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Approximately 20 million cases of acute bacterial rhinosinusitis (ABRS) are managed annually in the United States. According to National Ambulatory Medical Care Survey (NAMCS) data, sinusitis is the fifth most common diagnosis for which an antibiotic is prescribed, and it accounted for 7-12% of all antibiotic prescriptions written from 1992 to 1999. In 1996, the primary diagnosis of sinusitis led to expenditures of approximately \$3.39 billion in the United States.¹

Given the importance and widespread prevalence of this common outpatient infection, the primary mission statement of the Year 2004 ATBS (Antibiotic Therapy for Bacterial Sinusitis) Clinical Consensus Panel & Scientific Roundtable was to assemble an academically oriented panel of national experts—investigators and clinical scholars in otolaryngology, infectious diseases, primary care medicine, and emergency medicine—to evaluate the current medical literature and national

guidelines; and then, to determine their implications for diagnostic assessment and treatment of adult patients with acute bacterial sinusitis.

This article represents the output of this scientific roundtable and outlines, in evidence-based detail, what the ATBS Consensus Panel concluded to be optimal, risk-stratified, empiric treatment recommendations for this patient population. In addition, the panel has identified key clinical findings, resistance patterns, risk factors, coexisting conditions, and other clinical triggers supporting referral of patients with ABRS to an otolaryngologist for more complex—i.e., multimodal surgical and more intensive antimicrobial—management strategies.

To generate the evidence-based recommendations presented in this report, ATBS Consensus Panel members reviewed more than 100 published studies, as well as antimicrobial resistance data and consensus guideline

Acute Bacterial Rhinosinusitis: Patient Assessment, Risk Stratification, Referral Strategies, and Outcome-Effective Antibiotic Selection

Year 2004 ATBS (Antibiotic Therapy for Bacterial Sinusitis) Clinical Consensus Panel Report[®] and Treatment Recommendations, Part I

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documents pertaining to sinusitis issued by otolaryngologists, emergency medicine specialists, and primary care physicians.

Moreover, to ensure that the ATBS Consensus Panel's recommendations were current, fairly balanced, and consistent with expert opinion and national guidelines, its members consulted and carefully analyzed recommendations and position statements issued by such associations as the American College of Physicians (ACP), the American Academy of Otolaryngology and Head and Neck Surgery (AAOHN), the Sinus and Allergy Health Partnership, the Centers for Disease Control and Prevention (CDC), and the Infectious Disease Society of America (IDSA).²⁻⁴

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Endorsed by a multi-disciplinary panel of clinical experts, the Year 2004 ATBS Clinical Consensus Report primarily is directed toward physicians faced with the challenge of managing patients with ABRS in the primary care, emergency, and urgent care settings. The ultimate goal is to provide a concise, practical, and clinically relevant schemata for day-to-day patient management in which evidence can be put into practice to optimize clinical outcomes.

—The Editor

(Dr. Bosker served as moderator of the ATBS Consensus Panel. Panel members were **Michael Armstrong, MD**, Otolaryngologist, Private Practice, Richmond, VA; **Elizabeth Blair, MD**, Department of Otolaryngology, University of Chicago Hospitals and Medical Center, Chicago, IL; **Charles Emerman, MD, FACEP**, Professor and Chairman, Department of Emergency Medicine, Case Western Reserve University, Cleveland Clinic Foundation, Cleveland, OH; **Daniel Kim, MD, FACS**, Chief, Head and Neck Surgery, Department of Otolaryngology-Head and Neck Surgery, University of Massachusetts, Worcester; **Steven Mosher, MD**, Infectious Diseases, Sharpe Clinic, San Diego, CA; **Aphrodite Papadakis, MD**, Department of Family Practice and Geriatrics, Metrohealth Medical Center, Case Western Reserve University School of Medicine, Cleveland, OH; **Isidro Pujol, DO**, Department of Internal Medicine, Mt. Sinai Medical Center, Miami, FL; **Paul Stander, MD, FACP**, Medical Director, Banner Healthcare Systems, Department of Internal Medicine, Arizona Health Science University, Phoenix; and **Gregory A. Volturo, MD, FACEP**, Vice Chairman and Associate Professor, Department of Emergency Medicine, University of Massachusetts Medical School, Worcester.)

Introduction: Background, Definitions, and Antimicrobial Treatment Issues

Acute bacterial sinusitis is one of the 10 most common diagnoses encountered in ambulatory practice and is the fifth most frequent diagnosis for which an antibiotic is prescribed. Primary care physicians frequently approach sinusitis as the manifestation of acute bacterial infection and prescribe an antibiotic in 85-98% of cases. However, sinusitis frequently is caused by viral infection and often will resolve without antibiotic treatment, even if it is bacterial in origin.¹

Acute rhinosinusitis is defined by symptom duration of fewer than four weeks. Acute bacterial sinusitis usually is a secondary infection resulting from sinus ostia obstruction, impaired mucus clearance mechanisms caused by an acute viral upper respiratory

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Table 1. Triggers for Appropriate Use of Antibiotics in Patients without Comorbid Conditions Who Have Symptoms Consistent with Acute Rhinosinusitis

Initial antibiotic therapy is not recommended for patients with the following symptoms and presentations¹⁻³

- Acute, mild, or moderate symptoms of rhinosinusitis for < 7 days duration
- Symptoms limited to nasal drainage, rhinorrhea, or nasal congestion
- Malaise in the absence of severe symptoms suggestive of rhinosinusitis
- Non-specific, non-focal facial pain or pressure
- Temperature < 101°

The following management approaches and symptom-directed therapy may be considered in the risk-stratified group described above (i.e., < 7 days duration of symptoms with no comorbid conditions)

- Antipyretics
- Analgesics (acetaminophen)
- Topical or systemic decongestants for a period of 3-5 days
- For watery discharge, an oral or nasal anticholinergic (nasal ipatropium) may be considered for symptoms of vasomotor rhinitis
- In patients with thick mucous production, consider use of thinning agent (saline spray or guaifenesin) and a decongestant to promote drainage, followed by an expectorant
- In patients with a history of allergies or environmental allergies, topical nasal steroids should be considered as they may be helpful for reducing symptoms

Antibiotic therapy should be strongly considered in patients with some or all of the findings in the following severe-category symptom group suggestive of bacterial rhinosinusitis, regardless of duration

- Temperature > 102°
- Unilateral facial pain or pressure
- Bilateral facial pain, which may suggest pan-sinusitis
- Facial erythema
- Swelling over the sinus
- Maxillary teeth pain
- Bimodal disease course

¹ Patients with symptoms suggestive of rhinosinusitis who are not improving or worsening after 2 days may be considered for antibiotic therapy.

² Stronger consideration for antibiotic therapy should be given in immunocompromised patients for symptoms of less than 7 days duration; clinical judgment should prevail in such cases, and earlier referral to ENT may be necessary.

³ The presence of comorbid conditions, recurrent rhinosinusitis, and/or an unusual or aggressive course may prompt consideration of early antibiotic therapy.

tract infection, or both. According to epidemiological estimates, only 0.2-2% of viral upper respiratory tract infections in adults are complicated by bacterial rhinosinusitis.^{1,2,5,6} The accepted standard for the definitive diagnosis of bacterial sinusitis is sinus puncture, with *Streptococcus pneumoniae* and *Haemophilus influenzae* bacteria most commonly isolated from infected maxillary sinuses. However, sinus puncture is an invasive procedure seldom performed in the primary care setting; as a result, other criteria must be evaluated as triggers for antimicrobial therapy.

