

# PALS *Study Guide*

## 2010

**Bulletin:** New resuscitation science and American Heart Association treatment guidelines were released October 28, 2010!

The new AHA Handbook of Emergency Cardiac Care (ECC) contains these 2010 Guidelines and is required study for this course. The 2010 PALS Provider Manual is not yet available. This study guide will provide you with additional study information.

### What is required to successfully complete PALS?

- ♥ Completed PALS Pre-test is required for admission to the course.
- ♥ Score 84% on the multiple-choice post-test.  
It is a timed test and you may be allowed to use your ECC Handbook.
- ♥ You must be able to demonstrate:
  - the PALS rapid cardiopulmonary assessment
  - effective infant and child CPR
  - using an AED on a child
  - safe defibrillation with a manual defibrillator
  - maintaining an open airway
  - confirmation of effective ventilation
  - addressing vascular access
  - stating rhythm appropriate drugs, route and dose
  - consideration of treatable causes

### What happens if I do not do well in the course?

The Course Director or Instructor will first “remediate” (tutor) you and you may be allowed to continue in the course. If it is decided you need more time to study, you will be placed into the next course.

### Where do I start?

- **CPR/AED:** You will be tested with no coaching. If you can not perform these skills well without coaching, you can/may be directed to take the course at another time. **Know p. 7 of this study guide well.**
- **Arrhythmias:** Before you come be sure you can identify: Sinus Rhythm (SR), Sinus Bradycardia (SB), Sinus Tachycardia (ST), Supraventricular Tachycardia (SVT), Ventricular Tachycardia (VT), Ventricular Fibrillation (VF), Torsades de Pointes, Pulseless Electrical Activity (PEA) and Asystole.

**You will need to know:**

*f* **Respiratory Rate**

Age	Rate
Infant	30 - 60
Toddler	24 - 40
Preschooler	22 - 34
School-age child	18 - 30

**Heart Rate**

Age	Sleeping - Awake
< 3 months	80 - 205
3 months - 2 years	75 - 190
2 - 10 years	60 - 140
10 + years	50 - 100

ECC Handbook p. 74

*f* **Hypotension by Systolic Blood Pressure (SBP)**

Age	SBP
< 1 month	< 60
1 month - 1 year	< 70
1 - 10 years	< 70 + (2 x age in years)
10 + years	< 90

Hypotension + signs of poor perfusion = **decompensated shock.**

ECC Handbook p. 74

*f* **Treat Possible Causes**

5 Hs	5 Ts
Hypo xia	T amponade
Hypo volemia	T ension pneumothorax
Hypo thermia	T oxins – poisons, drugs
Hypo /hyper kalemia	T hrombosis – coronary ( <b>AMI</b> )
Hydro gen ion ( <b>acidosis</b> )	T hrombosis – pulmonary ( <b>PE</b> )

Spacing separations may help as a memory aid.

## Rapid Cardiopulmonary Assessment *and* Algorithms

This is a **systematic head-to-toe assessment** used to identify infants and children in respiratory distress and failure, shock and pulseless arrest. **Algorithms** are “menus” that guide you through recommended treatment interventions.

**Know the following assessment** because it begins all PALS case scenarios. The information you gather during the assessment will determine which algorithm you choose for the patient’s treatment. **After each intervention** you will reassess the patient again using the head-to-toe assessment.

< **Start with child's general appearance:**

**Is the level of consciousness:**      **A=** awake    **V=** responds to verbal    **P=** responds to pain    **U=** unresponsive  
**Is the overall color:**      good      or bad?  
**Is the muscle tone:**      good      or floppy?

< **Then assess ABCs:** (stop and give immediate support when needed, then continue with assessment)

**Airway:**      **Open and hold** with head tilt-chin lift

**Breathing:** **Is it present**      or absent?  
**Is the rate** normal      or too slow      or too fast?  
**Is the pattern** regular      or irregular      or gasping?  
**Is the depth** normal      or shallow      or deep?  
**Is there** nasal flaring      or sternal retractions      or accessory muscle use?  
**Is there** stridor      or grunting      or wheezing?

