Cardiac arrest in specific situations

Dr Alexandre Bardis - SAMU 92

Standard resuscitation

A quick reminder

Standard resuscitation

Generalities

- Most sudden cardiac arrest in adults is of cardiac cause, particularly myocardial infarction and electric disturbances

- Arrests without a primary cardiac origin are also common (consider treatment for reversible underlying cause)

- The main focus to secure the best outcome are :
  - rapid recognition
  - prompt provision of CPR
  - defibrillation of malignant shockable rhythms
  - post-ROSC supportive care
  - treatment of underlying causes

Chain of Survival

Adult IHCA Chain of Survival

Adult OHCA Chain of Survival

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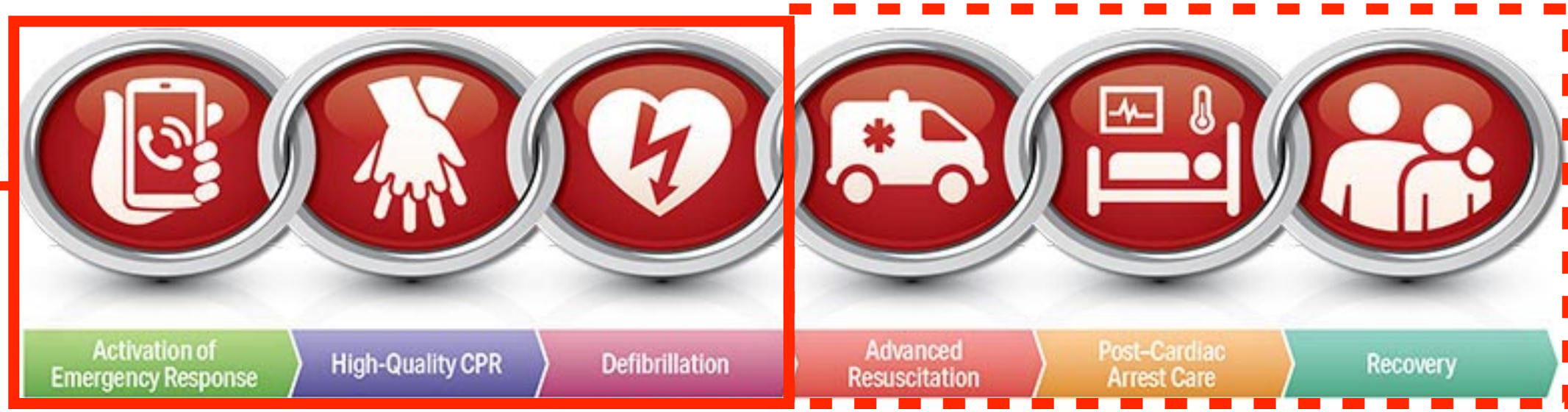
Chain of Survival

