CEPCP

Professional Development: **Pediatrics** Module 2

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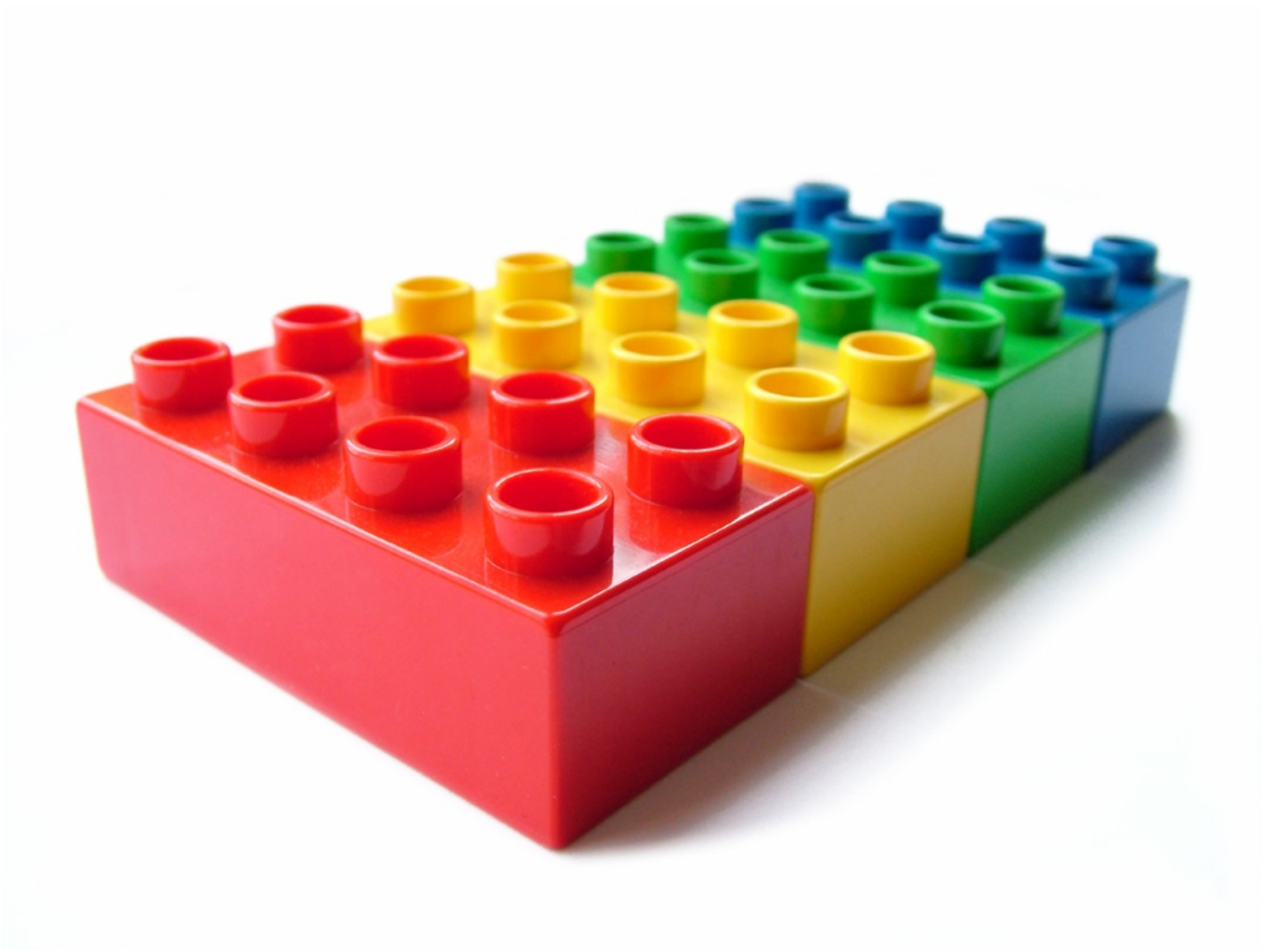
COURSE OBJECTIVES

On completion of this continuing medical education module, the participant should be able to:

- Identify basic anatomical and physiological differences between adult and pediatric patients and considerations in the prehospital setting
- Describe and demonstrate the general approaches to completing a thorough pediatric assessment in the prehospital setting
- Describe the clinical significance of abnormal assessment findings in pediatric patients
- Describe the strategies for assessing children of different ages and at various developmental stages



INTRODUCTION

In Module 1 of this series, we presented approaches and techniques to successfully facilitate prehospital pediatric assessment. We also examined the variances in children at various stages of development and we provided general age-specific assessment skills that address the unique aspects and needs of each child at different stages.

In this second module of our series, we will examine the pediatric assessment in greater detail in order to successfully formulate a solid working diagnosis, and we will provide succinct parameters that will assist the paramedic to identify the most appropriate treatment plan. Your understanding of this information will form the cornerstone for a successful prehospital care approach to children.

