Pediatric Outpatient Antibiotic Prescribing: how to drive appropriate use?

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Stony Brook Children’s Hospital
I have no disclosures
LEARNER OBJECTIVES

1. Recognize antibiotic resistance

2. Employ guideline-based approaches to antibiotic use for common outpatient pediatric conditions

We will achieve these by...
I WILL COVER TODAY:

1. A review of guideline-adherent antibiotic use in key pediatric conditions
2. Highlighting local Suffolk county data on inappropriate use and its drivers
3. Considering how to implement specific interventions in the listener’s own practice
“If we’re not careful, we will soon be in a post-antibiotic era. For some patients and some microbes, we are already there.”

—Tom Frieden,
Former Director of the CDC
PICC LINE...FOR UTI'S
Risk factors for community-onset urinary tract infections due to 
Escherichia coli harbouring extended-spectrum b-lactamases

Esther Calbo¹, Verónica Romaní¹, Mariona Xercavins², Lucía Gómez³, Carolina García Vidal¹,
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¹Department of Internal Medicine, Infectious Diseases Unit, Hospital Mútua de Terrassa, Barcelona, Spain;
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<table>
<thead>
<tr>
<th></th>
<th>Cases (n = 19)</th>
<th>Controls (n = 55)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/female</td>
<td>4/15</td>
<td>12/43</td>
<td>NS</td>
</tr>
<tr>
<td>Mean age (years) (SD)</td>
<td>61.8 (25)</td>
<td>61.3 (23)</td>
<td>NS</td>
</tr>
<tr>
<td>Place of residence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>home</td>
<td>17 (89%)</td>
<td>51 (93%)</td>
<td>NS</td>
</tr>
<tr>
<td>long-term care facility</td>
<td>2 (10%)</td>
<td>4 (7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Bacteraemia</td>
<td>1</td>
<td>3</td>
<td>NS</td>
</tr>
<tr>
<td>Charlson score, mean</td>
<td>2.5</td>
<td>1.7</td>
<td>NS</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>5 (26%)</td>
<td>4 (7%)</td>
<td>0.04</td>
</tr>
<tr>
<td>Intravenous treatment</td>
<td>4 (21%)</td>
<td>1 (2%)</td>
<td>0.01</td>
</tr>
<tr>
<td>(home programme)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous bacterial</td>
<td>13 (68%)</td>
<td>18 (33%)</td>
<td>0.01</td>
</tr>
<tr>
<td>infection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary abnormalities</td>
<td>11 (58%)</td>
<td>16 (33%)</td>
<td>&lt;0.03</td>
</tr>
<tr>
<td>Oral cefuroxime</td>
<td>12 (63%)</td>
<td>5 (9%)</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Macrolide and Azithromycin Use Are Linked to Increased Macrolide Resistance in *Streptococcus pneumoniae*\(^\text{\dag}\)

Miika Bergman,\(^1\)\* Solja Huikko,\(^1,2\) Pentti Huovinen,\(^1\) Pirkko Paakkari,\(^3\) Helena Seppälä,\(^1,4\)

and the Finnish Study Group for Antimicrobial Resistance (FiRe Network)\(^\dagger\)

*Antimicrobial Research Laboratory, Department of Bacterial and Inflammatory Diseases, National Public Health Institute, Turku, Finland\(^1\); School of Public Health, University of Tampere, Tampere, Finland\(^2\); National Agency of Medicines, Helsinki, Finland\(^3\); and Department of Ophthalmology, Turku City Hospital, Turku, Finland\(^4\)*

Received 23 February 2006/Returned for modification 2 June 2006/Accepted 15 August 2006
WHAT ARE WE DOING WRONG?

- Antibiotics given when they are not needed
- Continued when they are no longer necessary
- Antibiotics are given at the wrong dose
- Broad-spectrum agents are used to treat very susceptible bacteria
- The wrong antibiotic is given to treat an infection
Review

Antimicrobial Stewardship in Pediatrics
How Every Pediatrician Can Be a Steward

David Y. Hyun, MD; Adam L. Hersh, MD; Katie Namtu, PharmD; Debra L. Palazzi, MD; Holly D. Maples, PharmD; Jason G. Newland, MD, MEd; Lisa Saiman, MD

Evidence to support use of guidelines alone to modify inappropriate prescribing practices in the pediatric outpatient setting is scant.

