

PEDIATRIC BASIC LIFE SUPPORT

PEDIATRIC CHAIN OF SURVIVAL



- Prevention,
- Early cardiopulmonary resuscitation (CPR),
- Prompt access to the emergency response system
- Rapid pediatric advanced life support (PALS)
- Integrated post– cardiac arrest care

- Infant BLS guidelines apply to infants till 1 year of age.
- Child BLS guidelines apply to children approximately 1 year of age until puberty.

For teaching purposes, puberty is defined as breast development in females and the presence of axillary hair in males

- **Overall, 8% children who receive pre-hospital emergency response resuscitation survive**
- **Results of in-hospital resuscitation are better with an overall survival of 27%.**
- **Rapid and effective bystander CPR can be associated with successful return of spontaneous circulation (ROSC) and neurologically intact survival**

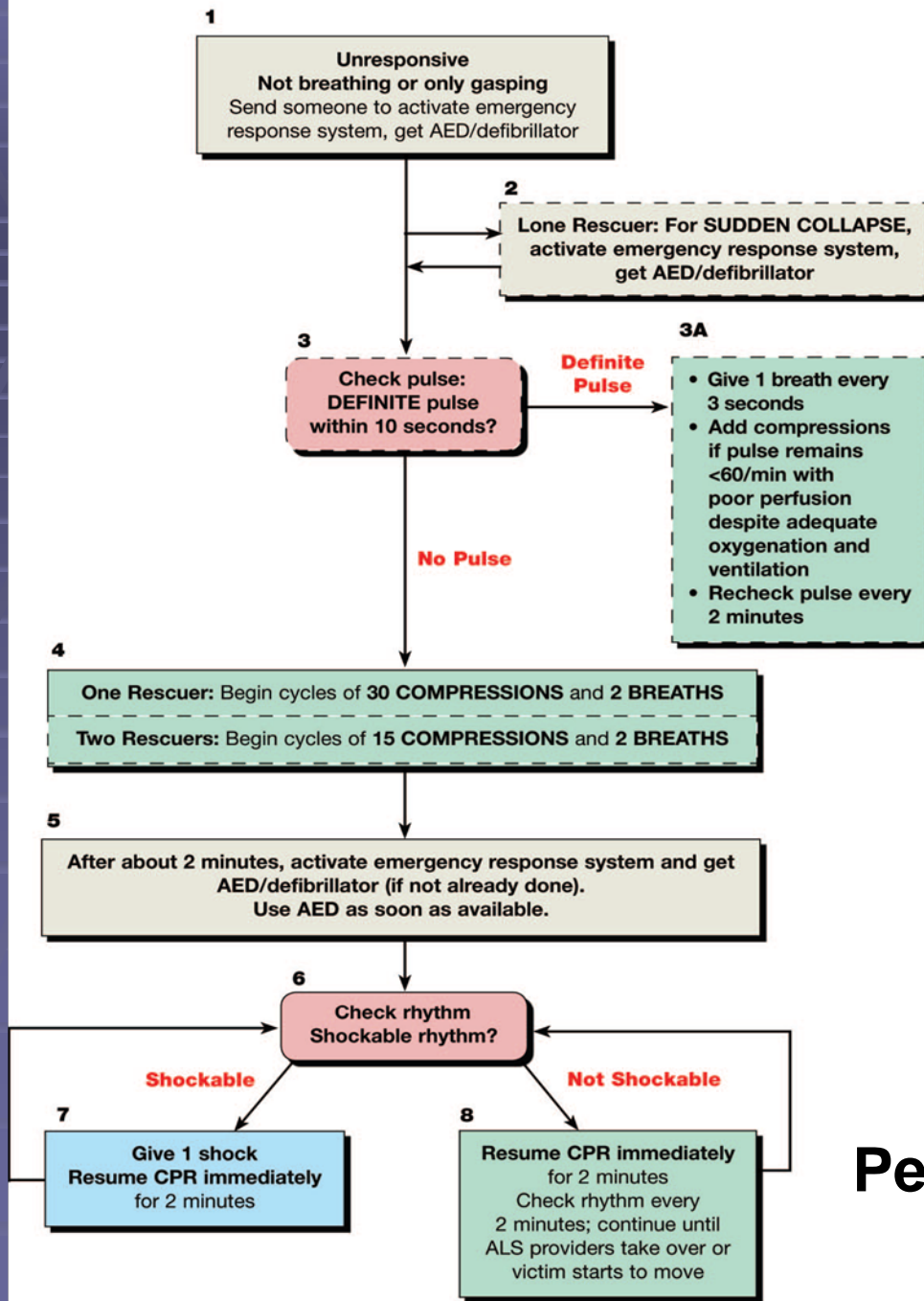
Prevention of Cardiopulmonary Arrest

- Injury
- Motor vehicle crashes

A-B-C or C-A-B?

