ADVANCED CARDIAC LIFE SUPPORT

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- **ACLS is a series of evidence based → simple enough → memory and recall under stress moments**
- **AHA protocols are considered to be the gold standard and review every 5 yrs**

Chain of survival :

- **Immediate *Recognition* , emergency response *Activation***
- **Early CPR emphasis → chest compression**
- **Rapid *Defibrillation***
- ***Effective* ACLS**

- ***Witnessed***
  - **if alone**

Activate EMS

Then CPR

- **if 2 rescuers**

Start CPR

Second one activate EMS

- ***Unwitnessed***

Start CPR for 2 min

Activate EMS

Excellent CPR (high quality) :

○ **excellent *chest compression* :**

Nonstop (less 10 s)

proper timing (100 – 120 /min)

force (5- 6 cm depth)

Avoid excessive ventilation

Complete chest recoil

cycling

Children /infant → at leat 1/3 AP diameter of chest

Adult: 2 hands on the lower half of sternum

Children :1 or 2 hands on the lower half of sternum

Infant :2 fingers or 2 thumbs

Chest compression

adult : 30 : 2

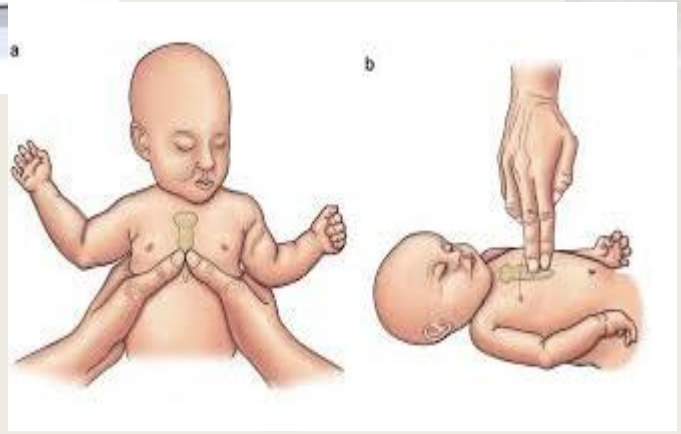
children or infant :

1 rescuer : 30 : 2

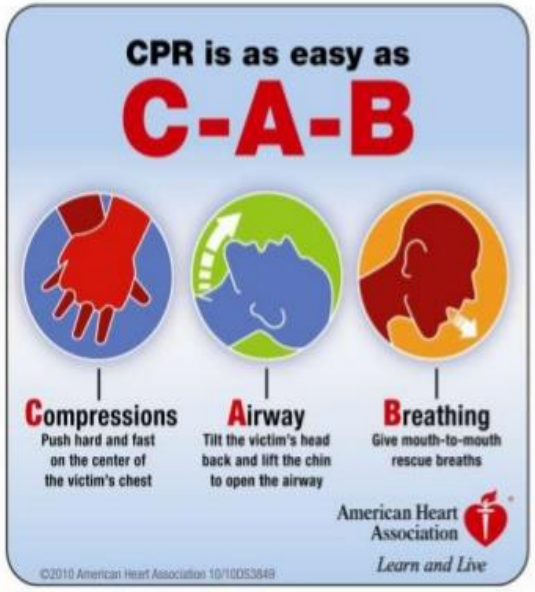
≥ 2 rescuer : 15 : 2

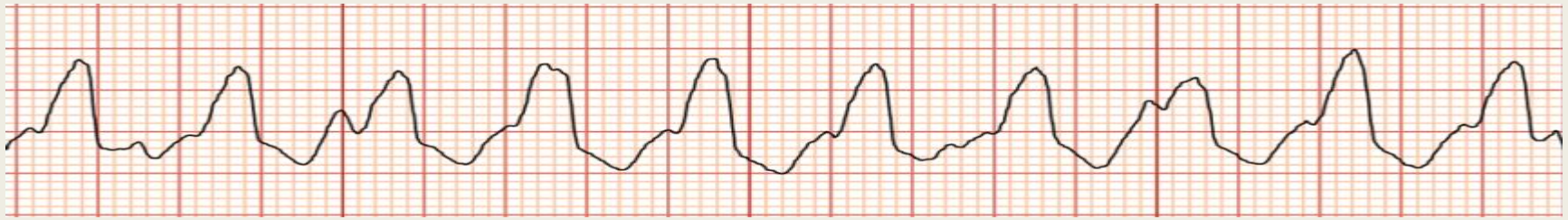

Push hard
in the center of chest
100 to 120 per minute
shutterstock.com • 519158911

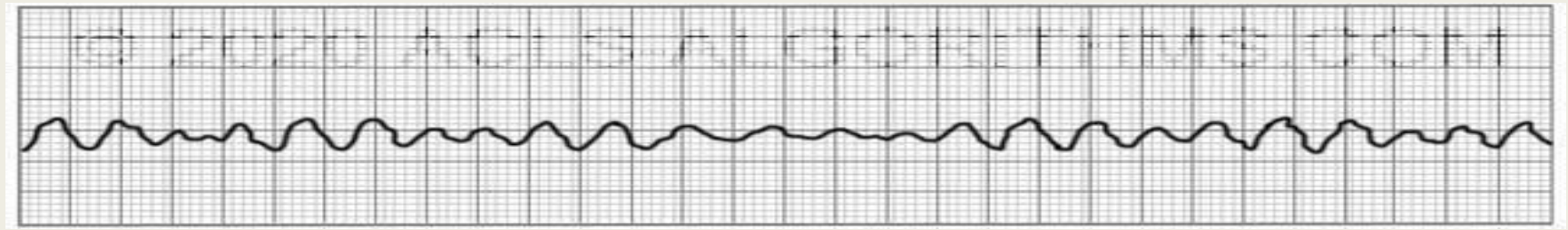

A.D.A.M.

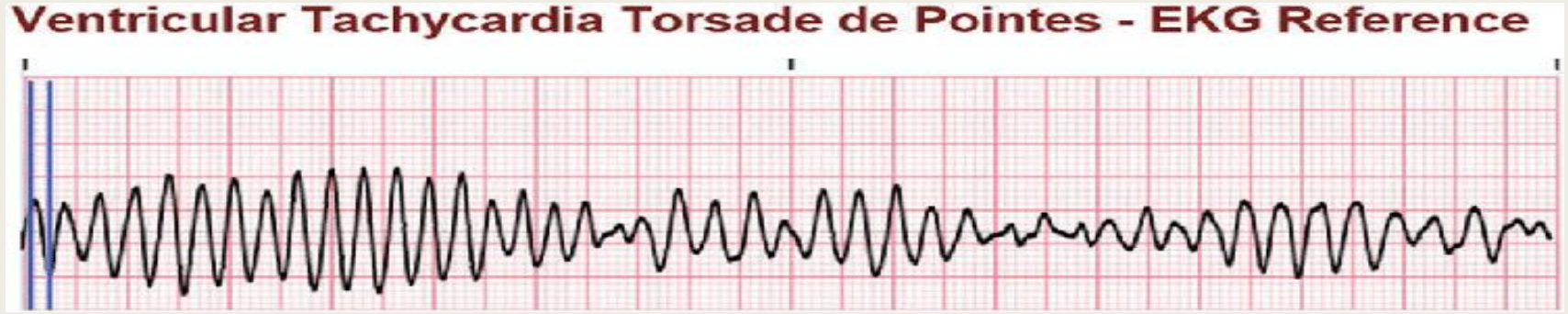

a
b

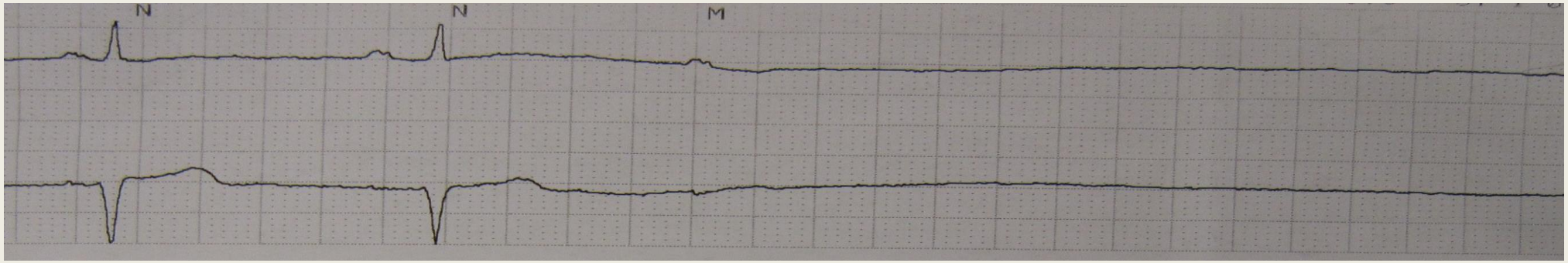
A Change From A-B-C to C-A-B








Ventricular Tachycardia Torsade de Pointes - EKG Reference


N
N
M

Cardiac arrest:

