ANTIMICROBIAL STEWARDSHIP

There are world-wide efforts that look for strategies to deal with the challenge of growing antimicrobial resistance. How can we all work together to be stewards of this important, but limited resource?

SELECT ANTIBIOTIC RESISTANT PATHOGENS OF MAJOR CONCERN

- methicillin-resistant *Staphylococcus aureus* (MRSA)
- multi-drug resistant *Streptococcus pneumonia* (MRSP)
- vancomycin-resistant *enterococci* (VRE)
- multi-drug resistant *Escherichia coli* & other gram negative bacteria (e.g. ESBL)

KEY STRATEGIES FOR REDUCING ANTIBIOTICS

- vaccinations to prevent infections and decrease antibiotic use
- practice and educate on infection prevention (wash hands, avoid touching eyes, cough etiquette, stay home when sick)
- avoid antibiotics for infections of predominantly viral cause
- use of point-of-care tools/tests
- treat infection, not contamination
- avoid treating positive cultures in the absence of signs/symptoms

STRATEGIES WHEN ANTIBIOTICS INDICATED

- Whenever suitable:
  - use narrow-spectrum agent
  - use shorter duration therapy
  - tailor empiric antibiotic choice & dosage according to local bacterial prevalence and resistance patterns
  - calculate weight-based dose in kids
  - if patient experiences an adverse reaction, provide patient education and document details to avoid labelling a side effect as an “allergy”
  - discourage saving of “left-over” antibiotics for future use

GETTING STRATEGIES TO WORK - REAL WORLD

- Public, patient & provider education over time to change expectations
- Realistic appreciation for viral versus bacterial etiologies
- Delayed prescriptions for select conditions with instructions to fill only if symptoms do not resolve or condition worsens. (Offer to those who value convenience.)
- “It’s easy to prescribe antibiotics. It takes time, energy & trust not to do so.” Success lies in changing the culture & the understanding of antibiotic limitations, benefits & harms.

ANTIBIOTIC HARMS – UNDERAPPRECIATED

<table>
<thead>
<tr>
<th>To the Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in 5 emergency room visits for adverse drug events (ADEs) are from antibiotics.</td>
</tr>
<tr>
<td>Antibiotics are the most common cause of ADEs in children, accounting for 7 of the top 15 drugs leading to ADE-related ER visits.</td>
</tr>
<tr>
<td>Antibiotic associated diarrhea, including <em>Clostridium difficile</em> diarrhea</td>
</tr>
<tr>
<td>Cardiac - QT interactions: with clarithromycin &amp; fluoroquinolones</td>
</tr>
<tr>
<td>Central nervous system (CNS) adverse effects (e.g. dizziness, headache, sleep disturbance, seizure, encephalopathy)</td>
</tr>
<tr>
<td>Hyperkalemia (cotrimoxazole)</td>
</tr>
<tr>
<td>Skin: minor/major (e.g. cotrimoxazole)</td>
</tr>
<tr>
<td>Tendon rupture (fluoroquinolones)</td>
</tr>
<tr>
<td>Risk of drug interactions (warfarin, statins/macrolides, ...)</td>
</tr>
<tr>
<td>↑ risk of secondary fungal infections</td>
</tr>
<tr>
<td>↑ risk of an untreatable infection in the patient due to ↑ bacterial resistance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To Society</th>
</tr>
</thead>
<tbody>
<tr>
<td>financial costs of treating adverse reactions (USA: $20 billion in excess healthcare costs)</td>
</tr>
<tr>
<td>antimicrobial resistance: more difficult to treat infections over time, leading eventually to no adequate options</td>
</tr>
</tbody>
</table>

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Antibiotics & Common Infections – Part 1

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Graphic design:

Debbie Bunka, Colette Molloy (designmolloy.com)

Coming up next, Spring 2017

ABX – Part 2:

Skin Infections, Acute Cystitis

www.RxFiles.ca

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ACUTE BRONCHITIS: Management Considerations

PEARLS for the MANAGEMENT of ACUTE UNCOMPLICATED BRONCHITIS

- Antibiotics are NOT recommended, as bronchitis is predominantly viral.
- Advise on treatments that will provide symptomatic relief: maintaining hydration & ↑ humidity. Cough suppressants may be considered for managing cough, & inhaled bronchodilators if wheezing is present. Honey may help children.
- Patients should see their prescriber if: 1) symptoms worsen, 2) new symptoms develop (e.g. dyspnea, fever, vomiting), 3) cough >1 month, or 4) >3 episodes/yr.

SYMPTOM MANAGEMENT

**NONPHARM**
- ↑/maintain hydration
  - No evidence for or against.
- ↑ humidity (e.g. PRN humidifier to maintain 30-50% humidity)
  - Hydration: caution in HF & CKD patients
  - ↑ humidity (e.g. PRN humidifier: clean frequently to humidifier to maintain ↑ humidity. Cough suppressants may be considered for managing cough, & 30-50% humidity)
- Advise on treatments that will provide symptomatic relief
- ↑ humidity (e.g. PRN humidifier: clean frequently to humidifier to maintain ↑ humidity. Cough suppressants may be considered for managing cough, & 30-50% humidity)
- Ipratropium 20mcg 4 puffs QID
  - Limited evidence (1 study, n=14 for 3 weeks) in post-infectious cough.
- Dextromethorphan (DM) e.g. BENYLIN DM, ROBITUSIN DM
  - May improve daytime & nighttime cough, & dyspnea associated with coughing.
- Honey 2.5 to 10mL po qHS
  - No strong evidence for or against.
  - Not recommended in <1yr due to concerns with infant botulism
- Ipratropium 20mcg 4 puffs QID
  - Limited evidence (1 study, n=14 for 3 weeks) in post-infectious cough.
- Salbutamol VENTOLIN
  - Limited evidence (1 study with fenoterol, n=80).
  - May ↓ number of coughing episodes but does not ↓ duration of illness.
- Ipratropium 20mcg 4 puffs QID
  - Limited evidence (1 study, n=14 for 3 weeks) in post-infectious cough.
  - May improve daytime & nighttime cough, & dyspnea associated with coughing.

**COUGH SUPPRESSANTS**
- Dextromethorphan (DM) e.g. BENYLIN DM, ROBITUSIN DM
  - May improve daytime & nighttime cough, & dyspnea associated with coughing.

**BRONCHODILATORS**
- Ipratropium 20mcg 4 puffs QID
  - Limited evidence (1 study, n=14 for 3 weeks) in post-infectious cough.
  - May improve daytime & nighttime cough, & dyspnea associated with coughing.

- Encourage prevention e.g. smoking cessation, ↓ exposure to second-hand smoke.
- Not routinely recommended for symptom management:
  - Oral or inhaled corticosteroids are not recommended in patients with acute bronchitis without asthma.
  - Expectorants (e.g. guaifenesin): most evidence failed to show a benefit.

PRE-TREATMENT CONSIDERATIONS

- Inappropriate antibiotic use is driving resistance & leading to a crisis. Please examine your own prescribing practices. Refer to newsletter cover.
- The majority of acute uncomplicated bronchitis cases are viral (90% in adults & 95-100% in children).
- Antibiotics are NOT recommended for acute uncomplicated bronchitis. Several RCTs assessing the efficacy of antibiotics for this indication have failed to show a benefit; however, up to 80% of adults in the U.S. still receive an antibiotic.
- Acute uncomplicated bronchitis is self-limiting. Cough usually persists for 1 to 3 weeks, although up to 50% of viral cases will have a cough beyond 3 weeks. Airway hyperactivity may last up to 6 weeks. Recommend symptom management.
- Acute complicated bronchitis (e.g. history of smoking, impaired lung function, chronic heart disease, immunocompromised) may require further investigation (e.g. lung function tests, chest x-ray).
- Rule out pneumonia if the following signs are present: HR>100bp, RR >24 breaths/min, oral temperature >38°C, or findings of local consolidation.
- Coloured sputum does not reliably differentiate between bacterial or viral origin.
- Fever is uncommon, & may be indicative of influenza or pneumonia.
- If the patient has confirmed pertussis, see RxFiles pg 78 for antibiotic regimens. Uncommon, but there is the occasional outbreak. Encourage vaccination.

MOST COMMON PATHOGENS

- Viral – e.g. Influenza A, Influenza B, Parainfluenza, RSV, & Adenovirus

EMPIRIC DRUG REGIMENS OF CHOICE & SUSCEPTIBILITY CONCERNS

Antibiotics are not recommended for acute uncomplicated bronchitis.

- Multiple studies & meta-analyses assessing antibiotics for the treatment of acute uncomplicated bronchitis have shown no benefit or modest improvement, along with an ↑ risk of adverse events.
- For example, a 2014 Cochrane review (17 RCTs, n=3,936) evaluating antibiotics (beta-lactams, doxycycline, macrolides, TMP-SMX) vs placebo found no difference in clinical improvement. Antibiotics ↓ cough (NNT=6), night cough (NNH=7) & mean duration of cough by 0.5 days, but ↑ risk of adverse events (NNH=5, primarily gastrointestinal related).

Clinical Q&A

Should pts ≥ 65yrs be treated with an ABX to ↓ the risk of developing pneumonia?

- No, but patients presenting with signs of pneumonia should undergo investigation (e.g. chest x-ray).
- A previous retrospective cohort study (1991 to 2001) suggested that individuals with acute bronchitis who were ≥65 years may benefit from antibiotics (NNT to prevent 1 additional case of pneumonia in the month following acute bronchitis was 39 for those ≥65 years, & 199 for those between 16-64 years of age).
- However, a 2013 RCT (n=1,038) comparing amoxicillin 1000mg po TID x 7 days to placebo showed no difference in duration or severity of symptoms up to 1 month, regardless of age. There was an ↑ risk of adverse events (nausea, rash, diarrhea) with the amoxicillin group (NNH=22).

