Objectives

- Discuss evidence based recommendations for diagnosis and treatment (antibiotics, dose, and duration) of common infections:
  - Skin and Soft Tissue Infection
  - Respiratory Tract Infection
    - Acute Bronchitis
    - Pneumonia
    - Acute Bacterial Rhinosinusitis
    - Pharyngitis
  - Urinary Tract Infection
Upper Respiratory Tract Infection:
  - most common acute illness evaluated in outpatient setting

Urinary Tract Infection:
  >8 million visits to physicians’ offices per year
Dealing with Uncertainty

• Accurate diagnosis of common conditions remains largely clinical
• “Our society expects immediate results”
• “One can't culture everything, and the utility of the results are very poor especially in the outpatient setting, and it takes days to get those results back”**
• Different doctors have differing comfort levels with uncertainty
  • Some providers feel more comfortable prescribing an antibiotic “just in case” there is an infection even w/o clinical evidence
• Patients like this too!

**http://online.wsj.com/article/SB10001424127887323423804579023113596120826.html#articleTabs%3Dcomments
There is a need for more effective consumer education to counter widespread misconceptions such as “Finally, over that cold. Thank God for Z-Pak”

- (Twitter—850 375 followers)

DOUBLE FACEPALM
FOR WHEN ONE FACEPALM DOESN'T CUT IT

www.thxforthe.info
Remember—there are potential risks when taking any prescription drug. Antibiotics should only be used when your child’s doctor determines they are needed.

**Antibiotic use can cause:**

- Kill good bacteria, which may lead to diarrhea or yeast infections.
- Cause a serious infection requiring hospitalization.
- Result in an antibiotic-resistant bacterial strain that is harder to kill. They can also be cured with an antibiotic.
- Cause death.

**SIX SIMPLE AND SMART FACTS ABOUT ANTIBIOTIC USE**

1. **Antibiotics are life-saving drugs**
   
   Using antibiotics wisely is the best way to preserve their strength for future bacterial illnesses.

2. **Antibiotics only treat bacterial infections**
   
   If your child has a viral infection like a cold, talk to a doctor or pharmacist about symptom relief. This may include over-the-counter medicine, a humidifier, or warm liquids.

3. **Some ear infections DO NOT require an antibiotic**
   
   A doctor can determine what kind of ear infection your child has and if antibiotics will help. The doctor may follow expert guidelines to wait for a couple of days before prescribing antibiotics since your child may get better without them.

4. **Most sore throats DO NOT require an antibiotic**
   
   Only 1 in 5 children seen by a doctor for a sore throat have strep throat, which should be treated with an antibiotic. Your child’s doctor can only confirm strep throat by running a test.

5. **Green colored mucus is NOT a sign that an antibiotic is needed**
   
   As the body’s immune system fights off an infection, mucus can change color. This is normal and does not mean your child needs an antibiotic.

6. **There are potential risks when taking any prescription drug**
   
   Antibiotic use can cause complications, ranging from an upset stomach to a serious allergic reaction. Your child’s doctor will weigh the risks and benefits before prescribing an antibiotic.
Infections by Organ System

<table>
<thead>
<tr>
<th>Organ System</th>
<th>Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>3</td>
</tr>
<tr>
<td>Central Nervous System (CNS)</td>
<td>2</td>
</tr>
<tr>
<td>Circulatory</td>
<td>1</td>
</tr>
<tr>
<td>Gastrointestinal (GI)</td>
<td>4</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>3</td>
</tr>
<tr>
<td>Intra-Abdominal</td>
<td>1</td>
</tr>
<tr>
<td>Lower/Upper Respiratory</td>
<td>5</td>
</tr>
<tr>
<td>Skeletal (Bones &amp; Joints)</td>
<td>3</td>
</tr>
<tr>
<td>Skin &amp; Soft Tissue</td>
<td>3</td>
</tr>
</tbody>
</table>
Guidelines

Why:
– Evidenced-based recommendations
– Standardization of recommendations
– Adherence to the use of formulary drugs
– Intellectual back-up

Antibiotic Guidelines
2013-2014

Sara Cosgrove, MD, MS

Slide modified from: SHEA2013
Skin and Soft Tissue Infections

- Skin: Largest organ of the body
- Diagnosis and treatment of cellulitis:
  - “One size fits all” approach no longer appropriate
With respect to cellulitis, lack of clarity about the microbiology is a problem.

