Acute Rhinosinusitis in Adults

Rhinosinusitis Guideline Team

Team Leader

Eric P. Skye, MD
Family Medicine

Team Members

R. Van Harrison, PhD
Medical Education

Jeffrey E. Terrell, MD
Otolaryngology

Denise H. Zao, MD
General Internal Medicine

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Ambulatory Clinical Guidelines Oversight
Connie J. Standiford, MD
Grant Greenberg, MD, MA, MHSA
R. Van Harrison, PhD

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Patient population: Non-immune compromised adults.

Objectives: Improve quality of care and decrease costs by: (1) accurate diagnosis; (2) appropriate medical therapy; (3) effective radiological imaging; and (4) appropriate subspecialist consultation.

Key points

Definitions. Acute rhinosinusitis is an inflammation of the paranasal sinuses and the nasal cavity lasting no longer than 4 weeks. It can range from acute viral rhinitis (the common cold) to acute bacterial rhinosinusitis. Fewer than 5 in 1,000 colds are followed by bacterial rhinosinusitis.

Diagnosis. Estimate the probability of acute *bacterial* rhinosinusitis (ABRS) based on history and physical examination. Best predictors include maxillary toothache, poor response to decongestants, patient report of colored nasal discharge, and purulent secretions by exam. Duration of symptoms has some predictive value. Patients with symptoms beyond 10 days have an increased likelihood of ABRS. Upper respiratory tract symptoms that persist > 10 days or worsen after 5 to 7 days are a moderately sensitive but not specific predictor of ABRS superimposed on a viral illness *[D*]*.

Treatment. Prescribe antibiotic therapy based on benefits and risks. Benefits depend on the probability of bacterial infection and the severity of symptoms. Risks of antibiotics include allergic reaction, potential side effects, and promotion of bacterial resistance. Antibiotics have not been shown to decrease the risk of complication or progression to chronic rhinosinusitis. Symptoms resolve within two weeks without antibiotics in 70% of cases and with antibiotics in 85% of cases.

First line antibiotics for acute bacterial rhinosinusitis are amoxicillin and trimethoprim/ sulfamethoxazole. They are superior to placebo and as effective as other agents that are more expensive, have greater risk of side effects, and/or should be reserved for more serious infections *[I A*]*. Use first-line alternatives (e.g., doxycycline, azithromycin) only for patients allergic to both first line drugs. The usual initial course of antibiotics should be 10-14 days. An exception is azithromycin (500 mg daily), which should be prescribed for 3 days.

For partial but incomplete resolution after an initial course of antibiotics, extend the duration of antibiotic therapy by an additional 7 to 10 days for a total of 3 weeks of antibiotics *[II A*]*.

For minimal or no improvement with initial treatment, re-evaluate your diagnosis and consider changing to an antibiotic with broader coverage to include resistant strains. Options include amoxicillin at high dose, amoxicillin/clavulanate, levofloxacin, and moxifloxacin *[II A*]*. Avoid ciprofloxacin due to limited activity against *Streptococcus pneumoniae.* Avoid telithromycin because risks for hepatotoxicity, loss of consciousness, and visual disturbances may outweigh potential benefits for ABRS *[III A*]*.

Ancillary therapies (see Table 5) for acute rhinosinusitis have little supporting data. Some studies examining treatments for viral upper respiratory infections have shown:

- Efficacy in symptom control: decongestants (especially topical decongestants), topical anticholinergics and nasal steroids (high dose) *[II A*]*.
- Possible efficacy: zinc gluconate lozenges, vitamin C, Echinacea extract, saline irrigation *[conflicting or insufficient data]*.
- No significant benefit: guaifenesin (except possibly at high dose), saline spray, steam, antihistamines (except in patients where allergic rhinitis is a contributing factor).

For recurrent acute rhinosinusitis or acute rhinosinusitis superimposed on chronic rhinosinusitis, the addition of high dose nasal corticosteroids may decrease duration of symptoms and improve rate of clinical success *[II A*]*. However, this is inconvenient, has potential side effects, and significant cost.

Imaging. If symptoms of rhinosinusitis persist for more than three weeks despite antibiotics or recur more than three times per year, a sinus CT scan should be performed while the patient is symptomatic to reassess diagnosis and determine need for referral *[I C/D*]*. CT scans provide much better definition than a plain sinus x-ray series. Plain sinus x-rays, therefore, are not recommended.

- New low dose CT scanners have substantial radiation dose reduction.
- At UM Health System the charge is $1,468 for any sinus CT scan (low dose, limited, or full).

*** Strength of recommendation:**
I = generally should be performed; II = may be reasonable to perform; III = generally should not be performed.
Level of evidence supporting a diagnostic method or an intervention:
A = randomized controlled trials; B = controlled trials, no randomization; C = observational trials; D = opinion of expert panel

