**Mandatory Precourse Self-Assessment at least 70% pass. Bring proof of completion to class.**

The PALS Provider exam is 50 multiple-choice questions. Passing score is 84%. Student may miss 8 questions. All AHA exams are now “open resource” so student may use books and/or handouts for the exam. For students taking PALS for the first time or updating/renewing with a current card, exam remediation is permitted should student miss more than 8 questions on the exam. Viewing the PALS Provider Manual ahead of time with the online resources is very helpful. The American Heart Association link is [www.heart.org/eccstudent](http://www.heart.org/eccstudent) has the PALS Precourse Self-Assessment, supplementary written materials, and videos. The code for these online resources is in the PALS Provider Manual page ii. **The code is pals15.** Basic Dysrhythmia knowledge is required. The exam has at least 5 strips to interpret. **The course is a series of video segments then skills. The course materials will prepare you for the exam.**

**Basic Dysrhythmias knowledge is required** in relation to asystole, ventricular fibrillation, tachycardias in general and bradycardias in general. Student does not need to know the “ins and outs” of each and every one. Tachycardias need to differentiate wide complex (ventricular tachycardia) and narrow complex (supraventricular tachycardia or SVT).

* Airway - child is grunting - immediate intervention
* Airway - deteriorates after oral airway, next provide bag-mask ventilation
* Airway - snoring with poor air entry bilaterally - reposition, oral airway
* AVPU - findings normal - rated as Alert
* CPR – 1-rescuer. 30:2 compression to ventilation ratio X5 cycles. 2 person 15:2 compression to ventilation X10
* CPR - after defibrillation resume compressions
* CPR - high quality component - allow complete chest wall recoil after each compression
* CPR - simultaneous pulse and breathing check no more than 10 seconds
* CPR - you are lone with infant - Begin CPR for 2 minutes then leave to activate emergency response
* Defibrillation - initial for 20 kg child - 40 J, with pulseless VT, VF 2 to 4 J/kg
* Fluid resuscitation - 20 mL/kg normal saline
* I/O before vascular access - for cardiac arrest
* Labs - lethargy, Polyuria, onset rapid, deep, labored breathing - assess blood glucose
* Motor vehicle accident, immediate intervention for decreased level of consciousness
* Oxygen sat - below 90 while on oxygen - immediate intervention, - ideal 94% to 99% (not 94% to 100%)
* Respiratory - distress - audible inspiratory stridor
* Respiratory - failure - lethargic, rapid respiratory rate, tachycardic, most indicative of a low oxygen saturation
* Respiratory - failure with fever, antibiotic is the most appropriate medication
* Respiratory - lower airway - wheezing
* Respiratory - seizures, slow respirations - disordered control of breathing
* Respiratory - unresponsive, respirations 6 per minute - provide bag-mask ventilation with 100% 02
* Respiratory - upper airway - increased work of breathing, inspiratory effort with retractions, stridor, nut allergy
* Respiratory - upper airway obstruction drug - nebulized epinephrine
* Respiratory distress from long tissue disease - crackles
* Rhythm - bradycardia, no pulse - pulseless electrical activity
* Rhythm - hypoxia most likely cause of bradycardia in an infant
* Rhythm - pulse above 180 Narrow complex, regular - Supraventricular tachycardia
* Rhythm - rate slow, sinus bradycardia
* Rhythm - Supraventricular tachycardia, hypotensive - synchronized cardioversion
* Shock - distributive, septic - fever, lactic acidosis, antibiotic as an early intervention
* Shock - fever, hypotensive - IV 20 mL/kg of isotonic crystalloid over 5 to 10 minutes
* Shock - hypotensive - best assessment variable is blood pressure, 55/40 for 2-week-old
* Shock - hypovolemic - history vomiting, diarrhea
* Shock - severity, compensated or not is determined by the blood pressure, not other variables
* Team dynamics - out of scope: team member should ask for a new task or role
* Team dynamics - wrong dose by team leader; Respond “I think the correct dose is.... should I give instead?"
* Vital Signs - Heart rate 88 is normal for a 10-year-old, respiratory rate 24 normal for 3-year-old

*Systematic Approach Algorithm*

**Initial Impression**

* **Appearance**
* **Work of Breathing**
* **Circulation**

**Evaluate – Identify - Intervene**

**A continuous sequence.**

**\*\*Determine if problem is life threatening.**

**EVALUATE**

**PRIMARY ASSESSMENT**

* **A**irway
* **B**reathing
* **C**irculation
* **D**isability
  + AVPU - alert, voice, painful, unresponsive
  + Glasgow Coma Scale, Pupils
  + Blood glucose
* **E**xposure

**SECONDARY ASSESSMENT**

* A focused medical history
* A and focused physical exam
* Ongoing reassessment

**S-** Signs & symptoms (What hurts?)

**A-** Allergies

**M**- Medications

**P-** Past medical history

**L-** Last meal

**E-** Events Preceding, what happened

**DIAGNOSTIC ASSESSMENT**

* ABG, Venous blood gas, arterial lactate
* Central venous 02 saturation, CVP
* CXR, ECG, Echo
* Peak expiratory flow rate

