BLS Healthcare Provider
Adult Cardiac Arrest Algorithm—2015 Update

Verify scene safety.

Victim is unresponsive. Shout for nearby help. Activate emergency response system via mobile device (if appropriate). Get AED and emergency equipment (or send someone to do so).

No breathing or only gasping, no pulse

Normal breathing, has pulse

Monitor until emergency responders arrive.

Look for no breathing or only gasping and check pulse (simultaneously). Is pulse definitely felt within 10 seconds?

No normal breathing, has pulse

Provide rescue breathing: 1 breath every 5-6 seconds, or about 10-12 breaths/min.

• Activate emergency response system (if not already done) after 2 minutes.
• Continue rescue breathing; check pulse about every 2 minutes. If no pulse, begin CPR (go to “CPR” box).
• If possible opioid overdose, administer naloxone if available per protocol.

By this time in all scenarios, emergency response system or backup is activated, and AED and emergency equipment are retrieved or someone is retrieving them.

CPR
Begin cycles of 30 compressions and 2 breaths. Use AED as soon as it is available.

AED arrives.

Check rhythm. Shockable rhythm?

Yes, shockable
Give 1 shock. Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.

No, nonshockable
Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.

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## Summary of High-Quality CPR Components for BLS Providers

<table>
<thead>
<tr>
<th>Component</th>
<th>Adults and Adolescents</th>
<th>Children (Age 1 Year to Puberty)</th>
<th>Infants (Age Less Than 1 Year, Excluding Newborns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scene safety</td>
<td>Make sure the environment is safe for rescuers and victim</td>
<td>Check for responsiveness</td>
<td><strong>Witnessed collapse</strong> Follow steps for adults and adolescents on the left</td>
</tr>
<tr>
<td>Recognition of cardiac arrest</td>
<td>No breathing or only gasping (ie, no normal breathing) No definite pulse felt within 10 seconds (Breathing and pulse check can be performed simultaneously in less than 10 seconds)</td>
<td><strong>Unwitnessed collapse</strong> Give 2 minutes of CPR</td>
<td>Leave the victim to activate the emergency response system and get the AED Return to the child or infant and resume CPR; use the AED as soon as it is available</td>
</tr>
<tr>
<td>Activation of emergency response system</td>
<td>If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression-ventilation ratio without advanced airway</td>
<td>1 or 2 rescuers 30:2</td>
<td>1 rescuer 30:2</td>
<td>2 or more rescuers 15:2</td>
</tr>
<tr>
<td></td>
<td>Continuous compressions at a rate of 100-120/min Give 1 breath every 6 seconds (10 breaths/min)</td>
<td>Compression rate</td>
<td>100-120/min</td>
</tr>
<tr>
<td>Compression-ventilation ratio with advanced airway</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression depth</td>
<td>At least 2 inches (5 cm)*</td>
<td>At least one third AP diameter of chest About 2 inches (5 cm)</td>
<td>At least one third AP diameter of chest About 1½ inches (4 cm)</td>
</tr>
<tr>
<td>Hand placement</td>
<td>2 hands on the lower half of the breastbone (sternum)</td>
<td>2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum)</td>
<td>1 rescuer 2 fingers in the center of the chest, just below the nipple line 2 or more rescuers 2 thumb-encircling hands in the center of the chest, just below the nipple line</td>
</tr>
<tr>
<td>Chest recoil</td>
<td>Allow full recoil of chest after each compression; do not lean on the chest after each compression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimizing interruptions</td>
<td>Limit interruptions in chest compressions to less than 10 seconds</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Compression depth should be no more than 2.4 inches (6 cm).

Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CPR, cardiopulmonary resuscitation.

