After surveying the scene, approach the child and begin the primary assessment which should follow the same order as for the adult patients:

A = Airway
B = Breathing
C = Circulation
D = Disability (CNS)
E = Environmental

First, assess the airway. Is the airway patent? If so, note the presence of stridor (upper airway obstruction), wheezing (lower airway obstruction), rales or rhonchi (fluid or mucous in the airways). Remember to protect the cervical spine if trauma is suspected.

Next, assess breathing. Note the child’s respiratory effort. This is often the best indicator of respiratory distress. Pay attention to chest movement, color and respiratory rate. A child who is crying loudly is rarely in any acute respiratory distress.

The third step is to assess circulation. In the child, circulation is best evaluated by determining the effectiveness of end-organ perfusion. The most important test in determining this is capillary refill. Capillary refill can be assessed by compressing a vascular area such as a fingernail bed with your fingers. After you release pressure, color should return to the area in less than two seconds. If it takes longer than two seconds for color to return, end-organ perfusion is inadequate. In addition to capillary refill, note the temperature and color of the extremities, the strength of the pulses, the heart rate, the child’s mental status, and, if possible, the urine output. All of this information can be obtained in 15 seconds or less.

Next, rapidly assess the child’s neurological status (disability). A happy smiling baby seldom has a neurological problem. Note both the child’s mental status and muscle tone. As children become critically ill, they become more lethargic and eventually appear detached from the environment. A child relatively unresponsive to the environment is often an ominous finding. Always examine the pupils and note their status. Dilated pupils may indicate hypoxia or CNS injury. Pinpoint, or significantly constricted pupils, may indicate poisoning. In young infants, gently palpate the fontanelles (the area of the skull where the cranial bones have not yet fused). A swollen or bulging fontanelle may indicate meningitis or increased intracranial pressure. A sunken fontanelle is often due to dehydration.

Finally, if time permits, again evaluate the environment. Note interactions between family members. Note also the cleanliness of the home and family members. If the child has been injured, determine whether the characteristics of the scene are consistent or inconsistent with the description of the accident and the apparent injuries. Always evaluate the environment objectively and tactfully. Ask only questions that pertain to the child’s medical complaint. If the environment is hostile, hold off on questioning and leave the scene; law enforcement personnel can evaluate the situation later.

As you complete the primary assessment, correct any immediate threats to the child’s life when they are encountered. If the child is having difficulty breathing or maintaining an airway, use mechanical ventilation or appropriate airway adjuncts. Every EMS unit should have an adequate supply of pediatric nasopharyngeal airways, oropharyngeal airways, endotracheal tubes and bag-valve-mask units. Remember, mechanical airways such as the Esophageal Obtruder Airway (EOA), Pharyngeal-tracheal Lumen (PLT) airway, and CombiTube cannot be used in children. If any problems cannot be immediately corrected in the field, immediately transport the child and attempt stabilization en route.

After completion of the primary assessment, and correction of any immediate threats to the child’s life, complete an age-related secondary assessment. The assessment is basically the same as for the adult. However, the order in which you complete it may vary depending upon the child’s age (See Table 2). Always determine accurate vital signs in children. Remember, the normal vital signs will vary depending upon the age of the child (See Table 3). If possible, correct any problems detected during the secondary assessment. Provide appropriate BLS or
ALS care as directed by medical control. ALS personnel should establish venous access if capillary refill is delayed or if the child will require medications. If a peripheral IV cannot be obtained, and the child is 5 years of age or less, an intracutaneous needle can be placed into the proximal tibia. Fluids and most drugs can be effectively administered via this route. Continuously reassess the critically ill or injured child. Transport the child to a facility with the capability of providing comprehensive pediatric care.

After completing the secondary assessment, if time allows, assess the family. The family is often anxious. Reassure family members and keep them abreast of your treatment. Never give the family members too many options. In a crisis situation it is hard for them to make appropriate decisions. If family members become hysterical, be firm with them. If they remain hysterical, they should be removed from the general area of the child. Often parents will be angry. In these cases, try and redirect their anger into something constructive. Have them hold IV bags or assist as they can with care of their child. Always be suspicious for “hidden agendas”. Some parents may be trying to hide an abuse situation.