Because no simple and accurate office-based test for acute bacterial sinusitis currently is available, clinicians must rely on clinical findings and historical features to confirm the diagnosis. This may be problematic, since signs and symptoms of acute bacterial sinusitis and those of prolonged viral upper respiratory tract infections are very similar, resulting in frequent misclassification of viral cases.^{5,6}

As expected, the diagnosis and management of acute bacterial sinusitis is a fiercely debated topic, with expert opinion varying

as to when antibiotic therapy is appropriate, and which antibiotics should be employed as first-line therapy. A recent set of recommendations published by the ACP concluded that most cases of acute rhinosinusitis diagnosed in ambulatory care are caused by uncomplicated viral upper respiratory tract infections, and that specific clinical triggers should be utilized to initiate antibiotic-centered management.³

Bacterial and viral rhinosinusitis are difficult to differentiate on clinical grounds. In most cases, the clinical diagnosis of ABRS should be reserved for patients with rhinosinusitis symptoms lasting seven days or more who have purulent nasal secretions and maxillary facial or tooth pain or tenderness. Patients who have mild-to-moderate symptoms of rhinosinusitis for fewer than seven days are unlikely to have bacterial infection.

With respect to patient evaluation, sinus radiography is not recommended for diagnosis in routine cases. Moreover, symptomatic treatment and reassurance are the preferred initial management strategy for patients with mild symptoms lasting fewer than seven

Table 2. Issues, Topics, and Guidelines Evaluated and Analyzed by the ATBS Clinical Consensus Panel

- Diagnostic evaluation of patients
- Risk stratification
- Principles dictating appropriate antibiotic therapy
- Clinical triggers for referral to ENT
- Clinical triggers and role for CT scanning
- Antimicrobial resistance patterns
- Duration of treatment: short-course therapy
- American College of Physician's Position Statements and Recommendations
- Adjunctive role of nasal steroids, decongestants, and antihistamines in specific subgroups
- Special considerations in patients with sinusitis with asthma
- Comorbid conditions precipitating early referral or broader spectrum therapy
- Symptomatic management
- Distinguishing between viral and bacterial etiologies

days. Antibiotic therapy, however, may be considered for patients with severe symptoms who meet the criteria for clinical diagnosis of ABRS, regardless of duration of illness. (See Table 1.)

When the 40-50% prevalence of bacterial rhinosinusitis in patients whose diagnosis is established by signs and symptoms and the modest effectiveness of antibiotic treatment were considered, a cost-effectiveness model sponsored by the Agency for Healthcare Research and Quality favored antibiotic treatment for patients with moderate-to-severe symptoms and symptomatic treatment for those with mild symptoms.^{1,3,6}

Antimicrobial Treatment Issues. There is general agreement that antibiotics should be used only when the clinical history, risk factors, and patient presentation strongly suggest bacterial rhinosinusitis. However, there is no universal consensus as to which antibiotics should be employed as first-line agents for empiric management of patients with ABRS and which antimicrobial classes—or specific agents within those classes—are more appropriately reserved for treating more invasive infections, treatment failures, and/or infections in patients with comorbid or immune-compromising conditions.^{7,8} Making such distinctions—using clinical trials, expert opinion, resistance patterns, and outcome-sensitive criteria as guideposts—was one of the mandates challenging the ATBS Consensus Panel.

In addition to such widely used agents as amoxicillin-clavulanate, doxycycline, and amoxicillin, the safety and efficacy of macrolides such as azithromycin and clarithromycin, as well as the respiratory fluoroquinolones moxifloxacin, levofloxacin, and gatifloxacin have been studied in patients with acute bacterial sinusitis.

The antibiotic selection decision can be complicated in real world practice, where medication compliance, duration of therapy, and patient convenience parameters frequently are factored into the drug selection equation for acute bacterial sinusitis and other respiratory tract infections. In fact, accumulating evidence pub-

Table 3. Risk Factors and Clinical Conditions Predisposing to and/or Associated with Bacterial Rhinosinusitis

- | | |
|--|---------------------------------------|
| • Allergy | • Immunodeficiency states |
| • Anatomic factors (septal deviation, choanal atresia) | • Malignancy (especially hematologic) |
| • Apical dental infections | • Nasal polyps |
| • Barotrauma (swimming/diving) | • Nasogastric tubes |
| • Ciliary dyskinesia | • Nasotracheal/orotracheal intubation |
| • Diabetes | • Trauma/surgery of the head and neck |
| • Foreign body | • Upper respiratory infection |
| • HIV infection | • Yellow nail syndrome |

lished in the peer-reviewed medical literature suggests that short-course (i.e., 1-, 3-, and 5-day courses of azithromycin for acute otitis media [AOM], acute bacterial exacerbations of chronic bronchitis [ABECB] and acute bacterial sinusitis, and community-acquired pneumonia [CAP], respectively) may be as effective as traditional, longer (10- to 14-day) therapeutic courses.^{2-5,7-10}

In acute bacterial sinusitis, most short-course therapy data have been generated for maxillary disease in adult patients. Regimens have included three days of azithromycin or cotrimoxazole (trimethoprim/sulfamethoxazole) or five days of cefpodoxime, telithromycin, gatifloxacin, gemifloxacin, or amoxicillin/clavulanic acid.¹¹⁻²² The ATBS Consensus Panel reviewed recent studies showing comparable clinical success rates for a three-day course of azithromycin and standard regimens of amoxicillin/clavulanate.²³ One study, in particular, has shown that three days of azithromycin (500 mg PO QD) was as effective as 10 days of amoxicillin/clavulanate (500 mg PO TID) in subjects with acute bacterial sinusitis, and that a statistically significant higher percentage of subjects completed therapy in the three-day azithromycin arm compared with the amoxicillin/clavulanate arm.²³

The potential clinical implications of such studies were evaluated by the ATBS Consensus Panel and will be discussed in more detail in the sections that follow. In this regard, many experts note that cost containment in antimicrobial therapy and sensitivity to medication compliance and patient satisfaction issues should prompt consideration of short-course therapy for the management of common bacterial respiratory tract infections, including acute bacterial sinusitis. Against the backdrop of such evidence, recent approval of a short-course (three days) regimen for acute sinusitis, and patient preference for convenient dosing, the ATBS Consensus Panel was asked to evaluate the possible role and appropriateness of short-course regimens for this condition.

Epidemiological Patterns and Drug Resistance. The ATBS Consensus Panel also noted that important changes have been occurring in the epidemiology and resistance patterns for antibiotics used as first-line therapy in patients with acute bacterial sinusitis. In particular, there is growing concern about the devel-

Table 4. Signs and Symptoms Associated with Rhinosinusitis

- Abnormal transillumination
- Cough
- Dental pain
- Facial pain (maxillary, frontal)
- Fever
- Headache
- Hyposmia/anosmia
- Nasal obstruction
- Nasal polyps
- Nasal speech
- Pain induced by forward bending
- Preceding upper respiratory infection
- Purulent nasal discharge
- Facial pressure

Table 5. Differential Diagnosis of Rhinorrhea and Nasal Congestion

- Seasonal allergic rhinitis
- Perennial allergic rhinitis
- Non-allergic rhinitis with eosinophilia
- Rhinitis medicamentosa
- Drugs/medication (prazosin, guanethidine, reserpine, cocaine)
- Mechanical/anatomic obstruction
- Cerebrospinal fluid rhinorrhea
- Pregnancy
- Hypothyroidism
- Wegener's granulomatosis
- Sinusitis (viral, bacterial, or fungal)

opment of monoclonal resistance among *S. pneumoniae* species to advanced generation fluoroquinolones, especially levofloxacin.²⁴⁻²⁷ A recent IDSA report echoes many of the cautionary statements about inappropriate use of respiratory fluoroquinolones issued by the CDC Drug-Resistant *Streptococcus pneumoniae* Working Group (CDC-DRSPWG).^{28,29}

Moreover, a number of surveillance reports have been published noting treatment failures with advanced fluoroquinolones, and recent epidemiological studies presented at the Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC) have revealed *S. pneumoniae* resistance rates to levofloxacin as high as 4.2% in states such as Massachusetts.³⁰ Because of these concerns, the CDC-DRSPWG has issued recommendations urging caution against overuse of this class of antibiotics as initial empiric therapy, except in selected patient subgroups. The IDSA Practice Update Guidelines noted explicit support for this drug selection strategy in patients with CAP; accordingly, the implications of overuse of advanced fluoroquinolones and their role as initial agents for ABRS will be discussed.^{2,7-9,31-33}

Summary. The aforementioned issues are of great interest to a wide range of emergency medicine; primary care; and ear, nose, and throat (ENT) practitioners. Consequently, it is important that clinical scholars and thought leaders generate clear, concise, and evidence-based analyses and recommendations for this commonly encountered clinical problem.

