London Health Sciences Centre
Southwest Ontario Regional Base Hospital Program

Pediatric Respiratory Distress

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Objectives

- **Discuss epidemiology & causes of respiratory distress in pediatric patients**
- **Identify differences between the pediatric and adult airways**
- **Correctly apply the Advance Life Support Patient Care standards in this patient population**
- **Discuss benefits and risks of common pre-hospital treatments for pediatric respiratory distress (i.e. Epi, Salbutamol, Intubation).**

Case

- 3 year old male.
- CC: "Breathing Problems"
- HPI:
  - Unwell with URTI symptoms earlier today
  - Woke up from sleep with increased W.O.B, "noisy" breathing"
- PMHX:
  - Healthy
- Meds:
  - None
- Allergies:
  - None

On scene

- You and your partner arrive on scene
- Cats x 6
- + Cigarette smoke

- Kid looks slightly pale, exhibiting increased WOB (TT, SCM use, IC/SC indrawing) when distressed, hoarse voice. Distress minimal when with mom.

- HR 150, RR 28, O2 sat-93%, BP 78/40, T 38.5
- ……..now what?

EPIDEMIOLOGY AND COMMON CAUSES OF PEDIATRIC RESPIRATORY DISTRESS

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Pediatric Respiratory Distress

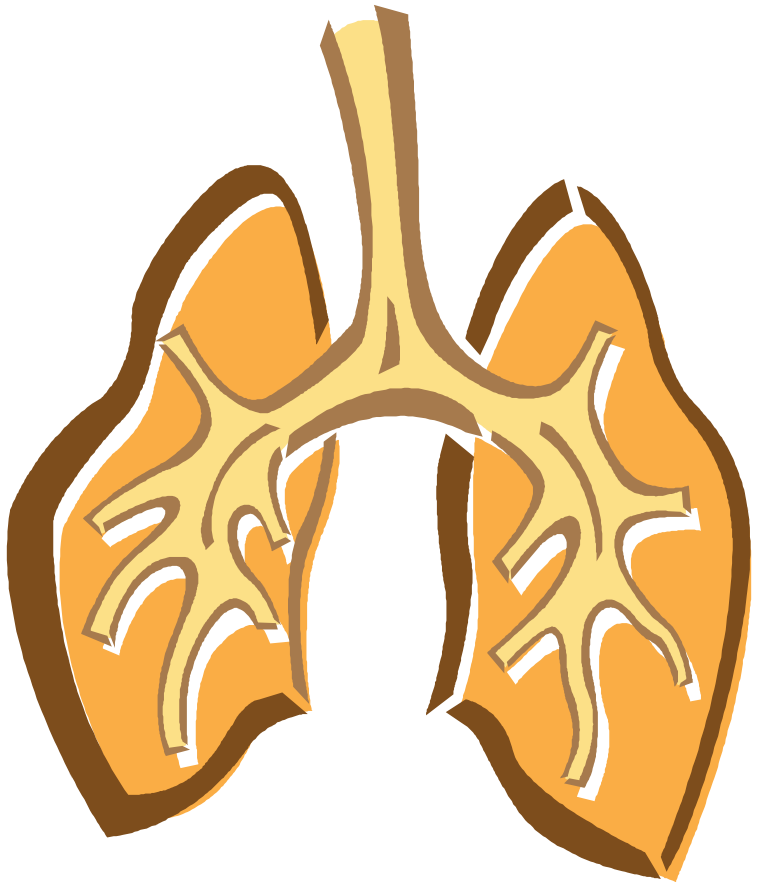
- A common “chief complaint”
- Accounts for ~10% of pediatric emergency department visits
- Important cause for hospitalization:
  - ~20–30% of admissions to the PCCU
- Important cause of mortality:
  - One of the top 5 causes of death in pediatric patients
  - ~20% of infant deaths

Respiratory Distress – features

- Respiratory Distress – look for:
  - Increased work of breathing
    - Nasal flaring
    - Tracheal Tub
    - Intercostal Indrawing
    - Subcostal indrawing
- Abnormal Rhythm
  - i.e. Gasping
- Abnormal Rate
  - Too fast
  - Too slow

