

# THE ABC'S OF ABX

## GENERAL CONCEPTS

- >100 million antibiotic prescriptions written each year in ambulatory care settings
- Inappropriate antibiotic use promotes resistance
- Broad spectrum antibiotics frequently used for upper respiratory infections with viral etiology
- Narrow spectrum antibiotics are equally effective if necessary

## GENERAL CONCEPTS

- 1/3 of physicians report a perceived expectation of an antibiotic prescription
- Time constraints on clinicians often make prescribing an antibiotic preferable to explaining why an antibiotic is unnecessary
- BUT...**
- There is no association between receiving an antibiotic prescription and patient satisfaction with the office visit

## GENERAL CONCEPTS

What does impact patient satisfaction???

When patients understand their illness after the visit and if they feel that their clinician spent enough time with them.

## ANTIBIOTIC OVERVIEW

- Penicillins**
  - Penicillin G
  - Penicillin VK
    - Group A strep
    - Group B strep
    - C. Peritingers
- Aminopenicillins**
  - Ampicillin
    - Above plus E. faecalis and E. coli
- Mechanism of action**
  - Bactericidal
  - Inhibits cell wall synthesis
- Adverse Reactions:**
  - hypersensitivity
  - hemolytic anemia

## BETA LACTAMS

- Augmentin (due to Clavulanic Acid)
  - Staph aureus
  - Staph epidermidis
  - E. coli
  - Klebsiella
- Mechanism:**
  - Inhibit beta lactamase
  - Bactericidal
  - inhibits cell wall synthesis

### CEPHALOSPORINS

**1<sup>st</sup> Generation**  
 Cephalexin (Keflex)  
 Cefazolin (Ancef, Kefzol)  
 Staph Aureus  
 Staph Epidermidis  
 E. Coll  
 Klebsiella

**Mechanism of Action:**  
 Bactericidal  
 Inhibits cell wall synthesis

**Adverse Reactions:**  
 hemolytic anemia  
 hypersensitivity reaction

### CEPHALOSPORINS

**2<sup>nd</sup> Generation**  
 Cefoxitin  
 Cefotetan (Cefotan)  
 Cefuroxime  
 Staph Aureus  
 Staph Epidermidis  
 increased gram negative coverage

**Adverse Reaction:**  
 Hypersensitivity  
 ETOH disulfiram reaction (antabuse like effect)

### CEPHALOSPORINS

**3<sup>rd</sup> Generation**  
 Ceftriaxone  
 Cefotaxime  
 Cefixidime  
 Cefepime (4<sup>th</sup> generation)  
 Staph Aureus  
 Staph epidermidis  
 increased gram negative coverage plus pseudomonas

### MACROLIDES

**Erythromycin**  
 Clarithromycin  
 Azithromycin

**Clarithromycin**  
 Azithromycin

**Clarithromycin**  
 Azithromycin

**Mechanism of Action:**  
 Protein synthesis inhibitor  
 Bacteriostatic

**Adverse Effects:**  
 GI upset

### FLOUROQUINOLONES

**Ciprofloxacin (Cipro)**  
**Levofloxacin (Levaquin)**  
**Moxifloxacin (Axept)**  
**Norfloxacin**

**Streptococcus**  
**Mycoplasma**  
**Aerobic Gram +**  
**Pseudomonas**

**Mechanism of Action:**  
 DNA gyrase inhibition  
 Bactericidal

**Adverse Effects:**  
 tendinopathy (avoid strenuous activity with corticosteroids)  
 Prolonged QT intervals  
 GI upset

### TETRACYCLINES

**Doxycycline**  
**Tetracycline**  
**Minocycline**

**spirochetes ( Lyme disease, anaplasmosis)**  
**Rickettsia**  
**mycoplasma**  
**Staph Aureus (MRSA)**

**Mechanism of action:**  
 Protein synthesis inhibition  
 Bacteriostatic

**Adverse effects:**  
 phototoxicity  
 GI upset  
 vaginal yeast infections

## BACTRIM

Trimethoprim/sulfonamides

Proteus  
Enterobacter  
MRSA

Mechanism of Action:

folic acid synthesis inhibitor  
Bacteriostatic

Adverse effects:

