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BY ROMMIE L. DUCKWORTH

GOOD VEHICLE EXTRICATION DEMANDS rescuers’ expertise with an ever-changing set of tools and techniques to adapt to constant updates in vehicle materials and design. Great vehicle extrication combines this with collaboration between rescue and emergency medical personnel and integration of rescue strategy and tactics with best practices in trauma care to ensure the best patient outcomes. For the best extrication teams, this collaboration extends to everyone from incident commander (IC), rescue boss, and extrication technician to primary care provider and support personnel.1,2

Although many calls for extrication involve straightforward tactics and simple emergency medical service (EMS) care, the situation can quickly become challenging when resources are scarce and responders are called to perform many different roles on scene, often splitting rescue efforts from EMS care. For calls that involve subtle or obvious life threats, it is easy, as personnel shift from one role to another, to become overly focused on “tools and tasks,” a form of tunnel vision that may result in perfectly executed cuts, pushes, spreads, and rolls while leaving patient care to whatever way EMS personnel can work around the rescue team.

COMPREHENSIVE APPROACH

A comprehensive approach to extrication that can help responders avoid tunnel vision is to integrate EMS aspects using the following five steps.

• Arrival—Approaching the scene. As you approach and arrive on scene, you know that a good size-up can determine how well the rest of the call goes.3 On arrival, it isn’t just the first-arriving unit or the IC who does a size-up. Although they may not relay it over the radio, every responder should perform a personal size-up to identify dangers on scene as well as the best way to integrate their roles in the extrication operation.4 This is the very essence of the concept of crew resource management.5

There are many mnemonics for extrication size-up. One that is easy to use on virtually any scene is “CAN DO”:

- Conditions: What are the first things you see?
- Actions: What is the next thing you are going to do?
- Needs: What do you need to do it?
- Dangers: What hazards might stop you from doing it?
- Orders: What do you tell other people to help you?

This simple mnemonic can aid responders in identifying what is going on on scene and what they are going to do about it.

The next step is to establish or integrate with command and control on scene.6 A near infinite number of roadway incidents and ways to respond to them exist, but responders will typically begin by defining zones and defining roles. (1, 2) They may not always be visually defined by cones, flares, or scene tape, but even basic extrications will have Hot, Warm, and Cold zones. Just as with hazardous materials incidents, extrication Hot, Warm, and Cold zones define the level of hazards in an area as well as the training and protective equipment responders will need to operate there. Responders who are not trained or equipped to operate in the extrication Hot zone should leave care to those who are.

Responders also need to determine what roles need to be filled at the scene, such as rescue boss, rescue tech, inside EMS, outside EMS, support, and so on. Exact titles and roles will vary from incident to incident and agency to agency, but what does not change is that all responders must know their own role and how they are going to interact with the roles immediately around them.

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• **Access—Putting EMS personnel in contact with the patient.** It can be tempting to “jump in” right away, but you need to ensure that certain initial actions have been accomplished so that every extrication can proceed efficiently and safely. (4)

Different departments may have different policies and procedures; however, the responder gaining access should accomplish or verify the following general tasks: Check around the vehicle (outer circle, inner circle, plus above and below) and mitigate immediate hazards (photo 1).

- Stabilize the suspension, and chock/set the brake.
- Put power doors, seats, windows, steering wheels, and so on in the optimal position.
- Kill the vehicle ignition and remove the key.
- Turn the headlights off and the hazards on.
- Disconnect the battery and, in the cases of electric or hybrid vehicles, shut off the high-voltage disconnect, or pull the fuse as appropriate.

Once these initial actions have been completed, the inside EMS providers will make initial contact with the patient or patients inside the vehicle. The extent of contact will depend on the extent and nature of the damage and the position of the vehicle. In fact, the inside EMS provider may never actually enter the vehicle and may only interact with patients by reaching through openings. However it has to be accomplished, the inside EMS provider who makes direct contact with the patient communicates with him; protects him from further injury; assesses the injuries; provides immediate lifesaving treatment; and, if possible, stays with the patient throughout transport. (4)

Another important job of the inside EMS provider is to report back to the person in charge of the extrication portion of the incident (who, for the purposes of this article, we will call the “rescue boss”) the nature of the patient’s injuries and the treatment needs, including a recommendation for fast or slow removal from the vehicle. Immediate life threats such as Massive hemorrhage, Airway difficulties, Respiratory emergencies, Circulation problems, or significant Hypothermia (MARCH) will necessitate immediate patient removal; assessment findings such as patient paralysis, significant neck or back pain, severe angulation of an extremity, impalement, significant crush injury, or the need for pain management or other medication administration will require a slow and careful removal. (7)

As with every other aspect of fireground operations, clear and concise communications are the key to effective action. One way the inside EMS provider can quickly relay key information on the patient is with CAN reports—**Condition**, the **Actions** the inside EMS provider is attempting, and what the inside EMS provider will **Need** to accomplish these actions. (8)

This information will enable the rescue boss to choose the best strategy and tactics for the extrication and the outside EMS providers and support personnel to know what they can do to assist in the care and removal of the patient.

