# AMERICAN HEART ASSOCIATION ALGORITHMS 2015

- BLS - ACLS - PALS - SPECIAL CASES



I have given the task of collecting the algorithms of the American Heart Association and bring it to you in one document that will be of benefit and can take advantage of materials already summarized in regard to the most important changes in the AHA 2015.

I want to clarify that this does not represent any organization that is free, voluntary and without any compensation to me, is only in order to educate ourselves.

All material was obtained is dare the website of the American Heart Association.

-Manuel Cruz Soto, AHA instructor

## TOP 3 CHANGES TO **BLS**

2015 AHA Guideline Highlights

# **Top 3 Changes to**



Read the complete 2015 AHA Guidelines at this link: https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/





## Not breathing? Naloxone!

The administration of naloxone (IM or IN) by trained BLS providers is reasonable in patients with abnormal breathing and suspected opioid ingestion.

## Opioid overdose education

Training to treat an opioid overdose can be provided to opioid abusers and their close contacts.









## Manual spinal immobilization

In suspected spinal cord injuries, lay rescuers should manually immobilize the spine with their hands rather than using immobilization devices.

https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/ From: For more Canadian content by the HSFC, check out http://goo.gl/fHu8lc

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Special thanks to Laurie Morrison and the American Heart Association.



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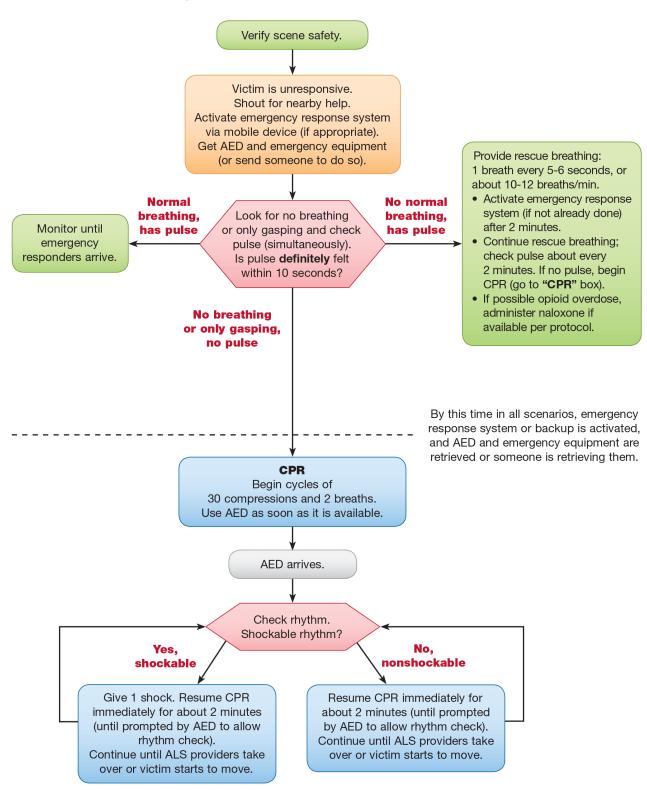


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## BLS FOR HEALTH CARE PROVIDERS

## GUIDELINES 2015 CPR & ECC

BLS Healthcare Provider
Adult Cardiac Arrest Algorithm — 2015 Update



## **OPIOID ALGORITHM (ADULT)**

#### Opioid-Associated Life-Threatening Emergency (Adult) Algorithm—New 2015

#### Assess and activate.

Check for unresponsiveness and call for nearby help. Send someone to call 9-1-1 and get AED and naloxone. Observe for breathing vs no breathing or only gasping.

#### Begin CPR.

If victim is unresponsive with no breathing or only gasping, begin CPR.\*
If alone, perform CPR for about 2 minutes before leaving to phone 9-1-1 and get naloxone and AED.

#### Administer naloxone.

Give naloxone as soon as it is available. 2 mg intranasal or 0.4 mg intramuscular. May repeat after 4 minutes.

## Does the person respond?

Yes

At any time, does the person move purposefully, breathe regularly, moan, or otherwise respond?

#### Na

## Continue CPR and use AED as soon as it is available.

Continue until the person responds or until advanced help arrives.

#### Stimulate and reassess.

Continue to check responsiveness and breathing until advanced help arrives. If the person stops responding, begin CPR and repeat naloxone.

\*CPR technique based on rescuer's level of training.

