Upper Respiratory Tract Infections

Department of Clinical Microbiology
http://www.tcd.ie/Clinical_Microbiology
OBJECTIVES

• **Understanding of**
• Presentation of Upper Respiratory Infections
• Causative organisms
• Pathogenesis
• Diagnosis (clinical, laboratory, other)
• Clinical Management (treatment, preventative measures)
Infection Syndromes

- Common Cold
- Pharyngitis/Tonsillitis
- Quinsy
- Epiglottis
- Otitis Media
- Sinusitis
Anatomy

Pharyngitis, Epiglottis

Sinusitis

Otitis Media

The Eustachian Tube may become blocked by inflammation. This may lead to a build-up of fluid in the Middle Ear which is unable to drain away.
Common Cold

- Causative agents: Coronaviruses etc
- Epidemiology: usually common in the winter months
- Presentation: rhinitis, headache, conjunctival suffusion
- Management: **Antimicrobial agents not to be given.** Symptomatic relief may be accompanied by mucopurulent rhinitis (thick, opaque or discolored nasal discharge), this is not an indication for antimicrobial treatment unless it persists without signs of improvement 10-14 days suggesting possible sinusitis.
Pharyngitis

• Definition: Inflammatory Syndrome of the pharynx caused by several microorganisms
• Causes: most viral but may also occur as part of common cold or influenza syndrome
• The most bacterial cause is Group A Streptococcus (Streptococcus pyogenes)-5-20%
• Review: NEJM 344:205 2001
## ETIOLOGY

### Microbial Causes of Acute Pharyngitis

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Syndrome/Disease</th>
<th>Estimated Importance</th>
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<tbody>
<tr>
<td><strong>Viral</strong></td>
<td></td>
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<tr>
<td>Rhinovirus (100 types and 1 subtype)</td>
<td>Common cold</td>
<td>20</td>
</tr>
<tr>
<td>Coronavirus (3 or more types)</td>
<td>Common cold</td>
<td>≥5</td>
</tr>
<tr>
<td>Adenovirus (types 3, 4, 7, 14, 21)</td>
<td>Pharyngoconjunctival fever, ARD</td>
<td>5</td>
</tr>
<tr>
<td>Herpes simplex virus (types 1 and 2)</td>
<td>Gingivitis, stomatitis, Pharyngitis</td>
<td>4</td>
</tr>
<tr>
<td>Parainfluenza virus (types 1-4)</td>
<td>Common cold, croup</td>
<td>2</td>
</tr>
<tr>
<td>Influenza virus (types A and B)</td>
<td>Influenza</td>
<td>2</td>
</tr>
<tr>
<td>Cocksackievirus A (types 2, 4-6, 8, 10)</td>
<td>Herpangina</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Epstein-Barr virus</td>
<td>Infectious mononucleosis</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Cyto megalovirus</td>
<td>Infectious mononucleosis</td>
<td>&lt;1</td>
</tr>
<tr>
<td>HIV-1</td>
<td>Primary HIV infection</td>
<td>&lt;1</td>
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<tr>
<td><strong>Bacterial</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streptococcus pyogenes (group A</td>
<td>Pharyngitis/tonsillitis, scarlet</td>
<td>15-30</td>
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<tr>
<td>β-hemolytic streptococci)</td>
<td>fever</td>
<td></td>
</tr>
<tr>
<td>Group C β-hemolytic streptococci</td>
<td>Gingivitis, Pharyngitis</td>
<td>5-10</td>
</tr>
<tr>
<td><strong>Mixed anaerobic infection</strong></td>
<td>(Vincent’s angina)</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Neisseria gonorrhoeae</td>
<td>Peritonsillitis/peritonsillar abscess</td>
<td>&lt;1</td>
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<tr>
<td>Corynebacterium diphtheriae</td>
<td>(quinsy)</td>
<td></td>
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<tr>
<td>Corynebacterium ulcerans</td>
<td></td>
<td></td>
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<tr>
<td>Arcanobacterium haemolyticicum (Corynebacterium haemolyticicum)</td>
<td>Pharyngitis</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Yersinia enterocolitica</td>
<td>Diphtheria</td>
<td>&lt;1</td>
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<tr>
<td>Treponema pallidum</td>
<td>Pharyngitis, diphtheria</td>
<td>&lt;1</td>
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<tr>
<td><strong>Chlamydial</strong></td>
<td>Pharyngitis, scarlatiform rash</td>
<td>&lt;1</td>
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<tr>
<td>Chlamydia pneumoniae</td>
<td>Secondary syphilis</td>
<td>Unknown</td>
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<tr>
<td><strong>Mycoplasmal</strong></td>
<td>Pneumonia/bronchitis/Pharyngitis</td>
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<tr>
<td>Mycoplasma pneumoniae</td>
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<tr>
<td>Mycoplasma pneumoniae</td>
<td>Pneumonia/bronchitis/Pharyngitis</td>
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<tr>
<td>Mycoplasma hominis (type 1)</td>
<td>Pharyngitis in volunteers</td>
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</table>