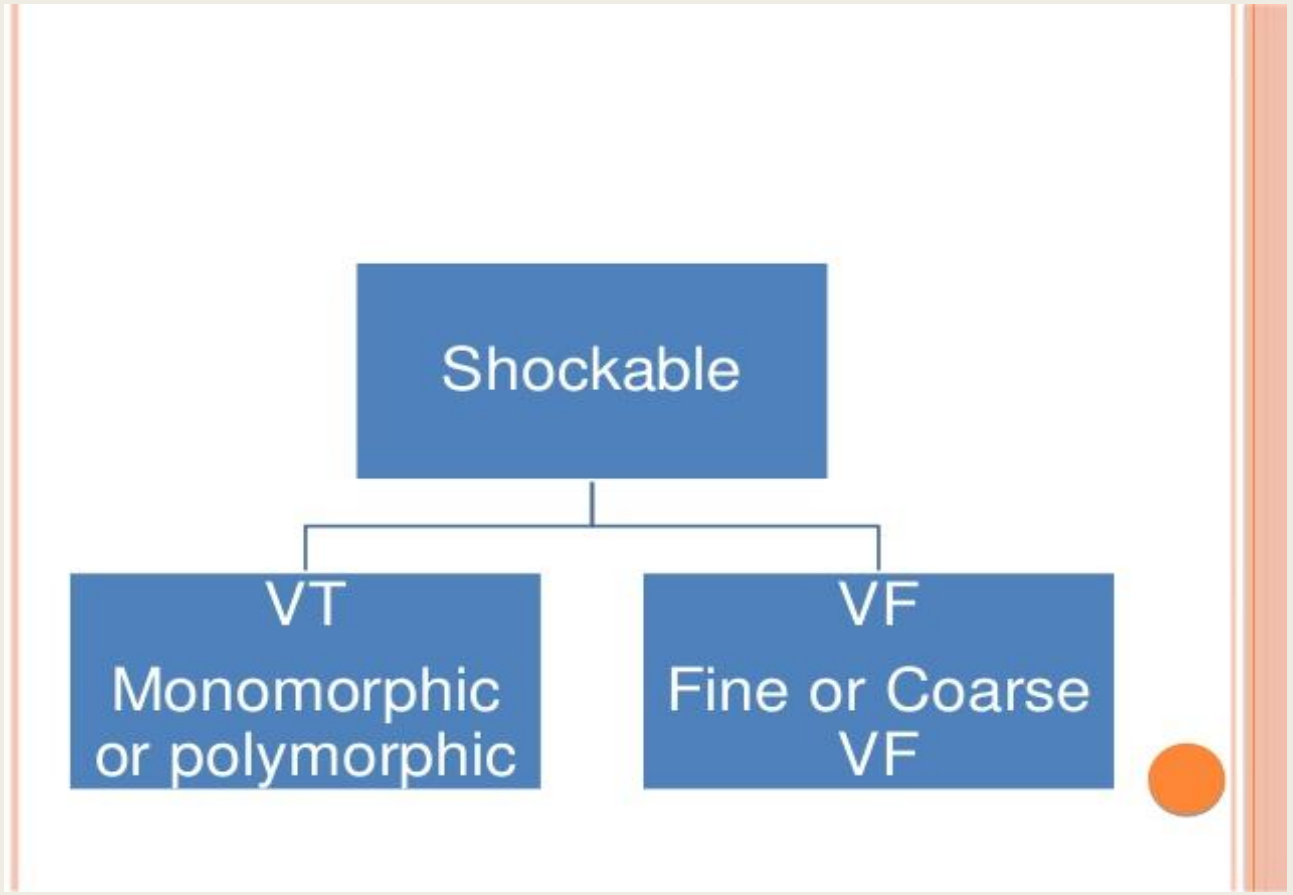
Can be caused by 4 rhythms :

1- VT

2-VF

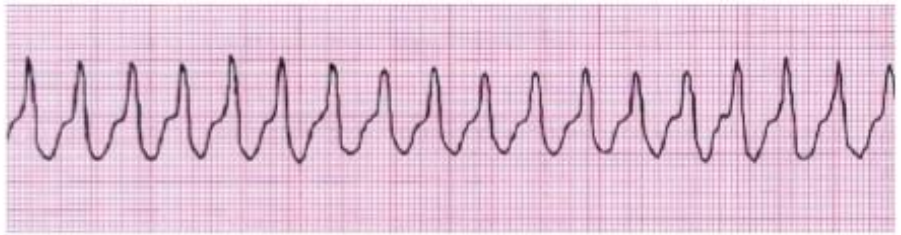
3- Asystole

4- Pulseless Electrical Activity


Shockable
VT
Monomorphic or polymorphic
VF
Fine or Coarse VF

Ventricular tachycardia

- .R-R interval usually regular, not always
- QRS not preceded by p wave.
- Wide and bizzare QRS.
- Difficult to find seperation between QRS and T wave
  Rate=100-250bpm



Torsades de Pointes

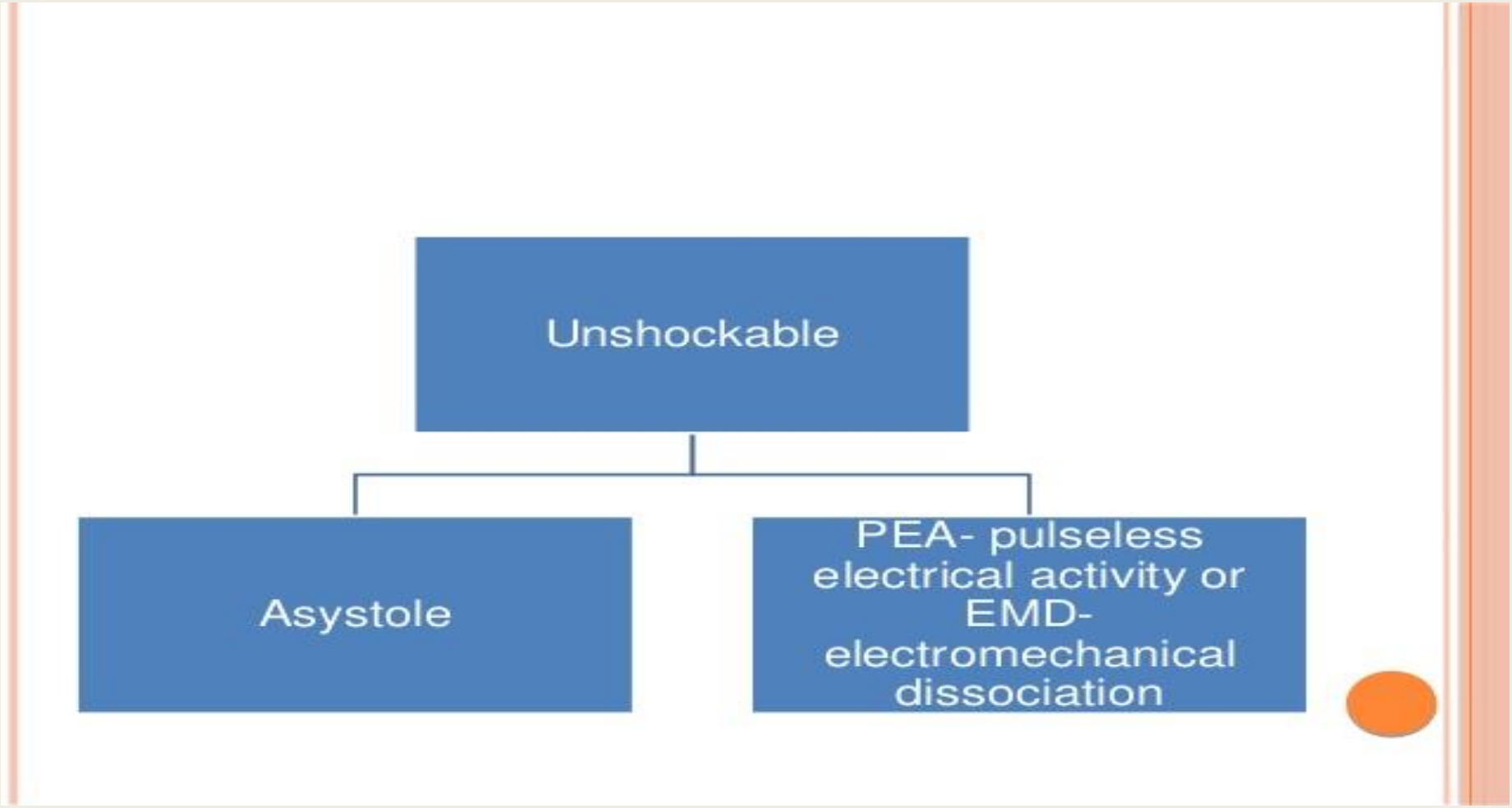
Ttwisting of points, is a distinctive form of polymorphic ventricular tachycardia characterized by a gradual change in the amplitude and twisting of the QRS complexes around the isoelectric line. Rate cannot be determined.

Ventricular fibrillation

Coarse VF

Fine VF

A severely abnormal heart rhythm (arrhythmia) that can be life-threatening.
No identifiable P, QRS or T wave
Emergency- requires Basic Life Support
Rate cannot be discerned, rhythm unorganized


Unshockable
Asystole
PEA- pulseless electrical activity or EMD- electromechanical dissociation

Asystole

a state of no cardiac electrical activity, hence no contractions of the myocardium and no cardiac output or blood flow.
Rate, rhythm, p and QRS are absent

Pulseless electrical activity

- Pulseless electrical activity (PEA)
- unresponsiveness and no palpable pulse
- some organized cardiac electrical activity.
- previously referred to as electromechanical dissociation

Treatable cause of cardiac arrest

Hypoxia

Hypovolumia

Hydrogen ions(acidosis)

Hypo / Hyper kalemia

Hypothermia

Toxin

Tamponade

Tension pneumothorax

Thrombosis (pulmonary)

Thrombosis (cardiac)

Defibrillation

Biphasic : 120 – 200 j

Monophasic : 360 j

AED

How to use?

If not- intubated / if intubated

Don’t place over pacemaker

Apical pad / sternal pad

switch on **defibrillator**

Charge to 200 j

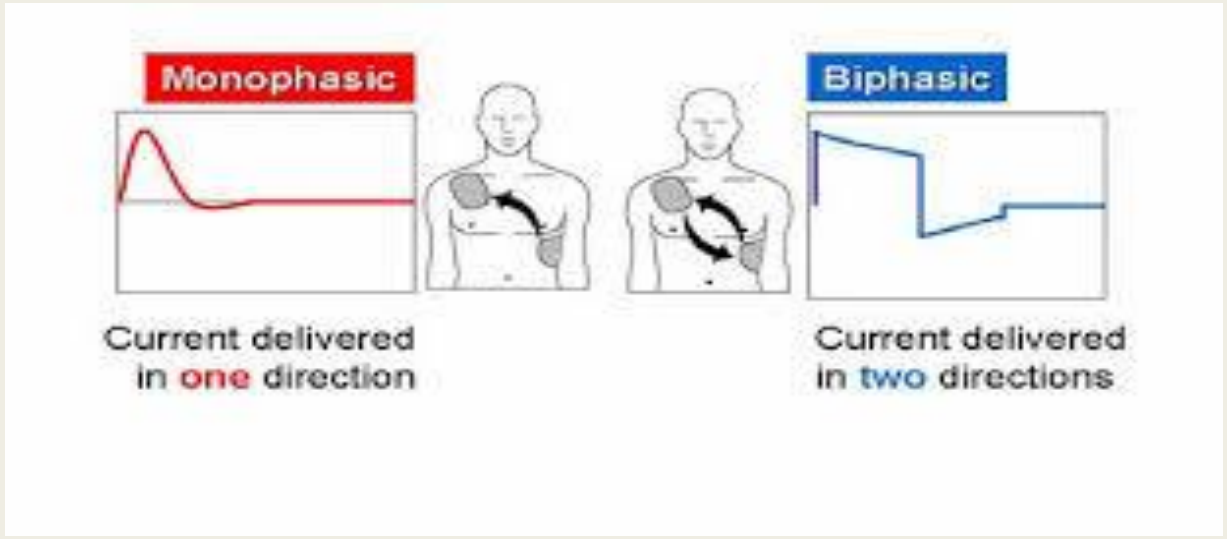
Warn all other rescuers to stand clear (are you clear?)