Figure 1. Diagnosis of Acute Bacterial Rhinosinusitis

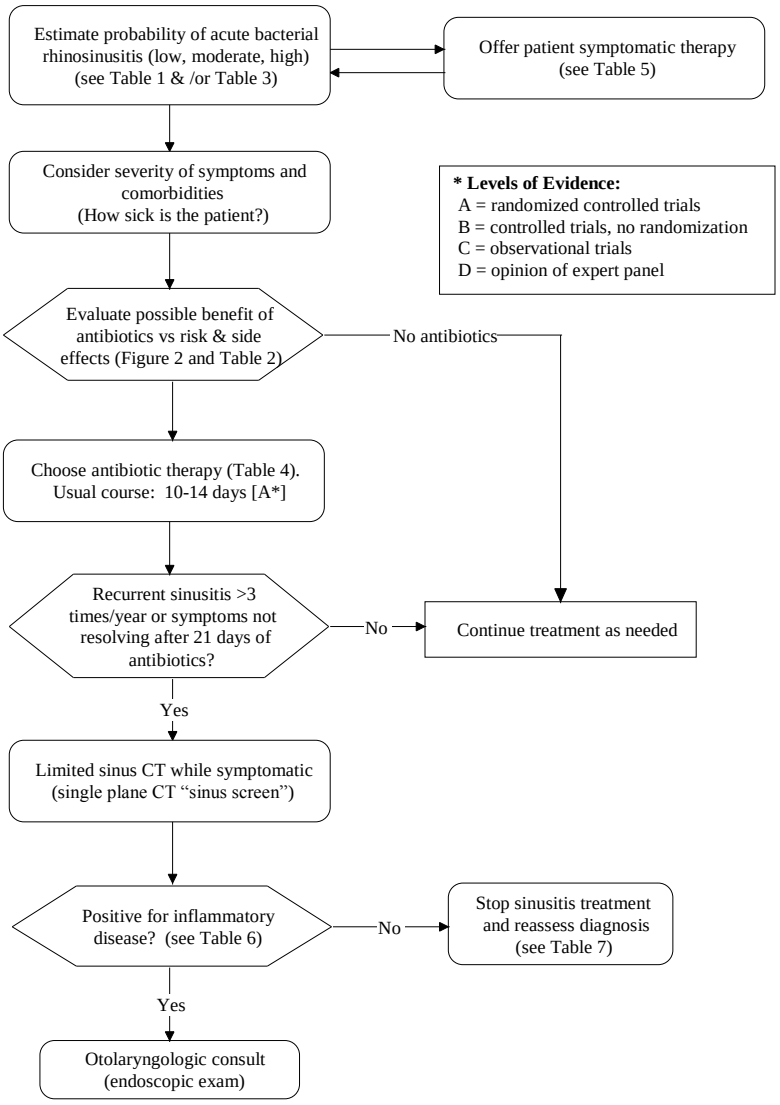

Figure 2: Antibiotic Treatment for Suspected Acute Bacterial Rhinosinusitis

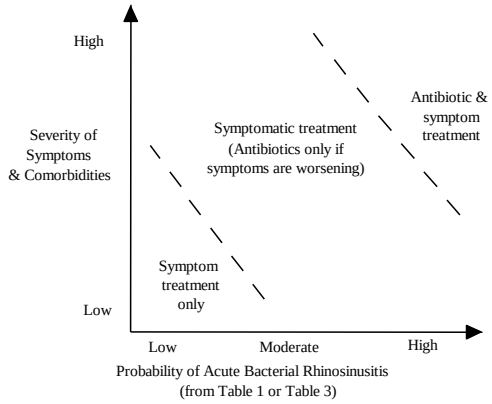

Table 1. Diagnosis of Acute Bacterial Rhinosinusitis*

Best Predictors :

- Maxillary toothache
- Purulent secretion by examination
- Poor response to decongestants
- Abnormal transillumination (see text)
- History of colored nasal discharge

Probability of Rhinosinusitis:

Predictors	Probability	95% CI
0	9%	5% - 17%
1	21%	15% - 28%
2	40%	33% - 47%
3	63%	53% - 72%
4	81%	69% - 89%
5	92%	81% - 96%

Table 2. Antibiotic Treatment Considerations for Acute Bacterial Rhinosinusitis

A reasonable strategy for many patients is to treat symptomatically and recommend antibiotics only if symptoms do not begin to improve.

- ~ 70% of patients improve within 2 weeks without antibiotics *[A*]*
- ~ 85% of patients improve within 2 weeks with antibiotics *[A*]*
- ~ 15% of patients take longer than 2 weeks to improve even with antibiotics *[A*]*
- Antibiotics have not been shown to prevent complications (including chronic rhinosinusitis)
- Antibiotics may cause side effects, including severe allergic reaction

Table 3. Performance Characteristics of Signs and Symptoms of Acute Bacterial Rhinosinusitis [1]

Characteristics	Sensitivity [2] (%)	Specificity [2] (%)	Frequency (%)	Likelihood Ratio [3] (Finding Present)	Likelihood Ratio [3] (Finding Absent)
Symptoms					
Maxillary toothache	18	93	11	2.5	0.9
No improvement with decongestants	41	80	28	2.1	0.7
Colored discharge	72	52	59	1.5	0.5
Cough	70	44	61	1.3	0.7
Signs					
Purulent secretion	51	76	34	2.1	0.7
Nasal speech	45	73	34	1.7	0.8
Abnormal transillumination	73	54	56	1.6	0.5
Sinus tenderness	48	65	39	1.4	0.8

[1] Adapted from Williams, et. al., Ann. Int. Med. 1992;117:705-710.

[2] Sensitivity = % of patients with sinusitis who have the symptom/sign. Specificity = % of patients without sinusitis who do not have the symptom/sign

[3] A likelihood ratio expresses the odds that a sign or symptom would occur in a patient with, as opposed to a patient without, rhinosinusitis. When a likelihood ratio is above 1.0, probability of disease increases; when the likelihood ratio is below 1.0, probability of disease decreases.

