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

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

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. Perfringens

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

1st Generation

- Cephalexin (Keflex)
- Cefazolin (Ancef, Kefzol)

- Staph Aureus
- Staph Epidermidis
- E. Coli
- Klebsiella

Mechanism of Action:

- Bactericidal
- Inhibits cell wall synthesis

Adverse Reactions:

- Hemolytic anemia
- Hypersensitivity reaction

2nd Generation

- Cefoxitin
- Cefotetan (Cefotan)
- Cefuroxime

- Increased gram negative coverage

Adverse Reaction:

- Hypersensitivity
- ETOH disulfiram reaction (antabuse like effect)

3rd Generation

- Ceftriaxone
- Cefotaxime
- Ceftaxidime
- Cefepime (4th generation)

- Staph Aureus
- Staph epidermidis

- Increased gram negative coverage plus pseudomonas

MACROLIDES

- Erythromycin
- Clarithromycin
- Azithromycin

- Strep
- H. flu
- Mycoplasma pneumonia

- Clindamycin

- Staph aureus
- Bacteroides fragilis
- Coagulase negative Staph and strep

- Excellent bone penetration

Mechanism of Action:

- Inhibit protein synthesis
- Bacteriostatic

Adverse effects:

- Coumadin interaction (cytochrome p450)
- GI upset

FLOUROQUINOLONES

- Ciprofloxacin (cipro)
- Levofloxacin (Levaquin)
- Moxifloxacin (Avelox)
- Norfloxacin

- Streptococcus
- Mycoplasma
- Aerobic Gram +
- Pseudomonas

Mechanism of Action:

- DNA synthesis inhibition
- Bactericidal

Adverse effects:

- Achilles tendon rupture (more likely with corticosteroids)
- Prolonged QT intervals
- GI upset

TETRACYLCINES

- 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 3rd trimester

ANTIBIOTIC RESISTANCE MECHANISMS
- Beta Lactamase
  - allows bacteria to hydrolyze PCN
  - E. Coli, Staph, Pseudomonas, Klebsiella
- Altered Cell Wall Permeability
  - offers resistance to tetracyclines, quinolones, trimethoprim and Beta lactams
- Creation of a biofilm barrier
  - allows bacteria to multiply despite hostile environment
  - salmonella, staph epiderm
- Active efflux pumps
  - offers 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
- 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
  - <3.5 add one point
  - 3.5 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 intracutarily
  - Does not accumulate in middle ear fluid, so will not treat OM

OTITIS MEDIA

Treatment
- Augmentin
- Amoxicillin
  - Need high dose
  - 80 mg/kg/day
Acute viral rhinosinusitis (AVRS) indistinguishable from acute bacterial rhinosinusitis (ABRS) in the first 10 days of illness based on history, exam or x-rays
- most are viral or allergic, pollutants, structural issues
- Rarely bacterial, fungal
So how do we differentiate????

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

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
  - Leviquin/moxifloxicin only if absolutely necessary
  - Macrolides only recommended for pregnant women allergic to PCN

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

When to treat with ABX
- FEVER >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 pneumonia
- H. influenza
- M. pneumonia
- 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

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

ACUTE BRONCHITIS

One of the most common causes of ABX misuse
- 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
- Rhino virus
- 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

PNEUMONIA???

Mycoplasma pneumonia
- 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

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

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ACUTE BRONCHITIS

Treatment
- Symptomatic
- Inhaled steroids
- Beta 2 agonists
- ABX
- Multiple studies indicate no benefit
- One study compared azithromycin vs. 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
- No factors for complications - consider ABX
- COPD or bronchiectasis
- Immunocompromised

ACUTE BRONCHITIS ALGORITHM
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