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A quick update in advanced cardiac life support

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November 28, 2005, heralded the launch of a new set of evidence-based emergency cardiovascular care guidelines. Because of prior criticism, the process was designed to be transparent to manage and minimize potential conflicts of interest between science and commercial ventures. The complete guidelines are published in *Circulation* (November 29, 2005;112;[22 suppl]) and are available at http://circ.ahajournals.org/content/vol112/22_suppl/.

Changes to basic life support

In adults, assess the patient while assigning someone to notify institutional emergency personnel. If outside the hospital and by yourself, activate EMS (call 911) before starting CPR. Defibrillation is critical to the success of most CPR. Thus, getting advanced life support (ALS) help is of paramount importance. Once EMS is called, open the airway, assess for normal breathing, and give two ventilations (1 second each).

In children, the solo provider should provide CPR for 2 minutes before initiating a team response since asphyxial arrest is the most common precipitator of cardiac arrest. If more than one rescuer is present, one rescuer should dial 911 or activate the response team.

Avoid hyperventilation. There are two ways to hyperventilate: giving individual breaths too forcefully and administering too many ventilations. Both cause harm to patients. Delivering a ventilation too forcefully causes most of the breath to insufflate the esophagus, leading to aspiration of gastric contents. Providing too many ventilations does not allow complete exhalation, creating positive end-expiratory pressure; this decreases preload to the heart during CPR, decreasing cardiac output overall.[1] Team members should observe one another and give constructive feedback during the code about the adequacy of ventilations and compressions.

For adults, ventilations are now recommended at 10 to 12 per minute before intubation. Once an advanced airway is in place, adult ventilation rates decrease to 8 to 10 per minute delivered between compressions. **For children**, the ventilation rate is 12 to 20 per minute. Deliver the ventilation so that there is visible chest rise.

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The compression-to-ventilation ratio is now 30:2 in both adults and children (but not in neonates), with approximately 100 compressions per minute. Compressions should be hard and fast with complete chest rise/recoil.[2] Because of operator fatigue, change the operator performing chest compressions every 2 minutes.

Defibrillation

If no CPR has been started before defibrillator arrival, perform basic life support for at least 2 minutes while the defibrillator is readied. Early defibrillation cannot work without quality CPR, which improves blood flow to the heart and increases successful defibrillation.

If CPR is in progress when the defibrillator arrives, it should be halted for only one shock instead of three. Prior generations of defibrillators have been monophasic—that is, they delivered a shock in one direction only. Newer defibrillators are biphasic: they deliver a first shock from one paddle to the next and a rapid second shock in the opposite direction. The goal is to completely depolarize the heart and allow the sinoatrial or atrioventricular node to restart pacing activity. The newer, biphasic defibrillators have been shown to convert ven-

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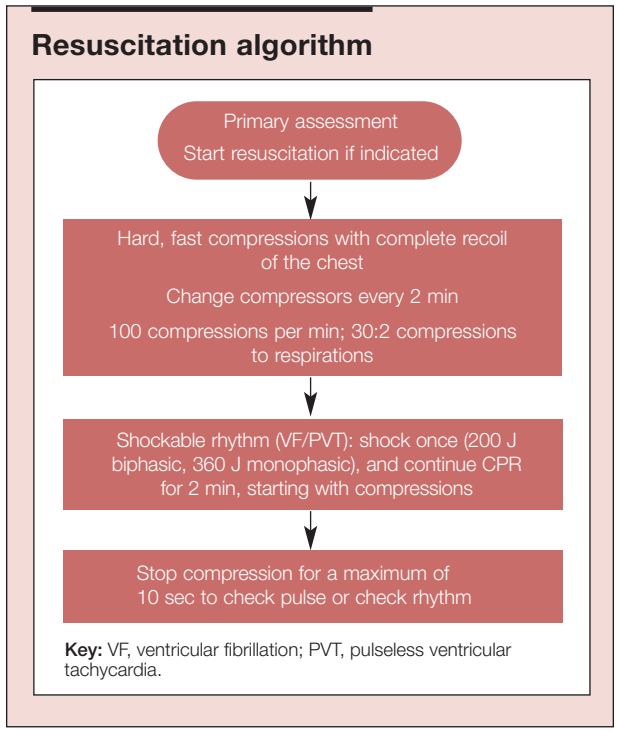

tricular fibrillation or pulseless ventricular tachycardia (VF/PVT) more than 90% of the time.[3] The need for immediate, quality compressions to reestablish good blood flow far outweighs the value of subsequent shocks.

