

## PEDIATRIC EDUCATION DEVELOPMENT SOCIETY INTERNATIONAL (PEDSI GLOBAL HEALTH – USA)

#### Global Health & Medical Educational Programs in USA and Abroad



American Heart Association Intl Training Center for BLS & PALS in Bangladesh American Academy Of Pediatrics - Advanced Pediatric Life Support Course



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#### PEDIATRIC ADVANCED LIFE PPORT COURSE (PALS) COURSE PEDSI GLOBAL HEALTH (USA)

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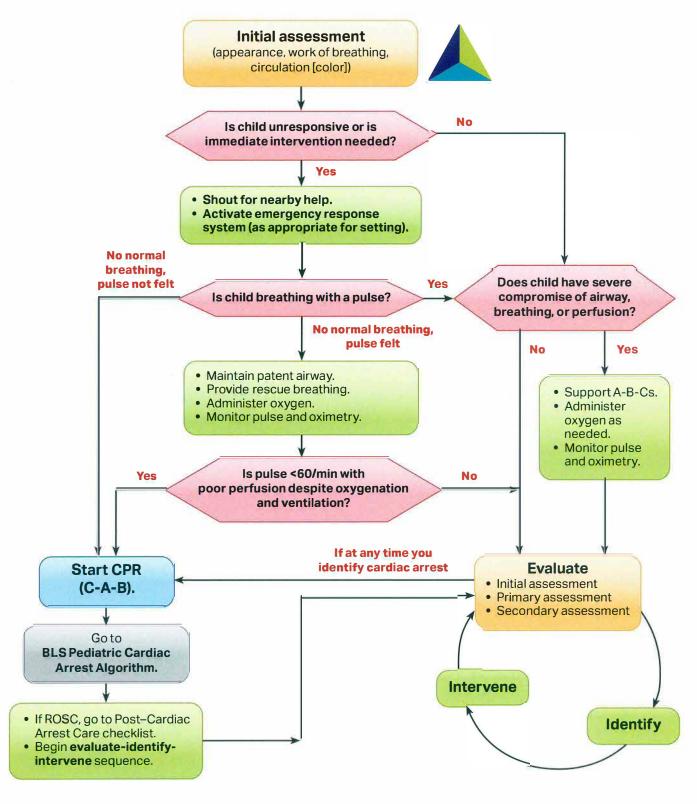
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#### PALS Systematic Approach Algorithm





#### **Pediatric Advanced Life Support**





#### BLS/PALS/NRP UPDATE © 2024-01 WH

Pediatric BLS Guidelines: Overview of 2020 International Guidelines Waseem Hafeez, MD – Cofounder & Medical Director, PEDSI Global Health

#### Summary of 2020 BLS Maneuvers for Infants, Children, and Adults

MANEUVER	INFANTS 1 Mo to < 1 YR	CHILD 1 Yr to Puberty	ADOLESCENT / ADULTS	
SCENE SAFETY	Make sure environment is safe for Rescuer and Victim			
RECOGNITION of CARDIAC ARREST	Check for Responsive (? Unresponsive) No Breathing or Gasping No pulse palpated within 10 seconds Breathing and Pulse check performed simultaneously			
ACTIVATE Emergency Response System If mobile phone - call EMS	Unwitnessed Arrest: CPR 5 cycles in 2 mins then call EMS Witnessed Sudden Arrest: Activate EMS & get AED - start CPR Activate after verifying that victim is Unresponsive		Activate EMS & get AED – start CPR Activate if victim found unresponsive If asphyxia arrest likely, call after CPR 5 cycles in 2 minutes	
CPR Sequence	C – A – B (COMPRESSION – AIRWAY – BREATHING)			
C: CIRCULATION Pulse check in < 10 sec	Brachial or Femoral	Femoral or Carotid	Carotid	
Compression Landmark	Just below Nipple line 1 Rescuer: 2 fingers 2 Rescuers: 2 thumb-encircling chest	Center of chest, Mid sternum between nipples  1 Hand: Heel of 1 hand only  2 Hands: Heel of 1 hand with second ontop		
Compression Depth	Atleast One-Third AP diameter About 1½ inches ( 4 cm)	Atleast <sup>1</sup> / <sub>3</sub> <sup>rd</sup> AP diameter About <b>2</b> inches ( <b>5 cm</b> )	At least 2 inches (5 cm) But Less than 2.4 ins (6 cm)	
Compression Rate	100 - 120 / min Push hard and fast / Allow complete recoil between compressions			
Compression -Ventilation ratio	1 rescuer = 30 : 2 2 rescuer = 15 : 2		30 : 2 1 or 2 rescuers	
A: AIRWAY	Head tilt—Chin lift Suspected trauma: use Jaw Thrust - if unable, protect C-spine then Head tilt—Chin lift			
B: BREATHING Initial	2 effective breaths at 1 second / breath - Visible Chest rise			
Rescue breathing without chest compressions	12 to 20 breaths / min (approximately 1 breath every 3 - 5 seconds)		10 to 12 breaths / min (approx 1 breath every 5 - 6 secs)	
Rescue breaths with advanced airway	10 breaths / min ( 1 breath ever	th every 6 seconds) - Continuous Chest compression 100 - 120 / min		
Foreign-body airway obstruction	Back slaps and Chest thrusts	Abdominal thrusts		
D: DEFIBRILLATION AED Witnessed Sudden Collapse	Infants <1 year of age / < 10 kg  Manual Defibrillator preferred Give 1 Shock and resume CPR	Child 1 to 8 years Use Pediatric dose- attenuator pads Give 1 Shock & resume CPR	Adolescent / Adult Use adult pads. Do not use child pads. Witnessed arrest – use AED Give 1 Shock and resume CPR Unwitnessed arrest or AED unavailable – start CPR 5 Cycles in 2min before shock	

## The Following State of the Control o

### BLS Guidelines: Critical Skills Descriptors © 2024-01 WH Infant / Child / Adult CPR

### Waseem Hafeez, MD PEDSI Global Health

### 1. Assess victim and activates emergency response system (this *must* precede starting compressions) within a maximum of 30 secs. After determining that the scene is safe:

- · Check for responsiveness by tapping and shouting
- Shout for help / direct someone to call for help and get emergency equipment.

Use mobile device to call 9-1-1

- Get Automatic External Defibrillator (AED)
- Use Manual Defibrillator for Infants
- Check for no breathing or no normal breathing (only gasping)
  - Scan from the head to the chest for a minimum of 5 seconds and no more than 10 seconds
- Check Brachial pulse (INFANT)
- Check Femoral or Carotid pulse (CHILD)
- Check Carotid pulse (ADULT)
  - Can be done simultaneously while checking for breathing
  - Check for a minimum of 5 seconds and no more than 10 seconds

### 2. Perform high-quality chest compressions (initiate compressions within 10 secs of identifying cardiac arrest)

- Correct placement of hands / fingers in center of chest (INFANT)
  - 1 rescuer: 2 fingers just below the nipple line
- Correct hand placement (CHILD)
  - -- Lower half of breastbone
  - 1- or 2-handed (second hand on top of the first)
- Correct hand placement (ADULT)
  - Lower half of sternum
  - 2-handed (second hand on top of the first or grasping the wrist of the first hand)
- Compression rate of 100 to 120/min
  - Deliver 30 compressions in 15 to 18 seconds (Adults & 1 Rescuer in Infant or Child)
  - Deliver 15 compressions in 7 to 9 seconds (2 Rescuer in Infant or Child)
- · Adequate depth for age
  - At least one third the depth of the chest = about 1½ inches = 4 cm (INFANT)
  - At least one third the depth of the chest = about 2 inches = 5 cm (CHILD)
  - At least 2 inches = 5 cm and avoid compressing more than 2.4 inches = 6 cm (ADULT)
  - Use of a commercial feedback device or high-fidelity manikin is highly recommended