- Asphyxial cardiac arrest is more common than VF cardiac arrest in infants and children
- Ventilations are extremely important in pediatric resuscitation.

- The CAB sequence is recommended to simplify training so that more victims of sudden cardiac arrest will receive bystander CPR.
- Consistency in teaching rescuers, whether their patients are infants, children, or adults.



High-Quality CPR

- Rate at least 100/min
- Compression depth to at least $\frac{1}{3}$ anterior-posterior diameter of chest, about $1\frac{1}{2}$ inches (4 cm) in infants and 2 inches (5 cm) in children
- Allow complete chest recoil after each compression
- Minimize interruptions in chest compressions
- Avoid excessive ventilation

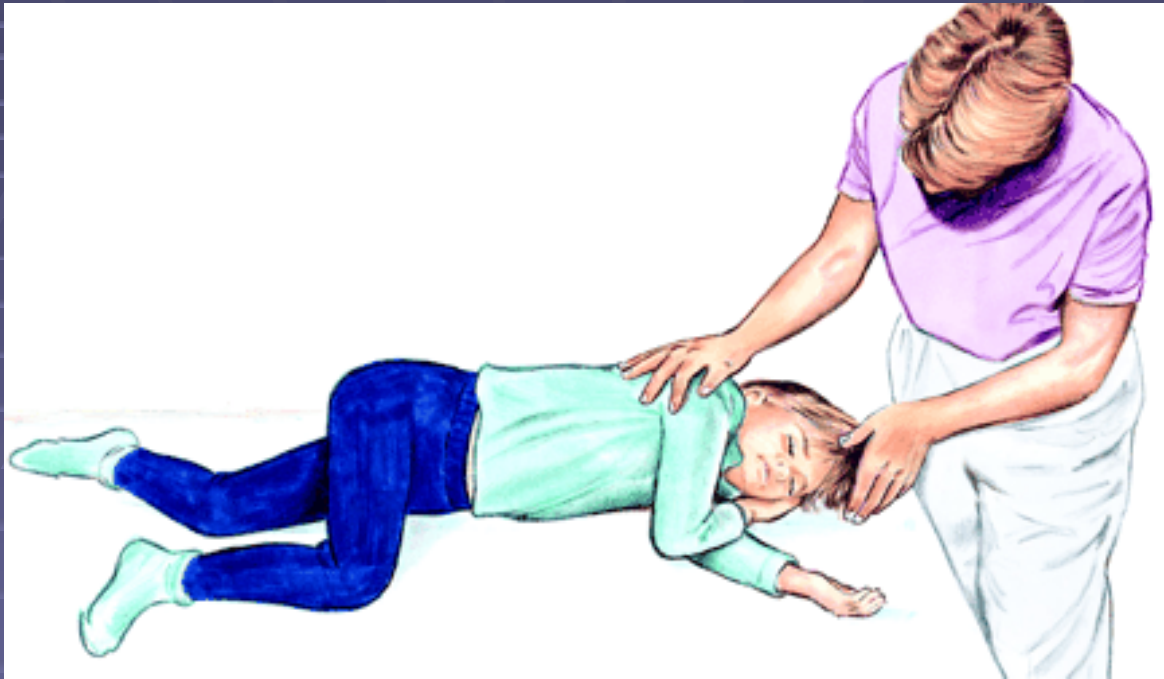
Pediatric BLS Algorithm

BLS Sequence for Healthcare Providers

Assess the Need for CPR(BOX 1)

- 1. unresponsive**
- 2. not breathing**
- 3. gasping**

send someone to activate the emergency response system.