2 early studies by Finkelstein et al (Pediatrics: 2001, 2008) showed modest improvement but with multiple educational interventions (guidelines, parent teaching) as well as provider feedback

Why don’t guidelines alone work?
• Survey of outpatient knowledge, attitudes, and practices re: guidelines in treating acute otitis media, Group A streptococcal pharyngitis, and pneumonia

• Compared, where possible, self-reported prescribing knowledge to actual local prescribing trends
• What is your first-line antibiotic choice for otitis media in a 1-year-old patient with no medication allergies?
  - amoxicillin
  - amoxicillin-clavulanate
  - azithromycin
  - oral 3rd generation cephalosporin (i.e. cefdinir)
  - parenteral 3rd generation cephalosporin (i.e. ceftriaxone)

• What is your second-line antibiotic choice for otitis media, in the same patient who has now failed first-line treatment?
OTITIS MEDIA

• What is your first-line antibiotic choice for otitis media in a 1-year-old patient with no medication allergies?
  - amoxicillin
  - amoxicillin-clavulanate
  - azithromycin
  - oral 3rd generation cephalosporin (i.e. cefdinir)
  - parenteral 3rd generation cephalosporin (i.e. ceftriaxone)

• What is your second-line antibiotic choice for otitis media, in the same patient who has now failed first-line treatment? amoxicillin-clav.
A 9 year-old patient presents to your office afebrile with a sore throat & cough. There is an injected pharynx but there are no tonsillar exudates or strawberry tongue. What is your next step?

- Observe the patient; do not test for bacterial infection and do not start antibiotics
- Order a rapid streptococcal antigen test and start empiric antibiotics if positive
- Order a throat culture; start antibiotics if results are positive for GAS
- Start antibiotics; do not order a throat culture
- Order anti-streptococcal antibody titers
A 9 year-old patient presents to your office afebrile with a sore throat & cough. There is an injected pharynx but there are no tonsillar exudates or strawberry tongue. What is your next step?

- Observe the patient; do not test for bacterial infection and do not start antibiotics
- Order a rapid streptococcal antigen test and start empiric antibiotics if positive
- Order a throat culture; start antibiotics if results are positive for GAS
- Start antibiotics; do not order a throat culture
- Order anti-streptococcal antibody titers
STREP THROAT

• What is your first-line antibiotic for treatment of GAS pharyngitis?
  o amoxicillin
  o Amoxicillin-clavulanate
  o 3rd generation cephalosporin (i.e. cefdinir)
  o 1st generation cephalosporin (i.e. cephalexin)
  o azithromycin
  o Clindamycin

• What is your 1st antibiotic choice for treatment of GAS pharyngitis in penicillin-allergic patients?
• What is your first-line antibiotic for treatment of GAS pharyngitis?
  o amoxicillin
  o Amoxicillin-clavulanate
  o 3rd generation cephalosporin (i.e. cefdinir)
  o 1st generation cephalosporin (i.e. cephalexin)
  o azithromycin
  o Clindamycin

• What is your 1st antibiotic choice for treatment of GAS pharyngitis in penicillin-allergic patients? cephalexin or clindamycin
What is your first-line antibiotic for outpatient treatment of CAP in a previously healthy 4 year old?

- azithromycin
- amoxicillin
- amoxicillin-Clavulanate
- 1st generation cephalosporin (i.e. cephalexin)
- oral 3rd generation cephalosporin (i.e. cefdinir)
- parenteral 3rd generation cephalosporin (i.e. ceftriaxone)
- clindamycin
What is your first-line antibiotic for outpatient treatment of CAP in a previously healthy 4 year old?