- · Allow complete chest recoil after each compression
- · Appropriate Ratio for age and number of rescuers
  - 1 rescuer: 30 compressions to 2 breaths (INFANT)
  - 2 rescuer: 15 compressions to 2 breaths (INFANT AND CHILD)
  - 1 OR 2 rescuer: 30 compressions to 2 breaths (ADULT)
- Minimize interruptions in chest compressions
  - Deliver 2 breaths each breath over 1 second
  - Start chest compression in less than 10 seconds between last compression of one cycle and first compression of next cycle
- 3 Switch compression technique at appropriate interval (after 5 cycles)

Switch should take about 5 seconds

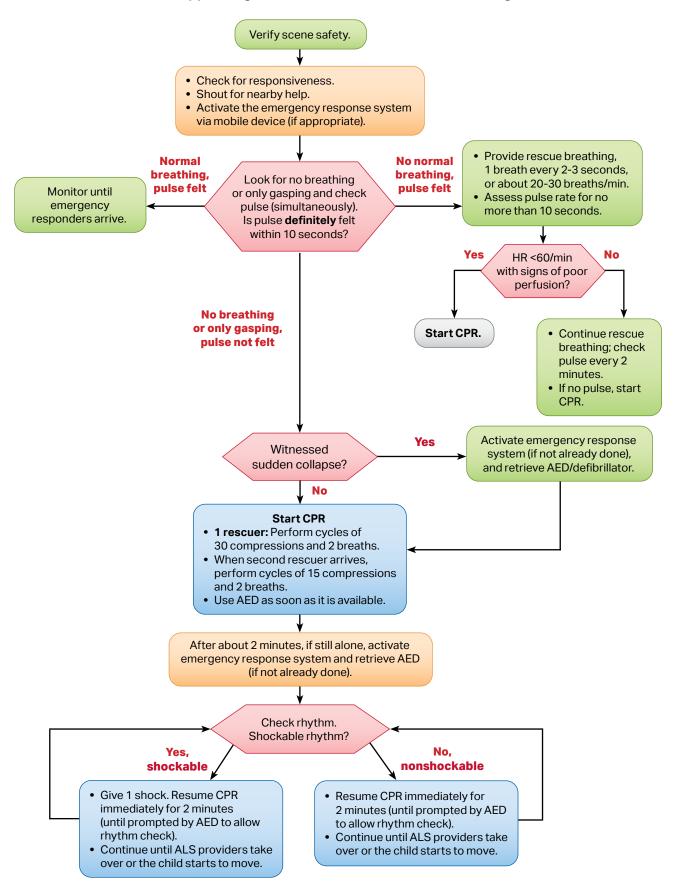
- 4. Perform same steps for compressions and breaths for Cycle 2
- 5. AED use
  - · Use Manual Defibrillator for Infants
  - Power on AED
    - Turn AED on by pushing button or lifting lid as soon as it arrives
  - Correctly attach pads (follow direction of AED)
    - Place proper-sized (Child) pads for victim's age under 8Yrs or < 25Kg in correct location
    - Place proper-sized (Adult) pads for victim's age in correct location
  - Clear for analysis
    - Clear rescuers from victim for AED to analyze rhythm (push analyze button if required by device)
    - -- Communicate clearly to all other rescuers to stop touching victim
  - Clear to safely deliver shock
    - Communicate clearly to all other rescuers to stop touching victim
  - · Deliver a shock
    - --- Resume chest compressions **immediately** after shock delivery
    - -- Do NOT turn off AED during CPR

#### 6. Resume compressions

- · Ensures that high-quality chest compressions are resumed immediately after shock delivery
  - Perform same steps for compressions

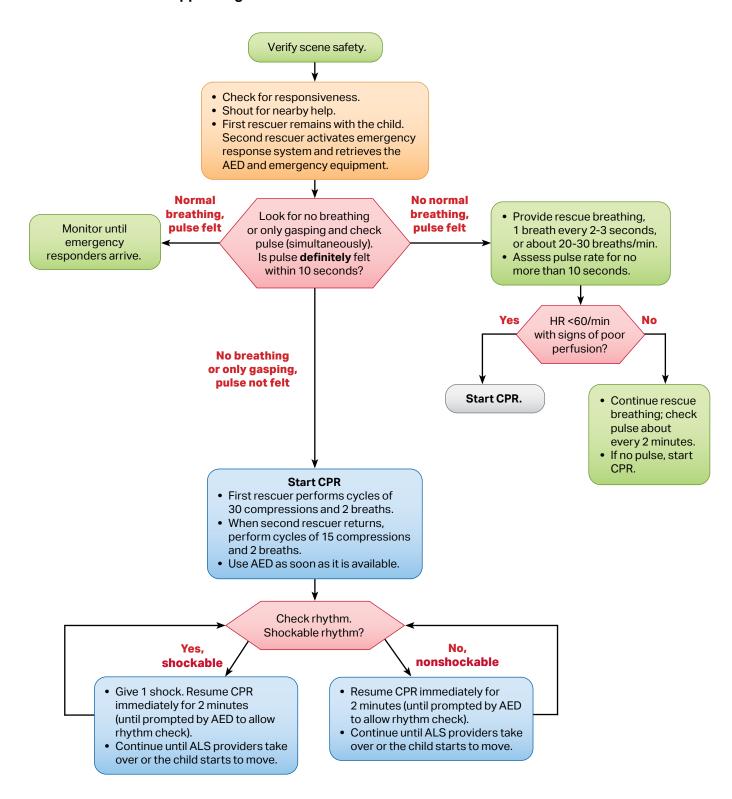


#### Pediatric Basic Life Support Algorithm for Healthcare Providers—Single Rescuer





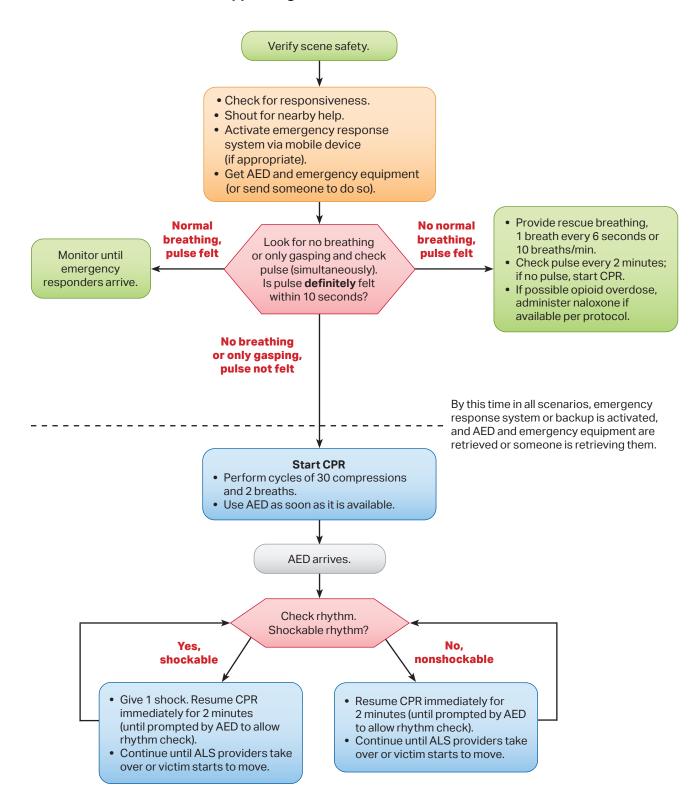
#### Pediatric Basic Life Support Algorithm for Healthcare Providers—2 or More Rescuers



