Pediatric Preambles

The American Heart Association's recommended age group classifications for pediatrics will be adopted for use within these protocols.

- an infant is less than one year of age.
- a child is one year of age to an adolescent (known by secondary sex characteristics; ~12-14 years of age)

Approximately half of the EMS responses to calls for pediatric patients are for injury. Calls for medical complaints outnumber traumatic calls in patients under 5 years. Seizures and respiratory distress are common pediatric medical complaints. Most pediatric cardiac arrests are triggered by respiratory failure. Early recognition and aggressive treatment of respiratory distress, as well as shock, is priority in the treatment of pediatric patients.

I. SHOCK

Heart rate, initially and on repeated assessments, is the key parameter for recognition of compensated shock. Tachycardia without fever, anxiety, or hypoxia requires immediate intervention. Heart rate varies with age, and knowledge of normal vital signs is needed (see table below).

Many clinicians equate shock with hypotension, which may be useful for adults, but this presents problems when caring for children. Normal blood pressure varies with age (see table below) and obtaining an accurate blood pressure in a child can be difficult. Due to children's unique physiology, when hypotension is present, the body's compensatory mechanisms have already failed, and clinicians should recognize that the child is in critical condition and at significant risk of death. While compensated shock may persist for hours, once the patient is hypotensive, cardiopulmonary failure may occur within only minutes.

A change in the level of consciousness demonstrates the effects of shock on the brain. Although this may be subtle, in children as young as 2 months, irritability or failure to recognize one's parents is a sign of cerebral hypoperfusion. A decreasing level of consciousness is an ominous sign. Other parameters to assess shock include muscle tone and pupillary responses.

PALS divides shock into 3 separate categories: compensated, inadequate end organ perfusion and decompensated.

Compensated :
- cool extremities
- normal BP
- prolonged capillary refill
- tachycardia
- weak peripheral pulses still having central pulses

Inadequate end organ perfusion (all of the Compensated plus...)
- decreased urine output
- depressed mental status
- metabolic acidosis
- tachypnea
- weak central pulses

Decompensated:
- hypotension

Treatment goals of shock include:

1) maintaining/restoring adequate oxygenation
2) perfusion to organs and tissues.

Oxygen should be placed empirically, with knowledge of the patient's baseline oxygen saturations. Restoring adequate intravascular volume by the administration of 20 mL/kg of a crystalloid (Lactated Ringers is preferred) should be initiated quickly (over 5-20 minutes). A resuscitation weight-estimation tool should be

used for fluids, drug dosing, and equipment size. Patients in shock may require up to 60 mL/kg of crystalloid fluid resuscitation.

- If cardiogenic shock is suspected, smaller fluid boluses of 5-10 mL/kg should be used (see Cardiogenic Shock below).
- In diabetic ketoacidosis with compensated shock, a bolus of 10-20 mL/kg should be administered over one hour.

If the patient's condition worsens during fluid resuscitation, such as pulmonary edema, worsening tissue perfusion or development of hepatomegaly, parenteral fluids should be stopped, and an epinephrine drip should be started.

Additional interventions for treatment of shock include:

- cardiac monitoring
- pulse oximetry
- end-tidal CO_2 monitoring
- blood glucose check

Once adequate fluid resuscitation has occurred, if shock is still present, vasopressors, such as norepinephrine or epinephrine, should be considered.

A major difficulty with pediatric patients in shock may be the ability to establish intravenous access. Limiting the number of attempts or time allowed for intravenous access before intraosseous cannulation (in the appropriate patient) is recommended when treating shock. **For septic shock, placement of intraosseous device after two failed intravenous catheter attempts is recommended.**

There are underlying disease processes that can effect a child's baseline oxygen saturation much like COPD in adults such as cardiac lesions. Before administering any supplemental O2 care should be taken to ask caregivers if child has any pervious medical history that has required the tracking of the child's oxygen saturation and obtain their baseline.

In Assessing vital signs, capillary refill – in conjunction with another assessment tool – is an adequate indicator of perfusion. The formula used to approximate blood pressure remains the same, and should be used for recognizing hypotension:

70 +(2 x age in years)

When fluid is needed, 20 ml/kg should be administered (10ml/kg for patients with cardiogenic shock -see below). This can be repeated two more times for a total of 60 ml/kg (30 mg/kg for cardiogenic shock); isotonic fluids only. When treating patients for shock, a fluid bolus of 20 ml/kg (10 ml/kg for neonate) should be given even if the patient has a normal blood pressure.

Pediatric patients are able to compensate prior to showing signs of poor perfusion. Children in shock may initially be present with only tachycardia.

