in the clinic

Acute Sinusitis

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CME Objective: To review current evidence for the risk factors, diagnosis, and treatment of acute sinusitis.

The information contained herein should never be used as a substitute for clinical judgment.

Annals of Internal Medicine

Acute sinusitis affects millions of persons in the United States every year and is among the most common reasons for physician visits, prompting over 3 million visits annually (1). The more accurate term for this condition is acute rhinosinusitis, because symptoms involve both the nasal cavity and the sinuses. For simplicity, this review uses the term "sinusitis" for rhinosinusitis. There are 4 pairs of air-filled paranasal sinuses: the frontal, maxillary, ethmoid, and sphenoid sinuses. Acute sinusitis typically occurs in the maxillary sinuses (Figure). Sinusitis is characterized as acute when the duration of symptoms is shorter than 4 weeks, subacute when the duration is from 4 weeks to 12 weeks, and chronic when the duration is more than 12 weeks. Sinusitis seems to be due to congestion and blockage of the nasal passages, usually in response to viral infection or allergic rhinitis but occasionally to other stimuli. The paranasal sinuses become inflamed, and mucus cannot drain properly, providing an environment where bacteria, or rarely fungus, can thrive. Persons with chronic nasal congestion, and particularly those with allergies and asthma, may be more prone to developing acute sinusitis, but it can affect anyone. Suggestive symptoms include headache, congestion, facial pain, fatigue, and cough, all of which can be disruptive to usual activities but are rarely severe.

The diagnosis is usually based on clinical signs and symptoms. Radiologic tests are not recommended initially and, to make the diagnosis from culture, primary care physicians do not typically perform anterior rhinoscopy or antral puncture with aspiration. Evidence is lacking regarding optimum prevention and treatment. It is well known that physicians grossly overprescribe antibiotics for presumed acute bacterial sinusitis despite a high prevalence of viral infection–causing symptoms. Moreover, 4 of 5 persons recover within 2 weeks without treatment (2). Overprescription of antibiotics probably reflects difficulty in establishing the diagnosis of sinusitis and in distinguishing viral from bacterial acute sinusitis. The risk for bacterial sinusitis is low until the symptoms persist for at least 7 to 10 days. A Cochrane review of 57 randomized, controlled trials (RCTs) from 1950 to 2007 of antibiotics in the treatment of acute bacterial sinusitis reported that antibiotic treatment reduced the risk for clinical failure at 7 to 15 days but was associated with significant side effects (2). When treatment is ineffective and sinusitis persists, or when symptoms are severe, sinus puncture, imaging, and other diagnostic tests may be helpful in guiding management. In these cases, evaluation by a specialist may be warranted.

1. Anand VK. Epidemiology and economic impact of rhinosinusitis. Ann Otol Rhinol Laryngol Suppl. 2004;193:3-5. [PMID: 15174752]
2. Ahovuo-Saloranta A, Borisenko OV, Kovanen N, et al. Antibiotics for acute maxillary sinusitis. Cochrane Database Syst Rev. 2008:CD000243. [PMID: 18425861]
3. Mahakit P, Pumhirun P. A preliminary study of nasal mucociliary clearance in smokers, sinusitis and allergic rhinitis patients. Asian Pac J Allergy Immunol. 1995;13:119-21. [PMID: 8703239]

Figure. Diffuse pansinusitis with mucosal thickening and polyposis in the anterior sinuses.

What factors increase the risk for acute sinusitis?

Most persons with acute sinusitis have had a recent upper respiratory viral infection, but acute sinusitis can also occur with allergies or exposure to local irritants. These last 2 causes are generally characterized by more recurrent or chronic symptoms. Immunocompromised persons are at increased risk for fungal infection.

Age

Older persons have more compromised immune systems and a greater prevalence of serious upper respiratory tract infections, both of which increase their risk for the complication of acute sinusitis. They also tend to have weakened cartilage and dryness in the nasal passages that can promote infection. Because young children have more colds and smaller nasal and sinus passages, they face an increased risk for sinusitis as well.

Smoke and other air pollutants

Cigarette and cigar smoke and other forms of air pollution, such as industrial chemicals, increase the risk for sinusitis. Air pollution can damage the cilia responsible for moving mucus out of the sinuses (3).

Air travel and changes in atmospheric pressure

Air travel as well as other situations that involve changes in atmospheric pressure, such as deep sea diving or climbing to high altitude, increase the risk for sinus blockage and sinusitis.

Swimming

In frequent swimmers, the chlorine in pools can irritate the lining of the nose and sinuses and can lead to sinusitis.

Asthma and allergies

Asthma and respiratory allergies increase sinus inflammation, which can increase the risk for infection. Allergic rhinitis may contribute to up to 30% of cases of acute maxillary rhinosinusitis (4). However, persons with asthma are more prone to chronic sinusitis, as are persons with a condition known as Samter Triad or the ASA Triad, which is characterized by asthma, nasal polyps, and aspirin intolerance. In addition, persons with a deviated nasal septum may also have an increased risk for both acute and chronic sinusitis.

Dental disease

Infections from dental disease, such as dental abscesses and periodontal infection, or procedures, such as sinus perforations during tooth extraction, can precipitate sinusitis. Patients with dental pain may indeed have sinusitis, especially involving the upper teeth and commonly the wisdom teeth. According to one review, odontogenic sinusitis accounts for about 10% to 12% of maxillary sinusitis cases (5). In such cases, the underlying dental condition may be asymptomatic or only mildly symptomatic. Intervention is needed to stop the disease progression and to avoid excess antibiotic treatment.

Other medical conditions

Medical conditions that cause inflammation in the airways or create persistent thickened stagnant mucus can increase the risk for recurrent acute or chronic sinusitis, such as diabetes and other disorders of the immune system. AIDS and poorly controlled diabetes particularly increase the risk for acute invasive fungal sinusitis, which is called mucormycosis, zygomycosis, or fulminant invasive sinusitis (6). Pregnancy can also cause temporary congestion and symptoms of sinusitis.

An autoimmune disease, Wegener granulomatosis, causes long-term swelling and tumor-like masses in air passages and predisposes to acute as well as chronic sinusitis.

4. Small CB, Bachert C, Lund VJ, et al. Judicious antibiotic use and intranasal corticosteroids in acute rhinosinusitis. Am J Med. 2007;120:289-94. [PMID: 17398218]
5. Brook I. Sinusitis of odontogenic origin. Otolaryngol Head Neck Surg. 2006;135:349-55. [PMID: 16949963]
6. Deshazo RD. Syndromes of invasive fungal sinusitis. Med Mycol. 2009;47 Suppl 1:S309-14. [PMID: 18654920]

In most cases, acute sinusitis is diagnosed based on the history and physical examination

How to Perform Nasal Irrigation

Make a salt-water solution by combining 1/2 tsp of noniodinated salt and 1/2 tsp baking soda in an 8-ounce glass of warm water.

Place the solution in a neti pot, bulb syringe, or other appropriate delivery device.

Lean over the sink with your head down and chin up.

Pour or gently squeeze water into the upper nostril. Water will drain out of other nostril.

Repeat on other side.

