Pediatric Life Support: Difference from Adult (PBLS and PALS)

NRP (Neonatal Resuscitation Program)

2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

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PALS課程
兒科進階生命支持術

由美國心臟學會及
美國兒科學院共同研擬

PALS要義

1. 生存鍊
2. 呼吸衰竭及休克之認知
3. 兒科**BLS**
4. 氣道、通氣及呼吸窘迫/衰竭之處置
5. 休克及心臟停止之輸液治療及藥物
6. 血管路徑之建立
7. 心律異常

PALS要義

8. 外傷復甦及脊椎固定
9. 須特殊醫療照護之兒童
10. 新生兒復甦
11. 快捷程序插管
12. PALS執行者之鎮靜
13. 面對死亡/瀕死之處置
14. CPR的倫理法律層面

PALS課程沿革回顧

1. **1966 BLS**
2. **1973 ALS**
3. **1978/1979** 兒科**BLS**及新生兒心肺復甦
4. **1985/1988** 兒科**BLS**及**ALS**，新生兒心肺復甦術
5. **1992**年 **(**加上外傷處置**)**
6. **2000**年新指引
7. **2010 update**
8. **2015 update**

REFERENCES:

Part 6: Pediatric Basic Life Support and Pediatric Advanced Life Support 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations

Circulation 2015;132(suppl 1):S177-S203

Part 11: Pediatric Basic Life Support and Cardiopulmonary Resuscitation Quality: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Circulation 2015;132(suppl 2):S519-S525

Part 12: Pediatric Advanced Life Support : 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Circulation 2015;132(suppl 2):S526-S542

Definition

- Infant BLS guidelines apply to infants younger than approximately 1 year of age.
- Child BLS guidelines apply to children approximately 1 year of age until puberty. For teaching purposes, puberty is defined as breast development in females and the presence of axillary hair in males.
- Adult BLS guidelines apply at and beyond puberty

In-hospital Cardiac Arrest (IHCA)

- Over the past 13 years, survival to discharge from pediatric in-hospital cardiac arrest (IHCA) has markedly improved.
- From 2001 to 2013, rates of return of spontaneous circulation (ROSC) from IHCA increased significantly from 39% to 77%, and survival to hospital discharge improved from 24% to 36% to 43% (Girotra et al1 and personal communication with Paul Chan, MD, MSc, April 3, 2015).

In-hospital Cardiac Arrest (IHCA)

- In a single center, implementation of an intensive care unit (ICU)–based interdisciplinary debriefing program improved survival with favorable neurologic outcome from 29% to 50%.
- Furthermore, new data show that prolonged cardiopulmonary resuscitation (CPR) is not futile: 12% of patients receiving CPR in IHCA for more than 35 minutes survived to discharge, and 60% of the survivors had a favorable neurologic outcome.

Improvement of Survival Rate from IHCA

- Emphasis on high-quality CPR
- Advances in post-resuscitation care.

OHCA

- Survival from out-of-hospital cardiac arrest (OHCA) has not improved as dramatically over the past 5 years.
- Data from 11 US and Canadian hospital emergency medical service systems (the Resuscitation Outcomes Consortium) during 2005 to 2007 showed age-dependent discharge survival rates of 3.3% for infants (less than 1 year), 9.1% for children (1 to 11 years), and 8.9% for adolescents (12 to 19 years).
- More recently published data (through 2012) from this network demonstrate 8.3% survival to hospital discharge across all age groups, with 10.5% survival for children aged 1 to 11 years and 15.8% survival for adolescents aged 12 to 18 years.

2015 Guidelines Update for PBLS

- Pediatric BLS Healthcare Provider Pediatric Cardiac Arrest Algorithms for a single rescuer and for 2 or more rescuers
- The sequence of compressions, airway, breathing (C-A-B) versus airway, breathing, compressions (A-B-C)
- Chest compression rate and depth
- Compression-only (Hands-Only) CPR

