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In part II of this two-part series, the Antibiotic Therapy in Bacterial Sinusitis (ATBS) Clinical Consensus Panel outlines risk-directed strategies for management of patients with acute bacterial rhinosinusitis. Outlining specific symptomatic, historical, and host criteria that prompt empiric antibiotic therapy, and a sequencing strategy for antimicrobial drug selection, this review provides practical, evidence-based strategies for patient management.

Tables are provided that will assist emergency physicians in identifying triggers for referral to otolaryngologists, while other resources in this report outline a comprehensive strategy for management of acute bacterial rhinosinusitis, including inhaled corticosteroids, antihistamines, and other agents when indicated.

—The Editor

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 II

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Approach to Antibiotic Therapy: Comparative and Non-comparative Clinical Trials in Acute Sinusitis

Short-Course Therapy. The majority of approved courses of antibiotic therapy for acute bacterial sinusitis recommend 10-14 days of therapy, although recent approval of azithromycin for a three-day course has prompted interest in evaluating the safety and efficacy—as well as possible other advantages—of shorter treatment duration in this condition.[1,2] The approval of a three-day treatment regimen for acute sinusitis represents an important advance in the management of this common condition, and more data on abbreviated therapeutic courses for acute bacterial rhinosinusitis (ABRS) and other common infections will help clarify the role of such approaches. The use of short-course antimicrobial therapy, in general, has potential economic benefits, including

reduced cost, improved adherence (compliance), reduced adverse events, reduced office visits, and increased patient compliance. However, a potential disadvantage includes lower efficacy compared with longer treatments (including the attendant costs of failure, relapse, recurrence, and disease complications).[1]

Unfortunately, many design flaws have been identified that apply to studies evaluating antimicrobial therapy for acute sinusitis. In this regard, diagnostic sensitivity and specificity of clinical examination vs. radiography vs. computerized tomography (CT) are controversial; equally difficult is differentiation between viral upper respiratory tract infections and acute bacterial sinusitis on the basis of clinical features. In addition, most antimicrobial studies in sinusitis have involved acute maxillary disease, and whether these results can be generalized to frontal, ethmoidal, and sphenoidal sinusitis is unknown.[3-6] Few published data are available regarding the efficacy of short-course antimicrobial therapy for acute sinusitis.[1,7-15]

Potential clinical advantages of short-course antimicrobial therapy include reduced drug acquisition costs, fewer adverse events, better adherence, and reduced impact on resident flora. Of interest, three cephalosporins, three fluoroquinolones, and two macrolides have been approved for short-course therapy (i.e., ≤ 5 days of therapy) for bacterial infections (acute bacterial exacerbation of chronic bronchitis, acute otitis media, community-acquired pneumonia [CAP]) of the respiratory tract, including one agent, azithromycin, which, in January 2004, received approval as a three-day treatment course for acute bacterial sinusitis.[2,16]

In a broad range of studies, short-course therapy has been shown to reduce adverse event incidence,[1,6-12,17-23] a factor that may reduce the costs of additional office visits, drugs, and monitoring often necessitated by their occurrence. In addition, short-course therapy should be more acceptable to the patient and has the potential to enhance medication compliance, although this has not yet been proven in clinical trials evaluating short-course therapy in sinusitis. At least theoretically, short-course therapy has the potential for reducing the impact on resident (commensal) flora. This may, in turn, reduce the potential for development of drug resistance and suppression of protective native bacterial flora (the latter providing so-called colonization resistance against overgrowth of pathogenic microorganisms).[1]

Direct costs of treatment may be reduced by short-course treatment, unless more expensive agents are substituted to achieve the same degree of clinical efficacy in a shorter treatment period. In this case, more detailed evaluation is required to assess *all* treatment costs, i.e., acquisition costs, costs of telephone contacts and office visits, treatment failures (including office visits and drugs to manage the adverse events), enhanced bacterial resistance, and time off work or school as a result of treatment failures or adverse events. A more expensive agent from the sole perspective of acquisition cost may prove to be more cost effective than a less expensive agent when all of these factors are taken into account.[1]

Azithromycin. The shortest treatment course currently approved by the Food and Drug Administration (FDA) for acute bacterial sinusitis is for azithromycin.[16] In a randomized, double-

