BLS & ACLS in 2011

An Introduction to the 2010 AHA CPR Guidelines

for Healthcare Providers

AnnMarie Fitzgerald Chase MSN, RN, CEN



Feeling stressed, overworked, and in information overload? Well, you can relax when it comes to the new 2010 American Heart Association CPR Guidelines, as BCLS and ACLS just got streamlined and simplified. Although making your life easier was not the driving force behind the changes, it seems likely that this will be the case. The American Heart Association (AHA) based the new guidelines on

the latest science in the field of resuscitation in order to reduce disability and save more lives. So sit back and relax as we go over what has changed for 2010.

"Approximately every 25 seconds, an American will have a coronary event, and approximately every minute, someone will die of one."¹ While there are no reliable national statistics on cardiopulmonary resuscitation,² one focus of the ongoing AHA Get with the Guidelines–Resuscitation initiative is to build this database.³ The most recent published studies demonstrated a less than 8 percent survival rate for out-of-hospital cardiac arrest⁴ and an average 17.6 percent survival-todischarge rate for inpatients regardless of the cardiac rhythm at arrest.⁵ This demonstrates the need for healthcare providers to deliver more effective resuscitation care. This article is geared toward healthcare providers practicing in the hospital setting and will review the key changes for adult patients, which will be taught in BLS and ACLS classes in the near future. For a comprehensive list of all the

changes and the rationale behind them you can read the 2010 AHA Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science by following this link:

http://circ.ahajournals.org/content/vol122/18_suppl_3/. The changes were officially released on October 18, 2010,



and are the result of an extensive literature review by international resuscitation experts.⁶ Over a threeyear period, these experts discussed and debated the results of thousands of resuscitation studies before coming to the consensus statements we will review today. BLS and ACLS course instructors are in the process of learning about the updates. Interim 2010 materials that supplement the 2005 materials will be used until March 2011 when all instructors have completed updated training. Complete new course materials based on the 2010 update will be rolled out in classes by AHA training centers after instructors have received this updated training.⁷ This article is designed to be an introduction to the changes and does not constitute training or replace an AHA class.

<u>C-A-B Is the New A-B-C</u> C-A-B stands for Circulation, Airway, and Breathing, which is the new sequence



of events to remember when treating an unresponsive patient (except in the newborn). Upon recognizing unresponsiveness, if the patient is not breathing or has gasping breaths, activate the Emergency Medical Response and get an AED/defibrillator. A brief pulse check of

less than 10 seconds should be conducted. If no pulse is present, the healthcare provider rescuer should immediately move to compressions. After 30 compressions, the airway should be opened and two breaths administered, then continue with 30:2 until the AED arrives (15:2 for two rescuers in pediatrics). This is a departure from opening the airway and providing two ventilations first. It will require a change in thinking for healthcare providers because for decades we have learned that the patient's airway was the priority intervention in resuscitation. As students, healthcare providers had the mantra *"Airway, Airway, Airway"* drilled into them, and one was guaranteed to get a test question correct if the priority intervention picked was Airway. Well, it's time for educators everywhere to start rewriting some questions, as one of the bigger changes for 2010 is a shift in priority to *Compressions* first. But why? It's not that the airway is not important; it is, but the act of opening the airway and ventilating the patient delays the start of compressions. Adults are most likely to arrest with ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT) as the underlying cause. The treatment for these rhythms is immediate CPR and early defibrillation. In fact, "the highest survival rates from cardiac arrest are reported among patients of all ages who have a witnessed arrest with a rhythm of ventricular fibrillation (VF) or pulseless ventricular tachycardia(VT)."⁵ On the other hand, animal studies have demonstrated decreased survival rates when compressions where delayed or interrupted.⁶ The 2005 guidelines already emphasized this need to minimize interruptions in compressions, and in 2010 this idea has been taken a

step further by doing compressions first. Starting with compressions will only delay ventilations for about 18 seconds as the provider delivers 30 compressions prior to opening the airway and ventilating. In most hospital settings, cardiac arrests are responded to by a team, usually with at least two healthcare providers present.



Frequently, compressions, calling for help, opening the airway, and providing ventilation breaths happen almost simultaneously by the team while waiting for a defibrillator and additional help. The new 2010 guidelines recognize this and emphasize starting compressions first while the airway is being opened by the second provider. As stated above, the most critical part of treatment for VF and pulseless VT is CPR and early defibrillation, and the new C-A-B sequence is intended to better address this need. Finally, the adage "look, listen, and feel" has been removed from BLS, as it was found to be time consuming and inconsistently applied.⁸ Unresponsiveness and lack of breathing (or inadequate breathing) are now to be assessed at the same time prior to the pulse check. Establish Unresponsiveness (No breathing or gasping breaths)

Activate Emergency Response Get Defibrillator/AED

Check Pulse: If pulse >rescue breathing If No Pulse within 10 seconds

Begin Cycle 30 Compressions and 2 Breaths

AED/Defib Arrives, check rhythm, shock if indicated, begin CPR immediately⁷

This sequence can be altered to enable the healthcare provider to tailor the response to fit the most likely cause of arrest. For instance, if the cause of arrest is hypoxia, as is the case with someone who has been submerged in water, the priority would be opening the airway and delivering ventilations. There are also 15 new specific treatment recommendations for cardiac arrest based on special situations such as morbid obesity, pulmonary embolism, PCI, and cardiac tamponade. See the 2010 AHA Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science for a complete list and the associated rationales.