Types of Shock

Septic shock: This is the most common cause of shock and is due to systemic infection. Patients in septic shock generally present with fever and tachycardia. Signs of poor perfusion are not always present. Patients with septic shock require 20/kg of isotonic fluids and can receive up to 3 fluid boluses in the field. Rapid administration of IV fluids is imperative in the treatment of septic shock. Early antibiotic administration is important - notifying the receiving hospital early will help them prepare the antibiotics in advance of the patients' arrival. Patients with underlying medical conditions are at much higher risk of developing septic shock; therefore, anyone with the following medical conditions who has fever and tachycardia should be treated for septic shock with fluids:

- Severe Developmental Delay
- Sickle Cell Disease or Asplenia
- Cancer
- History of Transplant
- Indwelling Line or Catheter
- Immune Deficiency/compromise/suppression

PALS Adjusted Vital Signs for Septic Shock

Age	Heart Rate	Resp Rate	Systolic BP	Temp (°F)
0d - 1m	> 205	> 60	< 60	<96.8 or >100.4
> 1m - 3m	> 205	> 60	< 70	<96.8 or >100.4
> 3m - 1y	> 190	> 60	< 70	<96.8 or >101.3
> 1y - 2y	> 190	> 40	< 70 + (age in yr x 2)	<96.8 or >101.3
> 2y - 4y	> 140	> 40	< 70 + (age in yr x 2)	<96.8 or >101.3
> 4y - 6y	> 140	> 34	< 70 + (age in yr x 2)	<96.8 or >101.3
> 6y - 10y	> 140	> 30	< 70 + (age in yr x 2)	<96.8 or >101.3
> 10y - 13y	> 100	> 30	< 90	<96.8 or >101.3
> 13y	> 100	> 16	< 90	<96.8 or >101.3

Anaphylactic shock: this is a distributive shock caused by histamine release and is a life-threatening allergic reaction. All the blood vessels dilate which causes decreased perfusion and hypotension. This is treated with epinephrine 1:1000 IM up to two times and isotonic fluid boluses of 20 ml/kg up to 2 times (max 40 ml/kg).

Cardiogenic shock: This is primarily a pump problem. The heart is weak and cannot pump blood to all the organs - this results in increased heart rate and eventually poor perfusion and fluid overload. Signs of cardiogenic shock include weak pulses, hepatomegaly, and crackles on lung exam. Cardiogenic shock still requires fluid but should be treated with 5-10 ml/kg isotonic fluid boluses (max of 500 ml) isotonic fluid boluses.

Patients with cardiogenic shock will get worse if they receive too much fluid too quickly. If there are any signs of fluid overload, consider starting an epinephrine drip. Signs of cardiogenic shock are similar to signs of septic

shock and sometimes it is difficult to differentiate between the two. **Any patient with signs of shock who gets worse after fluids should receive an epinephrine drip.** Call Medical Control if needed to ask for help with managing patients with cardiogenic shock and notify the hospital well in advance of the patient's arrival.

II. AIRWAY/VENTILATION

Overview:

Proper oxygenation is key in the management of critical pediatric patients. When done correctly, simply addressing oxygenation/ventilation issues, even with BLS interventions, often leads to rapid improvement in these patients. Proficiency in pediatric bag-valve-mask ventilation is mandatory for all prehospital clinicians. Model EMS clinical protocols recommend escalating from the least to most invasive intervention. When supplemental oxygen via nasal cannula, simple mask or non-rebreather mask do not maintain adequate oxygenation, assisted ventilation and airway management then become necessary. Complete airway occlusion with foreign body removal does require visualization with direct laryngoscopy and removal with Magill forceps.

The method of airway support used in the system should be based on the skill level of the clinicians, equipment and medications available, ongoing training and experience, and transport times. The risks of an advance airway may outweigh the benefits for non-critical care trained paramedic pediatric intubation given the very low frequency of occurrence, the high rates of complications, the increased mortality, no demonstrable benefit to good neurological outcomes in cardiac arrest and trauma, along with the questionable necessity in seizures, The 2019 American Heart Association/International Liaison Committee on Resuscitation update included that bag-valve-mask is sufficient for airway management in children during cardiac arrest in the prehospital setting.

Airway selection/placement:

When selecting oral airways make certain the correct size is being used. Oral airways that are too small will not keep the tongue from occluding the airway; if they are too large it can obstruct the airway.

There is a much higher rate of missed pediatric intubations than adult intubations in the prehospital setting. As a general rule, consider continuing with BVM if you can ventilate effectively. There are a variety of pediatric supraglottic airways available in pediatric and neonatal sizes. **Compared to endotracheal intubation, supraglottic airways have higher first pass success rates and are much quicker to place in the prehospital environment for both pediatric and adult populations**. Current prehospital literature does not show improved cardiac arrest outcomes with pediatric supraglottic airway use, and in fact bag-valve-mask was associated with a higher survival to hospital discharge compared to endotracheal intubation and supraglottic airway. Strict quality improvement programs and research are needed with pediatric supraglottic airway use to monitor efficacy and safety in the prehospital setting.

If pediatric ET intubation is attempted, the size of the ETT is determined by the following formulas:

Uncuffed: patient's (age in years / 4) + 4 = ETT size in mm

Cuffed: (patient age in years / 4) + 3 = ETT size in mm

It is very important that the ETT is properly sized to ensure minimal air leaking and maximal airway protection; therefore, if the tube is too small you should consider using a larger one provided it is a prudent choice to do so using sound clinical judgment. Cuffed endotracheal tubes are preferred in pediatric patients. Consider using the Braslow Tape on all Pediatric patients.

