American Heart Association

Algorithms 2015

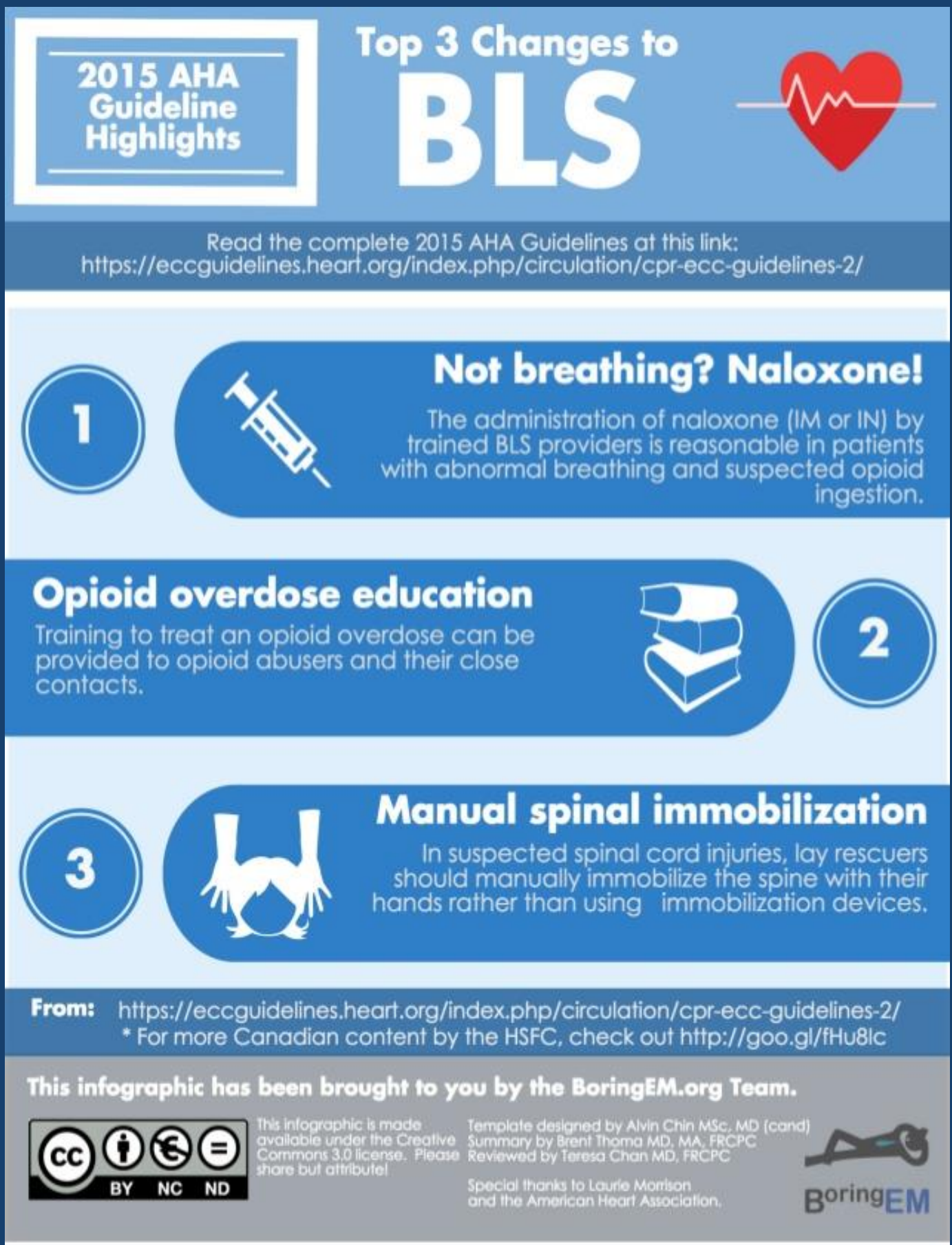
– BLS – ACLS – PALS – SPECIAL CASES

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



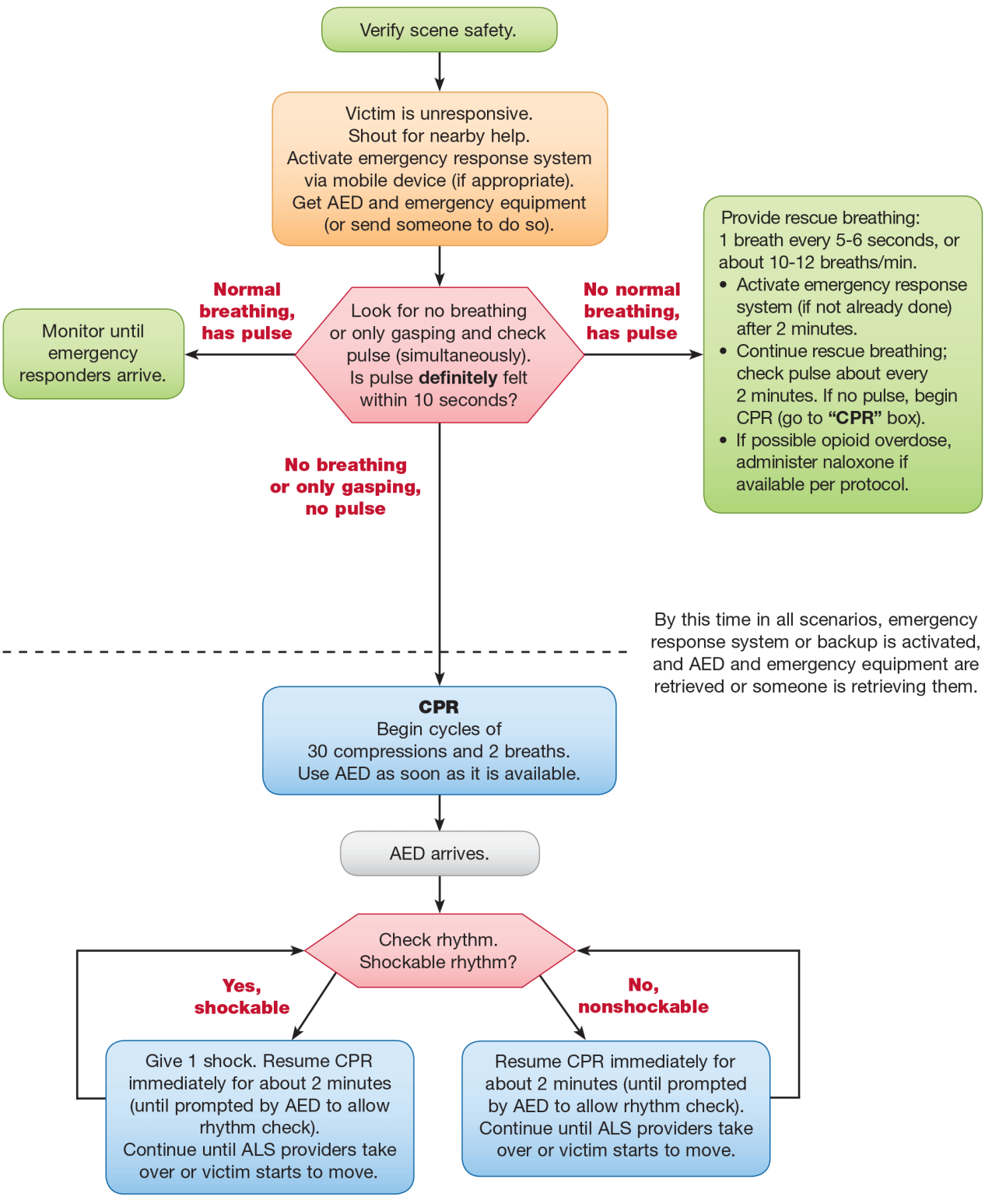
American Heart Association®

life is why™

BLS FOR HEALTH CARE PROVIDERS

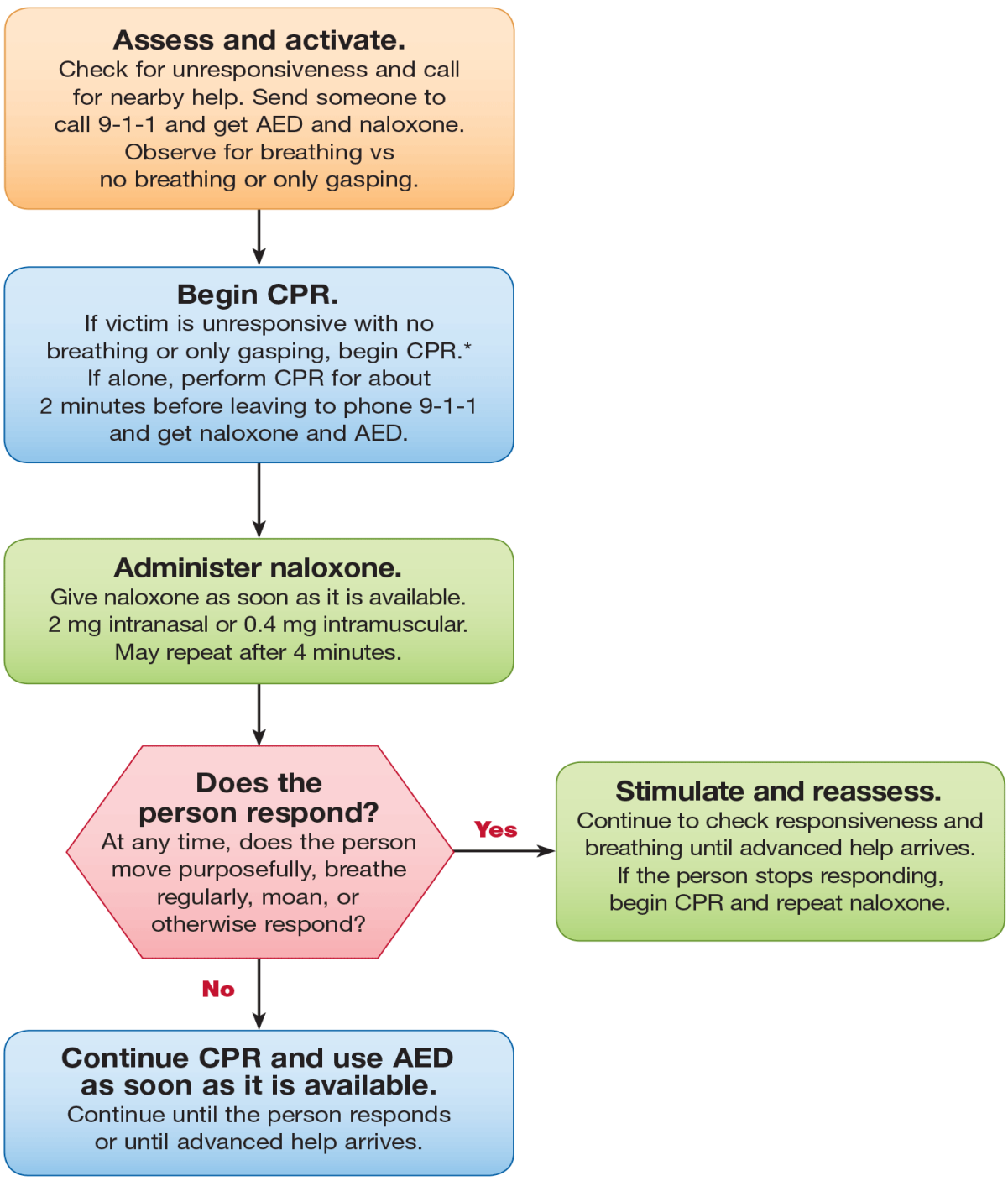
GUIDELINES 2015 CPR & ECC

BLS Healthcare Provider
Adult Cardiac Arrest Algorithm—2015 Update



OPIOID ALGORITHM (ADULT)

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



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

TOP 5 CHANGES TO ACLS

2015 AHA Guideline Highlights

Top 5 Changes to ACLS

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