<u>Depth and Rate of Compressions</u> Cardiac compressions have been in use for 50 years. They work because theyprovide blood flow by directly compressing the heart and increasing coronary perfusion pressure. Trying to remember ranges during an emergency can be difficult for anyone, let alone healthcare providers who may not perform CPR often. Plus, most rescuers do not push hard enough. Therefore, while the ratio for compressions to ventilation for a two-person healthcare provider rescue continues to be 30:2, the depth guidelines have been simplified. The 2005 recommendation of 1.5 to 2 inches was changed in 2010 to at least 2 inches in adults. In infants and children, it is at least one-third of the AP chest diameter or 1.5 inches in infants and 2 inches in children.⁶ This should eliminate the confusion associated with a range of depths: just remember to push down at least 2 inches on the adult patient.

The rate of compressions per minute has stayed the same at 100 a minute, but the emphasis is now on *at least* 100 a minute, not *around* 100 a minute. In order to achieve return of spontaneous circulation (ROSC) with good neurological function, effective compressions must be achieved to deliver oxygen to the heart and brain. "In most studies, *more* compressions are associated with higher survival rates, and fewer compressions are associated with lower survival rates."⁶ The number of compressions per minute actually delivered is dependent upon the rate per minute and the number of times CPR is interrupted. The healthcare provider should still allow for adequate chest recoil and should continue to minimize interruptions. Push hard and fast and use an AED as soon as it is available. Does your hospital have AEDs in non-ACLS designated areas? The goal is to defibrillate the patient within three minutes of collapse.⁷ If an AED is available, do all staff know where it is and how to use it? This early intervention can save lives before the code team arrives. Collapse-to-defibrillation times in hospitals should be measured; this *may be* one of the quality measures for sudden cardiac arrest monitored by the Joint Commission in the near future.⁸ Follow this link

http://www.jointcommission.org/sudden cardiac arrest initiatives/ for more information.

<u>The precordial thump is back; sort of.</u> For in-hospital, witnessed, *monitored* unstable VT (including pulseless) healthcare providers may use the precordial thump when a defibrillator is not immediately available, as it has been reported to convert ventricular tachycardias in a few studies. The thump should never delay the arrival of the defibrillator or initiation of CPR and comes with complications such as

sternal fracture, stroke, osteomyelitis, and triggering malignant arrhythmias.⁶ It should not be used for VF as it has not been demonstrated to result in ROSC for this arrhythmia.

Simplified ACLS Drugs and Algorithms BLS remains the bedrock of ACLS, but drugs and devices are deemphasized. Both the drugs and the algorithms have been streamlined and simplified. The algorithms are circular and focus on quality CPR and defibrillation in two-minute cycles. Drugs, IV access, and intubation are secondary. Atropine is no longer recommended for management of PEA and asystole and is completely removed from the cardiac arrest algorithm. The evidence shows that routine use of atropine is not effective in treating PEA and Asystole⁶, although it is still recommended for bradycardia (see below). The medications in the cardiac arrest algorithm are limited to epinephrine (dose 1 mg,), vasopressin (dose 40 units), and amiodarone (first dose 300 mg, second dose 150mg), and that's it!

The bradycardia algorithm is simplified as well: For symptomatic bradycardia, atropine (0.5 mg up to 3 mg total) and then consider transcutaneous pacing or dopamine or epinephrine infusion— simple. Even the tachycardia algorithm is easier because adenosine is now recommended for "the initial diagnosis and treatment of stable, undifferentiated regular, monomorphic wide-complex tachycardia."⁶ It should still not be used for irregular wide complex tachycardia as it may result in VF.

<u>Ventilations & Oxygen</u> Avoiding hyperventilation is key; hyperventilation increases gastric distension and increases intrathoracic pressure, thereby decreasing venous return and with it, the chance of survival. Tidal volume should be enough to make the chest rise and fall. When an advanced airway is placed, ventilations should be given asynchronously every 6 to 8 seconds, and hyperventilation should



be avoided. Hyperoxia post arrest should be avoided as well as its harmful effects have been documented⁶. During a code, pure oxygen is administered, often resulting in post-arrest PaO₂ levels (amount of oxygen present in the blood) ranging from 80 mg to 500 mg, but the oxygen

saturation will show 100 percent. Therefore, it is considered reasonable, if equipment is available, to monitor and maintain oxyhemoglobin saturation levels between 94 percent and 99 percent.⁶

<u>Continuous Capnography Monitoring</u> For patients who are intubated anytime during resuscitation, continuous quantitative capnography is now recommended.⁶ End tidal capnography produces a continuous waveform that monitors the amount of exhaled CO₂. It can serve as a physiologic indicator of cardiac output, because blood must circulate through the lungs in order for CO₂ to be exhaled. Therefore, continuous capnography can detect good CPR earlier than conventional methods and is also the most reliable way to confirm endotracheal tube placement. It is also a noninvasive way to determine whether effective compressions are being performed since rising CO₂ levels can be an early indication of ROSC and, conversely, falling Petco2 levels may indicate decreased cardiac output and re-arrest.

