ACLS Electrical Therapies

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GUMS

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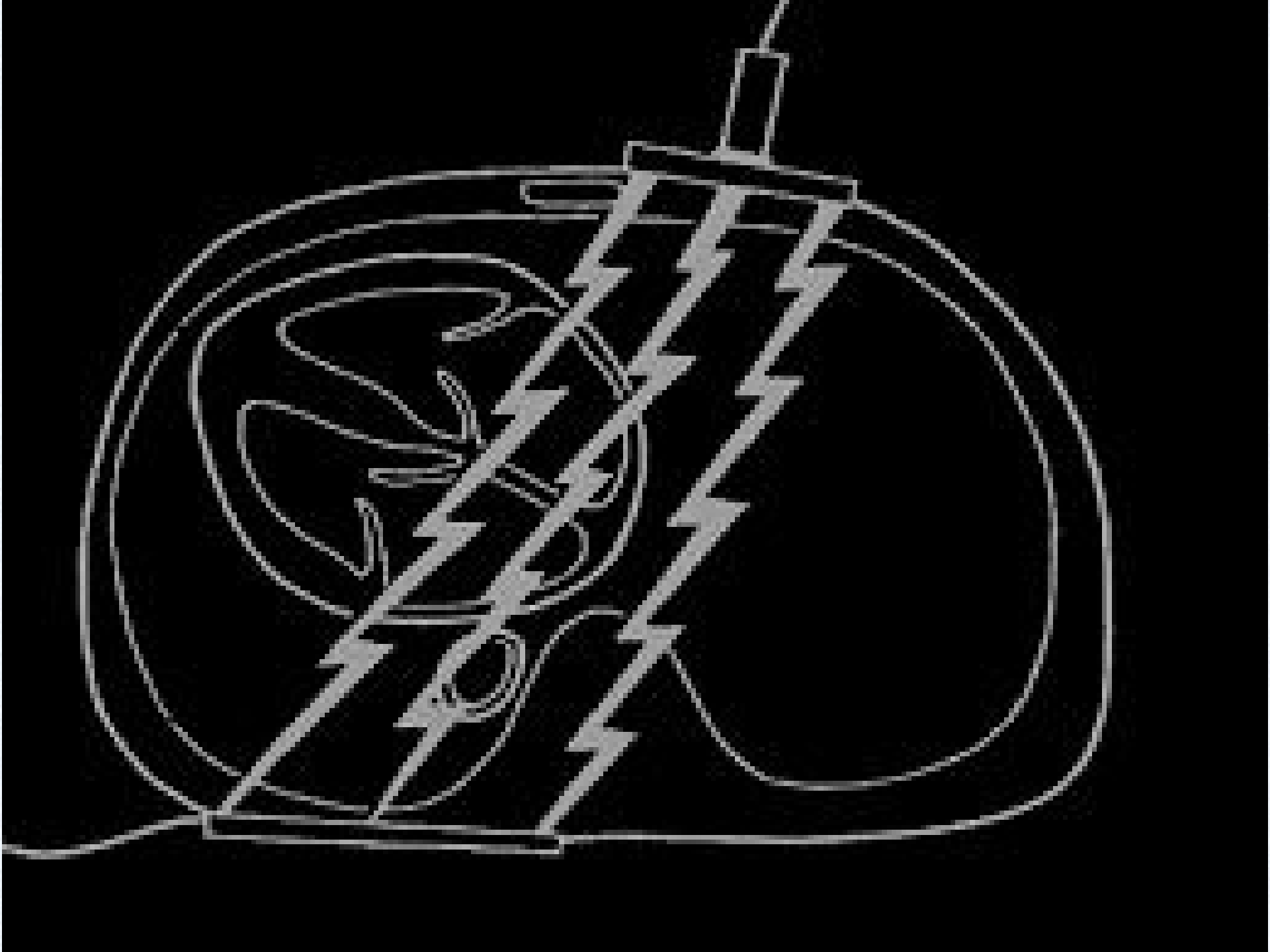
IN THE NAME OF GOD

What is defibrillation?

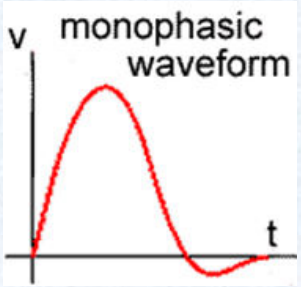
- Defibrillation is the delivery of Direct Current (DC) through the heart muscle. Defibrillation depolarizes the entire myocardium. This is generally followed by a brief period of asystole. The aim is that following defibrillation the heart will repolarize uniformly and that the heart's intrinsic pacemaker, **the SA node**, will resume pacing the heart.
- Remember CPR does not return the hearts rhythm to normal.
- Electrical **cardioversion** and **defibrillation** are procedures in the management of patients with cardiac arrhythmias. Cardioversion is the delivery of energy that is synchronized to The QRS complex, while defibrillation is the non-synchronized delivery of a shock randomly during the cardiac cycle.



