Uncomplicated acute sinusitis and rhinosinusitis in adults: Treatment

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INTRODUCTION

Acute rhinosinusitis (ARS) is defined as symptomatic inflammation of the nasal cavity and paranasal sinuses (figure 1) lasting less than four weeks. The term "rhinosinusitis" is preferred to "sinusitis" since inflammation of the sinuses rarely occurs without concurrent inflammation of the nasal mucosa [1].

The most common etiology of ARS is a viral infection. The clinical manifestations and diagnosis of ARS are discussed separately. (See "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis".)

Treatment for acute viral rhinosinusitis (AVRS) focuses on symptomatic management as it typically resolves within 7 to 10 days. Bacterial infection occurs in only 0.5 to 2 percent of episodes of ARS [2]. Acute bacterial rhinosinusitis (ABRS) may also be a self-limited disease. Patients may be treated symptomatically and observed or treated with antibiotics. Rarely, patients with ABRS develop serious complications.

This topic will address the treatment of uncomplicated ARS. The treatment of complications of ABRS are discussed in the appropriate topics. As examples:

- Orbital cellulitis (see "Orbital cellulitis")

- Preseptal (periorbital) cellulitis (see "Preseptal cellulitis")
- Intracranial abscess (see "Treatment and prognosis of bacterial brain abscess")
- Meningitis (see "Initial therapy and prognosis of community-acquired bacterial meningitis in adults")

The treatment of nosocomial bacterial sinusitis and acute invasive fungal sinusitis are also discussed separately. (See "Fungal rhinosinusitis", section on 'Treatment' and "Complications of the endotracheal tube following initial placement: Prevention and management in adult intensive care unit patients", section on 'Sinusitis'.)

ACUTE VIRAL RHINOSINUSITIS

Patients with acute viral rhinosinusitis (AVRS) should be managed with supportive care [3]. There are no treatments to shorten the clinical course of the disease. (See 'Symptomatic management' below.)

Natural history — AVRS may not completely resolve within 10 days but is expected to improve. Patients who fail to improve after ≥10 days of symptomatic management are more likely to have acute bacterial rhinosinusitis (ABRS) and should be managed as ABRS patients. (See "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis", section on 'Acute bacterial rhinosinusitis' and 'Acute bacterial rhinosinusitis' below.)

Symptomatic management — Symptomatic management of acute rhinosinusitis (ARS), both viral and bacterial in etiology, aims to relieve symptoms of nasal obstruction and rhinorrhea as well as the systemic signs and symptoms such as fever and fatigue. When needed, we suggest over-the-counter analgesics and antipyretics, saline irrigation, intranasal glucocorticoids, and potentially flavonoids [4] for symptomatic management in patients with ARS (table 1).

Analgesics and antipyretics — Over-the-counter analgesics and antipyretics such as nonsteroidal antiinflammatory drugs (NSAIDs) and acetaminophen can be used for pain and fever relief as needed [5,6].

Saline irrigation — Mechanical irrigation with buffered, physiologic, or hypertonic saline may reduce the need for pain medication and improve overall patient comfort, particularly in patients with frequent sinus infections. The evidence supporting the use of saline irrigation is limited but indicates possible benefits for symptom relief with minor adverse effects, such as nasal burning and irritation [7]. It is important that irrigants be prepared from sterile or bottled water as there have been reports of amebic encephalitis due to tap water rinses [8]. Instructions for preparing a rinse solution are shown in the table (table 2).

Intranasal glucocorticoids — Studies have shown small symptomatic benefits and minimal adverse effects with short-term use of intranasal glucocorticoids for patients with both viral and bacterial ARS [5,6]. Intranasal glucocorticoids are likely to be most beneficial for patients with underlying allergic rhinitis. The theoretic mechanism of action is a decrease in mucosal inflammation that allows improved sinus drainage.

A meta-analysis of three studies involving patients with ARS diagnosed by symptoms and confirmed by radiologic or endoscopic studies found that use of intranasal steroids increased the rate of symptom response compared with placebo (risk ratio 1.11, 95% CI 1.04-1.18) [9]. A higher dose of intranasal glucocorticoids had a stronger effect on symptom improvement. When used as an adjunct to antibiotic therapy in the treatment of ABRS, a meta-analysis of placebo-controlled trials suggests that 15 patients would need to be treated with intranasal glucocorticoids to improve clinical symptoms in one patient [6].

Other

- **Intranasal** saline **spray** – Sterile intranasal saline spray may temporarily improve nasal passage patency by moisturizing and loosening secretions. This approach may be useful in combination with intranasal glucocorticoids. The major disadvantages are that some patients may find this to be uncomfortable or difficult. Saline must also be sterile.

- **Intranasal** ipratropium **bromide** – Intranasal ipratropium bromide is an anticholinergic spray that can help reduce rhinorrhea in patients with concurrent common cold symptoms. It may not have significant effect on nasal congestion. (See "The common cold in adults: Treatment and prevention", section on 'Intranasal ipratropium bromide'.)

- **Oral decongestants** – Oral decongestants may be useful when Eustachian tube dysfunction is a factor for patients with AVRS. These patients may benefit from a short course (three to five days) of oral decongestants. Oral decongestants should be used with caution in patients with cardiovascular disease, hypertension, angle-closure glaucoma, or bladder neck obstruction [10]. (See "Eustachian tube dysfunction" and "Eustachian tube dysfunction", section on 'Medical management'.)

  In other patients, there is no evidence that oral decongestants are efficacious in decreasing symptoms of ARS, and they have many adverse side effects (table 3) [5,6].

- **Intranasal decongestants** – Intranasal decongestants are often used as symptomatic therapies by patients. These agents, such as oxymetazoline, may provide a subjective sense of improved nasal patency. However, there is no evidence to support their use for ARS [5,6]. There is also concern that intranasal decongestants themselves may provoke

mucosal inflammation, at least in an experimental animal model [11]. If used, topical decongestants should be used sparingly for no more than three consecutive days to avoid rebound congestion, addiction, and mucosal damage associated with long-term use [12]. (See "An overview of rhinitis", section on 'Nasal decongestant sprays' and "Chronic nonallergic rhinitis", section on 'Management of rhinitis medicamentosa'.)