In pediatrics, first impressions account for a great deal in the evaluation of the chief complaint. With infants and younger children, it is important to form a rapid first impression before approaching the child and before beginning the hands-on assessment process. Even though it may be easier to approach older children and adolescents in a more direct manner, it is still important to modify your interaction and communication techniques to account for specific age-related concerns.

When assessing a child, it is equally important to take into account the changing anatomical and physiological factors in order to accurately evaluate the findings. For example, normal muscle tone, coordination, and social interaction all change as a child reaches new developmental milestones. Other factors that can affect assessment findings and interpretation are the vital signs. For example, as a child grows older, normal heart rates and respiratory rates change and decrease, while the blood pressure gradually increases.

As previously noted, developmental considerations will have an impact on the paramedic's assessment techniques as well as on the general approach to pediatric patients. General age-specific approaches were described in Module 1 of this series as well as detail regarding the various childhood developmental stages. The chart that follows will help to provide specific developmental characteristics to keep in mind when assessing and managing a pediatric patient.

FUNDAMENTALS OF PEDIATRIC ANATOMY, PHYSIOLOGY AND PREHOSPITAL CARE CONSIDERATIONS

Anatomical Considerations	Prehospital Considerations
General Anatomy and Physiology • A young child's head is relatively larger in relation to the rest of the body and those proportions become more adult-like as the child reaches adolescence. • Young children have a greater body surface area to total body weight than adults. • The basal metabolic rates are higher in children than in adults, as a result of the extensive growth and development processes. - This process requires more energy with caloric expenditures at 3 to 4 times that of an adult. Children consume twice as much oxygen per kilogram compared to adults. - Illness and stress further accelerate the metabolic rate, which can lead to respiratory failure and shock. - Children also have higher fluid requirements due to a higher metabolic rate. A newborn's total body weight is 70 to 80% water whereas an adult's accounts for only 50 to 60%. • Total circulating blood volume in children is between 80 to 90 ml per kg. This is higher than in adults by 25% per unit of body weight.	• When a child falls or in cases where a child is thrown, the head typically will lead the body and will be the first body region to sustain the impact. This accounts for the high incidence of head trauma in young children. • Additional padding may be necessary under the shoulders to maintain airway patency (sniffing position) or when immobilizing the C-spine. • Infants and young children tend to lose more body heat and water through the surface of the skin and as a result are prone to hypothermia and dehydration. • Children are prone to hypoxia and require supplemental oxygen when critically ill or injured. • Children are also prone to dehydration when there is increased fluid loss due to diarrhea, vomiting, or in conditions that increase the metabolic rate. • With trauma, keep in mind that the *actual* blood loss is relative to weight (e.g., 200 ml of blood loss may not affect an adult but can cause shock in a 12 month old infant)

Anatomical Considerations	Prehospital Considerations
Airway • The tongue is larger in relation to the size of the oral cavity than an adult. • The trachea is shorter and narrower, and the cartilaginous rings are more pliable which increases the risk of collapse with high *inspiratory* pressures. • Young children have a larger proportion of soft tissue in the airways. • Newborns up to the age of 2 to 4 months are obligate "nose breathers". • Airways are smaller and narrower than in adults and the narrowest portion of the airway is at the cricoid cartilage. In adults the narrowest portion is at the level of the vocal cords.	• Children are at an increased risk for airway obstruction in comparison to adults. • The smaller airways render them more susceptible to swelling from edema and inflammation from allergic reactions, bacterial or viral infections as well as from foreign bodies. • Infants and young children who are obligate nose breathers are at increased risk of developing respiratory distress if the nose becomes congested or obstructed with mucous or secretions. • Infants are prone to obstruction when their airways are congested with fluid, mucous or secretions. • Airway management techniques must be modified in children. The head should be in a neutral "sniffing position" with the neck slightly extended. The external auditory meatus (ear canal) should be horizontal with the anterior portion of the shoulder.
Musculoskeletal System • The newborn skull has two fontanelles. - Anterior: fuses between 10 and 16 months - Posterior: fuses between birth and 3 months • The child's chest wall is softer than an adult's and more compliant due to bone immaturity.	• Assessing the anterior fontanelle in an infant is important to determining the child's state of hydration or increased intracranial pressure. • Rib fractures are uncommon in children; however, they transfer energy from blunt forces to underlying organs and blood vessels within the chest cavity. (Such cases could raise the suspicion of child maltreatment where the injuries do not fit the explanation of the mechanism.)

Anatomical Considerations	Prehospital Considerations
Musculoskeletal System (Cont'd)	
• Children have weaker abdominal muscles, which give an appearance of abdominal distension. The liver and spleen are also lower and more anterior, which leaves them exposed and not completely protected by the rib cage. • Young children are abdominal (diaphragmatic) breathers until about 8 years of age.	• Chest trauma may appear subtle externally but it may have a more significant impact internally. • Weak abdominal muscles provide minimal protection to intra-abdominal organs. Blunt trauma to this area can produce severe organ damage. • When immobilizing a child on a long spine board, always try to avoid restraints over the child's abdomen so as to facilitate "abdominal breathing". This also reduces pressure from the gut against the stomach, which can increase the potential for vomiting.

