

ADVANCED CARDIOVASCULAR LIFE SUPPORT



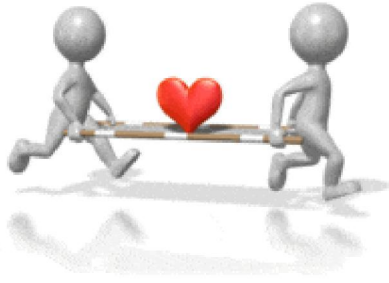
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MAIN SUBJECTS

- ADULT CARDIAC ARREST ALGORITHM
- ADULT POST CARDIAC ARREST CARE ALGORITHM
- ADULT TACHYCARDIA ALGORITHM
- ADULT BRADYCARDIA ALGORITHM





CARDIAC ARREST



- Cardiac arrsest is a sudden loss of blood flow resulting from the failure of the heart pump effectively.
- Signs include **loss of consciousness** and **abnormal or absent breathing**.
- Petient becomes **UNSTABLE**

HOW TO IDENTIFY UNSTABLE PATIENT? (HASIA)



- **H**YPOTENSION
- **A**LTERED MENTAL STATUS
- **S**IGNS OF SHOCK
- **I**SCHEMIC CHEST DISCOMFORT
- **A**CUTE HEART FAILURE

If any of the above conditions are there, then it is an unstable patient and think for **5H** and **5T** and start **CPR**.

A

- **Maintain airway in unconscious patient**
- **Consider advanced airway**
- **Monitor advanced airway if placed with quantitative waveform capnography**



B

- **Give 100% oxygen**
- **Assess effective ventilation with quantitative waveform capnography**
- **Do NOT over-ventilate**