## **TOP 5 CHANGES TO ACLS**

2015 AHA Guideline Highlights

# Top 5 Changes to



Read the complete 2015 AHA Guidelines at this link: https://eccguidelines.hearf.org/index.php/circulation/cpr-ecc-guidelines-2/





#### Vasopressin is OUT

In an effort to streamline and simplify cardiac arrest algorithms, vasopressin has been removed. Epinephrine & vasopressin have equivalent outcomes.

### Ultrasound for ETT confirmation

Ultrasound has been added as an additional method for confirming endotracheal tube placement.









### If you can't shock, give epi ASAP

Non-shockable rhythms (e.g. PEA) may have distinct pathophysiologic origins. It is reasonable to administer epinephrine ASAP to these non-shockable rhythms.

#### Use maximum Oxygen during CPR

Use maximum FiO2 during CPR. This recommendation was strengthened, but remember to titrate your oxygen after ROSC.









### **ECMO** is a possible alternative

/enoarterial extracorporeal membrane oxygenation ECMO) is a possible alternative to conventional CPR in patients with refractory cardiac arrest if the etiology is thought to be reversible.

https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/ \* For more Canadian content by the HSFC, check out http://goo.gl/fHu8lc

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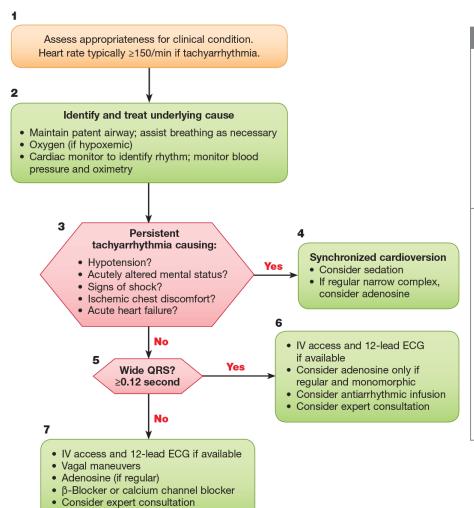
### **ADULT BRADYCARDIA**

Adult Bradycardia With a Pulse Algorithm

#### Assess appropriateness for clinical condition. Heart rate typically <50/min if bradyarrhythmia. 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; don't delay therapy 3 Persistent bradyarrhythmia causing: • Hypotension? No Monitor and observe Acutely altered mental status? Signs of shock? Ischemic chest discomfort? Acute heart failure? Yes 5 Doses/Details **Atropine** Atropine IV dose: If atropine ineffective: First dose: 0.5 mg bolus. Transcutaneous pacing Repeat every 3-5 minutes. Maximum: 3 mg. • **Dopamine** infusion Dopamine IV infusion: Usual infusion rate is • **Epinephrine** infusion 2-20 mcg/kg per minute. Titrate to patient response; taper slowly. **Epinephrine IV infusion:** Consider: 2-10 mcg per minute Expert consultation infusion. Titrate to patient Transvenous pacing response. © 2015 American Heart Association

### **ADULT TACHYCARDIA**

#### Adult Tachycardia With a Pulse Algorithm



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#### Doses/Details

#### Synchronized cardioversion:

Initial recommended doses:

- Narrow regular: 50-100 J
- Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J
  Wide irregular: defibrillation dose (not synchronized)

#### 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:

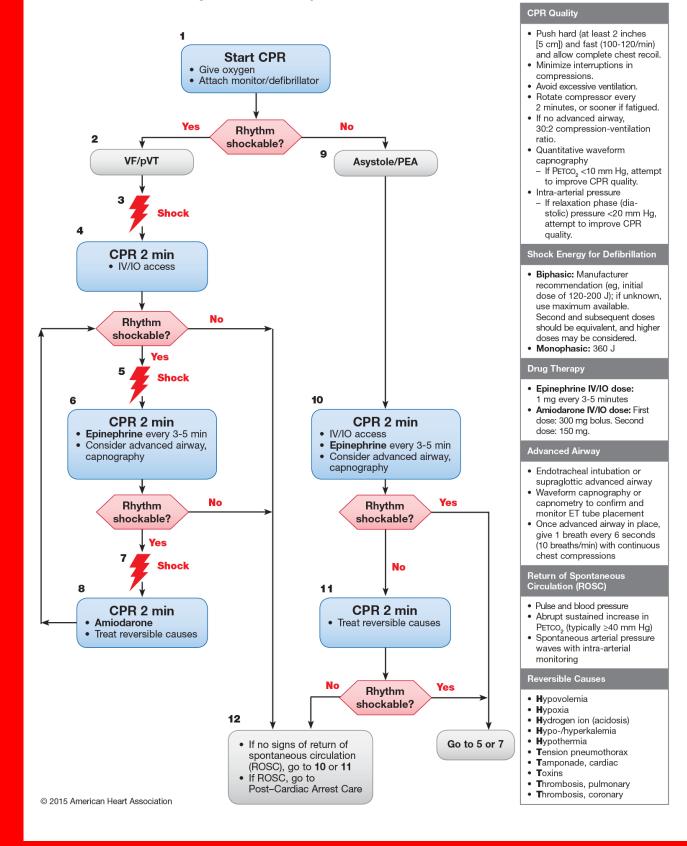
First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