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#### Adult Basic Life Support Algorithm for Healthcare Providers



© 2020 American Heart Association

## Heartsaver® Adult CPR AED







Tap and shout

Yell for help. Send someone to phone 911 and get an AED





Look for no breathing or only gasping

Push hard and fast. Give 30 compressions





Open the airway and give 2 breaths

Repeat sets of 30 compressions and 2 breaths



When the AED arrives, turn it ON and follow the prompts

## Heartsaver® Child CPR AED







Tap and shout

Yell for help. Send someone to phone 911 and get an AED





Look for no breathing or only gasping

Push hard and fast. Give 30 compressions





Open the airway and give 2 breaths

Repeat sets of 30 compressions and 2 breaths





If you are alone after 5 sets of 30 compressions and 2 breaths, phone 911, and then resume sets of 30:2

When the AED arrives, turn it ON and follow the prompts

## Heartsaver® Infant CPR







Tap and shout

Yell for help. Send someone to phone 911





Look for no breathing or only gasping

Push hard and fast. Give 30 compressions





Open the airway and give 2 breaths

Repeat sets of 30 compressions and 2 breaths



If you are alone after 5 sets of 30 compressions and 2 breaths, phone 911, and then resume sets of 30:2

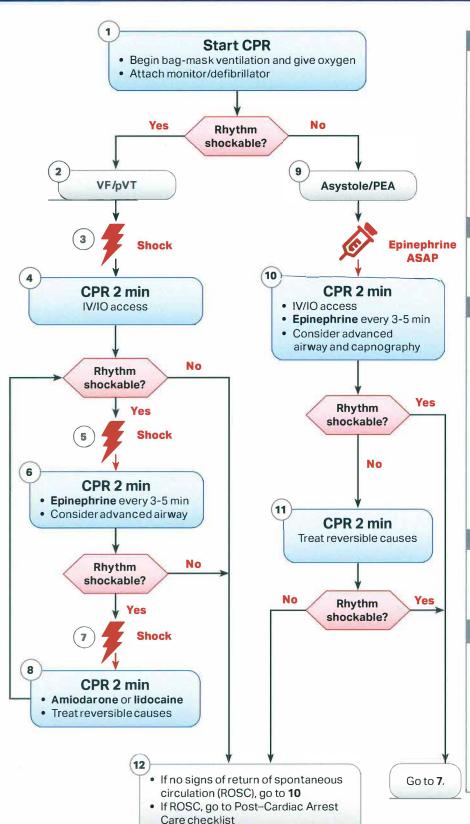
#### PEDIATRIC CARDIAC ARREST & DYSRYTHMIA ALGORITHM © 2024-01 WH Waseem Hafeez, MD 1. Assess Patient & Check Pulse 2. Analyze Rate CHECK PULSE 3. Rhythm: P-wave / ORS **PRESENT ABSENT** felt within 10 sec? 4. Treat Patient UNSTABLE SIGNS 2 Altered mental status Hypotension **CHECK RATE** s/s Shock, Resp failure CPR (5 cycles in 2min) > puberty: 30 compressions Check ABCs • Start CPR HR >160 bpm < puberty and 2 rescuer -HR < 60 bpm • 100% O<sub>2</sub>(BVM/ETT) • IV- IO 30 compressions And 2 Breaths UNSTABLE **STABLE** CHECK RHYTHM • Initiate CPR Check ABCs **CHECK QRS** ABSENT **PRESENT** • Epinephrine (1mg/10ml) • 100% O2 0.1 ml/kg IV q 3-5 min • Monitor Vagal/Primary AV block: • Evaluate • **Atropine** (0.02 mg/kg) Min 0.1 mg VT / VF **NARROW** WIDE ASYSTOLE **PEA** max 0.5 mg **UNSTABLE** ORS >0.09 ORS < 0.09 Consider Pacing CPR 2 min CHECK P-WAVE **Epinephrine** • IV (1mg/10ml): 0.1 ml/kg IV q 3-5 min • ETT (1mg/1ml): 0.1 ml/kg **ABNORMAL** NORMAL OR ABSENT PROBABLE SINUS TACHYCARDIA **Identify and Treat Reversible Causes:** • Infant <220 bpm; child <180 bpm) **H**ypoxemia • Pneumothorax **H**ypovolemia • Pericardial Tamponade · Identify and treat cause **H**ypoglycemia • pH- Acidosis **H**ypothermia • Pulmonary Embolism PROBABLE SVT (infant >220 bpm; child >180 bpm) Hypo/Hyperkalemia • Poisons – Drug OD STABLE: 3 · Check ABCs • Give 100% O<sub>2</sub> IV access PULSELESS VENTRICULAR TACH - FIBRILLATION • Vagal stimulation (no delay) • Continue CPR (while defibrillator charges) • Adenosine: rapid push / large IV + 5-10 ml NS flush 2 J/kg (max 200J – mono / biphasic) • Defibrillate X 1 First dose 0.1 mg/kg IV push (6 mg maximum) • **Defibrillate** 4 J/kg (max: Mono 360 J/ Biphasic 200 J) repeat dose 0.2 mg/kg IV push (12 mg maximum) • **Epinephrine:** (1mg/10ml) 0.1 ml/kg IV q 3 - 5 min Consider Synchronized Cardioversion • Amiodarone 5 mg/kg(max 300 mg) IV bolus → shock 4 J/kg **UNSTABLE:** or Lidocaine 1 mg/kg (max 100 mg) IV bolus → shock 4 J/kg • Torsades : Magnesium 25 - 50 mg/kg (2 G max) • Cardioversion 0.5 - 1 - 2 J/kg(max: Mono 100, 200, 300, 360J / Biphasic 100, 200J) Repeat sequence: CPR 2 min→ shock 4 J/kg → drug→ CPR VENTRICULAR TACHYCARDIA STABLE: • Check ABCs / 100% O<sub>2</sub> / IV access • Amiodarone 5 mg/kg (max 300 mg) IV in 20-60 min or Lidocaine 1 mg/kg (max 100 mg) IV bolus **NO PULSE UNSTABLE:** • Synchronized Cardioversion 0.5 - 1 - 2 J/kg(max: Mono100, 200, 300, 360 J / Biphasic 100, 200 J)

#### Pediatric Cardiac Arrest Algorithm





#### **Pediatric Advanced Life Support**



#### **CPR Quality**

- Push hard (≥⅓ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Change compressor every 2 minutes, or sooner if fatigued
- If no advanced airway, 15:2 compression-ventilation ratio
- If advanced airway, provide continuous compressions and give a breath every 2-3 seconds

#### **Shock Energy for Defibrillation**

- First shock 2 J/kg
- Second shock 4 J/kg
- Subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose

#### **Drug Therapy**

- Epinephrine IV/IO dose:
  0.01 mg/kg (0.1 mL/kg of the
  0.1 mg/mL concentration).
  Max dose 1 mg.
  Repeat every 3-5 minutes.
  If no IV/IO access, may give
  endotracheal dose: 0.1 mg/kg
  (0.1 mL/kg of the 1 mg/mL
  concentration).
- Amiodarone IV/IO dose:
   5 mg/kg bolus during cardiac arrest. May repeat up to 3 total doses for refractory VF/pulseless VT
  - Lidocaine IV/IO dose: Initial: 1 mg/kg loading dose

