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## Frequency of First-line Antibiotic Selection Among US Ambulatory Care Visits for Otitis Media, Sinusitis, and Pharyngitis

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TO THE EDITOR:

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Author contributions:

Dr. Hersh contributed with study design, interpretation of data analysis, drafting and revision of manuscript, and final approval of manuscript.

Drs. Fleming-Dutra, Hyun and Hicks contributed with study design, interpretation of data analysis, critical review of manuscript, and final approval of manuscript.

Mr. Shapiro contributed with study design, analysis and interpretation of data, critical review of manuscript, and final approval of manuscript.

**Access to data:** Dr. Hersh and Mr. Shapiro had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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The National Action Plan for Combating Antibiotic-Resistant Bacteria set a goal of reducing inappropriate outpatient antibiotic use by 50% by 2020.<sup>1</sup> A recent study<sup>2</sup> estimated at least 30% of antibiotic prescriptions in ambulatory care settings in the United States during 2010–2011 were unnecessary. Inappropriate antibiotic prescribing also includes choosing an unnecessarily broad-spectrum antibiotic instead of an equally or more effective narrower-spectrum alternative. Otitis media (OM), sinusitis and pharyngitis collectively account for nearly one-third of all antibiotics prescribed in outpatient settings<sup>2</sup> and professional guidelines recommend narrow-spectrum agents as first-line therapy for these conditions.<sup>2</sup> Alternatives to first-line therapy are indicated in select circumstances, including for patients with penicillin allergy or recent treatment failure. The objective of this study was to measure the frequency with which first-line agents are prescribed for OM, sinusitis and pharyngitis.

## METHODS

We identified antibiotic prescribing visits during 2010–2011 for OM (patients 19 years old only), sinusitis and pharyngitis using the National Ambulatory Medical Care Survey (NAMCS, which samples office-based physicians) and the National Hospital Ambulatory Medical Care Survey (NHAMCS, which samples hospital outpatient and emergency departments). The *International Classification of Diseases, Ninth Revision, Clinical Modification* codes were used to identify visits and assign diagnoses as described previously.<sup>2</sup>

National guidelines recommend first-line antibiotic therapy for each condition: *amoxicillin or amoxicillin with clavulanate (alternative)* for OM; *amoxicillin or amoxicillin with clavulanate* for sinusitis; and *penicillin or amoxicillin* for pharyngitis.<sup>2</sup> First-line therapy represents the initial recommended antibiotics for treatment of patients without drug allergies, including alternative therapy indicated for specific situations, e.g., amoxicillin-clavulanate for OM with concurrent conjunctivitis. First-line therapy would not apply to treated patients returning for unplanned follow-up care with worsening symptoms suggesting treatment failure.

For each condition, the primary outcome was the percentage of visits that received first-line antibiotics (stratified by age: pediatric, 19, adult >19). All analyses were performed using Stata 12 (Stata Corp, College Station, TX).

## RESULTS

During 2010–2011, among visits where antibiotics were prescribed, physician prescribing of first-line antibiotics ranged from a low of 37% (95% CI: 32–43%) for adult patients with sinusitis and pharyngitis to a high of 67% (95% CI: 63–71%) for pediatric patients with OM (Figure). For all three conditions overall, use of first-line agents was 52% (95% CI: 49–55%). Physicians prescribed first line therapies more commonly to pediatric patients than to adults ( $p < 0.001$  for sinusitis and pharyngitis). The most common non-first-line antibiotic class prescribed was macrolides (Figure).

## COMMENT

Collectively, physicians prescribed first-line recommended antibiotics approximately half of the time during visits for OM, sinusitis and pharyngitis. Overuse of non-first line agents, especially macrolides, was higher for adults than children. Available evidence suggests that 10% of the population reports penicillin allergy<sup>3</sup> and 10% of visits for sinusitis<sup>4</sup> and OM result from failed first-line therapy<sup>5</sup> suggesting that approximately 80% of visits for these diagnoses should be treated with first-line therapy.

This study has limitations. It was not possible to confirm the presence of allergy or previous treatment history, factors that influence appropriate antibiotic selection. These data are from 2010–11, but are the most recent complete data available from NAMCS/NHAMCS and we do not have reason to believe practice patterns have substantially changed.

