BLS & ALCS in Pregnancy 2020

American Heart Association.
2020
CPR & ECC GUIDELINES

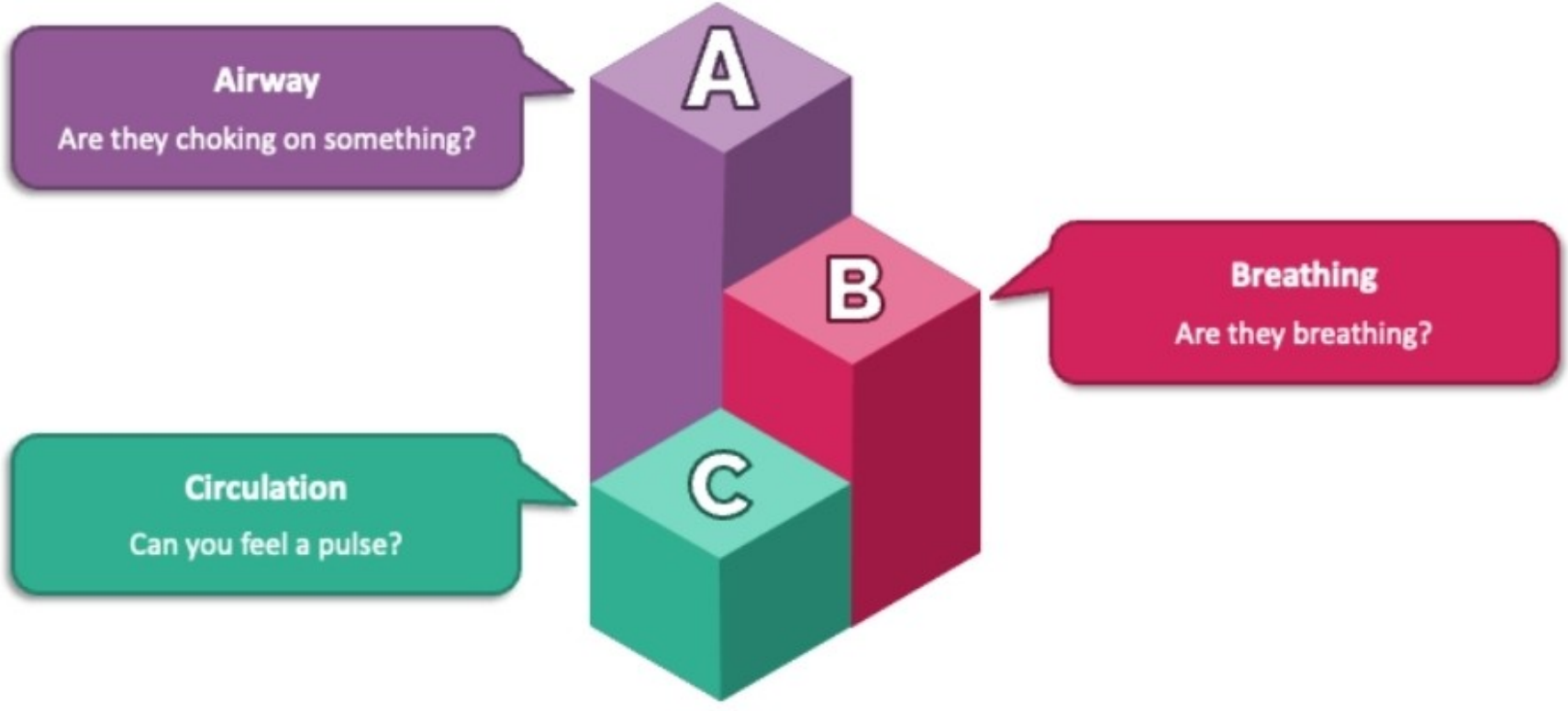


Objectives

-Basic life Support
-Adult cardiac arrest algorithmn
 -Modifications in BLS & ACLS in pregnancy
-Cardiac arrest algorithm specific to pregnancy
-Perimortem caesarean section
-Complications of CPR
-Post cardiac arrest care
-Termination of BLS&ACLS

CARDIOPULMONARY RESUSCITATION (CPR)

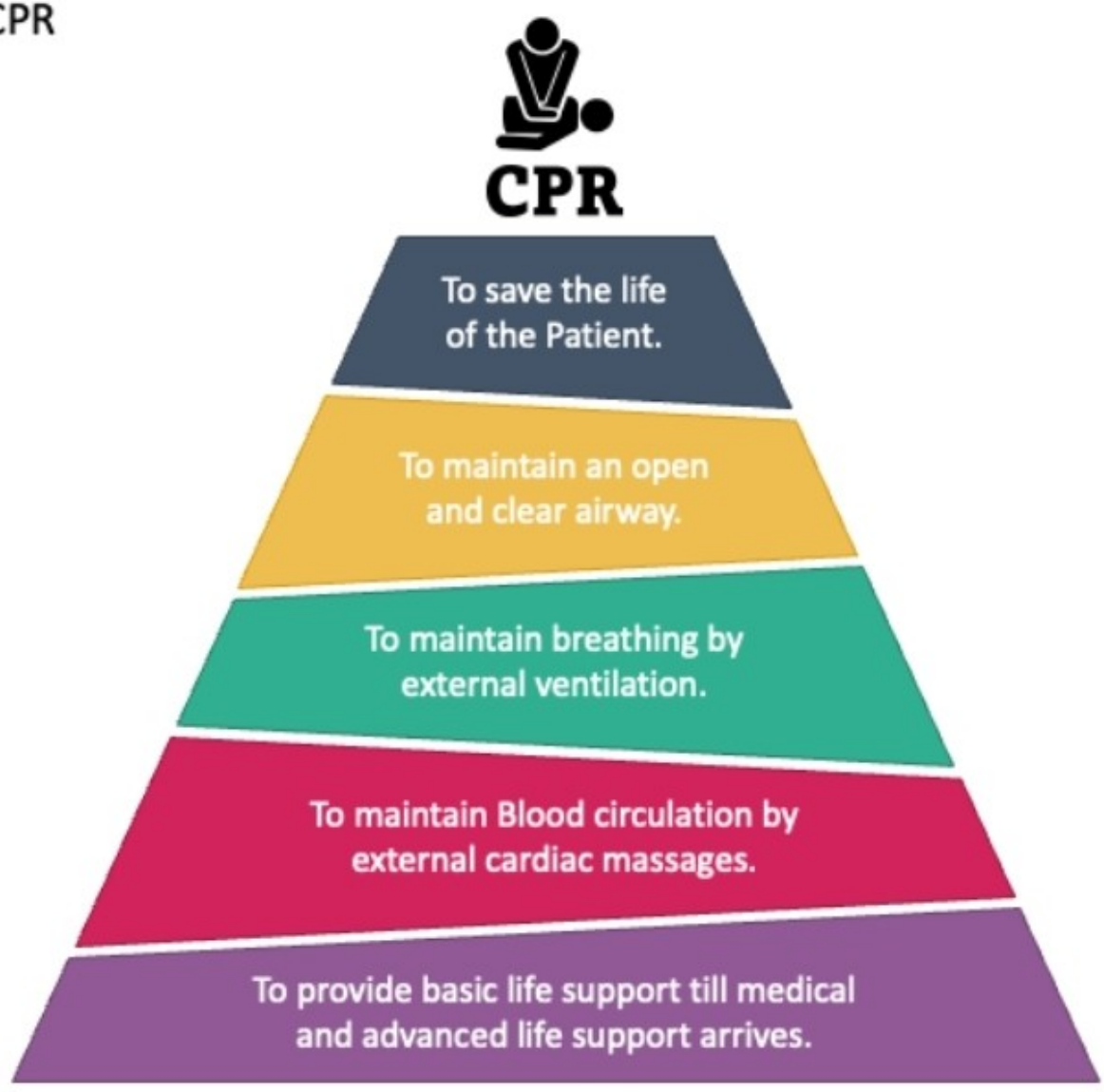
What does ABC stand for in CPR?



Cardiopulmonary Resuscitation

CARDIOPULMONARY RESUSCITATION (CPR)

Purposes of CPR



CARDIOPULMONARY RESUSCITATION (CPR)