#### **Advanced Airway**

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement

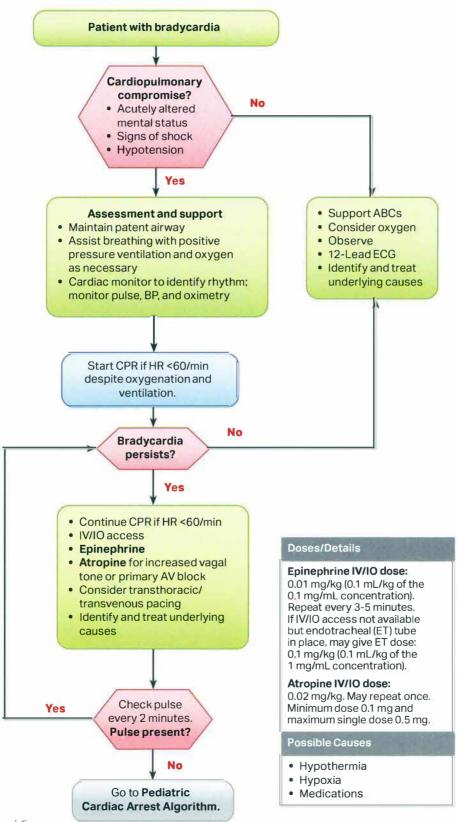
#### **Reversible Causes**

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

## Pediatric Bradycardia With a Pulse Algorithm



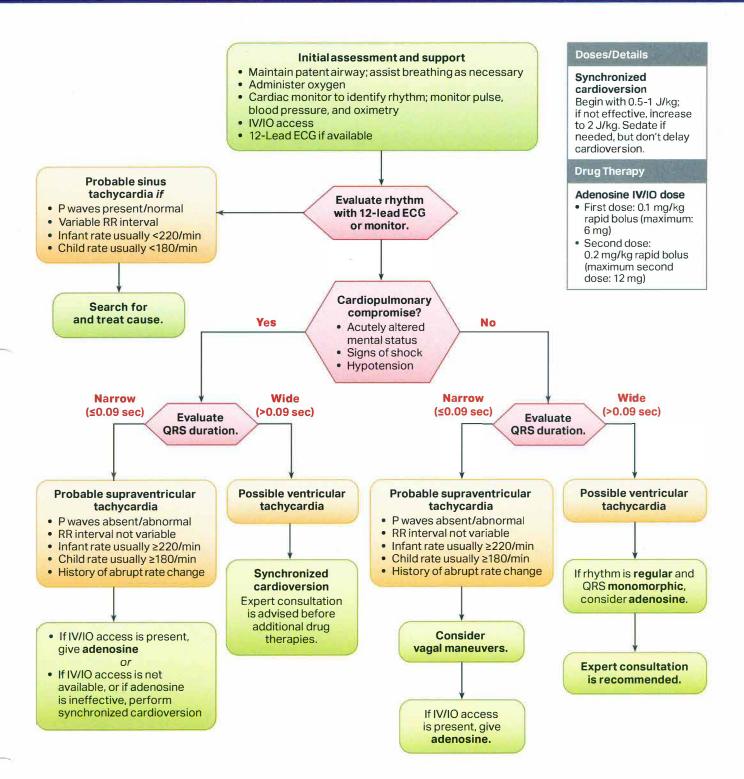
#### **Pediatric Advanced Life Support**



## Pediatric Tachycardia With a Pulse Algorithm



#### **Pediatric Advanced Life Support**



#### MANAGEMENT OF SHOCK © 2024-01 WH



#### Waseem Hafeez, MD

#### **Identify Signs of Shock**

- Appearance: mottled or pallor, Altered Mental Status
- Breathing(Respiratory): Tachypnea, Retractions, Hypoxia
- Circulation: Tachycardia or Bradycardia, Hypotension, prolonged capillary refill, cool or warm extremities, decreased urine output
- Temperature (fever or hypothermia)

#### **Optimize Ventilation and Oxygenation**

- Titrate FiO<sub>2</sub> to maintain oxygen saturation 94% 99%
- Consider advanced airway placement
- Monitor waveform capnography
- Target PCO<sub>2</sub> appropriate for patient's condition (limit exposure to severe hypercapnia and hypocapnia)

#### **Assess for and Support Circulation**

- Identify and treat contributing factors
- Monitor circulation heart rate, blood pressure, cap refill
- Isotonic crystalloid IV/IO bolus 20ml/kg X 3if needed
- Consider smaller bolus: 5 10ml /kg (if suspected poor cardiac function, Neonate, or with severe febrile illness in settings with limited resources)
- Consider inotropic support for fluid-refractory shock
- Correct Hypoglycemia, Hypocalcemia, Hyperkalemia, Metabolic acidosis, severe Anemia

#### **Identify and Treat Reversible Causes**

- Hypoxia
- Pneumothorax • **H**ypovolemia • Pericardial Tamponade
- Hypoglycemia
- pH- severe Acidosis
- **H**ypothermia
- PE-Pulmonary Embolism
- Hypo/Hyperkalemia Poisons Drug Overdose

#### HYPOTENSIVE SHOCK

#### Low CO-Hi SVR

#### Hi CO-Low SVR

- Epinephrine
- NorEpinephrine • Vasopressin
- NorEpinephrine
- Dobutamine
- Epinephrine

#### NORMOTENSIVE SHOCK

- Epinephrine 0.03- 0.05µg/kg/m
- Milinone
- Dobutamine

#### SEPTIC SHOCK

- Isotonic crystalloid IV/IO bolus 20ml/kg X 3 in 1<sup>st</sup> hour if needed & reassess after each bolus
- Antibiotics within 1<sup>st</sup> hour: broad spectrum
- Fluid refractory & Dopamine—or—Norepinephrine dependent shock is risk for adrenal insufficiency
- \*If Adrenal insufficiency is suspected:
- Hydrocortisone 1–2mg/kg IV bolus (Max 100mg)
- (Draw baseline cortisol; consider ACTH stimulation test)

#### **Post Resuscitation Monitoring**

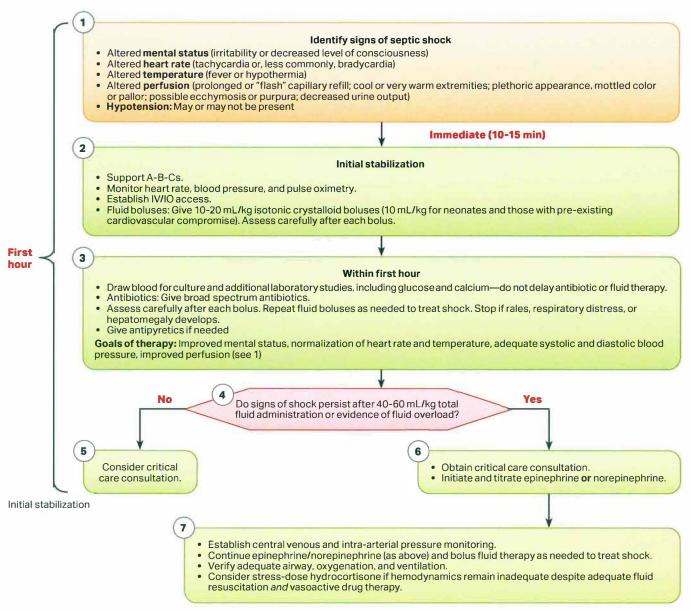
- Goal: Improve mental status, normalize HR, adequate BP improve organ perfusion, Respiration and Temperature, correct Metabolic derangements
- Monitor & Reassess Airway, Breathing and Circulation
- Monitor for and treat Hypoglycemia
- targeted Temperature management, treat fever aggressively
- Monitor for Myocardial dysfunction & Arrhythmia
- Monitor Neurological functions, treat agitation & seizure
- If patient remains comatose after resuscitation from Cardiac Arrest – evaluate for Therapeutic Hypothermia or ECMO

## Pediatric Septic Shock Algorithm





#### **Pediatric Advanced Life Support**



Brierley J, Carcillo JA. Choong K, et al. Clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock: 2007 update from the American College of Critical Care Medicine. Crit Care Med. 2009;37(2):666-688. Kissoon N, Orr RA. Carcillo JA. Updated American College of Critical Care Medicine—pediatric advanced life support guidelines for management of pediatric and neonatal septic shock: relevance to the emergency care clinician. Pediatr Emerg Care. 2010;26(11):867-869.