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

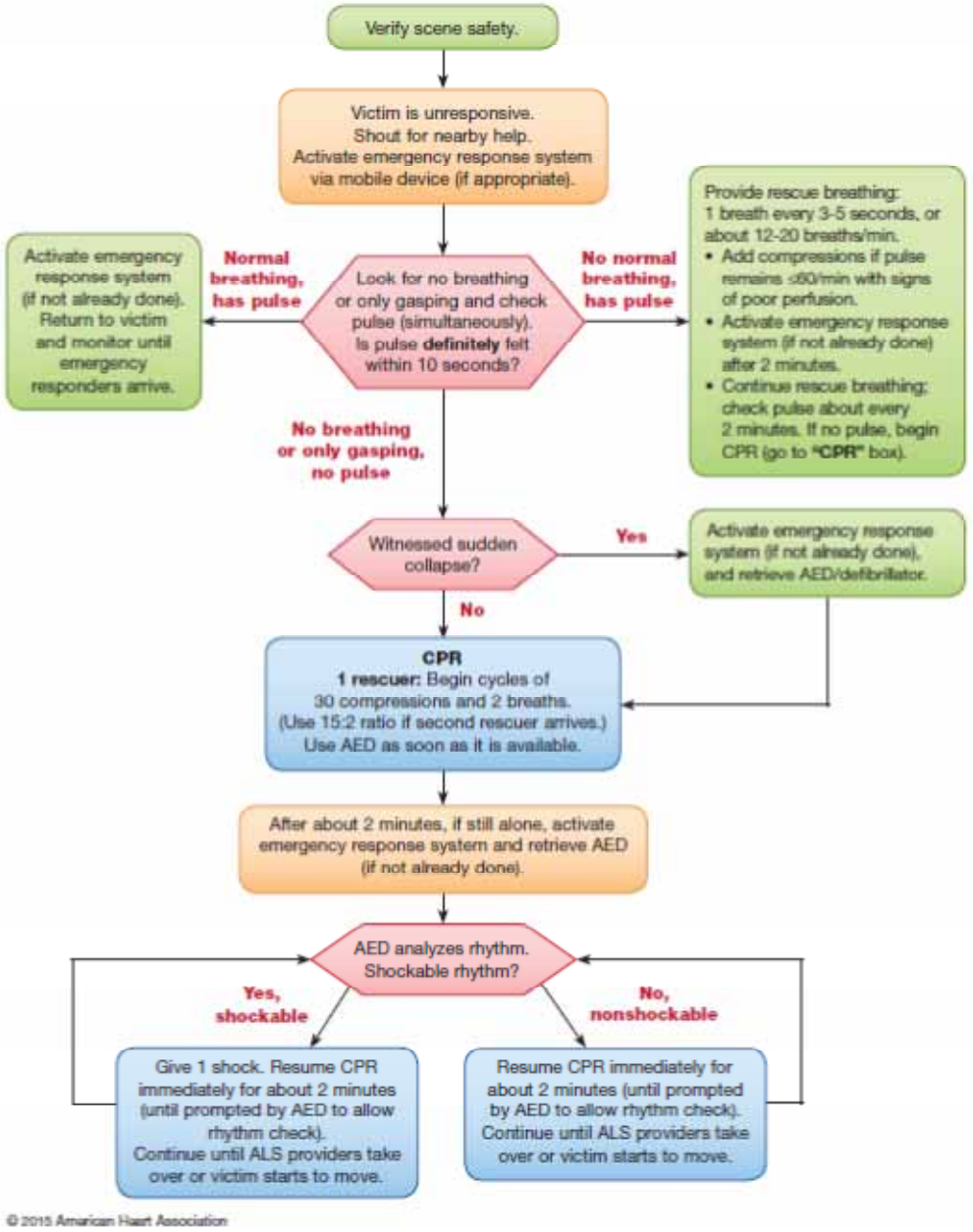


Figure 1. BLS Healthcare Provider Pediatric Cardiac Arrest Algorithm for the Single Rescuer—2015 Update.

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

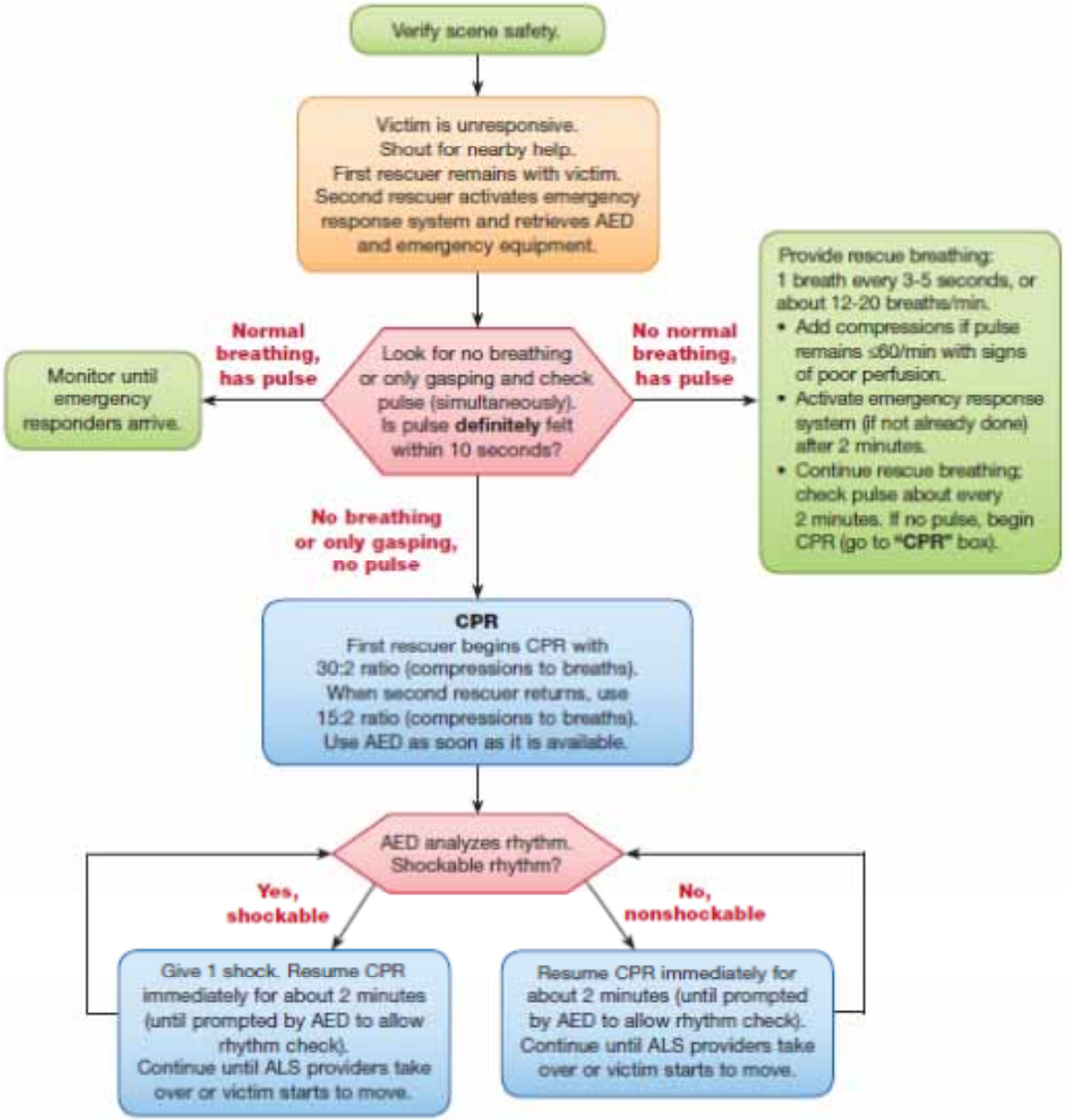


Figure 2. BLS Healthcare Provider Pediatric Cardiac Arrest Algorithm for 2 or More Rescuers—2015 Update.