Thrombocytopenia  
Avoid in 3<sup>rd</sup> trimester

## ANTIBIOTIC RESISTANCE MECHANISMS

Beta Lactamase

allows bacteria to hydrolyze PCN

E. Coli, Staph, Pseudomonas, Klebsiella

Altered Cell Wall Permeability

confers resistance to tetracyclines, quinolones, trimethoprim and Beta lactams

Creation of a biofilm barrier

allows bacteria to multiply despite hostile environment

salmonella, staph epi

Active efflux pumps

confers resistance to erythromycin and tetracyclines

staph

## ANTIBIOTIC RESISTANCE

Not inevitable

Finland noted increased macrolide resistance among patients with group A strep

- Nationwide recommendations developed for appropriate use of macrolide antibiotics
- Efforts led to a reduction in the use of macrolides
- Then subsequent decrease in erythromycin resistance

## UPPER RESPIRATORY INFECTIONS

Pharyngitis

Otitis media

Sinusitis

Cough

## PHARYNGITIS

When to treat

- Group A strep
  - Sore throat
  - Fever
  - Headache
- PE:
  - fever
  - Exudate
  - Palatal petechiae
  - Tender and enlarged anterior cervical lymph nodes
  - Absence of cough
- Confirm diagnosis with rapid antigen testing and/or possible throat culture

## PHARYNGITIS


Centor Criteria for obtaining strep testing

- Fever
- Exudate
- Tender enlarged anterior cervical lymph nodes
- Absence of cough
- Patient's age
  - <15 add one point
  - 15 to 45 0
  - >45 take away one point
- Score
  - -1-0 no further testing
  - 1-3 rapid strep, treatment based on result
  - 4-5 consider empiric treatment or rapid strep

### PHARYNGITIS

**Treatment**


- If group A strep
  - PCN VK
- tonsillitis
  - Augmentin
  - Ceftin
  - Cefzil
  - Clindamycin



### PHARYNGITIS

**When not to treat with antibiotics**

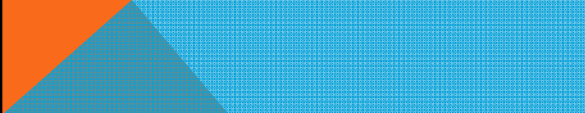
- Most cases are viral in origin
- Conjunctivitis
- Cough
- Rhinorrhea
- Diarrhea
- Absence of fever



### OTITIS MEDIA

**Usually abrupt onset of signs and symptoms of middle ear inflammation and effusion**

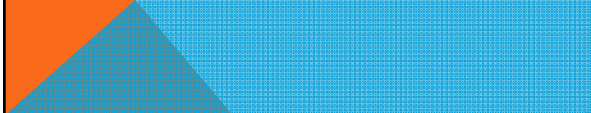
- Presence of middle ear effusion
  - Bulging of the tympanic membrane
  - Limited or absent mobility of TM
  - Air fluid level behind TM
  - otorrhea
- Signs or symptoms of middle ear inflammation
  - Erythema of TM
- Distinct otalgia interfering with normal activity or sleep



### OTITIS MEDIA

**Organisms**


- Streptococcus pneumoniae
- Nontypeable H. flu
- M. catarrhalis



### OTITIS MEDIA

**Treatment**


- True Fact...
  - 10 years ago there were high cure rates with most antibiotics
  - Now most OM resistant to Bactrim, PCN and Amox
- Bactrim
  - Strep pneumoniae shows >50% resistance
- Cillins
  - H. flu has 55% resistance to PCN, ampicillin and Amox
  - M. catarrhalis shows 100% resistance
- Macrolides
  - Concentrate intracellularly
  - Does not accumulate in middle ear fluid, so will not treat OM



### OTITIS MEDIA

**Treatment**

- Augmentin
- Amoxicillin
  - Need high dose
  - 80 mg/kg/day



## SINUSITIS

**Acute viral rhinosinusitis (AVRS) indistinguishable from acute bacterial rhinosinusitis (ABRS) in the first 10 days of illness based on history, exam or xrays**

