



Acute Bacterial Rhinosinusitis

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Introduction

Acute sinusitis, also known as acute rhinosinusitis, is an inflammation of the nasal cavity and paranasal sinuses that lasts up to 4 weeks [1, 2]. We preferentially use the term rhinosinusitis in place of sinusitis to acknowledge that the inflammation seen in sinusitis involves the nasal cavity as well. Although many patients present with rhinosinusitis that has lasted longer than 4 weeks, these more protracted forms of sinusitis—subacute and chronic rhinosinusitis—are discussed in Chap. 13. The definitions for the various types of rhinosinusitis are summarized in Table 11.1.

It is estimated that 12% of the U.S. population is affected by acute and chronic rhinosinusitis [3]. Women appear to be affected more than men, and the most commonly affected age group among adults is mid-40s to mid-60s [3]. Older age, smoking, air travel, exposure to changes in atmospheric pressure as with flying or diving, swimming in chlorinated pools, asthma and allergies, dental disease, and immunodeficiency are all considered risk factors for the development of ARS [4]. Direct costs from managing acute and chronic sinusitis are estimated at \$11 billion dol-

lars per year in the U.S., not accounting for significant indirect costs attributable to lost work productivity and reduced job effectiveness [5, 6]. Acute rhinosinusitis is the fifth most common diagnosis for which antibiotics are prescribed; thus correct diagnosis of ARS and judicious treatment with antibiotics are particularly important in an age of growing bacterial resistance [7].

Pathophysiology

Most patients suffering with sinus symptoms will have a viral etiology of their inflammation [8]. It can be quite difficult for a primary care physician to distinguish between simple upper respiratory infections (URI), episodes of acute viral rhinosinusitis (AVRS), and episodes of true bacterial rhinosinusitis (ABRS). Almost 90% of patients with viral URIs have evidence of AVRS [9]. The most common viruses that cause VRS are rhinovirus, influenza virus, and coronavirus; others include parainfluenza virus, adenovirus, respiratory syncytial virus, and metapneumovirus [10]. Patients with AVRS typically develop symptoms 1–4 days after infection. Viruses attach to the nasal epithelium and can spread from the nasal cavity to the paranasal sinuses. Once within the paranasal sinuses, viruses may exert direct toxic effects on mucociliary clearance, and may induce epithelial permeability and hypersecretion from inflammatory cytokines. These alterations lead to

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Table 11.1 Types of sinusitis, as defined by the American Academy of Otolaryngology-Head and Neck Surgery [2]

Term	Definition
Rhinosinusitis	Inflammation of the paranasal sinuses and nasal cavity
Uncomplicated rhinosinusitis	Inflammation confined to the nasal cavity and sinuses, without extension (e.g., to surrounding soft tissues, orbit, or central nervous system)
Acute rhinosinusitis	≤4 weeks of purulent nasal drainage (anterior, posterior, or both) accompanied by nasal obstruction (e.g., congestion, blockage, stuffiness), facial pain-pressure-fullness, or both
Recurrent acute rhinosinusitis	≥4 episodes per year of acute rhinosinusitis, without intervening rhinosinusitis symptoms
Subacute rhinosinusitis	Rhinosinusitis symptoms persisting >4 and <12 weeks. Clinicians should determine whether to treat such patients as acute versus chronic rhinosinusitis
Chronic rhinosinusitis	≥12 weeks of at least two of four symptoms (mucopurulent drainage, nasal obstruction, facial pain-pressure-fullness, hyposmia) plus at least one objective evidence of inflammation (see Chap. 13 for details)

the mucosal edema, thickened secretions, and ostial obstruction characteristic of acute rhinosinusitis.

Acute bacterial rhinosinusitis most commonly occurs as a complication of viral infection, complicating 0.5–2.0% of cases of the common cold [10]. However, other factors may also predispose to ABRS, such as allergy, immune dysfunction, impaired ciliary function, anatomic narrowing of the sinuses, or poor dentition [11]. The most common bacteria associated with ABRS are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*. Microaerophilic streptococci and anaerobic bacteria are commonly identified if the ABRS originates from an odontogenic source. When a sinus culture is positive in a patient with ABRS, a single pathogen is usually found in high concentration, although in approximately 25% of the patients, two pathogens can be found in high concentration [12]. The usefulness and validity of

sinus cultures have recently been reconsidered as more is understood about the complex commensal bacterial community comprising the sinus microbiome. However, cultures are still helpful in some clinical situations such as complicated or nosocomial ABRS.