Appendix

2015 Guidelines Update: Part 11 Recommendations

Year Last Reviewed	Topic	Recommendation	Comments
2015	Sequence of CPR	Because of the limited amount and quality of the data, it may be reasonable to maintain the sequence from the 2010 Guidelines by initiating CPR with C-A-B over A-B-C (Class IIb, LOE C-EO).	updated for 2015
2015	Components of High-Quality CPR: Chest Compression Rate and Depth	To maximize simplicity in CPR training, in the absence of sufficient pediatric evidence, it is reasonable to use the adult chest compression rate of 100/min to 120/min for infants and children (Class IIa, LOE C-EO).	updated for 2015
2015	Components of High-Quality CPR: Chest Compression Rate and Depth	Although the effectiveness of CPR feedback devices was not reviewed by this writing group, the consensus of the group is that the use of feedback devices likely helps the rescuer optimize adequate chest compression rate and depth, and we suggest their use when available (Class IIb, LOE C-EO).	updated for 2015
2015	Components of High-Quality CPR: Chest Compression Rate and Depth	It is reasonable that in pediatric patients (1 month to the onset of puberty) rescuers provide chest compressions that depress the chest at least one third the anterior-posterior diameter of the chest. This equates to approximately 1.5 inches (4 cm) in infants to 2 inches (5 cm) in children (Class IIa, LOE C-LD).	updated for 2015
2015	Components of High-Quality CPR: Compression-Only CPR	Conventional CPR (rescue breathing and chest compressions) should be provided for pediatric cardiac arrests (Class I, LOE B-NR).	updated for 2015
2015	Components of High-Quality CPR: Compression-Only CPR	The asphyxial nature of the majority of pediatric cardiac arrests necessitates ventilation as part of effective CPR. However, because compression-only CPR is effective in patients with a primary cardiac event, if rescuers are unwilling or unable to deliver breaths, we recommend rescuers perform compression-only CPR for infants and children in cardiac arrest (Class I, LOE B-NR).	updated for 2015

2015 Guidelines Update for PALS

Prearrest Care

- Effectiveness of **medical emergency teams or rapid response teams** to improve outcomes
- Effectiveness of a **pediatric early warning score (PEWS)** to improve outcomes
- **Restrictive volume of isotonic crystalloid** for resuscitation from septic shock
- **Use of atropine as a premedication** in infants and children requiring emergency tracheal intubation
- Treatment for infants and children with **myocarditis or dilated cardiomyopathy and impending cardiac arrest**

2015 Guidelines Update for PALS

Intra-arrest Care

- Effectiveness of **extracorporeal membrane oxygenation (ECMO) resuscitation** compared to standard resuscitation without ECMO
- Targeting a **specific end-tidal CO2 (ETCO2) threshold** to improve chest compression technique
- Reliability of **intra-arrest prognostic factors** to predict outcome
- Use of **invasive hemodynamic monitoring during CPR** to titrate to a specific systolic/diastolic blood pressure to improve outcomes
- Effectiveness of NO **vasopressor** compared with ANY vasopressors for resuscitation from cardiac arrest
- Use of **amiodarone** compared with **lidocaine** for **shockrefractory VF or pVT**
- Optimal **energy dose** for **defibrillation**

2015 Guidelines Update for PALS

Post-arrest Care

- Use of **targeted temperature management** to improve outcomes
- Use of a **targeted Pao2 strategy** to improve outcomes
- Use of a **specific Paco2 target** to improve outcomes
- Use of **parenteral fluids and inotropes and/or vasopressors** to maintain targeted measures of perfusion such as blood pressure to improve outcomes
- Use of **electroencephalograms (EEGs)** to accurately predict outcomes
- Use **of any specific post–cardiac arrest factors** to accurately predict outcomes