<u>Got TH and PCI?</u> The new 2010 Guidelines also recognize the importance of organized postresuscitative care by optimizing perfusion to both the brain and heart. While resuscitative care is primarily aimed at helping the patient achieve ROSC, post-resuscitative care has a huge impact not only on long-term survival, but on good neurological outcome as well. Therapeutic hypothermia (TH) is the only intervention shown to improve neurological recovery.^{7.} Coordinated post-resuscitative care is so important to achieving these goals, it was added as the final link in the chain of survival for 2010. This is a shift in thinking that recognizes resuscitation care does not stop when the patient gets a pulse back. Having the knowledge and resources available to care for patients immediately following resuscitation is



critical in order to give them the best chance for long-term survival and a high level of neurological functioning while decreasing multisystem organ failure. Structured, consistent, multidisciplinary care that includes TH and percutaneous coronary intervention (PCI), when indicated, are part of post-resuscitative care aimed at supporting both cardiac and neurological functioning. TH has been extended to PEA and asystole arrest rhythms for patients who have a ROSC, are comatose, and are able to maintain a blood pressure.

The goal for reperfusion therapy in STEMI patients is now three minutes⁷ from when the patient arrives in the ED because immediate PCI has been associated with favorable outcomes in adult patients resuscitated after cardiac arrest. After arrest, PCI may be a reasonable intervention even



if the initial EKG does not show STEMI. The EKG may be misleading after cardiac arrest, so it is reasonable to presume cardiac ischemia after an arrest. TH is considered safe when used in combination with PCI.¹¹ Bundled post-resuscitative care includes TH and PCI, when indicated, blood pressure optimization, 12-lead EKG, oxygen saturation, and blood chemistry monitoring.⁷ It is now recommended that if coordinated post-resuscitative care can't be delivered at a hospital, the patient should be transferred to a hospital that is able to provide post-arrest care.⁶ (Note: Therapeutic hypothermia for use in post resuscitative care is included in the 2010 AHA Guidelines and is not an FDA-cleared application).

More Training with Emphasis Teams

The AHA now recognizes what many healthcare providers have known for some time: Two years in between trainings is too long to maintain skills and mastery of BLS and ACLS. While interval training is recommended, the ideal time for retraining is unknown. One should also recognize that completing the AHA class is only the first step in competence. Classes and



interval training should include performance assessment as well as written exams. It is suggested that

high-fidelity mannequins and simulation may be helpful in skill and competency attainment. Studies of computerized simulations and case studies reveal that this learning modality can "teach decision making skills and can facilitate learners' understanding of broad core concepts."¹² Simulation can be an excellent learning tool because it is interactive and can facilitate active learning, which "is more apt to stimulate higher cognitive processes such as those associated with critical thinking."¹³ ACLS classes should also continue to include training in teamwork and leadership skills so that teams can work collaboratively to really minimize interruptions in compressions. Training as a team can help to identify barriers to effective ACLS delivery as well as identify learning needs of the team. Coordinated teamwork between pre-hospital and hospital healthcare providers is also critical in order to effectively link the chain of survival for cardiac arrest and stroke.

The new Guidelines also discuss creating a culture of high-quality resuscitation. Among the actions that can help achieve this goal are debriefing both mock codes and actual resuscitation events. Having the capability to review CPR quality for rate, depth, and interruptions can provide a great deal of guidance to rescuers. Defibrillators that coach CPR, such as the ZOLL R Series[®], not only assist with the performance of good CPR during the rescue, but provide valuable information to measure and improve. Tools such as See-Thru CPR[®] help prevent unnecessary interruption by filtering out the CPR artifact from the ECG, allowing rescuers to determine if an organized rhythm is developing. Electronic code data capture with products like ZOLL CodeNet[®] can also ensure that all code information is captured and time-stamped to allow for accurate debriefing.



The 2010 changes to CPR and ECG are innovative and practical, with the emphasis on compressions first, early defibrillation, and coordinated post-resuscitative care. They are the culmination of experts carefully reviewing the evidence and simplifying where possible. The new guidelines will hopefully reduce barriers found previously in resuscitation. So now that you have been introduced to the 2010 AHA Guidelines, go ahead and sign up for a class and try not to stress about it. After all, stress is a risk factor for cardiac arrest. 1. Roger VL et al. (2010) *Heart Disease and Stroke Statistics—2011 Update: A Report from the* American *Heart Association*, Circulation 2010, Dec 15 (Epub ahead of print) p. e2.

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