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**ACTION: INITIAL EMERGENCY CARE**

While many incidents will require only basic supportive EMS care for the patient, some incidents will require delivery of immediate life-saving interventions. The rescue boss’s extrication plan should consider and assist with immediate medical priorities. This plan often can be rapidly implemented by nonadvanced life support (ALS) responders (inside and outside EMS providers) even when no ALS responders are trained and equipped to operate in the Hot zone. These immediate medical priorities can be summarized by the phrase “MARCH Straight Forward to Trauma Care!”

• **MARCH**

A responder’s first priority must be to deal with the problems that are most threatening to a patient’s life. These conditions can kill a patient quickly, but first responders can deal with virtually all of them in the first few moments of patient contact. (9)

- **Massive Hemorrhage**

To control excessive bleeding, responders must follow the “5 D’s”: Detect (find the source); Direct pressure (compress the bleeding site); Devices (use equipment such as tourniquets, clot-
ting gauze, pressure bandages, and clamps to free responders’ hands; and Don’t Dilute (if you can obtain an intravenous (IV), don’t water down the patient’s blood) (photo 2).

• **Airway Difficulties**

  Management of airway emergencies during extrication should begin with basic life support (BLS) oral or nasal airways and suction and proceed to devices such as supraglottic airways, endotracheal intubation (ETI) (including video laryngoscopy and special techniques such as “ice pick” front-facing ETI) and cricothyrotomy, as needed and as a provider’s certification permits.10

• **Respiratory Emergencies**

  Management of immediately life-threatening respiratory emergencies may include assisting a patient’s breathing with bag-valve mask (BVM) ventilation; dealing with a flail chest; sealing a sucking chest wound; and, for ALS providers, de-compressing a tension pneumothorax. If a patient’s breathing is physically compromised by pressure from the vehicle itself, the inside EMS provider should communicate this to the rescue boss and watch for any further intrusion into the patient compartment. (10)

• **Circulation Problems**

  Whereas management of massive hemorrhage focuses on first stopping bleeding, circulation focuses on keeping the blood perfusing the body. Considerations include obtaining IV or intravenous vascular access, administering only enough fluid to maintain a minimum blood pressure without diluting the blood, coordinating careful movement of the patient so as not to dislodge any internal blood clots that have formed, and possible pain management or patient sedation to help rescuers remove the victim more quickly. In some advanced systems, this may also include administration of medications such as tranexamic acid and/or vasopressin to minimize internal bleeding. (9)11-13

• **Significant Hypothermia**

  The ability for a patient’s blood to clot depends heavily on the patient’s body temperature. In situations where the patient may become extremely cold, especially in prolonged extrications, make efforts to reduce patient heat loss and, if possible, provide heat to the patient through warmed IV fluids and warmed humidified oxygen.

• **Straight**

  The inside EMS provider should consider how best to keep the patient “straight” if he needs stabilization of the spine, pelvis, or extremities as he prepares to remove the patient from the vehicle. Although protocols and priorities vary from agency to agency and incident to incident, the earlier the inside EMS provider can coordinate to keep the patient straight, the more efficient will be the extrication, and the better the care for the patient.

• **Forward**

  While immediate patient care and extrication efforts continue, outside EMS providers and support personnel can begin to prepare to move the patient out of the vehicle and into the ambulance. Any equipment (such as a backboard, slide board, stretcher) needed to help remove the patient and transfer him to the waiting ambulance should be standing by before the final cuts, pushes, spreads, or rolls are made.

  Using a concept from rapid intervention teams, providers should “harden the egress” by ensuring that belts are cut, glass is fully removed, sharp edges are covered, and hoses and equipment are cleared along the path of the patient’s exit path.14 Additional coordination and medical intervention may also be needed to move the patient “forward” if there has been prolonged entrapment (>1-4 hours) and/or crush injuries have occurred.

• **To Trauma Care**

  The idea here is not simply to transport the patient to an emergency department but rather to get him to the appropriate level of trauma care and to ensure that the trauma team is ready for the patient’s arrival. For patients with severe injuries, this will mean coordination with and transport to a designated trauma facility.15 For the trauma team to be prepared, it must typically receive prenotification of the victim as early as possible.