Visually check them

I am clear

Deliver shock

Restart CPR without checking pulse


Monophasic
Biphasic
Current delivered
in one direction
Current delivered
in two directions


APEX

Article

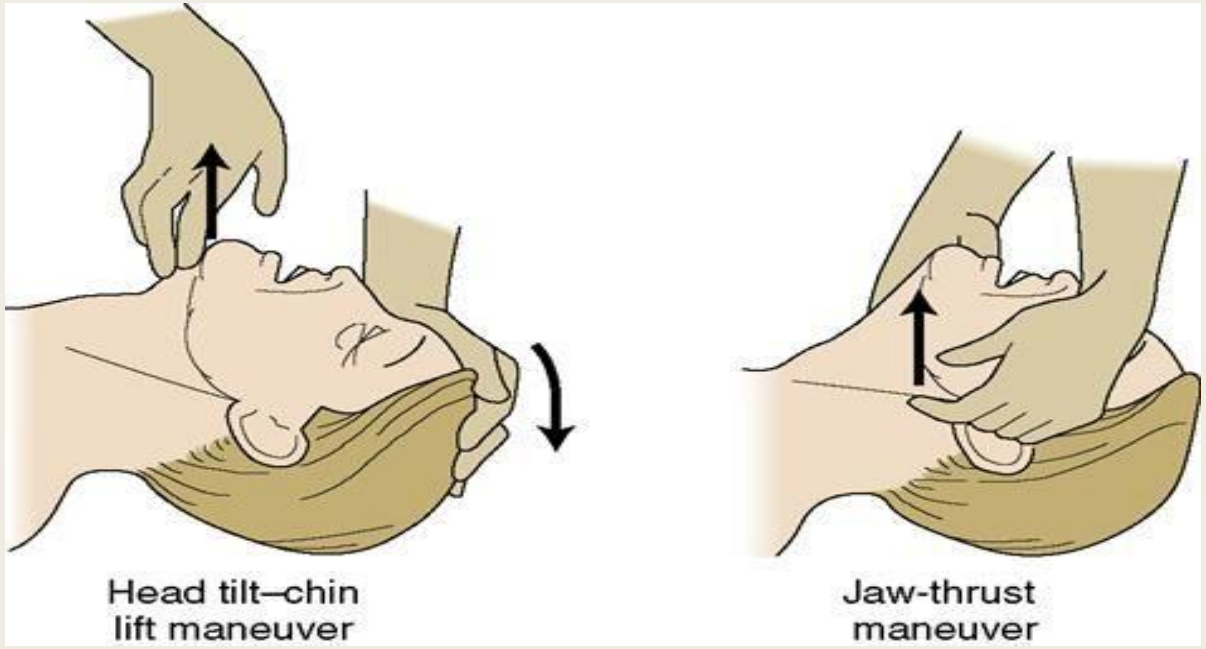
One-Shock Versus Three-Shock Defibrillation Protocol Significantly Improves Outcome in a Porcine Model of Prolonged Ventricular Fibrillation Cardiac Arrest

June 2006 · Circulation 113(23):2683-9
DOI: 10.1161/CIRCULATIONAHA.105.592121
Source · PubMed

Authors:

Wanchun Tang
Weil Institue of Critical Care Medicine

Airway and ventilation:



Airway devices

Basic:

oropharyngeal AW

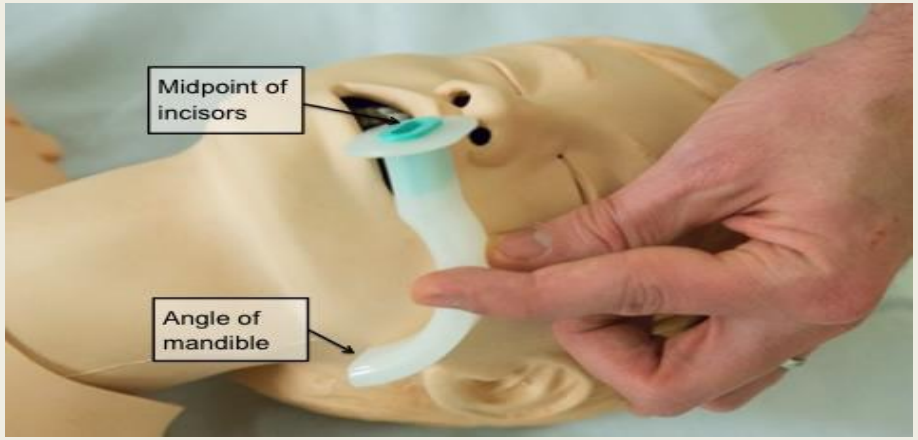
nasopharybgeal AW

Advance:

Endotracheal tube

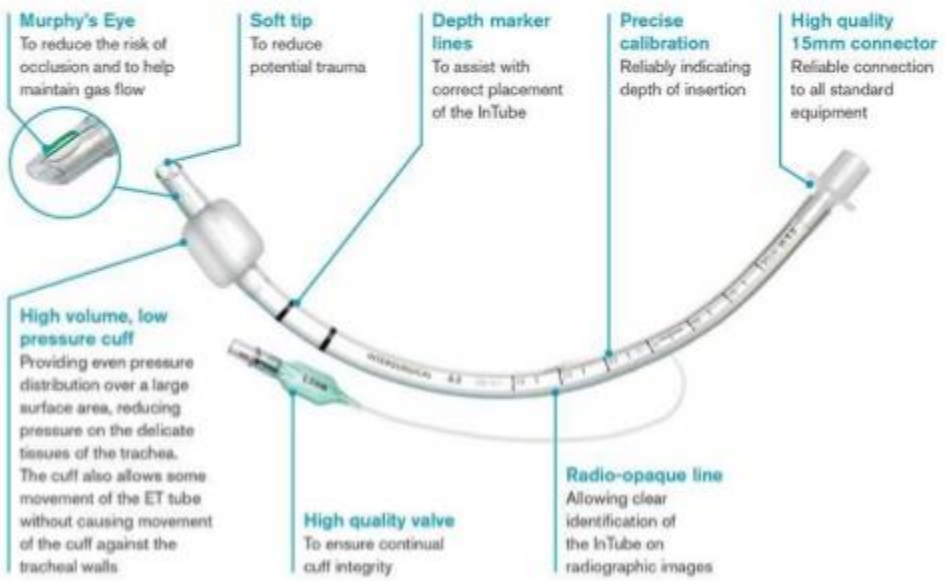
Laryngeal mask airway

Esopharyngeal tube

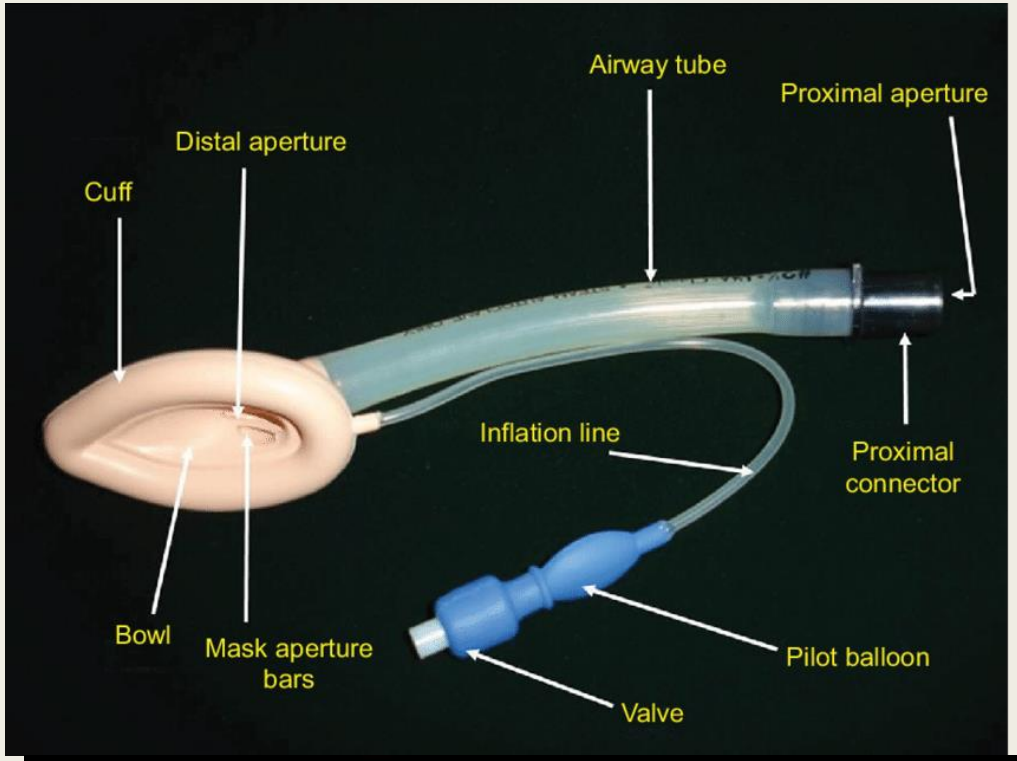


Size	Size No.	Dimension	Color
Neonatal	00	40 mm	Pink
Infant	0	50 mm	Lt Blue
Child	1	60 mm	Black
Small Adult	2	70 mm	White
Adult	3	80 mm	Green
Large Adult	4	90 mm	Yellow
XL Adult	5	100 mm	Red
XXL Adult	6	110 mm	Orange