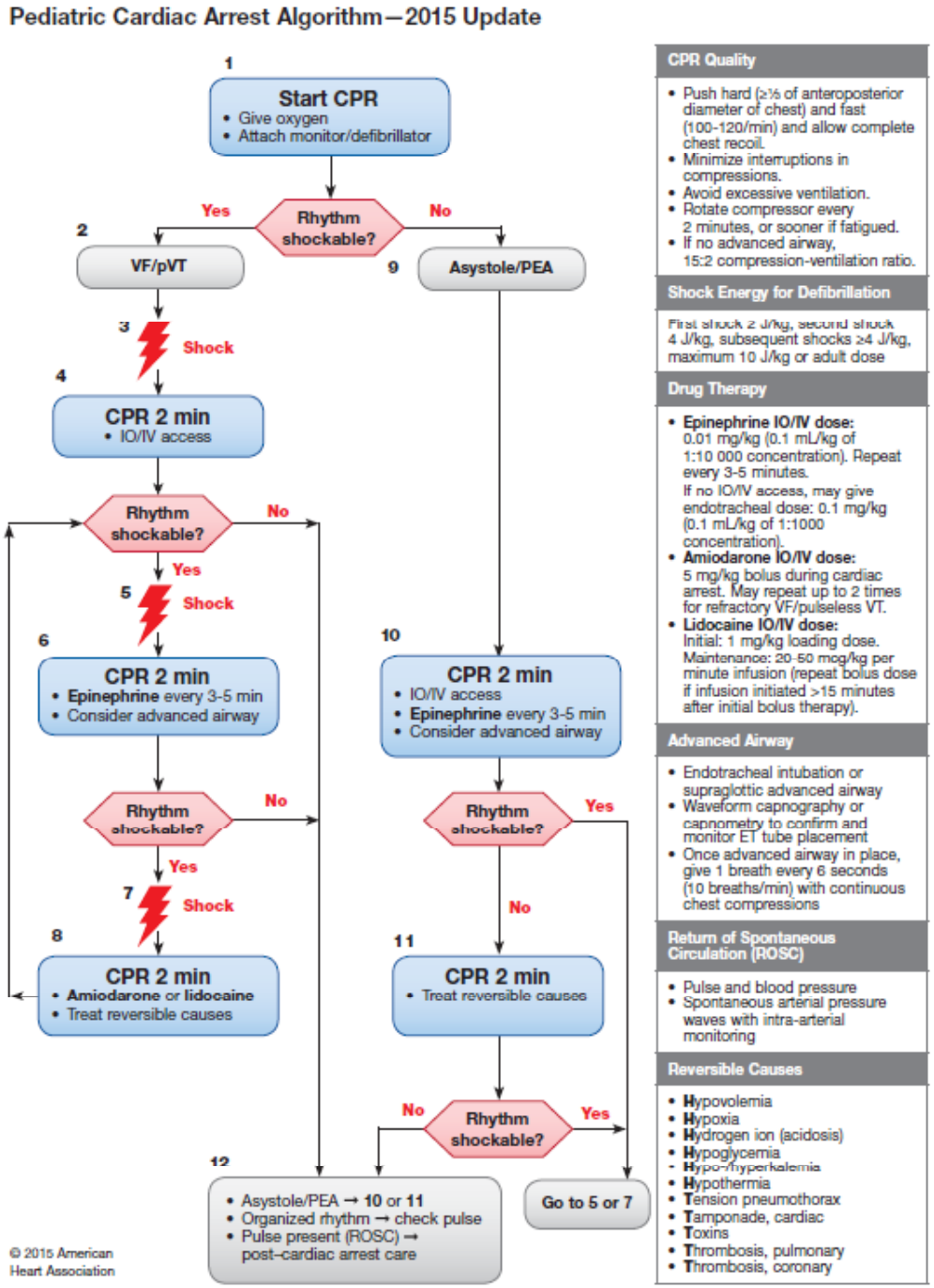


Figure 3. Pediatric Cardiac Arrest Algorithm—2015 Update.

2015 Guidelines Update: Part 12 Recommendations

Year Last Reviewed	Topic	Recommendation	Comments
2015	Prearrest Care Updates	Pediatric medical emergency team/rapid response team systems may be considered in facilities where children with high-risk illnesses are cared for on general in-patient units (Class IIb, LOE C-LD).	updated for 2015
2015	Prearrest Care Updates	The use of PEWS may be considered, but its effectiveness in the in-hospital setting is not well established (Class IIb, LOE C-LD).	new for 2015
2015	Prearrest Care Updates	Administration of an initial fluid bolus of 20 mL/kg to infants and children with shock is reasonable, including those with conditions such as severe sepsis (Class IIa, LOE C-LD), malaria and Dengue (Class IIb, LOE B-R).	new for 2015
2015	Prearrest Care Updates	When caring for children with severe febrile illness (such as those included in the FEAST trial), in settings with limited access to critical care resources (ie mechanical ventilation and inotropic support), administration of bolus intravenous fluids should be undertaken with extreme caution because it may be harmful (Class IIb, LOE B-R).	new for 2015
2015	Prearrest Care Updates	Providers should reassess the patient after every fluid bolus (Class I, LOE C-EO).	new for 2015
2015	Prearrest Care Updates	Either isotonic crystalloids or colloids can be effective as the initial fluid choice for resuscitation (Class IIa, LOE B-R).	new for 2015
2015	Prearrest Care Updates	The available evidence does not support the routine use of atropine preintubation of critically ill infants and children. It may be reasonable for practitioners to use atropine as a premedication in specific emergent intubations when there is higher risk of bradycardia (eg, when giving succinylcholine as a neuromuscular blocker to facilitate intubation) (Class IIb, LOE C-LD).	new for 2015
2015	Prearrest Care Updates	A dose of 0.02 mg/kg of atropine with no minimum dose may be considered when atropine is used as a premedication for emergency intubation (Class IIb, LOE C-LD).	new for 2015
2015	Prearrest Care Updates	Venoarterial ECMO use may be considered in patients with acute fulminant myocarditis who are at high risk of imminent cardiac arrest (Class IIb, LOE C-EO).	new for 2015

