Medical Protocols for RMERT
# Medical Protocols for RMERT

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**Advanced RMERT Medical Protocols**

*Updated June 11, 2014*

The following Protocols are intended to guide treatment for the Region 2 Medical Emergency Response Team (RMERT) in addition to the Peoria Area EMS Adult and Pediatric Patient Care Manuals. RMERT members may perform the following procedures after successfully completing training, testing and certification. Physicians will perform some of the advanced procedures. The procedures are discussed in detail to allow for materials and supplies planning/stocking, and to provide a description for non-physicians to provide assistance on scene.

**Technical Rescue/Urban Search and Rescue (USAR):**

One of the indications for Region 2 RMERT activation is to provide assistance at the site of a collapsed building or other structure entrapping victims. Medical responders who work inside or near a USAR site must have proper protection and training. Not all RMERT members are trained in technical rescue. In most situations, the local fire department rescue team extricates the victim(s) and transports them to the RMERT medical treatment area. Rarely, RMERT medical personnel (who have been trained in USAR/technical rescue) may be asked accompany the fire department technical rescue members to the scene or inside the structure to provide direct patient care and support. The types of technical rescue may include the following:

- USAR/building collapse/confined space
- High angle/rope rescue
- Trench collapse and deep well rescue

Region 2 RMERT team leaders will discuss each rescue situation and decide which RMERT members will participate and their extent of involvement in technical rescue operations. If RMERT members are uncomfortable or feel their safety is unnecessary at risk, immediately inform RMERT team leaders. **Safety is our number one priority.**

**Overview:**

Responding to a scene where the injured victim cannot be immediately rescued can be dangerous. This may include a prehospital situation where victims are entrapped in a damaged or collapsed building, grain elevator, trench collapse, deep well, steep terrain, or other environmental/structural hazard. Prolonged care in the field is sometimes unavoidable if unable to extricate the victim in a timely manner. The priority in these situations is scene safety for the involved rescue/medical team members. All rescues involve risk. Take steps to minimize risk, making the scene as safe as possible or to an acceptable level where the benefits outweigh the risks.

Before entering a dangerous scene, RMERT personnel will wear and utilize appropriate personal protective equipment (PPE), take steps to maximize scene safety and work as a team to approach the patient in a safe manner.
Technical Rescue/Urban Search and Rescue (USAR):

In general, the following guidelines and principles should be followed:

1. Only properly trained and appropriately protected RMERT rescue team members should enter the inner perimeter of a potentially dangerous incident location (e.g., building collapse). Scene safety takes priority. Rescuers must assess, communicate, prepare and execute a plan to stabilize the scene in an efficient and practical manner. Taking unnecessary risks is highly discouraged.

2. Work with on-scene technical rescue personnel to stabilize the immediate surroundings of the victim to prevent further injury. When approaching the patient(s), be aware that the scene may deteriorate and rescue personnel may be ordered to back out immediately. Take only medical equipment necessary to the situation. Utilize other personnel to bring additional medical supplies.

3. Assess rapidly whether the patient is dead or alive. If death is certain, notify the rescue crew discretely (maintaining professionalism and respect for patients and families). On determination that the victim is dead, the rescue becomes a body recovery operation with different tactics, urgency and approach.

4. In patient(s) found alive, stabilize the airway, breathing, and circulation as best as the situation allows. Treat bleeding and shock appropriately. Reassure the conscious patient and provide ongoing psychological support. Initiate care according to the PAEMS Routine Patient Care and Trauma Care Protocols. IV access should not be attempted in an injured extremity unless no other alternative exists.

   • **OXYGEN:** Warning—some rescue situations require use of metal cutting tools, torches, grinders, and saws, which produce sparks and can cause an explosion. Do NOT use oxygen unless it is absolutely certain there are no risks of a spark or fire. If critically ill, use 15 L/min by NRB mask. If the patient does not tolerate a NRB mask, administer 6 L/min by nasal cannula.

5. Control external bleeding:
   a. If there is significant extremity hemorrhage, apply a tourniquet properly and confirm that bleeding has stopped. Note the time of tourniquet placement, and lock the tourniquet securely in place.
      • Do NOT waste time applying local pressure in cases of moderate or severe bleeding.
   b. If there is mild bleeding and the site can be visualized and monitored, apply direct pressure and secure an appropriate pressure dressing.
      • Do NOT use pressure points in rescue situations.

6. If a victim has sustained a crushed or compressed extremity for >10–15 minutes, the circulation to that extremity should be occluded to prevent the release of toxic chemicals and potassium into the central circulation after heavy item removal. **Tourniquets** should be strongly considered for use in crush injuries and entrapment.
Advanced Airway Procedures:
Oral Endotracheal Intubation

Oral endotracheal intubation is the best method of securing an airway and ventilating a patient in situations that warrant aggressive airway and respiratory management.

Indications:
1. Apnea
2. Agonal respirations
3. Potential for airway compromise
4. Low SaO₂
5. Head injuries with GCS < 8

Relative Contraindications:
1. Epiglottitis
2. Laryngeal trauma
3. Significant oral maxillofacial trauma

Equipment:

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<td>End tidal CO₂ detector/waveform capnography</td>
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<td>Endotracheal tube/stylet/lubricant</td>
<td>Ambu bag</td>
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<td>10 mL syringe</td>
<td>Tape or commercial tube holder</td>
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Procedure:
1. Pre-oxygenate while assembling equipment. Maintain C-spine immobilization.
2. Apply cardiac monitor, pulse oximetry, and establish IV access.
3. Select proper size ET tube {tube size = [(age/4) + 4]}. Use 10 mL syringe to check for air leaks in the cuff. If patient is <8 years old, use uncuffed tube.
4. Insert stylet into tube if desired. Conform tube to fit natural curvature of pharynx.
5. Insert laryngoscope blade into right side of mouth moving tongue to the left until the glottic opening is visualized.
   a. **Straight blade**—Insert until the epiglottis is in view. With the tip of the blade, lift the epiglottis until the vocal cords are visualized.
   b. **Curved blade**—Insert into the vallecula and lift to facilitate visualization of the vocal cords.
   c. Time limit is no more than 30 seconds.
6. Insert ET tube through the vocal cords. Tube depth is determined by [(12+age)/2] and generally men=23 cm, women=21 cm. Remove stylet. Inflate cuff with 10 mL air. Ventilate the patient.
7. Confirm tube placement. If sounds are auscultated over the epigastrium, deflate cuff and remove the tube. If lung sounds are auscultated over the right chest, withdraw tube 1 cm at a time until lung sounds are equal bilaterally.
8. Secure tube with tape or commercially available tube holder noting location of tube (# in cm) at upper lip.
9. If intubation is unsuccessful after 2 attempts, use King LTS-D.
10. Documentation of the procedure should include:
   a. Indication for intubation
   b. Number of attempts and by whom
   c. Size of tube, # cm at lip, end tidal CO₂ color change or CO₂ value on waveform capnography, lung sounds, chest expansion
   d. Any complications encountered during the procedure.
**Advanced Airway Procedures:**

**RSI – Rapid Sequence Intubation (RSI)**

Endotracheal intubation may be used to establish a patent, secure airway to prevent aspiration, provide adequate ventilation, or improve oxygenation.

**Indications:**
1. Inability to maintain airway patency.
2. Inability to protect the airway against aspiration.
3. Ventilatory compromise.
4. Failure to adequately oxygenate pulmonary capillary blood.
5. Risk of impending airway edema and/or need for airway protection.

**Contraindications:**
1. Total upper airway obstruction, which requires a surgical airway.
2. Total loss of facial/oropharyngeal landmarks, which requires a surgical airway.

**Equipment:**
- Laryngoscope and blades
- Endotracheal (ET) tube
- Stylet
- Syringe, 10 mL (to inflate ET tube balloon)
- Suction catheter (e.g., Yankauer)
- Carbon dioxide detector (e.g., Easycap) or Waveform Capnography
- Oral and nasal airways
- Ambu bag and mask attached to oxygen source

**Procedure:**
1. **PRE-OXYGENATE:** Position the patient and pre-oxygenate with high flow oxygen by NRB mask or BVM for 2-5 minutes. Do not manually ventilate the patient unless ventilatory assistance is needed.
2. **PREPARE:** Assemble the required equipment and medications, including labeling the contents of the syringes. Ensure patency of IV access. Continuously monitor the cardiac rhythm, pulse oximetry, and waveform capnography.
3. **PLAN:** Plan for a failed endotracheal intubation attempt. Ensure alternate airway equipment is immediately available (i.e., King LTS-D airway, emergency cricothyrotomy kit, translaryngeal jet ventilation equipment).
4. **PRE-MEDICATION:** Give in the following order over 1-3 minutes.
   a. **Atropine:** 0.02 mg/kg IV (used for all children age <5 or pulse <120, or in bradycardic adults; minimum dose 0.1 mg and maximum dose 0.5 mg)
   b. **Pre-paralytic dose:**
      i. **Succinylcholine:** 0.15 mg/kg pre-paralytic IV
         - Contraindications to Succinylcholine: >5 days after major trauma or burn, history of paralysis, malignant hyperthermia, known pseudocholinesterase deficiency, or neuromuscular disorder (i.e., multiple sclerosis).
      ii. **Vecuronium (Norcuron):** 0.01 mg/kg pre-paralytic IV
      iii. **Rocuronium (Zemuron):** 0.1 mg/kg pre-paralytic IV (omit <5 y/o)
   c. **SEDATION:** Consider the following:
      i. **Midazolam:** 0.1 mg/kg IV
      ii. **Ketamine:** 1-2 mg/kg IV (status asthmaticus in infants, children and young adults only)
      iii. **Fentanyl:** 1-2 mcg/kg IV over several minutes
iv. **Etomidate:** 0.2-0.4 mg/kg (will not increase ICP, minimal CV effect) may not be used in patients <12 y/o.

d. **NOTE:** Continue pre-oxygenation for 2-3 minutes. Consider removing the C-collar (if present) while maintaining in-line manual stabilization of the head and neck.

5. **PARALYTIC MEDICATION ADMINISTRATION, then INTUBATE:**
   a. **Succinylcholine:** 1.5-2 mg/kg IV
      i. Apnea, jaw relaxation, and decreased resistance to BVM ventilations indicate the patient is ready to proceed with intubation.
   b. Intubate, check tube placement, secure tube, and continue to assist ventilations.

6. **CONTINUED NEUROMUSCULAR BLOCKADE:** After intubation, administer:
   a. **Norcuron:** 0.1 mg/kg IVP
   b. **Zemuron:** 0.5-1 mg/kg IVP

7. **CONTINUED SEDATION:** Administer:
   a. **Versed:** 0.05 mg/kg (3-5 mg in adult) every 15-30 min as needed.
   b. **Fentanyl:** 1-2 mcg/kg IV over 2 minutes as needed.
   c. **Ketamine:** 0.5-1.0 mg/kg every 5-10 minutes as needed.

8. **UNSUCCESSFUL PLACEMENT:** If endotracheal intubation fails after 2 attempts, and the patient is unable to be ventilated with BVM, consider attempting to gain airway control using one of the following techniques:
   a. King LTS-D Supraglottic Airway
   b. Surgical Airway

**NOTE:** If intubation is unsuccessful and additional paralytics are needed, Succinylcholine should NOT be repeated in children <5 y/o due to potential for marked bradycardia. A non-depolarizing agent should be considered only after confirming ease of bagging and airway back up is readily available.
Advanced Airway Procedures:
Chest Decompression/Needle Thoracostomy

Needle chest decompression is an emergent, life-saving procedure utilized when air has entered the pleural space and becomes trapped without means of escape. Needle decompression converts a tension pneumothorax into an open pneumothorax allowing the pleural space to equilibrate with the atmosphere.