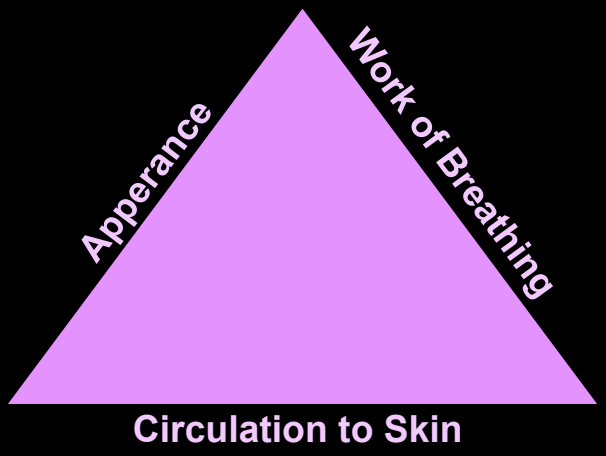
THE INITIAL ASSESSMENT
(THE GENERAL APPEARANCE AND FIRST IMPRESSION)

As noted earlier, when assessing pediatric patients, first impressions really do count. The initial assessment or "first impression" can be referred to as the "*doorway assessment"* and it provides a first glance of how the child presents, and takes into account the general degree of distress. It involves taking a moment while at a short distance from the patient and taking a *quick* look to establish whether there are significant life-threatening problems that require immediate interventions. At this point, your observations will determine whether you approach the child immediately or at a more moderate pace.

This step is particularly unique to the assessment of young children and it is done *before the primary assessment*. It may not be required when you are called to assist the older child or adolescent, both of whom can usually be approached as you would an adult. Young children, however, are usually afraid of strangers. Abruptly approaching a child who is already distressed because of an illness or injury will often increase agitation, potentially exacerbating the child's condition particularly if respiratory problems are present. Therefore, it is important to pause for a moment to "size up" the child's condition *before* you approach.

While approaching the child, take a moment to observe and inspect the following:

- Look at the general appearance of the child. Consider age-appropriate behaviour as well as their level of consciousness, and whether the child looks comfortable or restless. Does the child look around and respond with curiosity or does he/she look fearful? Is the child playing or sucking on a pacifier or bottle? Is he/she quiet with eyes open but not moving much or uninterested in his/her environment?
- Is there any obvious respiratory distress or extreme pain?
- What is the level of consciousness? Is the child awake, asleep or unresponsive?
- What is the child's position? Are the head, neck or arms in a position that is suggestive of a spinal injury or is the child sitting up and tripoding?
- Are there any unusual or significant odors?
- What is the muscle tone: good or limp?
- What is the quality of movement: spontaneous, purposeful, or symmetrical?
- What is the presenting colour: pink, pale, flushed, cyanotic, or mottled?
- Are there any obvious injuries such as bleeding, bruising, impaled objects, or gross deformities?

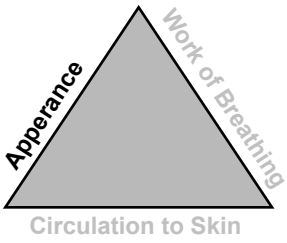


The Pediatric Assessment Triangle provides the basis for forming the first impression of the child's initial presentation and this system has quickly become the standard in many pediatric resuscitation courses. The three sides of the triangle address the major assessment components, while the congruency of the figure reminds the paramedic that all of the elements are inextricably interrelated. With practice, your assessments will simultaneously include these components, allowing you to form an accurate first impression in less than a minute

Your first impression should determine the priorities of care.

1. How ill or injured does the patient appear?
2. What does the environment reveal?
3. What is the patient's chief complaint?
4. What are the associated complaints?
5. PQRST of pain:
   P: Provoke
   Q: Quality
   R: Radiation
   S: Severity
   T: Time

The General Appearance



The child's general appearance and first impression are vital assessments that paint the primary picture of the child and their current status. Initially, we tend to look for the child's level of consciousness and general mental status. Three points help to determine the patient's mental status: the level of consciousness, interaction with parents, and the response to others present. Then we take into account the child's muscle tone and position in order to determine the child's level of disability and distress.

Level of Consciousness

Is the patient alert? Most healthy children interact constantly with their surroundings. If the child is alert, continue your visual evaluation. However, if the child exhibits agitation, marked irritability, or reduced responsiveness, proceed immediately with the primary assessment to identify and correct deficiencies.

Interaction with Parents

For children older than 6 to 8 months, ask the parents to call the child's name to see if the child responds. Children should recognize their parents. Younger children will generally cling to them, seeming to feel consoled and safe when held in a parent's arms. If the child responds immediately when the parent calls, continue your visual evaluation.

