

Disclosure Statement

- I have no financial relationships to disclose for this presentation.

Childhood Emergencies

Perspectives & Pitfalls

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PEMA

Pediatric Emergency Medicine Associates, LLC

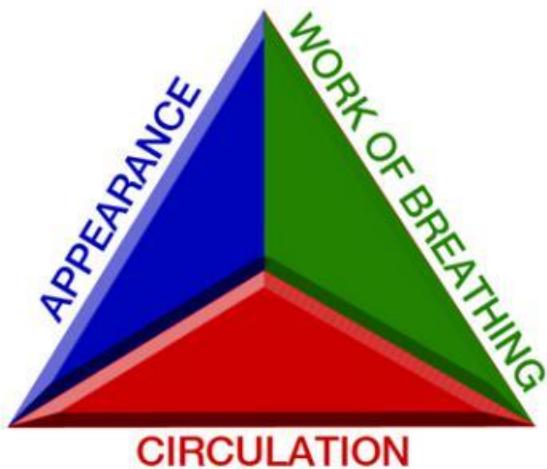
Objectives

- Assessment of the sick or injured child.
- Key differences in anatomy and physiology.
- Improving pre-hospital application of basic and advanced life support for kids.

Case 1 – Oh Baby...

- You are called for an 8 month old boy with “difficulty breathing”.
- When you arrive, the patient is being held by his mother, who is crying and intermittently yelling at her boyfriend. She says he was watching the baby while she went to the store.
- From what you can see, the patient seems to be breathing in a labored fashion and is a little dusky in color.
- The mom doesn’t seem to want to let go of her child as you approach her...

The Pediatric Assessment Triangle



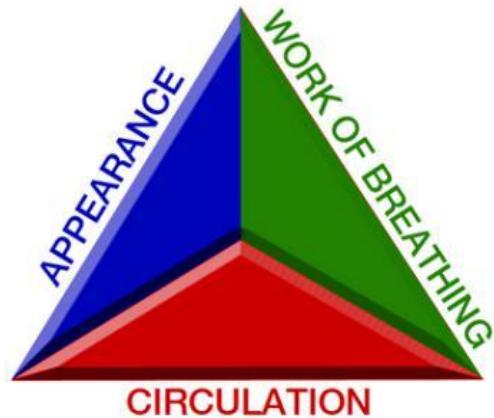
The Pediatric Assessment Triangle

Cry
Tone
Gaze
Consolability
Interactivity



The Pediatric Assessment Triangle

Cry
Tone
Gaze
Consolability
Interactiveness



Nasal Flaring
Positioning
Retractions
Breath Sounds

The Pediatric Assessment Triangle

Cry
Tone
Gaze
Consolability
Interactiveness



Nasal Flaring
Positioning
Retractions
Breath Sounds

Pallor
Mottling
Cyanosis

Case 1 – Oh Baby...

8 month old boy with “difficulty breathing”. Potentially hostile and dangerous environment.