Table 4. Antibiotic Therapy for Acute Rhinosinusitis (10-14 day usual course)

Drug	Dose	Cost[1]
A. First Line Antibiotic		
Amoxicillin	500 mg q8 hr	gen $10-13
Amoxicillin	875 mg q12 hr	gen $9-11
Trimethoprim/sulfamethoxazole (*Bactrim-DS®, Septra-DS®)*	160 mg/800 mg q12 hr	gen $7-8
B. If Allergic to or Intolerant of First Line Antibiotic - Alternative First Line Antibiotics		
Doxycycline hyclate *(Vibramycin®, Doryx®)*	100 mg q 12 hr	gen $7-8
Azithromycin *(Zithromax®)*[5]	500 mg daily *x 3 days* [2]	gen $18 $180
Cefuroxime axetil *(Ceftin®)*	250-500 mg q12 hr	gen $14-34 $210
Clarithromycin (*Biaxin* ®) [3]	500 mg q12 hr	gen $14-18
Clarithromycin XL *(Biaxin XL®)* [3]	1000 mg daily	$117-163
Cefprozil *(Cefzil ®)*	250 mg q12 hrs	gen $77-107
Cefprozil *(Cefzil ®)*high dose for "moderate to severe infections"	500 mg q12 hr	gen $121-170
Cefdinir *(Omnicef ®)*	300 mg q12 hrs or 600 mg day	gen $90
Levofloxacin (*Levaquin*) *only if allergies to all of the above*[4]	500 mg daily x 10 days or 750 mg daily x *5 days*	$192 $180
C. If Treatment Failure - Second Line Antibiotics		
Amoxicillin high dose	875-1000 mg q8 hr	gen $39-61
Amoxicillin/clavulanate potassium, usual dose *(Augmentin®)*	875/125 q12 hr	gen $53-75
Amoxicillin/clavulanate potassium, high dose *(Augmentin XR®)*	2000/125 q12 hr	$149-208
Levofloxacin (*Levaquin*®) [4]	500 mg daily	$175-245
Moxifloxacin (Avelox)[4]	400 mg daily	$165-231

[1] For cost presented as range, low=10 days, high=14 days. Cost=Average wholesale price based -10% for brand products and Maximum Allowable Cost (MAC) + $3 for generics on 30-day supply or less, *Sources: AmerisourceBergen item catalog, 10/10, and Michigan Department of Community Health M.A.C. Manager, 05/11*

[2] FDA approved for shorter treatment course.

[3] Discontinue lovastatin, simvastatin, or atorvastatin while taking macrolides. Macrolides (e.g., azithromycin, clarithromycin) inhibit metabolism of these statins by CYP enzymes, increasing serum concentrations of statins to a clinically significant risk for rhabdomyositis. Statins not appreciably metabolized by CYP enzymes are fluvastatin, pravastatin, and rosuvastatin, for which risk of statin toxicity with macrolides is not clinically significant.

[4] Due to risk for emergence of antibiotic resistance, consider a fluoroquinolone only after treatment failure with a first line antibiotic (or allergy to all first-line antibiotics). Ciprofloxacin [Cipro®] is not recommended as a second line antibiotic for acute bacterial rhinosinusitis because it, as well as other "first generation" fluoroquinolones, has limited activity against *Streptococcus pneumoniae.* Fluoroquinolones increase the risk of tendon rupture in those over age 60, in kidney, heart, and lung transplant recipients, and with use of concomitant steroid therapy. Use of fluoroquinolones has also been associated with risk for serious nerve damage (neuropathy), which may be irreversible.

[5] The FDA issued a warning that azithromycin could cause potentially fatal irregular heart rhythm in some patients. At-risk patients include those with a slower-than-normal heartbeat, with potassium or magnesium deficiencies, and those using medications to treat existing heart arrhythmia.

Clinical Background

Clinical Problem and Management Issues

Definition. Acute rhinosinusitis is a symptomatic inflammation of the paranasal sinuses and nasal cavity lasting no longer than 4 weeks.

Diagnosis. Rhinosinusitis is common and accounts for up to 5% of visits to primary care physicians. Its cause may be viral, bacterial, allergic, or, less frequently, of other etiology. Distinguishing acute *bacterial* rhinosinusitis from other types is important because of the potential benefit of antibiotic therapy. Although no single, simple factor confirms the diagnosis of acute bacterial rhinosinusitis, its probability can be estimated based a number of signs and symptoms. In one study, however, a physician's overall clinical impression was better than any single symptom or sign for predicting acute bacterial rhinosinusitis. For patients with persistent or recurrent symptoms, advances in imaging offer more informative options (limited sinus CT) than plain sinus x-rays.

Management. Symptoms of rhinosinusitis can last well over two weeks with or without antibiotic treatment. Expensive antibiotics are often prescribed when equally effective and less expensive alternatives are available. The long duration of symptoms in some patients may result in referral for otolaryngology evaluation before an adequate trial of medical therapy.