On the other hand, a slow or absent response, inconsolable crying or failure to recognize a parent indicates an urgent condition requiring an immediate hands-on primary assessment to identify and correct deficiencies followed by prompt transport.

Response to Others

Begin by assessing the child from across the room and try to allow the child to remain on the caregiver's lap.

Has the child recognized your presence? If so, continue your visual evaluation. If not, consider the condition urgent and proceed immediately with the primary assessment followed by prompt transport.

You can use bright lights or toys to measure interactiveness for young babies and infants. Have the parents or caregiver assist with assessments when appropriate.

Muscle Tone and Body Position

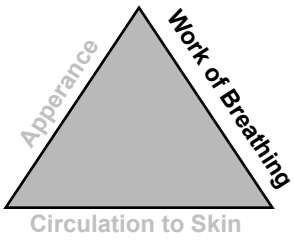
Observe the child's muscle tone and body position. For example, when you are assessing an infant you should note that in the clinically well infant, the extremities would be kept comfortably flexed. When infants are awake, they should exhibit equal movement in all extremities. When sleeping in the prone position, they generally keep their legs flexed and snug against the torso with their buttocks upended.

On the other hand, a moderately ill infant will tend to lie flat, whether prone or supine, with the extremities extended and flaccid.

Around the age of about 4 to 6 months, babies will begin developing the ability to sit up. Infants older than 6 to 8 months should be able to sit without assistance. Keeping in mind that children develop at different rates, ask the parents whether the child's capabilities seem normal. Also keep in mind that when children are ill, injured, or frightened, they may regress emotionally to an earlier age when they felt more secure and can assume the developmental capabilities of a much younger child. If you observe normal muscle tone and body position for the child's age, continue your visual evaluation.

If you note any abnormal findings (hypotonia, rigidity, inability to sit), proceed immediately with the primary assessment and consider immediate, rapid transport.

The Work of Breathing



While you are gathering your first impression, note their respiratory status in order to determine the adequacy of ventilation and oxygenation. There are two main goals during the visual assessment of breathing; one is to confirm that the child *is* breathing, and the second is to note any significant abnormalities in the work of breathing. With practice you will quickly identify the more subtle signs: tachypnea or bradypnea, suprasternal and intercostal retractions, nasal flaring and those related to respiratory distress and failure.

- This assessment is a more accurate, quicker indicator of oxygenation and ventilation than respiratory rate or chest sounds on auscultation.
- It also reflects the child's attempt to compensate for difficulties in oxygenation and ventilation.

Characteristics	Features to Observe
• Abnormal airway sounds • Abnormal positioning • Retractions • Flaring	• Snoring, speech, stridor, grunting, wheezing - muffled or hoarse • Sniffing position, tripoding, refusing to lie down, head bobbing in infants • Supraclavicular, intercostal, or substernal retractions of the chest wall • Nasal flaring

The Circulation to the Skin

Circulation to Skin

This assessment is aimed at evaluating the child's circulatory status by noting skin colour of the lips and tongue, the palms, or the soles of the feet, whichever area can be readily observed. If the child's colour is adequate, consider the condition as being non-critical and move to the primary assessment at a moderate pace. On the other hand, if the child presents with abnormal skin colour (pallor, mottling, or cyanosis), this clearly indicates a more urgent condition, dictating a more rapid approach to the child.

- This assessment reflects the general adequacy of cardiac output and core perfusion (perfusion of vital organs).
- It is important to keep in mind that cold room temperatures may cause false skin signs, i.e., the cold child may have normal core perfusion but abnormal circulation to the skin.
- Take the time to inspect the skin (face, chest, and abdomen) as well as mucous membranes (lips, mouth) for colour in central areas. (Mucus membranes are easy to assess when the child cries.)
- In dark-skinned children, the lips and mucous membranes are the best places to assess circulation.

Characteristic	Features to Observe
• Pallor • Mottling • Cyanosis	• White or pale skin or mucous membrane colouration • Patchy skin discolouration due to vasoconstriction (marble-like) • Bluish discolouration of skin and mucous membranes

If at any point during your first impression evaluation, you identify a significant clinical problem, immediately discontinue your visual assessment, approach the child, and begin the hands-on initial primary assessment, while applying appropriate interventions as you go.

However, as long as there are no significant findings, it is better to proceed at a moderate pace, evaluating the child's condition through observation and gathering background information as you establish rapport with the child and parents.

THE PEDIATRIC PRIMARY ASSESSMENT

After forming your first impression of the child's condition, immediately proceed with a complete primary survey, assessing the ***airway***, ***breathing***, and ***circulation***, as well as the ***mental status*** (also referred to as *disability*[1]). If a traumatic mechanism is suspected, ALWAYS initiate appropriate stabilization and immobilization measures before continuing with the assessment.

It is well known that the primary survey builds on information gathered after the first impression has been formed. It is important to "treat as you go", while identifying life-threatening conditions and performing appropriate interventions *before* moving on to the next step.

