Respiratory Problems in Children

A/Prof Alex Tang

all that glitters is not gold,
all the wheezes is not asthma
Objective

• Describe an overview of respiratory problems in children

• Define common respiratory problems in childhood and their management
Major Causes of Death in Children <5 Years of Age and in Neonates

Respiratory system

Observation
- Is there respiratory distress?
  - Nasal flaring, recession
  - Use of accessory muscles
- Count the respiratory rate
- Is there wheeze, stridor or grunting?
- Is the child restless or drowsy?
- Is there cyanosis or pallor?
- Is there finger clubbing?
  - Cystic fibrosis, bronchiectasis

Ear, nose and throat
- Examine eardrums using an auroscope
  - Grey and shiny: normal
  - Red and bulging: suggests otitis media
- Dull and retracted: chronic secretory otitis media (glue-ear)
- Examine nostrils for inflammation, obstruction and polyps
- Examine pharynx using tongue depressor (leave this until last!)
  - Are the tonsils acutely inflamed (red +/- pustules or ulcers) or chronically hypertrophied (enlarged but not red)
- Feel for cervical lymphadenopathy

Chest wall palpation
- Assess expansion
- Check trachea is central
- Feel apex beat
- Is there chest deformity?
  - Harrison's sulcus: asthma
  - Barrel chest: air-trapping
  - Pector excavatum: normal
  - Pigeon chest: congenital heart disease
- May feel 'crackles'

Auscultation
- Use an appropriately sized stethoscope
- Listen in all areas for air entry, breath sounds and added sounds
- Absent breath sounds in one area suggests pleural effusion, pneumothorax or dense consolidation
- With consolidation (e.g., pneumonia) there is often bronchial breathing with crackles heard just above the consolidated lung
- In asthma and bronchiolitis expiratory wheeze is heard throughout the lung fields
- In young children upper airway sounds are often transmitted over the whole chest. Asking the child to cough may clear them

Percussion
- Resonant: normal
- Hyper-resonant: pneumothorax or air-trapping
- Dull: consolidation (or normal liver in right lower zone)
- Stony dull: pleural effusions
Respiratory problems in Children

What are the common infective agents?
<table>
<thead>
<tr>
<th>Age</th>
<th>Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td><em>Group B streptococcus, E.coli, Klebsiella species, Enterobacteticeae</em></td>
</tr>
<tr>
<td>1–3 mo</td>
<td><em>Chlamydia trachomatis, respiratory syncytial virus (RSV), other respiratory viruses, Bordetella pertussis</em></td>
</tr>
<tr>
<td>2-5 yo</td>
<td>Respiratory viruses, <em>S. pneumoniae, Hib, NTHI, M. pneumoniae, Chlamydia pneumoniae</em></td>
</tr>
<tr>
<td>6-18 yo</td>
<td><em>M. pneumoniae, S. pneumoniae, C. pneumoniae, NTHI, influenza A or B, adenovirus, other respiratory viruses</em></td>
</tr>
</tbody>
</table>

Respiratory problems in Children

- Throat
Respiratory problems in Children

- Throat
- Nose
Nasopharyngeal Colonization

- *S. pneumoniae* can be a normal inhabitant of the nasopharynx\(^1\)
- Global nasopharyngeal (NP) colonization/carriage ranges:
  - 10% to 85% in children <5 years of age\(^2,3\)
  - 4% to 45% in adults\(^2-4\)

NP colonization is generally a prerequisite for mucosal and invasive pneumococcal disease\(^2,4\)


Nasopharyngeal Carriage rates in Children

Acute Otitis Media

• Acute otitis media is an inflammation of the middle ear
  – It is one of the most common infectious diseases in children

• Symptoms of otitis media can include:
  – Ear pain
  – Discharge from the middle ear
  – Difficulty hearing

• Nonspecific symptoms include: fever, irritability, headache, apathy, lack of appetite, vomiting, and diarrhea

Klein, p 215, 220
Respiratory problems in Children

- Throat
- Nose
- Larynx
Chronic stridor

Laryngomalacia
- Present from birth
- Worse on crying
- Improves with age
- Well, thriving child

Subglottic stenosis
- Previous intubation
- Worse with URTI

Vascular ring
- Congenital defect of great vessels
- Worsens over time
- Barium swallow may show indentation

Acute stridor

Croup
- Barking cough
- Coryzal illness

Tonsillar abscess (quinsy)

Anaphylaxis

Epiglottitis
- Sudden onset
- Septic
- Drooling
- Unable to speak
- No Hib vaccination

Inhaled foreign body
- Toddlers
- Sudden onset
- History of choking
- Unilateral signs
- Requires bronchoscopy
Respiratory problems in Children

- Throat
- Nose
- Larynx
- Trachea
Respiratory problems in Children

- Throat
- Nose
- Larynx
- Trachea
- Bronchus
Respiratory problems in Children

- Throat
- Nose
- Larynx
- Trachea
- Bronchus
- Bronchioles
Respiratory problems in Children

- Throat
- Nose
- Larynx
- Trachea
- Bronchus
- Bronchioles
- Lung Parenchyma
Nearly three-quarters of all pneumonia episodes worldwide in children <5 years of age occur in just 15 countries*

*India, China, Pakistan, Bangladesh, Nigeria, Indonesia, Ethiopia, Democratic Republic of the Congo, Vietnam, Philippines, Sudan, Afghanistan, United Republic of Tanzania, Myanmar, Brazil

Respiratory problems in Children

- Throat
- Nose
- Larynx
- Trachea
- Bronchus
- Bronchioles
- Lung Parenchyma
- Thoracic cavity
Respiratory problems in Children

