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**Please note:** for some of these questions, there may not be a “right answer”
Enhancing Judicious Use of Antibiotics: Tools for the Primary Care Pediatrician

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Future of Pediatrics
June 20, 2017
Objectives

1. To describe antibiotic use in outpatient pediatrics
2. To quantify unintended consequences of antibiotic use
3. To define antimicrobial stewardship
4. To identify behaviors and tools that enhance judicious antibiotic prescribing
We use a lot of antibiotics in outpatient pediatrics

~ 75 million antibiotic prescriptions to children/yr

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Prescriptions, No. in Millions (%)</th>
<th>Prescriptions per 1000 Persons, Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group, y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–2</td>
<td>15.4 (21)</td>
<td>1287</td>
</tr>
<tr>
<td>3–9</td>
<td>29.1 (40)</td>
<td>1018</td>
</tr>
<tr>
<td>10–19</td>
<td>29.3 (40)</td>
<td>691</td>
</tr>
<tr>
<td>Antibiotic agent (top 5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>24.9</td>
<td>300</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>15.2</td>
<td>183</td>
</tr>
<tr>
<td>Amoxicillin-clavulanate</td>
<td>7.2</td>
<td>87</td>
</tr>
<tr>
<td>Cefdinir</td>
<td>6.1</td>
<td>74</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>4.6</td>
<td>56</td>
</tr>
</tbody>
</table>

Hersh, Pediatrics 2011. 128(6):1053-61
Antibiotics are prescribed variably

Antibiotic prescriptions to children < 2 years in 2011

Hicks, *Clin Infect Dis* 2015. 60(9):1308-16
1 in 3 antibiotic prescriptions is unnecessary

**TABLE 1** Antibiotic-Prescribing Patterns Across Diagnostic Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Across-Condition Contribution to Antibiotic Prescribing, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>72.3</td>
</tr>
<tr>
<td>ARTIs for which antibiotics are indicated</td>
<td>48.9</td>
</tr>
<tr>
<td>ARTIs for which antibiotics are not indicated</td>
<td>13.1</td>
</tr>
<tr>
<td>Other respiratory conditions for which antibiotics are not definitely indicated</td>
<td>10.3</td>
</tr>
<tr>
<td>Other</td>
<td>27.7</td>
</tr>
<tr>
<td>Skin/cutaneous/mucosal</td>
<td>11.9</td>
</tr>
<tr>
<td>Urinary tract infections&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.0</td>
</tr>
<tr>
<td>Gastrointestinal infections</td>
<td>0.3</td>
</tr>
<tr>
<td>Miscellaneous infections</td>
<td>1.9</td>
</tr>
<tr>
<td>Other</td>
<td>11.6</td>
</tr>
<tr>
<td>Total</td>
<td>100&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

11.4 million potentially preventable antibiotic prescriptions per year

- **AOM:**
  - Bacterial prevalence: **64.7%** (95% CI: 50.5% - 77.7%)
  - Actual prescribing: **85.9%** (79-92.4%)

- **Sinusitis:**
  - Bacterial prevalence: **78%**
  - Actual prescribing: **88.8%** (60.2-100%)

- **Pharyngitis:**
  - *S. pyogenes* isolated in **20.2%** (95% CI: 15.9-25.2%)
  - Actual prescribing: **56.9%** (43.5-65.3%)

- **Bronchitis:**
  - Bacterial prevalence: presumed **0%**
  - Actual prescribing: **71.5%** (51.5-91.4%)

- **URI:**
  - Bacterial prevalence: presumed **0%**
  - Actual prescribing: **24.4%** (14-28.2%)

Consequences of antibiotic use include:

1. Antibiotic resistance
2. Adverse drug events
3. *Clostridium difficile* infections
4. Effects on the microbiome
Antibiotic use is the #1 driving factor leading to antibiotic resistance

- Broader spectrum antibiotics
- Inadequate doses
- Longer durations

Antibiotic resistance
Antibiotic Resistance is “one of the world’s most pressing health problems”
Antibiotic resistance is affecting outpatient pediatrics: *Staphylococcus aureus*

**Figure 1**

Antibiotic resistance is affecting outpatient pediatrics: Gram negative infections

Antibiotic resistance is affecting outpatient pediatrics: Gram negative infections

Adverse Effects of Antibiotics

- 1 in 5 ED visits for adverse drug events is due to an antibiotic
- 10%–25%: antibiotic-associated diarrhea
- 2%: skin reaction
- 1 in 5,000: anaphylactic reaction
- Overall:
  - number needed to harm (NNH) = 13
  - NNH = 6, including diarrhea

Bartlett JG. NEJM. 2002: 346(5)
Shehab N et al. CID 2008:47;
Gruchalla RS, Pirmohamed M. NEJM. 2006;354
Incidence of *C. difficile* infections in children is increasing.