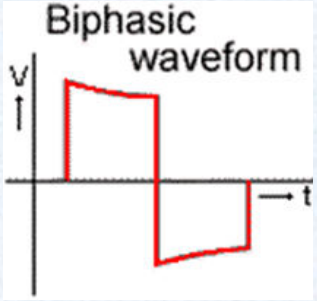
Defibrillation	Cardioversion
Not synchronised	Synchronised on the R wave
For cardiac arrest	For periarrest tachyarrhythmias (unstable)
Higher energy joules	Lower energy joules
No escalating energy for next shock	Escalate for next shock (100 - 200 - 300 - 360J)

Monophasic vs Biphasic

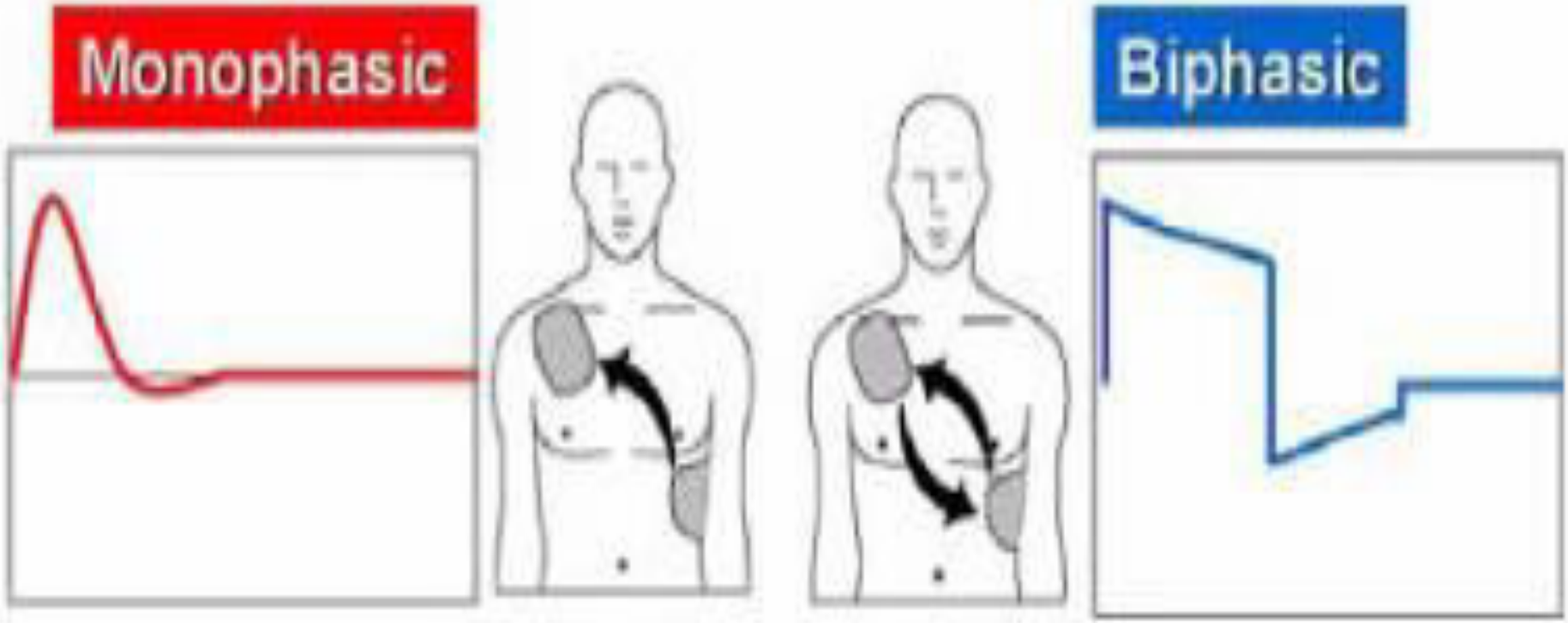
- Monophasic defibrillators deliver the energy in one direction and therefore require higher energy to defibrillate the heart.



- Biphasic defibrillators deliver energy in two directions. For half the shock energy is delivered in one direction then the energy is delivered in the opposing direction for the latter half of the shock. This allows for lower peak energies to be delivered.



Monophasic vs Biphasic Defibrillators



Current delivered in one direction

Current delivered in two directions

The success of defibrillation depends on:

- Time elapsed since arrest
- Quality of electrical contact between treatment electrode and chest wall
- Myocardial oxygenation during CPR
- Chest wall size
- Defibrillating energy
- The total number of shocks delivered
- The time interval between successive shocks (chest wall impedance to electrical flow drops with successive shocks-max 2 minutes between).