2015	Intra-arrest Care Updates	ECPR may be considered for pediatric patients with cardiac diagnoses who have IHCA in settings with existing ECMO protocols, expertise, and equipment (Class IIb, LOE C-LD).	new for 2015
2015	Intra-arrest Care Updates	$ETCO_2$ monitoring may be considered to evaluate the quality of chest compressions, but specific values to guide therapy have not been established in children (Class IIb, LOE C-LD).	new for 2015
2015	Intra-arrest Care Updates	Multiple variables should be used when attempting to prognosticate outcomes during cardiac arrest (Class I, LOE C-LD).	new for 2015
2015	Intra-arrest Care Updates	For patients with invasive hemodynamic monitoring in place at the time of cardiac arrest, it may be reasonable for rescuers to use blood pressure to guide CPR quality (Class IIb, LOE C-EO).	new for 2015
2015	Intra-arrest Care Updates	It is reasonable to administer epinephrine in pediatric cardiac arrest (Class IIa, LOE C-LD).	new for 2015
2015	Intra-arrest Care Updates	For shock-refractory VF or pVT, either amiodarone or lidocaine may be used (Class IIb, LOE C-LD).	new for 2015
2015	Intra-arrest Care Updates	It is reasonable to use an initial dose of 2 to 4 J/kg of monophasic or biphasic energy for defibrillation (Class IIa, LOE C-LD), but for ease of teaching, an initial dose of 2 J/kg may be considered (Class IIb, LOE C-EO).	updated for 2015
2015	Intra-arrest Care Updates	For refractory VF, it is reasonable to increase the dose to 4 J/kg (Class IIa, LOE C-LD).	updated for 2015
2015	Intra-arrest Care Updates	For subsequent energy levels, a dose of 4 J/kg may be reasonable and higher energy levels may be considered, though not to exceed 10 J/kg or the adult maximum dose (Class IIb, LOE C-LD).	updated for 2015

2015	Postarrest Care Updates	For infants and children remaining comatose after OHCA, it is reasonable either to maintain 5 days of continuous normothermia (36°C to 37.5°C) or to maintain 2 days of initial continuous hypothermia (32°C to 34°C) followed by 3 days of continuous normothermia (Class IIa, LOE B-R).	new for 2015
2015	Postarrest Care Updates	Continuous measurement of temperature during this time period is recommended (Class I, LOE B-NR).	new for 2015
2015	Postarrest Care Updates	Fever (temperature 38°C or higher) should be aggressively treated after ROSC (Class I, LOE B-NR).	new for 2015
2015	Postarrest Care Updates	It may be reasonable for rescuers to target normoxemia after ROSC (Class IIb, LOE B-NR).	new for 2015
2015	Postarrest Care Updates	It is reasonable for practitioners to target a $Paco_2$ after ROSC that is appropriate to the specific patient condition, and limit exposure to severe hypercapnia or hypocapnia (Class IIb, LOE C-LD).	new for 2015
2015	Postarrest Care Updates	After ROSC, we recommend that parenteral fluids and/or inotropes or vasoactive drugs be used to maintain a systolic blood pressure greater than fifth percentile for age (Class I, LOE C-LD).	new for 2015

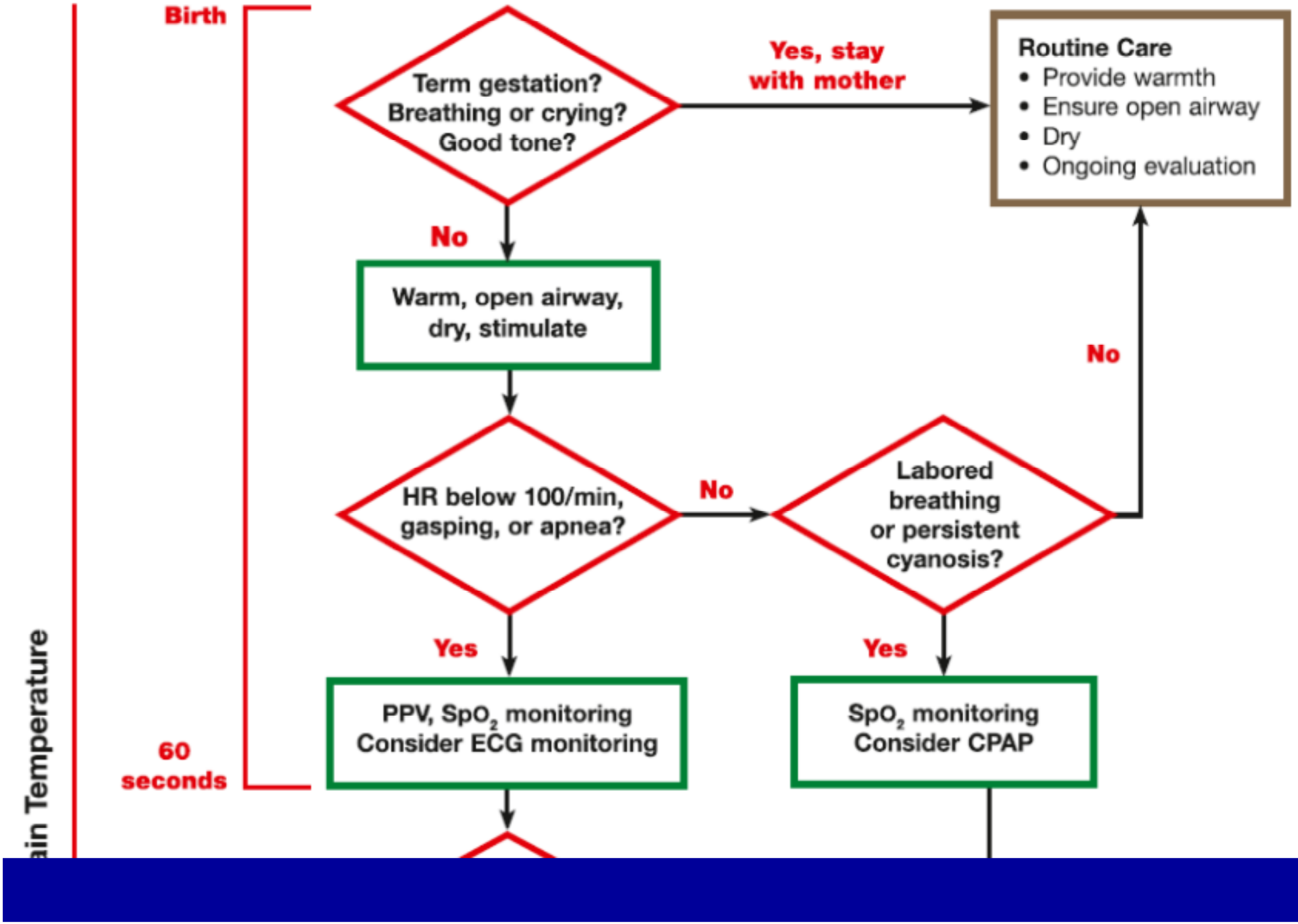
2015 Guidelines Update: Part 12 Recommendations, *Continued*

