CLINICAL REPORT

Principles of Judicious Antibiotic Prescribing for Upper Respiratory Tract Infections in Pediatrics

abstract

Most upper respiratory tract infections are caused by viruses and require no antibiotics. This clinical report focuses on antibiotic prescribing strategies for bacterial upper respiratory tract infections, including acute otitis media, acute bacterial sinusitis, and streptococcal pharyngitis. The principles for judicious antibiotic prescribing that are outlined focus on applying stringent diagnostic criteria, weighing the benefits and harms of antibiotic therapy, and understanding situations when antibiotics may not be indicated. The principles can be used to amplify messages from recent clinical guidelines for local guideline development and for patient communication; they are broadly applicable to antibiotic prescribing in general. Pediatrics 2013;132:1146–1154

INTRODUCTION

More than 1 in 5 pediatric ambulatory visits to a physician result in an antibiotic prescription, which accounts for nearly 50 million antibiotic prescriptions annually in the United States.¹ It is widely documented that inappropriate antibiotic prescribing, especially for upper respiratory tract infections (URIs) of viral origin, is common in ambulatory care.²⁻⁵ As many as 10 million antibiotic prescriptions per year are directed toward respiratory conditions for which they are unlikely to provide benefit.¹ Recent evidence shows that broad-spectrum antibiotic prescribing has increased and frequently occurs when either no therapy is necessary or when narrower-spectrum alternatives are appropriate.¹² Such overuse of antibiotics causes avoidable drug-related adverse events,⁴⁻⁶ contributes to antibiotic resistance,⁷⁻⁸ and adds unnecessary medical costs. This is compounded by the fact that few new antibiotics to treat antibiotic-resistant infections are under development.⁹ The growing health and economic threats of antibiotic resistance make promoting judicious antibiotic prescribing, which encompasses both reducing overuse and ensuring that appropriate agents are prescribed, an urgent public health and patient safety priority (http://www.cdc.gov/drugresistance/threat-report-2013).

Clinical decision-making about whether to prescribe antibiotics for a patient with URI symptoms is a daily occurrence for ambulatory-care physicians and other health care professionals who provide care for children. Although antibiotic prescribing is a routine part of clinical
care, judicious antibiotic prescribing is challenging because it is difficult to
distinguish between viral and bacterial URIs. A major objective of this clinical
report is to provide a framework for clinical decision-making regarding
antibiotic use for pediatric URIs. A point of emphasis is the importance of using
stringent and validated clinical criteria when diagnosing acute otitis media (AOM),
acute bacterial sinusitis, and pharyngitis caused by group A Streptococcus
(GAS), as established through clinical guidelines. Additionally, this document
emphasizes situations in which the use of antibiotics is not indicated, in par-
ticular for viral respiratory infections.

Considering the frequency of URIs and the large proportion of antibiotic pre-
scribing attributable to URI visits, these conditions represent a high-impact tar-
get for guidelines and other interven-
tions designed to optimize antibiotic
prescribing. The careful application of
these criteria has the potential to
mitigate overuse of antibiotics for
pediatric URIs.

The first “Principles of Judicious Use of
Antimicrobial Agents for Pediatric Up-
per Respiratory Tract Infections” were
published in 1998 in response to con-
cerns over the emergence and spread
of antibiotic-resistant organisms. The
Centers for Disease Control and Preven-
tion, in collaboration with the American
Academy of Pediatrics (AAP), sought to
update these principles in a current
context. Antibiotic resistance remains
a major public health concern, and
appropriate antibiotic use is an impor-
tant health care quality goal. Although
the introduction of a 7-valent pneumo-
coccal polysaccharide-protein conjugate
vaccine (PCV7) in 2000 led to large
debates in the incidence of invasive
pneumococcal infections, an increase
in the prevalence of nonvaccine sero-
types, most notably serotype 19A, a
commonly antibiotic-resistant serotype, prompted the 2010 introduction of
a 13-valent pneumococcal polysaccharide-
protein conjugate vaccine (PCV13).