  In addition, in many locations, it must be determined which mode of transportation—air or ground—is best for the level of care, transport distance, and incident location and conditions. Finally, since much can happen between the extrication of the patient and arrival at the trauma center, it is essential that an efficient and prioritized hand-off report be given to the trauma team on arrival. In many systems, this is recognized as so critical that right after dealing with the patient's immediate life threats, the transporting EMS provider is given a “moment of silence,” during which the entire trauma team focuses on the prioritized EMS report.

**“-ATRICS”: SPECIAL PATIENTS AND SITUATIONS**

Another aspect of extrication that separates the good from the great is the ability to deal with “-atrics,” categories of patients requiring special considerations during extrication calls.

• **Pediatrics**

  Because of their body shape, pediatric patients, especially infants, tend to act as top-heavy projectiles during a collision and may be thrown inside the vehicle or ejected if not properly secured. Pediatric patients often require rapid extrication, as it can be difficult to determine the severity of their injuries. Pediatric patients tend to compensate very well for even life-threatening shock, initially appearing okay but then quickly deteriorating. In addition, pediatric patients may require transport to a pediatric specialty facility or a pediatric trauma center if one is available. This decision and coordination with the destination facility should begin while extrication efforts are still underway.16

• **Geriatrics**

  While in general pediatric patients tend to be very resilient to traumatic injuries, geriatric patients tend to be very fragile. In addition to sustaining greater internal damage than younger patients, geriatric patients also tend to carry more comorbidities, additional medical conditions that leave them less able to cope with the injuries they sustain. For these reasons, geriatric patients generally rate a higher priority for initial assessment, treatment, and removal. 17

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Bariatrics
While the very size of larger patients may complicate the extrication process, additional medical considerations should also inform rescuers how they may need to proceed with bariatric patients. Although there is a documented “cushion effect” that occurs for some larger patients vs. very thin passengers, very large, morbidly obese patients tend to have a number of problems that don’t affect nonobese trauma victims. In addition to greater difficulty in assessing very large patients, it can be much more difficult to manage their airways, ventilate them, control bleeding, and obtain IV access.

Another consideration for large-size patients is how to move them Forward to Trauma Care. Responders need to be ready to answer questions such as, How are we going to move them from the vehicle to the stretcher? Will the stretcher safely hold them? and Do we have an available air or ground ambulance that will be able to both transport and care for a person of this size?
Pregnant-triatrics
The size of pregnant patients can also affect choices of extrication tools and techniques; however, a number of medical considerations will also affect patient priority for both medical care and removal. In later months of the pregnancy, the physical position of the patient is extremely important. The patient should remain leaning to the left side since the weight of the uterus on the vena cava, the major vessel returning blood to the heart, can significantly worsen shock if the patient is on her right side.

Other factors that responders should keep in mind include that the uterus and placenta present a significant potential point of bleeding in an area that can be very difficult to assess. Also, the compensatory mechanisms of the circulatory system that may protect the mother from shock do not generally protect the fetus; although the mom may be sustaining a viable blood pressure, the baby may not be receiving enough oxygen. In addition, direct traumatic injury to the uterus can bring on sudden, premature labor.

AFTER: FOLLOW-UP AND PREPARATION FOR NEXT CALL
After the last patient has been removed from the vehicle and is on the way to definitive care, a number of EMS aspects of extrication remain to be dealt with.

Pictures
Although there is no doubt that video and photographs of real extrication incidents can contribute to responders’ training and education, the guidelines for who should take them (and who should not) as well as how they are handled and who owns and has the right to distribute them (and who does not) should be well defined and clear to every responder. Even if this is the case, many times it remains unclear what rights members of the public have to record incidents and operations that are in public view as well as what obligations responders have to stop them and protect patients’ rights. Most often, the best policy is one that makes it clear to responders what rights the public has and what ethical, if not legal, obligations responders have to sometimes obstruct public views of incidents to protect the privacy and dignity of the patients involved without coming in direct conflict with the photographer.

Pain/Pathogens
Vehicle occupants aren’t the only ones who may become sick or injured as a result of motor vehicle collisions. Responder safety from physical and pathogen hazards should be evaluated after each incident: Are all of the responders safe? Were there any near-misses? What could we have done to improve safety? These are questions that should be asked after each call.

Post-Traumatic Stress Disorder
Some incidents, especially those involving large numbers of victims, young children, or fellow emergency responders, can have a significant psychological and emotional impact on those who respond. Just as we evaluate the potential for physical injury for our responders, we have to keep in mind their psychological well-being as well.