Appearance

- No cry
- Limp tone

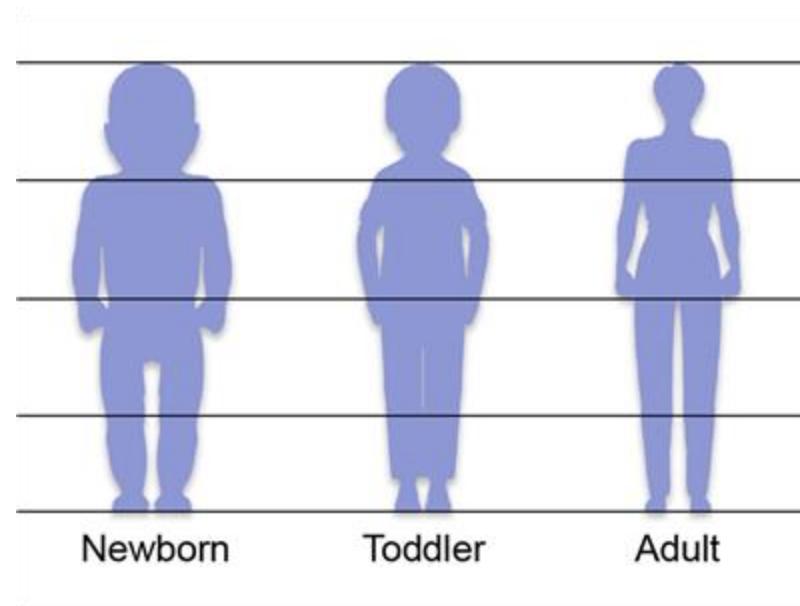
Breathing

- Noisy
- Retractions

Circulation

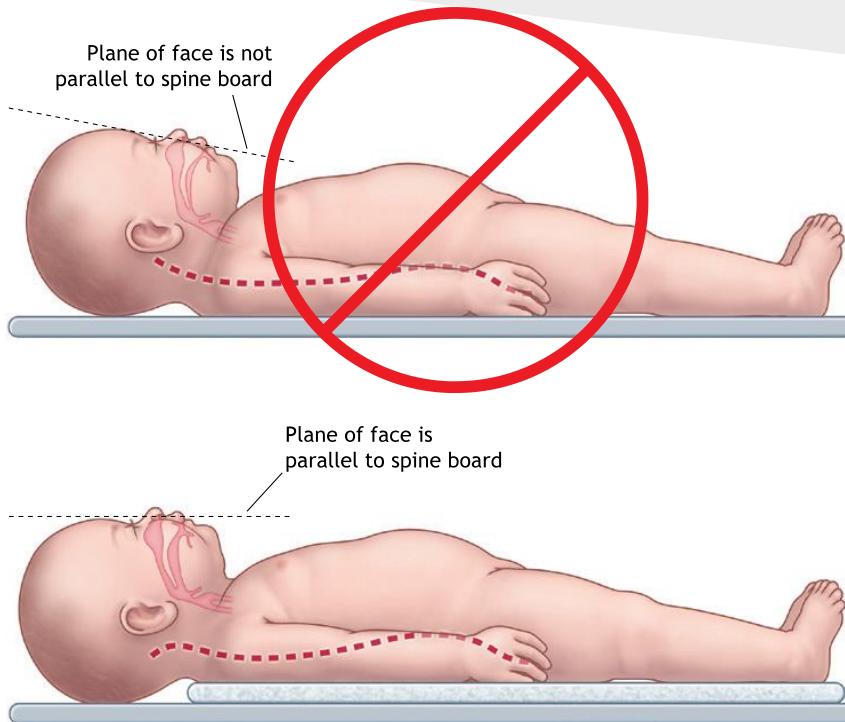
- Dusky Color
- Mottling

Anatomy & Physiology – Not Small Adults



Anatomy – Head, Neck & Airway

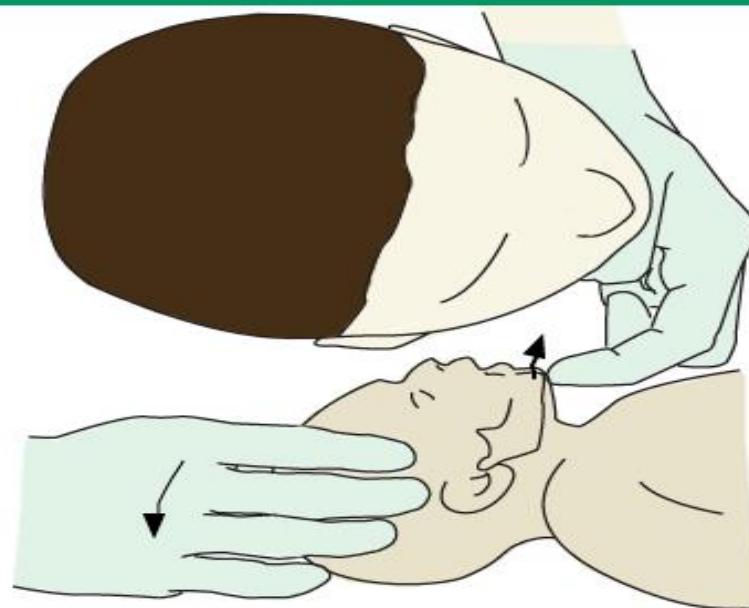
- Protuberant occiput
- Large tongue
- Airway shape
- Less bone and muscle
- More soft tissue



Anatomy – Airway basics matter!