Basic Life Support

Advanced Life Support



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Basic Life Support

Unresponsive with absent or abnormal breathing

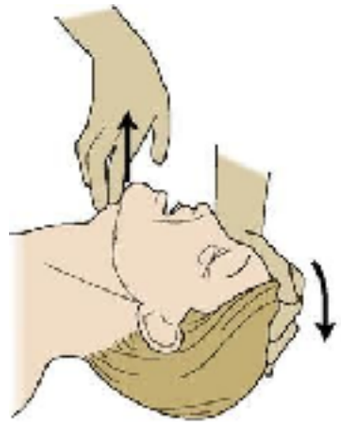
Call emergency services

Give 30 chest compressions

Give 2 rescue breaths

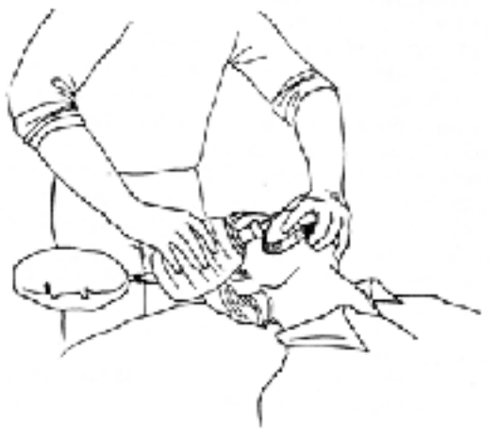
Continue CPR 30:2

As soon as AED arrives - switch it on and follow instructions



Head tilt–chin lift maneuver

Jaw-thrust maneuver



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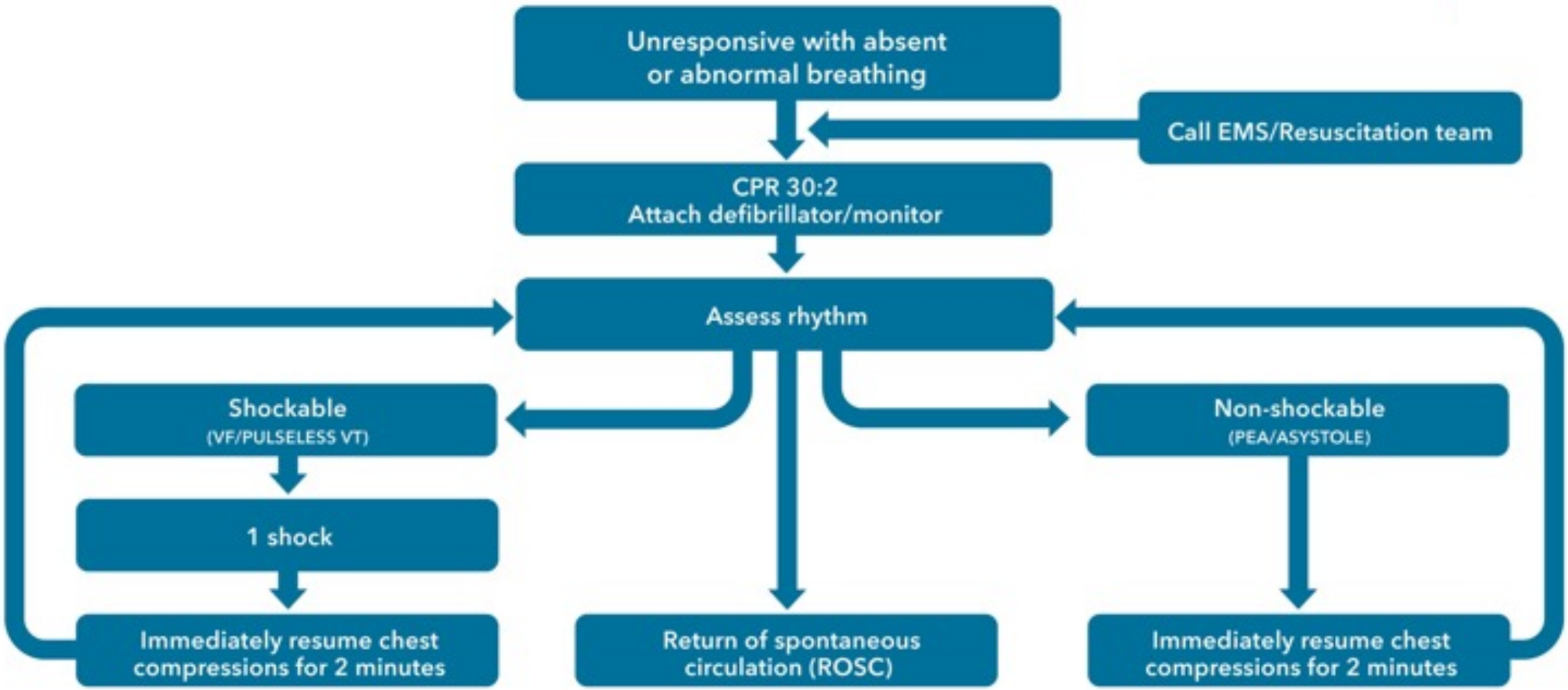
Advanced Life Support



Give high-quality chest compressions and

- Give oxygen
- Use waveform capnography
- Continuous compressions if advanced airway
- Minimise interruptions to compressions
- Intravenous or intraosseous access
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks
- Identify and treat reversible causes

Identify and treat reversible causes

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalemia/metabolic
- Hypo-/hyperthermia
- Thrombosis – coronary or pulmonary
- Tension pneumothorax
- Tamponade- cardiac
- Toxins

Consider ultrasound imaging to identify reversible causes

Consider

- Coronary angiography/percutaneous coronary intervention
- Mechanical chest compressions to facilitate transfer/treatment
- Extracorporeal CPR

After ROSC

- Use an ABCDE approach
- Aim for SpO_2 of 94-98% and normal $PaCO_2$
- 12 Lead ECG
- Identify and treat cause
- Targeted temperature management