Persons with abnormalities in ciliary function or mucous production, such as cystic fibrosis or the Kartagener syndrome (triad of bronchiectasis, sinusitis, and dextrocardia), are also more likely to have sinusitis. Structural abnormalities or facial injuries that impede mucus drainage from the sinuses, such as a deviated septum or nasal polyps, increase the risk as well.

Hospitalization

Hospitalized patients face a higher risk for sinusitis, particularly patients with head injuries or conditions requiring insertion of tubes through the nose, antibiotics, or steroid treatment. Mechanical ventilators significantly increase the risk for sinusitis in the maxillary sinuses.

How can patients decrease their risk for acute sinusitis?

No method is scientifically proven to prevent sinusitis, but various measures may decrease this risk. In particular, patients should follow frequent hand-washing guidelines and avoid persons with the common cold or influenza. Nasal irrigation may help reduce congestion and remove pathogens from the sinuses (Box). Using saline irrigation and steam inhalation can help keep the nose moist and the sinuses clear. A humidifier can moisten air in dry indoor environments.

Patients should avoid exposure to allergens. If exposure is unavoidable, then use nasal corticosteroids, which are more effective than antihistamines at preventing recurrent sinusitis in the allergic person. Immunotherapy (or allergy shots) may also reduce sinusitis due to allergies.

Environmental irritants should also be avoided, especially tobacco smoke, but also chemicals with strong odors. Limit time swimming in chlorine-treated pools and diving, which can force water into the sinuses from the nasal passages.

Air travel poses a problem for patients with acute or chronic sinusitis. With air pressure changes in a plane, pressure can build up in the head, blocking sinuses or the eustachian tubes in the ears. Using decongestant nose drops before a flight can help reduce this problem.

Risk Factors... Because the most common cause of acute sinusitis is viral infection, patients need to remember frequent hand washing and should avoid persons with the common cold or influenza. Smokers should be helped to quit. Persons with chronic allergic rhinitis many benefit from treatment to reduce congestion.

CLINICAL BOTTOM LINE

Diagnosis

What is the role of the medical history and physical examination in the diagnosis of acute sinusitis?

In most cases, acute sinusitis is diagnosed on the basis of the history and physical examination, because there is no accepted office-based test for acute bacterial sinusitis. The gold-standard test for the diagnosis of acute bacterial sinusitis is culture of the aspirate from an antral puncture, but this should not be done routinely because it is painful, risks complications, and requires expertise.

The history needs to focus on the duration of symptoms, because persons who have had less than 7 to 10 days of symptoms are unlikely to have a bacterial infection. The history should also include questions about allergic rhinitis, systemic diseases, trauma, airplane travel, tobacco use, exposure to

7. Rosenfeld RM, Andes D, Bhattacharyya N, et al. Clinical practice guideline: adult sinusitis. Otolaryngol Head Neck Surg. 2007;137:S1-31. [PMID: 17761281]
8. Williams JW Jr, Simel DL, Roberts L, et al. Clinical evaluation for sinusitis. Making the diagnosis by history and physical examination. Ann Intern Med. 1992;117:705-10. [PMID: 1416571]

environmental toxins, and anatomical abnormalities.

According to a multidisciplinary expert panel, the diagnosis of acute sinusitis should be based on 2 primary symptoms: purulent rhinitis and facial pain (7). Separately, these symptoms and physical findings for the diagnosis of acute sinusitis only have fair performance characteristics, but the combination is better in making the diagnosis. Purulent rhinorrhea has a sensitivity of 72% and a specificity of 52%, facial pressure or pain has a sensitivity of 52% and a specificity of 48%, and nasal obstruction has a sensitivity of 41% and a specificity of 80% (8). Other symptoms are commonly found (Box). Patients may also describe worsening symptoms after initial improvement (9). Nevertheless, the absence of these specific symptoms does not exclude the disease (10). Patients should also be asked about allergies and previous episodes of similar symptoms and seasonal patterns.

The physical examination should focus on checking for swollen turbinates, purulent rhinorrhea, nasal polyps, and local sinus pain when bending over. Pain induced with sinus percussion is a less reliable finding than focal pain when bending over. An oropharyngeal red streak also may also be useful for diagnosing acute sinusitis.

In a study of 60 patients at a Veterans Affairs urgent care center (54 men; mean age, 51 years) who had nasal symptoms lasting 4 or more weeks, patients were given a structured history and physical examination and then sinus computed tomography (CT). Sinusitis was diagnosed in 27 patients. The presence of oropharyngeal red streak had a sensitivity of 70% and a specificity of 67% (11). The generalizability of this finding is unclear. The authors recommended including the sign in future studies of acute sinusitis clinical diagnostic criteria.

Why is it important to distinguish acute sinusitis from chronic sinusitis?

Establishing the duration of symptoms is necessary to guide proper treatment and management. The duration of symptoms is the main distinguishing feature, with acute sinusitis occurring from 1 week to less than 4 weeks after onset of symptoms, whereas subacute or chronic sinusitis lasts longer. Acute sinusitis usually starts as a viral respiratory infection, but chronic sinusitis is more often caused by inflammation and blockage due to allergies or a physical obstruction, such as a deviated septum, nasal polyps, malformed bone or cartilage structures, tumors, or foreign objects. The symptoms of acute sinusitis are typically more severe than those of chronic sinusitis but, in the latter disease, symptoms often last for many months or even years and are often associated with a persistent cough and nasal congestion.

Chronic sinusitis responds poorly to conventional antibiotic therapy and typically requires a longer duration of treatment. Surgery may be warranted for patients with anatomic obstruction whose sinusitis is refractory to medical treatment. Predisposing factors that may further hinder cure include severe respiratory allergies or structural changes caused by chronic sinusitis itself or by previous surgery for symptoms. Acute exacerbations can frequently complicate chronic sinusitis.

What noninfectious conditions should clinicians consider when evaluating a patient for acute sinusitis?

A key distinguishing feature of acute sinusitis is the duration of symptoms. Symptoms lasting more than 12 weeks represent chronic sinusitis, which has a different differential than acute sinusitis. The Box lists conditions that clinicians should consider among the differential diagnoses for acute sinusitis.

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Common Signs and Symptoms Associated With Acute Rhinosinusitis

- Rhinorrhea (frequently purulent, occasionally blood tinged)
- Facial pain
- Nasal congestion or obstruction
- Postnasal drainage
- Hyposmia or anosmia
- Ear pressure
- Cough

Differential Diagnosis of Acute Rhinosinusitis

- Allergic rhinitis
- Drug-induced rhinitis (such as decongestant abuse more than 5 days, cocaine)
- Recurrent viral upper respiratory infections
- Dental pain
- Occupational rhinosinusitis (12)
- Gastroesophageal reflux (13)
- Migraine or tension headache (14)
- Nasal polyps (obstruction)

9. Snow V, Mottur-Pilson C, Gonzales R; American Academy of Family Physicians. Principles of appropriate antibiotic use for treatment of acute bronchitis in adults. Ann Intern Med. 2001;134:518-20. [PMID: 11255531]
10. Blomgren K, Alho OP, Ertama L, et al; Finnish Society of Otorhinolaryngology committee. Acute sinusitis: Finnish clinical practice guidelines. Scand J Infect Dis. 2005;37:245-50. [PMID: 15871161]

These conditions may produce similar signs and symptoms but require different treatment.

