DEBRIEFING GUIDE

INTRODUCTION

Debriefing has been shown to improve clinical behavior during cardiac resuscitation and, as such, has become a recommended procedure in the 2010 American Heart Association (AHA) Guidelines for CPR and Emergency Cardiovascular Care. Edelson and colleagues reported that the number of patients achieving return of spontaneous circulation (ROSC) at a university hospital in the Midwest increased from 44.6% to 59.4% (p=.03) when weekly debriefing sessions were conducted.[1] This guide has been developed to provide guidelines for debriefing the key measures of care that can have a significant impact on outcomes from sudden cardiac arrest (SCA).

OVERVIEW:

In-hospital resuscitation can be generally characterized as a disorganized, stressful event that lacks definitive leadership. Inexperienced providers and crowds of observers are also common, as are poor outcomes. Because on average, just 17% of all in-hospital arrests result in survival to discharge, one wonders if the low rate of survival is due to the process or the patient. Since the release of the 2005 AHA Guidelines, where emphasis was placed for the first time on high-quality CPR with longer periods of compression and fewer ventilations, we have begun to deconstruct the code response. Early data indicate that survival from in-hospital cardiac arrest can be improved (i.e., the current low rate of survival from in-hospital arrest cannot be entirely attributed to unsalvageable patients). It has become evident that obtaining a good outcome requires a chain of events, and in the dead center of the chain is the code response.

The key components of an optimal code response:

1. **Early recognition** that the patient is deteriorating or has become unresponsive.

2. **Bystander response.** At the risk of overstating the issue, with the exception of the Emergency Department (ED) or critical care staff, the first responder in a hospital is rarely more experienced than an educated bystander who comes upon a sudden cardiac arrest victim outside of the hospital. It is important that all staff are empowered to act, even if that means doing nothing more than immediately starting high-quality CPR. At a minimum, the second responder should bring the crash cart to the room, deploy the defibrillator pads, and turn on the defibrillator in anticipation of the arrival of the code team.

[1] Edelson DP, et al. *Arch Intern Med*. 2008;168(10):1063–69.

3. Early defibrillation when indicated. In the hospital, the arrhythmic arrest that requires an immediate diagnosis and shock is generally confined to the cardiac care unit, surgical intensive care unit, ED, or telemetry. The vast majority of codes outside of these units result from respiratory failure, and the need for a rapid defibrillation response may be less important than immediate circulatory support. Recent reports indicate that survival to discharge from in-hospital cardiac arrest is worse with the use of AEDs, possibly because health care providers waste time watching the defibrillator analyze a generally non-shockable rhythm when the time could be better spent delivering high-quality circulatory support in the form of CPR.[2]

Rapid recognition of a shockable rhythm and immediate shock delivery is critical when the presenting rhythm is coarse ventricular fibrillation (VF) or ventricular tachycardia (VT) because delays in shock delivery reduce shock efficacy. Inadvertent shocking of fine VF should be avoided as inappropriate shocks can result in asystole—a rhythm that is difficult to convert to a perfusing rhythm. The Guidelines currently recommend that shocks should not be stacked, rather a two-minute period of CPR should be performed between each shock. Shock energy can be delivered at the same or an escalating energy, according to manufacturer recommendations

There are some indications that a coarse VF or VT rhythm that does not respond to an initial shock may benefit from stacked shocks (a maximum of three before repeating the CPR interval) though this is not currently recommended in the Guidelines.[3]

4. High-quality, minimally interrupted CPR. Studies continue to show that high-quality CPR can make the difference between survival and death.[4,5,6]

The 2010 Guidelines state that the use of CPR feedback tools should be considered in both mock codes and in actual rescues. Data generated by Peberdy, et al. show how feedback can support the performance of compressions in target—individual compressions delivered at the correct depth and rate, according to Guideline recommendations.[7] In a manikin study of 125 health care professionals, compressions in target averaged 15% without feedback and 78% when audiovisual feedback on compression depth and rate was provided.

The importance of short pauses for pulse checks, pre-shock and post-shock, was demonstrated by Edelson et al[8]; the shock success rate was 94% when a shock was delivered within 10 seconds after stopping CPR but dwindled to 38% with a 30-second pause.

