Respiratory Infection in Children
Respiratory infections in children

- Main cause of morbidity and mortality in children
- Most common reason for doctors consultation
- Controversial issues:
  - Antibiotics usage
  - Cough suppressants
  - Anti-histamine
  - Nasal decongestants
  - Chest physiotherapy
  - Inhaled and systemic corticosteroids
  - Bronchodilators
  - Oxygen therapy
  - Adrenaline
Cough

• Most common pediatric problem managed by primary care doctors

• How much cough is normal?

Population: Forty-four children, age 8-12 years old in UK (season)

Method: Questionnaire, lung function test, recording device

Results: Mean number of cough per day in normal children 11.3 (1-34) cough per day

Munyard P, Bush Andrew. How much cough is normal? Archives of Disease in Childhood 1996;74:531-534
Cough

• The problem can be the **lung** or the **heart**

**When should you worry?**

**Alarm symptoms**
• Fever
• Choking
• Feeding difficulty
• Peak season for infective cough
• Irritant exposure
• Immunization

**Alarm signs**
• Stridor at rest / audible wheeze
• Respiratory distress
• Ill looking
Up to 12% of children with cough will develop complications:

<table>
<thead>
<tr>
<th>SIGNS AND SYMPTOMS</th>
<th>POSITIVE ODDS RATIO</th>
<th>NEGATIVE ODDS RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Added chest signs</td>
<td>2.78</td>
<td>1.0</td>
</tr>
<tr>
<td>Fever</td>
<td>4.65</td>
<td>1.0</td>
</tr>
<tr>
<td>Tachypnea</td>
<td>3.80</td>
<td>1.0</td>
</tr>
<tr>
<td>Attends day care</td>
<td>1.0</td>
<td>NA</td>
</tr>
<tr>
<td>Illness severity</td>
<td>1.34</td>
<td>NA</td>
</tr>
<tr>
<td>Lives with smoker</td>
<td>1.0</td>
<td>NA</td>
</tr>
<tr>
<td>Social deprivation</td>
<td>1.0</td>
<td>NA</td>
</tr>
<tr>
<td>Known to have asthma</td>
<td>2.90</td>
<td>NA</td>
</tr>
</tbody>
</table>

How long will the respiratory symptoms last?

• Duration of symptoms of respiratory tract infections in children: systematic review (Mathew Thompson et al, BMJ)
  • High income countries
• Acute respiratory tract illness: sore throat, ear ache, cough common cold
• Resolution of symptoms, in most children (>90%)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear ache</td>
<td>7-8 days</td>
</tr>
<tr>
<td>Sore throat</td>
<td>2-7 days</td>
</tr>
<tr>
<td>Acute cough</td>
<td>25 days (50% resolve by 10 days)</td>
</tr>
<tr>
<td>Bronchiolitis</td>
<td>21 days</td>
</tr>
<tr>
<td>Common cold</td>
<td>15 days</td>
</tr>
<tr>
<td>Non-specific RTI</td>
<td>16 days</td>
</tr>
</tbody>
</table>
Airway sounds

• **Wheeze**: intrathoracic obstruction (expiratory)
  - Structural obstruction of trachea and bronchi
  - Lower airway obstruction
• **Stertor**: nasal/oropharyngeal obstruction (snoring - inspiratory)
• **Stridor**: laryngeal obstruction (inspiratory, biphasic, expiratory)
Airway emergency

- Nasal Flaring
- Tachypnea/Tachycardia
- Retraction
- Cyanosis
- Grunting
- Drooling

Use of accessory muscles
- Apnea
- Altered mental status
Common Respiratory Infections

- Common Cold
- Croup
- Bronchiolitis
- Sore Throat
- Epiglottitis
- Pneumonia
Common Cold

• Common cold syndrome
  • Highly infectious viral upper respiratory tract illness
  • >100 viruses

• Symptoms
  • Nasal congestion, nasal discharge (+/-purulent), throat irritation and cough
  • Infant: Fever (> 38°C), feeding and sleep difficulties
  • Older child: myalgia, lethargy, anorexia

• Course of illness: 7 days, good outcome if uncomplicated

• Management: Self limiting, supportive management, antibiotic therapy is not useful
  • Avoidance of tobacco smoking
• 3rd National Health and Morbidity Survey (2006):
  • Prevalence of acute respiratory infection: 18%
  • Commonest:(URTI) common cold (6.9%)
  • Highest prevalence among children < 5 years old (28.8%)
  • Affects daily activity: 60.6%

• Malaysian statistics on Medicine 2008
  • Over prescription of antibiotics and symptomatic therapy
    • Antihistamines
    • Nasal decongestants
    • Cough suppressants
• National Medical Care Survey 2010