What is the role of imaging in the diagnosis of acute sinusitis?

The history and physical examination establishes the diagnosis for most patients (15). Radiologic evidence of "sinusitis" exists in 87% of viral upper respiratory infections; however, less than 3% of these infections progress to bacterial infection. Imaging should only be considered for persons with rhinosinusitis symptoms lasting at least 7 to 10 days who have a history of recurrent symptoms or nonresponse to multiple courses of antibiotics in the past. A lower threshold for imaging may be used for patients at risk for serious complications, such as immunocompromised persons.

Sinus radiography

Regardless of the prevalence of bacterial sinusitis in the patient population or the individual's likelihood of bacterial sinusitis, sinus radiography is not typically required in the routine management of uncomplicated sinusitis (16). Plain sinus radiography has reasonable diagnostic performance, with a sensitivity of 87% and a specificity of 89%; ultrasonography has poorer performance (10). However, neither test is cost-effective compared with symptomatic treatment or the use of clinical criteria to guide antibiotic therapy. Acute viral sinusitis resembles acute bacterial sinusitis on radiographs.

When other conditions are being seriously considered in the differential of acute sinusitis, sinus radiography may be warranted. Radiologic studies are also useful in patients with predisposing factors for atypical microbial causes, such as *Pseudomonas aeruginosa*, or fungal infection in immunocompromised patients or in those in whom empirical therapy has failed. The occipitomental view (also known as the Waters view) is the standard radiographic view for visualizing the paranasal sinuses, especially the maxillary sinuses. A series of 3 or 4 radiographs is often ordered. A common criterion for positive radiography is sinus fluid or opacity. Some studies also consider mucous membrane thickening greater than 50%, which increases the sensitivity of radiography but decreases its specificity.

A systematic review of methods for diagnosing acute maxillary sinusitis analyzed 11 eligible studies and determined that radiography was more accurate than sinus puncture and that ultrasonography was slightly less accurate than radiography (17). Only 2 studies compared clinical examination and sinus puncture, and both found that the clinical examination was unreliable, regardless of clinician expertise. On the basis of this weak evidence, the authors concluded that using radiography or ultrasonography improved diagnostic accuracy.

A meta-analysis of published studies comparing diagnostic tests for acute sinusitis included 13 studies and found that radiography and clinical evaluation provided useful diagnostic information, whereas ultrasonography performance varied substantially (18).

Role of CT and magnetic resonance imaging

Evidence to support the role of sinus CT and magnetic resonance imaging (MRI) in diagnosing acute bacterial sinusitis is limited. One study found CT was more sensitive than x-rays for showing radiographic changes consistent with acute sinusitis (19). Use of new low-dose scanners reduces radiation exposure compared with traditional CT. However, like plain sinus film x-rays, CT and MRI scans also have high false-positive rates in acute sinusitis.

Several studies using CT or MRI have reported sinus mucosal abnormalities in up to 49% of apparently healthy persons with no symptoms of sinusitis (20, 21). The clinical importance of these chance findings is uncertain. Asymptomatic patients with abnormalities on imaging studies do not require treatment.

Given problematic current evidence supporting the use of CT or MRI,

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17. Varonen H, Mäkelä M, Savolainen S, et al. Comparison of ultrasound, radiography, and clinical examination in the diagnosis of acute maxillary sinusitis: a systematic review. J Clin Epidemiol. 2000;53:940-8. [PMID: 11004420]
18. Engels EA, Terrin N, Barza M, et al. Meta-analysis of diagnostic tests for acute sinusitis. J Clin Epidemiol. 2000;53:852-62. [PMID: 10942869]

they should be reserved for investigation of symptoms or signs of local spread or intracranial complications (22). In addition, when sinusitis symptoms persist for more than 3 weeks despite treatment, or are recurrent, CT may be useful for reassessing diagnosis and determining the need for referral.

What is the role of laboratory testing in the diagnosis of acute sinusitis?

Usually, no laboratory tests are needed to diagnose acute sinusitis. In cases that do not respond to treatment or that get worse, tissue cultures may help pinpoint the specific cause. The sinus puncture is considered the gold standard for diagnosing sinusitis, because it is the most accurate way to identify the organism responsible for sinusitis. In this test, an otolaryngologist administers local anesthesia then uses a large-bore needle to withdraw small amounts of fluid from the maxillary sinus to culture. Because this test is invasive and carries the risk for complications, such as increased pain, bleeding, swelling, and false passage, it is usually reserved for cases requiring microbial identification, such as when antibiotic therapy has failed. Transnasal endoscopic culture represents a reasonable alternative to antral puncture. It is also performed in the otolaryngologist's office with the use of a topical anesthetic but is less invasive. In a meta-analysis of studies of endoscopic versus antral culture, the former had a sensitivity of 80.9%, specificity of 90.5%, positive predictive value of 82.6%, and negative predictive value of 89.4%, (23). On the other hand, nasal culture specimens obtained from a direct swab through the nose do not correlate well with sinus pathogens found in a sinus puncture, because of contamination of the swab with normal nasal flora. Other laboratory tests depend on the clinical situation, such as a complete blood count test with differential, thyroid function tests for fatigue; and chloride testing to rule out cystic fibrosis. Consider referral to an allergist or immunologist for evaluation of the role of allergy or an immune deficiency contributing to recurrent or persistent sinusitis.

What organisms can cause acute sinusitis?

The predominant isolates from acute bacterial sinusitis have long been *Streptococcus pneumonia* and *Haemophilus influenzae*. One early study estimated that these organisms accounted for more than 50% of acute bacterial sinusitis (24). With recent pneumococcal vaccination, there seems to be a relative increase in *H. influenzae*. Studies in more recent years have also shown more *Moraxella catarrhalis,* especially in children and young adults, and more *Streptococcus pyogenes*.

About one third of *H. influenzae* isolates and most isolates of *M. catarrhalis* produce β-lactamases and are resistant to penicillin and amoxicillin. These organisms become resistant to penicillins either through the production of β-lactamase (*H. influenzae, M. catarrhalis, Staphylococcus aureus, Fusobacterium* spp., and *Prevotella* spp.) or through changes in the penicillin-binding protein (*Streptococcus pneumoniae*) (25). In patients who harbor more resistant bacteria, antimicrobial therapy directed against all pathogens in mixed infections is often required.

Less commonly, acute sinusitis is caused by a fungal infection. Sinus fungal infections usually occur in immunocompromised persons but have been known to occur in persons who are immunocompetent. Acute fungal sinusitis is most commonly caused by either the *Aspergillus* or *Mucor* species (26). Fulminant invasive disease has a high mortality if not treated early and aggressively. Treatment usually involves removal of the fungus via nasal surgery.