- Nose breathers
- Simple steps
- Don't forget c-spine

Head-tilt/chin-lift maneuver



Anatomy – airway & ventilation pitfalls



Case 1 – Management & priorities

| Appearance | Breathing | Circulation |
|-------------|---------------|---------------|
| • No cry | • Noisy | • Dusky Color |
| • Limp tone | • Retractions | • Mottling |

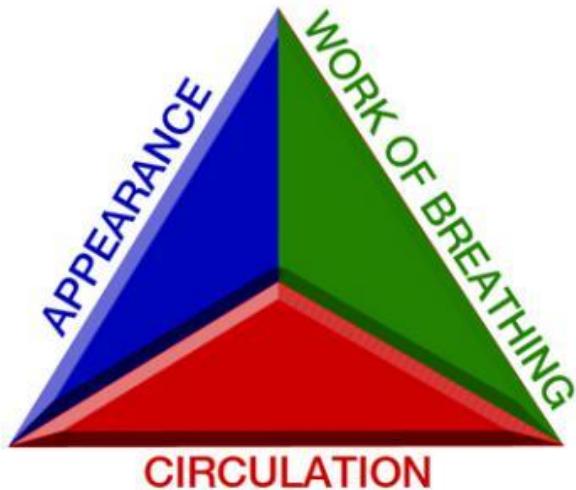
Management:

Scene safety → Stepwise intervention → Avoid further harm

Case 2 – “My child is choking...”

- You are called to the home of a 3 year old girl who woke up at 2 am and was choking, according to the mom.
- When you arrive, the child is leaning forward, crying and looking distressed. You can see retractions above her sternum and below her ribs.
- The mom tells you that she stuck her finger in her child's throat and “couldn't find anything blocking it”.
- Her color is good and she has high-pitched noise whenever she takes a breath in. You also notice a “barky” seal-like cough.

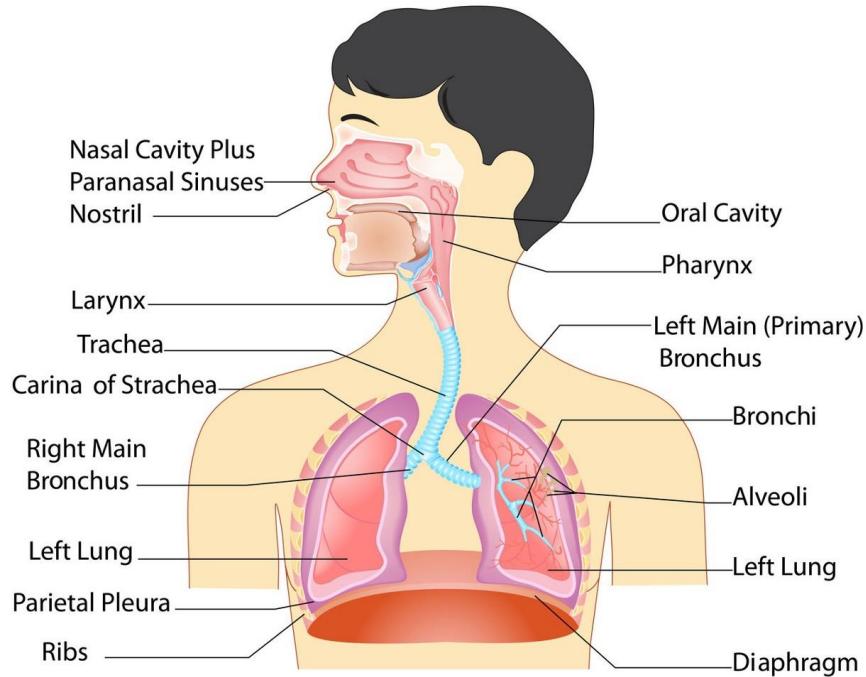
Case 2 – Assessment



- She's awake, but upset.
- Circulation seems good
- What can we learn from her pattern of breathing?