**Circulation:** **Is central pulse** present      or absent?  
**Is the rate** normal      or too slow      or too fast?  
**Is the rhythm** regular      or irregular?  
**Is the QRS** narrow      or wide?

< **Next look at perfusion:**

**Is the central pulse** versus peripheral pulse strength equal      or unequal?  
**Is skin** color, pattern and temperature normal      or abnormal?  
**Is capillary refill** normal      or abnormal (**greater than 2 seconds**)?  
**Is the liver edge** palpated at the costal margin (**normal or dry**)      or below the costal margin (**fluid overload**)?

< **And check:**

**Is systolic BP** acceptable for age (**normal or compensated**)      or hypotensive?  
**Is urine output** adequate for: infants and children (**1– 2cc/kg/hr**)      or adolescents (**30cc/hr**)?

< **Now classify the physiologic status:**

**Stable:**      needs little support; **reassess frequently**  
**Unstable:**      needs **immediate support** and intervention

**Respiratory distress:** increased rate, effort and noise of breathing; requires much energy  
**Respiratory failure:**      slow or absent rate, weak or no effort and is **very quiet**

**Compensated shock:** SBP is acceptable but perfusion is poor: central vs. peripheral pulse strength is unequal  
peripheral color is poor and skin is cool  
capillary refill is prolonged

**Decompensated shock:** Systolic hypotension with poor or absent pulses, poor color, weak compensatory effort.

< **Apply the appropriate treatment algorithm:**

- Bradycardia with a Pulse
- Tachycardia with Adequate Perfusion
- Tachycardia with Poor Perfusion
- Pulseless Arrest: VF/VT and Asystole/PEA

## Advanced Airway

A **cuffed or uncuffed Endotracheal Tube (ET)** may be used on Infants and children.

To estimate tube size: ECC Handbook p. 87

Uncuffed = **(Age in years  $\div$  4) + 4.** Example: (4 years  $\div$  4) = 1 + 4 = 5

Cuffed = **(Age in years  $\div$  4) + 3.** Example: (4 years  $\div$  4) = 1 + 3 = 4

**Immediately confirm tube placement by clinical assessment and a device:**

► **Clinical assessment:**

- Look for bilateral chest rise.
- Listen for breath sounds over stomach and the 4 lung fields (**left and right anterior and midaxillary**).
- Look for water vapor in the tube (**if seen this is helpful but not definitive**).

► **Devices:**

- **End-Tidal CO<sub>2</sub> Detector (ETD):** if weight > 2 kg
  - f* Attaches between the ET and Ambu bag; give 6 breaths with the Ambu bag:
    - Litmus paper center should change color with **each inhalation** and **each exhalation**.
    - **Original color** on inhalation = **Okay**      **O<sub>2</sub> is being inhaled:** expected.
    - **Color change** on exhalation = **CO<sub>2</sub>!!**      **Tube is in trachea.**
    - **Original color on exhalation** = **Oh-OH!!**      **Litmus paper is wet:** replace ETD.  
**Tube is not in trachea:** remove ET.  
**Cardiac output is low** during CPR.
- **Esophageal Detector (EDD):** if weight > 20 kg and in a perfusing rhythm
  - f* Resembles a turkey baster:
    - Compress the bulb and attach to end of ET.
    - Bulb **inflates quickly!**      Tube is in the trachea.
    - Bulb **inflates poorly?**      Tube is **in the esophagus**.
  - f* No recommendation for its use in cardiac arrest.

► **When sudden deterioration of an intubated patient occurs, immediately check:**

<b>D</b> isplaced	= tube is not in trachea	or has moved into a bronchus ( <b>right mainstem most common</b> )
<b>O</b> bstruction	= consider secretions	or kinking of the tube
<b>P</b> neumothorax	= consider chest trauma	or barotraumas      or non-compliant lung disease
<b>E</b> quipment	= check oxygen source	and Ambu bag      and ventilator

# PALS *Drugs*

## In Arrest:

**Epinephrine:** catecholamine ECC Handbook p. 92

Increases heart rate, peripheral vascular resistance and cardiac output; **during CPR** increases myocardial and cerebral blood flow.