Approximately 15% of all cases of Pharyngitis are due to S. pyogenes. Strep. of Group C and B have also been implicated in some cases.
Pharyngitis Clinical Presentation

- Clinical presentation with soreness of the throat, may be dysphagia and pain on swallowing, fever and additional upper respiratory symptoms may also be present, Tender cervical lymphadenopathy
Pharyngitis-Clinical Presentation

• Exudative or Diffuse erythema- *Group A*, *C*, *G Streptococcus*, *EBV*, *Neisseriae gonococcus*, *C.diphtheriae*, *A.haemolyticum*, *Mycoplasma pneumoniae*

• Vesicular, ulcerative- *Coxsackie A9, B 1-5, ECHO, Enterovirus 71, Herpes simplex 1 and 2*

• Membranous- *Corynebacterium diphtheriae* or *Vincent Angina (anaerobes/spirochetes)*
Pharyngitis Diagnosis

- Clinical Presentation
- Determine if Group A Streptococcus is present by throat swab onto blood agar
- Antigen Kit may also be used
- Important to determine if present as treatment reduces risk of acute rheumatic fever and will reduce duration of symptoms
Pharyngitis Diagnosis

- B-Haemolytic colonies of *Group A Streptococcus* from a throat swab
Management of Uncomplicated Acute Pharyngitis—Pediatric**

Clinical & epidemiologic features

- Not suggestive of group A streptococcal pharyngitis
- Suggestive of group A streptococcal pharyngitis (see below)

Symptomatic therapy (See reverse)

Throat culture

Rapid antigen detection test

- + Antimicrobial therapy (See reverse)
- -

Features of Group A Streptococcal Pharyngitis:
- Winter and early spring
- Contact with known case
- Sore throat, fever, dysphagia, exudative pharyngitis, tender lymphadenitis

* Adapted from reference 1 & 2
+ Additional diagnostic and therapeutic procedures may need to be employed for complicated pharyngitis (e.g. peritonsillar abscess, suspected diphtheria or pharyngeal gonorrhea)
Management of Uncomplicated Acute Pharyngitis--Pediatric

**Therapy**

- **Penicillin V:**
  - 250 mg bid or tid
  - X 10 days OR
- **Benzathine Penicillin G:**
  - 25,000 units/kg
  - X 1 dose IM
  - Max 1.2 million units

**Alternative:**

- Amoxicillin 45 mg/kg/day po divided tid X 10 day

If Penicillin allergic:

- **Erythromycin estolate:**
  - 10 mg/kg bid X 10 days OR
- **Erythromycin succinate:**
  - 20 mg/kg bid X 10 days OR

If a culture is performed, antibiotic therapy should be delayed until positive culture results are known.

**FACTOIDs:**

- 30% of pediatric cases of acute pharyngitis are due to Group A Streptococcus (compared to 10% in children).
- The vast majority of pharyngitis is due to respiratory viruses and there is no specific treatment other than symptomatic.
- Antibiotic therapy of pharyngitis will benefit only those with infection due to Group A Streptococcus. In these patients there is a decrease in duration of some symptoms by 1-2 days.
- The major indication for antibiotic therapy of Group A Streptococcal pharyngitis is the prevention of rheumatic fever.