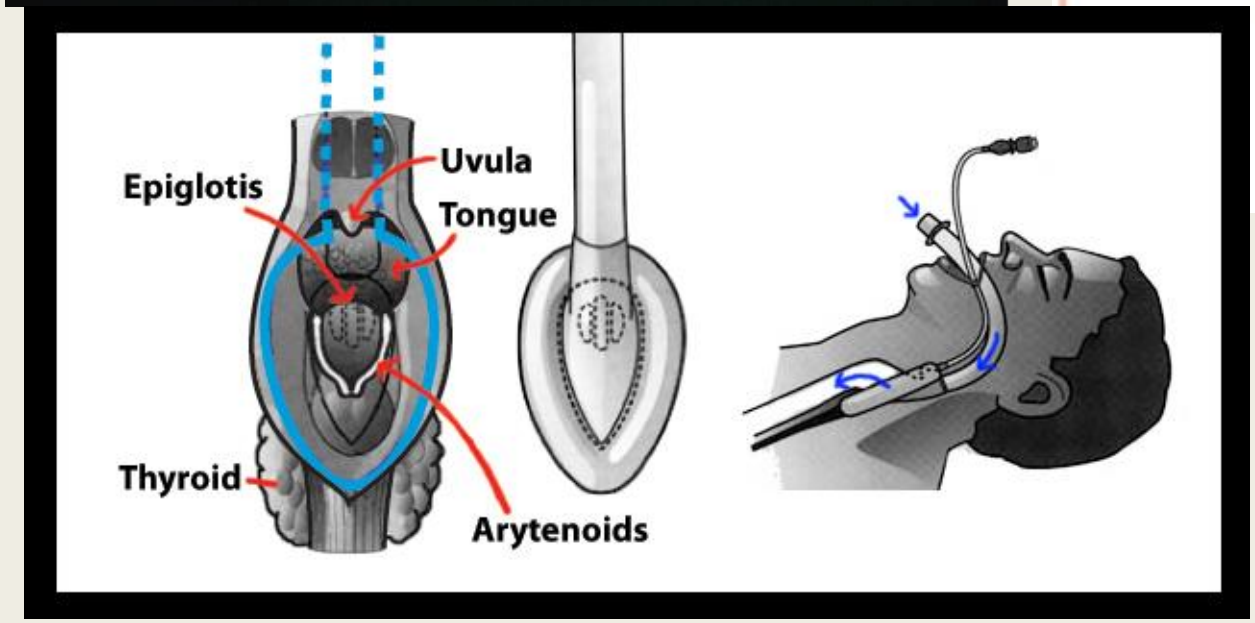
ENDOTRACHEAL TUBE



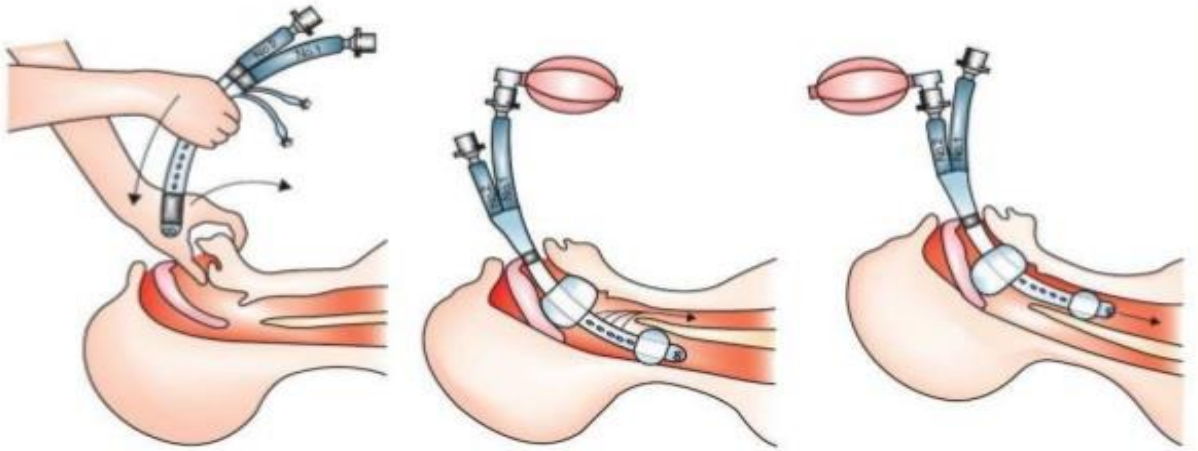
Age	Weight (kg)	ETT inner diameter
Newborn	< 1	2.5
Newborn	2	3.0
Newborn	3	3.0
Newborn	3.5	3.5
3 month	6	3.5
1 year	10	4.0
2 year	12	45
3 year	14	4.5
4 year	16	5.0
6 year	20	5.5
8 year	24	6.0
10 year	30	6.5
12 year	38	7.0
14 year	50	7.0
Adult	Woman	7.0
Adult	Man	8.0



LMA™ Size*	Patient Selection Guidelines
1	Neonates/ infants up to 5 kg
1½	Infants 5-10 kg
2	Infants/children 10-20 kg
2½	Children 20-30 kg
3	Children 30-50 kg
4	Adults 50-70 kg
5	Adults 70-100 kg
6	Adults over 100 kg



Esophageal tracheal tube

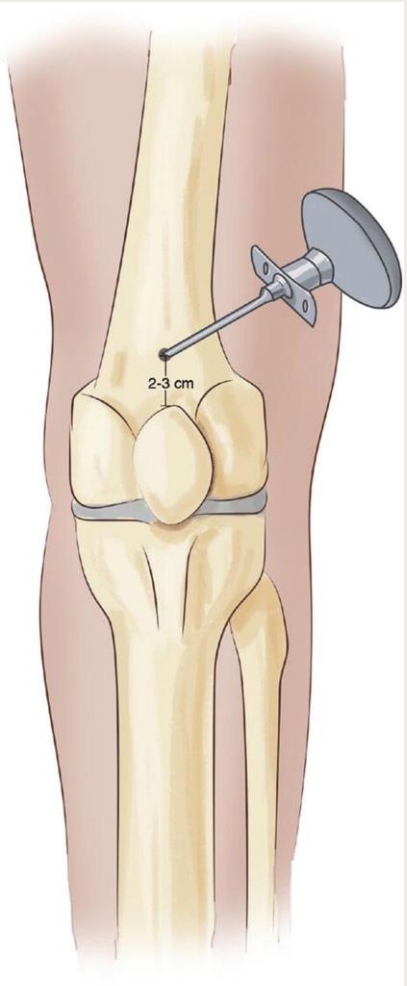


Peripheral IV : usual route

Centeral IV : best route (donot wait or waste time for cv line)

Intraosseou : in pediatric , also adult

Interatracheal



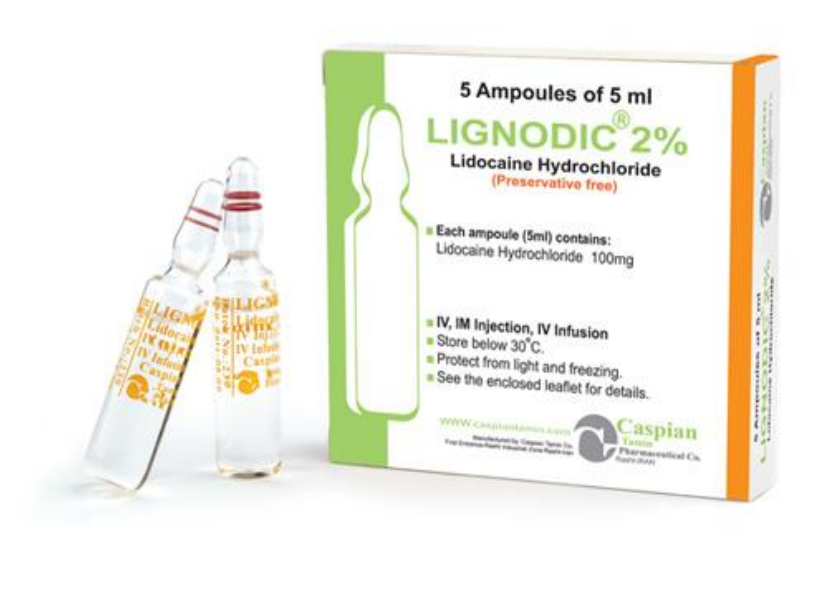
Amiodarone :

- **VT , VF**
- **300 mg in 20 ml of N/S**
- **then 150 mg in 20 ml of N/S**
- **then infusion of 1 mg/min for 6h and then 0.5 mg/ min for rest of time(max=2g)**

Lidocaine :

- **VT , VF**
- **1- 1.5 mg /kg bolus then 2-3 mg /min**

Can be give ETT



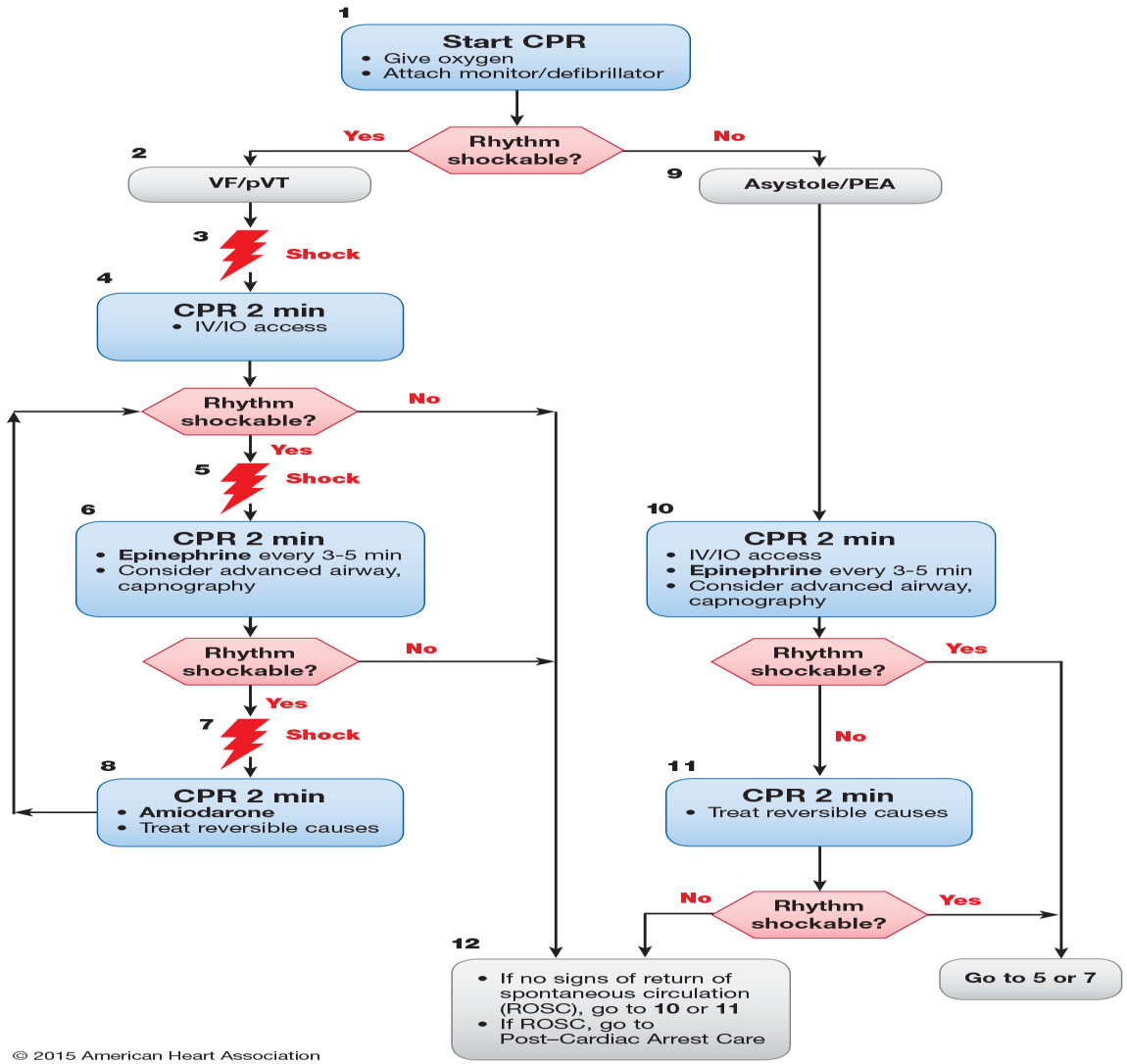
Magnesium sulfate

- refractory VT or Vf caused by hypomagnesemia
- torsa de pointes
- 1-2 g over 2min

