

Update

2015 **AHA BLS** and



ACLS guidelines

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ADVANCED CARDIOVASCULAR life support (ACLS) encompasses the entire spectrum of care from basic life support (BLS) to postcardiac arrest care. The 2015 American Heart Association (AHA) guidelines include recommendations on the use of I.V./intraosseous (I.O.) epinephrine, I.V./I.O. vasopressin during cardiac arrest, and end-tidal carbon dioxide (ETCO₂) measurements to predict patient outcome.¹ Let's take a closer look at these changes and more.

Managing cardiac arrest in an adult

The Adult Cardiac Arrest Algorithm outlines a plan of care for the patient in cardiac arrest secondary to pulseless ventricular tachycardia (pVT)/ventricular fibrillation (VF). After determining unresponsiveness, apnea, and pulselessness, the clinician administers chest compressions and ventilations at a ratio of 30:2 respectively until an advanced airway is in place. Advanced airways include an endotracheal tube (ETT) or supraglottic airway (SGA) device such as a laryngeal mask airway, laryngeal tube, or esophageal obturator airway.

The new BLS guidelines recommend a compression rate of at least 100/minute and no greater than 120/minute, and a compression depth of at least 2 in (5 cm) and no greater than 2.4 in (6 cm) for an average adult.² Upper limits for both compression rate and depth have been provided in the updated guidelines based on preliminary data suggesting that excessive compression rates and depths can adversely affect patient outcomes. Push hard and fast, rotating the compressor role every 2 minutes to prevent fatigue. Avoid excessive positive pressure ventilations, which

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can increase intrathoracic pressure and reduce cardiac output, and provide oxygen when available at maximum concentration by bag-valve mask or advanced airway to maximize the oxygen content of arterial blood.²

Attach the monitor/defibrillator as soon as it's available and analyze the cardiac rhythm. Treat pVT/VF with defibrillation. Based on their greater success in dysrhythmia termination, defibrillators using biphasic waveforms (biphasic truncated exponential or rectilinear biphasic) are preferred to monophasic defibrillators. The recommended energy dose for biphasic defibrillators is 120 to 200 joules (J); if the manufacturer's recommended energy dose is unknown, using the maximum energy dose available should be considered. Subsequent defibrillation energy doses should be equivalent or higher. The shock energy dose for a monophasic defibrillator is 360 J. Perform CPR for 2 minutes after defibrillation and obtain I.V. or I.O. access if not already established.

If VF/pVT persists with a rhythm check during the compressor role change at 2 minutes, defibrillate again. Biphasic doses can be equivalent to the first shock administered (120 to 200 J) or higher. Monophasic doses remain at 360 J. If the defibrillator unit is capable of escalating energies, it's reasonable to use them for the second and third shock.¹

After the second defibrillation attempt, continue CPR for 2 minutes and administer I.V./I.O. epinephrine 1 mg. This dose may be repeated every 3 to 5 minutes. Epinephrine's vasoconstrictor effects, which increase coronary and cerebral perfusion pressure during CPR, are beneficial in cardiac arrest. However, current research doesn't support the routine use of high-dose I.V./I.O. epinephrine (range of 0.1 to 0.2 mg/kg). In clinical trials, high-



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dose epinephrine was no more beneficial than standard-dose epinephrine in terms of survival to discharge with good neurologic recovery, survival to discharge, or survival to hospital admission.

A single dose of I.V./I.O. vasopressin was an option to consider in pVT/VF, pulseless electrical activity (PEA), and asystole to replace either the first or second dose of I.V./I.O. epinephrine in the 2010 guidelines. However, one notable change in the 2015 guidelines is the removal of vasopressin from the adult cardiac arrest algorithm. Studies indicate that vasopressin has no advantage over epinephrine and has been removed to simplify the cardiac arrest algorithm.¹

The team leader may consider placing an advanced airway and using ET CO_2 measurements during

the cardiac arrest. The choice of an advanced airway depends on the skill level and training of the clinician placing it. No high-quality evidence supports favoring endotracheal intubation over bag-mask ventilation or another advanced airway device in relation to overall survival or a good neurologic outcome.¹

Continuous waveform capnography for ET CO_2 measurements remains the most reliable method of confirming and monitoring ETT placement when used in addition to clinical assessment. If continuous waveform capnography isn't available, clinicians may use a colorimetric and nonwaveform CO_2 detector, an esophageal detector device, or an ultrasound transducer placed transversely on the anterior neck above the suprasternal notch to identify endotracheal or esophageal intubation.¹

After an advanced airway is properly placed, the patient should be ventilated at a rate of 1 breath every 6 seconds (10 breaths/minute) while continuous chest compressions are being performed. This is a change from the previously recommended 1 breath every 6 to 8 seconds (8 to 10 breaths/minute), again to simplify the algorithm for learners.