1

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.

2

3

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.

4

5

ECMO is a possible alternative

Venoarterial 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.

From: https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/
* For more Canadian content by the HSFC, check out http://goo.gl/fHu8Ic

This infographic has been brought to you by the BoringEM.org Team.

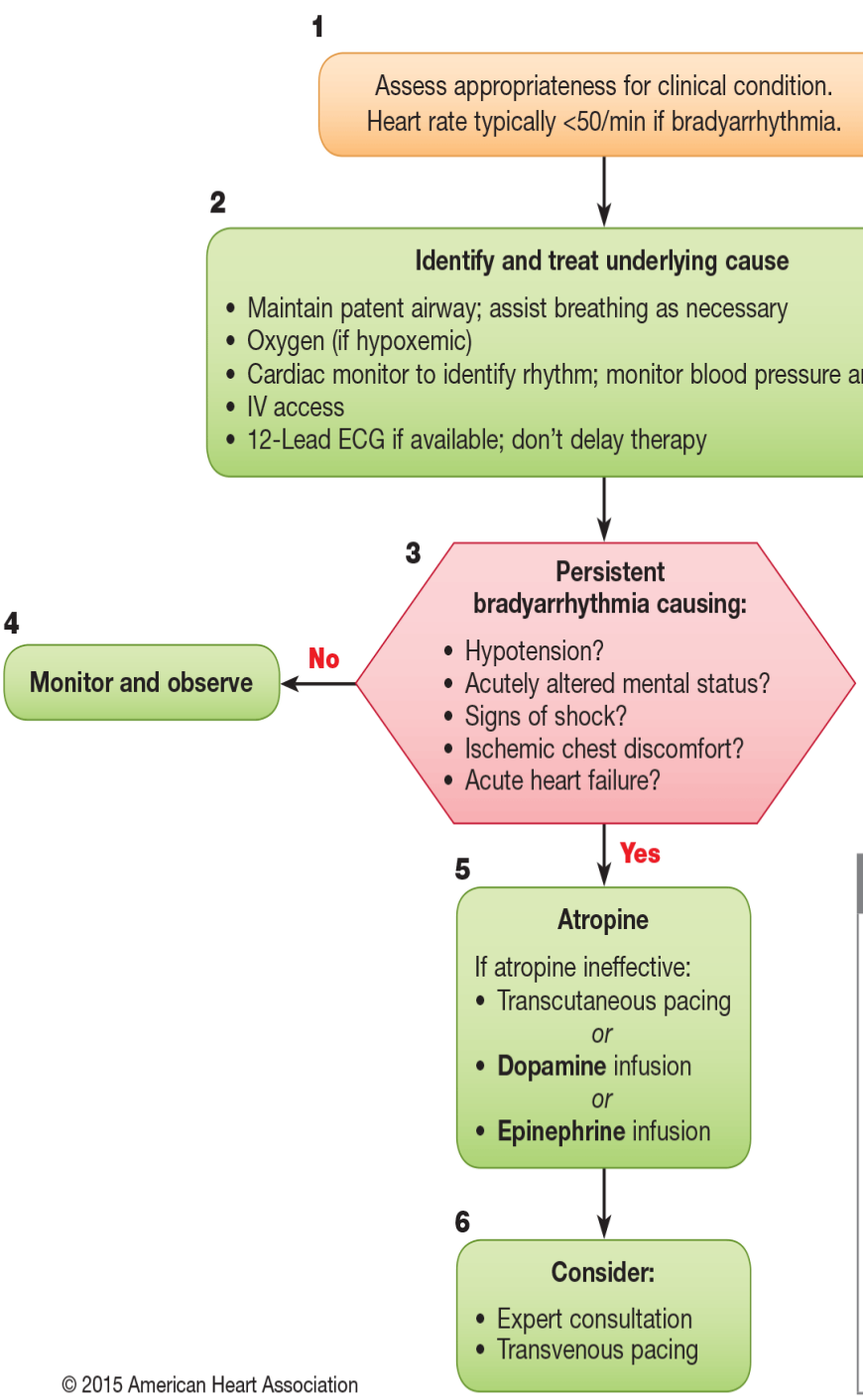
Template designed by Alvin Chin MSc, MD (cand)
Summary by Teresa Chan MD, FRCPC
Reviewed by Brent Thoma MD, FRCPC

Special thanks to Laurie Morrison and the American Heart Association.

