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 pre-course material.

In the course you will be expected to evaluate and identify different pediatric emergencies. Please pay attention to the three different types of emergencies (Respiratory, Circulatory, & Cardiac) 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](http://www.skillstat.com/Flash/ECGSim531.html) and play the 6 Second ECG Game to practice up on your ECG skills
3. Go to [www.heart.org/ecstudent](http://www.heart.org/ecstudent) and enter the password: pals15. Once logged-in,
   - Watch the CPR/AED Overview Video
   - Take the Precourse Self-Assessment and score 70% or better (This is an AHA requirement)
   - Print out your results and bring them to class! (This is an AHA requirement)

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, ECG, and NRP for your training needs as well. Thanks again!

Take care,

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

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.
Pediatric Vital Signs Overview

<table>
<thead>
<tr>
<th>Age</th>
<th>Heart Rate</th>
<th>Blood Pressure (Hypotensive)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Awake Rate</td>
<td>Sleeping Rate</td>
</tr>
<tr>
<td>Newborn – 3 Mos.</td>
<td>85-205</td>
<td>80-160</td>
</tr>
<tr>
<td>3 Months – 2 Yrs.</td>
<td>100-190</td>
<td>75-160</td>
</tr>
<tr>
<td>2-10 Years</td>
<td>60-140</td>
<td>60-90</td>
</tr>
<tr>
<td>Older than 10</td>
<td>60-100</td>
<td>50-90</td>
</tr>
</tbody>
</table>

Respiratory Rate (Breaths/Min)

<table>
<thead>
<tr>
<th>Age</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant</td>
<td>30-60</td>
</tr>
<tr>
<td>Toddler</td>
<td>24-40</td>
</tr>
<tr>
<td>Preschooler</td>
<td>22-34</td>
</tr>
<tr>
<td>School-aged child</td>
<td>18-30</td>
</tr>
<tr>
<td>Adolescent</td>
<td>12-16</td>
</tr>
</tbody>
</table>

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 inspiratory 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
  - 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, postictal state 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, grunting, periodic apnea, bradycardia, diminished air movement, low O₂ saturation levels, poor muscle tone, coma, cyanosis.**

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
  - 10 Breaths per minute (1 every 6 seconds)

If an intubated child deteriorates rapidly, check for the following:
- Displacement of the tube**
- Obstruction in the tube
- Pneumothorax
- Equipment failure (Ventilator, etc.)

Oxygen Delivery
- Most pediatric emergencies are due to a lack of oxygen.
- 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 = Fluids (like normal saline) 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 normal saline boluses and a vasopressor

Cardiogenic Shock
• Examples = Brady-dysrhythmias/Tachy-dysrhythmias 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
  o Treat dysrhythmias
  o 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
  o **Ductal-Dependent** = Prostaglandin E and expert consult
  o **Tension Pneumothorax** = Needle decompression (Midclavicular line, 2nd intercostal space) and tube thoracostomy.
  o **Cardiac Tamponade** = Pericardiocentesis and 20ml/kg fluid bolus.
  o **Pulmonary Embolism** = 20ml/kg fluid bolus, thrombolytics, 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**

<table>
<thead>
<tr>
<th>Age</th>
<th>Systolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonates (0-28 Days)</td>
<td>&lt;60</td>
</tr>
<tr>
<td>Infants (1-12 Months)</td>
<td>&lt;70</td>
</tr>
<tr>
<td>Children 1-10 Years</td>
<td>&lt;70 + (Age in years x 2)</td>
</tr>
<tr>
<td>Children &gt; 10 Years</td>
<td>&lt;90</td>
</tr>
</tbody>
</table>
**Pediatric Core Cases**

Throughout the course, students will be participating in core cases. 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 core cases will be conducted in a low stress environment to help you implement the skills that you learn in the course.