#### Sotalol IV dose:

100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.

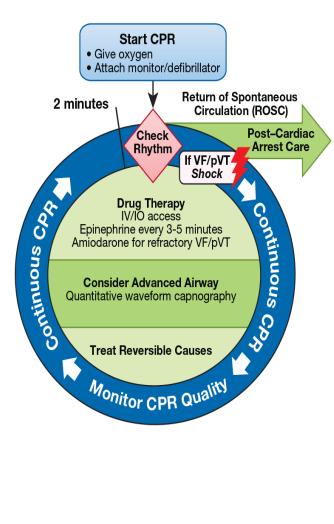
# ADULT CARDIAC ARREST ALGORITH

#### Adult Cardiac Arrest Algorithm - 2015 Update



# ADULT CARDIAC ARREST CIRCULAR ALGORITHM

## Adult Cardiac Arrest Circular 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 PETCO, <10 mm Hg, attempt to improve CPR quality</li>
- 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 PETCO, (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

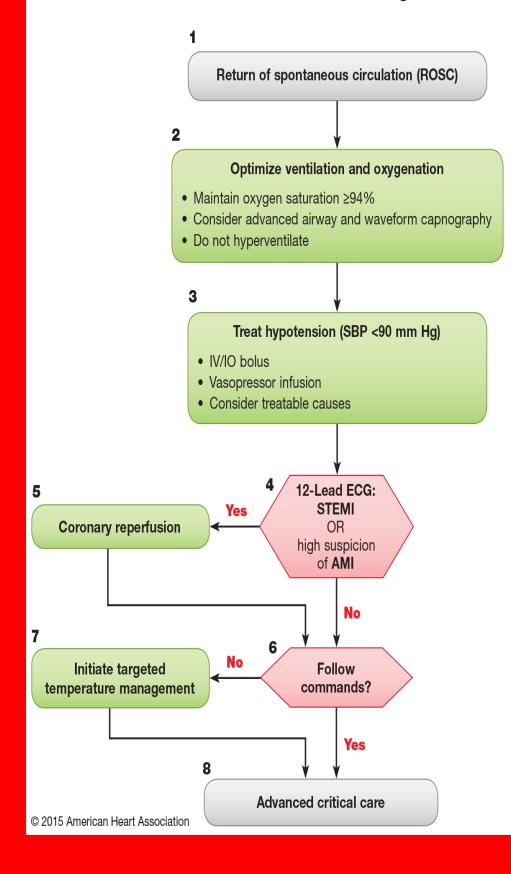
#### Reversible Causes

- **H**ypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- **H**ypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

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# ADULT CARDIAC ARREST ALGORITHM 2015

### Adult Immediate Post-Cardiac Arrest Care Algorithm - 2015 Update



#### Doses/Details

#### Ventilation/oxygenation:

Avoid excessive ventilation. Start at 10 breaths/min and titrate to target PETCO<sub>2</sub> of 35-40 mm Hg. When feasible, titrate FIO<sub>2</sub> to minimum necessary to achieve SpO<sub>2</sub>  $\geq$ 94%.