BoringEM

ADULT BRADYCARDIA

Adult Bradycardia With a Pulse Algorithm



Doses/Details

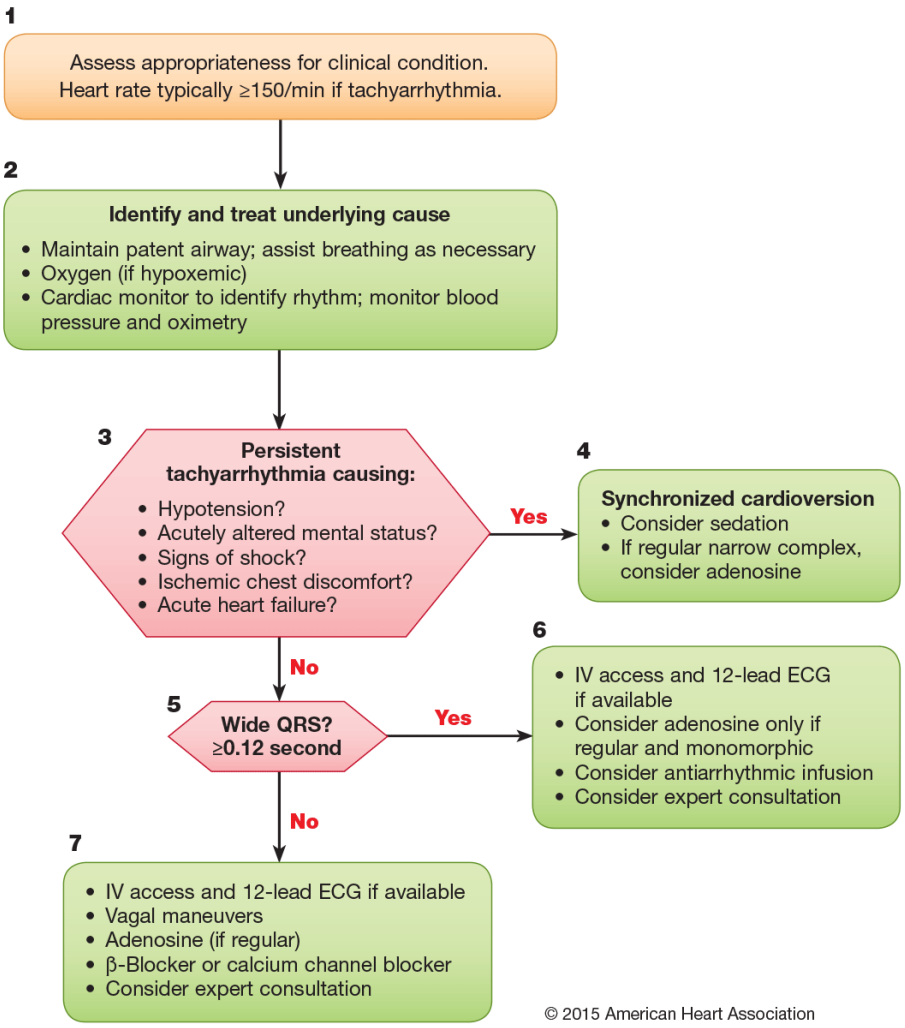
Atropine IV dose:
First dose: 0.5 mg bolus. Repeat every 3-5 minutes. Maximum: 3 mg.

Dopamine IV infusion:
Usual infusion rate is 2-20 mcg/kg per minute. Titrate to patient response; taper slowly.

Epinephrine IV infusion:
2-10 mcg per minute infusion. Titrate to patient response.

ADULT TACHYCARDIA

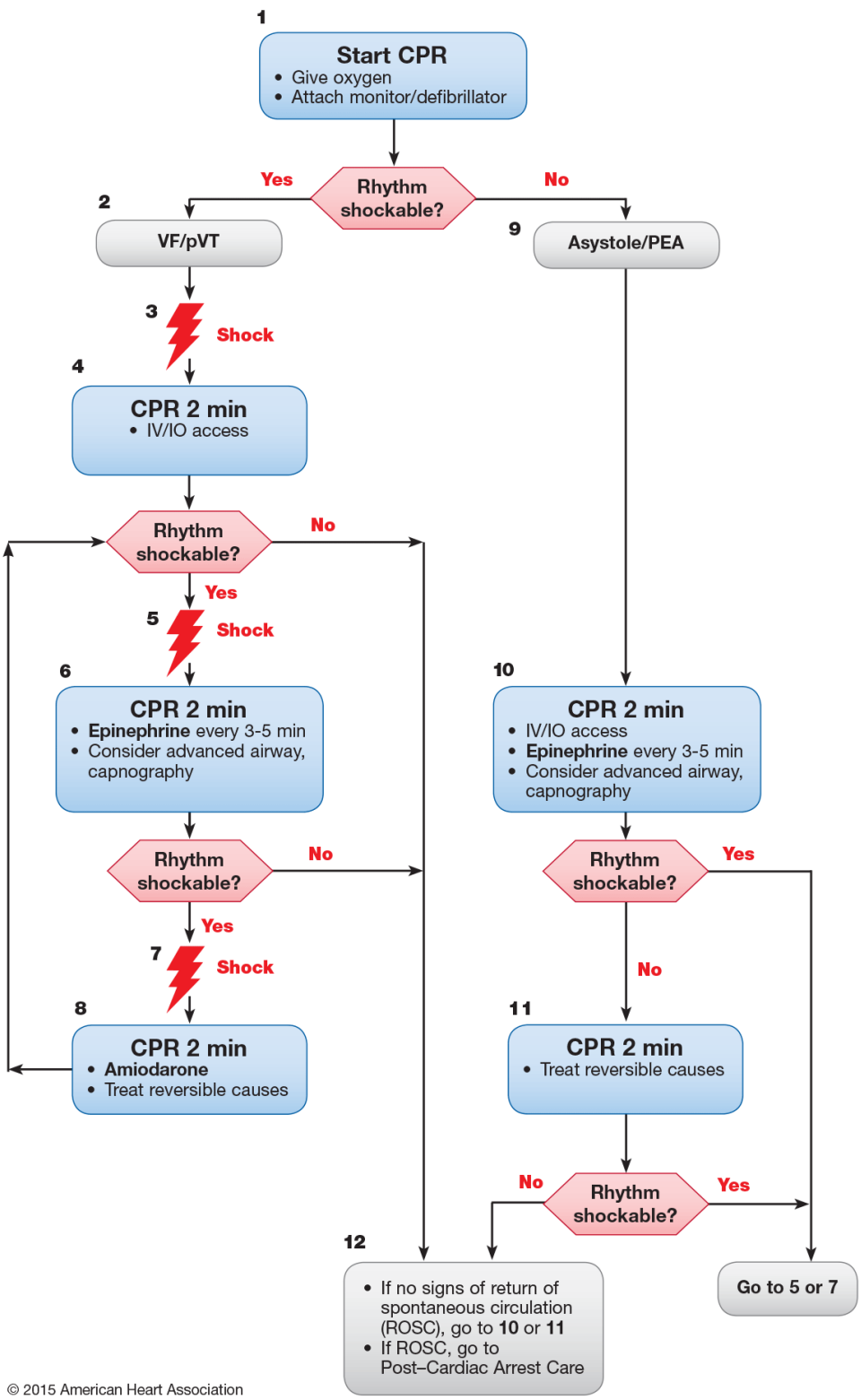
Adult Tachycardia With a Pulse Algorithm



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



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)

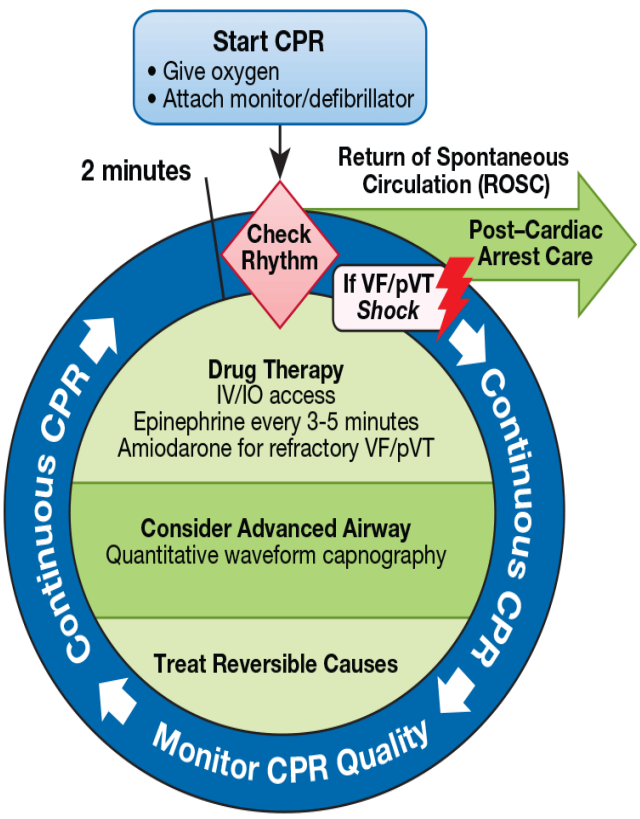
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