Nosocomial bacterial sinusitis may develop in patients on transplant services or in the intensive care unit, particularly in those who have had prolonged intubation or who have nasogastric tubes or feeding tubes. In contrast to community-acquired sinusitis, nosocomial sinusitis is more likely to involve resistant bacteria, including *Staphylococcus aureus* and Gram-negative bacilli such as *Pseudomonas* [13, 14].

Diagnosis

History and Physical Exam

Patients with acute rhinosinusitis typically complain of nasal congestion and obstruction, purulent nasal discharge, and facial pain or pressure that is worse when bending forward. Maxillary tooth discomfort may be present if the maxillary sinus is involved. Other less specific symptoms can include fever, fatigue, cough, hyposmia, ear pressure, headache, and halitosis. These symptoms apply to both AVRS and ABRS. Therefore, it is not possible for patients nor clinicians to discern a viral from bacterial infection based on symptoms alone. Another diagnostic fallacy is that if nasal drainage is colored it must be from a bacterial infection [2]. To discern AVRS from ABRS, the clinician should focus on the duration and course of the symptoms. Acute viral rhinosinusitis will typically have partial or complete resolution of symptoms by 10 days, with a peak at 3–6 days [15]. If symptoms persist beyond 10 days, or if symptoms improve but worsen again within 10 days (“double-worsening”), there is a higher likelihood that the patient has ABRS [2].

On physical examination, findings may include purulent drainage in the nose or posterior pharynx and nasal speech. Although many physicians have been taught to percuss the sinuses to evaluate for

pain, this has not been shown to be useful [16]. Similarly, transillumination of the sinuses to detect an air-fluid level is an insensitive test and not recommended [17]. Examination of the nasal cavity with either anterior rhinoscopy (performed with a handheld otoscope or nasal speculum) or nasal endoscopy (using a flexible or rigid endoscope) may show diffuse mucosal edema, narrowing of the middle meatus, inferior turbinate hypertrophy, and purulence. A complete head and neck examination is important to both confirm the suspected diagnosis of acute rhinosinusitis as well as rule out any other possible diagnoses and evaluate for any possible complications.

Complications

Complications from ABRS, less commonly seen in adults than children, are rare but can be potentially serious, even life-threatening. Bacterial sinusitis can spread beyond the paranasal sinuses and nasal cavity to the orbit or surrounding tissues directly, or to the central nervous system (CNS) either directly or hematogenously. Chapter 12 discusses complications of ABRS in children.

Orbital complications include preseptal cellulitis, orbital cellulitis, subperiosteal abscess, orbital abscess, and cavernous sinus thrombophlebitis. The Chandler classification, the most common method of characterizing orbital complications, organizes orbital complications in terms of progressive severity (see Fig. 11.1) [18]. Infection in preseptal cellulitis involves the eyelid skin in front of the orbital septum and tarsal plates of the eyelids, while infection in orbital cellulitis, subperiosteal abscess, and orbital abscess involves the orbit. In orbital cellulitis, there is diffuse inflammation of the orbital fat and extraocular muscles. In subperiosteal abscess, there is a collection of pus in the space between the orbital bony wall and periorbita, and in orbital abscess, there is a collection of pus in the orbital fat. It is important to distinguish preseptal cellulitis from orbital infection (cellulitis or abscess), because preseptal infections do not threaten vision while orbital infections do. Patients with preseptal cellulitis will present with lid swelling

and redness of the periorbital region but will not have involvement of the orbit (postseptal compartment) so will not have any of the three “orbital signs”: impaired extraocular motility, decrease in vision, or proptosis. Patients with orbital cellulitis or abscess will present with similar lid changes, but in addition will have one or more orbital signs as a result inflammation of the extraocular muscles and fat within the orbit. Patients with orbital cellulitis or abscess may also have chemosis (edema of the conjunctiva), pain with eye movement, and/or diplopia. In general, patients with subperiosteal or orbital abscess have more pronounced orbital signs than those with orbital cellulitis. Because most sinogenic orbital abscesses arise from the ethmoid or medial frontal sinuses, the inflammation in the orbit is often most pronounced medially and/or superomedially, and the eye may be displaced inferolaterally. Patients with chronic sinus obstruction with nasal polyps may develop a frontal sinus mucocele that silently erodes the frontal sinus floor (orbital roof); an acute superinfection may cause orbital cellulitis or abscess (Fig. 11.2). Cavernous sinus thrombophlebitis can sometimes be insidious, but advanced cases will be marked by cranial nerve palsies involving III, IV, VI (sometimes also V1 and V2), fever, photophobia, visual loss, and signs of contralateral orbital involvement.