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24. Gwaltney JM Jr. Acute community-acquired sinusitis. Clin Infect Dis. 1996;23:1209-23; quiz 1224-5. [PMID: 8953061]
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26. Taxy JB, El-Zayaty S, Langerman A. Acute Fungal Sinusitis Natural History and the Role of Frozen Section. Am J Clin Pathol. 2009;132:86-93. [PMID: 19864238]

Diagnosis... Most cases of acute sinusitis are diagnosed by history and physical examination. Key findings are purulent rhinitis and facial pain. Other symptoms that may be indicative of acute sinusitis include unilateral facial pressure or pain, facial pressure that is worse when bending forward, general headache, olfactory disturbance, fever, halitosis, maxillary toothache, cough, and the presence of an oropharyngeal red streak. Establishing the duration of symptoms is important because, when the duration is less than 7 to 10 days, the condition is more likely to be a viral infection, whereas bacterial infection generally only appears after at least 1 week of symptoms. Chronic sinusitis (symptoms longer than 30 days), nasal polyps, upper respiratory infection, migraine, and dental abscess may produce signs and symptoms similar to acute sinusitis. Imaging should be reserved for cases that are resistant to treatment or when a complication or alternative conditions is likely. Similarly, laboratory tests are usually unnecessary except for treatment failure. Bacterial pathogens *Streptococcus pneumoniae, H. influenzae,* and *M. catarrhalis* account for most cases of acute bacterial sinusitis.

CLINICAL BOTTOM LINE

Treatment

What nondrug measures are helpful in the treatment of patients with acute sinusitis?

No well-designed, randomized studies have addressed the efficacy of nondrug therapies. Steam inhalation, hydration, and sinus irrigation are often recommended. These measures can help thin mucus and aid sinus draining. Sinus irrigation, such as with a saline nasal irrigation or neti pot, can increase mucosal moisture and remove inflammatory debris and bacteria. According to a Cochrane review, nasal saline irrigation abbreviated symptoms by a nonsignificant 0.3 day (out of 8 days) in 1 study, whereas, in a second study, irrigation was associated with less time off work, but minor discomfort was not uncommon (27).

How should clinicians decide whether to use antibiotics to treat acute sinusitis?

Most cases of suspected sinusitis will resolve without antibiotic therapy, so this treatment should be reserved for persons who have had symptoms for at least 7 to 10 days and who have received conservative treatment. Widespread prescribing of antibiotics has serious ramifications, including increased costs of care and promotion of drug-resistant strains of common respiratory pathogens. Furthermore, restricted use of antibiotics avoids drug side effects, particularly gastrointestinal effects. A Markov disease simulation model found that empirical antibiotic treatment was cost-effective from a societal perspective but that drug resistance would eventually lead to increased costs and reduced efficacy (28).

A Cochrane review of 5 RCTs comparing antibiotics with placebo and 51 RCTs comparing antibiotics from different classes for the treatment of acute maxillary sinusitis in adults reported a statistically significant difference in favor of antibiotics compared with placebo (pooled relative risk [RR], 0.66 [95% CI, 0.44 to 0.98]) (2). The review considered trials with clinically diagnosed acute sinusitis but did not require confirmation by radiography or bacterial culture. Overall, the meta-analysis found a 34% reduction (CI, 2% to 56%) in the RR for resolution at 7 to 15 days, but the authors deemed this evidence as "equivocal" because 80% of the control group had symptoms resolve versus 90% of the antibiotic treatment group. The authors concluded that antibiotics have a small beneficial effect in patients with uncomplicated acute sinusitis.

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29. Arroll B, Kenealy T. Antibiotics for the common cold and acute purulent rhinitis. Cochrane Database Syst Rev. 2005:CD000247. [PMID: 16034850]
30. Williamson IG, Rumsby K, Benge S, et al. Antibiotics and topical nasal steroid for treatment of acute maxillary sinusitis: a randomized controlled trial. JAMA. 2007;298:2487-96. [PMID: 18056902]

Another Cochrane review of 6 RCTs comparing antibiotic therapy against placebo in persons with acute upper respiratory tract infections and less than 7 days of symptoms or less than 10 days of acute purulent rhinitis found that persons receiving antibiotics did no better than those receiving placebo (29). The antibiotics did not improve the cure rate or the persistence of symptoms (in terms of lack of cure or symptom persistence, RR, 0.89, [CI, 0.77 to 1.04]).

Other recent studies and analyses have reported similarly unclear findings.

One RCT of 240 adults with acute nonrecurrent sinusitis in the primary care setting found that an antibiotic did not provide effective treatment for acute sinusitis. Not only did 7 days of antibiotic amoxicillin (500 mg 3 times daily) prove ineffective, but so did this antibiotic combined with budesonide (200 µg once daily in each nostril), or 10 days of budesonide alone (30).

One review of 7 studies concluded that most patients will get better without antibiotics, with the benefit of avoiding antibiotic-related adverse effects (31). The authors calculated that patients treated with antibiotics for 5 to 8 days for persistent purulent rhinitis had a 1.18 pooled RR for benefit (CI, 1.05 to 1.33) but a 1.46 RR for adverse effects from antibiotics (CI, 1.10 to 1.94) They concluded that antibiotics are probably effective for acute purulent rhinitis but supported a no antibiotic as first line" strategy.

A meta-analysis of 9 randomized trials assessing whether common signs and symptoms can be used to identify patients who benefit from antibiotics determined that antibiotics would have to be given to 15 patients with rhinosinusitis-like symptoms before an additional patient was cured (95% CI NNT[benefit] 7 to NNT[harm] 190) (32). Patients with purulent discharge in the pharynx took longer to cure; 8 patients with purulent discharge in the pharynx would need to be treated with antibiotics before 1 additional patient was cured (95% CI NNT[benefit] 4 to NNT[harm] 47). Older patients or those whose symptoms were more severe or longer-lasting were no more likely than other patients to benefit from antibiotics. The authors concluded that common clinical signs and symptoms could not accurately identify patients with rhinosinusitis, even when a patient reported symptoms lasting longer than 7 to 10 days.

Because the signs and symptoms of acute bacterial sinusitis and of prolonged viral upper respiratory tract infections are similar, misclassification is common (33). The decision to use antibiotic therapy should be based on the probability of bacterial sinusitis (Box). Antibiotic therapy is appropriate for patients with a high likelihood of bacterial sinusitis, or if symptomatic therapy fails in low-probability cases. In patients with less severe symptoms who have had no improvement after 7 to 10 days of symptomatic therapy, antibiotic therapy may be added.

Antibiotic therapy

The choice of antibiotics depends on circumstances (Table). An increase in bacterial resistance may need to be taken into account when prescribing antibiotics, but evidence is lacking for better clinical outcomes by selecting antibiotics that might have a lower probability of resistance. Pneumococcal resistance to macrolides and other agents has increased, and trimethoprim–sulfamethoxazole is not a recommended second-line agent in children although it continues to be an acceptable first-line agent in adults.

Newer broad-spectrum agents are, however, more costly than most older agents, and substantial concern exists about promoting the development of widespread resistance among bacteria in the community and in the host. Evidence indicates that these broad-spectrum agents are usually unnecessary in first-line treatment.