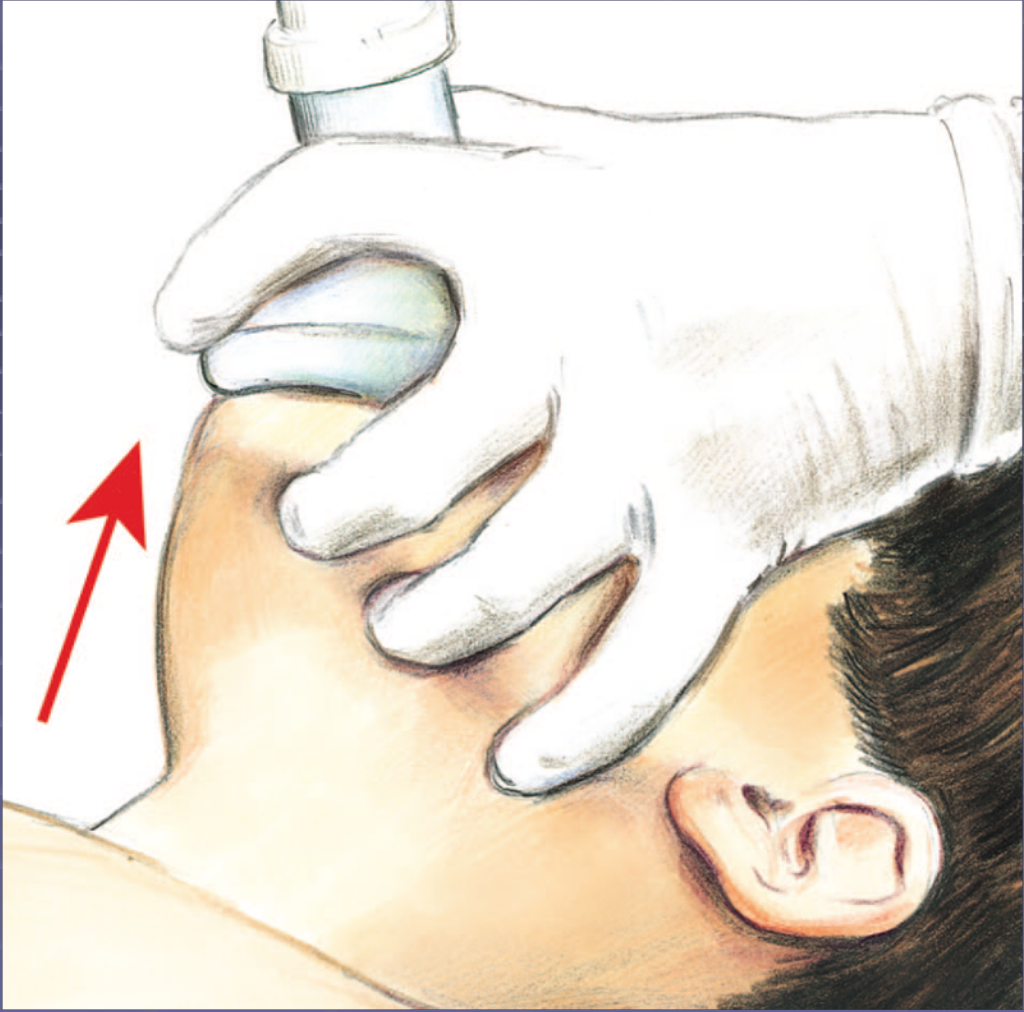
RECOVERY POSITION

Pulse Check (BOX 2)

- brachial in an infant and carotid or femoral in a child

1. Inadequate Breathing With Pulse:

- palpable pulse >60 per minute but inadequate breathing:
 - rescue breaths @ 12 to 20 breaths per minute (1 breath every 3 to 5 seconds) until spontaneous breathing resumes.
 - Reassess the pulse every 2 minutes.



