and Rate:

- **Adults:** Compress at least 2 inches (5 cm) deep at a rate of 100-120 compressions per minute.
- **Pediatrics:** Compress about 2 inches or approximately ⅓ the diameter of the chest.
- Ensure full chest recoil between compressions.

Hand Placement:

- Place hands on the lower half of the sternum.

Minimizing Interruptions:

- Limit pauses between compressions to less than 10 seconds.

4.2.2 Airway Management

- Use the head-tilt, chin-lift maneuver to open the airway for non-trauma patients.
- For suspected spinal injuries, use the jaw-thrust maneuver without head extension.
- Insert oral or nasopharyngeal airways (OPAs/NPAs) as needed to maintain an open airway.

4.2.3 Rescue Breaths

- Provide rescue breaths at a rate of one breath every 5-6 seconds (10-12 breaths per minute).
- Each breath should last about 1 second, causing visible chest rise.
- → **See Section 7** (Airway Management) and Section 8 (Ventilation) for detailed airway techniques.

4.2.4 Compression-to-Ventilation Ratio

- **Single Rescuer:** 30:2 for all age groups.
- **Two-Rescuer for Pediatrics:** 15:2 to provide more frequent ventilation.

4.2.5 Defibrillation

- Apply an automated external defibrillator (AED) as soon as it is available.
- Follow AED prompts for analysis and shock delivery while minimizing interruptions to chest compressions.

4.2.6 Team Approach

- Clear communication and role assignments improve efficiency and effectiveness.
- Rotate compressors every 2 minutes or sooner if fatigued to maintain quality.

> **CPR is the first skill we all learn in EMS for a reason.** It's the foundation everything else is built on—and it's one of the few times you see your effort bring someone back. Keep this one sharp.
>
> (Need more? Ask in the Discord—lots of people still swap compression tips there.)

4.3 Special Situations

4.3.1 Special Considerations

- For drowning victims, provide 2 initial rescue breaths before starting chest compressions.
    - Dry the patient off as best you can before application of the AED pads
- Use pediatric pads for children if available; if not, adult pads can be used but placed so they do not overlap.

4.3.2 Post-Resuscitation Care

- Ensure continuous monitoring, oxygen delivery, and transport to an appropriate medical facility for advanced post-resuscitation support.

Scope of Practice: CPR & Airway

EMT: Basic CPR, OPA/NPA insertion, BVM ventilation, AED operation.

AEMT: All EMT skills plus supraglottic airway insertion, IV/IO access during resuscitation.

Paramedic: Advanced airway management, intubation, medication administration during cardiac arrest.

Emergency Mindset: When Seconds Count

- Perfect technique matters less than rapid, continuous compressions.
- Don't delay—intervene immediately when cardiac arrest is suspected.
- Switch to high-quality compressions if patient becomes unresponsive.
- **Time Critical:** Brain death begins after 4-6 minutes without oxygen—every second counts.

Application Check: CPR

Scenario: During resuscitation of a cardiac arrest patient, you have performed 8 compressions when the AED begins analyzing. What is your correct action regarding chest compressions?

- A) Allow AED to complete analysis before resuming compressions
- B) Override the AED and continue compressions
- C) Resume compressions after AED completes its analysis
- D) Provide ventilations while the AED analyzes

See Appendix A for answers and explanations.

Section 5 — Choking Management for Adults and Pediatrics

5.1 Adults

- Confirm the person is choking and unable to cough, speak, or breathe.
- Perform abdominal thrusts (Heimlich maneuver):
  - Stand behind the person and wrap your arms around their waist.
  - Make a fist with one hand and place it just above the navel.
  - Grasp the fist with your other hand and deliver quick, upward thrusts until the object is expelled or the person becomes unresponsive.
- If the person becomes unresponsive, gently lower them to the ground, call for help, and begin CPR, starting with chest compressions. Check the mouth for any visible obstructions between compressions.

5.2 Pediatrics (Children and Infants)

5.2.1 Children (over 1 year)

- Use the same abdominal thrusts as adults.

5.2.2 Infants (under 1 year)

- Confirm the infant is choking and unable to cry or breathe.
- Place the infant face down on your forearm, supporting the head and neck.
- Deliver 5 firm back slaps between the shoulder blades using the heel of your hand.
- Turn the infant face up and provide 5 chest thrusts (two fingers on the center of the chest, about 1.5 inches deep).
- Repeat this cycle until the object is expelled or the infant becomes unresponsive.

5.2.3 Unresponsive Infants

- If the infant becomes unresponsive, start CPR and check the airway for visible obstructions between compressions.

Scope of Practice: Airway Obstruction

EMT: Back slaps and chest thrusts for infants, abdominal thrusts for adults/children.

AEMT: All EMT techniques plus advanced airway assessment.

All Levels: Direct visualization and removal of visible obstructions only—never blind finger sweeps.

Emergency Mindset: Airway Emergencies

- Choking kills faster than cardiac arrest—act immediately.
- If conscious choking becomes unconscious, switch to CPR immediately.
- Check for visible obstructions between compressions, but never blind sweep.

Application Check: Choking Management for Adults and Pediatrics

Scenario: A conscious choking infant suddenly becomes unresponsive. You can see a piece of food in their mouth. What is the correct sequence of actions?

- A) Continue back slaps and chest thrusts
- B) Perform a blind finger sweep
- C) Remove the visible object and start CPR
- D) Attempt rescue breathing first

See Appendix A for answers and explanations.

Section 6 — Med-Legal

6.1 Your Legal Responsibilities

6.1.1 Standard of Care

- The level at which an EMT/AEMT is legally and ethically required to perform to ensure patient safety and effective care.

6.1.2 Protocols and Standing Orders

- Define what actions are permitted in the field, as established by the medical director.
- **Certification:** The process in which an individual, institution, or program is evaluated and recognized as meeting specific safety and ethical standards.
- **Licensure:** The formal authorization granted by a competent authority, usually the state, to practice a job, trade, or profession.

6.1.3 Duty to Act

- A legal obligation to provide care while on duty. Bystanders generally have no obligation to assist strangers in distress.

Emergency Mindset: Legal Decision Points

- When on duty, your legal obligation to act begins immediately upon patient contact.
- Document everything—your actions AND the rationale behind your decisions.
- NEVER exceed your scope of practice—contact medical control if uncertain about interventions.

6.1.4 Assault

- The act of threatening someone, creating fear of imminent harm.

6.1.5 Battery

- Physical contact with another person without consent.

6.2 Negligence

6.2.1 Negligence

- Failure to provide the expected standard of care that a reasonable person with similar training would provide.

6.2.2 Gross Negligence

- Reckless disregard for duty or standard of care, indicating willful misconduct.

6.2.3 Misfeasance

- Performing a legal act in an improper or negligent manner.
- **Example:** Starting an IV but using improper technique, causing injury.

Clinical Pearl: Scope & Misfeasance

Misfeasance isn't just about poor technique—it's about doing something you're allowed to do, but doing it wrong. Focus on proper protocols within your scope.

6.2.4 Malfeasance

- Performing an act that is unlawful or exceeds your scope of practice.
- **Example:** An EMT performing endotracheal intubation (beyond EMT scope).

Clinical Pearl: Scope & Malfeasance

EMT doing AEMT skills: Even if performed perfectly, it's malfeasance (exceeding scope).

AEMT doing Paramedic skills: Needle decompression by an AEMT is malfeasance, regardless of technique.

Key Point: Good outcomes don't excuse scope violations.

6.2.5 Nonfeasance

- Failing to perform an act that you have a legal duty to perform.
- **Example:** Not providing CPR to an unresponsive patient when it's indicated.

Clinical Pearl: Scope & Nonfeasance

EMT: Failing to provide basic airway management when indicated.

AEMT: Not establishing IV access on a critical patient when within protocols.

Key Point: You're legally required to perform skills within your scope when indicated.

6.3 Patient Rights and Consent

6.3.1 Expressed Consent

- Voluntary permission given by a patient, indicated by verbal agreement or gestures (e.g., holding out an arm for a blood pressure check).

6.3.2 Informed Consent

- Occurs when the patient is made aware of the treatment and its potential risks and benefits.

6.3.3 Implied Consent

- Assumed when a patient is unconscious, delusional, or has an altered mental status due to drugs, alcohol, or other conditions. Used in true emergency situations where immediate care is necessary.

6.3.4 Ethics

- The philosophy dealing with what is right and wrong.

6.3.5 Morality

- A personal or societal code of conduct that shapes character and behavior.

6.4 End-of-Life Decisions

6.4.1 Do Not Resuscitate (DNR) Orders

Must clearly state the medical conditions and include:

- Signature of the patient or their legal guardian.
- Signature of one or more physicians.
- Expiration dates, if applicable.
- Without a valid DNR, resuscitation should be initiated.

6.4.2 Presumptive Signs of Death

- Initial indicators that suggest death but are not conclusive for withholding care (e.g., absence of pulse, unresponsive pupils).
- Care should be initiated unless definitive signs are present.

6.4.3 Definitive Signs of Death

Indicators that clearly confirm death:

- Dismemberment at the waist or neck.
- **Dependent Lividity:** Pooling of blood in the lower parts of the body.
- **Rigor Mortis:** Stiffening of body muscles after death.
- **Putrefaction:** Decomposition of body tissues.

Application Check: Med-Legal

Scenario: An intoxicated patient threatens violence if you touch them but clearly needs medical attention for a head wound. They are alert and oriented. What is your most appropriate initial action?

- A) Apply implied consent and restrain for treatment
- B) Request law enforcement assistance to secure the scene
- C) Document refusal and immediately leave the scene
- D) Attempt to convince patient to accept care

See Appendix A for answers and explanations.

Section 7 — Communication

7.1 Communication Equipment and Systems

7.1.1 Base Stations

- Fixed radio hardware containing a transmitter and receiver used for EMS communications.

7.1.2 Channel

- An assigned radio frequency for transmitting and receiving communication.

7.1.3 Dedicated Line (Hotline)

- A continuous open connection used for direct point-to-point communication, often for critical or secure communications.

7.1.4 VHF (Very High Frequency) Radios

- Operate between 30 and 300 MHz. They are effective for long-distance communication, particularly in rural areas but may be obstructed by buildings and terrain.

7.1.5 UHF (Ultra High Frequency) Radios

- Operate between 300 and 3,000 MHz. Better suited for urban environments as they penetrate structures more effectively.

7.1.6 Repeater Systems

- Devices that receive radio signals on one frequency and retransmit them on another. Used to extend communication range, especially in areas with difficult terrain or limited direct radio reach.

7.1.7 Telemetry

- The process of sending and receiving data wirelessly, including vital signs, to remote locations, such as hospitals or dispatch centers, for medical decision-making.

7.2 Communicating Effectively

7.2.1 Key Points for Effective Communication

- **Clear and Concise Language:** Always use plain, simple language to avoid misunderstandings.
- **Standard Communication Protocols:** Follow protocols for radio communication, including stating key information first (e.g., patient condition, location).
- **Avoid Radio Jargon:** Use approved language that all parties can understand.

7.2.2 Tips for Improved Communication

- **Identify Yourself and the Patient:** When transmitting patient data, ensure proper identification to maintain continuity of care.
- **Ensure Confidentiality:** Be cautious of patient privacy when discussing sensitive information over unsecured channels.
- **Active Listening:** Confirm receipt of information by repeating key points back to the sender.

Scope of Practice: Communication Responsibilities

EMT: Basic patient reports, receiving medical direction, documenting care provided.

AEMT: All EMT responsibilities plus advanced medication requests, complex procedure authorization.

All Levels: HIPAA compliance, professional language, accurate documentation.

Emergency Mindset: Communication Under Pressure

- Critical information first—condition, location, resources needed.
- When receiving orders, repeat back exactly what you heard.
- If you don't understand an order, ask for clarification immediately.

Application Check: Communication

Scenario: Family asks you "Is my mother going to die?" as you load their unconscious mother into the ambulance after cardiac arrest with ROSC. What response maintains professional communication while being honest?

- A) "I cannot discuss patient information"
- B) "She'll be fine, don't worry"
- C) "Your mother is receiving excellent care at the hospital"
- D) "The situation is very serious"

See Appendix A for answers and explanations.

Section 8 — Airway Management

8.1 Basic Airway Anatomy

8.1.1 Upper Airway

- **Nose and Mouth:** Entry points for air into the respiratory system.
- **Pharynx:** Throat area that serves as a pathway for air and food.
- **Larynx:** Voice box containing the vocal cords and epiglottis.
- **Epiglottis:** Flap that prevents food from entering the trachea during swallowing.

8.1.2 Lower Airway

- **Trachea:** Main airway that divides into the bronchi.
- **Bronchi:** Large airways that branch into smaller bronchioles.
- **Alveoli:** Tiny air sacs where gas exchange occurs.

8.2 Opening the Airway

8.2.1 Head-Tilt, Chin-Lift Maneuver

- Used for non-trauma patients to open the airway.
- Place one hand on the forehead and lift the chin with the other hand.

8.2.2 Jaw-Thrust Maneuver

- Used when spinal injury is suspected.
- Lift the jaw forward without tilting the head or extending the neck.

8.3 Airway Adjuncts

8.3.1 Oral Airway (OPA)

- Used in unconscious patients without a gag reflex.
- Insert upside down, then rotate 180 degrees once past the teeth.
- Measure from the corner of the mouth to the earlobe.

8.3.2 Nasal Airway (NPA)

- Can be used in conscious patients with an intact gag reflex.
- Lubricate before insertion into the nostril.
- Measure from the tip of the nose to the earlobe.

Scope of Practice: Airway Management

EMT: Basic airway positioning, OPA/NPA insertion, suction, BVM ventilation.

AEMT: All EMT skills plus supraglottic airway insertion (King LT, LMA).

Paramedic: Advanced airway management, endotracheal intubation, surgical airway procedures.

Critical Boundary: EMT attempting King LT insertion = malfeasance, even if patient improves. AEMT attempting intubation = scope violation regardless of experience.

Emergency Mindset: Airway Priority

- Airway comes first—no airway means no patient survival.
- If basic maneuvers don't work, move to adjuncts immediately.
- Never force an airway device—if it doesn't fit, try the next size.