Step by Step CPR Guide

STEP 01



Shake and shout

STEP 02



Call for Ambulance

STEP 03



Check for breathing

STEP 04



Place your hands at the center of their chest

STEP 05



Push hard and fast- about twice per second

STEP 06

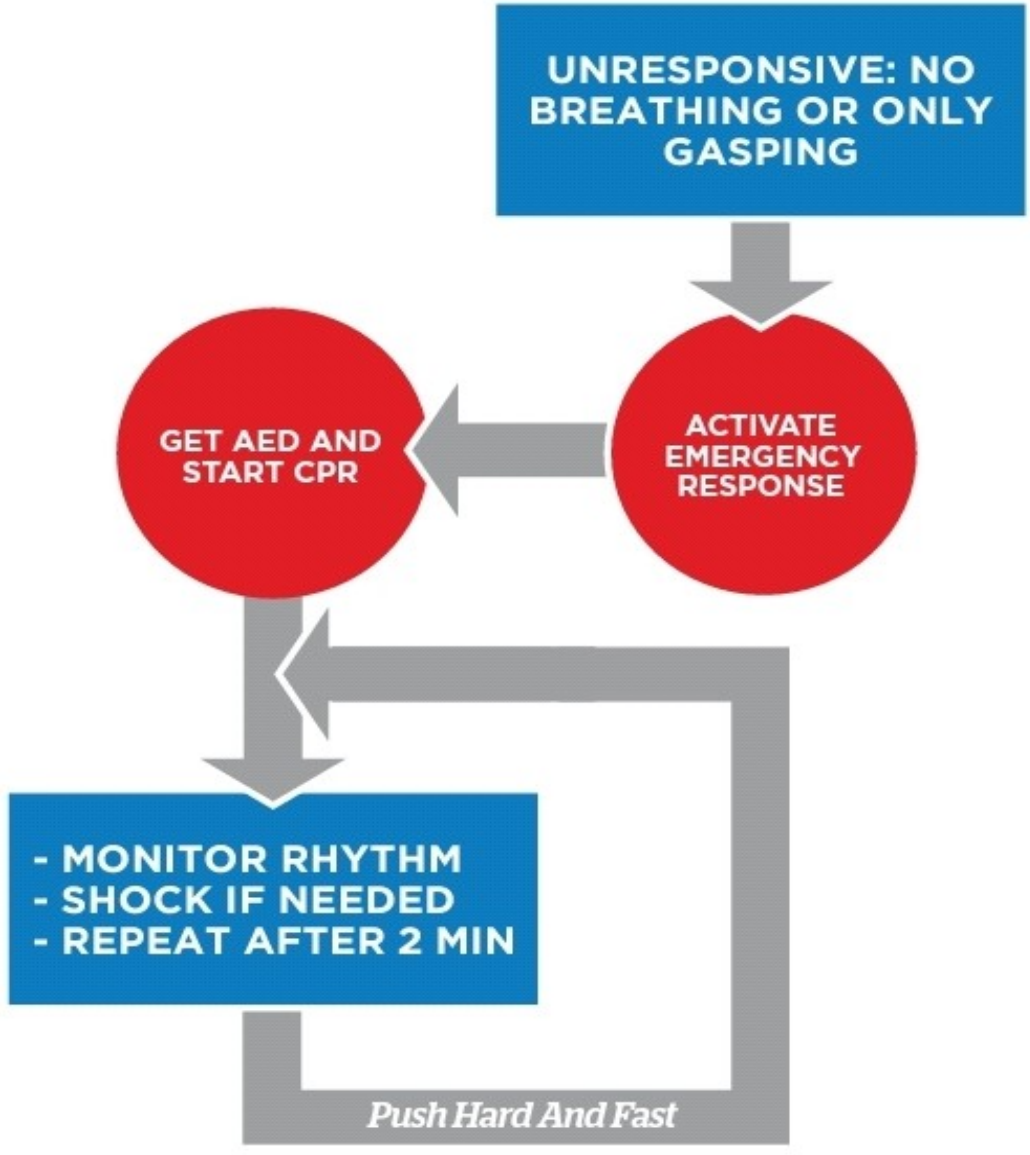


If you've had training, repeat, & 2 rescue breaths

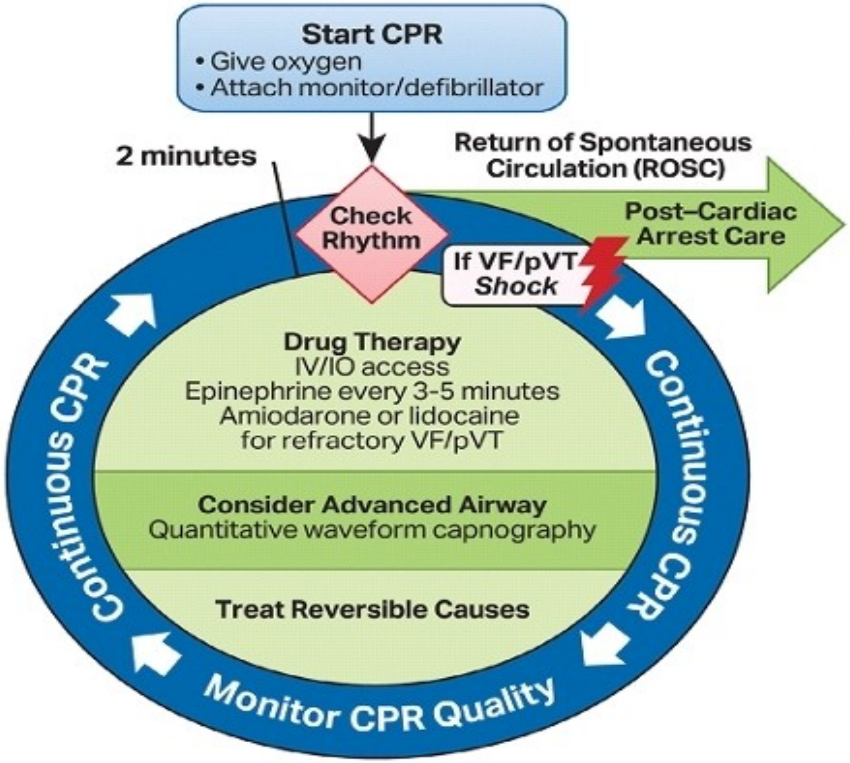
Figure 3. AHA Chains of Survival for adult IHCA and OHCA.



Simple Adult BLS Algorithm



Adult Cardiac Arrest Circular Algorithm



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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 $PETCO_2$ 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.
  or
- **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)

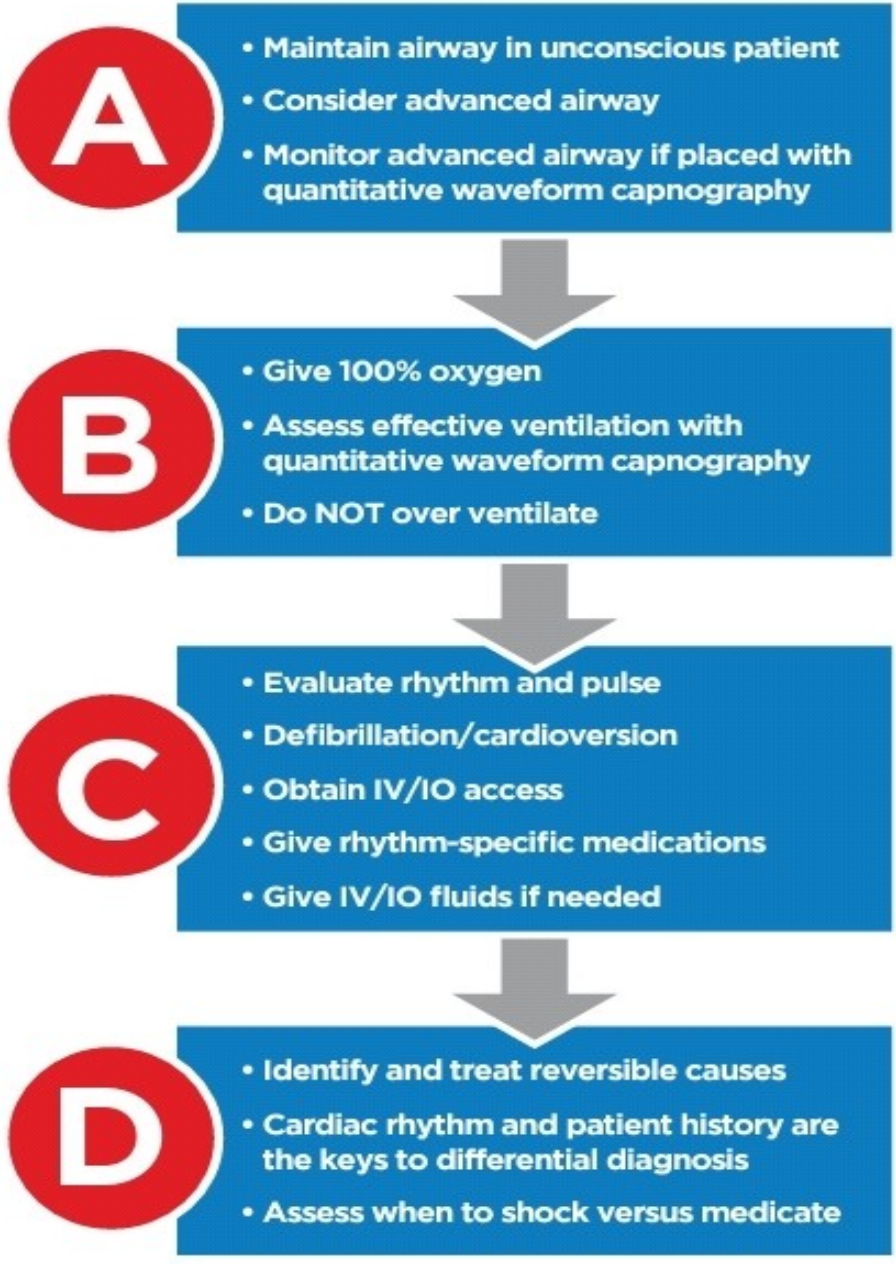
- Pulse and blood pressure
- Abrupt sustained increase in $PETCO_2$ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

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

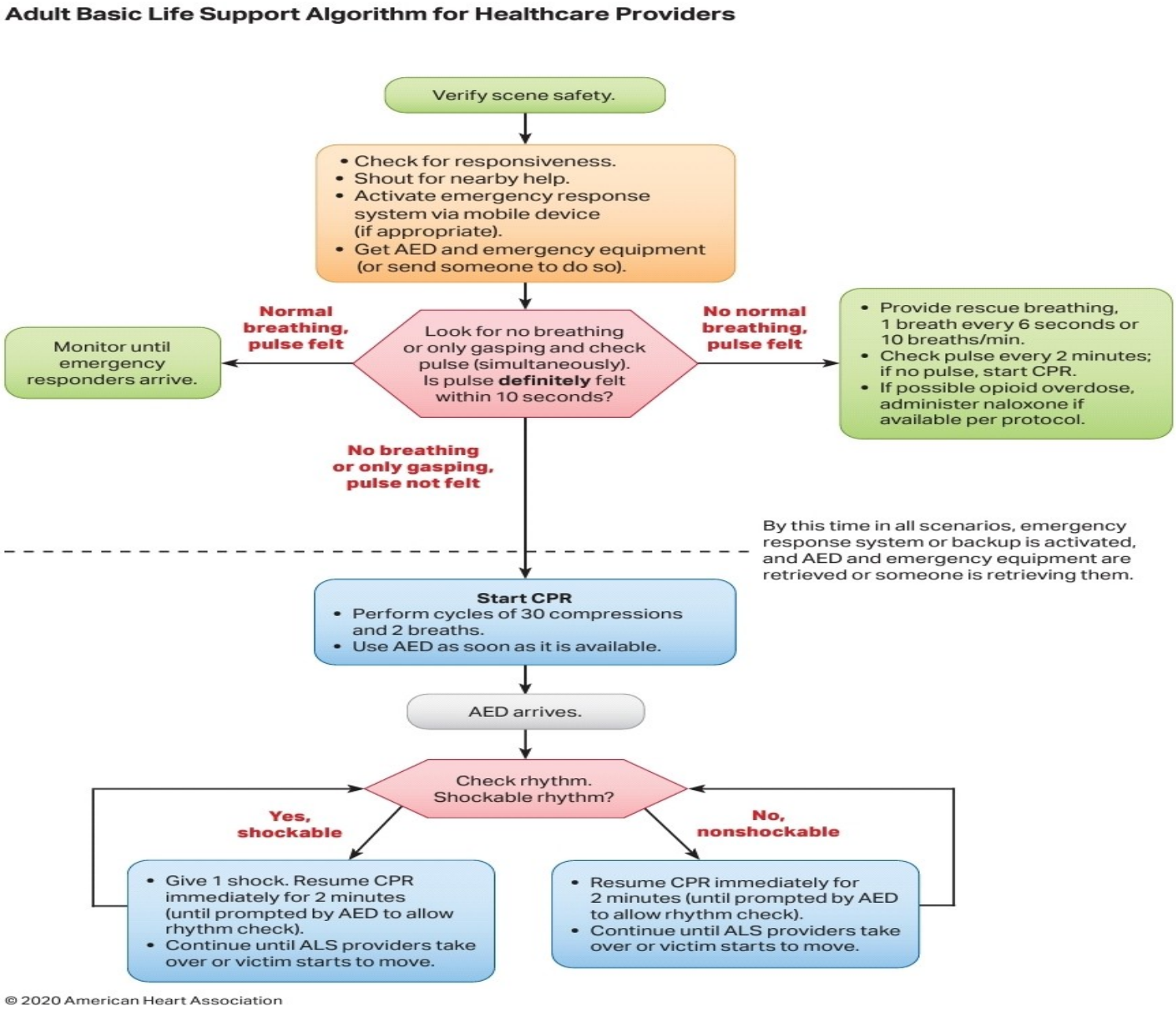
Figure 4. Adult Cardiac Arrest Circular Algorithm.