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2. Bradycardia With Poor Perfusion

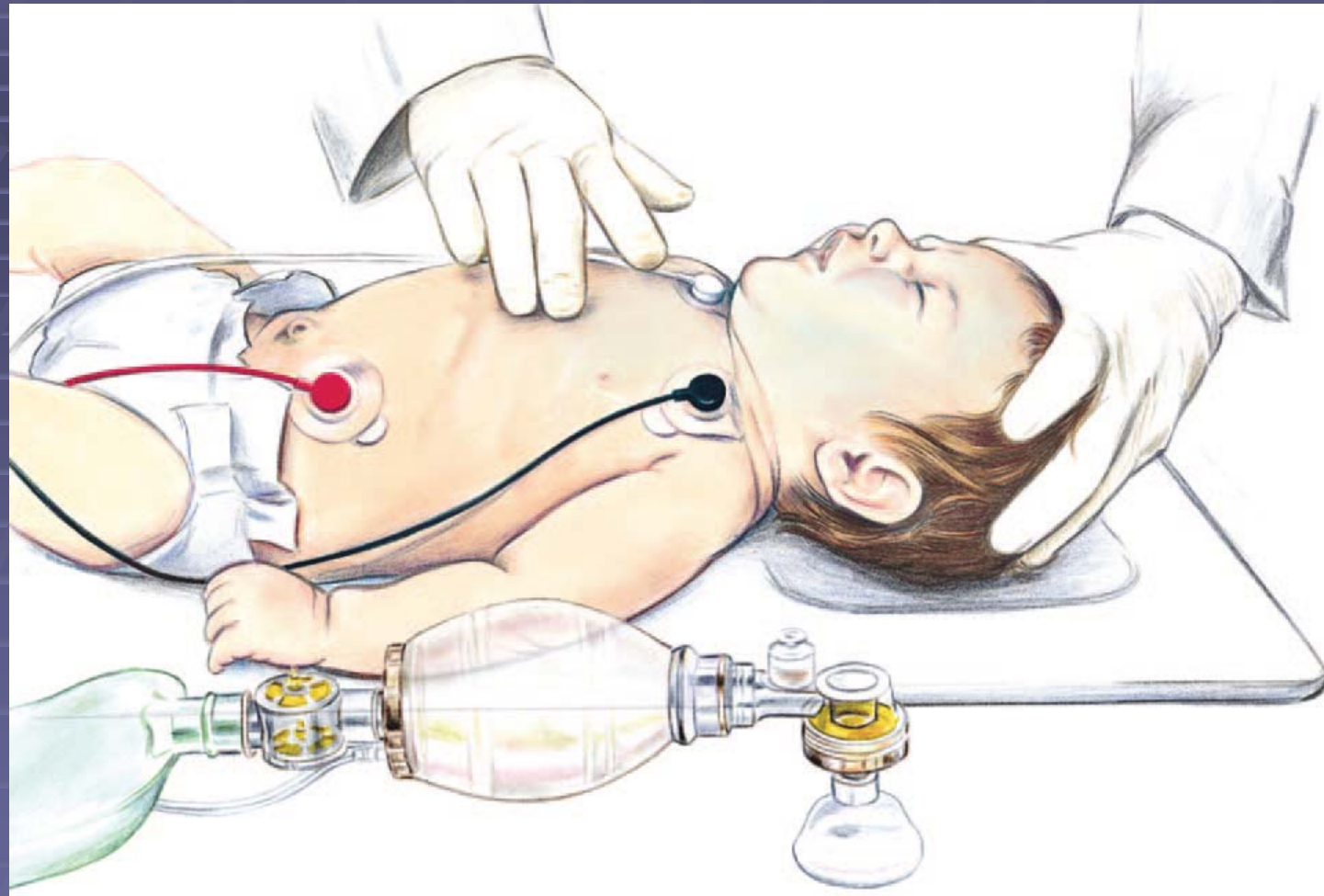
- **pulse is <60 per minute and there are signs of poor perfusion**
- (ie, pallor, mottling, cyanosis) despite support of oxygenation and ventilation,
-- begin chest compressions

Chest Compressions(BOX 4)

