



Pediatric Outpatient Antibiotic Prescribing: how to drive appropriate use?

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I have no disclosures



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



Stony Brook Children's

PICC LINE...FOR UTI'S





Risk factors for community-onset urinary tract infections due to *Escherichia coli* harbouring extended-spectrum b-lactamases

Esther Calbo^{1*}, Verónica Romani¹, Mariona Xercavins², Lucía Gómez¹, Carolina Garcia Vidal¹, Salvador Quintana³, Jordi Vila⁴ and Javier Garau¹

¹Department of Internal Medicine, Infectious Diseases Unit, Hospital Mútua de Terrassa, Barcelona, Spain; ²Service of Microbiology, Hospital Mútua de Terrassa, Barcelona, Spain; ³Intensive Care Unit, Hospital Mútua de Terrassa, Barcelona, Spain; ⁴Department of Microbiology, Hospital Clínic, University of Barcelona, Spain

Received 7 October 2005; returned 6 November 2005; revised 13 January 2006; accepted 25 January 2006

	Cases (<i>n</i> = 19)	Controls (<i>n</i> = 55)	<i>P</i>
Male/female	4/15	12/43	NS
Mean age (years) (SD)	61.8 (25)	61.3 (23)	NS
Place of residence			
home	17 (89%)	51 (93%)	NS
long-term care facility	2 (10%)	4 (7%)	NS
Bacteraemia	1	3	NS
Charlson score, mean	2.5	1.7	NS
Hospitalization	5 (26%)	4 (7%)	0.04
Intravenous treatment (home programme)	4 (21%)	1 (2%)	0.01
Previous bacterial infection	13 (68%)	18 (33%)	0.01
Urinary abnormalities	11 (58%)	18 (33%)	<0.03
Oral cefuroxime	12 (63%)	5 (9%)	<0.05



Macrolide and Azithromycin Use Are Linked to Increased Macrolide Resistance in *Streptococcus pneumoniae*[∇]

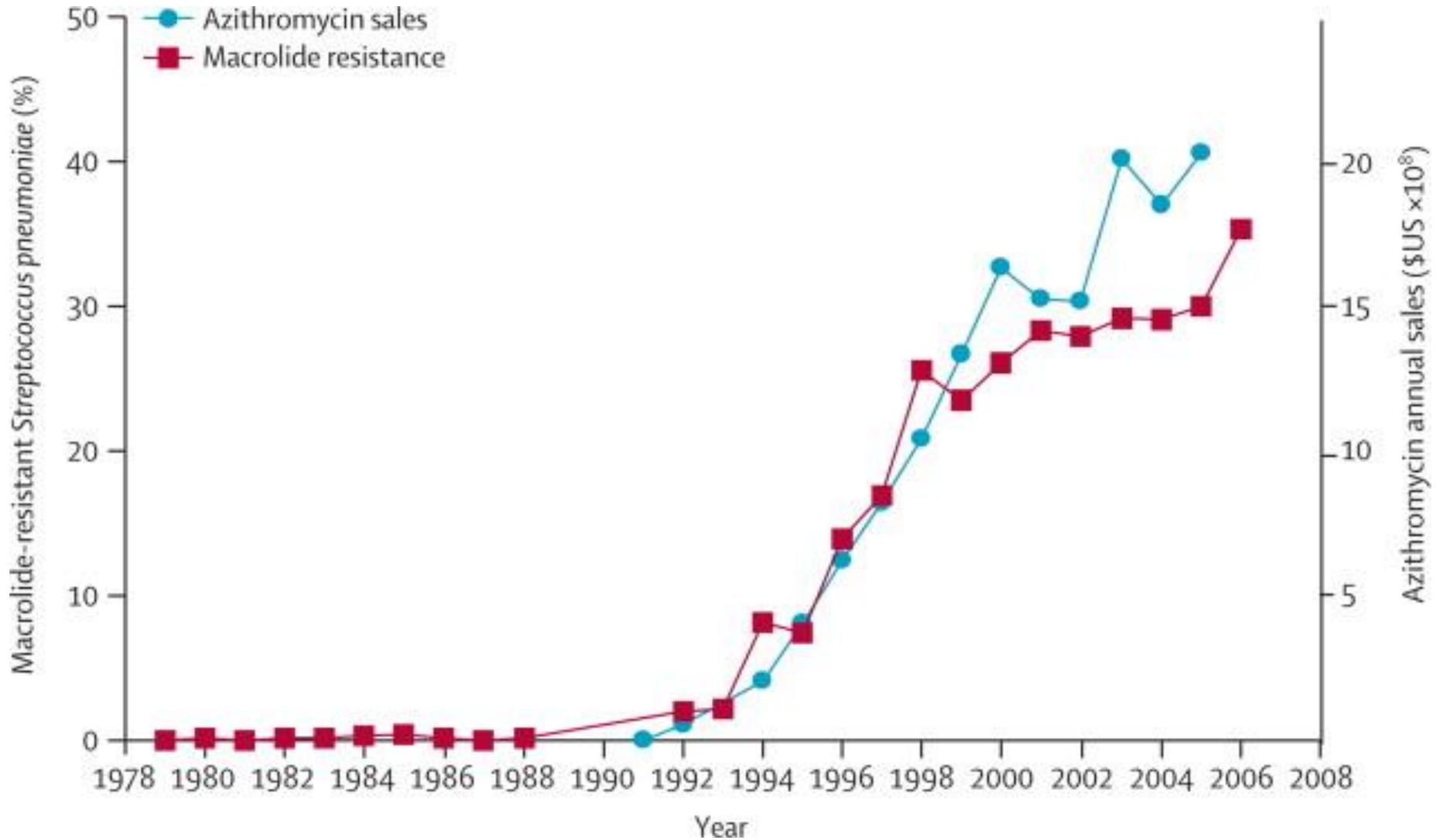
Miika Bergman,^{1*} Solja Huikko,^{1,2} Pentti Huovinen,¹ Pirkko Paakkari,³ Helena Seppälä,^{1,4}
and the Finnish Study Group for Antimicrobial Resistance (FiRe Network)[†]