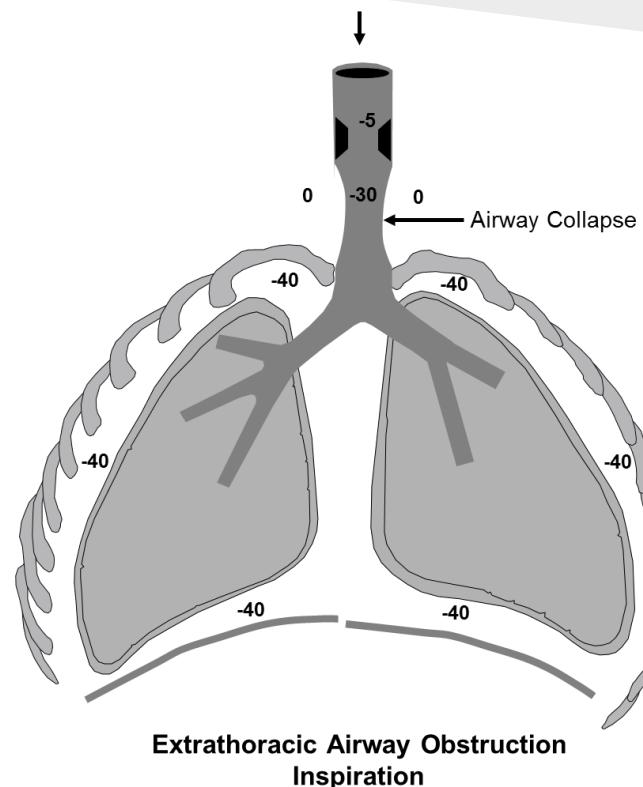
Anatomy – Airway & Breathing

- We breath – in and out.
- Advanced plumbing?
- Collapsible tubes.
- Airway divisions
 - 1) Extra-thoracic (upper) airway.
 - 2) Intra-thoracic (lower) airway.



Physiology – Upper airway obstruction

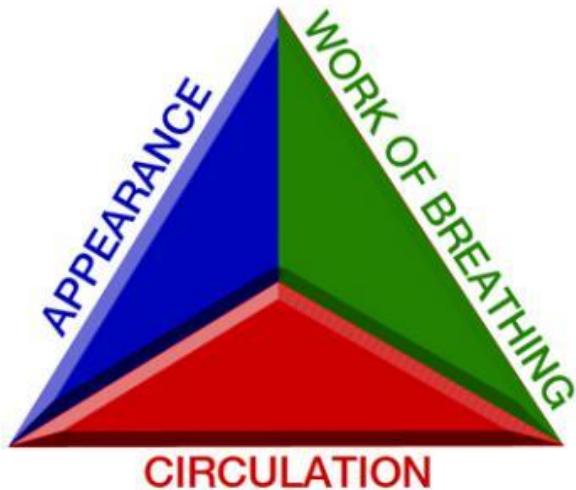
- What is stridor?
- What causes it?
- How do we treat?



Case 3 – The wheezy child...

- You're evaluating a 7 year old girl for an “asthma flare-up” which started suddenly while they were in the car.
- She's awake, looks pink and able to speak to you in partial sentences. Her breathing seems labored, but her color looks good, and she has a respiratory rate of about 30/min.
- She has intercostal retractions and seems to be wheezing on expiration.
- Assessment and intervention?

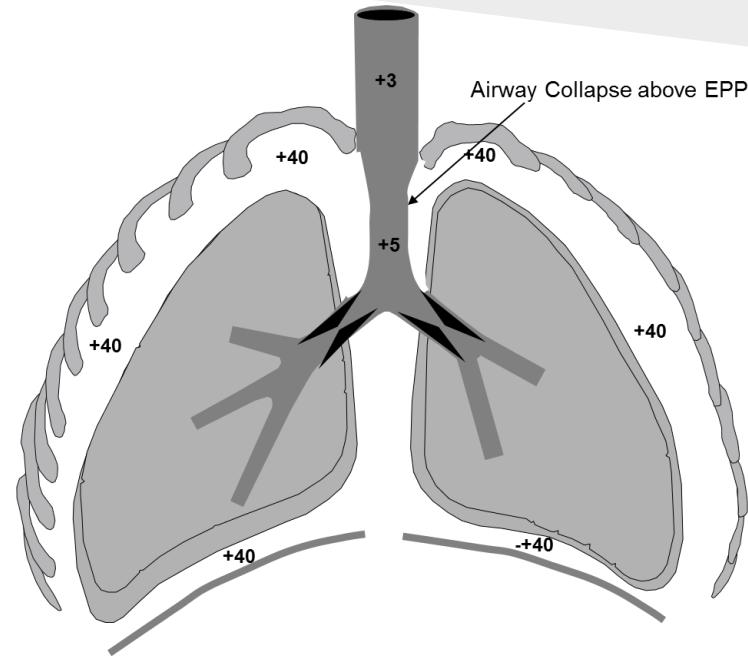
Case 3 – Assessment



- She's awake and speaks.
- Circulation seems good
- What can we learn from her pattern of breathing?