#### IV bolus:

Approximately 1-2 L normal saline or lactated Ringer's

#### **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
- Hypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

### **ACUTE CORONARY SYNDROMES**

#### Acute Coronary Syndromes Algorithm - 2015 Update Symptoms suggestive of ischemia or infarction 2 EMS assessment and care and hospital preparation: • Monitor, support ABCs. Be prepared to provide CPR and defibrillation · Administer aspirin and consider oxygen, nitroglycerin, and morphine if needed Obtain 12-lead ECG; if ST elevation: Notify receiving hospital with transmission or interpretation; note time of onset and first medical contact Notified hospital should mobilize hospital resources to respond to STEMI If considering prehospital fibrinolysis, use fibrinolytic checklist Concurrent ED assessment (<10 minutes) Immediate ED general treatment If $O_2$ sat <90%, start **oxygen** at 4 L/min, titrate **Aspirin** 160 to 325 mg (if not given by EMS) Check vital signs; evaluate oxygen saturation Establish IV access Perform brief, targeted history, physical exam Review/complete fibrinolytic checklist; Nitroglycerin sublingual or spray Morphine IV if discomfort not relieved by check contraindications nitroglycerin · Obtain initial cardiac marker levels, initial electrolyte and coagulation studies • Obtain portable chest x-ray (<30 minutes) **ECG** interpretation 5 ST elevation or new or ST depression or dynamic Normal or nondiagnostic changes in presumably new LBBB; T-wave inversion; strongly ST segment or T wave strongly suspicious for injury suspicious for ischemia Low-/intermediate-risk ACS ST-elevation MI (STEMI) High-risk non-ST-elevation ACS (NSTE-ACS) Start adjunctive therapies 10 12 as indicated Do not delay reperfusion Troponin elevated or high-risk patient Consider admission to Consider early invasive strategy if: ED chest pain unit or to Refractory ischemic chest discomfort appropriate bed for Recurrent/persistent ST deviation further monitoring and >12 Ventricular tachycardia possible intervention. hours Time from onset of Hemodynamic instability symptoms ≤12 hours? Signs of heart failure Start adjunctive therapies (eg, nitroglycerin, heparin) as indicated ≤12 hours Reperfusion goals: Therapy defined by patient and center criteria Door-to-balloon inflation (PCI) goal of 90 minutes Door-to-needle (fibrinolysis) goal of 30 minutes © 2015 American Heart Association

## **TOP 5 CHANGES TO PALS**

# Top 5 Changes to



Read the complete 2015 AHA Guidelines at this link: https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/





### Fluids in Sepsis

An initial fluid bolus of 20cc/kg is reasonable. Further fluid resuscitation should be tailored to the individual patient, with frequent reassessment, recognizing that over aggressive fluid resuscitation may be harmful in resource limited settings.

### Routine atropine unnecessary

Current Evidence does not support ROUTINE use of pre-intubation doses of atropine for critically ill children and non-neonatal infants requiring emergency intubation. Of course, however, use it if there is bradycardia.









### No minimum atropine dose

If you do use atropine prior to a non-cy intubation, 0.02mg/kg is effective. Don't worry about under-dosing!

### Avoid fever & control temp

Temperature control & fever management is important for comatose children after out-of-hospital cardiac arrest. Moderate hypothermia (32° to 34° C) or normothermia (36° to 37.5° C) are both reasonable.









### Amiodarone OR lidocaine

Both anti-arrhythmics are acceptable for treatment of shock-refractory VF or pulseless VT in pediatric patients.

https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/ For more Canadian content by the HSFC, check out http://goo.gl/fHu8lc