- **Antihistamines** – Antihistamines are frequently used for symptom relief due to their drying effects; however, there are no studies investigating their efficacy for ARS [5,6]. Over-drying of the mucosa may lead to further discomfort. Additionally, antihistamines (particularly first-generation medications) are often associated with adverse effects (drowsiness, xerostomia) [6]. (See "Pharmacotherapy of allergic rhinitis", section on 'Adverse effects and safety' and "Pharmacotherapy of allergic rhinitis", section on 'Adverse effects'.)

- **Mucolytics** – Mucolytics such as guaifenesin serve to thin secretions and may promote ease of mucus drainage and clearance; however, no published trials exist to support their use in ARS [5].

- **Steam inhalation or "tenting"** – Inhalation of warm, humidified air (steam), may provide patients with a transient sense of relief of congestion, but there is no evidence that it will shorten the duration or severity of symptoms [13,14]. If steam is used, care should be taken to ensure that the source of steam is clean, without mold or other contaminants.

ACUTE BACTERIAL RHINOSINUSITIS

In addition to supportive care, options for the outpatient management of uncomplicated acute bacterial rhinosinusitis (ABRS) are observation or antibiotics depending on patient follow-up (algorithm 1).

Guidelines for the management of sinusitis have been issued by the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS; 2015) and the Infectious Disease Society of America (IDSA; 2012). Our recommendations for management are largely consistent with those of the AAO-HNS.

Natural history — Many patients with ABRS have self-limited disease that resolves without antibiotic therapy. Patients rarely develop complications of bacterial infection beyond the nasal cavity into the central nervous system, orbit, or surrounding tissues. Patients treated with antibiotics may have a shorter course of illness; however, they also experience more adverse events. (See 'Observation and symptomatic management' below and 'Antibiotics' below.)

Indications for urgent referral — Urgent early referral is essential for patients with symptoms that are concerning for complicated ABRS or have evidence of complications on imaging. These include patients with high, persistent fevers >102°F; periorbital edema, inflammation, or erythema; cranial nerve palsies; abnormal extraocular movements; proptosis; vision changes (double vision or impaired vision); severe headache; altered mental status; or meningeal signs. (See "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis", section on 'Complications' and "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis", section on 'Complicated acute bacterial rhinosinusitis'.)

Observation and symptomatic management — We suggest observation (watchful waiting for a seven-day period after clinician diagnosis) with symptomatic management for immunocompetent patients with ABRS who have good follow-up (assurance that antibiotic therapy can be started if the patient does not improve or worsens) (algorithm 1) [5]. The symptomatic management of ABRS is similar to that of acute viral rhinosinusitis (AVRS) (table 1). (See 'Symptomatic management' above.)

For patients who do not have good follow-up, we start antibiotic therapy at the time of diagnosis. We also start antibiotics for patients with a clinical diagnosis of ABRS whose symptoms worsen or fail to improve within the seven-day observation period (algorithm 1). (See 'Antibiotics' below.)

There are also a variety of reasons for patients to have a suppressed immune system, and treatment decisions for immunocompromised patients should be made on a case-by-case basis. They may warrant immediate antibiotic treatment and/or specialist referral.

Guidelines from a multidisciplinary expert panel in 2015 recommend that patients with uncomplicated ABRS (regardless of severity of symptoms) may be managed symptomatically and observed if they have good follow-up [5]. The guidelines suggest that factors such as age, general state of health, and comorbidities should be considered when choosing this option. These guidelines differ from the 2012 IDSA guidelines, which recommend initiation of antibiotics for those with persistent symptoms or signs compatible with acute rhinosinusitis (ARS) lasting for ≥10 days without any evidence of clinical improvement **or** onset with severe symptoms or signs of high fever (≥39°C [102°F]) and purulent nasal discharge or facial pain lasting for at least three to four consecutive days at the beginning of the illness **or** worsening symptoms or signs for three to four days characterized by the new onset of fever, headache, or increase in nasal discharge following a typical viral upper respiratory infection that lasted five to six days and were initially improving ("double sickening") [6]. We prefer to provide an option for continued observation in patients with uncomplicated ABRS as many patients with ABRS improve without antibiotic therapy.

ABRS may be a self-limited disease, and patients may improve without antibiotic therapy. Systematic reviews and meta-analyses have found that many patients with clinically diagnosed ABRS improve without antibiotic therapy within two weeks [15]. For example, a 2014 systematic review of randomized trials in immunocompetent patients with maxillary sinusitis found that 80 percent of patients not treated with antibiotics improved within two weeks [16]. A 2018 systematic review of 15 randomized trials including over 3000 immunocompetent patients with uncomplicated ARS found that nearly half of patients improved by one week, and two-thirds by two weeks, irrespective of antibiotic therapy [17]. Additionally, compared with placebo, patients who receive antibiotics have more adverse events [17,18]. However, the rates of spontaneous recovery for patients with ABRS are likely to be lower than reported in these analyses, as trials generally diagnose ABRS by clinical criteria and are likely to include some patients with AVRS. (See 'Antibiotics' below.)

Antibiotics — For patients who do not have good follow-up, we initiate antibiotic therapy upon the diagnosis of ABRS (algorithm 1 and algorithm 2). In addition, antibiotics should also be started in patients who have been managed with observation who have worsening symptoms or fail to improve within a seven-day period after clinician diagnosis.

Treatment decisions for immunocompromised patients should be made on a case-by-case basis. Such patients may warrant immediate antibiotic treatment and/or specialist referral. In addition, treatment decisions for patients with other comorbidities that can affect immune function (eg, diabetes) should be individualized as there are insufficient data to determine which patients will benefit most from early initiation of antibiotics rather than watchful waiting [19].

Meta-analyses have consistently found that, compared with placebo, patients with ABRS may benefit from antibiotics at the cost of increased adverse events [6,16,20-22]. Estimates of the number needed to treat to benefit range from 13 to 18 patients, while the number needed to harm is approximately eight patients [5,6,20,21].

Other meta-analyses have estimated cure or symptom improvement. One meta-analysis found that, compared with placebo, patients treated with antibiotics had a higher cure rate or symptom improvement at 7 to 15 days (odds ratio [OR] 1.64, 95% CI 1.35-2.0), with moderate magnitude of effect at the expense of an increase in adverse effects with antibiotic therapy [22]. Another found that, compared with placebo, antibiotic therapy with penicillin or amoxicillin decreased clinical failure at 7 to 15 days (lack of full recovery or improvement; risk ratio [RR] 0.66, 95% CI 0.47-0.94), but the clinical benefit was small and adverse events were more common with antibiotic treatment [16].