IV/IO: 0.01 mg/kg of 1:10 000 solution (equals 0.1 mL/kg of the 1:10 000 solution); repeat q. 3–5 min

ÆET: 0.1 mg/kg of 1:1000 solution (equals 0.1 mL/kg of the 1:1000 solution); repeat q. 3–5 min

## Antiarrhythmics:

**Amiodarone:** atrial and ventricular antiarrhythmic ECC Handbook p. 89

Slows AV nodal and ventricular conduction, increases the QT interval and may cause vasodilation.

VF/PVT: IV/IO: 5 mg/kg bolus

Perfusing VT: IV/IO: 5 mg/kg over 20-60 min

Perfusing SVT: IV/IO: 5 mg/kg over 20-60 min

Max: 15 mg/kg per 24 hours

Caution: hypotension, Torsade; half-life is up to 40 days

**Lidocaine:** ventricular antiarrhythmic to consider when amiodarone is unavailable ECC Handbook p. 94

Decreases ventricular automaticity, conduction and repolarization.

VF/PVT: IV/IO: 1 mg/kg bolus q. 5-15 min

ÆET: 2 -3 mg/kg

Perfusing VT: IV/IO: 1 mg/kg bolus q. 5-15 min

Infusion: 20-50 mcg/kg/min

Caution: neuro toxicity → seizures

**Magnesium:** ventricular antiarrhythmic for Torsade and hypomagnesemia ECC Handbook p. 94

Shortens ventricular depolarization and repolarization (**decreases the QT interval**).

IV/IO: 25-50 mg/kg over 10–20 min; give faster in Torsade

Max: 2 gm

Caution: hypotension, bradycardia

**Procainamide:** atrial and ventricular antiarrhythmic to consider for perfusing rhythms ECC Handbook p. 96

Slows conduction speed and prolongs ventricular de- and repolarization (**increases the QT interval**).

Perfusing recurrent VT: IV/IO: 15 mg/kg infused over 30–60 min

Recurrent SVT: IV/IO: 15 mg/kg infused over 30–60 min

Caution: hypotension; use it with extreme caution with amiodarone as it can cause AV block or Torsade

## Increase heart rate:

**Epinephrine:** drug of choice for pediatric bradycardia after oxygen and ventilation ECC Handbook p. 92

Dose is the same as listed above.

**Atropine:** vagolytic to consider after oxygen, ventilation and epinephrine ECC Handbook p. 89

Blocks vagal input therefore increases SA node activity and improves AV conduction.

IV/IO: 0.02 mg/kg; may double amount for second dose

ÆET: 0.03 mg/kg

Child max: 1 mg

Adolescent max: 2 mg

Caution: **do not give less than 0.1 mg** or may worsen the bradycardia

## Decrease heart rate:

**Adenosine:** drug of choice for symptomatic SVT & Wide Complex Monomorphic VT injection technique

See ECC Handbook p. 88 for

Blocks AV node conduction for a few seconds to interrupt AV node re-entry.

IV/IO: first dose: 0.1 mg/kg max: 6 mg  
second dose: 0.2 mg/kg max: 12 mg

Caution: transient AV block or asystole; has very short half-life

## Increase blood pressure:

**Dobutamine:** synthetic catecholamine ECC Handbook p. 92

Increases force of contraction and heart rate; causes mild peripheral dilation; may be used to treat shock.

IV/IO infusion: 2- 20 mcg/kg/min infusion

Caution: tachycardia

**Dopamine:** catecholamine ECC Handbook p. 92

May be used to treat shock; effects are dose dependent.

Low dose: increases force of contraction and cardiac output.

Moderate: increases peripheral vascular resistance, BP and cardiac output.

High dose: higher increase in peripheral vascular resistance, BP, cardiac work and oxygen demand.