Application Check: Airway Management

Scenario: You attempt ventilation on an unconscious patient but meet resistance and see no chest rise. Your next immediate action should be:

- A) Insert an oropharyngeal airway
- B) Reposition the head and attempt ventilation again
- C) Begin chest compressions for presumed cardiac arrest
- D) Perform abdominal thrusts

See Appendix A for answers and explanations.

Section 9 — Ventilation and Oxygenation

9.1 Normal Breathing

9.1.1 Respiratory Physiology

- **Normal respiratory rate:**
  - Adults: 12-20 breaths per minute
  - Children: 15-30 breaths per minute
  - Infants: 25-50 breaths per minute
- **Tidal Volume:** Amount of air inhaled/exhaled in one breath (~500mL in adults).

9.2 Signs of Respiratory Distress

9.2.1 Assessment Findings

- **Increased respiratory rate** (tachypnea)
- **Decreased respiratory rate** (bradypnea)
- **Irregular breathing patterns**
- **Use of accessory muscles**
- **Cyanosis** (blue discoloration around lips and fingers)
- **Altered mental status**

9.3 Oxygen Delivery Systems

9.3.1 Nasal Cannula

- Delivers 24-44% oxygen at 1-6 L/min flow rate.
- Best for patients with mild respiratory distress who can tolerate nasal breathing.

9.3.2 Non-Rebreather Mask

- Delivers up to 90% oxygen at 10-15 L/min flow rate.
- Reservoir bag must remain inflated during use.
- Best for patients needing high-concentration oxygen.

9.3.3 Bag-Valve-Mask (BVM) Ventilation

- Provides positive pressure ventilation for patients who cannot breathe adequately.
- Requires proper mask seal and appropriate ventilation rate.
- Two-person BVM technique often provides better results than one-person.

Scope of Practice: Ventilation Support

EMT: Oxygen administration, BVM ventilation, basic suction techniques.

AEMT: All EMT skills plus CPAP administration for specific conditions.

All Levels: Must maintain proper oxygen flow rates and monitor patient response.

Example: EMT cannot initiate CPAP therapy—must be AEMT or higher, even if EMT knows how to operate the equipment.

Emergency Mindset: Breathing Assessment

- Look, listen, feel—use all your senses to assess breathing.
- If they can't speak in full sentences, they need oxygen.
- When in doubt, give high-flow oxygen—you can always reduce it later.

Application Check: Ventilation and Oxygenation

Scenario: An unresponsive overdose patient has a respiratory rate of 6 with poor tidal volume, SpO2 82%, and cyanosis. What is your immediate priority?

- A) High-flow oxygen by non-rebreather mask
- B) Assist ventilations with bag-valve mask
- C) Insert a nasal airway
- D) Position patient in recovery position

See Appendix A for answers and explanations.

This guide introduces patterns. We track which ones you master. **MedEdPrep.com**

Section 10 — Circulation and Shock

10.1 Circulatory System Basics

10.1.1 Components

- **Heart:** Muscular pump that circulates blood throughout the body.
- **Blood Vessels:** Arteries, veins, and capillaries that transport blood.
- **Blood:** Carries oxygen, nutrients, and waste products.

10.1.2 Normal Vital Signs

- **Blood Pressure:**
  - Adults: Systolic 90-140 mmHg, Diastolic 60-90 mmHg
  - Children: Lower ranges based on age
- **Pulse Rate:**
  - Adults: 60-100 beats per minute
  - Children: 70-120 beats per minute
  - Infants: 100-160 beats per minute

10.2 Types of Shock

10.2.1 Hypovolemic Shock

- Caused by loss of blood or fluid volume.
- **Examples:** Bleeding, dehydration, burns.

10.2.2 Cardiogenic Shock

- Heart cannot pump effectively.
- **Examples:** Heart attack, heart failure.

10.2.3 Distributive Shock

- Blood vessels dilate, causing relative volume loss.

- **Types:** Septic shock, anaphylactic shock, neurogenic shock.

10.2.4 Obstructive Shock

- Physical obstruction prevents effective circulation.
- **Examples:** Tension pneumothorax, cardiac tamponade, massive pulmonary embolism.

10.3 Signs and Symptoms of Shock

10.3.1 Early Signs

- Increased heart rate (tachycardia)
- Restlessness and anxiety
- Pale, cool, clammy skin
- Increased respiratory rate

10.3.2 Late Signs

- Decreased blood pressure (hypotension)
- Altered mental status
- Weak or absent peripheral pulses
- Decreased urine output

10.4 Treatment of Shock

10.4.1 General Principles

- Control external bleeding (→ **see Section 10** for bleeding control techniques)
- Maintain airway and provide high-flow oxygen (→ **see Section 7**-8 for airway/ventilation)
- Position patient appropriately (usually supine)
- Keep patient warm
- Transport rapidly to appropriate facility

Scope of Practice: Shock Management

EMT: Basic shock positioning, oxygen administration, bleeding control, rapid transport.

AEMT: All EMT skills plus IV fluid administration for hypovolemic shock.

Paramedic: Advanced interventions including vasopressors and cardiac monitoring.

Emergency Mindset: Recognizing Shock

- Don't wait for hypotension—treat shock before blood pressure drops.
- Tachycardia + altered mental status = assume shock until proven otherwise.
- **Compensation Period:** Body can compensate for 15-20% blood loss—by the time BP drops, patient is critically unstable.
- **Load-and-Go:** On-scene time <10 minutes for trauma patients in shock.

Application Check: Circulation and Shock

Scenario: A trauma patient from an MVC presents with cool, pale skin, rapid weak pulse at 120, BP 90/60, and confusion. No obvious external bleeding is noted. What type of shock is most likely?

- A) Neurogenic shock from spinal injury
- B) Hypovolemic shock from internal bleeding
- C) Cardiogenic shock from cardiac contusion
- D) Psychogenic shock from the traumatic event

See Appendix A for answers and explanations.

Section 11 — Bleeding Control

11.1 Types of Bleeding

11.1.1 External Bleeding

- **Arterial:** Bright red, spurting blood that corresponds with pulse
- **Venous:** Dark red, steady flow of blood
- **Capillary:** Slow oozing of blood

11.1.2 Internal Bleeding

- Bleeding within body cavities not visible externally
- **Signs:** Abdominal tenderness, rigid abdomen, signs of shock

11.2 Bleeding Control Methods

11.2.1 Direct Pressure

- First and most effective method for most external bleeding
- Apply firm, constant pressure directly over the wound
- Maintain pressure even if blood soaks through—add more bandages on top

11.2.2 Pressure Points

- Used when direct pressure alone is not effective
- Apply pressure to major arteries between the wound and the heart
- **Common sites:** Brachial artery (arm), femoral artery (leg)

11.2.3 Tourniquets

- Used for severe extremity bleeding when other methods fail
- Apply 2-3 inches above the wound, never over a joint
- Tighten until bleeding stops, note application time

- Do not remove once applied—leave for hospital staff

11.2.4 Hemostatic Agents

- Chemical agents that promote blood clotting
- Applied directly to wound with direct pressure
- Useful for areas where tourniquets cannot be applied

11.3 Special Bleeding Situations

11.3.1 Nosebleeds (Epistaxis)

- Have patient sit upright and lean forward
- Pinch nostrils together for 15 minutes
- Apply ice to bridge of nose

11.3.2 Internal Bleeding

- Focus on treating signs of shock
- High-flow oxygen
- Rapid transport to trauma center
- Monitor vital signs frequently
- → **See Section 9** (Circulation and Shock) for complete shock management protocols.

Scope of Practice: Bleeding Control

EMT: Direct pressure, pressure points, tourniquets, hemostatic agents, bandaging.

AEMT: All EMT skills plus IV fluid replacement for volume loss.

All Levels: Proper PPE use, scene safety awareness around blood exposure.

Emergency Mindset: Stop the Bleeding

- Control bleeding before it controls the patient—early aggressive intervention saves lives.
- Don't peek under direct pressure dressings—you'll disturb clot formation.
- **30-Second Rule:** If direct pressure isn't working within 30 seconds, move to the next intervention.
- **Golden Hour:** Severe trauma patients have ~1 hour for definitive care—don't waste time on scene.

Application Check: Bleeding Control

Scenario: Bright red blood is spurting from a deep forearm laceration. Direct pressure fails to control the severe arterial bleeding. According to current hemorrhage control protocols, what is your next intervention?

- A) Add more dressings and increase pressure force
- B) Apply pressure to the brachial artery pressure point
- C) Apply a tourniquet proximal to the injury
- D) Pack the wound with hemostatic gauze

See Appendix A for answers and explanations.

Section 12 — Trauma Assessment

12.1 Mechanism of Injury (MOI)

12.1.1 High-Energy Trauma

- **Motor vehicle accidents** at high speed
- **Falls** from significant height (>20 feet for adults, >10 feet for children)
- **Penetrating trauma** (gunshots, stabbings)
- **Explosions** and blast injuries

12.1.2 Significant Mechanisms

- Ejection from vehicle
- Death of another occupant in same vehicle
- Vehicle rollover
- Motorcycle accident at any speed
- Pedestrian struck by vehicle

12.2 Primary Assessment

12.2.1 ABCDE Approach

- **A - Airway:** Assess and maintain with spinal immobilization
- **B - Breathing:** Assess rate, depth, symmetry
- **C - Circulation:** Check pulse, skin signs, control major bleeding
- **D - Disability:** Assess neurological function, spinal injury
- **E - Exposure:** Remove clothing to assess for injuries, prevent hypothermia

12.3 Secondary Assessment

12.3.1 Head-to-Toe Examination

- **Head and Neck:** Check for deformities, bleeding, neurological deficits
- **Chest:** Assess for equal breath sounds, chest wall movement
- **Abdomen:** Palpate for tenderness, rigidity, distention
- **Pelvis:** Check for stability (compress once gently)
- **Extremities:** Assess for deformities, pulse, motor, sensation

12.4 Spinal Immobilization

12.4.1 Indications

- Significant mechanism of injury
- Altered mental status
- Spinal pain or tenderness
- Neurological deficits
- Anatomical deformity of spine

12.4.2 Technique

- Maintain manual in-line stabilization
- Apply appropriate immobilization device
- Secure patient completely before transport
- Reassess neurological function after immobilization

Scope of Practice: Trauma Assessment

EMT: Primary and secondary assessment, spinal immobilization, wound care.

AEMT: All EMT skills plus advanced pain management and IV therapy.

All Levels: Recognition of trauma patterns and need for rapid transport.

Emergency Mindset: Trauma Priority

- Life threats first—don't get distracted by obvious but non-critical injuries.
- Mechanism of injury guides your suspicion—assume the worst until proven otherwise.
- **Platinum 10:** Scene time <10 minutes for critical trauma—advanced care happens at hospital.
- **Primary Survey:** Complete ABCDE in <2 minutes, then move to transport decision.

Application Check: Trauma Assessment

Scenario: Your patient was ejected during a rollover MVC. They are conscious, complaining only of minor shoulder pain. Vital signs are stable. What assessment approach is required?

- A) Focused assessment of the shoulder
- B) Defer assessment until hospital arrival
- C) Rapid trauma assessment
- D) Detailed physical exam

See Appendix A for answers and explanations.

Section 13 — Medical Emergencies

13.1 Altered Mental Status

13.1.1 Common Causes

- **Hypoglycemia:** Low blood sugar
- **Hypoxia:** Low oxygen levels
- **Stroke:** Brain injury from blocked or ruptured blood vessel
- **Seizure:** Abnormal electrical activity in brain
- **Intoxication:** Alcohol or drug use
- **Head injury:** Traumatic brain injury

13.1.2 Assessment

- Use AVPU scale (Alert, Voice, Pain, Unresponsive)
- Check blood glucose if protocols allow
- Assess for stroke signs using FAST exam
- Look for medical alert jewelry or medications

13.2 Cardiac Emergencies

13.2.1 Chest Pain Assessment

- **OPQRST Method:**
  - **O** - Onset (when did it start?)
  - **P** - Provocation (what makes it worse/better?)
  - **Q** - Quality (describe the pain)
  - **R** - Radiation (does it spread?)
  - **S** - Severity (rate 1-10)
  - **T** - Time (how long has it lasted?)

13.2.2 Treatment

- High-flow oxygen (→ **see Section 8** for oxygen delivery methods)
- Assist with nitroglycerin if prescribed and BP >100 systolic (→ **see Section 13** for medication protocols)
- Prepare for cardiac arrest (→ **see Section 3** for CPR procedures)
- Rapid transport to appropriate facility

Medical conditions love to mimic each other. The trick is noticing the details that separate stroke from seizure, or an allergic reaction from something else. That skill takes time.

(Not sure if you'd call something a mimic? Throw it in Discord and see how others break it down.)

13.3 Respiratory Emergencies

13.3.1 Asthma

- **Signs:** Wheezing, difficulty breathing, use of accessory muscles
- **Treatment:** High-flow oxygen, assist with inhaler, consider CPAP

13.3.2 COPD Exacerbation

- **Signs:** Chronic cough, barrel chest, pursed-lip breathing
- **Treatment:** Oxygen as needed (monitor carefully), assist with medications

13.3.3 Pulmonary Edema

- **Signs:** Pink, frothy sputum; crackles in lungs; severe SOB
- **Treatment:** High-flow oxygen, position upright, rapid transport

Scope of Practice: Medical Emergencies

EMT: Basic assessment, oxygen therapy, assist with patient medications, glucose administration.

AEMT: All EMT skills plus advanced airway management, IV therapy, additional medications.

All Levels: Recognition of emergencies requiring immediate transport.

Emergency Mindset: Medical Assessment

- ABCs always come first—even in medical emergencies, airway and breathing are priority.
- History is crucial—spend time getting a good SAMPLE and OPQRST.
- When multiple problems exist, treat the life threat first.

Application Check: Medical Emergencies

Scenario: A diabetic patient presents with sudden left-sided weakness and slurred speech. Family states symptoms began 20 minutes ago. What assessment is most critical to complete first to rule out stroke mimics?

- A) Blood glucose level
- B) Cincinnati Stroke Scale
- C) Full medication list
- D) Time

See Appendix A for answers and explanations.