**IDENTIFY**

**Type and Severity of Potential Problems**

|  |  |
| --- | --- |
| **Respiratory** | **Circulatory** |
| Respiratory Distress  Or  Respiratory Failure | Compensated Shock  Or  Hypotensive Shock |
| Upper airway obstruction  Lower airway obstruction  Lung tissue disease  Disordered control of breathing | Hypovolemic shock  Distributive shock  Cardiogenic shock  Obstructive shock |
| **Cardiopulmonary Failure**  **Cardiac Arrest** | |

**INTERVENE**

* Positioning the child to maintain a patent airway
* Activating emergency response
* Starting CPR
* Obtaining the code cart and monitor
* Placing the child on a cardiac monitor and pulse oximeter
* Administering 02
* Supporting ventilation
* Starting medications and fluids using nebulizer, IV/IO fluid bolus

**An intubated patient’s condition deteriorates; consider the following possibilities (DOPE):**

* **D**isplacement of the tube from the trachea
* **O**bstruction of thetube
* **P**neumothorax
* **E**quipment failure

**6 Hs 5 Ts - Search for Reversible Causes**

**H**ypovolemia

**H**ypoxia

**H**ydrogen ion **(acidosis)**

**H**ypoglycemia

**H**ypo / **H**yper kalemia

**H**ypothermia

**T**ension pneumothorax

**T**amponade, cardiac

**T**oxins – poisons, drugs

**T**hrombosis – coronary (AMI)

**T**hrombosis – pulmonary (PE)

**Course Completion Requirements**

* Actively participate in, practice, and complete all skills stations and learning stations.
* Pass the child CPR and AED and infant CPR skills tests
* Pass an exam with minimum score of 84%
* Pass 2 PALS case scenario test as a team leader

**2015 Science Changes**

* In specific settings with febrile illnesses, use of restrictive volumes of isotonic crystalloid led to improved survival
* Routine use of atropine pre-intubation to prevent dysrhythmias is controversial
* If invasive BP monitoring, use to adjust CPR to targets
* Amiodarone or lidocaine are acceptable antiarrhythmic agents of VF, Pulseless VT
* Epinephrine recommended as vasopressor in pediatric cardiac arrest
* Extracorporeal CPR (ECPR) may be considered in in-hospital settings with cardiac diagnoses
* Avoid fever with ROSC
* After ROSC fluids and vasoactive infusions should be used to maintain SBP at fifth percentile for age
* After ROSC normoxemia should be targeted

**Vital Signs in Children - Normal Ranges**

|  |  |  |  |
| --- | --- | --- | --- |
| Age | Systolic BP | Pulse (awake) | Respirations |
| Neonate | 67-84 | 100-205 |  |
| Infant | 72-104 | 100-180 | 30-53 |
| Toddler | 86-106 | 98-140 | 22-37 |
| Preschooler | 89-112 | 80-120 | 20-28 |
| School-aged | 97-115 | 75-118 | 18-25 |
| Adolescent | 110-131 | 60-100 | 12-20 |

**Treatment of Dysrhythmias - General overview. See PALS text for details**

***Bradycardia***

* Airway, 02, monitor, IO/IV, 12 lead
* Hypotension, ALOC, Shock? - CPR if below 60, Epinephrine 0.01 mg/kg, Atropine 0.02 mg/kg, consider pacing, treat underlying causes

***Tachycardia with a Pulse***

* Airway, 02, monitor/defib, IO/IV, 12 lead
* QRS narrow - infant rate above 220 SVT, child above 180 SVT - adenosine 0.1 mg/kg, the 0.2 mg/kg rapid bolus
* QRS wide? - V tach - 12 lead, amiodarone 5 mg/kg IV, adenosine, cardioversion 0.5 to 1 J/kg then 2 J/kg

***Pediatric Cardiac Arrest - H's T's***

* CPR, 02, monitor/defib
* Shockable - VF, VT - shock 2 J/kg, then double to 10 J/kg, CPR 2 min, Epi 0.01 mg/kg, amiodarone 5 mg/kg, lidocaine 1 mg/kg shock - CPR 2 min - Drug repeat
* Non-Shockable - Asystole, PEA - CPR 2 min, IO/IV, Epi