- Poor electrode contact on patient's chest. *Diaphoretic patients* need to be dried off. *Excessive body hair* may also cause poor electrode contact, hair may need to be trimmed. Extra sets of adhesive pads should be readily available.
- Before placing electrodes, always be sure to remove anything on the surface of the patient's chest. This includes *bandages, NTG patch(s),* and other objects that might interfere with the placement of the electrodes on the patient's skin surface.
- If you encounter *an implanted pacemaker*, place the treatment electrode 2 to 4 inches away from the pacemaker site and as close to the normal pad placement as possible.

Factors to consider

- Paddle size

Adults (large paddles) : 10-13 cm diameter

Pediatric : Children 8 cm - Infants 4.5 cm

NOTE: Use largest size that completely contacts chest without paddles touching

Small paddles: concentrate current, burn heart

Large paddles: reduce current density

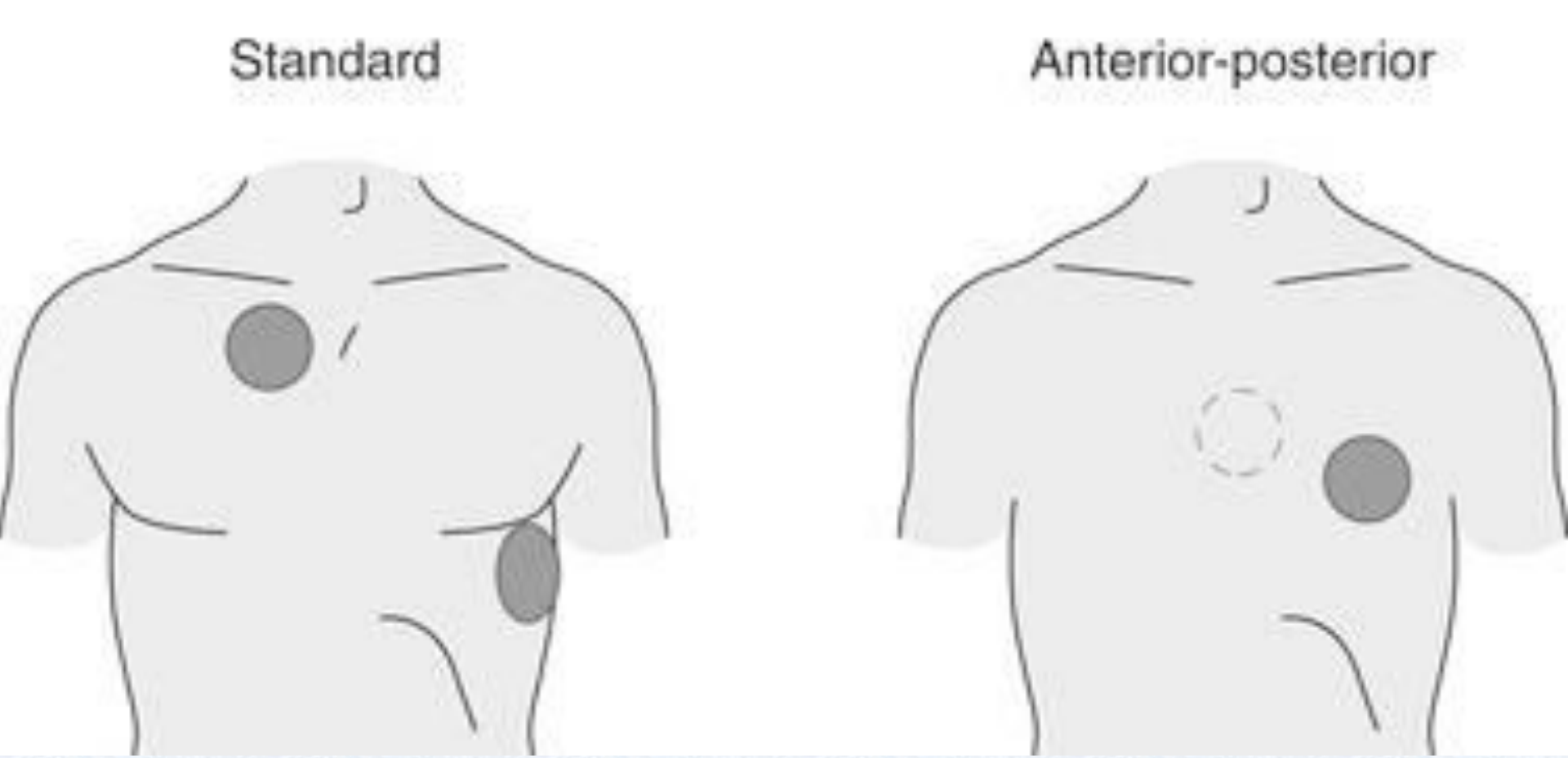
- # Paddle placement
- There are two accepted positions to optimize current delivery to the heart:

