Defibrillation and Cardioversion in CPR 2020

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Defibrillation

Defibrillation entails passing a therapeutic burst of electrical current across the chest wall through the myocardium for the purpose of terminating the chaotic electromechanical activity that is impeding the ventricles from ejecting blood into the circulation

NOTE

- Defibrillation can be used to terminate **ventricular fibrillation(VF)** **pulseless ventricular tachycardia (VT)**
- Patients with VF or pulseless VT are **unresponsive**, **pulseless**, and **apneic**

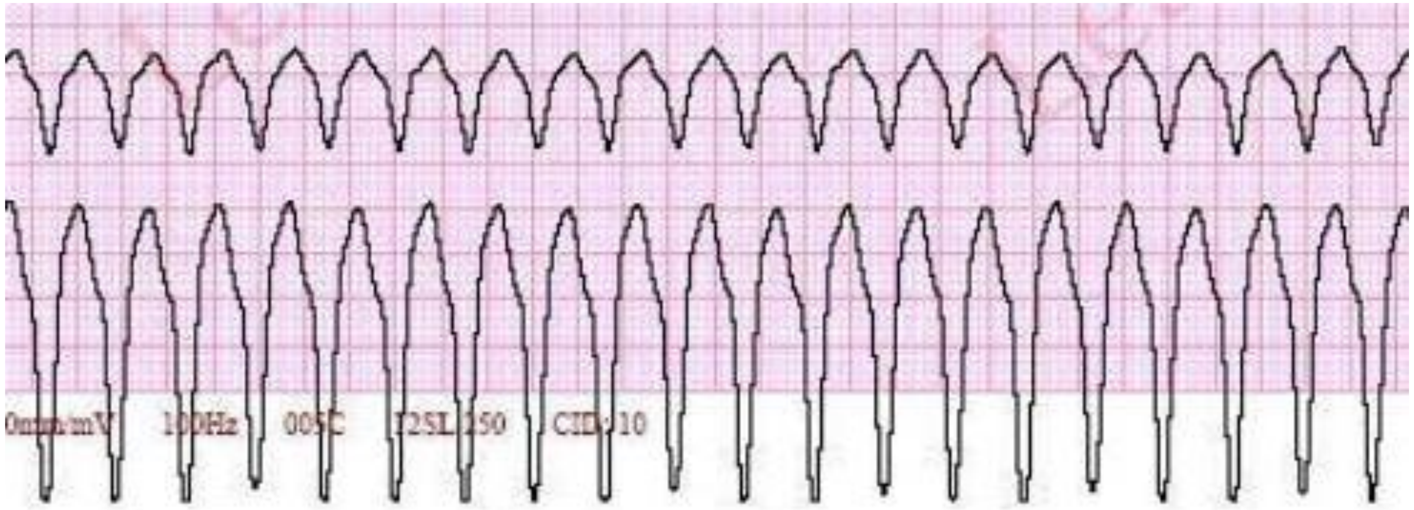
- **For every minute that the heart is in VF without treatment, the potential for the initial defibrillation to be successful and for the victim of SCA to survive decreases by 7% to 10%.**