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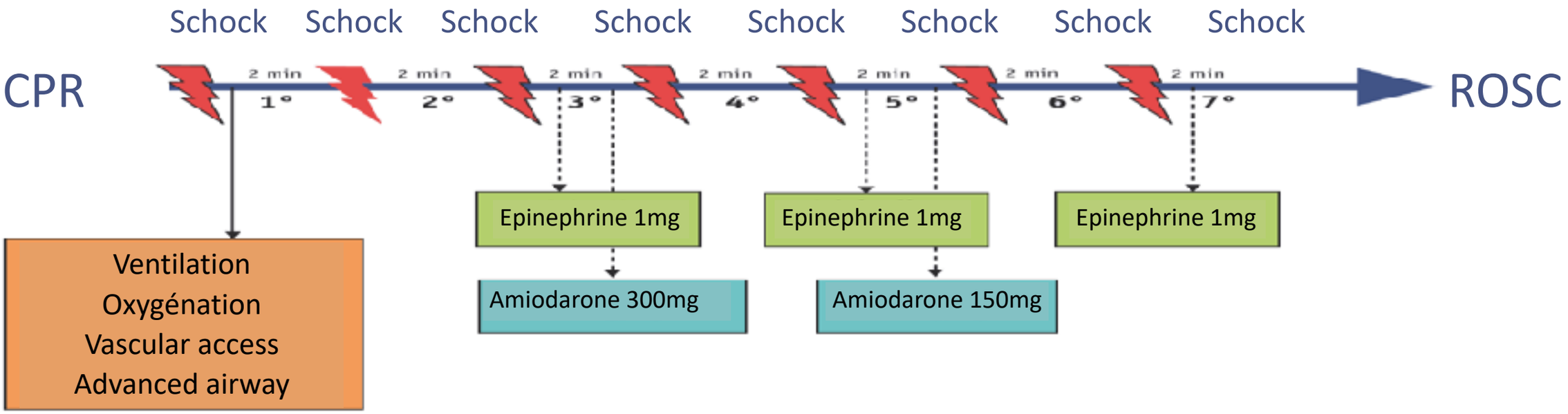
Advanced Life Support

- Prioritize intravenous (IV) access for drug administration in cardiac arrest
- After placement of an advanced airway (ALS):
    - 1 breath every 6 s (10 breaths/min) while continuous chest compressions
- Epinephrine 1 mg every 3 to 5 min for cardiac arrest.
    - As soon as feasible if non-shockable rhythm,
    - After initial defibrillation attempts have failed if shockable rhythm
- Amiodarone or lidocaine for VF/pVT that is unresponsive to defibrillation
    - Amiodarone 300 mg IV (IO) if still in VF/pTV after 3 schocks
    - Amiodarone 150 mg IV (IO) if still in VF/pTV after 5 schocks

VF/pVT Algorithm



Specific situations

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Drowning


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Drowning

Specific Challenges in Cardiac Arrest

- Drowning causes hypoxia leading to cardiac arrest.
- Victims often have asystole or pulseless electrical activity (PEA).
- Water in the airway complicates ventilation.

Drowning

Immediate Management at the Scene

- Safe rescue from water without endangering the rescuer.
- Start as soon as unresponsive submersion victim is removed from the water (don’t check for breath)
- Start CPR by 5 breathes, if possible with oxygen and a bag-masked
- No routine stabilization of the cervical spine in the absence of circumstances that suggest a spinal injury

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Drowning

Advanced Resuscitation Considerations

- Advanced Life Support (ALS):
    - Rapid airway management (intubation) may be needed.
    - Consider suction to clear water and debris before ventilation.
    - Monitor for hypothermia – rewarming is essential.
- Post-Resuscitation Care:
    - Risk of acute respiratory distress syndrome (ARDS).
    - Transport to the hospital (for evaluation and monitoring) all victims of drowning who require any form of resuscitation (including rescue breathing alone)

Cardiac Arrest Due to Electric Shock

Cardiac Arrest Due to Electric Shock

Specific Pathophysiology in Electrocution and Lightning Strike

- High-voltage injuries and lightning strikes should be treated as polytrauma.
- Types of cardiac arrest:
  - Ventricular fibrillation (typically low voltage)
  - Asystole (high voltage/lightning)
  - Respiratory origin: possible neuromuscular paralysis (e.g. diaphragm, intercostals) → secondary cardiac arrest
- Injuries may include:
  - Cardiac arrhythmias
  - Muscle necrosis and rhabdomyolysis
  - Internal organ damage despite minimal external burns

