ACLS 2015

Highlights from AHA 2015 Guidelines Update for CPR & ECC

Basic Life Support:

High quality CPR improves survival from cardiac arrest, including

- Ensuring chest compressions are adequate rate
- Ensuring chest compressions are adequate depth
- Allowing full chest recoil between compressions
- Minimizing interruptions in chest compressions
- Avoiding excessive ventilation

Prehospital:

"If the patient is unresponsive with abnormal or absent breathing it is reasonable for the emergency dispatcher to assume that the patient is in cardiac arrest." Class IIa

Lay rescuers will not check for a pulse.

C-A-B versus **A-B-C**

Compression only CPR for untrained rescuer because compression-only CPR is easier to teach, remember and perform (Class I). No difference in outcome for OHCA with compression-only CPR vs normal CPR. If a trained rescuer is able they should add rescue breaths in a ratio of 30:2 compressions to breaths.

Delayed Ventilation:

"In tiered EMS systems OHCA survival to discharge is improved by the use of an initial period of continuous chest compressions in patients with a shockable rhythm). Use 3 cycles of 200 compressions with passive oxygen insufflation and airway adjuncts (delays positive pressure ventilation). Class IIb."

For patients with suspected opioid overdose trained healthcare providers may administer intramuscular or intranasal naloxone.

CPR:

Hand position lower ½ of sternum in adults

Rate increased to 100-120/min (Class IIa)

Depth 5cm - less is less effective, more is associated with more injuries.

Allow full chest recoil (chest returns to its natural or neutral position during the decompression phase of CPR). This creates a relative negative intrathoracic pressure that promotes venous return and cardiopulmonary blood flow. Class IIa.

Minimize interruptions such as pre- and post-shock pauses.

Ventilation:

Without an advanced airway; 30:2

Advanced airway; 1 breath every 6 seconds (10/min) without interrupting CPR.

Passive ventilation techniques during conventional CPR is not recommended (Class IIb)

Conventional CPR (chest compressions and rescue breaths) are recommended for pediatric cardiac arrests (Class I) because the majority are secondary to asphyxia.

AED:

"For witnessed adult cardiac arrest when an AED is immediately available, it is reasonable that the defibrillator be used ASAP". No benefit from 90-180 sec. of CPR prior to defibrillation. Chest compressions should be resumed immediately after shock delivery for adults in cardiac arrest in any setting.

Alternative Techniques and Ancillary Devices for CPR

Devices to Support Circulation

1) Impedance Threshold Device – pressure-sensitive valve attached to ETT, supraglottic airway or mask which limits air entry during decompression phase of CPR enhancing negative intrathoracic pressure during chest wall recoil thereby improving venous return and cardiac output.

- high quality RCTs did not show benefit or harm. **Not Recommended**

2) Active Compression-Decompression CPR and Impedance Threshold Device – application of external negative suction (increases venous return)

- 4 RCTs showed no difference in survival, 2 showed improved ROSC but not survival to discharge. **Not Recommended for routine use.**

3) Mechanical Chest Compression Devices

Piston Device (Lund University Cardiac Arrest System) LUCAS – evidence does not demonstrate a benefit vs manual. May be of benefit in certain situations (limited resources, prolonged CPR eg hypothermic cardiac arrest, in angiography suite or in preparation for extracorporeal CPR)

Load Distributing Band Devices – not recommended

4) Extracorporeal Techniques and Invasive Perfusion Devices – insufficient evidence for routine use. "If it can be implemented rapidly it may be considered in select patients usually 18-75y with cardiac arrest of cardiac origin after conventional CPR of more the 10 min. without ROSC."

Adult Advanced Cardiac Life Support

International Liaison Committee on Resuscitation (ILCOR) - In depth evidence review process which AHA uses for treatment recommendations using the AHA Class of Recommendations and Level of Evidence (LOE) system

Oxygen Dose during CPR – Observational study only. Recommended to use the maximal feasible inspired oxygen concentration.

Monitoring Physiologic Parameters during CPR – "No clinical study has examined whether titrating resuscitative efforts to physiologic parameters during CPR improves outcome, it may be reasonable to use physiologic parameters (quantitative waveform capnography, arterial relaxation diastolic pressure, arterial pressure monitoring and central venous oxygen saturation) when feasible to monitor and optimize CPR quality, guide vasopressor therapy and detect ROSC." (Class IIb).