Provider concerns about antibiotic
resistance may be 1 factor leading to
increasing use of broad-spectrum
antibiotics. In recent years, several
high-quality randomized controlled
trials, meta-analyses, and new and
updated clinical guidelines have been
published that better define the
effectiveness of antibiotic use for se-
lected URIs, including AOM and acute
bacterial sinusitis. At the same
time, new evidence highlighting the
to which antibiotics lead to ad-
verse events requiring medical atten-
tion or potentially life-threatening
events has emerged.

This clinical report focuses on antibi-
otic prescribing for key pediatric URIs
that, in certain instances, may benefit
from antibiotic therapy: AOM, acute
bacterial sinusitis, and pharyngitis.

Specific recommendations are
applicable to healthy children who do
not have underlying medical conditions
(e.g., immunosuppression) placing them
at increased risk of developing serious
complications. The purpose of this
report is to provide practitioners with
specific context using the most current
recommendations and guidelines while
applying 3 principles of judicious
antibiotic use: (1) determination of
the likelihood of a bacterial infec-
tion, (2) weighing the benefits and
harms of antibiotics, and (3) implemen-
ting judicious prescribing strategies (Table 1).

PRINCIPLE 1: DETERMINE THE
LIKELIHOOD OF A BACTERIAL
INFECTION

Many aspects of the clinical history,
symptoms, and signs of bacterial URIs
overlap with or mirror those of viral
infections or noninfectious conditions.

To make a judicious decision about
antibiotic use, it is essential first to
determine the likelihood of a bacterial
infection. When a practitioner has
made the diagnosis of viral infection
and has reasonably excluded the
presence of concurrent bacterial
infection, antibiotics should not be
used because the potential for harm
outweighs the potential benefit. In
the specific cases of AOM, acute bacterial
sinusitis, and pharyngitis, there are
well-established stringent criteria that
aid in distinguishing bacterial from
nonbacterial causes.

AOM

The AAP and American Academy of
Family Physicians released updated
clinical practice guidelines for the di-
agnosis and treatment of AOM in
2013. AOM may be defined as “the
rapid onset of signs and symptoms of
inflammation in the middle ear.” The
signs include bulging with or without
erthema of the tympanic membrane
(TM), and the symptoms may include
otalgia, irritability, otorrhea, and fe-
ver. The diagnosis of AOM always
requires a careful otorcopic exami-
nation to confirm the presence of in-
flammatory changes in the TM. The
AAP guideline recommends that
physicians diagnose AOM definitively
under either of 2 conditions: (1) evi-
dence of middle-ear effusion, as

demonstrated by moderate to severe
bulging of the TM, or (2) new onset of
otorrhea that is not attributable to
otitis externa. AOM may also be di-
agnosed when a child presents with
only mild bulging of the TM but with
additional symptoms of recent onset
of ear pain or with intense erythema
of the TM. Although clear visualization
of the TM at times is difficult and be-
cause AOM is typically a self-limiting
disease, a high degree of diagnostic
certainty is essential to minimize an-
tibiotic overuse. After AOM is diag-
nosed, judicious antibiotic use can be
enhanced by further categorizing
patients on the basis of illness se-
verity (severe otalgia, otalgia lasting

FROM THE AMERICAN ACADEMY OF PEDIATRICS
Persistent symptoms are most common that are (1) persistent and not diagnosed on the basis of symptoms and (2) worsening or new onset fever, daytime cough, or nasal discharge after improvement of viral URI. Severe symptoms include (1) fever $\geq 39^\circ C$, purulent nasal discharge, (2) persistent symptoms without improvement: nasal discharge or daytime cough $>10$ d, and include nasal discharge (of any quality) or daytime cough not improving by 10 days. Worsening symptoms include a worsening or new onset of fever, daytime cough, or nasal discharge after improvement of a typical viral URI. Severe symptoms include persistent fever (temperature $\geq 39^\circ C$) and purulent nasal discharge for at least 3 days. These clinical criteria are the basis for the diagnosis of acute bacterial sinusitis. Because many children with viral URI will have radiographic abnormalities, imaging should not be performed routinely.