Confirmation of ETT placement is accomplished using the same methods in adult ETT confirmation. Capnography (electronic $EtCO_2$ monitoring) is the "gold standard" of airway placement confirmation, monitoring, & documentation. If unable to confirm tube placement by continuous $EtCO_2$ measurements, or if at **ANY TIME** it is thought that the ET tube is misplaced, it should be **immediately removed, and alternate means should be used to control the airway** (i.e. BVM).

Any intubation can stimulate the vagus nerve causing hypotension and bradycardia. Due to pediatric anatomy the vagus nerve is more easily stimulated. Because of this pre-intubation Atropine should be considered for all pediatric ETT placement at 0.02mg/kg to avoid these adverse effects.

For post intubation hypoxia: Troubleshoot the ETT with the **DOPE** mnemonic.

Displacement: Check to see if the tube has been pushed in too far or if it has come out. Look with the laryngoscope to check that the tube is in the trachea.
Obstruction: Suction the ETT.
Pneumothorax: Listen for breath sounds
Equipment: Check the equipment to make sure that everything is connected properly. Check the oxygen to make sure that the oxygen is on, and the tubing is connected properly.

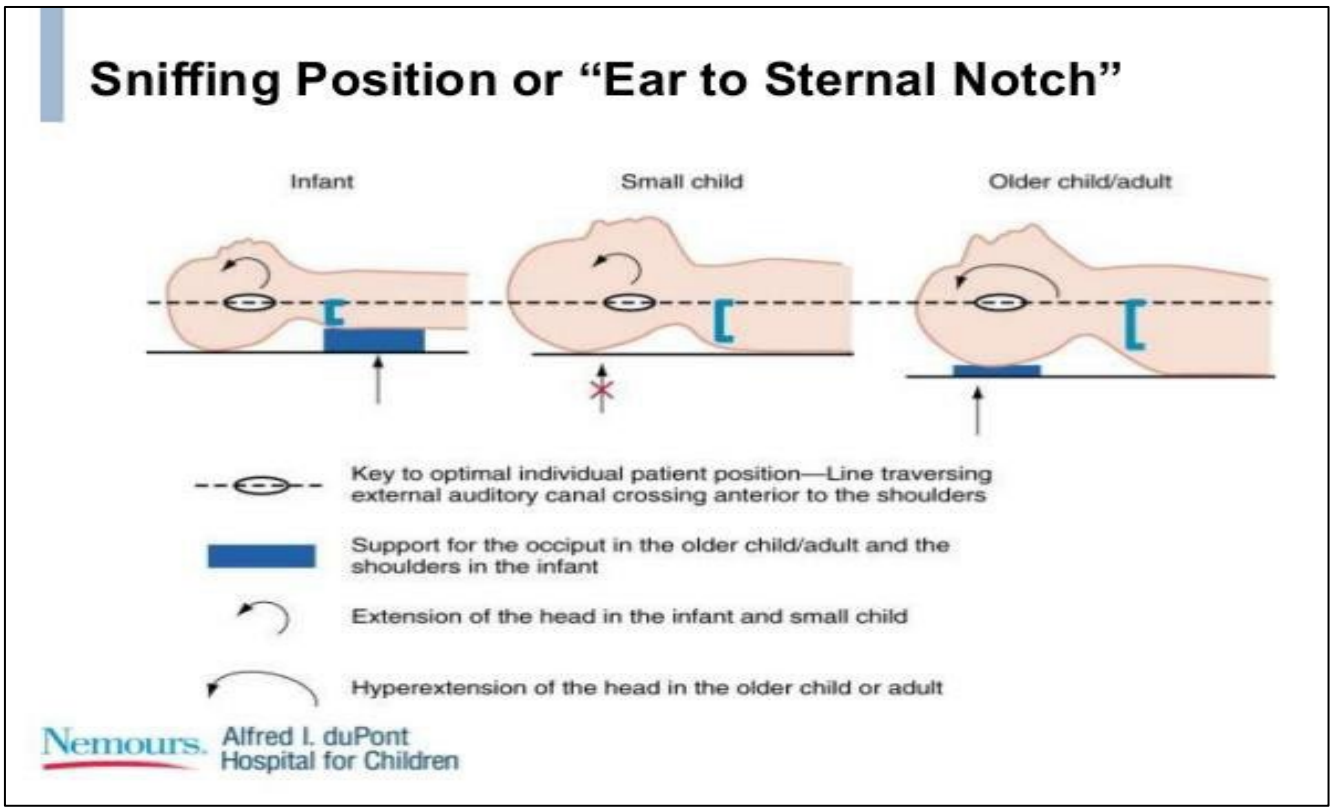
If you believe that the tube is in the trachea but are unable to ventilate, consider suctioning the tube briefly to remove any obstruction and then attempting to give a few breaths before making the decision to remove the ETT. $EtCO_2$ monitors may give low readings for the first few minutes in a cardiac arrest, but as CPR increases circulation and cellular perfusion, $EtCO_2$ values should increase in a patient with a viable downtime. The presence of any $EtCO_2$ value and/or waveform gives evidence of airway confirmation. **NOTE: $EtCO_2$ also often gives the first indicator of ROSC, as evidenced by an abrupt and sustained rise in $EtCO_2$.** The ideal placement of the tip of the ETT is above the carina and below the clavicle. This space is very small for infants and children. A useful formula for ETT depth = 3 x the size of the ETT in the child (i.e. tape a 4.0 ETT at around 12 cm depth). The ETT can easily become displaced. Please be mindful of this and check the position of the tube frequently.