**Respiratory - See PALS text for full details**

|  |  |  |
| --- | --- | --- |
| **Respiratory** | **Signs** | **Treatment** |
| **Distress**  Open and maintainable airway. | Marked tachypnea, respiratory effort, tachycardia, low 02 sat with 02, cyanosis | Open airway  Clear airway  OP/NP airway  02 sat, 02  Inhaled meds  Bag-mask  Advanced airway |
| **Failure**  Airway not maintainable | Very rapid rate or apnea, inadequate respiratory effort, low 02 sat with 02, decreased LOC, cyanosis |
| **Upper Airway**  Foreign body, anaphylaxis, tonsils, infection, croup | Inc respiratory rate and effort, inspiratory retractions, accessory muscles, flaring, stridor, hoarseness, barking cough, drooling, snoring, poor chest rise | Position comfort  Inhaled epinephrine  Decadron  heliox |
| **Lower Airway**  Asthma, bronchiolitis | Increases respiratory rate, retractions, flaring, prolonged expiration, wheezing, cough | Albuterol, steroids, magnesium sulfate |
| **Lung Tissue Disease**  Pneumonia, pulmonary edema, ARDS, lung disease | Grunting, crackles, decreased breath sounds | Antibiotics, albuterol, labs, tx pulmonary edema, CPAP |
| **Disordered Control Breathing**  Neurologic, seizures, drug overdose | Variable, irregular respiratory rate shallow breathing, apnea, normal or decreased air movement | Poison antidote, ventilatory support |

**Shock - See PALS text for full details**

|  |  |  |  |
| --- | --- | --- | --- |
| **Shock** | **Types** | **Symptoms** | **Treatment** |
| **Hypovolemic** | Non-hemorrhagic - vomiting, diarrhea, urinary  Hemorrhagic | Mild - dry mucous membranes, oliguria  Moderate - poor skin turgor, sunken fontanel, tachycardia  Severe - marked tachycardia, weak to absent distal pulse, increased respiratory rate  Mild - below 30% volume loss  Moderate - 30-45% volume loss  Severe - above 45% volume loss | Rapid administration of isotonic crystalloids 20 mL/kg bolus  Fluids, Colloids, blood |
| **Distributive** | Septic  Anaphylactic  Neurogenic | ALOC, tachycardia, fever, prolonged cap  Angioedema, upper airway obstruction  Hypotension, bradycardia, hypothermia | Antibiotics, crystalloid 20 mL/kg  Epi, fluid, Albuterol, antihistamines, steroids  Fluid, vasopressors |
| **Cardiogenic** |  | May have high preload (fluid) | Cautious fluid admin |
| **Obstructive** | Cardiac tamponade  Tension pneumothorax  Pulmonary emb. | Consult specialists and treat accordingly |  |

**Signs of compensated shock include (poor perfusion, NORMAL systolic BP)**

* Tachycardia
* Increased SVR
  + - Skin - cold, pale, mottled, diaphoretic
    - Peripheral circulation - delayed capillary refill
    - Pulses - weak peripheral pulses, narrowed pulse pressure
* Increases renal and splanchnic vascular resistance (redistribution of blood flow)
  + - Kidney - decreased urine output, oliguria
    - Intestine - vomiting, ileus
* Cerebral auto regulation - brain, altered mental status, anxiety, coma
* **Normalblood pressure**

**Signs of decompensated shock include**

As compensatory mechanisms fail, signs of inadequate end-organperfusion develop. In addition to the above, these signs include:

* Depressed mental status, decreased urine output
* Metabolicacidosis, Tachypnea, Weak central pulses
* **Hypotension**

The most common cause of shock is hypovolemia, one form of whichis hemorrhagic shock. Distributive and cardiogenic shock areseen less often

* Capillary refill time aloneis not a good indicator of circulatoryvolume, but a capillaryrefill time of >2 seconds is a usefulindicator of moderatedehydration when combined with a decreasedurine output, absenttears, dry mucous membranes, and a generallyill appearance
* Tachycardia also results from othercauses (eg, pain, anxiety,fever)
* Pulses may be boundingin anaphylactic, neurogenic, and septicshock

In compensated shock, blood pressure remains normal; it is lowin decompensated shock. Hypotension is a *systolic* blood pressureless than the 5th percentile of normal for age

**Pediatric Cardiac Arrest Medications**

|  |  |  |
| --- | --- | --- |
| **Medication** | **Dose** | **Remarks** |
| Epinephrine | Pulseless arrest, symptomatic bradycardia  0.01 mg/kg IV/IO q 3 to 5 min  0.1 mg/kg ET q 3 to 5min | Doses vary for other conditions and situations |
| Atropine | Bradycardia - 0.02 mg/kg IV/IO q 3 to 5 min  0.04 to 0.06 mg/kg ET | Child max 1 mg total dose  Adolescent max 3 mg total dose  Dose varies for toxins |
| Adenosine | SVT 0.1 mg/kg IV/IO rapid push maximum 6 mg  Repeat 0.02 mg/kg max 12 | Rapid push closest port followed by fluid bolus |
| Amiodarone | SVT, VT with pulse 5 mg/kg IV/IO Pulseless arrest - 5 mg/kg IV/IO | load over 20-60 min |
| Naloxone | 0.1 mg/kg IV/IO/IM bolus q 2 min | Maximum 2 mg |
| Lidocaine | VF/ Pulseless VT  1 mg/kg IV/IO bolus 2 to 2 mg/kg ET | Maintain 20 to 50 mcg/kg/min |
| Dextrose  Glucose | 0.1 to 1 g/kg IV/IO |  |
| Magnesium Sulfate | Asthma refractory - 25 to 50 mg/kg IV/IO | Maximum 2 G |