Respiratory Emergencies
Objectives

• Recognize the child in respiratory distress or failure
• Outline the categories of respiratory conditions and how they differ on presentation
• Discuss the initial management of children with different causes of acute respiratory distress
Rapid Assessment of Respiratory Distress

Appearance
Normal or anxious

Work of Breathing
Stridor, wheezing, retractions, rales

Circulation
Normal
Rapid Assessment of Respiratory Failure

Appearance
ALOC

Work of Breathing
Decreased tidal volume

Circulation
Tachycardia or bradycardia
Categorization of Respiratory Emergencies

• Airway Obstruction:
  – Upper - Stridor
  – Lower - Wheezing

• Alveolar or interstitial conditions
  – Rales
Case: 6 year old male

• Sudden onset of high fever, sore throat and drooling - doesn't want to lie down
• Toxic appearing
• Vital signs: HR 140, RR 30, T40.2°C, O₂ sat. 96%, weight 25 kg
What are your assessment and differential diagnosis for this patient?
Case Discussion: Assessment - Upper Airway Obstruction

Appearance
- Toxic

Work of Breathing
- Stridor

Circulation
- Normal
Case Discussion: Differential Diagnosis

- Epiglottitis
- Croup
- Bacterial tracheitis
- Retropharyngeal abscess
- Peritonsillar abscess
- Foreign body obstruction
# Croup versus Epiglottitis

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Epiglottitis</th>
<th>Croup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stridor</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Voice alteration</td>
<td>Muffled</td>
<td>Hoarse</td>
</tr>
<tr>
<td>Dyshagia</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Postural preference</td>
<td>+</td>
<td>±</td>
</tr>
<tr>
<td>Barky cough</td>
<td>-</td>
<td>+++</td>
</tr>
<tr>
<td>Fever</td>
<td>+++</td>
<td>±</td>
</tr>
<tr>
<td>Toxicity</td>
<td>++</td>
<td>-</td>
</tr>
</tbody>
</table>
What are your assessment and management priorities now?
Case Discussion: Assessment - Epiglottitis

- Upper airway emergency
- Occurs at any time of year in any age group
- Has become less common with increasing use of *Haemophilus influenzae* vaccine
Case Progression

• Child remained in mother's arms
• Consultants contacted immediately:
  – Evaluated by surgical specialist and anesthesiologist
• Airway management in operating room
• Intubation performed, cultures taken and antibiotics started
Case: 18 month old female

• Runny nose, cough and fever for 2 days
• Progressing to barking cough with high-pitched "noise" with every breath
• Assessment Triangle shows:
  – Appearance - anxious and alert
  – Work of Breathing - increased, stridor
  – Circulation - normal
Case Progression

- Alert, in moderate respiratory distress, significant inspiratory stridor at rest
- *Vital signs*: HR 130, RR 42, T 38.8° C, O₂ sat. 98%, weight 12 kg
What are your assessment and management priorities for this patient?
Case Discussion: Assessment - Croup (Laryngotracheobronchitis)

- Upper airway obstruction
- Most common infectious cause of upper airway obstruction
  - unusual cause of stridor in children <6 months and >6 years
- Seasonal - late fall and early winter
Case Discussion: Signs and Symptoms, Mild

- 1-3 day history of URI
- Barking cough (94%)
- Fever (low grade usually)
- Tachypnea
- Stridor (58%)
- Retractions/wheezing
Case Discussion: Signs and Symptoms, Severe

- Agitation
- Lethargy
- Progressive tachycardia and tachypnea
- Hypoxia (cyanosis)
- Decrease in tidal volume
- Apnea
Case Discussion: Emergency Department Management Options

- Cool mist (+/- oxygen)
- Aerosolized (L-) epinephrine/racemic epinephrine
- Corticosteroids
  - inhaled, oral, parenteral
- Airway management
Case Progression

- Child placed on mother's lap in treatment room
- Cool mist therapy delivered by mother
- Aerosolized epinephrine given via nebulizer
Case Discussion: Aerosolized Epinephrine

• Racemic mixture
  – Dose: 0.5 mL of 2.25% Racemic epinephrine in 4.5 mL normal saline

• L-epinephrine
  – Dose: 5 ml of the 1:1,000 solution prediluted with normal saline

• Observe patient in ED for 2-3 hours then discharge as appropriate
Case Discussion: Corticosteroids

- Anti-inflammatory
- Clinical effects within 3 to 4 hours
- Long biologic half-life (36 to 54 hours)
- Improvement with dexamethasone at 24 hours which may reduce need for hospitalization
- Nebulized budesonide may reduce need for hospitalization
Case Progression

• Cool mist, aerosolized epinephrine and dexamethasone (0.6 mg/kg PO) given
• Continues to have inspiratory stridor when agitated and continues to have barky cough

Should this child be admitted for further management?
Admission Criteria

• Stridor at rest after aerosolized epinephrine, corticosteroids and observation for 3 hours
• Respiratory failure requiring airway management
• Requires oxygen to maintain $O_2$ sat $>95$
• Consider if child is less than 6 months of age
Case Progression

- Observed for 3 hours and child continues to improve with disappearance of stridor
- Barky cough persists
- Feeding well
- Discharged with explicit home care instructions
Case: 3 year old female

- History of sudden onset of cough and choking while eating peanuts - paramedics transport to ED

- Assessment Triangle shows:
  - Appearance - anxious
  - Work of Breathing - retractions
  - Circulation - normal
Case Progression