In cardiac arrest, patients tend to be over ventilated which can have paradoxical effects. Ventilating with excessive tidal volume increases intrathoracic pressure and reduces venous return, which reduces cardiac

output, and can also cause barotrauma. Excessive minute volume or ventilatory rate will also decrease cerebral blood flow and coronary perfusion, thereby working against resuscitative efforts. Proper ventilation with controlled peak inspiratory pressure will also keep GI distension to a minimum, which will also reduce the risk of aspiration. Pediatric assessment tape (e.g. Broselow) is recommended to assist with proper tidal volumes & ventilatory rates. Continuous pulse-oximetry and capnography to ensure oxygenation and ventilation are key.

Positioning/Suctioning:

Children have larger occiputs which can cause neck flexion and airway occlusion. Proper sniffing position, with the sternal angle aligning with the external auditory meatus, can be obtained with a chin lift and, when supine, a towel roll beneath the shoulders (see image below. The proportionately larger tongue and adenoids can cause airway obstruction, especially in the supine apneic child. Lateral recumbent positioning, chin lift and jaw thrust, and adjunct (nasopharyngeal or oral) airway devices are potential solutions to this problem. Because children under 6 months of age are obligate nose breathers, nasal suctioning is key to a patent airway in patients who have occluded nares.



Suctioning is a necessary skill in airway protection, but keep in mind that it works against oxygenation efforts and can cause damage if the catheter comes in contact with tissue. Therefore, if suctioning is needed, the duration of suction efforts should be limited, and a max suction force should be between 80 and 100 mm Hg.

Respiratory Distress/Failure:

All children with respiratory distress should have pulse oximetry and capnometry/capnography used as adjuncts

to other forms of respiratory monitoring. Supplemental oxygen should be provided, escalating from nasal cannula to simple face mask to a non-rebreather mask as needed, with the cardiac patient being a special caveat. Known cardiac patients should be kept at their baseline oxygen saturation level. Suctioning can be a very effective intervention to relieve distress.

Signs for **upper airway** respiratory distress include:

- stridor
- suprasternal retractions
- nasal flaring
- neck muscle use
- respiratory rate greater than normal for age

Signs for **lower airway** respiratory distress include:

- wheezing
- intercostal, subcostal, supraclavicular retractions
- head bobbing, grunting
- abdominal muscle use
- respiratory rate greater than normal for age
- sleepy, intermittently combative, or agitated

Signs of **respiratory failure** include:

- central cyanosis / poor peripheral perfusion
- decreased muscle tone
- increased respiratory effort visible at sternal notch
- marked use of accessory muscles
- marked tachycardia

Respiratory failure involves the findings of respiratory failure with any one of the following:

- absent breath sounds
- absent or shallow chest wall motion
- respiratory rate < 10 breaths per minute
- apnea
- limp muscle tone
- unresponsive to voice or touch
- bradycardia
- weak or absent pulses / asystole

Evaluation of children and interventions delivered may be accomplished more easily with the parent's assistance. Moving a child from a position of comfort might worsen the respiratory distress; however, during transport, a child in respiratory distress should be safely restrained in an upright position, unless specific treatments require the supine position.

III. BRIEF RESOLVED UNEXPLAINED EVENTS (BRUE)

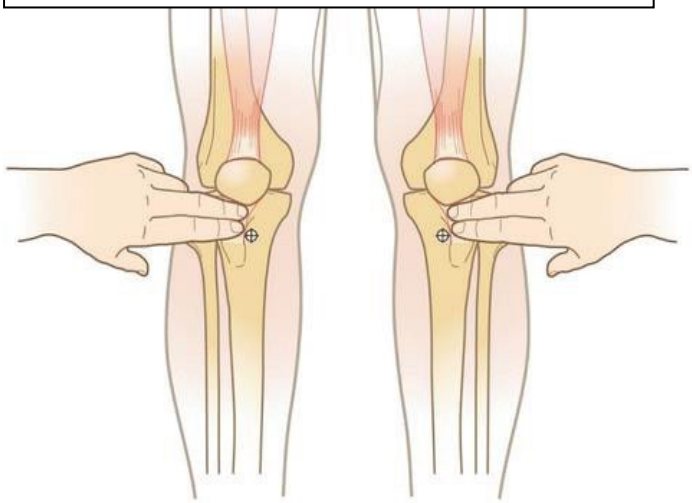
Any patient less than 1 year who has a brief resolved event that resulted in any period of apnea, altered or inadequate breathing, cyanosis, marked change in tone or mental status, or any episode that required bystander CPR should be transported even if they are well appearing on the scene. If another process is identified on exam, follow that protocol. If the parents refuse transport, please call Medical Control to discuss patient refusal against medical advice.