Throughout the primary assessment, continue thinking in terms of whether the child's condition appears critical or non-critical, and *always keep in mind that even a well-appearing child can deteriorate abruptly at any time*. It may be necessary to go back to the beginning if a new problem arises. For example, if you are assessing circulation in an apparently stable child and the child begins to choke, immediately return to airway assessment and perform appropriate interventions. This child's condition would now be considered critical, with rapid transport becoming the primary goal if the obstruction cannot be relieved. However, as long as the child's condition continues to appear stable, you should maintain a moderate pace, explaining your actions and taking the time to ask and answer questions.

As mentioned in Module 1, the way that the child responds as the examination progresses depends largely on the child's age as well as on the severity of the illness or injury. Young infants may reach out and want to be held, while older infants may cry when approached. Toddlers may be more interactive, and by 4 or 5 years of age, they become more eager to cooperate. On the other hand, a child who remains listless and apathetic during the examination is cause for serious concern, as this may indicate a more serious underlying illness or injury.

Airway

In order to determine airway patency, look for movement of the chest or abdomen, listen for breath sounds, and feel for air movement at the child's mouth or nose. Note any adventitious breath sounds including hoarseness, cough, stridor, snoring, or gurgling sounds.

Breathing

Assessment of breathing builds on airway assessment and management. Look for signs that indicate increased work of breathing including retractions on inspiration in the suprasternal, supraclavicular, intercostal, or subcostal areas. Also note nasal flaring on inspiration (most frequently seen in infants and toddlers) and head bobbing where the head lifts and tilts during inspiration, then falls forward during expiration. Nasal flaring and retractions are common signs of respiratory distress. Head bobbing may indicate respiratory failure.

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[1] Loss of mental function

Chest Assessment in Children

- Always try to auscultate the front of the chest as well as the back. Place the stethoscope on the apices as well as below each axilla in turn and compare breath sounds of the right and left lung fields and move from side to side to the lower lobes. Air entry should be equal.
- Because children have small chests, you should place the stethoscope near the axillae rather than the nipples when you auscultate breath sounds. This will minimize the transference of sounds across the thorax.
- During auscultation, evaluate chest symmetry while inspecting the chest for any injuries that may interfere with ventilation and oxygenation.

Standard Respiratory Assessment and Monitoring
• Ventilatory rate, pattern, and depth (if abnormal) • Any signs of impaired airway / respiratory distress and / or impaired gas exchange • Integrity of oxygen delivery system • Airway compliance if being manually ventilated (IPPV) • Adventitious breath sounds

Circulation

Evaluate the central (described below) and peripheral pulses. Count the heart rate, and evaluate skin colour, temperature, and capillary refill rate. Measure blood pressure in children older than 3 years. (It is generally impractical to attempt blood pressure measurement in children younger than 3 years in the prehospital setting, both because the patient is unlikely to keep still and because the systolic and diastolic sounds are difficult to hear).

An automated blood pressure device may work if an appropriate cuff size is available, but it is easier to simply evaluate the central pulse and general perfusion, which are good indicators of blood pressure. In children who have sustained trauma, remember to carefully inspect the child for evidence of hemorrhage, and if present, it must be rapidly controlled before proceeding with the rest of the circulation assessment.

Central Pulses

Palpating and assessing central pulses will vary according to age.

- In the newborn, check the pulse by palpating the base of the umbilical cord between your thumb and index finger.
- In infants and young children, the brachial or femoral pulse is usually easiest to palpate. These are the best locations to check when you suspect that a child younger than one year may have no pulse.
- In older children, the carotid artery is a good source for a central pulse. This site is not used in infants because the short, "chubby" neck makes it difficult to palpate the carotid pulse.

Perfusion

Perfusion is an important evaluation and is accomplished by assessing the peripheral

If the central pulses are clearly palpable, evaluate their strength.

The presence of a weak central pulse can be a sign of decompensated shock.

pulse, skin colour, temperature (by palpation), and capillary refill time.

Assessing Peripheral Pulses

While keeping one hand on the central pulse point, palpate the peripheral pulse with the other hand at either the radial or pedal site. If you are assessing the central pulse at the brachial or femoral site, check the peripheral pulse in the same extremity. Compare the peripheral and central pulses, noting that the rate and strength should be similar at both sites.

Peripheral pulses that are weak or irregular indicate poor peripheral perfusion, a sign of decompensated shock.

Assessing Skin Color

Peripheral skin colour should be pink. In children with darker skin tones, assess the peripheral colour at the lips, palms, or soles of the feet. Pallid, mottled, or cyanotic skin may indicate poor perfusion.

> Any child who presents with a respiratory component from any mechanism may already be severely hypoxemic even before they are visibly cyanotic.
>
> Therefore, do not rule out hypoxemia on the basis of colour alone.