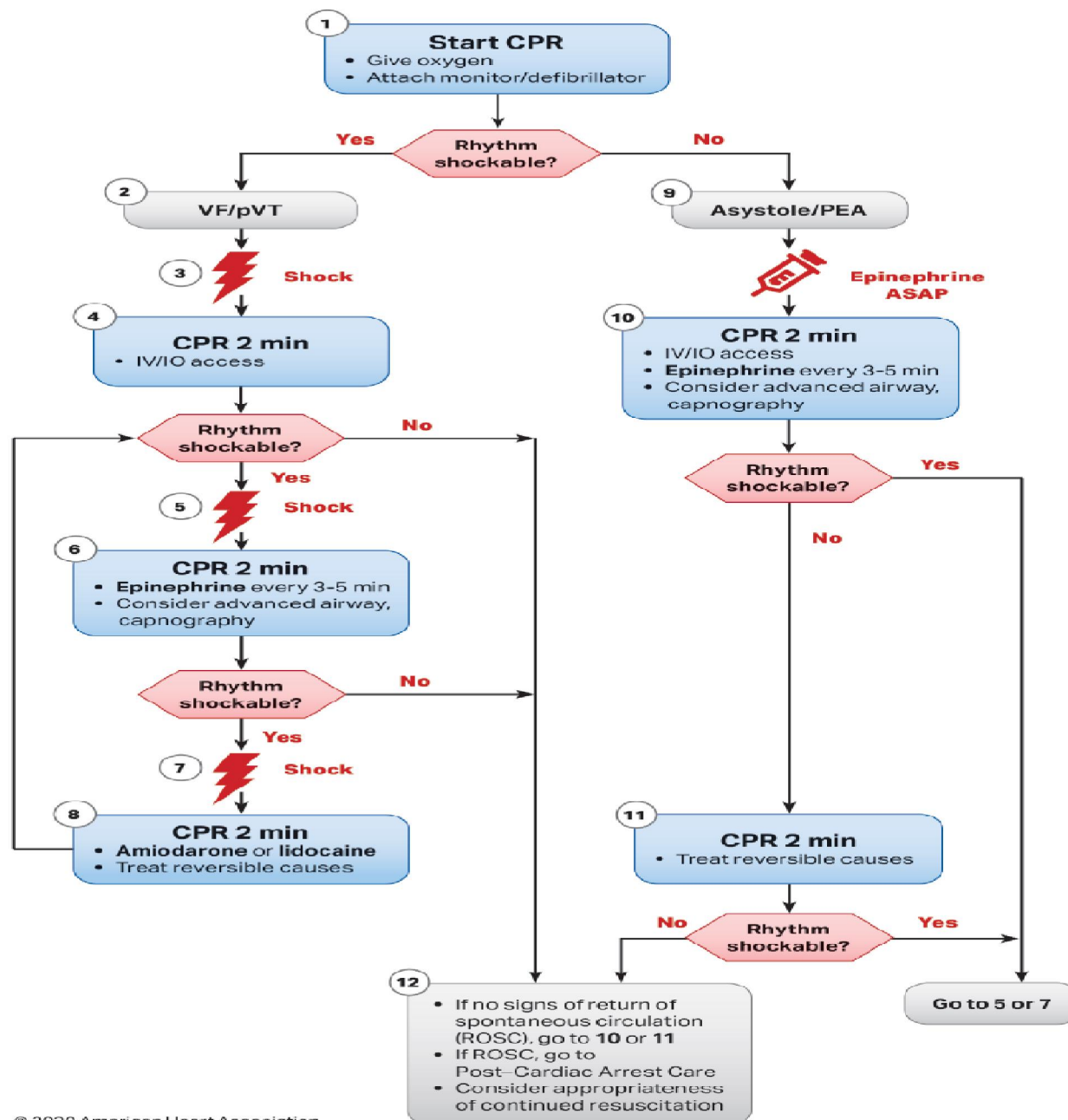
C

- **Evaluate rhythm and pulse**
- **Defibrillation/cardioversion**
- **Obtain IV/IO access**
- **Give rhythm-specific medications**
- **Give IV/IO fluids if needed**



D

- **Identify and treat reversible causes**
- **Cardiac rhythm and patient history are the keys to differential diagnosis**
- **Assess when to shock versus medicate**

Figure 4. Adult Cardiac Arrest Algorithm.

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.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
 - If PETCO₂ is low or decreasing, reassess 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.
- **Lidocaine IV/IO dose:** First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

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 PETCO₂ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