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blind, controlled clinical trial of acute bacterial sinusitis, azithromycin (500 mg once daily for 3 days) was compared with amoxicillin/clavulanate (500/125 mg TID for 10 days). Clinical response assessments were made at day 10 and day 28. The primary end point of this trial was prospectively defined as the clinical cure rate at day 28. For the 594 patients analyzed in the modified intent-to-treat analysis at the day 10 visit, the clinical cure rate for three days of azithromycin was 88% (268/303) compared to 85% (248/291) for 10 days of amoxicillin/clavulanate. For the 586 patients analyzed in the modified intent-to-treat analysis at the day 28 visit, the clinical cure rate for three days of azithromycin was 71.5% (213/298) compared to 71.5% (206/288), with a 97.5% confidence interval of -8.4 to 8.3, for 10 days of amoxicillin/clavulanate.[2,16]

In the safety analysis for this study, the overall incidence of treatment-related adverse events, primarily gastrointestinal, was lower in the azithromycin treatment arm (31%) than in the amoxicillin/clavulanate arm (51%). The most common side effects were diarrhea (17% in the azithromycin arm vs 32% in the amoxicillin/clavulanate arm) and nausea (7% in the azithromycin arm vs 12% in the amoxicillin/clavulanate arm). In trials in which adults have been dosed 500 mg/d for three days to manage bacterial respiratory tract infections, the discontinuation rate due to treatment-related side effects has been about 0.6%.[2,16]

In an open-label, non-comparative study requiring baseline sinus punctures, clinical success outcomes were assessed at day 7 and day 28 for the modified intent-to-treat patients administered 500 mg of azithromycin once daily for three days. For *Streptococcus pneumoniae* isolates, days 7 and 28 clinical success rates were 88% (23/26) and 84% (21/25), respectively; for *Haemophilus influenzae* isolates, days 7 and 28 clinical success rates were 87% (28/32) and 75% (24/32), respectively; and for *Moraxella catarrhalis* isolates, days 7 and 28 clinical success rates were 93% (14/15) and 87% (13/15), respectively. The overall incidence of treatment-related adverse events in the non-comparative study was 21% in modified intent-to-treat patients treated with azithromycin at 500 mg once daily for three days with the most common side effects being diarrhea (9%), abdominal pain (4%), and nausea (3%).[16]

Amoxicillin/Clavulanate. Amoxicillin/clavulanate is active against bacterial pathogens commonly encountered in acute bacterial rhinosinusitis, including *S. pneumoniae, H. influenzae,* and *M. catarrhalis.* It widely is recommended as an initial treatment for this condition, and the ATBS Consensus Panel concurs it has an important role in managing this common infection. Studies supporting the safety and efficacy of both amoxicillin/clavulanate and amoxicillin/clavulanate extended release are available.[24] Adults with a diagnosis of acute bacterial sinusitis were evaluated in three clinical studies. In one study, 363 patients were randomized to receive either amoxicillin/clavulanate extended release tablets 2000 mg/125 mg orally every 12 hours or levofloxacin 500 mg orally for 10 days in a double-blind, multicenter, prospective trial.[24] These patients were evaluated clinically and radiologically at the test-of-cure visit (day 17-28). The combined clinical and radiological responses were 83.7% for amoxicillin/clavulanate extended release and 84.3% for levofloxacin at the test-of-cure visit in clinically evaluable patients (95% CI for treatment difference = -9.4, 8.3). The clinical response rates at the test-of-cure visit were 87% and 88.6%, respectively.[24]

Two other non-comparative, multicenter center studies were designed to assess the bacteriological and clinical efficacy of amoxicillin/clavulanate extended release 2000 mg/125 mg orally every 12 hours for 10 days in 1554 patients with acute bacterial sinusitis. Evaluation time points were the same as in the prior study. Patients underwent maxillary sinus puncture for culture prior to receiving the medication. At the test-of-cure visit, the clinical success rates were 87.5% and 87.1% (intention-to-treat) and 92.5% and 94% (per protocol populations).

