



## Chapter 160 – General approach to the pediatric patient

### Key concepts

- Patterns of illness and injury vary by age; and we have to know the various anatomic and physiologic characteristics relevant to pediatric presentations and their respective management
  - A basic understanding of normal development helps us assess pediatric patient.
  - The pediatric assessment triangle (PAT) can be used as a tool for rapid evaluation of the patient's overall status: it includes: **appearance, work of breathing, and circulation to skin.**
  - Tachypnea in children must be evaluated relative to age norms and is often a sign of increased metabolic demands. A child with tachypnea despite normothermia should be evaluated for respiratory and non-respiratory causes (eg, hypoperfusion, acidemia).
  - Maintenance of a neutral thermal environment is necessary for critically ill infants.
  - Child abuse should be considered when injuries are inconsistent with history, when details of the history change, or with certain injury patterns.
- Systems level pediatric policies, and recommended equipment, supplies, and medications are crucial for EDs that may see pediatric emergencies!
  - The family's presence should be encouraged for pediatric procedures and resuscitations.
  - A variety of pharmacologic and nonpharmacologic techniques are available to decrease procedural pain and anxiety (i.e. child life specialists)

### Episode overview

- 1) List age specific vital signs (RR, HR): "1 odd yr - 60 count down aid"
- 2) What is the lower fifth percentile of systolic BP for the neonate, infant, and 1-10 yr old child?
- 3) Describe the 3 components of the Pediatric Assessment Triangle.
- 4) Describe the Canadian Pediatric Triage and Acuity Scale
- 5) List 5 historical indicators of child abuse
- 6) List 5 features suggestive of child abuse on physical examination and/or radiology?

### Wisecracks

- 1) What are developmental milestones (gross motor and otherwise) for 1-24 months?
- 2) What are other considerations in the management of pediatric patients: consent, pediatric-readiness, pediatric-friendly ERs?



## Rosen's In Perspective:

There are a few physiologic/anatomic considerations unique to kids that we should keep in mind:

- Temperature regulation: **KEEP THEM COVERED AND WARM!**
  - **Rapid heat loss** (*larger surface area–to–mass ratio, resulting in more heat loss to the environment than in adolescents and adults.*)
  - **Takes more energy to stay warm** (*Maintenance of a stable body temperature can be a significant metabolic demand for young infants, especially those stressed by injury or illness.*)
- Airway
  - Here's the list we keep reviewing!

A helpful approach: think about the patient as you walk into the resus room preparing to intubate:

- 2 big: head, tongue
- 2 small: narrow easily blocked nasal airways, narrow cricoid,
- 2 short: airway (depth = 3 x ett), time to desaturation (less reserve)
- 2 tall: epiglottis/floppy, think tall (prepare, pep talk, pee)

First, after a pit-stop and pre-resus breathing/ “pep talk”, do that airway “pause”/checklist or whatever you do to bring the stress level and noise in the room down!!!

1. Big head:  
*The relatively larger occiput in infants and young children can cause neck flexion in the supine position, leading to potential airway obstruction. To open the airway, particularly during intubation attempts, a towel roll placed under the shoulders may be needed to align the laryngeal, pharyngeal, and oral airway axes*
2. Important, but easily clogged noses  
*In addition, airways in children are much smaller in diameter and much more easily obstructed with secretions. Because young infants preferentially breathe through their noses, respiratory distress can develop from copious nasal secretions. Thus, suctioning the nose and upper airway can dramatically diminish an infant's work of breathing.*
3. Big tongues  
*Infants and young children also have relatively large tongues, which may lead to airway obstruction during periods of changes in muscle tone, such as during a seizure. Use of a nasopharyngeal airway can alleviate the obstruction by allowing a clear passage of inhaled gases.*
4. Anterior larynx; floppy epiglottis  
*the pediatric larynx is more anterior and cephalad, and the epiglottis is composed of more flexible cartilage, making it floppy.*



- CV system
  - **Bradycardia and/or hypotension are OMINOUS, LATE SIGNS.**
  - *Children have the ability to increase their heart rate and vasoconstrict peripherally to shunt blood centrally. Hypotension is a late finding of shock in previously healthy children, and interventions should ideally occur before the onset of hypotension.*
  - **Watch out for unexplained tachycardia in the resting child**
- MSK system
  - More likely to # bones than sprain ligaments
  - The physis is the weakest part of a bone
  - Their bones remodel better than adult's bones
- Immune system
  - *Febrile infants younger than 1 month are a particularly high-risk group and have a 10% or higher rate of serious bacterial infection. For this reason, the evaluation of infants with fever differs from the evaluation of older children and adults; the evaluation varies by age and vaccination status.*
- Pharm. Considerations:
  - **Use the weight-based dosing system!**
  - *ceftriaxone is not recommended for infants younger than 28 days because it can displace bilirubin from albumin, leading to kernicterus or bilirubin-induced neurologic dysfunction (BIND)*