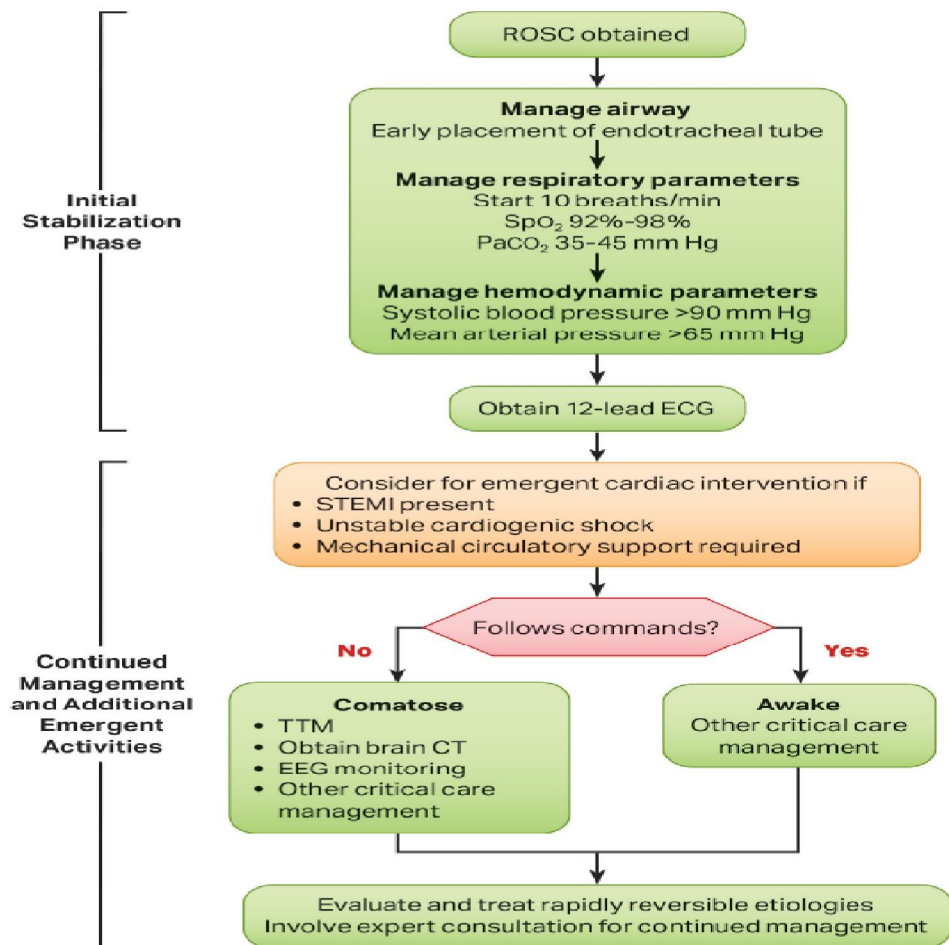
Reversible Causes

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

REVERSIBLE CAUSES OF CARDIAC ARREST

H's of ACLS			T's of ACLS		
Causes	Signs	Treatment	Causes	Signs	Treatment
Hypovolemia	-Rapid heart rate -Narrow QRS -Blood loss	-Obtain IO/IV Access -Administer fluid/blood -Use fluid challenge	Tamponade (Cardiac)	-Rapid heart rate -Narrow QRS -JVD -No pulse -Muffled heart sounds	-Pericardiocentesis -Thoracotomy
Hypoxia/ Hypoxemia	-Slow heart rate -Cyanosis	-Ensure airway is open -Ventilate -Ensure oxygen supply is adequate	Toxins	-Prolonged QT interval	-Based on overdose agent -Supportive care
Hydrogen Ion Excess (Acidosis)	-Low amplitude QRS complex	-Atrial blood gas -Provide adequate ventilations -Sodium bicarbonate (metabolic)	Tension Pneumothorax	-Slow heart rate -Narrow QRS -Unequal breathing -JVD -Tracheal deviation	-Needle decompression -Insertion of a chest tube
Hypokalemia/ Hyperkalemia	-Flattened T waves & a U wave (Hypokalemia) -Peaked T waves & a widened QRS (Hyperkalemia)	-Ventilate (respiratory) -Sodium bicarbonate (metabolic)	Thrombosis (Pulmonary)	-Rapid heart rate -Narrow QRS -Shortness of breath -Decreased oxygen -Chest pain	-Embolectomy -Fibrinolytic therapy -Anticoagulant therapy
Hypothermia	-Shivering -Previous exposure to cold temperatures	-Active warming measures -Temperature should be above 30°C	Thrombosis (Coronary)	-Abnormal ECG	-Angioplasty -Stent placement -Coronary bypass surgery

Figure 7. Adult Post-Cardiac Arrest Care Algorithm.



Initial Stabilization Phase
<p>Resuscitation is ongoing during the post-ROSC phase, and many of these activities can occur concurrently. However, if prioritization is necessary, follow these steps:</p> <ul style="list-style-type: none"> • Airway management: Waveform capnography or capnometry to confirm and monitor endotracheal tube placement • Manage respiratory parameters: Titrate FIO₂ for SpO₂ 92%-98%; start at 10 breaths/min; titrate to PaCO₂ of 35-45 mm Hg • Manage hemodynamic parameters: Administer crystalloid and/or vasopressor or inotrope for goal systolic blood pressure >90 mm Hg or mean arterial pressure >65 mm Hg
Continued Management and Additional Emergent Activities
<p>These evaluations should be done concurrently so that decisions on targeted temperature management (TTM) receive high priority as cardiac interventions.</p> <ul style="list-style-type: none"> • Emergent cardiac intervention: Early evaluation of 12-lead electrocardiogram (ECG); consider hemodynamics for decision on cardiac intervention • TTM: If patient is not following commands, start TTM as soon as possible; begin at 32-36°C for 24 hours by using a cooling device with feedback loop • Other critical care management <ul style="list-style-type: none"> – Continuously monitor core temperature (esophageal, rectal, bladder) – Maintain normoxia, normocapnia, euglycemia – Provide continuous or intermittent electroencephalogram (EEG) monitoring – Provide lung-protective ventilation
H's and T's
<p>Hypovolemia Hypoxia Hydrogen ion (acidosis) Hypokalemia/hyperkalemia Hypothermia Tension pneumothorax Tamponade, cardiac Toxins Thrombosis, pulmonary Thrombosis, coronary</p>