With these considerations in clear focus, the purpose of the ATBS Consensus Panel treatment guidelines is to provide evidence-based, expert-endorsed recommendations for the diagnosis and outcome-effective treatment of ABRS. To achieve its goal, the panel considered a number of clinical issues linked to diagnosis, referral strategies, and treatment options in patients with ABRS. (See Table 2.) It is their view that adherence to these guidelines will foster appropriate and effective antibiotic use, promote rational use of radiological resources for patient evaluation, suggest strategies for distinguishing between self-limited viral rhinosinusitis and bacterial infection, and identify those patients requiring prompt referral to an otolaryngologist.

Definition and Differential Diagnosis of ABRS

ABRS most often is preceded by a viral upper respiratory tract infection (URI). Allergy, trauma, dental infection, or other

factors that lead to inflammation of the nose and paranasal sinuses also may predispose individuals to ABRS. (See Table 3.) Patients with a “common cold” (viral URI) usually report some combination of the following symptoms: sneezing, rhinorrhea, nasal congestion, hyposmia/anosmia, facial pressure, postnasal drip, sore throat, cough, ear fullness, fever, and myalgia. A change in the color or the characteristic of the nasal discharge is not a specific sign of a bacterial infection. Bacterial superinfection may occur at any time during the course of a viral URI.

Most experts agree that while no historical features are perfectly predictive of bacterial involvement, from a practical—and differentiating—clinical perspective, the risk that bacterial superinfection has occurred is increased if the illness has not resolved after seven days.^{6,34,35} In general, then, a diagnosis of ABRS may be made in adults or children with symptoms of sinusitis that have not improved after seven days or have worsened after five days. Because individual cases may fall outside the boundaries of this typical range or disease progression pattern strongly suggesting bacterial infection, practicing clinicians should rely on clinical judgment when applying the principles and guidelines contained in this consensus report.

ABRS may be accompanied by some or all of the following symptoms: nasal drainage, nasal congestion, facial pressure/pain (especially when unilateral and focused in the region of a particular sinus), postnasal drainage, hyposmia/anosmia, fever, cough, fatigue, maxillary dental pain, and ear pressure/fullness. (See Table 4.) Physical examination provides limited, definitive information in the diagnosis of ABRS. Plain film radiographs and computed tomography (CT) and magnetic resonance imaging (MRI) scans are not recommended to diagnose uncomplicated cases of ABRS (see discussion in The Challenge of Patient Evaluation).^{4,36-40}

The differential diagnosis of patients with suspected ABRS includes a number of entities, among them: seasonal allergic rhinitis, perennial allergic rhinitis, non-allergic rhinitis with eosinophilia, rhinitis medicamentosa, mechanical or anatomic obstruction, cerebrospinal fluid rhinorrhea, hypothyroidism, Wegener's granulomatosis, and sinusitis of viral or fungal etiology. (See Table 5.)

Referral Triggers. While primary care and emergency medicine practitioners can manage most cases of ABRS, a small subset of patients may have physical findings, profiles, comorbid conditions, and/or presumed etiologic pathogens that will prompt

Table 6. Physical Findings, Etiologic Pathogens, and Patient Profiles Prompting Early Referral to Otolaryngologist Among Individuals with Suspected Acute Bacterial Rhinosinusitis

ETIOLOGIC AGENTS PROMPTING EARLY REFERRAL

- Suspected infection with methicillin-resistant *Staphylococcus aureus* (MRSA)
- Suspected mucormycosis infection
- Suspected *Pseudomonas* infection
- Anaerobic infection
- Infection with other unusual pathogens

PATIENT PROFILES PROMPTING EARLY REFERRAL (i.e., SUSPECTED BACTERIAL RHINOSINUSITIS OCCURRING IN THE FOLLOWING PATIENT SUBGROUPS OR IN PATIENTS WITH SPECIFIED PRE-EXISTING CONDITIONS)

- Poorly controlled diabetes
- Acute asthma exacerbation
- Cystic fibrosis
- Polyposis
- Chemotherapy
- Transplant patients
- Immunocompromised patient
- Chronic, high-dose (equivalent of > 15 mg prednisone QD) systemic steroid therapy
- Recurrent acute sinusitis
- Asthma, aspirin, polyposis syndrome

DISEASE COURSE CONSIDERATIONS

- Lower threshold for early referral and close follow-up would be prompted by failure of a single course of appropriate therapy, worsening symptoms, or failure to improve within 48-72 hours

PHYSICAL FINDINGS AND/OR CLINICAL CONSIDERATIONS

- Swelling around the eye
- Facial cellulitis
- Visual disturbances
- Asymmetrical findings
- Periorbital or neurological complication
- Bony erosion
- Enlargement of sinus cavity
- Subperiosteal abscess

early referral to an otolaryngologist for more specialized care and evaluation. (See Table 6.) In this regard, patients suspected of having infection with such etiologic agents and *Pseudomonas*, methicillin-resistant *Staphylococcus aureus* (MRSA), or fungal organisms should be referred to an otolaryngologist or infectious disease specialist for additional evaluation.

Certain patient subgroups and comorbid conditions also deserve early specialty-focused evaluation, among them: patients with poorly controlled diabetes; immunosuppression; transplant patients; patients with polyposis syndrome; and those with recurrent, acute bacterial sinusitis. Physical findings that would suggest the need for prompt referral include swelling around the eye, facial cellulitis, visual disturbances, asymmetrical findings, periorbital or neurological complications, bony erosion, enlargement of the sinus cavity, and suspicion of a subperiosteal abscess. Finally, a lower threshold for early referral and close follow-up also might be prompted by failure of a single course of appropriate therapy, worsening symptoms, or failure to improve within 48-72 hours after appropriate antimicrobial management.

Antibiotic Selection: General Principles and Considerations

The ATBS Consensus Panel concurred that appropriate use of antibiotics requires clinical confirmation of the diagnosis of ABRS based on criteria outlined in this report. (See Table 1.) In this regard, physicians should use clinical judgment when ordering radiographic modalities to evaluate patients with symptoms of rhinosinusitis, with the understanding that such modalities usually are neither required as part of an initial patient assess-

ment nor as a guide to antimicrobial management. (See Table 7.)