Section 14 — Pharmacology

14.1 Medication Basics

14.1.1 Drug Names

- **Generic Name:** Official medical name (e.g., aspirin)
- **Brand Name:** Manufacturer's name (e.g., Bayer)
- **Chemical Name:** Describes molecular structure

14.1.2 Routes of Administration

- **Oral (PO):** By mouth
- **Sublingual (SL):** Under the tongue
- **Intramuscular (IM):** Into muscle
- **Subcutaneous (SQ):** Under the skin
- **Intravenous (IV):** Into vein
- **Intranasal (IN):** Into nasal cavity
- **Intraosseous (IO):** Into bone marrow

14.2 Medications EMTs Can Administer

14.2.1 Oxygen

- **Indication:** Hypoxia, respiratory distress
- **Dose:** Varies based on delivery device
- **Route:** Inhalation

14.2.2 Oral Glucose

- **Indication:** Hypoglycemia in conscious patient
- **Dose:** 15-20 grams

- **Route:** Oral

14.2.3 Aspirin

- **Indication:** Chest pain of cardiac origin
- **Dose:** 160-325 mg (chewed)
- **Route:** Oral

14.2.4 Activated Charcoal

- **Indication:** Certain poisonings
- **Dose:** 25-50 grams
- **Route:** Oral

> **Pharm trips up almost everyone.** Don't stress—it's normal to mix meds at first. The goal is to recognize where you hesitate, then drill those few until they're second nature.
>
> (We keep a running 'drug swap stories' thread in Discord if you want to see what others struggle with.)

14.3 Medications EMTs Can Assist With

14.3.1 Nitroglycerin

- **Indication:** Chest pain (cardiac origin)
- **Contraindications:** Systolic BP <100, use of erectile dysfunction drugs
- **Route:** Sublingual

14.3.2 Metered Dose Inhalers (MDI)

- **Common medications:** Albuterol, Ipratropium
- **Indication:** Respiratory distress from asthma/COPD
- **Route:** Inhalation

14.3.3 Epinephrine Auto-Injector

- **Indication:** Severe allergic reaction (anaphylaxis)
- **Adult dose:** 0.3 mg IM

- **Pediatric dose:** 0.15 mg IM

Scope of Practice: Medication Administration

EMT: Limited to specific medications (oxygen, oral glucose, aspirin, activated charcoal) and assisting with patient's prescribed medications.

AEMT: All EMT medications plus IV/IO medications including epinephrine, albuterol, and others per protocol.

Key Rule: Always verify five rights: Right patient, drug, dose, route, time.

Scope Examples: EMT giving IV epinephrine = malfeasance. AEMT administering morphine (paramedic drug) = scope violation. Even "helping" with procedures outside your scope can be legally problematic.

Emergency Mindset: Medication Safety

- When in doubt, don't give it—verify orders and check contraindications.
- Always check expiration dates and medication integrity before administration.
- Document everything—what you gave, when, dose, route, and patient response.

Application Check: Pharmacology

Scenario: A chest pain patient requests their prescribed nitroglycerin. Blood pressure is 110/70, heart rate 88. What contraindication must you verify before assisting?

- A) Previous heart attack history
- B) Current chest pain severity
- C) Recent phosphodiesterase inhibitor use
- D) Aspirin allergy

See Appendix A for answers and explanations.

Section 15 — Obstetrics and Pediatrics

15.1 Normal Pregnancy and Birth

15.1.1 Stages of Labor

- **First Stage:** Onset of contractions to full cervical dilation
- **Second Stage:** Full dilation to delivery of baby
- **Third Stage:** Delivery of baby to delivery of placenta

15.1.2 Signs of Imminent Delivery

- Strong, regular contractions 1-2 minutes apart
- Mother feels urge to push or have bowel movement
- Crowning (baby's head visible at vaginal opening)
- No time for transport to hospital

15.1.3 Delivery Procedure

- Position mother with knees drawn up and apart
- Support baby's head as it emerges
- Check for nuchal cord (around neck) and remove if present
- Support body as shoulders and rest of baby deliver
- Keep baby level with mother's vagina
- Dry and warm baby immediately

15.2 Newborn Care

15.2.1 Initial Assessment

- **Breathing:** Should start within 30 seconds
- **Heart Rate:** Should be >100 bpm

- **Color:** Pink is normal, blue requires intervention

15.2.2 Newborn Resuscitation

- Dry and warm the baby
- Position head to open airway
- Suction mouth then nose if needed
- Stimulate if not breathing (rub back, flick feet)
- Provide positive pressure ventilation if needed

15.3 Obstetric Emergencies

15.3.1 Abnormal Presentations

- **Breech:** Baby's buttocks or feet present first
- **Prolapsed Cord:** Umbilical cord emerges before baby
- **Limb Presentation:** Arm or leg presents first

15.3.2 Emergency Actions

- For abnormal presentations: Transport immediately, position mother to take pressure off cord
- For prolapsed cord: Insert gloved hand to push baby off cord, rapid transport
- Never attempt to push baby back or pull on presenting part
- If newborn requires resuscitation, see → **Section 3 (CPR)** for pediatric protocols.

15.4 Pediatric Assessment

15.4.1 Age-Specific Considerations

- **Infants (0-1 year):** Normal heart rate 100-160, respiratory rate 25-50
- **Toddlers (1-3 years):** Normal heart rate 90-150, respiratory rate 20-30
- **School age (6-12 years):** Normal heart rate 70-110, respiratory rate 15-20

15.4.2 Pediatric Triangle

- **Appearance:** Mental status, muscle tone, consolability

- **Work of Breathing:** Respiratory effort, positioning
- **Circulation:** Skin color, pulse quality

15.5 Common Pediatric Emergencies

15.5.1 Respiratory Distress

- More common in children than adults
- Can progress to respiratory failure quickly
- Position of comfort, high-flow oxygen

15.5.2 Fever and Seizures

- Febrile seizures common in children 6 months - 6 years
- Usually brief and self-limiting
- Focus on airway management and cooling

Scope of Practice: Obstetrics and Pediatrics

EMT: Basic delivery assistance, newborn care, pediatric CPR, age-appropriate equipment sizing.

AEMT: All EMT skills plus advanced airway management for pediatrics, IV/IO access in children.

All Levels: Recognition of normal vs. abnormal presentations, family-centered care approach.

Emergency Mindset: Special Populations

- Children compensate well until they don't—when they decompensate, it happens fast.
- Family dynamics matter—calm parents help create calm children.
- Trust your instincts—if a child looks sick, they probably are.

Application Check: Obstetrics and Pediatrics

Scenario: Called for labor at 32 weeks gestation. Upon arrival, you see the infant's head crowning. The nearest hospital with OB is 5 minutes away, trauma center with NICU is 25 minutes. Your best action is:

- A) Deliver on scene and transport to nearest hospital
- B) Rapid transport to NICU facility while supporting the head
- C) Allow natural delivery during transport to nearest facility
- D) Call for ALS intercept and wait

See Appendix A for answers and explanations.

OB emergencies are high-stakes. Practice with the platform Georgia trusts. **MedEd-Prep.com**

Section 16 — Respiratory Emergencies

16.1 Upper and Lower Airway Structures

- **Upper Airway:** Starts at the mouth and nose and ends at the larynx (vocal cords)
- **Lower Airway:** Starts at the larynx and extends to the alveoli, leading to the pulmonary capillaries

16.2 Key Definitions

- **Ventilation:** The physical act of moving air in and out of the lungs
- **Oxygenation:** The process of loading oxygen molecules onto hemoglobin in the bloodstream
- **Respiration:** The exchange of oxygen and carbon dioxide at the alveoli and the tissues of the body
- **Diffusion:** Movement of gases from an area of high concentration to an area of low concentration; integral to respiration
- **Atelectasis:** Collapse of the alveoli, reducing gas exchange

16.3 Important Airway Metrics

- **Tidal Volume:** The depth of each breath
- **Dead Space:** The portion of tidal volume that does not participate in gas exchange
- **Alveolar Volume:** The portion of tidal volume that does participate in gas exchange
- **Partial Pressure:** Measurement of the amount of gas in air or dissolved in a fluid (e.g., blood), expressed in mmHg

16.4 Physiology

- **Diaphragm:** The primary muscle of respiration, innervated by the phrenic nerve; operates both voluntarily and involuntarily
- **Hering-Breuer Reflex:** Prevents over-inflation of the lungs by activating stretch receptors

- **Internal Respiration:** The exchange of gases between systemic circulation and the cells of the body
- **Hypoxic Drive:** Breathing stimulus triggered by low arterial oxygen levels, seen primarily in patients with chronic CO2 retention

16.5 Respiratory Control Centers

- **Dorsal Respiratory Group (DRG):** Initiates inspiration based on chemoreceptor input (involuntary breathing)
- **Ventral Respiratory Group (VRG):** Controls motor functions of inspiratory and expiratory muscles (voluntary breathing)
- **Chemoreceptors:** Monitor chemical composition of blood, particularly CO2 and O2 levels, and signal the brain to adjust breathing
- **Baroreceptors:** Detect changes in blood pressure and assist in blood pressure regulation

16.6 Respiratory Patterns

- **Cheyne-Stokes:** Rhythmic pattern with gradual increases and decreases in rate and tidal volume followed by apnea; associated with brain injury
- **Biot's Respirations:** Irregular pattern with variable rate and volume, often followed by apnea; linked to increased intracranial pressure
- **Agonal Gasps:** Occasional, gasping breaths due to severe hypoxia; occurs when the heart has stopped but the brain still signals respiratory muscles
- **Kussmaul Respirations:** Deep, rapid breathing; common in diabetic ketoacidosis (DKA)

16.7 Airway Diseases and Conditions

- **Asthma:** Wheezing on inspiration/expiration due to bronchospasm
- **Anaphylaxis:** Flushed skin, hives, generalized edema, decreased blood pressure, and laryngeal edema with dyspnea
- **Bronchitis:** Chronic cough, wheezing, cyanosis, and productive cough
- **Congestive Heart Failure (CHF):** Dependent edema, rales, and paroxysmal nocturnal dyspnea (difficulty breathing at night)
- **Croup:** Fever and barking cough, mostly seen in pediatric patients
- **Emphysema:** Barrel chest, pursed-lip breathing, dyspnea on exertion

- **Pneumonia:** Dyspnea, chills, fever, cough with dark sputum, and rales typically in the lower lobes on one side
- **Pneumothorax:** Sudden chest pain with dyspnea, decreased lung sounds on the affected side
- **Spontaneous Pneumothorax:** Common in tall, thin, athletic males and may occur in individuals with chronic lung infections or congenital lung weaknesses
- **Pulmonary Embolus:** Sharp, pinpoint chest pain, sudden dyspnea, often post-surgery or childbirth; known as the "heart attack" of the lungs
- **Tension Pneumothorax:** Progressive shortness of breath, altered level of consciousness, neck vein distention, and tracheal deviation as a very late finding
- **Pertussis (Whooping Cough):** Coughing spells, "whooping" sound, fever, and primarily seen in pediatric patients
- **Common Cold:** Viral infection causing nasal congestion and difficulty breathing through the nose
- **Epiglottitis:** Inflammation of the epiglottis, fever, drooling in pediatrics, and severe sore throat; can affect all ages but is typically seen in children
- **Meningitis:** Highly contagious, spread via respiratory and throat secretions; presents with stiff neck and flu-like symptoms
- **Pleural Effusion:** Collection of fluid outside the lung, affecting one or both sides of the chest, leading to decreased breath sounds
- **Cystic Fibrosis (CF):** A genetic disorder affecting the endocrine system, causing thick mucus in the airways and dyspnea

Emergency Mindset: Respiratory Emergencies

- **30-Second Rule:** If oxygen therapy isn't improving SpO2 within 30 seconds, consider more aggressive airway management.
- **Look, Listen, Feel:** Always assess breathing with the complete triad - visual chest rise, audible breath sounds, and feeling for air movement.
- **High-Flow First:** When in doubt, start with high-flow oxygen and titrate down based on patient response and pulse oximetry.

Scope of Practice: Respiratory Management

EMT Level:

- Oxygen therapy via nasal cannula, non-rebreather mask, BVM
- OPA/NPA insertion
- Assist with patient's prescribed inhaler (albuterol)
- Basic airway positioning and suctioning

AEMT Level:

- All EMT-level skills
- Supraglottic airway insertion (King LT, i-gel)
- Nebulized albuterol administration
- CPAP application for CHF/pulmonary edema

Critical Boundary: EMT attempting supraglottic airway insertion = scope violation, even if patient improves.

16.8 Lung Sounds

- **Rales (Crackles):** Fine breath sounds caused by air moving through fluid in the lower airway
- **Rhonchi:** Lower-pitched sounds from mucus in the bronchi/bronchioles
- **Stridor:** High-pitched sound on inspiration, indicating upper airway obstruction
- **Wheezing:** High-pitched, whistling sound, usually during expiration, indicating bronchoconstriction

16.9 Emergency Airway Management Tips

- Ensure proper suctioning to maintain a clear airway
- Use basic airway adjuncts like OPAs and NPAs when necessary
- For advanced airway management, use supraglottic devices or intubation as per scope of practice
- For severe respiratory distress, see → **Section 9 (Circulation & Shock)** for circulation support protocols.
- If respiratory distress is cardiac-related, see → **Section 16 (Cardiovascular Emergencies)** for comprehensive management.

Application Check: Respiratory Emergencies

Scenario: A 45-year-old patient presents with sudden onset severe dyspnea, SpO2 88% on room air, clear lung sounds bilaterally, and speaks in 2-3 word sentences. Peak flow is normal. They have unilateral leg swelling. What condition best explains these findings?

- A) Acute asthma exacerbation
- B) Spontaneous pneumothorax
- C) Pulmonary embolism
- D) Acute pulmonary edema

See Appendix A for answers and explanations.