Presence of a collection of pus affords the clinician great comfort, diagnostically and therapeutically.
Cellulitis without drainage or abscess

- Cellulitis without draining wounds or abscess, streptococci continue to be the likely etiology and beta-lactam antibiotics are appropriate therapy
- If the cellulitis appears to be related to a furuncle or an abscess, or if it is a postsurgical infection, including coverage for MRSA is prudent
- Up to 32% of patients admitted with cellulitis have stasis dermatitis
  - Suspect this whenever the rash is bilateral, not associated with fever, has failed outpatient oral antibiotics, or the PCT level is normal
Among patients diagnosed with cellulitis without abscess, the addition of trimethoprim-sulfamethoxazole to cephalexin did not improve outcomes overall or by subgroup.
Empiric antimicrobial therapy for nonpurulent cellulitis (including beta-hemolytic streptococci and MSSA but not MRSA)

<table>
<thead>
<tr>
<th>Oral therapy</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dicloxacillin</td>
<td>500 mg orally every six hours</td>
</tr>
<tr>
<td>Cephalexin*</td>
<td>500 mg orally every six hours</td>
</tr>
<tr>
<td>Clindamycin*</td>
<td>300 to 450 mg orally every six to eight hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intravenous therapy</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefazolin*</td>
<td>1 to 2 grams intravenously every eight hours</td>
</tr>
<tr>
<td>Oxacillin</td>
<td>2 grams intravenously every four hours</td>
</tr>
<tr>
<td>Nafcillin</td>
<td>2 grams intravenously every four hours</td>
</tr>
<tr>
<td>Clindamycin*</td>
<td>600 to 900 mg intravenously every eight hours</td>
</tr>
</tbody>
</table>

The duration of therapy should be individualized depending on clinical response; 5 to 10 days is usually appropriate longer duration of therapy may be warranted in patients with severe disease.
## Cellulitis: Antibiotic Dosing

### III. Antibiotic dosing

<table>
<thead>
<tr>
<th>Weight</th>
<th>Cephalexin</th>
<th>Trimethoprim-sulfamethoxazole (mg trimethoprim)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt;30 kg:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15–19 kg:</td>
<td>300 mg 4 times daily</td>
<td>40/200 mg qid</td>
</tr>
<tr>
<td>20–24 kg:</td>
<td>400 mg 4 times daily</td>
<td>60/300 mg qid</td>
</tr>
<tr>
<td>25–29 kg:</td>
<td>500 mg 4 times daily</td>
<td>72/360 mg qid</td>
</tr>
<tr>
<td>Adults and children ≥30 kg:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;60 kg:</td>
<td>500 mg 4 times daily</td>
<td>80/400 mg qid</td>
</tr>
<tr>
<td>60–80 kg:</td>
<td>1000 mg 3 times daily</td>
<td>160/800 mg tid</td>
</tr>
<tr>
<td>&gt;80 kg:</td>
<td>1000 mg 4 times daily</td>
<td>160/800 mg qid</td>
</tr>
</tbody>
</table>
Cellulitis: Duration of Rx

- In cases of uncomplicated cellulitis, 5 days of antibiotic treatment is as effective as a 10-day course

Hepburn MJ et al.
Comparison of short-course (5 days) and standard (10 days) treatment for uncomplicated cellulitis.
Microbiology of Purulent SSTIs

- **MRSA** 59%
- **MSSA** 17%
- B-hemolytic strep 3%
- Non-B hemolytic strep 4%
- Other 8%
- Unknown 9%

Moran NEJM 2006; 355: 666-74

Copyright Infectious Diseases Society of America (IDSA) 2011
Purulent Cellulitis: *S. aureus* >>> \( \beta \)-hemolytic strep

- Cellulitis associated with purulent drainage or exudate *without* a drainable abscess
- Empiric Rx for CA-MRSA is recommended *(AII)*.
- Empiric Rx for \( \beta \)-hemolytic strep unlikely needed *(AII)*.
- Duration of therapy: 5-10 days, individualize based on clinical response *(AII)*.
# Outpatient purulent cellulitis: Empiric Rx for CA-MRSA

<table>
<thead>
<tr>
<th>Drug</th>
<th>Adult Dose</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMP-SMX</td>
<td>1-2 DS BID</td>
<td>All</td>
</tr>
<tr>
<td>Doxycycline, Minocycline</td>
<td>100 BID</td>
<td>All</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>300-450 TID</td>
<td>All</td>
</tr>
<tr>
<td>Linezolid</td>
<td>600 BID</td>
<td>All</td>
</tr>
</tbody>
</table>

Copyright Infectious Diseases Society of America (IDSA) 2011
Complicated SSTI

• Surgical debridement & empiric therapy for MRSA pending cultures

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Adult</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancomycin</td>
<td>15-20 mg/kg IV Q8-12</td>
<td>A1</td>
</tr>
<tr>
<td>Linezolid</td>
<td>600 mg PO/ IV BID</td>
<td>A1</td>
</tr>
<tr>
<td>Daptomycin</td>
<td>4 mg/kg IV QD</td>
<td>A1</td>
</tr>
<tr>
<td>Telavancin</td>
<td>10 mg/kg IV QD</td>
<td>A1</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>600 mg PO/IV Q8</td>
<td>AIII</td>
</tr>
</tbody>
</table>

*Tigecycline associated with ↑ mortality; consider alternate agent for MRSA SSTI
*Ceftaroline: FDA approved after guidelines

Copyright Infectious Diseases Society of America (IDSA) 2011
Acute Respiratory Infections