IV/IO infusion: 2–20 mcg/kg/min

Caution: tachycardia

## Miscellaneous:

**Glucose:** ECC Handbook p. 93

Increases blood glucose in hypoglycemia; prevents hypoglycemia when insulin is used to treat hyperkalemia.

IV/IO: 0.5–1 g/kg; this equals: 2–4 mL/kg of D25 or 5–10 mL/kg of D10 or 10–20 mL/kg of D5

Caution: maximum recommended concentration should not exceed D25%; hyperglycemia may worsen neuro outcome

**Naloxone:** opiate antagonist ECC Handbook p. 95

Reverses respiratory depression effects of narcotics.

< 5 yr or 20 kg: IV/IO: 0.1 mg/kg

> 5 yr or 20 kg: IV/IO: up to 2 mg

Caution: half-life is usually less than the half-life of narcotic, so repeat dosing is often required;  $\nabla$ ET dose can be given but is **not preferred**; can also give IM or SQ.

**Sodium bicarbonate:** pH buffer for prolonged arrest, hyperkalemia, tricyclic overdose: ECC Handbook p. 97

Increases blood pH helping to correct metabolic acidosis.

IV/IO: 1mEq/kg slow bolus; give **only** after effective ventilation is established

Caution: causes other drugs to precipitate so flush IV tubing before and after

**ET drug administration:** distribution is unpredictable as is the resulting blood level of the drug; **if there is no IV/IO access**, give the drug down the ET and flush with 5 mL NS then give 5 ventilations to disperse the drug.

# Child *and* Infant CPR

## Child CPR

- 1. Tap and ask: Are you OK?**
  - Send someone to call 911 and bring an AED (AEDs are approved for children 0 – until puberty).
- 2. Open the airway with the head-tilt/chin lift.**
  - Assess breathing.
  - If inadequate: give 2 breaths over 1 second each.
  - Each breath should make the chest rise.
- 3. Check carotid or femoral pulse for no more than 10 seconds.**
  - If pulse is felt, give **12-20** breaths per minute (**one every 3-5 seconds**).
  - If pulse **not definitely felt**, give 30 compressions in center of chest on low half of the Sternum.
  - Compress 2" **depth** of chest wall with **one or two** hands.
  - One cycle of CPR is **30** compressions and **2** breaths.
  - **Give 5 cycles** of CPR; minimize interruptions (**about 2 minutes**).
- 4. When an AED arrives:**
  - **After 5 cycles** of CPR, turn it on and follow AED's voice prompts.
  - **Use child pads or adult pads in** victim's age are 0 – until puberty.
  - After the AED shocks or says "no shock advised", **resume CPR**.
  - After 5 cycles of CPR, check rhythm/pulse.

## Child Two-rescuer CPR

- 1. When using a basic airway:**
  - One rescuer gives **15 compressions and pauses**.
  - Other rescuer gives **2 breaths during pause**.
  - One cycle of CPR is **15 compressions and 2 breaths (over 1 second each)**.
  - Rescuers change "compressor" role after every 5 cycles of CPR.
- 2. When an advanced airway is in place:**
  - Give **100 continuous** compressions per minute.
  - Give **8-10 breaths** per minute (**one every 6-8 seconds**).
- 3. When an AED arrives:**
  - After 5 cycles of CPR, turn it on and follow AED's voice prompts.
  - **Use child pads or adult pads in** victim's age are 0 – until puberty.
  - **Continue CPR** while attaching the AED until it says to not touch victim.

## Infant CPR

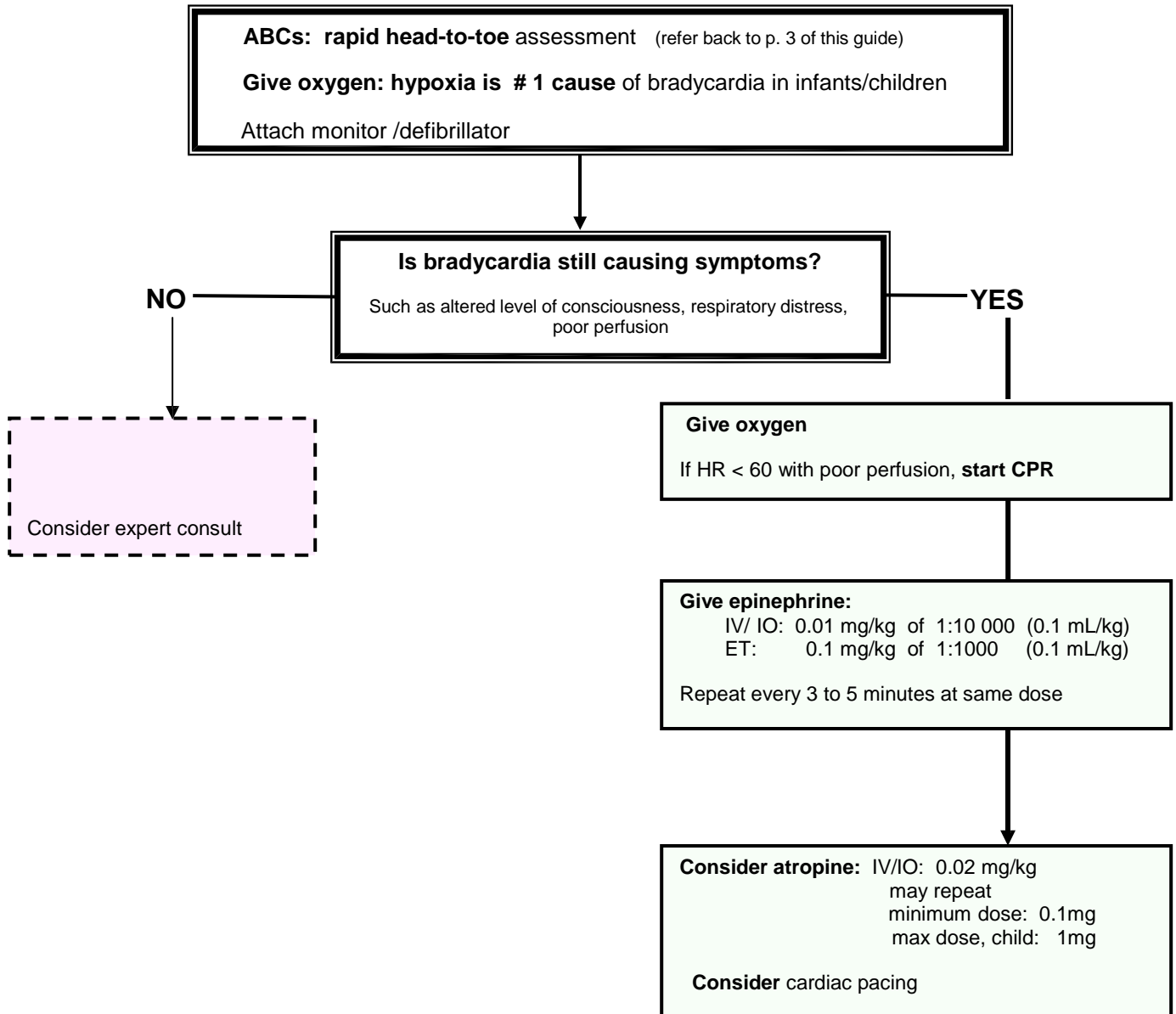
- Same as Child CPR except compress sternum with two fingers and depth 1/3 of the chest  
Depth or 1 ½ inches in depth
- AED is recommendation for use in infants under 1 year old.

## Infant Two-rescuer CPR

- Same as Two-rescuer Child CPR except use the 2 thumb-encircling hands technique.

# Bradycardia *with a Pulse*

ECC Handbook



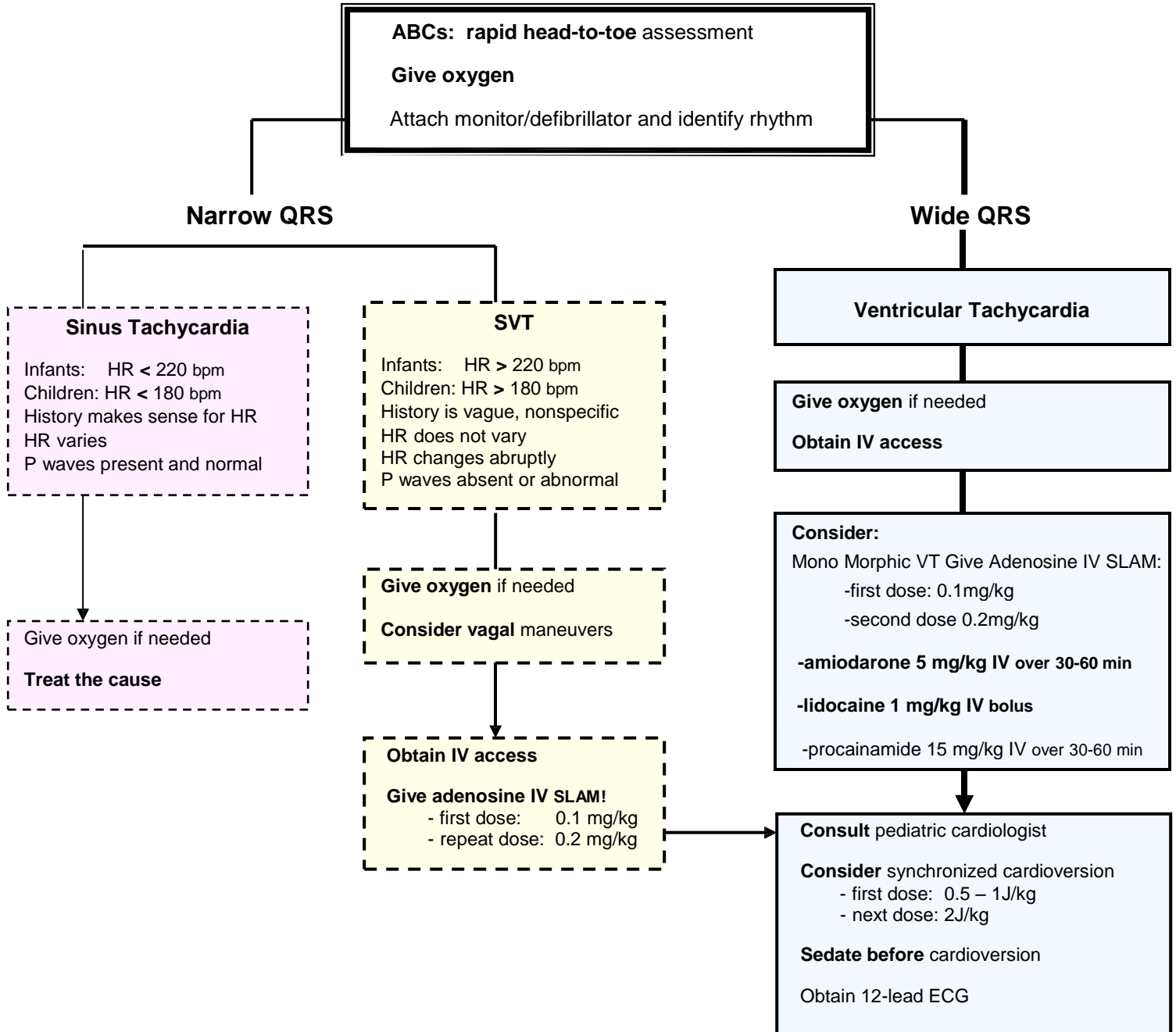
**Consider and treat possible causes: 5Hs and 5Ts**

Refer back to p. 2 of this study guide.



# Tachycardia *with Adequate Perfusion*

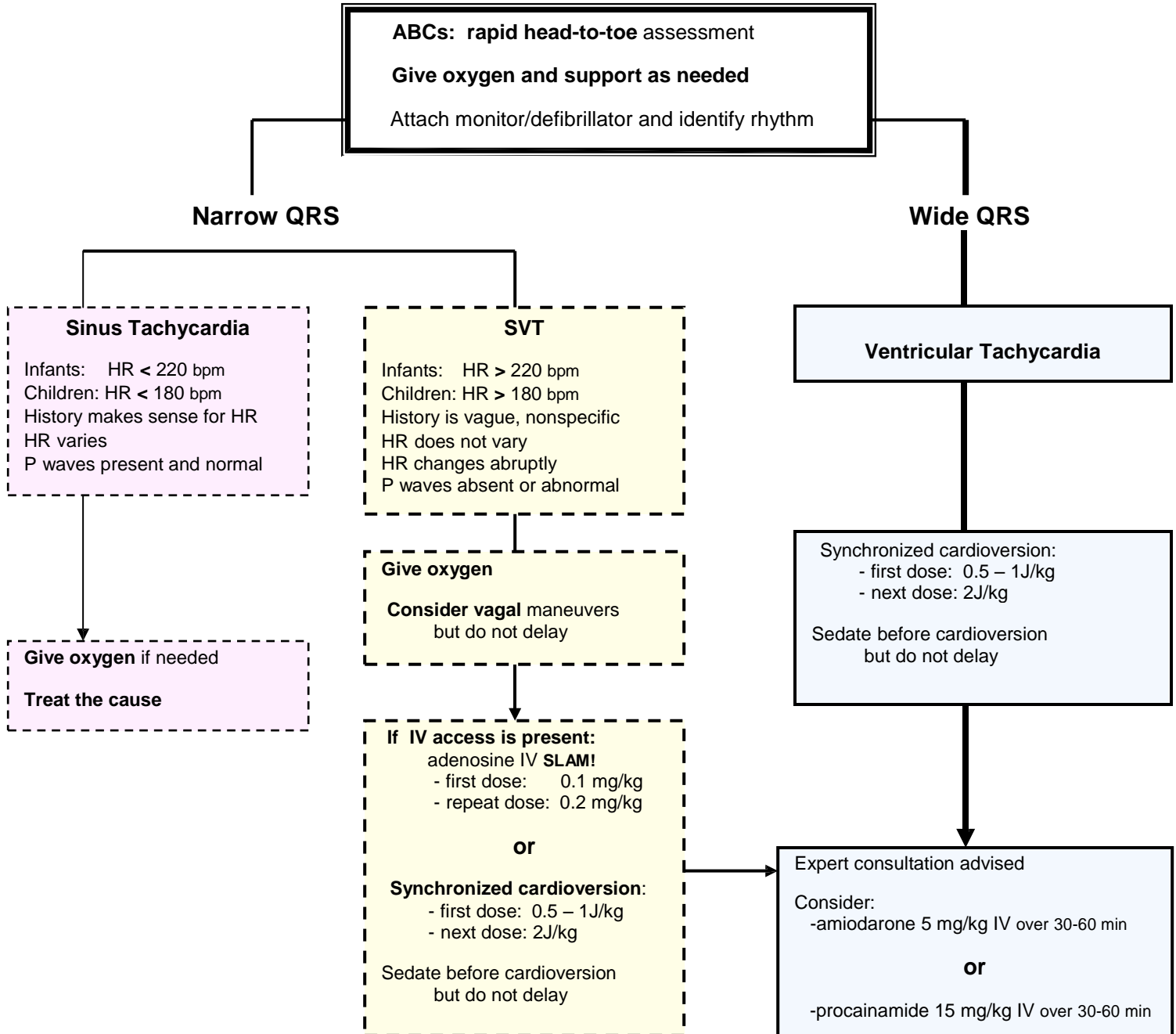
ECC Handbook



**Consider and treat possible causes: 5Hs and 5Ts**

# Tachycardia *with Poor Perfusion*

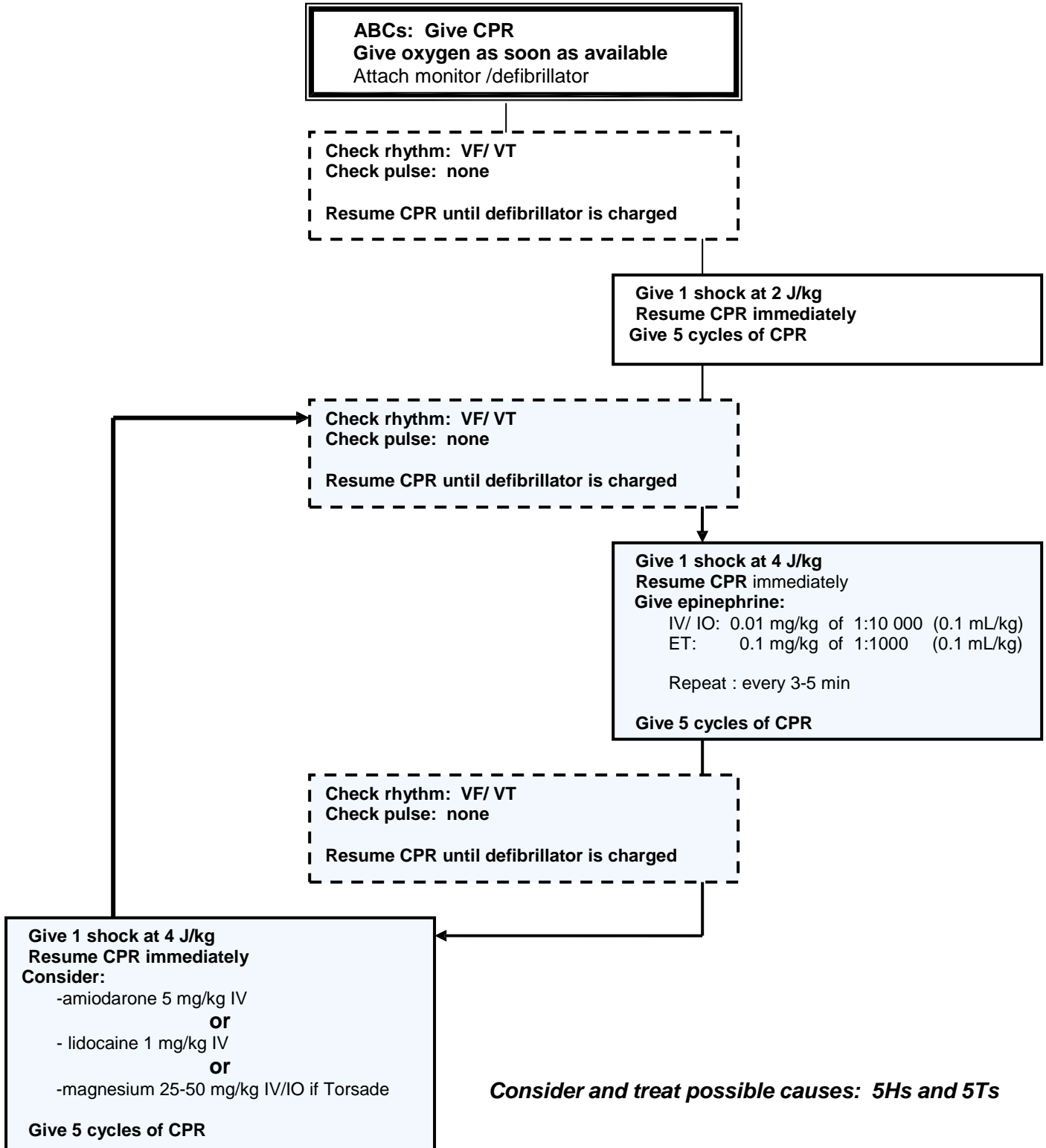
ECC Handbook



**Consider and treat possible causes: 5Hs and 5Ts**

# Pulseless Arrest – VF and Pulseless VT

ECC Handbook



# Pulseless Arrest – Asystole *and* PEA

ECC Handbook