However, the studies in these meta-analyses have limitations. Many of the studies are likely to have included patients with AVRS as most studies used clinical criteria for diagnosis of ABRS without culture confirmation. Including patients with AVRS would make antibiotics appear less effective for ABRS. Also, studies have not generally distinguished the effectiveness of antibiotics based on symptom severity.

Additionally, comparative studies of antibiotics for the treatment of ABRS are limited as many studies likely include patients with AVRS. The significant rate of spontaneous recovery in studies decreases the ability of studies to differentiate between antibiotics (the apparent response to less-effective antibiotics is greater than would be seen in a more strictly defined ABRS population; conversely, the relative effectiveness of more appropriate antibiotics is diminished).

Initial therapy — Most patients with ABRS do not have culture data to guide antibiotic therapy, and treatment is initiated empirically (algorithm 2). The choice of antibiotic is based on the most common bacteria associated with ABRS (table 4) as there is limited evidence to guide therapy [23-28]. Routine coverage for *Staphylococcus aureus* or methicillin-resistant *S. aureus* (MRSA) is not indicated at this time. Despite the prevalence of staphylococcal colonization in the middle meatus in health adults, *S. aureus* remains an uncommon cause of ABRS [29]. (See "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis", section on 'Acute bacterial rhinosinusitis'.)

For most patients, we suggest initial empiric treatment with either amoxicillin or amoxicillin-clavulanate. We treat patients with risk factors for resistance with high-dose amoxicillin-clavulanate. (See "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis", section on 'Acute bacterial rhinosinusitis'.)

- **Patients without risk factors for pneumococcal resistance** – Either amoxicillin (500 mg orally three times daily or 875 mg orally twice daily) or amoxicillin-clavulanate (500 mg/125 mg orally three times daily or 875 mg/125 mg orally twice daily) is appropriate initial therapy for patients with ABRS who do not have risk factors for resistance (table 5 and algorithm 2) [5,30]. The addition of clavulanate to amoxicillin improves coverage for ampicillin-resistant *Haemophilus influenzae* as well as *Moraxella catarrhalis*.

  The evidence to support the use of amoxicillin-clavulanate rather than amoxicillin is stronger in children than adults [6]. However, there is increasing emergence of antimicrobial resistance among respiratory pathogens, including *Streptococcus pneumoniae* and *H. influenzae*. Resistance rates vary regionally, with the prevalence of *H. influenzae* resistance ranging from 27 to 43 percent in the United States [6]. Additionally, the introduction of routine conjugated pneumococcal vaccination in children has changed

the spectrum of bacterial infection. In both adults and children, the percentage of ABRS due to *S. pneumoniae* has decreased while the proportion due to *H. influenzae* has increased.

- **Patients with risk factors for pneumococcal resistance** – High-dose amoxicillin-clavulanate (2 g/125 mg extended-release tablets orally twice daily) is appropriate initial therapy for patients who are at higher risk for pneumococcal resistance or poor outcomes (algorithm 2) [5,6]. Risk factors for resistance and/or poor outcomes include (table 5):

  - Living in geographic regions with rates of penicillin-nonsusceptible *S. pneumoniae* exceeding 10 percent. Local and regional histograms of bacterial resistance should be referenced to understand resistance trends in the local community.
  - Age ≥65 years.
  - Hospitalization in the last five days.
  - Antibiotic use in the previous month.
  - Immunocompromise.
  - Multiple comorbidities (eg, diabetes or chronic cardiac, hepatic, or renal disease).
  - Severe infection (eg, evidence of systemic toxicity with temperature of ≥102°F, concern for suppurative complications).

  Patients with penicillin allergy – For patients who have a penicillin allergy, the choice of initial therapy depends upon the severity of the allergy.

  - For any patient with a penicillin allergy, doxycycline (100 mg orally twice daily or 200 mg orally daily) is a reasonable alternative to amoxicillin or amoxicillin-clavulanate for initial therapy (algorithm 2) [5,6].
  - For penicillin-allergic patients who can tolerate cephalosporins, a third-generation oral cephalosporin (cefixime 400 mg daily or cefpodoxime 200 mg twice daily) prescribed with or without clindamycin (300 mg every six hours) is another option. Monotherapy with a third-generation cephalosporin is likely adequate for most patients, particularly those without risk factors for resistance.

    For patients with risk factors for resistance (table 5), the addition of clindamycin to a cephalosporin provides improved coverage for beta-lactam-resi*stant S. pneumoniae*,

although this carries an increased risk of adverse effects (eg, *Clostridioides* [formerly *Clostridium*] *difficile* infection).

- A respiratory fluoroquinolone (levofloxacin 750 mg or 500 mg orally once daily or moxifloxacin 400 mg orally once daily) is another alternative for penicillin-allergic patients. However, fluoroquinolones should be reserved for those who have no alternative treatment options as the risk of serious adverse effects associated with fluoroquinolones generally outweighs the benefits for patients with acute sinusitis [31]. (See "Fluoroquinolones", section on 'Benefits and risks of use'.)

Macrolides (clarithromycin or azithromycin) and trimethoprim-sulfamethoxazole are not recommended for empiric therapy because of high rates of resistance of *S. pneumoniae* [5,6]. This is discussed in detail elsewhere. (See "Resistance of *Streptococcus pneumoniae* to the macrolides, azalides, and lincosamides" and "Resistance of *Streptococcus pneumoniae* to the fluoroquinolones, doxycycline, and trimethoprim-sulfamethoxazole".)

Antibiotic therapy for patients with nosocomial sinusitis and pregnant women with sinusitis are discussed separately. (See "Approach to the pregnant patient with a respiratory infection", section on 'Acute sinusitis' and "Complications of the endotracheal tube following initial placement: Prevention and management in adult intensive care unit patients", section on 'Sinusitis'.)

Duration — Patients who are improving on initial antibiotic therapy should be treated for a course of five to seven days [5,6]. This shorter course is reasonable as the available evidence suggests that response rates are similar and associated with fewer adverse events than longer courses [5,6].