Abbreviations: ABX=antibiotic CKD=chronic kidney disease HF=heart failure NNH=number needed to harm NNT=number needed to treat RCTs=randomized controlled trials TMP-SMX=trimethoprim/sulfamethoxazole
COMMUNITY ACQUIRED PNEUMONIA: Management Considerations

PEARLS for the MANAGEMENT of COMMUNITY ACQUIRED PNEUMONIA (CAP)
- A chest x-ray is recommended to confirm suspected pneumonia. IDSA/07 LOE: moderate
- The CRB-65 score can be used to help identify adults who may require hospital admission due to a higher risk of mortality.
- S. pneumoniae is the most common bacteria, even in those with comorbidities.
- Doxycycline covers the majority of bacterial CAP pathogens (e.g. S. pneumoniae, S. aureus, H. influenzae & atypicals). Standard duration of therapy is 5 to 7 days.
- There is limited data on the role of corticosteroids in outpatients.
- Recommend the influenza vaccine every fall.
- Recommend the pneumococcal vaccine x1 for those ≥65 years of age, or at high risk regardless of age (e.g. chronic cardiac or pulmonary disease, DM, CKD).
- Patients should see their prescriber if symptoms worsen or do not improve within 48-72 hours. Cough, fatigue or dyspnea may persist for up to 1 month, or longer.

EMPIRIC DRUG REGIMENS OF CHOICE

PREVIOUSLY HEALTHY ADULT OUTPATIENT WITH NO RECENT ANTIBIOTIC USE

Most Common Bacterial Pathogen: Gram +ve: Streptococcus pneumoniae
Potential Pathogens: Atypical pathogens (M. pneumoniae, C. pneumoniae)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doxycycline</td>
<td>200mg po Day 1, then 100mg po BID x 5-7 days</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>1000mg po TID x 5-7 days</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>500mg po daily x 3 days, or 1000mg po daily x 5-7 days</td>
</tr>
</tbody>
</table>

Based on SK antibiogram data RQHR, SDCL, SHR, doxycycline has good activity against common/potential CAP pathogens (i.e. S. pneumoniae & atypical pathogens).

Amoxicillin:
- S. pneumoniae (even intermediate susceptibility isolates) remain sensitive to high-dose amoxicillin.
- Does not cover atypical pathogens.
See Clinical Q&A on whether atypical pathogen coverage is needed.

Macrolides:
- May be added to amoxicillin to cover atypical pathogens.
- There are concerns with using macrolides as monotherapy due to ↑ S. pneumoniae resistance. 2015 SK susceptibilities: RQHR 70%, SDCL 62%, SHR 80% (but 70% in 2014).

ADULT OUTPATIENT with COMORBIDITIES / ABX RESISTANT RISK FACTORS*

Most Common Bacterial Pathogen: Gram +ve: S. pneumoniae
Potential Pathogens: Gram –ve: H. influenza, M. catarrhalis, K. pneumoniae
Atypical pathogens: M. pneumoniae, C. pneumoniae, Legionella

Fluoroquinolones should be reserved for treatment failures, comorbidities with recent antibiotic use, allergies or documented infections with highly drug-resistant bacteria. Examples: levofloxacin ≥LEVOFLOXACIN500-750 mg po once daily x 5 days
400 mg po once daily x 5 days

*Comorbidity or risk factor for ABX-resistant S. pneumoniae: age >65; cardiac, pulmonary, renal or hepatic failure; smoking; alcoholism; malignancy; DM; malnutrition or acute weight loss (>5%); immunosuppressive tx including corticosteroid use (high-dose >30 days); hospitalization or broad spectrum ABX in past 3 months; HIV/immunosuppressed.

PRE-TREATMENT CONSIDERATIONS
- A chest x-ray is the most accurate way to diagnose CAP, regardless of age.
- Despite challenges with obtaining a good specimen, a sputum C&S will help differentiate between bacterial versus viral CAP. It can also help identify patients who may require broader spectrum antibiotics.
- Rule out influenza during late fall/early spring; consider a nasopharyngeal swab.
- Review antibiotics associated with higher S. pneumoniae resistance prescribed over the past 3 months. May warrant using an agent from another antibiotic class.

OUTPATIENT vs HOSPITAL ADMISSION
- Several severity of illness scores are available for pneumonia (see RxFiles page 90).
- Adult Outpatients: the CRB-65 does not require any blood work & can be easily used in an office setting to identify patients who may require hospital admission.

CRB-65

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confusion: new onset based on a specific mental test, or disorientation to person, place or time</td>
<td>1</td>
</tr>
<tr>
<td>Respiratory rate ≥30 breaths/minute</td>
<td>1</td>
</tr>
<tr>
<td>Low Blood Pressure: SBP &lt;90mmHg or DBP ≤60mmHg</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥65 years</td>
<td>1</td>
</tr>
</tbody>
</table>

Score | Risk of Mortality | Suggested Management |
-------|-------------------|-----------------------|
0      | < 2%              | Outpatient            |
1-2    | ~9%               | Consider hospital admission |
≥3     | >19%              | Hospital admission    |

If a recent urea is available, may use CURB-65 where BUN >7mmol/L = 1 point.
See RxFiles page 90 for information on LTC and pediatric patients.
Duration of Therapy in Adults:
- Treat for a minimum of 5 days & until afebrile for 48-72hrs.
- Meta-analyses (15 RCTs n=2,796; 5 RCTs n=1,303) comparing treatment durations of ≤7 days to >7 days showed no difference in clinical success rates in ambulatory pts.
- Azithromycin 3 vs 5 days: limited data is available comparing the two regimens, but there does not appear to be a difference in efficacy or safety. Due to the long t½ (~68 hours in adults), a 3-day course of azithromycin is in essence providing therapy beyond 3 days. Patients may still feel unwell at Day 3; reassure ABX is still working.

### Most Common Pathogens:
- **Infants & pre-school children:** viruses are the predominant cause
- **3 months to 5 years:** *S. pneumoniae*; viruses are still common
- - due to vaccination, typed *H. influenzae* as a causative pathogen is very rare
- **≥5 years:** *M. pneumoniae, C. pneumoniae*

### Treatment Evidence Summary – Adult CAP

#### Doxycycline as a 1st line agent
- Limited evidence with doxycycline for CAP. However, it has *S. pneumoniae, H. influenzae, S. aureus* & atypical coverage; achieves high serum & lung drug concentrations; and has concentration dependent killing.
- Monotherapy sufficient for most, although some Canadian references suggest the option of combining doxycycline with a beta-lactam due to concerns with doxycycline resistance to *S. pneumoniae*. Currently, *S. pneumoniae* has good susceptibility to doxycycline in Saskatchewan, & therefore the combination is not necessary.
- Most guidelines suggest a BID (200mg Day 1, then 100mg BID) regimen; however, 100mg po BID Day 1 followed by 100 mg daily may be suggested due to its long-half life (12hr after first dose, 24hr with multiple doses). Data comparing the efficacy of the two regimens is limited. Anecdotally, twice daily is generally tolerable.

#### Vaccinations:
- Recommend an annual influenza vaccine, as this can ↓ the relative risk of pneumonia by 53%, hospitalization by 50% & mortality by up to 68% observational data, in those age ≥65.
- **PNEUMOVAX-23** vaccine for those ≥65 years of age, or at high risk regardless of age (e.g. DM, CKD, chronic cardiac or pulmonary disease, LTC resident, immunocompromised).
- Over a 2 year period, PNEUMOVAX-23 prevents 1 case of pneumonia for every 12 immunized LTC residents.
- PREVNAR-13 studies showed a ↓ in invasive pneumococcal disease, but not overall pneumonia rates.
- Neither vaccine type has been shown to ↓ pneumonia-specific or all-cause mortality.
- A PNEUMOVAX-23 booster (>5 years) may be considered in high risk individuals, although data is limited and based on the theoretical ↓ in immunity over time.

### Clinical Q&A

#### When is coverage for atypical pathogens needed?
- Atypicals are thought to be responsible for ~15% of CAP, & maybe more common in the following populations:
  - *M. pneumoniae* in young, healthy adults (CAP usually resolves without ABX)
  - *C. pneumoniae* in LTC residents, immunocompromised patients, or those with multiple comorbidities. Acute onset of symptoms unlikely.
- The role of ABX with atypical coverage in other adults is uncertain. CAP-START was a non-inferiority study comparing a beta-lactam ± a macrolide for atypical pathogen coverage, or a fluoroquinolone, in 2283 patients in the Netherlands. Median: age 70 years, CURB-65 score=1. ~40% COPD/asthma, ~20% CVD, ~15% DM. Beta-lactam monotherapy was non-inferior to the other 2 treatment arms for the primary endpoint (all-cause mortality).
- If ABX with atypical coverage is not initiated empirically, consider adding atypical coverage (e.g. add a macrolide to amoxicillin / amox-clav, or switch to doxycycline) if the patient does not improve in 3-5 days or symptoms worsen.
**SHOULD ANTIBIOTICS BE USED TO TREAT PHARYNGITIS?**

- **80-90% of adults [>70% of children]** do NOT require antibiotics as infection likely viral.
- Patients with a positive throat swab should receive an antibiotic to \(\downarrow\) the risk of complications. See modified Centor score on left column, & antibiotic table below.
- The turn-around-time for throat swab results can take a few days. However, antibiotics started within 9 days of symptom onset in confirmed GAS will prevent rheumatic fever.
- If antibiotics are started empirically, ensure agent is discontinued if throat swab negative.