Section 17 — Cardiovascular Emergencies

17.1 Basic Anatomy and Physiology

17.1.1 Heart Structure

- The heart muscle, known as the **myocardium**, is surrounded by the **pericardium** (pericardial sac)
- **Heart Chambers:** Four chambers: two atria (upper chambers) and two ventricles (lower chambers)

17.1.2 Heart Valves

- **Atrioventricular Valves:**
  - **Tricuspid Valve:** Separates the right atrium from the right ventricle
  - **Bicuspid/Mitral Valve:** Separates the left atrium from the left ventricle
- **Semilunar Valves:**
  - **Pulmonary Valve:** Between the right ventricle and the pulmonary artery
  - **Aortic Valve:** Between the left ventricle and the aorta
- **Mnemonic:** "Toilet Paper Blocks My Anus" – Tricuspid, Pulmonary, Bicuspid/Mitral, Aortic

17.1.3 Blood Volume

- Average adult male: ~70 mL/kg of blood
- Average adult female: ~65 mL/kg of blood

17.2 Blood Vessels

- **Arteries:** Vessels that carry blood away from the heart
- **Arterioles:** Small branches between arteries and capillaries
- **Capillaries:** Thin vessels for nutrient and gas exchange
- **Venules:** Small vessels that connect capillaries to veins

- **Veins:** Vessels that return blood to the heart
- **Mnemonic:** "Aorta, arteries, arterioles, capillaries, venules, veins, vena cava"

17.3 Cardiac Electrical Conduction System

- **Sinoatrial (SA) Node:** The heart's primary pacemaker (60-100 bpm)
- **Atrioventricular (AV) Node:** Slows impulse for ventricular filling (40-60 bpm)
- **Bundle of His, Bundle Branches, and Purkinje Fibers:** Distribute impulses through the ventricles (20-40 bpm)

17.3.1 Electrocardiogram (ECG)

- **P wave:** Atrial depolarization
- **QRS complex:** Ventricular depolarization
- **T wave:** Ventricular repolarization

17.4 Cardiac Conditions

17.4.1 Atherosclerosis

- Build-up of fatty material forming plaque inside vessel walls, obstructing blood flow and reducing vessel elasticity

17.4.2 Thrombus vs. Embolus

- **Thrombus:** Stationary clot
- **Embolus:** Moving clot
- **Thromboembolism:** A moving clot that may obstruct blood flow

17.4.3 Angina

- **Symptoms:** Crushing, squeezing chest pain radiating to the left arm, jaw, or mid-back, lasting 3-8 minutes with possible shortness of breath, nausea, or sweating
- **Stable Angina:** Occurs predictably and is relieved by rest or medication
- **Unstable Angina:** Occurs unpredictably and may not be relieved by rest or medication

17.4.4 Myocardial Infarction (MI)

- Leading cause of death in the U.S. Occurs when blood flow to the heart is blocked, leading to tissue death (infarction)
- **Infarcted Tissue:** Dead and non-recoverable; forms scar tissue
- **Ischemic Tissue:** Deprived of oxygen but potentially recoverable with prompt treatment

17.4.5 Congestive Heart Failure (CHF)

- **Left-Sided Heart Failure:** Blood backs up into the lungs, causing rales, dyspnea, and requiring CPAP for treatment
- **Right-Sided Heart Failure:** Blood backs up into the body, causing pedal and sacral edema
- The heart functions as two pumps, with failure on one side affecting circulation and leading to fluid build-up

17.5 Heart Rhythms

- **Tachycardia:** Fast heart rate over 100 bpm
- **Bradycardia:** Slow heart rate below 60 bpm
- **PVC (Premature Ventricular Contraction):** Abnormal, wide complex beats appearing sporadically on a cardiac monitor
- **Ventricular Tachycardia (V-Tach):** Wide complex rhythm, rate 150-200 bpm. Requires immediate intervention; one of two shockable rhythms during cardiac arrest
- **Ventricular Fibrillation (V-Fib):** Disorganized, ineffective ventricular quivering. Treated with defibrillation; appears as erratic waves on the monitor
- **Asystole:** Flatline, indicating no electrical activity; non-shockable. Initiate CPR and attempt to convert to a shockable rhythm

> **Cardiac is about patterns.** Reading chest pain, ACS, CHF, shock—it takes repetition before the differences click. Slow down here, it pays off later.
>
> (If one rhythm or condition always blurs for you, bring it up in Discord—you'll see you're not alone.)

17.6 Aortic Aneurysms

- **Aortic Aneurysm:** Weakness in the wall of the aorta, potentially leading to rupture

- **Dissecting Aneurysm:** Separation of the aorta's inner layers, allowing blood to flow between them
- **Signs and Symptoms:** Sudden, severe chest pain without nausea, often radiating to the back or shoulder blades. A rupture leads to immediate, fatal internal bleeding

17.6.1 Emergency Mindset: Cardiovascular Emergencies

- **Door-to-Balloon Time:** Every minute matters in MI - goal is hospital arrival within Golden Hour for PCI intervention.
- **Chest Pain = Cardiac:** Until proven otherwise, treat all chest pain as potential MI with 12-lead ECG, aspirin, and rapid transport.
- **Silent MIs:** Diabetics, elderly, and women may present atypically - consider MI with jaw pain, nausea, or fatigue alone.

17.6.2 Scope of Practice: Cardiac Management

EMT Level:

- 12-lead ECG acquisition and interpretation training
- Assist with prescribed nitroglycerin (up to 3 doses)
- Administer aspirin for suspected MI (contraindications permitting)
- Basic cardiac monitoring and pulse assessment
- AED application and defibrillation

AEMT Level:

- All EMT-level skills
- IV access for cardiac medications
- Advanced cardiac life support protocols
- Medication administration for cardiac emergencies

Critical Boundary: EMT administering cardiac medications beyond aspirin and assisted nitroglycerin = scope violation.

17.7 Assessment and Management

17.7.1 Primary Assessment

- Check responsiveness, breathing, and pulse; begin CPR and use an AED if needed

17.7.2 Focused Exam

- Identify symptom duration, pain location, radiation, and any medications taken

17.7.3 Vital Signs and Monitoring

- Continuous ECG monitoring, blood pressure checks, and pulse oximetry

17.7.4 Transport

- Rapid transport for MI or cardiac arrest patients, preferably to a PCI-capable facility

17.8 Key Cardiac Medications

- **Aspirin:** Reduces clot formation; indicated in suspected MI
- **Nitroglycerin:** Vasodilator to relieve angina; contraindicated in hypotension and recent use of ED medications
- **Epinephrine:** Used in cardiac arrest to increase heart rate and contractility
- **Atropine:** Treats bradycardia by blocking the vagal response
- **Beta Blockers:** Reduce heart rate and blood pressure
- For medication interactions and contraindications, see → **Section 13 (Pharmacology)**.
- For shock management in cardiac emergencies, see → **Section 9 (Circulation & Shock)**.

Application Check: Cardiovascular Emergencies

Scenario: A 65-year-old male with crushing substernal chest pain radiating to his jaw has a blood pressure of 140/90, pulse 92, respirations 18, SpO2 95%. What intervention is contraindicated?

- A) Aspirin administration
- B) Nitroglycerin assistance
- C) Supplemental oxygen therapy
- D) Position of comfort

See Appendix A for answers and explanations.

Section 18 — Neurological Emergencies

Emergency Mindset: Neurological Emergencies

- **3-Hour Rule:** Ischemic stroke patients must reach hospital within 3 hours for tPA eligibility (up to 4.5 hours in select cases).
- **Time = Brain:** Every minute of untreated stroke costs approximately 1.9 million neurons - rapid transport is crucial.
- **Neuro Changes = Emergency:** Any acute alteration in mental status, speech, or motor function requires immediate assessment.

18.1 Basic Anatomy and Physiology

18.1.1 Central Nervous System (CNS)

- Composed of the brain and spinal cord, responsible for processing and interpreting sensory information

18.1.2 Peripheral Nervous System (PNS)

- Connects the CNS to the rest of the body and consists of sensory (afferent) and motor (efferent) nerves

18.1.3 Brain Structure

- **Cerebrum:** Responsible for voluntary movement, sensory processing, language, and decision-making
- **Cerebellum:** Coordinates muscle movements and maintains balance
- **Brainstem:** Controls essential life functions like heart rate, breathing, and blood pressure

18.1.4 Spinal Cord

- Transmits nerve signals between the brain and the body, playing a critical role in reflex actions

18.1.5 Cranial Nerves

- Twelve pairs of nerves that originate directly from the brain and are responsible for sensory and motor functions in the head and neck (e.g., optic nerve for vision, facial nerve for facial movements)

18.2 Key Neurologic Conditions

18.2.1 Stroke (Cerebrovascular Accident, CVA)

- An interruption of blood flow to the brain resulting in the loss of function in the affected area. Symptoms often appear suddenly

Ischemic Stroke

- Commonly referred to as the "heart attack of the brain"
- Caused by a clot lodged in an artery, preventing blood flow. Can lead to infarcted cells that cannot recover, resulting in permanent deficits
- **Ischemic cells,** however, are potentially salvageable with timely intervention
- **Symptoms:** Loss of movement on the opposite side of the body, confusion, and inability to speak

Hemorrhagic Stroke

- Results from bleeding within the brain, often due to a ruptured cerebral artery
- Increases intracranial pressure (ICP), compressing brain tissue and preventing oxygenated blood from reaching cells, leading to cell death
- **High-Risk Patients:** Those with uncontrolled hypertension
- **Key Sign:** "Worst headache of my life" followed by a sudden decrease in level of consciousness (LOC)
- **Indicators of Increased ICP:** Severe headache, nausea, vomiting, altered LOC

18.2.2 Transient Ischemic Attack (TIA)

- Known as a "mini-stroke"; symptoms mimic a stroke but resolve within a few hours
- A warning sign for a possible future stroke within months

18.2.3 Stroke Mimics

- **Hypoglycemia:** Low blood sugar presenting with stroke-like symptoms
- **Postictal State:** Period after a seizure where the brain resets; can cause confusion and mimic a stroke

- **Subdural/Epidural Bleeding:** Bleeding within the skull that compresses the brain

18.3 Seizures

18.3.1 Definition

- Sudden, erratic firing of neurons in the brain

18.3.2 Aura

- A sensation (e.g., taste of copper, tingling fingers) that may precede a seizure

18.3.3 Tonic-Clonic Seizures

Steps:

- **Aura:** Pre-seizure sensation
- **Loss of Consciousness**
- **Tonic Phase:** Whole-body rigidity
- **Hypertonic Phase:** Arched back and further rigidity
- **Clonic Phase:** Rhythmic muscle contractions
- **Post-Seizure:** Muscles relax
- **Postictal Phase:** Brain recovery period; patient may be confused, unable to speak, and could experience incontinence or a headache. Can last minutes to hours

18.3.4 Absence Seizures

- Characterized by brief periods of "spacing out" with little to no movement

18.3.5 Status Epilepticus

- A seizure lasting more than 5 minutes or consecutive seizures without regaining consciousness in between. Requires immediate medical intervention
- **Breakthrough Seizures:** Can occur even with compliant medication usage and may necessitate an increased dosage

18.3.6 Posturing

- **Decorticate Posturing:** Arms flexed toward the chest, toes pointed; indicates severe brain injury with higher-level brain function remaining

- **Decerebrate Posturing:** Arms extended outward with palms down and toes pointed; indicates more severe damage with lower brainstem involvement

18.4 Syncope

- Commonly known as "fainting" or "vasovagal episode"
- Results from a sudden decrease in blood flow to the brain, leading to temporary LOC. Usually resolved quickly once lying flat

Scope of Practice: Neurological Assessment

EMT Level:

- Basic neurological assessment (AVPU, GCS)
- Stroke screening tools (Cincinnati Stroke Scale)
- Blood glucose monitoring for altered mental status
- Seizure precautions and airway management
- Spinal immobilization for trauma-related neurologic injury

AEMT Level:

- All EMT-level skills
- Advanced airway management for unresponsive patients
- IV access for medication administration
- Blood glucose correction protocols

Critical Boundary: EMTs cannot administer seizure medications or advanced neurologic drugs - transport immediately.

18.5 Emergency Management

18.5.1 Airway and Breathing

- Ensure an open airway and provide oxygen as needed

18.5.2 Seizure Management

- Protect the patient from injury, maintain the airway, and place them in the recovery position after the seizure

18.5.3 Stroke

- Identify and transport rapidly to a stroke center for potential fibrinolytic therapy within the treatment window
- For stroke assessment tools and techniques, refer to patient assessment protocols for age-specific considerations.

18.5.4 C-Spine Precautions

- In trauma cases, maintain C-spine precautions to prevent further neurologic injury

18.6 Special Considerations

- **Visual Disturbances:** Can indicate potential brain tumors or other neurologic issues
- **Pediatric Patients:** Prone to febrile seizures; symptoms may differ from adults
- **Geriatric Patients:** Higher risk for strokes and altered mental status due to comorbidities and medications; symptoms may be more subtle
- For blood glucose management in altered mental status, see → **Section 12 (Medical Emergencies)**.
- For trauma-related neurological injuries, see → **Section 21 (Trauma)**.

Application Check: Neurological Emergencies

Scenario: A 72-year-old patient presents with sudden onset aphasia, right facial droop, and right arm drift. Blood glucose is 98 mg/dL. Last known well was 45 minutes ago. What factor most influences your transport destination?

- A) Patient's age and insurance status
- B) Time since symptom onset
- C) Presence of facial droop
- D) History of previous strokes

See Appendix A for answers and explanations.

Section 19 — Hematology

19.1 Overview of Blood Disorders

Hematology focuses on disorders of the blood and blood-forming tissues. These conditions can affect oxygen transport, clotting, and overall circulatory function. The three major inherited blood disorders covered in this section have significant implications for EMS care.

19.2 Sickle Cell Disease

19.2.1 Definition and Pathophysiology

- The most common inherited blood disorder in the United States
- Red blood cells are rigid, deformed, and have an abnormal crescent or "sickle" shape
- These abnormal cells cannot carry oxygen as efficiently as normal red blood cells
- Sickle cells have a shorter lifespan than normal RBCs, leading to chronic anemia
- The rigid shape causes cells to get stuck in small blood vessels, blocking blood flow

19.2.2 Clinical Manifestations

- **Chronic Anemia:** Due to rapid breakdown of abnormal red blood cells
- **Vaso-Occlusive Crisis:** Most common complication
    - Sickled cells block blood vessels, causing severe pain
    - Can affect any organ system
    - Often triggered by dehydration, infection, cold, or stress
- **Acute Chest Syndrome:** Life-threatening complication with chest pain, fever, and respiratory distress
- **Splenic Sequestration:** Blood pools in the spleen, causing sudden drop in hemoglobin
- **Increased Risk of:** Infections, stroke, organ damage, and hypoxia

Emergency Mindset: Sickle Cell Crisis

Think "The 3 H's":

- **Hydration:** Dehydration triggers crises - encourage fluid intake
- **Hypoxia:** Poor oxygen transport - provide high-flow O2
- **Hurt:** Severe pain management is critical - these patients need analgesia

Red Flags: Chest pain, difficulty breathing, severe abdominal pain, altered mental status, priapism - these indicate serious complications requiring immediate transport.