ADULT TACHYCARDIA WITH A PULS ALGORHYTHM



Adult Tachycardia With a Pulse Algorithm

1 Assess appropriateness for clinical condition. Heart rate typically $\geq 150/\text{min}$ if tachyarrhythmia.

2 **Identify and treat underlying cause**

- Maintain patent airway; assist breathing as necessary
- Oxygen (if hypoxemic)
- Cardiac monitor to identify rhythm; monitor blood pressure and oximetry
- IV access
- 12-lead ECG, if available

3 **Persistent tachyarrhythmia causing:**

- Hypotension?
- Acutely altered mental status?
- Signs of shock?
- Ischemic chest discomfort?
- Acute heart failure?

Yes

4 **Synchronized cardioversion**

- Consider sedation
- If regular narrow complex, consider adenosine

No

6 **Wide QRS? ≥ 0.12 second**

Yes

7 **Consider**

- Adenosine only if regular and monomorphic
- Antiarrhythmic infusion
- Expert consultation

No

8

- Vagal maneuvers (if regular)
- Adenosine (if regular)
- β -Blocker or calcium channel blocker
- Consider expert consultation

Doses/Details

Synchronized cardioversion:
Refer to your specific device's recommended energy level to maximize first shock success.

Adenosine IV dose:
First dose: 6 mg rapid IV push; follow with NS flush.
Second dose: 12 mg if required.

Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

Procainamide IV dose:
20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases $>50\%$, or maximum dose 17 mg/kg given. Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

Amiodarone IV dose:
First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

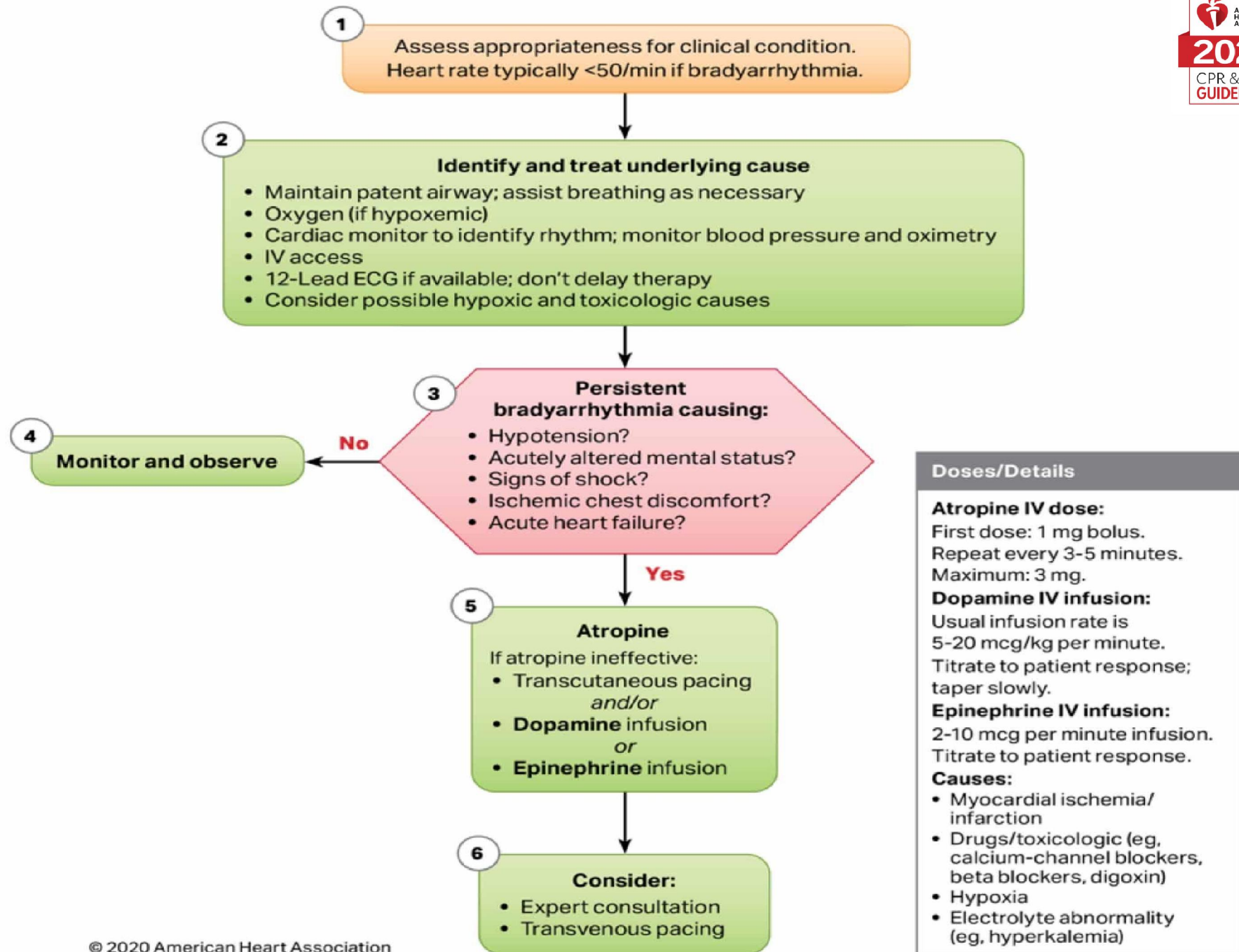
Sotalol IV dose:
100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.