In one meta-analysis of 12 randomized trials of ABRS in adults, no difference was noted in response rates or relapse rates comparing short courses (3 to 7 days) and longer courses (6 to 10 days) of antibiotics [32]. Rates of adverse events were lower for 5-day compared with 10-day courses. However, there was heterogeneity in the trials in terms of symptom duration and use of adjunctive medications.

Failure of initial therapy — Patients who have worsening symptoms or fail to have improvement within seven days on initial therapy should have the diagnosis of ABRS confirmed (algorithm 2) [5]. The diagnosis can be clinically confirmed if symptoms continue to be consistent with ABRS. While imaging is not indicated for most patients with uncomplicated ABRS, imaging is reasonable in patients who fail initial therapy (particularly if the initial agent was a respiratory fluoroquinolone) and whose symptoms are either not completely consistent with ABRS or are worrisome for possible complication to either confirm sinusitis and/or

evaluate for alternative diagnosis. (See "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis", section on 'Acute bacterial rhinosinusitis' and "Acute sinusitis and rhinosinusitis in adults: Clinical manifestations and diagnosis".)

An alternative treatment strategy is indicated for patients with confirmed uncomplicated ABRS whose symptoms worsen or fail to show some improvement with seven days of antibiotic therapy [5].

There are limited data to guide antibiotic selection for patients who do not respond to initial antibiotic treatment [5,6]. In general, treatment options for patients who fail to improve with initial therapy should have a broader spectrum of activity and/or be in a different drug class than the initial agent used. Choice of therapy thus depends on initial antibiotic therapy. Reasonable options include:

- Amoxicillin-clavulanate 2 g/125 mg extended-release tablets orally twice daily
- Levofloxacin 500 or 750 mg orally once daily
- Moxifloxacin 400 mg orally once daily

For penicillin-allergic patients, options include:

- Doxycycline 100 mg orally twice daily or 200 mg orally daily
- Levofloxacin 500 or 750 mg orally once daily
- Moxifloxacin 400 mg orally once daily

As noted above, fluoroquinolones should be reserved for those who have no alternative treatment options as the risk of serious adverse effects associated with fluoroquinolones generally outweigh the benefits for patients with acute sinusitis [31] (see "Fluoroquinolones", section on 'Benefits and risks of use'). A third-generation cephalosporin plus clindamycin is an alternative to fluoroquinolones; this regimen offers broader-spectrum coverage than doxycycline but offers no particular advantage over amoxicillin-clavulanate. Use of clindamycin also carries increased risk of *C. difficile* infection.

We typically treat patients who show improvement during the first week of therapy for 7 to 10 days.

Reasons for treatment failure include resistant pathogens, inadequate dosing, structural abnormalities, or a noninfectious etiology [6]. Experimental evidence indicates bacterial eradication by day 3 [33,34], and studies have correlated clinical and bacteriologic response [35]. Although older adults or those with multiple comorbidities may take longer to resolve

infection, such individuals should also show some symptom improvement within five days of initiating antibiotic therapy for ABRS [6].

Failure of multiple oral antibiotic courses — Patients should respond to a second course of appropriate antibiotic therapy within seven days of initiation. Patients who fail a second treatment course should have imaging and be referred for further evaluation (algorithm 2) [5,6]. A noncontrast computed tomography (CT) scan is appropriate in the evaluation of treatment-resistant sinusitis to evaluate for anatomic blockage [36]. Patients with anatomic abnormalities may require surgery. Patients should also be referred for sinus cultures either by direct aspirate or endoscopy of the middle meatus.

Relapse after oral therapy — Recurrence of symptoms within two weeks of response to initial oral treatment usually represents inadequate eradication of infection. Patients who had a good response to initial oral therapy and who have mild symptoms can be treated with a longer course of the same antibiotic. Patients whose relapse is moderate to severe, however, are more likely to have resistant organisms and require a change in the drug selected and/or imaging. (See 'Initial therapy' above and 'Failure of initial therapy' above and 'Failure of multiple oral antibiotic courses' above.)

Patients with relapse should be treated with antibiotics for at least 7 to 10 days. If symptoms persist despite a repeat 7- to 10-day course of antibiotics, referral is warranted.

Systemic glucocorticoids not indicated — We suggest not using systemic glucocorticoids in the treatment of ABRS. When given in addition to antibiotics, oral glucocorticoids may shorten the time to symptom resolution or improvement, although the benefits are small and, unlike topical glucocorticoids, systemic glucocorticoids pose a potential risk for side effects that outweighs the clinical benefits. (See "Major adverse effects of systemic glucocorticoids".)

A 2014 meta-analysis evaluated five randomized trials in 1193 adults with acute sinusitis. Four trials evaluated the benefits of systemic glucocorticoids in addition to antibiotics (three trials compared antibiotics plus glucocorticoids with antibiotics plus placebo, one trial compared antibiotics plus glucocorticoids with antibiotics plus a nonsteroidal antiinflammatory), and one trial compared systemic glucocorticoids with placebo. Patients receiving systemic glucocorticoids were more likely to have resolution or improvement in symptoms at three to seven days (RR 1.3, 95% CI 1.1-1.6), although there was a lack of benefit at days 4 to 14 [37]. A 2015 meta-analysis including only the four trials where antibiotics were prescribed demonstrated similar results for short-term improvement (improved symptom control at three to seven days with glucocorticoids; RR 1.4, 95% CI 1.1-1.8) [38]. These data, however, are limited

by methodologic problems including potential for attrition bias and the lack of long-term follow-up on the effects of steroids.

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Acute rhinosinusitis".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Sinusitis in adults (The Basics)" and "Patient education: What you should know about antibiotics (The Basics)")
- Beyond the Basics topic (see "Patient education: Acute sinusitis (sinus infection) (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- **Natural history of AVRS** – Acute viral rhinosinusitis (AVRS) is expected to improve or resolve within 10 days. Patients with AVRS should be managed with supportive care. Patients who fail to improve after ≥10 days of symptomatic management are more likely to have acute bacterial rhinosinusitis (ABRS) and should be managed as ABRS. (See 'Acute viral rhinosinusitis' above.)