- most are viral or allergic, pollutants, structural issues
- Rarely bacterial, fungal

**So how do we differentiate????**

## SINUSITIS

**Persistent symptoms lasting 10 or more days with no clinical improvement**

- Onset of severe symptoms
  - Fever >101
  - Purulent nasal discharge
  - Facial pain
  - Pain extending to maxillary teeth
    - No evidence of dental disease
- Onset with worsening symptoms
  - Following URI
  - Lasting 5-6 days with initial improvement
  - Symptoms lasting 3 consecutive days at onset of illness

## SINUSITIS

### Treatment

- Analgesics
- Saline irrigation
- Nasal steroids
- Topical decongestants
- Oral decongestants
  - Especially if Eustachian tube involvement

## RECOMMENDATIONS

### If mild ABRS manage expectantly

- Mild pain,
- Fever <101

### Withhold ABX X 3 days

### Supportive care

### If no better, treat with ABX

- Augmentin 5-7 days
- Doxycycline 5-7 days
- Levoquin/moxifloxacin only if absolutely necessary
- Macrolides only recommended for pregnant women allergic to PCN

## SINUSITIS

### JAMA study

- 240 patients with symptoms suggestive of ABRS
  - ABX alone
  - Nasal steroid spray alone
  - Both ABX and spray
  - No treatment
- NO TREATMENT = ABX ALONE

## SINUSITIS

### When to treat with ABX

- Fevers >100.6
- Symptoms lasting >10 days, or worsening after 5-7 days
  - Nasal discharge
  - Severe illness with fever
  - Pain in maxillary teeth with no evidence of dental disease
- Multiple episodes in one year
- Symptoms not relieved with OTC medications

## COUGH

### Acute bronchitis

- 90% of cases caused by routine respiratory viruses
- <10 % of cases caused by
  - Bordetella pertussis
  - Chlamydia pneumoniae
  - Mycoplasma pneumoniae

### Pneumonia

- Strep pneumoniae
- H. influenzae
- M. pneumoniae
- Legionella
- S. aureus

## ACUTE BRONCHITIS

### Common seasonal illness

70% of cough presentations

30 - 170 cases/100,000 per year

Generally viral

Generally self limited (1-2 weeks)

Seven large randomized, controlled trials and 3 meta analyses show no effect of ABX in general population

## ACUTE BRONCHITIS

### Self limited inflammation of the bronchi

#### Clinically expressed as cough

- Purulent sputum reported in 50%
- Sloughing off of inflammatory cells does not signify bacterial infection

#### Often associated with bronchospasm

#### Cannot be distinguished from URI in the first few days

#### Suggested by cough lasting more than 5 days

- Usually lasts 10-20 days
- In one study median duration of cough 18 days and mean 24 days

Fever is relatively rare

## ACUTE BRONCHITIS

### So.....

- Who do we treat?
  - During documented pertussis outbreaks
  - Chronic bronchitis
    - M. pneumoniae
    - B. pertussis
  - Underlying lung disease
    - Asthma
    - COPD
    - Heavy tobacco use

## ACUTE BRONCHITIS

### One of the most common causes of ABX abuse

- 60-70% of patients with acute bronchitis who seek care are given ABX
- Diagnosis usually leads to prescription for ABX but is usually caused by virus
- American College of Physicians and CDC state unequivocally

THE ONLY INDICATION FOR ANTIBACTERIAL AGENTS IN ACUTE BRONCHITIS IS PERTUSSIS!