Cardiac Arrest Due to Electric Shock

Initial Resuscitation Priorities at the Scene

- Ensure Scene Safety: Do not touch victim until source is disconnected.
- Initiate standard CPR but defibrillation should be prioritized
- Provide assisted ventilation if needed (respiratory muscle paralysis)

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Cardiac Arrest Due to Electric Shock

In-Hospital and ICU Management

- Monitoring:
  - Continuous ECG for ≥24 h (especially after VF/asystole or high-voltage shock)
  - Watch for delayed arrhythmias
- Rhabdomyolysis risk:
  - Check CK, myoglobinuria
  - Aggressive hydration to prevent renal failure
- Manage burns (external & internal) and hypothermia

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Cardiac Arrest in Pregnancy

Cardiac Arrest in Pregnancy

Key Features

- Unique Physiological Considerations:
    - Increased oxygen demand and reduced functional residual capacity
    - Aortocaval compression from uterus (≥20 weeks gestation)
    - Altered drug pharmacokinetics and reduced chest compression effectiveness
- Common Causes:
    - Obstetric: eclampsia, hemorrhage, amniotic fluid embolism
    - Non-obstetric: trauma, cardiac disease, sepsis, PE

Cardiac Arrest in Pregnancy

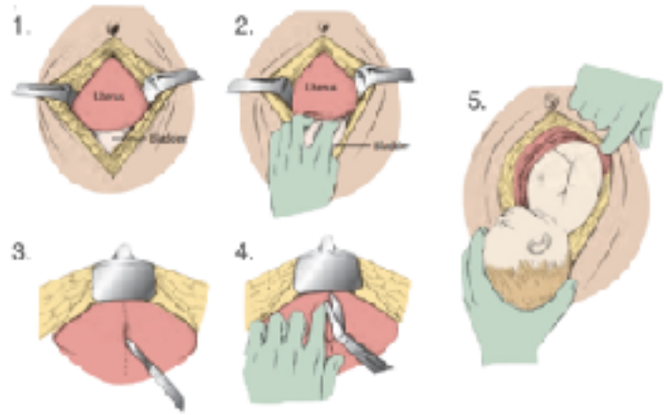
Resuscitation – Modifications Required

- Key Modifications in CPR:
    - Manual left uterine displacement (LUD) to relieve aortocaval compression (or tilt at 15–30° if LUD not possible)
    - High-quality chest compressions: same depth and rate as in non-pregnant patients
    - Early intubation: higher aspiration risk, rapid desaturation
- Defibrillation:
    - Use standard energy levels
    - Do not delay for fetal monitoring or removal of fetal monitors

Cardiac Arrest in Pregnancy

Perimortem Cesarean Section (PMCS)

- When to Perform PMCS:
  - If no ROSC within 4 minutes, perform cesarean by 5 minutes after arrest onset
  - Goal: improve maternal survival by relieving aortocaval compression
- Key Considerations:
  - Perform where the mother collapses
  - Gestational age ≥20 weeks (uterus palpable above umbilicus)
  - Requires early team coordination and preparedness



