

The 2010 AHA Guidelines: The 4 Cs of Cardiac Arrest Care

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Part I: Executive Summary: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

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The year 2010 marks the 50th anniversary of the introduction of cardiopulmonary resuscitation (CPR). During these past 50 years, tremendous research has been conducted to evaluate techniques, medications, and devices designed to advance the care of victims of cardiac arrest. The American Heart Association (AHA) developed the first CPR guidelines in 1966 and since that time has published frequent updates of the guidelines to help educate the public and medical establishment about optimal care for patients with cardiac arrest and other emergency cardiovascular conditions.

This past November, the newest set of guidelines pertaining to CPR and emergency cardiovascular care were published by the AHA in a supplement issue of *Circulation*. The guidelines consist of 16 parts. They address not only cardiac arrest, but also post-arrest care, dysrhythmias, acute coronary syndromes, stroke, cardiac arrest in special situations (eg, pregnancy, pulmonary embolism, etc), pediatric considerations, and ethics. Part I is a summary statement of the major changes in cardiac arrest and emergency cardiovascular care since the previous set of guidelines, which were published in 2005. The highlights of this "Executive Summary" are summarized below. For purposes of brevity, this discussion will focus on adult patients with acute cardiac conditions (cardiac arrest and dysrhythmias), excluding acute coronary syndromes, stroke, and pediatric considerations. The reader should note that the bulk of guideline recommendations, as in past years, are concentrated on victims of primary *cardiac* arrest and are not necessarily relevant to victims of *pulmonary* arrest (eg, drowning, drug overdose, etc).

Study Summary

Change from "A-B-C" to "C-A-B." A major change in basic life support is a step away from the traditional approach of airway-breathing-chest compressions (taught with the mnemonic "A-B-C") to first establishing good chest compressions ("C-A-B"). There are several reasons for this change.

- Most survivors of adult cardiac arrest have an initial rhythm of ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), and these patients are best treated initially with chest compressions and early defibrillation rather than airway management.
- Airway management, whether mouth-to-mouth breathing, bagging, or endotracheal intubation, often results in a delay of initiation of good chest compressions. Airway management is no longer recommended until after the first cycle of chest compressions -- 30 compressions in 18 seconds. The 30 compressions are now recommended to precede the 2 ventilations, which previous guidelines had recommended at the start of resuscitation.
- Only a minority of cardiac arrest victims receive bystander CPR. It is believed that a significant obstacle to bystanders performing CPR is their fear of doing mouth-to-mouth breathing. By changing the initial focus of resuscitation to chest compressions rather than airway maneuvers, it is thought that more patients will receive important bystander intervention, even if it is limited to chest compressions.

Basic life support. The traditional recommendation of "look, listen, and feel" has been removed from the basic life

support algorithm because the steps tended to be time-consuming and were not consistently useful. Other recommendations:

- Hands-only CPR (compressions only -- no ventilations) is recommended for the untrained lay rescuers to obviate their fears of mouth-to-mouth ventilations and to prevent delays/interruptions in compressions.
- Pulse checks by lay rescuers should not be attempted because of the frequency of false-positive findings. Instead, it is recommended that lay rescuers should just assume that an adult who suddenly collapses, is unresponsive and not breathing normally (eg, gasping) has had a cardiac arrest, activate the emergency response system, and begin compressions.
- Pulse checks by healthcare providers have been de-emphasized in importance. These pulse checks are often inaccurate and produce prolonged interruptions in compressions. If pulse checks are performed, healthcare providers should take no longer than 10 seconds to determine if pulses are present. If no pulse is found within 10 seconds, compressions should resume immediately.
- The use of end-tidal CO₂ (ETCO₂) monitoring is a valuable adjunct for healthcare professionals. When patients have no spontaneous circulation, the ETCO₂ is generally ≤ 10 mm Hg. However, when spontaneous circulation returns, ETCO₂ levels are expected to abruptly increase to at least 35-40 mm Hg. By monitoring these levels, interruptions in compressions for pulse checks become unnecessary.

CPR devices. Several devices have been studied in recent years, including the impedance threshold device and load-distributing band CPR. No improvements in survival to hospital discharge or neurologic outcomes have been proven with any of these devices when compared with standard, conventional CPR.