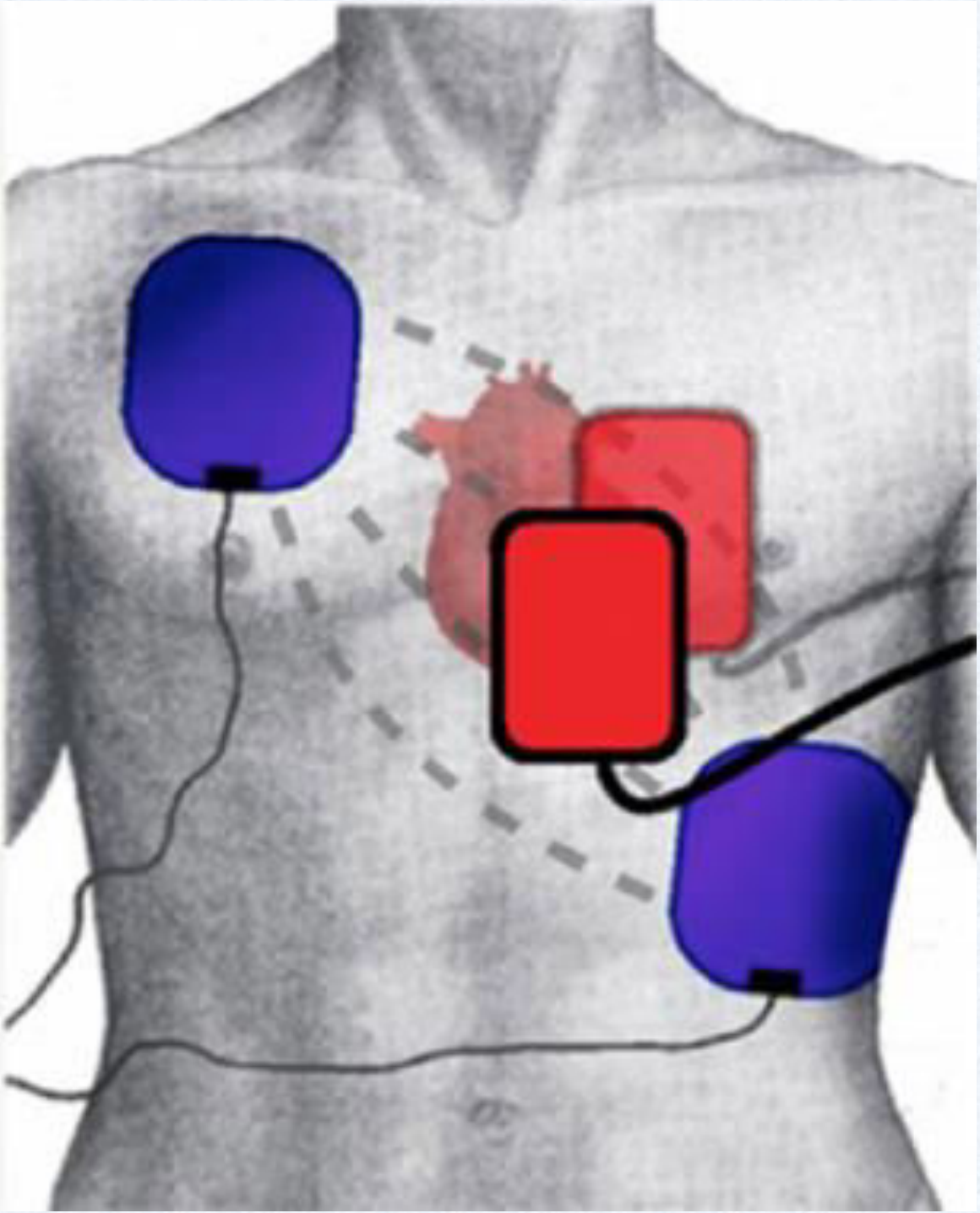
  (1) Anteroapical – one paddle is placed to the right of the sternum just below the clavicle, and the other is centered lateral to the normal cardiac apex in the anterior or midaxillary line (V5–6)

  (2)Anteroposterior – the anterior paddle is placed over the precordium or apex, and the posterior paddle is placed on the back in the left or right infrascapular region.