## Management of Shock After ROSC Algorithm





#### **Pediatric Advanced Life Support**

#### **Optimize Ventilation and Oxygenation**

- Titrate FIO<sub>2</sub> to maintain oxyhemoglobin saturation 94%-99% (or as appropriate to the patient's condition); if possible, wean FIO<sub>2</sub> if saturation is 100%.
- Consider advanced airway placement and waveform capnography.
- If possible, target a PCO<sub>2</sub> that is appropriate for the patient's condition and limit exposure to severe hypercapnia or hypocapnia.

#### Assess for and Treat Persistent Shock

- Identify and treat contributing factors.
- Consider 20 mL/kg IV/IO boluses of isotonic crystalloid. Consider smaller boluses (eg, 10 mL/kg) if poor cardiac function suspected.
- Consider the need for inotropic and/or vasopressor support for fluid-refractory shock.

#### Possible Contributing Factors

**H**ypovolemia

**H**ypoxia

**H**ydrogen ion (acidosis)

**H**ypoglycemia

Hypo-/hyperkalemia

**H**ypothermia

**T**ension pneumothorax

Tamponade, cardiac

**T**oxins

Thrombosis, pulmonary

Thrombosis, coronary

Trauma

#### **Hypotensive Shock**

- Epinephrine
- Norepinephrine

#### **Normotensive Shock**

- Epinephrine
- Milrinone\*
- Monitor for and treat agitation and seizures.
- Monitor for and treat hypoglycemia.
- Assess blood gas, serum electrolytes, and calcium.
- If patient remains comatose after resuscitation from cardiac arrest, maintain targeted temperature management, including aggressive treatment of fever.
- Consider consultation and patient transport to tertiary care center.

\*Milrinone can cause hypotension, so use and initiation of it should generally be reserved for those experienced with its use, initiation, and side effects (eg, ICU personnel).

#### Estimation of Maintenance Fluid Requirements

• Infants <10 kg: 4 mL/kg per hour

Example: For an 8-kg infant, estimated maintenance fluid rate

- = 4 mL/kg per hour × 8 kg
- = 32 mL per hour
- Children 10-20 kg: 4 mL/kg per hour for the first 10 kg + 2 mL/kg per hour for each kg above 10 kg

Example: For a 15-kg child, estimated maintenance fluid rate

- =  $(4 \text{ mL/kg per hour} \times 10 \text{ kg})$ 
  - + (2 mL/kg per hour × 5 kg)
- = 40 mL/hour + 10 mL/hour
- = 50 mL/hour
- Children >20 kg: 4 mL/kg per hour for the first 10 kg + 2 mL/kg per hour for 11-20 kg + 1 mL/kg per hour for each kg above 20 kg.

Example: For a 28-kg child, estimated maintenance fluid rate

- =  $(4 \text{ mL/kg per hour} \times 10 \text{ kg})$ 
  - + (2 mL/kg per hour × 10 kg)
  - + (1 mL/kg per hour × 8 kg)
- = 40 mL per hour + 20 mL per hour
  - +8 mL per hour
- = 68 mL per hour

After initial stabilization, adjust the rate and composition of intravenous fluids based on the patient's clinical condition and state of hydration. In general, provide a continuous infusion of a dextrosecontaining solution for infants. Avoid hypotonic solutions in critically ill children; for most patients use isotonic fluid such as normal saline (0.9% NaCl) or lactated Ringer's solution with or without dextrose, based on the child's clinical status.



#### BLS/PALS/ NRP PEARLS & UPDATE © 2024-01 WH

Pediatric BLS & PALS Guidelines: Overview of 2020 International Guidelines
Waseem Hafeez, MD – Medical Director, PEDSI Global Health
Division of Pediatric Emergency Medicine, Children's Hospital at Montefiore, NY

A – Assess Response: Unresponsive / No Breathing or No Normal Breathing (only gasping) / No pulse palpated <10 sec Appearance (well appearing / ill appearing / lethargic), Activity, Age-appropriate response Airway with C-Spine control:
 <ul>
 Clear
 Maintainable: Non-invasive - 100 % Oxygen, Head Tilt - Chin Lift, Jaw Thrust (trauma), Suction Unmaintainable: Intervention - Bag Valve Mask, Intubation, LMA, Cricothyrotomy

B – Breathing: (RACE) Initial 2 Rescue breaths (1 breath/second) then 12-20 bpm (infant); 10-12 bpm Child/Adolescent Respiratory Rate (average): NB = 60
1 yr = 50
3 yrs = 40
5 yrs = 30
8 yrs = 25

10 yrs = 20 >15 yrs = <u>16</u>

Air Entry – Breath sounds in all areas, Wheezing, Rales

Color - Pink, Pallor, Cyanosis, Mottled

Effort / Mechanics – Nasal flaring, Grunting, Head bobbing, Accessory muscle use, Stridor Retractions – Suprasternal / Subcostal / Intercostal

C - Circulation: check Pulse (4 P's)

Chest Compressions @100 - 120/min / 30C : 2B (2 rescuer < puberty = 15C : 2B)

In Shock: Establish 2 large-bore vascular access (Think IO!!)

Pulse Rate (average):

NB = 160
1 mo = 150
6 mo = 140
1 yrs = 90
1 yr = 130
3 yrs = 120

NB = 160
10 yrs = 100
15 yrs = 80
3 yrs = 120

>15 yrs = 60

Pulses (Central / Peripheral) – Femoral, Brachial, Carotid / Dorsalis pedis, Radial Pressure – Blood Pressure: Age: NB – 1 mo = Systolic [ 5th %tile] : 60 mm Hg

1 mo – 1 yr = Systolic [ **5th** %tile] : 70 mm Hg

1 yr – 10 yr = Systolic [ **5th** %tile] : **70 mm Hg + ( 2 x Age )** >10 yr = Systolic [ **5th** %tile] : **90** mm Hg (lowest adult BP) Diastolic = 2/3rd Systolic BP

Perfusion - End organ perfusion (Systemic Circulation):

Skin Perfusion - Cap refill, Color, Temperature

Renal Perfusion – Urinary Output @ 1 –2 ml/kg/hr upto 50 ml/hr CNS perfusion – Level of consciousness: **AVPU** Response:

(A= Awake; V= Responds to Voice; P= Responds to Pain; U= Unresponsive)

D – Dextrose (Bedside Fingerstick) / Disability - Neurologic status: Pupils, AVPU, GCS