Epinephrine

- **α , β1 , β2**
- **HR ↑ , BP ↑ , SV↑**
- **1 mg every 3- 5 min**

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

Resuscitation in Special Situations :

- hypothermia
- pregnancy
- drowning
- trauma
- elcctricution
- LAST
- covid -19

- Core temperature measurement :

Tympanic - Rectal - Urine bladder

- Classification:

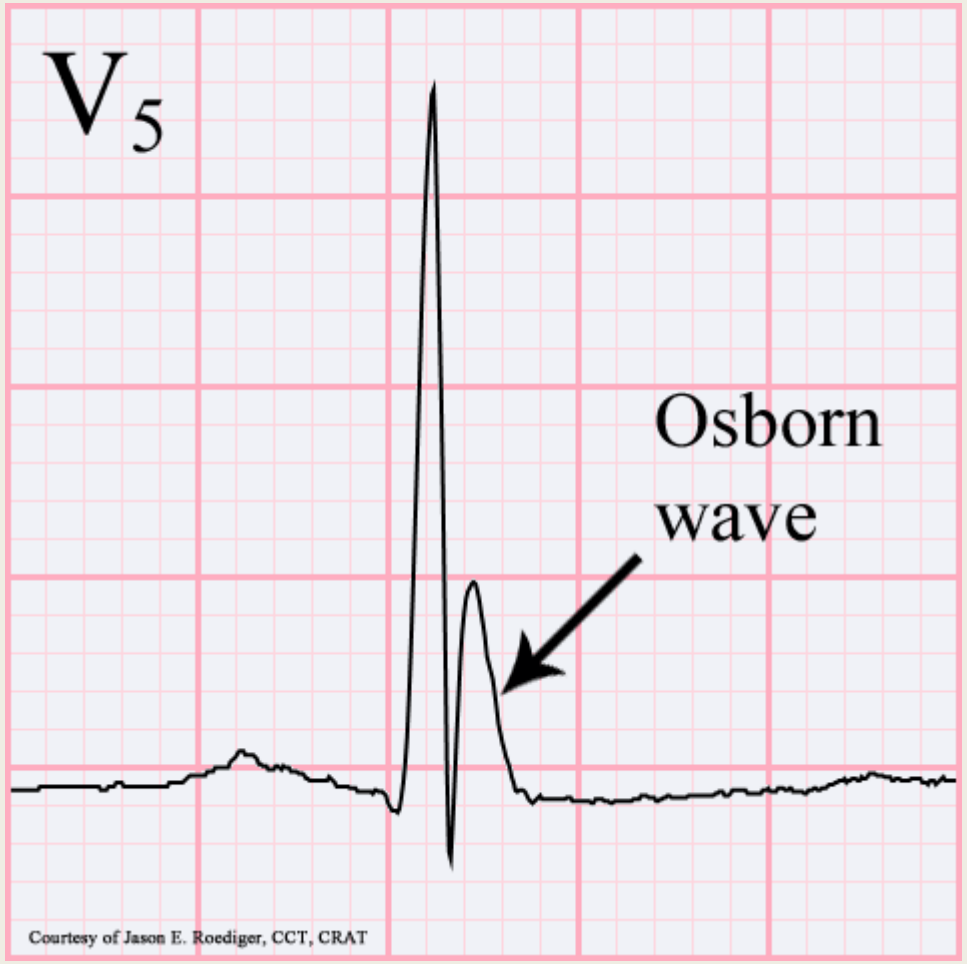
Mild 32 - 35 °C

Moderate 30 - 32°C

Severe < 30°C

ECG in hypothermia

J wave = Osborn wave



■ CPR Modifications in Hypothermia :

◦ Begin CPR without delay

◦ More force is needed to compress the chest wall sufficiently (↑ muscle rigidity)

◦The efficacy of most medications is temperature dependent (> 30 °C)

◦ Avoid pharmacologic manipulation of pulse and blood pressure (> 30 °C)

◦ Do not quit CPR until the patient rewarmed

◦ After first 3 shocks, postpone next shocks until > 30 °C

◦ Defibrillation attempts are usually unsuccessful until the core temperature is well above 30°C

■ Rewarming :

◦Recommended rewarming rates are between 0.5 to 2 °C/hr

◦Passive External Rewarming:

Moderate (30°C to 32°C)

Hypothermia with a perfusing rhythm ¨Wear off the cold and wet clothes ¨

Cover with blankets

Increase the room temperature

◦Active Rewarming:

Active External Rewarming

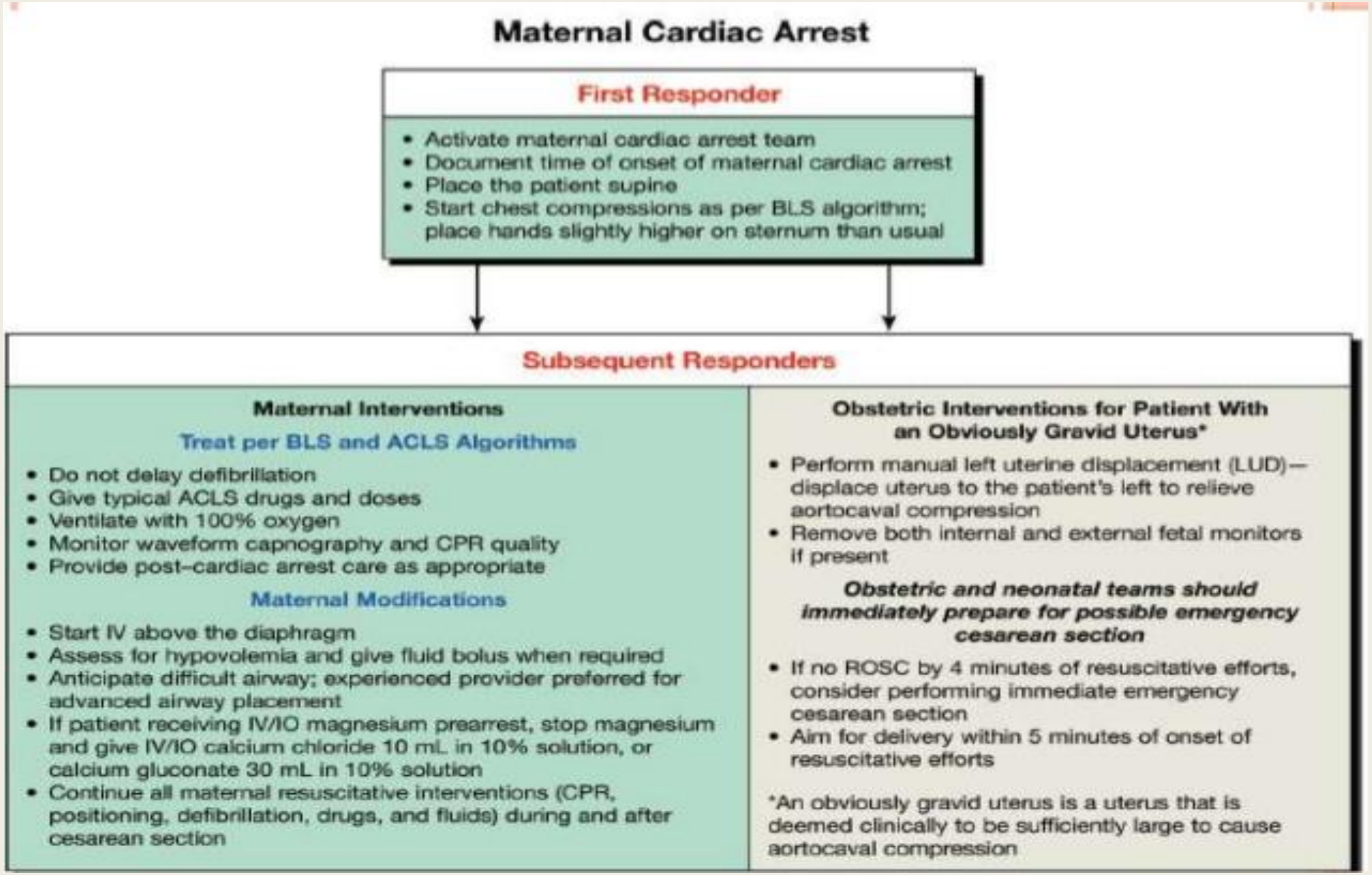
Active Core Rewarming

Active rewarming:

- Moderate to severe hypothermia (< 32 °C)
- Cardiovascular instability (cardiac arrest)
- Inadequate rate or failure to rewarm n
- Endocrinologic insufficiency
- Traumatic or toxicologic peripheral vasodilation
- Secondary hypothermia impairing thermoregulation

Techniques:

- Warm-water lavage of the pleural, peritoneal, gastric and urine bladder cavity (43 °C)
- Extracorporeal blood warming with partial bypass(ECMO)
- IV or introsseous (IO) fluid (43 °C)
- humidified O2


Maternal Cardiac Arrest
First Responder
• Activate maternal cardiac arrest team
• Document time of onset of maternal cardiac arrest
• Place the patient supine
• Start chest compressions as per BLS algorithm; place hands slightly higher on sternum than usual
Subsequent Responders
Maternal Interventions
Treat per BLS and ACLS Algorithms
• Do not delay defibrillation
• Give typical ACLS drugs and doses
• Ventilate with 100% oxygen
• Monitor waveform capnography and CPR quality
• Provide post–cardiac arrest care as appropriate
Maternal Modifications
• Start IV above the diaphragm
• Assess for hypovolemia and give fluid bolus when required
• Anticipate difficult airway; experienced provider preferred for advanced airway placement
• If patient receiving IV/IO magnesium prearrest, stop magnesium and give IV/IO calcium chloride 10 mL in 10% solution, or calcium gluconate 30 mL in 10% solution
• Continue all maternal resuscitative interventions (CPR, positioning, defibrillation, drugs, and fluids) during and after cesarean section
Obstetric Interventions for Patient With an Obviously Gravid Uterus*
• Perform manual left uterine displacement (LUD)—displace uterus to the patient's left to relieve aortocaval compression
• Remove both internal and external fetal monitors if present
Obstetric and neonatal teams should immediately prepare for possible emergency cesarean section
• If no ROSC by 4 minutes of resuscitative efforts, consider performing immediate emergency cesarean section
• Aim for delivery within 5 minutes of onset of resuscitative efforts
*An obviously gravid uterus is a uterus that is deemed clinically to be sufficiently large to cause aortocaval compression

Causes

- **Bleeding /DIC**
- **Embolism (pulmonary, coronary , amniotic)**
- **Anesthetic complication**
- **Uterine atony**
- **Cardiac disease(MI, ischemia ,Ao dissection, CMP)**
- **HTN(preeclampsia ,eclamsia)**
- **Placentaprevia , placenta abraptio**
- **sepsis**

■ **Class I intervention:**

◦ Give ***100%*** oxygen

◦ Establish intravenous (IV) access ***above the diaphragm***

◦ Assess for hypotension; warrants therapy has been defined as a systolic blood pressure ***<100 mmHg or 80% of baseline***

◦ patient who is not in arrest, both ***crystalloid*** and colloid solutions increase preload.