- azithromycin
- amoxicillin
- amoxicillin-Clavulanate
- 1st generation cephalosporin (i.e. cephalexin)
- oral 3rd generation cephalosporin (i.e. cefdinir)
- parenteral 3rd generation cephalosporin (i.e. ceftriaxone)
- clindamycin
In which of the following situations would you use azithromycin alone for the treatment of CAP? (Select all that apply)

- A 3 year-old with suspected CAP
- A 3 year-old with suspected CAP with a school-age sibling
- A 3 year-old with suspected CAP with a penicillin allergy
- None of the above
- All of the above
In which of the following situations would you use azithromycin alone for the treatment of CAP? (Select all that apply)

- A 3 year-old with suspected CAP
- A 3 year-old with suspected CAP with a school-age sibling
- A 3 year-old with suspected CAP with a penicillin allergy
- None of the above
- All of the above
Inappropriate antibiotic prescribing is a problem in my pediatric practice

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

And others
PART 2: RX DATA

- Retrospective chart review
- Patients 18 and under with specified ICD-9 codes
- Seen by providers at SBCH general pediatric outpatient offices and ER
- 10/2014-9/2015; n=3,951
## SURVEY RESULTS

<table>
<thead>
<tr>
<th>Study Respondents</th>
<th>57/255 (22%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Care Provider Type:</strong></td>
<td></td>
</tr>
<tr>
<td>• <strong>Private</strong> Pediatrician</td>
<td>19 (33%)</td>
</tr>
<tr>
<td>• <strong>Academic</strong> Pediatrician</td>
<td>33 (58%)</td>
</tr>
<tr>
<td>• General Pediatric Attending</td>
<td>7</td>
</tr>
<tr>
<td>• Pediatric Resident</td>
<td>20</td>
</tr>
<tr>
<td>• Peds ED Attending</td>
<td>5</td>
</tr>
<tr>
<td>• Unknown</td>
<td>5 (9%)</td>
</tr>
<tr>
<td><strong>Degree:</strong></td>
<td></td>
</tr>
<tr>
<td>• MD</td>
<td>33 (66%)</td>
</tr>
<tr>
<td>• DO</td>
<td>16 (33%)</td>
</tr>
</tbody>
</table>
SURVEY RESULTS

KNOWLEDGE OF GUIDELINE RECOMMENDATIONS

- >90% Correct: 34%
- 75-90% Correct: 40%
- <75% Correct: 26%
Knowledge did not correlate with attending vs resident, MD/DO, practice volume.
Moderate correlation ($r=0.5$) between lower knowledge scores, statement that prescribing not a problem.
SURVEY RESULTS

**SELF-REPORTED REASONS FOR LACK OF GUIDELINE USE**

- 32% reported not using guidelines
Due to poor survey response rate, unclear if this correlates with survey responses

**ACTUAL ANTIBIOTIC PRESCRIBING ADHERENCE TO GUIDELINES**

- **Otitis media (n=2827)**
  - 1st line antibiotic: 70.5%
  - Inappropriate non-1st line: 8.0%
  - Appropriate non-1st line: 21.5%

- **Strep pharyngitis (n=655)**
  - 1st line antibiotic: 82.7%
  - Inappropriate non-1st line: 4.6%
  - Appropriate non-1st line: 12.7%

- **Pneumonia (n=469)**
  - 1st line antibiotic: 76.8%
  - Inappropriate non-1st line: 3.2%
  - Appropriate non-1st line: 20.0%
• Awareness that antimicrobial resistance is a problem correlated with guideline-adherent survey responses
• Stated familiarity with the guidelines correlated with guideline-adherent responses
• So learn more!
  o A great first step is this very GR/webinar!
• Continue to learn about the issue of resistance and commit to continued smart use—it matters...
Original Investigation

