Approach to Common Outpatient Infections

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Infectious Diseases
Antibiotic Groups

- Cell wall less bacteria
- Mycoplasma
  - Young individual- walk in pneumonia
  - Cell wall antibiotics does not work
Recognize Outpatient Pathogens
Bacteria Cell wall and Importance of Gram stain

**Gram-positive bacteria**
- Peptidoglycan
- Cell wall
- Plasma membrane

**Gram-negative bacteria**
- Outer membrane
- Inner membrane
- Peptidoglycan

**Hans Christian Gram**
Danish Bacteriologist
Approach to Common Outpatient Illness

• Urinary Tract Infection
• Skin and Soft Tissue infection
• Ear and sinus infection
• Respiratory tract infection
Urinary Tract Infections (UTIs)
UTI - Terminology and Epidemiology

- **Upper urinary tract Infections:**
  - Pyelo-nephritis
  - Ureteritis
- **Lower urinary tract infections**
  - Cystitis (“traditional” UTI)
  - Urethritis (often sexually-transmitted)

**Uncomplicated:** UTI without underlying renal or neurologic disease.

**Complicated:** UTI with underlying structural, medical or neurologic disease.

**Recurrent:** > 3 symptomatic UTIs within 12 months following clinical therapy.

**Reinfection:** recurrent UTI caused by a different pathogen at any time

**Relapse:** recurrent UTI caused by same species causing original UTI within 2 wks after therapy.

- Seen in all age groups
- Infants up to 6 months – 2/1000
- More common in boys than girls

- **Women** – at greater risk than men; prevalence 40-50% in women and 0.04% in men.
- 10% women have recurrent UTI in their life
- 7 million new cases of lower UTI / year
- 1 million hospitalizations / year

- Incidence of UTI increases in old age; 10% of men and 20% of women are infected.
Case 1

• A 25-year-old sexually active female presented with urinary frequency and urgency. She uses spermicidal cream for contraception. This is her third episode of UTI in last 6 months. Otherwise no fevers, no chills, no back pain. Pt has no other medical history.

While men and women can get UTIs from sex, women are more likely to develop a post-coital UTI.
Case 2

A 78-year-old women with chronic cystocele presents with urinary frequency, and urgency, low abdominal cramps. This is her third episode of UTI in last 6 months. No fevers, no chills or back pain.

Vaginal pH rises after menopause and vaginal Lactobacillus decrease, allowing gram negative bacteria to grow and act as uropathogen. All these changes change vaginal flora and predispose to UTI.
The lowest rate of UTI due to E. coli (52%) belonged to O group and the highest rate (71%) was associated with AB group.

Persons with secretion of blood group antigen in body fluids are called secretors. Absence of respective antigen are called non-secretors. Non-secretor has increased inflammatory response to UTI.
Pathogens cultured in uncomplicated UTI

- Escherichia coli........................................ 70 – 95%
- Staphylococcus Saprophyticus.......... 5 – 20%
  \[(in \ pre\-menopausal \ women)\]
- Klebsiella.
- Enterococcus faecalis.
- Proteus Mirabilis.

Drug resistance-ESBL (extended spectrum beta lactamase producing) gram negative bacteria

Bacterial adherence
Adhesins on pili (fimbriae) attach to specific epithelial cell receptors

\[E.coli\]
Urine Dipstick

- Meta-analysis:
  - A useful screening test (nitrite + leucocyte esterase)
  - Nitrites are produced from the reduction of urea by urea-splitting bacteria.
  - Leucocyte esterase is produced as a result of leucocyte degradation in urine. It is a surrogate marker of pyuria.

Midstream specimen of urine (MSSU)

- The gold standard: quantitative culture and sensitivity testing of a freshly voided MSSU.
- Colony-forming units (CFUs) of is 100,000/ml: indicate infection.
- However, clinically significant UTI can still be present with lower counts.