Ultrasound during CPR – may be used to help identify potentially treatable causes of cardiac arrest but its usefulness has not been well established. Should not interfere with standard cardiac arrest treatment protocol.

Bag-Mask Ventilation Compared with any Advanced Airway

"There is inadequate evidence to show a difference in survival or favorable neurological outcome with the use of bag-mask ventilation compared with endotracheal or other advanced airway devices."

"For healthcare providers trained in their use, either an SGA device or an ETT may be used as the initial advanced airway during CPR." Class IIb.

Clinical Assessment of Tracheal Tube Placement

End-Tidal CO_2 detectors

False-Positive – ingestion of carbonated beverages

False-Negative – significant hypotension, PE, contamination of detector with gastric contents, severe airflow obstruction.

Recommended in addition to clinical assessment as the most reliable method of confirming and monitoring the correct placement of an ETT. Class I.

Management of Cardiac Arrest

Defibrillation Strategies for VF Pulseless VT

"No evidence indicating superiority of one biphasic waveform or energy level for the termination of VF with the first shock." Most studies give success ranges of 85-98% for biphasic shocks of 200J or less for the first shock. You may use the manufacturer's recommended energy level or if not known defibrillation at the maximal dose may be considered (Class IIb). (???)

It is recommended to continue CPR for 2 minutes after each shock. There may be a short period of asystole or PEA prior to a perfusing rhythm. It also allows for uninterrupted CPR before analysis. There is evidence that chest compression after a shock can induce VF but the benefit appears to outweigh the risk.

Antiarrhythmic Drug Therapy

"Establishing vascular access to enable drug administration should not compromise the quality of CPR or timely defibrillation." The preferred sequence and timing of drug administration in relation to shocks is not known.

"No antiarrhythmic drug has yet been shown to increase survival or neurological outcome after cardiac arrest due to VF/pVT."

Amiodarone – may be considered for VF/pVT that is unresponsive to CPR, defibrillation and vasopressor therapy.

Beta-blockers potentially hazardous

Not recommended but may be considered Post Arrest (???). Class IIb

Lidocaine – not recommended routinely but may be considered Post Arrest following VF/pVT.

Magnesium – no improvement in survival

Vasopressors

Epinephrine – increases coronary and cerebral perfusion pressure during CPR. There may be improved ROSC and survival to hospital admission but not survival to discharge with good neurological outcome with standard dose epinephrine. Recommended dose 1mg every 3 to 5 minutes. Class IIb.
High dose 0.1-0.2 mg/kg. is not recommended (Class III).

In IHCA the early administration of epinephrine in non-shockable rhythms was associated with increased ROSC, survival to hospital discharge and neurologically intact survival. (Shockable rhythms unknown).

Vasopressin – offers no advantage to epinephrine and has been removed from the algorithm. Still on RCH crash carts until multiple parties agree to removal.

Steroids – no benefit for IHCA or OHCA

Prognostication During CPR

End Tidal CO_2

Low levels may indicate inadequate cardiac output but may also be present in bronchospasm, mucus plugging of the ETT, kinking of the ETT, alveolar fluid in the ETT, or hyperventilation.

$ETCO_2$ levels less than 10mmHg are associated with low survival rates whereas levels greater than 20mmHg after 20 minutes of CPR are associated with improved survival to discharge.

Post-Cardiac Arrest Care:

Coronary angiography should be performed emergently on all patients with suspected cardiac etiology of arrest and ST elevation on ECG (Class I) (96% likelihood of coronary lesion).

It should also be considered in select patients who are comatose and electrically or hemodynamically unstable after OHCA of suspected cardiac origin (Class IIa)(58% likelihood of a coronary lesion)

Targeted Temperature Management (TTM)

For OHCA VF/pVT and post-ROSC coma – should be maintained at a constant temperature of 32-36 degrees C. There should be no patients where this is C/I. It should not be done pre-hospital.

Avoid hyperventilation (try for normocarbia) to avoid hyperventilation-induced cerebral vasoconstriction.

The earliest prognostication using clinical examination in patients treated with TTM is 72h after return to normo-thermia. In patients not treated with TTM it is 72h post-arrest.

In summary, there is much data but not a lot has changed. Proper CPR and early defibrillation are the only procedures that have proven improvement in outcome. There are also many contradictions in the document as well as very few Class I recommendations.

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January 2016