Relax! I'm not Death!
I'm his brother Bad Head Cold

http://fty720.blogspot.com/2008/02/increased-chance-of-upper-respiratory.html
Acute Bronchitis

- Viruses cause 85%--95% of acute bronchitis in healthy adults
  - rhinovirus, adenovirus, influenza A and B, parainfluenza
- Antibiotics: not needed to treat most patients with acute bronchitis
- Bacteria can cause bronchitis in patients with underlying health problems
  - *Mycoplasma pneumoniae*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, & *Bordetella pertussis*
- Antibiotics: modest benefit for minority of patients
- Amoxicillin, doxycycline, azithromycin, & TMP-SMX seem reasonable first choices

-Acute bronchitis. Graham Worrall
Canadian Family Physician Vol 54: Feb • 2008
- Does bronchitis really exist? Hueston et al
- There’s a lot of it about: acute respiratory infection in primary care. Abingdon, Engl: Radcliffe Publishing 2006
Acute Bronchitis

In 1995 Merle Sande wrote an editorial:

What will it take to stop physicians from prescribing antibiotics for acute bronchitis?

-Lancet 1995;345:665-6

Consider calling the cough a “chest cold” rather than “acute bronchitis”

Recent articles on ED show treatment rate still remains 68 -74% ¹ ²


Slide Adapted from SHEA 2012 Dr. Gary Kravitz (Abx Stewardship in ED)
“For every complex problem there is an answer that is clear, simple, and wrong.”

-H. L. Mencken
Resources for Patients

http://www.cdc.gov/getsmaet/campaign-materials/brochures.html
Treatment of acute bronchitis with antibiotics is recommended in:

- Immuno-compromised
- Severe CHF
- Severe chronic lung disease
- Other select conditions

Uncomplicated

- Patient presenting with increased cough, sputum volume, sputum purulence, and dyspnea relative to baseline and none of the risk factors for complicated exacerbation.
  - Doxycycline 100 mg PO BID
  - OR
  - TMP/SMX 1 DS tab PO BID
  - OR
  - Amoxicillin 500 mg PO TID (see treatment notes below)

Complicated

- Patient presenting with increased cough, sputum volume, sputum purulence, and dyspnea relative to baseline and at least one of the following: FEV₁ < 50% predicted, more than 4 exacerbations in last 12 months, significant coronary artery disease or heart failure, use of home oxygen, chronic oral steroid use, or antibiotic use in the past three months.
  - Azithromycin 500 mg PO/IV Q24H
  - OR
  - Amoxicillin/clavulanate 875 mg PO BID
  - OR
  - Cefuroxime 750 mg IV Q8H

References:
Canadian guidelines: Can Respir J. 2003; 10, Suppl B:38.

TREATMENT NOTES

Microbiology

- Predominantly H. influenzae, M. catarrhalis, S. pneumoniae
- Gram-negative enteric bacilli suspected only in complicated patients
Procalcitonin

- Identify patients with acute respiratory infection who do not warrant antibiotic treatment

- 2012 meta-analysis of 14 trials of 4,221 patients with acute respiratory infections (including bronchitis):
  - procalcitonin-guided decision making for antibiotic treatment was associated with a reduction in antibiotic exposure (median 8 to 4 days) without an increase in 30-day treatment failure or mortality

- True for patients with any type of acute respiratory infection and in any clinical setting (eg, outpatient clinic, emergency department, inpatient)

- Limitations of the trials: inadequate powering and lack of blinding

Eur Respir J. 2010;36(3):601
Arch Intern Med. 2011;171(15):1322
Cochrane Database Syst Rev. 2012;9:CD007498
Every Pulmonary Infiltrate is NOT due to Bacterial Pneumonia
Many Patients Diagnosed with CAP Don’t Have CAP

106 patients met criteria for CAP per ED CAP pathway

103 patients had CAP diagnosis by ED physician

76 patients had CAP diagnosis by treating team

68 patients had CAP diagnosis by external adjudication

Sara Cosgrove, Johns Hopkins Hospital
Procalcitonin to initiate or discontinue antibiotics in acute respiratory tract infections

- If a valid assay for procalcitonin is available & obtained in a timely manner at the point-of-care - useful for assessing patients with manifestations of acute bronchitis
- Proposed algorithm, antibiotic decisions for patients presenting to primary care with low acuity, nonpneumonic respiratory infections were based on the following procalcitonin parameters:
  - Procalcitonin <0.10 mcg/L: Strongly discourage antibiotic
  - Procalcitonin <0.25 mcg/L: Discourage antibiotic
  - Procalcitonin >0.25 mcg/L: Encourage antibiotic
  - Procalcitonin >0.50 mcg/L: Strongly encourage antibiotic

Arch Intern Med. 2011;171(15):1322
Antibiotics Are Not Tailored to Culture Results

- 16 (23.5%) patients had micro data that would have supported use of a narrower-spectrum agent
  - Only 3/16 had antibiotics appropriately narrowed

Sara Cosgrove, MD
### Table 7. Recommended empirical antibiotics for community-acquired pneumonia.