Scope of Practice: Sickle Cell Management

EMT Level:

- Recognition of sickle cell crisis signs and symptoms
- High-flow oxygen administration
- Position of comfort
- Keep patient warm (cold can trigger crisis)
- Rapid transport to appropriate facility
- Supportive care and reassurance

AEMT Level:

- All EMT-level interventions
- IV access for fluid resuscitation
- Pain assessment and management per protocol
- Monitor for signs of shock or organ failure

Critical Note: Many sickle cell patients are well-educated about their disease and know what helps them. Listen to the patient!

19.3 Thrombophilia

19.3.1 Definition and Pathophysiology

- A disorder characterized by an increased tendency to form abnormal blood clots (thrombosis)
- Can be inherited (genetic) or acquired

- Results from abnormalities in clotting factors or platelet function
- Blood clots can form even without injury or obvious trigger

19.3.2 Clinical Significance

- **Deep Vein Thrombosis (DVT):** Blood clots in deep veins, usually in legs
  - Signs: Leg pain, swelling, warmth, redness
  - Danger: Clot can break off and travel to lungs
- **Pulmonary Embolism (PE):** Life-threatening when clot travels to lungs
  - Signs: Sudden shortness of breath, chest pain, rapid heart rate
  - May present with cough, hemoptysis, or syncope
- **Other Complications:** Stroke, pregnancy complications, recurrent miscarriages

19.3.3 Risk Factors

- Family history of blood clots
- Prolonged immobility (long flights, bed rest, post-surgery)
- Pregnancy and postpartum period
- Oral contraceptives or hormone therapy
- Cancer and cancer treatments
- Recent surgery or trauma

Emergency Mindset: Recognizing PE

Think "PERC" - Pulmonary Embolism Recognition Clues:

- **P**ain: Sharp chest pain, worse with deep breath
- **E**xertional dyspnea: Sudden shortness of breath
- **R**apid heart rate: Tachycardia common
- **C**alf pain/swelling: May indicate DVT source

High-Risk History: Recent surgery, long flight, known clotting disorder, or cancer = high suspicion for PE.

19.4 Hemophilia

19.4.1 Definition and Pathophysiology

- A genetic disorder in which blood does not clot properly
- Caused by deficiency or absence of specific clotting factors
- **Hemophilia A:** Factor VIII deficiency (most common, ~80% of cases)
- **Hemophilia B:** Factor IX deficiency (also called "Christmas disease")
- X-linked recessive inheritance pattern (primarily affects males)

19.4.2 Clinical Manifestations

- **Prolonged Bleeding:** After injury, surgery, or dental work
    - May not bleed faster, but bleeding lasts much longer
    - Can restart hours or days after initial injury
- **Spontaneous Bleeding:** Can occur without obvious trauma
    - Joint bleeds (hemarthrosis) - most common
    - Muscle bleeds (hematomas)
    - Internal bleeding
- **Intracranial Hemorrhage:** Life-threatening complication, even from minor head trauma
- **Severity Levels:**
    - Mild: 5-40% of normal clotting factor
    - Moderate: 1-5% of normal clotting factor
    - Severe: <1% of normal clotting factor

19.4.3 Treatment Principles

- **Clotting Factor Replacement:** Primary treatment
    - May be administered prophylactically or on-demand
    - Patients often self-administer at home
- **Desmopressin (DDAVP):** For mild hemophilia A
- **Antifibrinolytics:** Help stabilize clots
- **Avoiding Certain Medications:** No aspirin or NSAIDs (increase bleeding risk)

Emergency Mindset: Hemophilia Trauma

Every trauma is potentially life-threatening in hemophilia patients:

- **Head Trauma:** Assume intracranial bleeding until proven otherwise - immediate transport
- **Abdominal/Chest Trauma:** Internal bleeding can be massive and hidden
- **Joint/Muscle Injuries:** Can cause severe bleeding into tissues, leading to compartment syndrome
- **Patient Knowledge:** Many hemophilia patients carry medical alert information and know their treatment plan

Golden Rule: Control external bleeding with direct pressure. DO NOT use tourniquets unless life-threatening hemorrhage cannot be controlled otherwise.

Scope of Practice: Hemophilia Management

EMT Level:

- Direct pressure for external bleeding control
- Gentle handling and immobilization
- Ice application to bleeding joints/muscles
- Document all injuries, even minor ones
- Rapid transport for any significant trauma
- Contact medical control early

AEMT Level:

- All EMT-level interventions
- IV access with large-bore catheter (may need factor replacement)
- Fluid resuscitation if signs of shock
- Coordinate with receiving facility for factor availability

Critical Communication: Alert receiving hospital immediately about hemophilia patient so they can prepare clotting factors.

19.5 Assessment and Management Principles for Hematologic Emergencies

19.5.1 Primary Assessment

- Airway, Breathing, Circulation - standard ABC approach
- Identify any life-threatening bleeding or respiratory distress
- Assess for signs of shock (tachycardia, hypotension, altered mental status)

19.5.2 Secondary Assessment

- **Medical History:**
  - Known blood disorders?
  - Previous episodes or hospitalizations?
  - Current medications or treatments?
  - Recent triggers (dehydration, infection, trauma)?
- **Physical Examination:**
  - Pallor, jaundice, or cyanosis
  - Signs of bleeding (external or internal)
  - Joint swelling or deformity
  - Abdominal tenderness or distension
  - Neurological status

19.5.3 General Management Principles

- **Oxygen:** High-flow O2 for sickle cell or any signs of hypoxia
- **Position:** Position of comfort unless contraindicated
- **Warmth:** Keep sickle cell patients warm
- **Gentle Handling:** Minimize additional trauma in hemophilia patients
- **IV Access:** Establish for fluid resuscitation or medication administration (AEMT level)
- **Bleeding Control:** Direct pressure, elevation, immobilization
- **Pain Management:** Per protocol (especially important in sickle cell crisis)
- **Psychological Support:** These patients often have chronic conditions and know what to expect

19.5.4 Transport Considerations

- Transport to facilities with hematology capabilities when possible
- Alert receiving facility early about specific diagnosis
- Many patients have established relationships with hematologists
- Bring any home medications or medical alert information

Application Check: Hematology

Scenario: A 22-year-old with known sickle cell disease presents with severe joint pain, difficulty breathing, and priapism lasting 3 hours. Vital signs: BP 108/68, HR 110, RR 24, SpO2 91%. What intervention is contraindicated?

- A) Application of cold packs to painful joints
- B) High-concentration oxygen therapy
- C) Gentle handling during transport
- D) IV fluid therapy if within scope

See Appendix A for answers and explanations.

Section 20 — Toxicological Emergencies

20.1 Routes of Absorption

20.1.1 Ingestion

- **Description:** The most common route of poisoning, involving swallowing toxic substances.
- **Absorption:** Slowest onset as little absorption occurs in the stomach; the majority takes place in the small intestine where absorption into the bloodstream is more efficient.
- **Management:**
  - Identify the substance ingested, amount, and time of ingestion.
  - Avoid inducing vomiting unless directed by poison control or medical professionals (e.g., ipecac is not recommended).
  - Administer activated charcoal if indicated to bind the toxin and reduce absorption.

20.1.2 Inhalation

- **Description:** Occurs when toxic substances in the form of gas, vapor, or aerosol are inhaled.
- **Absorption:** Rapid due to the large surface area and vascular nature of the lungs, leading to fast entry into the bloodstream.
- **Examples:** Carbon monoxide, chlorine gas, and industrial chemicals.
- **Management:**
  - Ensure the patient is removed from the contaminated environment to fresh air.
  - Provide high-flow oxygen to reduce hypoxia.
  - Monitor for signs of respiratory distress and administer nebulized bronchodilators if needed.

20.1.3 Injection

- **Description:** Involves direct entry of a toxic substance into the bloodstream or tissues, typically from drug abuse (e.g., heroin, cocaine) or insect/animal bites and stings.
- **Absorption:** Immediate as it bypasses the skin and digestive system, leading to rapid onset of symptoms.
- **Management:**
    - Keep the injection site below the level of the heart if possible to slow systemic spread.
    - Remove jewelry, rings, or bracelets from the affected area in case of swelling.
    - Administer antivenom for certain envenomations (e.g., snake bites) as per protocol.
    - Provide supportive care, including fluids and medications as needed.

20.1.4 Absorption (Surface Contact)

- **Description:** Poisoning that occurs when toxic substances come into contact with the skin or mucous membranes.
- **Examples:** Pesticides (e.g., organophosphates), industrial chemicals, and plant toxins.
- **Management:**
    - **Decontamination:** Remove contaminated clothing promptly and brush off any dry chemicals before flushing with water.
    - **Irrigation:** Flood the affected skin area with copious running water for at least 20 minutes. This is critical when large amounts of material have been spilled.
    - **Soap and Water:** Wash the skin thoroughly with soap and water after initial flushing.
    - **Eye Exposure:** Irrigate eyes quickly and thoroughly, ensuring that the fluid flows from the bridge of the nose outward to avoid contaminating the unaffected eye.

20.2 General Management of Poisoning

Scene Safety:

- Ensure personal protection (e.g., gloves, masks) to prevent secondary contamination.

- Identify the source of poisoning if possible.

Primary Assessment:

- Check for airway patency, breathing adequacy, and circulation stability.
- Be vigilant for signs of shock, altered mental status, or seizures.

Patient Positioning:

- Position the patient to prevent aspiration if vomiting occurs.

Activated Charcoal:

- Used for certain ingestions within 1-2 hours if indicated. Contraindicated if the patient has a reduced level of consciousness, has ingested corrosive substances, or if airway protection cannot be assured.

20.3 Specific Types of Poisoning

20.3.1 Carbon Monoxide (CO) Poisoning

- **Description:** Odorless, colorless gas resulting from incomplete combustion.
- **Signs and Symptoms:** Headache, dizziness, confusion, cherry-red skin (rare), and eventual loss of consciousness.
- **Management:**
  - Remove from exposure and provide high-flow oxygen or hyperbaric oxygen therapy if available.

20.3.2 Organophosphate Poisoning (Pesticides)

- **Mechanism:** Inhibits acetylcholinesterase, leading to the accumulation of acetylcholine and overstimulation of the nervous system.
- **Signs and Symptoms:** SLUDGE-M (Salivation, Lacrimation, Urination, Diarrhea, Gastrointestinal distress, Emesis, and Muscle twitching).
- **Management:**
  - Remove contaminated clothing and wash the skin thoroughly.
  - Administer atropine and pralidoxime (2-PAM) as antidotes.

20.3.3 Opiate Overdose

- **Signs and Symptoms:** Respiratory depression, pinpoint pupils, altered mental status.
- **Management:** Administer naloxone to reverse respiratory depression and restore consciousness.

20.3.4 Alcohol Poisoning

- **Signs and Symptoms:** Confusion, stupor, vomiting, hypothermia, and respiratory depression.
- **Management:** Supportive care including airway management, fluid administration, and monitoring.

20.4 Complications and Special Considerations

Delayed Reactions:

- Some toxins have delayed effects, necessitating long-term monitoring (e.g., acetaminophen toxicity).

Age and Comorbidities:

- Elderly and pediatric patients may exhibit different responses to toxins and require tailored care.

Multiple Substance Involvement:

- Be alert for mixed poisonings (e.g., alcohol combined with other drugs) that can alter clinical presentation and treatment.

20.5 Prevention Tips

- Educate patients on safe storage of chemicals and medications.
- Use proper ventilation when handling toxic substances.
- Recognize the dangers of over-the-counter drugs when taken in excess.

Application Check: Toxicological Emergencies

Scenario: College student found unresponsive in dorm room with empty medication bottles nearby. Respiratory rate 4, pinpoint pupils, fresh needle marks on arm, cyanotic lips. Roommate states the patient has chronic pain. What is your FIRST intervention?

- A) Contact poison control for guidance
- B) Ventilation assistance with BVM
- C) Naloxone administration
- D) Rapid transport without intervention

See Appendix A for answers and explanations.