ACLS Survey

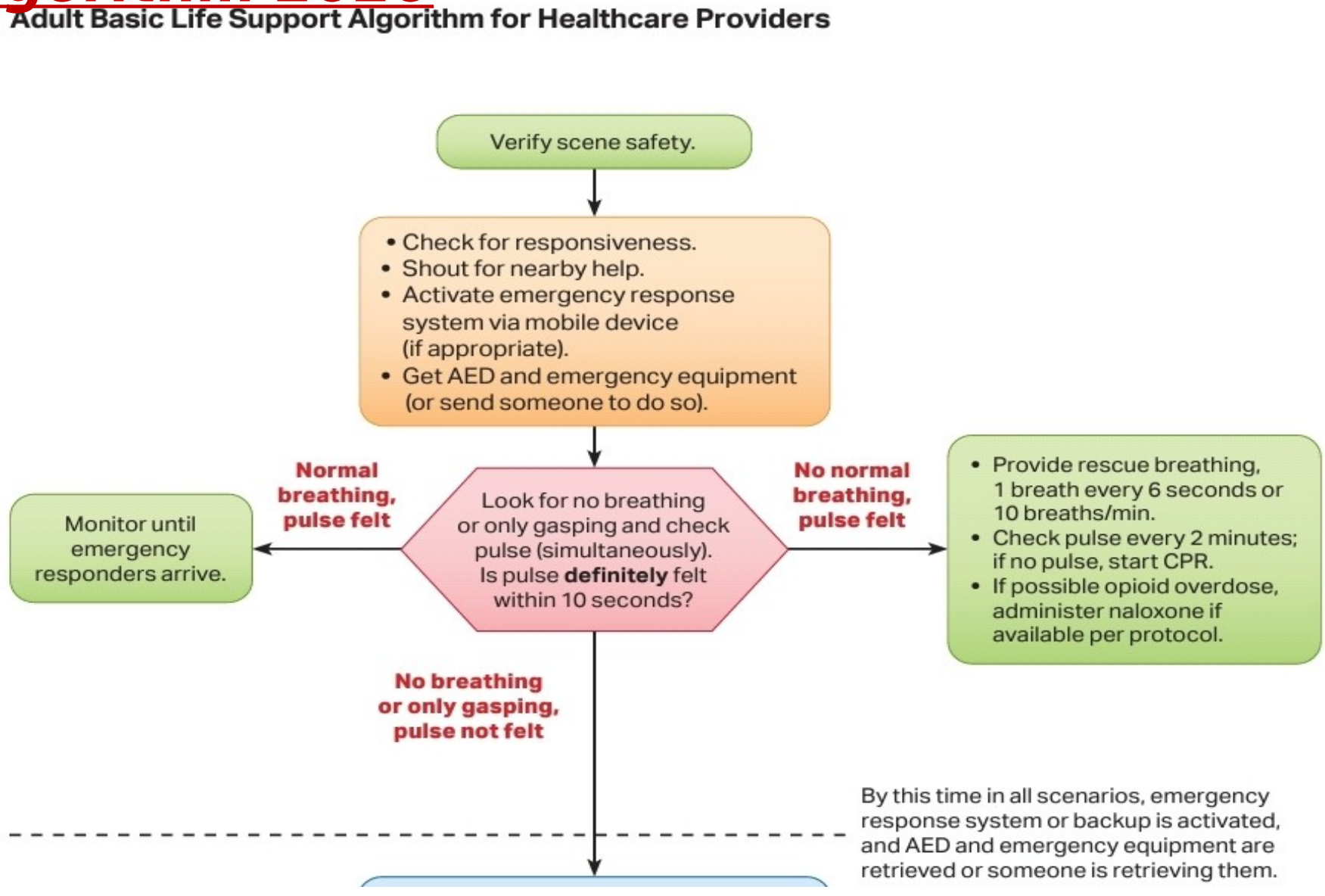

A
• Maintain airway in unconscious patient
• Consider advanced airway
• Monitor advanced airway if placed with quantitative waveform capnography
B
• Give 100% oxygen
• Assess effective ventilation with quantitative waveform capnography
• Do NOT over ventilate
C
• Evaluate rhythm and pulse
• Defibrillation/cardioversion
• 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

Adult BLS for health care provider

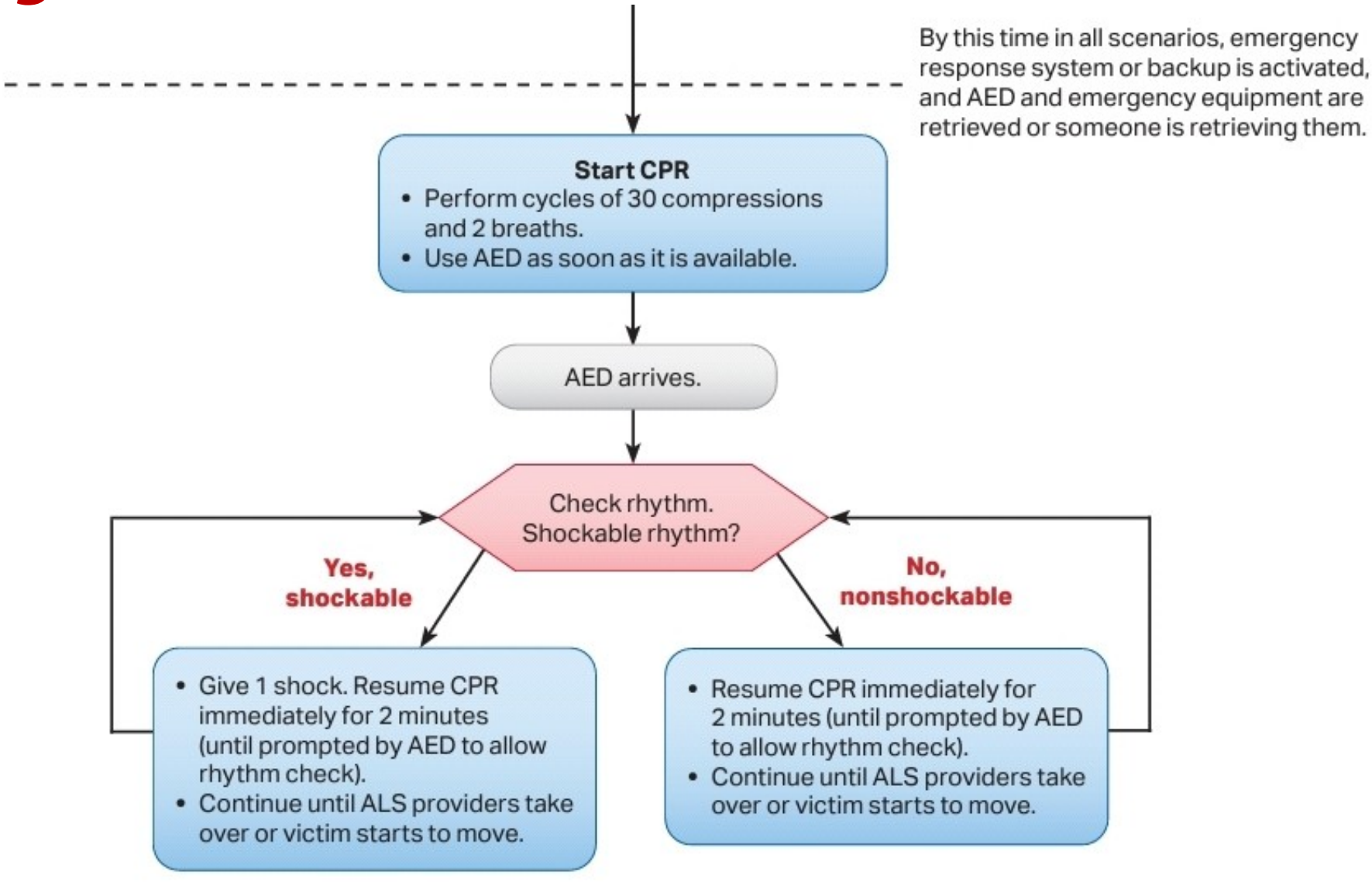
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Adult BLS for health care provider Algorithm 2020



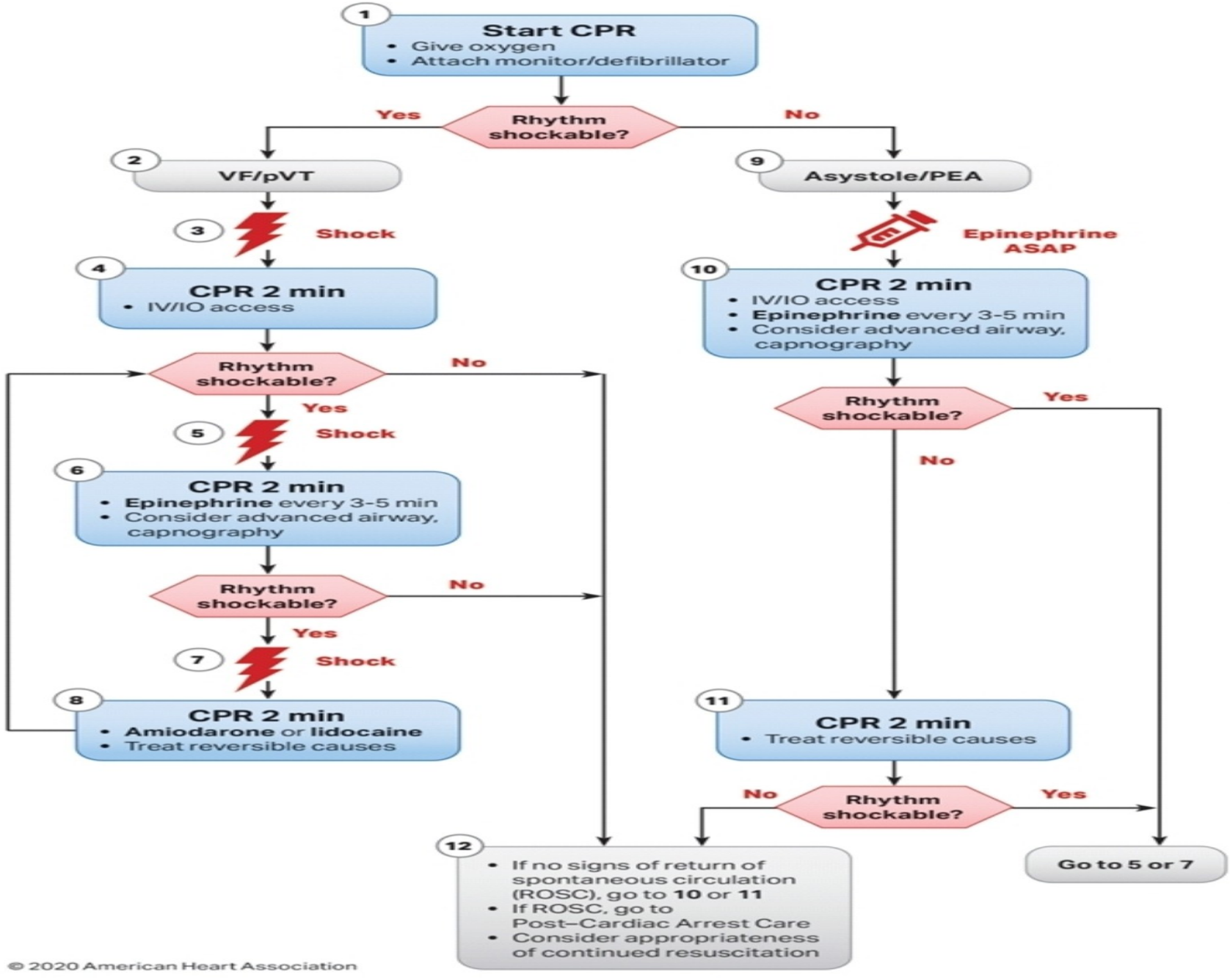
Adult BLS for health care provider Algorithm 2020



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Adult Cardiac Arrest Algorithm 2020