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

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.
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- Intra-arterial pressure.
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Drug Therapy

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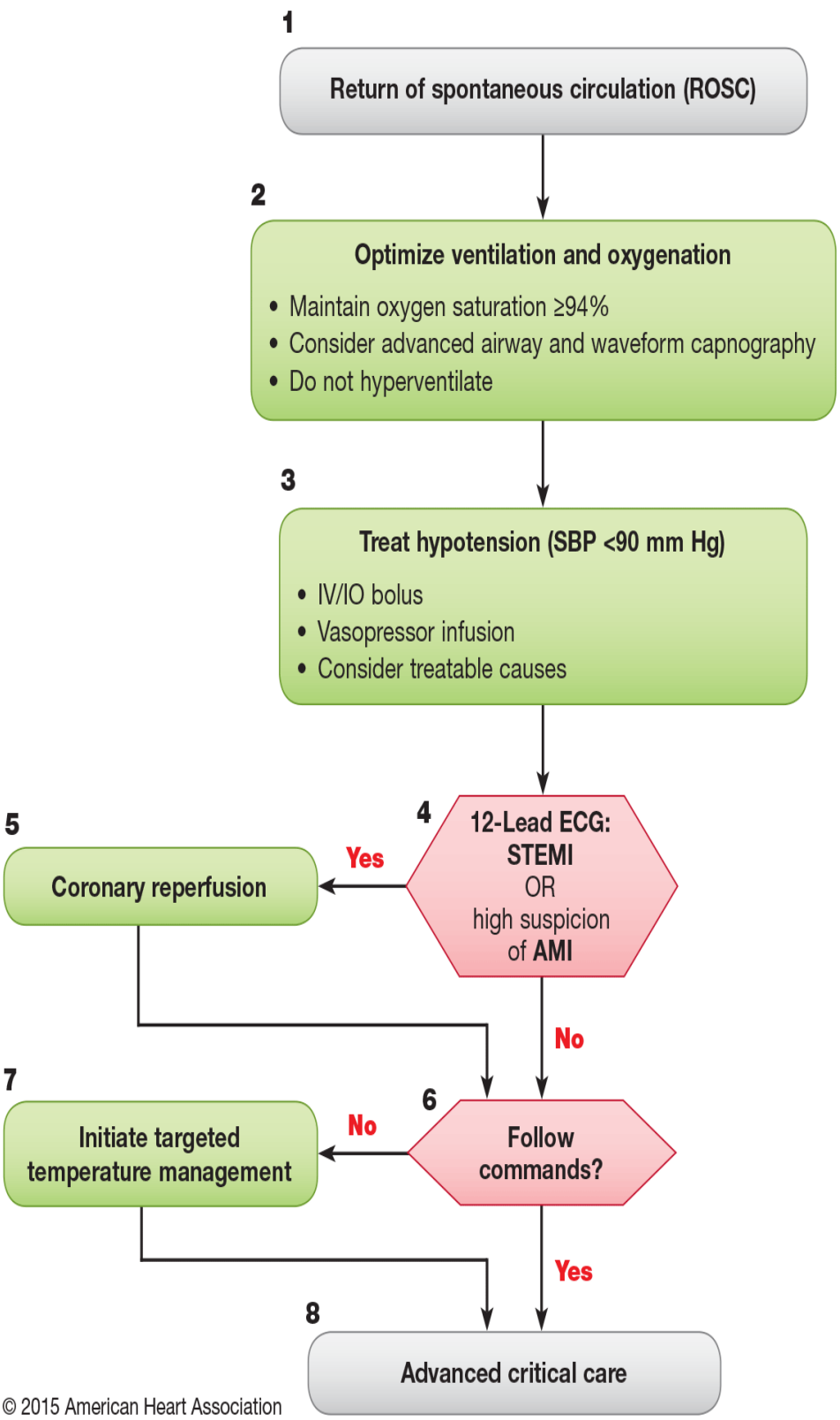
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

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 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:
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

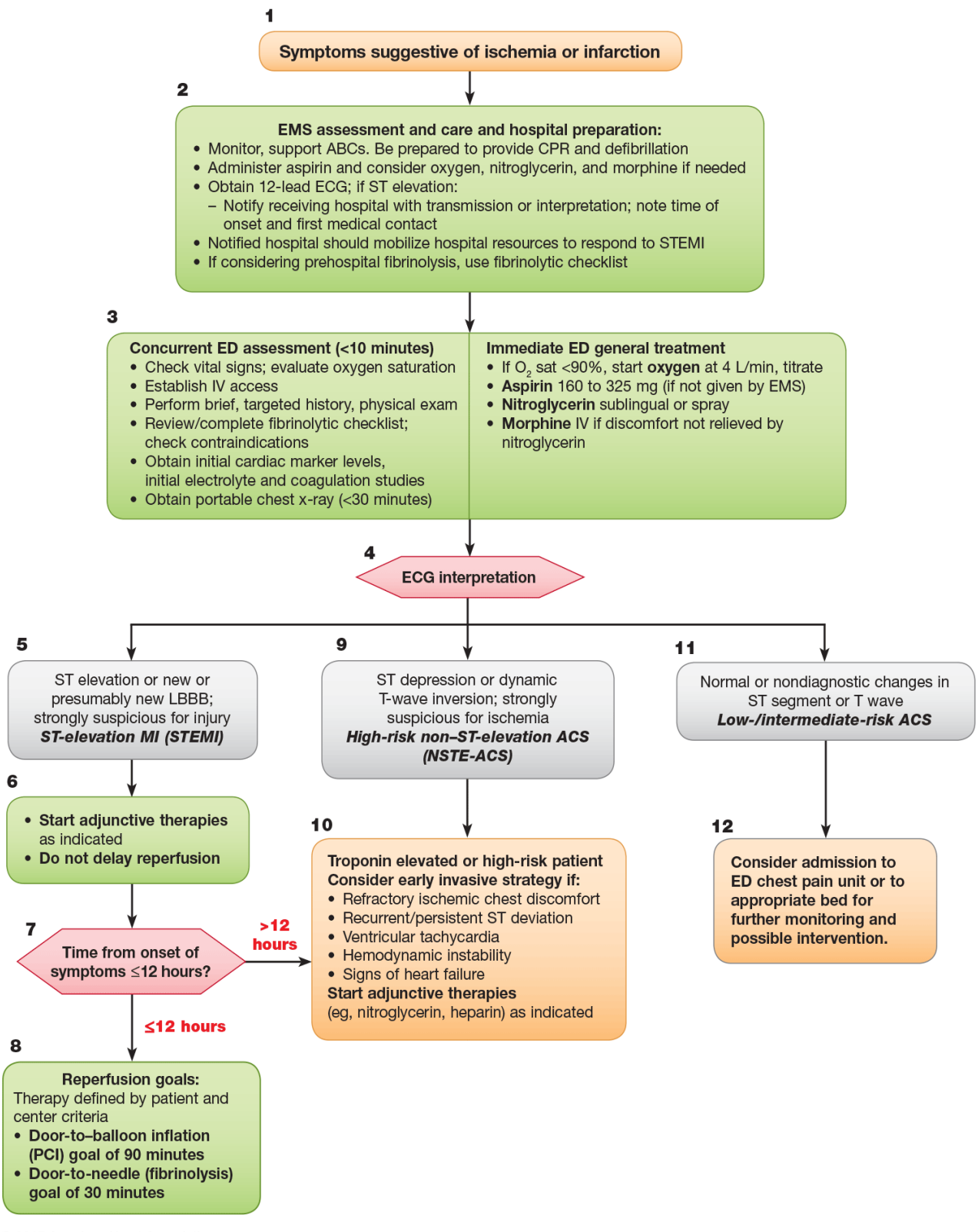
Norepinephrine IV infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Reversible Causes