Continuous waveform capnography can be used to evaluate the quality of CPR; for instance, an ET CO_2 less than 10 mm Hg or an arterial relaxation diastolic pressure less than 20 mm Hg indicates a need to improve CPR quality by optimizing chest compression parameters. For example, assess compression rate, depth, and chest recoil.

If pVT/VF persists, another shock is administered after 2 minutes of CPR. At this time, an antiarrhythmic agent may be considered. Recommendations include I.V./I.O. amiodarone; I.V./I.O. lidocaine may be

considered as an alternative to amiodarone for pVT/VF unresponsive to CPR, defibrillation, and vasopressor therapy.

The patient should be evaluated for an underlying reversible cause of the persistent dysrhythmia using the “Hs and Ts” as recommended in the 2010 AHA guidelines.³ (See *Reversible causes of cardiac arrest in an adult.*)

Once return of spontaneous circulation (ROSC) from cardiac arrest due to pVT/VF is achieved, the 2015 guidelines state that evidence is inadequate to support routine use of lidocaine or beta-blockers. In addition, no data support the routine use of steroids alone for patients experiencing in-hospital cardiac arrest.¹

Asystole/PEA

The adult cardiac arrest algorithm also outlines a plan of care for the patient presenting with asystole or PEA. This involves high-quality CPR as previously described.

After I.V./I.O. access is established, epinephrine 1 mg is recommended every 3 to 5 minutes. The use of vasopressin as an alternative to epinephrine has been removed from the asystole/PEA algorithm in the 2015 guidelines.¹ An advanced airway (ETT or SGA device) with continuous waveform capnography should be considered as the resuscitative effort continues. The patient is reevaluated every 2 minutes for the presence of a shockable rhythm. Reversible causes should be considered using the Hs and Ts.

Postcardiac arrest care

In ROSC, ETCO₂ increases abruptly (typically to 40 mm Hg or more) and a spontaneous arterial pressure waveform is present with intra-arterial monitoring.¹ After ROSC, patient-care goals include optimizing ventilation and oxygenation, treating hypotension, and evaluating

the need for targeted temperature management (TTM) and interventions for ST-elevation myocardial infarction (STEMI).

Avoiding hypoxemia that can worsen organ injury is a top priority. Administer the highest available oxygen concentration until the arterial oxyhemoglobin saturation or the partial pressure of arterial oxygen (PaO₂) can be measured. At that point, decrease the Fio₂ to maintain a saturation of 94% to 99%. Remember, peripheral vasoconstriction may make using pulse oximetry difficult immediately after ROSC.

Recommended ventilation goals include the maintenance of normocarbica (ETCO₂, 30 to 40 mm Hg or Paco₂, 35 to 45 mm Hg). Modify these goals as needed based on such factors as acute lung injury, high airway pressures, or cerebral edema.⁴ Keep in mind that if the patient's temperature is below normal, Paco₂ lab values may be higher than the patient's actual values.

Managing BP is particularly important. Studies demonstrate a significant relationship between systolic BP and mean arterial pressure (MAP) and patient outcomes. Immediately correct hypotension, defined as a systolic pressure of less than 90 mm Hg or MAP less than 65 mm Hg.⁴

The 2010 guidelines encouraged consideration of induced hypothermia (32 to 34° C [89.6 to 93.2° F] for 12 to 24 hours) for most comatose patients after cardiac arrest to improve neurologic outcomes. The term targeted temperature management (TTM) is now used to refer to the range of temperature targets recommended in the postresuscitation period. TTM is recommended for comatose adult patients with ROSC after cardiac arrest. TTM involves selecting a temperature between 32 and 36° C (89.6 and 96.8° F) and maintaining that temperature for at

Reversible causes of cardiac arrest in an adult¹

Assess adults with persistent dysrhythmias for the following potentially reversible “Hs and Ts” and initiate appropriate interventions.

- hypovolemia
- hypoxia
- hydrogen ion (acidosis)
- hypo-/hyperkalemia
- hypothermia
- tension pneumothorax
- tamponade, cardiac
- toxins
- thrombosis, pulmonary
- thrombosis, coronary.

least 24 hours. Outcome prediction for patients not treated with TTM should occur no earlier than 72 hours after cardiac arrest. Patients treated with TTM are typically evaluated at 4.5 to 5 days after ROSC.