For acute bacterial rhinosinusitis, randomized, double-blind, placebo-controlled trials of antibiotic treatment using pretreatment and post-treatment culture of sinus aspirates are limited. Five randomized, double-blind clinical trials with good methods have compared antibiotic treatment with placebo for acute rhinosinusitis in adults.² Two recent meta-analyses, one under the auspices of the Cochrane Collaboration and the other under contract from the Agency for Healthcare Research and Quality (AHRQ), recently have been published. Both concluded that although antibiotics are statistically more efficacious than placebo for reducing or eliminating symptoms at 10 and 14 days, the effect size (degree of benefit) is relatively small. Moreover, most patients who receive placebo improve without antibiotic therapy.^{2,4} The AHRQ report pointed out that symptoms improved or resolved in 69% (CI, 57-79%) of patients by 14 days without any antibiotic treatment. When the 40-50% prevalence of bacterial rhinosinusitis in patients whose diagnosis is determined by predictive signs and symptoms and the modest effectiveness of antibiotic treatment were considered, a cost-effectiveness model sponsored by the AHRQ favored antibiotic treatment.^{3,4,6}

Deciphering the strengths, subtleties, and weaknesses of recommendations issued by different authoritative sources can be problematic and confusing for primary care physicians. Because diagnostic approaches, patient disposition practices, and treatment pathways vary among practitioners and institutions—and from region to region—there is a need to develop evidence-based, management guidelines that can be applied to many different practice settings. Unfortunately, no single set of guidelines

Table 7. Principles of Diagnosis and Evaluation in Patients with Suspected Bacterial Sinusitis

- In general, radiologic studies are not recommended as part of initial evaluation, because these studies have low specificity and there is a significant incidence of abnormal findings in patients with nonbacterial (i.e., viral) rhinosinusitis.
- Sinus x-ray films are not recommended for routine work-up of patients with rhinosinusitis.
- If imaging is considered, CT is the modality of choice.
- Indications for CT imaging studies include, but are not limited to: threatened orbital complications; ophthalmologic complications; neurological failure or focal deficits; and/or failure to resolve symptoms after maximal medical therapy.
- Routine CBC, C-reactive protein, nasal cultures, and ultrasound are not recommended as initial screening.

is applicable to every patient or practice environment; therefore, clinical judgment must prevail. This means taking into account local antibiotic resistance patterns, epidemiological and infection incidence data, and patient demographic features to make antibiotic-related decisions.

In general, the approach to antibiotic therapy in patients with ABRS usually will be empiric, and must account for a number of clinical, epidemiological, and other—sometimes unpredictable—factors related to antibiotic resistance patterns and sinus tract pathogens. As a general rule, appropriate antibiotic choices for the patient with ABRS require consideration of a specific agent that will yield a clinical cure in the patient today, while preventing or diminishing the risk of inducing drug-resistant organisms that will infect the community tomorrow. This concept of sequential selection, in which agents are chosen on the basis of such pharmaceutic criteria as the propensity for resistance induction, clinical trial evidence, cost, correct spectrum coverage, daily dose frequency, duration of therapy, side effects, drug interactions, and other outcome-sensitive criteria, has been endorsed by the ATBS Consensus Panel.

Microbiology of ABRS. The most common bacterial isolates recovered from the maxillary sinuses of patients with ABRS are *S. pneumoniae*, *H. influenzae*, and *Moraxella catarrhalis*. Other streptococcal species, anaerobic bacteria, and *Staphylococcus aureus* are found in a small percentage of cases. The increasing prevalence of penicillin nonsusceptible isolates of *S. pneumoniae* is a problem in the United States. In 1998, 16.1% and 28.6% of outpatient respiratory isolates were penicillin-intermediate. A review of sinus aspiration studies that have been performed in adults with ABRS showed that *S. pneumoniae* is isolated in approximately 20-43% of aspirates, *H. influenzae* in 22-35%, and *M. catarrhalis* in 2-10%. In children with ABRS, *S. pneumoniae* is isolated in approximately 35-42%, whereas *H. influenzae* and *M. catarrhalis* each are recovered from about 21-28% of aspirates. *Streptococcus pyogenes* and anaer-

obes account for 3-7%.⁴¹⁻⁴⁵ Other bacterial isolates found in patients with ABRS include *S. aureus* and anaerobes.^{1-3,7,46,47}

Indications for Antibiotic Therapy in ABRS. Because of concerns about inappropriate and/or overuse of antibiotics, the ATBS Consensus Panel articulated specific triggers that support antimicrobial therapy in patients without comorbid conditions who have symptoms consistent with ABRS. (See Table 1.) Generally, in the absence of other compelling factors supporting antimicrobial treatment, initial antibiotic therapy is *not* recommended for patients with acute, mild-to-moderate symptoms of rhinosinusitis for fewer than seven days duration that are limited to the following: 1) nasal drainage, rhinorrhea, or nasal congestion; 2) malaise in the absence of severe symptoms suggestive of rhinosinusitis; 3) non-specific, non-focal facial pain or pressure; or 4) temperature less than 101°. Patients with the aforementioned symptoms suggestive of rhinosinusitis who are not improving or who are worsening after 2-3 days also may be considered for antibiotic therapy. The presence of comorbid conditions, recurrent rhinosinusitis, and/or an unusual or aggressive course may prompt consideration of early antibiotic therapy.

Even when antibiotics are not employed, a number of management approaches focused on symptom-directed therapy should be considered in the risk-stratified group described above (i.e., fewer than seven days duration of symptoms with no comorbid conditions). Among such interventions, antipyretics, analgesics, topical or systemic decongestants, mucous-thinning agents, and nasal steroids may be considered. (See Tables 1 and 8.)

Antibiotic therapy strongly should be considered in patients with some or all of the findings in the following severe-category ABRS symptom group, regardless of duration of symptoms. Put another way, even when the following symptoms are present for fewer than seven days, patients should be considered candidates for antibiotic treatment with: 1) temperature higher than 102°; 2) unilateral facial pain or pressure; 3) bilateral facial pain, which may suggest pan-sinusitis; 4) facial erythema; 5) swelling over the sinus; 6) maxillary teeth pain; or 7) bimodal disease course. Stronger consideration for antibiotic therapy also should be given in immunocompromised patients with symptoms of fewer than seven days duration. Clinical judgment should prevail in such cases, and earlier referral to an otolaryngologist may be necessary.

Antibiotic Selection: Overview and General Principles. Based on the current clinical studies and epidemiological data, the principal pathogens that must be covered on an empiric basis in adults with bacterial rhinosinusitis include: *S. pneumoniae*, *H. influenzae*, and *M. catarrhalis*. The 1998 outpatient U.S. prevalence of beta-lactamase-producing isolates of *M. catarrhalis* was 98%. More than 90% of isolates of *M. catarrhalis* were resistant to TMP/SMX (trimethoprim/sulfamethoxazole). All the isolates of *M. catarrhalis* were susceptible to amoxicillin/clavulanate, cefixime, fluoroquinolones, and macrolides/azalides.^{1-4,48}

A smaller percentage of patients will have infection with anaerobic organisms, *S. aureus*, and other streptococcal species. The ATBS Consensus Panel noted that there may be a “disconnect” (i.e., an incompletely understood and not entirely predictable relationship) between an antibiotic’s minimum inhibito-

Table 8. General Management Principles and Adjunctive Treatment Recommendations for Patients with Upper Respiratory Tract Infections and Sinusitis*

- Appropriate prescribing and use of antibiotics will help reduce the development of antimicrobial drug resistance. Most Americans will encounter 4-6 upper respiratory tract infections per year. The overwhelming majority of these infections will resolve in 7-10 days without antibiotic treatment.
- Patients should be made aware that a typical cold begins with symptoms of itching, sneezing, and watery drainage. Fever and malaise are possible. After 3 or 4 days, the watery nasal drainage becomes thicker and often discolored. It begins to drain down the back of the throat and often results in a cough. The cough may linger beyond a week, even after the nasal symptoms have resolved.
- Antibiotic therapy may be prescribed if symptoms extend beyond a week, if symptoms are severe, or if patients have a compromised immune system.
- Although there is very little that patients can do to shorten the course of a common cold or symptoms of rhinosinusitis associated with a viral infection, there are several fundamental treatments available at home and over-the-counter to reduce symptoms during the acute phase of the illness.
- Many of the treatments described below are available in combination form. Because symptoms will occur at different times during the illness, patients may need to have several individual medications available rather than one combination treatment that is designed for symptoms that may not be present at any particular time during the infection.