Patients with acute bacterial sinusitis due to *S. pneumoniae* with reduced susceptibility to penicillin were accrued through enrollment in these two open-label, non-comparative clinical studies. Microbiological eradication rates for the three principal isolates were as follows: 1) all *S. pneumoniae* isolates (92.5% [222/240] for intent-to-treat, and 97.7% [210/215] for clinically evaluable patients); 2) *H. influenzae* (87.2% [177/203] for intent-to-treat, and 94.1% [167/170] for clinically evaluable patients); and 3) *M. catarrhalis* (90.5% [67/74] for intent-to-treat, and 98.4% [61/62] for clinically evaluable patients).[24]

The incidence of diarrhea and other side effects associated with amoxicillin/clavulanate extended release tablets administered for seven days has been evaluated and reported in patients with CAP.[25] In this study, amoxicillin/clavulanate extended release 2000 mg/125 mg orally every 12 hours (n = 255) was compared to amoxicillin/clavulanate 875 mg/125 mg orally every 12 hours (n = 259). Treatment-related adverse events were reported in 25.1% of patients who received the extended-release formulation vs. 24.7% in the comparator group. In each group, the most frequently reported adverse events were diarrhea (18% vs 14.3%, p = 0.28), nausea (4.3% vs 5.4%), and headache (4.3% vs 5.0%).[38]

Amoxicillin also may be useful for treatment of ABRS. According to the American Academy of Otolaryngology and Head and Neck Surgery (AAOHNS) rhinosinusitis guidelines, amoxicillin requires 2-3 times higher-than-typical daily doses to eradicate *S. pneumoniae* isolates (even high doses may be insufficient vs the most resistant strains). Moreover, this higher dose is not FDA approved and has not undergone any systematic or safety evaluation.[3,4]

Extended Spectrum Fluoroquinolones: Intensification of Coverage and Patient Selection in Acute Bacterial Rhinosinusitis (ABRS)

The extended spectrum quinolones moxifloxacin, levofloxacin, and gatifloxacin are indicated for treatment of acute bacterial sinusitis. Because of concerns about overuse and inducing drug resistance, these agents generally are recommended in patients who have failed treatment with or who are allergic to advanced generation macrolides or amoxicillin/clavulanate, and in patients with more serious infections involving drug-resistant *S. pneumoniae* (DRSP) or gram-negative pathogens.

Each of these agents is available as an oral and intravenous preparation. Quinolones have been associated with cartilage damage in animal studies; therefore, they are not recommended for use in children, adolescents, and pregnant and nursing women. Upon review of multiple studies, resistance data, and pharmacodynamic data, the ATBS Consensus Panel has concluded that all advanced generation fluoroquinolones do not possess the same properties or susceptibility/resistance profiles, and that prudent, resistance-sensitive choices require differentiation among the available agents.

Among the new fluoroquinolones, moxifloxacin has the lowest minimum inhibitory concentrations (MICs) against *S. pneumoniae* and more specific gram-positive coverage; therefore, it is recommended by the ATBS Consensus Panel as the fluoroquinolone of choice—when a fluoroquinolone is indicated—for managing patients with acute bacterial rhinosinusitis. Moxifloxacin generally is well tolerated. In clinical trials, the most common adverse events were nausea (8%), diarrhea (6%), dizziness (3%), headache (2%), abdominal pain (2%), and vomiting (2%).[26,27] The agent is contraindicated in patients with a history of hypersensitivity to moxifloxacin or any quinolone antibiotic. The safety and effectiveness of moxifloxacin in pediatric patients, pregnant women, and lactating women have not been established.

Levofloxacin. Levofloxacin, the S-enantiomer of ofloxacin, is a fluoroquinolone antibiotic which, when compared to older agents in this class, has improved activity against gram-positive organisms, including *S. pneumoniae*. This has important drug selection implications for the management of patients with acute bacterial sinusitis. Levofloxacin is well-tolerated, with the most common side effects including nausea, diarrhea, headache, and constipation. Food does not affect the absorption of the drug, but it should be taken at least two hours before or two hours after antacids containing magnesium or aluminum, as well as sucralfate, metal cations such as iron, and multivitamin preparations with zinc. Dosage adjustment for levofloxacin is recommended in patients with impaired renal function (clearance < 50 mL/min). In general, levofloxacin has greater activity against gram-positive organisms than ofloxacin and is slightly less active than ciprofloxacin against gram-negative organisms. Levofloxacin generally is well tolerated (incidence of adverse reactions, < 7%). The recommended dose for acute bacterial sinusitis is 500 mg orally QD for 10-14 days.[28]