## ACUTE BRONCHITIS

### >90% viral Infections

- Influenza A and B
- Parainfluenza
- Coronavirus
- Rhinovirus
- Respiratory syncytial virus
- Human metapneumovirus

### ACUTE BRONCHITIS

No convincing evidence to support the concept of "acute bacterial bronchitis"  
 Only patients with airway violations, i.e., tracheostomy, endotracheal intubation or acute exacerbations of chronic bronchitis

### ACUTE BRONCHITIS

**Influenza**

- Merits special consideration due to morbidity and potential for specific therapy
  - cough
  - Purulent sputum
  - Fever
  - Constitutional complaints during the flu season
- Treatment
  - Neuramidase inhibitors
    - Oseltamivir
    - Zanamivir
    - Must be given within 48 hours of symptom onset
    - Reduce symptoms by one day

### PNEUMONIA???

**Mycoplasma pneumoniae**

- Relatively common in young adults
- Pharyngitis
- Constitutional symptoms
- Cough (may be present for up to 4-6 weeks)
- Studies of adults with acute cough lasting for more than five days implicate M. pneumoniae in <1% of cases

### ACUTE BRONCHITIS

**Treatment**

- Symptomatic
- Inhaled steroids
- Beta 2 agonists
- ABX
  - Multiple studies indicate no benefit
  - One study compared azithromycin v. vitamin C – all patients treated with dextromethorphan and albuterol MDI
    - Azithromycin no better than vitamin C
  - 9 placebo-controlled, double-blind studies of ABX treatment for acute bronchitis reviewed
    - 5 of 9 demonstrated no benefit
    - 2 demonstrated superiority of albuterol to erythromycin

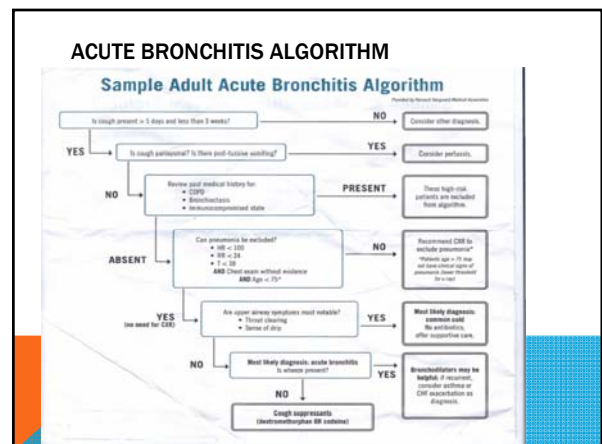
### ACUTE BRONCHITIS

**Do:**

- antitussives
  - dextromethorphan
  - codeine
- bronchodilators
  - Albuterol
  - Inhaled steroids

**Don't:**

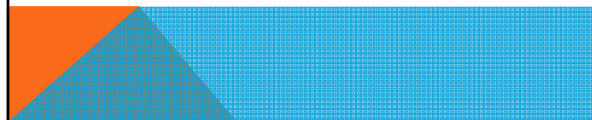
- ABX usually not recommended
- Smokers without COPD not at higher risk of bacterial infections
- Expectorants and mucolytics not helpful
- Risk factors for complications – consider ABX
  - COPD or bronchiectasis
  - Immunocompromised



### PERTUSSIS

**Pertussis**

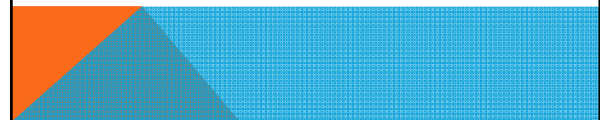
- Increasing worldwide over the past 15 to 20 years
- Accounts for about 1% of cases of acute bronchitis
- Partial immunity probably accounts for cases resembling viral bronchitis with prolonged duration of cough
- Study from San Francisco of 153 adults with chronic cough persisting for at least two weeks found 12 % had evidence of pertussis



### PERTUSSIS

**Treatment**

- Z Pak
- ABX provide clinical benefit only if started early (within the first week)
- ABX treatment should be instituted, even later in the course
  - limit spread of infection
- Bronchodilators and inhaled steroids recommended




### PNEUMONIA

**Abnormal vital signs**

- Tachypnea
- Tachycardia
- fever

**Signs of consolidation on PE**

- rales



### PNEUMONIA

**Treatment**

- Outpatient, healthy host
  - Advanced macrolide
  - doxycycline
- Outpatient with comorbidities, eg., DM, COPD, RF, cancer, ETOH, steroids
  - Advanced macrolides and b-lactam
  - fluoroquinolone
- Influenza with bacterial superinfection
  - B-lactam
  - fluoroquinolone