Medical Emergencies

There are many causes of pediatric medical emergencies. This section will briefly address common pediatric emergencies with special emphasis on prehospital recognition and management.

Respiratory Distress

Respiratory emergencies are often classified as upper airway problems or lower airway problems. Causes of upper airway emergencies include nasal congestion, upper respiratory infection, airway obstruction, croup and epiglottitis. Lower airway problems are often caused by bronchitis, aspirated foreign bodies, asthma, pneumonia, pneumothorax and bronchiolitis.

Airway obstruction in children is frequently caused by foreign bodies. It seems that children are always putting objects into their mouth, increasing their chances of choking. In addition, as with adults, the tongue is a common cause of airway obstruction. Signs and symptoms of airway obstruction include apnea, stridor or a frequent cough. Treatment includes the application of basic airway maneuvers, suctioning, mechanical airways or mechanical ventilation. ALS personnel may need to perform endotracheal intubation or remove the foreign body under direct laryngoscopy.

A common cause of pediatric respiratory distress is croup. Croup is a viral infection of the tissues below the glottis. It typically occurs in children 6 months to 3 years of age and is characterized by a barking cough and inspiratory stridor. Treatment includes monitoring the airway and breathing and administration of supplemental oxygen. Never manipulate or attempt to visualize the airway as this may cause laryngeal spasm and complete airway obstruction.

Epiglottitis is a life-threatening infection of the epiglottis. It is usually caused by the bacteria Haemophilus influenzae, Type B. The infection causes the epiglottis to swell, often to a point where it completely blocks the airway. Children with epiglottitis will be febrile and appear sick. They will often lean forward, resting on their extended arms (tripod position). In addition, they will hold their mouth open and exhibit copious drooling as they are often unable to swallow their own saliva due to the massively inflamed epiglottis. Epiglottitis is a serious emergency. Treatment includes application of the ABCs and administration of 100% humidified oxygen. Do not agitate the child or attempt to visualize the airway. Transport the child immediately in the position of their comfort and provide ongoing care en route. Always have equipment available for a needle cricothyotomy if the child develops a complete airway obstruction. Epiglottitis will be seen less frequently since the introduction of a vaccine given routinely to newborns.

Another common cause of respiratory emergencies, especially in children less than one year of age, is bronchiolitis. Bronchiolitis is usually caused by infection with the Respiratory Syncytial Virus (RSV) and occurs most frequently in the winter. RSV causes wheezing and progressive respiratory distress. In fact, during winter months, any child less than one year of age with wheezing should be assumed to have RSV until proven otherwise. Infants can die from bronchiolitis. Prehospital treatment includes attention to the ABC’s and administration of supplemental oxygen. ALS units may be ordered to administer bronchodilator medications. Always be prepared to assist respirations if the child develops respiratory failure.

Asthma frequently develops during childhood. Asthma results from both bronchospasm and inflammation of the smaller airways and is characterized by progressive respiratory distress, tachypnea and wheezing. Treatment should include the ABCs and administration of supplemental oxygen. ALS units may be ordered to administer bronchodilator medications such as salbutamol. Always be prepared to assist respirations or intubate if the child develops respiratory failure.

Shock

Shock is defined as inadequate tissue perfusion. In children, it can result from trauma, dehydration, sepsis, congenital heart defects and dysrhythmias. Signs and symptoms of shock in children include tachycardia, delayed capillary refill, altered mental status and decreased skin temperature. Treatment is directed at correcting the underlying cause.