Physiology – Lower airway obstruction

- What is wheezing?
- What causes it?
- How do we treat?
- Wheezing isn't always asthma!!



Intrapulmonary Airway Obstruction
Expiration

Case 4 – Seizing 6 year old

- You're called to a school where a 6 year old girl is having a generalized seizure.
- There is a crowd around her as you approach and you notice that she's laying flat on the ground, has good color, but very sleepy in appearance.
- The teacher says the girl is healthy with no history of seizures.
- She doesn't seem to be seizing any more and has noisy breathing with subcostal retractions.

Case 4 – Assessment



- Sleepy and not very responsive.
- Labored breathing...is it a problem?
- Color is good.
- What next?

Seizures - Epidemiology

- Approximately 5% of all children will have a seizure by age 16...
- One of the most frequent reasons for ER evaluation

Seizures - what and why...

100 Billion Neurons

- Electrochemical reactions
- Normal Discharges

**Seizure = Abnormal, excessive
synchronous discharges**



Seizures - what and why...



In our internal environment...

“We all have a seizure threshold....”

Seizures - Classifying a seizure

Acute -- Non-recurrent

With Fever

Chronic -- Recurrent

Without Fever

Extracranial Infection

Intracranial Infection

Febrile Seizure

- What is source?

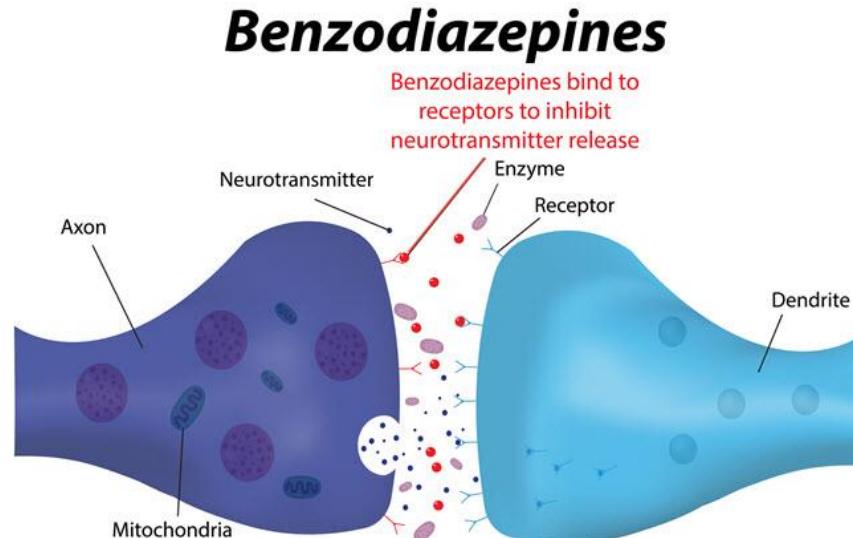
- Meningitis
- Encephalitis
- Abscess

- Toxic
- Metabolic
- Vascular
- Traumatic
- Hypoxic

Epilepsy

Seizures - Treatment

- Airway and ventilation support?
- What if she starts seizing again and you are 20 minutes away from ER?
- Treatment options?
 - 1) IV?
 - 2) Per rectum?
 - 3) Intranasal?



Case 5 – Peds versus auto...