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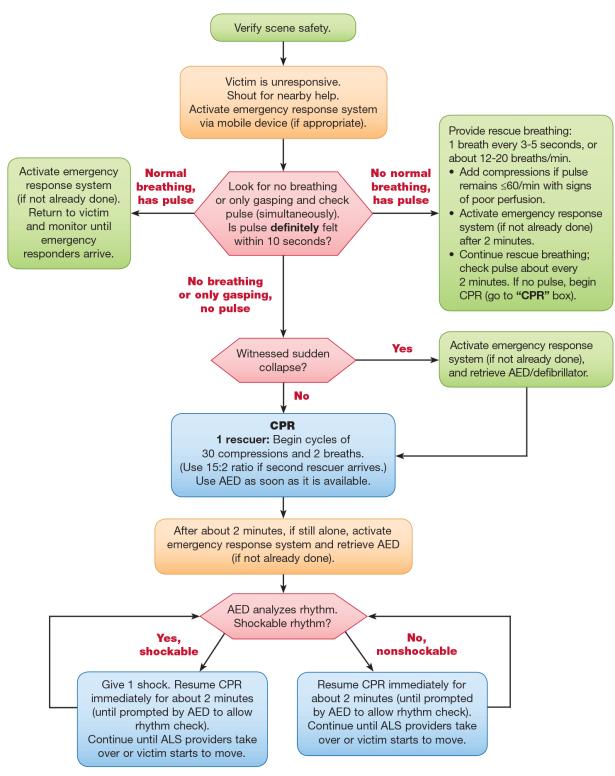
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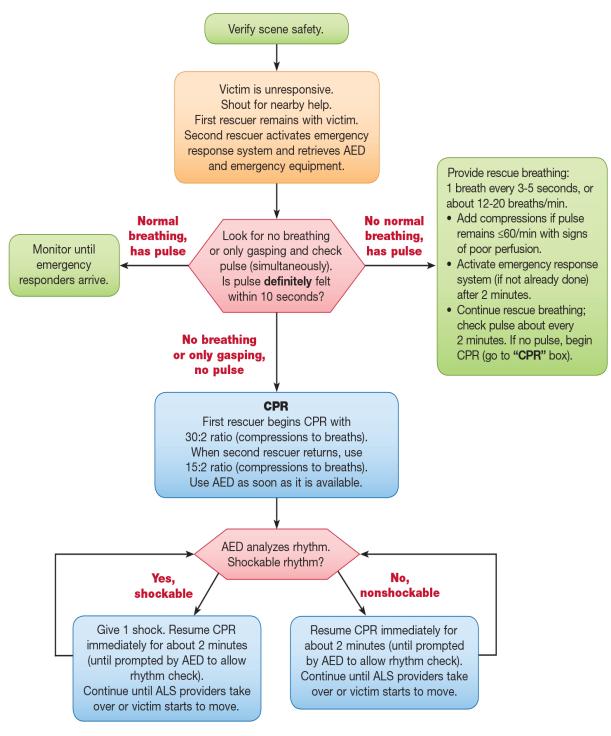
## BLS HEALTHCARE PROVIDERS SINGLE RESCUER