Dehydration is a frequent complication

<table>
<thead>
<tr>
<th>Table 1</th>
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<tr>
<td>Worrisome Findings Indicative of Critical Injury and Illness</td>
</tr>
<tr>
<td>◆ respiratory rate &gt; 60 breaths per minute</td>
</tr>
<tr>
<td>◆ heart rate &gt;180 or &lt;80 beats per minute (under 5 years of age) &gt;160 beats per minute (over 5 years of age)</td>
</tr>
<tr>
<td>◆ respiratory distress</td>
</tr>
<tr>
<td>◆ trauma</td>
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<tr>
<td>◆ burns</td>
</tr>
<tr>
<td>◆ cyanosis</td>
</tr>
<tr>
<td>◆ failure to recognize parents</td>
</tr>
<tr>
<td>◆ diminished level of consciousness</td>
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<td>◆ seizures</td>
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of fever, vomiting and diarrhea. In addition to the symptoms described above, patients with dehydration will often have decreased skin turgor. Dehydrated infants may exhibit a sunken fontanelle. Treatment of dehydration includes completion of the primary assessment and administration of 100% oxygen. ALS personnel should establish venous access and administer a fluid bolus of 20 mL/kg of lactated Ringer’s or normal saline. If there is no change in mental status following the first bolus, administer repeated fluid boluses at 20 mL/kg until the heart rate begins to decline and capillary refill improves.

Sepsis is a life-threatening bacterial infection of the bloodstream. This is often complicated by bacteria releasing chemicals called endotoxins, which cause dilation of the peripheral blood vessels and worsen tissue perfusion. Signs and symptoms of sepsis include fever, vomiting, diarrhea and abdominal distention. Later, the child may have a tachycardia, delayed capillary refill and eventually altered mental status. Prehospital personnel should complete the primary assessment, administer 100% oxygen and begin immediate transport. ALS personnel should establish venous access and administer a 20 mL/kg fluid bolus with lactated Ringer’s or normal saline. Prepare for endotracheal intubation and respiratory and circulatory assistance.

Dysrhythmias are uncommon in children. Usually dysrhythmias are the result of another problem and not the cause of the emergency. They may complicate congenital heart disease. Pediatric dysrhythmias are usually classified as tachycardias or bradycardias. Pediatric dysrhythmias should only be treated if they compromise cardiac output or have the potential to generate a lethal dysrhythmia. Stable tachycardias should not be treated. Unstable tachycardias, characterized by shock or decreased capillary refill, should be treated with cardioversion at 0.5-1.0 J/kg. Bradycardias should be treated first with ventilation. If this fails to increase the heart rate, provide oxygenation, chest compressions, and ultimately, atropine and epinephrine.

Altered Mental Status

Any alteration in mental status in a child or infant is a worrisome finding. Common causes of altered mental status include seizures, meningitis, fever, hypoglycemia, poisoning and trauma. Mental status changes can result from structural problems (tumors, bleeding), circulatory problems (shock, dysrhythmias), or metabolic problems (hypoglycemia, poisoning). Signs and symptoms of mental status changes in children are often subtle. It is important to rely upon the parents to help determine whether there has been a change in the child's mental status. Prehospital treatment of children with altered mental status includes evaluation of the airway, breathing, circulation, and cervical spine control if trauma is suspected. Always look for evidence of head injury and for signs of seizure activity. Try and obtain a brief history, especially if poisoning is suspected. Determine the blood glucose level with a Glucometer or commercial reagent strips.

Seizures are a frequent cause of altered mental status in children. In young children fever is often a cause of seizures. Generalized seizures are easy to detect. However, many types of pediatric seizures may only exhibit an alteration in mental status or subtle motor activity. Any time you encounter a child with seizure activity, promptly carry out the primary assessment and stabilize the cervical spine. Protect the child from injury and administer high-flow oxygen. Establish venous access and check the blood glucose level. If the seizure is prolonged, as in status epilepticus, consider administration of diazepam or lorazepam. If an IV cannot be established, both of these medications can be administered rectally.

Children, particularly infants, are at risk for meningitis. Meningitis is an infection of the covering of the brain and spinal cord. It can be caused by both viruses and bacteria. Bacterial forms of meningitis have an associated mortality of 5-10%. The signs and symptoms of meningitis are dependent upon the age of the child. Infants will often exhibit fever, irritability, poor feeding, bulging fontanelles or seizures. Meningitis in infants is often subtle. Because of this, any child less than three months of age with documented fever should be assumed to have meningitis until proven otherwise. Older children will have fever, vomiting, headache and a stiff neck. Prehospital treatment should include completion of the primary assessment and administration of 100% oxygen. ALS personnel should determine the blood glucose level and establish venous access. If capillary refill time is delayed or frank shock is present, give 20 mL/kg boluses of lactated Ringer’s or normal saline. Seizures are common and should be expected. Consider administration of diazepam or lorazepam as ordered by medical control. Transport promptly and provide continuing care en route.