In patients with acute sinusitis, 10 to 14 days treatment with oral levofloxacin 500 mg once daily was as effective as oral amoxicillin/clavulanic acid (500/125 mg three times daily) or clarithromycin (500 mg twice daily) in three randomized trials.[29] Overall, clinical response rates ranged from 88% to 96% with levofloxacin, and from 87% to 94% with comparators 2-5 days after completion of therapy. Follow-up at one month in patients who were evaluable at clinical end point indicated long-term success rates of 79-85% with levofloxacin and 76-83% with amoxicillin/clavulanic acid or clarithromycin.[30-32] In addition, one study found that resolution or improvement was demonstrated in 215 of the 262 (82%) levofloxacin recipients who had abnormal x-ray findings at admission and underwent post-therapy radiographs, and in 215 of 262 (82%) amoxicillin/clavulanic acid recipients.[30] Bacteriological efficacy was not assessed in any of these studies.

Moxifloxacin. Among the new fluoroquinolones, moxifloxacin has the lowest MICs against *S. pneumoniae*[33] and more specific gram-positive coverage; therefore, it is recommended by the ATBS Consensus Panel as the oral fluoroquinolone of choice—when a fluoroquinolone is indicated—for managing patients with comorbid conditions who have acute bacterial rhinosinusitis.[34-36] Moxifloxacin reaches higher sinus cavity concentrations compared to levofloxacin; this is important because quinolones demonstrate concentration-dependent killing.[36,37]

Its safety and efficacy in acute bacterial sinusitis have been established. In one prospective, multicenter, randomized, nonblinded phase III clinical trial, 475 adult patients with acute sinusitis received a 10-day oral regimen of either moxifloxacin (400 mg once daily) or amoxicillin/clavulanate (875 mg twice daily).[26] The primary measure of efficacy was clinical resolution. Secondary outcome measures included clinical relapse at follow-up and evaluation of patient-reported outcomes.

Of 471 adults comprising the intent-to-treat population (234 moxifloxacin, 237 amoxicillin/clavulanate), moxifloxacin treatment was statistically equivalent to amoxicillin/clavulanate at the test-of-cure visit (85% vs 82%; 95% CI -6%, 13%). Analysis of the efficacy evaluable population confirmed statistical equivalence (86% vs 84%; 95% CI -7%, 13%). Of note, by day three of treatment, significantly more moxifloxacin-treated patients (n = 47; 24%) than amoxicillin/clavulanate-treated patients (n = 28; 14%) reported feeling better ($p < 0.02$). Frequency of drug-related adverse events was similar between groups: nausea (11% in the moxifloxacin cohort, and 5% in amoxicillin/clavulanate group) and diarrhea (3% in moxifloxacin, 10% in amoxicillin/clavulanate). The investigators concluded that once-daily moxifloxacin is as effective and safe as twice-daily amoxicillin/clavulanate in the treatment of acute sinusitis, and that moxifloxacin was associated with more rapid symptomatic relief.[26]

Cefuroxime. Recent, comparative randomized trials evaluating the therapeutic efficacy of oral cefuroxime axetil in patients with acute sinusitis show safety and efficacy in cases caused by such commonly isolated pathogens as *H. influenzae, S. pneumoniae, M. catarrhalis,* and *S. aureus*.[38] In most trials, patient criteria included clinical signs and symptoms of acute sinusitis, generally of fewer than four weeks duration,[71-76] with the diagnosis confirmed using a sinus radiograph or ultrasound. In one nonblind, general practice study, cefuroxime axetil provided similar efficacy to cefprozil in 381 adolescent and adult patients with acute sinusitis.[39] In clinically evaluable patients, satisfactory clinical responses (cure or improvement) reported at the end-of-treatment visit (80 vs 88% of patients) were maintained at 18-22 days follow-up in 88% and 89% of cefuroxime axetil (250 mg twice daily for 10 days) and cefprozil (500 mg twice daily for 10 days) recipients, respectively.[39] No bacteriological efficacy data were reported.[39]