## Core questions

### 1) List age specific vital signs (RR, HR)

Look it up! These are the “max” - approximate

1-3-5-7-9-

6-5-4-3-2-

Age	RR	HR
<1 yr	60	160
3 y	50	150
5 y	40	140
7 y	30	130
9 y	20	120

Age (y)	RR	HR
<1	30-60	100-160
1-2	24-40	90-150
2-5	22-34	80-140
6-12	18-30	70-120
>12	12-16	60-100

By age 11 their vitals are essentially = to an adult's vital range. Check out this great web-page too (it lists HR by awake or sleeping, which is GOLD): <https://www.pedscases.com/pediatric-vital-signs-reference-chart>



2) What is the lower fifth percentile of systolic BP for the neonate, infant, and 1-10 yr old child?

60-70-(70+2\*age)

Age	Lower 5 <sup>th</sup> percentile of SBP
0-28 days	60 mmHg
1-12 months	70 mmHg
1-10 years	70 mmHg + (2*age in years)

3) Describe the 3 components of the Pediatric Assessment Triangle.

This is the “gestalt” or quick look from across the room. It’s the sick vs well determination! It is easy! We should know our “ABC’s”.

See Rosen’s Fig. 160.2 and Table 160.4 for more details, the ABCs are

- Appearance/gestalt look: TICLS (tone, irritable/interactive, consolable, look/gaze, speech/cry)
- work of **B**reathing: Sounds, HOUNDS
  - Head position,
  - bObbing
    - *Head bobbing (the use of neck muscles to assist respiration) and seesaw breathing (ineffective breathing pattern, in which the abdomen moves outward while the chest moves inward during inspiration) are signs of impending respiratory failure.*
  - Uncooperative
  - Nasal flaring
  - Drawing/retractions
    - suprasternal, supraclavicular, intercostal, and subcostal areas
  - Snoring / Seesaw
  - **“abnormal respiratory patterns may provide clues about a nonrespiratory illness. Effortless tachypnea may be a sign of shock from any cause, whereas deep rapid breathing without other auscultative findings may be compensation for a metabolic acidosis.”** - Rosen’s 9<sup>th</sup> edition, Ch 160
- Circulation to skin
  - PCPC (pallor, delayed cap refill, petechiae, cyanosis, mottling)
    - See Rosen’s Fig 160.5 for mottling vs. cutis marmorata
    - Cutis marmorata is a normal finding in young infants in a cool environment. In contrast to infants with mottling, infants with cutis marmorata will be otherwise well-appearing, and the skin findings will diminish or disappear if the infant is placed in a warm environment.



#### 4) Describe the Canadian Pediatric Triage and Acuity Scale

Check out this link for the PDF from the 2008 CJEM updated article:

[http://caep.ca/sites/caep.ca/files/caep/2008\\_revisions-to-the-canadian-triage-and-acuity-scale-paediatric-guidel.pdf](http://caep.ca/sites/caep.ca/files/caep/2008_revisions-to-the-canadian-triage-and-acuity-scale-paediatric-guidel.pdf)

- This is a specific consensus guideline that tailors the adult CTAS (Canadian Emergency Department Triage and Acuity Scale) to pediatric presentations to the ER
- It still uses the standard colour palettes:
  - *It adopts the adult poster colour palette for the CTAS level colour assignment: Level I – blue, Level II – red, Level III – yellow, Level IV – green, and Level V – white*
- It uses the “critical look”, first order modifiers (level of consciousness, respiratory rate and effort, and heart rate and circulatory status) and second order modifiers (temperature, pain, mechanism of injury and glucose) to calculate the CTAS score

This is used to help the triage nurse estimate:

- “What is this patient’s priority (urgency) to be seen?” and
- “How long can the patient safely wait?”

The reference ranges for paed CTAS can be found here:

<http://caep.ca/sites/caep.ca/files/caep/files/paedctas.pdf>

#### 5) List 5 historical indicators of child abuse

- They are:
  - History lacking in detail
  - Inconsistency – details change with repeated questioning
  - History inconsistent with child’s developmental status
  - Reported mechanism inconsistent with injury
- See Rosen’s Box 160.3 for the original
- Use those “spiny-senses” or trust your “gut” if something doesn’t seem right on history!
- Be sure to take that thorough history!