Signs and Symptoms:
1. Severe respiratory distress (in the presence of chest trauma)
2. Restlessness and agitation (in the presence of chest trauma)
3. Increased airway resistance on ventilated patients
4. JVD
5. Subcutaneous emphysema
6. Unequal breath sounds, absent on the affected side
7. Hypotension
8. Cyanosis
9. Tracheal deviation

Equipment:
- #14 gauge IV catheter
- Appropriate skin cleansing prep
- 10 mL syringe
- Heimlich valve with connecting tubing

Procedure:
1. Observe universal precautions.
2. Apply oxygen at 15 L/min via NRB mask, or ventilate via BVM.
3. Identify the 2nd intercostal space, midclavicular line on the affected side.
4. Cleanse site with appropriate skin prep.
5. Attach 10 mL syringe to IV catheter.
6. Puncture the skin perpendicularly just superior to the 3rd rib in the 2nd intercostal space. Direct the needle over the rib into the thoracic cavity.
7. Puncture the pleura noting the “pop” and air pushing syringe plunger outward.
8. Advance catheter while removing the needle.
9. Attach the Heimlich flutter valve and secure the catheter in place.
10. Reassess patient to verify improved breath sounds and ease of ventilation.
11. Documentation should include:
   a. Indications for procedure
   b. Number of attempts and by whom
   c. Verification of proper placement of catheter
   d. Patient’s condition following procedure
   e. Any complications
Advanced Airway Procedures:
Percutaneous Translaryngeal Jet Ventilation (PTJV)/Needle Cricothyrotomy

An alternative method of temporarily securing an airway in patients with acute respiratory distress needing immediate intervention. An over-the-needle plastic catheter is inserted through the cricothyroid membrane puncture. The catheter is attached to special tubing that supplies 100% oxygen allowing for adequate ventilation of the patient.

Indications:
PTJV is indicated when intubation is contraindicated or cannot be performed.
1. Obstructions at or above the vocal cords
2. Massive facial trauma
3. Acute respiratory distress and need for immediate airway management and advanced airway control was not achieved after multiple attempts.
4. Pediatric patient <8 y/o not able to be orotracheally intubated.

Absolute contraindications:
1. The ability to accomplish endotracheal intubation easily and rapidly.
2. Retraction of the distal trachea into the mediastinum after tracheal transsection.
3. Occurrence of known significant damage to the cricoid cartilage or larynx.

Relative contraindications:
1. Patients with known coagulopathy
2. Tumor/pathologic condition of larynx

Equipment:
- 12 mL syringe
- Transtracheal catheter kit or 14 gauge over-the-needle catheter
- Manual transtracheal jet ventilation device (air hose and valve)
- Oxygen source: adjustable 50 psi for adults, 30 psi for children <12 years
- Appropriate skin cleansing prep
- Gauze pad

Procedure:
1. Preoxygenate while assembling equipment. Follow universal standard precautions (upper airway secretions may be blown out of the nose and mouth during insufflation). Maintain C-spine immobilization.
2. Cleanse the anterior neck with appropriate skin prep.
3. Connect transtracheal jet ventilation device to 50 psi oxygen source. Adjust oxygen flow to 30 psi for pediatric (<12 years) patients.
4. Initiate several bursts of oxygen into the air prior to connecting to the catheter.
5. Select transtracheal catheter (14g for children and 13g for adults). Attach catheter to 12 mL syringe.
6. No anesthetic is needed in unconscious patient. If conscious, 1% Lidocaine anesthetic injected locally, and 1-2 mL may be injected into the larynx to prevent coughing when the needle/cannula enters the larynx.
7. Locate the cricothyroid membrane below the prominence of the thyroid cartilage and above the cricoid cartilage.
8. Firmly grasp the larynx with the non-operating hand.
9. Puncture cricothyroid membrane with the needle pointed 45° caudally. A small nick in the skin may facilitate passage of the catheter.
10. Advance the needle while withdrawing the syringe plunger until air is seen and felt coming back freely into the syringe, signifying intratracheal location.
11. Advance the catheter off the needle into the trachea, until the tabs are level with the skin.
12. Secure the proximal end of the cannula firmly against the skin to minimize localized subcutaneous emphysema and to prevent dislodgment.

13. Reattach the syringe to the catheter device and aspirate air to verify correct placement. If air is not freely aspirated, remove the catheter and re-attempt.

14. Attach leurop-lock end of the manual transtracheal jet ventilation device to the catheter hub and initiate ventilation by depressing the manual valve button. Airflow should be continued until the chest rises adequately.
   a. Inhalation: initiate ventilation for 1-2 seconds.
   b. Exhalation: release the valve, and allow the patient to exhale completely, which may take 4 to 9 seconds.

15. Continued ventilation is performed with a 1:4 ratio of inhalation to exhalation. Inhalation should last one second and exhalation three to four seconds.

16. Auscultate lung sounds during inhalation to confirm adequate ventilation.

17. Attach pulse oximetry and measure O₂ saturation.

18. Place the patient on waveform capnography, if available.

19. Monitor for high inflation pressures or massive subcutaneous air build up, which may indicate malposition of the catheter.

20. Documentation of the procedure should include:
   a. Indication for the procedure
   b. Number of attempts and by whom
   c. Verification of placement to include aspiration of air, absence of subcutaneous emphysema, bilateral chest expansion, and pulse oximetry
Advanced Airway Procedures: Surgical Cricothyrotomy—Melker Cricothyrotomy Catheter
An emergent procedure for patients >12 y/o in acute respiratory distress with upper airway obstruction or in whom oral intubation was unsuccessful or contraindicated.

Indications:
1. Upper airway obstruction due to edema, infection, caustic ingestion, allergic reaction, inhalation injuries or foreign body.
2. Maxillofacial trauma
3. Oral tracheal intubation unsuccessful after multiple attempts
4. Impending respiratory failure

Absolute Contraindications:
1. Crush injury to the larynx
2. Penetrating neck trauma

Relative Contraindications:
1. Known coagulopathy

Equipment:

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<td>#15 Scalpel</td>
<td>18 g introducer needle (finder)</td>
</tr>
<tr>
<td>Appropriate skin cleansing prep</td>
<td>18 g TFE catheter introducer needle</td>
</tr>
<tr>
<td>4x4 gauze pads</td>
<td>.038 inch stiff guidewire</td>
</tr>
<tr>
<td>Syringe</td>
<td>Curved dilator</td>
</tr>
<tr>
<td>Airway catheter securing device</td>
<td>Airway catheter (4mm I.D.)</td>
</tr>
</tbody>
</table>

Procedure:
1. Preoxygenate while equipment is assembled. Maintain C-spine immobilization.
2. Identify the cricothyroid membrane just below the thyroid cartilage. Make a vertical skin incision over this area.
3. Stabilize the larynx with the non-dominant hand.
4. With 18g TFE catheter introducer needle on syringe, advance through incision at 45° angle in caudal direction into the airway.
5. When advancing the needle, aspirate with syringe; proper placement is confirmed with return of air.
6. Remove syringed needle, leaving TFE catheter in place. Advance guide wire through catheter and into airway.
7. Remove catheter, leaving guide wire in place.
8. Insert tapered end of dilator through airway catheter until the handle stops against connector.
9. Advance the dilator/airway over guide wire until it is clearly visible at distal end of dilator. Once the guide is visible, advance the dilator/airway into the trachea. Maintain control of the guide wire at all times.
10. Hold catheter firmly against skin, remove guide wire and dilator simultaneously.
11. Secure airway with cloth tape.
12. Ventilate the patient with Ambu bag and 100% oxygen.
13. Documentation of the procedure should include:
   a. Indications for the procedure
   b. Number of attempts and by whom
   c. Pulse oximetry, chest expansion, breath sounds, skin color, vital signs
   d. Complications may include asphyxia, subglottic stenosis/edema, hemorrhage, subcutaneous/mediastinal emphysema, creating a false lumen, laryngeal stenosis, or laceration of the esophagus or trachea.
**Advanced Airway Procedures:**

**Surgical Open Cricothyrotomy (all RMERT 2 paramedics, nurses, physicians)**

An emergent procedure for patients >10 y/o in acute respiratory distress with upper airway obstruction or in whom oral intubation was unsuccessful or contraindicated. The most experienced provider, preferably a physician, will perform this procedure. If a physician is unavailable, properly trained RMERT team members may contact Medical Control for permission to perform the procedure. If hazardous or extreme conditions preclude communications or mandate immediate airway provision, good judgment by the RMERT team will determine optimal airway management or intervention.

**Indications:**
1. Unable to orally intubate
2. BVM cannot maintain adequate oxygen saturation.

**Relative contraindications:**
1. Distorted neck anatomy
2. Pre-existing infection
3. Coagulopathy

**Equipment:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal protection equipment</td>
<td>#6 or #6.5 endotracheal tube</td>
</tr>
<tr>
<td>#10 blade scalpel</td>
<td>Tape or commercial tube holder</td>
</tr>
<tr>
<td>Appropriate skin cleansing prep</td>
<td>BVM and oxygen source</td>
</tr>
</tbody>
</table>

**Procedure:**

1. Place the patient in a supine position with the neck in a neutral position. Palpate the thyroid notch, cricothyroid interval, and the sternal notch for orientation. Assemble the necessary equipment.
2. Cleanse the skin and anesthetize the area locally in a conscious patient.
3. Stabilize the thyroid cartilage with the non-dominant hand and maintain stabilization until the trachea is intubated.
4. Use the scalpel to incise a horizontal incision 2-3 cm. In obese patients, a vertical 4-5 cm incision should be made, using several light strokes of the scalpel to cut down to the level of the trachea/cricoid cartilage. Do not incise too deeply.
5. Using a finger, locate the cricothyroid membrane, and incise this with the scalpel horizontally, perforating this membrane (blade goes in approximately half its length). Remove and reverse the scalpel and place the scalpel handle into the incision to widen the opening to accept the endotracheal tube.
6. In obese patients, consider using the tracheal hook to grasp the inferior portion of the cricoid cartilage and maintain control of the trachea structures.
7. Place the endotracheal tube into the trachea directed towards the lungs approximately 2 cm. Inflate the cuff of the ET tube.
8. Secure the tube and connect to BVM for ventilation. Confirm ET tube placement.
9. Dressing and stabilization: Cut a slit down a 4x4 dressing and place it under the tracheostomy tube. Secure with tape. Transport with caution as the tube is easily displaced.
10. Document the procedure.
11. The PAEMS Medical Director must be notified ≤12 hrs of surgical airway.

**Note:** Bleeding is often profuse, and the procedure should be performed without relying on direct visualization of deep structures (i.e. significant bleeding or low-light conditions).
**Advanced Airway Procedures:**

**Chest Tube Thoracostomy: (physicians, assisted by RMERT members)**

Physicians will perform this procedure; although it is helpful to have RMERT members pass instruments and assist during placement of a chest tube.

**Indications:**
1. Pneumothorax (tension, open or simple)
2. Hemothorax
3. Traumatic Arrest (bilateral)

**Relative Indications:**
1. Rib fractures and positive pressure ventilation
2. Profound hypoxia/hypotension and blunt or penetrating chest injury

**Contraindications:**
1. Infection over insertion site
2. Uncontrolled bleeding diathesis
3. Coagulopathy
4. Pulmonary bullae
5. Pulmonary, pleural, or thoracic adhesions
6. Loculated pleural effusion or empyema

**Equipment:**
PPE, local anesthetic, sterile gloves, appropriate skin cleansing prep, scalpel, large hemostats, 4x4 gauze, appropriate chest tube, rubber tubing and Pleurevac, 2-0 silk suture on a straight needle, suction device, tape and dressing.

**Procedure:**
1. Obtain and prepare all PPE, instruments, and supplies needed.
2. Anesthetize the skin by injection of local anesthetic and possible nerve block
3. Apply appropriate skin cleansing prep.
4. Use a scalpel (#10 blade) to make an incision over the mid-axillary 5th rib.
5. Use the hemostats to spread and enlarge the passageway into the chest.
6. Pierce gently inside the thoracic wall, spread hemostats, and remove.
7. Use index finger to probe inside chest wall to ensure proper entry into chest cavity.
8. Use finger or hemostats to guide chest tube inside chest wall, guiding upwards towards the apex of the lung.
9. Insert chest tube so that the drainage holes are completely below the surface of the skin.
10. Attach the rubber hose from the Pleurevac, and begin continuous suction at 30mmHg.
11. Secure the chest tube in place with silk 2-0 or larger suture.
12. Place Vaseline gauze around the chest tube at insertion site.
13. Secure the chest tube and place additional dressings around the tube.
15. Transport to hospital as soon as practical, and obtain confirmatory chest X-ray.
Alternate Airway Procedures:

**Digital Intubation:**
Securing the airway using blind insertion to direct the ET tube into the larynx. This technique should only be performed in a deeply unconscious patient.