Table 3. Nitrite Test Results of Gram-negative Organisms

<table>
<thead>
<tr>
<th>Gram-negative</th>
<th>Positive cultures</th>
<th>Nitrites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eschereria coli</td>
<td>219</td>
<td>119 (53.9%)</td>
</tr>
<tr>
<td>Klebsiella sp</td>
<td>51</td>
<td>22 (43.1%)</td>
</tr>
<tr>
<td>Pseudomonas sp</td>
<td>29</td>
<td>16 (55.2%)</td>
</tr>
<tr>
<td>Enterobacter sp</td>
<td>13</td>
<td>3 (23.1%)</td>
</tr>
<tr>
<td>Citrobacter sp</td>
<td>10</td>
<td>5 (50.0%)</td>
</tr>
<tr>
<td>Others</td>
<td>14</td>
<td>3 (21.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>336</td>
<td>167 (49.7%)</td>
</tr>
</tbody>
</table>

Table 2. Nitrite Test Results of Gram-positive Organisms

<table>
<thead>
<tr>
<th>Gram-positive</th>
<th>Positive cultures</th>
<th>Nitrites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterococcus</td>
<td>31</td>
<td>1 (3.3%)</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>2</td>
<td>1 (50.0%)</td>
</tr>
<tr>
<td>Coagulase Negative</td>
<td>6</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>Staphylococci</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streptococci Group B</td>
<td>34</td>
<td>- (0.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>73</td>
<td>4 (5.5%)</td>
</tr>
</tbody>
</table>
Asymptomatic bacteriuria and Pyuria is COMMON

<table>
<thead>
<tr>
<th>Population</th>
<th>Prevalence</th>
<th>Population With ASB</th>
<th>Prevalence of Pyuria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy premenopausal women</td>
<td>1–5%</td>
<td>Young women</td>
<td>32%</td>
</tr>
<tr>
<td>Women 70–90 years old</td>
<td>11–16%</td>
<td>Pregnant women</td>
<td>30–70%</td>
</tr>
<tr>
<td>Female long-term care residents</td>
<td>25–50%</td>
<td>Women with diabetes</td>
<td>70%</td>
</tr>
<tr>
<td>Male long-term care residents</td>
<td>15–50%</td>
<td>Elderly institutionalized patients</td>
<td>90%</td>
</tr>
<tr>
<td>Females with diabetes</td>
<td>9–29%</td>
<td>Dialysis patients</td>
<td>90%</td>
</tr>
<tr>
<td>Males with diabetes</td>
<td>1–11%</td>
<td>Patients with short-term catheters</td>
<td>30–75%</td>
</tr>
<tr>
<td>People receiving hemodialysis</td>
<td>25%</td>
<td>Patients with long-term catheters</td>
<td>50–100%</td>
</tr>
<tr>
<td>People with long-term indwelling urinary catheters</td>
<td>&gt; 90%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Asymptomatic bacteriuria and pyuria is treated in Pregnancy
Management of recurrent UTI
Approach to Acute: Uncomplicated UTIs

First-line recommendations

▪ Nitrofurantoin
▪ Trimethoprim/sulfamethoxazole (TMP/SMX) (check local resistance data)

Second-line options

▪ Oral cephalosporins

For any UTI, look at prior urine culture information to guide empiric therapy.

• Uncomplicated MDRO-ESBL (Extended spectrum beta lactamase) producing bacteria – treat with Fosfomycin 3gm x 1 dose
Prevention is the Cure

• Behavioral modification and avoidance of risk factor
  • Personal hygiene
  • Avoid constipation
  • Sexual hygiene

• Non-antimicrobial measures
  • Increase water fluid intake
  • Hormone replacement in post menopausal women
  • Probiotics-to restore-lactobacilli
  • Cranberry juice
  • D-Mannose

• Antimicrobial prophylaxis
  • Self-start antibiotics
  • Chronic low dose
  • Post coital

• Promising result has been with intravaginal *Lactobacillus crispatus* daily for 5 days and then once weekly for 10 weeks.
  • No efficacy seen with oral lactobacillus.