Antimicrobial Research Laboratory, Department of Bacterial and Inflammatory Diseases, National Public Health Institute, Turku, Finland¹; School of Public Health, University of Tampere, Tampere, Finland²; National Agency of Medicines, Helsinki, Finland³; and Department of Ophthalmology, Turku City Hospital, Turku, Finland⁴

Received 23 February 2006/Returned for modification 2 June 2006/Accepted 15 August 2006



WE DID THIS





- 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

Must

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?



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- What is your second-line antibiotic choice for otitis media, in the same patient who has now failed first-line treatment? **amoxicillin-clav.**



STREP THROAT

- 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



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 - 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?
 - amoxicillin
 - Amoxicillin-clavulanate
 - 3rd generation cephalosporin (i.e. cefdinir)
 - 1st generation cephalosporin (i.e. cephalexin)
 - azithromycin
 - 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?
 - **amoxicillin**
 - Amoxicillin-clavulanate
 - 3rd generation cephalosporin (i.e. cefdinir)
 - 1st generation cephalosporin (i.e. cephalexin)
 - azithromycin
 - 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

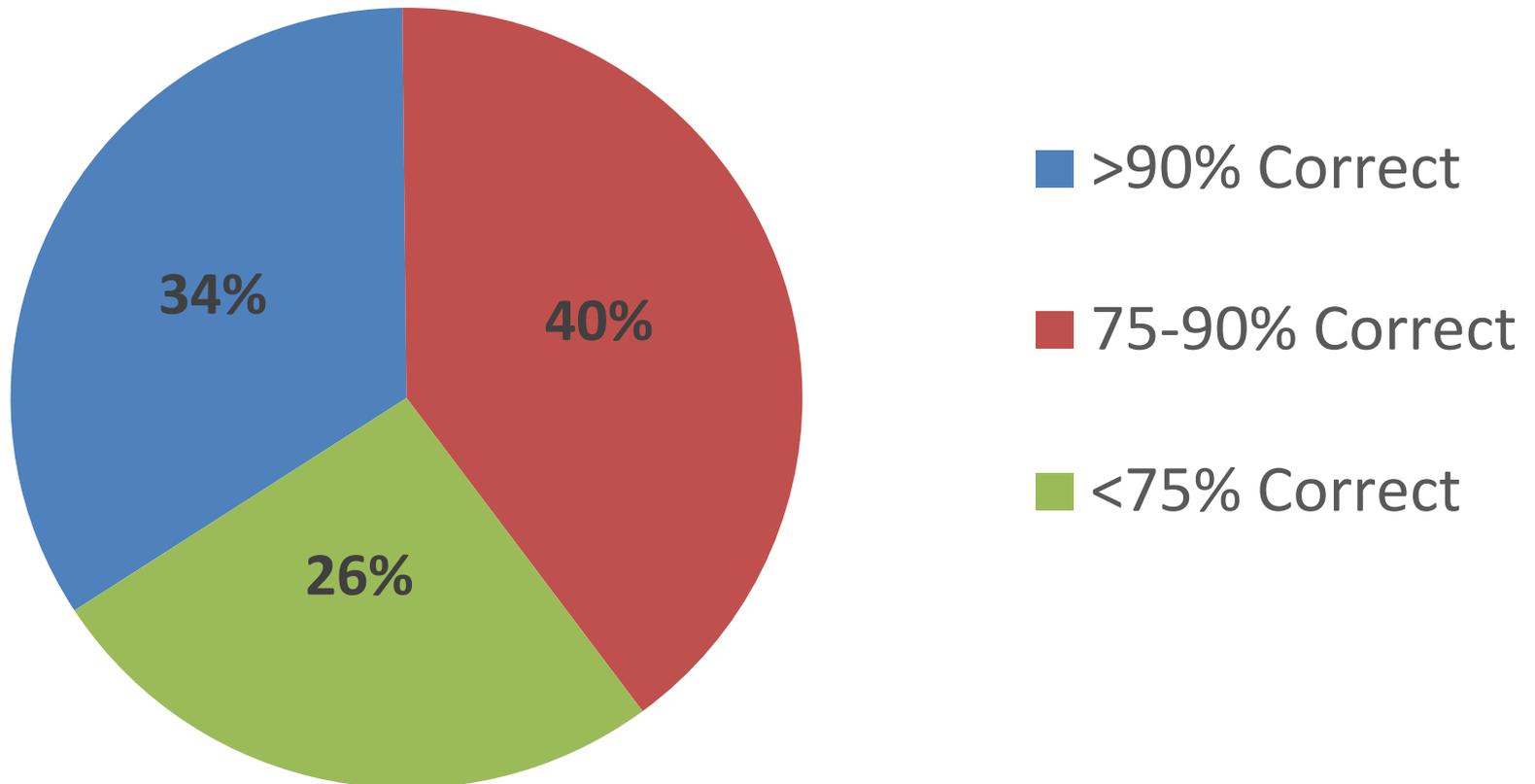


- Retrospective chart review
- Patients 18 and under with specified ICD-9 codes
- Seen by providers at SBCH general pediatric outpatient offices and ER
- 10/2014-9/2015; n=3,951

Study Respondents	57/255 (22%)
Primary Care Provider Type:	
• Private Pediatrician	19 (33%)
• Academic Pediatrician	33 (58%)
• General Pediatric Attending	7
• Pediatric Resident	20
• Peds ED Attending	5
• Unknown	5 (9%)
Degree:	
• MD	33 (66%)
• DO	16 (33%)