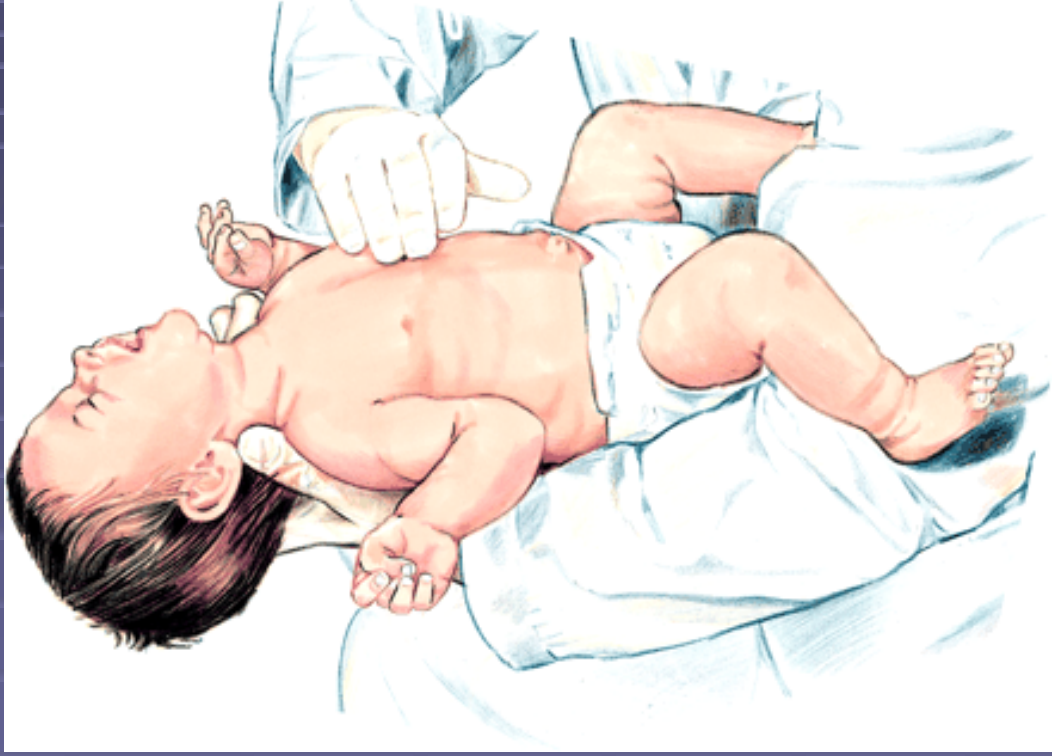
- The lone healthcare provider-- 2-finger chest compression technique for infants.
- The 2-thumb–encircling hands technique is recommended when CPR is provided by 2 rescuers.
- Encircle the infant’s chest with both hands; spread your fingers around the thorax, and place your thumbs together over the lower third of the sternum
- Forcefully compress the sternum with your thumbs

In an older child,

- compress the lower half of the sternum *at least* one third of the AP dimension of the chest or approximately 5 cm (2 inches) with the heel of 1 or 2 hands.



Two-finger chest compression technique in infant(1 rescuer)



Characteristics of high-quality CPR:

- Chest compressions of appropriate rate and depth.
- Push fast: push at a rate of at least 100 compressions per minute.
- Push hard: push with sufficient force to depress at least one third the anterior-posterior (AP) diameter of the chest or approximately 1.5 inches (4 cm) in infants and 2 inches (5 cm) in children
- Allow complete chest recoil after each compression to allow the heart to refill with blood.

- Incomplete recoil during CPR is associated with higher intrathoracic pressures and significantly decreased venous return, coronary perfusion, blood flow, and cerebral perfusion
- Rescuers should rotate the compressor role approximately every 2 minutes

Ventilations(BOX 4)

- After 30 compressions (15 compressions if 2 rescuers) open the airway with a head tilt– chin lift and give 2 breaths
- If evidence of trauma suggesting spinal injury, use a jaw thrust without head tilt to open the airway



CHEST COMPRESSION WITH BAG AND MASK VENTILATION

Coordinate Chest Compressions and Ventilations

- lone rescuer--compression-to-ventilation ratio of 30:2.
- For 2-rescuer infant and child CPR----one provider should perform chest compressions while the other keeps the airway open and performs ventilations at a ratio of 15:2.
- Deliver ventilations with minimal interruptions in chest compressions

- If an advanced airway is in place, the compressing rescuer should deliver at least 100 compressions per minute continuously without pauses for ventilation.
- The ventilation rescuer delivers 8 to 10 breaths per minute (a breath every 6 to 8 seconds).