IV. VASCULAR ACCESS

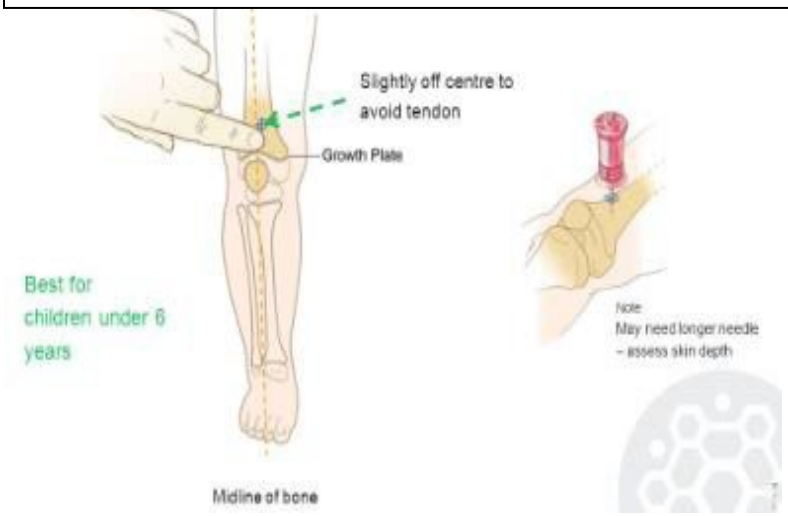
Intraosseous access is just as effective as IV access in pediatrics. IO access should be obtained early for unstable and/or symptomatic children. Therefore, it is unacceptable to take multiple IV attempts in a critical pediatric patient. In cardiac arrests, intraosseous (IO) access is preferred. The preferred IO site for an unconscious pediatric

patient or for a pediatric arrest is the distal femur. Only the 25mm (blue) or 45mm (yellow) needles may be used in the distal femur. For the conscious infant or child, a proximal tibial IO may be placed. The smallest IO needle (15 mm – pink) should only be used in those weighing less than 3 kg for a tibial IO. The 25 mm (blue) needle should be used for those requiring a tibial IO who weigh more than 3 kg.

Proximal Tibia IO Placement



Distal Femur IO Placement



V. PEDIATRIC CARDIAC ARREST

The focus is to be placed on immediate, effective, continuous, and minimally interrupted chest compressions in both adult and pediatric cardiac arrest. Even with the likelihood of a respiratory origin of arrest in the pediatric patient, compressions are to be started immediately as there is virtually no set-up time - even basic airway equipment requires some set-up time for sizing and deployment. Therefore, the first cycle of chest compressions should be initiated without delay, while allowing time (approx. 18 sec. for first cycle) for basic airway equipment set-up/sizing.

Chest compressions should be performed at a rate of **100-120 per minute.** To achieve effective chest

compressions, compress at least one third of the anteroposterior diameter of the chest. This corresponds to approximately 1½ inches (about 4 cm) in most infants and about 2 inches (5 cm) in most children. Once children have reached puberty (adolescents), the recommended adult compression depth of at least 2 inches (5 cm) but no greater than 2.4 inches (6 cm) is used. Before the next compression is delivered the chest must fully recoil from the previous compression.

Continue chest compressions while the defibrillator is charging. Pause compressions just before the shock is delivered to ensure the best chance of conversion.

NOTE: The chest compression/ventilation ratio for the neonate is 3:1 to increase focus on ventilation rate, unless there is evidence of a cardiac origin where the ratio reverts back to 15:2. If an advanced airway is present, the chest compressions should be continuous, and breaths should be given every 2-3 seconds.

In symptomatic (unstable) bradycardia for children eight years of age or younger, chest compressions should start when the heart rate is less than 60 beats per minute.

Neonatal Cardiac Arrest:

Any newborn resuscitation differs from infant CPR in that its purpose is predominately to assist the newborn in adjusting to life outside of the uterus (ie focus on warming, stimulation, oxygenation). CPR should be initiated if HR < 60/minute. The guidelines of CPR for the newborn are as follows:

- **Rate of compressions**: 120/minute
- **Depth of compressions**: 0.5”-0.75”
- **Compression to ventilation ratio**: 3:1
- **# of rescuers:** 2+
- **Target HR:** 80/minute
- If no ROSC (HR remains <60) is achieved after 2 minutes of compressions and ventilatory support Epinephrine 0.1-0.3mg/kg of 1:10,000 may be administered IV/IO

These calls can be extremely stressful and taxing on the crew. If there is any uncertainty about how to proceed with these delicate patients contact medical control.