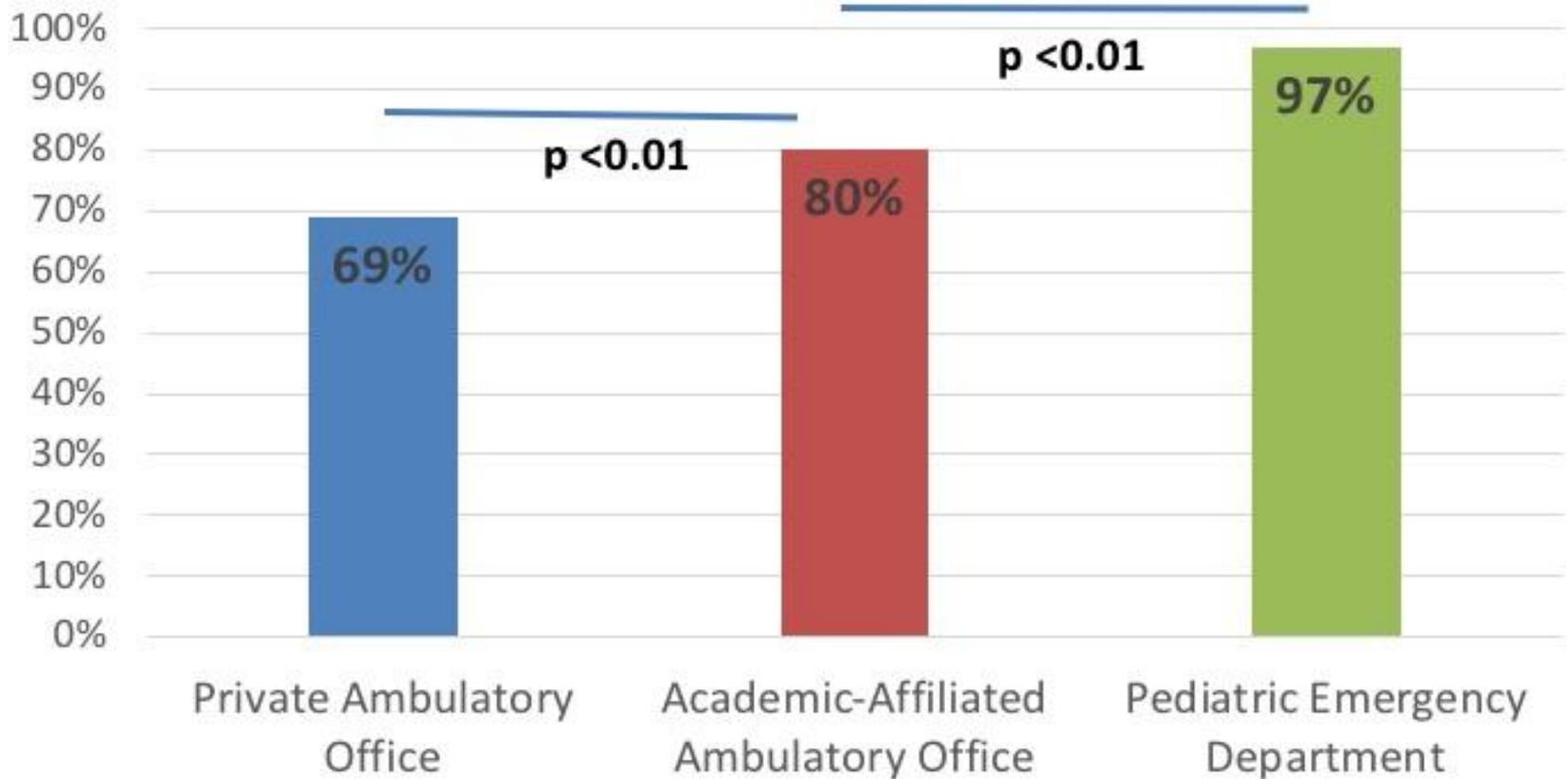
KNOWLEDGE OF GUIDELINE RECOMMENDATIONS





SURVEY RESULTS

PERCENT CORRECT RESPONSES BY PRACTICE TYPE