## BLS Healthcare Provider Pediatric Cardiac Arrest Algorithm for the Single Rescuer—2015 Update



## BLS HEALTHCARE PROVIDERS 2 OR MORE RESCUER

## BLS Healthcare Provider Pediatric Cardiac Arrest Algorithm for 2 or More Rescuers – 2015 Update



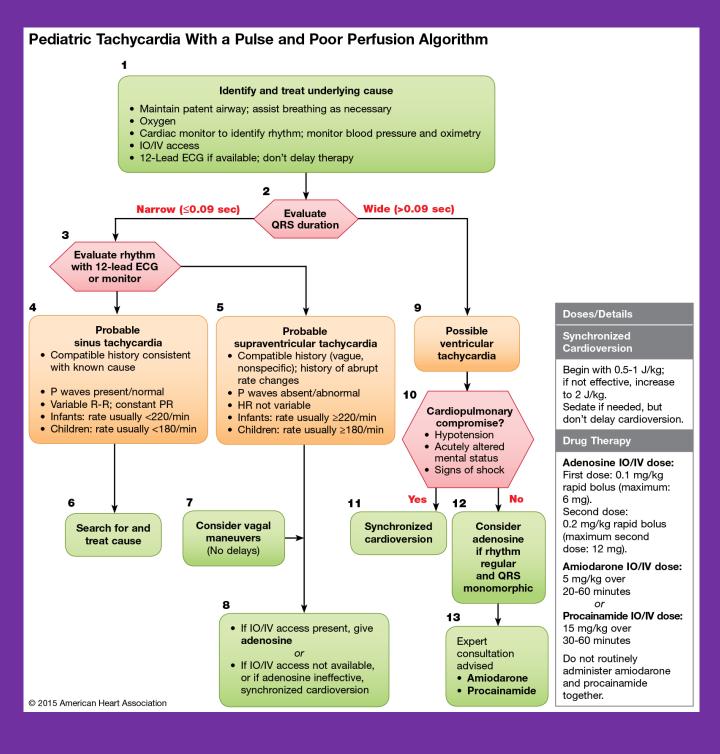
## PEDIATRIC BRADYCARDIA WITH A PULSE AND POOR PERFUSION

#### Pediatric Bradycardia With a Pulse and Poor Perfusion Algorithm

Identify and treat underlying cause Maintain patent airway; assist breathing as necessary Cardiac monitor to identify rhythm; monitor blood pressure and oximetry IO/IV access 12-Lead ECG if available; don't delay therapy Cardiopulmonary compromise? No Hypotension Acutely altered mental status Signs of shock CPR if HR <60/min with poor perfusion despite oxygenation and ventilation 4a Doses/Details Support ABCs Epinephrine IO/IV dose: Give oxygen No 0.01 mg/kg (0.1 mL/kg **Bradycardia**  Observe of 1:10 000 concentration). persists? Consider expert Repeat every 3-5 minutes. consultation If IO/IV access not available 5 but endotracheal (ET) tube in place, may give ET dose: 0.1 mg/kg (0.1 mL/kg of Epinephrine 1:1000). Atropine for increased vagal tone or primary AV block Atropine IO/IV dose: Consider transthoracic pacing/ 0.02 mg/kg. May repeat once. transvenous pacing Minimum dose 0.1 mg and Treat underlying causes maximum single dose 0.5 mg. 6 If pulseless arrest develops, go to Cardiac Arrest Algorithm

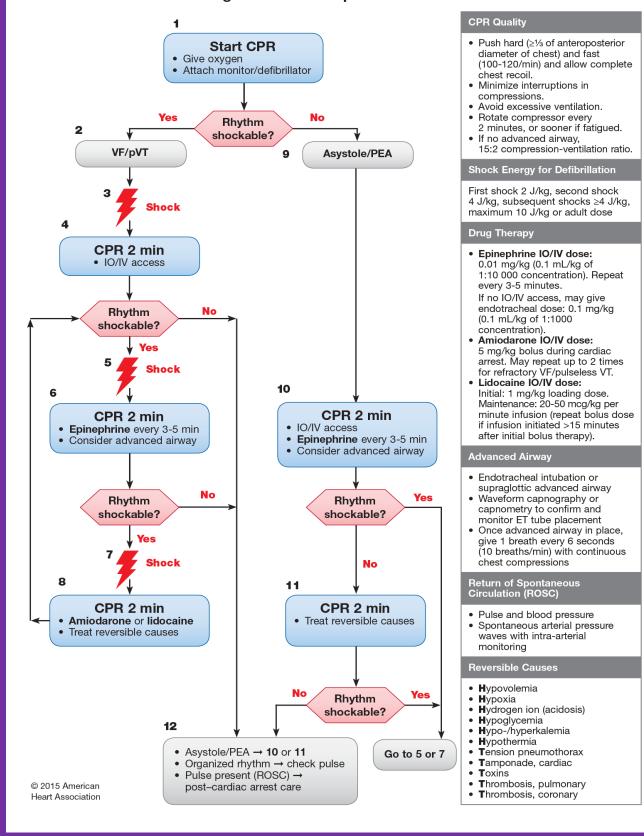
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## PEDIATRIC TACHYCARDIA WITH A PULSE AND POOR PERFUSION



# PEDIATRIC CARDIAC ARREST ALGORITHM

#### Pediatric Cardiac Arrest Algorithm - 2015 Update



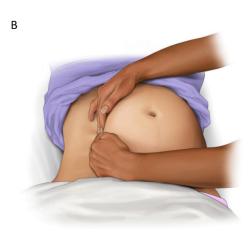
# SPECIAL CASES PREGNACY

#### Pregnancy

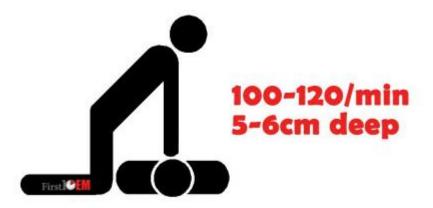
No more tilting the patient. It is no longer recommended to use a wedge or attempt to laterally tilt the patient because this will interfere with the quality of CPR. Just manually displace the uterus to the left. (Most people have been teaching this already)

Perimortem C-section is still recommended after 4 minutes of CPR with no ROSC. However, if the mother will clearly not survive, such as in non-survivable trauma, they recommend starting the c-section immediately





A, Manual LUD, performed with one-handed technique. B, Two-handed technique during resuscitation



#### · CPR

- The major points about CPR really haven't changed. Keep going with good compressions at 30:2, maximizing compression time, with no pauses longer than 10 seconds. However, they have made some minor changes to their descriptions of good CPR:
- Not too fast. Maximum compression rate of 120. They don't won't compressions going too fast, as there is evidence that quality decreases with more than 120 compressions per minute. The new target is 100-120 compressions a minute (instead of at least 100)
- Not too deep. Maximum compression depth 6 cm. The new target is 5-6cm in adults (instead of at least 5cm)
- 10 breaths a minute. If an advanced airway (endotracheal tube, LMA, etc) is in place, everyone gets just 10 breaths a minute.
   This applies to children and infants as well
- CAB is the alphabet. No change, just a statement of support.Start with compressions to reduce the delay to first compression.
- Compression only CPR is not endorsed. If you are a trained provider, keep giving rescue breaths. They state, "Our confidence in the equivalence between chest compression-only and standard CPR is not sufficient to change current practice"