**Indications:**
1. Secretions, vomitus or blood cannot be removed with suction (vision obscured).
2. When equipment, such as the laryngoscope, is lacking or has failed.
3. Situation makes it difficult or impossible to intubate via the normal methods.

**Contraindications:**
1. Digital intubation should not be attempted on any patient with risk of biting.

**Equipment:**
- See oral endotracheal intubation equipment list

**Procedure:**
1. Pre-oxygenate while assembling equipment. Maintain C-spine immobilization.
2. Apply cardiac monitor, pulse oximetry and establish IV access.
3. Select proper size ET tube. Attach 10 mL syringe and inflate cuff observing for any air leaks. Deflate cuff. Place a stylet inside the tube, and bend it in the shape of an “L”, or hockey stick, with a 90° angle ~8 cm from distal end.
4. Face the patient and re-assess mental status. If bite injury is unlikley, proceed with the digital intubation. Insert middle and index fingers of the non-dominant hand along the patient’s tongue, drawing the tongue forward as the fingers “walk down” the tongue to palpate the epiglottis with the middle finger. The epiglottis should feel like a “wet earlobe” at the base of the tongue; if unable to palpate the epiglottis, pull forward on the tongue and jaw, which usually corrects the problem.
5. Insert the lubricated ET tube along the side of the mouth and place alongside the middle finger that remains in contact with the epiglottis. The index finger directs the tube from the top, keeping the tube tip in contact with the middle finger and directing it toward the epiglottis.
6. Advance the ET tube between these two fingers, keeping it against the epiglottis with the index finger. When the tip of the tube reaches the end of the middle finger, lift the middle finger and press the tube tip against the tongue in this position. Anterior pressure is applied against the epiglottis as the tube is advanced further and directed toward the vocal cords. The index finger supports the tube from behind. Keep the tube tip or side-hole in constant contact with the middle finger in order to identify the position of the tip. Resistance is common as the tube enters the larynx. As the resistance increases, hold tube firmly in place.
7. Advance ET tube through vocal cords and remove the stylet. Inflate cuff with 10 mL of air. Ventilate the patient. Confirm tube placement. If sounds are auscultated over the epigastrum, deflate cuff and remove the tube. If lung sounds are auscultated greater over the right side of the chest, withdraw the tube 1 cm at a time until lung sounds are equal bilaterally.
8. Secure the tube with tape or commercially available tube holder noting location of the tube (# of cm) at the upper lip.
9. Documentation of the procedure should include:
   a. Indication for digital intubation
   b. Number of attempts and by whom
   c. Size of tube, # cm at lip, end tidal CO₂ detector color change or waveform capnography, lung sounds, chest expansion
   d. Any complications encountered during the procedure
Advanced Cardiac/Vascular Access:
Advanced IV access techniques are available for use by RMERT physicians and include central venous catheterization and rapid infusion large-bore IV catheter exchange kit.

Central Venous Catheter (CVC) Placement
Physicians only: The triple-lumen CVC kit is available in the RMERT crash cart. If a seriously injured or ill patient has poor peripheral vein IV access, an alternate vascular access device is indicated. Intraosseous (IO) access should be considered before placing a CVC if no contraindications to IO placement.

The location of the CVC placement includes the following: internal jugular (IJ) vein, subclavian (SC) vein or femoral vein. A trauma patient sustaining a pelvic fracture or penetrating trauma to the abdomen or lower back will likely have compromised venous return to the heart which warrants CVC placement in the IJ or SC vein. In this situation, avoid using the femoral vein.

Indications: A need for IV access in a patient with multiple failed peripheral vein cannulation attempts.
Contraindications: If significant pelvis trauma/fracture or penetrating trauma to the abdomen or lower back is identified, the CVC should preferentially be placed in the IJ or SC vein.
Materials: Triple-lumen CVC kit, local anesthetic, sterile towels, sterile gloves, gown, mask, goggles (standard PPE), and sterile saline flushes. Consider preparing IV fluids/necessary medications planned for use after successful placement of the CVC. Ultrasound guidance may be utilized to assist placement of the CVC if available.
Procedure:
1. Inform the patient/family of the risk/benefits/alternatives of the procedure and obtain verbal consent from the patient/family if possible.
2. Use antiseptic skin prep and assemble the material and supplies necessary.
3. Wash hands thoroughly and don the sterile PPE.
4. Use syringe and needle to inject local anesthetic at the site of the central line to maximize patient comfort.
5. Place the patient body in Trendelenburg position (head down) for IJ and SC vein lines, or reverse Trendelenburg (feet down) for femoral vein access. Use towels or other materials to position the patient.
6. Proceed using the Seldinger technique to place the central line.
   a. Insert the large hollow needle to find the central vein, place the guidewire into the needle and thread the wire into the vein 6-10 cm.
   b. Use the scalpel to incise the skin where the wire enters the skin.
   c. Insert the plastic dilator.
   d. Following dilation of skin and tissues, remove the dilator, and place the central line over the guidewire and advance into the vein.
   e. Remove the guidewire while holding the central line in the place.
7. Aspirate all ports with saline flushes to verify blood return and flush line.
8. Suture the CVC in place, place an occlusive dressing, and check X-ray placement as soon as available. Use once placement has been confirmed.
Complications: Bleeding, hematoma, accidental placement into an artery with subsequent loss of limb, infection, pneumothorax, intra-abdominal puncture injury, pseudoaneurysm formation, and extravasation of medication/fluid in an improperly placed CVC.
**Advanced Cardiac/Vascular Access:**

**Rapid Infusion IV Catheter Exchange:**
The Rapid Infusion Large-bore (7 French) IV exchange kit can be used to replace a smaller gauge IV.

**Indications:** The rapid exchange catheter is utilized in patients displaying hypovolemic shock who require rapid volume of crystalloid or blood product infusion. This technique exchanges a 20g or larger peripheral IV catheter to a 7 French IV for rapid volume infusion.

**Contraindications:** Do not perform if patient has only one peripheral IV access site.

**Equipment:** Commercial Rapid Infusion Large-bore (7 French) IV exchange kit with large gauge catheter, dilator, guidewire and scalpel.

**Procedure:**
1. Maintain sterile technique.
2. Cleanse IV indwelling catheter and tubing connector with antiseptic skin prep.
3. Disconnect the tubing from the indwelling catheter.
4. Place the exchange kit guide wire into the small gauge IV catheter using Seldinger technique.
   **CAUTION:** Maintain a firm grip on the guidewire at all times. If resistance is encountered while advancing the guidewire, hold the catheter in place and carefully withdraw the guide wire. Attempt to reinsert the guide wire. If resistance is encountered again, abort the procedure.
5. Leave the guide wire in place and remove the IV catheter in sterile fashion.
6. Incise the cutaneous puncture site with a scalpel to advance the dilator and 7F rapid bore infuser. Do NOT cut the guidewire.
7. Remove the clear plastic guard from the sheath dilator assembly.
8. Thread tapered tip of dilator over the guidewire. Grasping near skin, advance the dilator and sheath into the vessel with a slight twisting motion.
9. Once the 7F IV is in place, remove the IV dilator and guidewire.
10. Secure the 7F catheter, and aspirate to ensure blood return and flush, prior to infusing fluids and medications.
11. To avoid disconnection, use only luer-lock connecting tubing.

**CAUTION:** Vessel rupture is possible if the diameter of the sheath used is too large in comparison to the vessel diameter at the peripheral exchange site. Discretion must be used in choosing the size of a sheath appropriate for the intended exchange site.
**Advanced Cardiac/Vascular Access:**

**Pericardiocentesis:**
An emergent procedure to relieve acute cardiac tamponade by evacuating fluid accumulated in the pericardial space. A pericardial effusion is a fairly large collection of fluid outside the heart—inside the pericardial sac. As pericardial fluid increases, the increased pressure is compresses the myocardial wall and can collapse the atria, vena cava and pulmonary veins. This decreases right ventricular filling in diastole, resulting in lower stroke volume and cardiac output. Cardiac tamponade can be rapidly fatal. It is difficult to diagnose by physical exam. Maintain a high index of suspicion in chest trauma and utilize ultrasound, if available.

**Signs and symptoms:**
1. Muffled heart sounds
2. Distended neck veins
3. Hypotension
4. Pulsus Paradoxus
5. Narrowed pulse pressure

**Equipment:**
- 35-50 mL syringe
- Appropriate skin cleansing prep
- #18 or #20 gauge spinal needle or a central line/introducer kit
- Cardiac monitor and defibrillator

**Procedure:**
1. Assemble equipment including a crash-cart with ACLS medications, cardiac monitor and pacing patches. Monitor closely throughout the procedure.
2. Prep the xyphoid and subxyphoid areas with appropriate skin prep.
3. Insert the spinal needle with 50 mL syringe through the subxyphoid space. Direct the needle at a 45° angle to the chest aiming toward the left shoulder.
4. Maintain traction on the plunger as the needle is advanced.
5. Stop needle advancement when blood appears in the syringe.
6. The needle may touch the myocardium and cause v. tach or v. fib. In event of dysrhythmia, remove as much fluid as possible within 10 seconds and remove the needle. Proceed with standard ACLS care as indicated.
7. In the absence of cardiac dysrhythmia or arrest, withdraw 50 mL of blood/fluid.
8. Withdraw the needle at the same angle as it was introduced (save blood/fluid).
9. Reassess often for the redevelopment of cardiac tamponade or pneumothorax.
10. Attach Luer-lock administration tubing to sheath hub. Use large diameter trauma fluid administration tubing. To avoid disconnection, only Luer-lock connecting tubing is used. Secure sheath to the patient.
11. Apply antibiotic ointment and cover site with dressing.
12. Document of the procedure should include:
   a. Indication for the procedure
   b. Number of attempts and by whom
   c. Amount of fluid aspirated
   d. Presence of non-clotting blood in syringe
   e. Patient’s tolerance to the procedure
   f. Any complications encountered during the procedure
   g. Assessment of site before and after procedure.
Intraosseous Access:

Intraosseous Placement:
Intraosseous (IO) access is a reliable method of achieving a route for administration of drugs and fluids by placing a needle into the medullary cavity of bone. This procedure is performed on critically ill patients in whom intravascular access is not rapidly accessible or feasible.

Indications:
Multi-system trauma, severe dehydration with vascular collapse, loss of consciousness, and cardiac arrest; it may be utilized in any pediatric patient who is unresponsive and in need of immediate drug or fluid administration.

Contraindications:
Fracture above the access site, infection at the access site, and prior attempt at IO access at same location.

Equipment:
- #16 or #18 gauge intraosseous needles (or commercial IO kit)
- 10 mL syringe
- IV fluid with attached tubing
- Pressure infusion bag
- Appropriate skin cleansing prep
- Tape

Procedure:
1. Assemble and prepare all equipment.
2. Locate the landmarks of the insertion site. Palpate the tibial tuberosity. The insertion site is 1-3 cm below this and slightly medial. Avoid the joint itself as well as the epiphyseal plate.
3. Cleanse the area with appropriate skin prep.
4. Stabilize the leg and place the IO while maintaining a 90° angle during the insertion process.
5. Remove the inner stylet and attach the 10mL syringe.
6. Aspirate for bone marrow contents and flush.
7. Observe for signs of infiltration or leakage. If observed, discontinue the line.
8. Connect IV line with pressure bag attached.
9. Secure line with tape and/or dressing.
10. Administer fluids and/or drugs per protocol.
11. Document the procedure:
   a. Number of attempts, by whom and location
   b. Successful insertion location, gauge IO placed and verification procedure
   c. Fluid and drugs administered
   d. Complications
Extremity Injuries and Management:
Crush Injury:
Result from objects that have fallen on the patient or from the patient’s own body weight.