• Physical exam in ED shows patient in mild respiratory distress with unilateral wheezing

• *Vital signs*: HR 120, RR 42, T 37.8 °C, O₂ sat. 92%, weight 14 kg
What is your diagnosis?
Case Discussion: Foreign Body Aspiration

- Often occurs in children <5 years of age
- Common offending agents: foods and home items
Foreign Body Aspiration: Management Priorities

• Incomplete obstruction; alert and breathing
  – provide supplemental oxygen
  – allow position of comfort
  – immediate consultation with surgical specialist and airway evaluation and removal of FB in the operating room
Foreign Body Aspiration: Complete Obstruction

- Attempt ventilation, no chest rise
  - <1 year: 5 back blows then 5 chest thrusts;
    >1 year: 5 abdominal thrusts
- If unsuccessful:
  - perform direct laryngoscopy
  - immediate surgical consultation
  - attempt vigorous BVM ventilation, intubation, or cricothyrotomy
Case Progression

• Child taken to operating room
• A peanut was removed from the main stem bronchus
Case: 10-year-old Boy

• With a history of asthma has been wheezing for 8 hours

• Assessment Triangle shows:
  – Appearance - anxious
  – Work of breathing - increased with marked tachypnea and retractions
  – Circulation - normal
Case Progression

• Patient alert and anxious, in moderate respiratory distress with retractions and bilateral wheezing

• Vital signs
  – HR - 110
  – RR - 36
  – $O_2$ sat - 88%
  – Weight - 33 Kg
Case Discussion
Assessment - Asthma

• Lower airway obstruction
  – Intermittent, partially or completely reversible obstructive disease

• Multifactorial precipitants

• Pathogenesis: inflammation - bronchospasm with increased mucus production and airway edema
Case Discussion: Important Historical Factors

• Frequency and severity
  – ED visits, ICU admissions, intubation, corticosteroid treatment, medications

• Age at first onset

• Other atopic features

• Underlying cardiopulmonary disease
Estimation of the Severity by Auscultation

- Minimal: prolonged expiration
- Mild: end-expiratory wheeze only
- Moderate: expiratory and inspiratory wheezing
- Marked: minimal wheezing, inaudible air entry or exit
Diagnostic Evaluation of Severity

• Peak flow meter useful in children who are capable of using it

• Pulse oximetry:
  – May see initial drop in $O_2$ sat after treatment begins
  – Arterial blood gases not usually useful

• Chest X-ray: not routinely indicated
Asthma: ED Management

• Oxygen
• Fluid resuscitation (oral or iv)
• Nebulized β2-agonist bronchodilators
• Epinephrine or terbutaline
• Ipratropium bromide
• Corticosteroids
• Rapid sequence intubation for respiratory failure
Case discussion: Treatment options

• $\beta_2$-agonists (albuterol, ventolin)
  – 2.5 to 5 mg nebulized every 20 min
  – May give more frequently in required
  – MDI with spacer - 4 to 8 puffs every 20 min.

• Ipratropium bromide
  – 0.25 mg by nebulizer
Case Discussion: Treatment Options

• Corticosteroids
  – Dosage: methylprednisolone (iv) or prednisone (PO)
    • 1 to 2 mg/kg
    • Maximum: 60 mg/dose
    • Continue oral prednisone for 3 to 5 days

• Epinephrine 1 : 1000
  – 0.01 mL/kg subcutaneously
  – If severe disease or difficulty delivering inhalers
Other Treatment Modalities

- Magnesium sulfate
- Intravenous $\beta_2$-agonists
Case Progression

• $\beta_2$-agonist given with minimal improvement
• Corticosteroids given after initial assessment
• Peak flow remains at 100; $O_2$ sat. 90%
• Child admitted for continuous albuterol and inpatient management
Asthma admission Criteria

- Status asthmaticus
- Progressive respiratory distress or failure
- History of severe, poorly responsive attacks
- PEFR persisting at less than 70% in cooperative child
Case: 8 week old Girl

- Staccato-like cough for 2 days
- Assessment Triangle shows:
  - Appearance - anxious and alert
  - Work of breathing - tachypnea and mild intercostal retractions
  - Circulation - normal
Case Progression

• Additional history revealed conjunctivitis at 10 days of age - treated with drops
• Rales are noted in bilateral lung fields
• Vital signs
  – HR 146          O₂ sat 92%
  – RR 68            weight 4 Kg
  – T 38
What are your assessment and management priorities?
Case Discussion: Assessment - Pneumonia

- Fever, tachypnea and cough constitute cardinal triad
- Rales, decreased breath sounds, but there may be limited findings
- May present with complaint of abdominal pain
- Infants with cough and wheeze - consider Bronchiolitis
Bronchiolitis

- Inflammatory disease
- Viral etiology
- Management
  - Supportive - oxygen and hydration
  - Steroids and bronchodilators - probably not effective
  - Antibiotics - not indicated
Pneumonia Admission Criteria

• History of apnea
• Respiratory distress
• Hypoxia or cyanosis
• Toxic appearance
• Dehydration
• Immune deficiency or comorbid disease
• Parental factors
Conclusions

- Recognition of children in respiratory distress or failure discussed
- Cases presented to illustrate the difference between upper and lower airway obstruction
- Stepwise management of these disorders with continual reassessment of the patient to evaluate response to therapy
Case Discussion
Pneumonia - ED management

• Supplemental oxygen
• Chest X-ray