TREATMENT OPTIONS

1. Rest, fluids, and good nutrition are critical to maintaining maximum immune function for combating any medical illness. Although there is limited evidence supporting the use of large doses of vitamins, it is very clear that vitamin and other nutritional deficiencies can significantly impair immune function.
2. Antihistamines are most commonly indicated for patients with allergies. These medications tend to dry nasal secretions and may suppress itching and sneezing during the first few days of upper respiratory tract infections. There are several brands available on the market. Loratadine and most of the prescription brands are less sedating than the older generic antihistamines.
3. Decongestants open the nasal passages so patients can breathe more freely and secretions can drain more easily. Topical decongestants like oxymetazoline and phenylephrine have a risk of rebound nasal congestion. They also can become habit forming if used for longer than five days. Pseudoephedrine is an oral decongestant that has less rebound potential, but does have a higher potential to raise blood pressure or cause urinary retention.
4. Guaifenesin is an expectorant used to promote increased nasal secretions. This will loosen thick nasal or bronchial secretions and allow better drainage. Guaifenesin is only effective if consumed with adequate amounts of water, usually at least two glasses of water with every meal.
5. Non-medicated nasal saline is available over-the-counter or can be mixed at home by adding one-half teaspoon of salt and one-half teaspoon of baking soda to 8 oz. of warm water. This may be sniffed or sprayed into the nose to dissolve and wash away germs and thickened sections. Nasal saline spray may be used liberally regardless of other medical conditions.
6. Cough suppressants usually contain dextromethorphan or another mild narcotic. These are not habit forming unless used in high doses for extended periods of time. Prolonged coughing could be an indication of a serious medical disorder. Coughing that persists for longer than two weeks should undergo more thorough evaluation.
7. Analgesics such as acetaminophen, ibuprofen, and naproxen can greatly reduce the aches and pains of a respiratory tract infection, reduce fever, and enhance a general sense of wellness. Some of these are combined with caffeine as an additional stimulant. Although these drugs are useful for helping patients accomplish what needs to be done during the day, patients should be counseled that plenty of rest, fluids, and good nutrition will strengthen host response more than any of these other symptomatic medications; and if symptoms are getting worse or are not improving after a week, patients should be reevaluated.

* Physicians are given permission to copy this table and use as patient education materials in appropriate settings.

Table 9. Acute Bacterial Rhinosinusitis: Adult Treatment Guidelines
Otherwise Healthy Patients Without Comorbid Conditions with > 7 Days of Persistent Symptoms
or < 7 days² of Severe Symptoms¹ Suggestive of Bacterial Rhinosinusitis

FIRST-LINE ANTIBIOTIC THERAPY⁷

Amoxicillin/clavulanate extended release 2000 mg/125 mg PO BID x 10 days³
 (Alternative: amoxicillin/clavulanate 500 mg/125 mg PO TID x 10 days)
 OR
 Amoxicillin 875 mg PO BID x 10-14 days⁴
 OR
 Azithromycin 500 mg PO QD x 3 days

FIRST-LINE ALTERNATIVE ANTIBIOTIC THERAPY

Moxifloxacin^{5,8} 400 mg PO QD x 10 days (preferred fluoroquinolone)
 OR
 Levofloxacin⁵ 500 mg PO QD x 10-14 days
 OR
 Clarithromycin 500 mg PO BID x 14 days
 OR
 Doxycycline 100 mg PO BID x 10-14 days⁶

¹ One or more severe symptoms present for less than 7 days which may prompt early antibiotic therapy may include the following: temperature > 102°; unilateral facial pain or pressure; bilateral facial pain, which may suggest pan-sinusitis; facial erythema; swelling over the sinus; maxillary teeth pain; and/or bimodal disease course.

² Stronger consideration for initiating prompt antibiotic therapy should be given in the case of immunocompromised patients with symptoms of less than 7 days duration; clinical judgment should prevail in such cases, and earlier referral to ENT may be necessary.

³ Other beta-lactam antibiotics also may be considered, among them: cefpodoxime, cefuroxime, loracarbef, and ceftibuten.

⁴ Because of increasing resistance to amoxicillin among *S. pneumoniae* isolates from patients with bacterial respiratory tract infections, high-dose amoxicillin therapy is recommended for treatment of acute bacterial rhinosinusitis in adults. In addition, amoxicillin also is preferred as an initial agent when acquisition of the antibiotic may be compromised by cost considerations, resulting in medication noncompliance.

⁵ Fluoroquinolones are effective and safe agents for the treatment of acute bacterial rhinosinusitis, and produce similar outcomes when evaluated against comparator agents. However, recent practice guidelines for bacterial respiratory tract infections from the Infectious Disease Society of America (IDSA) and Centers for Disease Control and Prevention (CDC) note that effecting positive outcomes with potent, excessively broad-spectrum agents must be balanced against the pitfalls of inducing resistance to such agents, especially fluoroquinolones. In its Dec. 1, 2003, Practice Update Guidelines for community-acquired pneumonia (CAP), the IDSA committee expressed concern about misuse and overuse of fluoroquinolones, noting that if abuse of this class of drugs continues unabated, we may see the demise of fluoroquinolones as useful antibiotics within the next 5-10 years (*Clin Infect Dis.* 2003;37:1405-1433).

⁶ Doxycycline should be considered as an alternative agent when acquisition of the antibiotic may be compromised by cost considerations, resulting in medication noncompliance.

⁷ If a patient with presumed acute bacterial rhinosinusitis has received a previous course of antimicrobial therapy with either a beta-lactam (cefuroxime, amoxicillin, amoxicillin/clavulanate, etc.) or a macrolide within the past 3 months, excluding the current episode, a respiratory fluoroquinolone (i.e., moxifloxacin, levofloxacin) is recommended as the initial treatment. Conversely, recent use of a fluoroquinolone should dictate use of either an advanced generation macrolide (azithromycin or clarithromycin) or a beta-lactam (amoxicillin/clavulanate).

⁸ Among the advanced generation, respiratory fluoroquinolones, moxifloxacin is preferred because it has lower minimum inhibitory concentration levels against *S. pneumoniae* than levofloxacin, and because it has a more narrow (gram-positive organism-focused) spectrum of coverage.

ry concentration (MIC) level against a specific organism and its capacity for producing satisfactory clinical outcomes in the real world. This “disconnect” may be explained by the unique qualities of an antimicrobial, such as sinus tissue penetration and/or pharmacokinetics, patient medication compliance, and other incompletely understood factors.