Crush Injury Treatment:
1. Before any weight is lifted off the victim’s extremity, a secure tourniquet or inflated blood pressure cuff should be placed to occlude arterial and venous flow to the victim’s crushed/entrapped extremity.
   a. The goal on limiting circulation, including the amount of time the extremity is entrapped and time the tourniquet is in place is <2 hours.
      i. Check that no pulses are detected distal to the tourniquet.
   b. If >2 hours total of entrapment plus tourniquet time occurs, the victim should be moved to a safe place where the victim can be managed using a cardiac monitor, pulse oximetry, and IV access.
      i. Supervision of this ideally would include trained physicians.
      ii. ALS medications (including sodium bicarbonate and calcium gluconate) need to be immediately available before the tourniquet is released.
      iii. When released, the tourniquet or blood pressure cuff should be loosened slightly, allowing for brief blood flow to the extremity for 15 seconds.
      iv. The tourniquet/blood pressure cuff is tightened again, while observing the cardiac monitor rhythm for elevated or peaked "T" waves, which may represent hyperkalemia or other tissue toxic factors.
      v. If lethal arrhythmias or hyperkalemia occurs, treat as per ACLS guidelines and ensure the tourniquet remains tightly in place until the patient is stabilized.
2. Proceed with extrication and rapid transportation to a hospital.
3. If there is severe tissue damage or near-amputation with bleeding blood vessels exposed, do NOT use clamps or hemostats to stop bleeding. These cause unnecessary nerve and tissue damage.
Extremity Injuries and Management:

Extremity Injuries—General Considerations:

1. Examine and document the presence or absence of distal pulses, motor and sensory function.
2. Splint injured extremities (musculoskeletal joint injuries)
   a. Use a rigid splint for long bones, immobilizing the joints above and below the deformity.
   b. If using a soft splint/pillow, ensure the extremity is sufficiently stabilized.
   c. If no distal pulse is present and the extremity is angulated, consider administering pain medication and reducing the fracture by applying manual traction until pulses return.
   d. Splint in position to maintain distal pulse.
3. Frequently recheck and record distal pulse, motor and sensory functions.

Muscle Strains:

1. Use standard RICE treatment for the first 24-48 hours: Rest, Ice, Compression (elastic bandage) and Elevation.
2. Remove elastic bandages at night; swelling can turn them into tourniquets.
3. After 36-48 hours, apply heat, to bring more blood to the area and speed healing.
4. For spasms, cramps or stiffness, use gentle stretching after applying heat.

Sprains:

1. Minor injuries that appear to be sprains, and do not interfere with use of the extremity, should be treated with RICE treatment for the first 24-48 hours: Rest, Ice, Compression (elastic bandage) and Elevation.
2. Remove elastic bandages at night; swelling can turn them into tourniquets.
3. After 36-48 hours, apply heat, to bring more blood to the area and speed healing.
4. For more significant sprains, consider splinting and evacuating.

Closed Fractures:

1. Indications to reduce a deformed long bone fracture (including open fractures):
   a. To correct or improve a sensory or vascular deficit secondary to the fracture (if numbness, tingling, weakness, or lack of pulse beyond fracture).
   b. To align severely deformed long bone fractures to allow splinting with adequate immobilization.
2. Grasp the extremity distal to the fracture firmly. Pull traction along the normal axis of the injured extremity. Do not release traction until the limb is splinted.
3. Have an assistant apply countertraction, holding the extremity proximal to the fracture. Use the least amount of force needed to align the extremity. The initial pull will usually cause discomfort as the fragments move, but quickly subside. If the patient strongly resists traction, or if it causes markedly increased pain, stop, and splint in the deformed position.
4. Attempt realignment of a long bone fracture only twice, unless there is a sensory or vascular deficit. If unsuccessful after two attempts, or resistance during realignment, splint the extremity as is. In these circumstances there is a greater risk of making the injury worse.
Extremity Injuries and Management:

Open Fractures:
1. Realign open fractures for the same reasons as for long bone fractures as described above.
2. Open fractures deserve special consideration. Arrange immediate evacuation for any patient with an open fracture. These fractures require irrigation, debridement, and open surgical reduction in the operating room, ideally within 2–4 hours. Assume that any fracture (or suspected fracture) with a nearby laceration or wound is an open fracture. Care of open fractures in the wilderness environment depends upon evacuation time.
3. If evacuation can be completed within six hours, limit cleansing to brushing off dirt and other contaminants with clean gauze or a cloth and apply a moistened saline, sterile dressing, leaving the protruding bone fracture in place (as long as there is a good pulse distally). Control hemorrhage by a carefully applying a pressure dressing and immobilize the extremity by splinting.
4. If evacuation time will exceed 6 hours, clean the wound, perform limited debridement (trim away any obviously dead tissue), and irrigate before applying a sterile dressing. Control hemorrhage with a pressure dressing, and immobilize. If evidence of nerve or vascular compromise in a deformed extremity, clean bone fragments and local tissue as best possible. Realign the fracture and reevaluate before and after splinting and frequently during evacuation.

Femur Fractures:
For the initial management of a femur fracture, use a traction splint. Even with the best-padded ankle hitches, traction splints tend to cause pressure necrosis when used for a long period of time. Monitor carefully for signs of pressure necrosis, and readjust or remove the traction splint if the ankle shows signs of skin breakdown.

Dislocations:
Attempt reduction of all dislocations if numbness or no pulse is palpated distal to the dislocation. Attempt reduction of the following dislocations: jaw, finger or toe, elbow, shoulder, patella, knee, ankle. Attempt hip dislocation reduction only if needed to evacuate patient.
Extremity Injuries and Management:

Amputation injuries:
Amputation injuries may occur as a result of trauma. Alternatively, field amputation may need to be performed in the event of patient entrapment in which all resources have failed to successfully extricate the patient, or the patient’s life is in immediate danger with prolonged extrication.

Note: The most skilled medical person on scene, preferably a physician, will perform this procedure. If a physician is unavailable, the RMERT technical rescue paramedic or nurse should perform this procedure only if absolutely indicated. If no other practical alternative is available, and emergent extrication is warranted, proceed with the field amputation procedure.

Field Amputation Procedure:
1. Stabilize the site as best possible and wear appropriate PPE.
2. Control external bleeding. Use appropriate bandage or tourniquet to stop bleeding. Place a second tourniquet if bleeding continues. As a last resort, direct clamping of the bleeding artery should be considered (physician level).
3. Obtain IV access if possible and practical. Apply oxygen by NRB mask.
4. Inform the patient of the situation and the need for amputation. If the patient is alert and able to make a decision, get verbal consent before the procedure.
5. If vital signs are stable, administer narcotic pain medication.
6. Determine the incision/amputation site, and irrigate the wound to remove mud and debris.
7. Apply an appropriate tourniquet above the amputation site.
8. If time and conditions allow, inject 1% Lidocaine or other local anesthetic via into the subcutaneous, deeper muscle and periosteal tissues in a circumferential manner at the amputation site. Consider a proximal nerve block.
9. Use a scalpel, knife, saw, or other appropriate tool(s) to perform the amputation.
10. Work rapidly, optimize hemorrhage control, place a sterile or clean dressing over the amputation site, and extricate the patient quickly and safely.
11. If the severed body part is retrieved, irrigate it briefly, place it in a cool, appropriate container, and transport to the patient’s destination hospital.
12. Provide psychological support to the conscious patient.

Care of Severed / Amputated Body Part:
It is important to properly cleanse and transport an amputated body part for possible reimplantation.
1. Use saline or tap water to irrigate the body part of debris and other contaminants.
2. Wrap the body part in sterile gauze, a clean towel or sheet dampened with sterile water or lactated ringers.
3. Place part in waterproof bag or container and seal. Do NOT immerse amputated part in any solutions.
4. Place this container into a larger container filled with ice and enough water to almost cover the ice. Do NOT place the extremity in direct contact with ice, as it may cause freezing injury/frostbite.
5. Transport the body part with the patient, discretely out of sight of the patient.
6. Provide pain medication.
7. Contact MedComm to discuss the specific amputation. Certain amputations may warrant diversion to an appropriate regional surgical specialty center.
Extremity Injuries and Management:

Compartment Syndrome:
Thick layers of tissue, called fascia, separate groups of muscles in the arms and legs. Inside each layer of fascia is a confined space, called a compartment that includes muscle tissue, nerves, and blood vessels. Fascia surrounds these compartments, similar to the way insulation covers wires.

Fascia does not expand. Any swelling in a compartment will lead to increased pressure in that area, which compresses the muscles, blood vessels, and nerves. With accumulating pressure, blood flow to the compartment will be blocked and can permanently injure the muscle and nerves. In prolonged compartment syndrome, the muscles may die and the limb may need amputation. Swelling that leads to compartment syndrome occurs from trauma such as a motor vehicle crash, crush injury, significant fracture or soft tissue injuries. Compartment syndrome is most common in the lower leg and forearm, although it can occur in the hand, foot, thigh, and upper arm.

Signs and Symptoms:
1. Pain is almost universal and described as severe, deep, constant, poorly localized, and may be out of proportion for the extent of injury. The pain is aggravated by stretching the muscle and not relieved by narcotic medication.
2. Paresthesia (e.g., "pins and needles") in the nerves of the affected compartment.
3. Paralysis of the limb is a late finding and the compartment feels tense and firm.
4. Pulselessness rarely occurs, as pressures that cause compartment syndrome are below arterial pressures and pulse is affected only if the artery travels through the affected compartment.

If compartment syndrome is suspected and an extended evacuation situation is expected, attempt to have a surgeon brought in to operate on the leg.

Treatment:
Minimizing the lethal effect of compartment syndrome includes:
1. Ensure scene safety prior to initiating patient care.
2. Place the patient on a portable cardiac monitor, observe the cardiac rhythm for T-wave size and perform frequent ongoing exams.
3. Initiate oxygen therapy and IV access.
4. Infuse IV normal saline and sodium bicarbonate. Consider calcium gluconate in severe cases or if hyperacute T-waves are seen.
5. Prior to removing the heavy object off the extremity, place a tourniquet just proximal to the crush site (as far distally on the extremity as possible). This will minimize the sudden release of acids and potassium from the injured extremity. The tourniquet should remain in place until the patient arrives at the hospital, provided the transport time is <1 hour.
6. Observe the patient for signs of compartment syndrome after compression injury of an extremity or prolonged position lying on a hard surface.
Wound Care Management:

**Contusions:**
Use standard RICE treatment for first 24-48 hours: rest, ice, compression (elastic bandage) and elevation. Do not let people sleep with elastic bandages; swelling may turn them into tourniquets overnight. After 36-48 hours, apply heat, to bring more blood to the area and speed healing.

**Subungual Hematoma (blood trapped under fingernail):**
Clean the nail with appropriate cleansing prep and trephine the nail (make a hole in it). The preferred method is to heat tip of a safety pin in a flame to sterilize and make it red-hot, then apply firmly to nail. An alternative is to use a #11 scalpel blade or 18g needle to drill a hole in the nail.

**Open Soft-Tissue Wounds:**
Examine the wound and classify it as either low-risk or high-risk for complications.

**High-risk** wounds include: open fractures, (bone or tendons exposed), human or animal bites, deep punctures, grossly contaminated wound or severe crush injuries.

**Note:** Never put alcohol, Merthiolate, mercurochrome, or peroxide into an open wound. Povidone-iodine may be used around but not in wounds; the only exception is diluted povidone-iodine for high-risk wounds as described below.

**High-Risk Wounds**
1. Control bleeding.
2. Irrigate the wound (see below).
3. Leave the wound open, and pack and cover it with gauze soaked in povidone-iodine (e.g., Betadine®) diluted with 10 parts water.
4. Change the dressing every six hours; wash hands and wear gloves before changing dressings.
5. Evacuate the patient.

**Low-Risk Wounds**
1. Control bleeding.
2. Irrigate the wound if deep enough to require it.
3. Apply antibiotic ointment and a clean dry dressing.
4. Clean the wound with drinking water and soap twice a day.

**Irrigation:**
1. Use a 30 mL syringe and 18 gauge plastic intravenous catheters, or a zipper plastic bag with small hole to provide a small forceful stream.
2. Use 100 mL of irrigation fluid per inch of wound.
3. Aim the irrigation fluid away, wear glasses/goggles and keep mouth closed to prevent splashing into eyes or mouth.
4. Check Tetanus Status—if no tetanus immunization within the past 10 years, have the team member return to Base to obtain tetanus immunization.
**Friction Blisters:**
1. Leave the blister intact unless it is in a place where it will obviously rupture (e.g., the sole of the foot).
2. If in area that it is likely to rupture, make a small hole at the edge of the blister with a sterilized pin, needle, or #11 scalpel blade. Press gently to remove the fluid.
3. If the top of the blister is partially ripped off, trim it away neatly; clean the area and cover it with some povidone-iodine or antibiotic ointment and a self-adhesive dressing (e.g., a Band-Aid®) or other dressing.
4. Instruct the person to keep the blister clean, since it is susceptible to infection.