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Pediatric Cardiac Arrest

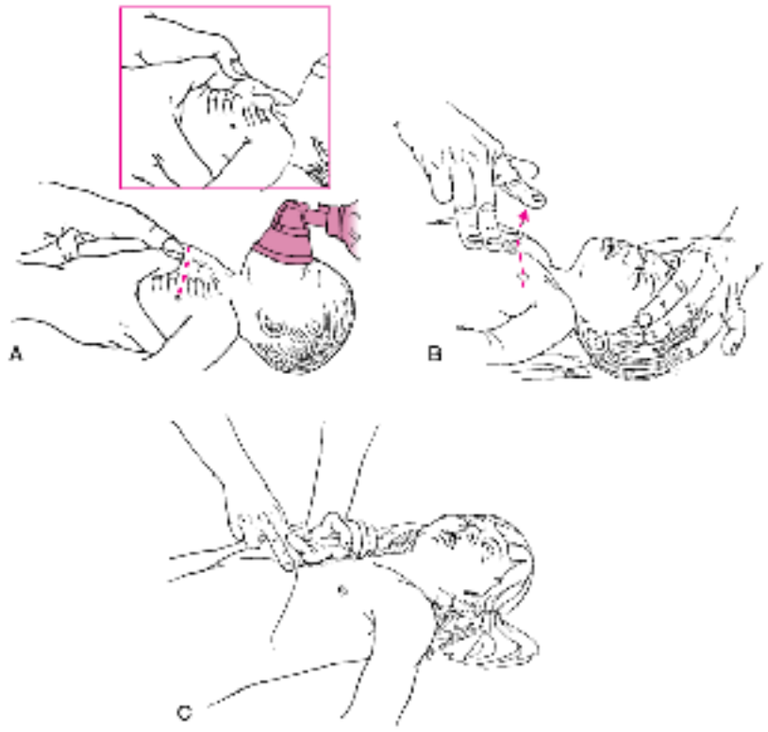
Pediatric Cardiac Arrest

Pediatric Cardiac Arrest – Key Characteristics

- Epidemiology & Pathophysiology:
  - Most pediatric cardiac arrests are of respiratory origin
  - Common causes: hypoxia, asphyxia, trauma, sepsis, congenital heart disease
  - Initial rhythm is usually non-shockable: asystole or PEA (pulseless electrical activity)
- Key Insight:
  - Prevention and early recognition of deterioration is crucial to avoid arrest

Pediatric Cardiac Arrest

Advanced Pediatric Life Support (APLS) and Post-Arrest Care

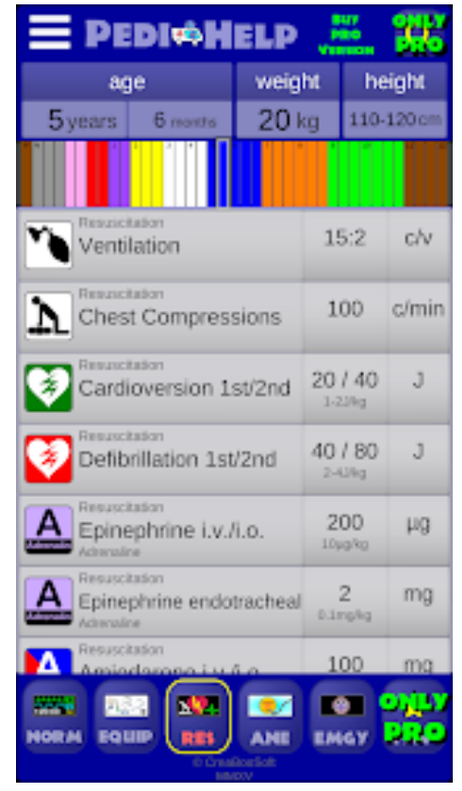


- Basic Life Support (BLS):
  - Start with 5 rescue breaths → check for signs of life
  - Compression-to-ventilation ratio:
    - 1 rescuer: 30:2
    - 2 rescuers: 15:2
  - Compression depth: 1/3 of chest diameter (≈4 cm in infants, ≈5 cm in children)
- Airway and Breathing:
  - Early and effective ventilation is key
  - Use bag-mask ventilation if trained; early intubation if necessary

Pediatric Cardiac Arrest

Advanced Pediatric Life Support (APLS) and Post-Arrest Care

- Advanced Interventions:
  - Adrenaline every 3–5 min (10 µg/kg)
  - Shockable rhythms (VF/pVT): Defibrillate with 4 J/kg
- Post-Resuscitation Care:
  - Address underlying cause (4 Hs & 4 Ts)
  - Transfer to PICU for ongoing support and monitoring



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Pediatric Cardiac Arrest

- Reversible Causes of Pediatric Cardiac Arrest – "4 Hs and 4 Ts"

- Hypoxia
  - Most common cause in children
  - Ensure airway patency and effective ventilation
- Hypovolemia
  - From dehydration, bleeding, or sepsis
  - Treat with IV fluids or blood products
- Hypo-/Hyperkalemia & Metabolic Disorders
  - Electrolyte imbalance, acidosis
  - Check labs; correct abnormalities (e.g. calcium, bicarbonate)
- Hypothermia
  - Especially in infants or drowning
  - Rewarm gradually (active/passive methods)

Pediatric Cardiac Arrest

- Reversible Causes of Pediatric Cardiac Arrest – "4 Hs and 4 Ts"

- Tension Pneumothorax
  - Unequal breath sounds, tracheal deviation
  - Treat with needle decompression and chest drain
- Tamponade (Cardiac)
  - Muffled heart sounds, hypotension
  - Requires urgent pericardiocentesis
- Toxins (Poisoning)
  - Ingestion or overdose (medications, household products)
  - Antidotes/supportive care as indicated
- Thromboembolism
  - Rare in children, but possible (e.g., pulmonary embolism)
  - Suspect in post-op, congenital heart disease, central lines