For the most part, clinical trials comparing the safety and efficacy of advanced generation macrolides, respiratory fluoroquinolones (i.e., moxifloxacin, levofloxacin, and gatifloxacin), and beta-lactams (i.e., amoxicillin/clavulanate, cefuroxime, cefpodoxime) have demonstrated generally comparable outcomes in terms of clinical cure and bacteriologic eradication rates in outpatients with acute sinusitis.^{6,11,12,18-23,49-51} Differences in trial

design have made it difficult to draw firm, agent-specific comparisons among available agents. It should be noted, however, that emergence of resistance among *S. pneumoniae* species to new generation fluoroquinolones has been reported in a number of geographic regions, including the United States, Hong Kong, and Canada; this may have implications for treatment.^{24-27,31-33}

Based on these findings, The CDC-DRSPWG and IDSA have cautioned against overuse of new generation fluoroquinolones in outpatients with CAP. The ATBS Consensus Panel concurs that it is reasonable to extend these concerns to patients with acute sinusitis, while recognizing that a certain, risk-stratified subset of patients (i.e., those with drug-resistant *S. pneumoniae* [DRSP] infection, gram-negative infection, and

Table 10. Acute Bacterial Rhinosinusitis: Adult Treatment Guidelines for Special Populations Patients with Comorbid Conditions, Infection with Drug-Resistant *S. pneumoniae* or Gram-Negative Organisms, Invasive Infection, and/or Immunosuppression

FIRST-LINE ANTIBIOTIC THERAPY

Moxifloxacin 400 mg PO QD x 10 days
OR
Levofloxacin 500 mg PO QD x 10-14 days

FIRST-LINE ALTERNATIVE ANTIBIOTIC THERAPY

Amoxicillin/clavulanate extended release 2000 mg/125 mg PO BID x 10 days¹
(Alternative: amoxicillin/clavulanate 500 mg/125 mg PO TID x 10 days)

¹ Other beta-lactam antibiotics also may be considered, among them: cefpodoxime, cefuroxime, loracarbef, and ceftibuten.

previous treatment failure with macrolides and/or beta-lactams) are suitable and appropriate candidates for initial, empiric therapy with respiratory fluoroquinolones.^{24-27,31-33}

The ATBS Consensus Panel evaluated issues and concerns surrounding antibiotic overuse, the potential for inducing drug resistance in the fluoroquinolone class, and the need to identify correct spectrum antibiotics with coverage patterns matching pathogens most likely to be encountered in patients with ABRS. The antibiotic selection process also should account for outcome-sensitive criteria such as cost, daily dose frequency, duration of therapy, side effects, patient tolerability, and drug interactions.

Based on such an aggregate analysis—one that accounts for the multiplicity of factors that go into the drug selection equation—the ATBS Consensus Panel recommends as first-line (preferred) initial, empiric therapy in otherwise healthy adult patients with acute bacterial rhinosinusitis who do not have comorbid conditions, the following agents: azithromycin; amoxicillin/clavulanate; or, when cost considerations predominate, high-dose amoxicillin therapy. (See Table 9.) As alternative first-line therapy, the panel recommends moxifloxacin (the preferred fluoroquinolone) or levofloxacin; other options include clarithromycin, gatifloxacin, or doxycycline. Among the advanced generation fluoroquinolones, moxifloxacin is preferred by the ATBS Consensus Panel as the initial fluoroquinolone of choice in ABRS because it has the most favorable MICs against *S. pneumoniae* and a more focused spectrum of coverage against gram-positive organisms than levofloxacin or gatifloxacin.⁵²⁻⁵⁴

The ATBS Consensus Panel emphasizes that some patients with ABRS present with more severe disease or have comorbid conditions that necessitate more intensive antibiotic therapy. In patients with comorbid conditions or immune system compromise or who are at risk for DRSP or more invasive infection, the panel recommends advanced generation fluoroquinolones such as moxifloxacin and levofloxacin as initial first-line therapy; amoxicillin/clavulanate and other beta-lactams may be considered for alternative first-line therapy. (See Table 10.) In those selected cases in which a sinus puncture has yielded an infecting organism, antibiotic therapy should be pathogen-directed and based on culture sensitivities.

The ATBS Consensus Panel recognizes that, in the final analysis, the choice of an antibiotic in any individual patient with ABRS will depend upon the clinician's assessment and judgment, local resistance trends, and established institutional or practice pathways that have been developed for this infection. As a result, the treatment guidelines recommended in this report are intended only as a guide; selection strategies that deviate from those recommended by the panel may represent acceptable, safe, and effective approaches to patient management.

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Physician CME Questions

81. Acute rhinosinusitis is defined by which of the following?
- Symptom duration of fewer than four weeks
 - Secondary infection resulting from sinus ostia obstruction
 - Maxillary facial or tooth pain
 - Purulent nasal secretions
82. The accepted standard for the definitive diagnosis of bacterial sinusitis is sinus puncture. Which of the following bacteria is (are) most commonly isolated from the infected maxillary sinuses?
- Staphylococcus aureus*
 - Streptococcus pneumoniae* and *Haemophilus influenzae*
 - Pseudomonas*
 - Streptococcus pyogenes*
83. In most cases, the clinical diagnosis of acute bacterial rhinosinusitis (ABRS) should be reserved for patients with which of the following rhinosinusitis symptoms?
- Symptoms lasting seven days or more
 - Purulent nasal secretions
 - Maxillary facial or tooth pain or tenderness
 - All of the above
84. A change in the color or the characteristic of the nasal discharge generally is regarded as a specific sign of a bacterial infection.
- True
 - False
85. The ATBS Consensus Panel recommends which of the following agents as first-line initial empiric therapy in otherwise healthy adult patients with ABRS who do not have comorbid conditions?
- Azithromycin
 - Amoxicillin/clavulanate
 - High-dose amoxicillin
 - All of the above
86. Which of the following is/are *not* recommended as components of the initial screening of a patient with suspected bacterial sinusitis?
- Complete blood count
 - Ultrasound
 - Nasal cultures
 - All of the above
87. Radiologic studies, due to their high specificity and low incidence of abnormal findings, are widely recommended as part of initial evaluation in patients with suspected bacterial sinusitis.
- True
 - False
88. The presence of which of the following may prompt early antibiotic therapy in selected patients according to individual circumstances and clinical judgment?
- Symptoms for three days
 - Nasal drainage
 - Immunosuppression
 - Rhinorrhea
89. Which of the following factors is/are associated with bacterial rhinosinusitis?
- Nasal polyps
 - Allergy
 - Immunodeficiency
 - Barotrauma
 - All of the above
90. The ATBS Consensus Panel recommends which of the following as initial first-line therapy for patients with comorbid conditions or immune system compromise or who are at risk for DRSP or more invasive infection?
- Advanced generation fluoroquinolones such as moxifloxacin and levofloxacin
 - Amoxicillin/clavulanate
 - Azithromycin
 - High-dose amoxicillin

Answer key: 81. A; 82. B; 83. D; 84. B; 85. D; 86. D; 87. B; 88. C; 89. E; 90. A

In Future Issues:

Acute Bacterial Rhinosinusitis, Part II

CME Objectives

To help physicians:

- quickly recognize or increase index of suspicion for specific conditions;
- understand the epidemiology, etiology, pathophysiology, and clinical features of the entity discussed;
- apply state-of-the-art diagnostic and therapeutic techniques (including the implications of pharmaceutical therapy discussed) to patients with the particular medical problems discussed;
- understand the differential diagnosis of the entity discussed;
- understand both likely and rare complications that may occur.

CME Instructions

Physicians participate in this continuing medical education program by reading the article, using the provided references for further research, and studying the questions at the end of the article. Participants should select what they believe to be the correct answers, then refer to the list of correct answers to evaluate their knowledge. To clarify confusion surrounding any questions answered incorrectly, please consult the source material. *After completing this activity, you must complete the evaluation form that will be provided at the end of the semester and return it in the reply envelope provided to receive a certificate of completion.* When your evaluation is received, a certificate will be mailed to you.