**Splinters:**
Attempt removal with a #18 gauge needle, or a #11 scalpel blade.

**Fishhooks:**
The barbs make removing them backwards difficult. Push the hook through and clip off the barbed tip, allowing easy removal. If the tip is deeply embedded, it may be better to clip off the external part of the hook, and stabilize it in place for removal by a physician on-scene, or in the Emergency Department once the person reaches civilization.

**Impaled Objects:**
Whenever possible, discuss this with a Medical Control Physician; the most experienced medic at the scene must decide whether to attempt to stabilize or to remove the object. Most large impaled objects cannot be "stabilized" during an evacuation, so remove an impaled object before transport.
- When removing an impaled object, remove it slowly and gently but firmly, pulling out along the line the object entered. Stop the attempt if any significant resistance is encountered or causes the patient significant pain.
Environmental Illness Management:

**Heat Illness:**
It is important for RMERT staff to stay well hydrated and cool to prevent heat-related illness. In addition, rescuers, victims and others at the disaster site are at risk in moderate to high temperatures and should be monitored.

**Heat Cramps:**
Brief, intermittent and often severe muscular cramps occurring in muscles that are fatigued by heavy work. Heat cramps appear to be related to salt deficiency and commonly occur during the first days of work in a hot environment in persons who produce large amounts of sweat and drink copious amounts of hypotonic fluid (water).

**Treatment:**
Provide oral rehydration of salt and electrolyte fluids.

**Heat Syncope (Fainting, Passing Out):**
Syncope may be a sign of serious medical problems (i.e., seizure disorder, heart valve problem, arrhythmia, or stroke). Fainting may also be due to minor problems, such as dehydration, a sudden psychological shock, prolonged standing, or forgetting to eat breakfast. People who are exposed to hot conditions are at increased risk for heat syncope.

**Signs and Symptoms:**
- Visual scotomata, tunnel vision, vertigo, nausea, diaphoresis and weakness

**Treatment:**
Check for orthostatic changes in blood pressure or pulse, and continue rehydration and sugar replenishment until the person is no longer orthostatic.

When assessing a team member after a syncopal or near-syncopal episode (passing out or nearly passing out), allow the team member who meets the following criteria to resume duties after rest, rehydration and electrolyte replenishment.

1. Lightheadedness or nausea prior to the episode
2. Loss of consciousness for only a few seconds
3. No history of heart disease, no chest pain/pressure associated with the episode
4. No focal neurological symptoms
5. No seizure activity/sign of seizure (tongue biting, bowel or bladder incontinence)
6. No significant injury from falling
7. No heart murmur, no rapid/slow/irregular pulse

**Note:** Use the above protocol with caution; anything about the episode that is suspicious for an etiology other than heat syncope (even if the team member meets all the above criteria), should be cause to terminate the task and head back to Base. A physician should examine any team member with syncope when the team returns to Base, even if initially cleared to continue with the duties.

**Prevention:**
Encourage team members to move often, flex leg muscles repeatedly when standing stationary, avoid protracted standing in hot environments and encourage them to sit or lie down if symptoms start.
Environmental Illness Management:

Heat Exhaustion:
A clinical syndrome characterized by volume depletion that occurs under conditions of heat stress. Two types of heat exhaustion are described:
- Water depletion—inadequate fluid replacement by individuals working in hot environment and limited access to free water (“voluntary dehydration”).
- Salt depletion—takes longer to develop and occurs when large volumes of thermal sweat are replaced by water with too little salt/electrolytes. In contrast to heat cramps, systemic symptoms are present in heat exhaustion.

Signs and Symptoms:
Weakness, fatigue, frontal headache, impaired judgment, vertigo, nausea and vomiting, and occasionally muscle cramps. Orthostatic dizziness or syncope can occur. Sweating persists and may be profuse. The core temperature is only moderately elevated (<104°F or 40°C) and signs of severe CNS dysfunction are NOT present.

Treatment:
1. Provide oral and IV fluids, since heat exhaustion is primarily a volume depletion problem.
   a. Young, otherwise healthy individuals who respond rapidly to hydration do not require transport to a hospital, but should not participate in duties for 24-48 hours.
   b. Older individuals, especially those with cardiovascular disease, require more cautious fluid and electrolyte replacement, frequent serum electrolyte measurements and should be urgently transported to an appropriate hospital for management.

Heat Stroke:
A catastrophic, life-threatening emergency occurring when thermoregulatory mechanisms fail. This results in elevation of body temperature to extreme levels, usually >105°F (40.5°C) producing multisystem tissue damage and organ dysfunction. Patients who present to the hospital with heat stroke have mortality rates ranging from 21-63%.

Signs and Symptoms:
The onset of heat stroke is sudden with altered level of consciousness. Prodromal symptoms lasting minutes to hours occur in ~20% of cases. These are nonspecific and may include weakness, dizziness, nausea, vomiting, anorexia, frontal headache, confusion, drowsiness, disorientation, muscle twitching, ataxia and psychiatric symptoms ranging from anxiety and irritability to psychosis.

Treatment:
1. Immediate cooling is the priority. Mortality increases when cooling is delayed.
2. Remove from the hot environment and place in cool area.
3. Dampen the patient’s clothes with water (preferably tepid or mildly warm fluid) and use a fan to facilitate evaporative heat loss.
4. Place cold packs at sides of the neck, in armpits, and in groin.
5. Place the patient on a cardiac monitor for identification of arrhythmias.
6. Aspiration and seizures are common in heat stroke and airway control is essential. Fluid requirements are modest and pulmonary edema can occur with overzealous fluid administration.
7. Emergent evacuation and transport to appropriate hospital with ICU capability.
Environmental Illness Management:

Cold Illness and Injuries:

Superficial Frostbite (Frostnip):
Frostnip commonly affects fingers, toes, ear lobes, and noses; it can be recognized by a sudden blanching of the nose, ear, or fingertip. Although the body part is pale or yellowish, it is soft to the touch. Numbness is not a useful symptom for diagnosing frostnip.

Treatment:
Re-warm by placing a warm hand over the nose or ear, or by placing a frostnipped finger in the mouth, armpit, or in a warm pocket. On re-warming, the affected part turns red, painful, and swollen, although no permanent damage results.

Deep Frostbite:
In deep frostbite, the subcutaneous tissues are frozen solid, and the affected part feels hard—like a piece of wood. Check for life-threatening hypothermia before treating frostbite. Treat frostbite and hypothermia at the same time.

Treatment:
Arrange for emergent transport to a hospital where definitive re-warming can occur. However, for delayed transport capabilities, or long transport times (>1 hour), re-warming should be initiated on scene and continued en route.
1. If hypothermic, re-warm the core and protect the patient from further cold exposure before worrying about frostbite. However, there is no justification for keeping the frostbitten part cold during transportation.
2. Rapid re-warming is the gold standard for deep frostbite, but slow re-warming (e.g., room temperature air or a warm sleeping bag) is preferable to alleviate more extensive damage of an area kept cold.
3. The best practice is rapid re-warming in 105-110°F (41-43°C) water. Water can be quickly heated on a stove while preparing for evacuation.
4. Avoid smoking, due to the vasoconstricting effect of tobacco. Caffeine also has a vasoconstrictor effect, and should be avoided (coffee, tea, or cola drinks).
5. Frostbitten limbs are numb, so avoid submersion in hot water and avoid thermal burns re-warming near a fire. If no thermometer is available, place an elbow in the water. It should feel very warm but not painful.
6. Frostbite in Litter Patients: Wrap the frostbitten extremities in towels or thick pieces of clothing soaked with warm 105-110°F (41-43°C) water. Wrap waterproof plastic and pieces of closed-cell foam around the towel-wrapped extremity, and place the patient in the litter.
7. Discontinue warming measures once the frostbitten part is thawed. Remove wet towels after several hours and allow the skin to dry.
8. Heat packs and heating pads cause burns during re-warming, even to areas not frostbitten. Heat packs can be used to prevent wet towels from cooling.
9. Treating frostbite in a patient who is also hypothermic is controversial. Re-warming of the periphery should be avoided in hypothermia, but the hands and feet (not the arms and legs) have direct venous connections to the core.
Environmental Illness Management:

**Hypothermia:**

<table>
<thead>
<tr>
<th>Severity</th>
<th>Core Temperature</th>
<th>Physiologic Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>90°F to 95°F (32.2°C to 35°C)</td>
<td>Tachypnea, tachycardia, shivering</td>
</tr>
<tr>
<td>Moderate</td>
<td>82.4°F to 90°F (28°C to 32.2°C)</td>
<td>Loss of shivering, altered LOC</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt;82.4°F (28°C)</td>
<td>Loss of reflexes, coma, v. fib</td>
</tr>
</tbody>
</table>

- Mild hypothermia:
  - Patients with mild hypothermia and no medical problems can be re-warmed using any method, as the ability to 'shiver' is intact and will increase body temperature.
  - Patients and team members with mild hypothermia may return to duty or be discharged after re-warming, ensuring adequate food and drink and documenting a normal physical exam.

- Moderate and severe hypothermia: <90°F (32.2°C)
  - These patients will need extensive medical care due to risk for significant complications including death.

**Treatment:**

**Add as much heat as possible, using any method available.** Attempt to re-warm the core first. Acceptable methods include warm IV fluid infusion, warm fluids by mouth if tolerated, hot packs at lateral neck, armpits, and groin, warm humidified air or oxygen, and re-warming devices (i.e., charcoal vest). Evacuation should NOT be delayed to re-warm the patient. Provide fluids and food if tolerated.

**Handling Hypothermic Patients:**

1. Do not let hypothermic patients exert themselves during rescue.
2. Transport hypothermic patients flat or in a slightly head-down position.
3. Subacute hypothermic patients (exhaustion, mountain, or cave) are often fluid depleted and require fluid resuscitation.
4. Patients who have been hypothermic for days may not tolerate large fluid loads, because of "stiffness" of the heart. In these cases, monitor frequently for signs of fluid overload when giving fluids (lung congestion, ankle or lower back swelling).

**Hypothermia and Cardiac Arrest:**

1. If rescue personnel find a cold and unresponsive person with no signs of life, start artificial ventilation.
   a. Do NOT start external cardiac compression if there are any signs of life.
2. Evaluate the patient for three (3) minutes to detect a pulse, heartbeat, and spontaneous respiration.
   a. Use normal rates for artificial ventilation and external cardiac compression (if asystole and pulseless after 3 minutes).
3. Check for a rhythm with a cardiac monitor. If there is any organized rhythm, even if 20bpm, start artificial ventilation WITHOUT external cardiac compression.
4. Provide oxygen.

Severely hypothermic patients in cardiac arrest may survive long periods without cardiopulmonary resuscitation, if necessary for extrication and rescue. If CPR must be interrupted during rescue (e.g., during evacuation through a small crawlway in a cave), resume CPR when the situation permits.

For hypothermic patients without detectable signs of life, consider transport to a facility that can perform bypass re-warming. Call ahead to alert the facility.
**Special Hypothermia ACLS Notes**

1) ACLS management of a cardiac arrest due to hypothermia focuses on aggressive active core re-warming techniques as the primary therapeutic intervention.
   a. The hypothermic heart may be unresponsive to cardiovascular drugs, transcutaneous cardiac pacing, and defibrillation.
   b. Drug metabolism is reduced. In a severely hypothermic victim, cardioactive medications can accumulate to toxic levels in the peripheral circulation.
      i. IV drugs are often withheld if victim’s core body temperature is <30°C (86°F).
      ii. If core temperature is >30°C, IV medications may be administered with increased time intervals between doses.

2) The criteria for endotracheal intubation are the same for normothermic and hypothermic patients. Intubation does not put hypothermic patients at any more risk of ventricular fibrillation than normothermic patients.