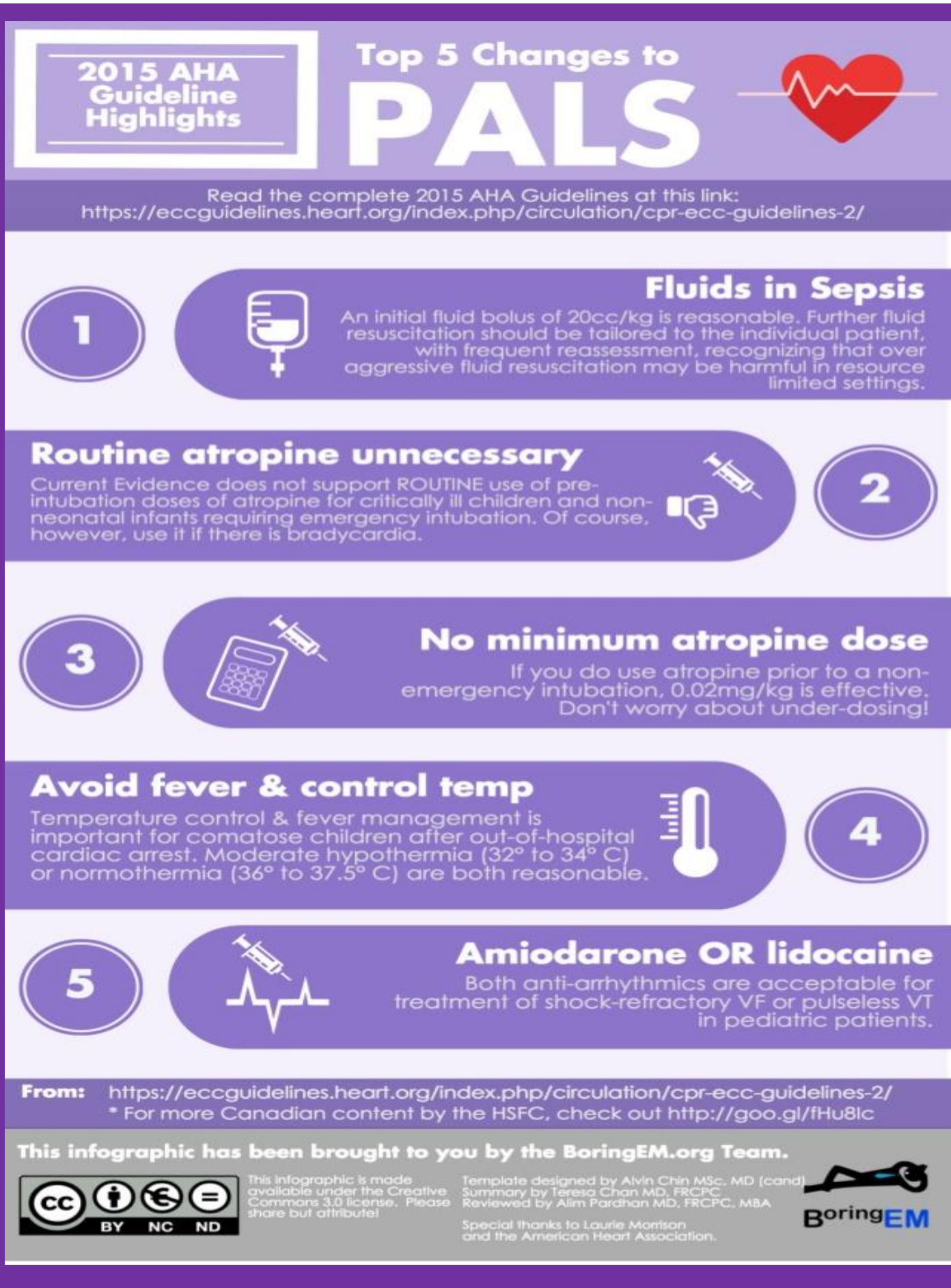
- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