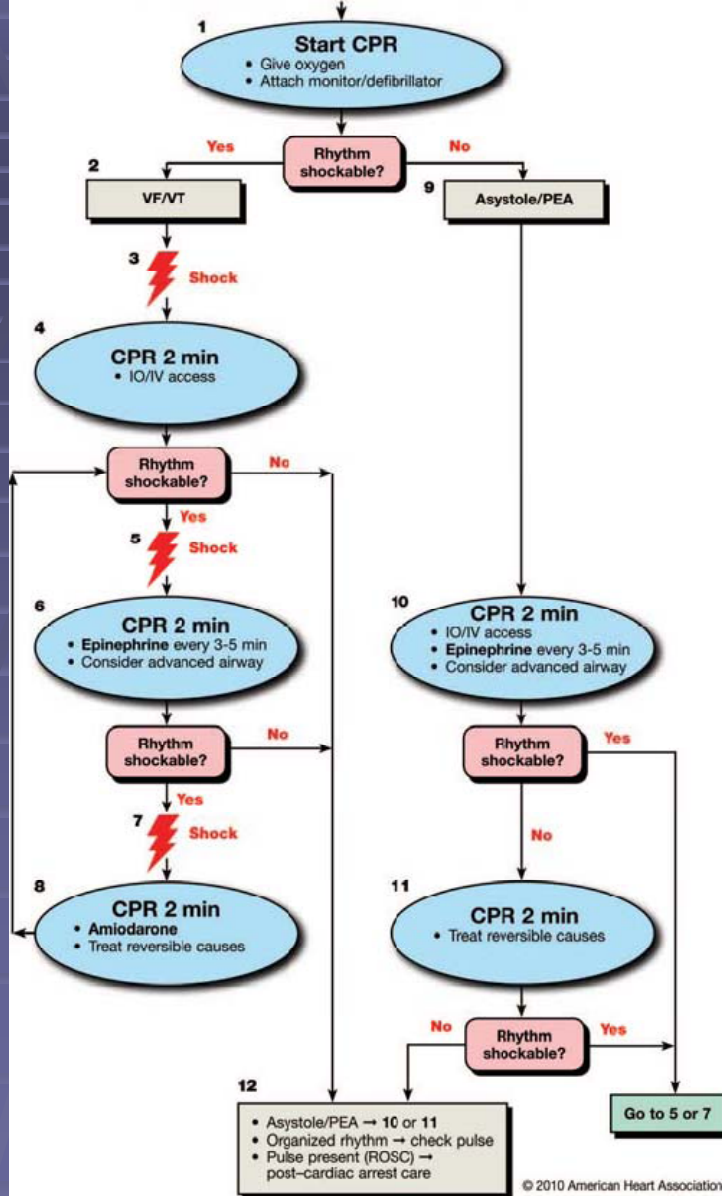
Defibrillation(BOX 6)

- Children with sudden witnessed collapse
 - likely to have VF or pulseless VT and
 - need immediate CPR and rapid defibrillation.
 - VF and pulseless VT are referred to as “shockable rhythms” because they respond to electric shocks (defibrillation).

- children with VF:an initial dose of 2 J/kg
- refractory VF:increase the dose to 4 J/kg
- Subsequent energy levels should be at least 4 J/kg
- AEDs can differentiate “shockable” from “nonshockable” rhythms

Pediatric Cardiac Arrest

Shout for Help/Activate Emergency Response



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Doses/Details

CPR Quality

- Push hard (≥1/2 of anterior-posterior diameter of chest) and fast (at least 100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 15:2 compression-ventilation ratio. If advanced airway, 8-10 breaths per minute with continuous chest compressions

Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose.