**References:**

MANAGEMENT OF PHARYNGITIS

Sore throat and pain on swallowing

Documented streptococcal infection in family member or face-to-face contact

Present

Absent

Associated features suggestive of group A streptococcal pharyngitis:

- Fever
- Headache
- Nausea/Vomiting
- Abdominal pain
- Tonsillopharyngeal erythema (± exudate)
- Tender cervical lymphadenopathy
- Bulbar exudate
- Palatine petechiae
- Scarletiform rash

Rapid group A streptococcus antigen detection

Positive

Throat culture

Positive

Antimicrobial therapy:

Penicillin V: 250 mg (<27 kg) or 500 mg (>27 kg) PO tid x 10 days

(Amoxicillin is often used in place of penicillin V in young children, based on the acceptance of the taste of amoxicillin suspension)

Benzathine penicillin G: 600,000 IU (<27 kg) or 1.2M IU (27 kg) IM once

For individuals allergic to penicillin

Erythromycin ethylsuccinate: 40 mg/kg/day tid x 10 days (1 gm/d maximum)

Cephalexin: Adult: 500 mg PO qid x 10d

Child: 20-50 mg/kg/day PO qid x 10 days (2 gm/day maximum)

Azithromycin: Adult: 500 mg (1st day) then 250 mg (2nd - 5th days) PO once daily

Child: 12 mg/kg/day PO qd x 5 days

No further evaluation

Negative

Symptomatic therapy
Quinsy Clinical Presentation

- Tonsillar Abscess with pain, fever, difficulty swallowing
Quinsy Diagnosis

• Tonsillar Abscess examination
Quinsy Clinical Management

• Drainage of Abscess and antimicrobial therapy
Epiglottis

- Definition: Inflammation of the epiglottis due to infection
- Epidemiology: usually occurs in the winter months
- Causative Organisms: *H. Influenzae* (now rare), *S. pyogenes*, *Pneumococcus*, *Staphylococcus aureus*
Epiglottis Clinical Presentation

• In children because of the small airway may obstruct breathing and symptoms of adults
• In adults fever, pain on swallowing, sore throat, cough sometimes with purulent secretions
Epiglottis Diagnosis

- Clinical presentation
- Lateral X-ray
- Blood Cultures/Respiratory Secretions for Culture
Epiglottitis Clinical Management

- Maintain airway in children may require tracheostomy
- (tracheostomy set should be at bedside)
- Cefotaxime I/V
Haemophilus Influenzae Culture
OTITIS MEDIA
American Academy of Pediatrics
and American Academy of Family Physicians
Clinical Practice Guidelines
Pediatrics Vol. 113 No.5 May 2004
Otitis Media

• Definition: for diagnosis requires 3 things
  • Confirmation of acute onset
  • Signs of Middle Ear Effusion (Pneumatic otoscopy)-Bulging of TM, Limited mobility, Air-fluid level, otorrhoea
  • Evaluation of Signs and Symptoms of Middle Ear Inflammation: Erythema of TM or Distinct otalgia (interfers with sleep)

• Epidemiology: AOM must common cause of antibiotic prescribing in paediatric population, cost $1.96 billion in U.S, more common in some conditions such as cleft palate, Down's syndrome, genetic influences, occurs in the winter months but may be recurrent
Otitis Media

• Causative Organisms:
  • *Streptococcus pneumoniae*-25-50%
  • *Haemophilus Influenzae*-15-30%
  • *Moraxella catarrhalis*-3-30%
  • *Rhinovirus/RSV/Coronaviruses/Adenoviruses/Enteroviruses* –40-75%
Streptococcus pneumoniae
Otitis Media Clinical Presentation

- Symptoms: Infant excessive crying, pulling ear
- Toddler: irritability, earache
- Both may have otorrhoea
- Signs: Fever, bulging eardrum, fullness and erythema of tympanic membrane
- May also be additional upper respiratory symptoms
Otitis Media Diagnosis

- Diagnosis of MEE can be made a number of ways
- MEE is not AOM
- MEE may occur before AOM, without AOM or post AOM
Recommendation 2

• The management of AOM should include an assessment of Pain
• (and treat accordingly|)
Recommendation 3a

- Observation without use of antimicrobial agents in a child with uncomplicated AOM is an option for selected children based on diagnostic certainty, age, illness severity and assurance of follow-up
# Overview of Acute Otitis Media Treatment Options