Table 5. Adjuvant Therapy for Acute Rhinosinusitis

Drug	Dose	Cost *
Likely to be effective in treating symptoms		
Decongestants[1]		
Topical[2] Oxymetazoline 0.05% (*Afrin®*)	2 sprays each nostril q12 hr maximum 3 days	gen $4
Systemic Pseudoephedrine *(Sudafed®)*	60 mg q6 hr or sustained release 120 mg q12 hr	gen $22
Anticholinergics		
Topical Ipratropium 0.03% *(Atrovent®)*	2 sprays each nostril q6 hr prn	gen $14
Ipratropium 0.06% *(Atrovent®)*	2 sprays each nostril q 6 hr prn	gen $23
Corticosteroid Nasal Spray in high doses		
Flunisolide 25 mcg/spray	8 sprays (200 mcg) each nostril q12 hr x 21 days [6.25 days / container (200 sprays), = 4 containers]	gen $156
Fluticasone *(Flonase®)* 50 mcg/spray	4 sprays (200 mcg) each nostril q12 hr x 21 days [7.5 days / container (120 sprays), = 3 containers]	gen $100
Mometasone Furoate *(Nasonex®)* 50 mcg/spray	4 sprays (200 mcg) each nostril q12 hr x 21 days [7.5 days / container (120 sprays), = 3 containers]	gen $82
Possibly effective in treating symptoms (for viral infections or colds)		
Zinc gluconate lozenges	1 lozenge q2h while awake	gen $11
Vitamin C	2-3g/day in divided doses	gen $10
Echinacea extract	Varies by preparation	
Saline irrigation	30-120 ml (1/8-1/2 cup) per session	<$1
No proven benefit or not studied in controlling symptoms		
Antihistamines (Except when treating underlying Allergic Rhinitis)		
Chlorpheniramine *(Chlor-Trimeton®)*	4 mg q4-6 hr or sustained release 8-12 mg q12 hr	gen $10
Clemastine *(Tavist®)*	1.34 mg q12 hr	gen $8
Diphenhydramine *(Benadryl®)*	25-50 mg q6 hr	gen $6
Less-sedating (2nd generation) antihistamines (loratadine, fexofenadine, cetirizine)		
Steam, saline spray		
Guaifenesin (except possibly at high dose)		

* Cost = Average wholesale price based -10% for brand products and Maximum Allowable Cost (MAC) + $3 for generics on 30-day supply or less, *Amerisource Bergen item Catalog 10/10* & *Blue Cross Blue Shield of Michigan Mac List, 05/11*

[1] Many preparations combine decongestants and antihistamines.

[2] Do not use for more than three consecutive days to decrease risk of rhinitis medicamentosa and atrophy.

[3] Contraindicated with monoamine oxidase inhibitors (MAOIs), uncontrolled hypertension, and severe ischemic heart disease. Use with caution in stable hypertension, stable ischemic heart disease, diabetes mellitus, prostatic hypertrophy, glaucoma, and the elderly.

Table 6. Interpreting Sinus CT Scan Reports

Red Flags*	**Abnormal**	**Not Generally Concerning**
• Unilateral disease	• Sinus opacification	• Retention cysts
• Sinus expansion	• Air fluid levels (> minimal)	• Concha bullosa and other anatomic variants
• Bony erosion	• Marked mucosal thickening	• Minimal mucosal thickening
	• Polyps	

***** Indicate Need for Immediate Referral

Table 7. Alternative Diagnoses

- Allergic rhinitis
- Headache, migraine or tension
- Nasal drying (esp sicca patients)
- Gastroesophageal reflux
- Atrophic rhinitis
- TMJ, dental pain
- Atypical facial pain

Rationale for Recommendations

Causes

Acute rhinosinusitis is primarily an infectious disease. Symptoms resolve completely with medical treatment in nearly 90% of cases. Approximately 20-30% of cases of acute rhinosinusitis are viral. The most common bacterial pathogens are *Streptococcus pneumoniae* (~20-43%) and *Haemophilus influenzae* (~22-35%), other *Streptococcus* species (3-9%), and *Moraxella catarrhalis* (~2-10%); less common are *Staphylococcus aureus* (~4%), anaerobes (~5%), and *Haemophilus* species (~8%). Several noninfectious factors are important in the pathogenesis of rhinosinusitis, including patency of sinus ostia, nasal

airflow, mucociliary activity, immunocompetence, and the nature and quantity of secretions.

Diagnosis

Predisposing conditions. Some predisposing conditions are: mechanical obstruction (polyps, septal deviation, tumor, trauma, foreign body); mucosal edema (rhinitis: allergic, vasomotor, viral); rapid change in altitude or pressure; impaired ciliary motility (Kartagener's syndrome, cystic fibrosis, and smoking); dental infections and immunodeficiency (HIV, immunoglobulin deficiencies).

Probability estimation. The probability of acute bacterial rhinosinusitis can be estimated based on history and physical exam. Williams, et al. (1992) studied VA general medicine patients suspected of having rhinosinusitis. The signs and symptoms found most likely to predict rhinosinusitis are given in Tables 1 and 3.

The physician's overall clinical impression was better than any single historical or examination finding. Other predictors include unilateral facial pain, pain with bending, and mildly elevated sedimentation rate. Findings demonstrating little predictive value, however, included headache, difficulty sleeping, sore throat, sneezing, malaise, itchy eyes, fever, chills or sweats, and painful chewing.

Transillumination was found by Williams, et al. (1992) to be among the 5 best predictors of rhinosinusitis. Many other studies have not found it to be helpful. Perform transillumination in a completely darkened room, using an extremely bright light (e.g., Welch-Allyn Finnoff transilluminator or MagLite® flashlight). Penlights and otoscopes are inadequate to transilluminate bone. For the maxillary sinuses, place the light source over the infraorbital ridge and judge light transmission through the hard palate by looking into the patient's mouth, comparing side to side. For the frontal sinuses, place the light source into the superior portion of the orbit (some patients find this too painful). Interpretation of the frontal sinuses may be difficult because they naturally develop asymmetrically. You will be using a bright light, so obviously you must take great care to avoid burning the patient. Findings are normal (typical light transmission), dull (reduced light transmission), or opaque (no light transmission).