- Reversing paddles marked “apex--sternum” does NOT affect defibrillation
- AP placement can be used to defibrillate small children with adult paddles

Defibrillator electrode placement





- Paddle-skin interface
- Cream, paste, saline pads, gelled pads : Decreases resistance to current flow
- Avoid smearing or running: “bridges” charge
- **NEVER use alcohol!!!**

- Paddle contact pressure
- Firm pressure of 25 pounds
- Deflates lungs; Shortens current pathway
- Do not lean on paddles; They slip

- **Ventricular fibrillation (VF)** and **pulseless ventricular tachycardia (pVT)** are non-perfusing rhythms emanating from the ventricles, for which early rhythm identification and defibrillation, are the mainstays of treatment.
- Biphasic defibrillators are recommended because of their increased efficacy at lower energy levels . The ACLS Guidelines recommend that when employing a biphasic defibrillator clinicians use the initial dose of energy recommended by the manufacturer (120 to 200 J). If this dose is not known, the maximal dose may be used. We suggest a first defibrillation at maximal energy for VF or pVT.

What Is an Automated External Defibrillator?

An automated external defibrillator (AED) is a lightweight, portable device that delivers an electric shock through the chest to the heart. The shock can potentially stop an irregular heart beat (arrhythmia) and allow a normal rhythm to resume following sudden cardiac arrest (SCA). SCA occurs when the heart malfunctions and stops beating unexpectedly. If not treated within minutes, it quickly leads to death.


HeartSine samaritan® PAD
SAM 450P
On/Off

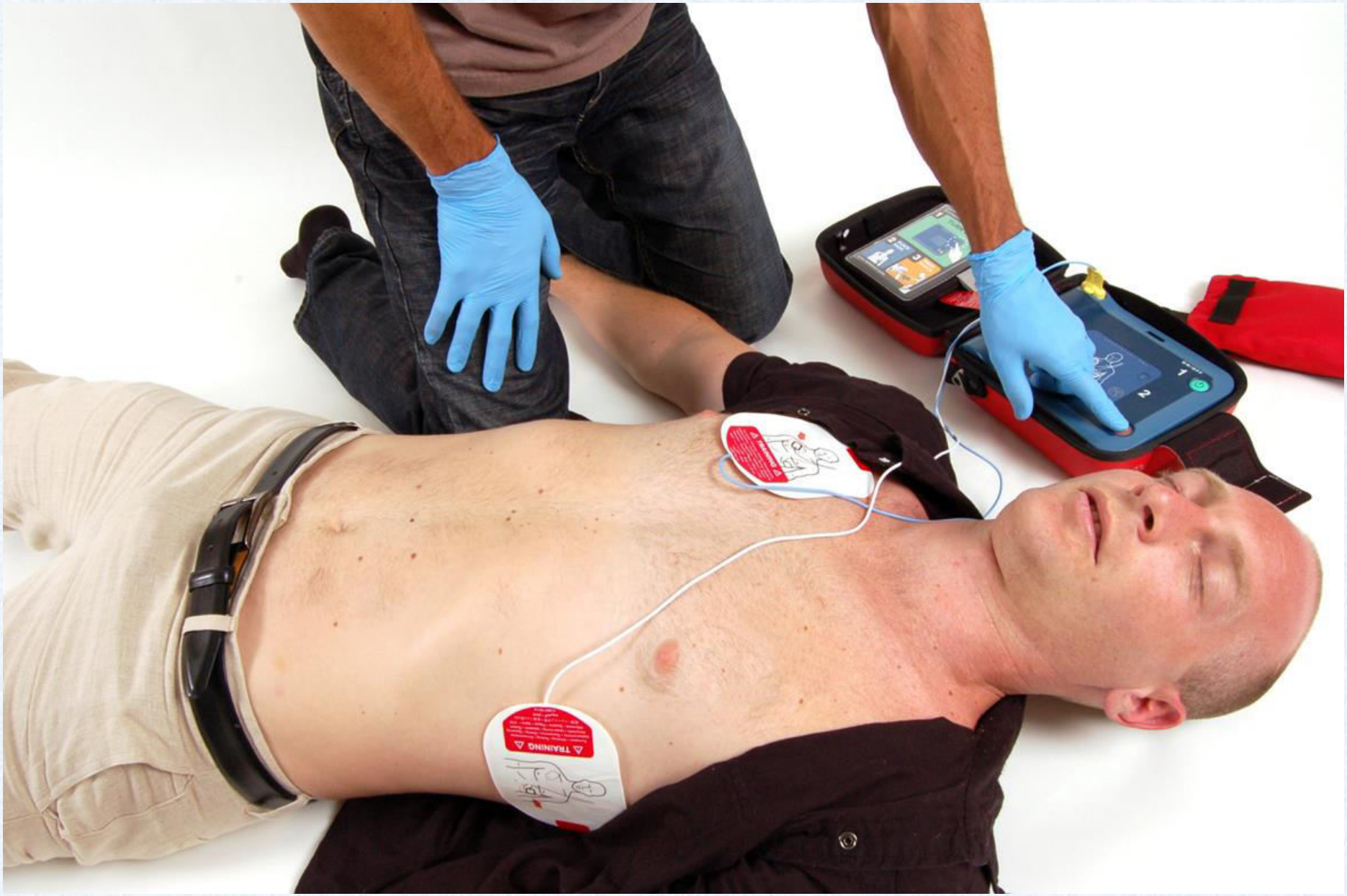

AED


LIFEPAK CR2
Defibrillator


ZOLL
AED
AED


PULL
HEART START
PHILIPS


Lifeline VIEW
Give 30 Compressions


TRAINING

- 1995 AHA recommended lay rescuer AED programs to improve survival rates from out-of-hospital SCA
- Did you know that your chance of surviving a Ventricular Fibrillation SCA is less than 5% without an AED?
- If used within 5 min, chances of survival is 49-75%