5 **If refractory, consider**

- Underlying cause
- Need to increase energy level for next cardioversion
- Addition of antiarrhythmic drug
- Expert consultation

ADULT BRADYCARDIA WITH A PULS ALGORHYTHM





Positions for 6-Person High-Performance Teams*

Resuscitation Triangle Roles



Compressor

- Assesses the patient
- Does 5 cycles of chest compressions
- Alternates with AED/Monitor/Defibrillator every 5 cycles or 2 minutes (or earlier if signs of fatigue set in)



AED/Monitor/Defibrillator

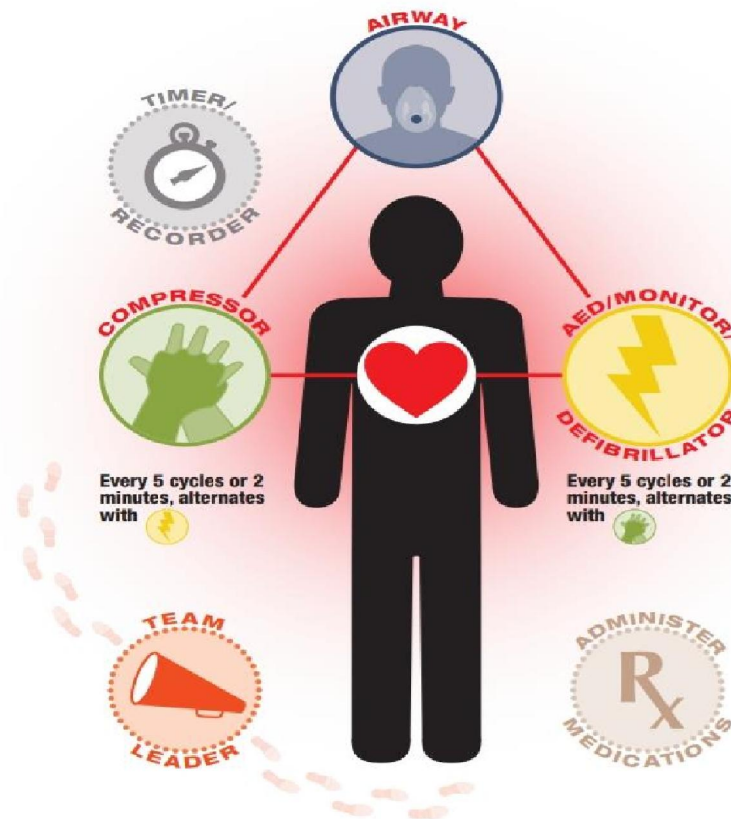
- Brings and operates the AED/monitor/defibrillator
- Alternates with Compressor every 5 cycles or 2 minutes (or earlier if signs of fatigue set in), ideally during rhythm analysis
- If a monitor is present, places it in a position where it can be seen by the Team Leader (and most of the team)



