

PEDI ED CONFERENCE

Natanya Maio
October 7, 2011

Question #1

- ▣ An unresponsive 3-month old male is rushed into your ER by screaming parents. The parents frantically say that they found the baby face down in his crib at home, and that he wasn't moving or breathing. You rush the infant into the resuscitation room with a team of residents and nurses. In route, one resident feels for a pulse and is unsure if he can feel it. What is the most appropriate next step?

Answer Choices

- a) You follow the ABC's of resuscitation and you immediately give the patient 2 breaths via bag and mask.
- b) You give 30 chest compressions of $\frac{1}{2}$ the AP diameter of the chest followed by 2 breaths.
- c) You give 15 chest compressions of at least $\frac{1}{3}$ the AP diameter of the chest followed by 2 breaths.
- d) You "look, listen and feel for breathing" and attempt again to feel for a femoral pulse for 10 seconds.
- e) You charge the defibrillator to the maximum energy dose of 2 J/kg and administer the shock.

Answer

- a) You follow the ABC's of resuscitation and you immediately give the patient 2 breaths via bag and mask.
- b) You give 30 chest compressions of $\frac{1}{2}$ the AP diameter of the chest followed by 2 breaths.
- c) You give 15 chest compressions of at least $\frac{1}{3}$ the AP diameter of the chest followed by 2 breaths.**
- d) You “look, listen and feel for breathing” and attempt again to feel for a femoral pulse for 10 seconds.
- e) You charge the defibrillator to the maximum energy dose of 2 J/kg and administer the shock.

New BLS considerations during PALS

C-A-B RATHER THAN A-B-C

NEW

- ▣ Initiate CPR with chest compressions rather than rescue breaths
- ▣ 1 rescuer: 30 compressions
- ▣ 2 rescuers: 15 compressions

OLD

- ▣ Initiate CPR with opening of the airway and 2 breaths

PALS

- ▣ Most often, pediatric cardiac arrests are asphyxial, a result of progressive respiratory failure or shock.
 - Respiratory failure: inadequate ventilation or insufficient oxygenation
 - Shock: inadequate blood flow and O₂ delivery to meet tissue metabolic demands (most common in children is hypovolemic)
 - ▣ Compensated: tachycardia, cool/pale extremities, >2 sec CR, weak periph pulses, normal SBP
 - ▣ Uncompensated: pallor, periph cyanosis, tachypnea, mottling, decreased UOP, weak/absent pulses, weak central pulses, hypotension

C-A-B rather than A-B-C

- ▣ The need for ventilations and compression is understood, however pediatric cardiac arrests are much less common than adults and many rescuers do nothing because they are uncertain or confused. C-A-B approach improves the likelihood that a bystander will perform CPR and should only delay rescue breaths by 18 sec (1 rescuer) or less (2 rescuers).
- ▣ PALS usually takes place in the setting of an organized response, however chest compressions should still immediately be started by 1 rescuer while a 2nd prepares for ventilation. Previously, ventilations were often delayed because of the time it takes to prepare for ventilation.

New BLS considerations during PALS

CHEST COMPRESSION DEPTH

NEW

- ▣ Compress at least $\frac{1}{3}$ the AP diameter of the chest (4cm in infants and 5cm in children)
- ▣ Compression to $\frac{1}{2}$ AP diameter may not be achievable.

OLD

- ▣ Push with sufficient force to compress to $\frac{1}{3}$ to $\frac{1}{2}$ the AP diameter of the chest.

New BLS considerations during PALS

PULSE CHECK DE-EMPHASIZED

- ▣ Take up to 10 sec to feel for a pulse. If you do not feel one or are unsure, begin chest compressions.
- ▣ Studies showed that both healthcare providers and lay rescuers are unable to reliably detect a pulse.

Sudden Unexplained Deaths

- ▣ May be associated with genetic mutations causing cardiac ion channelopathies
 - Dysfunctional myocyte ion channels that result in abnormal movement of electrolytes into and/or out of the cell → predispose to arrhythmia
- ▣ Obtain a complete PMH and FHx (including hx of syncopal episodes, seizures, unexplained accidents or drownings, or sudden unexplained death at <50 y/o) and review previous ECG's
- ▣ Should have an unrestricted, complete autopsy. Consider genetic analysis of tissue to determine the presence of a channelopathy. May be critically important for living relatives.