Nudging Guideline-Concordant Antibiotic Prescribing: A Randomized Clinical Trial

Daniella Meeker, PhD; Tara K. Knight, PhD; Mark W. Friedberg, MD, MPP; Jeffrey A. Linder, MD, MPH; Noah J. Goldstein, PhD; Craig R. Fox, PhD; Alan Rothfeld, MD; Guillermo Diaz, MD; Jason N. Doctor, PhD
• Control group did nothing
• Intervention group randomized to display of signed poster (with photo) explaining commitment to judicious antibiotic use for all.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Poster Condition</th>
<th>Control Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Final Measurement</td>
</tr>
<tr>
<td>Inappropriate prescribing rate, % (95% CI)</td>
<td>43.5 (38.5 to 49.0)</td>
<td>42.8 (38.1 to 48.1)</td>
</tr>
<tr>
<td></td>
<td>33.7 (25.1 to 43.1)</td>
<td>52.7 (44.2 to 61.9)</td>
</tr>
<tr>
<td>Absolute percentage change, baseline to final measurement (95% CI)</td>
<td>-9.8 (0.0 to -19.3)</td>
<td>9.9 (0.0 to 20.2)</td>
</tr>
<tr>
<td>Difference in differences between poster condition and control (95% CI)</td>
<td>-19.7 (-5.8 to -33.04)(^{b})</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: ARI, acute respiratory infection.

\(^{a}\) Adjusted for demographic characteristics and insurance status.

\(^{b}\) \(p=.02\) for the difference.
SO WHAT CAN I DO?

The Diagnosis and Management of Acute Otitis Media - Pediatrics
pediatrics.aappublications.org/content/131/3/e964
by AS Lieberthal - 2013 - Cited by 625 - Related articles
Abstract. This evidence-based clinical practice guideline is a revision of the 2004 acute otitis media (AOM) guideline from the American Academy of Pediatrics (AAP) and American Academy of Family Physicians. It provides recommendations to primary care clinicians for the management of children from 6 months through ...

The Diagnosis and Management of Acute Otitis Media - Pediatrics
pediatrics.aappublications.org/content/early/2013/02/20/peds.2012-3488
by AS Lieberthal - 2013 - Cited by 625 - Related articles
The Diagnosis and Management of Acute Otitis Media. Allan S. Lieberthal, Aaron E. Carroll, Tasnee Chonmaitree, Theodore G. Ganiats, Alejandro Hoberman, Mary Anne Jackson, Mark D. Joffe, Donald T. Miller, Richard M. Rosenfeld, Xavier D. Sevilla, Richard H. Schwartz, Pauline A. Thomas, David E. Tunkel. Article · Info ...

AAP Issues New Guidelines on Treating Ear Infections in Children
https://www.aap.org/...aap/aap.../AAP-Issues-New-Guidelines-on-Treating-Ear-Infections...
SO WHAT CAN I DO?

Google search results:

1. Evidenced-based guidelines for management of infants and children with community-acquired pneumonia (CAP) were prepared by an expert panel comprising clinicians and investigators representing community pediatrics, public health, and the pediatric specialties of critical care, emergency medicine, hospital medicine, etc.

   Management of Community-Acquired Pneumonia (CAP) in Infants and Children, by JS Bradley, 2011. Cited by 816 - Related articles


3. Recommended Empiric Outpatient Treatment of Childhood Community-Acquired Pneumonia. Age range in Alberta guideline is three months to five years. Higher dose for patients who attend child care or who received antibiotics in the previous three months.

4. We are pleased to inform you of a new Pediatric Infectious Diseases Society (PIDS) and Infectious Diseases Society of America (IDSA) guideline that has been published in Clinical Infectious Diseases and is available online on the management of community-acquired pneumonia (CAP) in infants and children. In addition...

pediatric guidelines pneumonia

https://www.idsociety.org/.../Guidelines-Patient.../2011%20CAP%20in%20Children.p...

https://pediatrics.aappublications.org/content/128/6/e1677

https://www.aafp.org/afp/2012/1001/p661.html

SO WHAT CAN I DO?

by ST Shulman - 2012 - Cited by 577 - Related articles
Sep 9, 2012 - III. What Are the Treatment Recommendations for Patients With a Diagnosis of GAS Pharyngitis? 8. Patients with acute GAS pharyngitis should be treated with an appropriate antibiotic at an appropriate dose for a duration likely to eradicate the organism from the pharynx (usually 10 days).