**MOST COMMON BACTERIAL PATHOGEN**
- Group A Streptococcus (GAS) (outpatient Group C and G strep do not require antibiotics)

**EMPIRIC DRUG REGIMENS OF CHOICE & SUSCEPTIBILITY CONCERNS**

**FIRST LINE**

<table>
<thead>
<tr>
<th>No antibiotic</th>
<th>- Majority of cases are viral.</th>
<th>- Only use antibiotics in confirmed bacterial pharyngitis.</th>
<th>- See Symptom Management following page.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin V</td>
<td>Peds: ≤27 kg: 40mg/kg/day ÷ BID or TID x10 days (maximum 750mg/day) &gt;27 kg &amp; Adults: 300mg TID x 10 days, or 600mg BID x 10 days</td>
<td>Compared to penicillin: - broader spectrum than required; as effective - liquid more palatable for children 😊</td>
<td></td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>Peds: 40mg/kg/day ÷ BID or TID x10 days (maximum 1000mg/day) Adults: 500mg BID x 10 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalexin</td>
<td>Peds: 25-50mg/kg/day ÷ BID or QID x10 days (maximum 1000mg/day) Adults: 250mg QID x 10 days, or 500mg BID x 10 days</td>
<td>- No documented resistance to GAS.</td>
<td></td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Peds: 20mg/kg/day ÷ TID x10 days (maximum 900mg/day) Adults: 300mg TID x 10 days</td>
<td>Macrolide considerations: - Clarithromycin x 10 days was superior to azithromycin x 5 days for bacterial eradication (NNT=9) in adults, but equivalent for clinical cure. - ↑ GI side effects with erythromycin. - Azithromycin 3 vs 5 days: no head-to-head trials. Both regimens provide same total dose over the course of therapy (i.e. 60mg/kg/d; 1.5g).</td>
<td></td>
</tr>
<tr>
<td>Clarithromycin</td>
<td>Peds: 15mg/kg/day divided BID x10 days (maximum 500mg/day) Adults: 250mg BID x 10 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erythromycin</td>
<td>Peds: 40mg/kg/day ÷ BID or TID x10 days (maximum 2000mg/day) Adults: 250mg QID x 10 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Azithromycin</td>
<td>Peds: 12mg/kg/day x 5 days, or 20mg/kg/day daily x3 days (max 500mg/d) Adults: 500mg Day 1, 250mg x Days 2-5, or 500mg daily x 3 days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PENICILLIN ALLERGY: TYPE IV HYPERSENSITIVITY (e.g. rash)**

- Do not use the following antibiotics unless confirmed GAS & confirmed type I reaction to penicillin, due to concerns with ↑ resistance to macrolides & adverse events e.g. C. diff.

**PENICILLIN ALLERGY: TYPE I HYPERSENSITIVITY (i.e. anaphylaxis)**

| Clindamycin | Peds: 20mg/kg/day ÷ TID x10 days (maximum 900mg/day) Adults: 300mg TID x 10 days | | |

**PRE-TREATMENT CONSIDERATIONS**

- Inappropriate antibiotic use is driving resistance & leading to a crisis. Please examine your own prescribing practices. Refer to newsletter cover.
- A validated clinical decision rule, like the modified Centor score, can be used to help identify low risk patients who do not require diagnostic testing or antibiotics.

<table>
<thead>
<tr>
<th>Modified Centor (or McIssac) Score</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria</td>
<td></td>
</tr>
<tr>
<td>Temperature &gt; 38°C (&gt;100.5 °F)</td>
<td>1</td>
</tr>
<tr>
<td>Oral temperature used in Centor score (adults)</td>
<td></td>
</tr>
<tr>
<td>Absence of cough</td>
<td>1</td>
</tr>
<tr>
<td>Swollen, tender anterior cervical nodes</td>
<td>1</td>
</tr>
<tr>
<td>Tonsillar swelling or exudate</td>
<td>1</td>
</tr>
<tr>
<td>Age 3 to 14 years</td>
<td>1</td>
</tr>
<tr>
<td>Age 15 to 44 years</td>
<td>0</td>
</tr>
<tr>
<td>Age ≥ 45 years</td>
<td>-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk of Streptococcal Infection</th>
<th>Suggested Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 to 0</td>
<td>1 to 2.5%</td>
<td>- Symptomatic treatment</td>
</tr>
<tr>
<td>1</td>
<td>5 to 10%</td>
<td>- No RADT, culture or antibiotic needed</td>
</tr>
<tr>
<td>2</td>
<td>11 to 17%</td>
<td>- RADT or throat swab for culture.</td>
</tr>
<tr>
<td>3</td>
<td>28 to 35%</td>
<td>- If positive for GAS ⇒ antibiotic.</td>
</tr>
<tr>
<td>24</td>
<td>51 to 53%</td>
<td></td>
</tr>
</tbody>
</table>

Modified Centor score: sensitivity 94% (95% CI 92-97%), specificity 54% (95% CI 49-59%). Lower specificity leans towards false positives & over-treatment.

Back-up throat cultures are recommended for negative lateral flow RADT in children.

- Diagnostic testing is **not** recommended if:
  - A modified Centor score of ≤1
  - Symptoms of a viral infection rhinorrhea, cough, oral ulcers, hoarseness |
  - <3yrs, unless other risk factors e.g. sibling with GAS infection |
  - Asymptomatic contact of patient with GAS pharyngitis |

**PEARLS for the MANAGEMENT of PHARYNGITIS**

- The majority of pharyngitis cases do **NOT** require antibiotics as they are viral infections (80-90% in adults, >70% in children).
- Pharyngitis is typically self-limiting (often 3-7 days; up to ≤10 days).
- A validated clinical decision rule e.g. modified Centor score can help identify low risk patients who do not require diagnostic testing (see below) or antibiotics.
- For confirmed Group A Streptococcus (GAS) pharyngitis, penicillin for 10 days is the drug of choice. There is no documented GAS resistance to penicillin.
- Advise on treatments that will provide **symptomatic relief**: NSAIDs, acetaminophen, medicated throat lozenges, topical anesthetics, warm liquids.
- Patients should see their prescriber if: 1) symptoms worsen, 2) symptoms take longer than 3 to 5 days to resolve, &/or 3) unilateral neck swelling develops.

**PHARYNGITIS: Management Considerations**

Pre-Treatment Considerations:

- Inaccurate clinical decision rules. Use validated clinical decision rules e.g. modified Centor score to help identify patients who do not require diagnostic testing or antibiotics.

**PHARYNGITIS: Management Considerations**

- Inaccurate clinical decision rules. Use validated clinical decision rules e.g. modified Centor score to help identify patients who do not require diagnostic testing or antibiotics.

Pre-Treatment Considerations:

- Inaccurate clinical decision rules. Use validated clinical decision rules e.g. modified Centor score to help identify patients who do not require diagnostic testing or antibiotics.
PHARYNGITIS: Management Considerations

Duration of Antibiotic Therapy:
- Confirmed bacterial pharyngitis should be treated with 10 days of antibiotics (exception: if azithromycin is used in penicillin allergic patients; other options available).
- Patients will likely have clinical improvement within the first few days of therapy, but 10 days of therapy is recommended for preventing acute rheumatic fever, & short courses are not as effective for treating the infection.
  - E.g. a meta-analysis comparing 5 vs 10 days of penicillin (2 RCTs, n=309) concluded short courses were inferior in achieving bacterial cure, OR 0.29 (CI 95% 0.13-0.63).

Clinical Q&A

What is the risk of acute rheumatic fever?
- In Canada, the current prevalence of acute rheumatic fever is 0.1 to 2 cases per 100,000.
  - The incidence in some remote, Canadian Aboriginal communities may be higher (i.e. Northern Ontario 8.33/100,000).
  - The risk may also be higher in immigrants from endemic areas, e.g. Philippines, China.
- It is difficult to estimate the risk of acute rheumatic fever due to untreated pharyngitis:
  - as the majority of studies comparing antibiotics versus placebo were conducted prior to the 1960s (higher rate of acute rheumatic fever, and in young males from the US Armed Forces)
  - bacterial versus viral etiology was often not confirmed
  - newer studies have either no documented cases of acute rheumatic fever or did not assess this outcome
- In an effort to balance unnecessary antibiotic use with preventing rheumatic fever:
  - use the modified Centor score to identify patients who require a throat swab/RADT
  - wait to prescribe antibiotics until the results of the throat swab are available
  - starting antibiotics within 9 days of symptom onset prevents acute rheumatic fever
  - if antibiotics are started empirically, discontinue if throat swab is negative
  - children are at a greater risk of complications (e.g. otitis media, peritonsillar abscess, rheumatic fever); may initiate antibiotics sooner
- A full 10 day course of penicillin is recommended for confirmed GAS pharyngitis.

Pharyngitis caused by Chlamydia trachomatis
- It is rare that Chlamydia trachomatis causes pharyngitis, but rates appear to be ↑.
- Risk factors include: age 15 -24 years, sexually active, engagement in oral sex.
- In Saskatchewan, Chlamydia trachomatis screening requires a different lab requisition.
- Treatment: doxycycline 100mg po BID x 7days, or azithromycin 1g x 1 dose.

Management of Recurrent Pharyngitis
- Potential causes: recurrent pharyngitis due to inadequate eradication, new infection, viral infection in an asymptomatic carrier ~20% of the population are GAS carriers.
- Controversial as to whether or not asymptomatic carriers with recurrent pharyngitis need to be identified.
  - Identification may help avoid antibiotics in those with recurrent viral pharyngitis.
  - Avoid identifying asymptomatic carriers without recurrent pharyngitis.
- Also consider age, season, signs & symptoms to rule out a viral etiology (see modified Centor score).
- Avoid using continuous long-term antibiotic therapy (i.e. repeated courses or prophylaxis).

Not recommended for symptom management:
- Routine use of corticosteroids. ↓ in duration of pain is not considered clinically significant, and NSAIDs/acetaminophen have less adverse events.
- Chinese herbas: insufficient evidence to support use. If patient insists, encourage a product with a Natural Product Number (NPN).