Generally, cefuroxime axetil (250 mg twice daily for 8-10 days) provided comparable clinical and bacteriological efficacy to that of 7-10 days treatment with a quinolone agent, including moxifloxacin (400 mg once daily),[34] gemifloxacin (320 mg once daily),[40] or

ciprofloxacin (500 mg twice daily).[41,42] In clinically evaluable patients, clinical responses (cure or improvement) occurred in 83-90% of patients receiving cefuroxime axetil vs. 83-97% of recipients treated with a quinolone comparator agent. Clinical response rates were similar, although slightly lower, in intent-to-treat populations.[34,40] Overall bacteriological eradication rates paralleled satisfactory clinical responses, with eradication occurring in 89-95% of microbiologically evaluable cefuroxime axetil recipients vs. 94-97% of those treated with a quinolone agent.

Nevertheless, in a double-blind trial, fewer cefuroxime axetil (250 mg twice daily for 10 days) recipients experienced clinical cure than moxifloxacin-treated (400 mg once daily for 7 days) patients in clinically evaluable patients (91% vs 97% of patients; 95% CI, 1.5%, 10.6%; p-value not reported).[35] Respective clinical cure rates in the intent-to-treat population showed cefuroxime axetil was as effective as moxifloxacin (87% and 89% of patients; 95% CI, -3.7%, 7.8%).[35] Sustained (27-31 days post-therapy) clinical response rates were comparable in the two treatment groups, occurring in 89% of cefuroxime axetil-treated patients and 91% of moxifloxacin recipients (95% CI, -4.3%, 5.4%).[35] Presumed or documented bacteriological eradication occurred in fewer microbiologically evaluable patients receiving cefuroxime axetil than moxifloxacin recipients (84% vs 95% of patients; 95% CI, 3.6%, 19.7%; p-value not reported).[35]

Cefuroxime axetil (250 or 500 mg twice daily) also provided comparable clinical efficacy to that of clarithromycin[43,44] (250 or 500 mg twice daily) or amoxicillin/clavulanic acid[45,46] (500/125 mg three times daily or 875/125 mg twice daily). Of note, in one study, although cefuroxime axetil provided similar efficacy to that of clarithromycin, patients received cefuroxime axetil for five days vs. clarithromycin for 10 days.[44] Overall clinical responses (cure or improvement) occurred in 85-96% of groups receiving cefuroxime axetil or a comparator agent.[43-46] At follow-up (4-5 weeks post-therapy), satisfactory clinical responses persisted in 81% and 83% of cefuroxime axetil and clarithromycin recipients, respectively.[43] However, in a nonblind study, satisfactory clinical responses were maintained (2-4 weeks post-therapy) in significantly fewer cefuroxime axetil-treated patients than amoxicillin/clavulanic acid recipients (78% [91/116] vs 90% [104/115] of patients; p = 0.009).[46] Only one of these studies reported bacteriological efficacy, with bacteriological success (eradication or presumed eradication) occurring in 68% and 65% of cefuroxime axetil and amoxicillin/clavulanic acid recipients, respectively.[46]

The Challenge of Patient Evaluation: Methods, Modality, and Clinical Strategies in Acute Bacterial Rhinosinusitis (ABRS)

Accurate diagnosis of acute sinusitis will depend both on the history and clinical examination of the patient. While the clinical signs and symptoms of acute sinusitis often are difficult to distinguish from viral upper respiratory infection,[47,48] such an assessment remains the best approach to diagnosing acute sinusitis. As a general rule, there is no role for routine imaging or radiography in the diagnosis of acute sinusitis. For patients who have persistent symptoms despite adequate medical therapy, evidence of serious complications, or those in whom surgery is being considered, coronal CT scan of the paranasal sinuses may be considered.[49]

Three recent, evidence-based guidelines[50-52] suggest that children and adults with acute bacterial sinusitis may benefit from treatment with antibiotics more than those with rhinitis. However, to ensure that antibiotics are being used for patients with bona fide bacterial infections, clinicians must develop assessment strategies that permit them to distinguish uncomplicated, self-limited rhinitis from bacterial rhinosinusitis. In the absence of a clear diagnosis of acute bacterial sinusitis, antibiotics are unlikely to improve symptoms or clinical outcomes and symptomatic measures may be appropriate. *(See Table 1.)*

One group[46] studied 150 patients with a clinical diagnosis of sinusitis and found that 85% had positive sinus puncture. In another review of 11 studies that met evidence-based inclusion criteria, the authors concluded that clinical evaluation has a sensitivity of about 75%, whereas radiographic methodologies have sensitivities slightly greater than 80%.[53] In a prospective trial and subsequent reviews of the literature,[54-56] a number of authors suggest a constellation of key clinical signs and symptoms that provide a level of sensitivity that approaches that of CT or MRI, while enhancing specificity.