Airway

- Opens and maintains the airway
- Provides ventilation

The team owns the code. No team member leaves the triangle except to protect his or her safety.



Leadership Roles



Team Leader

- **Every resuscitation team must have a defined leader**
- Assigns roles to team members
- Makes treatment decisions
- Provides feedback to the rest of the team as needed
- Assumes responsibility for roles not assigned



Administer Medications

- An ALS provider role
- Administers medications



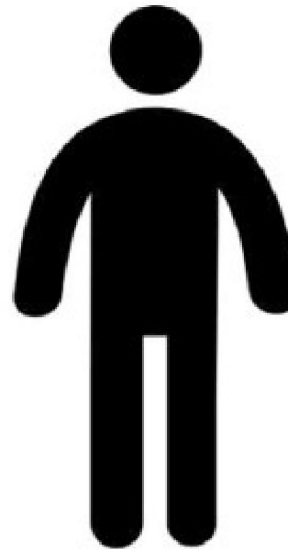
Timer/Recorder

- Records the time of interventions and medications (and announces when these are next due)
- Records the frequency and duration of interruptions in compressions
- Communicates these to the Team Leader (and the rest of the team)

*This is a suggested team formation. Roles may be adapted to local protocol.



Position 1: Airway management



Position 3: Chest compressions and defibrillation



Position 2: Chest compressions and IV access



Position 4: "Hands off" team leader

Fig. 1 – “Circle of life” rescuer positions.

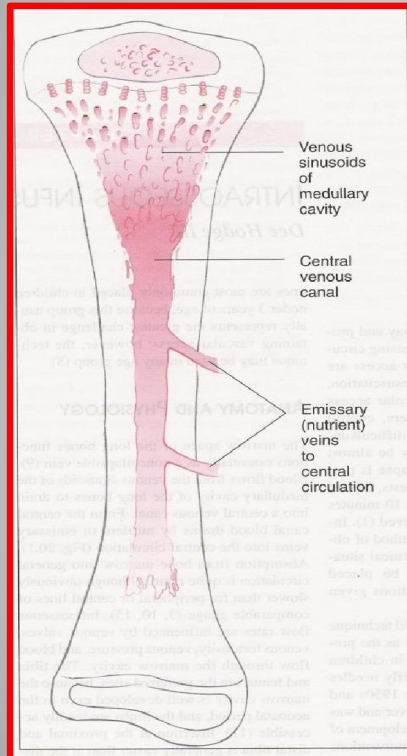
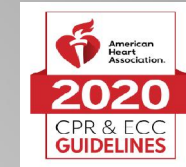


IV Access Preferred Over IO

2020 (New): It is reasonable for providers to first attempt establishing IV access for drug administration in cardiac arrest.

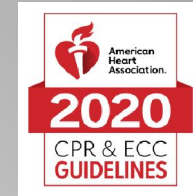
2020 (Updated): IO access may be considered if attempts at IV access are unsuccessful or not feasible.

INTRAOSSEROUS ROUTE



- Drugs and fluids can be delivered safely and effectively if IV access is not available
- Important points about IO:
 - ❖ Can be established in all age groups
 - ❖ Often can be achieved in 30 to 60 seconds
 - ❖ IO access is preferred over the ET route
 - ❖ Any drug or fluid administered IV can be given IO
 - ❖ No needs interruption of CPR

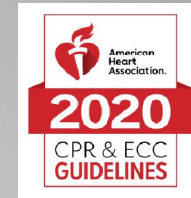
ENDOTRACHEAL ROUTE



- IV and IO are preferred over the ET route
- The typical dose of the drugs via the Et route is 2 to 2/5 times the IV route
- **AMIODARONE** and **SODIUM BICARBONATE** are not allowed.
- Dilute the drugs in 5 to 10 ml of water or N/S , then inject into the trachea and several hyperventilation.