The total amount of time in CPR is also critical for a successful outcome. The CPR fraction, defined as the percentage of time that compressions are delivered during a code, is an important measure of CPR

2 Chan P, et al. *Arch Intern Med.* 2009;169(14)1265–73.
3 Indik, JH, et al. *Circ Arrhythm Electrophysiol.* 2009;2(2):179-84. Epub 2009 Feb 18.
4 Abella BS, et al. *Circulation* 2005;111:428–34.
5 Bohn A, et al. *Anaesthesist.* 2011;60(7):653–60.
6 Davis DP, et al. Abstract presented at the 2009 ReSS symposium of the AHA.
7 Peberdy MA, et al. *Resuscitation.* 2009;80:1169–74.
8 Edelson DP, et al. *Resuscitation.* 2006;71:137–45.

performance. While a CPR fraction of 50% to 60% is typical, this is not acceptable to achieve good patient outcome. After implementing an Advanced Resuscitation Training (ART) program at the University of California San Diego (UCSD) Medical Center, that emphasizes minimizing chest compression interruption, UCSD Resuscitation Director Daniel Davis, MD, reported a 91% CPR fraction and a doubling of survival to discharge at UCSD hospitals.[9]

5. Controlled ventilation. Aufderheide, et al. demonstrated that excessive ventilation (20 to 30 times a minute) causes intrathoracic pressure to rise, impeding cardiac filling and reducing coronary perfusion pressure. Edelson demonstrated that the use of end-tidal CO_2 was the most accurate means to track respirations during a code.[11] The 2010 Guidelines have made use of $EtCO_2$ a Class I recommendation for intubation verification and Class IIa for tracking resuscitation progress.[12] According to the current Guidelines, ventilation should be performed at a rate of 2 ventilations for every 30 compressions before intubation, and 8 to 10 times a minute after intubation.

Ideally, intubation should be performed without pausing compressions, or done during other natural pauses (for rhythm analysis or pulse checks). Delays in intubation and multiple attempts should be noted.

6. Appropriate use of drugs and auxiliary equipment. The AHA Guidelines suggest the use of 1 mg of epinephrine every 3 to 5 minutes, with a suggestion that the first or second dose of epinephrine can be replaced with a 40-unit dose of vasopressin. Institution policy should determine appropriate drug administration.

Amiodarone may be considered for recurrent arrhythmia in a first dose bolus of 300 mg and a second dose of 150 mg.

The Guidelines suggest that use of intraosseous cannulation may speed vascular access, and use of laryngeal airways may aid in rapid intubation. Transcutaneous pacing is currently only recommended to treat bradycardia, not asystole.