The 2015 guidelines recommend against the routine initiation of induced cooling in the prehospital setting. After rewarming from TTM to normothermia, fever, which is associated with worsening ischemic brain injury, should be prevented.

The 2015 postcardiac arrest guidelines also address seizure detection and treatment. Electroencephalography (EEG) should be promptly performed and interpreted in comatose patients after ROSC and monitored frequently or continuously to diagnose seizure activity.⁴ The guidelines recommend treating status epilepticus in ROSC with the same antiepileptic drug therapy used for status epilepticus caused by other etiologies.

Acute coronary syndromes (ACS) are often a cause of cardiac arrest. A 12-lead ECG obtained early after ROSC will identify patients with ST-segment elevation and facilitate rapid coronary angiography and

intervention. Emergent coronary angiography and intervention can be performed whether the patient is conscious or comatose.⁴

Termination of efforts

As the 2015 guidelines recommend, ETCO₂ readings obtained by continuous waveform capnography can be used as a component to guide the decision to terminate resuscitative efforts in the intubated patient. Failure to achieve an ETCO₂ of greater than 10 mm Hg after 20 minutes of CPR may be used as a component to decide to terminate care. However, it's important not to use ETCO₂ measurements in isolation. ETCO₂ measurements can't be used in patients who aren't intubated because studies included only intubated patients.¹

The 2010 recommendations for treatment of patients with stable and unstable bradycardia or tachycardia with a pulse remain unchanged. The 2015 AHA guidelines do, however, address the care of patients with stroke or ACS, and pregnant patients.

Recommendations for stroke

Because stroke is a leading cause of death and disability in the United States, the 2015 AHA guidelines have placed an increased emphasis on stroke symptom recognition for faster diagnosis and treatment. The Face, Arm, Speech, Time (FAST) and Cincinnati Prehospital Stroke Scale (CPSS), two stroke assessment systems, are now recommended for use by first aid providers.⁵

Recommendations for ACS

The 2015 AHA guidelines for ACS can be utilized by all providers involved in the care of the patient, from initial medical contact until transfer from the ED. These guidelines stress the need for a prehospital



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12-lead ECG as early as possible in patients with suspected ACS with interpretation by an appropriately trained healthcare provider in conjunction with computer-assisted ECG interpretation. This 12-lead ECG will facilitate the early diagnosis and treatment of patients with STEMI, reducing time to first medical contact as well as door-to-needle (fibrinolysis) and door-to-balloon (percutaneous coronary intervention) time when appropriate.

The 2015 guidelines also address early aspirin administration by first aid providers to patients with chest pain due to probable myocardial infarction. Research indicates that early aspirin administration significantly reduces mortality. It's recommended that while waiting for the arrival of emergency medical services, first aid providers may

encourage the patient with chest pain to chew and swallow 1 adult 325-mg aspirin or 2 to 4 low-dose "baby" aspirin (81 mg each) if the patient has no history of aspirin allergy or other contraindications to aspirin use.⁶

Recommendations for pregnant patients

Priorities in the resuscitation of the pregnant patient include high-quality CPR and the relief of aorto-caval compression with manual left lateral uterine displacement (LUD) during chest compressions if the fundus height is at or above the level of the umbilicus. In cases of nonsurvivable maternal trauma or prolonged pulselessness, delivery by cesarean section should be considered if the fundus height is at or above the umbilicus and ROSC hasn't been achieved with adequate resuscitative efforts. Typically, C-section delivery should be considered 4 minutes after cardiac arrest or resuscitative efforts and manual LUD. When resuscitation efforts are deemed futile (as in nonsurvivable maternal trauma or prolonged pulselessness), there is no reason to delay cesarean delivery. With a witnessed arrest, cesarean delivery should be considered 4 minutes after the start of resuscitative measures or onset of cardiac arrest.⁷

Current and future changes

In summary, the 2015 AHA guidelines for ACLS contain some new recommendations, such as the removal of vasopressin from the Adult Cardiac Arrest Algorithm and a change in the ventilation rate for the intubated patient during CPR to a simplified 10 breaths/min (1 every 6 seconds), and a temperature range of 32 to 36° C for 24 hours when using TTM after ROSC.

What does the future hold? History tells us we can expect the integration of new approaches to

resuscitative efforts. Research also suggests that our educational approach to teaching BLS and ACLS may change in structure. For instance, shorter, more frequent educational sessions, such as roving BLS scenarios or ACLS mock codes, may be more efficient and cost-effective strategies for keeping key concepts fresh in our minds. ■

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