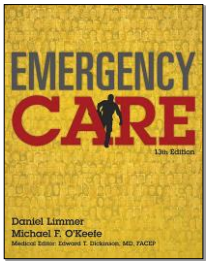
Emergency Care

THIRTEENTH EDITION



CHAPTER 38

Highway Safety and Vehicle Extrication

Highway Emergency Operations

Highway accidents are one of the greatest hazards emergency responders face today.

Highway Emergency Operations

- Responding agencies and personnel need to be cognizant of their responsibilities in these types of hazardous environment.
- EMS response should be limited to only the manpower and vehicles needed to accomplish the mission.

Highway Emergency Operations

- The first-arriving unit should institute "blocking" to protect the work area.
  - Preferably fire apparatus
- If it is necessary to block lanes of traffic, clear them quickly as possible so flow of traffic can return to normal.

Initial Response

- Limited access highways
  - Only primary or first-due units should proceed directly to scene.
- On-scene units
  - Park single file in same direction to minimize on-scene congestion.

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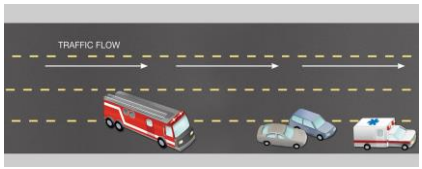
Initial Response

- First-arriving units should:
  - Establish Command and confirm exact location of incident with dispatch center.
  - Use apparatus to institute "upstream blocking" to protect work area.
  - Rescue trucks arriving to perform extrication should be positioned downstream of initial blocking vehicle.

Position Blocking Apparatus

- Create 1.5 to 2 lanes of blockage.
- Position apparatus at angle with front wheels rotated away from incident.



Position Blocking Apparatus

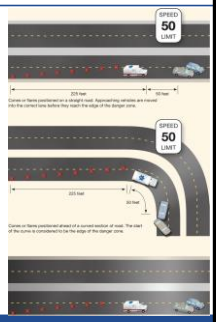
- Positioning the other apparatus
  - Leave space immediately next to crash for vehicle extrication units.
  - Position ambulances, command vehicles, and other units downstream from crash.
    - Allows safer patient loading and rapid departure from scene

Exiting the Vehicle Safety

- Responders should always exit into the safe zone, if possible, after checking to be sure traffic has stopped.
- Be alert for oncoming traffic.

Be Seen and Warn Oncoming Traffic

- Place flares or traffic cones to slow traffic and channel away from incident.



Night Operations

- Shut off vehicle's headlights and white response lights.
- Best combination of lights to provide maximum visibility
  - Red/amber warning lights—on
  - Headlights—off
  - Fog lights—off
  - Traffic directional boards operating

Think About It

- Is it safe to enter the highway scene?
- Which units are necessary?

Vehicle Extrication

Phases of Vehicle Extrication

- Preparing for rescue
- Sizing up the situation
- Recognizing and managing hazards
- Stabilizing vehicle prior to entering
- Gaining access to patient
- Assess ABC's & rapid trauma assessment
- Disentangling patient
- Immobilizing and extricating patient
- Transport to most appropriate hospital
- Terminating the rescue

Preparing for Rescue

- Combination of training, practice, and the right protective gear and tools
- Availability of training will depend on the kinds of rescues most likely to be required in your area.

Sizing Up the Situation

- Conduct a good size-up to evaluate hazards and address need for additional resources.
  - How many patients are involved, their priority, and MOI?
  - Are additional ambulances needed?
  - What is extent of patient's entrapment?

Think About It

- What does scene size-up tell me about the need for extrication?

TABLE 38-1 Supplies and Equipment for Vehicle Stabilization and Gaining Access

Quantity	Item
10	2" × 4" × 8" cribbing
10	4" × 4" × 18" cribbing
4	Step chocks
6	Wood wedges
2	Vehicle wheel chocks
100 feet	Nylon ½" utility rope
2 sets	Struts
1	Door-and-window kit with hand tools
1	pair, battery pliers
1	12" adjustable wrench
1	3- or 4-pound drilling hammer

Recognizing and Managing Hazards

- Protective gear for EMS responders
  - At a crash any personnel working in the "inner circle" should wear full protective gear to avoid being injured.
  - If your service does not provide protective gear, then get your own.
  - Use your protective gear!

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Recognizing and Managing Hazards

- Protective gear for EMS responders
  - Working in traffic
    - Wear helmet.
    - Wear ANSI safety vests to enhance visibility.
    - Eye protections
    - Hand protection
    - Body protection

Recognizing and Managing Hazards

- Protective gear for EMS responders
  - During extrication operations
    - Increased risk of exposure to flame, glass, fluids, and sharp objectives
    - Best practice to wear EMS or firefighter turnout clothing including helmet and eye protection
  - Matching the level others are wearing
    - Look at other workers in the industry.

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Complex Access

Complex access involves the use of tools and equipment to reach and extricate the patient. © *Edward T. Dickinson, MD*

Safeguarding Your Patient

- To protect your patient, you should have:
  - Aluminized rescue blanket
  - Lightweight tarp
  - Wool blanket
  - Short and long spine boards
  - Hard hats, safety goggles, industrial hearing protectors, disposable dust masks, and thermal masks
  - Emotional support for the patient

Managing Traffic

- Use ambulance and its warning lights as first form of traffic control
- Position other warning devices as soon as possible
- Using flares for traffic control
  - Look for and avoid spilled fuel, dry vegetation, other combustibles, especially at a road edge.
  - Do not throw out of moving vehicles.