Section 21 — OB/GYN

21.1 Umbilical Cord and Placental Function

- **Umbilical Cord:** Connects the placenta to the fetus at the umbilicus
- **Composition:** Contains two arteries and one vein
    - **Vein:** Carries oxygenated blood from the placenta to the fetus
    - **Arteries:** Carry deoxygenated blood from the fetus to the placenta

21.2 GPA Score

- **G (Gravida):** Total number of pregnancies
- **P (Para):** Number of pregnancies resulting in a viable birth
- **A (Abortion):** Number of pregnancies that did not result in a viable birth
- **Example:** A woman in labor with her third pregnancy, who delivered twins previously, would have a GPA score of G3 P3 A0. Upon delivery of her current pregnancy, it becomes G3 P4 A0 if viable

21.3 Amniotic Sac

- **Critical Timing:** Once ruptured, delivery should ideally occur within **24 hours** to prevent infection

21.4 Common Obstetric Conditions

21.4.1 Spontaneous Abortion (Miscarriage)

- Most frequent cause of vaginal bleeding in the first and second trimesters
- May be induced by trauma, medications, or other medical issues

21.4.2 Ectopic Pregnancy

- Embryo implants outside the uterus, commonly in the fallopian tube
- **Signs and Symptoms:** Lower abdominal pain and cramping, potentially progressing to severe shock and cardiac arrest if rupture occurs

Emergency Mindset: Ectopic Pregnancy

- **Life-Threatening Priority:** Ruptured ectopic pregnancy can cause fatal internal bleeding within minutes
- **Classic Triad:** Missed period + abdominal pain + vaginal bleeding = transport immediately
- **Rapid Deterioration:** Patient can go from stable to full shock quickly - prepare for aggressive fluid resuscitation

21.4.3 Preeclampsia and Eclampsia

- **Preeclampsia:** High blood pressure, proteinuria, and edema after 20 weeks gestation
  - **Symptoms:** Headache, nausea, visual disturbances, and rapid weight gain
- **Eclampsia:** Seizures occurring due to severe preeclampsia
  - Postpartum eclampsia can occur within 24 hours after birth
  - **Management:** May include magnesium sulfate and oxygen; avoid medications that cross the placental barrier unless necessary

21.5 Placental Complications

21.5.1 Placenta Previa

- Placenta covers the cervix, causing painless, bright red vaginal bleeding near term

21.5.2 Placental Abruption

- Premature detachment of the placenta from the uterine wall, typically in the third trimester
- **Presentation:** Severe abdominal pain and dark, venous bleeding
- **Most Common Cause:** Hypertension, followed by trauma

- Can lead to significant risk for both mother and fetus; rapid transport is essential

21.6 Delivery Guidelines

21.6.1 Preparation

- Obtain IV access if possible
- Disrobe the patient from the waist down

21.6.2 Contractions

- Time the contractions from the beginning of one to the next to monitor frequency
- Encourage short, quick breaths during contractions
- Discourage pushing until crowning

Emergency Mindset: Field Delivery Decision

- **Transport vs. Deliver:** If crowning is visible or contractions are <2 minutes apart, prepare for on-scene delivery
- **Never Delay Delivery:** Don't hold back the baby's head - this can cause fetal harm
- **One Hand Rule:** Support, don't pull - guide the baby gently with one hand

21.6.3 Delivery Procedure

- Support the newborn's head as it emerges
- Once the head crowns, check for a **nuchal cord** (cord around the neck)
    - If present, attempt to slip it over the head or clamp and cut if necessary
- **Suction the mouth first, then the nose**
- Dry and wrap the newborn immediately, ensuring skin-to-skin contact with the mother for warmth
- Position the newborn lower than the vagina before cord clamping to avoid siphoning blood back to the placenta
- Clamp the umbilical cord approximately **3-4 inches** from the newborn
- Place a second clamp **2-4 inches** beyond the first before cutting
- **Critical:** Handle the cord gently to prevent detachment from the newborn's abdomen, which could lead to fatal blood loss

21.7 Emergency Indicators During Delivery

- Placenta delivery should occur within **30 minutes** of birth
- Watch for excessive bleeding (>500 mL) or delayed placental expulsion
- Post-delivery hemorrhage requires management and transport if significant

21.8 Complicated Deliveries

21.8.1 Nuchal Cord

- Attempt to slip the cord over the head
- If unsuccessful, clamp and cut

21.8.2 Breech Delivery

- Allow the body to deliver slowly
- If the head becomes trapped, form a "V" with your gloved fingers to create an airway until full delivery

21.8.3 Prolapsed Cord

- The cord precedes the fetus, compressing blood flow
- Push the presenting part of the fetus away from the cord and maintain that position until arrival at the hospital

21.8.4 Meconium Staining

- Indicates fetal distress if amniotic fluid is green or brown
- Be prepared for potential airway management if the newborn is depressed

Scope of Practice: Delivery Management

EMT Level:

- Support normal spontaneous vaginal delivery
- Provide basic newborn care (warming, drying, stimulation)
- Clamp and cut umbilical cord
- Manage uncomplicated deliveries

AEMT Level:

- All EMT skills plus:
- IV access for maternal fluid resuscitation
- Oxytocin administration (if permitted by protocol) for postpartum hemorrhage
- Advanced assessment of maternal vital signs

Critical Boundary: Surgical interventions (C-section, episiotomy) are beyond EMS scope - rapid transport required

21.9 Postpartum Complications

21.9.1 Postpartum Eclampsia

- The mother remains at risk for seizures weeks after delivery

21.9.2 Amniotic Fluid Embolism

- Rare but severe, involving amniotic fluid entering the maternal bloodstream
- Leads to sudden respiratory distress and cardiovascular collapse

21.10 Gynecological Emergencies

21.10.1 Pelvic Inflammatory Disease (PID)

- Infection of the pelvic cavity leading to abdominal pain and fever

21.10.2 Ruptured Ovarian Cyst

- Can cause significant pain and internal bleeding

21.10.3 Uterine Rupture

- A life-threatening emergency, often during labor in women with previous C-sections or multiple pregnancies

21.11 Important Considerations

21.11.1 Supine Hypotensive Syndrome

- Avoid placing pregnant patients flat on their back
- Elevate the right hip or position them on their left side

21.11.2 Support and Transport

- Always provide emotional and physical support
- Ensure rapid transport for any complications

Application Check: OB/GYN Emergencies

Scenario: A 28-year-old at 34 weeks gestation reports severe constant abdominal pain and dark vaginal bleeding after a minor fall. Abdomen is rigid and tender. BP 88/56, HR 118. What condition is most likely?

- A) Placental abruption
- B) Placenta previa
- C) Uterine rupture
- D) Preterm labor

See Appendix A for answers and explanations.

Section 22 — Trauma

22.1 Mechanisms of Injury (MOI)

22.1.1 Front Impact Collisions

- **Three Collisions:**
  - **Vehicle vs. Object:** The initial impact of the vehicle with another object
  - **Passenger vs. Interior:** The passenger collides with parts of the vehicle such as the steering wheel, seatbelt, dashboard, or windshield
  - **Internal Organs vs. Body Structures:** The passenger's internal organs move and collide against the body's internal structures
- **Coup-Contrecoup Injury:** Occurs when the brain impacts the skull's front, then rebounds to strike the rear. This type of injury can happen in car accidents or other high-impact events
- **Frontal Collision Pathways:**
  - **Up and Over Pathway:** Head, spine, chest, and abdominal injuries
  - **Down and Under Pathway:** Posterior knee, hip dislocations, femur, lower extremity, and pelvic fractures

22.1.2 Vehicle vs. Pedestrian

- Evaluate vehicle size, speed, damage points, and patient size
- Pediatric patients often sustain thoracic and abdominal injuries due to their shorter stature and pliable bones, which may not show fractures but can mask significant internal damage

22.1.3 Vehicle vs. Bicycle

- Inspect for helmet damage as an indicator of potential neck and spine injuries

22.1.4 Falls

- Falls onto feet can transmit energy to the spine, causing injuries to the spine, legs, and pelvis

Emergency Mindset: The Golden Hour

- **Platinum 10 Minutes:** Minimize on-scene time to 10 minutes or less for trauma patients
- **ABCs First:** Airway, Breathing, Circulation - maintain these at all costs
- **Load and Go:** Rapid transport to appropriate trauma center can be life-saving

22.2 Blast Injuries

- **Primary Blast Injury:** Damage caused by the blast wave, primarily affecting hollow organs (e.g., lungs, intestines)
- **Secondary Blast Injury:** Caused by flying debris striking the body
- **Tertiary Blast Injury:** Occurs when the patient is thrown against an object or the ground
- **Miscellaneous Blast Injury:** Includes burns, inhalation injuries, or crush injuries from collapsing structures

22.3 Golden Principle of Prehospital Trauma Care

- Prioritize maintaining the **ABCs** (Airway, Breathing, Circulation)
- Minimize on-scene time to **10 minutes or less**—the "Platinum 10"

22.4 Trauma Center Levels

- **Level I:** 24-hour in-house general surgeons; comprehensive trauma care
- **Level II:** 24-hour immediate coverage by general surgeons
- **Level III:** Emergency physician coverage and prompt surgical availability
- **Level IV:** Basic emergency facilities, ATLS protocols, and 24-hour lab coverage

22.5 Critical Blood Loss

- The body cannot tolerate an acute loss of more than **20%** of blood volume
- Average adult blood volume is approximately **70 mL/kg**

22.6 Crush Injuries and Syndromes

- **Crushing Injury:** Prolonged compression causing tissue damage that worsens until pressure is relieved
- **Crush Syndrome:** Necrotic tissue releases harmful substances (e.g., myoglobin) into the bloodstream upon extrication, potentially leading to rhabdomyolysis, cardiac arrest, or renal failure

> **Trauma is the longest section because it touches every part of EMS.** Stay with it—mastering the flow from MOI to injuries is what makes the chaos manageable.
>
> (Not sure how others walk through trauma assessments? Drop your process in Discord and compare notes.)

22.7 Head and Brain Trauma

22.7.1 Traumatic Brain Injury (TBI)

- Insult to the brain causing potential physical, cognitive, or social changes
- **Primary Injury:** Direct damage from impact
- **Secondary Injury:** Results from processes like cerebral edema, increased ICP, or hypoxia post-injury

22.7.2 Types of Brain Hematomas

- **Epidural Hematoma:** Blood accumulation between skull and dura mater
- **Subdural Hematoma:** Blood beneath the dura mater but outside the brain
- **Intracerebral Hematoma:** Bleeding within brain tissue

22.7.3 Cerebral Edema

- Swelling that can elevate ICP
- **Hyperventilation Contraindication:** Only use in brain herniation evidenced by decorticate/decerebrate posturing and irregular breathing (e.g., Biot or Cheyne-Stokes)

Scope of Practice: Trauma Management

EMT Level:

- Airway management with manual maneuvers and basic adjuncts
- Hemorrhage control with direct pressure and tourniquets
- Spinal immobilization when indicated
- Splinting of fractures and dislocations

AEMT Level:

- All EMT skills plus:
- IV access for fluid resuscitation in trauma
- Advanced airway management (supraglottic airways)
- Needle decompression for tension pneumothorax (per protocol)

Critical Boundary: Surgical procedures and definitive hemorrhage control require hospital-level care - rapid transport essential

22.8 Chest Injuries

22.8.1 Closed vs. Open Chest Injury

- **Closed Chest Injury:** Skin is intact, but internal structures are damaged
- **Open Chest Injury:** Skin penetration by an external object (e.g., knife, bullet)

22.8.2 Flail Chest

- Paradoxical chest motion with multiple rib fractures
- **Initial Care:** Cover with a bulky dressing; avoid circumferential wrapping

22.8.3 Pneumothorax

- **Closed:** No skin penetration
- **Open:** Skin penetration with potential air accumulation

22.8.4 Tension Pneumothorax

- Air buildup shifts the mediastinum, compresses the vena cava, and causes tracheal deviation away from the affected side

- Can present with Beck's Triad - just also has absent breath sounds
- Life-threatening emergency requiring immediate intervention

22.8.5 Cardiac Tamponade

- Blood between myocardium and pericardium
- **Beck's Triad:** Muffled heart sounds, JVD, narrowing pulse pressure
- Requires rapid transport for pericardiocentesis

Emergency Mindset: Chest Trauma Recognition

- **Tracheal Deviation:** Late sign of tension pneumothorax - don't wait for it to act
- **Beck's Triad:** Muffled heart sounds + JVD + narrow pulse pressure = cardiac tamponade
- **Paradoxical Movement:** Flail segment moves opposite to rest of chest - support and transport

22.9 Facial and Eye Injuries

22.9.1 Blowout Fracture

- Orbit fracture causing double vision and numbness

22.9.2 Le Fort Fractures

- **Le Fort I:** Horizontal fracture of the maxilla
- **Le Fort II:** Involves nasal bones and maxilla
- **Le Fort III:** Complete midface separation from the skull

22.10 Compartment Syndrome

- Often occurs in fractures below the elbow or knee
- **Signs:** Severe pain, pain on stretching, decreased strength
- **Goal:** Transport to an emergency facility before pulselessness occurs

22.11 Muscle Types

- **Cardiac Muscle:** Involuntary, only in the heart
- **Smooth Muscle:** Involuntary, lines organs
- **Skeletal Muscle:** Voluntary, attached to bones (e.g., biceps, triceps)

22.12 Evisceration

- Abdominal contents protruding outside the body
- Cover with moist, sterile dressing and secure loosely
- **Never attempt to replace organs**

Application Check: Trauma

Scenario: A construction worker fell 20 feet, landing on concrete. He has paradoxical chest movement on the left side, respiratory rate 28, SpO2 90%, BP 92/60. What is your primary treatment after spinal immobilization?

- A) Needle decompression of the affected side
- B) Stabilization with bulky dressing
- C) Circumferential chest binding
- D) Immediate rapid transport without intervention

See Appendix A for answers and explanations.