Assessing Skin Temperature

Check the skin temperature with the dorsum of your hand. Cold skin may indicate either poor peripheral perfusion or exposure to cold ambient temperatures. Conversely, hot skin may indicate fever, infection, or hyperthermia caused by very warm ambient temperatures, such as a child would experience in a closed car on a hot day.

Assessing Capillary Refill

To check capillary refill time, firmly press the skin on the forehead, chest, abdomen, or fleshy part of the palm, then release. Colour should return within 2 to 3 seconds. In a young child who is alert, it may be less agitating to perform this test on the palm or sole of the foot, but for best accuracy the chosen site should be the warmest point on the child's body. (A fingertip is not the best site for this test.)

Delayed capillary refill may indicate poor perfusion or exposure to cool ambient temperatures. Pallid or mottled skin, cool skin temperature, or a delayed capillary refill time suggests inadequate circulation to skin, which is a clear sign of shock.
When tabulating your findings, be sure to account for environmental temperature, as exposure to cold ambient temperatures can cause similar findings.

Assessing Blood Pressure

Measurement of blood pressure should be completed only if time allows, and only after you have completed the rest of the circulatory assessment.

Obtaining an accurate blood pressure measurement can be time-consuming, particularly in younger children. Transport of critical patients should not be delayed for this assessment. Children often become agitated and fearful during blood pressure measurement, which increases respiratory and heart rates, and can potentially affect subsequent reassessment of vital signs.

In children aged 3 years or younger, presence of a strong central pulse is an acceptable sign of adequate blood pressure. For children older than 3 years, select a blood pressure cuff about two-thirds as wide as the length of the upper arm or thigh. You will get a more accurate reading at the upper extremity. Follow the same technique used in adults. A young child may

feel less anxious if you say you're going to give the child's arm a hug.

When evaluating these findings, **keep in mind that children can maintain normal blood pressure and a strong central pulse well after developing compensated shock**. In addition, pain or fear can raise a child's blood pressure so always initiate appropriate interventions in any child who is at risk for shock, even if the blood pressure measurement is normal.

Standard Cardiovascular Assessment and Monitoring
• Peripheral pulses and central pulses • Blood pressure • Skin colour / temperature / moisture • Temperature (in climate extremes) • ECG rhythm • Fluid volumes administered by type and amount

Mental Status

Complete the primary assessment with a brief evaluation of mental status and neurologic function. In children, a quick and acceptable assessment tool is the AVPU method:

- **Alert**: The child is active and appropriately responsive to parents and external stimuli.
- **Verbal**: The child responds only when the parents call the child's name.
- **Painful**: The child responds only to a painful stimulus, such as pinching the nail bed.
- **Unresponsive**: The child does not respond to any stimulus.

Standard Neurological Assessment and Monitoring
• General mental status - level of alertness and activity AVPU / GCS • Pupils • Motor and sensory changes • Continued spinal immobilization with trauma patients

Remember - Always treat as you go, assessing the A, B, Cs, while identifying any life-threatening conditions and performing appropriate interventions before moving to the next step.

The CUPS assessment tool is used to evaluate the status of pediatric patients and should be used as a guide to determining urgency of treatment and transport.

Critical: Absent Airway, Breathing or Circulation. Requires rapid interventions and rapid transport. Must be reassessed frequently.

Unstable: Compromised Airway, breathing or circulation with altered mental status. Requires rapid interventions and transport. Should be reassessed frequently.

Potentially Unstable: Normal ABC's, ***BUT*** significant illness or injury. Requires initial assessments with prompt interventions. Requires a focused physical assessment as well as a focused history *during transport*.

Stable: ABC's are normal and without significant illness or injury. Requires a focused physical assessment as well as a focused history *during* routine transport.

THE DETAILED PEDIATRIC SECONDARY ASSESSMENT AND HISTORY

The detailed physical examination is aimed at inspecting all parts of the body for deformities, ecchymoses, lacerations and abrasions, punctures and penetrating wounds, in addition to any tenderness, edema, or burns. If possible, try to examine painful areas last and try to avoid moving the affected areas.

Younger children will be reassured if the parents are encouraged to help with the examination. For example, the parents may be able to do some of the exposure and palpation under your direction. Keep in mind while exposing a child that they lose body heat very rapidly; therefore, remove clothing only as necessary to assess each area, and then replace it before continuing.

While the procedure is known as a **head-to-toe assessment**, *for infants and young children the sequence of examination should be reversed so that you begin with the lower extremities*. These patients find it particularly threatening when strangers touch their faces, so beginning with the extremities and working backward gives you a chance to develop a rapport while reducing the child's fears.

Project a friendly, reassuring demeanor as you proceed. Additional assessment strategies have been detailed in Module 1 of this series.

Based on the chief complaint, assessment findings, and AMPLE[2] history, focus additional questions on all areas that are applicable and relevant to the problem. If any significant finding is revealed as you conduct your interview, modify the child's assessment and reevaluate your treatment and management approach. In general, focus on the following assessments in order to complete a thorough assessment.