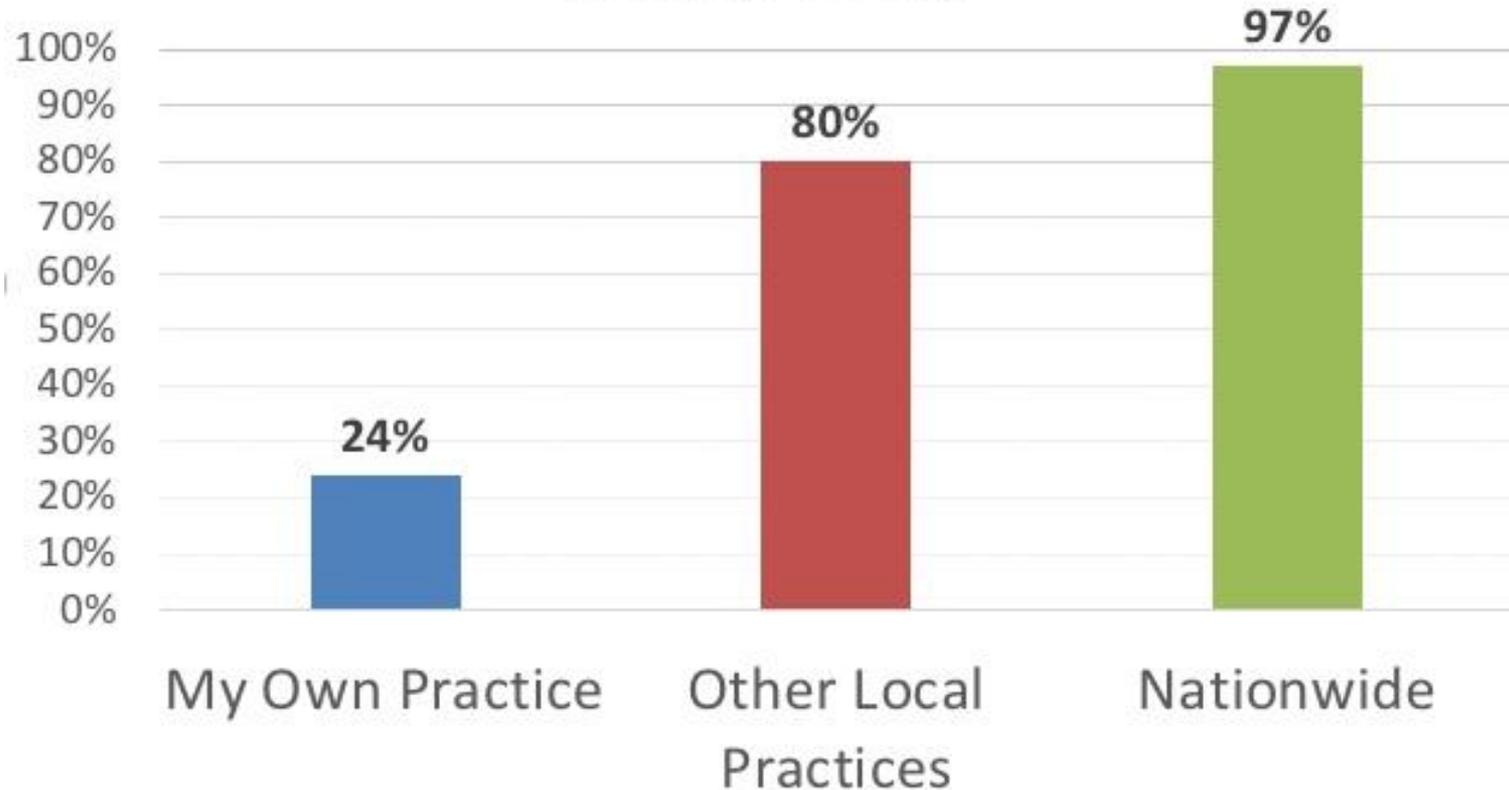


Knowledge did not correlate with attending vs resident, MD/DO, practice volume



SURVEY RESULTS