Temporality of symptoms has some predictive value. Although fewer than 5 in 1,000 colds are followed by bacterial rhinosinusitis, upper respiratory tract symptoms that persist longer than 10 days or worsen after 5 to 7 days are a moderately sensitive but not specific predictor of acute bacterial rhinosinusitis superimposed on a viral illness.

Nasal drainage associated with an uncomplicated rhinovirus upper respiratory tract infection can occasionally persist for 2 to 3 weeks and may be clear or discolored. A patient's report of purulent nasal drainage is a moderately sensitive (72%) but less specific (52%) symptom of acute bacterial rhinosinusitis. In contrast, a physician's observation of purulent nasal secretion is a less sensitive (51%) but relatively specific (76%) sign.

Diagnostic imaging, limited sinus CT. If symptoms persist after appropriate medical treatment or recur more than 3 times per year, refer the patient for imaging to document the presence and extent of sinus disease. Imaging must be performed while the patient is symptomatic – otherwise it is of little value.

In most cases, the preferred method of imaging the paranasal sinuses is a sinus computed tomography (CT). This scan consists of single plane CT "sinus screen" images from the frontal to the sphenoid sinuses. It is an excellent tool for identifying patients with acute rhinosinusitis and may help differentiate patients with rhinosinusitis from those with allergic rhinitis, atypical facial pain, and other problems. Note that single plane CT "sinus screen" images do include images of tooth roots, disease of which can be a source of or mimic the signs of sinusitis.

For patients who may have had or need repeated scans, low dose CT scanners are becoming available with the advantage of substantial radiation dose reduction compared to a full sinus CT scan. However, if surgery is anticipated, a standard CT scan is preferred by many surgeons because standard-dose CT scanners produce images with slightly better tissue resolutions. At UM Health System the charge is $1,468 for any sinus CT scan (low dose, limited, or full) [October 2010].

To help interpret CT scan reports, Table 6 lists "red flags" that should prompt urgent otolaryngology referral (e.g., unilateral recurrent or chronic disease, bony erosion, or sinus expansion). It also lists findings that are abnormal as well as those that are generally not concerning.

CT findings must always be correlated with clinical information. If imaging suggests no inflammatory disease, then rhinosinusitis is not a likely cause of a patient's symptoms. Discontinue rhinosinusitis therapy, review the history and examination, and consider alternative diagnoses, some of which are listed in Table 7.

Neither plain sinus x-rays nor magnetic resonance imaging (MRI) is recommended. Compared to plain sinus x-rays, the sinus CT yields a far superior definition of sinus pathology, sinus obstruction, and ostiomeatal complex disease. MRI fails to demonstrate the bony anatomy of the ostiomeatal complex and is overly sensitive to mucosal changes.

Sinus aspiration/nasal culture. Sinus puncture and aspiration is not indicated for routine acute rhinosinusitis. Patients that are evaluated by a specialist for an active and recurrent infection may benefit from endoscopic cultures of the discharge as it exits the sinuses, in order to guide antibiotic therapy.

Dental sinusitis. Clues for dental source include poor oral health, single tooth sensitivity/pain, facial swelling, and foul nasal odors.

Complications. Signs and symptoms worrisome for intracranial or intraorbital extension of infection include high fever, severe pain, worsening headache, meningeal signs, infraorbital hypesthesia, altered mental status, significant facial swelling, diplopia, ptosis, chemosis (swelling of tissue lining eyelid and eye surface), proptosis, and pupillary or extraocular movement abnormalities.

Medical Therapy

Decision to use antibiotics. As noted in Table 2, approximately 70% of patients with acute bacterial rhinosinusitis improve within 2 weeks without antibiotics; approximately 85% improve with appropriate antibiotics. The incidence of severe complications and progression from acute to chronic rhinosinusitis is extremely low. In addition, there is no evidence that antibiotic therapy of rhinosinusitis prevents severe complications or the progression to chronic disease. For these reasons, the decision to use antibiotics in an individual patient should be influenced very little or not at all by the desire to prevent complications and/or the development of chronic rhinosinusitis.

A reasonable strategy is to assess a patient's clinical probability of rhinosinusitis (Tables 1 and 3). If symptoms, clinical probability, and comorbidities are low to moderate, use symptomatic therapies without antibiotics. If, on the other hand, symptoms are moderate to severe or worsening and clinical suspicion for bacterial rhinosinusitis is high, include antibiotics in the treatment regimen (Figure 2).

Antibiotic selection. Numerous clinical studies have compared the efficacy of various antibiotics with placebo and with other antibiotics for acute bacterial rhinosinusitis. These were reviewed in a meta-analysis (6 randomized, placebo controlled trials of about 2 weeks duration) and in a Cochrane Review (49 randomized controlled trials). Based on these data and on cost, amoxicillin (500 mg q8 hr - *not q12 hr)* and trimethoprim/sulfamethoxazole (e.g., Bactrim-DS®) are the recommended first line antibiotics for 10-14 days (Table 4, Section A) *[AI*]*. Table 4, Section B lists alternatives for patients who are unable to take amoxicillin due to allergy or other intolerance. No evidence suggests that these alternative antibiotics have superior efficacy to first line agents. Prescribe alternatives only because of allergy or intolerance to first line agents, not for antibiotic failures (see below).