Acute bacterial rhinosinusitis may also lead to CNS infections, including meningitis, epidural abscess, subdural empyema, or brain abscess. Symptoms of meningitis include fever, headache, photophobia, nuchal rigidity, and mental status changes. Symptoms of epidural and brain abscesses may include headache, mental status changes, lethargy, and nausea and vomiting. There may or may not be papilledema or unilateral neurological findings on examination.

Osteomyelitis of the paranasal sinus bones can occur as a consequence of ABRS but is a rare complication. Patients usually complain of dull pain at the involved site and have localized tenderness, warmth, erythema, and swelling; fever may be present. Chronic frontal sinusitis may lead to osteomyelitis of the anterior table of the frontal sinus with frontal “bossing”—i.e., swell-

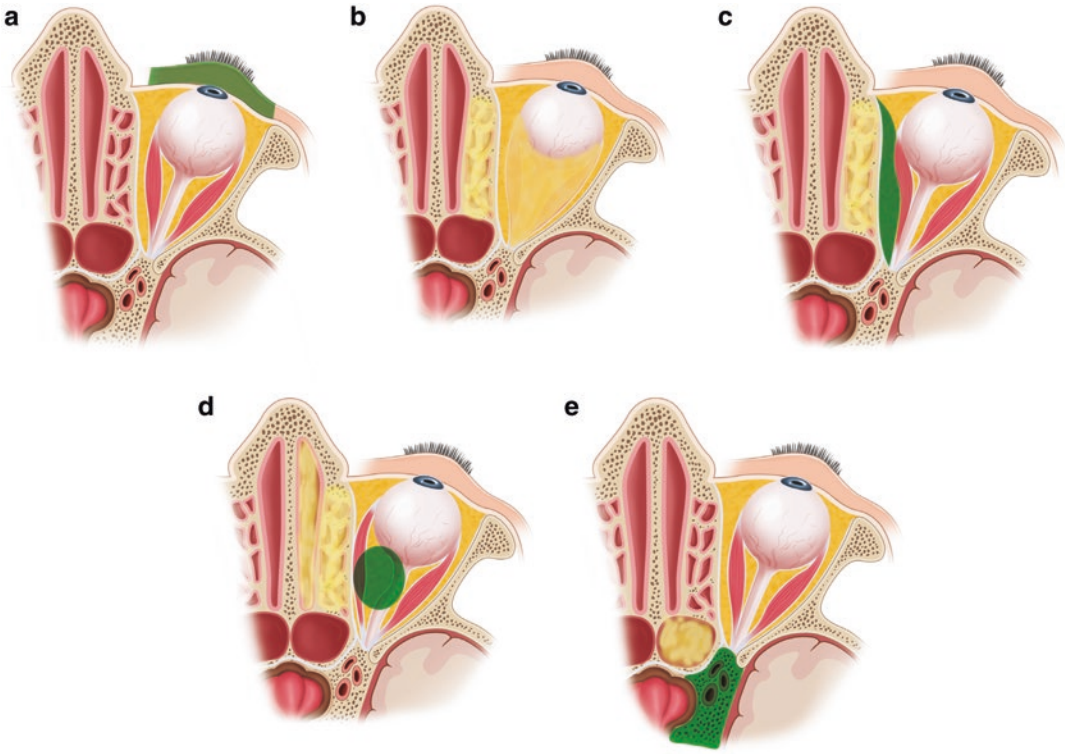


Fig. 11.1 Diagram of the orbital complications of sinusitis. (a) Preseptal cellulitis; (b) Orbital cellulitis; (c) Subperiosteal abscess; (d) Orbital abscess; (e) cavernous sinus thrombophlebitis