Clinical Practice Guideline for the Diagnosis and ... - Oxford Academic https://academic.oup.com/cid/article/55/10/e86/321183
by ST Shulman - 2012 - Cited by 577 - Related articles
Sep 9, 2012 - The primary objective of this guideline is to provide recommendations on the management of this very common clinical condition among adult and pediatric patients. The guideline addresses issues related to the diagnosis of streptococcal pharyngitis and its treatment in patients who are or are not allergic to penicillin.

Group A Strep | Strep Throat | For Clinicians | GAS | CDC https://www.cdc.gov/groupastrep/diseases-hcp/strep-throat.html
Sep 16, 2016 - Antibiotic treatment is indicated for patients, regardless of age, who have a positive RADT or throat culture. Viral pharyngitis should not be treated with antibiotics. ... See the resources section for specific treatment guidelines for adult and pediatric patients1,2,3.
Poster Commitments Make an Impact on Antibiotic Prescribing...

https://blogs.cdc.gov/.../poster-commitments-make-an-impact-on-antibiotic-prescribing...

Nov 15, 2016 - CDC - Blogs - Safe Healthcare Blog – Poster Commitments Make an Impact on Antibiotic Prescribing - The Division of Healthcare Quality Promotion plans to blog on as many healthcare safety topics as possible. We encourage your participation in our discussion and look forward to an active exchange of...

Print Materials for Healthcare Professionals | Community | Antibiotic Use

https://www.cdc.gov/antibiotic-use/community/materials-references/.../index.html

Jump to Posters - Written public commitments in support of antibiotic stewardship that are placed in examination rooms have been shown to reduce inappropriate antibiotic prescriptions. These posters can also facilitate patient communication about appropriate antibiotic use. We encourage you to add your healthcare...

Print Materials | Community | Antibiotic Use | CDC

https://www.cdc.gov/antibiotic-use/community/materials-references/.../index.html

Nov 7, 2017 - Print Materials for American Indians/Alaska Natives. ... Appropriate Antibiotic Use: Know When Antibiotics Work on the Farm. ... These print-friendly materials focus on the issue of antibiotic resistance and emphasize the importance of appropriate antibiotic prescribing and use.
SO WHAT CAN I DO?

Get Smart: Know When Antibiotics Work

Print Materials for Healthcare Professionals

These print materials focus on when it is and is not appropriate to prescribe antibiotics and explain why antibiotic resistance is one of the world’s most pressing public health problems.

These print materials focus on the issue of antibiotic resistance and emphasize the importance of appropriate antibiotic prescribing and use. These materials are print-friendly and we encourage you to share them widely with your partners and colleagues. To order small quantities of select materials for free or to purchase large quantities, click here.

Antibiotic Stewardship Commitment Posters

Written public commitments in support of antibiotic stewardship that are placed in examination rooms have been shown to reduce inappropriate antibiotic prescriptions. These posters can also facilitate patient communication about appropriate antibiotic use. We encourage you to add your healthcare facility logo, healthcare professional photo or signature to any of these posters. Print the posters via your office printers, or send to a professional printer, and post in patient examination rooms. Posters can be printed in color or black and white.

A Commitment to Our Patients About Antibiotics Poster, version 1

- Printer-friendly version in color 8.5 x 11 [1 page]
- Printer-friendly version in color 8.5 x 1 [1 - page]
- Printer-friendly version in color 8.5 x 1 [1 - page]
That’s why I’m signing the “Get Smart Guarantee.”

Antibiotics don’t work for viral infections like the common cold, most coughs, and cold sore sores. Taking antibiotics when they don’t work can do more harm than good by causing usher’s ear, diarrhea, or allergic reactions.

I guarantee I will do my best to prescribe antibiotics only when you need them.

Antibiotics can be effective, but always are becoming more resistant. If we can’t use antibiotics properly, we might not have them in the future.

To learn more visit cdc.gov/getsmt.
Antibiotic resistance is an increasing problem in the outpatient setting, driven by inappropriate use of outpatient antibiotics, which remains a major problem.

Knowledge of guidelines, and adherence to their use in outpatient pediatrics is still not where it should be.

Easy things to do:
- Learn about the problem
- Learn the guidelines
- Commit to yourself, and your patients, to do better