### Acute Pharyngitis
Pharyngitis, or sore throat, may be accompanied by other nonspecific symptoms including cough, congestion, and fever. The most important diagnostic consideration is whether $\beta$-hemolytic GAS is the cause. Unlike AOM and acute bacterial sinusitis, the diagnosis of GAS infection can be confirmed with laboratory testing (either a rapid-antigen detection test or culture).26,27 Scoring systems (Modified Centor or Mlosta Scors29) can assist in identifying candidates for testing. Patients with 2 or more of the following features should undergo testing: (1) absence of cough, (2) presence of tonsillar exudate or swelling, (3) history of fever, (4) presence of swollen and tender anterior cervical lymph nodes, and (5) age younger than 15 years. Children with URI signs and symptoms, including cough, nasal congestion, conjunctivitis, hoarseness, diarrhea, or oropharyngeal lesions (ulcers, vesicles) more likely have viral illnesses and not GAS infection and should not be tested for GAS. Testing should generally not be performed in children younger than 3 years in whom GAS rarely causes pharyngitis and in whom rheumatic fever is uncommon. GAS should not be diagnosed in the

### TABLE 1 Application of Judicious Antibiotic Principles for Pediatric URIs

<table>
<thead>
<tr>
<th>Principles</th>
<th>AOM</th>
<th>Acute Bacterial Sinusitis</th>
<th>Acute Pharyngitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle 1: Determine the likelihood of a bacterial infection</td>
<td>Requires middle ear effusion and signs of inflammation: • moderate or severe bulging of TM, or • otitis media, or • hearing loss, or • mild bulging of TM with ear pain or erythema of TM</td>
<td>URI symptoms that are either worsening, severe, or persistent</td>
<td></td>
</tr>
<tr>
<td>Principle 2: Weigh benefits versus harms of antibiotics</td>
<td>Benefits: for strictly defined AOM, NNT of as few as 4 patients to achieve improvements in symptoms • no significant benefits in preventing complications such as mastoiditis</td>
<td>Benefits: for strictly defined bacterial sinusitis, antibiotics improve symptoms at 3 and 14 d • no evidence that antibiotic therapy prevents complications such as brain abscess</td>
<td>Benefits: for confirmed GAS, antibiotics shorten symptom duration, prevent rheumatic fever and may limit secondary transmission. • Limited evidence that therapy prevents complications such as PTA</td>
</tr>
<tr>
<td>Principle 3: Implement judicious prescribing strategies</td>
<td>Amoxicillin with or without clavulanate</td>
<td>Amoxicillin with or without clavulanate</td>
<td>Amoxicillin or penicillin</td>
</tr>
</tbody>
</table>

**Acute Bacterial Sinusitis**
The AAP23 and the Infectious Diseases Society of America21 recently developed evidence-based clinical guidelines for the diagnosis and treatment of acute bacterial sinusitis. These guidelines support use of strict diagnostic criteria to distinguish bacterial from viral URIs. In particular, acute bacterial sinusitis is diagnosed on the basis of symptoms that are (1) persistent and not improving, (2) worsening, or (3) severe. Persistent symptoms are most common and include nasal discharge (of any quality) or daytime cough not improving by 10 days. Worsening symptoms include a worsening or new onset of fever, daytime cough, or nasal discharge after improvement of a typical viral URI. Severe symptoms include persistent fever (temperature $\geq 39^\circ C$) and purulent nasal discharge for at least 3 days. These clinical criteria are the basis for the diagnosis of acute bacterial sinusitis. Because many children with viral URI will have radiographic abnormalities, imaging should not be performed routinely.