E - Exposure / Etiology

F - Foley / Fever control

G – Gastric tube (NGT / Orogastric – if midface injury) / Guaiac / Gases

H – Hct / History (SAMPLE – Signs & Symptoms, Allergy, Medications, PMH, Last meal time, Environment)

2. Preparation: IMSOAPP = I – IV Fluids / IV Catheter / IO - Intraosseous needle

M – Monitors: Cardiac; Pulse Oximeter; Blood Pressure (Dynamap)

S – Suction: Yankauer & flexible catheters

O - Oxygen - 100 % O<sub>2</sub> source

A - Airway equipment: BVM, Laryngoscope & ETT, Oral & NP airway

P – Pharmacy (code meds)

Personnel (Call a Code: have team available)

3. Weight Estimation: Wt (kg) = 2 X (Age in Years + 4)

4.	Laryngoscope Blade: MiLler [L-shaped]	<u>Age</u>	Size
	Ma <u>C</u> intosh [C-shaped]	0	0 [miLler]
	_	1	1 [mi <b>L</b> ler]
		2 - 8	2 [mi <b>L</b> ler]
		> 8 – Adol	3 [miLler / maCintosh]

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Premature = Gestational Age in wks
                                                         10
        ET Tube depth: Alveolar ridge to mid-trachea = 3 x ETT size
6.
                                                                                      (12 + Age)
7.
        Complications of Intubation:
                                       DOPE = D - Dislodge / Displaced into Esophagus
                                                 O - Obstructed: Secretions, Kinked, Right mainstem
                                                 P – Pneumothorax
                                                 E - Equipment - air leak(small tube) / check Oxygen source /
                                                        inadequate Tidal Volume - small Bag, shallow breaths, Pop off valve
8.
        Medications through ETT:
                                       LEAN - Lidocaine, Epi, Atropine, Narcan
9.
        End tidal CO<sub>2</sub> monitor: Gold - is Good;
                                                        Purple - is Problem ( Pull it out)
10.
        Airway Size:
                                Oral Airway: Unconscious = corner of mouth to angle of jaw
                                NP Airway: Conscious = tip of nose to tragus of ear
11.
        Tube Size:
                        Suction / NG tube / Foley sizes = 2 X ETT size
                                                                                Chest tube size = 4 X ETT size
12.
        "Tubes and fingers in every orifice": ET tube, NG tube, Foley, Rectal exam: guaiac / tone
                                Rule of One's {all peds code medication doses related to 1}
13.
        Medication Dose:
14.
        Epi doses: IV/IO= 0.1 ml/Kg (0.01mg/Kg) @1mg/10ml; ETT dose= 0.1 ml/Kg (0.1mg/Kg) @1mg/1ml
15.
        Shock: Medical – Initial Fluids NS bolus @ 20 ml/kg x 3 = 20 \rightarrow 40 \rightarrow 60 ML/kg (total) \rightarrow Panic (Pressor)
               Trauma – Initial Fluids NS @ 20 ml/kg x 2 = 20 \rightarrow 40 ml/kg (total) \rightarrow Panic(PRBC: cross matched / Type specific
                                                                                                 female - O neg / male - O pos)
16.
        Shock & Inotropes (see Management of Shock algorithm):
                           Hypovolemic → Fluids NS bolus@ 20 - 60 ml/kg → +/- Dopamine
                           Cardiogenic → Fluids NS bolus @ 5-10 ml/kg → Dobutamine / or pinep rine Milrinone
                           Sepsis (Distributive) → Fluids NS bolus @ 20 - 60 ml/kg/1st hr → Cold shock → Epinephrine
                                                                                          → Warm shock → Nor Epinephrine
17.
        Preparation of Infusion Drips:
                                        (Premixed Solutions available)
          Alprostadil: Dose = 0.05 - 0.1 mcg/kg/min ( Mix 500 mcg in 250 mL D5W = 2 mcg/ml)
          Dopamine: Dose = 2 - 20 mcg/kg/min (Mix 400 mg in 250 ml D5W = 1.6mg/ml)
          Dobutamine: Dose = 5 - 20 mcg/kg/min (Mix 250 mg in 250 ml D5W = 1mg/ml)
          Epinephrine Dose = 0.05 - 2 mcg/kg/min (Epi = Mix 2 mg in 100 ml D5W = 20mcg/ml)
          NorEpi Dose= 0.05 - 2 \text{ mcg/kg/min} (Mix 8 mg in 250 ml D5W = 32\text{mcg/ml})
          Lidocaine: Dose = 20 - 50 mcg/kg/min (Mix 2000 mg in 250 ml D5W = 8mg/ml)
          Nicardipine: Dose = 0.5 - 5 mcg/kg/min (Mix 20 mg in 200 mL NS = 0.1mg/ml)
          Vasopressin: Dose = 0.5- 1.5 milliUnit/kg/min (Mix 10 Units in 100 ml D5W = 0.1Unit/ml)
18.
        V Fib Algorithm: CPR-Shock(2J/Kg)-CPR-Shock(4J/Kg)-Everybody-Shock(4J/kg)-Adult-Shock(4J/kg)-Little-Shock(4J/kg)
                        CPR-Defibrillate
                                            CPR-Defibrillate
                                                                 Epinephrine-Defib
                                                                                          Amiodarone-Defib Lidocaine-Defib
          Sequence: CPR (stop only to deliver shock)\rightarrow Defib (2J/kg) \rightarrow CPR \rightarrow Defib (4J/kg) \rightarrow Drug \rightarrow CPR \rightarrow Defib (4J/kg)
19.
        Causes of Arrest:
                 5 H's = Hypovolemia, Hypoxemia, Hypoglycemia, Hypothermia / Hyporthermia, Hypo kalemia / Hyporkalemia
                 5 P's = Pneumothorax (Tension), Pericardial tamponade, PE, Poisons (toxic OD), pH (severe acidosis)
                                                10 "P"s
20.
        Rapid Sequence Intubation (RSI):
        Preparation / Pre-sedation assessment / Pre-Oxygenation / Pre-Medication / Priming-defasiculation /
        Pain control(sedation)/ Pressure(cricoid)/Paralysis/ Place tube(Intubate)/ Post-Intubation Analgesia & Paralysis
21.
        Newborn Resuscitation: Functional History: 4 M's=Maturity(FT-PT)/Multiple Gestation/Meconium/Meds(Narcotics in 4 hrs)
             3 Assessment questions: (1) Term gestation? (2) Good tone? (3) Breathing or crying?
             Temp, A, B, C, Drugs: T: Dry, Warm, Position, Suction, Stimulate