<table>
<thead>
<tr>
<th>Outpatient treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Previously healthy and no use of antimicrobials within the previous 3 months</td>
</tr>
<tr>
<td>- A macrolide (strong recommendation; level I evidence)</td>
</tr>
<tr>
<td>- Doxycycline (weak recommendation; level III evidence)</td>
</tr>
<tr>
<td>2. Presence of comorbidities such as chronic heart, lung, liver or renal disease; diabetes mellitus; alcoholism; malignancies; asplenia; immunosuppressing conditions or use of immunosuppressing drugs; or use of antimicrobials within the previous 3 months (in which case an alternative from a different class should be selected)</td>
</tr>
<tr>
<td>- A respiratory fluoroquinolone (moxifloxacin, gemifloxacin, or levofloxacin [750 mg]) (strong recommendation; level I evidence)</td>
</tr>
<tr>
<td>- A β-lactam plus a macrolide (strong recommendation; level I evidence)</td>
</tr>
<tr>
<td>3. In regions with a high rate (&gt;25%) of infection with high-level (MIC ≥16 μg/mL) macrolide-resistant <em>Streptococcus pneumoniae</em>, consider use of alternative agents listed above in (2) for patients without comorbidities (moderate recommendation; level III evidence)</td>
</tr>
</tbody>
</table>
Inpatients, non-ICU treatment

A respiratory fluoroquinolone (strong recommendation; level I evidence)

A β-lactam plus a macrolide (strong recommendation; level I evidence)

Inpatients, ICU treatment

A β-lactam (cefotaxime, ceftriaxone, or ampicillin-sulbactam) plus either azithromycin (level II evidence) or a respiratory fluoroquinolone (level I evidence) (strong recommendation) (for penicillin-allergic patients, a respiratory fluoroquinolone and aztreonam are recommended)
Special concerns

If *Pseudomonas* is a consideration

An antipneumococcal, antipseudomonal β-lactam (piperacillin-tazobactam, cefepime, imipenem, or meropenem) plus either ciprofloxacin or levofloxacin (750 mg)

or

The above β-lactam plus an aminoglycoside and azithromycin

or

The above β-lactam plus an aminoglycoside and an antipneumococcal fluoroquinolone (for penicillin-allergic patients, substitute aztreonam for above β-lactam)

(moderate recommendation; level III evidence)

If CA-MRSA is a consideration, add vancomycin or linezolid

(moderate recommendation; level III evidence)
Duration of CAP Therapy: Guidelines

- 1993 ATS Guidelines: 7-10 days
- 1998 IDSA Guidelines: 7-14 days
- 2007 ATS/IDSA Guidelines: minimum of 5 days
What Is the Evidence for Durations That We Use?

• With a few exceptions the length of most courses of therapy are arbitrary and tend to resemble football scores for *no good reason*.

• Historically, duration of therapy has not been considered a problem because:
  – There were plenty of antibiotics to go around
  – Extra antibiotics days were not considered harmful
  – Extra antibiotic days made doctors feel better
  – Lots of clinical trials use long durations as a default

• Data regarding the minimal acceptable treatment courses are limited because:
  – There is little impetus for pharmaceutical companies to study shorter courses!
  – There has been minimal federal funding to address these issues
TREATMENT OF PNEUMOCOCCAL PNEUMONIA WITH PENICILLIN*

Manson Meads, M.D.,† H. William Harris, M.D.,‡ and Maxwell Finland, M.D.§

With the technical assistance of Clare Wilcox

BOSTON

<table>
<thead>
<tr>
<th>Severity before penicillin:</th>
<th>Average Total Dosage of Penicillin</th>
<th>Average Duration of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 2 (moderately ill)</td>
<td>411,000 units</td>
<td>86 hr.</td>
</tr>
<tr>
<td>Grade 3 (acutely ill and irrational)</td>
<td>728,000 units</td>
<td>162 hr.</td>
</tr>
<tr>
<td>Grade 4 (shock or congestive failure, or both)</td>
<td>317,000 units</td>
<td>66 hr.</td>
</tr>
<tr>
<td>Grade 3</td>
<td>477,000 units</td>
<td>107 hr.</td>
</tr>
<tr>
<td>Grade 4</td>
<td>735,000 units</td>
<td>148 hr.</td>
</tr>
<tr>
<td>All cases</td>
<td>507,000 units</td>
<td>107 hr.</td>
</tr>
</tbody>
</table>
Effectiveness of discontinuing antibiotic treatment after three days versus eight days in mild to moderate-severe community acquired pneumonia: randomised, double blind study

Rachida el Moussaoui, Corianne A J M de Borgie, Peterhans van den Broek, Willem N Hustinx, Paul Bresser, Guido E L. van den Berk, Jan-Werner Poley, Bob van den Berg, Frans H Krouwels, Marc J M Bonten, Carla Weenink, Patrick M M Bossuyt, Peter Speelman, Brent C Opmeer, Jan M Prins