## **MEDICATIONS**

#### Medications

- Vasopressin is OUT. A change that is unlikely to affect many providers. This change is not because vasopressin is in anyway worse than epinephrine, but because it has equivalent outcomes, so they only list epinephrine to simplify the algorithm. (I won't get started here on the question of whether epinephrine actually provides any benefit.)
- Give epinephrine early in non-shockable rhythms. Based on one observational study, they say if you are going to give epinephrine, you should probably get epinephrine on board as soon as possible in non-shockable rhythms.
- The vasopressin, epinephrine, steroid combination is notrecommended. They discuss the trials that look at this and rate them as very low quality evidence. They say, "we suggest against the routine use of steroids during CPR for OHCA (weak recommendation, very-low-quality evidence)."
- The guidelines do recognize the "equipoise concerning the role of drugs in improving outcomes from cardiac arrest". Personally, I think that the bulk of the evidence makes it pretty clear that medications are more likely to be harmful (by putting patients in the ICU only to die anyway) than they are to be helpful.
- Naloxone added to the guidelines. In patients with known or suspected opioid addiction who are not breathing normally but have a pulse, it is reasonable for trained lay rescuers and BLS providers to administer naloxone. The doses listed are 2mg intranasally or o.4mg IM. They suggest standard following the standard ALS algorithm if the patient does not have a pulse, but state that providing a dose of naloxone may be reasonable based on the possibility that the patient may be in respiratory distress.

## **CAPNOGRAPHY**

#### Capnography

- Waveform capnography receives a little more attention than in the past. They say:
- Waveform capnography is the most reliable method to confirm and continuously monitor tracheal tube placement
- An end-tidal less CO<sub>2</sub> than 10 mmHg after 20 minutes is associated with extremely low chance of survival, but should not be used alone in the decision to stop resuscitation
- Waveform capnography can be used to monitor the ventilation rate
- Waveform capnography can be used to monitor the quality of CPR. (High quality compressions should produce an end-tidal CO<sub>2</sub> of at least 12-15 mmHg).
- A rise in end-tidal CO<sub>2</sub> can be used as an early indication of ROSC

## **TECHNOLOGY**

#### Technology

- Social media has a role in cardiac arrest. Or maybe it does.
   Specifically they state: "It may be reasonable for communities to incorporate social media technologies that summon rescuers who are in close proximity to a victim of suspected OHCA and are willing and able to perform CPR."
- Mechanical chest compressions are not recommended. Not routinely at least. "The evidence does not demonstrate a benefit with the use of mechanical piston devices for chest compressions versus manual chest compressions in patients with cardiac arrest." They state that mechanical compression is a reasonable alternative if sustained high quality compressions are impractical or compromise provider safety.
- Do not (routinely) use impedance threshold devices. No real surprise here. Although I know some people absolutely love these, the bulk of the evidence to date is completely unconvincing.
- ECMO is in. They state that ECMO is a reasonable alternative to conventional CPR if the etiology is thought to be reversible.

#### Ultrasound:

- Added as an additional method for ETT confirmation. Probably not a big game changer for most with quantitative end tidal CO<sub>2</sub>
- Peri-arrest ultrasound may have a role for identifying reversible causes of arrest in addition to myocardial contractility, though it is unclear if it affects clinical outcomes
- Post-resuscitation care

#### Oxygen

- They are looking for the Goldilocks zone: not too little, not too much. They specifically recommend against hypoxia and hyperoxia in the post-resuscitation period. Basically, follow your O<sub>2</sub> sat
- During arrest, when the O<sub>2</sub> sat is unreliable, they recommend using a 100% FiO<sub>3</sub>

## HOSPITAL AND PRE HOSPITAL INFO

### Cardiac catheterization

 There is a greater emphasis on need for urgent coronary cath if the arrest was likely to be cardiac in nature