Section 23 — Environmental Emergencies

23.1 Mechanisms of Heat Loss

- **Conduction:** Direct transfer of heat from the body to a colder surface
- **Convection:** Transfer of heat through moving air or liquid across the skin
- **Evaporation:** Heat loss as a liquid (e.g., sweat) converts to a gas
- **Radiation:** Loss of body heat to cooler objects not in direct contact
- **Respiration:** Heat loss through exhaled air

23.2 Cold-Related Conditions

23.2.1 Hypothermia

- Defined as a core body temperature below **95°F (35°C)**
- **Signs and Symptoms:**
  - **Mild:** Shivering, foot stamping, rapid breathing, constricted blood vessels
  - **Severe:** Withdrawn demeanor, confusion, decreased communication, or unconsciousness

23.2.2 Frostnip and Immersion Foot

- **Frostnip:** Superficial cooling of the skin; usually not painful. The deeper tissues remain unaffected
- **Immersion Foot (Trench Foot):** Prolonged exposure to cold, wet conditions causing foot damage. Common in individuals standing in water for extended periods (e.g., hunters, hikers)

23.2.3 Frostbite

- **Characteristics:** Affected area is hard, frozen, and may appear waxy. Blisters and swelling can develop. Depth of damage can vary
- **Important Note:** Do not rewarm if there is a risk of refreezing; this can cause further damage

Emergency Mindset: Cold Emergencies

- **Hypothermia Priority:** Handle gently - rough handling can trigger fatal arrhythmias
- **Rewarming Rule:** Never rewarm frostbite if refreezing is possible - more damage occurs
- **Core Temperature:** Active rewarming of hypothermia requires hospital care - prevent further heat loss

23.3 Heat-Related Conditions

23.3.1 Hyperthermia

- Defined as a core body temperature of **101°F (38.3°C)** or higher

23.3.2 Heat Cramps

- Occur due to loss of electrolytes and may present even in non-hot conditions (e.g., factory work, athletes)
- Typically affect the legs or abdominal muscles

23.3.3 Heat Exhaustion

- The most common heat illness, caused by excessive fluid and electrolyte loss through sweating
- **Signs and Symptoms:** Fatigue, headache, nausea, and subtle neuro deficits. Core body temperature may be slightly elevated

23.3.4 Heatstroke

- Most severe heat-related condition, potentially life-threatening
- **Signs and Symptoms:** Change in behavior is often the first indicator, followed by hot, dry, flushed skin as sweating mechanisms fail. Rapid progression to unresponsiveness is possible
- **Management:** Immediate cooling and transport to an emergency facility

Emergency Mindset: Heat Emergencies

- **Behavior Change First:** Altered mental status often appears before classic "hot and dry" skin in heatstroke
- **Cool Immediately:** Don't wait for transport - begin active cooling on scene for heatstroke
- **Critical Sign:** When sweating stops in a hot environment, heatstroke is imminent

Scope of Practice: Environmental Emergency Management

EMT Level:

- Passive rewarming for hypothermia (blankets, warm environment)
- Active cooling for heat emergencies (cool water, fanning)
- Recognition of environmental emergencies and transport decisions
- Basic wound care for frostbite (protect from further injury)

AEMT Level:

- All EMT skills plus:
- IV fluid therapy for heat exhaustion/dehydration
- Advanced assessment and monitoring
- Heated IV fluids (per protocol) for severe hypothermia

Critical Boundary: Active core rewarming and aggressive treatment of severe environmental emergencies require hospital-level care

23.4 Water-Related Emergencies

23.4.1 Rescue Priorities

- **Reach:** Extend an object to the patient
- **Throw:** Throw a flotation device
- **Row:** Use a boat
- **Go:** Enter the water as a last resort
- **Important Considerations:** Always ensure personal safety when attempting water rescues

23.5 Bites and Stings

23.5.1 Spider Bites

- **Black Widow Spider:**
  - **Venom:** Neurotoxin affecting nerve tissues
  - **Signs and Symptoms:** Immediate pain, muscle spasms, tight chest, difficulty breathing, severe cramps, and board-like abdominal rigidity. Symptoms generally subside within 48 hours but can be fatal in children
  - **Treatment:** Clean the bite with soap and water, apply an ice pack, and transport to the emergency department
- **Brown Recluse Spider:**
  - **Venom:** Cytotoxic, causing severe local tissue damage
  - **Signs and Symptoms:** Initially painless, progressing to pain within hours. Swelling, tenderness, and a pale, mottled center with potential blister formation. A necrotic scab can form, leading to a deep ulcer
  - **Treatment:** Prompt transport to an emergency department for proper care

Application Check: Environmental Emergencies

Scenario: A 42-year-old construction worker has been working 6 hours in 95°F heat. He is found sitting in shade with severe leg and abdominal cramps. He is alert and oriented, sweating profusely. BP 118/76, HR 98, RR 18, skin hot and moist. What condition best fits this presentation?

- A) Heatstroke
- B) Heat cramps
- C) Heat exhaustion
- D) Dehydration

See Appendix A for answers and explanations.

Section 24 — EMS Operations

24.1 Lifting and Moving Patients

- Always **lift with your legs, not your back,** to prevent injury
- Maintain proper body mechanics and use adequate personnel for patient moves

Emergency Mindset: Safe Patient Movement

- **Legs Not Back:** Always bend at the knees and use leg muscles for lifting power
- **Team Communication:** Count "1-2-3" before any coordinated lift to prevent injury
- **Scene Time vs. Safety:** Never sacrifice proper lifting technique for speed

24.2 Vehicle Operations

24.2.1 Hydroplaning Risk

- Vehicles can **hydroplane at speeds over 30 MPH**
- Exercise extreme caution in wet conditions

24.2.2 Three Basic Principles for Ambulance Operations

- **Must be on a true emergency call:** Lights and sirens only for genuine emergencies
- **Use both audible and visual warning devices:** Both are required simultaneously
- **Operate with due regard for the safety of everyone on the road:** Emergency status does not eliminate liability for unsafe driving

24.2.3 Escort Vehicles

- **Avoid using escorts** whenever possible

- Civilians may not realize there are two vehicles and may proceed after the first passes, creating collision risk

24.3 Helicopter Operations

24.3.1 Landing Zone (LZ) Requirements

- **Ideal LZ:** Should be **100 x 100 feet**
- **Minimum LZ:** At minimum **60 x 60 feet**
- Ensure the area is clear of obstructions and debris
- Mark the LZ clearly and communicate wind direction to the pilot
- Never approach a helicopter without clearance from the crew

24.4 National Incident Management System (NIMS)

- A nationwide template enabling coordinated response among federal, state, local governments, private-sector, and non-governmental organizations
- Used for **preparation, prevention, response, and recovery** from incidents of all sizes
- Applicable to incidents including hazardous materials, natural disasters, and terrorism
- All EMS personnel should be NIMS-compliant through proper training

24.5 Incident Command System (ICS) Roles

24.5.1 C-FLOP Mnemonic

- **Command:** Overall responsibility for the incident; includes the incident commander
    - Establishes objectives and priorities
    - Has ultimate authority and responsibility
- **Finance:** Tracks expenditures and manages financial documentation
    - Crucial in large-scale, extended incidents
    - Handles cost recovery and procurement

- **Logistics:** Manages resources, equipment, food, water, and medical supplies
  - Provides support and resources to operational units
  - Handles communications and facilities
- **Operations:** Conducts tactical operations to achieve incident objectives
  - Oversees branches, divisions, and groups at larger incidents
  - Directly manages response activities
- **Planning:** Anticipates future needs and develops action plans
  - Works with other ICS sections to coordinate resources
  - Coordinates with technical experts and liaison officers
  - Maintains documentation and situation status

Scope of Practice: ICS Participation

EMT Level:

- Function within assigned roles in ICS structure
- Report to designated supervisor
- Maintain accountability and track resources
- Understand basic ICS principles and terminology

AEMT Level:

- All EMT responsibilities plus:
- May serve in leadership roles for medical groups
- Coordinate with other agencies and sections
- Provide input for planning and resource needs

Critical Boundary: Incident Commander role typically requires additional certification and experience beyond AEMT level

24.6 Triage Systems

24.6.1 START Triage (Simple Triage and Rapid Treatment)

- **Triage Tags:**
  - **Red:** Immediate, life-threatening injuries requiring immediate care
  - **Yellow:** Serious but not immediately life-threatening
  - **Green:** Walking wounded with minor injuries
  - **Black:** Deceased or unsalvageable
- **Steps:**
  - **Step 1:** Direct ambulatory patients to a designated area (Green)
  - **Step 2:** Assess respiratory status; adjust airway once if not breathing. If breathing does not start, tag Black. If breathing starts or is present, continue assessment
  - **Step 3:** Check radial pulse or capillary refill; absent pulse or capillary refill >2 seconds tags the patient as Red
  - **Step 4:** Conduct mental assessment; inability to follow simple commands results in Red tag. Able to follow commands results in Yellow tag

JumpSTART Triage (for pediatrics <8 years or <100 lbs)

- Modified START system for pediatric patients
- **Key Differences:**
  - Assess pulse and provide **5 rescue breaths** if apneic before tagging Black
  - Respiratory rate outside **15-45 breaths/min** results in Red tag
  - Mental status: "P" (responds to pain) or "U" (unresponsive) = Red; "A" (alert) or "V" (responds to voice) = Yellow
  - Follow commands or appropriate pain localization results in Yellow tag

Emergency Mindset: Triage Priorities

- **Speed Over Perfection:** START triage should take 30-60 seconds per patient maximum
- **Don't Stop to Treat:** Triage first, treat second - resist the urge to stop and provide care
- **Retriage Regularly:** Patient conditions change - yellow can become red quickly

24.7 Reverse Triage

- **Used only during lightning strike incidents**
- Treat patients in **cardiac arrest first**, as those who are conscious are less likely to deteriorate
- Lightning victims in cardiac arrest may be successfully resuscitated if treated promptly
- Conscious victims typically have stable cardiac function despite other injuries

24.8 Hazardous Materials (HAZMAT)

24.8.1 Hazard Classes (EGLSOPRCO Mnemonic)

- **E** - Explosives
- **G** - Gases (compressed, liquefied, or dissolved)
- **L** - Flammable Liquids
- **S** - Flammable Solids
- **O** - Oxidizers and Organic Peroxides
- **P** - Poisons (Toxic Materials)
- **R** - Radioactive Materials
- **C** - Corrosive Materials
- **O** - Other/Miscellaneous Hazardous Materials

24.8.2 DOT Emergency Response Guidebook (ERG)

- A resource for first responders during initial phase of HazMat incidents
- Provides information on potential hazards and emergency response actions
- Uses identification numbers and placards to identify materials

24.8.3 Material Safety Data Sheets (MSDS)

- Required in facilities using or storing chemicals
- Contain detailed information about chemical composition, hazards, and handling procedures
- Include first aid measures and emergency response information

24.8.4 Shipping Papers

- Required during transport of hazardous materials
- Include material identification, quantity, and addresses of shipper and receiver
- Must be accessible to emergency responders

24.9 Nerve Agent Exposure

24.9.1 SLUDGEM Mnemonic

- **S** - Salivation (excessive drooling)
- **L** - Lacrimation (tearing)
- **U** - Urination
- **D** - Defecation
- **G** - Gastric upset
- **E** - Emesis (vomiting)
- **M** - Miosis (pinpoint pupils) and Muscle spasms

24.9.2 Treatment

- Use **Mark 1 Kit** or **DuoDote Kit** containing:
  - **2 mg atropine** (blocks acetylcholine receptors)
  - **600 mg pralidoxime chloride (2-PAM)** (reactivates cholinesterase)
- Decontamination is critical before treatment
- Multiple doses may be required for severe exposure

24.10 Toxic Agents

24.10.1 Cyanide

- Metabolic agent that impairs cellular oxygen utilization
- Characteristic **almond odor** (not everyone can detect this)
- Causes rapid onset of symptoms including confusion, seizures, and cardiac arrest
- Treatment includes cyanide antidote kit and supportive care

24.10.2 Ricin

- Derived from castor beans
- Highly toxic if inhaled or ingested
- No antidote available; treatment is supportive
- Symptoms include respiratory distress, nausea, and vascular collapse

24.11 Types of Radiation

- **Alpha Radiation:**
  - Least harmful externally; stopped by clothing or skin
  - Dangerous if inhaled or ingested
  - Cannot penetrate intact skin
- **Beta Radiation:**
  - Slightly more penetrating than alpha
  - Requires clothing for protection
  - Can cause skin burns with prolonged exposure
- **Gamma Rays:**
  - Penetrates human tissue deeply
  - Requires lead or thick concrete for protection
  - Most dangerous form of external radiation
- **Neutron Particles:**
  - Most powerful and penetrating
  - Penetrate lead
  - Require several feet of concrete for shielding

Application Check: EMS Operations

Scenario: During a multi-casualty incident, you encounter a patient with absent radial pulse but present carotid pulse, respiratory rate 32, who follows simple commands. Using START triage, what category does this patient fall into?

- A) Green (Minor)
- B) Yellow (Delayed)
- C) Red (Immediate)
- D) Black (Deceased)

See Appendix A for answers and explanations.

Section 25 — Bonus - Must-Know Calculations and Charts

25.1 Glasgow Coma Scale (GCS)

- **Purpose:** Assess level of consciousness after head injury or neurologic emergency
- **Maximum Score:** 15 (best response)
- **Minimum Score:** 3 (worst response)
- **Interpretation:**
  - 13-15: Mild brain injury
  - 9-12: Moderate brain injury
  - 3-8: Severe brain injury (coma)

25.1.1 Eye Opening Response (Maximum 4 Points)

- **4 Points:** Spontaneous - eyes open without stimulation
- **3 Points:** To voice - eyes open in response to verbal command
- **2 Points:** To pain - eyes open only to painful stimuli
- **1 Point:** No response - eyes remain closed regardless of stimulation

25.1.2 Verbal Response (Maximum 5 Points)

- **5 Points:** Oriented - knows who they are, where they are, and the date
- **4 Points:** Confused conversation - responds to questions but answers are confused
- **3 Points:** Inappropriate words - random or inappropriate words
- **2 Points:** Incomprehensible sounds - moans or groans only
- **1 Point:** No response - no verbal output at all

25.1.3 Motor Response (Maximum 6 Points)

- **6 Points:** Obeys commands - follows simple instructions (e.g., "squeeze my hand")
- **5 Points:** Localizes pain - purposeful movement toward painful stimulus
- **4 Points:** Withdraws from pain - pulls limb away from painful stimulus

- **3 Points:** Abnormal flexion (decorticate posture) - arms flex toward chest, toes pointed
- **2 Points:** Abnormal extension (decerebrate posture) - arms extend away from body, palms down, toes pointed
- **1 Point:** No response - no motor response to painful stimuli

Emergency Mindset: Using GCS

- **Trending Matters:** A declining GCS is more concerning than a single low score
- **Document Fully:** Record all three component scores (e.g., E3V4M5 = 12) not just the total
- **Critical Threshold:** GCS ≤8 typically indicates need for airway protection/ intubation

25.2 APGAR Scoring

- **Purpose:** Rapid assessment of newborn health at 1 and 5 minutes after birth
- **Maximum Score:** 10 (best condition)
- **Minimum Score:** 0 (worst condition)
- **Timing:** Assessed at 1 minute and 5 minutes post-delivery (sometimes at 10 minutes if initial scores are low)
- **Interpretation:**
  - 7-10: Normal, infant is doing well
  - 4-6: Moderately abnormal, may need resuscitation
  - 0-3: Critically low, immediate resuscitation required

25.2.1 APGAR Components (Use "APGAR" Mnemonic)

25.2.2 A - Appearance (Skin Color)

- **2 Points:** Entire body is pink (normal color)
- **1 Point:** Body is pink, but hands and feet remain blue (acrocyanosis)
- **0 Points:** Entire body is pale, blue, or gray

25.2.3 P - Pulse (Heart Rate)

- **2 Points:** Heart rate greater than 100 beats per minute
- **1 Point:** Heart rate less than 100 beats per minute
- **0 Points:** No pulse detected