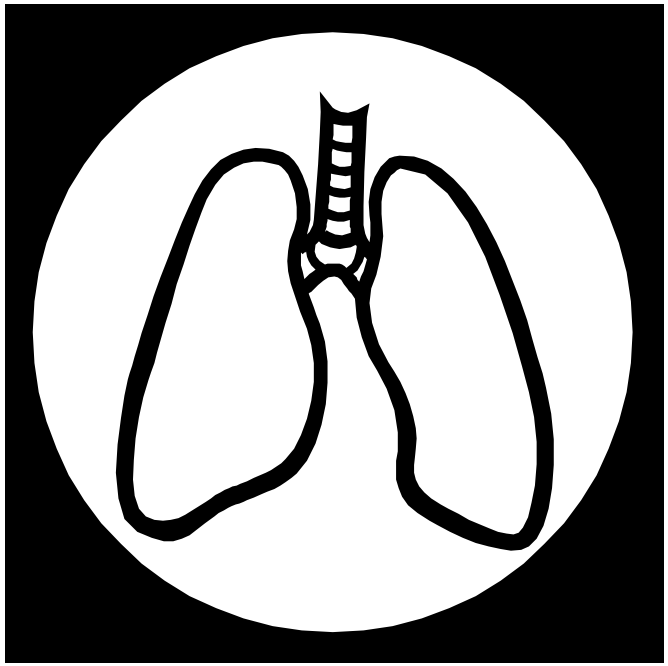
Causes of Shortness of Breath

- Airway
- Respiratory System/ Lungs
- Cardiovascular System
- Miscellaneous:
  - Metabolic
  - Anemia
  - Hyperventilation
  - Poisoning
  - CNS problem (i.e. Guillian Barre)



Airway

- Obstruction
  - Foreign body
  - Angioedema
  - Anaphalaxis
- Infectious
  - Croup – viral
  - Epiglottitis
  - Abscess
  - Other – i.e. Diptheria
- Trauma



Breathing

- Infectious:
  - Pneumonia – bacterial/viral
  - Croup – (laryngotracheobronchitis)
  - Bronchiolitis
- Idiopathic:
  - Asthma
  - "Reactive Airways Disease"
  - Pneumothorax
- Traumatic:
  - Pneumothorax (tension or simple)
  - Hemothorax +/- Rib Fractures/Flail Chest
  - Pulmonary Contusion

Cardiac

- Arrhythmias:
  - SVT – HR >220 bpm, no “P waves”
- Congenital Cardiac Anomalies with heart failure:
  - Present with “Tachy, Tachy, Megaly, Megaly”
    - Tachycardia
    - Tachypnea
    - Cardiomegaly
    - Hepatomegaly
  - Usually < 1 year of age.

DIFFERENCES BETWEEN PEDIATRIC AND ADULT AIRWAYS

Why can children be scary?

- Fatigue easily & decompensate quickly
- Small airways
  - High resistance!
  - Lower residual capacity
- High metabolisms – so need a lot of O2
- Inadequate compensatory mechanisms
  - Chest wall not very muscular
  - Have trouble increasing Tidal Volume

Uptodate, 2011

Why can children be scary?

- Decreased respiratory reserve
- Infants are “nose breathers”, block nose = resp. distress

Also:

- Their anatomy = different than adults

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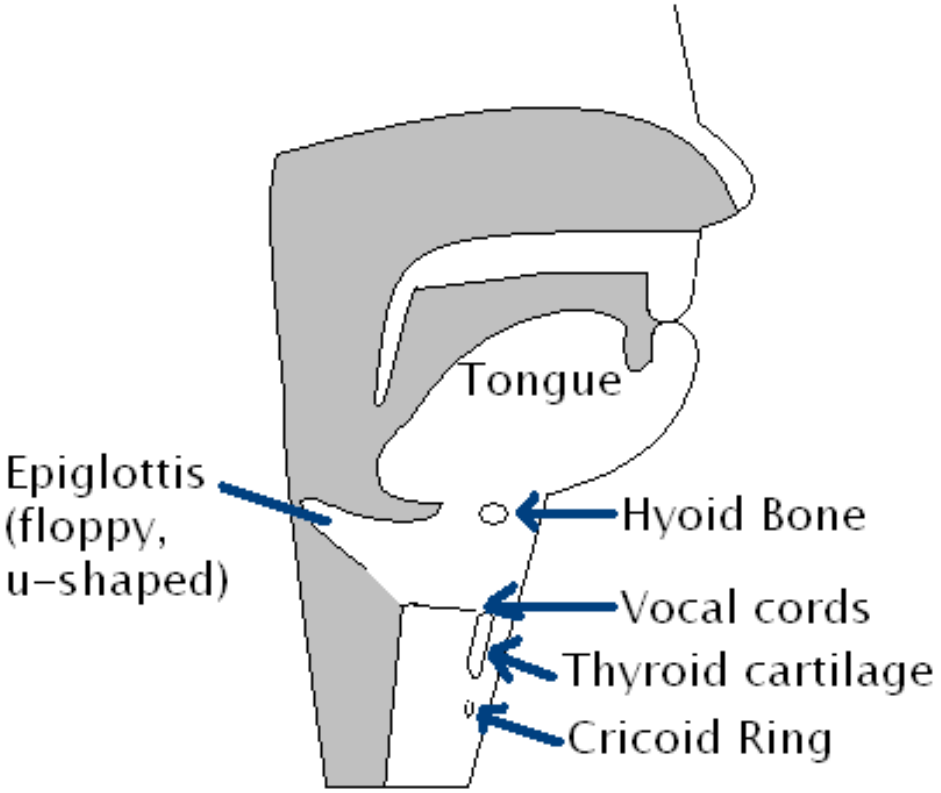
Airway Anatomy: Child