A Cochrane review of antibiotic use for acute sinusitis identified 51 studies that compared different classes of antibiotics and found that the efficacy of these regimens was similar, with the exception of a significantly lower risk for clinical failure at 7 to 15 days follow-up for amoxicillin–clavulanate than for cephalosporins, but this benefit disappeared with longer follow-up. However, adverse

Probability of Bacterial Sinusitis

High probability (>50%) when at least 2 of the following are present: upper respiratory infection >7 days, facial pain, and purulent discharge (nasal, pharyngeal, or both).

Low probability (<25%) when only 1 of the following are present: upper respiratory infection >7 days, facial pain, or purulent discharge.

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Table. Drug Treatment for Sinusitis, by Highest Level of Evidence*

Agent	*Notes*
Nasal steriods (e.g., fluticasone, 2 puffs intranasally [200 µg] daily)	Reduces mucosal inflammation. May cause local irritation.
Oral corticosteroids	For severe disease, reduces pain.
Antibiotics	Only prescribe after 5 days of symptoms and treat for at least 7 to 10 days. Or treat for 7 days after the resolution of symptoms.
First-line: Amoxicillin, 1.5 to 3.5 g/d divided 2 or 3 times daily)	Potential adverse effects: rash, hypersensitivity reaction (rare), gastrointestinal symptoms.
Trimethoprim–sulfamethoxazole (800/160 mg twice daily)	Consider in patients allergic to penicillin. Potential adverse effects: hematologic (rare), rash, gastrointestinal symptoms, toxic epidermal necrolysis (rare). Pneumococcal resistance is high.
Second-line: Amoxicillin–clavulanate (500/125 mg 3 times daily)	Same as first-line amoxicillin.
Second- or third-generation cephalosporins (e.g., cefuroxime, 250 or 500 mg twice daily, or cefaclor, 250 or 500 mg 3 times daily)	Caution in patients allergic to penicillin. Side effects include gastrointestinal upset, headache, rash, blood dyscrasias.
Doxycycline (200 mg on first day then 100 mg twice daily for 2 to 10 days)	Potential adverse effects: gastrointestinal upset, photosensitivity, neutropenia. Not recommended in children aged ≤8 y.
Macrolides (e.g., clarithromycin, 500 mg twice daily, or azithromycin, 500 mg daily for 5 days)	Consider in patients allergic to both penicillin and trimethoprim–sulfamethoxazole. For 5 d of azithromycin, stop for 5 d, then may have to repeat. Potential adverse effects: gastrointenstinal upset, allergic reactions (e.g., angioedema), liver dysfunction.
Fluoroquinolones (e.g., ciprofloxacin, 500 twice a day, levofloxacin, 500 mg once daily)	Side effects: gastrointestinal upset, diarrhea, headache, confusion. Concern about antibiotic resistance.†
Oral antihistamines (e.g., loratadine, 10 mg daily)	Inhibits inflammatory pathways, helpful especially with history of allergic rhinitis.
Nasal decongestant (e.g., xylometazoline intranasally, 2 to 3 sprays every 8 to 10 h)	Reduces mucosal inflammation, improves ostial drainage by vasoconstriction. Avoid use for more than 3 to 5 days because of the risk for rebound congestion.
Systemic decongestants (e.g., pseudoephedrine short-acting, 60 mg every 4 to 6 h, or long-acting, 120 mg every 12 h)	Use caution with underlying cardiovascular disease, poorly controlled hypertension, hyperthyroidism, or diabetes mellitus.
Mucolytic agents (e.g., guaifenesin, 1200 mg twice daily, not to exceed 2400 mg per 24 h)	Reduces viscosity of nasal secretions. May cause gastrointestinal symptoms.

** Thomas M, Yawn BP, Price D, et al; European Position Paper on Rhinosinusitis and Nasal Polyps Group. EPOS Primary Care Guidelines: European Position Paper on the Primary Care Diagnosis and Management of Rhinosinusitis and Nasal Polyps 2007 - a summary. Prim Care Respir J. 2008;17:79-89. [PMID: 18438594]*

† Le Saux N. The treatment of acute bacterial sinusitis: no change is good medicine. CMAJ. 2008;178:865-6. [PMID: 18362382]

effects were greater for the amoxicillin–clavulanate group compared with the macrolide and cephalosporin groups (29). Therefore, little evidence supports using more expensive, broad-spectrum antibiotics for acute sinusitis.

A review of 49 studies determined that for acute maxillary sinusitis confirmed radiographically or by aspiration, the current limited evidence supports the use of penicillin or amoxicillin for 7 to 14 days (34). The authors note, however, that the moderate benefits of antibiotic treatment need to be weighed against the potential adverse effects.

Amoxicillin

Amoxicillin is generally recommended as a first-line agent. Traditionally, courses of 7 to 14 days have been used in clinical practice and in most randomized trials. Data are limited on the optimum duration of antibiotic treatment for acute sinusitis, and it is unclear whether such long courses are necessary. A recent Cochrane review on the use of antibiotics for acute sinusitis found no appropriately designed studies to address the duration of therapy (2). Unfortunately, lengthy courses of antibiotic treatment increase the risk for resistance (35, 36).

A patient who responds only partially to initial amoxicillin therapy may benefit from extending therapy by an additional 7 to 10 days, for a total of 3 weeks (37). In cases of sinusitis that do not improve after 3 to 5 days of antibiotic treatment, an alternative antibiotic may be considered.

34. Williams JW Jr, Aguilar C, Cornell J, et al. Antibiotics for acute maxillary sinusitis. Cochrane Database Syst Rev. 2003:CD000243. [PMID: 12804392]
35. Guillemot D, Carbon C, Balkau B, et al. Low dosage and long treatment duration of beta-lactam: risk factors for carriage of penicillin-resistant Streptococcus pneumoniae. JAMA. 1998;279:365-70. [PMID: 9459469]

Doxycycline

For patients who are allergic to penicillin or who have persistent symptoms, consider alternative antibiotics, such as doxycycline or trimethoprim–sulfamethoxazole in adults and doxycycline in older children. Cure rates are similar for doxycycline and amoxicillin (38).

Doxycycline has a broader spectrum than amoxicillin; it also covers β-lactamase–producing strains of *H. influenzae* and *M. catarrhalis*. Its use should satisfy concerns about antimicrobial resistance when providing treatment for acute sinusitis.

Trimethoprim–sulfamethoxazole

Trimethoprim–sulfamethoxazole is another good option for patients with penicillin allergies or persistent symptoms. However, pneumococcal resistance rates to trimethoprim–sulfamethoxazole have increased to at least 24% (39). For patients who are not allergic to sulfamethoxazole, trimethoprim–sulfamethoxazole is an effective drug for most patients, but because of resistance concerns, failure to respond after approximately 5 days should prompt reconsideration of therapy.

Cephalosporins

First-generation cephalosporins have minimal efficacy against *Streptococcus pneumoniae* and *H. influenzae*. Second-generation cephalosporins, such as cefpodoxime, are considered second-line agents for acute sinusitis.

Minor side effects, mostly gastrointestinal, occurred in 10% to 20% of patients in most reports and as many as half in some trials. In most cases, side effects resolved once antibiotic treatment was stopped. The withdrawal rate in randomized trials averaged between 4% and 6% with amoxicillin, folate inhibitors, or doxycycline (38, 40).