**Acute Pharyngitis**
Pharyngitis, or sore throat, may be accompanied by other nonspecific symptoms including cough, congestion, and fever. The most important diagnostic consideration is whether $\beta$-hemolytic GAS is the cause. Unlike AOM and acute bacterial sinusitis, the diagnosis of GAS infection can be confirmed with laboratory testing (either a rapid-antigen detection test or culture).26,27 Scoring systems (Modified Centor or Mlosta Scors29) can assist in identifying candidates for testing. Patients with 2 or more of the following features should undergo testing: (1) absence of cough, (2) presence of tonsillar exudates or swelling, (3) history of fever, (4) presence of swollen and tender anterior cervical lymph nodes, and (5) age younger than 15 years. Children with URI signs and symptoms, including cough, nasal congestion, conjunctivitis, hoarseness, diarrhea, or oropharyngeal lesions (ulcers, vesicles) more likely have viral illnesses and not GAS infection and should not be tested for GAS. Testing should generally not be performed in children younger than 3 years in whom GAS rarely causes pharyngitis and in whom rheumatic fever is uncommon. GAS should not be diagnosed in the
absence of testing, even among patients with all of the aforementioned clinical criteria, with rare exceptions (eg, symptomatic and household contact with confirmed GAS pharyngitis). The importance of limiting testing to children with appropriate clinical criteria is further supported by the fact that colonization rates can reach 15% to 20% even among asymptomatic children.

Common Cold, Nonspecific URI, Acute Cough Illness, and Acute Bronchitis

Symptoms of the common cold, nonspecific URI, and bronchitis may overlap with or mirror those of bacterial URIs and can include cough, congestion, and sore throat. Collectively, these viral conditions account for millions of office visits per year. Acute bronchitis, in particular, is a cough illness that is diagnosed during more than 2 million pediatric office visits annually, and antibiotics are prescribed more than 70% of the time.1 Application of diagnostic clinical criteria for AOM, sinusitis, and pharyngitis should aid clinicians in excluding these conditions. Management of the common cold, nonspecific URI, acute cough illness, and acute bronchitis should focus on symptomatic relief. Antibiotics should not be prescribed for these conditions.

PRINCIPLE 2: WEIGH BENEFITS VERSUS HARMs OF ANTIBIOTICS

If a bacterial infection is determined to be likely, the next step is to compare the evidence about the benefits of antibiotic therapy for each condition to the potential for harms. Relevant outcomes to consider for benefits include the cure rate, symptom reduction, prevention of complications, and secondary cases. Outcomes for harms include antibiotic-related adverse events (eg, abdominal pain, diarrhea, rash), *Clostridium difficile* colitis, development of resistance, and cost.

AOM

**Benefits**

Several high-quality randomized controlled trials and meta-analyses have been published since the publication of the first principles of judicious use of antibiotics.16–20,29–33 Collectively, these have emphasized the following: (1) at least half of patients with AOM will recover without antibiotic therapy; (2) recovery is more likely and is hastened for children who receive antibiotic therapy compared with placebo; and (3) recovery without antibiotic therapy is less likely for younger children, those with bilateral versus unilateral disease, and those with more severe signs and symptoms. These observations underlie the rationale for treatment recommendations for AOM.

Multiple meta-analyses indicate that children receiving antibiotic therapy are more likely to achieve clinical success in terms of symptom resolution compared with placebo with a number needed to treat (NNT) of 7 or 8 patients.18,33 Two recent randomized controlled trials among younger children that used even more stringent diagnostic criteria demonstrated that children who received antibiotics had more favorable symptom scores than those who received placebo, achieved faster symptom recovery, and had significantly lower rates of clinical failure as measured by otoscopic examination and persistence of symptoms, with an NNT closer to 4.19,20 Nonetheless, it is important to note that in numerous studies of antibiotic efficacy for AOM, the majority of patients have symptoms that ultimately resolve spontaneously regardless of therapy and without complications. The potential for preventing complications, such as mastoiditis, may contribute, in part, to the clinical decision to use antibiotics for AOM. However, across the aforementioned controlled studies and meta-analyses, antibiotics have not demonstrated significant benefit in preventing these rare but serious complications. Observational data from the United Kingdom including more than 1 million AOM episodes indicates that when mastoiditis occurs, it typically is present at time of initial clinical presentation to care.34 The estimated NNT to prevent 1 episode of mastoiditis is nearly 5000.34

The AAP recommends antibiotic therapy for children diagnosed with AOM on the basis of presence of established clinical criteria. Observation can be considered for selected children, particularly children older than 2 years with nonsevere symptoms and unilateral disease.