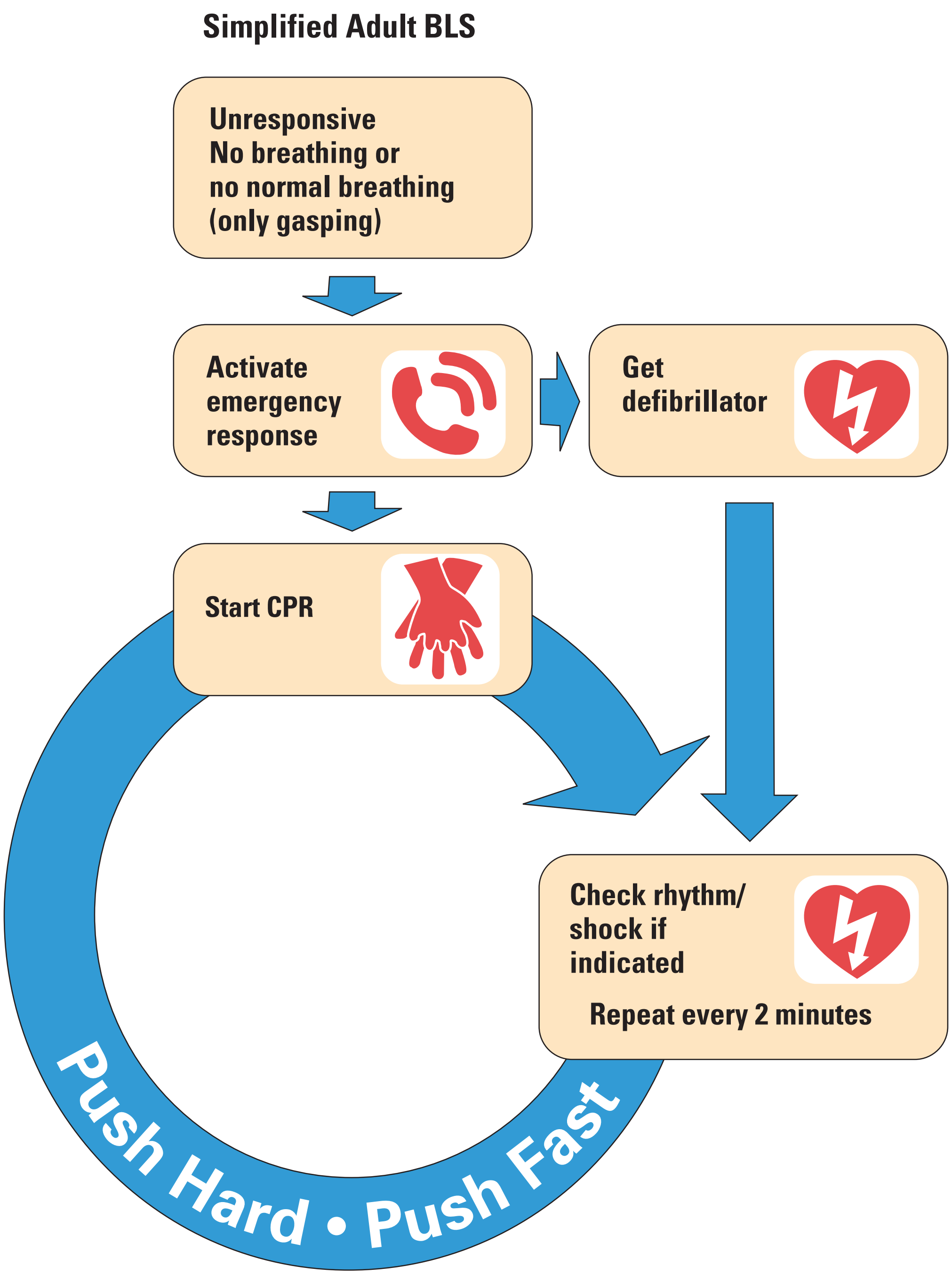
7. Consider the reversible causes of arrest. At some point in the resuscitation, time should be taken to rapidly assess whether the patient may have a reversible cause of arrest, such as the Hs and Ts:

- Hypovolemia, hypoxia, hydrogen ions (acidosis), hyperkalemia or hypokalemia, hypothermia, hyperglycemia and hypoglycemia
- Toxins, tamponade, tension pneumothorax, thrombosis, thromboembolism, trauma

A checklist of signs and symptoms can be helpful.

[9] Davis DP. CEU program, A New Algorithm for CPR Training: Strengthening the Chain of Survival. Medcom Trainex. 2012
[10] Aufderheide TP, et al. *Circulation.* 2004 Apr 27;109(16):1960–5.
[11] Edelson DP, et al. *Resuscitation.* 2010;81:317–322.
[12] AHA 2010 guidelines for CPR and Emergency Cardiac Arrest

The charts below show the AHA Adult Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) algorithms as well as the pediatric and newborn resuscitation algorithms.