<table>
<thead>
<tr>
<th></th>
<th>3 Days</th>
<th>8 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical cure at 10 days</td>
<td>93%</td>
<td>93%</td>
</tr>
<tr>
<td>Clinical cure at 28 days</td>
<td>90%</td>
<td>88%</td>
</tr>
<tr>
<td>Adverse events</td>
<td>11%</td>
<td>21%</td>
</tr>
</tbody>
</table>

Stewardship Reduces Resistance

Clinical Pulmonary Infection Score (CPIS)

<table>
<thead>
<tr>
<th>CPIS</th>
<th>Cipro</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 6</td>
<td>3 days</td>
<td>10 days</td>
</tr>
<tr>
<td>≤ 6</td>
<td>9 days</td>
<td>15 days</td>
</tr>
</tbody>
</table>

Antibiotic resistance/superinfection

<table>
<thead>
<tr>
<th></th>
<th>Cipro</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Study terminated early because attending physicians began to treat standard care group with 3 days of therapy.

Shorter Works!

- Ventilator associated pneumonia
  - 8 days equal to 15 days in RCT

- Uncomplicated cellulitis
  - 5 days equal to 10 days in RCT

- Uncomplicated cystitis
  - 3 days with TMP/SMX or quinolone
  - 5 days with nitrofurantoin
  - 7 days with cephalosporins

- Pyelonephritis
  - 7 days if using ciprofloxacin; 5 days if using levofloxacin (750 mg)

Antibiotic Time-Out

- Following 3 simple steps will ensure you are prescribing antibiotics wisely and help promote efforts to optimize use.
- First, all orders must contain a dose, duration, and an indication.
- Secondly, when placing orders, make certain that they include laboratory cultures.
- And finally, when your culture results come back in 24-48 hours, take an antibiotic time-out – reassess therapy.

- With this additional information, ask yourself – Is this antibiotic still warranted or, more importantly, is this antibiotic still effective against this organism?
Acute Rhinosinusitis

- Viral causes account for 90-98%
- Yet, 5\textsuperscript{th} leading indication for antimicrobial prescription in office practice
- Antibiotics prescribed for 81\% of patients with acute rhinosinusitis
- Direct healthcare cost attributed to sinusitis exceed $3\text{ BILLION} per year
- Difficulty in differentiating Acute Bacterial Rhinosinusitis (ABRS) from a viral URI $\rightarrow$ over-prescription of antibiotics

-Ann Otol Rhinol Laryngol Suppl 2004
-J Allergy Clini Immunol 1999
-Fam Med 2006
-Lancet 2008
-Ann Intern Med 2001
First Line Treatment-ABRS

- Beta-lactam (amoxicillin-clavulanate) rather than a respiratory fluoroquinolone
- Doxycycline remains an alternative regimen
  - Remains highly active against respiratory pathogens
  - Excellent PK/PD properties
- Combination Rx: 3rd generation cephalosporin (cefixime or cefpodoxime) PLUS clindamycin
  - Second line therapy, children, non-type I PCN allergy
  - Regions with high endemic rates of Penicillin non-susceptible *S. pneumoniae*
Duration of Treatment?

- 5-7 days vs 10-14 days?
- Recommended duration for Uncomplicated ABRS in adults: 5-7 days

<table>
<thead>
<tr>
<th>Table 11. Long Versus Short Courses of Antimicrobial Therapy for Acute Bacterial Rhinosinusitis [164]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcomes</strong></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Clinical success with test-of-cure visit</td>
</tr>
<tr>
<td>Follow-up: 10-36 days</td>
</tr>
<tr>
<td>Any adverse events</td>
</tr>
<tr>
<td>Follow-up: 10-36 days</td>
</tr>
<tr>
<td>Any adverse effects</td>
</tr>
<tr>
<td>(Only studies comparing 5 days vs 10 days of treatment were included)</td>
</tr>
<tr>
<td>Follow-up: 10-36 days</td>
</tr>
</tbody>
</table>

In children- longer treatment duration of 10-14 days still recommended
Group A Streptococcal (GAS) Pharyngitis

Clinical Practice Guideline for the Diagnosis and Management of Group A Streptococcal Pharyngitis: 2012 Update by the Infectious Diseases Society of America

- GAS: most common bacterial cause of acute pharyngitis
- 5%–15% of sore throat visits in adults, 20-30% in children
- ~15 million visit per year for acute pharyngitis

-IDSA Guidelines CID 2012
Table 2. Antibiotic Regimens Recommended for Group A Streptococcal Pharyngitis