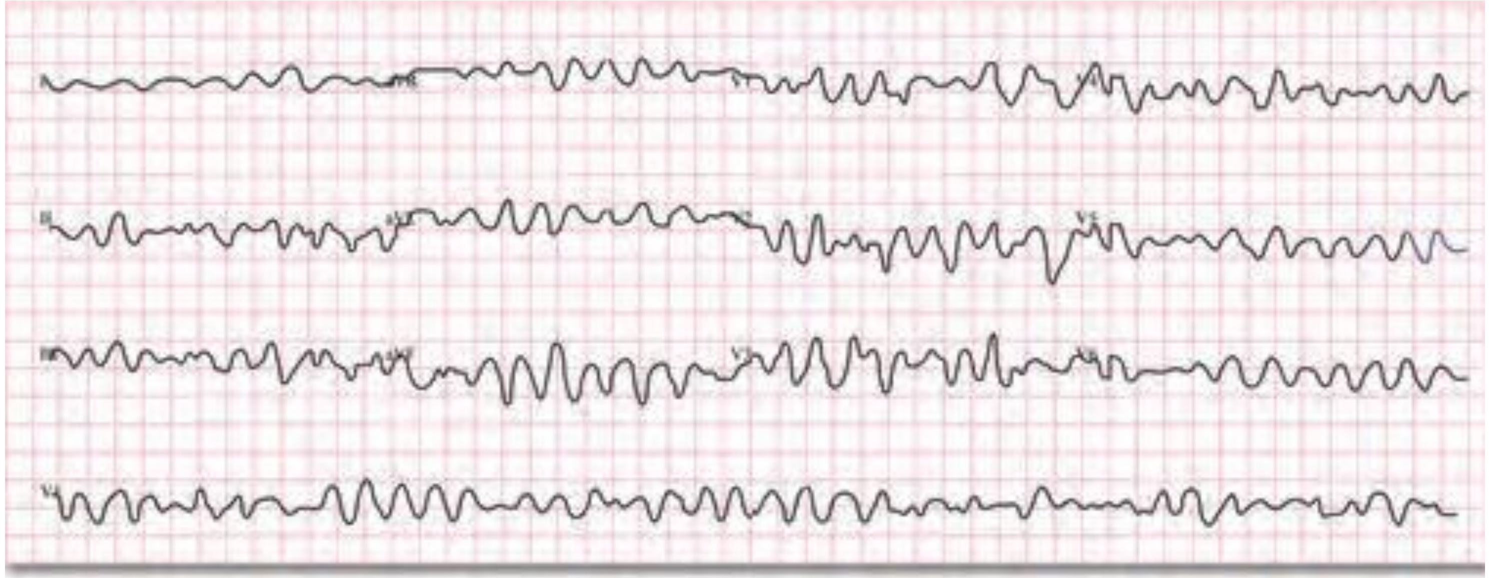
Cardioversion

- Cardioversion is performed to suppress dysrhythmias that produce a rapid pulse and cause the patient to become unstable; such dysrhythmias (include supraventricular tachycardia (SVT), atrial fibrillation (AF), atrial flutter, and unstable monomorphic VT)

- These patients *do have a pulse, albeit weak*, but can rapidly decompensate, become hypotensive, experience chest pain, or have a change in mental status that will require rapid intervention (i.e., cardioversion).
- CPR is obviously not indicated because these patients have a pulse and their peripheral tissues are being perfused.

مرور ریتم





VF can be caused by :

1. myocardial infarction
2. myocardial ischemia,
3. Undiagnosed coronary artery disease,
4. electrical injuries
5. Medications
6. chest trauma
7. Hypothermia
8. Cardiomyopathy
9. electrolyte disturbances
10. various toxidromes
11. Hypoxia
12. Congenital malformations