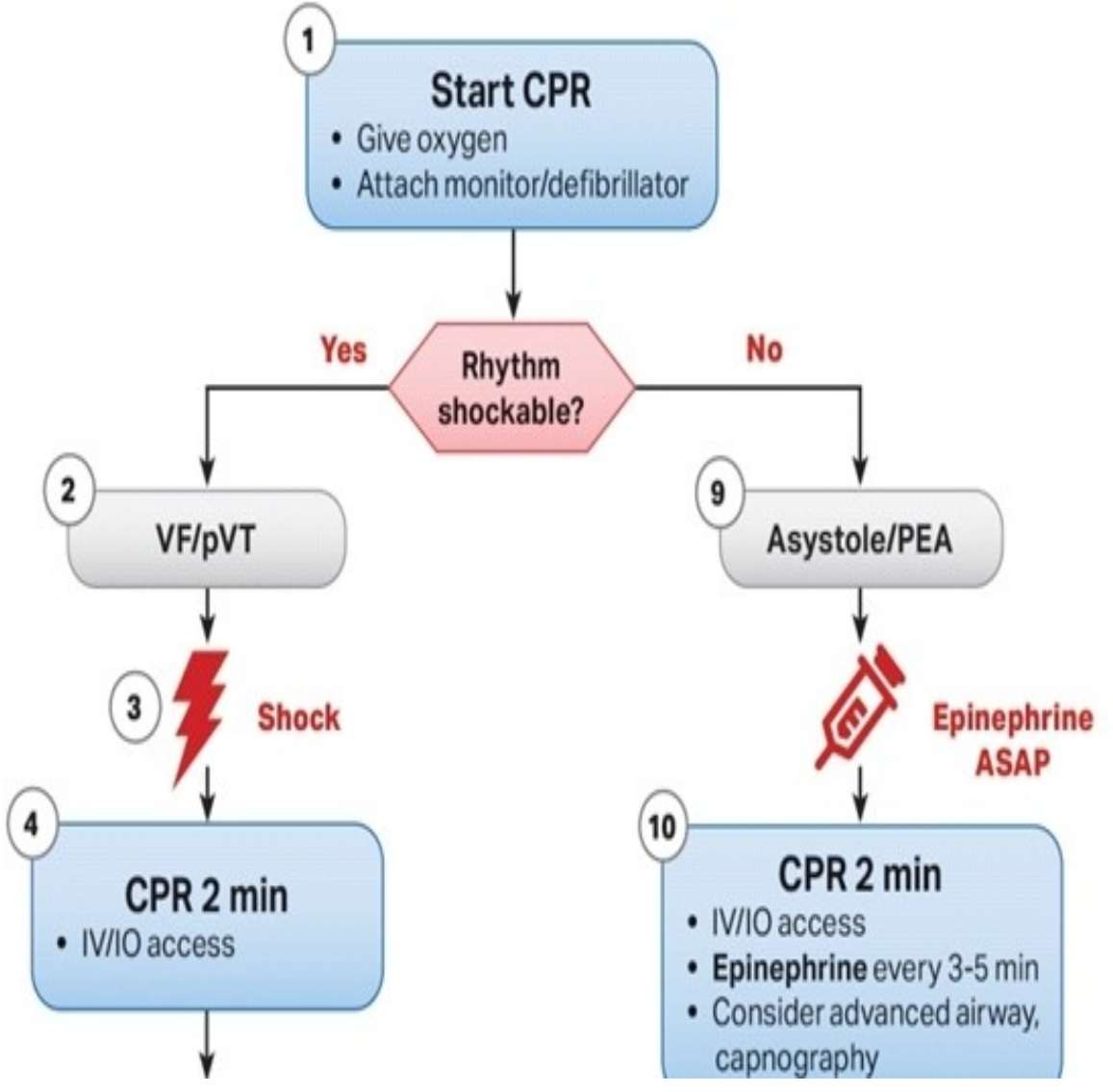
Figure 4. Adult Cardiac Arrest Algorithm.



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Adult Cardiac Arrest Algorithm.2020

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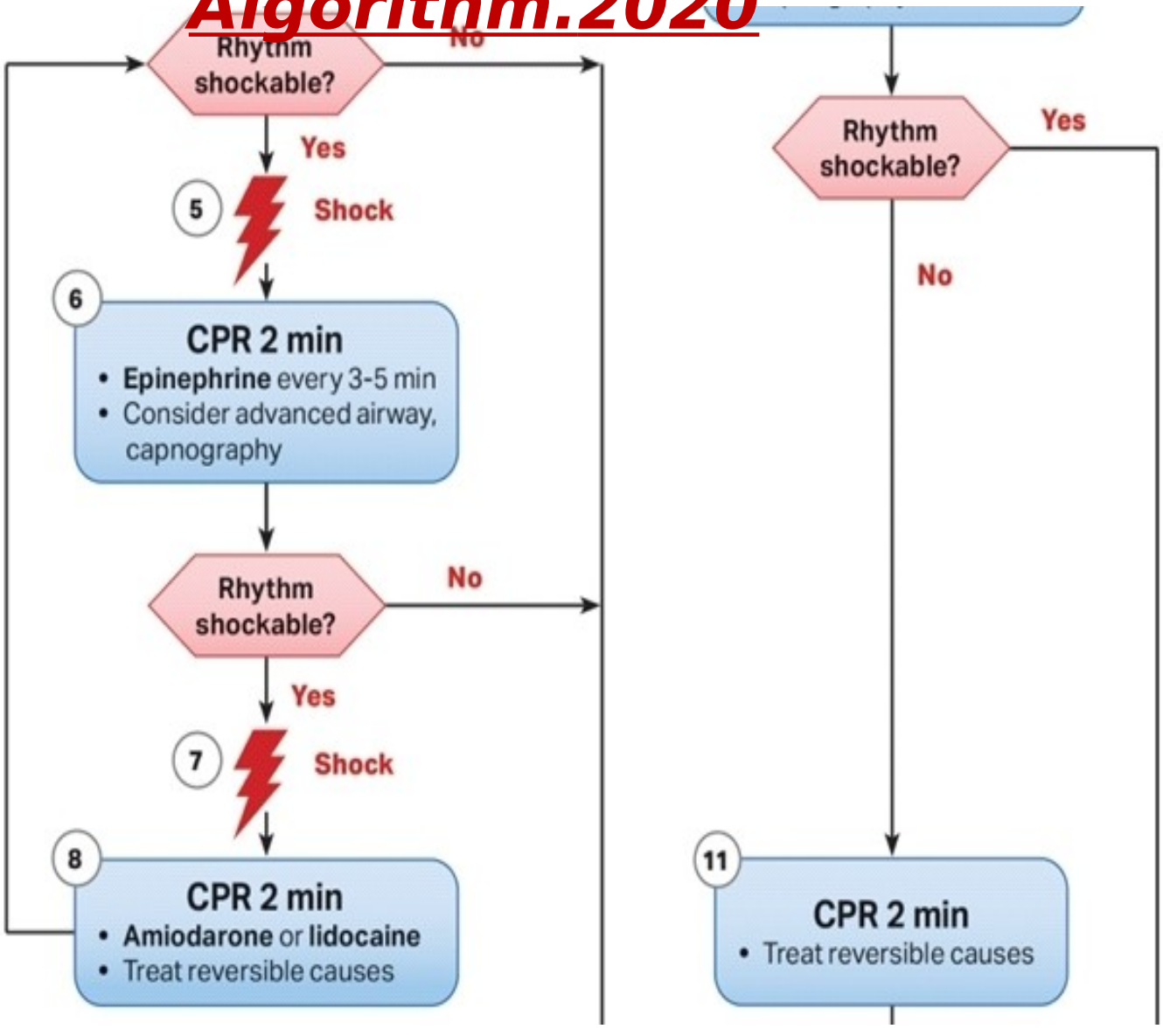
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Adult Cardiac Arrest Algorithm.2020



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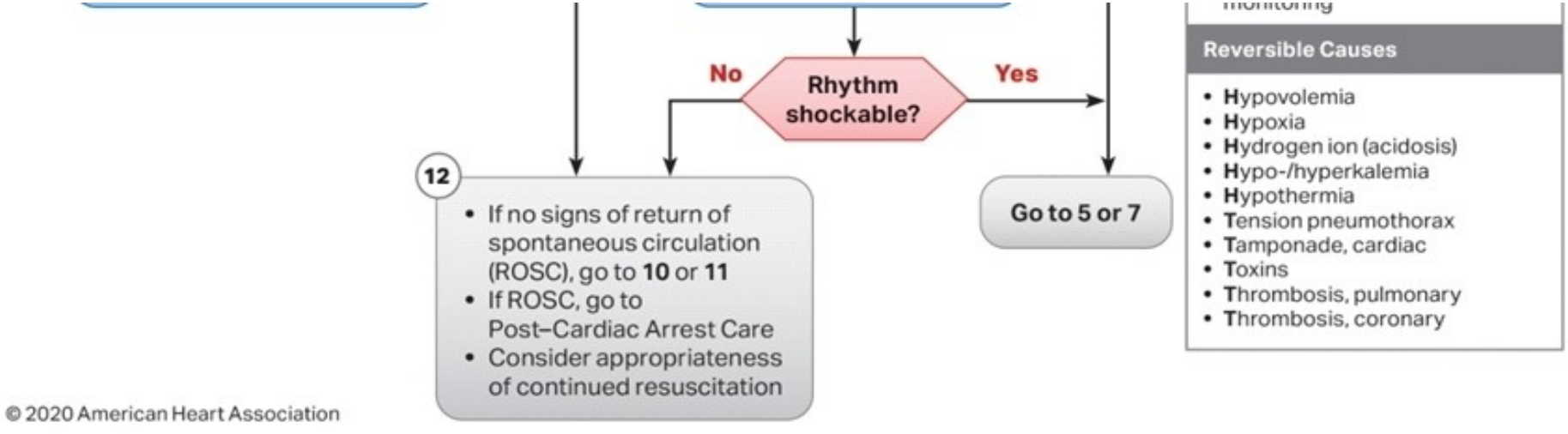
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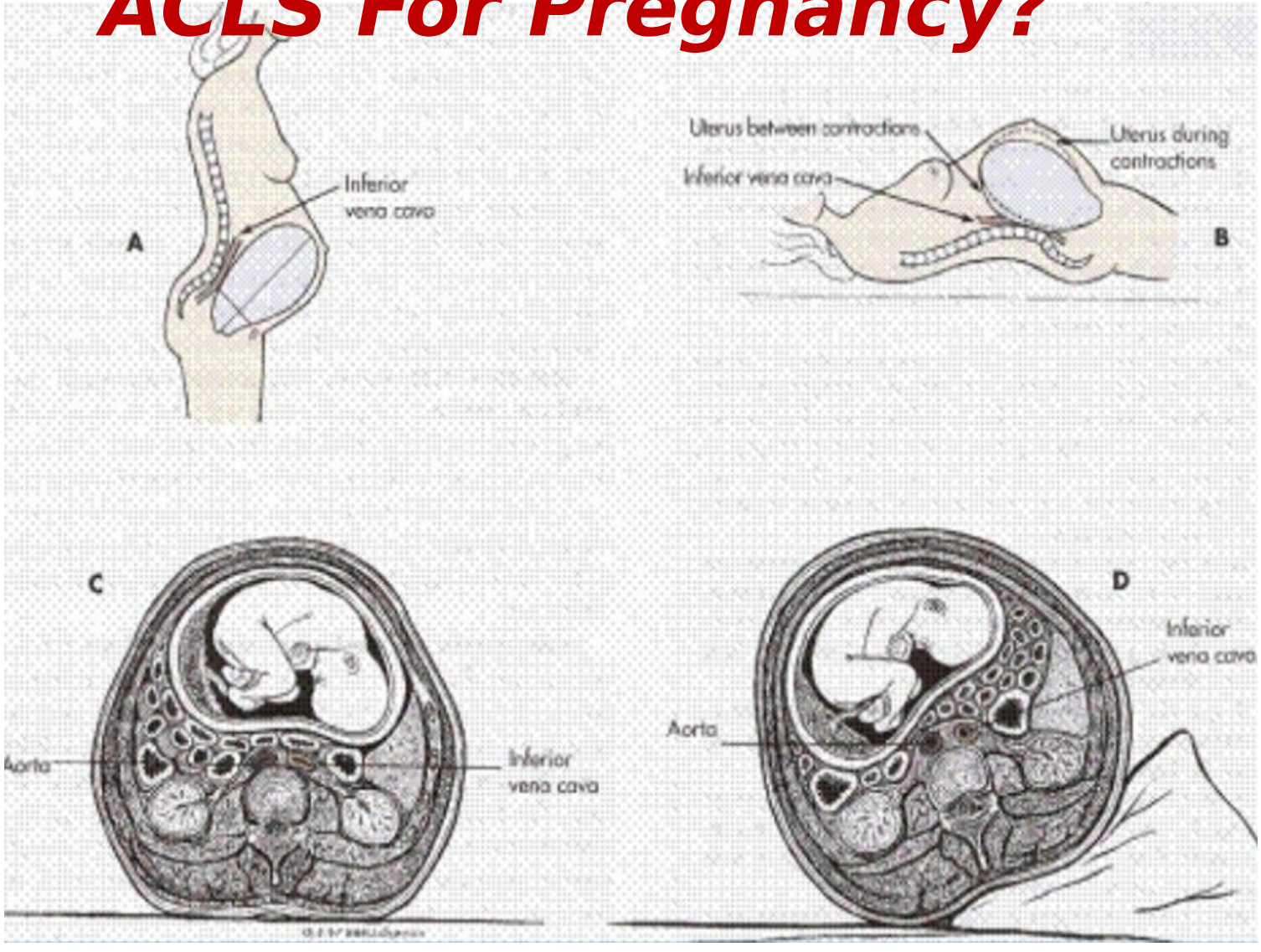
Adult Cardiac Arrest Algorithm.2020