- **Symptomatic management of ARS** – Symptomatic management of acute rhinosinusitis (ARS) aims to relieve symptoms of nasal obstruction and rhinorrhea. For patients with ARS, we suggest over-the-counter analgesics and saline nasal irrigation (**Grade 2C**). In addition, we suggest treatment with intranasal glucocorticoids (**Grade 2B**), particularly for patients with underlying allergic rhinitis. Decongestants may be useful when Eustachian tube dysfunction is a factor for patients with AVRS, but they are not likely to be helpful for patients with ABRS and they have adverse side effects (table 1). (See 'Symptomatic management' above.)

- **Observation and symptomatic management for the majority of patients with ABRS** – In the majority of patients, ABRS may also be a self-limited disease. Systematic reviews and meta-analyses have found that 70 to 80 percent of immunocompetent patients improve within two weeks without antibiotic therapy.

  - For immunocompetent patients with ABRS who have good follow-up, we suggest symptomatic management and observation over a seven-day period after clinician diagnosis (watchful waiting) (**Grade 2B**). For patients who have been managed with observation who have worsening symptoms or fail to improve within the observation period, antibiotics should be started (algorithm 1 and algorithm 2). (See 'Antibiotics' above.)

  - For patients who do not have good follow-up, we initiate antibiotic therapy upon diagnosis of ABRS. (See 'Observation and symptomatic management' above and 'Symptomatic management' above.)

  There are a variety of reasons for patients to have a suppressed immune system, and treatment decisions for immunocompromised patients should be made on a case-by-case basis. Such patients may warrant immediate antibiotic treatment and/or specialist referral. Treatment decisions for patients with other comorbidities that can affect immune function (eg, diabetes) should also be individualized.

- **Urgent referral for complicated ABRS** – For patients with symptoms that are concerning for complicated ABRS, or who have evidence of complications on imaging, urgent, early referral is essential. (See 'Indications for urgent referral' above.)

- **Initial antibiotic therapy for ABRS** – In light of increasing microbial resistance to antibiotics, we suggest initial empiric treatment with either amoxicillin or amoxicillin-clavulanate rather than macrolides (clarithromycin or azithromycin) or trimethoprim-sulfamethoxazole (**Grade 2B**). (See 'Initial therapy' above.)

- For patients without risk factors for resistance (table 5), we treat with either amoxicillin (500 mg orally three times daily or 875 mg orally twice daily) or amoxicillin-clavulanate (500 mg/125 mg orally three times daily or 875 mg/125 mg orally twice daily).

- For patients with risk factors for pneumococcal resistance (table 5), we treat with high-dose amoxicillin-clavulanate (2 g/125 mg extended-release tablets orally twice daily).

- For patients with a penicillin allergy, choice of initial therapy depends upon the severity of their allergy:

  - For any penicillin allergic patient, doxycycline (100 mg orally twice daily or 200 mg orally daily) is a reasonable option for initial therapy.

  - For penicillin-allergic patients who can tolerate cephalosporins, using an oral third-generation cephalosporin (eg, cefixime 400 mg daily or cefpodoxime 200 mg daily) with or without oral clindamycin is another option. For patients with risk factors for pneumococcal resistance (table 5), the addition of clindamycin (300 mg every six hours) to a cephalosporin provides improved coverage for beta-lactam-resistant *S. pneumoniae*.

  - A respiratory fluoroquinolone (levofloxacin 500 or 750 mg orally or moxifloxacin 400 mg orally once daily) is another alternative for penicillin-allergic patients. However, fluoroquinolones should be reserved for those who have no alternative treatment options as the risk of serious adverse effects associated with fluoroquinolones generally outweigh the benefits for patients with acute sinusitis.

- Patients who are improving on initial antibiotic therapy should be treated for five to seven days, as response rates are similar and adverse effects are fewer with this shorter course of therapy. (See 'Duration' above.)

- **Failure of initial antibiotic therapy** – Patients who have worsening symptoms or fail to have improvement within seven days on initial antibiotic therapy should have the diagnosis of ABRS confirmed (algorithm 2). While imaging is not indicated for most patients with uncomplicated ABRS, imaging is reasonable in patients who fail initial therapy, in patients whose symptoms are not completely consistent with ABRS, to confirm the diagnosis of sinusitis, and/or to evaluate for a complication or an alternative diagnosis. (See 'Failure of initial therapy' above.)

- For patients with confirmed uncomplicated ABRS who fail initial antibiotic therapy, an alternative treatment strategy is indicated. Choice of therapy will depend upon initial antibiotic therapy; the agent should have a broader spectrum of activity and/or be in a different drug class than the initial agent used. Treatment options include high-dose amoxicillin-clavulanate (2 g/125 mg extended-release tablets orally twice daily), a respiratory fluoroquinolone (levofloxacin 500 mg orally once daily or moxifloxacin 400 mg orally once daily), or a third-generation cephalosporin plus clindamycin.

  For penicillin-allergic patients, doxycycline 100 mg orally twice daily or 200 mg orally daily is an additional alternative.

  If improvement is seen within seven days of initiation of therapy, antibiotic treatment should be continued for a total course of 7 to 10 days.

- Patients who fail ≥2 courses of appropriate antibiotics should have imaging and be referred for further evaluation (algorithm 2). (See 'Failure of initial therapy' above.)

- Recurrence of symptoms within two weeks of response to initial treatment usually represents inadequate eradication of infection. (See 'Relapse after oral therapy' above.)

- **Systemic glucocorticoids not indicated** – For the treatment of ABRS, we suggest **not** using systemic glucocorticoids (**Grade 2C**). When given in addition to antibiotics, oral glucocorticoids may shorten the time to symptom resolution or improvement, although the benefits are small and, unlike topical glucocorticoids, systemic glucocorticoids pose a potential risk for side effects that outweighs the clinical benefits.