NOTE

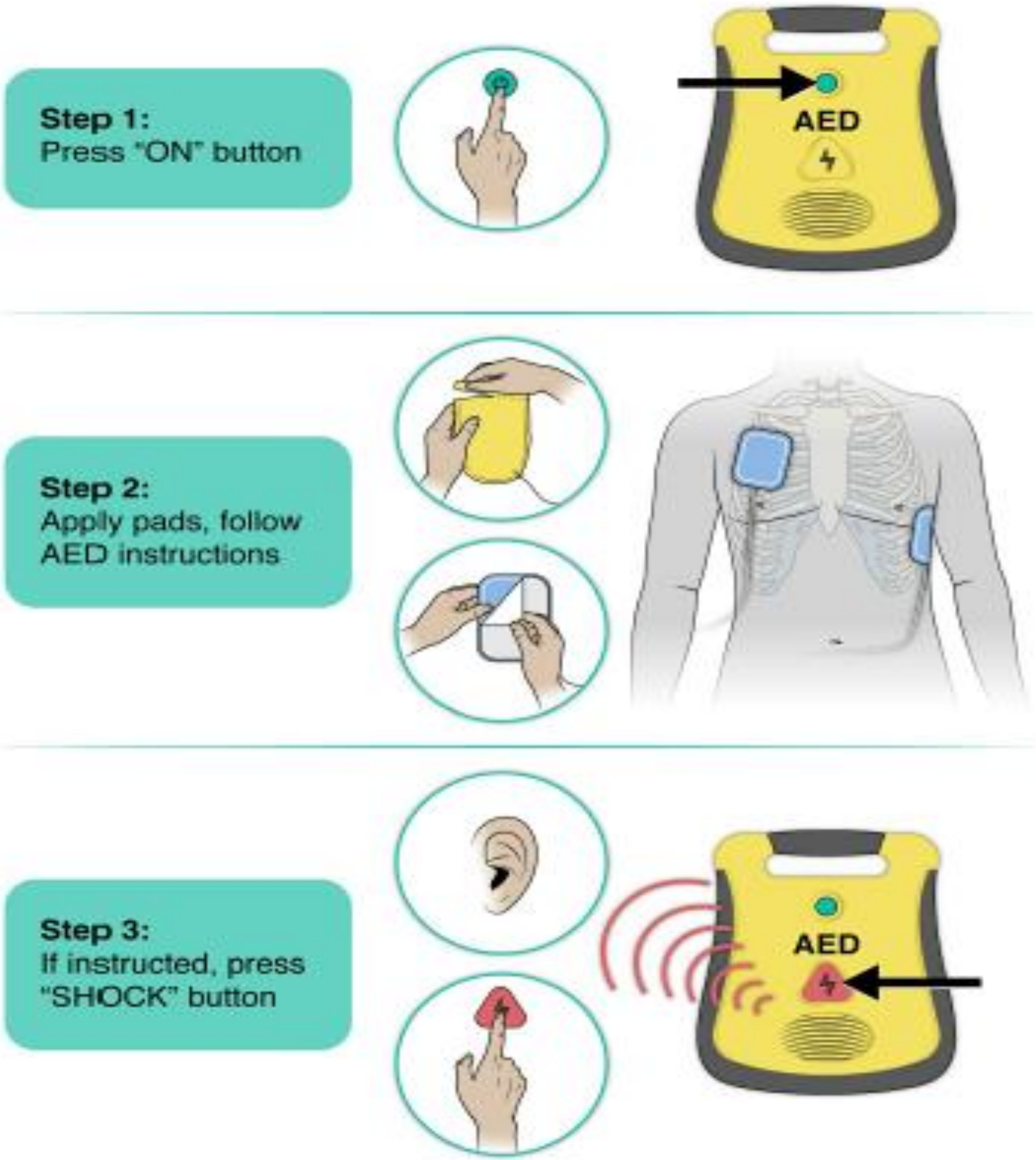
the recommendations are intended for application to an adult patient (defined as older than 8 years or weighing more than 25 kg with SCA or VF.

If the patient is a child (e.g., 1 to 8 years of age or weighing less than 25 kg), modifications in the sequence, defibrillation energy, energy attenuation equipment, and size of the defibrillation paddles are necessary

Automated External Defibrillator Application

Although AEDs are designed for lay public use,
application of these devices may also occur in the clinical setting.
Operation of the AED is guided by voice and visual prompts.
Turn the device on, apply the patient electrodes
in the appropriate positions, analyze the rhythm, and deliver
a shock if a shockable rhythm is present.
The AED will determine the rhythm and choose the energy level.

Use an automated external defibrillator equipped with a pediatric attenuator (if available) for an unresponsive, apneic, pulseless child younger than 8 years. If unavailable, use an AED with standard electrodes.