SYMPTOM MANAGEMENT

<table>
<thead>
<tr>
<th>SYMPTOM MANAGEMENT</th>
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<tr>
<td>e.g. Ibuprofen</td>
<td>- Ibuprofen ↓ associated pain more than acetaminophen &amp; placebo.</td>
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<tr>
<td>Advil, g</td>
<td>- Reduces fever.</td>
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<tr>
<td>Peds: 5-10 mg/kg po q6-8hr PRN</td>
<td>(maximum 40mg/kg/day)</td>
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<tr>
<td>Adults: 400mg po q6-8hr PRN</td>
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<tr>
<td>Acetaminophen</td>
<td>- Less effective than NSAIDs for ↓ associated pain but more effective than placebo.</td>
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<tr>
<td>Tylenol, g</td>
<td>- Reduces fever.</td>
</tr>
<tr>
<td>Peds: 10-15mg/kg po q4-6hr PRN</td>
<td>(maximum 75 mg/kg/day)</td>
</tr>
<tr>
<td>Adults: 1000mg po q4-6hr PRN</td>
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<tr>
<td>Benzocaine</td>
<td>- Alleviates throat pain if used frequently.</td>
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<tr>
<td>Cepacol ES, Chloraseptic</td>
<td>- Avoid in children due to:</td>
</tr>
<tr>
<td>10mg lozenge q2hr PRN</td>
<td>- risk of choking</td>
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<td>- concerns with methemoglobinemia</td>
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<tr>
<td>Phenol</td>
<td>- No evidence, but anecdotally may provide relief from associated pain.</td>
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<tr>
<td>Chloraseptic</td>
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<tr>
<td>5 sprays q2hr PRN</td>
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<tr>
<td>Rinses</td>
<td>- Little evidence, but anecdotally provide relief from associated pain.</td>
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<tr>
<td>Gargling or drinking warm liquids</td>
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<td>e.g. warm salt water rinse, tea</td>
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<tr>
<td>Benzylamine</td>
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<td>Tantum, Pharixia</td>
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<tr>
<td>15mL gargle or rinse q1.5-3hr PRN</td>
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Medication Summary

Penicillin vs Cephalosporins vs Macrolides: penicillin remains the antibiotic of choice
- There is no clinically relevant difference in symptom resolution between the various antibiotics.
- Penicillin has the most evidence for preventing complications; has a narrow spectrum; is efficacious, safe, inexpensive; & there is no documented resistance to GAS.

Abbreviations:
GAS = Group A Streptococcus
IDSA = Infectious Diseases Society of America
NSAID = non-steroidal anti-inflammatory drug
NNT = number needed to treat
RADT = rapid antigen detecting test
ACUTE SINUSITIS: Management Considerations

PEARLS for the MANAGEMENT of ACUTE SINUSITIS
- Most cases do NOT require antibiotics as 98-99.5% of infections are viral.
- Viral & bacterial sinusitis have similar symptoms, but symptoms that worsen or are prolonged (≥10 days) suggest bacterial involvement.
- Advise on treatments that provide symptom relief: analgesics, saline nasal drops/rinses, decongestants, warm facial packs, & corticosteroids.
- Amoxicillin is the antibiotic of choice for bacterial sinusitis. Reserve macrolides for patients with true penicillin allergies.
- Patients should see their healthcare provider if symptoms worsen or take longer than 10 days to resolve.

PRE-TREATMENT CONSIDERATIONS
- Inappropriate antibiotic use is driving resistance & leading to a crisis. Please examine your own prescribing practices. Refer to newsletter cover.

ACUTE SINUSITIS

VIRAL OR BACTERIAL
- Purulent nasal discharge
- Nasal obstruction
- OR Facial
- pain-pressure-fullness

98% Viral Sinusitis: antibiotics NOT required
1.7% Bacterial Sinusitis: antibiotics NOT required
0.3% Bacterial Sinusitis: may require antibiotics

- Prediction rules have been developed to help distinguish bacterial from viral sinusitis. However, due to limitations with these, the guidelines instead focus on the presence & duration of the above 3 symptoms. Acute viral sinusitis symptoms tend to improve within 1wk.
- The colour of mucus should not be used to diagnosis a bacterial sinusitis infection (indicative of inflammation, but not of bacteria).
- Sinusitis is self-limiting. ~85% of bacterial cases will improve within 2 weeks without antibiotics. In other words, out of 1000 patients presenting with sinusitis, 5 to 20 patients would have bacterial sinusitis, and 4 to 17 of these bacterial cases would resolve without antibiotics.
- Compared to placebo, antibiotics (beta-lactams, macrolides, FQ) have not been shown to ↓duration of pain or illness. The NNT for clinical improvement is high (NNT=7 to 18), & a systematic review including patients with symptoms for ≥7 days failed to show a benefit with antibiotics. Antibiotic AE primarily GI related were common (NNH=8 to 12).

ACUTE SINUSITIS

BACTERIAL
- Signs & symptoms that persist without improvement for ≥10 days
- OR Worsens within 10 days after an initial improvement

PRE-TREATMENT CONSIDERATIONS
- Sinusitis complications are very rare, e.g. orbital, intracranial or soft tissue infections. See alarm symptoms on next page. Incidence is similar among those treated with antibiotics versus placebo (<0.1%).
- Sinusitis is very rare in children (<9 years) due to underdeveloped sinus cavities.

SYMPTOM MANAGEMENT

ANALGESICS
- Acetaminophen - Tylenol, g
  - 10-15mg/kg q4-6hr PRN (max 75mg/kg/day)
  - 1000mg po q6hr PRN (max 3.2-4g/day)
- Ibuprofen - Advil, g
  - 5-10mg/kg q6-8hr (max 40mg/kg/day)
  - 400mg po q6-8hr PRN
- Amoxicillin is the antibiotic of choice for sinusitis.
- Reserve macrolides for patients with true penicillin allergies.

DECONGESTANTS
- Xylometazoline
  - (≥12 yrs & adults): 2-3 sprays/nostril q8-10hr PRN
- Pseudoephedrine: SUDAFED
  - 6-11yrs: 30mg po q4-6hr PRN (max 120mg/d)
  - ≥12 yrs & adults: 60mg po q4-6hr PRN, or 120mg ER po q12h PRN
- INTRANASAL (not recommended in <3yrs)
  - Fluticasone FLONASE, g
    - 50 mcg 2 sprays in each nostril once daily
  - Mometasone NASONEX, g
    - 50 mcg 2 to 4 sprays each nostril twice daily

CORTICOSTEROIDS
- Prednisone 40 to 60mg po daily x 7 days
- Prednisone 40 to 60mg po daily x 7 days

NONPHARM
- warm facial packs
- saline nasal drops/rinses/irrigation
  - 150mL hypertonic saline nasal irrigation NETI POT daily
  - Saline spray SALINEX 1 spray TID-QID PRN

Is watchful waiting an appropriate option for patients with acute sinusitis?
- Most sinusitis cases improve without antibiotics. Watchful waiting should be considered in patients who:
  - present with symptoms that have not worsened, or
  - have had symptoms for less than 10 days, and
  - you feel confident in their ability for follow-up (i.e. antibiotic will be started if the acute sinusitis symptoms fails to improve after 7 days or worsen at any time)
- Write a prescription that is post-dated for when therapy may be initiated, & instruct the patient to call and inform the clinic if they fill the prescription.

- No quality evidence but should reduce fever & treat localized pain.
- Limited evidence with xylometazoline.
- May relieve congestion & promote sinus drainage.
- Topical preparations: less systemic absorption (oral AE: CV, insomnia); limit to 3-5 days to prevent rebound symptoms.
**ACUTE SINUSITIS: Management Considerations**

- **MOST COMMON BACTERIAL PATHOGENS**
  - *S. pneumoniae, H. influenzae, M. catarrhalis (in children), S. aureus*

- **EMPIRIC DRUG REGIMENS OF CHOICE**

  - **MILD to MODERATE** (symptoms <10 days or no worsening in symptoms)
    - **No antibiotic**
      - 98-99.5% of cases are viral
      - See symptom management

  - **MILD to MODERATE** (symptoms ≥10 days or worsens within 10 days)
    - **Amoxicillin**
      - **Amoxicillin vs Amoxicillin/Clavulanate:**
        - **S. pneumoniae, H. influenzae, M. catarrhalis (in children)**
        - **Amoxicillin** is considered the antibiotic of choice due to its efficacy, safety, low cost, narrow spectrum, & quantity of evidence (most studied antibiotic for this indication).
        - **Amoxicillin** covers **S. pneumoniae**. Effectiveness of high-dose amoxicillin (1000mg po TID, or 90mg/kg/day in children) extends to isolates with intermediate susceptibility.
        - Provides broader coverage, specifically towards beta-lactamase producing bacteria (e.g. *H. influenzae, M. catarrhalis*). However, the addition of clavulanate ↑ the risk of GI adverse events. The higher amoxicillin to clavulanate ratio even isolates with intermediate susceptibility.
        - Addition of clavulanate ↑ the risk of GI adverse events (use 7:1 ratio formulation & BID dosing to lessen).
        - Amoxicillin-clavulanate covers all of the common bacterial pathogens.
        - Covers all of the potential bacterial pathogens.
        - Old age >65 years
        - Close contact with child in daycare or treated individuals
        - Comorbidities (e.g. diabetes or chronic cardiac, hepatic or renal disease)
        - Smoker or exposed to second-hand smoke in the same household
    - **Amoxicillin/Clavulanate**
      - **Clarithromycin** is the preferred macrolide, unless major drug interactions (e.g. warfarin, digoxin, statin), as azithromycin may lead to more resistance (re: t½).
      - **Doxycycline** also covers all of the potential bacterial pathogens.

- **SEVERE** (fever ≥39°C AND purulent nasal discharge or facial pain x 3-4 days)
  - **Amoxicillin/clavulanate may be preferred in the following patients:**
    - **Amoxicillin** is considered the antibiotic of choice due to its efficacy, safety, low cost, narrow spectrum, & quantity of evidence (most studied antibiotic for this indication).
    - **Amoxicillin covers S. pneumoniae**. Effectiveness of high-dose amoxicillin (1000mg po TID, or 90mg/kg/day in children) extends to isolates with intermediate susceptibility.
    - **Amoxicillin-clavulanate** provides broader coverage, specifically towards beta-lactamase producing bacteria (e.g. *H. influenzae, M. catarrhalis*). However, the addition of clavulanate ↑ the risk of GI adverse events. The higher amoxicillin to clavulanate ratio with the BID dosing (7:1) ↓ the risk of moderate/severe diarrhea vs TID (4:1) (BID 3.4% vs TID 5.9%, NNH=40), & may be more convenient.
    - **Either high-dose amoxicillin or amoxicillin-clavulanate** may be preferred in the following patients:
      - **Antibiotic use in the past month**
      - **Age >65 years**
      - Severe sinusitis infection (e.g. systemic toxicity with temperature ≥39°C)
      - Recent hospitalization
      - Immunocompromised

- **CHRONIC SINUSITIS:** ≥12 weeks of inflammation plus ≥2 of the following: mucopurulent discharge, nasal congestion, facial pain-pressure-fullness, or ↓ sense of smell.
  - **Consider intranasal corticosteroids + saline irrigation** for symptom management.
  - **Repeated courses of antibiotics are not recommended.**
  - **Consider referral to an Ears/Nose/Throat specialist** if above measures fail.