Triggers for Appropriate Use of Antibiotics in Patients without Comorbid Conditions Who Have Symptoms Consistent with Acute Rhinosinusitis

Initial antibiotic therapy is not recommended for patients with the following symptoms and presentations¹⁻³

- Acute, mild, or moderate symptoms of rhinosinusitis for < 7 days duration
- Symptoms limited to nasal drainage, rhinorrhea, or nasal congestion
- Malaise in the absence of severe symptoms suggestive of rhinosinusitis
- Non-specific, non-focal facial pain or pressure
- Temperature < 101°

The following management approaches and symptom-directed therapy may be considered in the risk-stratified group described above (i.e., < 7 days duration of symptoms with no comorbid conditions)

- Antipyretics
- Analgesics (acetaminophen)
- Topical or systemic decongestants for a period of 3-5 days
- For watery discharge, an oral or nasal anticholinergic (nasal ipratropium) may be considered for symptoms of vasomotor rhinitis
- In patients with thick mucous production, consider use of thinning agent (saline spray or guaifenesin) and a decongestant to promote drainage, followed by an expectorant
- In patients with a history of allergies or environmental allergies, topical nasal steroids should be considered as they may be helpful for reducing symptoms

Antibiotic therapy should be strongly considered in patients with some or all of the findings in the following severe-category symptom group suggestive of bacterial rhinosinusitis, regardless of duration

- Temperature > 102°
- Unilateral facial pain or pressure
- Bilateral facial pain, which may suggest pan-sinusitis
- Facial erythema
- Swelling over the sinus
- Maxillary teeth pain
- Bimodal disease course

¹ Patients with symptoms suggestive of rhinosinusitis who are not improving or worsening after 2 days may be considered for antibiotic therapy.

² Stronger consideration for antibiotic therapy should be given in immunocompromised patients for symptoms of less than 7 days duration; clinical judgment should prevail in such cases, and earlier referral to ENT may be necessary.

³ The presence of comorbid conditions, recurrent rhinosinusitis, and/or an unusual or aggressive course may prompt consideration of early

Issues, Topics, and Guidelines Evaluated and Analyzed by the ATBS Clinical Consensus Panel

- Diagnostic evaluation of patients
- Risk stratification
- Principles dictating appropriate antibiotic therapy
- Clinical triggers for referral to ENT
- Clinical triggers and role for CT scanning
- Antimicrobial resistance patterns
- Duration of treatment: short-course therapy
- American College of Physician's Position Statements and Recommendations
- Adjunctive role of nasal steroids, decongestants, and antihistamines in specific subgroups
- Special considerations in patients with sinusitis with asthma
- Comorbid conditions precipitating early referral or broader spectrum therapy
- Symptomatic management
- Distinguishing between viral and bacterial etiologies

Risk Factors and Clinical Conditions Predisposing to and/or Associated with Bacterial Rhinosinusitis

- Allergy
- Anatomic factors (septal deviation, choanal atresia)
- Apical dental infections
- Barotrauma (swimming/diving)
- Ciliary dyskinesia
- Diabetes
- Foreign body
- HIV infection
- Immunodeficiency states
- Malignancy (especially hematologic)
- Nasal polyps
- Nasogastric tubes
- Nasotracheal/orotracheal intubation
- Trauma/surgery of the head and neck
- Upper respiratory infection
- Yellow nail syndrome

General Management Principles and Adjunctive Treatment Recommendations for Patients with Upper Respiratory Tract Infections and Sinusitis*

- Appropriate prescribing and use of antibiotics will help reduce the development of antimicrobial drug resistance. Most Americans will encounter 4-6 upper respiratory tract infections per year. The overwhelming majority of these infections will resolve in 7-10 days without antibiotic treatment.
- Patients should be made aware that a typical cold begins with symptoms of itching, sneezing, and watery drainage. Fever and malaise are possible. After 3 or 4 days, the watery nasal drainage becomes thicker and often discolored. It begins to drain down the back of the throat and often results in a cough. The cough may linger beyond a week, even after the nasal symptoms have resolved.
- Antibiotic therapy may be prescribed if symptoms extend beyond a week, if symptoms are severe, or if patients have a compromised immune system.
- Although there is very little that patients can do to shorten the course of a common cold or symptoms of rhinosinusitis associated with a viral infection, there are several fundamental treatments available at home and over-the-counter to reduce symptoms during the acute phase of the illness.
- Many of the treatments described below are available in combination form. Because symptoms will occur at different times during the illness, patients may need to have several individual medications available rather than one combination treatment that is designed for symptoms that may not be present at any particular time during the infection.

TREATMENT OPTIONS

1. Rest, fluids, and good nutrition are critical to maintaining maximum immune function for combating any medical illness. Although there is limited evidence supporting the use of large doses of vitamins, it is very clear that vitamin and other nutritional deficiencies can significantly impair immune function.
2. Antihistamines are most commonly indicated for patients with allergies. These medications tend to dry nasal secretions and may suppress itching and sneezing during the first few days of upper respiratory tract infections. There are several brands available on the market. Loratadine and most of the prescription brands are less sedating than the older generic antihistamines.
3. Decongestants open the nasal passages so patients can breathe more freely and secretions can drain more easily. Topical decongestants like oxymetazoline and phenylephrine have a risk of rebound nasal congestion. They also can become habit forming if used for longer than five days. Pseudoephedrine is an oral decongestant that has less rebound potential, but does have a higher potential to raise blood pressure or cause urinary retention.
4. Guaifenesin is an expectorant used to promote increased nasal secretions. This will loosen thick nasal or bronchial secretions and allow better drainage. Guaifenesin is only effective if consumed with adequate amounts of water, usually at least two glasses of water with every meal.
5. Non-medicated nasal saline is available over-the-counter or can be mixed at home by adding one-half teaspoon of salt and one-half teaspoon of baking soda to 8 oz. of warm water. This may be sniffed or sprayed into the nose to dissolve and wash away germs and thickened secretions. Nasal saline spray may be used liberally regardless of other medical conditions.
6. Cough suppressants usually contain dextromethorphan or another mild narcotic. These are not habit forming unless used in high doses for extended periods of time. Prolonged coughing could be an indication of a serious medical disorder. Coughing that persists for longer than two weeks should undergo more thorough evaluation.
7. Analgesics such as acetaminophen, ibuprofen, and naproxen can greatly reduce the aches and pains of a respiratory tract infection, reduce fever, and enhance a general sense of wellness. Some of these are combined with caffeine as an additional stimulant. Although these drugs are useful for helping patients accomplish what needs to be done during the day, patients should be counseled that plenty of rest, fluids, and good nutrition will strengthen host response more than any of these other symptomatic medications; and if symptoms are getting worse or are not improving after a week, patients should be reevaluated.

* Physicians are given permission to copy this table and use as patient education materials in appropriate settings.

Signs and Symptoms Associated with Rhinosinusitis

- Abnormal transillumination
- Cough
- Dental pain
- Facial pain (maxillary, frontal)
- Fever
- Headache
- Hyposmia/anosmia
- Nasal obstruction
- Nasal polyps
- Nasal speech
- Pain induced by forward bending
- Preceding upper respiratory infection
- Purulent nasal discharge
- Facial pressure

Differential Diagnosis of Rhinorrhea and Nasal Congestion

- Seasonal allergic rhinitis
- Perennial allergic rhinitis
- Non-allergic rhinitis with eosinophilia
- Rhinitis medicamentosa
- Drugs/medication (prazosin, guanethidine, reserpine, cocaine)
- Mechanical/anatomic obstruction
- Cerebrospinal fluid rhinorrhea
- Pregnancy
- Hypothyroidism
- Wegener's granulomatosis
- Sinusitis (viral, bacterial, or fungal)

Principles of Diagnosis and Evaluation in Patients with Suspected Bacterial Rhinosinusitis

- In general, radiologic studies are not recommended as part of initial evaluation, because these studies have low specificity and there is a significant incidence of abnormal findings in patients with nonbacterial (i.e., viral) rhinosinusitis.
- Sinus x-ray films are not recommended for routine work-up of patients with rhinosinusitis.
- If imaging is considered, CT is the modality of choice.
- Indications for CT imaging studies include, but are not limited to: threatened orbital complications; ophthalmologic complications; neurological failure or focal deficits; and/or failure to resolve symptoms after maximal medical therapy.
- Routine CBC, C-reactive protein, nasal cultures, and ultrasound are not recommended as initial screening.