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Positions for 6-Person High-Performance Teams*

Resuscitation Triangle Roles

**Compressor**
- Assesses the patient
- Does 5 cycles of chest compressions
- Alternates with AED/Monitor/Defibrillator every 5 cycles or 2 minutes (or earlier if signs of fatigue set in)

**AED/Monitor/Defibrillator**
- Brings and operates the AED/monitor/defibrillator
- Alternates with Compressor every 5 cycles or 2 minutes (or earlier if signs of fatigue set in), ideally during rhythm analysis
- If a monitor is present, places it in a position where it can be seen by the Team Leader (and most of the team)

**Airway**
- Opens and maintains the airway
- Provides ventilation

Leadership Roles

**Team Leader**
- Every resuscitation team must have a defined leader
- Assigns roles to team members
- Makes treatment decisions
- Provides feedback to the rest of the team as needed
- Assumes responsibility for roles not assigned

**Administer Medications**
- An ALS provider role
- Administers medications

**Timer/Recorder**
- Records the time of interventions and medications (and announces when these are next due)
- Records the frequency and duration of interruptions in compressions
- Communicates these to the Team Leader (and the rest of the team)

The team owns the code. No team member leaves the triangle except to protect his or her safety.

*This is a suggested team formation. Roles may be adapted to local protocol.*
Adult Cardiac Arrest Circular Algorithm—2018 Update

Start CPR
- Give oxygen
- Attach monitor/defibrillator

2 minutes

Return of Spontaneous Circulation (ROSC)

Check Rhythm

If VF/pVT

Post-Cardiac Arrest Care

Drug Therapy
IV/IO access
Epinephrine every 3-5 minutes
Amiodarone or lidocaine for refractory VF/pVT

Consider Advanced Airway
Quantitative waveform capnography

Treat Reversible Causes

CPR Quality
- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If PETCO₂ <10 mm Hg, attempt to improve CPR quality.
  - Intra-arterial pressure
    - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation
- Biphasic: Manufacturer recommendation (e.g., initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- Monophasic: 360 J

Drug Therapy
- Epinephrine IV/IO dose: 1 mg every 3-5 minutes
- Amiodarone IV/IO dose: First dose: 300 mg bolus. Second dose: 150 mg.

Lidocaine IV/IO dose: First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

Advanced Airway
- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

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Adult Cardiac Arrest Algorithm—2018 Update

1. **Start CPR**
   - Give oxygen
   - Attach monitor/defibrillator

2. **Rhythm shockable?**
   - Yes
   - **VF/pVT**
   - **Shock**
   - **CPR 2 min**
     - IV/IO access

3. **Rhythm shockable?**
   - No
   - **CPR 2 min**
     - Epinephrine every 3-5 min
     - Consider advanced airway, capnography

4. **Rhythm shockable?**
   - Yes
   - **Shock**

5. **Rhythm shockable?**
   - No
   - **CPR 2 min**
     - Amiodarone or lidocaine
     - Treat reversible causes

6. **CPR 2 min**
   - Epinephrine every 3-5 min
   - Consider advanced airway, capnography

7. **Rhythm shockable?**
   - Yes
   - **Shock**

8. **CPR 2 min**
   - Amiodarone or lidocaine
   - Treat reversible causes

9. **Asystole/PEA**

10. **CPR 2 min**
    - IV/IO access
    - Epinephrine every 3-5 min
    - Consider advanced airway, capnography

11. **CPR 2 min**
    - Treat reversible causes

12. **Rhythm shockable?**
    - No
    - **Go to 5 or 7**
    - If no signs of return of spontaneous circulation (ROSC), go to 10 or 11
    - If ROSC, go to Post-Cardiac Arrest Care

**CPR Quality**
- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If $PETCO_2 < 10$ mm Hg, attempt to improve CPR quality.
- Intra-arterial pressure
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tolic) pressure $< 20$ mm Hg, attempt to improve CPR quality.

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- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

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- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
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**Return of Spontaneous Circulation (ROSC)**
- Pulse and blood pressure
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**Reversible Causes**
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

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Return of spontaneous circulation (ROSC)

Optimize ventilation and oxygenation
- Maintain oxygen saturation ≥94%
- Consider advanced airway and waveform capnography
- Do not hyperventilate

Treat hypotension (SBP <90 mm Hg)
- IV/IO bolus
- Vasopressor infusion
- Consider treatable causes

12-Lead ECG: STEMI OR high suspicion of AMI

Follow commands?

