## EMS SKILL

### CARDIAC EMERGENCY: CARDIOPULMONARY RESUSCITATION

#### INFANT - 1 and 2 RESCUE CPR

## PERFORMANCE OBJECTIVES
Assess signs of cardiopulmonary arrest in an infant and demonstrate competency in performing cardiopulmonary resuscitation and managing a full arrest.

## CONDITION
Assess for signs of cardiopulmonary arrest and perform resuscitative measures as needed for an infant who appears to be unresponsive. Necessary equipment will be adjacent to the manikin or brought to the field setting.

## EQUIPMENT
Infant CPR manikin, bag-valve-mask device, O2 connecting tubing, oxygen source with flow regulator, AED, oropharyngeal airway appropriate for manikin, silicone spray, water-soluble lubricant, 10cc syringe, goggles, masks, gown, gloves, emergency resuscitation tape, timing device.

## PERFORMANCE CRITERIA
- Items designated by a diamond (♦) must be performed successfully to demonstrate skill competency.
- Items identified by double asterisks (**) indicate actions that are required if indicated.
- Items identified by ($) should be practiced.
- Ventilations and compressions must be at least at the minimum rate required.

### PREPARATION

<table>
<thead>
<tr>
<th>Skill Component</th>
<th>Key Concepts</th>
</tr>
</thead>
</table>
| ♦ Take body substance isolation precautions | - Mandatory personal protective equipment – gloves at all times  
- Situational - long sleeves, goggles, masks, gown as needed |
| ♦ Assess scene safety/scene size-up | |
| ** Consider spinal immobilization - if indicated | - If unknown as to possible trauma, treat as trauma (determined by environment and information obtained from bystanders).  
- Depending on the size of the infant and if spinal immobilization is required, an additional rescuer is needed to maintain in-line axial stabilization. |
| ♦ Evaluate additional BSI needs | - Situational - goggles, masks, gown |
| ♦ Approach the infant and introduce yourself to the caregivers | |