Step 1:
Press "ON" button
AED
Step 2:
Apply pads, follow
AED instructions
Step 3:
If instructed, press
"SHOCK" button
AED

Paddle and Pad Application

- Appropriate pad or paddle size : the largest surface area possible without direct electrode-to-electrode contact—will decrease transthoracic impedance and enhance defibrillation.
- Use infant paddles for children weighing less than 10 kg. However, use larger paddles if they do not contact each other.
- In children who weigh more than 10 kg (mean age, 1 year), use adult pads or paddles (8 to 10 cm in diameter)
- Never use dry paddles because the resistance to flow of current will be very large. However, refrain from using saline-soaked pads in children because they may cause arcing as a result of the proximity of the pads on the chest.

Pediatric defibrillation equipment


LIFEPAK 12


mindray

Defibrillation

- PAD program for OHCA
- CPR before defibrillation ?

Short time until the fibrillatory is ready

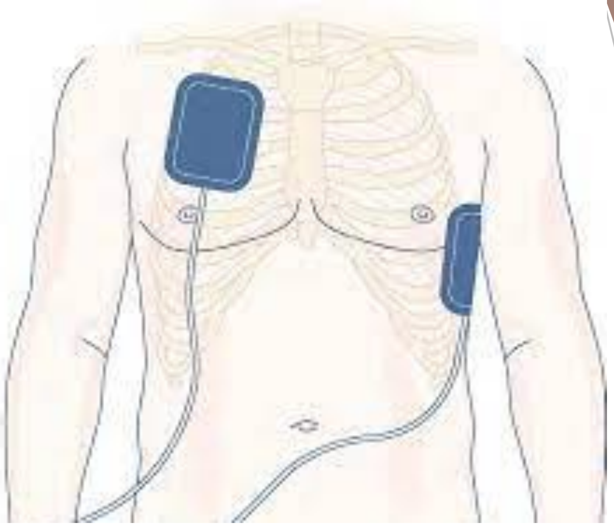
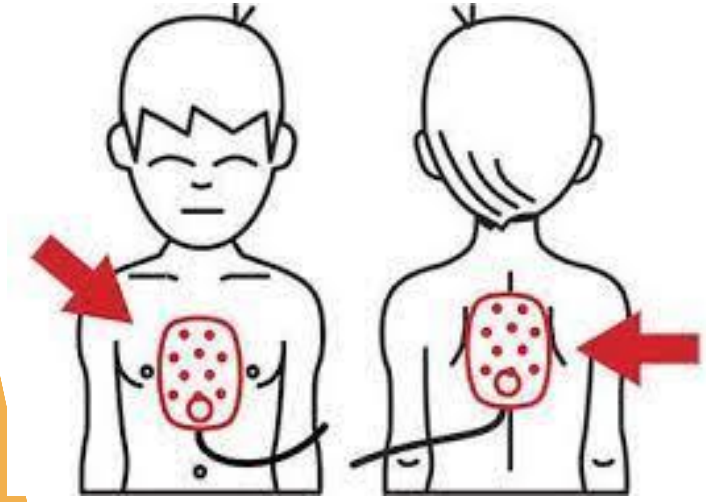
- 3 shock ?
  Old method and not recommended anymore