<table>
<thead>
<tr>
<th>Drug, Route</th>
<th>Dose or Dosage</th>
<th>Duration or Quantity</th>
<th>Recommendation Strength, Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>For individuals without penicillin allergy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penicillin V, oral</td>
<td>Children: 250 mg twice daily or 3 times daily; adolescents and adults: 250 mg 4 times daily or 500 mg twice daily</td>
<td>10 d</td>
<td>Strong, high</td>
</tr>
<tr>
<td>Amoxicillin, oral</td>
<td>50 mg/kg once daily (max = 1000 mg); alternate: 25 mg/kg (max = 500 mg) twice daily</td>
<td>10 d</td>
<td>Strong, high</td>
</tr>
<tr>
<td>Benzathine penicillin G, intramuscular</td>
<td>&lt;27 kg: 600 000 U; ≥27 kg: 1 200 000 U</td>
<td>1 dose</td>
<td>Strong, high</td>
</tr>
<tr>
<td>For individuals with penicillin allergy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalexin, oral</td>
<td>20 mg/kg/dose twice daily (max = 500 mg/dose)</td>
<td>10 d</td>
<td>Strong, high</td>
</tr>
<tr>
<td>Cefadroxil, oral</td>
<td>30 mg/kg once daily (max = 1 g)</td>
<td>10 d</td>
<td>Strong, high</td>
</tr>
<tr>
<td>Clindamycin, oral</td>
<td>7 mg/kg/dose 3 times daily (max = 300 mg/dose)</td>
<td>10 d</td>
<td>Strong, moderate</td>
</tr>
<tr>
<td>Azithromycin, oral</td>
<td>12 mg/kg once daily (max = 500 mg)</td>
<td>5 d</td>
<td>Strong, moderate</td>
</tr>
<tr>
<td>Clarithromycin, oral</td>
<td>7.5 mg/kg/dose twice daily (max = 250 mg/dose)</td>
<td>10 d</td>
<td>Strong, moderate</td>
</tr>
</tbody>
</table>

Shulman et al. IDSA Guideline for GAS Pharyngitis • CID 2012
Treatment Recommendations for GAS Pharyngitis

- Penicillin or amoxicillin, for 10 days, is the drug of choice
- In penicillin-allergic individuals:
  - First generation cephalosporin, (cephalexin/cefadroxil), for those not anaphylactically sensitive, for 10 days or
  - Clindamycin or clarithromycin for 10 days, or
  - Azithromycin for 5 days

Shulman et al. IDSA Guideline for GAS Pharyngitis • CID 2012
Urinary Tract Infections
Specimen collection

- Clean catch
- May become contaminated with commensals
- ? Presence of squamous epithelial cells

Detection of:

- Pyuria by urine microscopy
- Bacteriuria by nitrites
- Pyuria by leukocyte esterase

Urine Culture

-Clinical Infectious Diseases 2004; 38:1150–8
International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases

Kalpana Gupta,1 Thomas M. Hooton,2 Kurt G. Naber,9 Björn Wullt,10 Richard Colgan,3 Loren G. Miller,4 Gregory J. Moran,5 Lindsay E. Nicolle,8 Raul Raz,11 Anthony J. Schaeffer,8 and David E. Soper7

Clinical Practice Guidelines, CID 2011; 52:e103-20

Slides Adapted from IDSA website: Reproduced with Permission: Presentation by Dr. Kalpana Gupta
Acute Uncomplicated Cystitis

Approach to choosing an optimal antimicrobial agent for empirical treatment of acute uncomplicated cystitis.

Woman with acute uncomplicated cystitis
- Absence of fever, flank pain, or other suspicion for pyelonephritis
- Able to take oral medication

No

Consider alternate diagnosis (such as pyelonephritis or complicated UTI) & treat accordingly (see text)

Yes

Gupta K et al. Clin Infect Dis. 2011;52:e103–e120

© IDSA 2012
Approach to choosing an optimal antimicrobial agent for empirical treatment of acute uncomplicated cystitis.

Can one of the recommended antimicrobials* below be used considering:
- Availability
- Allergy history
- Tolerance

Yes

Nitrofurantoin monohydrate/macrocrystals 100 mg bid X 5 days
(avoid if early pyelonephritis suspected)

OR

A–I

Trimethoprim-sulfamethoxazole 160/800 mg (one DS tablet) bid X 3 days
(avoid if resistance prevalence is known to exceed 20% or if used for UTI in previous 3 months)

OR

A–I

Fosfomycin trometamol 3 gm single dose
(lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)

OR

A–I

Pivmecillinam 400 mg bid x 5 days
(lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)

A–I

No

Fluoroquinolones
(resistance prevalence high in some areas)

A–III

OR

β-lactams B–I*

(avoid ampicillin or amoxicillin alone; lower efficacy than other available agents; requires close follow-up)

amox/clav, cefdinir, cefaclor, cefpodoxime for 3–7 d B–I

“β-lactams generally have inferior efficacy & more adverse effects, compared with other UTI anti-microbials” B–I

*The choice between these agents should be individualized and based on patient allergy and compliance history, local practice patterns, local community resistance prevalence, availability, cost, and patient and provider threshold for failure (see Table 4)