**Duration of therapy, if needing to treat with an antibiotic:**
- In healthy adults suffering from sinusitis, short courses (e.g. 5 days) have the same benefit as longer courses of therapy (e.g. 10 days), with less harm.
- A meta-analysis (12 RCTs, n=4430) found no difference in clinical success (cure or improvement of symptoms) with short courses (3 to 7 days) versus longer courses (6 to 10 days) of the same antibiotic. A sensitivity analysis (7 RCTs, n=2715) comparing 5 versus 10 days did not find a difference in clinical success either. Overall, there was no difference in adverse events. However, in the sensitivity analysis (5 vs 10 days), short courses had fewer adverse events (OR 0.79, 95% CI 0.63-0.98).
- **Older patients** with comorbidities were excluded from the trials, and therefore we do not have evidence to support a shorter course of therapy in this population.
- A longer course of therapy (i.e. 10 days) is still recommended for **children**, based on the available evidence.

**Antibiotic Treatment Evidence Summary**

- **Amoxicillin vs Amoxicillin/Clavulanate:**
  - **Amoxicillin** is considered the antibiotic of choice due to its efficacy, safety, low cost, narrow spectrum, & quantity of evidence (most studied antibiotic for this indication).
  - **Amoxicillin covers S. pneumoniae**. Effectiveness of high-dose amoxicillin (1000mg po TID, or 90mg/kg/day in children) extends to isolates with intermediate susceptibility.
  - **Amoxicillin-clavulanate** provides broader coverage, specifically towards beta-lactamase producing bacteria (e.g. *H. influenzae, M. catarrhalis*). However, the addition of clavulanate ↑ the risk of GI adverse events. The higher amoxicillin to clavulanate ratio with the BID dosing (7:1) ↓ the risk of moderate/severe diarrhea vs TID (4:1) (BID 3.4% vs TID 5.9%, NNH=40), & may be more convenient.

**Clinical Q&A**

- **When should patients with sinusitis be referred to a specialist?**
  - **Recurrent Sinusitis:** ≥4 episodes of acute bacterial sinusitis/year
    - Neither antibiotics nor intranasal steroids have shown a reduction in the recurrent sinusitis episodes.
    - Consider assessment for allergies, immunologic deficiency, or surgery.
  - **Chronic Sinusitis:** ≥12 weeks of inflammation plus ≥2 of the following: mucopurulent discharge, nasal congestion, facial pain-pressure-fullness, or ↓ sense of smell.
    - Consider intranasal corticosteroids + saline irrigation for symptom management.
    - Repeated courses of antibiotics are not recommended.
    - Consider referral to an Ears/Nose/Throat specialist if above measures fail.
  - **Alarm Symptoms for Urgent Referral to Emergency Room:**
    - Systemic toxicity; altered mental status; severe headache; swelling of the orbit or change in visual acuity; black, necrotic tissue or discharge

**Abbreviations:**
- **AE=adverse events**
- **CV=cardiovascular**
- **ER=extended release**
- **FQ=fluoroquinolones**
- **GI=gastrointestinal**
- **NNH=number needed to harm**
- **NNT=number needed to treat**
- **RCT=randomized controlled trial**
**Definitions**

- **MIC (Minimum Inhibitory Concentration):** The lowest concentration of an antimicrobial that prevents bacterial growth, but does not kill the organism.
- **Time vs Concentration Dependent Killing:** In time-dependent killing, an antimicrobial will be effective at any concentration above the MIC. A general rule of thumb is that serum levels should be above the MIC for >50% of the dosing interval. In concentration-dependent killing, an antimicrobial is more effective at a higher dose. Thus achieving a high peak (e.g. >10x) relative to the MIC is ideal.
- **Bacteriostatic vs Bactericidal:** Bacteriostatic agents inhibit the further growth of bacteria. Bactericidal agents actively destroy existing bacteria. Classifications are not absolute - for example, agents may be bacteriostatic in most situations but bactericidal at high concentrations, or bacteriostatic against some organisms but bactericidal against others.
- **Gram staining:** Gram-positive bacteria appear purple under a Gram stain, due to retention of crystal violet dye in their thick peptidoglycan cell walls. Gram-negative bacteria appear red and have thinner cell walls.

**Overview**

- **Antibiotics During Pregnancy/Lactation**
  
  **FLUOROQUINOLONES**
  - **Erythromycin – non-estolate:** 7 malformations
  - **Erythromycin estolate** (ILOSENE) – risk of maternal hepatotoxicity
  - **Azithromycin / Clarithromycin**
  
  **MACRO**
  - **Penicillin G**
  - **Penicillin V**
  
  **CEPHALOSPORINS**
  - **Clindamycin**
  - **Cotrimoxazole** (SEPTRA, BACTRIM)
  - **Sulfamethoxazole**
  - **Trimethoprim**
  
  **TETRACYCLINES**
  - **Clindamycin**
  - **Cotrimoxazole**
  - **Sulfamethoxazole**
  - **Metronidazole (oral)**
  - **Nitrofurantoin**
  - **Vancomycin**

  **Quick References**

  **1st** (available in Canada)
  - cephalaxin (po)
  - cefuroxime (po/IV/IM)
  - cefazolin (IV/IM)

  **2nd**
  - cefadroxil (po)
  - cefprozil (po/IV/IM)
  - cefaclor (po)

  **3rd**
  - ceftiraxone (IV/IM)
  - cefazolin (IV/IM)
  - cefotaxime (IV/IM)

  **4th**
  - cefepime (IV/IM)

**Important Definitions**

- **BETA-LACTAMASE:** Important mechanism for gram-negative bacterial resistance to penicillins. Beta-lactamase is an enzyme which cleaves the beta-lactam ring. Common beta-lactamase producers include *Haemophilus influenzae*, *Neisseria gonorrhoeae*, *Moraxella catarrhalis*, *Escherichia coli*, *Proteus*, *Klebsiella*, and *Bacteroides fragilis*. Adding clavulanic acid to amoxicillin can renew coverage to these organisms. Unfortunately, resistance can still occur – such as through Extended-Spectrum Beta-Lactamase (ESBL) (esp. in *E. coli*, *Proteus*, and *Klebsiella*). Organisms producing ESBL tend to be resistant to all penicillins, all cephalosporins, usually all beta-lactam/beta-lactama inhibitor combinations and may show multi-drug resistance to other classes (e.g. aminoglycosides, fluoroquinolones, tetracyclines). In the Regina Qu’Appelle Health Region in 2014, 3.5% of *E. coli* and 0.89% of *Klebsiella pneumoniae* isolates were ESBL positive.

- **MRSA & MSSA:** *Staph aureus* was originally susceptible to all penicillins. However, today *Staph aureus* is reliably resistant to penicillin, amoxicillin, and ampicillin through beta-lactamase production. In response to this resistance, antibiotics like methicillin (*cloxacillin*, oxacillin are equivalents) were invented (resistant to beta-lactamase), as well as agents like clavulanic acid (to inhibit beta-lactamase). *Cloxacillin* and amox-clav are able to kill methicillin-sensitive *Staph aureus* (MSSA). Unfortunately, *Staph aureus* resistant to methicillin (i.e., MRSA) soon emerged. MRSA is resistant to all beta-lactams; alternative agents must be used. Community-Associated MRSA (CA-MRSA) is defined as MRSA in patients who have not been hospitalized in the previous 12 months. CA-MRSA is less likely to be multi-drug resistant.

- **High-risk AECOPD:** presence of ≥ 1 of the following → severe COPD or worse (i.e. FEV < 50%); ≥ 4 exacerbations per year; ischemic heart disease; use of home O₂; chronic oral corticosteroids; antibiotic use in the past 3 months.

- **Complicated UTIs:** lacks standard definition, but resistant organisms appear more likely if 1 or more of the following risk factors → signs and symptoms for greater than 7 days; male sex; renal failure; immunosuppression; poorly controlled diabetes (but controversial); catheterization; structural abnormality; obstruction; recent urological procedure; spinal cord injury.

**Antibiotic Use**

- **Beta-Lactams**
  - Patients who have only had a penicillin rash, the risk of reaction is <0.1%. The usual recommendation is that cephalosporins are safe. Consider referral to an Allergy specialist.

- **In penicillin-allergic patients, how likely is cephalosporin cross-sensitivity?**
  - In anaphylactic penicillin allergies, the risk of cross-reactivity with cephalosporins is low (1-2%); however, the usual recommendation is to avoid cephalosporins. (Some suggest that risk increases with similar side-chains - i.e. amoxicillin or ampicillin with cefprozil or cephalaxin; penicillin with cefoxitin.)

- **Which antimicrobials are most associated with *Clostridium difficile* colitis?**
  - Risk of *C. difficile* is essentially zero with antibiotic exposure. Most antibiotics carry some risk. Greatest risk appears to be with clindamycin (OR 16.8 vs no antibiotic exposure), cephalosporins, and fluoroquinolones. 1,7

- **Which antimicrobials are most associated with QT prolongation?**
  - For patients at risk of QT-prolongation, effect appears greatest with macrolides (clarithro, erythry > azithro) & fluoroquinolones (especially moxifloxacin and levofloxacin).