Mental Status

Ask whether changes have occurred in the child's behaviour and mental status. Reassess the child's mental status frequently during the examination and while transporting.

Airway and Breathing

Ask whether there have been changes in the child's respiration and central colour, including periods of apnea or cyanosis. Make a note if the child has chronic pulmonary disease, such as asthma; if the child depends on a home ventilator or other assistive device; or if the child has a tracheostomy. Monitor the child's respiration carefully during examination and transport.

Circulation

If there is a history of external hemorrhage, ask the parents how much blood they think the child lost. Parents will often find it easier to think about this in terms of household measurements, such as tablespoons or cups. Their estimate may not be very accurate, but nonetheless it should be documented for reference. If there is a history of emesis or diarrhea, ask how often and for how long it has continued and whether the child has been able to drink fluids. Try to find out when the child last urinated and how much. For infants urination may be measured by the number of wet diapers since the morning. Children who have lost fluids should be reassessed frequently for signs of poor perfusion and shock.

Trauma

If there is any history of trauma, try to determine how and when it occurred. For example, if the child fell, it is important to estimate the distance as well as the type of surface on which the child landed. If the child was in a motor vehicle crash, note whether the child was appropriately restrained and whether the child was struck by an air bag.

If the child was struck by a car and thrown while walking, roller-skating, or bicycling, try to determine whether a helmet or other protective gear was worn. Try to find out approximately how far the child was thrown and how fast the car was moving at impact. Also ask whether the child lost consciousness or if he/she showed signs of respiratory problems following the injury.

Monitor any injured child for changes involving respiration, circulation, or level of consciousness. Also note the possibility of child abuse if the parents' explanation for the incident does not seem to fit the injury and the child's abilities, however, do not delay transport or confront the parents.

Neurologic and Developmental History

If the child has experienced seizures, try to determine their duration and frequency. Get a description of the child's seizure activity during the event. Ask about fever if a child younger than 5 years of age has experienced seizures. Make a note if the child has a past history of seizures and

[2] The AMPLE mnemonic is used when obtaining information pertaining to the patient's **A**llergies, **M**edications, **P**ast medical history, **L**ast meal and **E**vents leading up to today's complaint.

find out how recent seizure activity compares with prior episodes. Try to get a description of the child's usual behaviour and developmental abilities such as how well the child generally moves, sits, and talks. Try to determine if the child has had any change in behaviour or abilities.

In children with seizures or behavioural changes, monitor the airway and respiration. Note any changes in mental status throughout the call.

Fever

If the parents have taken the child's temperature, record the reading and the method used to obtain it (such as rectal or oral). Fever in children is defined by a temperature at or above 38º C (100.5º F) when measured at the rectal or tympanic sites. Oral temperature readings are usually about 0.5º C lower than this or about 37.5 º C (99.5º F). Axillary temperatures are 1º C lower or about 37º C (98.5º F).

While fever rarely requires prehospital treatment, it can make infants and children irritable or listless, affecting AVPU findings and the general neurological assessment. In young children, a high fever can cause tachypnea and tachycardia. In rare cases, a rapid elevation in temperature may precipitate a febrile seizure.

If the child is febrile, ask if the parents have noted changes in mental status, respiration, muscle tone, or coordination. Obtain a more focused past medical history with an emphasis on factors that increase the risk of complications during infection, such as sickle-cell anemia, HIV infection, recent cancer therapy, or other conditions that the child's physician may have mentioned to the parents.

It is important to note that febrile infants aged 2 months or younger need to be investigated for possible underlying sepsis.

Temperature should also be measured when hyperthermia is suspected. A physician should evaluate all febrile children if possible. Particularly when it is combined with another risk factor, fever is sufficient cause to transport. Reassess for changes in mental status and ABCs during transport.

History for the Newborn

When called to assist with an emergency out-of-hospital childbirth, remember the 4 Ms:

1. **M**ultiple births
2. **M**econium
3. **M**aternal drug use
4. **M**aturity of the fetus

Ask whether the mother is expecting multiple births, in which case additional emergency personnel may be needed. Find out whether labor is more than 4 weeks premature. If the amniotic sac has ruptured, ask whether meconium was present. If possible, find out whether the mother has a recent history of substance abuse, particularly heroin or methadone, and when drugs were last used.

In any situation involving out-of-hospital birth, transport should be initiated as soon as possible.

RECURRENT ASSESSMENTS

The recurrent (ongoing) assessment is usually performed following a detailed physical exam. However, the patient's condition may promptly divert attention from the detailed physical assessment while immediate life-threatening problems are addressed. For this reason, recurrent assessments are extremely valuable in recognizing a change in the pediatric patient's condition.

To effectively maintain awareness of changes in the patient's condition, repeated assessments are essential and should be performed ***at least every 5 minutes on the unstable*** patient, and ***at least every 15 minutes on the stable*** patient.