Neonatal cardiac arrests are rare and present a unique set of issues for the pre-hospital provider as workability is largely based on gestational age. Generally speaking a fetus is not viable until at least 20 weeks, however, there is no way to definitively determine in the field the exact gestational age of a fetus. Estimated gestation in the field should allow for a 4-week buffer to gestation provided by the mother. As a rule of thumb if a patient has signs compatible with life resuscitation should be initiated with immediate transport to closest facility with a Level 3 or 4 NICU if possible. Signs of life include:

- visible heartbeat and/or palpable pulse

- spontaneous breathing, crying, gasping
- spontaneous limb movement
- pulsation of cord following clamping
- signs must be sustained for >1 min following birth

Any neonates requiring ventilation whose airway is too small for the 2.5mm ETT will not be a candidate for any NICU. Per the American Academy of Pediatrics Neonate Resuscitation Program, neonates younger than 23 weeks are not generally candidates for resuscitation as their anatomy is normally too small to accommodate. If there is any doubt about the gestational age do not delay resuscitative efforts. Providers may call Medical Control to request termination of resuscitative efforts after they have started resuscitating a newly born patient and then determined that the fetus was less than 20-week gestation. **If the mother did not have prenatal care or is not able to give a history, continue resuscitative efforts and transport the patient.**

These cardiac arrests are like traumatic arrests in that what the patient really requires are the tools and knowledge of specialized care at the correct hospital. In the pre-hospital setting all we can do is give these patients the best chance of reaching that care through emergency management to the best of our ability. During neonatal resuscitation, keep it simple. Focus on warming, drying, and oxygenating the patient like any other birth. We do not currently have the size of tools necessary for neonate resuscitation in the field. Because of this **ventilatory support should be focused on achieving a good seal not attempting to intubate.** The initial steps of resuscitation are:

1. Provide warmth by placing the infant under a radiant heat source / warm environment
2. Position the head in a 'sniffing' position to open the airway
3. Clear the airway with a bulb syringe or suction catheter
4. Dry the infant and stimulate breathing.
5. Evaluate the neonate for respiration, heart rate and color at every 30-second interval

NICU Levels are based on the severity of a baby's health condition:

Level 1: For full-term babies without serious health conditions.

Level 2: For babies born at or later than 32 weeks gestation with a serious health condition.

Level 3: For seriously ill babies born before 32 weeks

Level 4: For babies with the most complex health issues

NICU Capable hospitals in Region 7 & 8

St Francis Medical Center, Monroe- Level 3 NICU

CHRISTUS Shreveport Bossier-Highland Medical Center- Level 3 NICU

Willis-Kighton Medical Center, Shreveport- Level 3 NICU

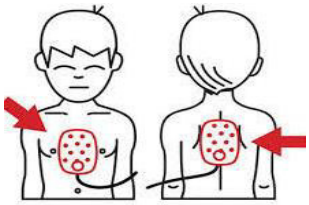
Post Cardiac Arrest Care

After return of spontaneous circulation (ROSC) continue cardiac monitoring, pulse oximetry, and quantitative capnometry; also obtain a blood pressure, electrocardiogram, and blood glucose. Outcomes are worse when hypotension or hypoglycemia are present post cardiac arrest – both should be treated rapidly or avoided.

Oxygenation and ventilation should be optimized. Patients should have a goal oxygen of 94-99% (or as appropriate for patient's underlying condition), with avoidance of hypoxia and weaning of oxygen when oxygen saturations are 100%. Clinicians should target CO_2 appropriate to patient's condition with avoidance of hyper- and hypocapnia.

The 2019 guidelines for post-arrest shock include identifying and treating the "H's and T's" that may be contributing to persistent shock, considering a 20 ml/kg intravenous or intraosseous bolus of isotonic crystalloid (10 ml/kg if poor cardiac function is suspected), and considering the need for inotropic and/or vasopressor support for fluid refractory shock. Cardiac arrhythmias may occur post-cardiac arrest and patients should be closely monitored with any arrhythmias promptly treated.

Defibrillator / Cardioversion Settings



If Pediatric pads are not available then Adult defib pads are generally used on all pediatric patients > 10 kg. However, refer to your device's guidelines.

Defibrillator pad placement – The proper location to attach pads on a child is the anterior-posterior (or "front-and-back") position – one electrode pad is placed in the center of the child's chest and the other pad is placed in the center of their back. Ensure that the pads are not touching or overlapping.

Energy Settings

- In V-Fib / Pulseless V-Tach, the first defibrillation should be given with 2 J/kg; the second shock should be given at 4 J/kg, escalating to a maximum of 10J/kg in refractory V-fib. Stacked shocks should not be given.
- After the 2nd shock, Epi 1:10,000 0.01mg/kg q 3-5 min
- For refractory VF/VT, give Amiodarone 5 mg/kg after the 3rd shock.