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Modification in BLS & ACLS For Pregnancy

Why there is Modification in BLS & ACLS For Pregnancy?



Cardiac Arrest Associated with Pregnancy

The most common causes of maternal cardiac arrest

- ✓ Hemorrhage
- ✓ Cardiovascular diseases
- ✓ Amniotic fluid embolism
- ✓ Sepsis
- ✓ Aspiration pneumonitis
- ✓ PE
- ✓ Eclampsia

Important iatrogenic causes

- ✓ Hypermagnesemia
- ✓ Anesthetic complications

Recommendations for Planning and Preparation for Cardiac Arrest in Pregnancy		
COR	**LOE**	**Recommendations**
1	C-LD	1. Team planning for cardiac arrest in pregnancy should be done in collaboration with the obstetric, neonatal, emergency, anesthesiology, intensive care, and cardiac arrest services.
1	C-LD	2. Because immediate ROSC cannot always be achieved, local resources for a perimortem cesarean delivery should be summoned as soon as cardiac arrest in a woman in the second half of pregnancy is recognized.
1	C-EO	3. Protocols for management of OHCA in pregnancy should be developed to facilitate timely transport to a center with capacity to immediately perform perimortem cesarean delivery while providing ongoing resuscitation.

CPR TEAM



Suggested Composition of the Maternal Cardiac Arrest Team

A. Adult resuscitation team

B. Obstetrics: one obstetrician, one midwife or a nurse

C. Anaesthesia : obstetrical anaesthes iologist if available,
or staff anaesthes iologist, anaesthesia assistant if available

D. Emergency physician

E. Neonatology team: one nurse, one physician, one neonatal respiratory therapist

BLS Modification: Relief of Aortocaval Compression

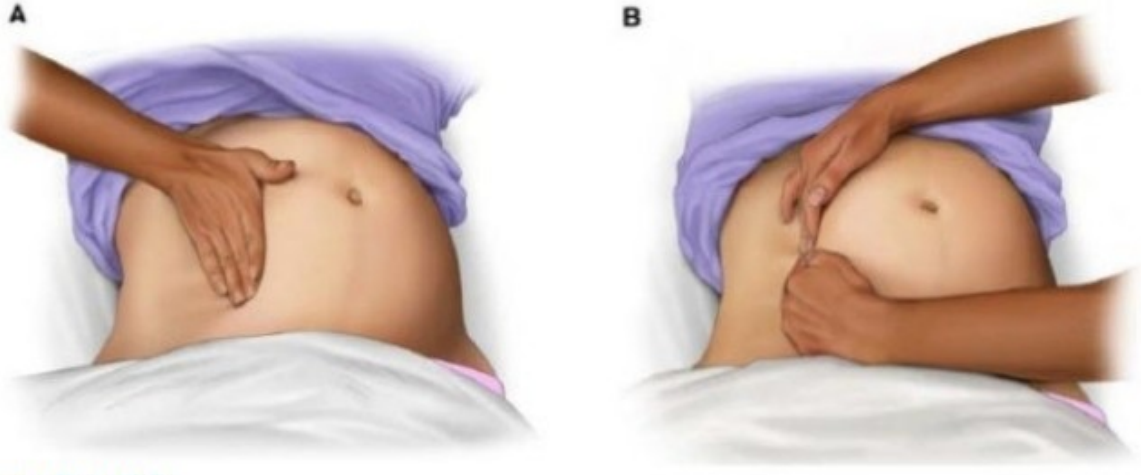
Priorities for the pregnant woman in cardiac arrest are provision of high-quality CPR and relief of aortocaval compression (Class I, LOE C-LD).

If the fundus height is at or above the level of the umbilicus, manual LUD can be beneficial in relieving aortocaval compression during chest compressions (Class IIa, LOE C-LD).

High-quality CPR

Relief of aortocaval compression





Lateral Uterine Displacement (LUD)

Lateral Uterine Displacement (LUD)







ALS Modification: Emergency Cesarean Delivery in Cardiac Arrest

PMCD should be summoned as soon as cardiac arrest is recognized in a woman in the second half of pregnancy (Class I, LOE C-LD).

Perimortem Cesarean Delivery (PMCD)



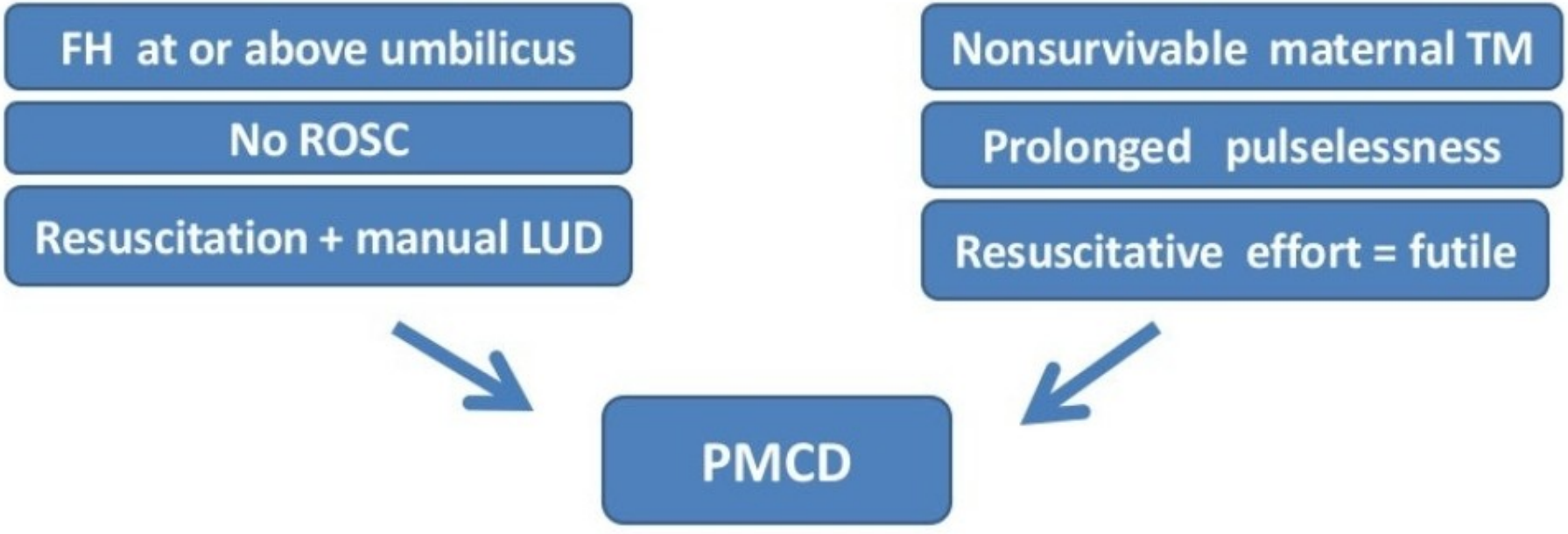
Systematic preparation and training are the keys to a successful response to such rare and complex events.

Care teams that may be called upon to manage these situations should develop and practice standard institutional responses to allow for smooth delivery of resuscitative care (Class I, LOE C-EO).

ALS Modification: Emergency Cesarean Delivery in Cardiac Arrest

During cardiac arrest, if the pregnant woman with a fundus height at or above the umbilicus has not achieved ROSC with usual resuscitation measures plus manual LUD, it is advisable to prepare to evacuate the uterus while resuscitation continues (Class I, LOE C-LD).

In situations such as nonsurvivable maternal trauma or prolonged pulselessness in which maternal resuscitative efforts are obviously futile, there is no reason to delay performing PMCD (Class I, LOE C-LD).



ALS Modification: Emergency Cesarean Delivery in Cardiac Arrest

PMCD should be considered at 4 minutes after onset of maternal cardiac arrest or resuscitative efforts (for the unwitnessed arrest)
if there is no ROSC (Class IIa, LOE C-EO).