Defibrillation and Cardioversion

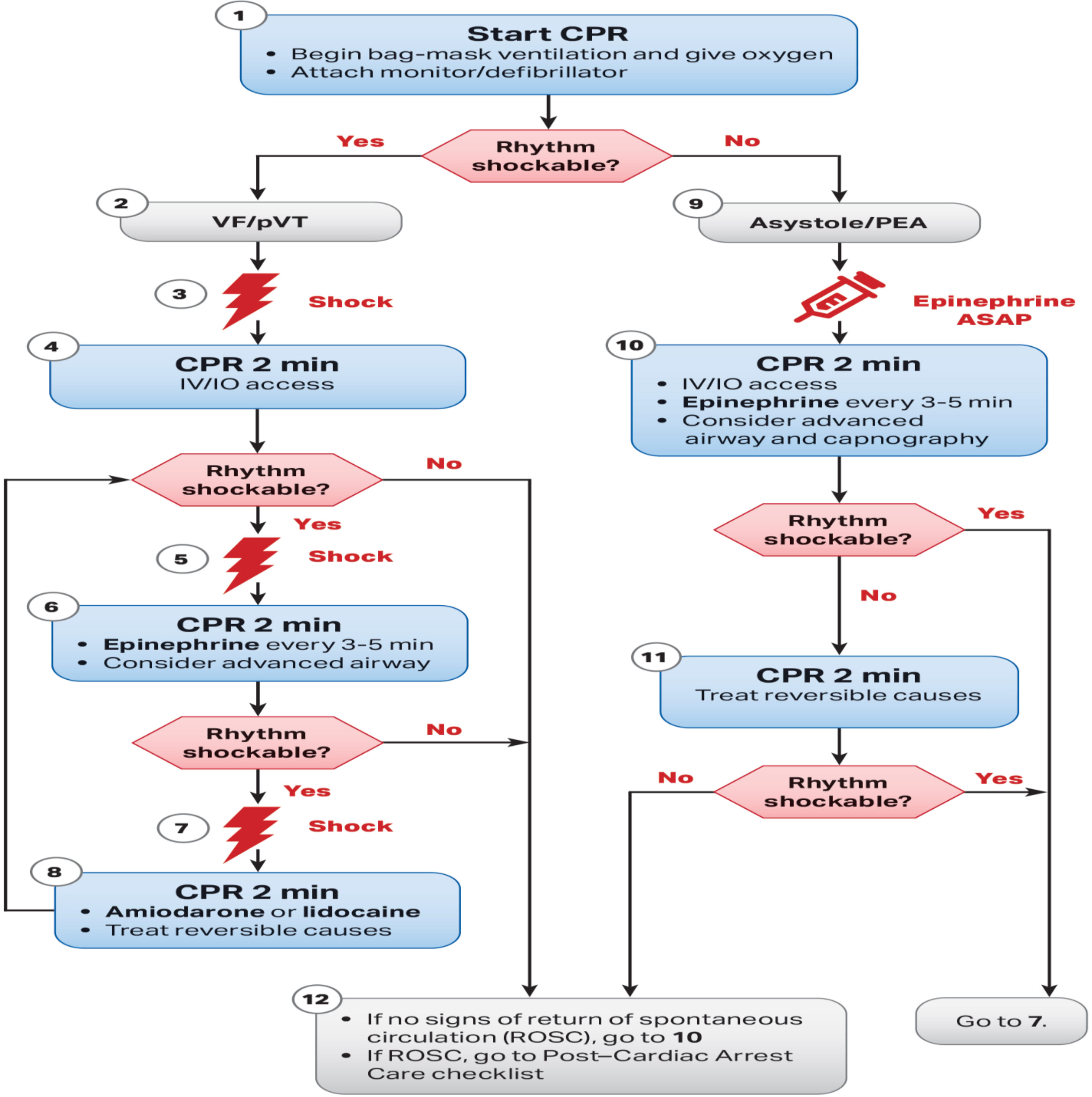
Indications	Contraindications
Defibrillation	*Defibrillation*
Ventricular fibrillation	**Presence of a pulse**
Pulseless ventricular tachycardia	**Asystole or pulseless electrical activity**
Cardioversion	**Obvious signs of death**
Ventricular tachycardia with a pulse	**Valid do-not-resuscitate order**
Supraventricular tachycardia	*Cardioversion*
Atrial fibrillation	**Arrhythmias due to digitalis toxicity**
Atrial flutter	**Sinus tachycardia**

Paddle Size and placement

- Anterior-lateral position
- Anterior-posterior
- In large breasted individuals
- Rapid removal of chest excessive hair
- Insufficient evidence to recommend a specific size for adult but greater than 8 cm is reasonable


Pediatric Cardiac Arrest Algorithm.