Question #2

- ▣ A 10-month old male ex-30 week premie with pulmonary hypertension among other medical issues and a complicated NICU course is brought into the ED. He is unresponsive, sweaty and blood pressure is 40/0. He is taken into the resuscitation room, CPR is started and he is put on a monitor which shows ventricular fibrillation. Which of the following is a reasonable step to be included in your algorithm?

Answer Choices

- a) Charge the AED with attenuator to the maximum initial dose of 2 J/kg, deliver the shock and wait 5 seconds to see if the VF has terminated.
- b) Use a manual defibrillator to deliver a maximum of 4 J/kg shock and immediately resume CPR with chest compressions.
- c) Ask the nurse to draw up 0.1 mg/kg of epinephrine and be prepared to give it every 3-5 minutes.
- d) Ask the nurse to draw up 20mg/kg of calcium chloride as it will likely be required during the resuscitation.
- e) If the patient responds to the chest compressions and breaths given, be prepared to give O₂ to maintain saturations as high as possible.

Answer

- a) Charge the AED with attenuator to the maximum initial dose of 2 J/kg, deliver the shock and wait 5 seconds to see if the VF has terminated.
- b) Use a manual defibrillator to deliver a maximum of 4 J/kg shock and immediately resume CPR with chest compressions.**
- c) Ask the nurse to draw up 0.1 mg/kg of epinephrine and be prepared to give it every 3-5 minutes.
- d) Ask the nurse to draw up 20mg/kg of calcium chloride as it will likely be required during the resuscitation.
- e) If the patient responds to the chest compressions and breaths given, be prepared to give O₂ to maintain saturations as high as possible.

Defibrillators

- ▣ Manual defibrillator vs. AED
 - Manual preferred for infants <1 y/o
- ▣ Paddle size:
 - >10kg (~1 y/o) – use adult size
 - <10kg - use infant size
- ▣ Energy dose:
 - It is acceptable to use an initial dose of 2-4 J/kg, but for ease of teaching an initial dose of 2 J/kg is usually used. Subsequent energy levels should be at least 4 J/kg, not to exceed 10 J/kg or the adult max dose.

Importance of CPR in pulseless arrest algorithm

- ▣ Provide CPR until the defibrillator is ready to deliver a shock
- ▣ After shock delivery, resume CPR beginning with chest compressions
 - It has been shown that if 1 shock fails to terminate VF, the benefit of another immediate shock is low and resumption of CPR has a greater value
- ▣ Minimize interruptions of chest compressions

Epinephrine

- ▣ MOA: Vasoconstriction increases aortic diastolic pressure and thus coronary vascular perfusion pressure
- ▣ Timing: CPR → shock → CPR → shock? → CPR → epi (during CPR)
- ▣ Dose: 0.01 mg/kg (0.1 ml/kg of 1:10,000 concentration) every 3-5 minutes (max dose of 1 mg)

Drugs no longer recommended

- ▣ Calcium
 - Not recommended in absence of documented hypoCa, CCB (calcium channel blocker) overdose, hyperMg, hyperK.
 - Routine administration provides no benefit and may be harmful.
- ▣ Etomidate in septic shock resuscitation
 - Etomidate facilitates ET intubation
 - In septic shock patients, it causes adrenal suppression and is associated with a higher mortality rate

Limiting O₂ to normal levels

- ▣ Ventilate with 100% O₂ during CPR, but once circulation is restored, monitor arterial oxyhemoglobin saturation to titrate the F_IO₂ to keep PaO₂ ≥ 94% and less than 100%.
- ▣ A sat of 100% may correspond to PaO₂ anywhere between ~80-500mmHg.
Hyperoxemia enhances the oxidative injury observed after ischemia-reperfusion such as occurs after resuscitation from cardiac arrest.

REFERENCE

Part 14: Pediatric Advanced Life Support: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Kleinman, ME, Chameides, L, et al. *Circulation* 2010, 122:S876-S908.