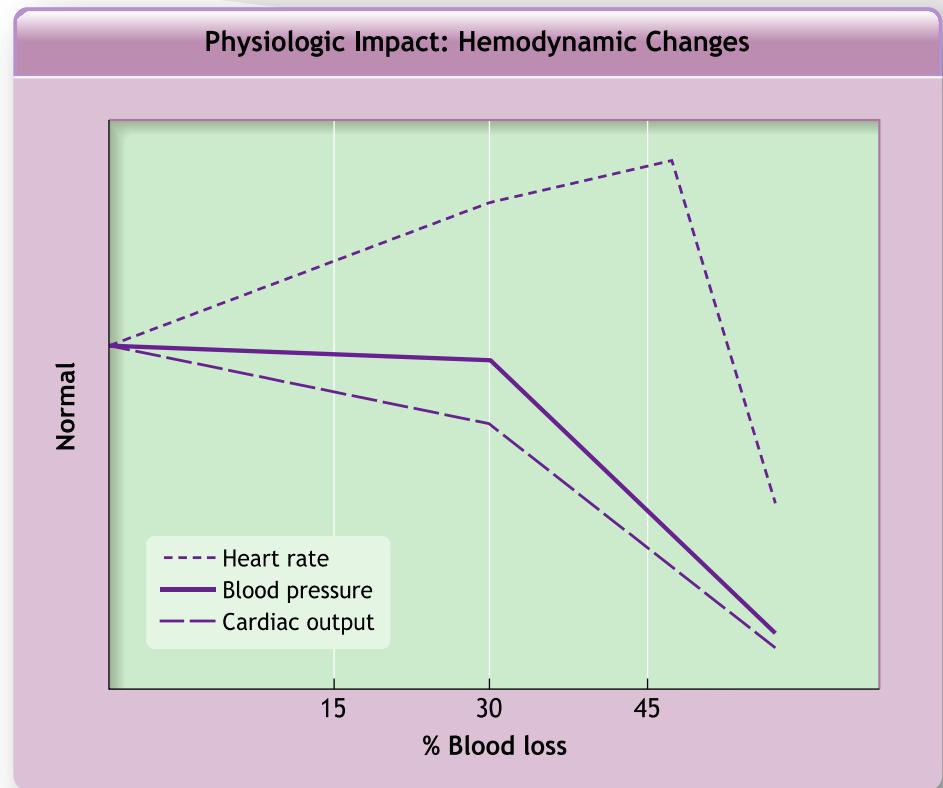
- A 6-year-old boy is struck by a moving car while riding his bicycle. He was not wearing a helmet.
- He is unresponsive when you get there. He's breathing rapidly, and looks pale with mottled extremities.
- He's moaning in pain but not responsive to you and he's making some posturing movement with his arms and legs.
- There are no obvious signs of external trauma...

Case 5 – Anatomy and physiology

- How seriously is he injured?
- What's your next priority?
- You obtain the following vitals: **HR 155, RR 38, BP 80/57**
- What should you be concerned about as you proceed?

Physiology – Kids can compensate

- In trauma and in sepsis, decompensation can be sudden!
- Kids can maintain fairly normal BP despite loss of 30% of their blood volume.



Physiology – Kids are different

Pediatric respiratory rate and heart rate by age*

| Age group | Respiratory rate | Heart rate |
|-----------------|---------------------------------|--|
| | Median (1st-99th percentile) | Median (1st-99th percentile) |
| 0 to 3 months | 43 (25-66) | 143 (107-181); term newborn at birth: 127 (90-164) |
| 3 to 6 months | 41 (24-64) | 140 (104-175) |
| 6 to 9 months | 39 (23-61) | 134 (98-168) |
| 9 to 12 months | 37 (22-58) | 128 (93-161) |
| 12 to 18 months | 35 (21-53) | 123 (88-156) |
| 18 to 24 months | 31 (19-46) | 116 (82-149) |
| 2 to 3 years | 28 (18-38) | 110 (76-142) |
| 3 to 4 years | 25 (17-33) | 104 (70-136) |
| 4 to 6 years | 23 (17-29) | 98 (65-131) |
| 6 to 8 years | 21 (16-27) | 91 (59-123) |
| 8 to 12 years | 19 (14-25) | 84 (52-115) |
| 12 to 15 years | 18 (12-23) | 78 (47-108) |
| 15 to 18 years | 16 (11-22) | 73 (43-104) |

* The respiratory and heart rates provided are based upon measurements in awake, healthy infants and children at rest. Many clinical findings besides the actual vital sign measurement must be taken into account when determining whether a specific vital sign is normal in an individual patient. Values for heart rate or respiratory rate that fall within normal limits for age may still represent abnormal findings that are caused by underlying disease in a particular infant or child.