Adult defibrillation

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

Shock Energy in Pediatrics

- First shock 2J/Kg
- Second shock 4J/Kg
- Subsequent shocks >4J/Kg , maximum10 J/Kg or adult dose

Tintinalli 2020

TABLE 109-7 Energy Requirements for Defibrillation and Cardioversion

Rhythm	Type of Shock	Initial Dose	Subsequent Doses
Ventricular fibrillation or pulseless ventricular tachycardia	Defibrillation (unsynchronized)	2 J/kg	4 J/kg to maximum of 10 J/kg or adult dose
Unstable supraventricular tachycardia or ventricular tachycardia with pulse but poor perfusion	Synchronized cardioversion	0.5–1 J/kg	2 J/kg

Anticipatory Defibrillator Charging

- *Treatment Recommendation*

There was no treatment recommendation on timing of defibrillator charging previously, and in the absence of sufficient evidence, none was added

Double Sequential Defibrillation

- some case reports have shown good outcomes
- AHA2020 recommended against its routine use.
- Repositioning the pads may be as effective as double sequential defibrillation while avoiding the risks of harm from increased energy

Some conditions need to be considered in refractory VT

Assure oxygen is NOT flowing across the patient's chest when delivering shock

Do NOT stop chest compressions for more than 10 seconds when assessing the rhythm

Stay clear of patient when delivering shock

Assess pulse after the first two minutes of CPR

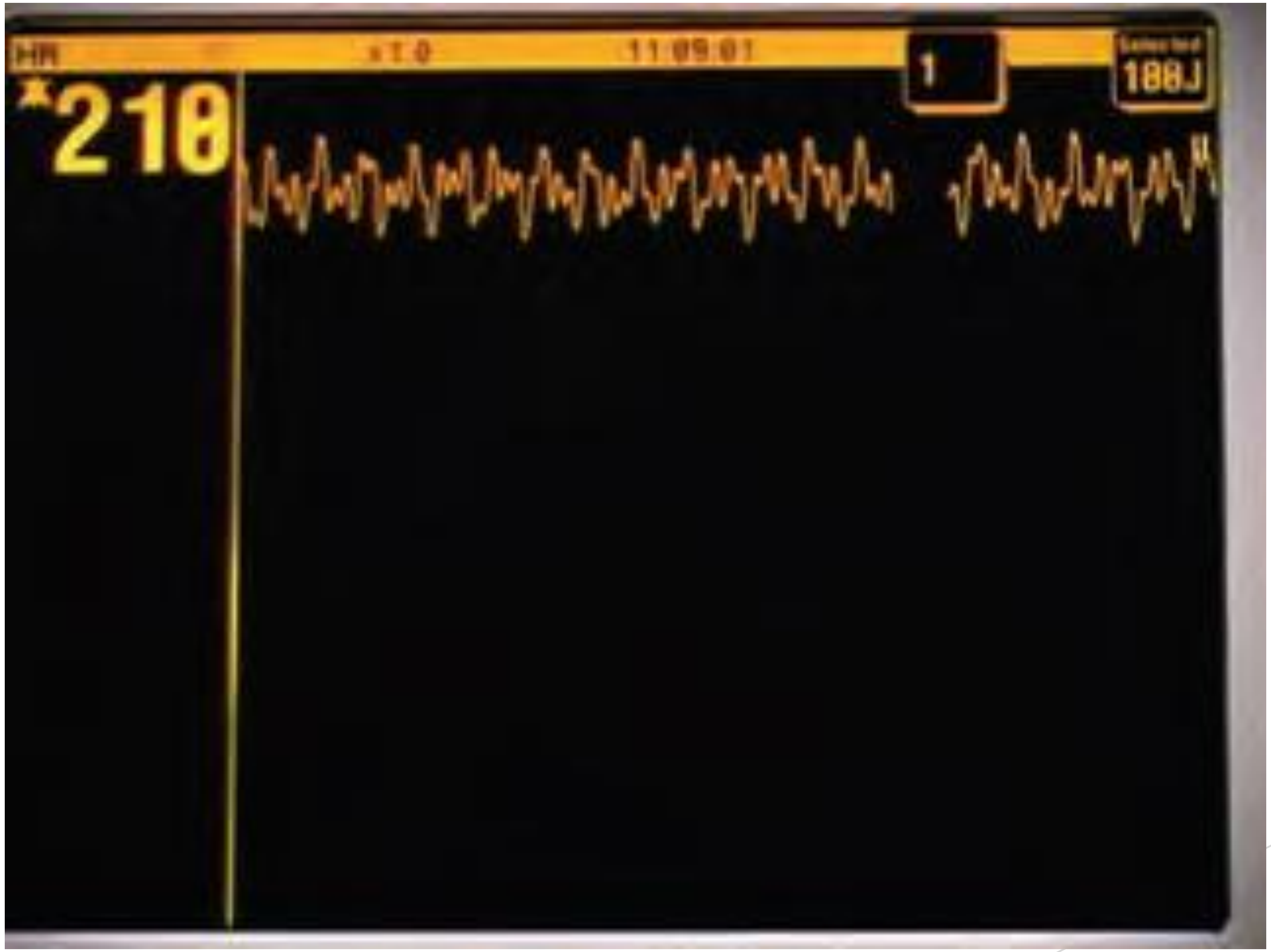
If the end tidal CO_2 is less than 10 mmHg during CPR, consider adding a vasopressor and improve chest compressions