Drug Therapy

- **Epinephrine IO/IV Dose:** 0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes. If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of 1:1000 concentration).
- **Amiodarone IO/IV Dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place give 1 breath every 6-8 seconds (8-10 breaths per minute)

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

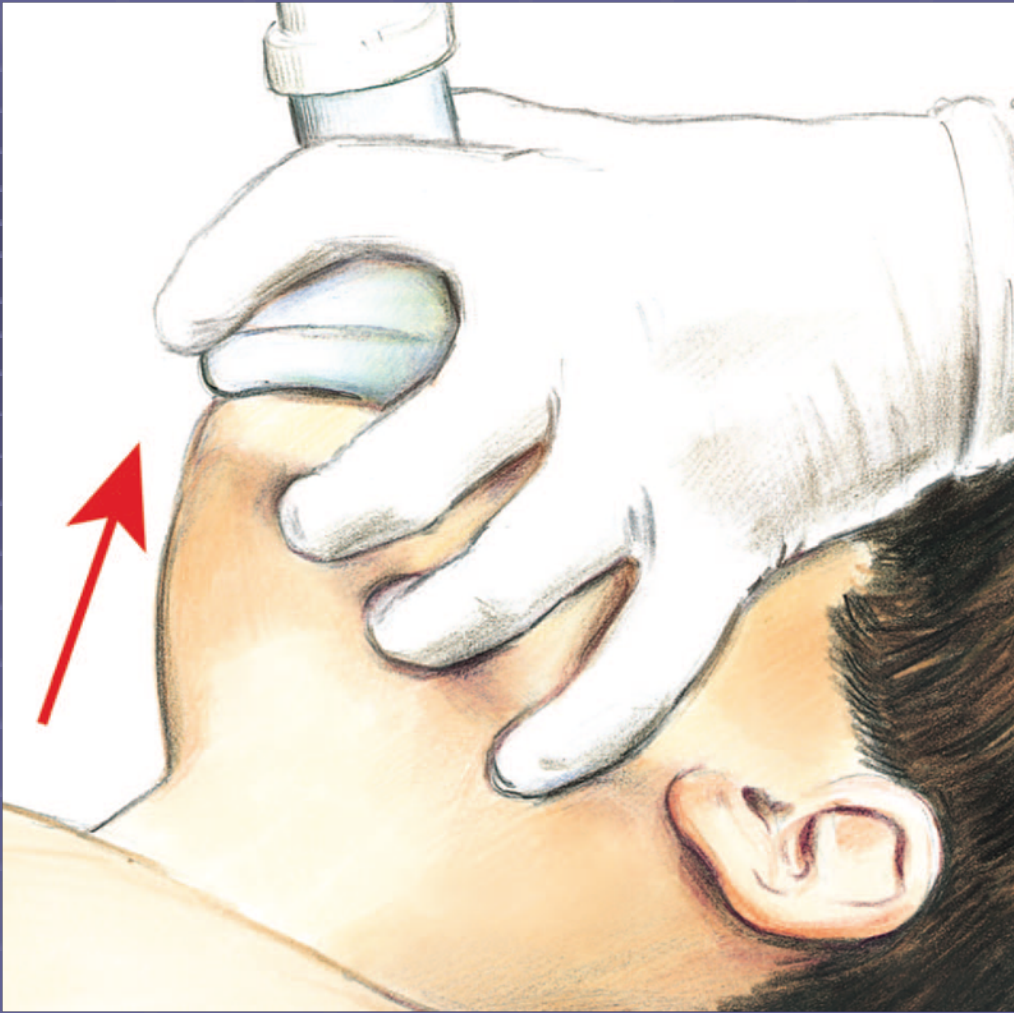
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypoglycemia
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

Hands-Only (Compression-Only) CPR

Optimal CPR in infants and children includes both compressions and ventilations, but compressions alone are preferable to no CPR

Bag-Mask Ventilation

- selecting the correct mask size,
- opening the airway,
- making a tight seal between the mask and face,
- delivering effective ventilation,
- assessing the effectiveness of ventilation.



The EC clamp technique of bag-mask ventilations. Three fingers of one hand lift the jaw (they form the “E”) while the thumb and index finger hold the mask to the face (making a “C”).