Preview/Review
Departments should learn from every incident. Formal or informal after-action reviews are the times to evaluate not only what occurred but also how the response team can improve each aspect of the response to better prepare for the next call.

Practice
Review and self-reflection are the beginning, but great extrication teams put words into action by practicing and performing hands-on procedures or tactics they have identified as those that will get them from good to great.

In the end, all fires eventually go out, all bleeding eventually stops, and all patients eventually get freed from their vehicles. Yet, with consideration of and coordination with the EMS aspects of extrication, rescuers each arrive to do their own size-up and know their own roles and zones. They know that the vehicle is safe so that they can access the patient rapidly to assess what the patient needs from the extrication team. They don’t wait for ALS providers to perform life-saving BLS actions, but when ALS skills are needed, paramedics are ready with the tools and training to do the job. They’re ready to manage special “-triatrics” patients, and the best rescue teams take a look back after each call and ask, What can we improve? This is how integrating EMS aspects into the heart of your training and operations makes a good crew into a truly great extrication team.

ENDNOTES
10. NAEMT. PHTLS. (Jones & Bartlett Publishers, 2010).
17. Snyder, DR & Christmas, C. Geriatric Education for Emergency Medical Services (Jones & Bartlett Learning, 2003).

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Notes
EMS Aspects of Extrication

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COURSE EXAMINATION
1) Great vehicle extrication combines expertise, collaboration between rescue and emergency medical personnel and integration of rescue strategy and tactics with best practices in trauma care
   a. True
   b. False

2) The above collaboration includes which of the following?
   a. Incident Commander (IC)
   b. Rescue Boss
   c. Extrication technician
   d. All of the above

3) For calls that involve subtle or obvious life threats, it is easy to become overly focused on which of the following:
   a. Tools and tasks
   b. Tools and treatment
   c. Tools and command
   d. Command and control

4) Tunnel vision as a result of focusing on tools and tasks can result in perfectly executed cuts, pushes and rolls, while leaving out:
   a. Command
   b. Request for needed resources
   c. Patient care
   d. All of the above

5) Which of the following is part of a comprehensive approach to extrication?
   a. Arrival
   b. Access
   c. MARCH
   d. All of the above

6) Every responder should perform a size-up to identify dangers on scene as well as the best way to integrate their roles in the extrication operation
   a. True
   b. False

7) Which of the following is a mnemonic device for extrication size-up?
   a. COAL WAS WEALTH
   b. RECEO
   c. CAN DO
   d. ADULTS

8) Which of the following is one of the components of the CAN DO mnemonic device/
   a. Conditions
   b. Actions
   c. Needs
   d. All of the above

9) After conducting a size-up, what is the next step in the comprehensive approach to extrication?
   a. Establish correct tool assignments
   b. Establish or integrate with command and control on scene
   c. Assume command
   d. Request additional resources if necessary

10) Just as with hazardous materials incidents, extrication Hot, Warm and Cold Zones define the level of hazards in an area
    a. True
    b. False

11) Which of the following are common roles to be filled at an extrication scene?
    a. Rescue Boss
    b. Rescue Tech
    c. Support
    d. All of the above

12) First responders gaining access should accomplish or verify which of the following general tasks?
    a. Check around vehicle
    b. Mitigate hazards
    c. Kill the ignition
    d. All of the above

13) What area of the vehicle should the first responder check when determining access?
    a. Outer circle
    b. Inner circle
    c. Above and below
    d. All of the above

14) Which of the following are means of mitigating immediate hazards?
    a. Stabilize the suspension
    b. Turn headlights off and hazards on
    c. Disconnect the battery
    d. All of the above

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15) Immediate medical priorities can be determined by using which acronym?
   a. MARCH
   b. COAL WAS WEALTH
   c. RECEO
   d. All of the above

16) Which of the following is a component of the MARCH acronym?
   a. Massive hemorrhage
   b. Respiratory emergencies
   c. Hypothermia
   d. All of the above

17) “Hardening” the egress while extricating a patient includes cutting seatbelts, removing glass and hoses and equipment are cleared along the path of patient’s exit path?
   a. True
   b. False

18) The “-atrics” categories is an aspect of extrication that considers which of the following patients?
   a. Level I trauma patients
   b. Special patients and situations
   c. Those needing immediate removal
   d. None of the above

19) Because of their body shape, __________ patients tend to act as top-heavy projectiles during a collision and may be thrown inside the vehicle or ejected
   a. Pediatrics
   b. Geriatrics
   c. Bariatrics
   d. Pregnant-atrics

20) Responder safety from physical and pathogen hazards should be evaluated after each incident?
   a. True
   b. False

Notes
EMS Aspects of Extrication

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