• *Intravaginal estrogen therapy* in the form vaginal creams, ring pessary significantly **reduces the risk of recurrent UTI in postmenopausal women.**

• Oral estrogen has **not effective** to prevent recurrence.
Simply created a revolution-cranberry and D-Mannose—in prevention of UTIs Each

- Potent source of antioxidants
- Has phytochemical-antiadhesive-prevent bacteria adhering to walls of bladder
- Also changes bladder pH to more acidic-preventing bacterial growth

Each tablet contains
Cranberry extract (25 % proanthocyanidins)-300mg  
D-mannose ------------------------------------------600 mg

* Early randomized controlled trials showed that cranberry juice decreased the number of symptomatic relapses over a 12-month period in women with recurrent UTIs.
Role of Urinary Antiseptic-

• decreases inflammation,

• hypermotility and Pain
  • Methenamine- decomposes slowly in acidic urine pH to release formaldehyde→ inhibits all bacteria
  • Pyridium-phenazopyridine (Azo)-is a dye-has analgesic action-provides symptomatic relief. May stain clothing
Antibiotic prophylaxis

Consider antimicrobial prevention only after counselling and behavioural modification has been attempted & when the non-antimicrobials have been unsuccessful!

- Continuous daily, weekly for longer periods of time (3-6 months)
- Post-coital

Continuous antibiotic prophylaxis

- TMP/SMX (40 mg/200 mg daily or thrice weekly)
- Trimethoprim (100 mg daily)
- Ciprofloxacin (125 mg daily)
- Cephalexin (125 mg to 250 mg daily)
- Nitrofurantoin (50 mg to 100 mg daily)
- Norfloxacin (200 mg daily)
- Fosfomycin (3 gm every 10 days)

Post Coital Prophylaxis
(Within 2 hours of Coitus)

- TMP/SMX (40 mg/200 mg to 80 mg/400 mg)
- Ciprofloxacin (125 mg)
- Cephalexin (250 mg)
- Nitrofurantoin (50 mg–100 mg daily)
- Norfloxacin (200 mg)
- Ofloxacin (100 mg)
Skin and Soft tissue infection
• *Streptococcus* - spreads widely along tissue planes. No pus should be found. If there is any pus, there is more than *strep* there!

• *Staph aureus/MRSA* – produces localized pus and abscesses with small area of surrounding *erythema*, rather than diffuse inflammation.
Staph cellulitis

Strep-cellulitis
<table>
<thead>
<tr>
<th>Condition</th>
<th>Treatment Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impetigo</td>
<td>Topical mupirocin, retapamulin 5 days</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>Oral clindamycin OR combination of SMX-TMP or doxycycline PLUS cephalaxin or amoxicillin 7 days</td>
</tr>
<tr>
<td>Abscess</td>
<td>Drainage alone if &lt; 5 cm. If fever, add antibiotics against <em>S. aureus</em>: clindamycin alone OR combination of SMX-TMP or doxycycline PLUS cephalaxin or amoxicillin 7 days</td>
</tr>
</tbody>
</table>
Ear Infections - Otitis Media (OM)
Acute Otitis Media (AOM)

**Acute Otitis Media (AOM)**

- “acute onset of symptoms, evidence of a middle ear effusion, and signs or symptoms of middle ear inflammation.”
- Recurrent AOM: three or more episodes in the previous six months or four or more in the preceding twelve months.
- Treatment failure AOM: a lack of improvement in sign and symptoms within 48-72 hours of AB treatment.

- 31 million visits to physicians annually in U.S.
- Most common diagnosis for an AB prescription in children.
- Diagnosed > 5 million times a year.
- 3-5 billion $/year in U.S.
- 50,000 deaths / year worldwide.
Common causes of AOM

- **Eustachian tube obstruction**
  - Length: shorter in children
  - Angle: $10^\circ$ children vs. $45^\circ$ adult

- **Decreased immunocompetence**

- **Follows upper respiratory infection (URI)**
  - Peak incidence 2 - 4 days
Pathogens - Otitis Media (OM)

OM-Microbiology-Bacterial Causes

- **Acute OM**
  - < 3 months of age
    - *S. pneumoniae* (40%)
    - Group B Streptococcus
    - *H. influenzae* (non-typable)
    - Gram negative bacteria and *P. aeruginosa*
  - > 3 months of age
    - *S. pneumoniae*,
    - *H. influenzae*, others eg, *S. pyogenes*, *Moraxella catarrhalis*, *S. aureus*

- **Chronic OM**
  - Mixed flora in 40% of cases

- **Serous OM**
  - Same as chronic OM, but
  - Most of the effusions are sterile
  - Few acute inflammatory cells
Why Focus on Pneumococcus?