### PROCEDURE

<table>
<thead>
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| ♦ Establish unresponsiveness | - Tap bottom of feet or gently shake and shout.  
- The 2nd Rescuer should contact ALS and get the AED.  
- DO NOT start CPR in infants who meet the criteria for: Reference No. 814 or 815 |
| ** Call for additional resources – if needed**  
** Consider an AED - if available | |
| ♦ Assess breathing 5-10 seconds for:  
- Apnea  
- Abnormal breathing  
- Gasping | - Assess breathing for at least 5 seconds and no more than 10 seconds.  
- Agonal gasps are not breathing but may be present in the 1st several minutes after sudden cardiac arrest.  
- Gasps may sound like a snort, snore, or groan  
- If more than 2 rescuers, the 3rd rescuer should open the airway and start ventilations. |
<table>
<thead>
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<tbody>
<tr>
<td>♦ Call for additional resources – if needed</td>
<td>♦ If rescuer must leave the infant to call for help, the rescuer should provide 5 cycles of CPR (2 minutes) before calling for help and getting the AED.</td>
</tr>
<tr>
<td>** Request an AED - <em>if available</em></td>
<td>♦ In a pediatric arrest, it is important to provide oxygenation and ventilation. CPR for 5 cycles (2 minutes) should be performed prior to the use of the AED.</td>
</tr>
<tr>
<td>♦ Palpate for brachial/femoral pulse 5-10 seconds:</td>
<td>♦ For infants, use a defibrillator with a child key/switch, pediatric pads, or adult pads with a pediatric dose-attenuator. If an attenuator system is not available, use adult pads and AED.</td>
</tr>
<tr>
<td>** Start compression cycle - (C-A-B sequence) **</td>
<td>♦ If two rescuers are present, the 2nd rescuer should contact ALS and get the AED</td>
</tr>
<tr>
<td>- if no pulse or signs of circulation</td>
<td>♦ If a team is present:</td>
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<tr>
<td>- if pulse &lt; 60 beats/minute with poor perfusion</td>
<td>1 rescuer calls for ALS</td>
</tr>
<tr>
<td>***Use AED as soon as available</td>
<td>1 rescuer starts chest compressions</td>
</tr>
<tr>
<td>♦ Place infant on a hard surface if no pulse</td>
<td>1 rescuer provides ventilation</td>
</tr>
<tr>
<td>♦ Perform chest compressions:</td>
<td>1 rescuer retrieves a defibrillator and prepares to use it</td>
</tr>
<tr>
<td>- 2 finger technique – 1 rescuer</td>
<td>These are the recommended rates for infants:</td>
</tr>
<tr>
<td>- Location: lower 1/2 of sternum (1 finger width below nipple line)</td>
<td>♦ Compression rate of 100/minute (speed of compressions)</td>
</tr>
<tr>
<td>- Depth: 1/3 of chest circumference or approximately 1 ½ inches</td>
<td>Technique for chest compressions when performing CPR:</td>
</tr>
<tr>
<td>- Rate: at least 100/minute</td>
<td>- 2 finger technique - 2 finger pads of either index &amp; middle finger or middle &amp; ring finger of one hand on lower 1/2 of sternum.</td>
</tr>
<tr>
<td>- Ratio cycle: 30 compressions to 2 ventilation</td>
<td>- 2 thumb-encircling technique (2 rescuer CPR) – Use both thumbs side by side</td>
</tr>
<tr>
<td>♦ 2 Thumb-encircling technique – 2 rescuer</td>
<td>♦ Compression method – push hard and fast</td>
</tr>
<tr>
<td>- Location: center of the chest just below nipple line</td>
<td>♦ Compression/ventilation rates for infants:</td>
</tr>
<tr>
<td>- Depth: at least 1/3 of chest circumference</td>
<td>Infant 1 rescuer CPR = 30:2 ratio</td>
</tr>
<tr>
<td>- Rate: at least 100/minute</td>
<td>Infant 2 rescuer CPR = 15:2 ratio</td>
</tr>
<tr>
<td>- Ratio cycle: 15 compressions to 2 ventilation</td>
<td>♦ Compression rate of 100/minute (speed of compressions) delivers fewer than 100/minute due to interruption of providing ventilations. The actual number is determined by the accuracy and consistency of the compression cycle.</td>
</tr>
<tr>
<td>** DO NOT compress on or near the xiphoid process **</td>
<td>♦ Slightly elevate chest so that head and neck remain in neutral position and the neck is not flexed or hyperextended.</td>
</tr>
<tr>
<td>** Allow for chest recoil</td>
<td>♦ The 2-thumb-encircling technique is preferred over the 2-finger technique because it produces higher coronary artery perfusion pressure and may generate higher systolic and diastolic pressures.</td>
</tr>
</tbody>
</table>
Skill Component | Key Concepts
--- | ---
Open/Maintain a patent airway:  
- Medical - head-tilt/chin-lift  
- Trauma - jaw-thrust  
- neutral position (tragus of ear level with top of shoulder) | Use shoulder padding to maintain proper airway and spinal alignment.  
The tongue is proportionately large in size to the oropharynx and may cause partial or complete airway obstruction in infants.  
The infant's airway is more compliant and may collapse during respiratory effort. The airway is easily obstructed by mucus, blood, pus, edema, external compression and hyperextension.  
Infants have limited lung expansion and depend more on diaphragm movement to generate a tidal volume.  
If suspected trauma, the head and torso should be turned as a unit.  
A second rescuer is needed to maintain in-line axial stabilization if spinal immobilization is required.

** Clear/suction airway - if indicated**  
** Consider oropharyngeal airway - if indicated**

Manage ventilations:  
- Give 2 breaths with BVM device or pocket mask - (1 second/breath)  
- Insert an oral airway or nasopharyngeal airway - if indicated | Rescue breathing is 1 breath every 3 - 5 seconds (12 – 20/minute).  
If the airway is open and it is difficult to compress the bag and air leaks around the seal, an airway obstruction is present.  
To ventilate, use *only* enough force to produce visible chest rise. Over-inflation causes gastric distention and elevating the diaphragm which will affect tidal volume.  
EMS personnel often deliver excessive ventilations during CPR which may result in:  
- increased intrathoracic pressure and impedance of venous return resulting in decreased cardiac output, cerebral blood flow, and coronary perfusion  
- air trapping and barotraumas in children with small-airway obstruction  
- increases risk of regurgitation and aspiration in children without an advanced airway

** Ensure adequate chest rise**  
** Avoid excessive ventilation**

Establish a compression to ventilation ratio of 30:2 for 1 rescuer and 15:2 for 2 rescuers | A compression cycle consist of 30 compressions to 2 ventilations  
Five (5) compression cycles should take approximately 2 minutes.

Continue to next step if AED is unavailable or rhythm is analyzed and “No Shock Advised”

Switch duties after every 5 cycles – if additional rescuers are available | Switch duties after every 5 cycles to prevent rescuer fatigue.  
Switching duties should take less than 5 seconds.  
If using an AED, to minimize interruption make switch when AED is analyzing.