CPR in pregnancy:

■ CPR interventions aim to rescue always ***FIRST the mother***

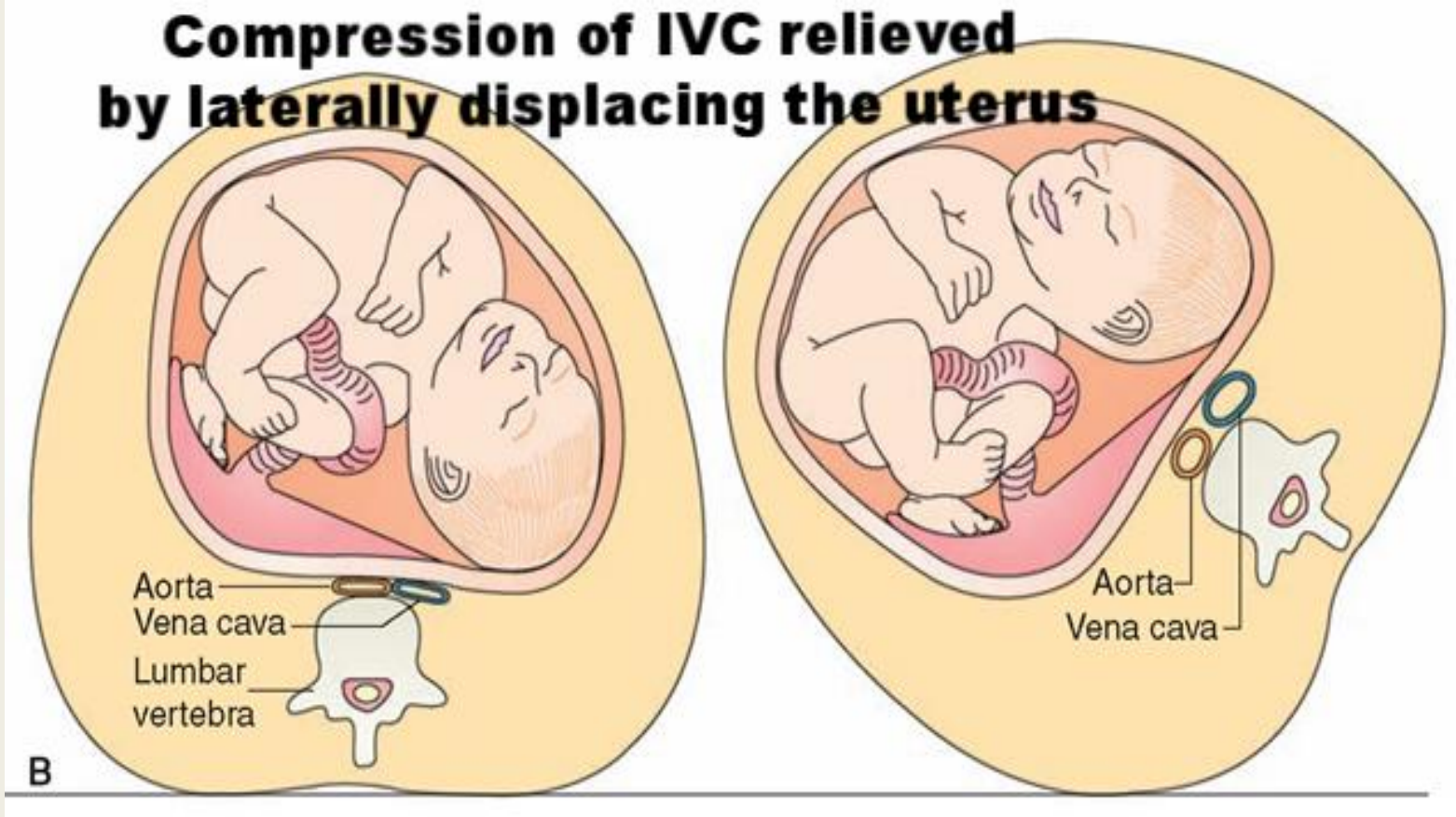
■ Standard ACLS algorithms require ***no modification***

■ ***No need*** to adjust resuscitative *drug doses*

Prevent cardiac arrest:

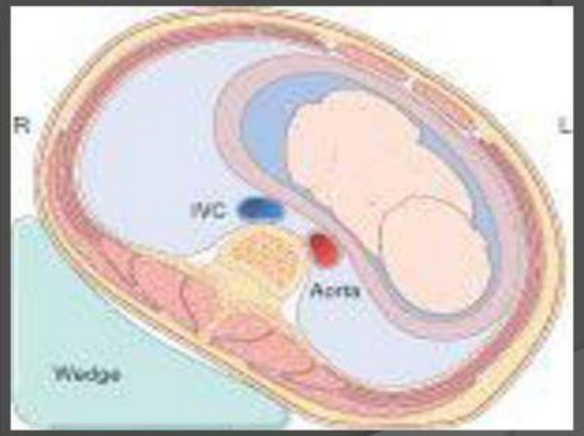
■ Place the patient in the *full left-lateral position* to relieve possible compression of the inferior vena cava

■ Maternal aortocaval compression can occur for singleton pregnancies at 20 weeks of gestational age

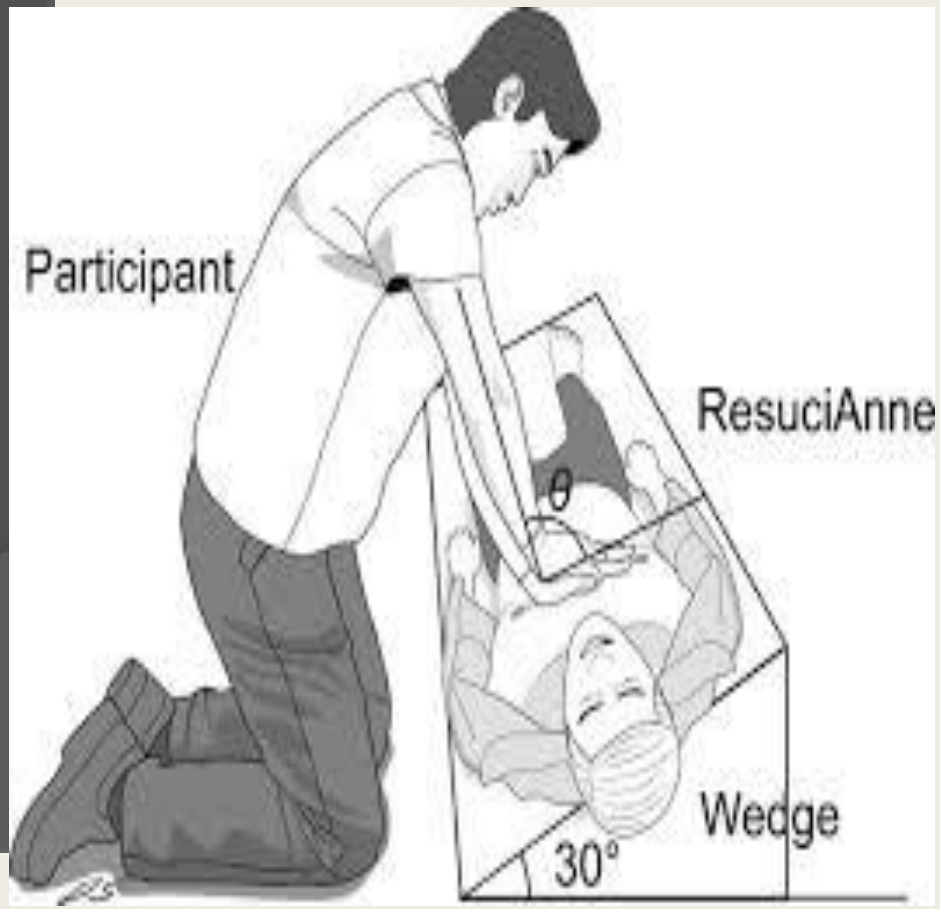

Compression of IVC relieved
by laterally displacing the uterus
Aorta
Vena cava
Lumbar
vertebra
B
Aorta
Vena cava

Cardiac arrest in pregnancy

- **place the patient supine**
- **start BLS**
- **place hand slightly higher**
- **donot delay defibrillation**
- **ventilation with 100% o2(intubation is essential in pregnant)**
- **capnograph**
- **ACLS drug doses**



Patient in a 30° left-lateral tilt using a firm wedge to support pelvis and thorax



- Left uterine displacement - patient's left side with the 2-handed technique
- The patient's right side with the 1-handed technique , depending on the positioning of the resuscitation team.
- If chest compressions remain inadequate after lateral uterine displacement or left-lateral tilt, immediate emergency cesarean section should be considered.