Gupta K et al. Clin Infect Dis. 2011;52:e103–e120a

© IDSA 2012
• Acute Uncomplicated Cystitis due to E. coli
• TMP-SMX may no longer be acceptable for treatment with increasing rate of resistance => 20 %

Table 1. Annual Rates of Resistance in Urinary *Escherichia coli* Isolates to Select Antimicrobials Among Outpatient Women of Childbearing Age (16-45 y), 2000-2010

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>TMP-SMX</td>
<td>667648</td>
<td>17.5</td>
<td>16.9</td>
<td>16.7</td>
<td>17</td>
<td>17.3</td>
<td>17.7</td>
<td>18.3</td>
<td>18.8</td>
<td>19.7</td>
<td>19.6</td>
<td>20.8</td>
<td>3.3</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>592555</td>
<td>1.2</td>
<td>1.4</td>
<td>1.9</td>
<td>2.4</td>
<td>2.9</td>
<td>4.1</td>
<td>5.4</td>
<td>6.2</td>
<td>7.2</td>
<td>7</td>
<td>7.1</td>
<td>5.9</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>646516</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>Amox-Clav</td>
<td>255728</td>
<td>3.7</td>
<td>3.3</td>
<td>4.3</td>
<td>3.6</td>
<td>3</td>
<td>3.6</td>
<td>4.7</td>
<td>6.7</td>
<td>7.6</td>
<td>4.4</td>
<td>4</td>
<td>0.3</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>657246</td>
<td>39.7</td>
<td>38.9</td>
<td>38.8</td>
<td>38.4</td>
<td>37.4</td>
<td>38</td>
<td>38.8</td>
<td>39</td>
<td>39.6</td>
<td>39.6</td>
<td>40.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Cephalothin</td>
<td>170561</td>
<td>12</td>
<td>14.1</td>
<td>12.5</td>
<td>12</td>
<td>11.5</td>
<td>14.9</td>
<td>15.3</td>
<td>13.4</td>
<td>12.8</td>
<td>11.7</td>
<td>12.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*Sanchez et al, CID 2011; Letter to Editor in response to UTI GL*
What is the optimal treatment for Acute Uncomplicated Cystitis? (AUC)

- Nitrofurantoin 100 mg PO BID x 5 days
- Trimethoprim-sulfamethoxazole 160/800 mg (one DS tablet) PO BID x 3 days
  - Avoid if E coli resistance prevalence is >20%
  - Avoid if used for UTI in previous 3 months
- Fosfomycin 3 gm PO single dose
  - Lower efficacy, avoid if pyelonephritis suspected
- Pivmecillinam is not available in USA

-Adapted from IDSA 2012
Alternative Treatments for AUC

- Fluoroquinolones
  - Highly efficacious in 3- day regimens
  - High propensity for collateral damage
  - Should be reserved for important uses other than acute cystitis

- Beta-lactam agents
  - Amoxicillin-clavulanate, Cefdinir, Cefaclor, Cefpodoxime in 3-7 days regimen
  - Appropriate choice when other recommended agents cannot be used
  - Cephalexin: less well studied, may be appropriate
  - Amoxicillin or ampicillin-not used for empiric treatment
  - Beta-lactams generally have inferior efficacy compared with other UTI antimicrobials

- Adapted from IDSA 2012
“There is no single best agent for treatment of acute uncomplicated cystitis (AUC)”
Fosfomycin

- For uncomplicated UTI due to an ESBL producer
- Phosphonic acid derivative
- Inhibits cell wall synthesis
- Oral sachet for uncomplicated cystitis
- In vitro studies: activity against multidrug resistant uro-pathogens, including ESBL producing Gram negative rods
- May be less effective; Side effects: nausea
- Non-formulary on all the managed care plans
- Average retail price is $50.86 for a single dose
Asymptomatic Bacteriuria

<table>
<thead>
<tr>
<th>Component</th>
<th>SOURCE:</th>
<th>Urine Suprapubic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REPORT RELEASE TYPE:</td>
<td>Final Report</td>
</tr>
<tr>
<td></td>
<td>CULTURE:</td>
<td>Note: Flowsheet view of Micro does not show all results.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 100,000/mL Multiple organisms probable contaminants</td>
</tr>
</tbody>
</table>

**Result Narrative**
May represent colonization, No further workup pending

**Culture, continued**

<table>
<thead>
<tr>
<th></th>
<th>&gt; 100,000/ML ENTEROCOCCUS SP.:</th>
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<td>-</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>&gt; 100,000/ML E. COLI:</th>
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</thead>
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<td>-</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>10-50,000/ML PROTEUS SP.:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults

Lindsay E. Nicolle,1 Suzanne Bradley,2 Richard Colgan,3 James C. Rice,4 Anthony Schaeffer,5 and Thomas M. Hooton6

1University of Manitoba, Winnipeg, Canada; 2University of Michigan, Ann Arbor; 3University of Maryland, Baltimore; 4University of Texas, Galveston; 5Northwestern University, Chicago, Illinois; and 6University of Washington, Seattle

SUMMARY OF RECOMMENDATIONS

1. The diagnosis of asymptomatic bacteriuria should be based on results of culture of a urine specimen collected in a manner that minimizes contamination (A-II) (table 1).