Transcutaneous Pacing (this is rarely needed in pediatric patients)

- Use pediatric pacing pads for those patients less than 15 kg.
- Start at a rate of 80-100 for pediatric patients.
- Start at 50 mAmps and titrate up until you obtain capture (usual range 50-100 mAmps, some patients may need higher)

VI. PEDIATRIC TERMINATION OF RESUSCITATION

Pediatric out of hospital cardiac arrest (OHCA) is rare and is associated with poor outcomes. Since the recent advancements in pediatric emergency medicine the survival rate has increased from 2-6% to 17-40%. Of those that survive, only 1-4% have good neurologic outcomes at this point.

Pediatric OHCA is harder on families and on paramedics than OHCA in other patients. Because of this, there are different termination of resuscitation guidelines for children than for adults.

Our guiding principle is to "first do no harm". While it is recommended to attempt resuscitation for all pediatric patients, there are times when resuscitation of a child that has no hope of survival can be more traumatic for the family and EMS providers.

Below are some cases when providers may consider termination of resuscitation for a pediatric patient, however **resuscitation may continue at the provider's discretion:**

- The withholding of resuscitative efforts should be considered in pediatric victims of penetrating or blunt trauma with injuries obviously incompatible with life, such as decapitation.

- The withholding of resuscitative efforts should be considered in pediatric victims of penetrating or blunt trauma with evidence of a significant time lapse following pulselessness, including dependent lividity, rigor mortis, and decomposition.

- The withholding of resuscitative efforts should be considered in newly born patients less than 20 weeks gestation. All efforts should be made to resuscitate infants born at 20 weeks gestation or later – these patients should be transported to a level 3 or 4 NICU. If there is any doubt about the gestational age, continue resuscitative efforts and transport to a hospital with a level 3 or 4 NICU.

Providers may call Medical Control to request termination of resuscitative efforts after they have started resuscitating a newly born patient and then determined that the fetus was less than 20-week gestation. If the mother did not have prenatal care or is not able to give a history, continue resuscitative efforts and transport the patient. **(See neonate resuscitation for more information)**

- Standard resuscitation should be initiated for all cardiopulmonary arrest patients in whom the mechanism of injury does not correlate with a traumatic cause of arrest.

- Standard resuscitation should be initiated for cardiopulmonary arrest victims of lightning strike or drowning in whom there is significant hypothermia.

- Immediate transportation to the ED should be initiated for children who exhibit witnessed signs of life before traumatic cardiopulmonary resuscitation and have CPR ongoing or initiated within 5 minutes in the field, with resuscitation maneuvers including airway management and intravenous or intraosseous line placement planned during transport.

- Following blunt and penetrating trauma in victims in whom there is an unwitnessed traumatic cardiopulmonary arrest, a longer period of hypoxia may be presumed to have occurred. High quality CPR with an advanced airway should continue for at least 30 minutes prior to considering termination of resuscitation.

- If there is any doubt as to the circumstances or timing of the traumatic cardiopulmonary arrest, resuscitation should be initiated and continued until arrival to the appropriate facility.

- Providers should talk to the family prior to termination or resuscitation and explain that the injuries are not compatible with life and that the child has already died. If the family insists that providers continue resuscitative efforts, continue CPR and transport to the closest appropriate facility where there will be more resources to support the family.

For termination of resuscitation of a pediatric patient (<18 years old), providers must call Medical Control to discuss the case and request withholding of resuscitative efforts or termination of resuscitation. When in doubt, it is always better to resuscitate the pediatric patient.

Death Notification: The GRIEVING Mnemonic

Death notification is an action that no EMS provider should take lightly. It is an event that is a common albeit unfortunate occurrence in the prehospital setting and EMS providers should seek proper coaching and instruction prior to performing.

G-GATHER

Gather the patient's family and friends who are at the scene.

R-RESOURCES

Utilize resources that are available to you, including police. Families respond to unexpected news of death of a loved one in unpredictable ways. This can sometimes manifest as violence towards the care provider. It is not always necessary to have police at the scene, but It is important to always have an available exit if things turn

violent. If the scene is unsafe, please leave.

I-IDENTIFY

Identify yourself as the paramedic provider. Identify the deceased patient by name. Have family/friends present identify their relation to the deceased (Ask "How is everyone related to _"). Identify what the family knows about the situation ("What do you know about what has happened?").

E-EDUCATE

Educate the family on the events leading up to the patient's death. This includes events that happened with EMS. Remember to avoid medical jargon and use simple language.

V-VERIFY

Verify that the family member has died. Use the words "dead" or "died." Avoid euphemisms like "passed away" or "no longer with us."

_ GIVE SPACE

Allow the loved one's time and space to absorb the information. There will be a lot of silence and it may be uncomfortable, however there needs to be time for the family to process the information.

I-INQUIRE

Inquire if there are any questions. Answer them to the best of your knowledge. If you do not know, be honest and open.

N-NUTS AND BOLTS

Start planting the seeds about logistical tasks. This includes the coroner and police. This all does not have to be discussed immediately and is variable depending on the patient's situation. Offer to have the family see the patient if they desire.

G-GIVE

Give the family your name, condolences, and sympathies. Use the name of the person who has died. Offer to answer any questions.