■ Airway :

◦Aspiration risk → Early intubation & cricoid pressure

◦Laryngeal sweling → Small bore tube (0,5-1 mm ↓)

◦Hypoxia risk → Preoxygenation

■ Breathing:

◦↑ Oxygen demand → hypoxia risk

◦↓ Functional residual capacity → faster desaturation

◦Elevated diaphram → ↓ ventilation volume

Pregnant Prearrest On Magnesium Treatment

Patients receiving ***magnesium*** treatment (eclampsia) before cardiac arrest should be applied IV / IO

- 10 ml 10% calcium chloride
- 30 ml 10% calcium gluconate

- **iv above diaphragm**
- **hypovolemia ? (fluid bolus)**
- **ready for difficult AW**

Rapid developing hypoxemia(FRC↓)

- **if patient receive MgS prearrest , stop Mg , start iv Ca-chloride 10% (10 ml)**

Or Ca-gluconate 10% (30ml)

- **continue CPR during and after C/S**

Recommendation for emergency C/S

- **Maternal hypotension can result in *placental perfusion* ↓**
- **when the gravid uterus is large enough to cause maternal hemodynamic changes due to Aortocaval compression**
- **emergency C/S regardless to fetus viability while resuscitating**
- **if there is no ROSC by 4 min of CPR → consider immediate C/S**

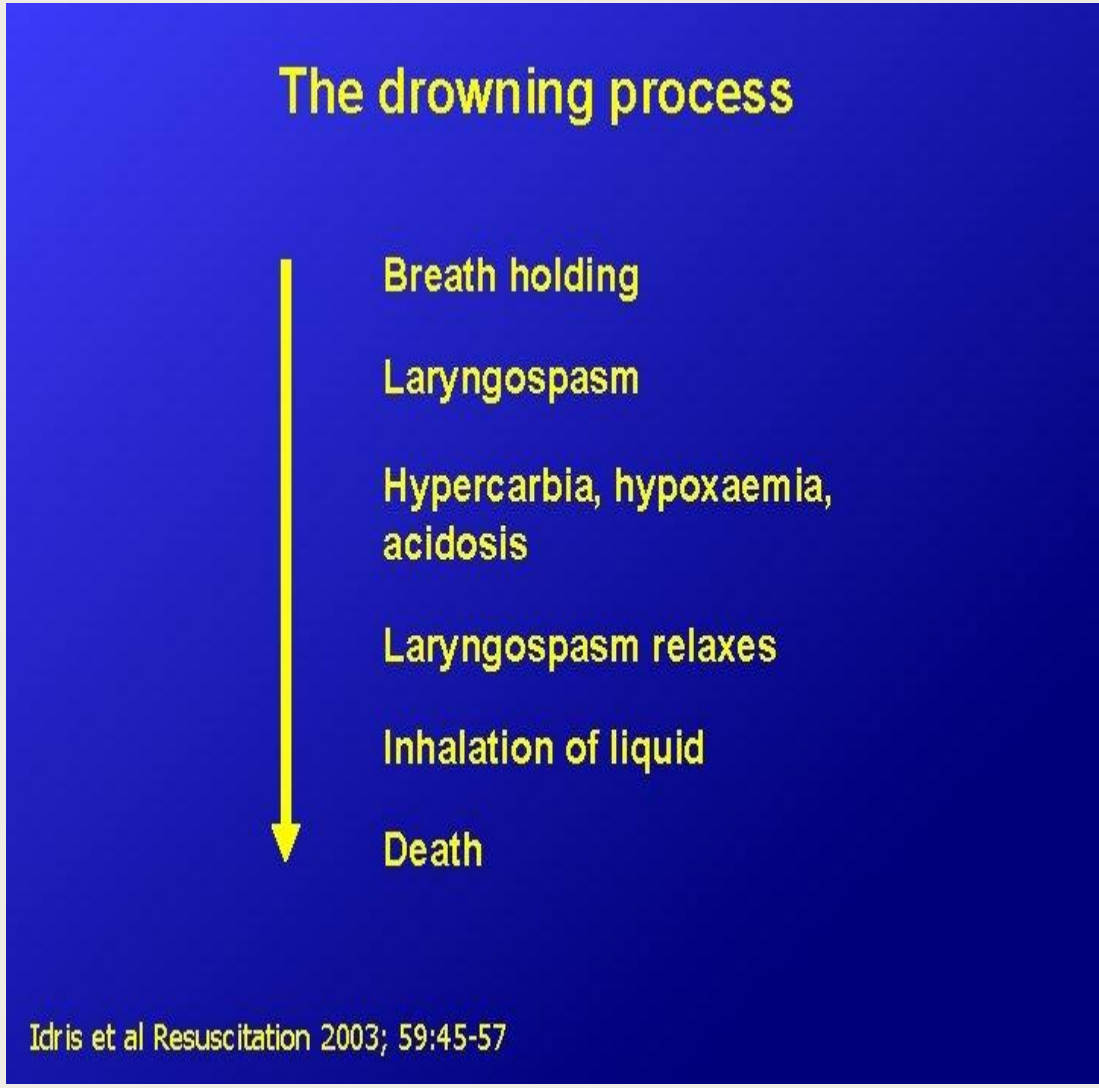
aim for delivery within 5 min of onset CPR

Drowning :

■The process of experiencing respiratory impairment from submersion / immersion in liquid

Immersion = to be covered in water

Submersion = the whole body under water



■ If water **T> 6 °C**, survival / resuscitation is extremely unlikely if **submerged > 30 min**

■ If water **T≥ 6 °C** , survival / resuscitation is extremely unlikely if **submerged >90 min**

Salt vs Fresh Water:

fresh water more dangerous than salt waters

- **Prehospital:**

CPR (initiate ventilation in water if possible)

ABC not CAB

No benefit of Heimlich maneuver

Prevent hypothermia

Cervical collar not needed if no trauma (cervical injury incidence only 0.5%)

- **Hospital :**

– Pulmonary support

  - ABG, electrolyte
  - Intubate alert victims if pulmonary function impaired (ALI PaO /FiO2≤300)
  - Use of surfactant, ECMO, NO2 needs more evidence
  - CPAP or PEEP ≥ 10 cmH_2O for best $SaO_2$with lowest FiO_2

– Prophylactic antibiotics??

– No steroids

■ ***Traumatic cardiac arrest*** :

1- suspect cervical injury

2- in chest trauma suspect : tension pneumothorax , cardiac tamponade

→ immediate thoracotomy & open CPR

3- volume resuscitation : 2 lit fluid through 2 large bore iv

■ ***Electricution***

Danger of cardiac arrest :

- Major factors:
  - magnitude of current
  - duratuion of exposure
- Minor of factors :
  - type of current (AC worse than DC)
  - resistance of skin and tissue

< 1 mA : Tingling

50 – 30 mA : Lets go current

40 – 50 mA : Respiratory arrest

50 – 100 mA: VF

> 10 A : Prolonged apnea

Elecricity travels along NN and VV

Burns are often full thickness : may extend to bone , may requirement debridment, escharotomy ,fasciotomy , amputation

- remember secondary injury:
  - Cervical spine or other bony Fx
  - Head injury
  - myoglobulineuria

Management :

- ◦Turn off current
- ◦ABC
- ◦Protect cervical spine & treat injuris
- ◦Iv fluid for severe burn and myoglobineuria:

U/o → 100 ml/h

mannitol 25 g iv then12.5 g/h for 6 h

to urine alkalization → sodium bicarb

Surgical consultation

Local Anesthetic systemic Toxicity (LAST):

■ LA toxicity → CNS , heart → seizure , dysrhythmia , arrest

Cardiac arrest → same algorithm but *lipid preparation* specific

◦ *intralipid* → administered concurrently as part of ACLS

Dose: *1.5 ml/kg of 20%* or

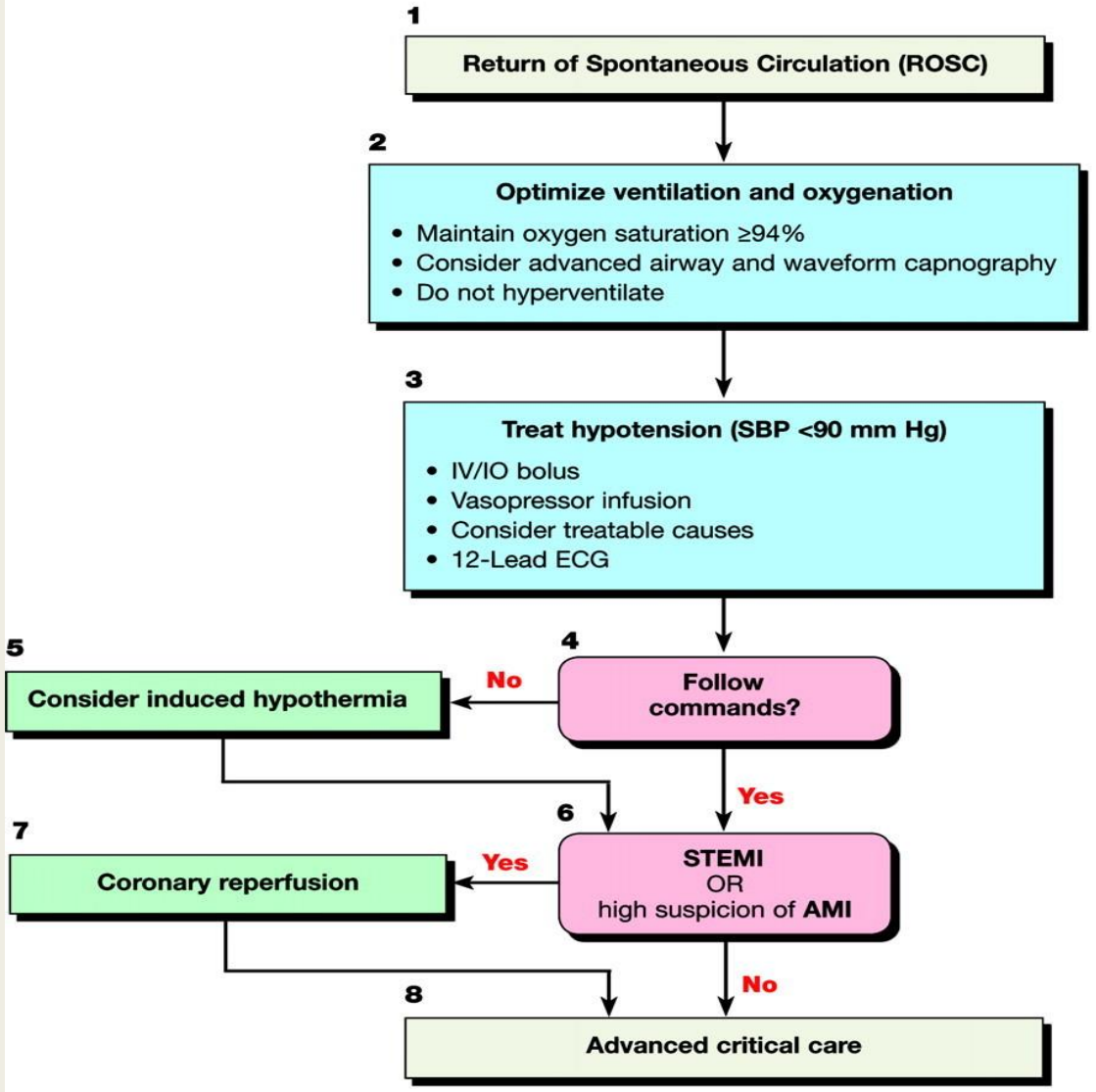
100ml for >70 kg & *1.5 ml/kg for <70kg*

Initial bolus : 0.25 ml/kg/min

Cardiac life support of patients with covid-19:

- **personal protective Equipment (PPE) and availability before CPR**
- **High Efficacy Particular Air(HEPA) filter for bag-mask ventilation and mechanical ventilation**
- **emphasize early intubation , use video laryngoscope , stop chest compression while intubation performed**
- **if intubation is delayed (→supraglottic device)**
- **avoid prolonged resuscitation**

Adult Immediate Post–Cardiac Arrest Care



Doses/Details

Ventilation/Oxygenation
Avoid excessive ventilation. Start at 10-12 breaths/min and titrate to target P_{ETCO_2} of 35-40 mm Hg.
When feasible, titrate F_{IO_2} to minimum necessary to achieve Sp_{O_2} ≥94%.