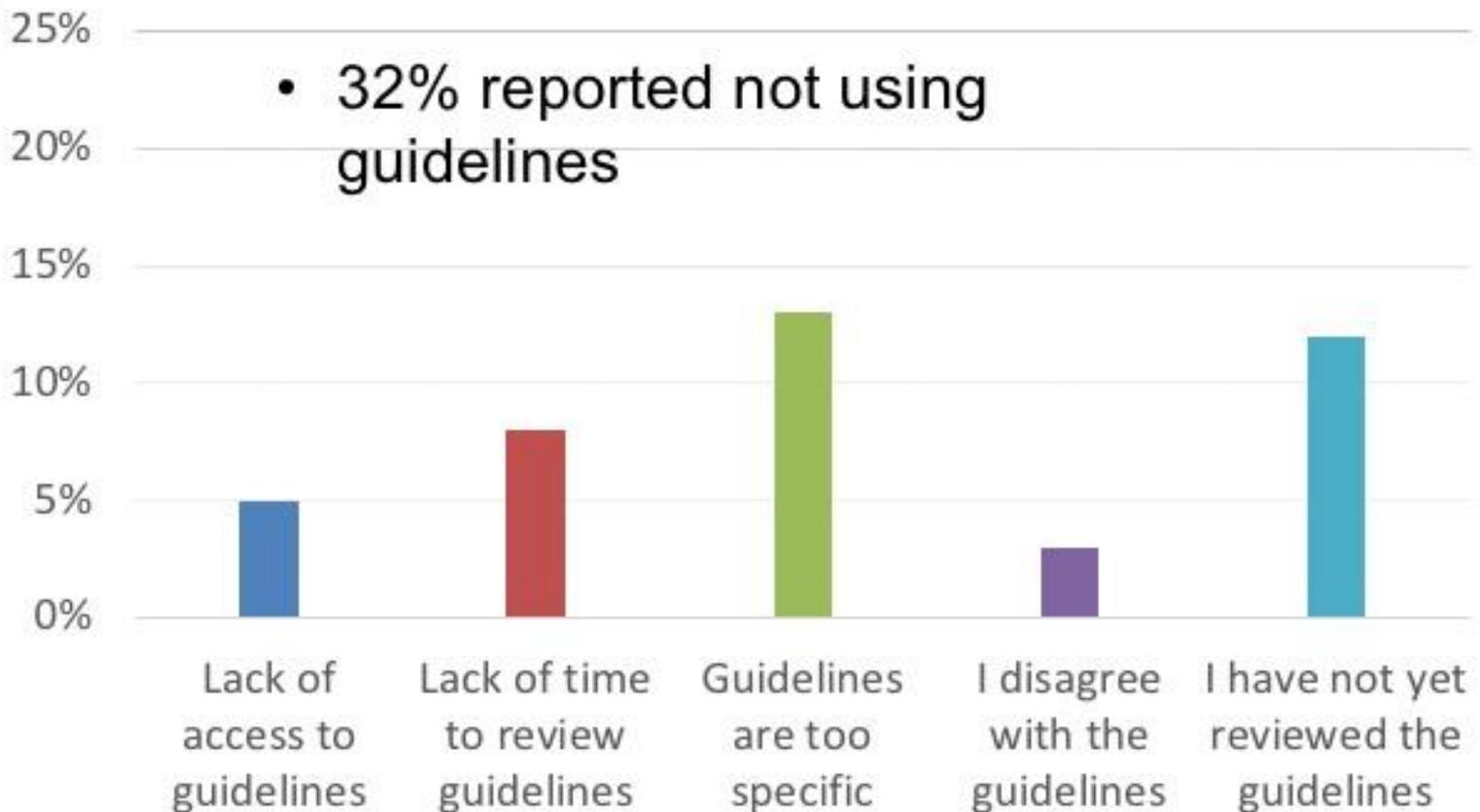
LOCATIONS WHERE PROVIDERS FEEL THAT INAPPROPRIATE ANTIBIOTIC PRESCRIBING IS A PROBLEM