Data from: Fleming S, Thompson M, Stevens R, et al. Normal ranges of heart rate and respiratory rate in children from birth to 18 years of age: a systematic review of observational studies. Lancet 2011; 377:1011.

Normal blood pressure in children: 50th to 90th percentiles

| Age | Systolic pressure, mm Hg | Diastolic pressure, mm Hg |
|-----------------------------|-----------------------------|------------------------------|
| Birth, 12 hours, <1000 g | 39-59 | 16-36 |
| Birth, 12 hours, 3 kg | 50-70 | 25-45 |
| Neonate, 96 hours | 60-90 | 20-60 |
| Infant, 6 months | 87-105 | 53-66 |
| Toddler, 2 years | 95-105 | 53-66 |
| School age, 7 years | 97-112 | 57-71 |
| Adolescent, 15 years | 112-128 | 66-88 |

Physiology – Different measurements

| PEDIATRIC GLASGOW COMA SCALE (PGCS) | | | | |
|--|---|---|--|---|
| | > 1 Year | < 1 Year | Score | |
| EYE OPENING | Spontaneously | Spontaneously | 4 | |
| | To verbal command | To shout | 3 | |
| | To pain | To pain | 2 | |
| | No response | No response | 1 | |
| MOTOR RESPONSE | Obeys | Spontaneous | 6 | |
| | Localizes pain | Localizes pain | 5 | |
| | Flexion-withdrawal | Flexion-withdrawal | 4 | |
| | Flexion-abnormal (decorticate rigidity) | Flexion-abnormal (decorticate rigidity) | 3 | |
| | Extension (decerebrate rigidity) | Extension (decerebrate rigidity) | 2 | |
| | No response | No response | 1 | |
| | > 5 Years | 2-5 Years | 0-23 months | |
| VERBAL RESPONSE | Oriented | Appropriate words/phrases | Smiles/coos appropriately | 5 |
| | Disoriented/confused | Inappropriate words | Cries and is consolable | 4 |
| | Inappropriate words | Persistent cries and screams | Persistent inappropriate crying and/or screaming | 3 |
| | Incomprehensible sounds | Grunts | Grunts, agitated, and restless | 2 |
| | No response | No response | No response | 1 |
| TOTAL PEDIATRIC GLASGOW COMA SCORE (3-15): | | | | |

Case 6 – Fever and “not acting right...”

- You arrive at the home of a 3 year old boy who has a fever and is “very sleepy” per his mother.
- He has never been vaccinated and she says he’s been acting tired for about 36 hours.
- You approach the child and notice that he indeed looks lethargic and is breathing fast – rapid and shallow. He’s also covered in a rash.

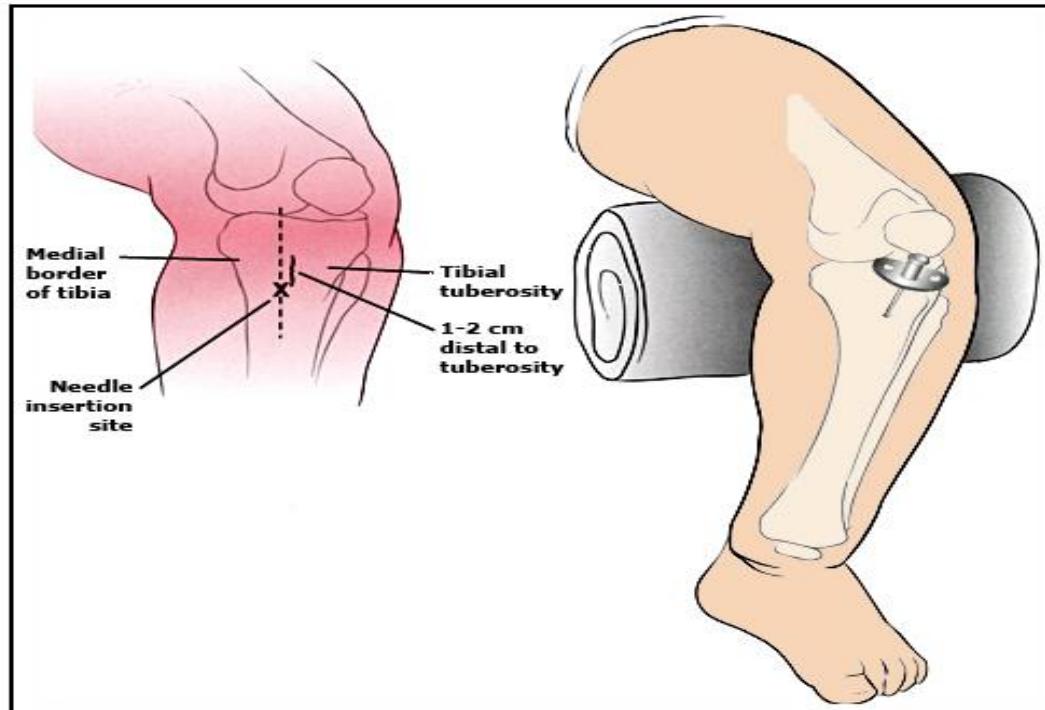
Case 6 – Fever and “not acting right...”