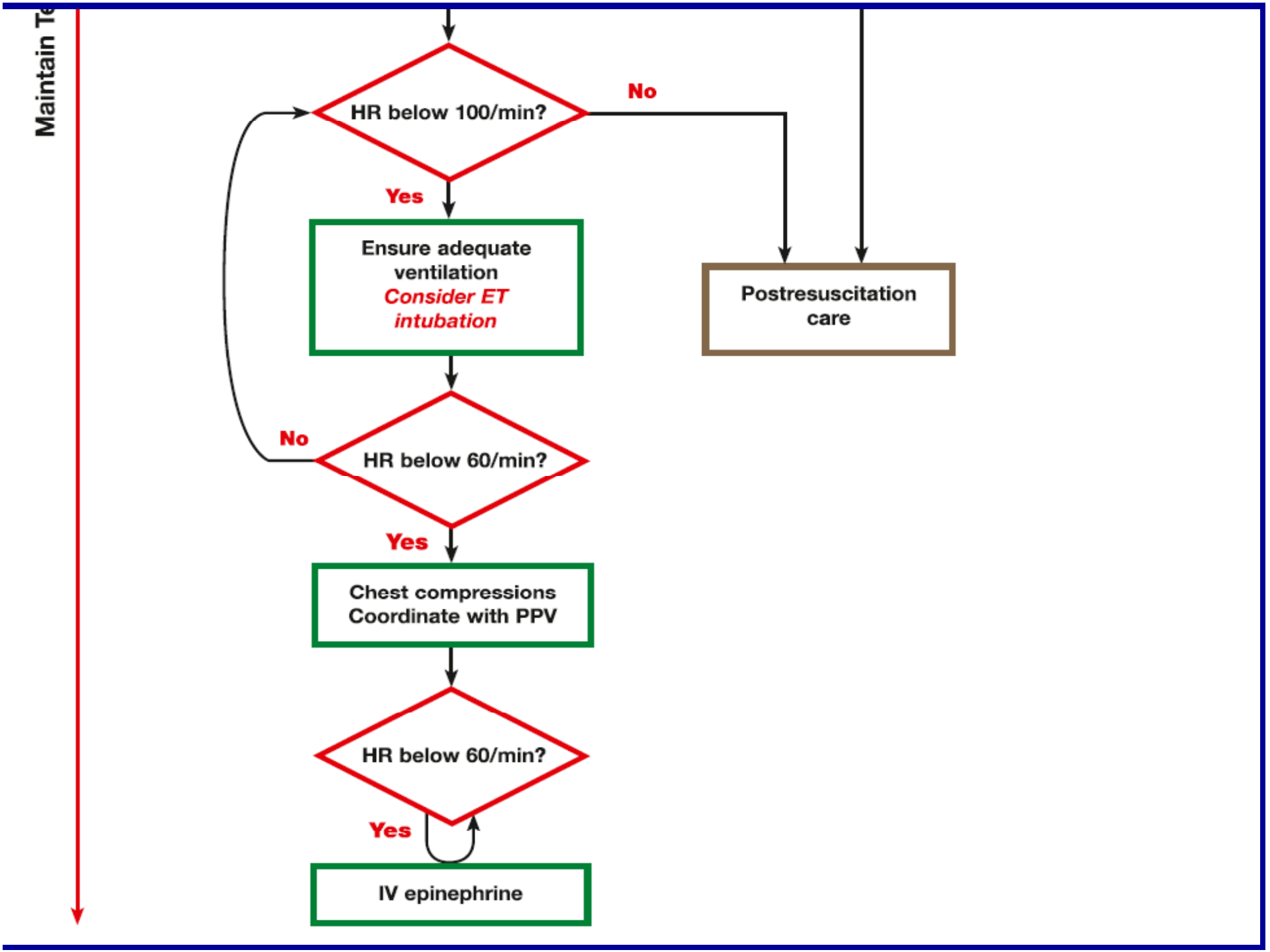
Year Last Reviewed	Topic	Recommendation	Comments
2015	Postarrest Care Updates	When appropriate resources are available, continuous arterial pressure monitoring is recommended to identify and treat hypotension (Class I, LOE C-EO).	new for 2015
2015	Postarrest Care Updates	EEGs performed within the first 7 days after pediatric cardiac arrest may be considered in prognosticating neurologic outcome at the time of hospital discharge (Class IIb, LOE C-LD) but should not be used as the sole criterion.	new for 2015
2015	Postarrest Care Updates	The reliability of any one variable for prognostication in children after cardiac arrest has not been established. Practitioners should consider multiple factors when predicting outcomes in infants and children who achieve ROSC after cardiac arrest (Class I, LOE C-LD).	new for 2015
The following recommendations were not reviewed in 2015. For more information, see the *2010 AHA Guidelines for CPR and ECC*, "Part 14: Pediatric Advanced Life Support."			
2010	Family Presence During Resuscitation	Whenever possible, provide family members with the option of being present during resuscitation of an infant or child (Class I, LOE B).	not reviewed in 2015
2010	Laryngeal Mask Airway (LMA)	When bag-mask ventilation (see "Bag-Mask Ventilation," below) is unsuccessful and when endotracheal intubation is not possible, the LMA is acceptable when used by experienced providers to provide a patent airway and support ventilation (Class IIa, LOE C).	not reviewed in 2015