- Self-inflating bag with a volume of 450 to 500 mL for infants and young children, and 1000 mL in older children or adolescents
- Supplementary oxygen is attached with an oxygen inflow of 10 L/min, the concentration of delivered oxygen varies from 30% to 80%

- To deliver a high oxygen concentration (60% to 95%), attach an oxygen reservoir to the self-inflating bag.
- Maintain an oxygen flow of 10 to 15 L/min.
- Tight seal between the mask and the victim's face.

- Open the airway by lifting the jaw toward the mask making a tight seal and squeeze the bag until the chest rises
- Bag and mask ventilation is not recommended for a lone rescuer (mouth to barrier device ventilation)
- Avoid excessive ventilation

- Give each breath slowly, over approximately 1 second.
- If the chest does not rise, reopen the airway, verify tight seal between the mask and the face (or between the bag and the advanced airway), and reattempt ventilation

Two-Person Bag-Mask Ventilation

- significant airway obstruction,
- poor lung compliance
- difficulty in creating a tight seal between the mask and the face.

Gastric Inflation and Cricoid Pressure

To minimize gastric inflation

- Deliver each breath over approximately 1 second.
- Cricoid pressure may be considered in an unresponsive victim if there is an additional healthcare provider

Foreign-Body Airway Obstruction (Choking)

- children <5 years of age
- Liquids- most common cause in infants
- balloons, small objects, and foods(round candies, nuts, and grapes)- most common causes in children
- Signs of FBAO -- **a sudden onset of respiratory distress with coughing, gagging, stridor, or wheezing in the absence of fever or other respiratory symptoms .**

Relief of FBAO

(foreign body airway obstruction)

- If FBAO is mild, do not interfere.
- If the FBAO is severe (ie, the victim is unable to make a sound) you must act to relieve the obstruction.
- For a **child** perform sub-diaphragmatic abdominal thrusts (**Heimlich maneuver**) until the object is expelled or the victim becomes unresponsive.
- For an **infant**, deliver repeated cycles of **5 back blows (slaps) followed by 5 chest compressions** until the object is expelled or the victim becomes unresponsive.

- If the victim becomes unresponsive, start CPR with chest compressions (do not perform a pulse check).
- After 30 chest compressions, open the airway.
- If you see a foreign body, remove it but no blind finger sweeps
- Attempt to give 2 breaths and continue with cycles of chest compressions and ventilations until the object is expelled.
- After 2 minutes, if no one has already done so, activate the emergency response system.

Trauma

- Anticipate airway obstruction
- Stop all external bleeding with direct pressure.
- When the mechanism of injury is compatible with spinal injury, minimize motion of the cervical spine and movement of the head and neck

- open and maintain the airway with a jaw thrust and try not to tilt the head
- To limit spine motion, secure at least the thighs, pelvis, and shoulders to the immobilization board.

Neonatal Resuscitation

- Etiology: asphyxia
- A-B-C sequence has been retained unless known cardiac etiology
- Best indicators for need of resuscitation: heart rate, respirations, and tone.
- Pulse oximetry: need for supplementary oxygen.

- For term babies, begin resuscitation with room air.
- supplementary oxygen:regulated by oximetry
- No evidence to support airway suctioning in active babies, even in the presence of meconium

- The recommended compression-ventilation ratio remains 3:1
- If the arrest is known to be of cardiac etiology, a higher ratio (15:2) can be considered.
- Epinephrine: dose of 0.01 to 0.03 mg/kg IV
- Endotracheal route: 0.05 mg/kg to 0.1 mg/kg.

- Newborns who require CPR in other settings (eg, prehospital, ED, pediatric intensive care unit [PICU], etc.), should receive CPR according to infant guidelines
- 2 rescuers provide continuous chest compressions with asynchronous ventilations if an advanced airway is in place
- 15:2 ventilation-to-compression ratio if no advanced airway is in place

Postresuscitation Care (Post-Cardiac Arrest Care)

- Therapeutic hypothermia is recommended for evolving moderate to severe hypoxic-ischemic encephalopathy.
- duration of resuscitation for newborns with prolonged cardiac arrest : In a newly born baby with no detectable heart rate that remains undetectable for 10 minutes, it is appropriate to consider stopping resuscitation

Thank You !