PALS Study Guide 2016

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 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. 2 person 15:2 compression to ventilation
- 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% O_2
- Respiratory - upper airway - increased work of breathing, inspiratory effort with retractions, stridor, nut allergy
- Respiratory - upper airway obstruction drug - nebulized epinephrine
- Respiratory distress from lung 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

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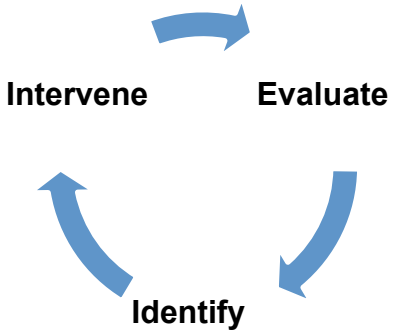
Systematic Approach Algorithm

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 O_2 saturation, CVP
- CXR, ECG, Echo
- Peak expiratory flow rate

Course Completion Requirements

✓ Actively participate in, practice, and complete all skills stations and learning stations.

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 O_2
- 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 the tube
- **P**neumothorax
- **E**quipment failure

6 Hs 5 Ts - Search for Reversible Causes

Hypovolemia
Hypoxia
Hydrogen ion **(acidosis)**
Hypoglycemia
Hypo / **H**yper kalemia
Hypothermia

Tension pneumothorax
Tamponade, cardiac
Toxins – poisons, drugs
Thrombosis – coronary (AMI)
Thrombosis – pulmonary (PE)

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- ✓ 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, O_2, 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, O_2, monitor/defib, IO/IV, 12 lead
- QRS narrow - infant rate above 220, 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, O_2, monitor/defib
- Shockable - VF, VT - shock 2 - 4 J/kg, then 4/6/8 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

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Respiratory - See PALS text for full details

Respiratory	Signs	Treatment
Distress Open and maintainable airway	Marked tachypnea, respiratory effort, tachycardia, low O_2 sat with O_2, cyanosis	Open airway Clear airway OP/NP airway O_2 sat, O_2 Inhaled meds Bag-mask Advanced airway
Failure Airway not maintainable	Very rapid rate or apnea, inadequate respiratory effort, low O_2 sat with O_2, 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 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	Mild - dry mucous membranes, oliguria Moderate - poor skin turgor, sunken fontanel, tachycardia Severe - marked tachycardia, weak to absent distal pulse, increased respiratory rate	Rapid administration of isotonic crystalloids 20 mL/kg bolus
	Hemorrhagic	Mild - below 30% volume loss Moderate - 30-45% volume loss Severe - above 45% volume loss	Fluids, Colloids, blood
Distributive	Septic	ALOC, tachycardia, fever, prolonged cap	Antibiotics, crystalloid 20 mL/kg
	Anaphylactic	Angioedema, upper airway obstruction	Epi, fluid, Albuterol, antihistamines, steroids
	Neurogenic	Hypotension, bradycardia, hypothermia	Fluid, vasopressors
Cardiogenic		May have high preload (fluid)	Cautious fluid admin
Obstructive	Cardiac tamponade Tension pneumothorax Pulmonary emb.	Consult specialists and treat accordingly	

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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
- **Normal blood pressure**

Signs of decompensated shock include

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

- Depressed mental status, decreased urine output
- Metabolic acidosis, Tachypnea, Weak central pulses
- **Hypotension**

The most common cause of shock is hypovolemia, one form of which is hemorrhagic shock. Distributive and cardiogenic shock are seen less often

- Capillary refill time alone is not a good indicator of circulatory volume, but a capillary refill time of >2 seconds is a useful indicator of moderate dehydration when combined with a decreased urine output, absent tears, dry mucous membranes, and a generally ill appearance
- Tachycardia also results from other causes (e.g., pain, anxiety, fever)
- Pulses may be bounding in anaphylactic, neurogenic, and septic shock

In compensated shock, blood pressure remains normal; it is low in decompensated shock. Hypotension is a *systolic* blood pressure less 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 mL/kg (concen.) 0.1 mg/kg ET q 3 to 5min	Doses vary for other conditions and situations
Atropine	Symptomatic Bradycardia - 0.02 mg/kg IV/IO q 3 to 5 min 0.04 to 0.06 mg/kg ET Maximum single dose of 0.5 mg.	Child max 1 mg total dose Adolescent maximum 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, pulseless arrest 5 mg/kg IV/IO up to total dose of 15 mg/kg (2.2g in adolescents) IV over 24 hours	load 5 mg/kg IV/IO over 20-60 min Maximum single dose 300 mg.
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 3 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 over 15 to 30 min.	Maximum 2 G