Respiratory Emergencies

TEREM-APLS Course
Case Study 1

• Mother of 13-month-old boy found him choking and gagging next to container of spilled nuts.
• On arrival to register at TEREM, the following is noted: appearance is alert; work of breathing is increased with audible stridor; subcostal retractions; color is normal.
Initial Assessment (1 of 2)

**PAT:**
- Normal appearance, abnormal breathing, normal circulation
Initial Assessment (2 of 2)

A: Stridor
B: Tachypneic with retractions, reduced tidal volume
C: Color is normal, skin is warm and dry, pulse is rapid but strong and regular.
D: Alert with no focal neurologic signs; GCS 15
E: No obvious signs of injury

Vital signs:
- HR 160, RR 60, O₂ sat 93%, Wt 11 kg
General Impression

Respiratory distress:

What are your initial management priorities?
Management Priorities

- Patient is brought to monitored bed and allowed to remain in position of comfort.
- Supplemental oxygen is provided.
What is your working diagnosis?

Upper airway obstruction
  – Foreign body aspiration

What are your clues?
Your First Clue: Foreign Body Aspiration

• A history of choking is the most reliable predictor of FB aspiration.

• Other signs and symptoms include:
  – Upper airway: Stridor, respiratory or cardiopulmonary arrest
  – Lower airway: Coughing, wheezing, retractions, decreased breath sounds, cyanosis
Diagnostic Studies

• Radiology
  – Radiopaque FBs are seen in about 15% of cases.
  – Other findings seen in lower airway FB aspiration on chest radiograph
    • Air trapping/hyperinflation
    • Pulmonary consolidation
    • Barotrauma
In this chest radiograph, FB aspiration is suggested as the left side of the chest is hyperlucent from air trapping.
Case Progression/Outcome

- Patient was transferred by NATAN to hospital where taken to operating room. There, rigid bronchoscopy was performed and a peanut was removed from the subglottic airway.
Discussion:
Foreign Body Aspiration

• Background:
  – 150-300 fatalities in young children each year.
  – 2/3 of cases are in children 1-2 years of age.
Background: Foreign Body Aspiration (1 of 2)

- Food items are the most commonly aspirated FB.
- Balloons are the most common FB to result in death.
Background: Foreign Body Aspiration (2 of 2)

- Foreign objects can be lodged in the upper or lower airway, or esophagus.
- Differences in the pediatric airway make evaluation and management of foreign body aspiration challenging.
<table>
<thead>
<tr>
<th></th>
<th>Infant</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>Large prominent occiput resulting in sniffing position</td>
<td>Flat occiput</td>
</tr>
<tr>
<td>Tongue</td>
<td>Relatively larger</td>
<td>Relatively smaller</td>
</tr>
<tr>
<td>Larynx</td>
<td>Cephalad position, opposite C2 and C3 vertebrae</td>
<td>Opposite C4 to C6</td>
</tr>
<tr>
<td>Epiglottis</td>
<td>Ω shaped, soft</td>
<td>Flat, flexible</td>
</tr>
<tr>
<td>Vocal cords</td>
<td>Short, concave</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Smallest</td>
<td>Cricoid ring, below cords</td>
<td>Vocal cords</td>
</tr>
<tr>
<td>diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cartilage</td>
<td>Soft, less calcified</td>
<td>Firm, calcified</td>
</tr>
<tr>
<td>Lower airway</td>
<td>Smaller, less developed</td>
<td>Larger, more cartilage</td>
</tr>
</tbody>
</table>
Management (1 of 6)

• Upper airway FB:
  – If patient is able to cough or speak:
    • Leave in a position of comfort.
    • Provide supplemental oxygen.
    • Priority to get patient to operating room for removal
Management (2 of 6)

• Upper airway:
  – With severe partial or complete airway obstruction, management depends on age.
  – Management options can be divided into basic life support (BLS) and advanced life support (ALS).
Management (3 of 6)

• BLS:
  – Infant: 5 back blows/5 chest thrusts
Management (4 of 6)

• BLS:
  – Child: 5 abdominal thrusts
Management (5 of 6)

• ALS:
  – Laryngoscopy and removal with pediatric Magill forceps
Management (6 of 6)

- Lower airway FB:
  - Bronchoscopy and removal of FB in operating room
  - FB retrieval rate approaches 100%.
Case Study 2:

• 15-month-old boy with a history of cold for 2 days develops a barking cough.
• He tracks you with his gaze as you approach.
• He has stridor at rest, retractions, and has cyanosis around his lips.
Initial Assessment (1 of 2)

PAT:
  – Normal appearance, abnormal breathing, normal circulation

Vital signs:
  – HR 180, RR 60, T 38.4°C, O₂ sat 89%, Wt 10 kg
Initial Assessment  (2 of 2)

A:  Stridor at rest
B:  Tachypnea, retractions
C:  Slight cyanosis around the lips, otherwise color is normal, capillary refill <2 seconds, skin warm and dry, pulse strong and rapid
D:  Alert, GCS 15
E:  No signs of injury, no rash
Question

What is your general impression of this patient?
General Impression

Respiratory distress:
*What are your initial management priorities?*
Management Priorities

- Patient is brought to monitored bed and allowed to remain in position of comfort.
- Supplemental oxygen is provided.
What is your working diagnosis?