                                     A: HR <100 – Oxygen: 100% or Room Air (upto 90 sec → no improvement→ 100% O<sub>2</sub>)
                                     B: HR <100 - Ventilation: BVM / ETT @ 30/min
                                     C: HR <60 - Chest Compression @ 90/min
                                     D: HR <60 - Medications - Epi 0.1 ml/kg (0.01mg/Kg) @1mg/10ml
            Meconium with (Apnea / Respiratory Distress / HR < 100 / Limp / Blue) = CPR / BVM / ETT / Meds
```

Uncuffed = (16 + Age)

ET Tube size:

All ages: Cuffed = 3.5 + Age

5.

## **Components of Post-Cardiac Arrest Care**





#### **Pediatric Advanced Life Support**

Oxygenation and ventilation	Check			
Measure oxygenation and target normoxemia 94%-99% (or child's normal/appropriate oxygen saturation).				
Measure and target Paco <sub>2</sub> appropriate to the patient's underlying condition and limit exposure to severe hypercapnia or hypocapnia.				
Hemodynamic monitoring				
Set specific hemodynamic goals during post–cardiac arrest care and review daily.				
Monitor with cardiac telemetry.				
Monitor arterial blood pressure.				
Monitor serum lactate, urine output, and central venous oxygen saturation to help guide therapies.				
Use parenteral fluid bolus with or without inotropes or vasopressors to maintain a systolic blood pressure greater than the fifth percentile for age and sex.				
Targeted temperature management (TTM)				
Measure and continuously monitor core temperature.				
Prevent and treat fever immediately after arrest and during rewarming.				
If patient is comatose apply TTM (32°C-34°C) followed by (36°C-37.5°C) or only TTM (36°C-37.5°C).				
Prevent shivering.				
Monitor blood pressure and treat hypotension during rewarming.				
Neuromonitoring				
If patient has encephalopathy and resources are available, monitor with continuous electroencephalogram.				
Treat seizures.				
Consider early brain imaging to diagnose treatable causes of cardiac arrest.				
Electrolytes and glucose				
Measure blood glucose and avoid hypoglycemia.				
Maintain electrolytes within normal ranges to avoid possible life-threatening arrhythmias.				
Sedation	-			
Treat with sedatives and anxiolytics.				
Prognosis				
Always consider multiple modalities (clinical and other) over any single predictive factor.				
Remember that assessments may be modified by TTM or induced hypothermia.				
Consider electroencephalogram in conjunction with other factors within the first 7 days after cardiac arrest.				
Consider neuroimaging such as magnetic resonance imaging during the first 7 days.	П			



#### Neonatal Resuscitation in ED: (See Neonatal Resuscitation Algorithm) © 2024-01 WH

#### Waseem Hafeez, MD

- ✓ The order of the 3 assessment questions has changed to (1) Term gestation? (2) Good tone? and (3) Breathing or crying?
- ✓ The Golden Minute (60-second) mark for completing the initial steps, reevaluating, and beginning ventilation (if required) is retained to emphasize the importance of avoiding unnecessary delay in initiation of ventilation
- ✓ A-B-C sequence maintained with compression-to-ventilation ratio (3:1 with 90 compressions and 30 breaths per minute). Recommendations about chest compression technique (2 thumb-encircling hands)) remain unchanged.
- ✓ Rescuers may consider using higher ratios (e.g., 15:2) if the arrest is believed to be of cardiac origin.
- ✓ Blood oxygen levels in uncompromised babies generally do not reach extrauterine values until approx 10 mins following birth. Skin color is poor indicator of oxyhemoglobin saturation during immediate neonatal period.
- ✓ Initiate resuscitation with air or blended oxygen, titrating the oxygen concentration to an SpO₂ in the target range (see Neonatal algorithm) using pulse oximetry with the probe attached to the right upper extremity (i.e., wrist or palm).
- ✓ During CPR, use 100% oxygen whenever chest compressions are provided. It is reasonable to wean the oxygen concentration as soon as the heart rate recovers.
- ✓ Spontaneously breathing preterm infants with respiratory distress may be supported with continuous positive airway pressure(CPAP) initially rather than with routine intubation for administering PPV.
- ✓ Resuscitation of preterm newborns of less than 35 weeks of gestation should be initiated with low oxygen (room-air 21% to 30%) and the oxygen titrated to achieve pre-ductal oxygen saturation approximating the range achieved in healthy term infants.
- ✓ A laryngeal mask may be considered as an alternative to tracheal intubation if face-mask ventilation and tracheal intubation is unsuccessful for resuscitation of newborns 34 weeks or more of gestation.
- ✓ If the baby is bradycardic (HR <60 per min) after 90 seconds of resuscitation with a lower concentration of oxygen, oxygen concentration should be increased to 100% until recovery of a normal heart rate.</p>
- ✓ Neonatal chest compression:
  - ► HR < 60 bpm after 30 secs of adequate ventilation</p>
  - Two-thumb encircling hands lower third of sternum / Depth: one-third of AP chest diameter
- ✓ Neonatal Initial volume of fluid resuscitation NS 10 ml/kg (not Albumin)
- ✓ IO only if UV Catheterization not readily available
- ✓ Epinephrine IV dose 0.1 ml/kg of 1:10,000 / ETT dose 1 ml/kg of 1:10,000 (do not use 1:1,000 in newborn)
- Meconium Vigorous infants born with meconium-stained fluids do not require Intrapartum oropharyngeal suction or routine intubation for tracheal suction.
- ✓ Infant born through meconium-stained amniotic fluid and presents with poor muscle tone and inadequate breathing efforts, the infant should be placed under a radiant warmer, begin initial steps of resuscitation. Appropriate intervention to support ventilation and oxygenation should be initiated as indicated for each individual infant. This may include intubation and suction if the airway is obstructed. PPV should be initiated if infant is not breathing or HR < 100 bpm. Routine intubation for tracheal suctioning is not suggested.