ACUTE CORONARY SYNDROMES

Acute Coronary Syndromes Algorithm—2015 Update

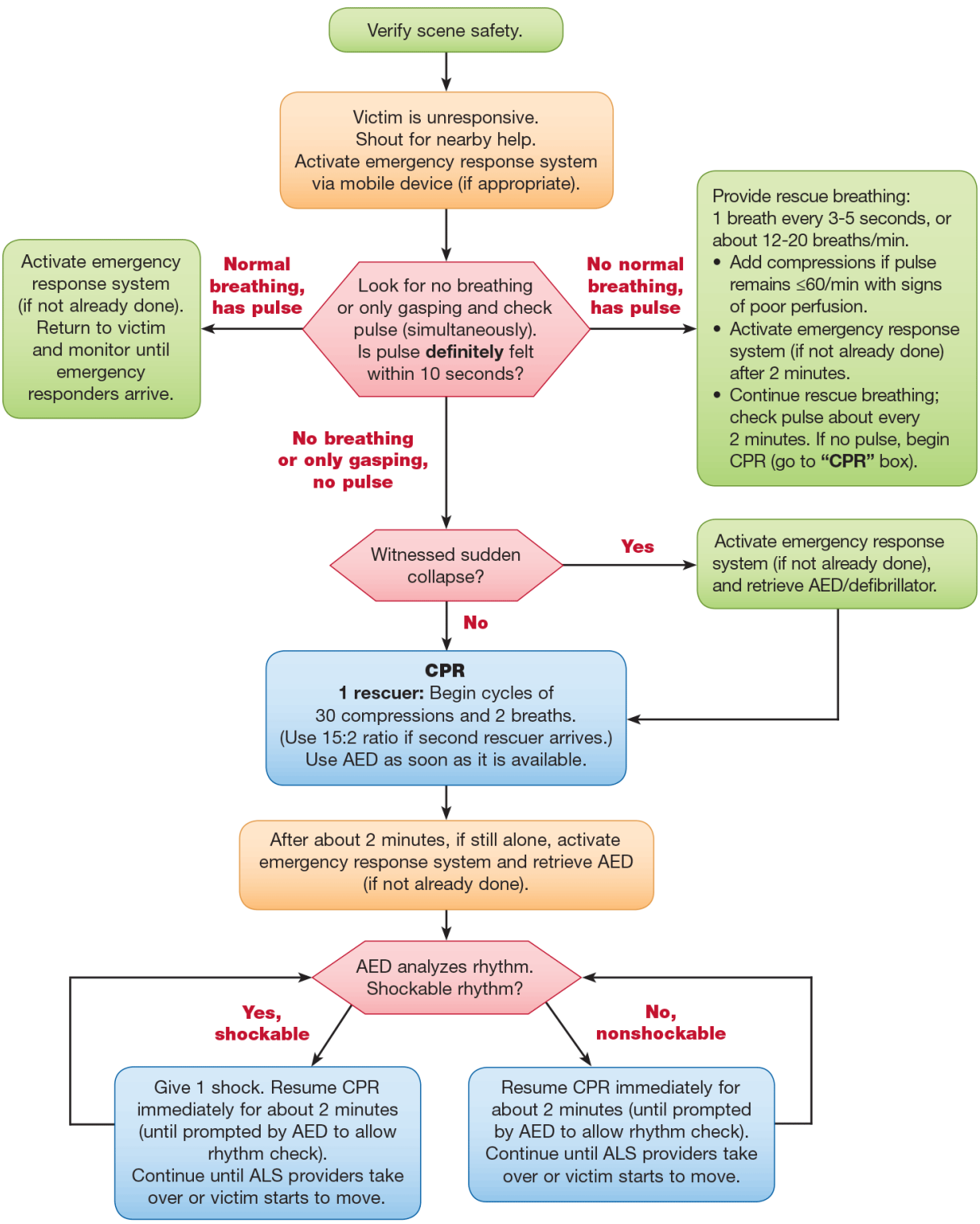


TOP 5 CHANGES TO PALS



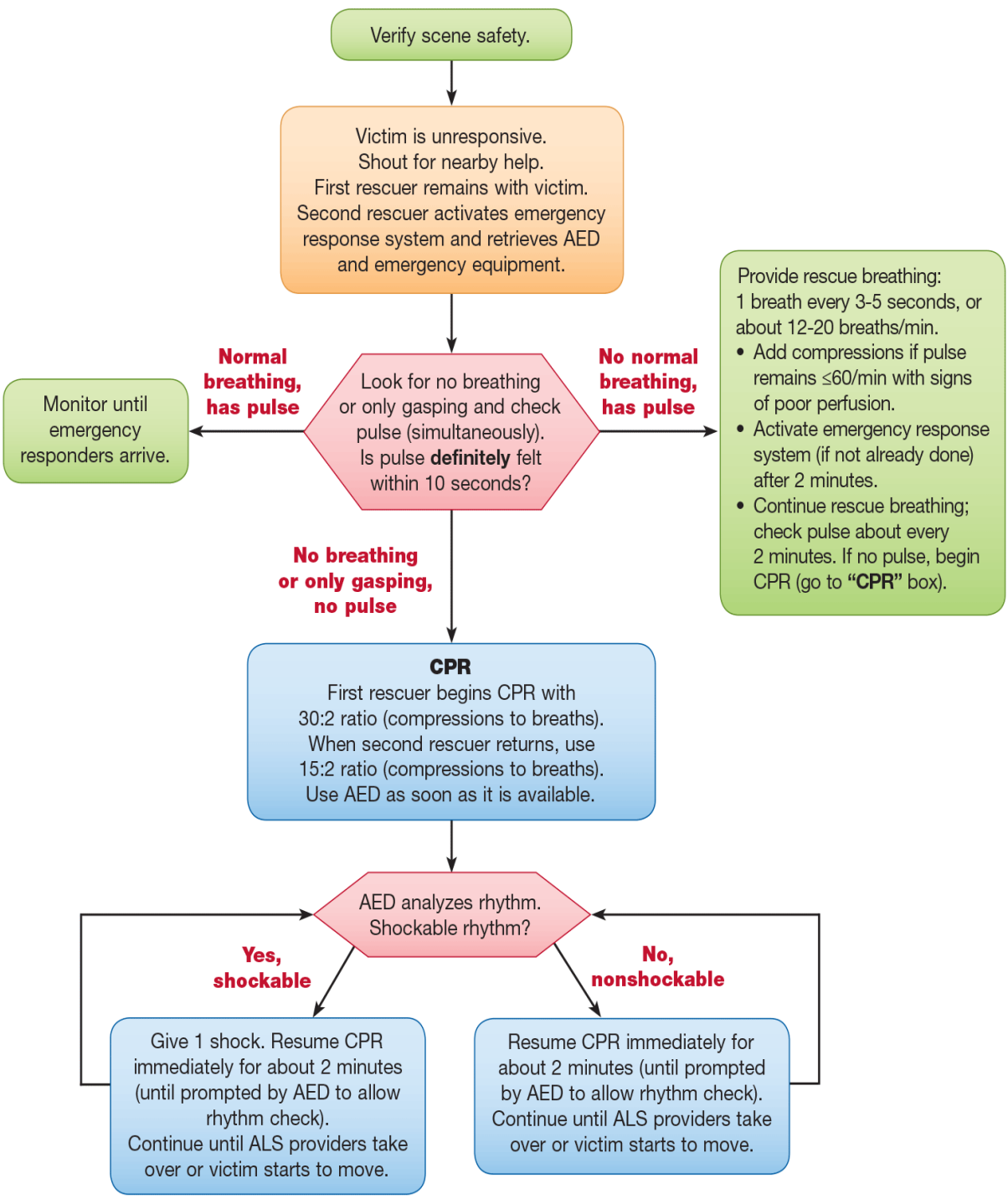
BLS HEALTHCARE PROVIDERS SINGLE RESCUER

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



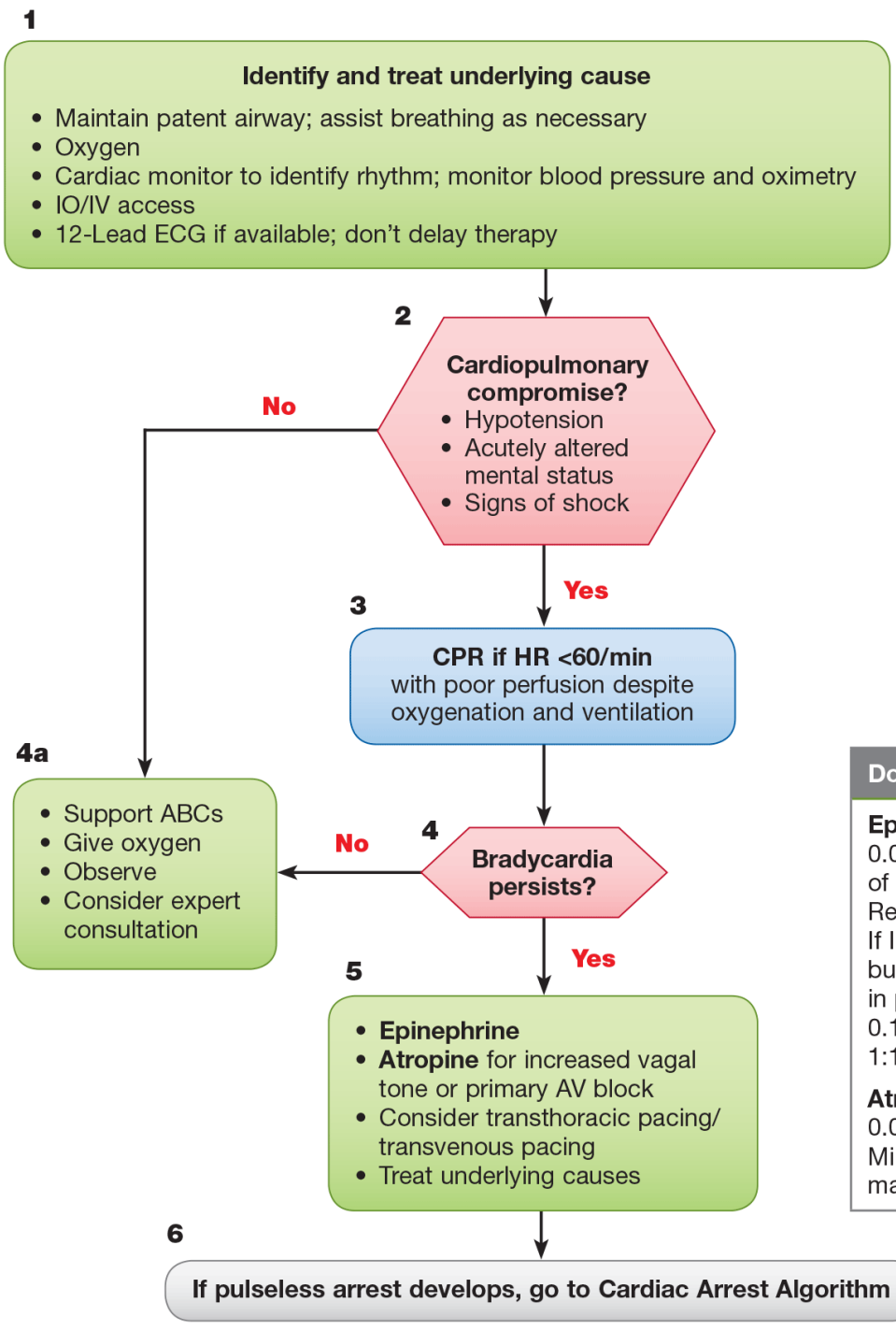
BLS HEALTHCARE PROVIDERS 2 OR MORE RESCUER

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

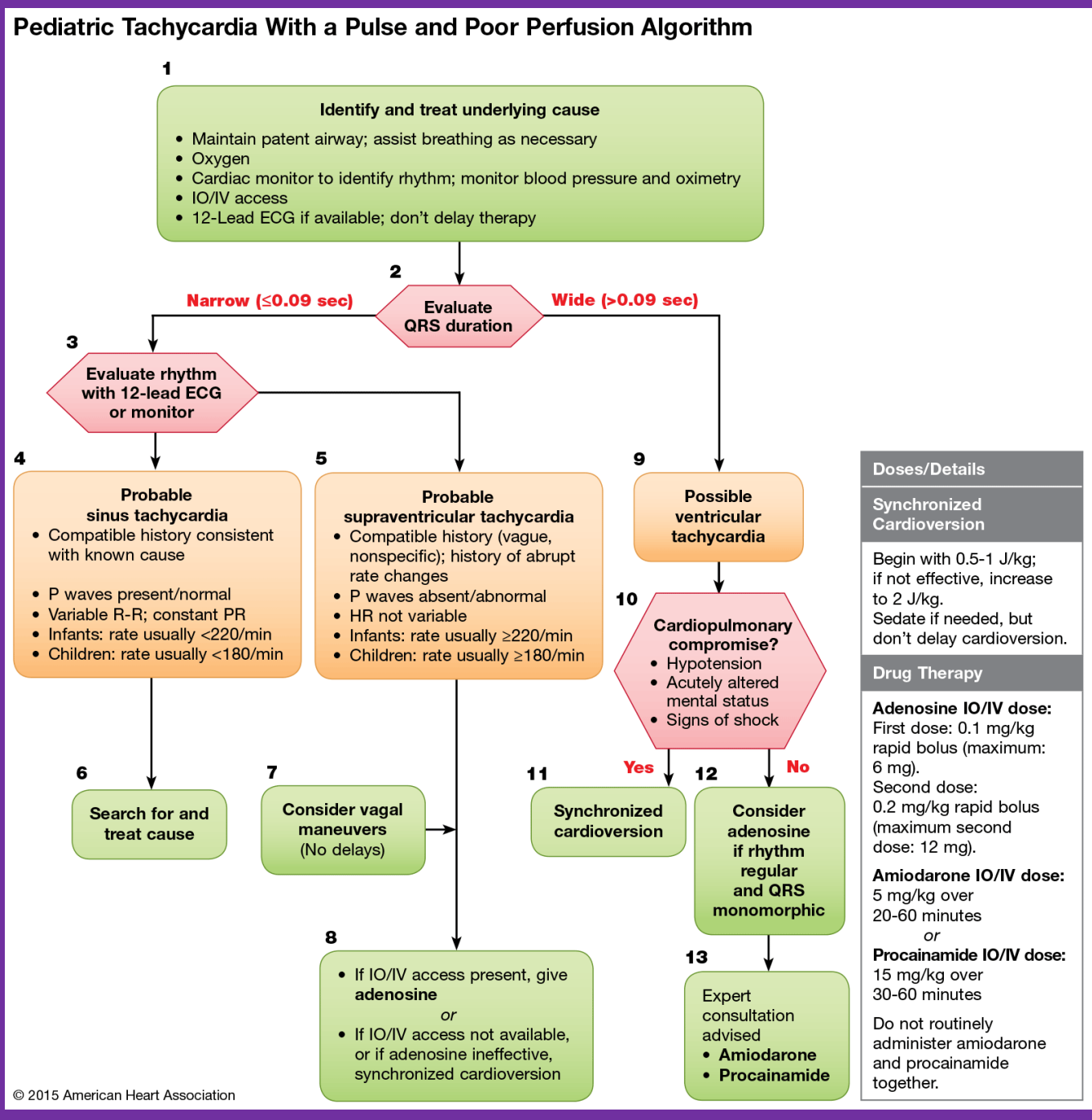


Doses/Details

Epinephrine IO/IV dose:
0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes. If IO/IV access not available but endotracheal (ET) tube in place, may give ET dose: 0.1 mg/kg (0.1 mL/kg of 1:1000).

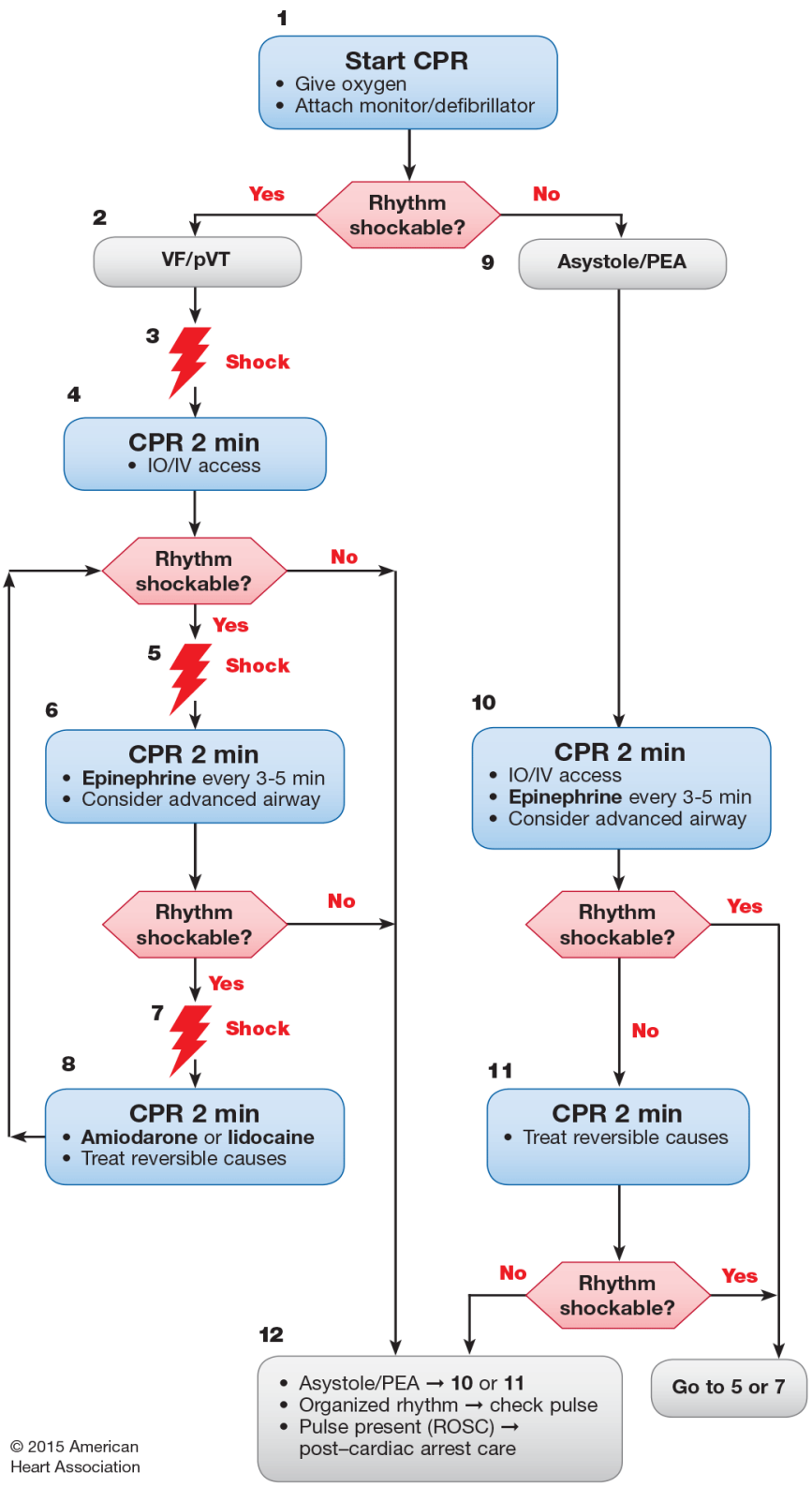
Atropine IO/IV dose:
0.02 mg/kg. May repeat once. Minimum dose 0.1 mg and maximum single dose 0.5 mg.

PEDIATRIC TACHYCARDIA WITH A PULSE AND POOR PERFUSION



PEDIATRIC CARDIAC ARREST ALGORITHM

Pediatric Cardiac Arrest Algorithm—2015 Update



CPR Quality

- Push hard (≥⅓ of anteroposterior diameter of chest) 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, 15:2 compression-ventilation ratio.

Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose

Drug Therapy

- **Epinephrine IO/IV dose:** 0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes.
  If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of 1:1000 concentration).
- **Amiodarone IO/IV dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.
- **Lidocaine IO/IV dose:** Initial: 1 mg/kg loading dose. Maintenance: 20-50 mcg/kg per minute infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus therapy).