How should clinicians decide whether to use other drugs to treat acute sinusitis?

A range of nonantibiotic drugs are commonly used to try to restore normal sinus environment and function (Table). In patients with a low probability of bacterial disease, these other drugs may be used as initial therapy. They can also relieve symptoms in patients who have been prescribed antibiotics. Efficacy seems to vary, and evidence is limited, but available research indicates that these ancillary drug therapies are generally beneficial, particularly for people with less severe symptoms. In particular, intranasal steroids have received some recent attention.

In a Cochrane meta-analysis, 3 trials found that intranasal steroids for acute sinusitis increased resolution or improvement of symptoms compared with control participants (73% versus 66.4%; risk ratio, 1.11 [CI, 1.04 to 1.18]). Mometasone furoate (MFNS), 400 μg versus 200 μg, was associated with greater improvement (risk ratio, 1.10 [CI, 1.02 to 1.18]) with no significant adverse events reported at either dose (41).

*In a double-blind, placebo-controlled trial in 139 patients aged 15 to 65 years with allergies and acute rhinosinusitis confirmed by rhinoscopy and sinus radiograph, participants received antibiotics, steroids, and either loratadine or placebo. The group with adjunctive loratadine had significantly greater improvement in sneezing (*P = *0.003) after 14 days, and in nasal obstruction (*P = *0.002) after 28 days compared with patients who received placebo (42).*

Over-the-counter pain medications may also be used to reduce sinusitis-related congestion and discomfort.

Evidence on the effect of herbal remedies is very limited. A review of RCTs testing the effect of any herbal medicine as sole or adjunctive treatment for sinusitis found limited evidence that any are beneficial (43).

What are the complications of acute sinusitis?

Serious complications of acute bacterial sinusitis are rare when the

36. Hay AD, Thomas M, Montgomery A, et al. The relationship between primary care antibiotic prescribing and bacterial resistance in adults in the community: a controlled observational study using individual patient data. J Antimicrob Chemother. 2005;56:146-53. [PMID: 15928011]
37. University of Michigan Health System. Acute rhinosinusitis in adults. Ann Arbor, MI: Univ Michigan Health System; 2007
38. de Bock GH, Dekker FW, Stolk J, et al. Antimicrobial treatment in acute maxillary sinusitis: a meta-analysis. J Clin Epidemiol. 1997;50:881-90. [PMID: 9291872]
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41. Zalmanovici A, Yaphe J. Intranasal steroids for acute sinusitis. Cochrane Database Syst Rev. 2009:CD005149. [PMID: 19821340]
42. Braun JJ, Alabert JP, Michel FB, et al. Adjunct effect of loratadine in the treatment of acute sinusitis in patients with allergic rhinitis. Allergy. 1997;52:650-5. [PMID: 9226059]

Serious complications of acute bacterial sinusitis are rare when the infection is managed properly.

Clinical Alerts

Orbital swelling, erythema of conjunctiva, limited extraocular movements
Focal neurologic signs
Altered mental status
Abnormal culture on sinus puncture
Exacerbation of asthma

infection is managed properly. Antibiotic treatment can usually resolve even severe episodes. However, clinicians need to be aware of clinical alerts signifying more serious infection or complications (Box). Because of the proximity of the sinuses to the brain, the infection can become life threatening if it spreads. Intracranial complications occur if the infection passes through the layer of bone separating the sinuses from the tissue and fluid that lines the brain. In severe cases of this complication, infection spreads to the brain and causes an abscess. Based on data from the early 1990s, approximately 1000 cases of brain abscesses per year are sinusitis-related, translating to an attack rate of 1 in 3000 in patients seen for acute sinusitis (44). A retrospective review of the incidence of head and neck abscesses in children admitted to a tertiary care pediatric hospital during the first quarters of 2000 through 2003 found increasing incidence of complications of acute sinusitis (45).

In a French series of 25 cases of intracranial complications from sinusitis, most were men aged 10 to 20 years who had no risk factors. Frontal and sphenoid sinuses were the most commonly involved. Diffuse headache evolving to altered mental status was indicative of meningitis and brain abscess (46).

Infection can also spread from the sinuses to the orbit and can cause inflammation of the eyelid, abscesses, and blindness. Orbital cellulitis is diagnosed on the basis of orbital swelling, redness of the conjunctiva, and limitation of extraocular movements. Periorbital and orbital cellulitis are seen mainly in children. When sinusitis becomes chronic and erodes the bony areas around the sinuses, it makes the infection more difficult to treat and increases the risk for intracranial and intraorbital complications. Other potential complications include an aneurysm or blood clot that can be triggered if the infection spreads from the sphenoid sinus cavity to the carotid artery or cavernous sinus. This complication can also be fatal. Nerve damage from a sinus infection may cause permanent loss of sense of smell or taste. When either ophthalmic or neurologic symptoms or signs are present, the patient should be referred for consultation by a specialist. Appropriate diagnostic imaging, such as CT, may be required.

In addition to these serious but rare complications, sinusitis may exacerbate asthma; therefore, treating the sinus condition will improve asthma symptoms. Gastroesophageal reflux can also exacerbate sinusitis when it is sufficiently severe to be associated with laryngopharyngeal reflux; patients may respond to treatment with gastric acid suppression and other behavioral changes, such as avoiding late or spicy meals (13).

When should clinicians consider consultation from a specialist?

In patients with uncomplicated sinusitis, consultation increases the costs of care without added diagnostic or clinical benefits. It should be reserved for complicated cases or for patients whose symptoms are severe or do not respond to initial therapy. Otolaryngologists can provide specialized care when patients with presumed acute sinusitis do not respond to initial treatment or have recurrent or chronic sinus infections, or if an anatomical abnormality is suspected. An allergist should be consulted when underlying atopic disease is present, especially in persons with recurrent episodes or persistent symptoms. Patients with other underlying disease may require referral to other specialists.

Specialty referral is also advised when serious complications, such as periorbital cellulitis, venous sinus thrombosis, an abscess or meningeal spread of infection are suspected. Consultation with an otolaryngologist, ophthalmologist, neurosurgeon, infectious disease expert, or neurologist may be appropriate, depending on

43. Guo R, Canter PH, Ernst E. Herbal medicines for the treatment of rhinosinusitis: a systematic review. Otolaryngol Head Neck Surg. 2006;135:496-506. [PMID: 17011407]
44. National Ambulatory Medical Care Survey. National Hospital Discharge Survey. National Center for Health Statistics. Series 13. 1993-1995.
45. Cabrera CE, Deutsch ES, Eppes S, et al. Increased incidence of head and neck abscesses in children. Otolaryngol Head Neck Surg. 2007;136:176-81. [PMID: 17275535]
46. Bayonne E, Kania R, Tran P, et al. Intracranial complications of rhinosinusitis. A review, typical imaging data and algorithm of management. Rhinology. 2009;47:59-65. [PMID: 19382497]

symptoms. Patients should be hospitalized if they have serious complications of acute bacterial sinusitis, such as local extension of the infection or orbital involvement, infection or thrombosis of the intracranial venous sinuses, or metastatic spread to the central nervous system. These complications require a long course of parenteral antibiotics and close observation.