A three-day course of azithromycin 500 mg daily has FDA-approval for the treatment of acute bacterial sinusitis. Azithromycin is an acceptable alternative for patients who are allergic to first line antibiotics and for whom you plan to treat for shorter (10-14 days) rather than longer (14-21 days) duration. Therapeutic tissue levels (although not serum levels) of the drug are reported to persist for 3 to 7 days after azithromycin is discontinued, thus the 3-day regimen provides an equivalent of up to 10 days of antibiotic exposure. Complex dosing is necessary for more extended treatment. In general, do <u>not</u> use azithromycin for treatment of chronic sinusitis or for treatment failure of first line antibiotics or their alternatives.

Levofloxacin 750 mg daily for 5 days has been found to be as effective to levofloxacin 500 mg daily for 10 days in the treatment of acute bacterial sinusitis. Only use this regimen if the patient is allergic to/intolerant of first line antibiotics or their alternatives.

Incomplete resolution. Clinical trials indicate that approximately 15% of patients require more than two weeks to improve, regardless of the initial antibiotic. Of these patients, the majority eventually achieve resolution of their symptoms. Therefore extending therapy with the same antibiotic for a total of three weeks before changing antibiotics or pursuing further evaluation with a limited sinus CT scan.

Antibiotic failures – second line antibiotics. Many of the trials of antibiotic therapy for acute bacterial rhinosinusitis predate more recent increases in antimicrobial resistance.

A broader spectrum ("second line") antibiotic (see Table 4, Section C) may be needed for adults with symptoms and signs that are highly suspicious for acute bacterial rhinosinusitis and who have little or no improvement with either a first line antibiotic or one of the first line alternatives (see Table 4, Sections A & B).

Infections likely to be of dental origin may involve oral anerobes producing beta lactamase. Amoxicillin/clavulanic acid is a reasonable choice. Or a second, anerobe-covering drug (e.g., metronidazole, or clindamycin) could be added to the first or second line antibiotic.

Depending upon recent (within 4-6 weeks) antibiotic exposure and antimicrobial resistance patterns in your area, consider coverage for resistant *Streptococcus pneumoniae*, *Haemophilus influenzae*, and/or *Moraxella catarrhalis*. Little evidence is available regarding risk factors for rhinosinusitis due to penicillin resistant *S. pneumoniae.* For community acquired pneumonia, major risk factors for penicillin resistant *S. pneumoniae* are: antibiotics (especially β-lactam) within 3 months; age greater than 65 years; alcoholism; and immunocompromise.

Due to risk for emergence of antibiotic resistance, use fluoroquinolone antibiotics only after treatment failure with a first line antibiotic (or in the case of allergy to all first-line antibiotics). Ciprofloxacin [Cipro®] is not recommended as a second line antibiotic for acute bacterial rhinosinusitis because it, as well as other "first generation" fluoroquinolones, has limited activity against *S. pneumoniae.* In contrast, levofloxacin [Levaquin®] and several other newer fluoroquinolones (e.g., moxifloxacin) have better activity against *S. pneumoniae*, making them

options among second line antibiotics. Fluoroquinolones increase the risk of tendon rupture in those over age 60, in kidney, heart, and lung transplant recipients, and with use of concomitant steroid therapy. Use of fluoroquinolones has also been associated with risk for serious nerve damage (neuropathy), which may be irreversible.

Antibiotics options for treatment failures include 10-14 days of (Table 4, Section C):

- Amoxicillin, high dose, 875-1000 mg q8 hr
  - OK for many resistant *S. pneumoniae*
  - Less likely to cover *H. influenzae* or *M. catarrhalis*
- Amoxicillin/clavulanic acid
  - Usual dose, 875/125 q12 hr or
  - High dose, XR 2000/125 q12 hr
- Levofloxacin 500 mg daily or 750 mg daily for 5 days
- Moxifloxacin 750 mg daily

Antibiotics that should not be used for acute bacterial rhinosinusitis include:

- Ciprofloxacin has limited activity against Strep and is thus potentially ineffective.
- Telithromycin, as of February 2007, no longer carries FDA approval for acute bacterial rhinosinusitis. The risks for hepatotoxicity, loss of consciousness, and visual disturbances appear to outweigh potential benefits for this indication.

Partial immunosuppression. Patients with acute sinusitis who are partially immunosuppressed (i.e. not neutropenic) should be managed on a case by case basis. Consider holding or reducing immunosuppression if, after treatment is initiated, the infection fails to improve or resolve in a timely fashion. Broader spectrum antibiotics may be warranted as a first line agent in this population.

Adjuvant therapies. Adjuvant therapies are listed in Table 5. Little evidence exists regarding the use of ancillary therapies for acute rhinosinusitis. Some studies support the use of adjuvant medications, but many contradict one another or show only minimal, if any, improvement in symptoms. Thus, while adjuvant therapies may improve symptoms of acute rhinosinusitis and colds, they have not been shown to change the course of the disease (except possibly zinc lozenges). Nevertheless, because adjuvant therapies tend to be inexpensive and have few side effects, use based on the clinician's individual judgment may be justified.

Likely to be effective in treating symptoms.

- Topical steroids reduce edema and inflammation and may improve symptoms in acute rhinosinusitis. Studies have not clearly demonstrated a benefit in any role other than symptom management. When using topical steroids expert opinion suggests that high dose nasal steroids are most likely to be effective.
- Topical decongestants may decrease nasal congestion; expert opinion suggests that they may improve drainage. Topical decongestant use should be limited to 3 days due to the risk of rebound vasodilation (*rhinitis medicamentosa)* or atrophic rhinitis.
- Topical anticholinergics may be used as adjunct therapy to decrease the production of mucus and diminish thin rhinorrhea for patients. This may be effective for symptom relief. While it is plausible that thickening of the mucus could impair its clearance from the sinuses (thereby possibly perpetuating the acute infection or leading to chronic rhinosinusitis), this phenomenon has not been documented despite numerous clinical trials with anticholinergic medications.