Yes

Coronary reperfusion

No

Initiate targeted temperature management

Advanced critical care

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Doses/Details

Ventilation/oxygenation:
Avoid excessive ventilation. Start at 10 breaths/min and titrate to target \( P_{\text{ETCO}_2} \) of 35-40 mm Hg. When feasible, titrate \( F_{\text{IO}_2} \) to minimum necessary to achieve \( S_{\text{PO}_2} \) ≥94%.

IV bolus:
Approximately 1-2 L normal saline or lactated Ringer’s

Epinephrine IV infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Dopamine IV infusion:
5-10 mcg/kg per minute

Norepinephrine IV infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Reversible Causes
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary
Adult Bradycardia With a Pulse Algorithm

1. Assess appropriateness for clinical condition. Heart rate typically <50/min if bradyarrhythmia.

2. Identify and treat underlying cause
   - Maintain patent airway; assist breathing as necessary
   - Oxygen (if hypoxemic)
   - Cardiac monitor to identify rhythm; monitor blood pressure and oximetry
   - IV access
   - 12-Lead ECG if available; don’t delay therapy

3. Persistent bradyarrhythmia causing:
   - Hypotension?
   - Acutely altered mental status?
   - Signs of shock?
   - Ischemic chest discomfort?
   - Acute heart failure?

4. Monitor and observe
   - No

5. Yes
   - Atropine
     If atropine ineffective:
     - Transcutaneous pacing or
     - Dopamine infusion or
     - Epinephrine infusion

6. Consider:
   - Expert consultation
   - Transvenous pacing

**Doses/Details**

**Atropine IV dose:**
First dose: 0.5 mg bolus. Repeat every 3-5 minutes. Maximum: 3 mg.

**Dopamine IV infusion:**
Usual infusion rate is 2-20 mcg/kg per minute. Titrate to patient response; taper slowly.

**Epinephrine IV infusion:**
2-10 mcg per minute infusion. Titrate to patient response.
**Adult Tachycardia With a Pulse Algorithm**

1. Assess appropriateness for clinical condition. Heart rate typically ≥150/min if tachyarrhythmia.

2. Identify and treat underlying cause
   - Maintain patent airway; assist breathing as necessary
   - Oxygen (if hypoxemic)
   - Cardiac monitor to identify rhythm; monitor blood pressure and oximetry

3. Persistent tachyarrhythmia causing:
   - Hypotension?
   - Acutely altered mental status?
   - Signs of shock?
   - Ischemic chest discomfort?
   - Acute heart failure?

4. Synchronized cardioversion
   - Consider sedation
   - If regular narrow complex, consider adenosine

5. Wide QRS? ≥0.12 second
   - Yes: IV access and 12-lead ECG if available
   - Vagal maneuvers
   - Adenosine (if regular)
   - β-Blocker or calcium channel blocker
   - Consider expert consultation
   - No: Consider antiarrhythmic infusion
   - Consider expert consultation

6. Yes: Consider antiarrhythmic infusion
   - Consider expert consultation

7. IV access and 12-lead ECG if available
   - Vagal maneuvers
   - Adenosine (if regular)
   - β-Blocker or calcium channel blocker
   - Consider expert consultation

**Doses/Details**

**Synchronized cardioversion:**
- Initial recommended doses:
  - Narrow regular: 50-100 J
  - Narrow irregular: 120-200 J monophasic or 200 J biphasic
  - Wide regular: 100 J
  - Wide irregular: defibrillation dose (not synchronized)

**Adenosine IV dose:**
- First dose: 6 mg rapid IV push; follow with NS flush.
- Second dose: 12 mg if required.

**Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia**

**Procainamide IV dose:**
- First dose: 20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given.
- Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

**Amiodarone IV dose:**
- First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

**Sotalol IV dose:**
- 100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.

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