VII. NOTATIONS AND REFERENCE

Medications

Adenosine	0.1mg/kg (max 6mg) IV/IO	repeat 0.2 mg/kg (max 12mg)
Amiodarone	5 mg/kg IV/IO (max 300 mg)	repeat 15 mg/kg (max 300 mg)
Atropine	0.02 mg/kg IV/IO (minimum dose = 0.1mg) max single dose child = 0.5mg, max single dose adolescent = 1mg	repeat x 1
Calcium Chloride	20 mg/kg IV/IO	slow IVP (not proven helpful in cardiac arrest)
Epinephrine	0.01 mg/kg (1:10,000) IV/IO	repeat q3-5 minutes
Glucose	0.5-1 g/kg IV/IO	D25: 2 ml/kg D50: 1ml/kg

Magnesium	50mg/kg IV/IO (max 2g)	give over 10-20 min, faster in torsades
Naloxone	0.1 mg/kg IV/IO	if cardiac arrest, 1-2 mg IV/IO
Sodium Bicarbonate	1mEq/kg of 8.4% solution IV/IO	

Solu-Medrol (Methylprednisolone), if available, 2 mg/kg IV/IO (MAX 125mg)

APGAR

An APGAR score is required at 1 and 5 minutes postpartum. Perform life-saving interventions immediately after birth as necessary. **The APGARs are calculated after the patient is stabilized based on how the patient appeared at 1 and 5 minutes of life.**

Clinical Sign	0 (zero)	1 point	2 points
Appearance	Blue or pale	Pink body with blue extremities	Completely pink
Pulse	Absent	Below 100	Over 100
Grimace	No response	Grimaces	cries
Activity	Limp	Some flexion	Active motion
Respiratory	Absent	Slow; irregular	Good, strong cry

A score of 7 – 10 is associated with coughing and crying within seconds of delivery. Newborns with this score typically do not require any further resuscitation.

A score of 4 – 6 are moderately depressed. They will typically appear pale or cyanotic and have respiratory complications and flaccid muscle tone. These newborns will require some type of resuscitation efforts.

Pediatric Glasgow Coma Scale

	Child	Infant	Score
Eye Opening	Spontaneous	Spontaneous	4
	To Speech	To speech	3
	To pain only	To pain only	2
	No response	No response	1
Best Verbal Response	Oriented appropriate	Coos & babbles	5
	Confused	Irritable cries	4
	Inappropriate words	Cries to pain	3
	Incomprehensible sounds	Moans to pain	2
	No response	No response	1
Best Motor Response	Obeys commands	Moves spontaneously & purposefully	6
	Localizes commands	Withdraws to touch	5
	Withdraws in response to pain	Withdraws in response to pain	4
	Flexion in response to pain	Abnormal flexion posture to pain	3
	Extension in response to pain	Abnormal extension posture to pain	2
	No response	No response	1

Term Newborn Vital Signs

Heart rate 120 – 160
Respiratory rate 30 – 60
SBP 56 – 90 mm/Hg
DBP 26 – 56 mm/Hg
Glucose ≥ 40 mg/dL

Portions include excerpts from:

Gross T, Donofrio-Odmann J. Pediatric Medical Priorities. In: Brice J, Cone D, Delbridge T, Myers B eds. *Emergency Medical Services: Clinical Practice and Systems Oversight.* New Jersey: John Wiley & Sons, Inc.; in press.

Syncope Pediatric:

Syncope is heralded by both the loss of consciousness and the loss of postural tone and resolves spontaneously without medical interventions. Syncope typically is abrupt in onset and resolves equally quickly. EMS providers may find the patient awake and alert on initial evaluation. Convulsive movements may occur with syncope. These are called myoclonic jerks and should not be confused with seizures; no post-ictal state, tongue biting, or incontinence will be present. Presyncope is defined as the prodromal symptoms of syncope. It usually lasts for seconds to minutes and may be described by the patient as “nearly blacking out” or “nearly fainting.”

By being most proximate to the scene and to the patient’s presentation, EMS providers are commonly in a unique position to identify the cause of syncope. Consideration of potential causes, ongoing monitoring of vitals and cardiac rhythm as well as detailed exam and history are essential pieces of information to pass onto hospital providers.

High risk causes of syncope include the following:

a. Cardiovascular
    i. Myocardial infarction
    ii. Aortic stenosis
    iii. Hypertrophic cardiomyopathy
    iv. Pulmonary embolus
    v. Thoracic aortic dissection
    vi. Lethal dysrhythmia
b. Neurovascular
    i. Intracranial hemorrhage
    ii. Transient ischemic attack or stroke

Treatment of syncope should be directed at abnormalities discovered in the physical exam and may include management of cardiac dysrhythmias, cardiac ischemia/infarct, hemorrhage, shock, and the like. Consider high risk 12-lead EKG features including, but not limited to:

a. Evidence of QT prolongation (generally over 500ms)
b. Delta waves (seen with Wolff-Parkinson-White syndrome)
c. Brugada syndrome (incomplete RBBB pattern in V1/V2 with ST segment elevation)
d. Hypertrophic obstructive cardiomyopathy