Among criteria proposed for helping distinguish between viral and bacterial rhinosinusitis are the following: 1) Mild-to-moderate symptoms lasting for at least seven days; 2) severe symptoms and associated findings, even if present for fewer than seven days; 3) purulent secretion reported as a symptom or found in the nasal cavity by the doctor; 4) pain in the teeth; 5) pain on bending forward (inconsistent findings between studies); 6) two phases (bimodal course) in the illness history; or 7) elevated erythrocyte sedimentation rate or increased C-reactive protein.

The clinical value of imaging techniques for initial assessment of uncomplicated bacterial rhinosinusitis has been reviewed by a number of investigators[52,57] who recommend reserving these techniques for high-risk and atypical patient subgroups. Investigators[57] reviewed 14 studies that compared various imaging studies with clinical evaluation or sinus puncture and aspiration with culture or both. A positive aspirate for bacterial pathogens was defined as the clinical standard for diagnosis of sinusitis. When comparing standard sinus x-rays to sinus puncture, depending on the criteria used to define a diagnosis of sinusitis on plain radiograph, estimates of sensitivity in these studies ranged from 0.41 to 0.90, and specificity estimates ranged from 0.61 to 0.85. Imaging studies that included "mucous membrane thickening" as a criterion for sinusitis were more sensitive but less specific than studies defining positive radiographs as "opacification of sinus."

While a CT scan is more sensitive than plain x-ray film,[25] and MRI is more sensitive than a CT scan,[58,59] the specificity of these studies is unclear. For example, in children and adults without symptoms of sinusitis, the prevalence of sinusitis signs on CT and MRI is 45% and 42%, respectively.[53,54,60] In light of such findings, these imaging methodologies are better reserved for patients in whom surgery is being contemplated, who have signs of neuro-

Table 1. 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 2. 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 presentations:[1-3]

- 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 (acetominophen)
- 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 unsual or aggressive course may prompt consideration of early antibiotic therapy.

logical compromise, risk of invasive infection, or for whom chronic sinusitis is a concern. In the 1980s and 1990s, ultrasound was studied enthusiastically. Variability in test performance is great.[53] Since the cost of this procedure is similar to that of a sinus CT, ultrasound is not indicated in the diagnostic evaluation of the sinuses. Though the sensitivity and specificity of a clinical evaluation possibly could be enhanced with the use of imaging studies, diagnostic accuracy of acute disease is not sufficiently improved to justify the cost or inconvenience of such interventions.

Most national panels concur with this approach. In guidelines on appropriate antibiotic use in sinusitis,[4,51,54,55,57] endorsed by the Centers for Disease Control and Prevention, the American Academy of Family Physicians, the American College of Physicians-American Society of Internal Medicine, and the Infectious Diseases Society of America (IDSA), radiography uniformly is not recommended for confirming the diagnosis of acute sinusitis. Rather, the guidelines recommend that clinicians rely on duration of illness (i.e., at least 7 days) and severity of symptoms to arrive at a diagnosis. This approach has gained wide acceptance among different organizations that have evaluated the appropriateness of immediate radiographic assessment in patients suspected of having bacterial sinusitis.