Advanced Airway

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- **H**ypothermia
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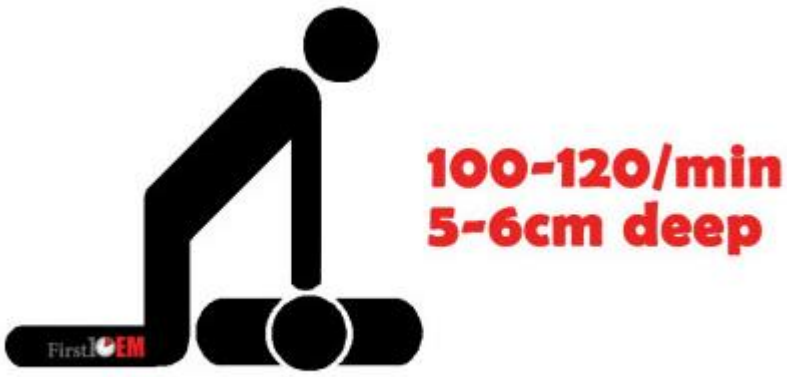
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

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 *not*recommended.** 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 0.4mg 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_2 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_2 of at least 12-15 mmHg).
- A rise in end-tidal CO_2 can be used as an early indication of ROSC

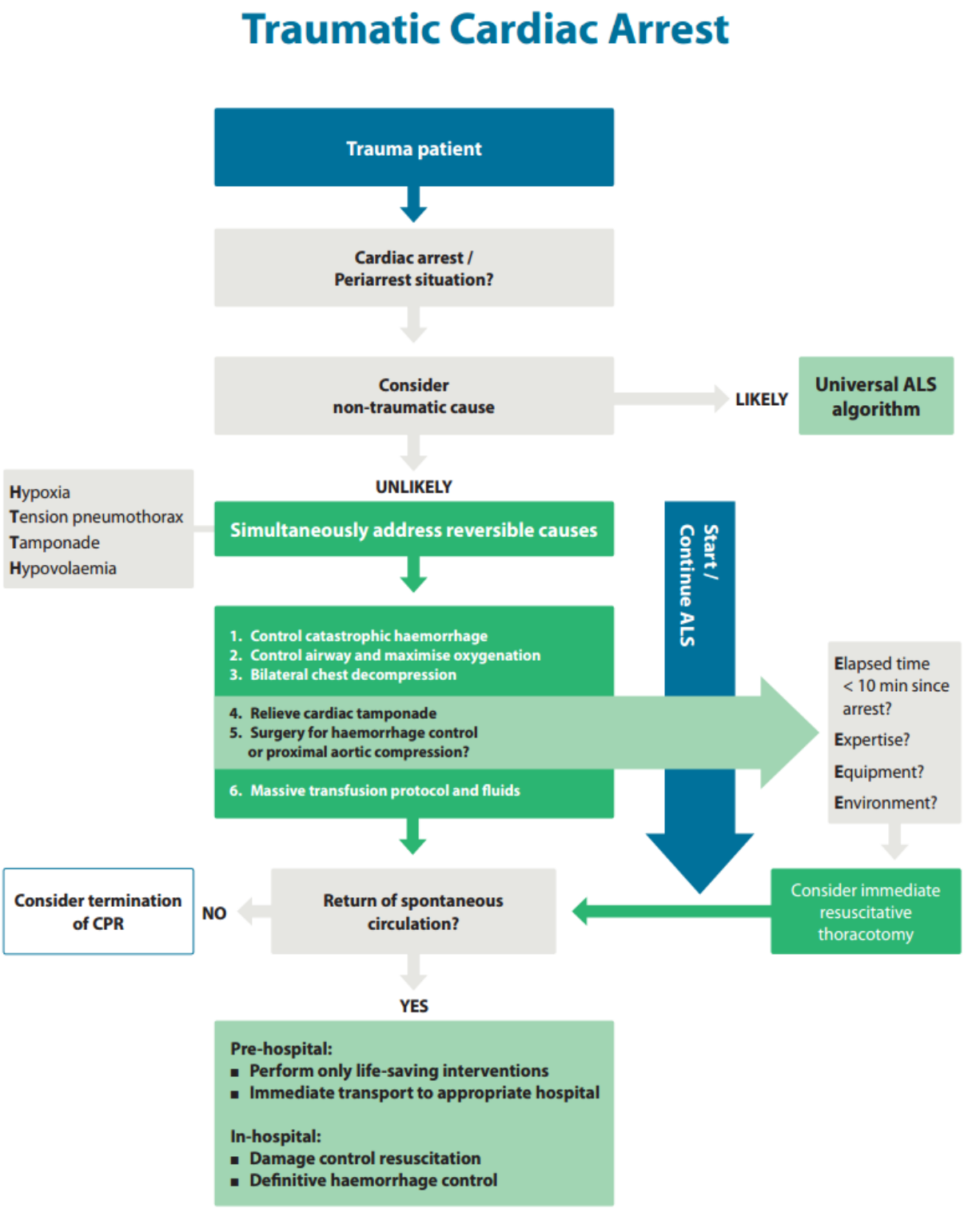
TECHNOLOGY

- **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 CO2
  - 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_2 sat
  - During arrest, when the O_2 sat is unreliable, they recommend using a 100% FiO_2

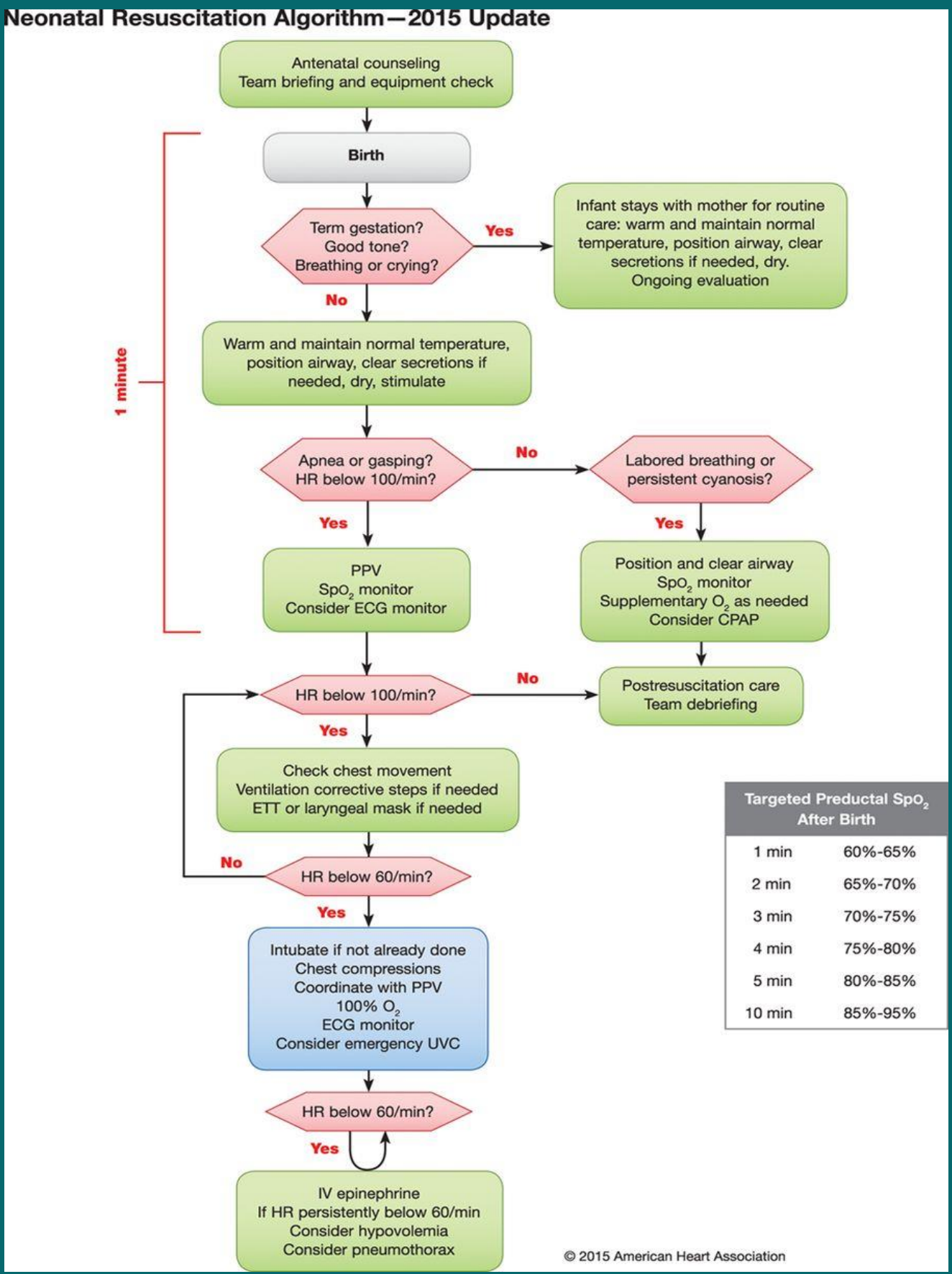
HOSPITAL AND PRE HOSPITAL INFO

- **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



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 neonatal resuscitation 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-ecc-guidelines-2/

RESOURCE

Manuel Cruz Soto

INSTRUCTOR DISCIPLINES CPR, ACLS, AND PALS

for more information please contact email mcscprtc@gmail.com