3) Do NOT treat atrial fibrillation, atrial flutter, PVCs, or atrioventricular block in a hypothermic patient. Specifically, avoid atropine and avoid transcutaneous pacing.

**Submersion (Near-Drowning):**
Cold-water submersion (near-drowning) is **not** the same as acute (immersion) hypothermia. **Do NOT re-warm victims of cold water submersion—keep them cold.**
Environmental Illness Management:

Lightning Strikes:
A particularly important point about lightning strikes is the patient may have respiratory paralysis, unconsciousness, and vasospasm with undetectable pulses; even in this scenario, prolonged artificial respiration may allow the patient to recover with no neurological deficit. (Vasospasm is a "cramp" of blood vessel muscles that may make a pulse impossible to feel.) Coma may last for days or weeks, but patients may still make a full recovery.

1. Each lightning strike victim needs immediate ABC's, with careful attention to protecting the C-spine. Lightning strike victims have an excellent chance of full recovery through basic life support.
2. If a patient is found in or near a thunderstorm with confusion or coma, dendritic burns, or ruptured eardrums, lightning strike treatment should be initiated.
3. Check for a pulse (remember the possibility of vasospasm) and measure the BP. Perform a trauma exam. If an otoscope is available, check for tympanic membrane/eardrum perforations. Although these patients are generally stable and recover without incident, evacuate the patient after placing on a cardiac monitor (if available).
4. When triaging a group of people hit by lightning, the rule is "resuscitate the dead," since those showing some signs of life are likely to recover.

Bee Stings:
1. Apply ice to the sting to reduce pain.
2. Ensure the stinger is removed.
3. Patient may use Tylenol and Benadryl to treat local symptoms, but use caution when administering Benadryl as it causes drowsiness.
4. If patient is unstable or having severe symptoms, treat accordingly with PAEMS Anaphylactic/Allergic Reaction protocol.

Animal Bites/Rabies:
For any person who sustains a bite by a mammal (other than rodents, squirrels, or rabbits) that may have rabies virus-contaminated saliva, attempt to capture or kill the mammal without risking additional bites. Do not damage the brain since it is tested for rabies. Arrange for the head to be taken to a public health service laboratory.

1. Reduce the amount of virus in a bite wound, and decrease the possibility of infection, by scrubbing the wound briskly with a scrub brush. Use alcohol and soap if available. Traditionally strong antiseptics or alcohol are avoided in wound care—mammal bites are an exception. Alcohol has been shown to kill the virus, and soaps help remove the virus.
2. After scrubbing the wound, immediately evacuate the patient for possible post exposure vaccination. If the patient has already been vaccinated for rabies, the need for evacuation depends on the wound severity and need for treatment.
3. For high-risk bites, the patient should be given the rabies antigen vaccine series and rabies immune globulin (RIG). Inject half of the RIG at the bite site (infiltrated locally subcutaneously) and the other half intramuscularly. Further rabies antigen vaccine shots will need to be given on a fixed schedule during the next 4 weeks. Arrange for follow up wound care and vaccine administration.
Management of Common Complaints – Rehab Station:
The following is a general description of common medical complaints that may be seen at a rehab or first aid station. It is important to differentiate minor versus serious causes of symptoms, and exam findings that may represent a serious or potentially life-threatening problem. Concerns for serious illness or injury warrant transport and evaluation at an appropriate hospital.

Over the Counter (OTC) Medicines:
During activation of RMERT, it is intended the paramedics, nurses, and physicians may allow patients and fellow rescue workers at the rehab station to utilize these medicines for common complaints. Prior to dispersing medicines, the patient must have an appropriate screening history and limited physical exam. If the complaint is straightforward and the history and physical suggest a benign cause, the medicine may be dispersed per protocol. If a patient presents with a potentially serious complaint, a thorough history, physical, and advanced treatment may be required (e.g., chest pain, lower abdomen pain, or severe headache).

OTC Medications:
1. Tylenol/acetaminophen
   a. Adult dose: 1000 mg oral dose every 6 hrs as needed for pain or fever.
   b. Pediatric dose: 15 mg/kg oral or rectal dose every 6 hrs as needed for pain or fever.
2. Motrin/ibuprofen
   a. Adult dose: 600 mg every 6 hrs as needed for pain or fever.
   b. Pediatric dose: 10 mg/kg oral every 6 hrs as needed for pain or fever.
3. Pseudoephedrine/cold tablets: use as per box label (for adults).
4. Robitussin or Mucinex/guaifenesin: use as per box label (for adults and children).
5. Antacids: Maalox or Mylanta 30-60 mL oral every 6 hrs as needed.
6. Benadryl/diphenhydramine (caution: sedation and decreased reflexes)
   a. Adult dose: 50 mg oral every 6 hrs as needed
   b. Pediatric dose: 1 mg/kg oral every 6 hrs as needed
7. Imodium/loperamide: use for mild diarrhea without fever or abdominal pain.
   Dosing as per box label.
8. Dramamine/Meclizine: for treatment of nausea or vertigo/motion sickness.
   Dosing as per box label.
Management of Common Complaints – Rehab Station:

**HEENT**

**Headache:**
For patients complaining of a severe headache, obtain a detailed history and exam including the head and neck, and neurologic exam. In the presence of neurological symptoms (confusion, visual disturbances, weakness, numbness, or tingling in an arm or a leg, stiff neck, or fever), or complaints of the worst headache of their life, arrange for urgent transport to a hospital.

**Eye Irritation:**
1. Obtain visual acuity.
2. Examine the eye, by inverting the eyelid (if trained), and gently removing any foreign bodies seen on the eyelid or conjunctiva (white part of the eye) with a cotton-tipped applicator or improvised equivalent.
3. Irrigate with clean water to remove foreign bodies from the cornea (clear part of eye).
4. Arrange transport at a pace determined by the patient’s discomfort level.

**Epistaxis/Nosebleed:**
1. Use direct pressure to pinch the nostrils together firmly (proximally on the bridge of the nose).
2. Apply uninterrupted pressure for 10 minutes then recheck. Hold for another 10 minutes if still bleeding. Have the patient sit forward during pressure.
3. For persistent bleeding, pack the nose with gauze. Roll up a small gauze pad (not tissue or paper towel that will partially dissolve) and place it inside the affected nostril to aid in applying pressure. Double-compressed nasal tampons or commercial epistaxis products may be used instead of gauze. To avoid infections, leave gauze pads in place for no more than 1-2 days. Examine the posterior pharynx to ensure no persistent bleeding behind the packing.

**Dental Injury:**
For an avulsed tooth (completely out of the socket), rinse the dirt off. Do NOT scrub the tooth. It destroys the delicate layer of cells that will allow for reattachment. Further treatment depends on the time until transport to a dentist or oral surgeon.
1. Within 1-2 hours of a dentist or oral surgeon, keep the tooth moist so for re-implantation. Keeping the tooth in the patient's cheek is ideal, since the patient's own saliva is the best fluid medium.
2. If evacuation will exceed 1-2 hours, promptly replace the tooth in the socket. Apply dental splinting material to keep the tooth in place. Chewing gum works well. Ensure the patient doesn't aspirate the tooth. If the evacuation route involves difficult climbing, or if the patient has altered level of consciousness, do NOT replace the tooth in the mouth. Instead, place it in a gauze pad moistened with the patient's saliva and clean water or saline, then place it in a plastic bag.
Management of Common Complaints – Rehab Station: 
Chest/Abdomen

Chest Pain:
Chest pain warrants a detailed history and physical exam, taking into consideration the person’s medical history, vital signs and appearance.
1. If an episode of chest pain is clearly identified to result from the following etiologies, the person may choose to be evaluated at a hospital or to continue performing duties.
   a. Minor trauma or muscle strain
   b. Gastroesophageal reflux/heartburn
   c. Bronchitis
2. If there is any concern for more serious etiology, initiate cardiac monitoring, oxygen, IV access and arrange for evacuation. Any team member with chest pain in the field, who was not transported to a hospital, should be evaluated by a physician on return to civilization.

Vomiting and Diarrhea:
History should focus on identifying the possible etiology. In most cases it is viral, but could also be food poisoning, bacterial diarrhea (recent trip to Mexico or known outbreak), intestine obstruction, migraine headache, or other cause.

Treatment:
1. Determine severity of the illness.
   a. If the illness is thought to be benign and the patient does not appear ill, ensure his/her hydration status is adequate (give oral and/or IV fluids) and monitor.
   b. The most serious consequence of vomiting and diarrhea is dehydration, which may progress to hypovolemic shock. If the patient is unstable or appears ill, arrange for evacuation and transport to appropriate hospital.
2. After infectious diarrhea, advance diet as tolerated.
   a. Start with clear fluids, which are rapidly absorbed and leave no residue to form stool and prompt an unwanted bowel movement.
   b. Once clear liquids are tolerated, eating food will stimulate regeneration of intestinal enzymes, and will increase water absorption. Easy-to-digest starches will decrease the diarrhea. Bread, toast, crackers, rice, potatoes, and cooked vegetables are preferred.

Urinary Tract Infection:

Signs and symptoms:
- Dysuria (burning on urination)
- Frequency of urination
- Urgency of urination (having to go right now)
- Incontinence of urine (dribbling of urine, especially with coughing or sneezing)
- Blood in the urine (“hemorrhagic cystitis”)

Treatment:
1. Encourage oral hydration with plenty of fluids.
2. Consider cranberry/cranberry juice, which prevents adherence of bacteria to the ureter and urinary epithelium.
3. Evacuation is not necessary unless the patient has significant discomfort. In cases of fever or significant back pain, evacuate immediately.
Management of Common Complaints – Rehab Station:

Miscellaneous Complaints

Motion Sickness:
Instruct person to fix vision on the horizon or a distant object. For significant symptoms, consider OTC anti-nausea or anti-vertigo medications such as Dramamine or meclizine.

Diabetic Complaints:
Standard first aid training teaches that any sick diabetic should be given sugar, because it will make insulin shock better and will not harm someone who is hyperosmolar or in ketoacidosis.

- If a diabetic does not improve with sugar, start oral rehydration, preferably with WHO Oral Rehydration Solution.

Deep Venous Thrombosis:
A deep venous thrombosis (DVT) or blood clot in the leg is characterized by swelling in one leg, with mild redness and warmth. The calf is swollen compared to the unaffected side and is tender to deep palpation. If the foot is forcibly dorsiflexed (pushed up), the resulting traction on the calf may cause pain. Sometimes the tense, clotted veins can be palpated behind the knee or in the upper calf or posterior thigh ("cords").

1. If there is any suggestion the patient might have a deep venous thrombosis, don’t allow the patient walk. Walking could lead to embolism of a clot and resultant pulmonary embolism. Evacuate with the leg elevated and keep it warm with heat packs.

2. Prevention of deep venous thrombosis in litter patients (who are at risk due to trauma, immobilization, and/or dehydration) is important.
   a. If the patient is conscious, prompt him/her to alternately tighten and relax the legs. If the rigging isn’t ready, and the patient doesn’t have a suspected spine injury, untie the patient and let him/her move around.

3. Hydrate the patient.

4. Be careful of the leg tie-in—anything tight around the leg or ankle will decrease venous flow and promote clotting. Leave room for the patient to wiggle his/her legs.
**Disaster Stress Management:**

**Pain Management:**
Pain has a significant impact on patient’s psychological well-being. Studies have shown that failure to recognize and appropriately treat acute pain may result in increased incidence of chronic pain and post-traumatic stress disorder (PTSD). The degree to which a person experiences pain is a complex and subjective interaction between the physical stimulus and the patient’s cognitive and emotional state. The degree of pain a patient perceives is not directly determined by the degree of the physiologic injury.

**Communication Strategies:**
1. Apprehension and uncertainty of the extent of injuries may accentuate pain. A clear statement of the patient’s injuries may dispel fear and reduce apprehension and pain.
2. Distraction can greatly diminish the perception of pain, and engaging interest in a discussion may help.
3. Invoke imagination to distance a patient from his/her pain. Ask the patient to imagine a favorite place or event and describe it in detail. Imagery in this way can provide powerful pain relief.
4. If appropriately trained and the patient has the ability, a light state of hypnosis may serve as outstanding pain control.

