LEARNING OBJECTIVES

At the conclusion of this activity, participants will be able to:

- Recognize different disease processes in children that lead to respiratory emergencies
- Assess the pediatric airway and how to apply it in children
- Identify and manage pediatric airway obstructions
- Describe common pitfalls when endotracheally intubating children
- Avoid and recognize potential airway failure and catastrophic consequences

Pediatric Respiratory Emergencies

Little kids tryna make sure you see them coughing

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Causes of Pediatric Respiratory Failure

- Asthma
- Bronchiolitis
- Croup
- FB aspiration
- Pneumonia
- Retropharyngeal Abscess
- Peritonsillar abscess
- Epiglottitis
- Bacterial Tracheitis

How to approach every sick patient

1. Sick or not sick?
2. ABCs
3. Clinical assessment
4. Working diagnosis
5. Interventions
6. Reassessment
   * Phone a friend
Sick or not Sick?

- Pediatric Assessment Triangle

**CHECKLIST**

- ABCs

**ABCs**

- “Follow your ABCs”
- Know the airway
  - Stabilize the airway
  - Unstable/maintainable airway
  - Unstable/unmaintainable airway
- Oxygen if hypoxic
- BVM, intubate
- IV, IO
Clinical Assessment

• History
  • What happened
  • Onset of symptom
  • Severity
  • Home interventions
  • Past medical history
  • Medications
  • Allergies
  • Immunizations

• Exam
  • Alertness
  • Respiratory effort
  • Color
  • Vital Signs
    • Respiratory Rate
    • Pulse ox
  • Examine with shirt off
  • Retractions
  • Asymmetric chest rise
  • Listen
  • Auscultation

• Working Diagnosis
**Working Diagnosis**
- Asthma
- Bronchiolitis
- Croup
- FB aspiration
- Anaphylaxis
- Pneumonia
- Retropharyngeal Abscess
- Peritonsillar abscess
- Epiglottitis
- Bacterial Tracheitis
- Non Respiratory Diagnosis

**Interventions (based on diagnosis)**
- Airway support
  - Positioning
  - Suctioning
  - Oxygen
  - Non-visualized airway
  - Intubation
- Medications
  - Albuterol
  - Racemic Epinephrine
  - Steroids
Reassessment

- ABC again
- Improvement?
- Possibly another cause?
- Repeat interventions?

Phone a friend

- Protocol
- Your partner
- Medical control
- Call ED/Pediatric ED
Case 1
• 4 month old with nasal congestion for 2-3 days, breathing harder and not taking bottles
  • Ex-32 weeker
  • Decreased PO intake
  • Decreased UOP
  • Cranky but consoleable
  • Alert but in moderate distress
  • Temp=38C, HR=180, RR=64, Sats=90%
  • Dry mucous membranes
  • Severe nasal congestion and coughing
  • Decreased air entry with rhonch throughout
  • Moderate intercostal and subcostal retractions

Bronchiolitis
• Viral infection of medium to small airways
• This is NOT Bronchitis
• Majority of cases (>85%) caused by RSV
• Peaks in winter to spring in WNY
• Birth to 2 years of age have clinical symptoms
  • URI
  • Tachypnea, (wheezing) rhochi, retractions, nasal flaring
  • Grunting
  • Apnea in younger age
  • Typically lasts 7-10 days
    • Most kids worst at 3-5 days
Bronchiolitis Treatment

- Nasal suctioning
- Hydration
- Albuterol vs hypertonic saline vs racemic epinephrine
- Oxygen
  - NC
  - HFNCl-start at 2L/kg
- Intubation and MV
  - "Pitfall #1 intubating a bronchiolitic
  - Patients often need increased PEEP to re-recruit collapsed alveoli

Case 2

- 3 year old with respiratory distress for 1 day with noisy breathing and retractions
  - Hx of wheezing
  - Currently taking albuterol prn
  - Exposed to second hand smoke at a family event
  - Albuterol given by mom without effect
  - Alert but in moderate distress
  - Temp 36C, HR=155, RR=44, Sats=93%
  - Decreased BS throughout with moderate wheezing
  - Minimal intercostal retractions

Asthma

- Classics signs/symptoms are:
  - Recurrent wheezing
  - Coughing (especially nighttime)
  - SOB
  - Chest tightness
- Affects bronchus and bronchioles
- Reversible airway obstruction
  - Bronchospasm
  - Inflammation
  - Mucous production
Asthma Risk Factors