#### 6) List 5 features of suggestive of child abuse on physical examination and/or radiology?

- Any bruises in young precruising infants
- Patterned ecchymosis, burns, or skin marks (abrasions, lacerations)
- Bruises on the ears, trunk, inner thighs, neck, or groin
- Posterior oropharynx bruising or lacerations



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- Posterior rib fractures
- Classic metaphyseal fractures
- Any fracture in a nonambulatory child
- Fractures in different stages of healing

*Look for those patterns! (cigarette burns, hand prints, rope burns)*

## Wisecracks

### 1) What are developmental milestones (gross motor and otherwise) for 1-24 months?

Age (mo)	Gross motor	Fine, social, language
1 mo	Lifts head	Alert to sound and face
3 mo	Rolls over	Smiles, and recognises voices
6	Sits independently	babbles
9	Cruises	Single words
12	Walks	Two words
15	Goes up stairs	Four words
18	Runs	8 words
24	Goes down stairs	Sentences (2 word)

### 2) What are other considerations in the management of pediatric patients: consent, pediatric-readiness, pediatric-friendly ERs?

#### Consent

Much of the legality around pediatric consent is region-specific; but Rosen's includes a helpful discussion on the controversy around pediatric competence and consent:

*"If a condition that is threatening to life or health exists, treatment should be provided under the doctrine of implied consent. If an emergency medical condition is not suspected after a screening examination, non-emergent care should be delayed until guardian consent is obtained, unless the minor is legally able to consent for care." – Rosen's 9<sup>th</sup> ed*

The CMPA has a helpful article on the subject: <https://www.cmpa-acpm.ca/en/advice-publications/browse-articles/2014/can-a-child-provide-consent>. Here are a few excerpts:



*“The CMPA reviewed its medico-legal case files that closed between 2007 and 2012 involving patients between the ages of one and 18. There were 451 complaints to regulatory authorities (Colleges) involving child patients, and of these 55% resulted in an unfavourable medico-legal outcome for physicians.*

**Consent and communication issues featured prominently in these cases.**

**Age of consent** — *The legal age of majority has become largely irrelevant in determining when a young person may consent to his or her medical treatment. The concept of maturity has replaced chronological age, except in Québec, where the age of consent is 14 years and older.*

**How does a physician determine whether or not a child has the capacity to consent? By discussing with the child, the physician should be reasonably confident that the child understands the nature of the proposed treatment and its anticipated effect.** *The child should also understand the consequences of refusing treatment. One way to gauge this capacity is to use the teach-back technique: ask the child to re-phrase what they have just been told and invite the child to ask questions. More complex medical situations may require more rigour in determining whether the child understands. It is prudent for physicians to also encourage the child to invite a family member to attend the discussion.”*

*“The Canadian Paediatric Society requires that the minor demonstrate comprehension of the magnitude of the intervention, the probabilities of harm and benefit, and the consequences of consent or refusal. The American Academy of Pediatrics policy statement emphasizes that a minor's choice must be voluntary and rational.” - Royal College of Canada*

*“but minors can generally consent if they are emancipated or if they are seeking treatment for mental health issues, drug or alcohol abuse, contraception, pregnancy, or testing for or treatment of sexually transmitted infections.” - Rosen's 9<sup>th</sup> edition*

### **Paediatric readiness**

If you work in a shop that rarely sees children, or in a rural centre - you should have a preparedness plan to get ready for the sick child who may walk through your doors!

Here's a great website and toolkit that lists the recommended supplies and medications you should have available!

<https://emscimprovement.center/projects/pediatricreadiness/readiness-toolkit/equipment-supplies-oand-medications/>

<https://emscimprovement.center/projects/pediatricreadiness/>

Here's how the above project got started: <https://www.aap.org/en-us/about-the-aap/aap-press-room/Pages/Emergency-Departments-Improve-Readiness-to-Care-for-Children.aspx>

### **Pediatric friendly ERs**

*Appropriate use of sedation, anesthesia, analgesia, and nonpharmacologic methods of pain management can increase the patient's cooperation and increase visit satisfaction for the child*



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*and parent. Children have significant anxiety and fear surrounding medical procedures, leading to additional challenges in performing procedures successfully.*

*In addition to reducing pain and anxiety during the acute visit, adequate pain control is likely to have long-term benefits. Multiple studies have demonstrated that inadequate procedural pain control can lead to increased pain perception with future painful procedures.*

Evidence shows that it is usually therapeutic for families and parents to be present in the resuscitation room or during critical procedures.