**Critical Incident Stress Management:**
A critical incident is any crisis situation or event with sufficient impact to overwhelm the usual coping skills of an individual or group. In general, the longer the delay between exposure to the critical incident and subsequent psychological intervention, the smaller the chance for a successful outcome.

Examples of critical incidents:
- Serious injury or death of an emergency services worker in the line of duty
- Serious injury or death of a bystander from an emergency services operation
- Multiple deaths or serious injuries
- Serious injury or death of a child or infant
- Any situation that attracts an unusual amount of attention from the media
- Any loss of life after extraordinary and prolonged search and rescue efforts
- Any situation that is charged with emotion and that causes an emotional response that is beyond the normal coping mechanisms of emergency services workers.

The immediate stress reaction may include physical, emotional, cognitive, and behavioral components. Any of these signs and symptoms may be present. It generally occurs at the time of the incident or within 24 hours.

**Note:** An immediate stress reaction is the response of a normal person to an abnormal situation, and NOT a sign of any psychological weakness or chronic psychiatric problems.
Disaster Stress Management:

Physical symptoms include:
1. Profound fatigue and weakness
2. Fine tremor or muscle twitches
3. Diaphoresis
4. Orthostatic hypotension or vasovagal syncope (simple fainting)
5. Lightheadedness
6. Headache
7. Difficulty focusing one’s eyes
8. Difficulty hearing
9. Palpitations
10. Dyspnea and chest pain with or without hyperventilation
11. Nausea, vomiting, diarrhea, or abdominal pain
12. Sensation of a lump in the throat (globus hystericus)

Emotional symptoms include:
1. Anticipatory or generalized anxiety (anxiety about the future, or unconnected with any present danger or fear)
2. Strong fear or even panic reactions
3. Psychological shock (described later)
4. Survivor guilt uncertainty (guilt over surviving when others have died)
5. Acute grief reactions
6. Depression
7. Intensified or inappropriate emotional reactions to normal occurrences

Cognitive symptoms include:
1. Blaming others (even those who are logically blameless) for the critical incident
2. Generalized confusion
3. Inability to concentrate
4. Inability to perform simple calculations
5. Poor attention span
6. Memory lapses
7. Anomia (inability to find the right words)
8. Inability to distinguish the difference between serious and trivial concerns
9. Inability to make decisions
10. Greatly increased (or greatly decreased) alertness and awareness of surroundings

Behavioral symptoms are relative to normal behavior patterns, which vary between individuals and include:
1. Changes in speech patterns
2. Withdrawal
3. Angry outbursts
4. Hypervigilance (increased suspicion and attention to one’s environment or outright paranoia)
5. Changes in interactions with others (i.e., wife, friends, team members)
6. Increase or decrease in appetite or alcohol consumption
7. Sleep disturbances including early morning awakening, insomnia, hypersomnia, and generalized fatigue
8. Visits to health professionals for seemingly minor or nonexistent problems.
**Disaster Stress Management:**
Be vigilant in identifying individuals exhibiting signs of stress and, once identified, initiate psychological support and management. On-scene psychological support should be conducted one-on-one. Groups of people may overwhelm the individual. The goal is to assist the individual in regaining emotional control by facilitating communication of feelings and reactions through listening and support.

1. Arrange for frequent breaks to rest from duties.
2. If possible, remove the individual from the sights, sounds and smells of the incident.
   a. Face away from the incident
   b. Get into a vehicle in a position away from the incident
   c. Move upwind of the smells of the incident
   d. If the individual cannot be moved, place an object to block the person’s view
3. Engage the person in discussion, starting with factual information.
4. Once rapport has been established, emotions and feelings can be discussed.
5. Validate the person’s feelings
6. Stay with the individual or arrange for someone to stay and continue to provide psychological support.
**Extended Field Patient Care Protocols:**

These protocols discuss those circumstances when RMERT medical providers provide extended field medical care. In most circumstances, any critically ill or injured patient will be assessed, triaged, stabilized as best possible, and rapidly transported to an appropriate hospital for further care. However, this may not always be possible or indicated. Severe weather conditions, overwhelming numbers of patients (either in the field or at nearby hospitals) may preclude or delay patient transportation. Some patients may be treated and released on-scene after providing care. Since Region 2 RMERT is capable of functioning for 4 days, these protocols will discuss the first 96 hours of in-field prehospital medical care.

**General patient care considerations:**
RMERT administrators and medical professionals will determine patient care decisions after considering the following variables:

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<th>Weather</th>
<th>Patient’s condition</th>
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<td>Personnel</td>
<td>Transportation limitations</td>
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<td>Medical supplies</td>
<td>Status of nearby hospitals</td>
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<td>Other identified issues</td>
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**Emergent evacuations:**
1. Seriously ill or injured patient will receive triage and stabilizing medical care appropriate for circumstances.
2. Arrange safe and appropriate transportation, including appropriately trained and equipped medical staff to care for the patient during transportation. **Note:** RMERT does not have vehicles for transport but will arrange and provide personnel for transport if needed.

**Patient categorization:**
Patients who arrive at the RMERT medical facility will be categorized after evaluation.

1. **Ambulatory:**
   - Treatment is provided ≤3 hours, resulting in a stable patient and released.

2. **Transport by private vehicle:**
   - Treatment is provided, resulting in a stable patient, and referred to a nearby hospital or specialist’s office (i.e., plastic surgeon, orthopedic surgeon).

3. **Transport by EMS:**
   - Treatment is provided in seriously ill or injured patient requiring transfer to appropriate hospital by ambulance or helicopter.

4. **Patient expired** (DOA or died in field).

5. **Delayed Transport:**
   - Treatment is provided in seriously ill or injured patient requiring transfer to appropriate hospital, but no transportation is available.

6. **Extended Treatment and Release:**
   - Treatment provided to exceed 3 hours and expected to result in a stable patient within 24 hours of treatment and/or observation.
**Extended Field Patient Care Protocols:**

**Transportation Decisions:**
RMERT administrators and medical professionals will determine transportation priorities after considering the patients’ condition, and resources available for transport (vehicles, equipment, personnel and hospital capacity to receive patients). These decisions consider the risks and benefits of transport versus the risks and benefits of keeping the patient at the RMERT facility.

1. In general, any criticality ill or injured patient should be transferred to a hospital with the capacity and capability of providing the medical care needed.
2. In a disaster or mass casualty incident (MCI), the designated medical transportation officer maintains contact with the vehicle-staging officer in order to maximize the availability of ambulances or other modes of transportation (e.g., buses).
3. In other scenarios, a designated RMERT administrator will be responsible for arranging appropriate transportation and communication with the accepting hospital or emergency department.

**Medical Discharge Decisions:**
Patient care provided in the RMERT facility >3 hours warrants a discussion regarding the anticipated course of treatment.
The physician and/or nurse caring for the patient will determine whether
- The patient warrants further medical care and transport to a hospital
- The patient needs further outpatient medical follow up
- The patient is expected to be stable for discharge (released to the care of family/friends)
The RMERT medical team will make the appropriate arrangements as indicated.

**Note:** Patients DOA or dying at the RMERT medical facility are coroner cases and will be processed in a coordinated fashion.

**Documentation:**
It is important to accurately and thoroughly document the history, physical exam, vital signs, care provided, medications administered, interventions performed and instructions given in each patient care encounter. The provider caring for the patient is responsible for completion of the documentation.

**Examples of appropriate documentation:**
1. Simple patient treat and release—Simple patient encounter registration form, which is a single page with space to document treatment and disposition.
2. Complex patient/seriously ill or injured—Document on the appropriate T-sheet. These will be completed and copied, and accompany the patient or be faxed to the destination hospital or emergency department.
3. Extended patient care chart—Document for patient care exceeding 3 hours to include serial vitals sign measurements, fluids in and out, medication and treatments rendered, response to treatment, and medical decision-making.
4. Peoria Area EMS (PAEMS) Short Form—Document for patient care provided during transport to the hospital. These documents should eventually be transferred electronically into the IDPH EMS database.
**Extended Field Patient Care Protocols:**

**Vital Sign Measurements:**

1. The patients who arrive at the RMERT tent or medical facility will have a complete set of vitals signs taken including:
   a. Heart rate
   b. Blood pressure
   c. Respiratory rate
   d. Temperature (oral-rectal)
   e. Pulse oximetry.

2. Depending on the seriousness of the injury or illness, the physician or nurse in charge of the patient’s care will then direct the medical support staff to check the patient’s vitals signs on a routine basis according to appropriate time scale to detect any significant change in patient’s status.

3. On initial evaluation, the patient’s vitals should be measured every 15 minutes, and if stable and demonstrate a positive response to resuscitation efforts, the time interval may be extended to hourly or other appropriate time interval.

4. No patient with abnormal vital signs should be released until after specific risks and benefits of release are discussed with the patient and on-scene or Medical Control physician approves patient release.

**Fluid intake and Output:**

Document fluid intake and output on every extended care patient chart.

1. Water/fluid intake (amount, type)
2. Intravenous fluid administration (type of IV fluid, rate, total amount infused)
3. Urine output
4. Bowel movement—in cases of diarrhea, the fluid amount should be approximated, recorded, and considered for replacement with IV or oral fluids.

**Food/Nutrition:**

RMERT responses are equipped to provide adequate food and water for staff for the first 96 hours. Additional resources for food and water will be needed if the RMERT field hospital is providing care for multiple patients. Options for additional resources include the following:

- American Red Cross
- Local restaurants
- Local grocery stores
- Local community members

If these sources are not available or exhausted, RMERT has pre-packaged Heater Meals which are stored at RMERT headquarters. Once these are consumed the team will need to be resourceful and obtain the food and water from other sources.

**Water/Oral Hydration:**

RMERT will bring or arrange for water provisions for staff and patients. Water filtration is an option from nearby water resources, in the event the community does not or cannot supply reliable potable drinking water. Nearby grocery stores will be a source of juices, soda, and other non-water hydration.
Extended Field Patient Care Protocols:

Wound care and dressing changes:
RMERT members will provide wound care according to general guidelines. Wound care ranges from simple wound cleansing and dressing to extensive tissue debridement, and multi–level sutured wound closure. All wounds will be promptly inspected, receive gross decontamination/cleansing (taking into account pain tolerance) and dressed. For delayed transport (>3 hours) of significant wounds, open fractures, or high-risk wounds, consider administration of IV or oral antibiotics.

Respiratory Care:
The liquid oxygen dispenser can provide oxygen for multiple patients, and distribution lines allow for utilization in the field hospital. For stable patients with normal respirations and adequate room air pulse oximetry, oxygen therapy will not be necessary.

Critically ill and mechanical ventilator-dependent patients will be provided oxygen therapy. The medical staff caring for the patient will determine the concentration of oxygen and delivery modality.

Pain Control:
All patients will have their pain assessed and treated as deemed appropriate by RMERT staff. Pain scores will be documented prior to and after pain medications are given to demonstrate effect. The on-scene physician or Medical Control physician will be consulted on narcotic pain management decisions. If a painful condition is readily apparent and easily diagnosed (e.g., ankle sprain, contusion), RMERT staff can administer OTC medications.

1. Stable patient with mild to moderate pain and able to tolerate oral medications
   a. Tylenol (acetaminophen)
   b. Ibuprofen
   c. Hydrocodone/acetaminophen
   d. Other available oral pain medications

2. Stable patient with acute injury or severe pain
   a. Consider initial dose of IV narcotic pain medication
   b. Continued pain control with oral pain medications

3. Stable/Unstable patient without the ability to swallow
   a. IV narcotic pain medication

Medication Administration:
All other medications, including antibiotics, will be administered at the direction of the on-scene nurse or physician or via telephone contact with a Medical Control physician. Prior to medication administration, all patients will have their identity/name verified, and medication allergies verified.

Patient privacy and sleep considerations:
Extended care patients will have their personal privacy maintained. Privacy curtains will be utilized between beds to provide the most privacy possible given the conditions. Patients will be given time and conditions to sleep/rest with as few interruptions as their condition warrants. For patients with stable medical conditions and vital signs, the vital sign measurements can be extended to every 4 hours.
Mechanical Ventilation Set-up and Management:

Basics of Mechanical Ventilation Modes

There are several modes available for use in mechanical ventilation of patients.