Electrode placement

- Right pad – Right Infraclavicular
- Left pad – Inf-lateral left chest, lateral to the left breast
- Position the pad at least 2 inch (5 cm) away from the implantable medical device
- Do not place pads directly on top of a transdermal medication patch
- If the victim's chest is covered with water or the victim is extremely diaphoretic, wipe the chest before attaching pads
- AEDs can be used when the victim is lying on snow or ice
- If the victim has a hairy chest, remove some hair

How to use an AED

Expose the chest

- Open shirt/blouse (rip open!) or cut clothing if necessary.
- Remove any medication patches.
- Make sure chest is clean and dry.
- CPR should be ongoing

Attach pads

- Remove pads from packet.
- Remove backing from pads, one at a time, then place them as shown on the pads.
- One pad goes on the upper right chest below collarbone.
- One pad goes on the left side chest wall.
- CPR should be ongoing.
- When the AED so advises, stop CPR.
- Make sure that nobody, including yourself, is touching the victim.

Allow AED to analyze the rhythm

- There are 4 electrical rhythms that the heart can be in when the heart stops beating, only 2 of which are shockable, **ventricular fibrillation** and **pulseless ventricular tachycardia**.
- If "Shock advised", shock victim and resume CPR.
- If "No shock advised", then resume CPR.
- Deliver the shock
- If AED prompts a shock:

  Make sure no one is touching the victim.

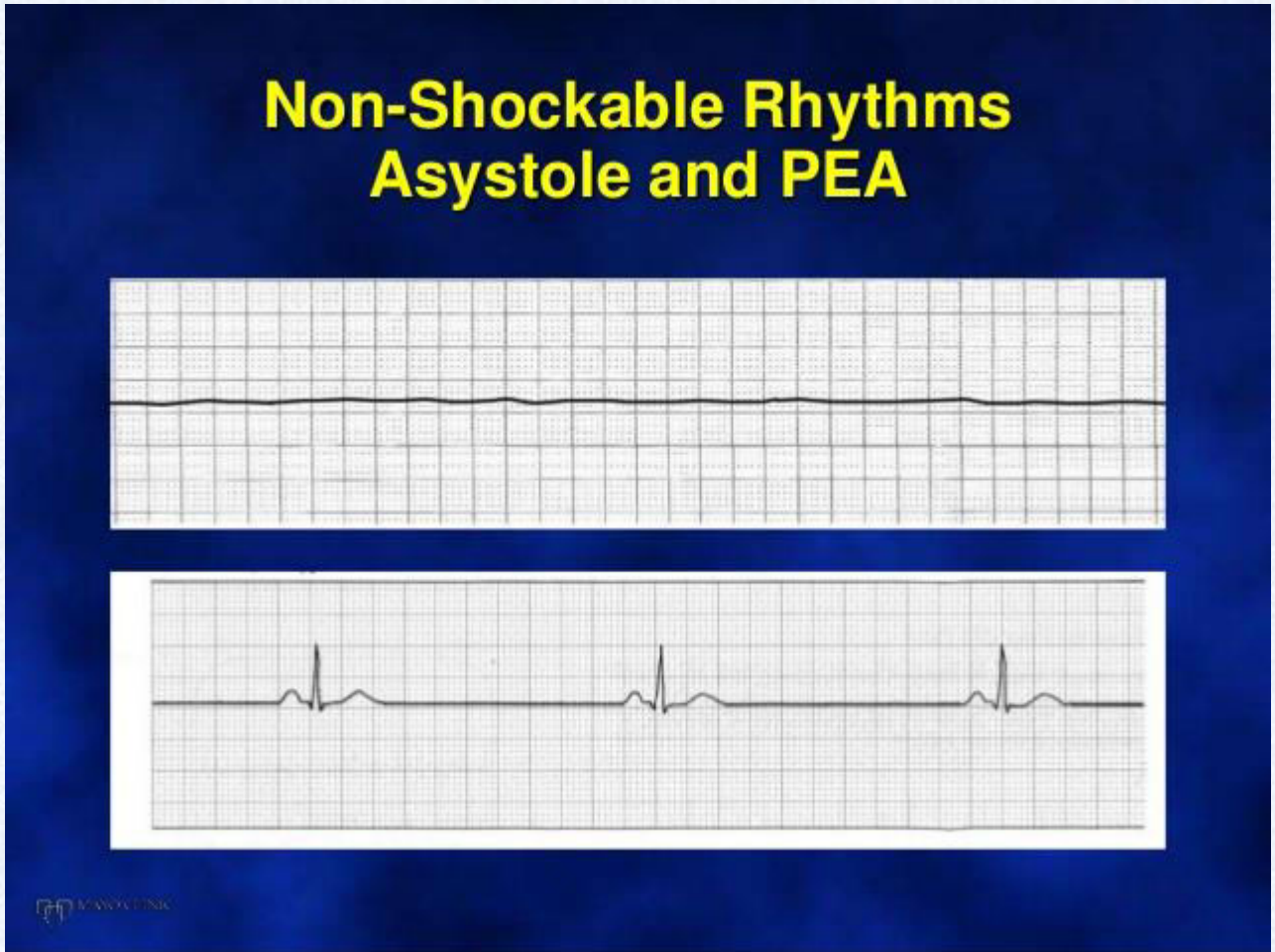
  Push the "Shock" button.
- If no shock is advised, continue CPR. Effective CPR may lead to a shockable rhythm.
- Every 2 minutes follow the AED prompts.
- Stop CPR if you see signs of life (breathing, movement).