Likely to be effective in acute rhinosinusitis for persons with a history of chronic or recurrent sinusitis.

- Adding high dose nasal steroid spray to antibiotic therapy has been shown in controlled clinical trials to significantly reduce the duration and severity of symptoms of acute rhinosinusitis for recurrent acute rhinosinusitis or acute rhinosinusitis superimposed on chronic rhinosinusitis. For example, in one trial, cefuroxime x 10 days (250 mg q12 hrs) plus intranasal fluticasone x 21 days (equivalent to 4 sprays each nostril q12 hr) vs. cefuroxime plus placebo spray had higher rate of clinical success (93.5% vs. 73.9%; P=.009) and more rapid improvement (median to "clinical success" 6.0 vs. 9.5 days; P=.01) *[A,II*]*.

Possibly effective in treating symptoms.

- Vitamin C and zinc gluconate lozenges have been shown in some studies to provide more prompt resolution of symptoms in upper respiratory infections. Other studies have refuted these claims.
- Echinacea extract has demonstrated a trend toward symptom improvement. While the evidence for these agents is not clear, their side-effect profile is relatively benign.
- Nasal saline irrigation (e.g., neti pot with) either isotonic or hypertonic, may improve symptoms.

No proven benefit / not studied in treating symptoms.

- Antihistamines, the theoretical therapeutic effect of antihistamines is due to their anticholinergic properties and the effectiveness in non-atopic individuals is not demonstrated. Further, newer, less-sedating antihistamines are less likely to be effective for diminishing rhinorrhea while first generation antihistamines may cause sedation and impair psychomotor functioning.
- Expectorants, such as guaifenesin, thin secretions and thus theoretically improve mucus clearance. No evidence supports or refutes this theory.

- Nasal saline spray, local heat, and inhaled steam may soften secretions and provide symptomatic relief, but again, little objective evidence exists regarding their use.
- Oral corticosteroids similarly have no proven benefit though in theory they may decrease mucosal inflammation and re-establish mucus clearance. The significant side effects of systemic steroids must be weighed against any theoretical benefit.

Otolaryngology Referral and Surgical Alternatives

Otolaryngology referral. Refer for evaluation:

- Patients who have failed appropriate medical therapy for acute rhinosinusitis and who have evidence of inflammatory disease on limited sinus CT should be referred for otolaryngology evaluation.
- Patients with more than 3 episodes per year of acute rhinosinusitis and evidence of inflammatory disease on CT.

Consider urgent referral for patients who have worrisome symptoms after 24 - 72 hours of antibiotic therapy, especially if the patient has been taking broad-spectrum antibiotics." Worrisome symptoms includes: Worsening pain, worsening headache, high fever, cranial neuropathies, meningitis symptoms, or redness or swelling of the orbit or soft tissues over the sinuses.

Otolaryngology evaluation. An otolaryngology evaluation will almost always include nasal endoscopy. If rhinosinusitis is confirmed, a detailed CT scan may be requested to identify the extent of sinus disease and to visualize bony detail.

Surgical alternatives. Surgery for acute rhinosinusitis is reserved for patients with threatened intraorbital or intracranial complications, for those who fail to respond to oral and parenteral antibiotics, and for some immunocompromised patients. For less urgent surgical intervention potential indications include persistent rhinosinusitis despite appropriate medical therapy and documented recurrent rhinosinusitis with identifiable and related anatomical or acute pathological abnormalities in the ostiomeatal complex. In limited studies, the reported success of endoscopic sinus surgery has been favorable with an expectation of benefit for 80% to 90% of patients. Possible complications mirror those of traditional sinus surgery. Major complications are rare, but include hemorrhage, cerebrospinal fluid leakage, intracranial trauma, blindness, and visual disturbances. Minor complications include periorbital hematoma, subcutaneous orbital emphysema, epiphora, synechiae, and natural ostia closure.

Strategy for Literature Search

The literature search for this update began with the results of the literature searches performed in 1996 to develop the initial guideline, in 1998 for an update, and in 2004 for an update that included literature through April 2004.

The literature search conducted in 2010 for this update used keywords that were almost identical to those used in the previous searches. However, instead of beginning the search with literature in 2004, the guideline team accepted the search strategy and results of the search performed for the "Clinical practice guideline: Adult sinusitis" commissioned by the American Academy of Otolaryongology – Head and Neck Surgery (see Related National Guidelines). That search included literature through November 2006. The search for this update added literature from December 2006 through April 2010. That time frame was use for all keyword searches except for Dental sinusitis and odontogenetic sinusitis, new search terms for which the search began with January 2000.

The search was conducted prospectively on Medline using the major keywords of: rhinosinusitis, sinusitis; clinical guidelines, controlled clinical trials, cohort studies; adults; and English language. Terms used for specific topic searches within major key words included: history; physical exam, signs, symptoms; predictors; computed tomography, magnetic resonance imaging, x-ray, ultrasound; sinus aspiration; nasal culture; dental sinusitis, ondontogenic sinusitis; diagnosis not included above; observation, saline, steam, postural drainage; decongestants; cough suppressants; antihistamines; antibiotics; guaifenesin; corticosteroids; zinc; vitamin C; ipratropium; capsaicin; Echinacea; treatment failure, recurrence, persistent; immunocompromised, immunosuppressed, immunomodulators, transplant; treatment or management not included above. Specific search strategy available upon request.