Supplemental Restraint Systems: Air Bags

- Air bags designed to inflate on impact, dissipate kinetic energy, minimize trauma to body
- Creates "smoke" in vehicle
  - Cornstarch and talcum powder (and sometimes sodium hydroxide)
- Watch for an air bag that remains undeployed after a crash.

Energy-Absorbing Bumpers

- If the bumpers were involved in the collision, you may notice that the bumper's shock absorber system is compressed, or "loaded."
- Never stand in front of a loaded bumper.
  - Diagonal or perpendicular instead
- Chain the shock absorber to prevent an uncontrolled release.

Spectators

- May interfere with rescue and emergency care efforts in addition to traffic.
- If policies permit, ask responsible-looking bystanders to keep spectators away.
  - Give barricade tape.
  - Do not put in unsafe positions.
  - You may be held liable in adverse event.

Electrical Hazards

- High voltage lines common
- Assume entire area around exposed wire dangerous.
  - Conductors may have touched and energized.
- Ordinary protective clothing gives no protection against electrocution.

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Electrical Hazards

- Broken utility pole with wires down
  - Very dangerous
  - Set up a large safety zone.
  - Advise power company of location and pole number (nearest safe one).
  - Do not attempt to move downed wires.
  - Stand in a safe place until power company disconnects the power or cuts the wire.

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Electrical Hazards

- Broken utility pole with wires intact
  - Park the ambulance outside danger zone.
  - Notify your dispatcher of the situation.
  - Stay outside the danger zone until power company representatives can de-energize the conductors and stabilize the pole.
  - Keep spectators and other emergency service personnel out of danger zone.

Electrical Hazards

- Damaged pad-mounted transformer
  - Request an immediate power company response.
  - Do not touch either the transformer case or a vehicle touching it.
    - Warn other emergency personnel.
  - Stand in a safe place until the power company de-energizes it.
  - Keep spectators out of the danger zone.

Vehicle Fires

- Small fires
  - 15- or 20-pound class A:B:C dry chemical fire extinguisher extinguishes almost anything burning.

Fire in the Engine Compartment

Do not attempt extinguishment unless hood fully open

Vehicle Fires

- Fire in the passenger compartment or trunk
  - Apply extinguisher sparingly until occupants can be freed.
  - If in trunk, apply same principles as engine compartment fire.
- Fire under the vehicle
  - Sweep from under the passenger compartment

Vehicle Fires

- Truck fires
  - A:B:C extinguisher
  - Burning truck tires are especially dangerous.
    - Never stand directly in front of one.
    - Flames can spread to cargo or the tires can explode.

Disabling a Vehicle's Electrical System

- Remember that many cars have electrically powered door locks, window operators, and seat adjustment mechanisms.
- Disconnect the **negative** cable from the battery.

Stabilizing a Vehicle

- Vehicle on its wheels
  - Turn off engine.
  - Step-chock 3 sides.

Stabilizing a Vehicle

- Vehicle on its side
  - Stabilize with ropes, cribbing, or stabilizer bars.
- Vehicle on its roof
  - Utilize 4 × 4 wood blocks to build crib box.

Gaining Access

- Simple access
  - Check if door or window can be opened.
  - "Try before you pry."
- Complex access
  - Utilize tools and equipment.
  - Break glass in side or rear window as far from passengers as possible.

Disentanglement: A Three-Part Action Plan

- Steps one and two: gain access by disposing of doors and the roof
  - Makes vehicle interior accessible
  - Creates large exit
  - Provides fresh air and helps cool heated patient
  - Quick access to critical patient can improve survivability and perhaps decrease morbidity

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Disentanglement: A Three-Part Action Plan

- Step three: disentangle occupants by displacing the front end
  - Easily accomplished with heavy duty jacks and hacksaws
  - Do not cut steering column or airbag wiring; may cause unexpected firing.

Rapid Extrication Video

Click on the screenshot to view a video on rapidly extricating patients from a vehicle.

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Chapter Review

Chapter Review

- Remember, highway operations are *high risk*. Take these precautions:
  - Wear high-visibility garments.
  - Position the ambulance for blocking until fire apparatus arrives. Then positions ambulances "downstream" in a safe zone.
  - Reduce lighting that may blind passing drivers.
  - Avoid crossing traffic lanes with patients.

Chapter Review

- Scene size-up is key - How many patients are there? What is the triage status? Are additional resources needed?
- Protect yourself. Look out for:
  - Traffic
  - Un-deployed airbags
  - Loaded bumpers
  - Sharp metal

Chapter Review

- Match the level of PPE being worn by other public safety responders.
- Ensure scene safety:
  - If wires are down, keep spectators back.
  - Make sure the vehicle is stable.
- First try simple means to gain access.
- Protect your patient during the extrication process.

Remember

- Highway response is a significant safety hazard for EMTs. Specific safety planning and procedures must be utilized to keep responders safe.
- Responding units should evaluate need for further units, institute "blocking" to protect work area, and always exit apparatus into safe zone.

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Remember

- Use protective equipment and warning devices.
- Vehicle extrication often requires specialized training and resources. Know local resources and procedure for activating those resources.

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Remember

- Determine extrication resources needed and patient extrication priority through thorough scene size-up.
- Extrication can pose a variety of threats. Evaluate the scene carefully and employ safety procedures.

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Remember

- Gaining access to patients frequently requires mechanical and technological assistance. Always start simply and escalate only when simple measures fail.

Questions to Consider

- What is the best access for my unit?
- Where should I park the apparatus?
- Does the vehicle need to be stabilized?

Critical Thinking

- The highway crash you are dispatched to is a seven-car pile-up. Your unit is first on the scene. What steps are required that are different from those for a crash involving one car striking a tree?