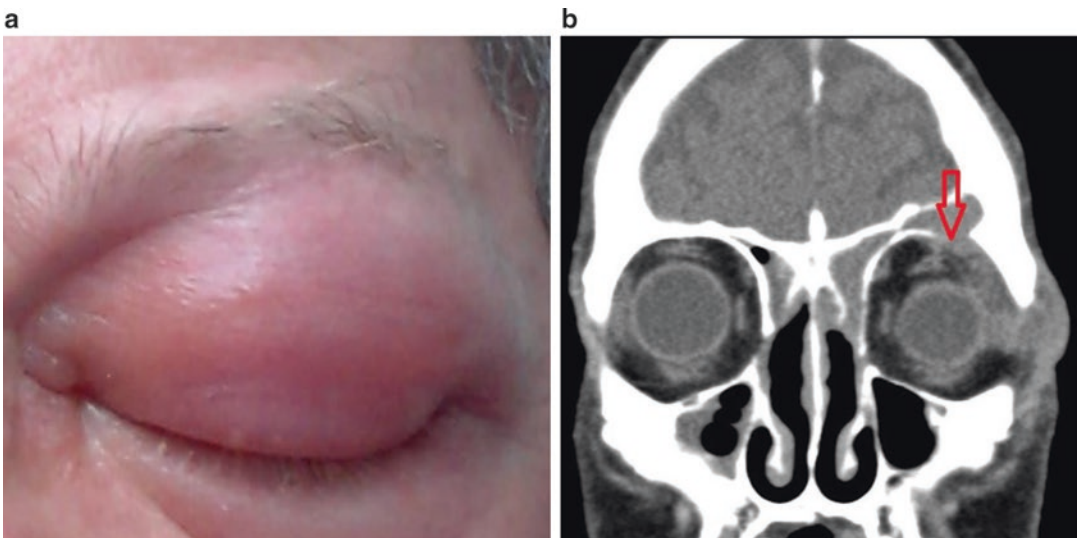


Fig. 11.2 Orbital cellulitis and acute frontal sinusitis due to *Staphylococcus aureus* in a patient with a history of chronic sinusitis and nasal polyps. The polyps had resulted in a chronic mucocele which eroded the floor of the left

frontal sinus (left orbital roof), and acute superinfection resulted in orbital findings. (a) left eye. (b) computed tomography image; arrow shows bony erosion. Courtesy of Dr. Marlene L. Durand

ing of the forehead over the bone involved (also called “Pott’s puffy tumor”); ABRS may cause abrupt worsening of symptoms.

Patients with any of the signs or symptoms suggesting a complication of ABRS should be urgently referred to an emergency department for evaluation and management. While preseptal cellulitis alone may respond to oral antibiotics, patients with any other orbital or any CNS complication require intravenous antibiotics, close inpatient monitoring, and may require emergency surgery to drain an abscess if one is present. An ophthalmologist should be consulted for patients with orbital complications, and consultation with a neurologist or neurosurgeon is usually indicated for patients with CNS complications. Orbital cellulitis or abscess may lead to permanent loss of vision if not appropriately and promptly treated. Neurologic complications may progress rapidly and lead to permanent disability or death if not recognized and treated promptly. Adequate clinical suspicion as well as prompt recognition and treatment of extrasinus complications are essential.

Imaging

Imaging is not indicated in uncomplicated ABRS. A practitioner should consider ordering an imaging study only to rule out a complication of ABRS or to establish an alternative diagnosis. It is important to remember that “abnormal” findings involving the sinuses do not necessarily confirm a diagnosis of acute rhinosinusitis, as 42% of normal individuals may demonstrate some form of abnormal mucosal thickening of the sinuses on CT [19]. Equally important, imaging cannot distinguish between viral and bacterial rhinosinusitis [19].

When there is sufficient indication, CT with contrast or magnetic resonance imaging (MRI) are the studies of choice. Computed tomography better delineates bony detail, while MRI provides superior delineation of soft tissue detail. When a complication is suspected, contrast-enhanced imaging is indicated to demarcate areas of extrasinus infection. Plain films are no longer indicated in evaluating adult sinusitis [2].

Cultures

No role has been established for routine cultures in uncomplicated ABRS. Cultures may be considered when there is concern for a complication of sinusitis, antimicrobial resistance, or an unusual organism—the last might be suspected in the case of an immunocompromised host. Nasal cavity cultures from blindly obtained swabs are not reliable indicators of true pathogens in the sinuses and are therefore not useful in the diagnosis of ABRS [19]. The gold standard in the diagnosis of ABRS is a maxillary sinus antral puncture and aspiration via an inferior meatal or canine fossa approach. However, sinus aspiration is invasive and not available to most primary care physicians. Endoscopic culture of the middle meatus is minimally invasive alternative and has been shown to correlate well with maxillary sinus cultures obtained by antral puncture [20].

Differential Diagnosis

There are many conditions that can cause symptoms of rhinorrhea, facial pain, or dental pain, mimicking the presentation of ABRS. The common cold, allergic and nonallergic rhinitis, and primary dental pathology are the most typical. Temporomandibular joint disorders, neuralgias, and other causes of atypical facial pain should also be considered, as well as primary headache disorders such as migraine, tension headache, and cluster headache. Importantly, in immunosuppressed patients, acute invasive fungal sinusitis must also be considered (see Chap. 15).