The searches were conducted in components each keyed to a specific causal link in a formal problem structure. The search was supplemented with very recent clinical trials known to expert members of the panel. Negative trials were specifically sought. The search was a single cycle. When possible, conclusions were based on prospective randomized controlled trials. In the absence of randomized controlled trials, observational studies were considered. If none were available, expert opinion was used.

Related National Guidelines

The UMHHC Clinical Guideline on Rhinosinusitis is consistent with:

Rosenfeld RM, Andes D, Bhattacharyya N, et al. Clinical practice guideline: Adult sinusitis. Otolaryngology-Head and Neck Surgery, 2007, 137:S1-S31. (Commissioned by the American Academy of Otolaryngology – Head and Neck Surgery Foundation)

Slavin RG, Spector SL, Bernstein I L, et al. The diagnosis and management of sinusitis: A practice parameter update. Journal of Clinical Immunology,

2005, 116(6):S13-S47. (Commissioned by the American Academy of Allergy Asthma and Immunology)

Disclosures

The University of Michigan Health System endorses the Guidelines of the Association of American Medical Colleges and the Standards of the Accreditation Council for Continuing Medical Education that the individuals who present educational activities disclose significant relationships with commercial companies whose products or services are discussed. Disclosure of a relationship is not intended to suggest bias in the information presented, but is made to provide readers with information that might be of potential importance to their evaluation of the information.

Team Member	Company	Relationship
R. Van Harrison, PhD	(none)	
Eric P. Skye, MD	(none)	
Jeffrey E. Terrell, MD	Xoran	Shareholder
Denise H. Zao, MD	(none)	

Review and Endorsement

Drafts of this guideline were reviewed in clinical conferences and by distribution for comment within departments and divisions of the University of Michigan Medical School to which the content is most relevant: Family Medicine, General Medicine, and Otolaryngology–Head and Neck Surgery. The Executive Committee for Clinical Affairs of the University of Michigan Hospitals and Health Centers endorsed the final version.

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2004: Jane McCort, General Internal Medicine, Daniel Dubay, MD, General Internal Medicine, Van Harrison, PhD, Medical Education, James Peggs, MD, Family Medicine, Jeffey Terrell, MD, Otolaryngology, and Richard Orlandi, MD, Otolaryngology.

2005: Jane T. McCort, MD, General Internal Medicine, R. Van Harrison, PhD, Medical Education, James F. Peggs, MD, Family Medicine, and Jeffey E. Terrell, MD, Otolaryngology.

Annotated References

For general information:

Ahovu-Saloranta A, Borisenko OV, Kovanen N, Varonen H, Rautkorpi UM, Williams Jr JW. Antibiotics for acute maxillary sinusitis (Review). In: The Cochrane Library 2009, Issue 3. Chichester, UK: John Wiley & Sons, Ltd.

A review of randomized trials of antibiotics for acute maxillary sinusitis (57 studies met inclusion criteria) found no significant differences in comparisons between classes of antibiotics. Authors conclude that antibiotics have a small treatment effect in patients with uncomplicated acute sinusitis, with 80% of patients not receiving antibiotics improving within two weeks. The small benefit of antibiotic treatment should be weighed against the potential for adverse effects at the individual and general population levels.

Sinus and Allergy Health Partnership. Antimicrobial treatment guidelines for acute bacterial rhinosinusitis. Otolaryngol Head Neck Surgery. 2004;130(1 Suppl):1-45.

Summary of pharmacokinetics and pharmacodynamics and how they relate to the effectiveness of antimicrobial therapy. These updated guidelines include most recent management principles, antimicrobial susceptibility patterns, and therapeutic options.

Lau J, Zucker D, Engels EA, Balk E, et al. Diagnosis and treatment of acute bacterial rhinosinusitis. Evidence Report/Technology Assessment No. 9 (Contract 290-97-0019 to the New England Medical Center). Rockville, MD: Agency for Health Care Policy and Research. March 1999.

Summary of published evidence (1966 - May 1998) on diagnosis and treatment of community-acquired acute bacterial rhinosinusitis in adults & children. Includes 6 RCTs of any antibiotic vs. placebo.

Selected issues:

Dolor RJ, Witsell DL, Hellkamp AS, et al. Comparison of cefuroxime with or without intranasal fluticasone for the treatment of rhinosinusitis. The CAFFS trial: A randomized controlled trial. JAMA. 2001;286:3097-150.

For patients with acute rhinosinusitis *and* a history of chronic or recurrent sinusitis, cefuroxime plus intranasal corticosteroids (at relatively high dose x 21 days) had significantly higher rate of clinical success and faster rate of improvement than cefuroxime plus placebo spray.

Jackson, et al. A Meta-Analysis of Zinc Salts Lozenges and the Common Cold. Arch Internal Med. 1997;157:2373-2376.

Meta-analysis of 6 trials assessing effectiveness of zinc on cold symptoms.

Williams JW Jr, Simel DL, Roberts L, Samsa GP. Clinical evaluation for sinusitis: making the diagnosis by history and physical examination. Ann Intern Med 1992;117:705-710.

Prospective study of VA general medicine patients that compared clinical findings with plain sinus radiographs in diagnosis of sinusitis.