Do special considerations exist for clinical care of patients with recurrent acute sinusitis?

In patients with persistent symptoms, it can be difficult to determine whether the recurrence represents a relapse of previous infection or a de novo episode. Re-evaluation is warranted when symptoms persist for several weeks or new or worsening symptoms develop, especially symptoms suggestive of serious complications. Failure to improve may indicate antibiotic resistance, significant allergic inflammation, a fungal rather than bacterial infection, or the presence of complications.

In cases where sinusitis persists or recurs, a follow-up physical should include a check for persistent fever, sinus tenderness, purulent discharge, and changes in mental status or vision. Clinicians should assess factors that could modify management, such as allergic rhinitis, anatomic variation, cystic fibrosis, ciliary dyskinesia, and immunocompromised state (7).

Imaging studies and bacterial cultures, such obtained from nasal endoscopy, may help determine the course of treatment and rule out complications. Patients with recurrent episodes of acute sinusitis who have been evaluated and found not to have anatomic anomalies may benefit from second-line antibiotic therapy.

Treatment... Steam inhalation, hydration, and sinus irrigation are frequently recommended nondrug measures for treating acute sinusitis. Nonantibiotic drugs, such as nasal steroids, antihistamines, and decongestants, can also help restore normal sinus environment and function. Expert opinions vary on the appropriate role of antibiotics in treating acute sinusitis. Many cases of suspected sinusitis will resolve without antibiotics. Antibiotic therapy is appropriate for patients with less severe symptoms with no improvement after 7 to 10 days, especially with adjunctive therapy. Antibiotic therapy may be added in patients with a high likelihood of bacterial sinusitis. The choice of antibiotics depends on circumstances. Amoxicillin is generally recommended as a first-line agent for patients with no penicillin allergy. Serious complications of acute bacterial sinusitis are rare when the infection is managed properly, but there is potential for the infection to be life-threatening if it spreads. Specialty consultation or hospitalization may be needed for complicated cases or for patients whose symptoms are severe or fail to respond to initial therapy.

CLINICAL BOTTOM LINE

Practice Improvement

Are there practice guidelines relevant to acute sinusitis?

In 2005, the Joint Council of Allergy, Asthma, and Immunology updated their 1998 guidelines on diagnosis and management of sinusitis (47). The guidelines incorporated new concepts in diagnosis and management and new insights into pathogenesis. In particular, the authors note that fungi are increasingly being recognized as a factor in chronic sinusitis, particularly in the southeast and southwest parts of the country.

In 2006, the American College of Chest Physicians (ACCP) Expert Panel on the Diagnosis and Management of Cough (URTI) recommended that, in patients with cough

47. Slavin RG, Spector SL, Bernstein IL, et al; American Academy of Allergy, Asthma and Immunology. The diagnosis and management of sinusitis: a practice parameter update. J Allergy Clin Immunol. 2005;116:S13-47. [PMID: 16416688]
48. Pratter MR. Cough and the common cold: ACCP evidence-based clinical practice guidelines. Chest. 2006;129:72S-74S. [PMID: 16428695]
49. Centre for Clinical Practice. Respiratory tract infections—antibiotic prescribing. Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care. London: National Institute for Health and Clinical Excellence; 2008.
50. Ip S, Fu L, Balk E, et al. Update on acute bacterial rhinosinusitis. Evid Rep Technol Assess (Summ). 2005;124:1-3. [PMID: 15989375]

and acute upper respiratory tract infection, the diagnosis of bacterial sinusitis should not be made during the first week of symptoms (48). The authors noted that the symptoms, signs, and sinus imaging abnormalities of an upper respiratory tract infection may be indistinguishable from acute bacterial sinusitis.

Guidelines released in 2007 from the American Academy of Otolaryngology and Head and Neck Surgery Foundation recommended that clinicians should reevaluate the diagnosis and consider other causes of illness and possible complications when symptoms worsen or do not improve by 7 days after diagnosis and management (7). If the diagnosis of acute bacterial sinusitis is confirmed, the clinician should begin antibiotic therapy in patients initially managed with observation and should change the prescribed antibiotic in patients initially managed with an antibiotic.

Guidelines from the British National Institute for Health and Clinical Excellence recommend a "no antibiotic or delayed antibiotic strategy" for most cases of sinusitis (49). Recommendations do, however, advise an immediate antibiotic prescription and further appropriate investigation and management for patients who are systemically sick or who have symptoms and signs suggestive of serious illness or complications; for patients who have a preexisting comorbid condition that increases risk for serious complications; and for elderly patients who have additional criteria that increase risk, such as diabetes or oral glucocorticoid use.

An evidence report sponsored by the Agency for Healthcare Research and Quality on the treatment of acute bacterial sinusitis noted that studies comparing newer antibiotics with older, less expensive ones like amoxicillin and trimethoprim–sulfamethoxazole are lacking (50).

in the clinic

Tool Kit

Acute Sinusitis

PIER Modules

http://pier.acponline.org/physicians/diseases/d096/d096.html

Access the PIER module on acute sinusitis from the American College of Physicians. PIER modules provide evidence-based, updated information on current diagnosis and treatment in an electronic format designed for rapid access at the point of care.

Patient Information

http://pier.acponline.org/physicians/diseases/d096/d096-pi.html

Access the Patient Information material that appears on the following pages for duplication and distribution to patients.

www.aaaai.org/patients/publicedmat/tips/sinusitis.stm

Access a *Tips to Remember: Sinusitis*, a patient handout from the American Academy of Allergy, Asthma & Immunology (AAAAI).

www.nlm.nih.gov/medlineplus/sinusitis.html

Access MEDLINE Plus information about acute sinusitis for patients, including an interactive tutorial available in both English and Spanish.

Clinical Guidelines

www.entnet.org/Practice/adultSinusitis.cfm

Clinical practice guidelines, released in 2007, from the American Academy of Otolaryngology and Head and Neck Surgery Foundation on adult sinusitis.

www.aaaai.org/professionals/resources/pdf/sinusitis2005.pdf

Practice recommendations, issued in 2005, from the Joint Council of Allergy, Asthma, and Immunology on the diagnosis and management of sinusitis.

http://chestjournal.chestpubs.org/content/129/1_suppl/1S.full

Practice recommendations, released in 2006, from the American College of Chest Physicians (ACCP) Expert Panel on the diagnosis and management of cough (URTI).

Diagnostic Tests and Criteria

www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=erta9&part=A13283

Sensitivity and Specificity of a 4-Item Clinical Score for Diagnosing Acute Bacterial Sinusitis.

Quality of Care Guidelines

www.guideline.gov/content.aspx?id=12682&search=acute+sinusitis

A 2007 update of an earlier guideline from the University of Michigan Health System

in the clinic

THINGS YOU SHOULD KNOW ABOUT ACUTE SINUSITIS

In the Clinic
Annals of Internal Medicine

What is acute sinusitis?