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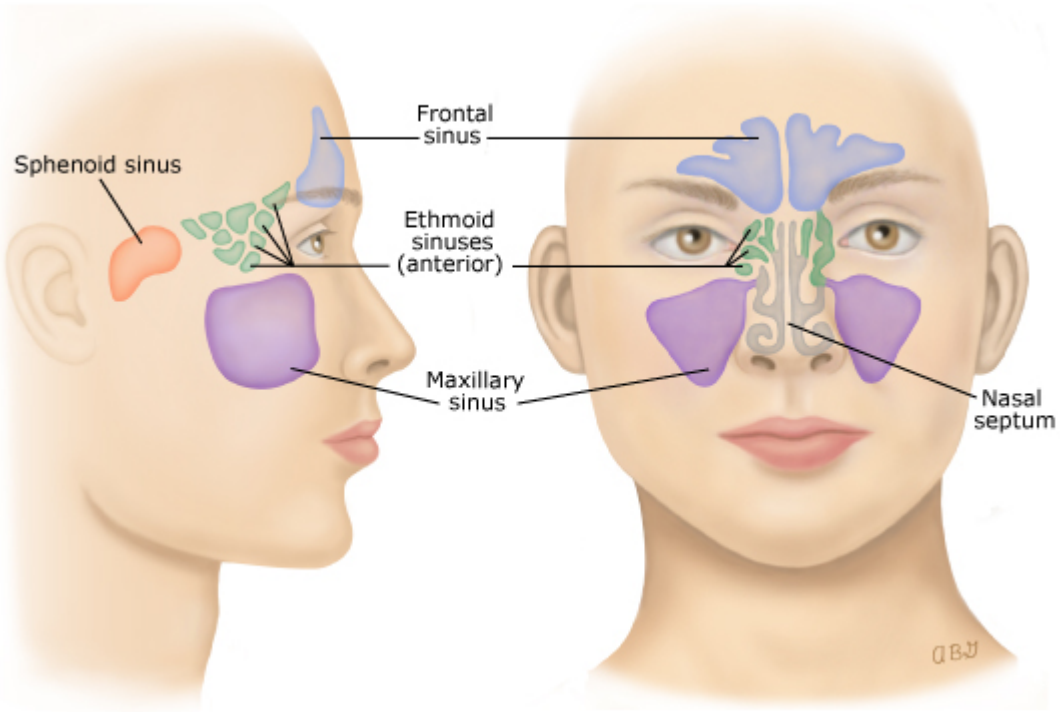
Topic 83012 Version 64.0

GRAPHICS

Paranasal sinus anatomy



Schematic drawing showing location of the frontal, ethmoid, maxillary, and sphenoid sinuses.

Graphic 78790 Version 6.0

Symptomatic care options for adults with acute rhinosinusitis

Class	Selected medication options	Advantages	Disadvantages
Oral analgesics and antipyretics (preferred)	▪ Acetaminophen ▪ NSAIDS (eg, ibuprofen, naproxen)	▪ Provide systemic pain relief and fever control ▪ Generally well-tolerated	▪ Acetaminophen use should be limited or avoided in patients with advanced-stage liver disease or decompensated cirrhosis ▪ NSAIDs are avoided or used with caution in patients with cardiovascular disease, chronic kidney disease, or advanced-stage liver disease or cirrhosis ▪ NSAIDs can be associated with increased risk of bleeding and gastrointestinal upset
Intranasal glucocorticoid sprays (preferred)	▪ Fluticasone propionate ▪ Mometasone ▪ Triamcinolone	▪ Relieve congestion by reducing inflammation ▪ May be particularly helpful for patients with allergic rhinitis	▪ Can cause epistaxis and sore throat
Intranasal saline spray	▪ Intranasal sterile saline	▪ Moisturizes passages and loosens secretions ▪ May temporarily improve nasal passage patency ▪ Useful in combination with intranasal glucocorticoid sprays	▪ Some patients may find this difficult or uncomfortable ▪ Saline must be sterile
Intranasal anticholinergic spray	▪ Ipratropium bromide	▪ Significantly reduces rhinorrhea	▪ May not improve congestion
Intranasal decongestant	▪ Oxymetazoline	▪ Can improve nasal patency and promote	▪ May cause rebound congestion or mucosal

sprays		drainage	damage when used for long-periods ▪ Should not be used for >3 days
Oral decongestants	▪ Pseudoephedrine ▪ Phenylephrine	▪ Relieves congestion through vasoconstriction ▪ Pseudoephedrine may be more effective than phenylephrine ▪ May be particularly helpful for patients with Eustachian tube dysfunction (eg, ear pain, a sensation of ear fullness or pressure, hearing loss, and/or tinnitus)	▪ Avoid or use with caution in patients with cardiovascular disease, hypertension, angle-closure glaucoma, or bladder neck obstruction due to sympathomimetic effects
Oral antihistamines	▪ **First generation:** • Clemastine • Diphendydramine ▪ **Second generation:** • Fexofenadine • Loratadine • Cetirizine	▪ First-generation agents can be useful for drying effect ▪ Second-generation agents can be useful in patients with allergies ▪ Available in combination with oral decongestants	▪ Can lead to over-drying, thickened, difficult-to-mobilize secretions, and increased discomfort ▪ Can cause drowsiness, cognitive impairment, and anticholinergic effects
Oral expectorants	▪ Guaifenesin	▪ Can promote drainage by thinning secretions	▪ Side effects can include gastrointestinal upset and drowsiness

The approach to symptomatic care for patients with acute rhinosinusitis is typically based on the patient's symptoms, comorbidities, and preferences as well as the potential adverse medication effects. Most medications described above can be obtained over-the-counter in the United States and elsewhere. Other useful supportive measures include mechanical saline irrigation, which is reviewed in a separate UpToDate table. Key risks and benefits are provided in this table. For detailed discussion and comprehensive review of adverse effects as well as drug interactions, refer to the UpToDate text, Lexicomp drug monographs, and drug interactions program.

NSAIDs: nonsteroidal antiinflammatory drugs.

Graphic 119574 Version 5.0

How to perform nasal irrigation

Buffered normal saline nasal irrigation

The benefits

- Saline (saltwater) washes the mucus and irritants from your nose.
- The sinus passages are moisturized.
- Studies have also shown that a nasal irrigation improves the function of cilia (tiny hair-like structures on cells that move the mucus).