• 16.3% encounters were children < 12 years old
  • 49% prescribed with cough and cold medications
  • 23% prescribed to children < 2 years old
  • Similar frequency in prescription and encounters in private and government settings
  • 65% - 1 CCM per visit; 32% - 2 CCM per visit, 3% - 3 CCM per visit
Sore throat

• Uncommon in children <1 year old, peaks at 4-7 years old and continue towards adult¹
• *Viruses, Group A β-hemolytic streptococcus (GABHS) accounts form 10-20% of children with sore throat
  • Secondary bacterial infection
  • *S.pneumococcus, H.influenzae
  • Purulent nasal discharge, pharyngitis, persistent fever

In Malaysia (Streptococcal infection):
• specific identification is not practical
• Constellation of clinical features that allows presumptive treatment of high proportion of people is recommended¹

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Sore throat

**Viral**
- Conjunctivitis
- Rhinitis
- Cough
- Coryza
- Anterior stomatitis
- Discrete ulcerative lesions
- Viral exanthem
- Diarrhea

**GABHS – CENTOR score**
- Fever
- Diffuse redness of the tonsils and pharyngeal exudates
- Tender, enlarged anterior cervical lymph nodes
- Absence of cough
- Age < 15 years old
Complications of bacterial disease

Suppurative complications
• Sinusitis
• Otitis media
• Cervical adenitis
• Peritonsillar abscess
• Retropharyngeal abscess
• Pneumonia

Post streptococcal complications
• Rheumatic valvular disease
• Acute glomerulonephritis (major health problems)

Treatment

- Adequate hydration
- Supportive management
- Antibiotics in bacteria infection
  - GABHS – 10 days of penicillin, amoxicillin, erythromycin
- *Codeine preparation for treatment of cough is strongly discouraged in children and young infants*
Croup (laryngo-tracheo-bronchitis)

- Clinical syndrome: barking cough, inspiratory stridor, hoarse voice, respiratory distress
- Incidence: 6 months to 6 years
- Causative organisms:
  - Viral: *parainfluenza, RSV, adenovirus, enterovirus, measles, mumps, rhinovirus
  - Bacteria: Mycoplasma *pneumoniae, Corynbacterium Diphteriae*
Management

• **Mild croup**: stridor heard only when the child is agitated
  • home management, supportive care

• **Severe croup**: stridor at rest, rapid breathing or chest indrawing, cyanosis or SpO2 ≤ 90%
  • Oxygen, Hydration, Cortitosteroid (nebulized +/- systemic)
  • Nebulized adrenaline – temporary relieve only
  • Emergency airway management
Epiglottitis

- *Haemophilus Influenza B*
- Medical airway emergency
  - Pediatric anaesthesist
  - Pediatric surgeon
  - Pediatric otolaryngologist

- AVOID PROCEDURES THAT CAN INCREASE CHILD'S ANXIETY
- Transport upright to OT

- Management:
  - Relieve airway obstruction
  - Eradicate infectious agent
  - Corticosteroid to reduce inflammation
Bronchiolitis

• Peak at 1 month – 6 months old
• Peak season: November - January¹
• Guideline for hospital admission

<table>
<thead>
<tr>
<th></th>
<th>Home Management</th>
<th>Hospital management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; than 3 months</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Toxic – looking</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Chest recession</td>
<td>Mild</td>
<td>Moderate/Severe</td>
</tr>
<tr>
<td>Central cyanosis</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Wheeze</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Crepitations on auscultation</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Feeding</td>
<td>Well</td>
<td>Difficult</td>
</tr>
<tr>
<td>Apnoea</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td>&gt;95%</td>
<td>&lt;93%</td>
</tr>
<tr>
<td>High risk group</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

• Logistic problem, social circumstances, parental anxiety

1. Chan PWK, Chew FT, Chua KB. Seasonal variation in respiratory syncytial virus infection in Kuala Lumpur, Malaysia. Proceedings of the 7th Western Pacific Congress of Chemotherapy and Infectious Diseases, HongKong 2000
Bronchiolitis
- Australiasian bronchiolitis guideline

**Diagnosis:**
- Infants with URTI, with respiratory distress / fever and one or more of: cough, tachypnea, retractions, diffuse crackles or wheeze

**Risk factors:**
- Prematurity
- chronological age < 10 weeks
- exposure to cigarette smoke
- breast feeding <2months
- failure to thrive, having chronic lung disease, having chronic heart +/- neurological conditions