**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 quickly and the child is deteriorating rapidly, or if the child is in cardiac arrest, initiate intraosseous (IO) access.** Contraindications of IO access include: fractured extremities, bone infection, or prior IO access at the same site.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardioversion</td>
<td>.5-1J/kg (1st Dose) 2J/kg (Subsequent Doses)</td>
</tr>
<tr>
<td>Defibrillation</td>
<td>2-4J/kg (1st Shock) 4J/kg (Subsequent Shocks)</td>
</tr>
<tr>
<td>Epinephrine (Cardiac Arrest)</td>
<td>.01mg/kg IV/IO (0.1mg/mL)</td>
</tr>
<tr>
<td>Amiodarone</td>
<td>5mg/kg IV/IO</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>1mg/kg IV/IO</td>
</tr>
<tr>
<td>Atropine (Bradyocardia)</td>
<td>.02mg/kg IV/IO (Minimum Dose .1mg)</td>
</tr>
<tr>
<td>Adenosine (SVT)</td>
<td>.1mg/kg</td>
</tr>
<tr>
<td>Fluids (Hypotensive or Septic Shock)</td>
<td>20ml/kg NS over 5-10 minutes</td>
</tr>
<tr>
<td>Fluids (Cardiogenic Shock)</td>
<td>5-10ml/kg over 10-20 minutes</td>
</tr>
</tbody>
</table>

**Cardiac Algorithms**

**Bradycardia**

1. Oxygen First**
2. Begin CPR if HR is < 60 with signs of poor perfusion
3. Epinephrine .01mg/kg IV/IO (0.1mg/mL) (First drug of choice for bradycardia) **
4. Atropine .02mg/kg IV/IO (Minimum dose 0.1mg, maximum dose 0.5mg)
5. Consider transcutaneous pacing (TCP)
Supraventricular Tachycardia (SVT)

(Stable Patient)
1. Vagal (ice on the face for infants**)
2. Adenosine .1mg/kg (Max dose 6mg, 2\textsuperscript{nd} dose 12mg)

(Unstable Patient)
1. Synchronized Cardioversion**

Monomorphic Ventricular Tachycardia (with pulses)

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

(Unstable Patient)
1. Synchronized Cardioversion

Synchronized Cardioversion (For Unstable SVT or Unstable V-Tach Patients)

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

Steps to Perform Synchronized Cardioversion:

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
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 (0.1mg/mL)
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)

Torsades de Pointes (aka: Polymorphic Ventricular Tachycardia)

Treat like any other Ventricular cardiac arrest rhythm, but also consider giving Magnesium 25-50mg/kg over 10 minutes
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 (0.1mg/mL)
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 (0.1mg/mL)

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

- Hypovolemia (most common cause)
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo/hyperkalemia
- Hypoglycemia
- Toxins
- Tamponade, cardiac
- Tension pneumothorax
- Thrombosis, coronary
- Thrombosis, pulmonary

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 24 hours may be beneficial for patients who remain comatose after ROSC. This may also be considered in children and infants.
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. Check responsiveness
   a. Tap the Person and Shout, “Are You OK?”
   b. If unresponsive, shout for any nearby help
3. Check Circulation & Breathing
   a. Check the carotid pulse while simultaneously looking for chest rise
   b. Assess pulse and breathing for 5-10 seconds**
   c. Remember, agonal breaths or “guppy” breathing is not effective breathing and should be treated like respiratory arrest.
4. Activate Emergency Response and Get the AED
   a. If patient is unresponsive or a pulse/breathing is absent, activate emergency response and send someone to get an AED, then...
   b. If pulse is present but patient is not breathing: assist ventilations
   c. If no pulse and no breathing: Start CPR
5. Defibrillation
   a. Early defibrillation is a key aspect of the BLS survey
   b. Once the AED arrives, turn it on, apply the pads, and defibrillate if indicated by the AED. Don’t forget to state “Clear!” or “Do not touch the patient!” and ensure no one is touching the patient prior to defibrillating
6. Continue CPR 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 you are by yourself, perform two minutes of CPR before leaving to activate the emergency response system.

If you hear snoring in an altered patient and there is no suspected neck injury, the best way to maintain a patent airway is with a head-tilt, chin-lift and insertion of an OPA/NPA**

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

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
- 100-120 compressions per minute (The beat to the song Stayin’ Alive is at 100 beats per minute!)

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 100-120 per minute**
- Breaths are 1 every 6 seconds**

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.**
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!