25.2.4 G - Grimace (Reflex Irritability)

- **2 Points:** Vigorous cry, cough, sneeze, or strong withdrawal when stimulated
- **1 Point:** Weak cry, grimace, or minimal response to stimulation
- **0 Points:** No response to stimulation

25.2.5 A - Activity (Muscle Tone)

- **2 Points:** Active spontaneous movement, good muscle tone, resists straightening of limbs
- **1 Point:** Some flexion of arms and legs, weak resistance to straightening
- **0 Points:** Limp, floppy, no muscle tone

25.2.6 R - Respirations (Breathing Effort)

- **2 Points:** Strong, lusty cry with good respiratory effort
- **1 Point:** Slow, irregular breathing, weak cry
- **0 Points:** Absent respirations, apnea

Scope of Practice: APGAR Scoring

EMT Level:

- Calculate APGAR score at appropriate intervals
- Recognize need for neonatal resuscitation based on score
- Provide basic newborn care (warming, drying, stimulation)
- Initiate CPR if heart rate <60 bpm despite interventions

AEMT Level:

- All EMT skills plus:
- Advanced assessment and interventions for distressed newborns
- IV access if needed per protocol

Critical Boundary: Advanced neonatal resuscitation including intubation and medication administration requires paramedic or physician-level care

25.3 Rule of 9's for Burn Surface Area Estimation

- **Purpose:** Quickly estimate percentage of body surface area (BSA) affected by burns
- **Clinical Significance:** Burns covering >15-20% BSA in adults (>10% in children) require fluid resuscitation
- **Alternative Method:** The patient's palm (including fingers) represents approximately 1% BSA

25.3.1 Adults (Rule of 9's)

- **Head and Neck:** 9%
- **Front Torso:** 18%
- **Back Torso:** 18%
- **Each Arm:** 9% (total both arms = 18%)
- **Groin:** 1%
- **Each Leg:** 18% (total both legs = 36%)
- **Total:** 100%

25.3.2 Children (Rule of 9's - Modified)

- **Head and Neck:** 12%

- **Front Torso:** 18%
- **Back Torso:** 18%
- **Each Arm:** 9% (total both arms = 18%)
- **Groin:** 1%
- **Each Leg:** 16.5% (total both legs = 33%)
- **Total:** 100%

25.3.3 Infants (Rule of 9's - Modified)

- **Head and Neck:** 18% (larger proportion due to bigger head relative to body)
- **Front Torso:** 18%
- **Back Torso:** 18%
- **Each Arm:** 9% (total both arms = 18%)
- **Groin:** 1%
- **Each Leg:** 13.5% (total both legs = 27%)
- **Total:** 100%

Emergency Mindset: Burn Assessment

- **Only Count Partial and Full Thickness:** Don't include superficial (first-degree) burns in BSA calculation
- **Circumferential Burns:** Burns encircling limbs or torso are high-risk for compartment syndrome
- **Critical Areas:** Face, hands, feet, genitals, and major joints require specialist burn center care

25.4 Parkland Burn Formula for Fluid Resuscitation

- **Purpose:** Calculate fluid requirements for burn patients in the first 24 hours
- **Used For:** Patients with partial-thickness or full-thickness burns covering >15-20% BSA
- **Fluid Type:** Lactated Ringer's (LR) solution is preferred

25.4.1 The Formula

- **Total Volume (mL) = 4 mL × Patient Weight (kg) × % BSA Burned**

- **Administration Schedule:**
  - **First 8 hours:** Give 50% (half) of total calculated volume
  - **Next 16 hours:** Give remaining 50% (half) of total volume
- **Important Note:** The 8-hour period starts at the time of the burn injury, NOT when treatment begins

25.4.2 Example Calculation #1

- **Patient:** 70 kg adult with 30% BSA burns
- **Calculation:** 4 mL × 70 kg × 30 = 8,400 mL total over 24 hours
- **Administration:**
  - First 8 hours: 4,200 mL (525 mL/hour)
  - Next 16 hours: 4,200 mL (262.5 mL/hour)

25.4.3 Example Calculation #2

- **Patient:** 75 kg adult with 45% BSA burns
- **Calculation:** 4 mL × 75 kg × 45 = 13,500 mL total over 24 hours
- **Administration:**
  - First 8 hours: 6,750 mL (843.75 mL/hour)
  - Next 16 hours: 6,750 mL (421.875 mL/hour)

25.4.4 Example Calculation #3

- **Patient:** 50 kg child with 25% BSA burns
- **Calculation:** 4 mL × 50 kg × 25 = 5,000 mL total over 24 hours
- **Administration:**
  - First 8 hours: 2,500 mL (312.5 mL/hour)
  - Next 16 hours: 2,500 mL (156.25 mL/hour)

Scope of Practice: Burn Fluid Resuscitation

EMT Level:

- Recognize burns requiring fluid resuscitation
- Begin transport to appropriate burn center
- Cannot initiate IV fluid therapy (outside scope)

AEMT Level:

- All EMT skills plus:
- Establish IV access with large-bore catheters
- Calculate Parkland formula requirements
- Initiate fluid resuscitation per protocol
- Adjust rates based on urine output and clinical response (if protocol allows)

Critical Boundary: The Parkland formula is a starting guideline - hospital providers will titrate fluids based on urine output (goal: 0.5-1 mL/kg/hour in adults)

Emergency Mindset: Burn Resuscitation

- **Time Matters:** The clock starts at time of burn injury, not arrival time - adjust volumes if delayed
- **Two Large IVs:** Establish at least two large-bore IV lines in unburned tissue if possible
- **Don't Delay Transport:** Begin fluid resuscitation en route to burn center, don't delay for IV starts

Application Check: Must-Know Calculations

Scenario: You respond to a house fire where an 80 kg male patient has sustained burns to his entire front torso, both arms, and his head and neck. He is alert and oriented but in significant pain. What is his estimated %BSA burned, and how much fluid should he receive in the first 8 hours per the Parkland formula?

- A) 36% BSA; 5,760 mL in first 8 hours
- B) 45% BSA; 7,200 mL in first 8 hours
- C) 54% BSA; 8,640 mL in first 8 hours
- D) 27% BSA; 4,320 mL in first 8 hours

See Appendix A for answers and explanations.

Appendix A - Mini-Quiz Answer Key

Section 1 - EMS Systems

Answer: B) Apply implied consent and begin treatment

Explanation: Unconscious patients with life-threatening conditions receive care under implied consent—we assume they would consent if able. Verbal statements from family members don't override this unless accompanied by valid legal documentation like a DNR order or healthcare power of attorney.

Section 2 - Safety and Wellness

Answer: C) N95 respirator and standard precautions

Explanation: Three-week productive cough with night sweats and fever in a congregate setting screams tuberculosis until proven otherwise. N95 respirators are required for airborne precautions to protect you from TB exposure.

Section 3 - CPR

Answer: C) Resume compressions after AED completes its analysis

Explanation: Never interfere with AED rhythm analysis—it needs a still chest to accurately detect shockable rhythms. Once analysis is complete, immediately resume compressions to minimize total hands-off time.

Section 4 - Choking Management

Answer: C) Remove the visible object and start CPR

Explanation: When a choking infant becomes unresponsive, immediately transition to CPR. Remove any visible foreign body (never blind sweep), then start chest compressions—they provide circulation and may help dislodge the obstruction.

Section 5 - Med-Legal

Answer: B) Request law enforcement assistance to secure the scene

Explanation: Scene safety always comes first. When a patient threatens violence, you need law enforcement to secure the scene before providing care. This isn't abandonment—you're ensuring everyone's safety while maintaining your duty to act.

💡 You've got the answers. Now see why choices attracted you across these five. Objective-by-objective tracking at **MedEdPrep.com**

Section 6 - Communication

Answer: D) "The situation is very serious"

Explanation: Be honest without giving false hope or violating patient privacy. Acknowledge the severity while avoiding specific clinical details that should come from the hospital team. Never say "she'll be fine" when you don't know the outcome.

Section 7 - Airway Management

Answer: B) Reposition the head and attempt ventilation again

Explanation: When ventilation fails, the most common cause is improper head positioning. Reposition using head-tilt chin-lift (or jaw thrust if trauma suspected) and attempt again before moving to adjuncts or other interventions.

Section 8 - Ventilation and Oxygenation

Answer: B) Assist ventilations with bag-valve mask

Explanation: Respiratory rate of 6 with poor tidal volume means this patient isn't moving enough air to sustain life. Active ventilation assistance is the immediate priority—passive oxygen won't fix inadequate respiratory effort.

Section 9 - Circulation and Shock

Answer: B) Hypovolemic shock from internal bleeding

Explanation: Trauma + signs of shock + no external bleeding = internal hemorrhage until proven otherwise. The presentation (tachycardia, hypotension, confusion, pale cool skin) indicates compensated shock from volume loss.

Section 10 - Bleeding Control

Answer: C) Apply a tourniquet proximal to the injury

Explanation: Current hemorrhage control protocols emphasize early tourniquet use for life-threatening extremity bleeding. When direct pressure fails on severe arterial bleeding, apply the tourniquet immediately—don't waste time with pressure points.

Section 11 - Trauma Assessment

Answer: C) Rapid trauma assessment

Explanation: Ejection from a vehicle is a significant mechanism of injury that requires full trauma assessment regardless of patient complaints. Stable vitals and minor complaints don't rule out serious internal injuries in high-energy trauma.

Section 12 - Medical Emergencies

Answer: A) Blood glucose level

Explanation: Hypoglycemia is the great stroke mimic. Always check blood glucose first before activating stroke protocols—it's a treatable condition that presents identically to stroke but requires completely different management.

Section 13 - Pharmacology

Answer: C) Recent phosphodiesterase inhibitor use

Explanation: Viagra, Cialis, and similar medications combined with nitroglycerin can cause catastrophic hypotension. This is an absolute contraindication—always ask about ED medications taken in the last 24-48 hours before assisting with nitroglycerin.

Section 14 - Obstetrics and Pediatrics

Answer: A) Deliver on scene and transport to nearest hospital

Explanation: When you see crowning, delivery is imminent—you cannot and should not attempt to delay it. Deliver on scene, provide immediate newborn care, then transport mother and baby to the closest appropriate facility.

Section 15 - Respiratory Emergencies

Answer: C) Pulmonary embolism

Explanation: Sudden severe dyspnea with clear lung sounds and unilateral leg swelling (indicating DVT) is classic for pulmonary embolism. The clear lungs rule out most respiratory causes, and the leg swelling provides the smoking gun.

Section 16 - Cardiovascular Emergencies

Answer: C) Supplemental oxygen therapy

Explanation: Current AHA guidelines state that supplemental oxygen is contraindicated in chest pain patients with SpO2 ≥94%. There's no benefit and potential harm from hyperoxia in MI patients who aren't hypoxic.

Section 17 - Neurological Emergencies

Answer: B) Time since symptom onset

Explanation: Time is brain. Stroke patients are only eligible for clot-busting drugs within specific time windows, so last-known-well time determines which hospital can provide appropriate treatment. This drives your transport destination decision.

Section 18 - Hematology

Answer: A) Application of cold packs to painful joints

Explanation: Cold causes vasoconstriction which worsens sickling and increases pain in sickle cell crisis. Keep the patient warm, provide oxygen, and manage pain—never apply ice to a sickle cell patient.

Section 19 - Toxicological Emergencies

Answer: B) Ventilation assistance with BVM

Explanation: ABCs always come first. With a respiratory rate of 4 and cyanosis, this patient is dying from hypoxia right now. Support ventilations immediately to correct the life-threatening problem, then administer naloxone.

Section 20 - OB/GYN

Answer: A) Placental abruption

Explanation: Trauma + severe constant pain + dark bleeding + rigid abdomen + shock = placental abruption. This is a true obstetric emergency where the placenta separates from the uterine wall, causing life-threatening hemorrhage for both mother and baby.

Section 21 - Trauma

Answer: B) Stabilization with bulky dressing

Explanation: Paradoxical chest movement indicates flail chest. Support the flail segment with bulky dressings to reduce pain and improve ventilation—never use circumferential binding as it restricts chest expansion. Provide oxygen and rapid transport.

Section 22 - Environmental Emergencies

Answer: B) Heat cramps

Explanation: Alert and oriented patient with normal vital signs, profuse sweating, and severe muscle cramps after heat exposure equals heat cramps—the mildest heat illness. The hot, moist skin and normal mental status rule out heatstroke.

Section 23 - EMS Operations

Answer: C) Red (Immediate)

Explanation: In START triage, absent radial pulse automatically makes the patient Red (Immediate) regardless of mental status. Absent radial pulse indicates shock and compromised perfusion requiring immediate intervention.

Bonus - Must-Know Calculations and Charts

Scenario: Burn BSA and Parkland Formula Calculation

Correct Answer: B) 45% BSA; 7,200 mL in first 8 hours

Explanation: Using adult Rule of 9's: Entire front torso = 18% (chest 9% + abdomen 9%), both arms = 18% (9% each), head and neck = 9%. Total = 45% BSA burned. Parkland formula: 4 mL × 80 kg × 45 = 14,400 mL total in 24 hours. First 8 hours = half of total = 7,200 mL.

Step-by-step calculation:

- Front torso: 18% (9% chest + 9% abdomen)
- Both arms: 18% (9% left + 9% right)
- Head and neck: 9%
- Total BSA: 18% + 18% + 9% = 45%
- Parkland formula: 4 mL × 80 kg × 45 = 14,400 mL total
- First 8 hours: 14,400 ÷ 2 = 7,200 mL
- A) 36% BSA incorrectly excludes either the arms or head—must count all burned areas
- C) 54% BSA incorrectly includes the back or uses wrong percentages—only front torso specified
- D) 27% BSA significantly underestimates the burned surface area

A Final Word

This guide was built from years of teaching, learning, and refining. Every page reflects lessons tested in classrooms, in conversations with students, and in the field. It's not perfect—because EMS isn't perfect. Medicine evolves, education evolves, and so will this guide.

Our hope is that you make it your own. Highlight it. Add notes. Challenge it. Improve it. What you're holding is a foundation, not a finish line.

Thank you for being part of its history. With every student who studies here, the guide grows stronger. May your journey be smoother than ours was, and may those who come after you find the path even clearer.

— The MedEdPrep Team