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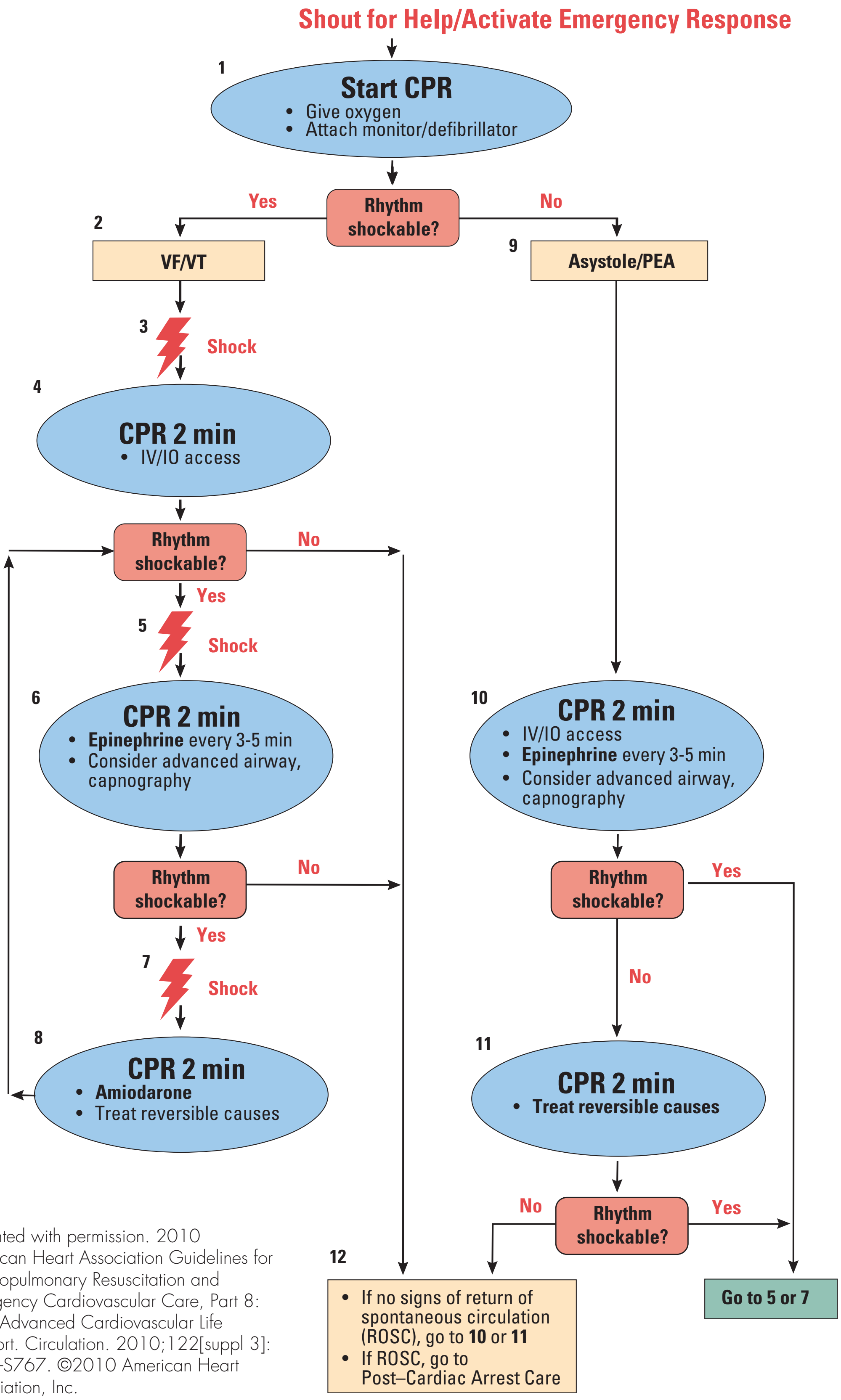
Adult Cardiac Arrest Algorithm



CPR Quality
- Push hard (≥2 inches [5 cm]) and fast (≥100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- 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