The immediate goal in pediatric emergency care is to stabilize the child for rapid transport to a well-equipped facility that can provide definitive care. Transport is indicated for any child who has any or a combination of the following:

- Abnormalities on initial assessment or any deterioration during recurrent assessments
- A significant mechanism of injury
- A history of serious medical illness
- Physical abnormalities discovered during the detailed physical examination
- Significant pain

It is vital to reassess the child repeatedly until care is transferred to the receiving facility. As noted previously, children who look well early in a call may suddenly deteriorate. Therefore, it is important to continually monitor for any change in the patient's status in order to revise treatment and transport plans according to the child's condition.

Young children will find it comforting to have their parents close by during transport, so try to allow the parents to remain in physical contact as long as they are safely secured and not interfering with necessary interventions.

Additional Assessments

Pulse Oximetry

Pulse oximetry, in addition to continuous cardiac monitoring, is generally indicated for all infants and children who display abnormal findings involving respiratory rate or work of breathing, heart rate, perfusion, blood pressure, or mental status. Pulse oximetry is also indicated when there is a history of respiratory difficulty or chronic pulmonary disease, such as asthma, while cardiac monitoring is indicated when there is a history of tachycardia, cardiac disease, or syncope. Correlate the results with other clinical findings to guide management decisions. Unless monitoring is essential to determine treatment options, start it only after the initial assessment and necessary interventions have been performed.

Cardiac Monitoring

Continuous cardiac monitoring provides an audible signal as well as a numeric display of the child's heart rate while a monitor displays a continuous electrocardiogram. To assess this information accurately, you must be familiar with normal heart rates, ECG tracings and artifacts, and common pediatric dysrhythmias. Although life-threatening cardiac rhythm disturbances are rare in children, when they do arise, they usually reflect respiratory failure or shock rather than the primary cardiac events, which are more prevalent in the adult patient population.

GUIDELINES FOR PEDIATRIC VITAL SIGNS AND ASSESSMENT FINDINGS

Weight

(Average minimum)
A rough estimate of a child's weight can be made from age but actual weight shows considerable variation.

Birth	3.5 - 4.0 kg
6 months	7.0 kg - 8.0 kg. (Double birth weight)
12 months	10.5 kg -12.0 kg. (Triple birth weight)
1 -10 years	(age X 2) + 8 or 10

Pulse Rate

(Always consider situational effects)

Neonate	130	(100 - 160)
Infant	110	(90 - 120)
3 Years	100	(80 - 120)
6 Years	90	(70 - 110)
10 Years	75	(60 - 90)
15 Years	75	(60 - 90)
18 Years	72	(50 - 95)

Blood Pressure

(Average minimum)
Essential to use cuff which covers 3/4 of the upper arm, thigh or calf and which does not have an overlapping bladder.

Neonate	40 - 60 systolic
Birth	50 - 70 systolic
6 months	80 - 100 systolic
12 months	100 systolic
> 12 months	**80 + (age X2)** (mean average) (5%) 70 + (age X2) *(Hypotensive state)* (50%) 90 + (age X2)
Toddler (2 y)	80 – 110 systolic
School age (7 y)	90 – 120 systolic
Adolescent (15 y)	100 – 130 systolic

Respiratory rate

Newborn	30-60
Infant	30-40
Pre-school	20-30
School age	20
Adolescent	15-18

Modified GCS

Eye Opening

	Adult/Child	Infant
4	Spontaneous	Spontaneous
3	To speech	To verbal stimuli
2	To pain	To pain
1	No response	No response

Verbal response

	Adult/Child	Infant
5	Oriented	Coos / Babbles
4	Confused	Irritable Cries
3	Inappropriate Words	Cries to Pain
2	Incomprehensible Sounds	Non Specific Sounds

Motor Response

	Adult/Child	Infant
6	Obeys Commands	Normal Spontaneous Movement
5	Localizes Pain	Withdraws to Touch
3	Withdraws to Pain	Withdraws to Pain
2	Abnormal Flexion	Abnormal Flexion to Pain
1	Abnormal Extension	Abnormal Extension to Pain
1	No response	No response

TAKE HOME POINTS

1. Paramedics should become knowledgeable about children and pediatrics in general. *Know what a sick child looks like and how they present*.

2. The child's general appearance is the most important thing to consider when determining how severe the illness or injury is, the need for treatment, and the response to therapy.

3. When assessing children, the Pediatric Assessment Triangle (PAT) should be added to the patient assessment sequence.

4. Although the general components of the patient assessment will remain the same as for the adult, modifications should be made for children.

5. When completing the detailed physical exam, it does not matter whether you proceed head-to-toe or toe-to-head, as long as all anatomical areas are included.

6. Do not delay the transport of a critically ill or injured child in order to complete the focused history and detailed physical exam. If time allows, this can be performed en route to the hospital.

7. For critically ill, injured or unconscious children, follow the same patient assessment sequence as for the unconscious adult.

8. The child's appearance is generally more important than the chief complaint; always *look* at the child and *listen* to the parent.

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