Upper airway obstruction
  – Croup
What are your clues?
Your First Clue: Croup

- Prodromal symptoms mimic upper respiratory infection.
- Fever is usually low grade (50%).
- Barky cough and stridor (90%) are common.
- Hoarseness and retractions may also occur.
Background: Croup

• Croup, or laryngotracheobronchitis, is common in infants and children.
  – Affects children 6 months to 6 years
  – Incidence 3-5/100 children
  – Peak in second year of life
  – Seasonal: Occurs in fall and early winter
  – Viral etiology most common: Parainfluenza virus
The diagnosis of croup is made clinically. Routine laboratory or radiological studies are not necessary. Plain radiography of neck performed on cases in which diagnosis was in question may show a Steeple sign.
Steeple Sign
Differential Diagnosis: What Else?

- Epiglottitis (rare)
- Bacterial tracheitis
- Peritonsillar abscess
- Uvulitis
- Allergic reaction
- Foreign body aspiration
- Neoplasm
Management Options: Croup
(1 of 3)

• Humidified oxygen
  – Theoretical benefit – literature suggests NO significant benefit

• Steroids
  – Faster improvement with croup score, decrease in endotracheal intubation, and shorter hospital stays
Management Options: Croup
(2 of 3)

• CORTICOSTEROIDS

• No evidence that IM vs PO vs INH makes a difference.

• Our approach at TEREM is to give one time inhalation with budicort 2 cc one size fits all and then one po dose of po dexamethasone (0.6 mg/kg)

• Max at 10 mg.

• Use the IV prep (phosphate) orally as they do at RAMBAM and many US institutions.

• Recent exposure to varicella and immunosuppression are relative contraindications to steroid use.
Management Options: Croup
(3 of 3)

- Adrenaline 1:1000 0.5 MG/KG (max 5 mg). If small volume, dilute in 3 cc NS. If moderate to severe, give already with 2 cc budicort.
- The feared rebound effect is not a rebound but a return to pre treatment baseline → it is much reduced with concomittant steroid use.
- All patients receiving EPI need a minimum of 2 (3-4?) hours observation.
- Failure to respond to epi within about 20 to 30 minutes (usually faster) is absolute need for referral for observation and eval. of alternate dx.
Case Progression/Outcome

• 15-month-old patient received inhaled epinephrine and dexamethasone IM.
• He was observed in the ED for 3 hours.
• At the time of discharge, his respiratory rate was 40 breaths/min and $O_2$ sat was 97% on room air.
Case Study 3:

- 5-year-old boy is sent home from school after an acute wheezing episode during show-and-tell after a classmate brought in a new kitten.
Case Progression

• He is brought to TEREM by his mother where he is found to be alert, shows increased work of breathing with nasal flaring and retractions, and has normal skin color.
Initial Assessment

PAT:

– Normal appearance, abnormal breathing, normal circulation

Vital signs:

– HR 130, RR 50, BP 120/80, axillary temp 36.6°C, O₂ sat 89% on room air
Initial Assessment (2 of 2)

A: No audible wheezing or stridor
B: Tachypnea, poor air entry, and decreased breath sounds throughout
C: Color normal, tachycardia, pulse strong and regular, no diaphoresis
D: Alert but anxious, GCS 15
E: No signs of injury, no rash
Focused History

S:  Shortness of breath
A:  Allergy to cats, otherwise none
M:  Medications – albuterol and Singulair®
P:  History of asthma
L:  Last meal was 3 hours ago
E:  Exposure to cats
What is your general impression of this patient?
General Impression

• Respiratory distress
  – Lower airway obstruction
  – Asthma exacerbation

What are your initial management priorities?
Differential Diagnosis: What Else?