**No role for CXR / blood tests / bacteriological testing / routine virological test**
- Infants < 2months old with bronchiolitis and a temperature > 38°C has low risk of UTI concurrent
Bronchiolitis
- Australiasian bronchiolitis guideline

Management

• No role of scoring system in predicting hospital length of stay

• Discharge: Consider factors such as
  • oxygen saturations
  • adequacy of feeding
  • age (infants < 8 weeks old)
  • lack of social support
Bronchiolitis
- Australiasian bronchiolitis guideline

Do not administer:

- Administer β-2 agonists to infants ≤12 months old (with family history of atopy)
  - Malaysia CPG: Trial of nebulized β-2 agonists, with vigilence
- Nebulized hypertonic saline
- Do not administer combination of glucocorticoids (even in children with positive response to β-2 agonists and adrenaline or both)
- Antibiotics including azithromycin
Bronchiolitis
- Australiasian bronchiolitis guideline

Not recommended:

• Routine chest physiotherapy

• Routine nasal suction / deep nasal suction
  • Superficial nasal suction can be considered in those with moderate disease to assist feeding

• Routine nasal saline drops
  • Intermittent nasal drops at the time of feeding

• Routine use of continuous pulse oximetry for non-hypoxic (SpO2 ≥92%) infants not receiving oxygen or stable infants receiving oxygen
Bronchiolitis
- Australiasian bronchiolitis guideline

**Recommends:**
- Consider use of supplemental oxygen in treatment of hypoxia (SpO2 < 92%, in uncomplicated bronchiolitis)
- High flow nasal cannulae oxygen can be considered
- Nasal CPAP therapy for infants with bronchiolitis may be considered
- After a period of observation, infants at low risk for severe bronchiolitis can be considered for discharge on home oxygen as part of an organized “home oxygen program”, which has a clear “return to hospital” advice
- Supplemental hydration is recommended (NG / IV routes)
Prevention of bronchiolitis

• Breast feeding
• Avoidance of tobacco smoking
• **Humanised RSV specific monoclonal antibody** (Palivizumab)
  • Intramuscular, 15mg/kg per dose
  • Given during the expected annual RSV outbreak (October – February)
  • In high risk infants
    • Children born < 35 weeks of gestation and less than 6 months old at the onset of RSV season
    • Children < 2 years old requiring treatment for BPD within last 6 months
    • Children < 2 years old with hemodynamically significant congenital heart disease
Pneumonia

- **Definition:** Febrile illness with tachypnea for which there is no apparent cause (WHO)

- **National statistics 2016:** 3rd commonest cause of death in children < 5 years old

- **Risk factors:**
  - Low birth weight
  - Malnutrition
  - Lack of breastfeeding
  - Failure to complete immunization
  - Overcrowding in bedroom
  - Tobacco smoking
• **Tachypnea** is the best indicator to diagnose pneumonia in children of all ages.

• 2 clinical definitions
  - **Bronchopneumonia**: febrile illness with cough, respiratory distress with evidence of localized or generalized patchy infiltrates on CXR
  - **Lobar pneumonia**: physical and radiographs indicate lobar consolidation

• Aetiology:
  - 40-60% unidentified aetiology
  - Viral and bacterial pneumonia cannot be distinguished based on single parameter: clinical, laboratory and radiological

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonate</td>
<td>GBS, E.Coli, Klebsiella species, Enterobacteriaceae</td>
</tr>
<tr>
<td>1-3 months</td>
<td><em>Chlamydia trachomatis</em></td>
</tr>
<tr>
<td>Preschool</td>
<td><em>S. pneumoniae, Hib, S.aureus, GAS, M. catarrhalis, P aeruginosa</em></td>
</tr>
<tr>
<td>School</td>
<td><em>Mycoplasma pneumoniae, Chlamydia pneumoniae</em></td>
</tr>
</tbody>
</table>
### Severity

- **Assessment of severity (Adapted from WHO)**

<table>
<thead>
<tr>
<th>Severe pneumonia</th>
<th>Severe chest indrawing or fast breathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very severe pneumonia</td>
<td>Not feeding</td>
</tr>
<tr>
<td></td>
<td>Convulsions</td>
</tr>
<tr>
<td></td>
<td>Abnormally sleepy or difficult to wake</td>
</tr>
<tr>
<td></td>
<td>Fever/ low body temperature</td>
</tr>
<tr>
<td></td>
<td>Hypopnea with slow irregular breathing</td>
</tr>
</tbody>
</table>