After the shock

- After the shock is delivered, resume CPR. Do not stop CPR for more than 10 seconds.
- Do not turn off AED! It will continue to monitor the victim's heart rhythm.
- It is now safe to touch the pads and patient.
- Every 2 minutes follow the AED prompts.
- Stop CPR if you see signs of life (breathing, movement). If breathing is inadequate, assist ventilations.
- Do not remove AED pads! Even if the victim seems to have recovered.
- If necessary, continue CPR and keep pads on

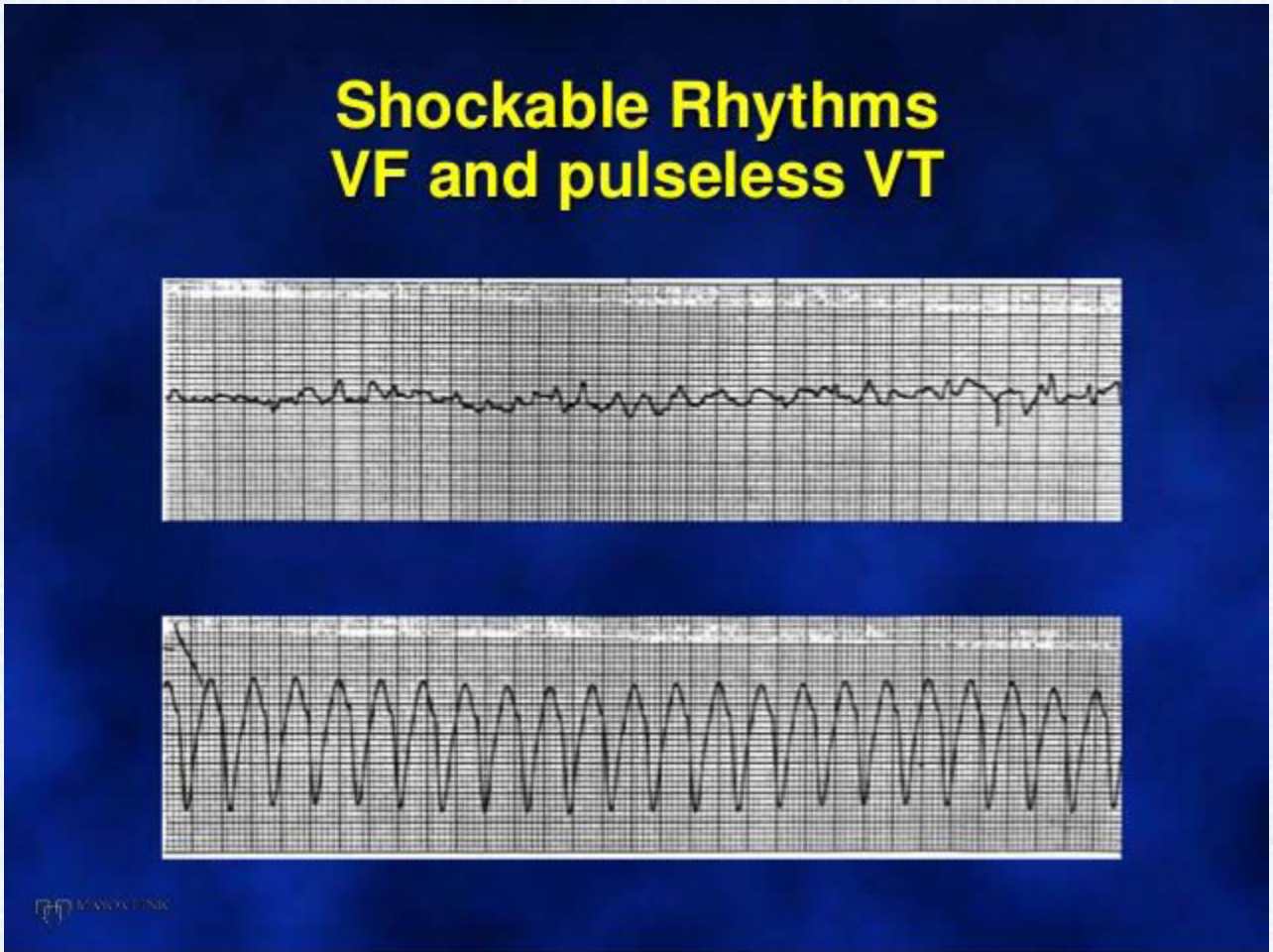