Treatment

Acute bacterial rhinosinusitis is generally a self-limited disease and can resolve on its own without antibiotics. Systematic reviews and meta-analyses have found that the majority of patients with ABRS will resolve their symptoms without antibiotic therapy within 2 weeks [21]. Therefore, contrary to conventional wisdom, the successful distinction of ABRS from AVRS does

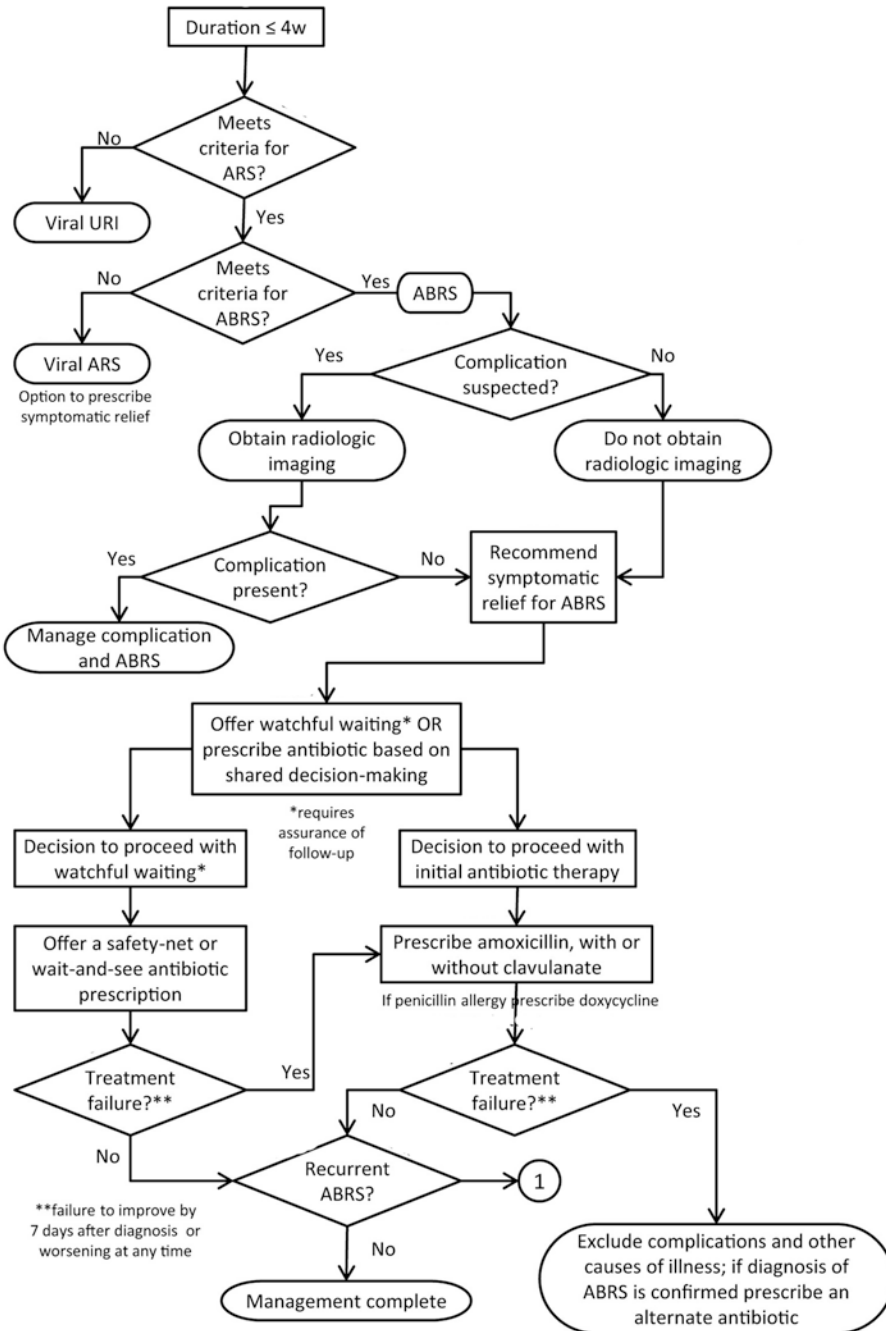
not equate with an automatic indication to prescribe antibiotics. In the first 10 days of symptoms, supportive therapy alone is indicated for uncomplicated ABRS in adults regardless of whether a diagnosis of AVRS or ABRS has been made, except for cases of “double worsening” or severe symptoms persisting for at least 3 days. Severe symptoms are defined as high fever (temperature 102 °F or higher) and purulent nasal drainage [19, 22]. “Double worsening” refers to worsening of symptoms after initial improvement. This is suggestive of an initial viral infection followed by a bacterial superinfection.