3–7 days (A-II).

• Periodic screening for recurrent bacteriuria should be undertaken following therapy (A-III).

• No recommendation can be made for or against repeated screening of culture-negative women in
Asymptomatic Bacteriuria

• Frequently finding in elderly patients (30-40%)
  – No benefit to treating
• Treatment of UTIs at single LTCF
  – >60% courses were for asymptomatic bacteriuria
• Two Rhode Island LTCF
  – 96 residents treated for UTI
    • 27% met criteria for treatment
    • 67% treated longer than recommended
  – 11 developed C. difficile infection
    • All were inappropriately treated (8.5-fold increased risk)

Asymptomatic bacteriuria is common

- Pregnant women with asymptomatic bacteriuria are at an increased risk for adverse outcomes
  - Pregnant women should be screened for bacteriuria and treated +
- Also a risk for patients undergo traumatic urologic interventions with mucosal bleeding
  - Patients should be treated prior to such interventions.
- For all other adult populations, asymptomatic bacteriuria has not been shown to be harmful
- Persons with bacteriuria are at an increased risk of symptomatic urinary infection; however treatment of asymptomatic bacteriuria does not decrease the frequency of symptomatic infection or improve other outcomes.
Antibiotic choice: Etiological agent

- Be careful of the identification of the agent by the laboratory
  - Example: UTI
    - How was sample collected?
    - Contamination of sample is frequent, even in the best conditions
    - Consider the symptoms...
    - Consider the urinalysis...

- Most probable agents: based on epidemiology and clinical experience

- Importance of local antibiotic resistance data
Key Moments in Antibiotic Stewardship

1. When considering starting antibiotics
   - Is it likely a viral infection? (acute rhinitis/bronchitis)
   - Is CAP present? Or is it CHF, atelectasis, low lung volumes, etc?
   - Is it a UTI or ASB?
   - Is it cellulitis or stasis dermatitis?
   - Is a procalcitonin test promptly available?

2. When culture/sensitivity results become available

3. When patient has had recent C difficile infection

4. When patient is being discharged from the hospital
## QUICK RECAP

<table>
<thead>
<tr>
<th>Infection</th>
<th>Diagnosis</th>
<th>Abx</th>
<th>Dose</th>
<th>Duration (Adults)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSSI -Uncomplicated cellulitis</td>
<td>Unmet diagnostic tests need ?Stasis dermatitis</td>
<td>Cephalexin Single agent</td>
<td>?weight based</td>
<td>5 days</td>
</tr>
<tr>
<td></td>
<td>?Purulent cellulitis</td>
<td>I&amp;D, S. aureus</td>
<td>TMP-SMX, Doxy, Vancomycin</td>
<td>Varies</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>?Procalcitonin CXR: infiltrates- many etiologies</td>
<td>Host factors</td>
<td>--</td>
<td>Minimum 5 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Range: Varies</td>
</tr>
<tr>
<td>Bronchitis</td>
<td>Unmet diagnostic need</td>
<td>May not require abx; Host factors</td>
<td>--</td>
<td>5 days</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>Mostly viral Remember IDSA</td>
<td>Amox-clav</td>
<td>Some need higher dose</td>
<td>5-7 days</td>
</tr>
<tr>
<td>UTI: Cystitis</td>
<td>UTI vs ?ASBU</td>
<td>Varies</td>
<td>--</td>
<td>3-5 days</td>
</tr>
</tbody>
</table>
Unfortunately a simplistic approach to anti-infective therapy and establishment of a fixed series of simple rules for the use of these agents is unwise.

These physicians ignore the remarkable adaptability of bacteria, fungi, and viruses.
Seven Ways to Preserve the Miracle of Antibiotics

John G. Bartlett,1 David N. Gilbert,2 and Brad Spellberg3

1Johns Hopkins University School of Medicine, Baltimore, Maryland; 2Department of Medical Education, Providence Portland Medical Center, Portland, Oregon; and 3Liu Vaccine Center, Torrance, California

Antibiotic resistance is a well-acknowledged crisis with no clearly defined comprehensive, national corrective plan. We propose a number of interventions that, collectively, could make a large difference. These include collection of data to inform decisions, efforts to reduce antibiotic abuse in people and animals, great emphasis on antibiotic stewardship, performance incentives, optimal use of newer diagnostics, better support for clinical and basic resistance-related research, and novel methods to foster new antibiotic development.

Keywords: antibiotic resistance; antibiotic salvage; European Union; stewardship; molecular diagnostics
Antibiotics Do's and Don'ts

By SUMATHI REDDY

Doctors Too Often Prescribe 'Big Guns'; Impatient Patients Demand a Quick Fix

http://au.lifestyle.yahoo.com/mens-health/health/health-strategies/article/-/14030936/are-antibiotics-doing-you-more-harm-than-good/