- Delayed cord clamping for longer than 30 seconds is reasonable for both term and preterm infants, but not for infants who require resuscitation at birth or for infants born at less than 29 wks gestation.
- ✓ For nonvigorous term and late preterm newborn infants >34 wks gestation intact cord milking may be reasonable compared with early cord clamping (<30 seconds).
- ✓ For preterm newborn infants <28 weeks' gestation, intact cord milking is not recommended.</p>
- ✓ Effective positive-pressure ventilation is the priority in newborn infants who need support after birth. Using a T-piece resuscitator to deliver positive-pressure ventilation is preferred to the use of a self-inflating bag.
- ✓ Temperature should be recorded as a predictor of outcomes and as a quality indicator.
- ✓ Temperature of newly born non-asphyxiated infants should be maintained between 36.5°C and 37.5°C after birth through admission and stabilization.
- Prevent hypothermia in preterm infants A variety of strategies (radiant warmers, plastic wrap with a cap, thermal mattress, warmed humidified gases, and increased room temperature).
- ✓ Hyperthermia (temperature over 38°C) should be avoided because it introduces potential associated risks.
- ✓ Assessment of heart rate remains critical during the first minute of resuscitation and the use of a 3-lead ECG may be reasonable, because providers may not assess heart rate accurately by auscultation or palpation, and pulse oximetry may underestimate heart rate. Use of the ECG does not replace the need for pulse oximetry to evaluate the newborn's oxygenation.
- ✓ Withholding or withdrawing resuscitation An Apgar score of 0 at 10 minutes is a strong predictor of mortality and morbidity in late preterm and term infants, decisions to continue or discontinue resuscitation must be individualized.

Newborn Resuscitation: Functional History: 4 M's=Maturity(FT-PT)/Multiple Gestation/Meconium/Meds(Narcotics in 4hrs)
3 Assessment questions: (1) Term gestation? (2) Good tone? (3) Breathing or Cying?

Temp, A. B. C. Drugs: T: Dry, Warm, Position, Suction, Stimulate

A: HR <100 – Oxygen: 100% or Room Air (upto 90 sec  $\rightarrow$  no improvement  $\rightarrow$  100% O<sub>2</sub>)

B: HR <100 - Ventilation: BVM / ETT @ 30/min

C: HR <60 - Chest Compression @ 90/min

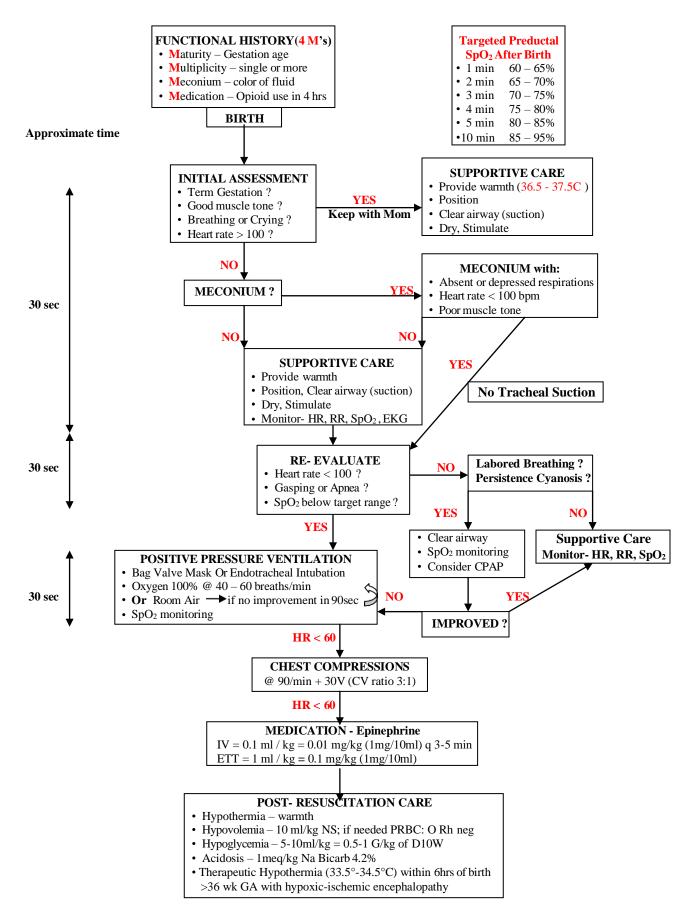
D: HR <60 – Medications - Epi 0.1 ml/kg (0.01mg/Kg) @1mg/10ml

Meconium with (Apnea / Respiratory Distress / HR < 100 / Limp / Blue) = CPR / BVM / ETT / Meds

#### NEONATAL RESUSCITATION ALGORITHM © 2024-01 WH



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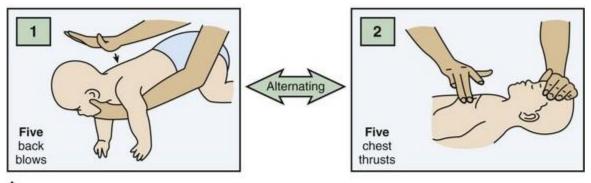




#### FOREIGN BODY AIRWAY OBSTRUCTION

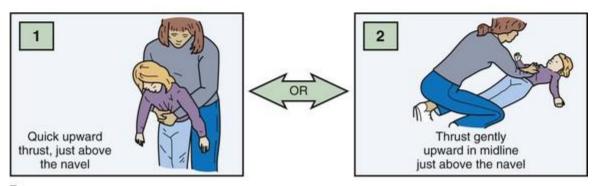
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#### INFANT CHOKING



Α

#### CHILD CHOKING



В



# 6-Person High-Performance Teams Positions for

# Resuscitation Triangle Roles



## Compressor

 Does 5 cycles of chest Assesses the patient

compressions

Alternales with AED/Monitor/ Defibrillator every 5 cycles or 2 minutes (or earlier if signs of fatigue set in)

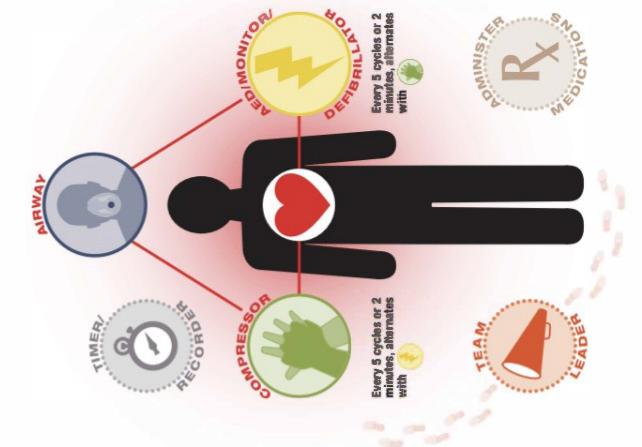
## **QED/Monitor**

- Brings and operates the AED/monitor/defibrillator
- Alternates with Compressor every 5 cycles or 2 minutes set in), ideally during rhythm or earlier if signs of fatigue analysis
- If a monitor is present, places be seen by the Team Leader it in a position where it can (and most of the team)

## Airway

- · Opens and maintains the airway
- Provides ventilation

The team owns the code. No team member leaves the triangle except to protect his or her safety.





## life is why

## Leadership Roles



- Every resuscitation team must have a defined leader
- Assigns roles to tearn members
- Makes treatment decisions
- rest of the team as needed Provides feedback to the
- Assumes responsibility for roles not assigned

- · An ALS provider role
- Administers medications



## Tmer/Recorder

- ventions and medications Records the time of interand announces when these are next due)
- Records the frequency and duration of interruptions in compressions
- Communicates these to the Team Leader (and the rest of the team)

"This is a suggested team formation. Roles may be adapted to local protocol



#### RESUSCITATION TEAM ORGANIZATION & CODE ROLES © 2024-01 WH

#### Waseem Hafeez, MD

#### AIRWAY & BREATHING: BVM / ETT

RIGHT SENIOR MD LEFT

#### **PGY 3/2**

C-SPINE CONTROL
CHEST COMPRESSION
IV - IO ACCESS
EXPOSE/Log Roll/ GUIAIC
NG TUBE
CHECK LABS & X -RAY

#### **NURSE**

ATTACH MONITOR / BP CHECK TEMPERATURE CHECK GLUCOSE FOLEY- CHECK UA & HCG

#### PNP & PGY 1 / 2

PRIMARY EVALUATION R/O PNEUMOTHORAX BLEEDING CONTROL IV – IO ACCESS SECONDARY EVALUATION HISTORY

#### **NURSE**

PLACE OXYGEN
PULSE OXIMETER
DRAW MEDICATIONS
DOCUMENTATION

#### **TEAM LEADER CHECK LIST**

- PREP: IV-IO / Monitors / Suction / O<sub>2</sub> / Airway equip / Meds
- ESTIMATE WEIGHT = 2 X (Age in Yrs + 4) Kg
- ASSESS RESPONSE / BREATHING ? / PULSE CHECK <10sec</li>
- AIRWAY Head tilt Chin lift / Jaw thrust C-Collar / O2 / Suction
- BREATHING Rate / Air Entry / Retractions / Pulse O<sub>2</sub>
- R/O PNEUMOTHORAX
- CIRCULATION Heart Rate / BP / Cap Refill / Pulses
- IV / IO access NS 20 ml/kg X 3 / Pressor / PRBC
- DISABILITY AVPU, Pupils, Neuro Exam, GCS
- DEXTROSE- 2 ml/kg D<sub>25</sub>W / < 3mo = 5 ml/kg D<sub>10</sub> W
- EXPOSURE Log Roll, Rectal & Guaiac
- FEVER Maintain Normal Temperature
- FAST (Trauma): RUQ, LUQ, Suprapubic, Sub-xiphoid, Cardiac
- FOLEY Not if: High Prostate / Blood in Meatus or Scrotum
- GASTRIC TUBE (NG) If Midface Injury = Orogastric tube
- GUIAIC if not done during logroll / Gases
- HISTORY SAMPLE: Signs-Symptoms / Allergy / Meds / PMH / Last Meal



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