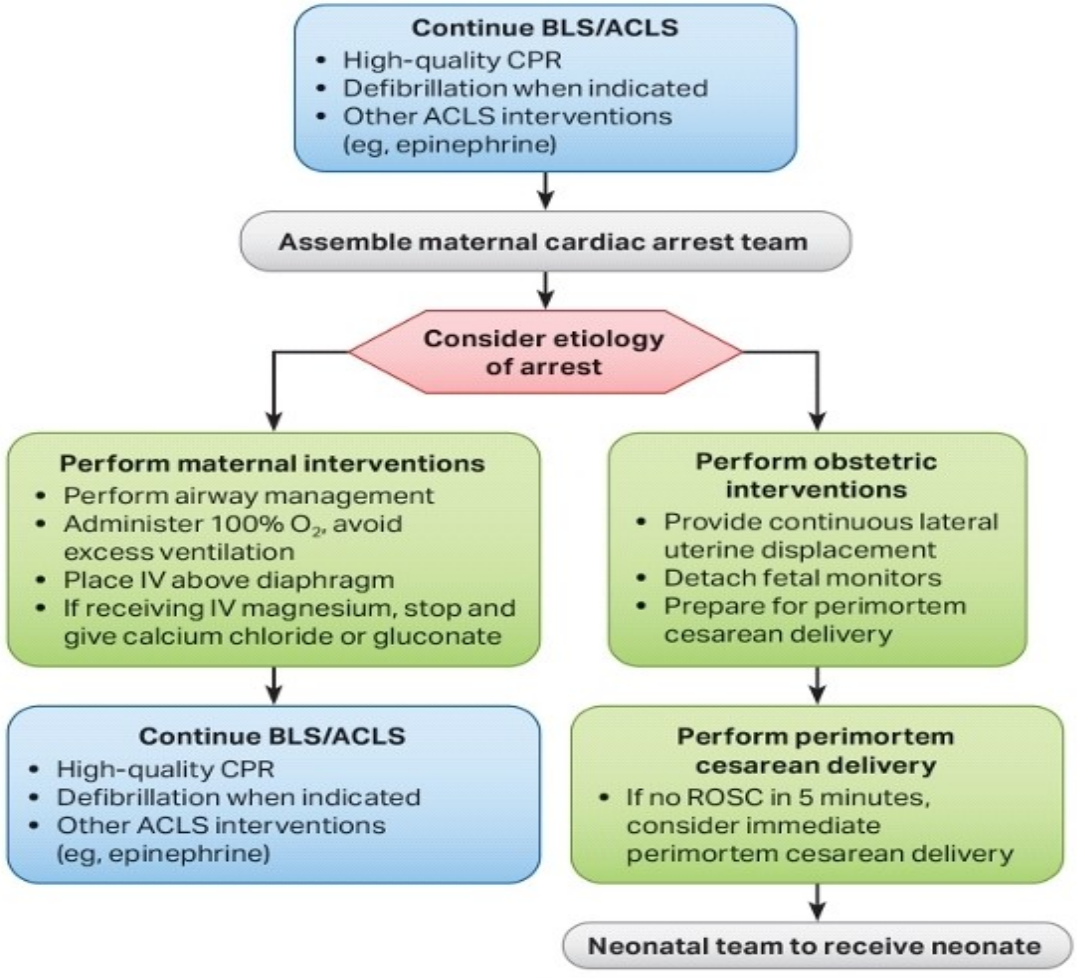


Recommendations for Resuscitation of Cardiac Arrest in Pregnancy		
COR	**LOE**	**Recommendations**
1	C-LD	1. Priorities for the pregnant woman in cardiac arrest should include provision of high-quality CPR and relief of aortocaval compression through left lateral uterine displacement.
1	C-LD	2. Because pregnant patients are more prone to hypoxia, oxygenation and airway management should be prioritized during resuscitation from cardiac arrest in pregnancy.
1	C-EO	3. Because of potential interference with maternal resuscitation, fetal monitoring should not be undertaken during cardiac arrest in pregnancy.
1	C-EO	4. We recommend targeted temperature management for pregnant women who remain comatose after resuscitation from cardiac arrest.
1	C-EO	5. During targeted temperature management of the pregnant patient, it is recommended that the fetus be continuously monitored for bradycardia as a potential complication, and obstetric and neonatal consultation should be sought.

Recommendations for Cardiac Arrest and PMCD		
COR	**LOE**	**Recommendations**
1	C-LD	1. During cardiac arrest, if the pregnant woman with a fundus height at or above the umbilicus has not achieved ROSC with usual resuscitation measures plus manual left lateral uterine displacement, it is advisable to prepare to evacuate the uterus while resuscitation continues.
1	C-LD	2. In situations such as nonsurvivable maternal trauma or prolonged pulselessness, in which maternal resuscitative efforts are considered futile, there is no reason to delay performing perimortem cesarean delivery in appropriate patients.
2a	C-EO	3. To accomplish delivery early, ideally within 5 min after the time of arrest, it is reasonable to immediately prepare for perimortem cesarean delivery while initia BLS and ACLS interventions are being performed.

Cardiac Arrest in Pregnancy In-Hospital ACLS, 2020

Figure 9. Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm.



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Maternal Cardiac Arrest

- Team planning should be done in collaboration with the obstetric, neonatal, emergency, anesthesiology, intensive care, and cardiac arrest services.
- Priorities for pregnant women in cardiac arrest should include provision of high-quality CPR and relief of aortocaval compression with lateral uterine displacement.
- The goal of perimortem cesarean delivery is to improve maternal and fetal outcomes.
- Ideally, perform perimortem cesarean delivery in 5 minutes, depending on provider resources and skill sets.

Advanced Airway

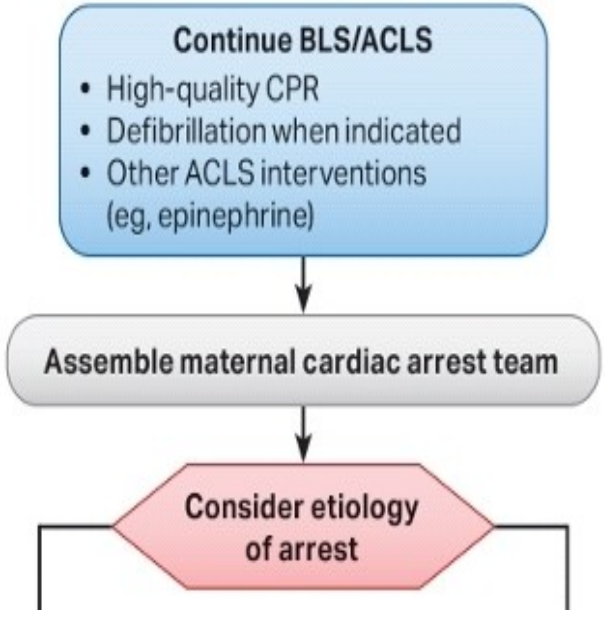
- In pregnancy, a difficult airway is common. Use the most experienced provider.
- Provide endotracheal intubation or supraglottic advanced airway.
- Perform waveform capnography or capnometry to confirm and monitor ET tube placement.
- Once advanced airway is in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions.

Potential Etiology of Maternal Cardiac Arrest

A Anesthetic complications
B Bleeding
C Cardiovascular
D Drugs
E Embolic
F Fever
G General nonobstetric causes of cardiac arrest (H's and T's)
H Hypertension

Cardiac Arrest in Pregnancy In-Hospital ACLS .2020

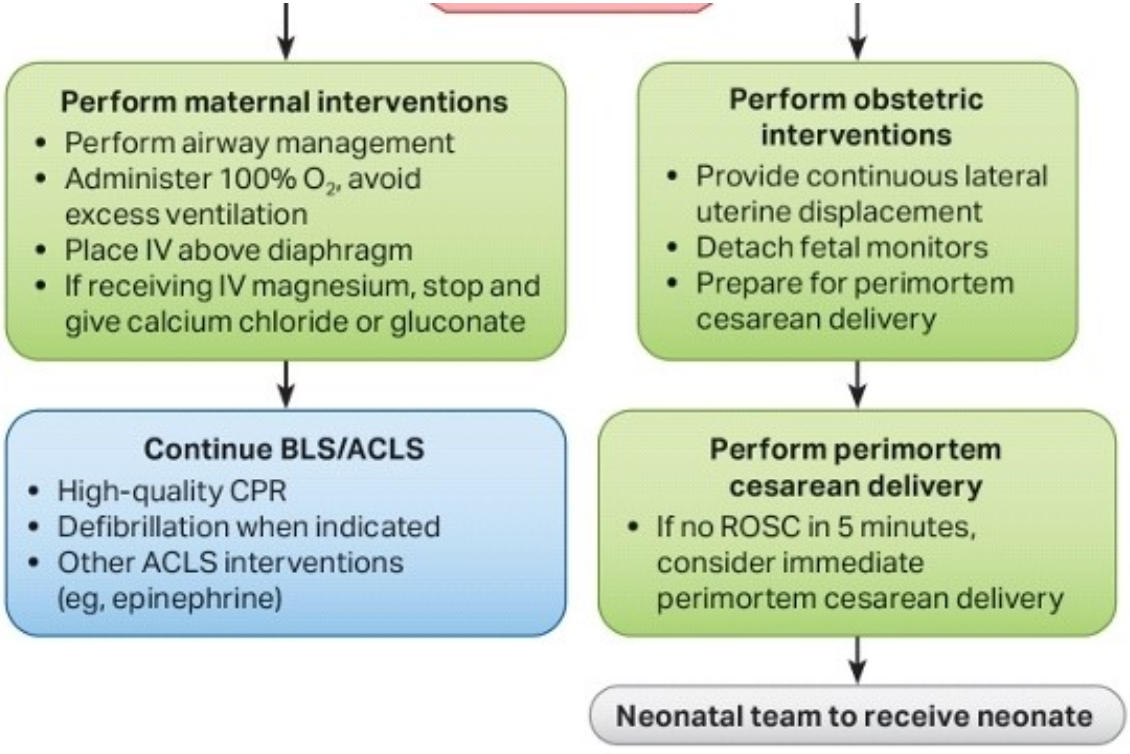
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Cardiac Arrest in Pregnancy In-Hospital ACLS .2020



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Cardiac Arrest in Pregnancy

2020 (New): Because pregnant patients are more prone to hypoxia, oxygenation and airway management should be prioritized during resuscitation from cardiac arrest in pregnancy.

2020 (New): Because of potential interference with maternal resuscitation, fetal monitoring should not be undertaken during cardiac arrest in pregnancy.

2020 (New): We recommend targeted temperature management for pregnant women who remain comatose after resuscitation from cardiac arrest.

2020 (New): During targeted temperature management of the pregnant patient, it is recommended that the fetus be continuously monitored for bradycardia as a potential complication, and obstetric and neonatal consultation should be sought.

Why: Recommendations for managing cardiac arrest in pregnancy were reviewed in the 2015 Guidelines Update and a 2015 AHA scientific statement.[7] Airway, ventilation, and oxygenation are particularly important in the setting of pregnancy because of an increase in maternal metabolism, a decrease in functional reserve capacity due to the gravid uterus, and the risk of fetal brain injury from hypoxemia.

Evaluation of the fetal heart is not helpful during maternal cardiac arrest, and it may distract from necessary resuscitation elements. In the absence of data to the contrary, pregnant women who survive cardiac arrest should receive targeted temperature management just as any other survivors would, with consideration for the status of the fetus that may remain in utero.

Why Performing PMCD in Cardiac Arrest?

- Emergency cesarean section in maternal cardiac arrest indicate a return of spontaneous circulation or improvement in maternal hemodynamic status only after the uterus has been emptied.

- Recent studies indicates ROSC and maternal hemodynamic stability of the mother and normal neurological outcome of the neonate post perimortem casarean.

- The critical point to remember is that both mother and infant may die if the provider cannot restore blood flow to the mother's heart.