Kim et al. *Pediatrics* 2008;122:1266-1270
Antibiotics Cause Prolonged Alterations to Gut Flora

Green: susceptible bugs
Purple: resistant bugs

Antibiotics Cause Prolonged Alterations to Gut Flora

Green: susceptible bugs
Purple: resistant bugs

2 years!

Stop the killing of beneficial bacteria

Concerns about antibiotics focus on bacterial resistance — but permanent changes to our protective flora could have more serious consequences, says Martin Blaser.

The average child in the United States and other developed countries has received 10–20 courses of antibiotics by the time he or she is 18 years old. In many respects, this is a life-saving development. The average US citizen born in 1940 was expected to live to the age of 63; a baby born today should reach 78, in part because of antibiotics. But the assumption that antibiotics are generally safe has fostered overuse and led to an increase in bacterial resistance to treatments.

Other, equally serious, long-term consequences of our love of antibiotics have received far less attention. Antibiotics kill the bacteria we do want, as well as those we don’t. Early evidence from my lab and others hints that, sometimes, our friendly flora never fully recover. These long-term changes to the beneficial bacteria within people’s bodies may even increase our susceptibility to infections and disease. Overuse of antibiotics could be fuelling the dramatic increase in conditions such as obesity, type 1 diabetes, inflammatory bowel disease, allergies and asthma, which have more than doubled in many populations (see graph).

We urgently need to investigate this possibility. And, even before we understand the full scope, there is action we should take.
Thus the call for Antimicrobial Stewardship ...

- To ensure optimal selection, dosage, route, duration
- to result in the **best clinical outcome**
- with **minimal toxicity** to the patient and minimal impact on subsequent resistance.
Antimicrobial Stewardship promotes principles of judicious antibiotic use

- No antibiotics for viral infections
- Use narrowest spectrum antibiotic effective
- Use adequate dosing
- Limit duration for established infections based upon current evidence
- Narrow therapy when organism is isolated
- Stop antibiotics if bacterial infection is unlikely
Case #1

• 7 year old girl with cough, low-grade fever, rhinorrhea x 2 days
• Reassuring exam
Case #1: Next steps?

A. Supportive care, he has a URI

B. It's probably viral, but prescribe an antibiotic "just in case"
A. Lack of knowledge by clinicians that antibiotics are not needed for URIs

B. It's just easier sometimes: Lack of time to explain that antibiotics are not needed

C. Parental expectations for antibiotics causes pressure on clinician to prescribe

D. Fear of missing a possible bacterial process

E. All of the above
tial expectations: Can you tell whether a parent expects antibiotics?

A. Yes, definitely
B. Usually
C. No

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Pediatricians’ perceptions of parental expectations for antibiotics do not match parents’ reported expectations

- 10 physicians, 306 parents of children

<table>
<thead>
<tr>
<th></th>
<th>Physician thinks parent wants abx</th>
<th>Physician doesn’t think parent wants abx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic prescribed</td>
<td>62%</td>
<td>7%</td>
</tr>
<tr>
<td>Bacterial diagnosis given</td>
<td>70%</td>
<td>31%</td>
</tr>
</tbody>
</table>

- Physician antibiotic prescribing behavior **not** associated with **actual** parental expectations for receiving antibiotics.
- Not providing expected antibiotics did not affect satisfaction.

Framing:
How we communicate with parents is critical

1. Explanation for why antibiotics are not needed  
   coupled with

2. Positive treatment recommendations
   and

3. Contingency plan
Communication strategies:
#1: Explanation for why antibiotics are not needed

This is a nasty cold, so antibiotics won't make you better faster.

The strep test is negative, meaning your sore throat is caused by a virus, and antibiotics won't help.

You have a chest cold, and antibiotics won't help.

Communication strategies

Always combine explanations for why antibiotics are not needed with positive treatment recommendations.

Communication strategies:
#2: **Positive** treatment recommendations

- Taking ibuprofen and drinking plenty of fluids will help you feel better.
- Honey can actually soothe your child's cough and help her sleep better.

If your child is still sick in a week or if he develops a fever, come back and see me.

If you are not better in 3 or 4 days, call or come back and we can reassess the need for antibiotics then.

Patient/parental education outside the clinic room

- Educational pamphlets
- Available for free at: www.cdc.gov/getsmart

**UNDERSTANDING INAPPROPRIATE ANTIBIOTIC USE**

Inappropriate antibiotic use can refer to two types of antibiotic misuse: when an antibiotic is prescribed, but not needed or when the wrong antibiotic, dose, or duration is chosen.