---

**Footnotes:**

- 1. *Trimethoprim = sulfamethoxazole/trimethoprim* Ten = toxic epidermal necrolysis
- 2. *Staphylococcus aureus* MSSA = methicillin-susceptible *Staphylococcus aureus* OR odds ratio PP = pneumocystis jiroveci pneumonia PK = pharmacokinetics PRSP = penicillin resistant *Streptococcus pneumoniae* QT = QT prolongation SJ = Stevens Johnson syndrome SMX/TMP = sulfamethoxazole/trimethoprim TEN = toxic epidermal necrolysis UTI = urinary tract infection VRE = vancomycin resistant enterococcus
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<td>• AE: rash, nausea, vomiting, diarrhea, melanoglossia. Rare:</td>
<td>allergic reactions, cytopepsin, acute intestinal nephritis. Aminopenicillins (amoxicillin, ampicillin) ↑ risk of SJS (but rare → 2-3 per 100,000 patients).</td>
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<td>Rare:</td>
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### Ampicillin

- Coverage: *Streptococcus; Enterococcus faecalis; Listeria; N. meningitidis*. [Same spectrum as amoxicillin.]
- Useful in: Some UTIs with sensitive enterococcus; meningitis (IV formulation, as part of combo therapy).
- ↓ absorption, ↓ convenience (q8h), & ↑ AE (diarrhea, due to incomplete absorption) vs amoxicillin. Good CSF penetration. Useful in severe listeria infections due to availability of an IV formulation.

#### Dosing
- **Adults:** 500-1000mg q6h
- **Max:** 2000mg/day

### Amoxicillin

- **AMOXIL, g**
- 125, 250mg chew tab cherry
- 25, 50mg/mL susp strawberry, banana, sugar free, berry
- 250, 500mg cap
- 1st trimester: see amoxicillin
  - **Coverage:** *Streptococcus; Enterococcus faecalis; Listeria; N. meningitidis.*
  - **Useful in:** upper respiratory tract infections; sinusitis; acute otitis media; dental procedure prophylaxis; low-risk AECOPD. *Strep pneumonia resistance only 3% in Canada for community-treated infections.*
  - High pediatric doses (e.g. 90mg/kg/day) can overcome moderate *Strep pneumonia* resistance in acute otitis media & community acquired pneumonia. Risk factors for PRSP: recent antibiotic use, daycare, not given PREVANAR.
  - **Consider watchful waiting in acute otitis media for suitable children (see page 78).**
  - Excellent bioavailability. Achieves high concentrations in the middle ear.

### Amox/Clavulanate

- **CLAVULIN, g**
- **Amox/clav ratio**
- **Strength listed is amoxicillin component. Clavulanate component is 125mg.**
- **Coverage as per amoxicillin, plus:** MSSA, many Enterobacteriaceae; *Haemophilus influenzae; Moraxella;* many anaerobes.
- **Useful in:** bite wounds; respiratory tract infections; high-risk AECOPD
- **Same pregnancy rating as amoxicillin alone. Max dose:** 2000-4000mg/day
  - ↑ diarrhea vs amoxicillin NHI-10. Less diarrhea with q12h dosing vs q8h.

### Cloxacillin

- **50mg/mL susp cherry**
- **500, 500mg cap**
- **Coverage:** *MSSA; some Streptococci (penicillin covers more Streptococci species).*
- **Useful in:** Skin and soft tissue infections (where primarily MSSA). Narrow-spectrum agent; often used as step-down therapy when MSSA is known pathogen.
- **Methicillin, oxacillin, & dicloxacin options in countries outside of Canada and have equivalent spectrum.**

### Penicillin V Potassium

- **PEN-VK, g**
- 25, 50mg/mL sol’n fruity
- **300mg (500,000 unit) tab**
  - **Coverage:** *Streptococcus;* oral anaerobes (e.g. Actinomyces, Clostridium perfringens, Peptostreptococcus, Propionibacterium). Still no resistance with Group A *Streptococcus* (aka *Streptococcus pyogenes*).
  - **Useful in:** bacterial pharyngitis; sinusitis; rheumatic fever prophylaxis (prophylactic dose is 250mg po q12h)
  - q12h dosing in pharyngitis appears effective.

### Cefalexin

- **KEFLEX, g**
- 25, 50mg/mL orange-banana
- 250, 500mg tab
- **1st-generation cefalexins.**
- **Coverage:** *Streptococcus; MSSA; Proteus; E. coli; Klebsiella. (PEK)**
- **Useful in:** skin and soft tissue infections; step down option from IV cefazolin.
  - **Take with food to reduce GI upset.**

### Cefadroxil

- **DURICEF, g**
- **500mg cap**
- **2nd-generation cefadroxil.**
- **Coverage:** *Streptococcus; MSSA; Moraxella; Haemophilus influenzae; Proteus; E. coli; Klebsiella. (H PEK)**
- **Useful in:** low-risk AECOPD; community-acquired pneumonia.

### Cefoprozil

- **CEFZIL, g**
- 25, 50mg/mL susp bubblegum
- 250, 500mg tab
- **2nd-generation cefprozil.**
- **Coverage:** *Streptococcus; MSSA; Moraxella; Haemophilus influenzae; Proteus; E. coli; Klebsiella. (H PEK)**
- **Useful in:** low-risk AECOPD; community-acquired pneumonia.

### Cefuroxime axetil

- **CEFTIN, g**
- 25mg/mL susp, 250mg sachet tutti-frutti
- 250, 500mg tab
- **3rd-generation cefuroxime. Coverage: Streptococci; Moraxella; Haemophilus influenzae; ?Enterobacter; Neisseria; Proteus; E. coli; Klebsiella; Serratia. (HEN PECKS)**
- **Useful in:** gonorrhea (800mg po x1 dose); pyelonephritis or complicated UTIs; low-risk AECOPD.

### Cefixime

- **SUPRAX, g**
- 20mg/mL susp strawberry
- **400mg tab**
- **3rd-generation cefixime.**
- **Coverage:** *Streptococci; Moraxella; Haemophilus influenzae; ?Enterobacter; Neisseria; Proteus; E. coli; Klebsiella; Serratia. (HEN PECKS)**
- **Useful in:** gonorrhea (800mg po x1 dose); pyelonephritis or complicated UTIs; low-risk AECOPD.

### Ceftriaxone Injection

- **ROCEPHIN, g**
- **1, 2, 10g vials for injection (IM/IV)**
- **3rd-generation ceftriaxone with excellent gram-negative coverage. Used in hospitalized pts for empiric coverage of gram-negative infections; also useful in an out-patient setting (e.g. one-time IM dose for gonorrhea; initial treatment of suspected pyelonephritis while waiting for cultures).**

### Discontinued Products

- Penicillin V Benzathine **PEN-VEE** suspension; cefaclor **CECLOR** tablet
### Azithromycin (ZITHROMAX, g)

- **Coverage:** Strepococci; N. gonorrhoeae; Moraxella; Haemophilus influenzae; Legionella; many atypicals.
- **Useful in:** pneumonia; upper respiratory tract infections; low-risk AECOPD; MAC prophylaxis in HIV pts (but DIs with HIV medications possible).
- **Keep suspension at room temp.**
- **XL tab = with food.**
- **Regular tab = with or without food.**

### Clarithromycin (BIAXIN, g)

- **Coverage:** Strepococci; Moraxella; Legionella; many atypicals. (Unlike other macrolides, lacks H. influenzae coverage - therefore not recommended as empiric therapy for pneumonia in adults or in AECOPD. Reasonable option for pneumonia in kids < 12 years as H. influenzae uncommon in this group.)
- **Useful in:** upper respiratory tract infections; acnée; pneumonia if sensitive pathogen is cultured.
- **Has been used to increase GI motility e.g. in gastroparesis, but resistance concerns & development of tachyphylaxis if used long-term limit this indication.**
- **Estolate formulation: contraindicated in pregnancy (↑ hepatotoxicity), but best in kids as most acid stable.**
- **Empty stomach ideal for increased absorption, but if not tolerated, taking with food decreases GI upset.**
- **ERYC may be sprinkled on food.**
- **Erythromycin unsafe in porphyria.**

### Tetracyclines

- **Common:** GI upset (DOX = MIN < TET), vaginal candidiasis, photosensitivity (DOX > TET > MIN; esp. UVA, & dose-dependent i.e. less of a problem at DOX 100mg/day). Use Sunscreen SPF 15-30, especially if long-term use.
- **Sit up after taking for at least 30 minutes, and take with a full glass of water, to reduce risk of pills lodging in the esophagus and causing ulceration. MIN: hyperpigmentation of skin (rare, bluish skin) & mucous membranes, lightheadedness, dizziness, vertigo, ataxia, drowsiness & fatigue. **Serious:** rare azotemia, pseudotumor cerebri (benign intracranial hypertension). MIN: rare lupus-like reaction, autoimmune hepatitis & hypersensitivity syndrome (case reports; implicated far more often in hypersensitivity reactions than other tetracyclines).
- **CI:** Pregnancy, Children < 8yrs, severe renal or hepatic dysfunction; DOX: myasthenia gravis (possible serious association with muscle weakness).
- **GI absorption: Fe++, bismuth, Al++, Ca++, Mg++ (separate dose by 2 hr); ↑INR: warfarin; may ↓ oral contraceptive effectiveness; isotretinoin (intracranial hypertension/hemorrhage).**
- **MIN long-term, consider LFTs & antinuclear factor baseline & q3-4 months.**

### Doxycycline (DOXY, DOXYCIN, g)

- **Coverage:** Broad spectrum agent → Staphylococci (often MRSA); Strep pneumoniae; Moraxella; Haemophilus influenzae; many atypicals; many anaerobes including spirochetes.
- **Useful in:** pneumonia; low-risk AECOPD, purulent skin & soft tissue infections; ricketssia; acne; Lyme disease
- **Better absorption on empty stomach (↑20%), but may take with food to improve tolerability** if necessary.
- **Dosing at 100mg once daily OK in acne & malaria prophylaxis.**

### Minocycline (MINOCIN, g)

- **Coverage:** Broad spectrum agent → Staphylococci; Strep pneumoniae; Moraxella; Haemophilus influenzae; many atypicals; many anaerobes including spirochetes.
- **Useful in:** some prostatic joint infections; acne
- **Due to association with serious renal AE, some suggest avoiding minocycline (doxycycline safer and effective).**

### Tetracycline (TETRACYN, g)

- **Coverage:** Broad spectrum agents → Staphylococci; Strep pneumoniae; Moraxella; Haemophilus influenzae; many atypicals; many anaerobes including spirochetes.
- **Useful in:** acne; actinomycosis; periodontitis.
- **Take TET on empty stomach - absorption is ↓ by food & dairy.**

### Discontinued Products

- Erythromycin/Sulfisoxazole PEDIAZOLE suspension
- Erythromycin Ethylsuccinate ERYPED suspension
- Telithromycin KETEK tablet
Fluoroquinolones inhibits DNA gyrase, causing breakdown of bacterial DNA. Bactericidal. Concentration dependent killing (aim for high peak concentrations).