Decision Making for PMCD

Gestational age less than 20 weeks

- Need not be considered because this size gravid uterus is unlikely to significantly compromise maternal cardiac output

Gestational age approximately 20 to 23 weeks

- Perform to enable successful resuscitation of the mother, not the survival of the delivered infant, which is unlikely at this gestational age

Gestational age greater than 24 weeks

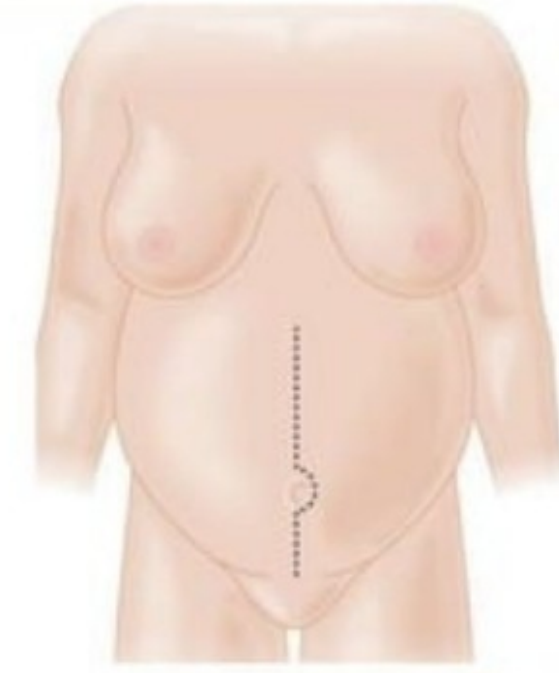
- Perform to save the life of both the mother & infant

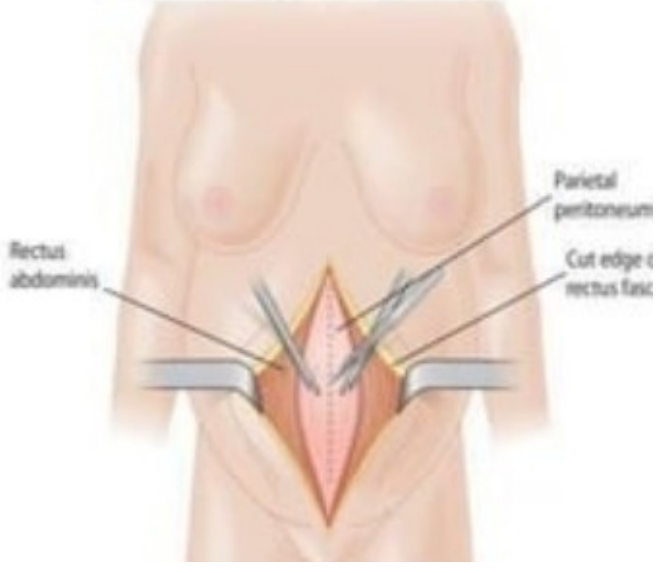
The following can increase the infant's survival:

- Short interval between the mother's arrest & the infant's delivery
- Perimortem caesarean section to be performed within 4 mins of cardiac arrest and delivery of the foetus within 5 mins.
- No sustained pre arrest hypoxia in the mother
- Minimal or no signs of fetal distress before the mother's cardiac arrest
- Aggressive & effective resuscitative efforts for the mother
- Delivery to be performed in a medical center with easy access to NICU.

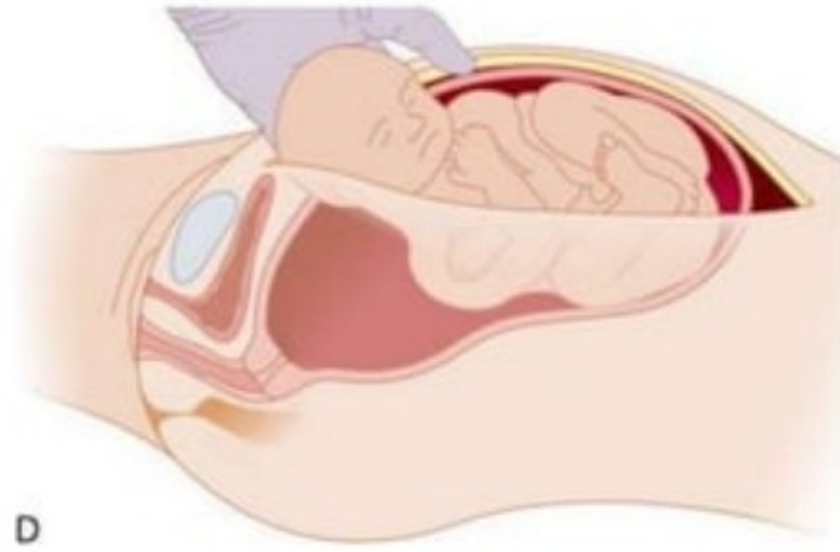
Perimortum Ceaserean Delivery PMCD

- Prognosis for intact survival of infant is best if delivered within 5 mins of maternal arrest.
- Goal : to remove foetus and continue resuscitation of both mother and foetus
- During the procedure maternal CPR has to be continued.
- Vertical midline abdominal incision from 4 -5 cm below xiphoid process to pubic symphysis
- Incise through the fascia and muscles into the peritoneum





- Vertical uterine incision .
- Delivery of the fetus
- Manual removal of placenta and its membranes.
- Closure of abdomen may be delayed until maternal blood pressure and pulse is restored.
- Dilute oxytocin 10 units in 9 ml NS to prevent uterine atony.
- INFORMED CONSENT FOR PERIMORTEM CS IS NOT NECESSARY





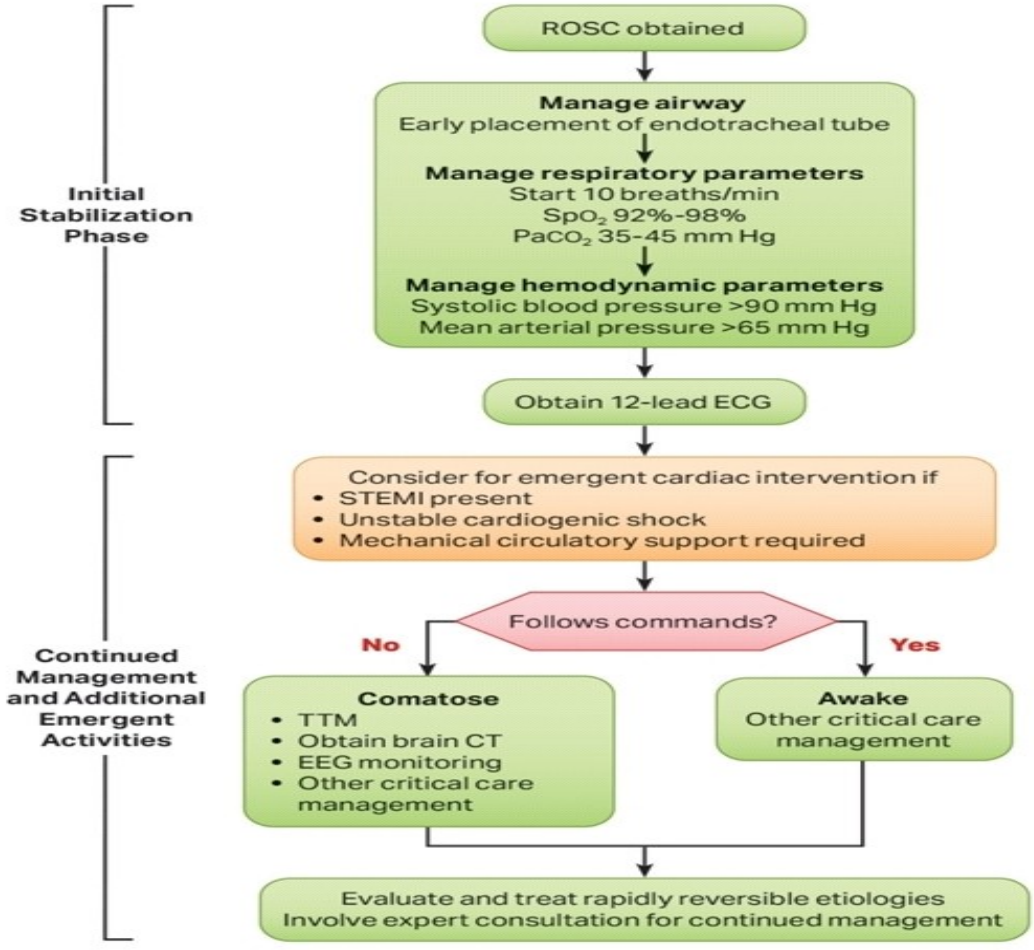
COMPLICATIONS FROM CPR

-Maternal problems secondary to CPR and ACLS
include rib fractures, liver lacerations, uterine rupture,
hemothorax, and hemopericardium

-Fetal complications include cardiac dysrhythmias
from maternal defibrillation and ACLS drugs, central nervous system toxicity from ACLS drugs,
and altered uteroplacental blood flow from

Post-Cardiac Arrest Care Algorithm 2020

Figure 7. Adult Post-Cardiac Arrest Care Algorithm.



Initial Stabilization Phase

Resuscitation is ongoing during the post-ROSC phase, and many of these activities can occur concurrently. However, if prioritization is necessary, follow these steps:

- Airway management: Waveform capnography or capnometry to confirm and monitor endotracheal tube placement
- Manage respiratory parameters: Titrate FIO_2 for SpO_2 92%-98%; start at 10 breaths/min; titrate to $PaCO_2$ 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

These evaluations should be done concurrently so that decisions on targeted temperature management (TTM) receive high priority as cardiac interventions.

- 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
  - Continuously monitor core temperature (esophageal, rectal, bladder)
  - Maintain normoxia, normocapnia, euglycemia
  - Provide continuous or intermittent electroencephalogram (EEG) monitoring
  - Provide lung-protective ventilation

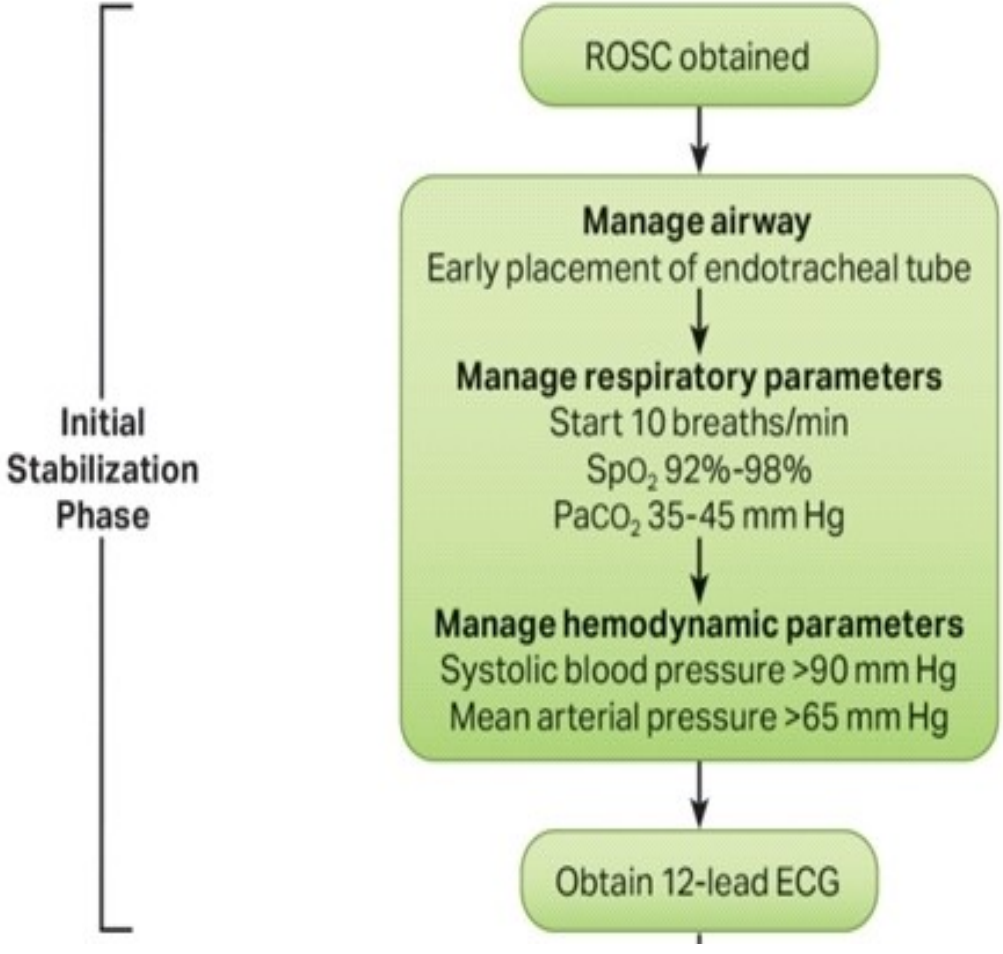
H's and T's

Hypovolemia
Hypoxia
Hydrogen ion (acidosis)
Hypokalemia/**h**yperkalemia
Hypothermia
Tension pneumothorax
Tamponade, cardiac
Toxins
Thrombosis, pulmonary
Thrombosis, coronary