- URI
- Bronchiolitis
- Pneumonia
- FB aspiration
- Congestive heart failure
- Anaphylaxis
Prehospital Management

• Administer albuterol nebulized or by MDI.
• Provide oxygen.
• Administer epinephrine SQ for patients with poor inspiratory effort.(.1 mg(ml)/kg – max .3)
• Support ventilation if in respiratory failure.
Documentation of Signs

- Position
- Respiratory rate
- Quality of air exchange
- Presence of:
  - Grunting
  - Nasal flaring
  - Retractions
  - Wheezing
  - Rhonchi
  - Rales
Case Discussion: Asthma

• Background:
  – Characterized by inflammation, airway obstruction, increased mucous production, and airway edema.
  – Common: 7% of American children
    • Greater than 867,000 ED visits per year
    • Children <4 years are at highest risk.
Background: Asthma

- Genetics and environment play important role in development of disease.
- Factors associated with increased rate of asthma:
  - Exposure to cigarette smoke
  - Urban and low income environment
- Risk factors for severe disease:
  - Rapid onset of symptoms (<3 hours)
  - Previous need for mechanical ventilation
Diagnostic Studies

- Pulmonary function studies are a mainstay of asthma management.
  - Peak expiratory flow meters are difficult to use in children <5 years of age.

- Pulse oximetry

- Arterial blood gas (rare)

- Chest radiographs not routinely recommended
Management pathways are available from the National Institutes of Health.

Every patient should receive:
  – Supplemental oxygen
  – Cardiorespiratory monitoring
  – Short-acting bronchodilators

Management strategies divided into mild, moderate, and severe exacerbation
Management: Asthma (2 of 2)

• Mild:
  – Short-acting $\beta$-2 agonist given up to 3 times the first hour; corticosteroids begun if >1 treatment necessary

• Moderate:
  – Short-acting $\beta$-2 agonist, systemic corticosteroids, oxygen

• Severe:
  – As above, Call for the NATAN
Case Progression

• Patient received a total of 6 nebulized bronchodilator treatments plus systemic corticosteroids.
• On reassessment patient is alert, has decreased retractions but tachypnea and pulse oximetry reads 92% on room air.

What is your impression and management priorities now?
Case Outcome

- Continued respiratory distress
- Patient is admitted for further care
- Chest radiograph shows no infiltrate but collapse of right upper lobe
Case Study 4:

• A mother brings in her 3-month-old girl who is breathing too fast.
• She is irritable and feeding poorly.
• She is alert; has tachypnea, nasal flaring, intercostal retractions; color is pale.
Initial Assessment (1 of 2)

PAT:
  – Abnormal appearance, abnormal breathing, normal/abnormal circulation

Vital signs:
  – HR 190, RR 60, T 38°C, O₂ sat 90% on room air, Wt 4 kg
Initial Assessment (2 of 2)

A: Open; no stridor
B: Tachypneic with retractions and reduced tidal volume.
C: Color is normal, skin is warm and dry, pulse is rapid but strong and regular.
D: Alert with no focal neurologic signs.
E: No obvious signs of injury
Question

What is your general impression of this patient?
General Impression

- Respiratory distress:
  - Lower airway obstruction
  - Possible bronchiolitis

What are your initial management priorities?
Management Priorities

- Patient is placed on cardiorespiratory monitoring.
- Supplemental oxygen is provided.
- Obtain portable chest radiograph/ do not send to x ray alone.
Your First Clue: Bronchiolitis

- Tachypnea
- Cough
- Nasal congestion
- Fever
- Tachycardia
- Otitis media

- Retractions
- Hypoxia
- Apparent life-threatening event
- Apnea
Discussion: Bronchiolitis (1 of 4)

• Respiratory syncytial virus (RSV) is the most common cause.
• Most children have been infected by RSV before their second birthday.
• There is no vaccine available.
Discussion: Bronchiolitis (2 of 4)

- Average incubation is 5 days.
- Symptoms can last a month or more.
- Hypoxia is most often due to ventilation/perfusion (V/Q) mismatch.
- Progression to respiratory failure and shunting may be seen with pneumonia and atelectasis.
Discussion: Bronchiolitis (3 of 4)

- Infants at increased risk for severe RSV disease:
  - Premature infants
  - Complex congenital heart disease
  - Chronic lung disease
  - Immunosuppression
  - Neuromuscular disease
  - Metabolic disorders
Discussion: Bronchiolitis (4 of 4)

• Single best predictor of severe disease in a healthy infant is O₂ saturation <95%

• Other factors associated with severe disease include:
  – Age <3 months, prematurity, toxic appearance, atelectasis, and tachypnea (rate >70 bpm)

• Diagnosis of bronchiolitis is generally made clinically
Case Progression/Outcome

• Our 3-month-old patient received nebulized racemic epinephrine but continued to have respiratory distress.
• Patient was admitted to PICU where she was intubated for recurrent apneic spells.
The Bottom Line

• Respiratory emergencies are common.
• Respiratory assessment begins with the PAT and ABCDEs.
• Management priorities include oxygen and specific therapy geared to optimize oxygenation and ventilation.
The Bottom Line

• Infants and children are at higher risk for complications due to specific respiratory emergencies.

• Immediate support of oxygenation for all patients with respiratory distress and support of ventilation in patients with respiratory failure can be life saving.