- AE: GI upset; rash/photosensitivity; ↑QT; confusion/psychosis; ↑ or ↓ BG; seizure; tendinopathy/tendon rupture; retinal detachment; ↓weakness in myasthenia gravis; articular damage in kids; hepatotoxicity; nephrotoxicity.
- DI: CYP1A2 inhibition → ↑levels of clozapine, duloxetine, methotrexate, quinapril, rasagiline, ropinirole, theophylline, tizanidine, varenicline, ↓INR with warfarin. QT prolongation (watch for other QT-prolonging agents).
- ↓absorption via chelation with Ca²⁺, Fe⁺⁺, Al³⁺, Mg²⁺ (may space calcium, iron, multivitamins, etc. by giving >2 hours after fluoroquinolone, or hold for duration of fluoroquinolone therapy). Binds to enteral tube feeds (due to cations in feed - calcium, iron, etc.). May have less absorption via jejunostomy tube since fluoroquinolones are likely absorbed in the duodenum. Increased risk of tendon rupture when given with corticosteroids.
- CI: See adverse effects. Safety < 18 years not proven (but ciprofloxacin in particular is often used). If prolonged therapy: CBC, SCR, LFTs. Ciprofloxacin, levofloxacin, moxifloxin = excellent bioavailability.

- Mexifloxacin and levofloxacin → anaerobic, atypical, Streptococci, & gram-negative coverage has lead to designation as "respiratory fluoroquinolones"; effective in pneumonia and AECOPD, but reserve use wherever possible.

Reserve fluoroquinolones whenever possible.

**Why?**
- These are broad-spectrum agents, with particularly good coverage against gram-negative pathogens. Preventing resistance, by limiting fluoroquinolone use, is important.
- Ciprofloxacin has reliable antiapneumococcal activity; agents that kill *Pseudomonas* are uncommon. *Note:* If *Pseudomonas* suspected in serious infection, may use combination therapy empirically.

When might use be necessary?
- Patients with contraindications to other therapies (e.g. true penicillin allergies).
- Patients with infections resistant or likely to be resistant to other therapies.

**Fluoroquinolone use discouraged in <18 yrs.**

**Ciprofloxacin** CIPRO, g
- **250, 500, 750mg tab**: 
  - 500mg XL tab, g @; 100mg XL tab @
  - 100mg/mL susp = ▼ strawberry
- **Levofloxacin** LEVAQUIN, g
  - 250, 500, 750mg tab ▼
  - NIHB x 30 days maximum
- **Moxifloxacin** AVELOX, g
  - 400mg tab ▼
  - NIHB x 14 days maximum
- **Norfloxacin** NOROXIN, g
  - 400mg tab ▼

**Antifolates**
- Prevent bacterial folate synthesis. Sulphamethoxazole & trimethoprim inhibit successive steps in folic acid pathway, → thus are synergistic in combination. Combination bactericidal; concentration-dependent killing.
- AE: Generally well tolerated. Common: nausea, vomiting, skin reactions (photosensitivity; rash; pruritus; rare: SJS/TEN → 3 per 100,000 patients), headaches, ↑K⁺, ↓Na⁺, ↑SCR (often mild/transient), ↓BG.
- CI: history of drug-induced immune-thrombocytopenia from sulfonamides or trimethoprim; megaloblastic anemia from folate deficiency; severe liver disease; previous SJS from sulfonamides.
- Caution: patients with G6PD deficiency (risk of hemolysis); patients porphyria. Infants < 2 months of age.
- **MC:** 2C9 inhibitor, SAA substrate: ↑levels of carboxid, digoxin, phenytoin; ↓INR and bleed risk with warfarin. ↑Hypoglycemia risk with hypoglycemic agents (e.g. gluclizide, insulin). Levels of cotrimoxazole ↓ by 34A inducers (e.g. carbamazein, phenobarb, phenytoin, rifampin). Watch for other drugs that can cause hyperkalemia (see AE section above).
- **B:** CBC, Scr, BUN.

**Sulfamethoxazole/Trimethoprim**
- **BACTRIM, SEPTRA, Cotrimoxalone, g**
  - 100/20mg (pediatric) tab
  - 400/80mg (single strength) tab
  - 800/160mg (double strength) tab
  - 40/8mg per 1mL susp cherry
- **BACOMIP, PROLOPRIM, g**
  - 100, 200mg tab

**Discontinued Products:** Gemifloxacin FACTIVE tab; Ofloxacin FLOXIN tab; Trovafloxacin TROVAN tab (hepatic adverse events); Gatifloxacin TEQUIN tab (increased diabetes); Grepafloxacin REXAR tab (increased cardiac events)
### Oral Antibiotics (continued): Miscellaneous Agents

<table>
<thead>
<tr>
<th>Generic/TRADE</th>
<th>Adverse Events</th>
<th>AE / Contraindications</th>
<th>DI / Drug Interactions</th>
<th>Comments</th>
<th>Dosing (Adult, Pediatric, Usual Max)</th>
<th>$/10d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clindamycin</td>
<td>• Inhibits bacterial protein synthesis. Bacteriostatic; time-dependent killing. <strong>Coverage</strong>: <em>Staphylococcus</em>, <em>Streptococcus</em>; many oral anaerobes. Unreliable MRSA coverage and inducible <em>Staph</em> &amp; <em>Strept</em> resistance. • <strong>Useful in</strong>: skin and soft tissue infections; dental infections (although usually safer options). Reduces toxin production of <em>Streptococcus</em> and <em>Staphylococcus</em>. (e.g. useful to ↓ toxic shock syndrome in necrotizing fasciitis - give in combination with penicillin).</td>
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<tr>
<td>DALACIN C, g 150, 300mg cap 15mg/mL sol’n cherry Excellent bioavailability</td>
<td>• AE: nausea, diarrhea, rash (rare: SJS), ↑LFTs. Rare: leukopenia, thrombocytopenia. Higher risk of Clostridium difficile than other agents. <strong>AE profile plus increasing resistance</strong> (including inducible D-zone) limits role. • DI: May decrease effect of erythromycin (competitive binding to same protein site). <strong>Oral</strong>:</td>
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<tr>
<td>Metronidazole</td>
<td>• Disrupts DNA of bacterial cells. Bactericidal. <strong>Coverage</strong>: most <em>anaerobes</em>, including anaerobic protozoa. • <strong>Useful in</strong>: intra-abdominal infections; <em>C. difficile</em>; bacterial vaginosis; trichomiasis; diabetic foot infections; fistulizing Crohn’s disease (may help drainage); 7 Chronic use may have benefit in Crohn’s, but risk of AE. • <strong>GI</strong>: GL upset, metallic taste, headache, vaginitis, peripheral/optic neuropathy (long-term use). • <strong>Rare</strong>: neurotoxicity, leukopenia, skin reactions (sh Rash, pruritus, SJS/TEN). • <strong>Cl</strong>: Use of disulfiram in previous 2 weeks; alcohol during and 3 days after therapy. • <strong>Dr</strong>: disulfiram-like reaction with alcohol; ↑INR and bleeding risk with warfarin; ↑ SJS risk with mebendazole.</td>
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<tr>
<td>FLAGYL, g 250mg tab 500mg cap ▼ Excellent bioavailability</td>
<td>• <strong>Drug Interactions</strong>: • <strong>DI</strong>: Decrease the bioavailability of other agents. • <strong>M</strong>: Decrease absorption of other agents</td>
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<tr>
<td>Nitrofurantoin</td>
<td>• Damages bacterial DNA/proteins (bacteria convert nitrofurantoin into reactive forms). Multiple sites of attack → resistance slow to develop. <strong>Coverage</strong>: <em>Staphylococcus</em>: <em>E. coli</em>, <em>Enterococcus faecalis</em>, <em>Citrobacter</em>, <em>Klebsiella</em>. • <strong>Useful in</strong>: First-line therapy in UTIs (only 5 days needed if uncomplicated). Avoid if suspected peyelonephritis. • <strong>AE</strong>: Common: darkens urine, nausea, headache. Very rare: SJS/TEN = 1 per 100,000 patients. • <strong>DI</strong>: Common: hyperkalemic effect of spironolactone; may ↓ effect of norfloxacin. • <strong>Cl</strong>: Signs of pulmonary toxicity; may be needed if neutropenia; LFTs, SCr if chronic use. • <strong>M</strong>: May increase inactivation of any antibiotics that require gut flora.</td>
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<tr>
<td>MACROBID MACRODANTIN, g</td>
<td>• <strong>Useful in</strong>: Nitrofurantoin resistance.</td>
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<tr>
<td>Dosed q6h: 50mg macrocrystalline capsule 50, 100 mg ▼</td>
<td>• <strong>Dosed q12h: 100mg macrocrystalline capsule</strong></td>
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<tr>
<td>Nitrofurantoin</td>
<td>• <strong>Useful in</strong>: Nitrofurantoin resistance.</td>
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<tr>
<td>MONOURL, g 3000mg powder sachet ▼</td>
<td>• **Inhibits cell-wall formation. Bactericidal. <strong>Coverage</strong>: Staphylococci; Enterococci; Enterobacteriaceae. Often coverage even if multi-drug resistance (MRSA, ESBL-producing organisms, VRE). • <strong>Useful in</strong>: UTIs. Avoid if suspected peyelonephritis. Safe in pregnancy but usually better options. • <strong>GI</strong>: GL upset, diarrhea, headache, hypokalemia. Significant adverse effects rare with short-course use. • <strong>Dr</strong>: Usually no significant drug interactions.</td>
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<tr>
<td>Fosfomycin</td>
<td>• **Inhibits bacterial protein synthesis. Usually bacteriostatic, but bactericidal against Streptococcus. <strong>Coverage</strong>: <em>Streptococci</em>, <em>Enterococci</em> (including VRE), <em>Staphylococcus</em> (including MRSA). • <strong>Useful in</strong>: multi-drug resistant infections (including pneumonia, skin and soft tissue, etc.).</td>
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<tr>
<td>Linezolid</td>
<td>• <strong>Useful in</strong>: multi-drug resistant infections (including pneumonia, skin and soft tissue, etc.).</td>
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<tr>
<td>ZYVOXAM, g 600mg tab ▼</td>
<td>• <strong>NIH prior approval = treatment of:</strong> -proven VRE -proven MRSA with vancomycin intolerance</td>
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<tr>
<td>Excellent bioavailability</td>
<td>• **Inhibits bacterial protein synthesis. Usually bacteriostatic, but bactericidal against Streptococcus. <strong>Coverage</strong>: <em>Streptococci</em>, <em>Enterococci</em> (including VRE), <em>Staphylococcus</em> (including MRSA). • <strong>Useful in</strong>: multi-drug resistant infections (including pneumonia, skin and soft tissue, etc.).</td>
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<tr>
<td>Probenecid</td>
<td>• <strong>Prolongs penicillin levels by competitively inhibiting their excretion. 30-45min prior to IV penicillin dose.</strong></td>
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<tr>
<td>BENURYL, g 500mg tabX ▼ Non-prescription ▶ over the counter</td>
<td>• <strong>Occasionally useful when IV therapy is needed in an outpatient setting to convenience / home care visits (e.g. in syphils to penicillin dosing to q24h IM; in cellulitis to IV cefazolin dosing to q24h).</strong> • <strong>AE</strong>: flushing, rash, GI upset, diziness, headache.</td>
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<tr>
<td>Vancomycin</td>
<td>• **Inhibits cell-wall formation. <strong>Coverage</strong>: The only oral use is for treatment of <em>Clostridium difficile</em> colitis (drug of choice if severe infection, or if second recurrence of <em>C. diff</em> infection; taper over ~8wks in recurrent infections). • <strong>RARE</strong>: only used for severe colitis.</td>
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<tr>
<td>VANOCIN, g 125, 250mg cap ▼</td>
<td>• <strong>Useful in</strong>: Vancomycin-resistant Enterococci.</td>
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<tr>
<td>See IDSA <em>Clostridium difficile</em> guidelines</td>
<td>• <strong>Useful in</strong>: Vancomycin-resistant Enterococci.</td>
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<tr>
<td>Methenamine mandelate</td>
<td><strong>MANDELAMINE</strong> 500mg po q6h $33 ▼ • Creates acetic acid; used for UTI prophylaxis, but not first line (limited evidence); 22 likely inefficacious in catheterized patients; ▲ AE: rash, GI upset, bladder irritation, ↑LFTs; ▲ β-agonists, β-agonists, amphetamines, sulfonamides, acetazolamide, antacids; ▲ Urinalysis, periodic LFTs. ▲ <strong>Contraindications</strong>: <strong>severe hepatic dysfunction.</strong></td>
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</tbody>
</table>
| Probiotics includes Saccharomyces boulardii, Lactobacillus rhamnosus GG, others. ↓ *Clostridium-associated* diarrhea; separate ≥2hrs from antibiotics. **S. boulardii** 14 daily for C. difficile diarrhea (caution: immunocompromised, pancreatitis).**
A Non-antibiotic Rx for Predominantly Viral Infections