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Post-Cardiac Arrest Care Algorithm 2020

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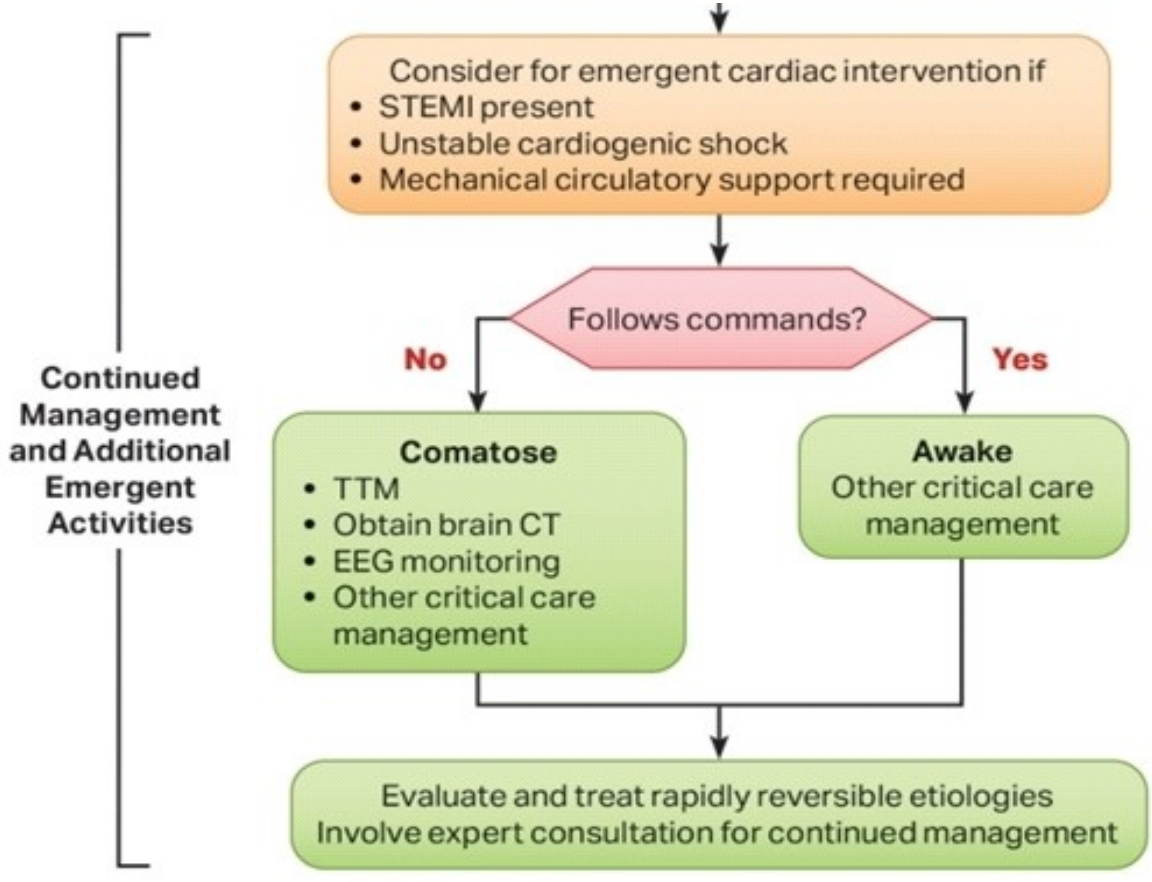


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These evaluations should be done concurrently so that decisions on targeted temperature management (TTM) receive high priority as cardiac interventions.

- 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
  - Continuously monitor core temperature (esophageal, rectal, bladder)
  - Maintain normoxia, normocapnia, euglycemia
  - Provide continuous or intermittent electroencephalogram (EEG) monitoring
  - Provide lung-protective ventilation

Obstetric Cardiac Arrest

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Alterations in maternal physiology and exacerbations of pregnancy related pathologies must be considered. Priorities include calling the appropriate team members, relieving aortocaval compression, effective cardiopulmonary resuscitation (CPR), consideration of causes and performing a timely emergency hysterotomy (perimortem caesarean section) when ≥ 20 weeks.

START

1. **Confirm cardiac arrest** and **call for help. Declare 'Obstetric cardiac arrest'**
   - Team for mother and team for neonate if > 20 weeks
2. **Lie flat, apply manual uterine displacement to the left**
   - Or left lateral tilt (from head to toe at an angle of 15–30° on a firm surface)
3. **Commence CPR** and request **cardiac arrest trolley**
   - Standard CPR ratios and hand position apply
   - **Evaluate potential causes (Box A)**
4. **Identify team leader, allocate roles including scribe**
   - Note time
5. **Apply defibrillation pads and check cardiac rhythm** (defibrillation is safe in pregnancy and no changes to standard shock energies are required))
   - if VF / pulseless VT → defibrillation and first adrenaline and amiodarone after 3rd shock
   - If PEA / asystole → resume CPR and give first adrenaline immediately
   - Check rhythm and pulse every 2 minutes
   - Repeat adrenaline every 3-5 minutes

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6 **Maintain airway and ventilation**

- Give 100% oxygen using bag-valve-mask device
- Insert supraglottic airway with drain port *–or–* tracheal tube if trained to do so (intubation may be difficult, and airway pressures may be higher)
- Apply waveform capnography monitoring to airway
- If expired CO_2 is absent, presume oesophageal intubation until absolutely excluded

7 **Circulation**

- I.V. access above the diaphragm, if fails or impossible use upper limb intraosseous (IO)
- See **Box B** for reminders about drugs
- Consider extracorporeal CPR (ECPR) if available

8 **Emergency hysterotomy (perimortem caesarean section)**

- Perform if ≥ 20 weeks gestation, to improve maternal outcome
- Perform immediately if maternal fatal injuries or prolonged pre-hospital arrest
- Perform by 5 minutes if no return of spontaneous circulation

9 **Post resuscitation from haemorrhage - activate Massive Haemorrhage Protocol**

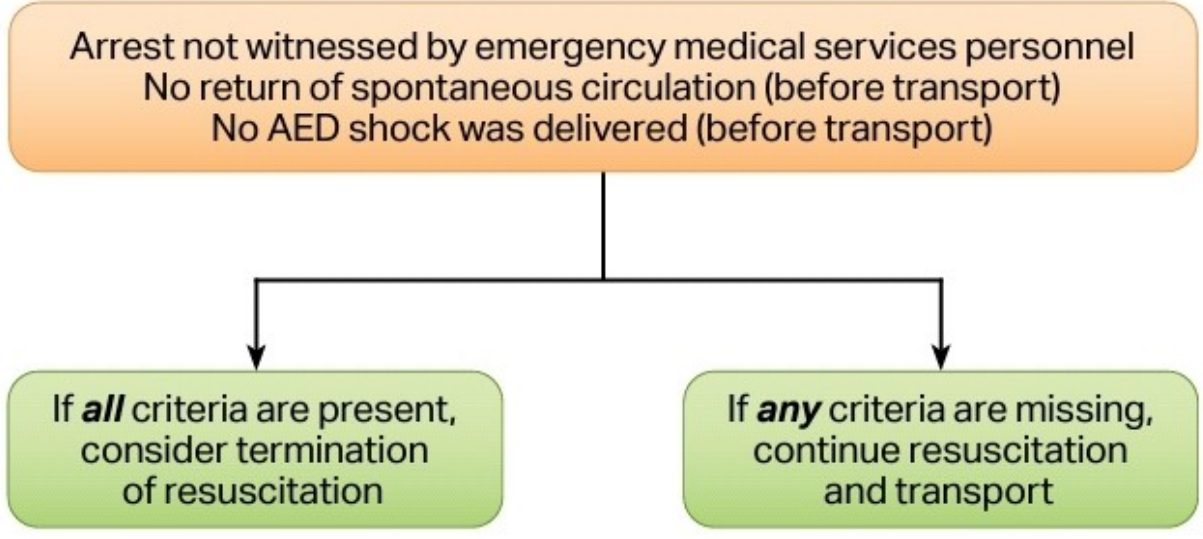
Consider uterotonic drugs, fibrinogen and tranexamic acid

Uterine tamponage / sutures, aortic compression, hysterectomy

When to prolong, when to stop CPR

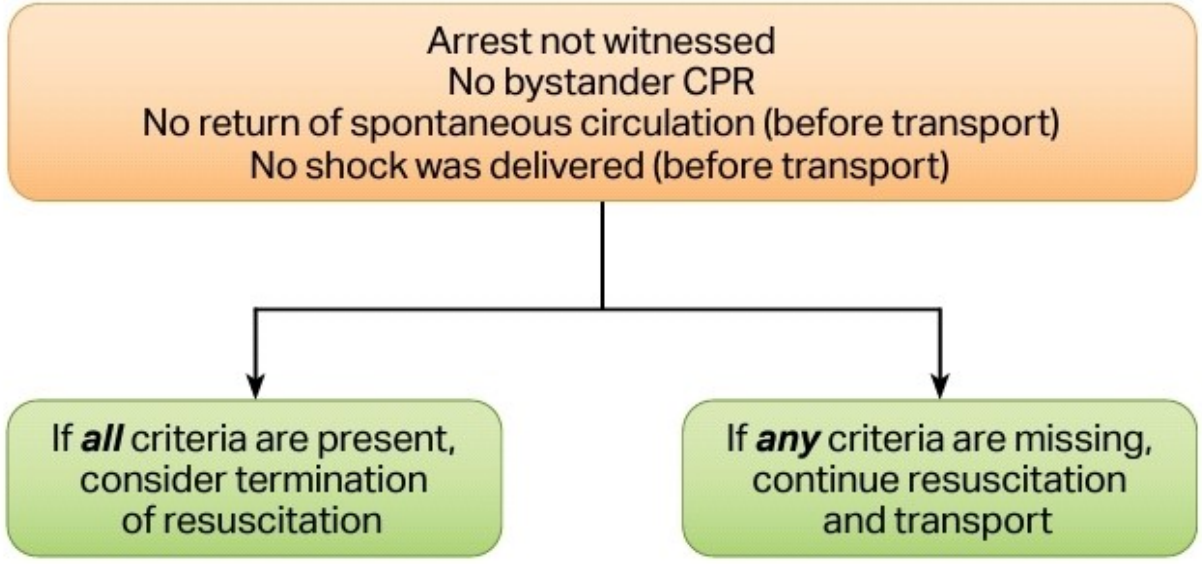


BLS Termination of Resuscitation



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ACLS Termination of Resuscitation



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THANK YOU