EMS personnel are often called to assist children with febrile seizures. A rapid elevation in body temperature may precipitate a seizure in a young child. Although usually not a life-threatening event, it is very frightening for the parents. All children with febrile seizures should be transported to the hospital for additional evaluation. Complete the standard assessment. If transport times are long, consider the administration of acetaminophen or ibuprofen to control the fever.

Altered mental status in children can be caused by deviations in the blood glucose level. Low blood sugar, or hypoglycemia, is the most emergent condition. Hypoglycemia in children can be due to
diabetes, poisoning, tumors or infection. The child will often have an obvious alteration in mental status. However, be alert for subtle changes in mental status as described by the parents. Always complete the primary and secondary assessment. Look for signs and symptoms of poisoning. ALS personnel should determine the blood glucose level. If the child is indeed hypoglycemic, administer 25% dextrose as ordered by medical control (25% dextrose can be created by diluting 50% dextrose with equal amounts of sterile water). Always transport the child to a facility capable of providing pediatric emergency care.

One of the most common causes of pediatric emergencies is poisoning. In fact, more than 1 million children are poisoned each year. Poisoning can occur through ingestion, skin absorption, inhalation, or injection of a chemical or medication. The signs and symptoms of poisoning can vary significantly. Prehospital care of the suspected poisoning should include completion of the primary and secondary assessment and determination of the child’s level of consciousness. Try and obtain any possible containers of the suspected poison. Contact regional medical control for advice. ALS personnel should determine the blood glucose level. If ordered by medical control, administer the specific antidote. Also consider calling the local poison center. Transport promptly.

Environmental Emergencies

Children are at risk for environmental emergencies. The most commonly encountered environmental emergencies are drowning, hypothermia and hyperthermia. All of these can be life-threatening if not recognized and effectively managed in the field.

Drowning is defined as death within 24 hours of immersion in water and the third cause of preventable death in children. The near-drowning victim should be promptly removed from the water by qualified water rescue personnel. Initially assess the ABCs and provide BLS care. Always immobilize the cervical spine if trauma is suspected. Treat hypothermia and maintain the child's body temperature. ALS personnel should intubate the child as soon as possible and provide mechanical ventilation. Establish venous access (IV or IO) and follow PALS resuscitation guidelines. If extra crew members are available, have them provide emotional support for the parents. Transport the child and provide ongoing care en route.

Hypothermia and hyperthermia are primarily seasonal events. Children are at increased risk for environmental emergencies because of their high surface area to body weight ratios. Causes of hypothermia include submersion in cold water or exposure to low ambient temperatures. The signs and symptoms of hypothermia include frostbite, alterations in mental status, a lowered body core temperature, and respiratory or cardiac arrest. Prehospital treatment includes application of basic life support. Rewarming should follow local protocols as ordered by medical control.

Hyperthermia results from exposure to high ambient temperatures or coexisting fever. Signs and symptoms of hyperthermia include an elevated core temperature, dehydration, warm skin, altered mental status, and diarrhea. Prehospital treatment includes assessment of the ABCs and basic life support. Remove any heavy clothing. If the child is alert, administer oral fluids. Always be alert for possible seizures. Administer high flow oxygen. ALS personnel should establish venous access and should administer a 20 mL/kg bolus of lactated Ringer’s or normal saline if capillary refill time is delayed. Transport immediately.

Summary

The goal of prehospital pediatric critical care is to recognize the unstable infant or child. Children, unlike adults, rarely die from a primary cardiac event. Death in children is almost always due to respiratory failure, injuries, or infections. Your role, as a prehospital provider, is to rapidly detect the critically ill or injured child and provide life saving care.

References


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Editors note: Pediatric Trauma will be covered in the November issue.

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