** End with ventilations**  
** Begin with compressions**

Continue CPR until ALS arrives or patient shows signs of return of spontaneous circulation (ROSC)  
- If circulation is present and breathing is normal – place in recovery position  
- If circulation present, but breathing is absent or inadequate - continue with rescue breathing 12-20 ventilations/minute (every 3-5 seconds)  
- If no circulation present - continue CPR ratio of 15:2 | Signs of return of circulation such as movement and/or response to verbal or tactile stimuli  
Signs of poor perfusion are pallor, mottling, cyanosis, delayed capillary refill and altered level of consciousness.  
If after 10 minutes of EMS resuscitation and no other resources are enroute, consider transport to the nearest receiving hospital – Reference No. 510.

** Start compressions - if heart rate is less than 60/minute with poor perfusion**

Analyze rhythm every 2 minutes – if AED applied | Continue rhythm analysis every 2 minutes until ALS takes over or patient has obtained ROSC.
### Skill Component

**Reassess patient every 60 seconds after return of spontaneous circulation (ROSC):**
- Check for:
  - responsiveness
  - pulse
  - breathing

**Obtain baseline vital signs**

**Perform rescue breathing - if indicated**
- Ventilation rate:
  - BVM – 12-20 breaths/minute (1 breath every 3-5 seconds)
  - Advanced airway – 8-10 breaths/min (1 breath every 6-8 seconds)

**§ Explain the care being delivered and the transport destination to caregivers**

### Key Concepts

- The main considerations post-resuscitation are:
  - Perform pulse check every 60 seconds
  - Perform a primary and pertinent secondary assessment every 5 minutes.
  - If a pulse is present and the infant is not breathing adequately, start positive pressure ventilations.

- If respirations are absent or inadequate the rescuer must open the airway and ventilate the infant to prevent cardiac arrest and hypoxic injury to the brain and other organs.
- Hypoxia may result in bradycardia and followed by cardiac arrest.
- Infants shall be managed with BVM ventilations and OP.
- Infants over may have an advanced airway inserted by paramedics such as an endotracheal tube.
- Ventilations with an advanced airway is asynchronous with a rate of 8-10 breaths/minute (1 breath every 6-8 seconds).

- Communication is important when dealing with the patient, family or caregiver. This is a very critical and frightening time for all involved and providing information helps in decreasing the stress they are experiencing.

### REASSESSMENT

(Ongoing Assessment)

<table>
<thead>
<tr>
<th>Skill Component</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Perform pulse check every 60 seconds</td>
<td>This is a priority patient and must be re-evaluated at least every 5 minutes or sooner if any treatment is initiated; medication administered, or condition changes.</td>
</tr>
<tr>
<td>§ Repeat an ongoing assessment at least every 5 minutes:</td>
<td>Priority patients are infants who have abnormal vital signs, signs/symptoms of poor perfusion, or if there is a suspicion that the infant’s condition may deteriorate.</td>
</tr>
<tr>
<td>† Initial assessment</td>
<td>Infant must be re-evaluated at least every 5 minutes if any treatment was initiated or medication administered.</td>
</tr>
<tr>
<td>† Relevant portion of the focused assessment</td>
<td>Evaluating and comparing results assists in recognizing if a patient is improving, responding to treatment or condition is deteriorating.</td>
</tr>
<tr>
<td>† Evaluate response to treatment</td>
<td><strong>Manage infant’s condition as indicated.</strong></td>
</tr>
<tr>
<td>† Compare results to baseline condition and vital signs</td>
<td></td>
</tr>
</tbody>
</table>