This study provides evidence of substantial overuse of non-first-line antibiotics for three of the most common conditions in ambulatory care that collectively account for > 40 million antibiotic prescriptions annually.<sup>2</sup> These findings indicate that the problem of inappropriate antibiotic prescribing includes not only prescriptions that are unnecessary altogether, but also selection of inappropriate agents.<sup>2</sup> As a result, stewardship interventions should address both antibiotic overuse and inappropriate antibiotic selection to improve patient safety and healthcare quality. Implementation of stewardship strategies is a key component to meeting the National Action Plan goal of reducing inappropriate antibiotic use by 50% in outpatient settings.<sup>1</sup>

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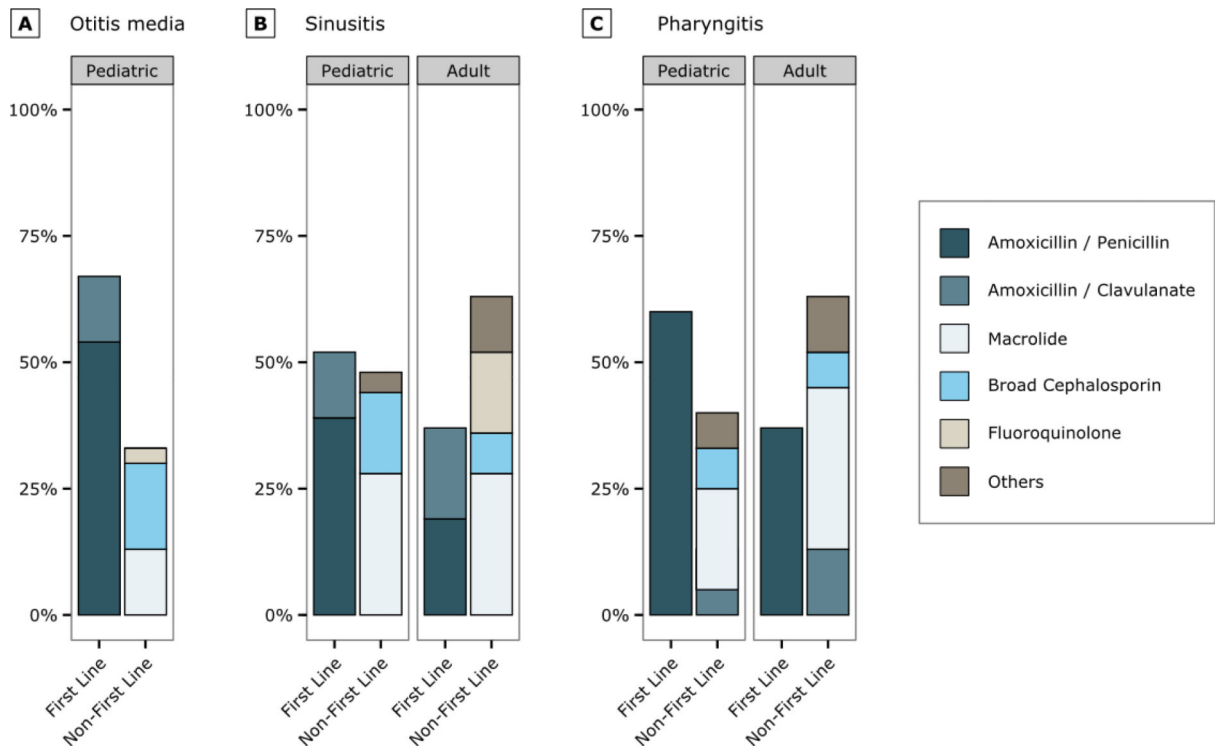
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**Figure.**

Percentage of visits where antibiotics prescribed that are first line and non-first line for otitis media (A, first line: amoxicillin or amoxicillin/clavulanate), sinusitis (B, first line: amoxicillin or amoxicillin/clavulanate) and pharyngitis (C, amoxicillin or penicillin) during 2010–2011. Estimates based on 1705 sampled visits for otitis media, 463 for pediatric sinusitis, 1223 for adult sinusitis, 1006 for pediatric pharyngitis and 830 for adult pharyngitis.

Broad cephalosporin includes 2<sup>nd</sup>/3<sup>rd</sup> generation agents

Pediatric patients, 19 years old