Defibrillation energy has also changed. Energies are now defibrillator specific. Each biphasic defibrillator manufacturer should make it clear what energy is required with its machine. If not indicated on the biphasic machine, a universal energy of 200 J is recommended. Pediatric defibrillation energy levels have not changed: 2 J/kg initially, then 4 J/kg for subsequent defibrillation.

If the defibrillator is monophasic, the rescuers should use a higher energy level—360 J—for all defibrillation attempts (escalating doses are no longer recommended).

ALS resuscitation

Advanced airways and medications in cardiac arrest are being de-emphasized. In all cardiac arrests, the recommendation is to defer advanced airway management until later in the code. The recommendation in VF/PVT is to wait until after the second or third defibrillation in the sequence of (1) CPR, (2) shock, (3) compressions (for 2 minutes), (4) pause 10 seconds for assessment (and decisions), before inserting an advanced airway. Thus, the decision to use or not use an advanced airway does not come until at least 4 to 6 minutes into the code.

Do not interrupt CPR to give medications. All drugs should be given by the IV or intraosseous (IO) route and should be given during the 10-second break in CPR that occurs every 2 minutes. Endotracheal administration of medications is discouraged and may be harmful in some situations (eg, with epinephrine).

Circulate all drugs for 2 minutes before attempting the next shock. The main effect of pressor agents is to improve the effectiveness of CPR and cardiac perfusion; antiarrhythmics need time to circulate. Thus, shocking immediately after giving a drug, especially a pressor, is not beneficial.

Vasopressors can be considered. This recommendation has not changed; give 1 mg of epinephrine every 3 to 5 minutes, or give vasopressin, 40 units IV/IO, one time only. Neither drug seems to make much difference in outcome.

Antiarrhythmics have not been proven beneficial in cardiac arrest. Amiodarone has been shown in comparison studies to increase short-term survival (to hospital admission only; there is no difference in discharge rates).[4] There are essentially no changes in the recommendations for antiarrhythmics in VF/PVT with the exception that procainamide has been deleted from the algorithms.

Asystole

There is no benefit to pacing the patient during asystolic cardiac arrest. The goal in asystole and pulseless electrical activity is to perfuse the heart with good CPR and find a reversible cause.

Bradycardia

The bradycardia algorithm has changed very little except for a new dose for atropine: 0.5 mg while awaiting a pacemaker. A total of 3 mg of atropine may be given in 0.5-mg aliquots. Additionally, the recommended dose of dopamine has changed. Dopamine is now recommended at 2 to 10 mcg/kg/min; previous guidelines suggested 2 to 20 mcg/kg/min.

Noncardiac arrest algorithms

The tachycardia algorithm has been simplified. However, treatments are unchanged from the 2000 recommendations (including cardioversion energies).

Recommendations for acute coronary syndromes are essentially unchanged and emphasize early aspirin administration and risk stratification.

The stroke algorithm is essentially unchanged and includes recommendations for tissue plasminogen activator use and dedicated stroke units. □

REFERENCES

1. Aufderheide TP, Sigurdsson G, Pirrallo RG, et al. Hyperventilation-induced hypotension during cardiopulmonary resuscitation. *Circulation*. 2004;109:1960-1965.
2. Berg RA, Sanders AB, Kern KB, et al. Adverse hemodynamic effects of interrupting chest compressions for rescue breathing during cardiopulmonary resuscitation for ventricular fibrillation cardiac arrest. *Circulation*. 2001;104:2465-2470.
3. Ewy GA. Cardiocerebral resuscitation. *Circulation*. 2005;111:2134-2142.
4. Kudenchuk PJ, Cobb LA, Copass MK, et al. Amiodarone for resuscitation after out-of-hospital cardiac arrest due to ventricular fibrillation. *N Engl J Med*. 1999;341:871-878.