The recipe

1. Use a one-quart glass jar that is thoroughly cleansed.
2. You may use a large medical syringe (30 cc), water pick with an irrigation tip, squeeze bottle, or Neti pot. Do not use a baby bulb syringe. The syringe or pick should be sterilized frequently or replaced every 2 to 3 weeks to avoid contamination and infection.
3. Fill with water that has been distilled, previously boiled, or otherwise sterilized. Plain tap water is not recommended, because it is not necessarily sterile.
4. Add 1 to 1½ heaping teaspoons of pickling/canning salt. Do **not** use table salt, because it contain a large number of additives.
5. Add 1 teaspoon of baking soda (pure bicarbonate).
6. Mix ingredients together and store at room temperature. Discard after 1 week.
7. You may also make up a solution from premixed packets that are commercially prepared specifically for nasal irrigation.

The instructions

Irrigate your nose with saline 1 to 2 times per day.

- If you have been told to use nasal medication, you should always use your saline solution first. The nasal medication is much more effective when sprayed onto clean nasal membranes, and the spray will reach deeper into the nose.
- Pour the amount of fluid you plan to use into a clean bowl. Do **not** put your used syringe back into the storage container, because it contaminates your solution.
- You may warm the solution slightly in the microwave but be sure that the solution is **not hot**.
- Bend over the sink (some people do this in the shower) and squirt the solution into each side o your nose, aiming the stream toward the back of your head, **not** the top of your head. The solution should flow into one nostril and out of the other, but it will not harm you if you swallow a little. Avoid blowing your nose for about 15 minutes (this is especially helpful if the solution sometimes gets trapped in your ears).
- Some people experience a little burning sensation the first few times that they use buffered saline solution, but this usually goes away after they adapt to it.

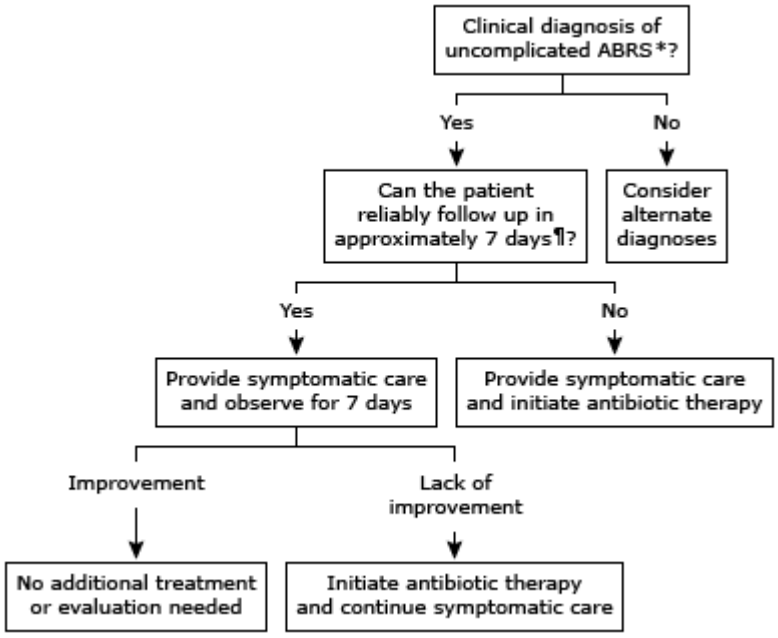
Graphic 71059 Version 17.0

Some adverse effects of antihistamines and decongestants

Antihistamines
Anticholinergic effects
Dry mouth and eyes
Impotence
Urinary hesitancy
Glaucoma
Central nervous system effects
Sedation
Rarely stimulation (usually children)
Confusion (older patients)
Cognitive impairment
Miscellaneous effects
Weight gain
Hypersensitivity
Prolonged QT interval
Ventricular arrhythmias
Decongestants
Nervousness
Irritability
Insomnia
Headache
Urinary hesitancy
Tachycardia/palpitations
Hypertension
Nausea

Graphic 65742 Version 4.0

Observation versus antimicrobial therapy for uncomplicated acute bacterial rhinosinusitis in immunocompetent adults



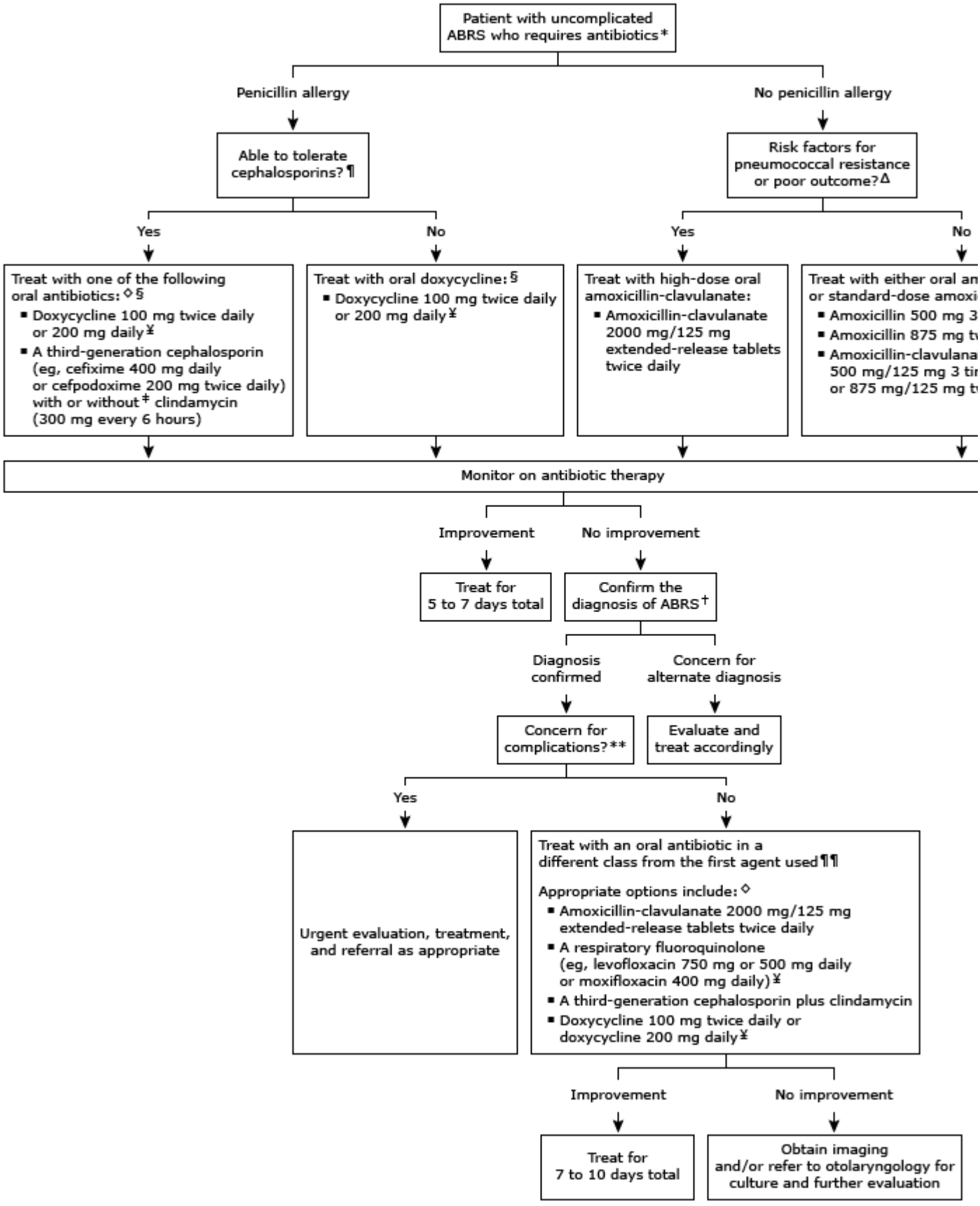
ABRS: acute bacterial rhinosinusitis; ARS: acute rhinosinusitis.