- Most common initial bacterial pathogen
- Most common isolate after failed therapy
- Least likely bacterial pathogen to self resolve
- Most likely to cause severe otitis media
- Most likely to cause suppurative complications of otitis (mastoiditis)

Drug resistant *S. pneumoniae* (DRSP) incidence increasing

Patients at high risk for DRSP

- Attending day care
- < 2 years old
- Antibiotic therapy in preceding 3 months
Approach - Common Otitis Media - Pathogens

Amoxicillin: 1st Line Rationale

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>% Cases</th>
<th>% Resistant to amoxicillin</th>
<th>% Spontaneous resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. pneumoniae</td>
<td>40 – 50</td>
<td>10 - 16</td>
<td>20</td>
</tr>
<tr>
<td>H. influenzae</td>
<td>20 – 30</td>
<td>35 – 40</td>
<td>50</td>
</tr>
<tr>
<td>M. catarrhalis</td>
<td>10 – 15</td>
<td>95</td>
<td>90</td>
</tr>
</tbody>
</table>
Treatment Failure

- No improvement in ear pain, fever, or tympanic membrane otorrhea, bulging or redness after 3 days of antibiotic therapy

2nd Line Therapy

- DRSP
- Beta-lactamase producing *H. influenzae* and *M. cattarhalis*
## Treatment

<table>
<thead>
<tr>
<th>High risk DRSP? (Day care, &lt;2 yo, antibiotics within ≤3 months)</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; Line Therapy</th>
<th>Treatment Failure (Day 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>High dose (HD) amoxicillin, HD Augmentin®, or cefuroxime axetil</td>
<td>HD Augmentin®, cefuroxime axetil, ceftriaxone IM x3 days, or clindamycin</td>
</tr>
<tr>
<td>No</td>
<td>HD amoxicillin</td>
<td></td>
</tr>
</tbody>
</table>
Summary of Otitis Media

**ACUTE OTITIS MEDIA IS TYPICALLY PRECEDED BY A **VIRAL **UPPER RESPIRATORY INFECTION**

**TOP 3 PATHOGENS**
- *S. pneumoniae*
- *H. influenzae*
- *Moraxella*

**ANTIBIOTIC TREATMENT IN AOM**
- HIGH-DOSE AMOXICILLIN
- OR AMOXICILLIN-CLAVULANATE
- OTHER OPTION → CEFDINIR

**COMPICATIONS**
- MASTOIDITIS → ERYTHEMA, PAIN, SWELLING BEHIND THE EAR
- INTRACRANIAL (ABSCESS, MENINGITIS)
- CHANGE IN MENTAL STATUS
- FACIAL NERVE COMPRESSION
- FACIAL WEAKNESS/PARALYSIS
Sinusitis
BACTERIOLOGY

- Most cases of acute sinusitis start as viral infections followed soon by bacterial invasion such as:
  - *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*,
  - *Streptococcus pyogenes*, *Staphylococcus aureus* and *Klebsiella pneumoniae*.
  - Anaerobic organisms and mixed infections are seen in sinusitis of dental origin.
CLINICAL MANIFESTATIONS

- Maxillary sinusitis: Pain in the upper jaw.
- Frontal sinusitis: Pain in the forehead.
- Ethmoid sinusitis: Pain over nasal bridge.
- Sphenoid sinusitis: Pain over the occiput or vertex.

ANTIBIOTICS

1ST LINE: AMOXICILLIN (45 mg/kg/day)
AMOXYCLAV 625 mg (Amoxicillin 500 mg + clavulanic acid 125 mg) in patients not responding to amoxicillin in <72 hours.