Guidelines regarding treatment of ABRS have been published for adults by the American Academy of Otolaryngology – Head and Neck Surgery (AAO-HNS) [2], for both adults and children by the Infectious Disease Society of America (IDSA) [19], and for children by the American Academy of Pediatrics (AAP) [22]. The IDSA and AAP guidelines are similar, but these differ from the AAO-HNS guidelines in that the latter offers the option of “watchful waiting” rather than antibiotics for up to 7 days beyond ABRS diagnosis for adults whose follow-up is assured. The AAP also offers the option of “watchful waiting” in children diagnosed with non-severe “persistent” uncomplicated ABRS but only up to 3 days. Figure 11.3 shows the AAO-HNS decision tree, Table 11.2 compares AAO-HNS and IDSA guidelines for adults with ABRS, and Table 11.3 summarizes the AAP guidelines for children with ABRS. The antibiotic options for children are further discussed in the AAP guidelines [22]. It is important to note that daytime cough is a symptom of ABRS for children, unlike adults, and the AAP recommends a clinical diagnosis of ABRS in children who have (1) nasal drainage or daytime cough persisting for more than 10 days without improvement, (2) worsening or new onset of nasal discharge, daytime cough, or fever after initial improvement, or (3) severe onset, which is defined as fever ≥ 39 °C (102.2 °F) plus concurrent nasal discharge for at least 3 days.

Part of the risk-benefit analysis of treating ABRS with antibiotics involves an appreciation

for potential complications of antibiotic therapy. A Cochrane review in 2014 found that although using antibiotics can help shorten the course of ABRS, the number of adults needed to treat to see that benefit is greater than the number needed to see adverse effects [23]. Meta-analyses of randomized controlled trials have found that, compared with placebo, adults with ABRS may benefit from antibiotics at the cost of increased adverse events. 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 [24]. The clinician should consider that results of these meta-analyses may be influenced by inclusion and exclusion criteria. The 2014 Cochrane review analyzed ten trials that randomized antibiotics versus placebo to treat adults with clinically diagnosed ABRS [23], but many of these trials did not meet current criteria for ABRS so probably included AVRS as well as ABRS. For example, some trials included patients with only 5 or even 2 days of symptoms [25]. Exclusion criteria also may have influenced results, and common exclusion criteria in the ten trials were recent antibiotic use (80% of the trials), severe symptoms (30%), prior ear-nose-throat disease (50%), previous sinus surgery (20%), immune deficiency (50%), and comorbidities such as diabetes, heart failure, or pulmonary disease (50%) [23].

Of course, exceptions to clinical guidelines always exist, especially in immunocompromised patients and any patient in whom a complication is suspected. The individual clinical situation should dictate therapy above all and may warrant immediate antibiotic treatment and referral to a specialist. The clinician should decide if the risk of watchful waiting in the individual patient outweighs the benefit. This was illustrated by a complication that occurred in a patient randomized to the placebo arm of one trial of amoxicillin-clavulanate; the patient had persistent symptoms despite 2 weeks of placebo followed by 1 week of antibiotic and was found to have a brain abscess (the abscess pathogen was susceptible to the antibiotic) [25].



ARS, acute RS; AB, acute bacterial RS; CRS, chronic RS; KAS, key action statement; RS, rhinosinusitis; URI, upper respiratory infection

Fig. 11.3 Algorithm for the evaluation and management of acute rhinosinusitis in adults, according to the American Academy of Otolaryngology – Head and Neck Surgery.

Adapted from Rosenfeld RM, et al. [2] with permission from Sage Publications

Table 11.2 Adult acute bacterial rhinosinusitis (ABRS): recommendations for evaluation and treatment by the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) [2] and the Infectious Disease Society of America (IDSA) [19]

Recommendation	AAO-HNS	IDSA
Clinical diagnosis of acute bacterial rhinosinusitis (ABRS)	Symptoms of acute rhinosinusitis that: (1) persist ≥ 10 days or (2) worsen after initial improvement (“double worsening”)	Same as (1) and (2) of AAO-HNS plus (3): (3) severe onset of symptoms ($T \geq 102$ °F plus either purulent nasal drainage or facial pain) lasting ≥ 3 days
Use of radiologic imaging (CT or MRI)	Only for suspected complication or alternative diagnosis	Same as AAO-HNS
Initial therapy of ABRS	“Watchful waiting” versus antibiotics ^a .	Antibiotics
First line antibiotic choice	Amoxicillin or amoxicillin-clavulanate ^b	Same as AAO-HNS but preference for amoxicillin-clavulanate over amoxicillin ^b
Penicillin-allergy	(1) Doxycycline or (2) clindamycin plus cefixime or cefpodoxime (if non-type 1 hypersensitivity to penicillin) ^c	Doxycycline ^c
Duration of antibiotics	5–10 days	5–7 days if no risk for resistant bacteria (7–10 days if such risk)
Treatment failure	Exclude complications and other causes of symptoms; if ABRS confirmed, switch antibiotics	Same as AAO-HNS

^aThe AAO-HNS states that “watchful waiting” in adults “should be offered only when there is assurance of follow-up such that antibiotic therapy is started if the patient’s condition fails to improve by 7 days after ABRS diagnosis or if it worsens at any time” [2].