Acute Bacterial Rhinosinusitis: Adult Treatment Guidelines for Special Populations: Patients with Comorbid Conditions, Infection with Drug-Resistant *S. pneumoniae* or Gram-Negative Organisms, Invasive Infection, and/or Immunosuppression

FIRST-LINE ANTIBIOTIC THERAPY

Moxifloxacin 400 mg PO QD x 10 days
OR
Levofloxacin 500 mg PO QD x 10-14 days

FIRST-LINE ALTERNATIVE ANTIBIOTIC THERAPY

Amoxicillin/clavulanate extended release 2000 mg/125 mg PO BID x 10 days¹
(Alternative: amoxicillin/clavulanate 500 mg/125 mg PO TID x 10 days)

¹ Other beta-lactam antibiotics also may be considered, among them: cefpodoxime, cefuroxime, loracarbef, and cefibuten.

Acute Bacterial Rhinosinusitis: Adult Treatment Guidelines: Otherwise Healthy Patients Without Comorbid Conditions with > 7 Days of Persistent Symptoms or < 7 days² of Severe Symptoms¹ Suggestive of Bacterial Rhinosinusitis

FIRST-LINE ANTIBIOTIC THERAPY⁷

Amoxicillin/clavulanate extended release 2000 mg/125 mg PO BID x 10 days³
(Alternative: amoxicillin/clavulanate 500 mg/125 mg PO TID x 10 days)
OR
Amoxicillin 875 mg PO BID x 10-14 days⁴
OR
Azithromycin 500 mg PO QD x 3 days

FIRST-LINE ALTERNATIVE ANTIBIOTIC THERAPY

Moxifloxacin^{5,8} 400 mg PO QD x 10 days (preferred fluoroquinolone)
OR
Levofloxacin⁵ 500 mg PO QD x 10-14 days
OR
Clarithromycin 500 mg PO BID x 14 days
OR
Doxycycline 100 mg PO BID x 10-14 days⁶

¹ One or more severe symptoms present for less than 7 days which may prompt early antibiotic therapy may include the following: temperature > 102°; unilateral facial pain or pressure; bilateral facial pain, which may suggest pan-sinusitis; facial erythema; swelling over the sinus; maxillary teeth pain; and/or bimodal disease course.

² Stronger consideration for initiating prompt antibiotic therapy should be given in the case of immunocompromised patients with symptoms of less than 7 days duration; clinical judgment should prevail in such cases, and earlier referral to ENT may be necessary.

³ Other beta-lactam antibiotics also may be considered, among them: cefpodoxime, cefuroxime, loracarbef, and cefibuten.

⁴ Because of increasing resistance to amoxicillin among *S. pneumoniae* isolates from patients with bacterial respiratory tract infections, high-dose amoxicillin therapy is recommended for treatment of acute bacterial rhinosinusitis in adults. In addition, amoxicillin also is preferred as an initial agent when acquisition of the antibiotic may be compromised by cost considerations, resulting in medication noncompliance.

⁵ Fluoroquinolones are effective and safe agents for the treatment of acute bacterial rhinosinusitis, and produce similar outcomes when evaluated against comparator agents. However, recent practice guidelines for bacterial respiratory tract infections from the Infectious Disease Society of America (IDSA) and Centers for Disease Control and Prevention (CDC) note that effecting positive outcomes with potent, excessively broad-spectrum agents must be balanced against the pitfalls of inducing resistance to such agents, especially fluoroquinolones. In its Dec. 1, 2003, Practice Update Guidelines for community-acquired pneumonia (CAP), the IDSA committee expressed concern about misuse and over-use of fluoroquinolones, noting that if abuse of this class of drugs continues unabated, we may see the demise of fluoroquinolones as useful antibiotics within the next 5-10 years (*Clin Infect Dis.* 2003;37:1405-1433).

⁶ Doxycycline should be considered as an alternative agent when acquisition of the antibiotic may be compromised by cost considerations, resulting in medication noncompliance.

⁷ If a patient with presumed acute bacterial rhinosinusitis has received a previous course of antimicrobial therapy with either a beta-lactam (cefuroxime, amoxicillin, amoxicillin/clavulanate, etc.) or a macrolide within the past 3 months, excluding the current episode, a respiratory fluoroquinolone (i.e., moxifloxacin, levofloxacin) is recommended as the initial treatment. Conversely, recent use of a fluoroquinolone should dictate use of either an advanced generation macrolide (azithromycin or clarithromycin) or a beta-lactam (amoxicillin/clavulanate).

⁸ Among the advanced generation, respiratory fluoroquinolones, moxifloxacin is preferred because it has lower minimum inhibitory concentration levels against *S. pneumoniae* than levofloxacin, and because it has a more narrow (gram-positive organism-focused) spectrum of coverage.

Physical Findings, Etiologic Pathogens, and Patient Profiles Prompting Early Referral to Otolaryngologist Among Individuals with Suspected Acute Bacterial Rhinosinusitis

ETIOLOGIC AGENTS PROMPTING EARLY REFERRAL

- Suspected infection with methicillin-resistant *Staphylococcus aureus* (MRSA)
- Suspected mucormycosis infection
- Suspected *Pseudomonas* infection
- Anaerobic infection
- Infection with other unusual pathogens

PATIENT PROFILES PROMPTING EARLY REFERRAL (i.e., SUSPECTED BACTERIAL RHINOSINUSITIS OCCURRING IN THE FOLLOWING PATIENT SUBGROUPS OR IN PATIENTS WITH SPECIFIED PRE-EXISTING CONDITIONS)

- Poorly controlled diabetes
- Acute asthma exacerbation
- Cystic fibrosis
- Polyposis
- Chemotherapy
- Transplant patients
- Immunocompromised patient
- Chronic, high-dose (equivalent of > 15 mg prednisone QD) systemic steroid therapy
- Recurrent acute sinusitis
- Asthma, aspirin, polyposis syndrome

DISEASE COURSE CONSIDERATIONS

- Lower threshold for early referral and close follow-up would be prompted by failure of a single course of appropriate therapy, worsening symptoms, or failure to improve within 48-72 hours

PHYSICAL FINDINGS AND/OR CLINICAL CONSIDERATIONS

- Swelling around the eye
- Facial cellulitis
- Visual disturbances
- Asymmetrical findings
- Periorbital or neurological complication
- Bony erosion
- Enlargement of sinus cavity
- Subperiosteal abscess

Supplement to *Emergency Medicine Reports*, April 19, 2004: "Acute Bacterial Rhinosinusitis: Patient Assessment, Risk Stratification, Referral Strategies, and Outcome-Effective Antibiotic Selection—Year 2004 ATBS (Antibiotic Therapy for Bacterial Sinusitis) Clinical Consensus Panel Report® and Treatment Recommendations, Part I." Author: Gideon Bosker, MD, Assistant Clinical Professor, Section of Emergency Services, Yale University School of Medicine; Editor-in-Chief, Clinical Consensus Reports®, writing on behalf of the ATBS Clinical Consensus Panel. *Emergency Medicine Reports' "Rapid Access Guidelines"* Copyright © 2004 Thomson American Health Consultants, Atlanta, GA. Editor-in-Chief: Gideon Bosker, MD. Vice President and Group Publisher: Brenda L. Mooney. Editorial Group Head: Valerie Loner. Managing Editor: Allison Mechem. For customer service, call: 1-800-688-2421. This is an educational publication designed to present scientific information and opinion to health care professionals. It does not provide advice regarding medical diagnosis or treatment for any individual case. Not intended for use by the layman.