2ND LINE: MACROLIDE (Azithromycin, Clarithromycin)
FLUOROQUINOLONE (Levofloxacin, Ofloxacin, Moxyfloracin)
Cefdinir, Cefuroxime, Cefpodoxime
RTI (respiratory tract infection) IMPORTANCE

- Nearly 50% of all paediatric consultations in industrialized countries are caused by respiratory tract infections (RTIs). Acute RTIs are among the leading causes of childhood mortality, especially in developing countries.
  - Their annual incidence per child decreases with age:
    - 6.1 in children less than 1 year
    - 5.7 in children aged 1-2
    - 4.7 in children aged 3-4
    - 3.5 in children aged 5-9
    - 2.7 in children aged 10-14
    - 2.4 in children aged 15-19.
Respiratory tract infections refers to any of a number of infectious diseases involving the respiratory tract.

It is classified into 2 types they are:

- UPPER RESPIRATORY TRACT INFECTIONS
- LOWER RESPIRATORY TRACT INFECTIONS
<table>
<thead>
<tr>
<th>BACTERIA</th>
<th>AGE GROUP AFFECTED</th>
<th>CHARACTERISTIC CLINICAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bordetella pertussis</td>
<td>Infants &amp; young children</td>
<td>Paroxysmal cough</td>
</tr>
<tr>
<td>Corynebacterium diphtheriae</td>
<td>Children</td>
<td>Diphtheria</td>
</tr>
<tr>
<td>Hemophilus influenzae</td>
<td>Adults</td>
<td>Acute ex of ch bronchitis Acute epiglottitis</td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>Adults</td>
<td>Lobar pneumonia</td>
</tr>
<tr>
<td>Legionella pneumophila</td>
<td>Adults</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>Staph. pyogenes</td>
<td>All ages</td>
<td>Lobar and bronchopneumonia</td>
</tr>
<tr>
<td>Strep. pneumoniae</td>
<td>All ages</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>Strep. pyogenes</td>
<td>All ages</td>
<td>Acute pharyngitis and tonsillitis</td>
</tr>
<tr>
<td>Age</td>
<td>Usual Pathogen(s)</td>
<td>Presumptive Therapy</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>3 months–6 years</td>
<td><em>Pneumococcus, H. influenzae</em>, RSV, adenovirus, parainfluenza</td>
<td>Amoxicillin or cephalosporin, Ampicillin–sulbactam, amoxicillin–clavulanate, Ribavirin for RSV</td>
</tr>
<tr>
<td>&gt;6 years</td>
<td><em>Pneumococcus, Mycoplasma pneumoniae</em>, adenovirus</td>
<td>Macrolide/azalide, cephalosporin, amoxicillin–clavulanate</td>
</tr>
</tbody>
</table>
## Treatment

<table>
<thead>
<tr>
<th>First Line</th>
<th>Penicillin Allergy</th>
<th>Treatment Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin high dose 80–90 mg/kg/day</td>
<td>Non-type I:</td>
<td>Amoxicillin-clavulanate&lt;sup&gt;α&lt;/sup&gt;</td>
</tr>
<tr>
<td>divided twice daily</td>
<td>Cefdinir 14 mg/kg/day once or twice daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cefuroxime 30 mg/kg/day divided twice daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cefpodoxime 10 mg/kg/day once daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cefprozil 30 mg/kg/day divided twice daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Type I:</strong></td>
<td>Ceftriaxone 50 mg/kg/day IM/IV for 3 days</td>
</tr>
<tr>
<td></td>
<td>Azithromycin 10 mg/kg/day 1, then 5 mg/kg/day for days 2–5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clarithromycin 15 mg/kg/day divided twice daily</td>
<td></td>
</tr>
</tbody>
</table>

If severe symptoms (severe otalgia and temperature above 39°C [102.2°F])

Amoxicillin-clavulanate<sup>α</sup>

Alternatives:

Clindamycin 30–40 mg/kg/day in 3 divided doses

Tympanocentesis
Any Questions