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

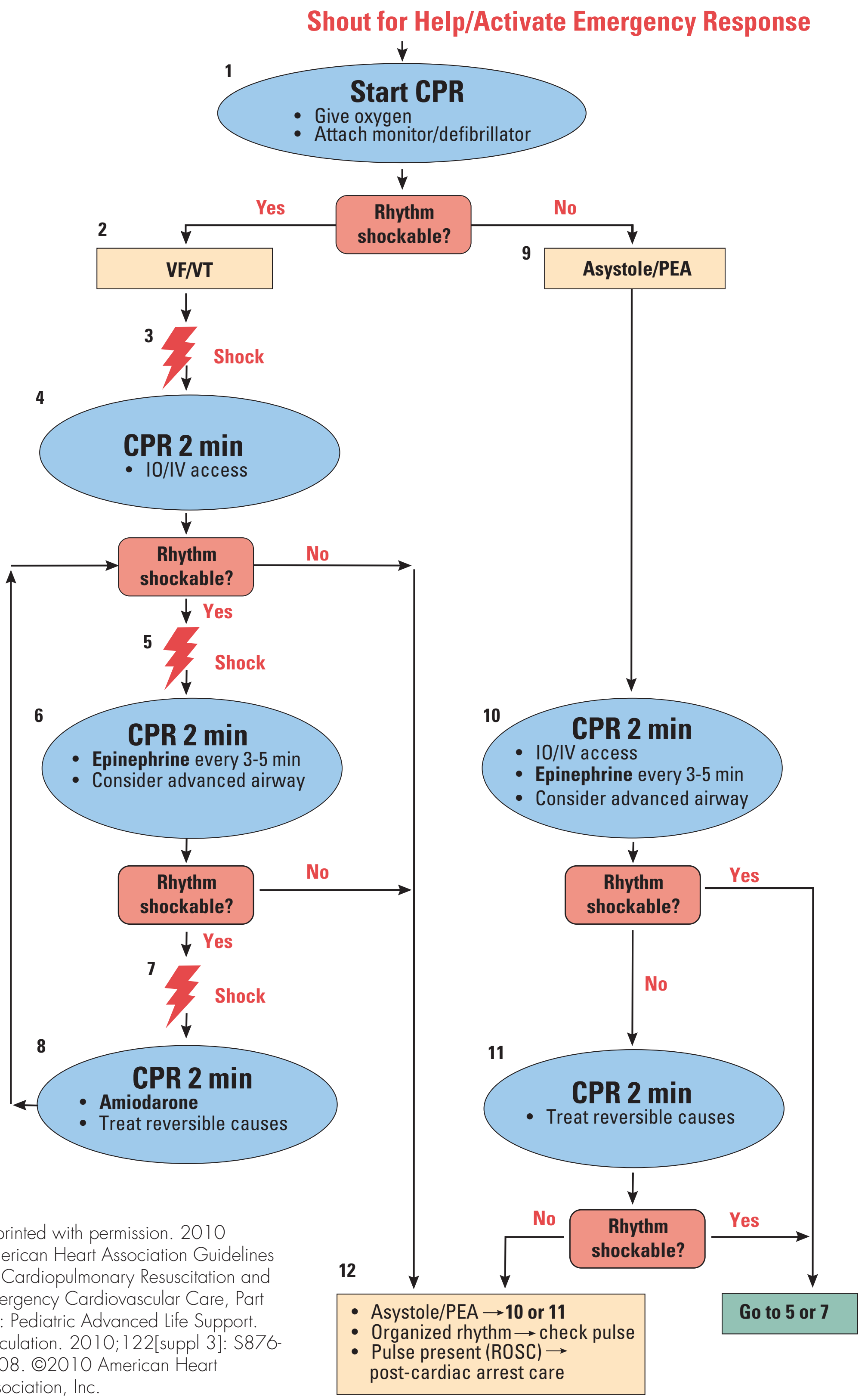
Shock Energy
- **Biphasic:** Manufacturer recommendation (120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy
- **Epinephrine IV/IO Dose:** 1 mg every 3-5 minutes
- **Vasopressin IV/IO Dose:** 40 units can replace first or second dose of epinephrine
- **Amiodarone IV/IO Dose:** First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway
- Supraglottic advanced airway or endotracheal intubation
- Waveform capnography to confirm and monitor ET tube placement
- 8-10 breaths per minute with continuous chest compressions

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

Pediatric Cardiac Arrest



Doses/Details

CPR Quality
- Push hard (≥1/3 of anterior-posterior diameter of chest) and fast (at least 100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 15:2 compression-ventilation ratio. If advanced airway, 8-10 breaths per minute with continuous chest compressions

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.