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- Thoracic cavity

- Tuberculosis
Respiratory problems in Children

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- Trachea
- Bronchus
- Bronchioles
- Lung Parenchyma

- Tuberculosis
- Cystic fibrosis
Cystic Fibrosis

- Ear, nose and throat
  - Nasal polyps

- High salt losses in sweat
  - Salty taste to skin
  - Risk of salt-losing crisis during very hot weather

- Recurrent chest infections
  - Cough
  - Purulent sputum
  - Pneumonia
  - Chronic pseudomonas infection
  - Bronchiectasis
  - Chest deformity
  - Eventual respiratory failure

- Finger clubbing
  - Seen with chronic lung infection

- Liver disease
  - Obstructive jaundice in neonatal period (rare)
  - Biliary stasis may require treatment with ursodeoxycholic acid
  - Eventually liver cirrhosis may develop

- Poor growth
  - Require 40% extra energy intake compared with normal child
  - Poor weight gain
  - Short stature
  - Normal growth is achievable with pancreatic replacement, physiotherapy and aggressive treatment of chest infections

- Pancreatic insufficiency
  - Poor fat absorption
  - Steatorrhoea (fatty stools)
  - Distended abdomen
  - Rectal prolapse
  - Meconium ileus at birth (15%)
  - Meconium ileus equivalent—can mimic acute appendicitis
  - Need to take pancreatic enzymes with meals
  - May develop diabetes

- Male infertility
  - Congenital absence of the vas deferens
Respiratory problems in Children

- Throat
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- Trachea
- Bronchus
- Bronchioles
- Lung Parenchyma
- Tuberculosis
- Cystic fibrosis
- Childhood Asthma
Chronic asthma

- Cough
  - Recurrent dry cough
  - Worse at night
  - Worse with exercise

Wheeze
- Expiratory noise due to airway narrowing
- Often triggered by viral infections
- Responds to bronchodilators

Shortness of breath
- Exercise limitation
- Triggers can be exercise, cold, allergens, smoke

Uncontrolled asthma
- Poor growth
- Chronic chest deformity
- Time off school
- Frequent acute exacerbations

Pathology
- Environmental triggers cause bronchoconstriction, mucosal oedema and excess mucous production in a genetically predisposed child
- Airway narrowing causes wheeze and shortness of breath

Acute asthma

- Acute asthma attack
  - Acutely short of breath
  - Cough and wheeze
  - Work of breathing increased
  - Child often frightened
  - May be triggered by viral illness, exposure to allergens, exercise or cold air

Assessing severity

Mild
- Breathless but not distressed
- Peak expiratory flow rate (PEFR) reduced but still >50% of normal

Severe
- Too breathless to talk or feed
- Respiratory rate >50 breaths/min, pulse >140 beats/min
- PEFR <50% of expected

Life-threatening
- PEFR <33% of expected
- ‘Silent chest’ or cyanosis
- Fatigue, drowsiness
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- Childhood Asthma
- Bronchopulmonary Dysplasia (BPD)
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- Tuberculosis
- Cystic fibrosis
- Childhood Asthma
- Bronchopulmonary Dysplasia (BPD)
- Respiratory failure
Causes of respiratory failure

Upper airway obstruction
- Foreign body
- Epiglottitis
- Croup

Lower airway
- Asthma
- Bronchiolitis
- Pneumonia
- Cystic fibrosis
- Neonatal lung disease

Neurological
- Head injury
- Meningitis
- Raised ICP
- Muscle weakness

Clinical features
- Shortness of breath
- Tachypnoea
- Cyanosis
- Nasal flaring
- Grunting
- Intercostal recession
- Restlessness or confusion

Symptoms and signs of the underlying disease
- Expiratory wheeze
- Inspiratory stridor
- Crackles
- Neurological weakness

Severe cardiac failure

Drug ingestion

Investigations
- Oxygen saturation
- Arterial blood gases
- Chest X-ray

Management
- Assess severity by examination, blood gases and oxygen saturation monitor
- Give high flow oxygen
- Intubate and ventilate if rising pCO₂. (The decision to ventilate is based on clinical criteria, not just blood gases)
- Treat the underlying cause: antibiotics (infection), bronchodilators and steroids (asthma), remove foreign body
What are the causes of cough and breathlessness in children?
Causes of cough and breathlessness

**Croup**
- Barking cough
- Stridor

**Pneumonia**
- Fever, cough
- Respiratory distress
- Chest or abdominal pain
- Intercostal recession
- Crackles and signs of consolidation

**Bronchiolitis**
- Age: <2 years
- Coryza
- Respiratory distress
- Difficulty feeding
- Apnoea in young infants
- Wheezing and crackles

**Heart failure**
- Left to right shunts, e.g. ASD, VSD

**Tuberculosis**
- Contact with TB
- Not immunized with BCG

**Acute asthma**
- Known asthmatic
- History of atopy
- Wheeze
- Cough
  (See Chapter 52 for details)

**Viral-induced wheeze**
- Wheeze with URTI
- Some progress to asthma
- May respond to bronchodilators

**Whooping cough (pertussis)**
- Paroxysmal cough, followed by vomiting, whoop or apnoea

**Inhaled foreign body**
- Toddlers
- History of choking
- Unilateral wheeze
- Sudden onset

**Cough without breathlessness**
- Gastro-oesophageal reflux
- Post-nasal drip
- Tracheo-oesophageal fistula
- Passive smoking
- Cystic fibrosis
Light at the end of the tunnel