Acute Bacterial Sinusitis

**Benefits**

The evidence base evaluating the effectiveness of antibiotics for treatment of acute bacterial sinusitis in children is limited and mixed. Three randomized controlled trials have assessed the effectiveness of antibiotics versus placebo for clinically diagnosed acute bacterial sinusitis in children, 2 of which have been published since the 1998 principles of judicious use of antibiotics.14,17,35 Two trials concluded that antibiotics significantly improved the likelihood of symptom resolution after both 3 and 14 days,14,35 but 1 study revealed no benefit of antibiotics over placebo.17 Key differences in the study design between these studies likely contributed to the differences in outcomes; the trials showing benefit included patients with more severe symptoms and applied more strict diagnostic criteria. This emphasizes the importance of careful attention to clinical diagnosis because antibiotics confer no clinical benefit for patients...
without diagnostic criteria suggesting acute bacterial sinusitis.

The benefit of antibiotic therapy in preventing suppurative complications, such as orbital cellulitis or intracranial abscess, is unproven. Individual efficacy trials lack the statistical power to demonstrate effectiveness against these rare complications, and a meta-analysis of randomized controlled trials in children and adults found no significant association between antibiotic use and the rate of complications.36

The AAP recommends antibiotic therapy for children with clinical features of acute bacterial sinusitis, especially those with symptoms that are worsening or severe. Observation with close follow-up or antibiotic therapy can be considered for those with persistent symptoms (>10 days).

**GAS Pharyngitis**

**Benefits**

Antibiotic treatment of acute pharyngitis has been studied with respect to the effects on symptom resolution, transmission, and prevention of complications, including rheumatic fever. Five randomized controlled studies and 1 meta-analysis have examined the effect of immediate antibiotics on resolution of symptoms, 1 of which was completed since publication of the first principles of judicious use of antibiotics.37–41 These studies provide strong evidence that antibiotic therapy for children with pharyngitis and confirmation of GAS shortens the duration of symptoms, including sore throat and headache, by approximately 1 day. These benefits are apparent within as few as 3 days. However, the benefits of antibiotic therapy on shortening duration of fever are uncertain. Although data are somewhat limited, antibiotic therapy for index cases of GAS may reduce horizontal transmission and thereby prevent secondary cases.40,42 These benefits are especially relevant in large households, child care settings, schools, and military settings.

Historically, the primary motivation for prescribing antibiotics for GAS pharyngitis was prevention of rheumatic fever. Randomized controlled trials in children before 1975 showed a four-fold benefit in preventing the onset of rheumatic fever, which occurred in approximately 3% of untreated patients.43 Although localized outbreaks have occurred in recent decades, the incidence of rheumatic fever in most developed countries has declined dramatically.44 Some of this decline might be attributable to better recognition and antibiotic treatment,45 but more likely this relates to a decline in the prevalence of rheumatogenic strains of GAS.46

Antibiotics may also have a role in preventing suppurative complications associated with GAS pharyngitis, such as peritonsillar abscess (PTA), AOM, and acute sinusitis. One meta-analysis suggested that antibiotic treatment prevents PTA; however, the majority of cases were derived from a single study conducted in 1951.45 Data from a large observational cohort conducted in the United Kingdom suggest that antibiotic treatment may prevent development of PTA, but with an NNT >4000.47

The AAP recommends antibiotic therapy for children with pharyngitis confirmed to be caused by GAS.