It helps if I give them something they can do, as well as explain why an antibiotic was not prescribed this time!

Samples

1) Viral Info Pads from MUMS Health – PAACT CME, Toronto, ON
   - Print version – order information (minimal cost)
   http://www.mumshealth.com/guidelines-tools/viral-info-pads
   http://www.mumshealth.com/guidelines-tools/anti-infective

2) Viral Prescription Pad – RQHA, Regina, SK
   - Print version (available online):
   - Electronic version (available online):

Note – for our academic detailing sessions with clinicians in SK, we will try to have some of this type of information along with us to leave with you.
We asked some clinicians: “How do you deal with patient expectations around antibiotics?”

<table>
<thead>
<tr>
<th>PATIENT SAYS:</th>
<th>POSSIBLE CLINICIAN RESPONSE:</th>
<th>EVIDENCE AROUND REDUCING UNNECESSARY ANTIBIOTICS?</th>
<th>ADDITIONAL TIPS FOR GETTING PATIENT BUY-IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel really rotten!</td>
<td>Yes, I’m sure you do... and you look sick too, but feeling rotten doesn’t equal a bacterial infection. It’s most likely to be viral!</td>
<td>• Studies have demonstrated patient satisfaction with care for acute bronchitis depends most on physician-patient communication, not antibiotic treatment. iii, iv</td>
<td>• Use the term “chest cold” or “viral upper respiratory tract infection” as this makes it easier to convince patients they do not need antibiotics.</td>
</tr>
<tr>
<td>I really think I need something.</td>
<td>Yes, for sure. You need to stay home &amp; rest for a day. Here is an information hand-out and a script with options for symptom management.</td>
<td>• One study found that the duration of office visits for acute respiratory infection was only one minute longer when antibiotics were not prescribed. v</td>
<td>• Viruses commonly make you feel sick all over your body.</td>
</tr>
<tr>
<td>But, last time I got antibiotics!</td>
<td>In the past, we sometimes used antibiotics, they didn’t work, but the practice has given us “superbugs”!</td>
<td>• A change in antibiotic reimbursement resulted in fewer antibiotics prescribed, and a reduction in the level of antimicrobial resistance. vi</td>
<td>• Viruses are more easily spread from one person to another, so if you are the 3rd person in your house who’s sick... it’s probably a virus.</td>
</tr>
<tr>
<td>I drove and waited a long time. I don’t want to have to come back!</td>
<td>Yes. What I could do is give you a provisional prescription, good for a week. Don’t fill it now, but if all of the sudden you feel a lot worse, you can fill it without having to come in.</td>
<td></td>
<td>• Fever is how our bodies fight off any infection and not an indication of a bacterial infection.</td>
</tr>
<tr>
<td>I’ve been coughing for two weeks...</td>
<td>It’s pretty typical to cough for several weeks after a chest cold due to a virus. Would you like it if I gave you something to help with the cough?</td>
<td></td>
<td>• Colored nasal secretions do not equal a bacterial infection! Snot and sputum that becomes yellow/green is a sign your body is fighting off any infection.</td>
</tr>
<tr>
<td>I’ve been coughing steady, feverish, and feel like dying.</td>
<td>You do look quite unwell. It could just be a chest cold, but we should send you for an x-ray to rule out pneumonia and anything else.</td>
<td></td>
<td>• Antibiotics cause a lot more side effects than we realize. Throat infections, yeast infections, and occasionally some very serious harms. Plus, when we overuse, we increase the risk of resistant bacteria!</td>
</tr>
<tr>
<td>I think I’d like an antibiotic just in case. Can’t get wrong, right?</td>
<td>Actually, antibiotics cause a lot more side effects than we realize. There’s diarrhea, yeast infections, and occasionally some very serious harms. Plus, when we overuse, we increase the risk of resistant bacteria!</td>
<td></td>
<td>• Most sore throats are viral infections. Strep throat can only be diagnosed by a throat swab.</td>
</tr>
</tbody>
</table>

**EVIDENCE AROUND REDUCING UNNECESSARY ANTIBIOTICS?**

- Studies have demonstrated patient satisfaction with care for acute bronchitis depends most on physician-patient communication, not antibiotic treatment. iii, iv
- One study found that the duration of office visits for acute respiratory infection was only one minute longer when antibiotics were not prescribed. v
- A change in antibiotic reimbursement resulted in fewer antibiotics prescribed, and a reduction in the level of antimicrobial resistance. vi

**ONE PHYSICIAN’S SCRIPT AROUND ACUTE BRONCHITIS**

I have examined you and I am happy there is no sign of serious illness, which would need an antibiotic today. Most chest colds get better on their own, although the cough may take several weeks to go away completely.

Antibiotics don’t seem to make much difference to how quickly most people recover. However, if you feel you are actually getting worse after awhile, taking antibiotics then may be reasonable.

So, here is an antibiotic prescription for you to keep at home. You are quite likely not to need it, but if your symptoms get noticeably worse, you can fill it within 7 days.

**ADDITIONAL TIPS FOR GETTING PATIENT BUY-IN**

- Use the term “chest cold” or “viral upper respiratory tract infection” as this makes it easier to convince patients they do not need antibiotics.
- Viruses commonly make you feel sick all over your body.
- Viruses are more easily spread from one person to another, so if you are the 3rd person in your house who’s sick... it’s probably a virus.
- Fever is how our bodies fight off any infection and not an indication of a bacterial infection.
- Colored nasal secretions do not equal a bacterial infection! Snot and sputum that becomes yellow/green is a sign your body is fighting off any infection.
- Most sore throats are viral infections. Strep throat can only be diagnosed by a throat swab.
- 70-80% of ear infections get better without antibiotics.
- Antibiotics do not reduce the duration of viral illness, but may cause harms (nausea, diarrhea, allergic reactions, etc.)
- Always provide a) patient education, b) symptom duration, and c) when to return.
- Hand washing!! Important for sick contact prevention.

**TYPICAL SYMPTOM DURATION FOR SELECT VIRAL ILLNESS**

- Sore throat, pharyngitis: 6-10 days
- Cough, acute bronchitis: 2-3 weeks

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Details That Matter
~
Objective & Evidence-based Drug Information

Drug Comparison Charts
10th Edition

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Alternatives to explore, when less may be more