- **Intra-arrest**
- **Pre-arrest**
- **Post-arrest**

Neonatal Resuscitation Program

Part 7: neonatal resuscitation: 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2015;132(suppl 1):S204–S241.


Birth
Term gestation?
Breathing or crying?
Good tone?
Yes, stay
with mother
Routine Care
• Provide warmth
• Ensure open airway
• Dry
• Ongoing evaluation
No
Warm, open airway,
dry, stimulate
No
HR below 100/min,
gasping, or apnea?
No
Labored
breathing
or persistent
cyanosis?
Yes
Yes
PPV, SpO2 monitoring
Consider ECG monitoring
SpO2 monitoring
Consider CPAP
60
seconds
ain Temperature


Maintain Te
HR below 100/min?
No
Yes
Ensure adequate ventilation
Consider ET intubation
Postresuscitation care
No
HR below 60/min?
Yes
Chest compressions
Coordinate with PPV
HR below 60/min?
Yes
IV epinephrine

Neonatal Resuscitation Algorithm

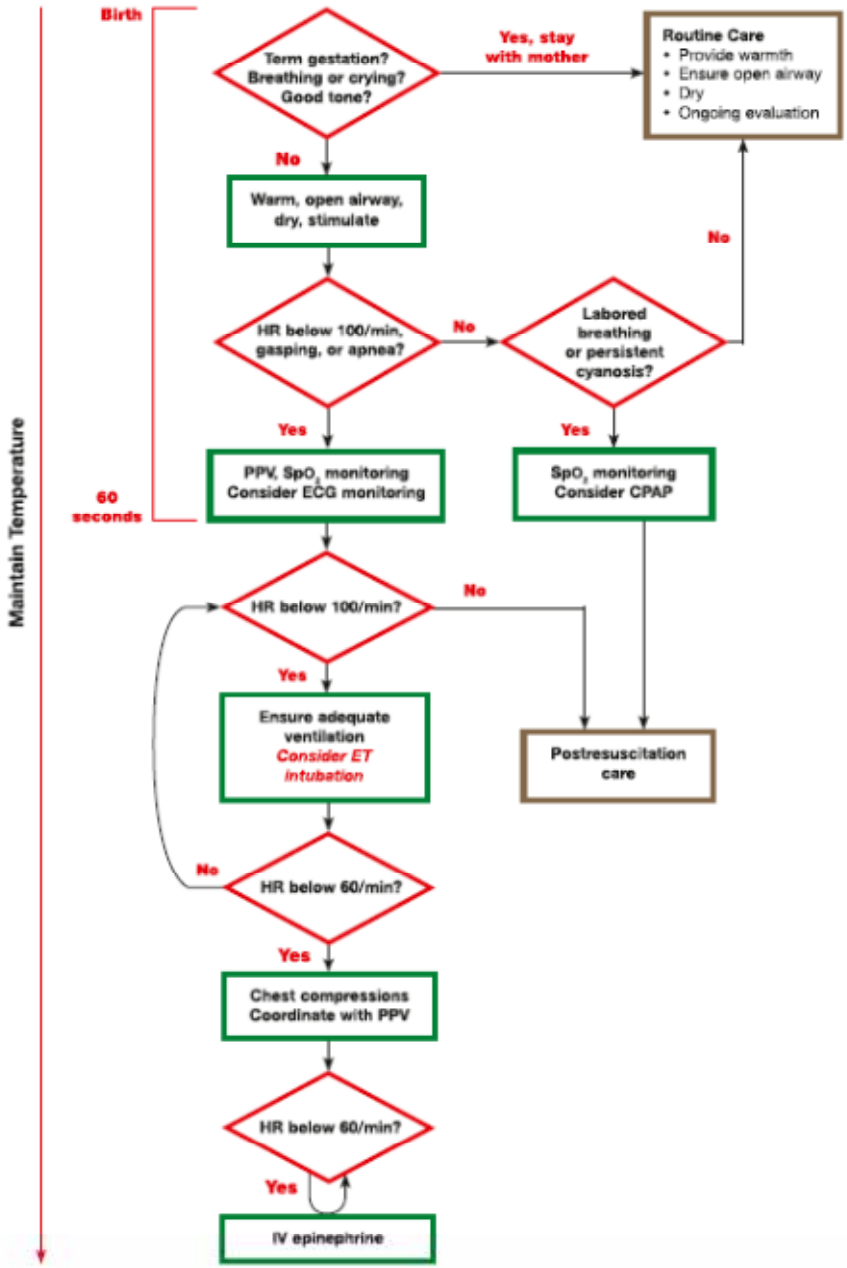
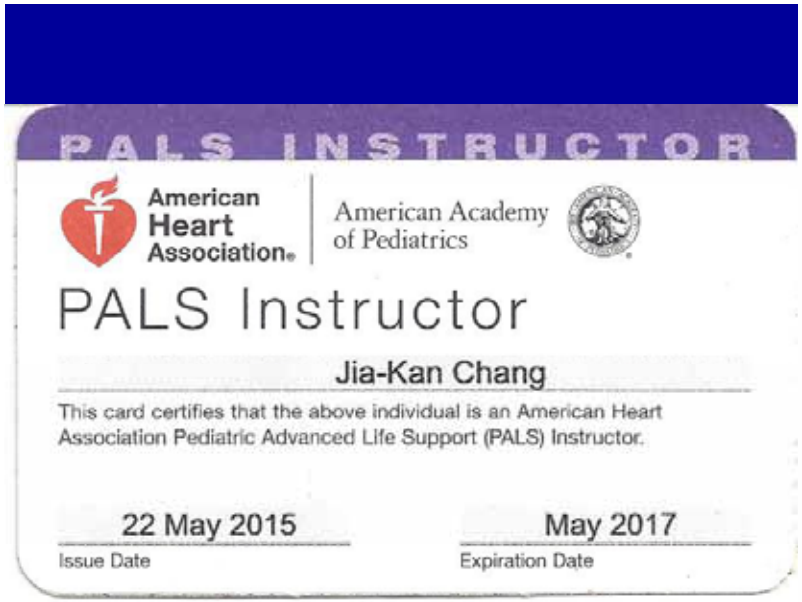