**Common Cold, Nonspecific URI, Acute Cough Illness, and Acute Bronchitis**

Because the predominant etiologies for these conditions are viruses, antibiotic therapy is not indicated. Because of uncertainty about the relevance of the diagnosis of acute bronchitis for children, data are limited. Nonetheless, a large meta-analysis concluded that there was no benefit to antibiotic therapy (including for delayed prescriptions) for patients with nonspecific cough and cold.48

**Harms of Antibiotic Therapy**

It is crucial to account for the potential for antibiotics to cause harm when used for treatment of URIs. The significance of potential harms should be directly balanced against the potential for benefit on a case-by-case basis. The importance of harms associated with antibiotic use is directly related to (1) an assessment of the magnitude of potential benefit (eg, greater benefit achieved for young children with bilateral AOM than unilateral) and (2) the extent to which uncertainty remains in the diagnosis. The preponderance of evidence for benefits of antibiotic therapy in treatment of bacterial URIs relates to attenuation of symptoms. When it is unclear whether the URI represents an acute bacterial infection, in general, the harms of antibiotic use have the potential to outweigh benefits. The importance of applying stringent clinical criteria to establish the diagnosis of a bacterial infection aids in differentiating children with nonspecific URI and common cold. Prescribing antibiotics for nonspecific URI and colds generally does not provide benefit and only exposes these children to potential harm.

Antibiotics are responsible for the largest number of unplanned medical visits for medication-related adverse events among children, which exceeds 150,000 per year and incurs substantial potential morbidity and cost.4 Antibiotic-associated adverse events can range from mild (diarrhea and rash), to more severe (Stevens-Johnson syndrome), to life-threatening (anaphylaxis or sudden cardiac death) reactions. Most clinical trials conducted to assess the treatment of AOM, sinusitis, and pharyngitis have used amoxicillin or amoxicillin-clavulanate,
and these remain the first-line recommended agents for antibiotic therapy for these conditions. Studies comparing antibiotic treatment to placebo for AOM suggest a modestly increased rate of adverse events among treated patients, particularly diarrhea and rash. Two meta-analyses estimated rate differences of approximately 5% for adverse events.18,52 Not included in these are the results from 2 recent trials using amoxicillin-clavulanate (older studies frequently used amoxicillin), which demonstrated even higher rates of diarrhea and dermatitis among patients receiving antibiotic therapy.19,20 Among studies of sinusitis, in the most recent trial that demonstrated a benefit of antibiotic therapy, adverse events (defined as rash, diarrhea, vomiting, and abdominal pain) occurred in 44% of patients treated with high-dose amoxicillin-clavulanate compared with 14% in the placebo group.14 The adverse events described previously occur relatively frequently, although are relatively mild in most cases. Antibiotics can produce serious allergic reactions such as Stevens-Johnson syndrome.25 There is rapidly growing evidence that antibiotic exposures early in life may disrupt the microbial balance of the intestines and other parts of the body in such a way as to contribute to long-term adverse health effects, such as inflammatory bowel disease, obesity, eczema, and asthma.49–51 A recent study highlighted the risk of sudden death in adults treated with azithromycin, likely related to drug-associated prolongation of the QT interval.24 Azithromycin is not a first-line antibiotic for any pediatric URI and is the antibiotic most likely to be used inappropriately (inadequate coverage for the most common pathogens causing AOM and sinusitis).1 The incidence of C difficile colitis in hospitalized children has increased substantially during the past decade.52 Although children with comorbid conditions are at greatest risk, community-onset infections occur,53 with recent antibiotic exposure as an important risk factor. The relationship between antibiotic exposure and development of antibiotic resistance at the level of the individual patient and at the level of the community is well established.7,8 Because of limited therapeutic options, antibiotic-resistant infections are difficult to treat and, in some cases, are associated with poor clinical outcomes.54 Application of stringent diagnostic criteria and use of therapy only when the diagnosis and potential benefits are well established is essential to minimizing the impact of antibiotic overuse on resistance in individuals and within communities.