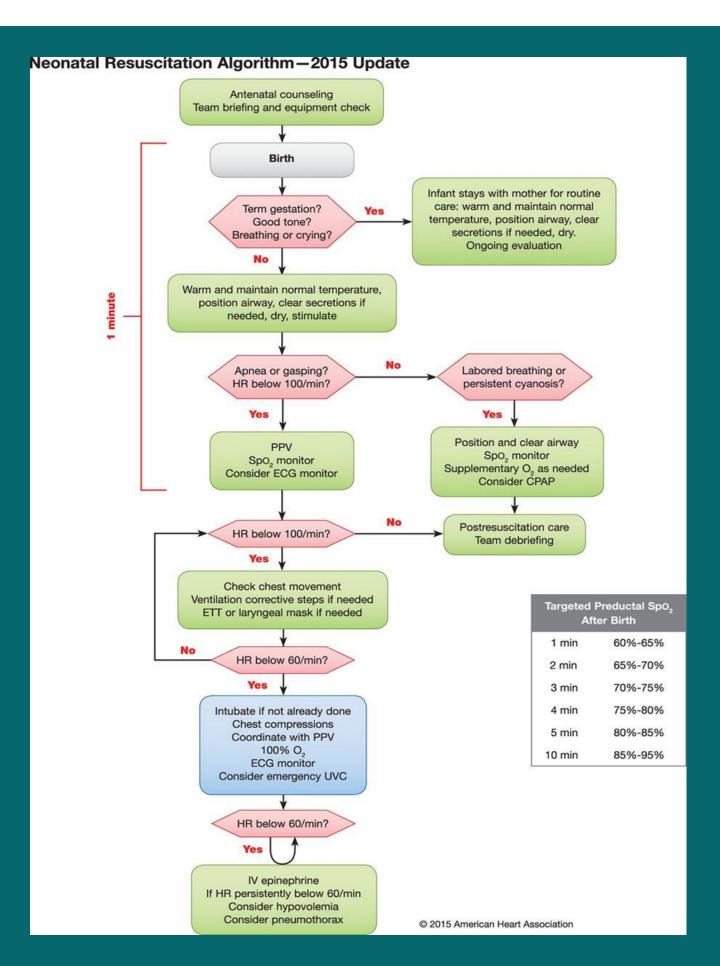
## Temperature

- They recommend picking and maintaining a target temperature, based on low or very low quality evidence
- The target temperatures they now recommend are anything between 32 and 36 degrees Celsius
- The recommendation to prevent fever is based on "very-low-quality evidence"
- No prehospital cooling (EMS SYSTEM)

## TRAUMATIC CARDIAC ARREST

#### **Traumatic Cardiac Arrest** Trauma patient Periarrest situation? **Universal ALS** Consider LIKELY non-traumatic cause algorithm UNLIKELY Нурохіа Tension pneumothorax Start / Continue ALS Simultaneously address reversible causes Tamponade **H**ypovolaemia Control catastrophic haemorrhage Control airway and maximise oxygenation Bilateral chest decompression Elapsed time < 10 min since arrest? 4. Relieve cardiac tamponade 5. Surgery for haemorrhage control or proximal aortic compression? Expertise? Equipment? 6. Massive transfusion protocol and fluids Environment? **Consider termination** Return of spontaneous NO 4 of CPR circulation? YES ■ Perform only life-saving interventions ■ Immediate transport to appropriate hospital In-hospital: ■ Damage control resuscitation ■ Definitive haemorrhage control

## **NEONATAL RESUSCITATION**



### **NEONATAL RESUSCITATION**

## · Neonatal Resuscitation

- The NRP algorithm is actually the area with the biggest changes, as far as I can tell. I am going to review these in a little more depth when I update my post on <u>neonatal resuscitation</u> in the next couple weeks.
- The one big change people should know about is that the presence of meconium does not necessitate intubation unless tracheal obstruction is suspected. No matter what the fluid color is, they want us to start ventilation as soon as possible.
- "Review of the evidence suggests that resuscitation should follow the same principles for infants with meconium-stained fluid as for those with clear fluid; that is, if poor muscle tone and inadequate breathing effort are present, the initial steps of resuscitation (warming and maintaining temperature, positioning the infant, clearing the airway of secretions if needed, drying, and stimulating the infant) should be completed under an overbed warmer."

### THANKS FOR YOUR ATTENTION

## BIBLIOGRAPHY

https://eccguidelines.heart.org/index.php/circulation/cpr-eccguidelines-2/

## RESOURCE Manuel Cruz Soto

INSTRUCTOR DISCIPLINES CPR, ACLS, AND PALS

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