Figure 1
Neonatal Resuscitation Algorithm.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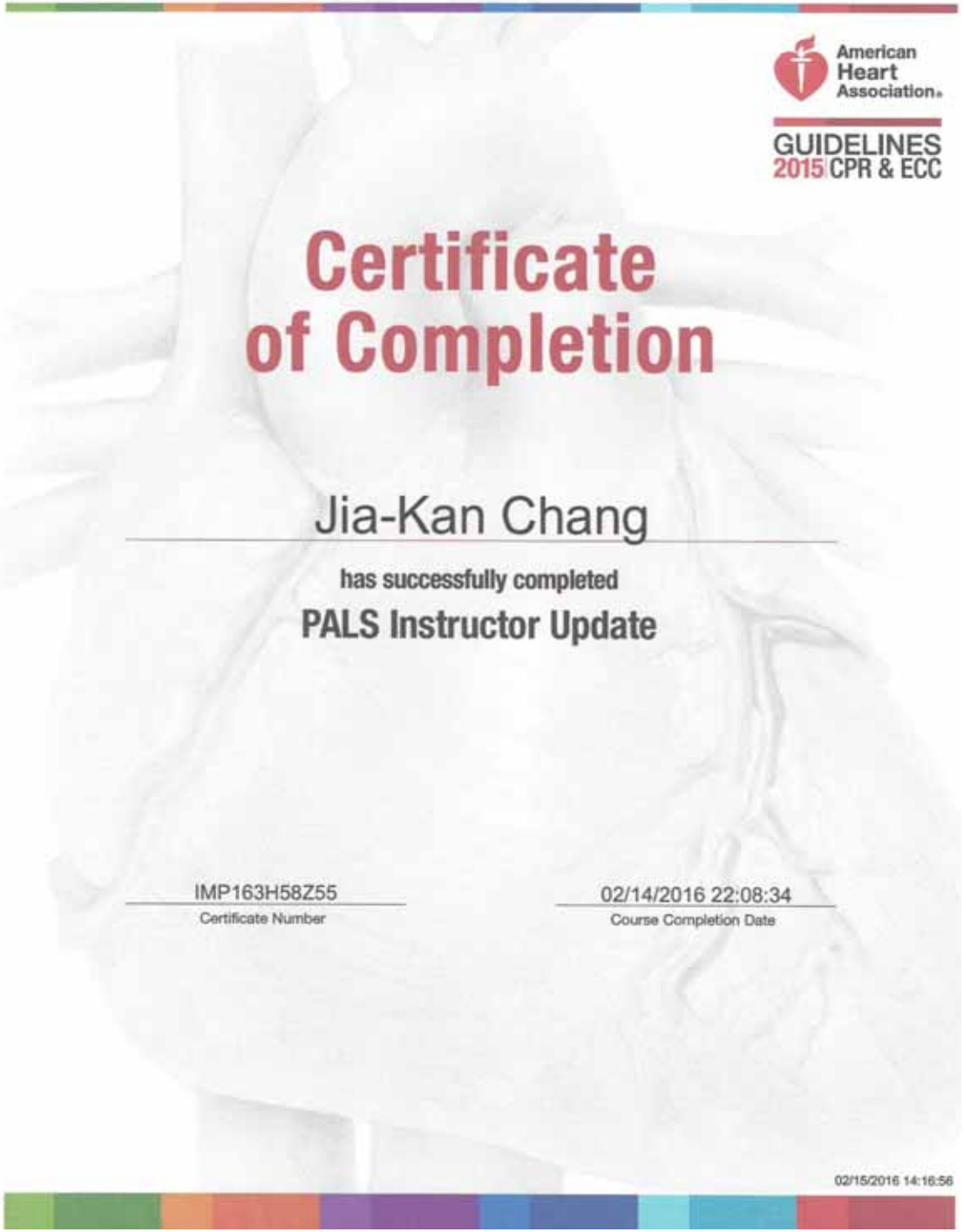
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IMP163H58Z55
Certificate Number
02/14/2016 22:08:34
Course Completion Date
02/15/2016 14:16:56

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