Children's Airway Considerations

- Head – large occiput
- Tongue – relatively large
- Adenoids +tonsils = big
- Epiglottis – floppy, omega shaped
- Narrowest portion – cricoid ring



Prominent occiput

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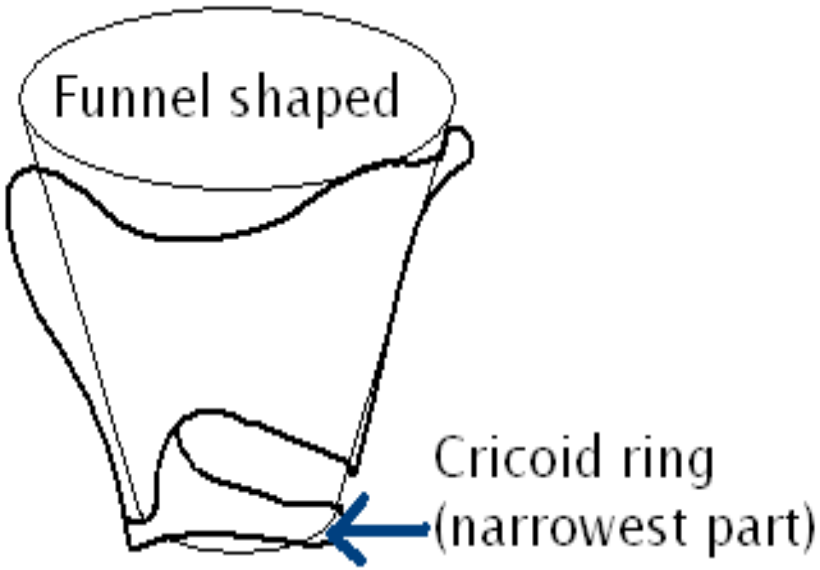
Nagler, J., Wang, V. J., Stack, A. M., Willey, J. F. Airway management in children: Unique pediatric considerations. UpToDate. Last Updated: April 7, 2011. Retrieved: October 18, 2011. From: http://www.uptodate.com

Respiratory Anatomy

- Larynx:
  - High and anterior (C3-4) in children vs. C4-5 in adults
- Trachea:
  - Compressible
  - Narrow
  - "Sniff Position" in infants is preferred



…back to our case

- You sit the child in the back of the truck and note progressive increased work of breathing as well as a loud “Barky” cough

BASIC AND ADVANCE LIFE SUPPORT PATIENT CARE STANDARDS

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Croup

History of URTI

AND

"Barking Cough" & "Stridor" at rest with "severe respiratory distress"

AND

HR < 200 bpm

And

< 8 years

- Treat with 100% oxygen, NEB EPI (1:1000) @ 6-8Lpm according to weight
- Vital signs q5min

Croup & Croup Score

- What is “Severe respiratory Distress?”
- Two common severity scales:
  - Alberta Clinical Practice Guideline Working Group
  - Westley score

Alberta Croup Severity Scale

- Mild :
  - occasional bark, no stridor at rest, minimal/no retractions
- Moderate:
  - frequent bark, stridor at rest, increased WOB at rest, no/mild agitation
- Severe:
  - above with agitation, may have insp and expiratory stridor
- Impending Failure:
  - severe + lethargy

Alberta Medical Association , 2003

Westley croup score

	0	1	2	3
Insp. Stridor	None	With Agitation	At rest	--
Retractions	None	Mild	Moderate	Severe
Air Entry	Normal	Mild dec.	Marked Dec	--
LOC	Normal	Depressed LOC + 5		
Cyanosis	None	With Agitation + 4, At rest +5		

Total Score:

< 3 points = Mild

3-6 points = Moderate

>6 points = Severe

Westley et al. 1978

SOB/ Respiratory Distress

- Respiratory Distress AND Wheezing

Treatment:

- 100% O2
- CR monitoring + O2 sat monitor
- Salbutamol
  - MDI: 6puffs <25kg OR 8 puffs if >25kg
  - NEB if – afebrile, "SRI", < 1yr, neurologic disease, severely ill.
- Transport to hospital

SOB/Respiratory Distress

- Vitals q5min
- If not significantly better – can repeat x 2

Beware the "SILENT CHEST"

- Very severe bronchoconstriction = no wheeze
- Consider Epi!
- Follow Mod –to–Severe protocol

BENEFITS AND RISKS OF COMMON PRE-HOSPITAL TREATMENTS

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Epinephrine

- Indications:
  - Cardiac Arrest
  - Asystole/PEA
  - Pulseless VT/VF (after failed defib).
  - Bradycardia
  - Bronchodilation
  - Anaphalaxis
  - Moderate-Severe Respiratory Distress

- Routes:
  - S/C, IM, ETT, inhalation

Neonatal Lexi-Drugs Online, 2011

Epinephrine

- Pathophysiology:
  - Stimulates α and β1adrenergic receptors
    - Increased HR and BP
  - Stimulates β2 receptors
    - Relaxation of bronchial smooth muscle
  - Large doses:
    - Stimulate skeletal and vascular smooth muscle contraction
    - HTN
- Effects occur within:
  - 1 minute for inhalational forms
  - ~5-10 minutes for subcutaneous

Epinephrine

- Contraindications:
  - Life-threatening situation: no contraindications
  - Non-life threatening:
    - Hypersensitivity
    - Cardiac arrhythimas
    - Acute angle-closure glaucoma
  - Note: may raise Glucose levels in diabetics

Neonatal Lexi-Drugs Online, 2011

Salbutamol

- Indications:
  - Asthma
  - Exercise-induced bronchospasm
- Routes:
  - Inhalation, MDI, Oral (not recommended), IV (ICU)
- Pathophysiology:
  - Acts on B2 receptors to induce bronchial smooth muscle relaxation

Neonatal Lexi-Drugs Online, 2011

Salbutamol

- Side Effects:
  - Tachycardia
  - Tremors
  - Insomnia
  - Hyperactivity
  - Others

Contraindications:

- Allergy to Salbutamol

Neonatal Lexi-Drugs Online, 2011

Mod -to-Severe Asthma Protocol

- Severe SOB from suspected asthma AND requiring BVM AND/OR severe agitation, confusion, cyanosis
- History of Asthma

Treatment:

- O2 + BVM (if necessary)
- CV monitor + O2 sat monitoring
- EPI (1:1000) SC/IM (0.05mg to 0.5mg – wt based).

…back to our case

- You administered nebulized epinephrine as per Croup Protocol.

- The child now appears very pale, RR 8, poor respiratory effort, O2 saturation 88%

Intubation

- Indications:
  - Inadequate oxygenation or ventilation
  - Inability to maintain airway
  - Inability to protect airway
  - Potential for deterioration (i.e. burn victim, overdose).

…to name a few…

Uptodate, 2010

Considerations

- May be difficult to assess airway
  - i.e. Mouth opening, Mallampati score
- Should look for signs of possible difficult airway:
  - Retrognathia (i.e Pierre Robin Sequence – large tongue, small chin)
  - Cleft – lip/Palate
  - Down syndrome
    - Low tone, Atlantoaxial instability

Uptodate, 2010

Intubation

- RSI medications
  - Atropine as pre-medication <5 years
  - Sedative + Paralytic
- Infants:
  - Should roll
  - “Sniff Position”
- Tube:
  - Neonates : 3.5
  - Uncuffed Tube Size: (Age/4) + 4
  - Cuffed Tube Size: (Age/4) + 3
- Insertion Depth:
  - Tube size x 3 at teeth

Uptodate, 2010

Complications:

- Failed Intubation
  - "Failed" after 3 attempts
- Tube Problems – displacement, obstruction, in esophagus
- Trauma – local, barotrauma
- Pneumothorax
- Aspiration Pneumonia – vomiting, gastric distension
- Hypoxia
- Bradycardia

Uptodate, 2010

Summary

- "Kids are not small adults"
  - Unique anatomy
  - Unique pathophysiology
- Respiratory Distress – has many causes
  - Not just croup & asthma – even though these are common
- Epinephrine, Ventolin – not without side-effects, however, benefits generally outweigh risk.

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