Electrical therapies

- Patients with VF or pulseless VT should receive chest compressions until a defibrillator is ready. Defibrillation should then be performed immediately.
- Chest compressions for 1.5-3 minutes before defibrillation in patients with cardiac arrest longer than 4-5 minutes have been recommended in the past, but recent data have not demonstrated improvements in outcome.
- Transcutaneous pacing of patients who are in asystole has not been found to be effective and is no longer recommended.

Advanced cardiac life support. Good basic life support, including high-quality chest compressions and rapid defibrillation of shockable rhythms, is again emphasized as the foundation of successful advanced cardiac life support. The recommendations for airway management have undergone 2 major changes: (1) the use of quantitative waveform capnography for confirmation and monitoring of endotracheal tube placement is now a class I recommendation in adults; and (2) the routine use of cricoid pressure during airway management is no longer recommended.

As they did in 2005, the AHA acknowledges once again that as of 2010, data are "still insufficient ...to demonstrate that any drugs improve long-term outcome after cardiac arrest."

Several important changes in recommendations for dysrhythmia management have occurred:

- For symptomatic or unstable bradydysrhythmias, intravenous infusion of chronotropic agents (eg, dopamine, epinephrine) is now recommended as an equally effective alternative therapy to transcutaneous pacing when atropine fails.
- As noted above, transcutaneous pacing for asystole is no longer recommended; and
- Atropine is no longer recommended for routine use in patients with pulseless electrical activity or asystole.

Post-cardiac arrest care. Post-cardiac arrest care has received a great deal of focus in the current guidelines and is probably the most important new area of emphasis. There are several key highlights of post-arrest care:

- Induced hypothermia, although best studied in survivors of VF/pulseless VT arrest, is generally recommended for adult survivors of cardiac arrest who remain unconscious, regardless of presenting rhythm. Hypothermia should be initiated as soon as possible after return of spontaneous circulation with a target temperature of 32°C-34°C.
- Urgent cardiac catheterization and percutaneous coronary intervention are recommended for cardiac arrest survivors who demonstrate ECG evidence of ST-segment elevation acute myocardial infarction regardless of neurologic status. There is also increasing support for patients without ST-segment elevation on ECG who are suspected of having acute coronary syndrome to receive urgent cardiac catheterization.
- Hemodynamic optimization to maintain vital organ perfusion, avoidance of hyperventilation, and maintenance of euglycemia are also critical elements in post-arrest care.

Viewpoint

The AHA 2010 guidelines represent significant progress in the care of victims of cardiac arrest. Most important is the stronger emphasis on post-cardiac arrest care. Induced hypothermia is underscored, and perhaps the most important advance is the recommendation for urgent percutaneous coronary intervention in survivors of cardiac arrest. The wealth of data thus far indicate that post-arrest percutaneous coronary intervention may be the most significant advance toward improving survival and neurologic function since defibrillation was first introduced decades ago.

In reviewing these guidelines, I must admit, however, that I was disappointed that AHA hesitated to adopt the concepts of "cardiocerebral resuscitation" (CCR). CCR also promotes the "C-A-B" approach to resuscitation, but it fosters even further delays in airway intervention -- withholding any form of positive pressure ventilations, in favor of persistent chest compressions, for as long as 5-10 minutes after the cardiac arrest. The current guidelines recommend withholding positive pressure ventilation for a mere 18 seconds. First described in 2002,^[1] CCR has been studied more recently as well and demonstrated marked improvements in rates of resuscitation and neurologic survival.^[2-4] I think that CCR should be incorporated into basic life support protocols for victims of primary cardiac arrest as quickly as possible to further improve outcomes.

Optimal management of cardiac arrest in the current decade can be summarized simply by "the 4 Cs": Cardiovert/defibrillate, CCR, Cooling, and Catheterization.

Abstract

References

1. Weisfeldt M, Becker L. Resuscitation after cardiac arrest: a 3-phase time-sensitive model. JAMA. 2002;288:3035-3038. [Abstract](#)
2. Ewy G. A new approach for out-of-hospital CPR: a bold step forward. Resuscitation. 2003;58:271-272. [Abstract](#)
3. Kellum MJ, Kennedy KW, Barney R, et al. Cardiocerebral resuscitation improves neurologically intact survival of patients with out-of-hospital cardiac arrest. Ann Emerg Med. 2008;52:244-252. [Abstract](#)
4. Garza AG, Gratton MC, Salomone JA, et al. Improved patients survival using a modified resuscitation protocol for out-of- hospital cardiac arrest. Circulation. 2009;119:2597-2605. [Abstract](#)