<table>
<thead>
<tr>
<th>Child Age</th>
<th>Certain Diagnosis</th>
<th>Uncertain Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 6 months</td>
<td>Antibiotics</td>
<td>Antibiotics</td>
</tr>
<tr>
<td>6 months to 2 years</td>
<td>Antibiotics</td>
<td>Antibiotics if severe illness</td>
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<tr>
<td></td>
<td></td>
<td>Observe* if non-severe illness</td>
</tr>
<tr>
<td>2 years or older</td>
<td>Antibiotics if severe illness</td>
<td>Observe*</td>
</tr>
<tr>
<td></td>
<td>Observe* if non-severe illness</td>
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</tr>
</tbody>
</table>

*Observation is appropriate only when follow-up can be assured and antibiotics started if symptoms persist or worsen.

Non-severe illness implies mild otalgia and fever ≤39°C orally (about 102°F) or 39.5°C rectally in the past 24 hours. Severe illness is moderate to severe otalgia or higher fever.

Certain diagnosis is a clinical picture suggesting acute otitis media with a high probability of middle-ear effusion. Uncertain diagnosis is a clinical picture suggesting acute otitis media with anything less than a high probability of middle ear effusion.
Otitis Media Clinical Management

- Analgesia
- Observation if appropriate
- If a decision is made to treat with an antibacterial agent amoxicillin should be prescribed for most children at a dose of 80-90 mg/kg/day.
Recommendation 4

• If there is no clinical improvement in 48-72 hours
• Reassess and confirm or exclude diagnosis of AOM
• If Observation arm: treat
• If Treatment arm: Change therapy
• Duration of therapy: 10 days if 2 or less or severe 10 days, if > 2 years 5-7 days
Recommendation

• Physicians should encourage prevention
• -How?
Recurrent Otitis Media
Sinusitis

• Definition: Acute Bacterial Sinusitis, subacute Bacterial Sinusitis, Recurrent acute, Chronic sinusitis, Superimposed

• Epidemiology: children has 6-8 viral UTI per year and 5-13% may be complicated by sinusitis
Definitions Sinusitis

- Acute Bacterial: Bacterial Infection of the paranasal sinuses lasting less than 30 days in which symptoms resolve completely.
- Subacute Bacterial Sinusitis: Lasting between 30 and 90 days in which symptoms resolve completely.
- Recurrent acute bacterial sinusitis: Each episode lasting less than 30 days and separated by intervals of at least 10 days during which the patient is asymptomatic.
- Chronic Sinusitis: Episode lasting longer than 90 days. Patients have persistent residual respiratory symptoms such as cough, rhinorrhea or nasal obstruction.
- Chronic Sinusitis: New symptoms resolve but underlying residue symptoms do not.
Sinusitis

- Pathogens:
  - *Streptococcus pneumoniae*- 30%
  - *Haemophilus Influenzae*- 20%
  - *Moraxella catarrhalis*- 20%
Sinusitis

- Diagnosis: > or = 10,000 cfu/ml from the cavity of paranasal sinus - but this is invasive
Recommendation 1

- Diagnosis is based on clinical criteria who have upper RT symptoms that are persistent or severe
- Acute bacterial
- Persistent symptoms: nasal or postnasal D/C, daytime cough (worse at night) or both
- Severe Symptoms: Temp(>39 C) and purulent nasal D/C present concurrently for at least 3-4 days in a child who seems ill
Recommendation 2a

- Imaging studies are not necessary to confirm a diagnosis of clinical sinusitis in children less than 6 years of age
X-ray of Sinuses
Recommendation 2b

- Ct scans should be preserved for those who may require surgery as part of management
Recommendation

• Antibiotics are recommended for Acute Bacterial Sinusitis to achieve a more rapid clinical cure

• Amoxicillin at 45 or 90 mg/kg.day recommended
  – Most response in 48-72 hours
  – Duration : until symptom free plus 7 days
Recommendation

• Children with complications or suspected should be treated promptly and aggressively
• Referral to ENT specialist, Ophthalmologist, ID physicians and neurosurgeon
• Complications involve orbit and Central Nervous System