^bFirst-line therapy with amoxicillin-clavulanate rather than amoxicillin is generally recommended by the AAO-HNS for the following: older age (age >65 years), immunocompromise, comorbid conditions (chronic cardiac, hepatic, or renal disease), history of recurrent ABRS, moderate to severe symptoms, or risk factors for resistant organisms such as antibiotics within the past month, contact with health care environment, contact with child in daycare, high prevalence of resistant bacteria in the community. The AAO-HNS recommends high-dose amoxicillin (IDSA recommends high dose amoxicillin-clavulanate) for adults at increased risk for infection with amoxicillin-resistant organisms

^cBoth AAO-HNS and IDSA recommended either doxycycline or a respiratory fluoroquinolone such as levofloxacin in penicillin-allergic patients, but the Food and Drug Administration subsequently recommended against use of fluoroquinolones for ABRS unless no alternatives exist (see the text).

First-Line Antibiotic Therapy

As cultures are not indicated in ABRS, the initial choice of antibiotic treatment is empiric and is based on the most common pathogens (as outlined above). Therefore, first-line therapy for adults would be oral amoxicillin or amoxicillin-clavulanate (500/125 three times daily or 875/125 mg twice daily), depending on the resistance patterns within the community. In communities with a higher prevalence of beta-lactam resistance among *Haemophilus influenzae* and *Moraxella catarrhalis* isolates, amoxicillin-clavulanate is preferred [2, 19]. Macrolides and trimethoprim-sulfamethoxazole are not recommended due to high rates of *S. pneumoniae* resistance (and for trimethoprim-sulfamethoxazole,

also *H. influenzae* resistance) [2, 19]. All doses given are for patients with normal renal function.

In adults with specific risk factors for antibiotic resistance, high dose amoxicillin with clavulanate (2 g/125 mg twice daily) would be indicated. Examples of risk factors for resistance include living in communities where the prevalence of penicillin-non-susceptible *S. pneumoniae* exceeds 10%; age >65 years; hospitalization in the last 5 days; antibiotic use in the previous month; immunocompromise; multiple comorbidities; or severe infection with evidence of systemic toxicity and threat of suppurative complications [2, 19].

For adults with penicillin allergy, oral doxycycline (100 mg twice daily or 200 mg daily) is a

Table 11.3 Pediatric acute bacterial rhinosinusitis (ABRS), patients age 1–18 years: evaluation and treatment recommendations by the American Academy of Pediatrics, 2013 [22]

Recommendation	AAP guidelines ^a	Comments
Clinical diagnosis of acute bacterial rhinosinusitis (ABRS)	Either: (1) persistent nasal drainage or daytime cough or both for >10 days (“persistent illness”) or (2) worsening course (see text) or (3) severe onset of symptoms ($T \geq 102^\circ\text{F}$ plus nasal drainage) lasting ≥ 3 days	Cough is not included as a symptom of ABRS in adults (see Table 11.2)
Use of radiologic imaging (CT with contrast)	Only for suspected complication involving orbit or central nervous system	Similar recommendations for adults
Initial therapy of ABRS	Antibiotics for worsening course or severe onset (“2” or “3” above), but antibiotics or watchful waiting (for up to 3 days) for “persistent illness” (“1” above)	If watchful waiting is chosen for persistent illness, antibiotics should be started if there is clinical worsening at any point or if the child fails to improve by 3 days
First line antibiotic choice ^a	Amoxicillin or amoxicillin-clavulanate	Give high-dose amoxicillin if resistant bacteria are a concern; give high-dose amoxicillin-clavulanate for <age 2, attends child care, moderate to severe ABRS, recent course of antibiotics
Penicillin allergy ^a	non-type 1 allergy, mild ABRS: second or third generation cephalosporin (cefuroxime, cefdinir, cefpodoxime) ^a	Moderate to severe ABRS: clindamycin (or linezolid) plus cefixime (if non-type 1 allergy), or levofloxacin ^a
Duration of therapy	No recommendation but favors 7 days after symptoms resolve so at least 10 days	IDSA guidelines: 10–14 days for children with ABRS [19]