Non-Shockable Rhythms

- Asystole
- Pulseless electrical activity

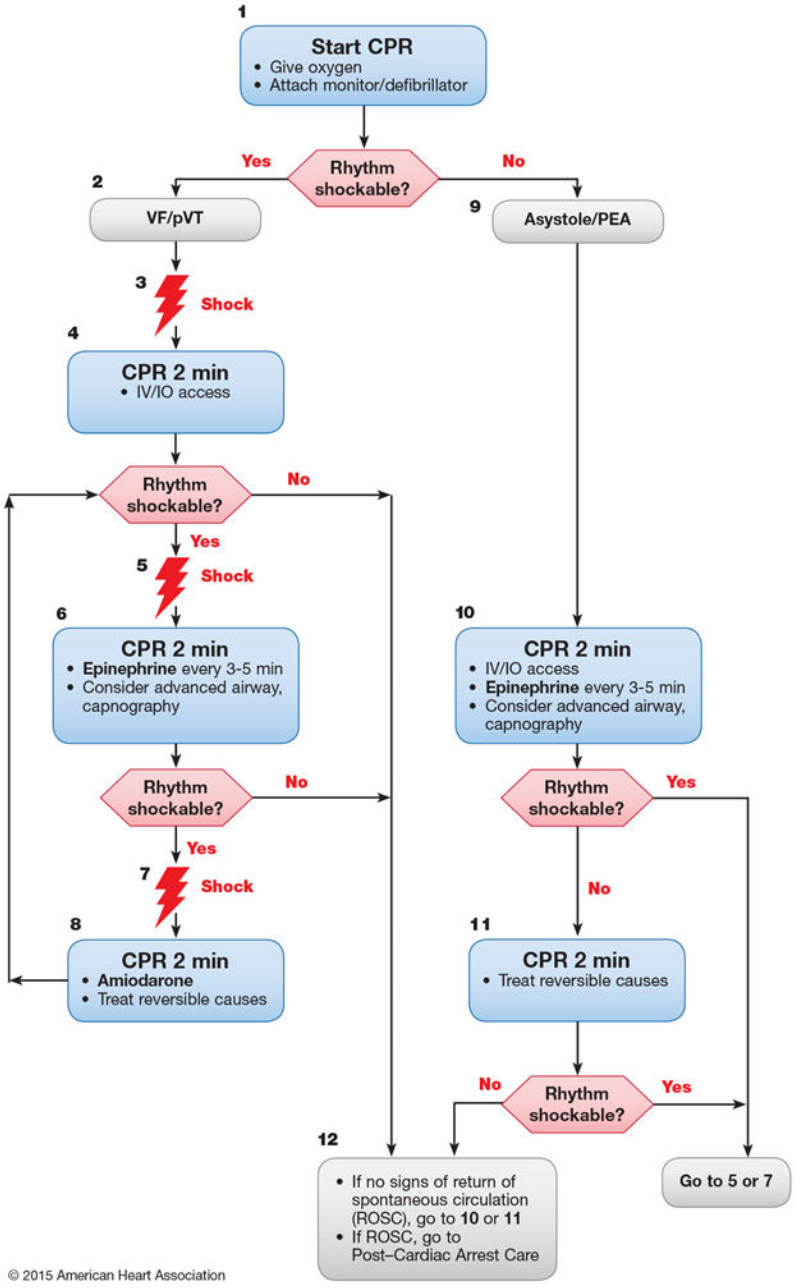


Shockable rhythms

- Ventricular fibrillation (VF)
- pulseless ventricular tachycardia (PVT)



Adult Cardiac Arrest Algorithm—2015 Update



CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If P_{ETCO_2} <10 mm Hg, attempt to improve CPR quality.
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.

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 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary


Thank You