IV Bolus
1-2 L normal saline or lactated Ringer's.
If inducing hypothermia, may use 4°C fluid.

Epinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Dopamine IV Infusion:
5-10 mcg/kg per minute

Norepinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

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

- *Unconscious* → advanced airway for ***mechanical support*** of breathing
- necessary → ***replace***: supraglottic airway used for initial resuscitation with an *endotracheal tube*
- several simple maneuvers :
  - should *avoid* → *ties* circumferentially around the ***neck*** → potentially ***obstructing*** *venous return* from the brain → *cerebral edema*
  - *elevate* the head of the bed **30°** if tolerated → ***reduce*** → incidence of *cerebral edema*, *aspiration*, and *ventilatory-associated pneumonia*
  - *Hyperventilation* or ***"overbagging"*** → common after cardiac arrest → should be *avoided* Hyperventilation → ***intrathoracic pressure*** ↑ → CO ↓

$PaCO_2$ ↓ seen : hyperventilation → CBF ↓ directly. Ventilation →

10 to 12 breaths / minute and titrated → ***$PETCO_2$ of 35 to 40 mm Hg*** or a ***$PaCO_2$ of 40 to 45 mm Hg***

Sedation: Opioid , Midazolam , Muscle relaxants

Induced hypothermia:

Brain protection and other organs → ***hypothermia*** →**helpful** therapeutic → patients who *remain comatose* (usually defined as a lack of meaningful response to verbal commands) after ROSC

Cooling onset : during 2h (median 8h) from ROSC

Duration: 12 – 24 h (up to 72 h in neonate)

IV ice-cold fluids (*500 mL to 30 mL/kg of saline 0.9% or Ringer's lactate*). Caseseries showed that the deterioration in oxygenation that often occurs after ROSC was not significantly affected by the infusion of cold fluids

patient's ***core temperature*** : *esophageal thermometer, bladder catheter* in nonanuric patients, or *pulmonary artery catheter*

should be cooled to 32°C to 34°C

Pulmonary dysfunction :common.

(1)hydrostatic pulmonary edema from left ventricular dysfunction (2)noncardiogenic edema from inflammatory(3) infective, or physical injuries; (4)severe pulmonary atelectasis(5) aspiration →V/Q mismatch. severity → PaO_2/FIO_2

■ A PaO_2/FIO_2 ratio of ≤300 mm Hg → ALI.

■chest x-ray : acute onset of bilateral infiltrates & PAWP≤18 mm Hg or no evidence of left atrial hypertension are common → *ALI* and *ARDS*. (PaO_2/FIO_2 ratio <300 or <200 mm Hg separates acute lung injury from ARDS, respectively).

■Tv 6-8 mi/kg ,(PEEP) and titrated FIO_2 are strategies

■ beneficial effect of high FIO_2 on systemic oxygen delivery should be balanced with the deleterious effect of generating oxygen-derived free radicals during the reperfusion phase

Fio2 decrease where o2 sat : 94-96%

■ *Ventilation rate* and volume → titrated to maintain high-normal ***$Paco_2$ (40 to 45 mm Hg)*** or ***$PETCO_2$ (35 to 40 mm Hg)***

Drug	Typical Starting Dose (Then Titrate to Effect)
Epinephrine	0.1–0.5 mcg/kg/min (In 70-kg adult, 7–35 mcg/min) • Useful for symptomatic bradycardia if atropine and transcutaneous pacing fail or if pacing is not available • Used to treat severe hypotension (eg, systolic blood pressure <70 mm Hg) • Useful for anaphylaxis associated with hemodynamic instability or respiratory distress[158]
Norepinephrine	0.1–0.5 mcg/kg/min (In 70-kg adult, 7–35 mcg/min) • Used to treat severe hypotension (eg, systolic blood pressure <70 mm Hg) and a low total peripheral resistance • Relatively contraindicated in patients with hypovolemia. It may increase myocardial oxygen requirements, mandating cautious use in patients with ischemic heart • Usually induces renal and mesenteric vasoconstriction, in sepsis, however, norepinephrine improves renal blood flow and urine output[159,160]
Phenylephrine	0.5–2.0 mcg/kg/min (In 70-kg adult, 35–140 mcg/min) • Used to treat severe hypotension (eg, systolic blood pressure <70 mm Hg) and a low total peripheral resistance
Dopamine	5–10 mcg/kg/min

Phenylephrine	0.5–2.0 mcg/kg/min (In 70-kg adult, 35–140 mcg/min) • Used to treat severe hypotension (eg, systolic blood pressure <70 mm Hg) and a low total peripheral resistance
Dopamine	5–10 mcg/kg/min • Used to treat hypotension, especially if it is associated with symptomatic bradycardia • Although low-dose dopamine infusion has frequently been recommended to maintain renal blood flow or improve renal function, more recent data have failed to show a benefic from such therapy[161,162]
Dobutamine	5–10 mcg/kg/min • The (+) isomer is a potent beta-adrenergic agonist, whereas the (–) isomer is a potent alpha-1-agonist[163] • The vasodilating $beta_2$-adrenergic effects of the (+) isomer counterbalance the vasoconstricting alpha-adrenergic effects, often leading to little change or a reduction in systemic vascular resistance
Milrinone	Load 50 mcg/kg over 10 minutes then infuse at 0.375 mcg/kg/min • Used to treat low cardiac output • May cause less tachycardia than dobutamine

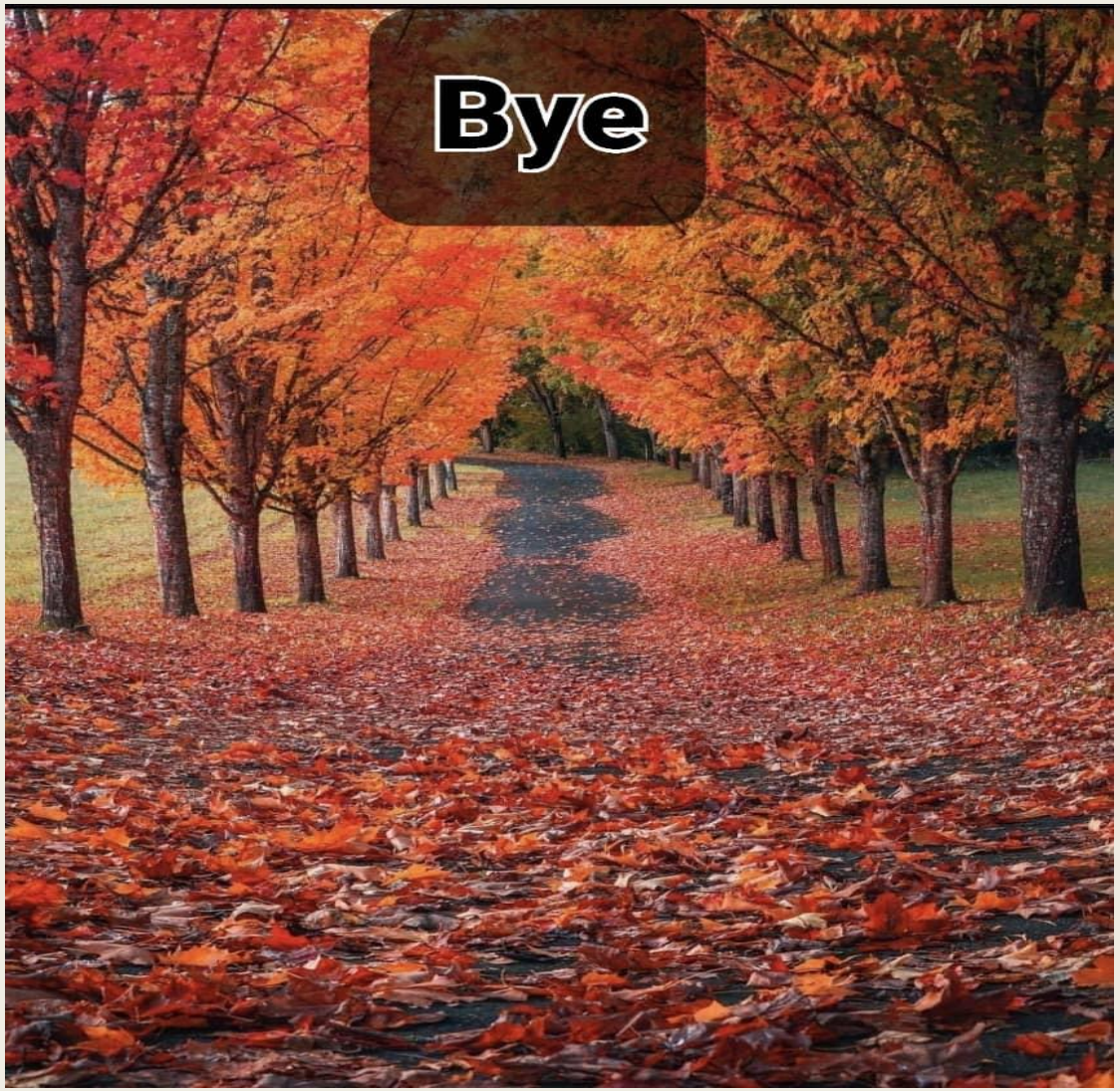
Fluid administration as well as vasoactive (norepinephrine), inotropic (dobutamine), and inodilator (milrinone) → titrated → optimize BP, CO, systemic perfusion .

■ ideal targets for blood pressure or blood oxygenation：MAP≥65 mm Hg and an $ScvO_2$ ≥70%

■**hyperglycemia** Strategies : target *moderate glycemic control* ***(144 to 180 mg/dL [8 to 10 mmol/L])*** may be considered in adult patients with ROSC after cardiac arrest

■ **steroids** : no (sepsis?)

■ CNS protection : seizure & neuroprotection


Bye