The Institute for Clinical Systems Improvement recommends that radiology be used only if initial maximal medical (i.e., antimicrobial) therapy has failed, and notes that a primary goal of its guideline was to reduce the number of x-rays that physicians order for this diagnosis.[61] In addition, the American College of Radiology's criteria for sinusitis in the pediatric population ranked several radiographic studies based on their appropriateness for given clinical conditions. This review[62] suggests imaging is not appropriate if symptoms have persisted fewer than 10 days. For patients with symptoms lasting more than 10 days and with persistent fever, CT scan is recommended.[49,62]

Table 3. Acute Bacterial Rhinosinusitis: Adult Treatment Guidelines (*Otherwise Healthy Patients Without Comorbid Conditions with > 7 Days of Persistent Symptoms or < 7 days[2] of Severe Symptoms[1] Suggestive of Bacterial Rhinosinusitis)*

FIRST-LINE ANTIBIOTIC THERAPY[7]

Amoxicillin/clavulanate extended release 2000 mg/125 mg PO BID x 10 days[3]
(Alternative: amoxicillin/clavulanate 500 mg/125 mg PO TID x 10 days)
OR
Amoxicillin 875 mg PO BID x 10-14 days[4]
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
Levofloxacin[5] 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 days[6]

[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 fewer 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 affecting 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 MICs against *S. pneumoniae* than levofloxacin, and because it has a more narrow (gram-positive organism-focused) spectrum of coverage.

Summary of ATBS Consensus Panel Guidelines and Recommendations

Most cases of acute rhinosinusitis diagnosed in ambulatory care are caused by uncomplicated viral upper respiratory tract infections. Bacterial and viral rhinosinusitis are difficult to differentiate on clinical grounds. Because ABRS resolves without antibiotic treatment in most cases, the ATBS Consensus Panel recommends specific treatment triggers for initiating antibiotic therapy. The clinical diagnosis of ABRS and antibiotic treatment, in general, should be reserved for patients with mild-to-moderate rhinosinusitis symptoms lasting seven days or more or for patients with *severe* symptoms lasting for fewer than seven days. *(See Table 2.)*

The presence of immunosuppression, serious comorbidity, a history of recurrent infections, or other factors may prompt early antibiotic therapy in selected patients according to individual circumstances and clinical judgment. Sinus radiography is not recommended for diagnosis in routine cases. Referral to an otolaryngologist may be prompted by a number of factors, including neurological or ophthalmologic findings, suspicion of invasive infection, infection in a compromised host, and other clinical findings.

When patients do not meet criteria for antimicrobial treatment, symptomatic treatment and reassurance are the preferred initial management strategy for patients with mild symptoms. *(See Table 1.)* Agents directed toward symptomatic improvement

Table 4. 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 days[1] (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.

in this subgroup have been described and indications for their use presented. As previously stressed, antibiotic therapy should be reserved for patients with severe symptoms who meet the criteria for the clinical diagnosis of ABRS regardless of duration of illness, or for those with mild-to-moderate symptoms not resolving after seven days. As a rule, patients who do not have persistent purulent nasal drainage, maxillary facial or tooth pain or tenderness, or both are unlikely to have bacterial rhinosinusitis, regardless of the duration of illness.

When antibiotic therapy is deemed to be appropriate, the ATBS Consensus Panel has issued recommendations and guidelines that account for the multiplicity of factors that go into the drug selection equation, including: resistance induction patterns among antimicrobial classes, susceptibility data, duration of therapy, cost of therapy, daily dose frequency, side effects, and patient convenience.

Based on this outcome-sensitive analysis, for first-line, initial and empiric therapy in otherwise healthy adult patients with acute bacterial rhinosinusitis, who do not have comorbid conditions, the ATBS Consensus Panel recommends azithromycin (3-day course), amoxicillin/clavulanate, or, when cost considerations predominate, high-dose amoxicillin therapy. *(See Table 3.)* As alternative first-line therapy, the panel recommends moxifloxacin (the preferred respiratory fluoroquinolone) or levofloxacin; other options include clarithromycin, gatifloxacin, or doxycycline.

In patients with ABRS who present with more severe disease or have comorbid conditions that necessitate more intensive antibiotic therapy (i.e, patients with comorbid conditions, immune system compromise, who are at risk for more invasive infection) the ATBS Consensus Panel recommends advanced generation fluoroquinolones such as moxifloxacin and levofloxacin as initial first-line therapy; amoxicillin/clavulanate and other beta-lactams also may be considered in this subgroup. *(See Table 4.)* 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.

(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.)*

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Emergency Medicine Reports 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.