Assess patient responsiveness, breathing, and circulation. Check for a pulse for <10 seconds. Call for help

If there is no pulse, begin CPR.
Avoid interruptions in CPR, PUSH HARD, and PUSH FAST.

Apply the electrodes to the patient's chest. Place the sternal electrode **below the clavicle, to the right of the sternum**. Place the apical electrode in **the midaxillary line at the fifth** intercostal space.

Check the rhythm on the monitor




HR
93
1
200J
1
ON
ADVISORY
2
ENERGY SELECT
ANALYZE
3
CHARGE
SHOCK
LEAD
SIZE
SYNC
NIBP
PACER
ALARMS
RATE
OPTIONS
CURRENT
EVENT
PAUSE
Manual Mode
Select Biphasic Energy
200J


95
1
288J
Manual Mode
3
Charging to 200J
152J
Push Selector knob to disarm
1
ON
2
ENERGY SELECT
ADVISORY
3
ANALYZE
LEAD
SIZE
SYNC
NIBP
PACER
ALARMS
RATE
OPTIONS
CURRENT
EVENT
PAUSE


Clear!!!

Resume CPR immediately and continue for 5 cycles/2 minutes

After 2 minutes of CPR, reassess the patient and the rhythm

Double Sequential Defibrillation

- The ALS Task Force discussed whether any potential benefit might arise from increased shock energy, the fact that 2 shocks were delivered sequentially, different pad placement and vector for the second shock,
- ***The study found differences** in VF termination (DSD 76%, vector change 82%, and standard placement 66%) and ROSC (DSD 40%, vector change 39%, and standard defibrillation 25%).*
- This pilot RCT was **not designed to formally test differences** between the groups, and no survival data were reported..
- *Implementation of DSD requires <u>training of staff</u> and <u>availability of defibrillators</u>. <u>monitor the intervention to determine effectiveness</u>, and to <u>track adverse events</u>*

AUTOMATED EXTERNAL DEFIBRILLATOR VERSUS MANUAL DEFIBRILLATOR

- ***Treatment Recommendation***

This treatment recommendation (below) is unchanged from 2010

- **No significant survival differences** have been demonstrated between defibrillation in semiautomatic and manual modes during out-of-hospital or in-hospital resuscitation;
- however, the **semiautomatic mode is preferred** because it is easier to use and may deliver fewer inappropriate shocks

Waveform Analysis for Predicting Successful Defibrillation

- ***Treatment Recommendation***
- This treatment recommendation (below) is unchanged from 2010.
- There is insufficient evidence to support routine use

of VF waveform analysis to guide defibrillation management in adult cardiac arrest in- or out-of-hospital