Risk Factors for Status Asthmaticus

Medical Factors
- Previous asthma attack within 24 hours
- Admission to ICU
- Respiratory failure and mechanical ventilation
- Severe or syncope
- Hypoxemia ($\text{PaO}_2 < 45 \text{ mmHg}$)
- High consumption of $\beta$-agonics MDI (>2 canisters per month)
- Use of corticosteroid therapy

Psychosocial Factors
- Denial of or failure to perceive severity of illness
- Associated depression or other psychiatric disorder
- Nonadherence
- Dysfunctional family unit
- Inner-city residents

Ethnic Factors
- Nonwhite children (Black, Hispanic, others)
**Asthma Treatment**
- Position of comfort
- Albuterol
- Oxygen
- Steroids
- Magnesium Sulfate
- Epinephrine
- BiPAP
- Negative Pressure Ventilation
- Ketamine
- Heliox
- Terbutaline
- Intubation and MV
  - Pitfall #2 intubating an asthmatic
    - Need more preload (volume is your friend)
    - May not exhale CO2 right away
    - Be patient when waiting for exhaled CO2 confirmation of placement

**Case 3**
- 3 year old with 2 days of URI now with fever, barky cough
  - Woke up with stridor and barky cough
  - Vomited with coughing
  - Doorling a lot so mom brought in to ED
  - Alert but irritable, drooling, tripod position
  - Temp=39°C, HR=180, RR=60, Sats=94%
  - Audible marked inspiratory stridor
  - Severe suprasternal retractions
  - Occasional barky cough
  - Good air entry

**Croup**
- Viral infection of upper airway
  - Causes subglottic edema
- Viral etiology (parainfluenza type 1 and 2)
- Usually in fall and winter months (children 3 months to 3 years)
- Barky cough and stridor are classic findings
- Fevers very common
**Croup Treatment**

- Cool air
- Nebulized epinephrine (if retracting)
- Steroids
- Oxygen (if needed)
- Intubation and MV

*Pitfall #3 intubating a crouper*
- Subglottic edema can cause stenosis (bring ETT 1 and 2 sizes below what you think you would need)
- Always use a cuffed tube

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**Comparison Table**

<table>
<thead>
<tr>
<th></th>
<th>Asthma</th>
<th>Bronchiolitis</th>
<th>Croup</th>
<th>Foreign Body</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age Group</strong></td>
<td>&gt; 2 yrs</td>
<td>Birth-2 yrs</td>
<td>3 mo-3 yrs</td>
<td>Up to 3 yrs</td>
</tr>
<tr>
<td><strong>Cause</strong></td>
<td>Allergen, infection, other etiologies</td>
<td>Viral infection (RSV, Rhinovirus, HMPV)</td>
<td>Viral infection (parainfluenza)</td>
<td>Foreign body</td>
</tr>
<tr>
<td><strong>Structure Affected</strong></td>
<td>Bronchus or bronchioles</td>
<td>Bronchioles</td>
<td>Subglottic area</td>
<td>Pharynx to bronchus</td>
</tr>
<tr>
<td><strong>Findings</strong></td>
<td>Dyspnea, wheezing, no aeration (absent BS)</td>
<td>Nasal congestion, retractions, stridor, ? wheezing, decreased BS</td>
<td>Barky cough, stridor, suprasternal retractions</td>
<td>? choking, ? coughing, ? dyspnea</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>Varies</td>
<td>Gradual over days</td>
<td>1-2 day hrs of URI</td>
<td>Acute onset</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>O2, Albuterol, steroids</td>
<td>Aggressive nasal suctioning, O2, supportive treatment (BND albuterol)</td>
<td>Cool air, nebulized epinephrine</td>
<td>O2, supportive care, removal of FB</td>
</tr>
</tbody>
</table>
Interventions-Intubation

• Choose an appropriate size ETT

AGE

4

+ 4

*Cheater method:
  Gestational age/10
  Newborn = 4.0
  5 y.o. = 5.0
  Adult = 6.0

Pediatric Airway

• Important differences between the adult and pediatric airway:
  • Pediatric tongue is larger in proportion to the mouth/pharynx
  • The pediatric glottis is more anterior and superior (Epiglottis is at C1 at birth, C3 by 6 months of age, C5-6 by adolescence)
  • Epiglottis is larger and floppier in children

Pediatric Airway

• Important differences:
  • The narrowest portion of the pediatric airway is the subglottic space (specifically, the cricoid, and often the area of subglottic stenosis development due to the complete ring that likely leads to greater likelihood of mucosal compression) whereas the glottic opening (vocal cords) is the most narrow portion of the adult airway
Pediatric Airway

- Important differences between the adult and pediatric airway:
  - While not truly obligate nose-breathers, infant nares are smaller and more easily occluded by mucus or edema.
Thank You!
Questions?