

Review of Clinical Guidelines for Cardiopulmonary Resuscitation

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More than 359,000 out-of-hospital cardiac arrests occur each year in the United States, with a survival rate of only 8% [1]. Improving the chances of meaningful recovery after cardiac arrest depends on a team approach from the community, first responders, emergency medical services, and hospital-based health care providers. The American Heart Association's term "chain of survival" provides a useful metaphor, with the following 5 "links" in the chain: immediate recognition of cardiac arrest and activation of the emergency response system, early cardiopulmonary resuscitation (CPR) with an emphasis on chest compressions, rapid defibrillation, effective advanced life support, and integrated post-cardiac arrest care.

This sidebar highlights features of the American Heart Association (AHA) guidelines for CPR and emergency cardiovascular care (ECC), which were released in 2010 [2]. This article serves as a primer to the much anticipated, updated AHA CPR/ECC guidelines that will be coming out in late 2015.

Link 1: Early Recognition

Sudden cardiac arrest may be confused with other clinical presentations such as seizure, due to gasping (agonal) respirations or myoclonic jerking. Thus, the first link of survival is to start chest compressions for any unresponsive adult victim with no breathing or abnormal breathing (ie, only gasps). For historical perspective, the "look, listen, and feel" instruction was removed from the 2010 CPR algorithm to prevent delays in activation of 911 and initiation of chest compressions.

Link 2: Early CPR With an Emphasis on Chest Compressions

One of the most significant features of the 2010 AHA CPR/ECC Guidelines is the change from the common resuscitation strategy of "A-B-C" (airway, breathing, circu-

lation) to "C-A-B" (circulation, airway, breathing). There were several reasons for this change: the vast majority of arrests occur in adults with a predominant initial shockable rhythm; emphasis on airway intervention results in delayed initiation of and/or long interruptions in chest compressions; and emphasis on chest compressions is thought to increase bystander CPR.

CPR that focuses on minimizing interruptions in chest compressions improves hemodynamics during CPR [3-8]. Many emergency medical services (EMS) protocols have evolved to focus on minimally interrupted chest compressions by delaying advanced airway interventions, minimizing time for rhythm analyses, minimizing time between compressor changes, minimizing the time between stopping chest compressions and delivering defibrillator shock, and minimizing the post-shock pause in resuming chest compressions.

With these relatively simple modifications, EMS systems have markedly improved survival after cardiac arrest [9-11]. In addition to minimizing chest compression interruptions, high-quality CPR—including optimal rate, depth, full recoil, and appropriate ventilations—has been shown to improve survival [12-21].

Hands-Only CPR Encouraged

Out-of-hospital EMS strategies that provide continuous chest compressions without pauses for ventilations have been associated with improved outcomes [22]. It is reasonable for health care providers to tailor the sequence of rescue actions to the most likely arrest etiology. For example, for a drowning victim, airway and rescue breathing measures should be prioritized. When the etiology of arrest is unclear, a focus on chest compressions and de-emphasis on airway measures is encouraged. Ensure the appropriate rate (target 100-120 compressions per minute), depth (at least 2-inch compression of the chest wall),

and full recoil after each compression (avoid residual leaning). Thus, focus on the mantra “push hard and push fast” without interruptions.

Link 3: Rapid Defibrillation

Early defibrillation is a critical component of the chain of survival. Often, an automated external defibrillator (AED) is the most readily accessible device and should be used when available. There has been much interest around the concept of “priming the pump” by performing several minutes of chest compressions prior to defibrillation; however, 2 randomized controlled trials did not result in improved outcomes, thus suggesting that it is not necessary. The optimal technique is to deliver a single biphasic electrical shock of 120–200 J (manufacturer recommended settings encouraged) for ventricular fibrillation or pulseless ventricular tachycardia as early as possible with minimal interruptions in chest compressions.

Link 4: Advanced Cardiovascular Life Support (ACLS)

Vascular access, drug delivery, and advanced airway placement are still recommended but should not cause significant interruptions in chest compressions or delay shocks. Recently, much controversy has surrounded the use of epinephrine, as recent studies question its efficacy. Upcoming guideline revisions should provide additional recommendations on use of this drug.

Link 5: Post-Cardiac Arrest Care

Treatment at a cardiac resuscitation center with goal-directed critical care, emergent percutaneous coronary intervention capability, and therapeutic temperature management to optimize neurological recovery are important aspects of comprehensive care for the post-cardiac arrest patient. Many EMS agencies now transport out-of-hospital cardiac arrest patients directly to one of these cardiac resuscitation centers. Additionally, facilities without all these capabilities are encouraged to transport patients to a center with this full complement of resources [23].

Beyond the Guidelines: Team-Focused CPR

Many of the tasks performed during a resuscitation can be done concurrently; however, executing this effectively can be a challenge. Training of health care providers should focus on building the team as each member arrives and rapidly delegating roles and responsibilities [24]. Combining scenario-based training and utilizing real-time audiovisual feedback technology during resuscitations has led to improved CPR quality, survival, and neurological outcomes [16].

Team-focused CPR (also known as “pit crew” CPR) was developed by using evidence-based strategies of maximizing chest compressions and ensuring CPR quality. Team-focused CPR is a choreographed approach to CPR in which first responders know and practice their role in resuscitation, with an emphasis on minimally interrupted chest compressions, early defibrillation, controlled ventilations, and appropriate timing of interventions.

Widespread incorporation of team-focused CPR in North Carolina EMS agencies began in 2011. Since 2010, the Regionalized Approach to Cardiovascular Emergencies Cardiac Arrest Resuscitation System (RACE CARS) team, which is part of the Heart Rescue Project, has provided statewide education and resources aimed at improving outcomes after cardiac arrest. RACE CARS endorses pit crew CPR for both out-of-hospital and in-hospital cardiac arrest. For more information, visit <http://racecars.dcri.org/>. NCMJ

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