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 6-8 seconds (8-10 breaths per minute)

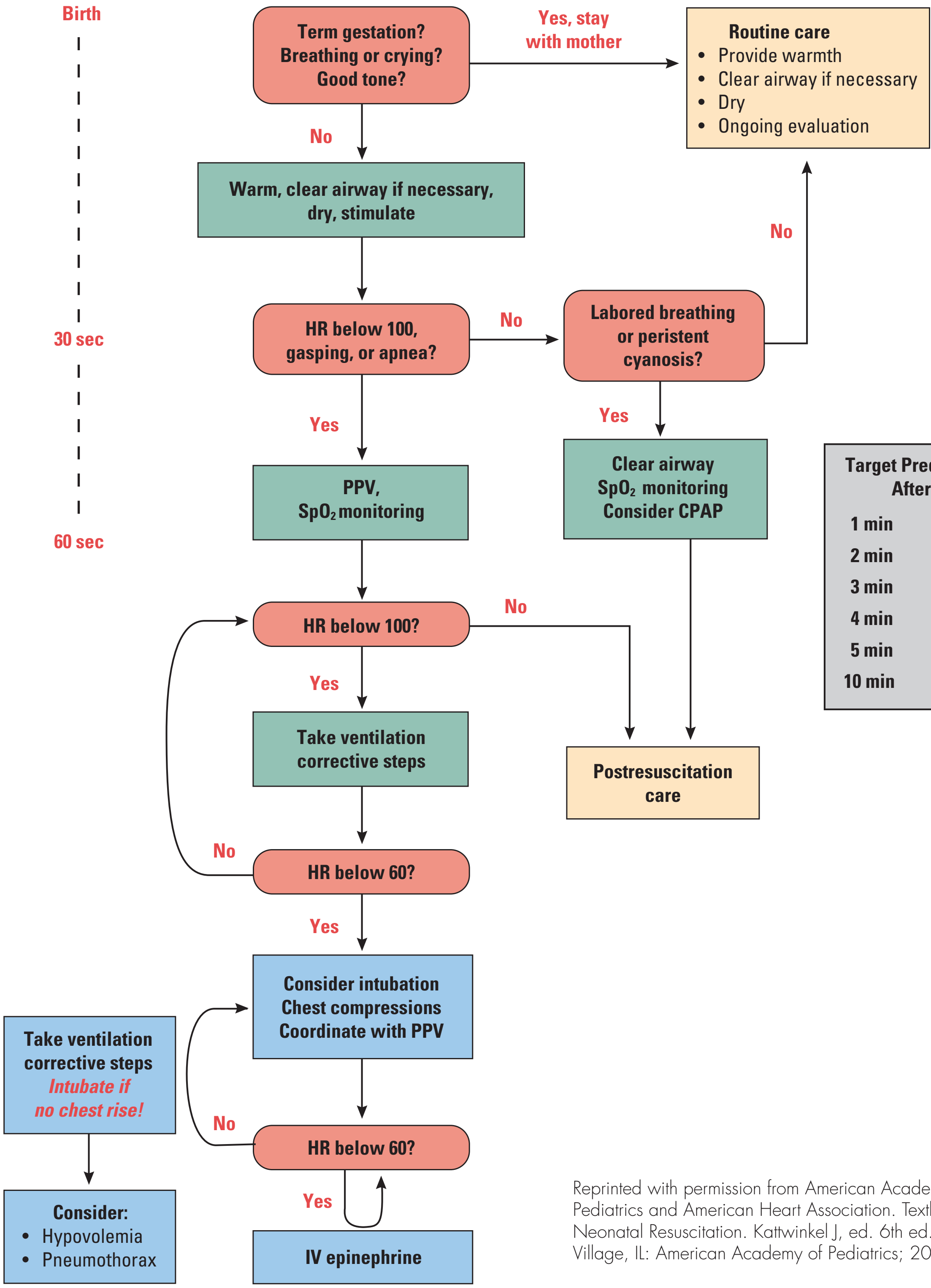
Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

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

HOW TO DEBRIEF A CASE USING RESCUENET® CODE REVIEW

QUICK GUIDE

Reversible Causes of Cardiac Arrest—the Hs & the Ts



Target Preductal SpO_2 After Birth

1 min	60%-65%
2 min	65%-70%
3 min	70%-75%
4 min	75%-80%
5 min	80%-85%
10 min	85%-95%

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Printed in the U.S.A. PN-239