**PRINCIPLE 3: IMPLEMENT JUDICIOUS PRESCRIBING STRATEGIES**

When evidence suggests that antibiotics may provide benefit, several aspects of judicious prescribing should be considered. These include selecting an appropriate antibiotic agent that treats the most likely pathogens (including accounting for local resistance patterns), selecting the appropriate dose, and treating for the shortest duration required. Additionally, physicians may consider the role of observation and use of delayed prescribing strategies. The treatment of AOM and acute bacterial sinusitis illustrates several key aspects of judicious antibiotic use. Amoxicillin has traditionally been the recommended first-line agent for these conditions because Streptococcus pneumoniae is the most important cause. However, in some communities, the prevalence of amoxicillin-resistant β-lactamase-producing Haemophilus influenzae among bacterial URIs has increased significantly.56 This underlies (in part) the recommendation to consider amoxicillin-clavulanate in certain instances (eg, severe symptoms, recent [<6 weeks] antibiotic exposure, known high local prevalence of amoxicillin-resistant H influenzae). It is important to note, however, that the benefits of antibiotic therapy appear to be greatest for patients with S pneumoniae infection, compared with other bacterial causes of URI, including H influenzae and Moraxella species, which may have higher rates of spontaneous resolution.19 In recognition of the possibility of a higher rate of adverse events caused by amoxicillin-clavulanate compared with amoxicillin, some physicians may choose to use amoxicillin as the first-line agent in most instances.

An understanding of local epidemiology and resistance patterns is especially important for understanding appropriate antibiotic selection. The rates of pneumococcal resistance to macrolides56 and oral third-generation cephalosporins57,58 make these agents poor choices for treating most children with suspected bacterial URIs. Emergence of macrolide resistance to GAS is also an important problem, although susceptibility testing is not routinely performed.

The role of observation (also termed “wait and see” or “delayed prescribing”) instead of immediate antibiotic therapy is an important consideration for children with AOM and acute bacterial sinusitis. Studies among patients with AOM have shown that this approach reduces antibiotic use, is well accepted by families, and, when supported by close follow-up, does not result in worse clinical outcomes.22 Observation therapy may be considered as an alternative strategy to immediate therapy for AOM and sinusitis for older patients without severe symptoms.22,23 The use of this approach is an opportunity to engage in shared decision-making with patients and families to include a discussion.
about the potential benefits and risks associated with immediate antibiotic therapy. Another important consideration for judicious antibiotic use is overall magnitude of exposure. Relatively short courses of therapy may achieve the same clinical benefits as longer courses while minimizing the risks of adverse events and development of resistance and lead to better compliance. Important examples are the use of once-daily amoxicillin for GAS pharyngitis (vs 2 or 3 times daily dosing but the same daily dose of 50 mg/kg) and short-course therapy (eg, 7 days vs 10 days) for older children with AOM.

**CONCLUSIONS**

This clinical report discusses principles of judicious antibiotic use for pediatric URIs. There is a strong emphasis on appropriate diagnosis, which is the foundation for making judicious decisions about prescribing antibiotics. Although focused on specific URIs, the main message has broader application for antibiotic use in general. These principles can be used to promote educational efforts for physicians, amplify the messages from recent clinical guidelines, assist with communication about appropriate antibiotic use to patients and families, and support local guideline development for judicious antibiotic use.

**COMMITTEE ON INFECTIOUS DISEASES, 2013–2014**

Michael T. Brady, MD, Chairperson, Red Book Associate Editor
Carrie L. Byington, MD
H. Dele Davies, MD
Kathryn M. Edwards, MD
Mary Anne Jackson, MD, Red Book Associate Editor
Yvonne A. Maldonado, MD
Dennis L. Murray, MD
Walter A. Orenstein, MD
Mobeen Rathore, MD
Mark Sawyer, MD
Gordon E. Schutze, MD
Rodney E. Willoughby, MD
Theoklis E. Zaoutis, MD

**REFERENCES**

12. Centers for Disease Control and Prevention (CDC). Invasive pneumococcal disease in...


the UK General Practice Research Database. BMJ. 2007;335(7627):982


Principles of Judicious Antibiotic Prescribing for Upper Respiratory Tract Infections in Pediatrics
Adam L. Hersh, Mary Anne Jackson, Lauri A. Hicks and the COMMITTEE ON INFECTIOUS DISEASES

Pediatrics 2013;132;1146; originally published online November 18, 2013;
DOI: 10.1542/peds.2013-3260

The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/132/6/1146.full.html