AAP = American Association of Pediatrics. IDSA = Infectious Disease Society of America

^aThis table is not comprehensive: see AAP Guidelines for details regarding treatment options

reasonable alternative, as is a combination of clindamycin plus a third-generation cephalosporin such as cefixime or cefpodoxime [2]. Fluoroquinolones have traditionally been another alternative, but are now highly cautioned against due to an increasing recognition of serious side effects, including tendinitis, tendon rupture, and peripheral neuropathy. The Food and Drug Administration has advised that fluoroquinolones should be used for ABRS only when no alternative options exist [26].

For children with ABRS, the first-line treatment recommended by the AAP is amoxicillin at standard pediatric dosing (45 mg/kg per day in 2 divided doses) for children aged 2 and older with uncomplicated ABRS of mild to moderate severity and who do not have risk factors for antimicrobial resistance (no antibiotics within 4 weeks and no day care), or high-dose amoxicillin (80–90 mg/kg per day in 2 divided doses, up to a maximum of 2 g per dose) in communities with

high prevalence of resistant bacteria (i.e., penicillin non-susceptible *S. pneumoniae*) [22]. For children presenting with moderate to severe ABRS, as well as children under age 2 years, attending day care, or who have recently received an antibiotic, the AAP recommends high dose amoxicillin-clavulanate. A single 50 mg/kg dose of intravenous or intramuscular ceftriaxone may be given to children who are vomiting, unable to tolerate oral medications, or are unlikely to be adherent to initial doses of antibiotics [22]. Oral antibiotics may be started 24 h after this parenteral dose, to complete the course of therapy. For additional details regarding treatment of children with ABRS, including treatment in patients with penicillin allergies, the reader is referred to the AAP Guidelines [22]. Note that these guidelines do not apply to children younger than age 1.

The recommended duration of antibiotic treatment is 5–7 days in adults (longer in children), provided the patient is improving. Longer courses

of antibiotics (e.g., 10–14 days) have not been shown to offer greater efficacy in adults, yet are associated with higher rates of adverse drug effects.

Second-Line Antibiotic Therapy

If a patient does not improve or in fact worsens with first-line therapy, a change in therapy is indicated. There is not good evidence to guide the choice of second-line therapy, but one may consider either increasing the dose or changing class of antibiotics. Options in adults include high dose amoxicillin (2 g twice daily) with clavulanate, doxycycline, levofloxacin, and moxifloxacin. The latter quinolone options should again be prescribed with caution, with regard for potential adverse effects of fluoroquinolone use [26].

Failure of Response

If patients with ABRS have failed to respond to both first-line and second-line therapies, or if at any time a potential complication is suspected, they should be referred for further evaluation to a specialist and possibly undergo radiologic imaging.

Supportive Therapy

The use of over-the-counter antipyretics and analgesics can help to treat fever and pain in ABRS [2]. Saline irrigations offer the opportunity for symptomatic relief with a favorably low side effect profile (minor nasal burning and irritation) [27]. However, there are no randomized controlled trials of the use of saline irrigations in ABRS [2], so their benefit is unknown. In addition, patients cannot obtain sterile solutions for nasal irrigations so whether or not there is risk with nasal irrigations with non-sterile solutions is unknown. Intranasal glucocorticoid sprays can be helpful in ABRS. A meta-analysis of three studies has shown a minor benefit in adding nasal steroid sprays to the treatment regimen of patients with ABRS [28]. Other therapies that are sometimes used in supportive treatment of ABRS include oral and topical decongestants, antihistamines, and mucolytics. However, none of these therapies has good evidence to support its use; some may

actually cause harmful side effects, such as raising blood pressure (associated with oral decongestants), and irritating or overdrying the nasal lining (associated with antihistamines) [2].

Conclusion

Acute bacterial rhinosinusitis is one of the most common infections treated by primary care providers. The distinction between ABRS and viral upper respiratory tract infections is usually made based on duration and time course of compatible symptoms, with ABRS characterized by either persistence of symptoms for at least 10 days, worsening of symptoms (or double worsening), or severe onset of symptoms including high fever for 3 days. Radiologic imaging and sinus cultures are not indicated for uncomplicated ABRS. Adults with non-severe, uncomplicated ABRS and whose follow-up is assured may be observed without antibiotics (watchful waiting) or treated with antibiotics. Patients with orbital or CNS complications require aggressive treatment with intravenous antibiotics and possibly surgery.

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