- What are your priorities?
- He's breathing spontaneously and pulse ox is about 96% on 100% oxygen non-rebreather.
- You have a hard time getting IV access. What next?



Intraosseous Access

Proximal tibial intraosseous access site



Fever in kids

- Generally, fever is not an emergent problem.
- Much more common in kids compared to adults.
- In healthy kids with benign conditions, fever can cause tachycardia as well as “sick appearance”.

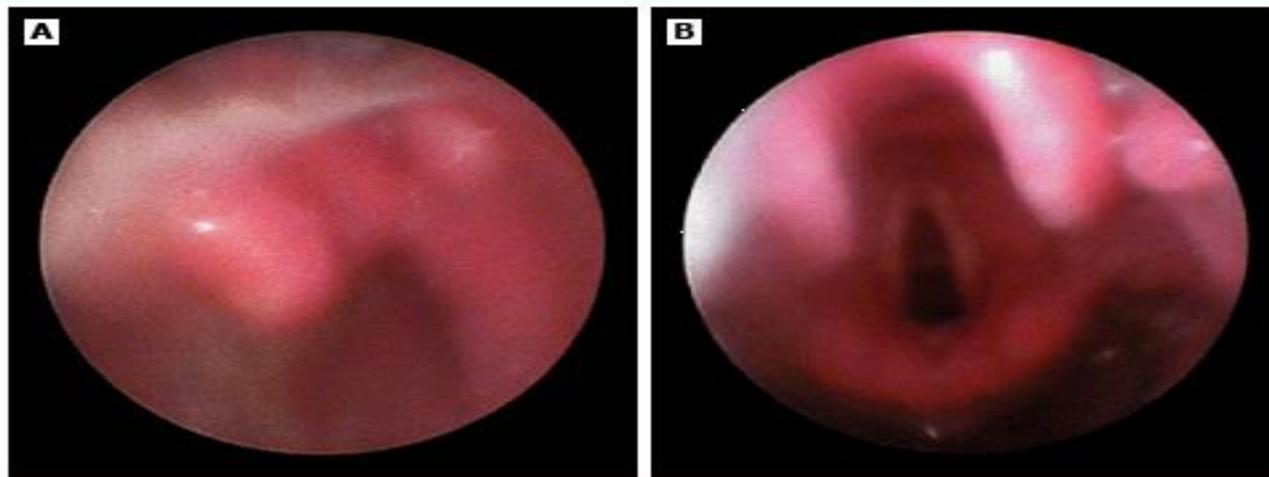
Case 1 – Revisited

- Difficulty breathing can be almost anything.
- Primary respiratory problem, seizure, trauma, metabolic disorder, infection, cardiac, etc.

Final thoughts

- Be flexible and keep an open mind.
- Physiology rules!!
- Use the Pediatric Assessment Triangle to help guide how you need to intervene.

View of glottis with and without external laryngeal manipulation



ELM improves the glottic view in more than 50 percent of patients with inadequate initial views. The photos show the view of the glottis without (A) and with (B) ELM.

ELM: external laryngeal manipulation.

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Bimanual laryngoscopy in a child



While performing direct laryngoscopy, the laryngoscopist uses the right hand to sweep the thyroid cartilage to the right and upward until the optimal glottis view is obtained. At that point, the laryngoscopist instructs an assistant to place their fingers in the exact same spot and apply the same direction and degree of force so that the endotracheal tube can be placed.

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