<table>
<thead>
<tr>
<th>Unnecessary Use/Overuse</th>
<th>Misuse/Incorrect Prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: A 40-year-old woman is diagnosed with bronchitis and prescribed an antibiotic, even though national guidelines recommend against prescribing antibiotics for bronchitis.</td>
<td>Example: An 8-year-old boy is diagnosed with strep throat and needs an antibiotic to treat it, but the antibiotic prescribed is the wrong one, or the dose is too low, or the duration is too long.</td>
</tr>
</tbody>
</table>
Display a poster asserting your commitment to using antibiotics only when necessary

Antibiotics are Not Always the Answer:
An Important Message from Your Clinicians

Dear Parents,

We want to give you some important information about antibiotics.

Antibiotics only fight infections caused by bacteria.
Antibiotics will NOT help your child feel better if they have a viral infection like:

- Cold or runny nose
- Chest cold
- Flu
- Sore throat not caused by Strep

If you use antibiotics when you do not need them, they can cause more harm than good:

- Your child might feel worse.
- Your child can get diarrhea, rashes, or yeast infections.
- Antibiotics may NOT work when you really need them, because antibiotics make bacteria more resistant to them. This can make future infections harder to treat.

What can you do as a parent? Talk to me about the treatment that is best for your child. Follow the treatment plan we discuss.

As your clinician, I will give you the best care possible. I am dedicated to avoid prescribing antibiotics when they are likely to do more harm than good. If you have any questions, please ask me, your nurse, or your pharmacist.

Mark Weissman, MD

Case #2

- 4 year old girl with right ear pain
- Low grade fever, eating fine, otherwise well.
- On exam:
A. Always
B. Sometimes
C. Rarely

Start the presentation to activate live content
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Case #2: Observation for acute otitis media if > 2 years and not severe

<table>
<thead>
<tr>
<th></th>
<th>&lt; 6 months</th>
<th>6-24 months</th>
<th>&gt; 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not severe, unilateral</td>
<td>Amoxicillin x 10 days</td>
<td>Observation</td>
<td>Observation</td>
</tr>
<tr>
<td>Not severe, Bilateral</td>
<td>Amoxicillin x 10 days</td>
<td>Amoxicillin x 10 days</td>
<td>Observation</td>
</tr>
<tr>
<td>Severe disease</td>
<td>Amoxicillin x 10 days</td>
<td>Amoxicillin x 10 days</td>
<td>Amoxicillin x 5 days</td>
</tr>
</tbody>
</table>

*Severe disease: T > 39 °C; severe otalgia

Your child has an ear infection that will likely clear up on its own. If the ear still hurts in 2 days or gets worse, call or come back and we will recheck the ears.

Case #3

• 7 year old boy with 1 week of progressively worsening cough, high fevers, crackles in the right base

• You diagnose him with community-acquired pneumonia and prescribe high-dose amoxicillin
B: When a guideline recommends a range of duration of antibiotic therapy, I tend to prescribe:

A. The longest duration

B. The shortest duration (with or without follow up at time of stopping)

C. Somewhere in the middle

Start the presentation to activate live content
If you see this message in presentation mode, install the add-in or get help at PollEv.com/app
Tip: If the patient has clinically improved, use the shortest duration shown to be effective:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Shortest effective duration</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellulitis)</td>
<td>No antibiotics indicated</td>
<td></td>
</tr>
</tbody>
</table>
Beyond the individual practitioner: How can our practice as a whole improve antibiotic prescribing?
Measure appropriate antibiotic prescribing in your practice

A performance measure tool: Healthcare Effectiveness Data and Information Set (HEDIS)

1. Appropriate testing for children with pharyngitis
   • Mean performance nationally: 80% (Goal: 100%)

2. Appropriate treatment (no antibiotics) for children with upper respiratory infection (URI)
   • Mean performance nationally: 83% (Goal: 100%)

Individualized feedback reports can be an effective tool

Other clinical decision support (i.e. accountable justification) can effectively reduce unnecessary antibiotic prescriptions.

You have elected to prescribe an antibiotic for a diagnosis for which antibiotics are not indicated. Please enter a justification for this antibiotic prescription in the text box below. If you do not write a justification, the phrase "No justification for prescribing antibiotics was given." will appear in the patient chart.

Take-home points

• Judicious use of antibiotics essential to preserving their effectiveness
• Broader spectrum, longer duration, inadequate doses of antibiotics → antibiotic resistance.
• Your toolkit:
  – positive messaging,
  – delayed prescribing for AOM,
  – displaying a commitment poster,
  – educational pamphlets
  – individualized feedback to prescribers
THANK YOU!

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