**Manage infant’s condition as indicated.**
### PATIENT REPORT AND DOCUMENTATION

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>§ Give patient report to equal or higher level of care personnel</td>
<td>• Report should consist of all pertinent information regarding the assessment finding, treatment rendered and patient response to care provided.</td>
</tr>
<tr>
<td>§ Verbalize/Document:</td>
<td>• EMS Personnel are defined as EMTs and paramedics. Law enforcement and EMS personnel off duty who may have started CPR are considered citizens for documentation purposes.</td>
</tr>
<tr>
<td>• Arrest witnessed by EMS personnel or citizen</td>
<td>• Time of arrest cannot be determined in an unwitnessed arrest, but information as to when the infant was last seen may be helpful.</td>
</tr>
<tr>
<td>• Time last seen alive</td>
<td>• If pulses are not felt with compressions this may be due to either inadequate compressions or hypovolemia.</td>
</tr>
<tr>
<td>• CPR initiated by citizen or EMS personnel</td>
<td>• Response to CPR – infant regains pulse and/or respirations or remains pulseless and/or apneic.</td>
</tr>
<tr>
<td>• Pulses palpated/not palpated with compressions</td>
<td>• Documenting reassessment information provides a comprehensive picture of patient’s response to treatment.</td>
</tr>
<tr>
<td>• Response to CPR and shock if provided</td>
<td>• Last reassessment information (before patient care is transferred) should be documented in the section of the EMS form that is called “Reassessment after Therapies and/or Condition on Transfer”.</td>
</tr>
<tr>
<td></td>
<td>• Documentation must be on either the Los Angeles County EMS Report or departmental Patient Care Record form.</td>
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<tr>
<td></td>
<td>• Documentation element on EMS Report form asks for:</td>
</tr>
<tr>
<td></td>
<td>Witnessed by: □ Citizen □ EMS □ None</td>
</tr>
<tr>
<td></td>
<td>CPR by: □ Citizen</td>
</tr>
<tr>
<td></td>
<td>EMS CPR@__________ Time</td>
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<tr>
<td></td>
<td>□ Arrest to CPR __________ Time</td>
</tr>
<tr>
<td></td>
<td>□ AED □ Analyze □ Defib</td>
</tr>
<tr>
<td></td>
<td>□ ALS Resuscitation</td>
</tr>
</tbody>
</table>

Developed: 8/01  Revised: 12/03, 7/04, 6/06, 12/07, 12/08, 5/09, 8/11, 1/13
DEFINITIONS:
- **Newborn** - Neonate in the first minutes to hours after birth.
- **Neonate** - Infant in first month after birth (28 days).
- **Infant** - Newborn to 1 year (0 - 12 months).

INDICATIONS:
- Infants who are unresponsive, apneic, and pulseless
- Heart rate is < 60 beats per minute

CONTRAINDICATIONS:
- None when above conditions apply.

COMPLICATIONS:
- Gastric distention
- Rib fractures
- Sternal fractures
- Separation of ribs from sternum
- Laceration of liver or spleen
- Pneumothorax
- Hemothorax
- Lung and heart contusion
- Fat emboli
- Pneumothorax
- Hemothorax
- Lung and heart contusion
- Fat emboli

PRECAUTIONS:
- EMS personnel often deliver excessive ventilations during CPR which may result in:
  - increased intrathoracic pressure and impedance of venous return resulting in decreased cardiac output, cerebral blood flow, and coronary perfusion
  - air trapping and barotraumas in children with small-airway obstruction
  - increases risk of regurgitation and aspiration in children without an advanced airway

NOTES:
- Do not start resuscitation if the patient meets the criteria in Ref. No. 814 or 815.
- If infant meets 814 criteria, the infant should be left at the scene and not transported to the hospital.
- Start compression cycle if an infant has no pulse or signs of circulation or if a newborn has a pulse < 60 beats/minute. Even though the newborn or infant has a pulse, the low rate and cardiac output is insufficient to provide for adequate perfusion.
- The viability of organs is directly affected by perfusion and oxygenation and the longer a patient is without CPR, the greater the damage to vital organs.
- Use shoulder padding to maintain proper airway and spinal alignment.
- Move the infant no more than necessary to ensure an open airway. A second rescuer is needed to maintain in-line axial stabilization if spinal immobilization is required.
- If the infant is in a prone position with suspected trauma, the patient should be turned using log-roll method to avoid flexion or twisting of the neck or back.
- The recovery position is not recommended for an infant unless the head is adequately supported since the airway may become obstructed. Have suction readily available to prevent airway obstruction by mucus or vomit.
- In infants and children, the most common cause of arrest is an inadequate airway, complete 1 sequence to remove obstruction or provide 5 cycles (30:2 OR 15:2 for two rescuers) of CPR, before leaving the infant to call for EMS personnel.
- Other signs of circulation are: breathing, coughing or movement in response to rescue breaths. This is checked in conjunction with palpating for a pulse.
- An alternative to Palpating the brachial pulse is Palpating for a femoral pulse.
- Chest compressions must be performed on a hard surface, if on a soft surface place a board under the infant or move the infant to a table, etc.
- CPR cycle begins with compressions and ends with ventilations.
- Use an oropharyngeal airway when providing positive pressure ventilations.

POLICIES:
- Reference No. 510 - Pediatric Patient Destination
- Reference No. 814 - Determination/Pronouncement of Death in the Field
- Reference No. 815 - Honoring Prehospital Do-Not-Resuscitate (DNR) Orders