ET MEDICATIONS

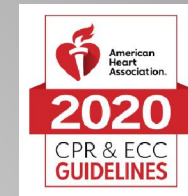
NAVEL



N ALOXONE
A TROPINE
V ASOPRESSIN
E PINEPHRINE
L IDOCAINE

Dose: 2-2.5 x normal

TYPES OF SHOCK

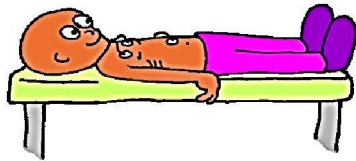


- Asynchronized (Defibrillation)
 - ✓ PulslessVT
 - ✓ VF

- Synchronized (Cardioversion)
 - ✓ PAT
 - ✓ Atrial Flutter
 - ✓ Atrial Fibrillation
 - ✓ V.Tach

CARDIOVERSION VS DEFIBRILATION

CARDIOVERSION



- Elective Procedure
- Client Awake & Frequently Sedated
- Synchronized With "QRS"
- 50 - 200 Joules
- Consent Form
- EKG Monitor



Consent Form
x *[signature]*
Signed

If it's V-Fib
you DeFibr!
...Call
a code!

Synch Off



- Emergency
- V-Fib / V-Tach
- No Cardiac Output
- Begin With 200 Joules
Up to 360
- Client Unconscious
- EKG Monitor

DEFIBRILLATION

DRUGS USED FOR CPR

Drug	IV Dosage	Indications
Epinephrine	Low dosage (0.01 mg/kg); High dosage (0.1 mg/kg) after prolonged CPR; 10 times the dosage may be required when given IT	Administered every 3-5 minutes early in CPR (every other cycle) for asystole, ventricular fibrillation, PEA ^b
Vasopressin	0.4-0.9 U/kg	As an alternative to epinephrine every 3-5 minutes (every second BLS cycle) for asystole, bradycardia, PEA
Atropine	0.04 mg/kg; 0.1 mL/5 lb (0.5 mg/mL solution)	Sinus bradycardia, asystole, or PEA associated with high vagal tone
Lidocaine	2-4 mg/kg	Pulseless ventricular tachycardia, ventricular fibrillation resistant to defibrillation

DRUGS USED FOR CPR

Drug	IV Dosage	Indications
Sodium bicarbonate	1 mEq/kg (1 mEq/mL solution)	Severe metabolic acidemia (pH < 7.0) associated with prolonged (>10–15 minutes) CPR efforts (must be adequately ventilated to be effective), hyperkalemia
Calcium gluconate	1 mL/5–10 kg (2% solution without epinephrine)	Routine use not recommended; treat cases with documented hypocalcemia or severe hyperkalemia
Amiodarone	5 mg/kg	Refractory ventricular fibrillation or pulseless ventricular tachycardia
Magnesium sulfate	30 mg/kg	Hypomagnesemia, torsades des pointes
Defibrillation	4–6 J/kg external monophasic; 2–4 J/kg external biphasic; 0.5–1 J/kg internal monophasic; 0.2–0.4 J/kg internal biphasic	Single shock for ventricular fibrillation or pulseless ventricular tachycardia; resume CPR efforts immediately after for one cycle (2 minutes) and reassess ECG, after which dosage escalation by 50% may occur (maximum dosage of 10 joules/kg)

REVERSAL AGENTS

Drug	IV Dosage	Indications
Naloxone	0.02–0.04 mg/kg	To reverse opioids
Flumazenil	0.01–0.02 mg/kg	To reverse benzodiazepines
Atipamezole	0.05 mg/kg (or same volume as dexmedetomidine)	To reverse dexmedetomidine