1. **Continuous mandatory ventilation “CMV”**—Ventilators set to CMV will cause breaths (ventilations) to be delivered at preset intervals, regardless of the patient effort. This mode is used most often in the paralyzed or apneic patient. A person receiving CMV can neither trigger a breath nor inspire gas spontaneously through the ventilator circuit, which makes this mode only appropriate for apneic, pharmacologically paralyzed, deeply sedated patients.

2. **Assist-control ventilation**—The assist control (A/C) mode on the ventilator delivers a minimum number of preset breaths in coordination with the respiratory effort of the patient. With each inspiratory effort, the ventilator assists by delivering the full tidal volume. If an A/C ventilator is set to deliver 12 breaths per minute, a breath is provided every 5 seconds. Should the patient initiate a breath, an additional breath is provided and the ventilator’s timer resets for another 5 seconds. This mode is well tolerated by patients.

3. **Intermittent mandatory ventilation (IMV)**—Like CMV and A/C ventilation, IMV can be either pressure or volume-controlled. In this mode the ventilator delivers a preset rate, tidal volume (or inspiratory pressure) and FiO_{2}. The patient may also draw spontaneous breaths in-between mandatory breaths. Unlike A/C, breaths that the patient takes spontaneously do NOT trigger or cycle the ventilator. Patient-initiated breaths are completely spontaneous, neither assisted nor supported by the ventilator.

4. **Synchronous intermittent mandatory ventilation (SIMV)**—This mode delivers a preset number of breaths in coordination with the respiratory effort of the patient. Spontaneous breathing is allowed between breaths. This is well tolerated, and the synchronization limits barotrauma.

Choosing the Mechanical Ventilation Mode:

The initial choice of the ventilation mode (e.g., SIMV, A/C) is institution and practitioner dependent. A/C ventilation, as in CMV, is a full support mode where the ventilator performs most, if not all, the work of breathing. Both modes are beneficial for patients who require high minute ventilation. Full support reduces the patient’s oxygen consumption and CO_{2} production of the respiratory muscles. A potential drawback of A/C ventilation in the patient with obstructive airway disease or asthma is worsening of air trapping and breath stacking.

When full respiratory support is necessary for the paralyzed patient following neuromuscular blockade, no difference exists in minute ventilation or airway pressures with any of the above modes of ventilation. In the apneic patient, A/C with a respiratory rate (RR) of 10 and a TV of 500 mL deliver the same minute ventilation as SIMV with the same parameters.
Mechanical Ventilation Set-up and Management:

Ventilator Settings for Spontaneously Breathing Patients:

1. **Pressure support ventilation**—Pressure support ventilation (PSV) has been advocated to limit barotrauma and to decrease the work of breathing. Breathing is controlled by the patient and peak pressures are controlled by the ventilator. The primary goal of PSV is to support the patient’s spontaneous breathing effort while providing satisfactory oxygenation. Airway pressure support is maintained until the patient’s inspiratory flow falls below a certain cutoff (e.g., 25% of peak flow). With some ventilators, there is the ability to set a back-up IMV rate should spontaneous respirations cease. PSV is the mode of choice in patients whose respiratory failure is not severe and who have an adequate respiratory drive. It can result in improved patient comfort, reduced cardiovascular effects, reduced risk of barotrauma, and improved distribution of gas.

2. **Noninvasive positive pressure ventilation (NPPV)**—Includes Continuous Positive Airway Pressure (CPAP) or Biphasic Positive Airway Pressure (BiPAP) and is applied with a facemask instead of an endotracheal tube. Consider this mode for patients with mild to moderate respiratory failure. The patient must be alert enough to follow commands. Clinical situations in which it has proven useful include:
   a. Acute exacerbation of chronic obstructive pulmonary disease (COPD)
   b. Acute exacerbation of asthma
   c. Decompensated congestive heart failure (CHF)
   d. Pulmonary edema from hypervolemia.

   BiPAP is commonly misunderstood to be a form of pressure support ventilation triggered by patient breaths; in actuality, BiPAP is a form of CPAP that alternates between high and low positive airway pressures, permitting inspiration (and expiration) throughout.

**Indications for Mechanical Ventilation**

The principal indications for mechanical ventilation are airway protection and respiratory failure. The decision to intubate and mechanically ventilate or to institute noninvasive ventilation support is generally made on clinical grounds without delay for laboratory evaluation. Obtaining a PaCO₂ is useful to confirm respiratory failure when broader differential diagnoses exist (e.g., hypercarbic obtunded patient might have a reversible metabolic or toxicological etiology), but adequate stabilization and ventilation of these patients should not be delayed.

Laboratory Criteria:

1. Blood gases:
   a. PaO₂ < 55 mmHg
   b. PaCO₂ > 50 mmHg and pH < 7.32

2. Pulmonary function tests
   a. Vital capacity < 10 ml/kg
   b. Negative inspiratory force < 25 cm H₂O
   c. FEV₁ < 10 ml/kg

Clinical Criteria:

- Apnea or lack of adequate respirations or effective ventilations
- Respiratory distress with altered mentation
- Clinically apparent increasing work of breathing unrelieved by other interventions
- Obtundation (altered mental status) and need for airway protection
Mechanical Ventilation Set-up and Management:

Mechanical Ventilator Setting Guidelines:

1. **Mode of ventilation**: The mode of ventilation should be tailored to the needs of the patient. In the emergent situation, the RMERT member may need to order initial setting quickly. SIMV and A/C are versatile modes that can be used for initial management. In patients with a good respiratory drive and mild-to-moderate respiratory failure, PSV is a good initial choice.

2. **Tidal Volume (TV)**: An initial tidal volume of 5-8 ml/kg of ideal body weight is generally indicated, with the lower values recommended in the presence of obstructive airway disease and ARDS. The goal is to adjust the TV so that plateau pressures are <35 cm H$_2$O.

3. **Respiratory rate**: 10-12 breaths per minute is recommended initially for adult patients not requiring hyperventilation for management of toxic or metabolic acidosis, or intracranial injury. High respiratory rates allow less time for exhalation, which increases mean airway pressure, and causes air trapping in patients with obstructive airway disease. The initial rate for COPD/Asthma/ARDS may be as low 5-6 breaths per minute.

4. **Supplemental oxygen therapy**: Initial setting should provide 100% oxygen delivery and transitioning quickly to provide the lowest FiO$_2$ that produces arterial oxygen saturation (SaO$_2$) >90% and PaO$_2$ >60 mmHg.

5. **Inspiration/Expiration Ratio**: The normal inspiration/expiration (I/E) ratio to start is 1:2. This ratio reflects the duration of machine insufflation and the rest periods between them.
   a. If atelectasis is a problem, Positive End-Expiratory Pressure (PEEP) should be added. This may permit the use of more physiologic FiO$_2$ levels.
   b. In COPD patients, the I/E ratio is reduced to 1:3 or 1:4 to avoid air-trapping (breath stacking) and auto-PEEP or intrinsic PEEP (iPEEP).
   c. Use of inverse I/E ratio may be appropriate in certain patients with complex compliance problems (e.g., ARDS).

6. **Inspiratory flow rates**: Inspiratory flow rate is a function of the TV, I/E ratio, and RR and may be controlled internally by the ventilator. If flow rates are set manually, 60 L/min is typically used. This may be increased to 100 L/min to deliver tidal volumes quickly and allow for prolonged expiration in the presence of obstructive airway disease.
**Mechanical Ventilation Set-up and Management:**

7. **Positive End-Expiratory Pressure (PEEP):** PEEP has several beneficial effects and may be clinically underutilized. Applying physiologic PEEP of 3-5 cm H$_2$O is common to prevent decreases in functional residual capacity in those with normal lungs. The reasoning for increasing levels of PEEP in critically ill patients is to provide acceptable oxygenation and to reduce the FiO$_2$ to nontoxic levels (FiO$_2$ < 0.5). The level of PEEP must be balanced such that excessive intrathoracic pressure (with a resultant decrease in venous return and risk of barotrauma) does not occur.
   a. PEEP has been found to reduce the risk of atelectasis and increase the number of “open” alveoli participating in ventilation, thus minimizing V/Q mismatches.
   b. In ARDS, the degree to which alveoli function is compromised varies tremendously and there is no single “ideal” PEEP appropriate for all alveoli. ARDS can occur from inhalation injury from fires, blast lung (primary blast injury) from explosions, inhalation of ammonia or chlorine or other toxic chemicals from a Hazmat scene. If high levels of PEEP are required, the lungs have a greater tendency to “pop”. Therefore, the patient must be closely monitored for pneumothorax or tension pneumothorax. Chest decompression needles and chest tube kits with Pleurevac must be kept nearby and ready for immediate use.
   c. PEEP shifts fluid from the alveoli to the perivascular interstitial space, and therefore beneficial in cardiogenic and noncardiogenic pulmonary edema. Additionally it causes decreased venous return to the right side of the heart by increasing intrathoracic pressure.

8. **Sensitivity:** Sensitivity adjusts the level of negative pressure required to trigger the ventilator. A typical setting is -1 to -2 cm H$_2$O. Too high a setting causes weak patients to be unable to trigger a breath. Too low a setting may lead to overventilation by causing the machine to auto-cycle. Patients with high levels of autoPEEP may have difficulty inhaling deeply enough to achieve a sufficiently negative intra-airway pressure.

**Monitoring during Mechanical Ventilation:**

Peak inspiratory and plateau pressure be assessed frequently, although recognize these will increase in the presence of extrapulmonary pressure (e.g., stiff chest wall or distended abdomen), and do not reflect the true risk of barotrauma. Parameters may be adjusted to limit pressure to <35 cm H$_2$O.

Expiratory volume is checked initially and periodically (continuously if ventilator is capable) to ensure the set tidal volume is delivered.

Any indication of an air leak must prompt a search for underinflated ET tube cuff, open tubing port, or worsening pneumothorax.

In patients with airway obstruction, monitor auto-PEEP.
Mechanical Ventilation Set-up and Management:

Mechanical Ventilator Troubleshooting:

1. **High-pressure alarms** are triggered when resistance to ventilation is high. This may occur secondary to reduced lung elasticity or airway obstruction, or extrinsic compression. Patients should be evaluated for pneumothorax, bronchospasm, elevated abdominal pressure, mainstem intubation, ETT obstruction, tube biting, dynamic hyperinflation/air trapping, psychomotor agitation, and worsening pulmonary compliance secondary to progressive pulmonary disease.
   a. Tube suctioning and adequate patient sedation are recommended after other causes of obstruction are ruled out.
   b. Comparison of peak pressure with plateau pressures may be helpful in indentifying the location of resistance, especially if graphical representation of airway pressure is available. Plateau pressure can be measured by applying a brief inspiratory pause after ventilation. It better reflects the risk of barotrauma than peak inspiratory pressure. If pleural pressure is elevated secondary to a stiff chest wall or high abdominal pressure, transpulmonary pressure (plateau pressure-pleural pressure) will be low, minimizing the risk of bleb or alveolar rupture.

2. **Low exhaled volume alarms** are triggered by air leaks. These are most frequently secondary to ventilatory tubing disconnect from the patient’s tracheal tube but may also occur in the event of balloon deflation or tracheal tube dislodgement. Tube placement, balloon inflation, and connection to the ventilator should be verified.

3. **Hypoxia** after intubation may occur secondary to hypoventilation, worsening cardiac shunting, mainstem intubation, aspiration, tube dislodgement, pulmonary edema, or inadequate FiO₂. High airway pressures and low exhaled volumes described above can result in hypoxia if they cause hypoventilation. Despite the use of numerous safety precautions, cases are occasionally documented of ventilators being connected to compressed air or nitrous oxide rather than oxygen. Increasing FiO₂ and adjusting ventilatory settings to increase PEEP or respiratory rate are useful first steps after excluding equipment failure and mechanical cause of hypoxia.

4. **Hypotension** after intubation is usually attributable to diminished central venous blood return to be the heart secondary to elevated intrathoracic pressure. This can be treated with fluid infusions and/or adjustment of ventilatory settings to lower intrathoracic pressure (reduce PEEP, tidal volume, and, if air trapping is suspected, respiratory rate). Hypotension may also be secondary to vasovagal reaction to intubation, rapid sequence induction, sedation, and tension pneumothorax.
Pre-Hospital (PAEMS) Patient Care Protocols: