



Thank you for choosing SureFire CPR! This study guide is an outline to help you prepare for your upcoming PALS course. Even though there is a lot of information in this guide, it is important to have your textbook to help you review the material over the next 2 years to keep your skills sharp.

Because the course covers a lot of material in a short amount of time, there is required prestudy material.

In the course you will be expected to evaluate and identify different pediatric emergencies. Please pay attention to the 8 different types of emergencies (4 Respiratory and 4 Circulatory) in the study guide. At the completion of the course, you will act as the team leader to diagnose and treat real pediatric case studies.

Here is what you need to do before you come to class.

1. Read through this study guide (paying particular attention to anything marked with a “*”)
2. Go to <http://www.skillstat.com/Flash/ECGSim531.html> and play the 6 Second ECG Game to practice up on your EKG skills
3. Go to www.heart.org/eccstudent and enter the password: palsprovider
4. Take the Precourse Self-Assessment
5. Print out your results and bring them to class!

We look forward to having you in class. If you need anything at all, please don't hesitate to call us. Remember we also have ACLS, BLS, PEARS, EKG, and NRP for your training needs as well. Thanks again!

Take care,

Zack Zarrilli
CEO/President
SureFire CPR
(888) 277-3143
www.SureFireCPR.com



Pediatric Assessment

The PALS course is centered on the Systematic Approach to Pediatric Assessment which starts with an initial impression and is made up of three parts:

1. Evaluate

2. Identify

3. Intervene

Initial Impression

- Perform a rapid assessment of the level of consciousness, breathing, and color of the child. If you find a life threatening emergency, stop and begin treatment.**

Evaluate: The evaluation consists of a Primary Assessment, Secondary Assessment, and Diagnostic Tests.

Initial Impression: This is considered your “door way” assessment. What you see as soon as you approach your patient. Pay attention to their Consciousness, Breathing and Color

- Do they appear alert or obtunded. Are they totally unconscious or tracking you as you walk into the room?
- Make a note of their breathing. Are they breathing? Does it appear adequate for rate, depth, tidal volume? Do you note any adventitious airway sounds such as stridor, snoring or grunting? Head bobbing may be indicative of a rapidly declining patient.**
- Finally, be aware of skin color. Are they pale, cyanotic or pink? Do they appear flushed, or do you see any pupura, mottling or obvious external bleeding?

Primary Assessment: This is a rapid, hands on ABCDE approach to assess respiratory, circulatory, and neurologic function. It includes vital signs and pulse oximetry.

A = Airway – Positioning and need for devices

B = Breathing – Rate, effort, volume, breath sounds

C = Circulation – Rate, rhythm, pulses present?, blood pressure, skin signs

D = Disability – AVPU, GCS, pupils

E = Exposure – Temperature

Secondary Assessment: A focused medical history and physical exam (Using SAMPLE mnemonic)

S = Signs and Symptoms

A = Allergies

M = Medications

P = Past Medical History

L = Last Meal

E = Events Leading to Incident

Diagnostic Tests: Labs, radiographic tests, etc. Check glucose levels early**

Identify: Based on the assessment, identify if the child’s condition is respiratory, circulatory, or a combination of both. Also determine the severity of the problem.

There are 4 main types of respiratory problems and 2 levels of severity.

Respiratory Problems

1. Upper Airway Obstruction
2. Lower Airway Obstruction
3. Lung Tissue Disease
4. Disordered Control of Breathing

Severity Levels

1. Respiratory Distress
2. Respiratory Failure

There are 4 main types of circulatory problems and 2 levels of severity.

Circulatory Problems

1. Hypovolemic Shock
2. Distributive Shock
3. Cardiogenic Shock
4. Obstructive Shock

Severity Levels

1. Compensated Shock
2. Hypotensive Shock

Intervene:

- Start treatment interventions for the condition you identify.
- Reassess all patients after treatment**

Pediatric Vital Signs Overview

Heart Rate

Age	Awake Rate	Sleeping Rate
Newborn – 3 Mos.	85-205	80-160
3 Months – 2 Yrs.	100-190	75-160
2-10 Years	60-140	60-90
Older than 10	60-100	50-90

Blood Pressure (Hypotensive)

Age	Systolic BP
Neonates (0-28 Days)	<60
Infants (1-12 Months)	<70
Children 1-10 Years	<70 + (Age in years x 2)
Children > 10 Years	<90

Respiratory Rate (Breaths/Min)

Age	Rate
Infant	30-60
Toddler	24-40
Preschooler	22-34
School-aged child	18-30
Adolescent	12-16

Below are the signs and corresponding conditions we will discuss in the course:

Respiratory Emergencies

Upper Airway Obstruction:

- Examples = Croup, Anaphylaxis and Foreign Body Airway Obstruction
- Signs
 - Stridor (typically inspiratory)
 - Increased respiratory rate and effort
 - Barking cough
 - Hoarseness
 - Snoring or gurgling
- Treatment
 - Croup = humidified oxygen, nebulized epinephrine**, and corticosteroids
 - Anaphylaxis = IM Epinephrine, albuterol, antihistamines, and corticosteroids
 - Foreign Body = Position of comfort and expert consult

Lower Airway Obstruction:

- Examples = Asthma and bronchiolitis
- Signs
 - Expiratory wheezes and prolonged exhalation phase**
- Treatment
 - Asthma = Albuterol, corticosteroids, SQ epinephrine, magnesium sulfate, terbutaline
 - Bronchiolitis = Bronchodilator and nasal suctioning

Lung Tissue Disease

- Examples = Pneumonia and pulmonary edema
- Signs
 - Increased respiratory rate and effort
 - Decreased air movement
 - Grunting or Crackles
- Treatment
 - Pneumonia = Albuterol and antibiotics
 - Pulmonary Edema = Ventilatory and vasoactive support, consider diuretics

Disordered Control of Breathing

- Examples = Increased intracranial pressure, overdose, neuromuscular disease, can be present after seizures**
- Signs
 - Irregular breathing patterns and rates
 - Decreased or absent respiratory drive
- Treatment
 - Increased ICP = Avoid hypoxemia, hypercarbia, and hyperthermia
 - Overdose = Antidotes or poison control center
 - Neuromuscular disease = Ventilatory support

Severity Levels of Respiratory Emergencies

Respiratory Distress – tachypnea, increased respiratory effort, tachycardia, wheezing, stridor, grunting, “seesaw” breathing, head bobbing, decreased oxygen saturation.**

Respiratory Failure – bradypnea, periodic apnea, bradycardia, diminished air movement, low O₂ saturation levels, poor muscle tone, coma, cyanosis.**

Declining Mental status and vital signs show trending from compensated (distress) to decompensated (failure)**

Airway Basics

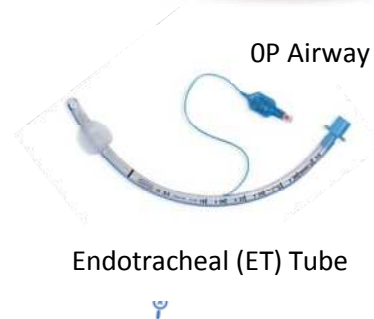
Adjuncts

- Nasopharyngeal airway (NP)
 - Used in semi-conscious patients
 - Measured from the tragus of the ear to the corner of the nose
 - Contraindicated in head injuries
- Oropharyngeal airway (OP)
 - Used in unconscious patients with no gag reflex**
 - Measured from the corner of the mouth to the angle of the jaw



Advanced Airways

- Endotracheal Tube
 - The ideal airway for most patients
 - Sizes are found on the Broselow Tape or the formula:
 - Uncuffed Tube – Child’s age / 4 + 4
 - Cuffed Tube – Child’s age / 4 + 3.5
- Laryngeal Mask Airway (LMA)
 - Used by providers not familiar with ET tube intubation
- Once an advanced airway is in place, compressions and breaths are asynchronous.
 - 100 compressions per minute
 - 8-10 Breaths per minute (1 every 6-8 seconds)
- If an intubated child deteriorates rapidly, check for the following:
 - Displacement of the tube**
 - Obstruction in the tube
 - Pneumothorax
 - Equipment failure (Ventilator, etc.)



Endotracheal (ET) Tube



Oxygen Delivery

- Most pediatric emergencies are due to a lack of oxygen
- Most pediatric patients require supplemental oxygen if their SpO₂ values are less than 94%**
- Oxygen should be given as soon as possible
- If delivered through a non-rebreather mask or bag valve mask (BVM), O₂ should be set at 10-15LPM.
- Pediatric rescue breathing should be at a rate of 1 breath every 3-5 seconds
- Capnography and pulse oximetry should be used when available
- When monitoring a patient with pulse oximetry, make sure to read the patient, not the monitor. Pulse oximetry can be unreliable.**
- Post cardiac arrest oxygenation should be kept between 94-99%.**

Circulatory Emergencies

Hypovolemic Shock

- Examples = Hemorrhagic vs. Non-hemorrhagic
- Signs = Tachycardia, pale cool skin, increased respiratory rate
- Treatment = Fluids: 20mL/kg over 5-10 minutes**

Distributive Shock

- Examples = Septic, Anaphylactic, Neurogenic
- Signs = Increased respiratory rate, tachycardia, pink warm skin, high fever (septic shock)**
- Treatment
 - **Septic Shock** = See septic shock algorithm. Support airway and breathing. Supplemental Oxygen should be initial treatment priority, especially with SpO₂ values less than 94%.** Fluids 20mL/kg over 5-10 minutes,** antibiotics, support BP, epinephrine, and norepinephrine.
 - **Anaphylactic Shock** = IM epinephrine first,** consider antihistamines, corticosteroids, epi infusion, and albuterol.
 - **Neurogenic Shock** = 20mL/kg NS/LR boluses and a vasopressor

Cardiogenic Shock

- Examples = Bradyarrhythmias/Tachyarrhythmias or Others (Myocarditis, Cardiomyopathy, Poisoning, etc.)
- Signs = Abnormal breath sounds (rales or grunting), increased respiratory rate and effort, tachycardia, lethargic or coma, cool pale gray or blue skin.
- Treatment
 - Treat arrhythmias
 - Fluids: 5-10mL/kg over 10-20 minutes, Vasoactive infusion and expert consultation.

Obstructive Shock

- Examples = Ductal-Dependent, Tension Pneumothorax, Cardiac Tamponade, Pulmonary Embolism
- Signs = Signs of poor perfusion. Similar to cardiogenic shock
- Treatment
 - **Ductal-Dependent** = Prostaglandin E and expert consult
 - **Tension Pneumothorax** = Needle decompression (Midclavicular line, 2nd intercostal space) and tube thoracostomy.**
 - **Cardiac Tamponade** = Pericardiocentesis and 20ml/kg fluid bolus.
 - **Pulmonary Embolism** = 20ml/kg fluid bolus, thrombolitics, anticoagulants, and expert consult.

Severity Levels of Circulatory Emergencies

Compensated Shock – Patient has a normal systolic BP, delayed capillary refill (or faint distal pulses), decreased level of consciousness, and cool extremities.

Hypotensive Shock – Hypotension with signs of shock.**

Blood Pressures in Hypotensive Shock

Age	Systolic BP
Neonates (0-28 Days)	<60
Infants (1-12 Months)	<70
Children 1-10 Years	<70 + (Age in years x 2)
Children > 10 Years	<90

Vascular Access and Pediatric Drug Review

In cases of shock, vascular access can be difficult through a peripheral IV. If IV access cannot be established or needs to be established quickly because of a rapidly deteriorating child, initiate intraosseous (IO) access.** Contraindications of IO access include: fractured extremities, bone infection, or prior IO access at the same site.



Cardioversion	.05-1J/kg (1 st Dose) 2J/kg (Subsequent Doses)
Defibrillation	2-4J/kg (1 st Shock) 4J/kg (Subsequent Shocks)
Epinephrine (Cardiac Arrest)	.01mg/kg IV/IO (1:10,000)
Amiodarone	5mg/kg IV/IO
Atropine (Bradycardia)	.02mg/kg IV/IO (Minimum Dose .1mg)
Adenosine (SVT)	.1mg/kg
Fluids (Hypotensive or Septic Shock)	20ml/kg NS over 5-10 minutes
Fluids (Cardiogenic Shock)	5-10ml/kg over 10-20 minutes

Cardiac Algorithms

Ventricular Fibrillation and Pulseless Ventricular Tachycardia



Treatment:

1. Defibrillate – 2J/kg**
2. CPR – 2 Minutes
3. Rhythm and Pulse Check (if no change continue to #4)
4. Defibrillate – 4J/kg
5. CPR – 2 Minutes and Epi .01mg/kg
6. Rhythm and Pulse Check (if no change continue to #7)
7. Defibrillate – 4J/kg
8. CPR – 2 Minutes and Amiodarone 5mg/kg

Continue Epi .01mg/kg IV/IO every 3-5 minutes and Amiodarone 5mg/kg (max dose of 15mg/kg for 24 hours)

Pulseless Electrical Activity (PEA) or Asystole



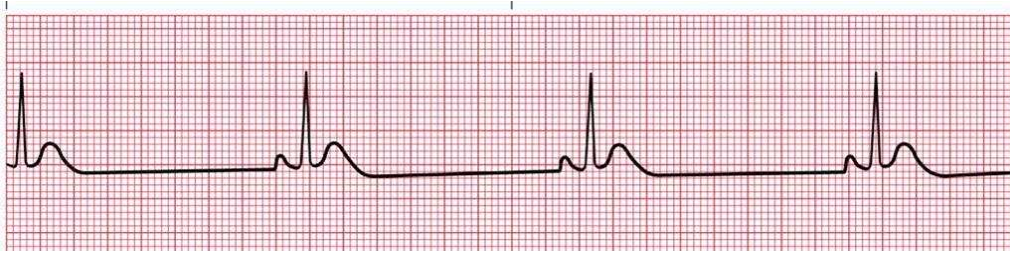
Treatment:

1. Rhythm and Pulse Check
2. CPR – 2 Minutes
3. Rhythm and Pulse Check (if no change continue to #4)
4. CPR – 2 Minutes and Epi .01mg/kg
5. Rhythm and Pulse Check (if no change continue to #6)
6. CPR – 2 Minutes
7. Rhythm and Pulse Check (if no change continue to #8)
8. CPR – 2 Minutes and Epi .01mg/kg

Consider H's and T's to find the root of the problem

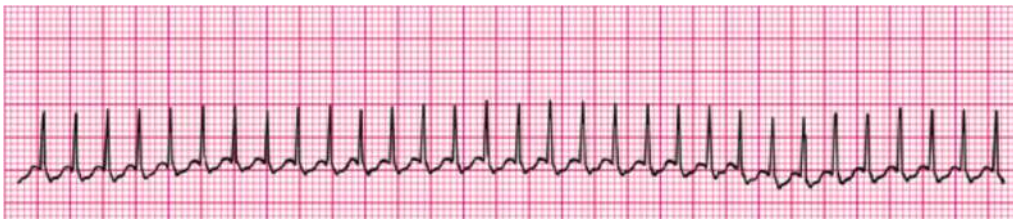
- **Hypovolemia** (most common cause)
 - 20mL/kg of NS/LR
- **Hypoxia**
 - Oxygen
- **Hydrogen ion (acidosis)**
 - Sodium Bicarbonate
- **Hypo/hyperkalemia**
 - Magnesium Sulfate of <K+
 - Bicarb, Calcium, Glucose/insulin, Albuterol, kayexelate for >K+
- **Hypoglycemia**
 - Appropriate Dextrose dose
- **Trauma**
 - Control bleeding
- **Toxins**
 - Appropriate antidote
- **Tamponade, cardiac**
 - Pericardiocentesis
- **Tension pneumothorax**
 - Needle decompression**
- **Thrombosis, coronary**
 - PCI, thrombolytics
- **Thrombosis, pulmonar**
 - Anticoagulants, thromnolytics

Bradycardia



1. Oxygen First
2. Begin CPR if HR is < 60 with signs of poor perfusion
3. Epinephrine .01mg/kg IV/IO (First drug of choice for bradycardia)**
4. Atropine .02mg/kg IV/IO (Minimum dose .1mg, maximum dose 1mg)
5. Consider transcutaneous pacing (TCP)

Supraventricular Tachycardia



(Stable Patient)

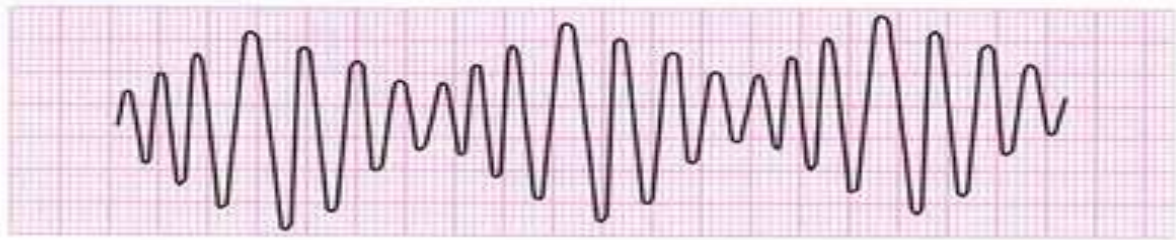
1. Vagal (ice on the face for infants**) and/or Medication
2. Adenosine .1mg/kg (Max dose 6mg, 2nd dose 12mg)

Ventricular Tachycardia (with pulses)



1. Amiodarone 5/mg/kg IV over 20-60 minutes or Procainamide 15 mg/kg IV over 30-60 minutes

Torsades de Pointes



1. Magnesium 25-50mg/kg over 10 minutes

Synchronized Cardioversion (For Unstable Patients)

.5-1J/kg for first dose and increase 2J/kg if the initial dose is ineffective.**

Steps:

1. Consider sedation
2. Turn on defibrillator
3. Attach electrodes to patient
4. Press "Sync" button
5. Look for markers on R waves
6. Select appropriate energy level
7. Press "Charge"
8. Clear the patient
9. Press "Shock"
10. Analyze the rhythm again

BLS for the Healthcare Provider Review

The Basic Steps of Pediatric BLS / CPR

1. Check the Scene for Safety As Soon As You See A Potential Victim**
2. Tap the Person and Shout, "Are You OK?"
3. If No Response, Have Someone:
 - a. Call 911 or a Code
 - b. Get an AED
 - c. Come Back
4. Look for Normal Breathing
5. If No Normal Breathing, Check the Carotid Pulse (Brachial for Infants**) for 10 Seconds or Less**
6. If No Pulse or Pulse < 60 with signs of poor perfusion, Begin Cycles of 30 Compressions and 2 Breaths if performing CPR in a solo provider setting. 15 compressions to 2 Breaths with multiple rescuers
 - a. Chest compressions should be hard and fast!
 - i. At least 1/3 of anterior/posterior depth of the patient's chest
 - ii. At least 100 compressions per minute
 - iii. Allow full chest recoil to ensure refilling of the heart**
 - iv. Deliver ventilations just until you see chest rise
7. Continue until:
 - a. An AED Arrives
 - b. Paramedics or Rapid Response Team Take Over, or
 - c. The Victim Starts to Move

CPR should be performed on victims that have no pulse and no normal breathing within 10 seconds.**

If there is no suspected neck injury, the best way to open the airway is with a head-tilt, chin-lift.**

For Children and Infants, CPR should be started if there is no normal breathing, signs of poor perfusion, and a pulse of less than 60 beats per minute

Hand Placement for Adult CPR

- 2 Hands on the lower half of the breastbone**

Hand Placement for Infant CPR

- 1 Rescuer - 2 Fingers on the Center of the Chest
- 2 Rescuers – Encircling Thumbs Technique



2 Finger Infant CPR Hand Placement



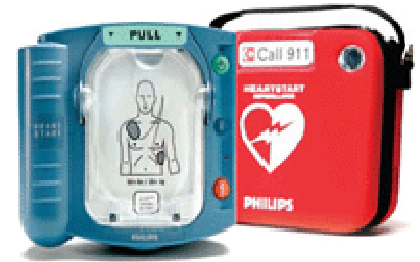
2 Rescuer Encircling Thumbs Technique**

What if they have a pulse, but aren't breathing effectively?

- You will start rescue breathing
- Your breaths should last 1 second and make the victim's **chest rise****
 - Adults (1 Breath every 5-6 Seconds)
 - Children (1 Breath every 3-5 Seconds if the pulse is >60)**
 - 12-20 breaths per minute**
 - Bag Mask devices are not recommended for 1 rescuer CPR.**

AED Review

- The first thing to do when an AED becomes available is to turn it on.**
- As soon as an AED is available, it should be used.**
- After a shock from the AED, immediately resume compressions.**
- Adult pads may be used on pediatric patients if pediatric pads are not available.**



Pulse Check Locations

- Children – Carotid Artery
- Infants – Brachial Artery**

Compression Rate

- At least 100 per minute** (The same beat as the song *Stayin' Alive*)

Compression Depth

- Adults – At least 2"
- Children and Infants – At least 1/3rd the depth of the chest**

Compression to Ventilation Ratio

- Adults – 30 Compressions : 2 Breaths**
- Children and Infants (1 Rescuer) – 30 Compressions : 2 Breaths
- Children and Infants (2 Rescuers) – 15 Compressions : 2 Breaths**

After an Advanced Airway (Endotracheal Tube or Combitube) is placed the Ratio Changes

- Compressions are Continuous at 100 per minute**
- Breaths are 1 every 6-8 seconds**

If parents wish to remain in the room during a resuscitation attempt, allow them to do so as long as they do not pose a safety threat or interfere with resuscitative efforts.** It is important that they see providers are doing everything in their power to help the child. It is *their* child after all!

Choking

- The best way to relieve severe choking in a responsive infant is with cycles of 5 back slaps followed by 5 chest thrusts.**
- If a victim of foreign-body airway obstruction becomes unconscious, send someone to get help and then start CPR, beginning with compressions.**

Post Resuscitation Care

After resuscitation, patients can display a wide variety of responses. Some may become awake and alert, while others remain comatose. After we achieve return of spontaneous circulation (ROSC) it is important to continue to provide cardio-respiratory support through the ABCD's.

- Airway
- Breathing
- Circulation
- Differential Diagnosis (12 lead, H's, and T's)

A healthy brain is the primary goal of CPR and it has been shown that therapeutic hypothermia for 12-24 hours may be beneficial for patients who remain comatose after ROSC. This may also be considered in children and infants.

Pediatric Core Cases

At the end of the course you will lead a resuscitation team in the care for a sick child or infant. During the core case you will see videos of actual pediatric patients and lead your team in through the 3 step Pediatric Assessment. After seeing the child you will start with the initial impression, continue through the primary and secondary assessment, and identify and treat the emergency. (It will be 1 of either the 4 respiratory or 4 shock emergencies and 1 cardiac emergency.) The 6 roles of your team members will be: Team Leader, Airway, Medications, BLS, Monitor/Defibrillator, and Recorder. The core cases will be conducted in a low stress environment to help you implement the skills that you learn in the course. Note that you will be evaluated on an individual basis in the role of team leader. As a team leader, you will assign other team members their roles, assess your patient, diagnose problems with respiratory, circulatory and cardiac arrest cases, and implement treatments based on what you learned during the course.**

What to Expect

1. Please come 10-15 minutes early to class to check in so that we can start on time.
2. Wear comfortable clothing, if you have long hair we recommend you bring a hair tie for the CPR portion of class.
3. Feel free to bring food and drinks to class. We have a refrigerator and microwave for you to use if you need them. (We also have snacks and drinks for you in case you get hungry.)
4. We like to keep our classes small so that you have the best learning environment possible.
5. We promise to do whatever we can to make your experience fun, stress free, and educational.

Thank you again for taking our course and for your dedication to helping sick children. We look forward to seeing you in class and hope this study guide helps you prepare. If you have any suggestions on how we can make this guide or your course better, please let us know!

**Starred material relates to test questions!