Physician CME Questions

91. Initial antibiotic therapy is *not* recommended for patients with which of the following presentations?
    A. Symptoms limited to nasal drainage, rhinorrhea, or nasal congestion
    B. Non-specific, non-focal facial pain or pressure
    C. Temperature less than 101°
    D. Acute, mild, or moderate symptoms of rhinosinusitis for fewer than seven days duration
    E. All of the above

92. Which of the following factors is *not* an indication that antibiotic therapy should be considered?
    A. Temperature greater than 102°
    B. Maxillary teeth pain
    C. Symptoms of rhinosinusitis for fewer than seven days
    D. Swelling over the sinus

93. The overwhelming majority of upper respiratory tract infections will resolve within 7-10 days without antibiotic treatment.

A. True
B. False

94. Ultrasound is *not* indicated in the diagnostic evaluation of the sinuses.
A. True
B. False

95. Imaging modalities such as CT or MRI are better reserved for which patients?
A. Those in whom surgery is being contemplated
B. Patients who have signs of neurological compromise
C. Those with a risk of invasive infection
D. Patients for whom chronic sinusitis is a concern
E. All of the above

96. Which of the following factors may prompt referral to an otolaryngologist?
A. Any routine sinus infection
B. Neurological or ophthalmologic findings
C. Patients with non-specific, non-focal facial pain
D. Mild or moderate symptoms for fewer than seven days

97. Which of the following is considered to be the first-line antibiotic therapy for acute bacterial rhinosinusitis in special populations?
A. Moxifloxacin 400 mg PO QD x 10 days
B Amoxicillin 875 mg PO BID x 10-14 days
C. Clarithromycin 500 mg PO BID x 14 days
D. Doxycycline 100 mg PO BID x 10-14 days

98. Which of the following drugs is considered to be the first-line antibiotic therapy in otherwise healthy patients with acute bacterial rhinosinusitis?
A. Moxifloxacin 400 mg PO QD x 10 days
B. Levofloxacin 500 mg PO QD x 10-14 days
C. TMP/SMX
D. Amoxicillin/clavulanate extended release 2000 mg/125 mg PO BID x 10 days

99. Which of the following is/are design flaws identified in studies of antimicrobial therapy for acute sinusitis?
A. Controversy regarding diagnostic sensitivity and specificity of clinical examination vs. radiography vs. CT
B. Difficulty in differentiating viral upper respiratory tract infections and acute bacterial sinusitis based on clinical features
C. Uncertainty about whether results involving acute maxillary disease can be generalized to frontal, ethmoidal, and sphenoidal sinusitis
D. All of the above

100. Among the new fluoroquinolones, moxifloxacin has the lowest MICs against *S. pneumoniae* and more specific gram-positive coverage.
A. True
B. False

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.

CME Anwer Key

91. E	96. B
92. C	97. A
93. A	98. D
94. A	99. D
95. E	100. A

In Future Issues:

Pulmonary Embolism

Emergency Medicine Reports
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Acute Bacterial Rhinosinusitis, Part II

General Management Principles and Adjunctive Treatment Recommendations: 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.

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

Initial antibiotic therapy is not recommended for patients with the following symptoms and presentations:[1-3]

- 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 (acetominophen)
- 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.

Acute Bacterial Rhinosinusitis: Adult Treatment Guidelines (Otherwise Healthy Patients without Comorbid Conditions with > 7 Days of Persistent Symptoms or < 7 days[2] of Severe Symptoms[1] Suggestive of Bacterial Rhinosinusitis)

FIRST-LINE ANTIBIOTIC THERAPY[7]

Amoxicillin/clavulanate extended release 2000 mg/125 mg PO BID x 10 days[3]
(Alternative: amoxicillin/clavulanate 500 mg/125 mg PO TID x 10 days)
OR
Amoxicillin 875 mg PO BID x 10-14 days[4]
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
Levofloxacin[5] 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 days[6]

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 fewer 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 affecting 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 MICs against *S. pneumoniae* than levofloxacin, and because it has a more narrow (gram-positive organism-focused) spectrum of coverage.

Acute Bacterial Rhinosinusitis: Adult Treatment Guidelines for Special Populations (Patients with Comorbid Condtions, Infections 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 days[1]
(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.

Supplement to *Emergency Medicine Reports*, May 3, 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 II." *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.