* The diagnosis of ARS, which may be bacterial or viral, can be made clinically and requires the presence of purulent nasal discharge for <4 weeks and severe congestion and/or facial pain/pressure. The diagnosis of ABRS can also be made clinically and requires that symptoms be present for ≥10 days or that signs and symptoms of ARS initially improve but then worsen, typically over a 10-day time period ("double worsening"). For ABRS to be uncomplicated, there should be no evidence of extension of infection beyond the sinuses into the surrounding skin, soft tissue, bone, or central nervous system.

¶ Because a substantial number of patients with clinically diagnosed ABRS improve with supportive care alone, we generally provide symptomatic care and observe patients who can reliably return for follow-up or be in close contact with their providers if additional care is needed within the next 7 days.

Graphic 106157 Version 5.0

Empiric antimicrobial therapy for outpatient treatment of uncomplicated acut bacterial rhinosinusitis (ABRS) in immunocompetent adults



ABRS: acute bacterial rhinosinusitis.

* Indications for antibiotic therapy include lack of adequate follow-up, worsening symptoms during observation, and symptoms unchanged after 7 days of observation. Refer to the UpToDate topic on treatment of uncomplicated acute sinusitis and rhinosinusitis in adults for details.

¶ Refer to the UpToDate topics on penicillin allergy and cephalosporin allergy.

Δ Risk factors for resistance or poor outcome include:

- Living in geographic regions with rates of penicillin-nonsusceptible *Streptococcus pneumoniae* exceeding 10%
- Age ≥65 years
- Hospitalization in the last 5 days
- Antibiotic use in the previous month
- Immunocompromised
- Multiple comorbidities (eg, diabetes or chronic cardiac, hepatic, or renal disease)
- Severe infection (eg, evidence of systemic toxicity with temperature of ≥102°F)

◇ Selection among these agents depends on patient allergies (as above), comorbidities, potential adverse drug effects, likelihood of patient adherence, and other patient values and preferences.

§ A respiratory fluoroquinolone (eg, levofloxacin 750 mg or 500 mg orally daily or moxifloxacin 400 mg orally daily) is an additional option for initial treatment but should be reserved for those who cannot tolerate other options as the serious adverse effects associated with fluoroquinolones generally outweigh the benefits for patients with acute rhinosinusitis.

¥ Doxycycline and fluoroquinolones should be avoided in pregnancy.

‡ The addition of clindamycin provides improved coverage for beta-lactam-resistant *S. pneumoniae* but carries increased risk of adverse effects (eg, *Clostridioides* [formerly *Clostridium*] *difficile* infection).

† The diagnosis of ABRS can be confirmed clinically. In patients in whom there are concerns for complications, imaging should be obtained. In other patients in whom symptoms are not completely consistent with ABRS, imaging is reasonable to rule out sinusitis and/or evaluation for alternative diagnosis.

** Signs and symptoms of complications include toxic appearance, altered mental status, neurologic deficits, and/or evidence of extension of infection into the surrounding skin, soft tissue, or bone. Refer to the UpToDate topics on the diagnosis of acute rhinosinusitis, deep neck space infections, and orbital cellulitis for additional detail.

¶¶ For patients who received a respiratory fluoroquinolone as initial therapy, antimicrobial resistance is unlikely to be the cause of treatment failure. We often pursue evaluation in such patients in place of or in addition to prescribing a second course of antibiotics.

Graphic 106156 Version 14.0

Distribution of pathogens in acute bacterial rhinosinusitis in adults

Pathogen	Incidence (%)
Streptococcus pneumoniae	20 to 43
Haemophilus influenzae	22 to 36
Moraxella catarrhalis	2 to 16
Staphylococcus aureus	10 to 13
Streptococcus pyogenes	3

Distribution of pathogens in acute bacterial rhinosinusitis based upon culture results.

Data from:

1. *Hadley JA, Mosges R, Desrosiers M, et al. Moxifloxacin five-day therapy versus placebo in acute bacterial rhinosinusitis. Laryngoscope 2010; 120:1057.*
2. *Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, et al. Clinical practice guideline (update): Adult sinusitis. Otolaryngol Head Neck Surg 2015; 152:S1.*

Graphic 81702 Version 8.0

Risk factors for pneumococcal resistance in adults with acute bacterial rhinosinusitis

Living in geographic regions with rates of penicillin-nonsusceptible *S. pneumonia* exceeding 10%*
Age ≥65 years
Hospitalization in the last 5 days
Antibiotic use in the previous month
Immunocompromise
Multiple comorbidities (eg, diabetes or chronic cardiac, hepatic, or renal disease)
Severe infection (eg, evidence of systemic toxicity with temperature of ≥102°F, threat of suppurative complications)

* Local and regional histograms of bacterial resistance should be referenced to understand resistance trends in the local community.

Graphic 105611 Version 5.0