**Infants < 2 months old**

<table>
<thead>
<tr>
<th>Mild Pneumonia</th>
<th>Fast breathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe pneumonia</td>
<td>Chest indrawing</td>
</tr>
<tr>
<td>Very severe pneumonia</td>
<td>Not able to drink</td>
</tr>
<tr>
<td></td>
<td>Convulsions</td>
</tr>
<tr>
<td></td>
<td>Drowsiness</td>
</tr>
<tr>
<td></td>
<td>Malnutrition</td>
</tr>
</tbody>
</table>

**Children 2 months – 5 years old**
Severe Pneumonia

- Central cyanosis or oxygen saturation <90% (pulse oximetry)
- Severe respiratory distress
- General danger sign
  - Inability to breastfeed
  - Lethargy or unconscious
  - Convulsions
  - persistent high grade fever ≥38.5 °C for more than 72 hours
  - persistent tachycardia (in an apparently well child)
Investigations

• CXR – not necessary for mild pneumonia
• Differential white cell count
• Blood culture
  • Non-invasive gold standard to determine bacteriological aetiology
  • Positive blood culture 10-30%
  • Severe pneumonia and doesn’t respond to first line antibiotic
• Culture from respiratory secretions
  • Throat swabs and URTI secretions not representative of pathogens
• BAL
• Serological studies
Management

• Assessment of oxygenation by pulse oximetry

• Risk assessment for admission:
  • Children aged ≤3 months old
  • Fever > 38.5°C, refusal to feed or vomiting
  • Rapid breathing +/- cyanosis
  • Systemic manifestation
  • Failure of previous antibiotic therapy
  • Recurrent pneumonia
  • Severe underlying disorders (immunodeficiency, chronic lung disease, heart failure, malnutrition)
Management - Supportive treatment

**Mild pneumonia**
- Home based management
- Hydration

**Severe pneumonia**
- Oxygen therapy
- Fluid therapy
- Chest physiotherapy
- Anti-tussive remedies are not recommended
- Monitor for complications
  - Respiratory failure
  - Septicaemia / septicaemic shock
  - Pleural effusion / empyema / pneumothorax

- Monitor for complications
  - Respiratory failure
  - Septicaemia / septicaemic shock
  - Pleural effusion / empyema / pneumothorax
Antibiotic therapy

• Age of the child, local epidemiology of respiratory pathogens and sensitivity, emergence of anti-microbial resistance

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>Antimicrobial agents</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus pneumonia, Group A streptococcus</em></td>
<td>Penicillin, ampicillin, cephalosporins</td>
</tr>
<tr>
<td><em>Haemophilus influenzae type b</em></td>
<td>Ampicillin, chloramphenicol, cephalosporins</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>Cloxacillin</td>
</tr>
<tr>
<td><em>Mycoplasma pneumoniae, Chlamydia pneumoniae</em></td>
<td>Macrolide</td>
</tr>
<tr>
<td><em>Bordetella pertussis</em></td>
<td>Macrolide</td>
</tr>
</tbody>
</table>
Home Based Management
Home based management - safe remedy

- Anti-pyretics
- Keep child hydration
  - Normal fluid requirement plus extra breast milk or fluids if there is fever
  - Breast milk and warm water (esp: for infant < 6months)
- Clear nasal secretion / decongestants
  - nasal drops: use only when nose blockage interferes with feeding
  - humidification
- Soothe sore throat
- Soothe the cough
How to prepare safe remedy:

• Ginger drink (for older child):
  • Boil 1-2 thumb-sized pieces of peeled root ginger (chopped /ground) in 4 glasses of drinking water for 15 minutes
  • Divide into 3 parts and give 1 part every 8 hours

• Warm to hot chicken soup few times a day

• A glass or cup of warm to hot lemon (lime) tea with or without honey
  • Lemon or lime juice (1/2-1 tablespoon)
  • Honey (1/2-1 tablespoon) - only for above 1 years old
Prevention
AVOID COUGH MIXTURES

- Sedation to the child
- Interfere with child’s feeding
- Interfere with the child’s ability to cough up secretions from the lungs
- Abdominal distension
When to return?

1. General danger signs
   • inability to breastfeed or drink
   • lethargy or unconscious
   • convulsion
2. Fast breathing / increased breathing effort
3. Develops high grade, persistent fever, with rash
4. Develops fit
When to refer?

1. Has general danger sign: -
   - inability to breastfeed or drink
   - lethargy or unconscious
   - convulsion
2. Chest indrawing
3. Stridor in calm child
4. Fast breathing
5. SpO2 < 96% - not responding to initial treatment
6. Unwell child
   - sustained tachycardia, persistent high grade fever > 48 - 72hours

* If a child presents with recurrent wheeze, please refer to a doctor.
Thank you