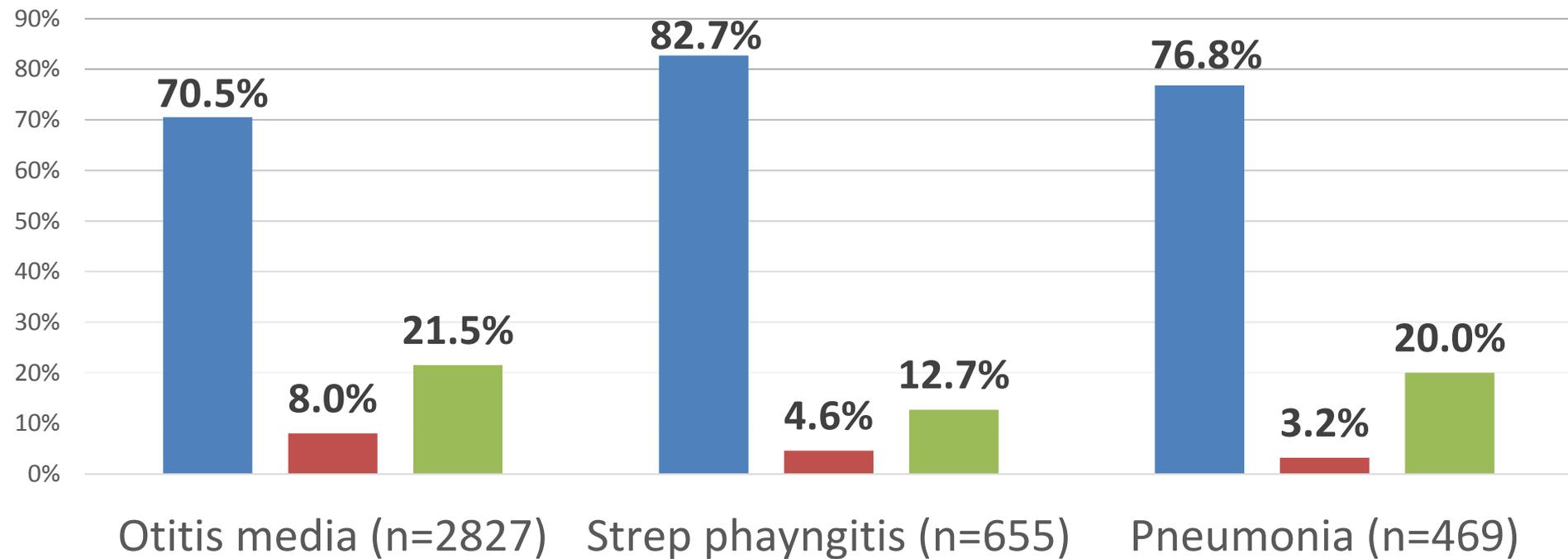
SURVEY RESULTS

SELF-REPORTED REASONS FOR LACK OF GUIDELINE USE





ACTUAL ANTIBIOTIC PRESCRIBING ADHERENCE TO GUIDELINES



■ 1st line antibiotic ■ Appropriate non-1st line ■ Inappropriate non-1st line

Due to poor survey response rate, unclear if this correlates with survey responses



AND...SO WHAT?

- 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!
 - 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 4. Changes in Adjusted Rates^a of Inappropriate Antibiotic Prescribing for ARIs

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

Abbreviation: ARI, acute respiratory infection.

^b $P=.02$ for the difference.

^a Adjusted for demographic characteristics and insurance status.



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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-Infecti...> ▼

Feb 25, 2013 - The evidence-based clinical **guideline**, "The Diagnosis and Management of Acute **Otitis Media**," published in the March 2013 **Pediatrics** and released online Feb. 25, provides recommendations to physicians managing uncomplicated AOM in children ages 6 months through 12 years.



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[\[PDF\] The Management of Community-Acquired Pneumonia in Infants and ...](#)

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

by JS Bradley - 2011 - Cited by 816 - Related articles

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,.

[Management of Community-Acquired Pneumonia \(CAP\) in ... - Pediatrics](#)

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

by American Academy of Pediatrics - 2011 - Cited by 5 - Related articles

In November 2010, the American Academy of **Pediatrics** endorsed the following publication: Bradley JS, Byington CL, Shah SS, et al. The management of community-acquired **pneumonia** (CAP) in infants and children older than 3 months of age: clinical practice **guidelines** by the **Pediatric Infectious Diseases Society** (PIDS) ...

[Community-Acquired Pneumonia in Children - American Family ...](#)

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

Oct 1, 2012 - 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.

[CAP Guidelines Available Online - Pediatric Infectious Diseases Society](#)

<https://www.pids.org/news/273-cap-guidelines-available-online.html>

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 ...



SO WHAT CAN I DO?



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[PDF] Clinical Practice Guideline for the Diagnosis and Management of ...

<https://www.idsociety.org/.../IDSA/Guidelines.../2012%20Strep%20Guideline.pdf> ▼

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.

[Abstract](#) · [EXECUTIVE SUMMARY](#) · [INTRODUCTION](#) · [METHODOLOGY](#)

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** patients^{1,2,3}.



SO WHAT CAN I DO?



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Poster Commitments Make an Impact on Antibiotic Prescribing ...

<https://blogs.cdc.gov/.../poster-commitments-make-an-impact-on-antibiotic-prescribin...> ▼

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.

Get Smart: Know When Antibiotics Work

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[For Healthcare Professionals](#) +

[Improving Prescribing](#) +

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[Print Materials for Parents of Young Children](#)

[Print Materials for Spanish Speakers](#)

[Print Materials for American Indians/Alaska](#)

[CDC](#) > [Get Smart Home](#) > [Materials and References](#) > [Print Materials](#)

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]
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SO WHAT CAN I DO?





- 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