- Acute sinusitis, also known as a sinus infection or rhinosinusitis, refers to inflammation and infection in one or more of the paranasal sinuses.
- It often occurs after a cold, when mucus gets trapped in inflamed sinuses and does not drain properly. This condition encourages bacterial growth, or rarely fungal growth, that can lead to infection.
- Sinusitis affects is one of the most common reasons people visit the doctor.
- It is acute when in the early stages, from 1 to 4 weeks after symptoms start. Subacute or chronic sinusitis has symptoms that last longer than 1 month.

Who gets it?

- Anyone can get sinusitis, but it is more common in very young people and elderly people.
- People with nasal allergies or asthma have an increased risk for sinusitis.
- Smoking, swimming, air travel, and dental problems are factors that increase risk for sinusitis.

What are the signs and symptoms?

- Symptoms include a headache, congestion with pus in the nose, facial pressure and pain, postnasal drip, cough, sore throat, and fatigue.
- A fever lasting more than 3 to 4 days is suggestive of a bacterial infection.

What is the difference between a cold and acute sinusitis?

- A cold is caused by a virus and usually lasts about 1 week. Persons with symptoms of acute sinusitis for less than 1 week are still usually only infected with a virus.
- Acute bacterial sinusitis generally occurs after symptoms have persisted for 7 to 10 days.

How do you know if you have acute sinusitis?

- Your doctor will make the diagnosis based on your symptoms and a physical examination.
- In complicated, severe, or persistent cases, x-rays or computed tomography may be needed. A sample of sinus fluid may need to be obtained by a specialist to identify the exact strain of bacteria causing the sinusitis.

How is it treated?

- Resting, drinking plenty of fluids, and using a saline spray or neti pot can reduce symptoms.
- Decongestants, antihistamines, and other over-the-counter medications may also reduce symptoms.
- Antibiotics may be prescribed if your doctor believes your symptoms and the duration of the disease warrant this treatment.

For More Information

https://aaaai.org/patients/topicofthemonth/1206/
Sinusitis FAQs from the American Academy of Allergy, Asthma, and Immunology.

www.entnet.org/HealthInformation/doIHaveSinusitis.cfm
Fact Sheet: Do I Have Sinusitis? From the American Academy of Otolaryngology-Head and Neck Surgery.

http://www3.niaid.nih.gov/topics/sinusitis/
Information on sinusitis from the National Institute of Allergy and Infectious Disease.

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Patient Information

CME Questions

MKSAP
MEDICAL KNOWLEDGE *Self-Assessment Program*

1. A 37-year-old woman is evaluated for a 2-week history of sinus congestion. She initially believed she had a cold and felt better after taking an over-the-counter combination of oral pseudoephedrine and diphenhydramine; however, her symptoms returned, and she began having low-grade fevers and increased nasal secretions. She has no drug allergies.

   On physical examination, the temperature is 37.4°C (99.4°F). There is right maxillary pressure when her head is down, erythematous turbinates, yellowish-green nasal secretions and a thickened postnasal drip and erythema of the posterior pharynx.

   Which is the most appropriate management for this patient's disorder?

   A. Oral amoxicillin
   B. Oral nonsedating antihistamine
   C. Sinus radiography
   D. Sinus computed tomography (CT)
   E. Oral amoxicillin–clavulanate

2. A 28-year-old man presents with 4 days of upper respiratory congestion and sinus pain. The patient has had no significant medical history. He notes that he may have initially had a mild fever but he has not been febrile in the past 48 hours. He describes some yellowish nasal discharge. On examination, he has fluid behind his tympanic membranes and moderate tenderness over his maxillary sinuses. He has taken acetaminophen for his discomfort and an "herbal" drug for colds.

   What is the most appropriate initial management?

   A. Oral prednisone taper
   B. Amoxicillin
   C. Oral decongestants
   D. Trimethoprim–sulfamethoxazole
   E. Azithromycin

3. A 32-year-old man has a 5-day history of persistent nasal congestion and pain in the right forehead area associated with a clear nasal discharge and mild cough. The patient reports that he has had similar episodes in the past that were helped by antibiotics. Medical history is otherwise unremarkable, and he currently takes no medications.

   On physical examination, vital signs, including temperature, are normal. Mild right suborbital ridge tenderness is present. The nares are patent with a clear mucoid discharge. There is no pharyngeal erythema or exudate. The lungs are clear to auscultation.

   Which is the best initial management?

   A. Amoxicillin
   B. CT of the sinuses
   C. Plain films of sinuses
   D. Symptomatic treatment
   E. Trimethoprim–sulfamethoxazole

4. A 24-year-old man requests antibiotics during an evaluation for symptoms he has attributed to a sinus infection. He reports sinus congestion and clear nasal drainage that has persisted for 1 month after he developed a cold; he has no fever, sinus pain, purulent nasal drainage, sneezing, or nasal itching. Since the onset of his symptoms, he has been using a nasal decongestant spray with only short-term symptomatic relief, but he states that antibiotics have been effective in the past for treating his sinus infections. His history includes allergic rhinitis, but his primary allergens are not in season.

   Nasal examination shows congested nasal mucosa with a profuse watery discharge. The nasal septum seems normal, the turbinates are pale, and there are no polyps. The remainder of the physical examination is normal.

   Which is the most likely reason for this patient's symptoms?

   A. Allergic rhinitis
   B. Bacterial sinusitis
   C. Nonallergic rhinitis
   D. Rhinitis medicamentosa
   E. Viral upper respiratory infection

5. A 37-year-old man is evaluated for frontal headaches, nasal congestion, and mucopurulent nasal drainage that have persisted intermittently for several years. He also has fatigue, a nighttime cough, and decreased sense of smell. Over the past 4 months, he has received 3 successive courses of antibiotics for worsening symptoms—initially with week-long courses of trimethoprim–sulfamethoxazole and doxycycline. Most recently, he completed a 3-week course of amoxicillin–clavulanate in combination with a nasal steroid inhaler, nasal saline irrigation, and an oral decongestant. This treatment regimen provided only partial relief. He has no history of allergic rhinitis, eczema, or drug allergy.

   On physical examination, he is afebrile. The turbinates are edematous, with yellowish mucus between the right middle turbinate and lateral nasal wall. The septum is deviated to the right but with no nasal polyps. Percussion of his right maxillary sinus elicits mild tenderness.

   Which is the most appropriate management for this patient's condition?

   A. Allergy testing
   B. Nasal swab cultures
   C. Sinus MRI
   D. Sinus CT
   E. Sinus radiography

Questions are largely from the ACP's Medical Knowledge Self-Assessment Program (MKSAP, accessed at http://www.acponline.org/products_services/mksap/15/?pr31). Go to www.annals.org/intheclinic/ to obtain up to 1.5 CME credits, to view explanations for correct answers, or to purchase the complete MKSAP program.

Correction: Acute Sinusitis

In the recent In the Clinic on acute sinusitis (1), the figure title on page ITC3-2 was incorrect. The correct title is: "Diffuse pansinusitis with mucosal thickening and polyposis in the anterior sinuses."

Also, the sidebar "How to Perform Nasal Irrigation" on page IT3-4 contained an error. The last line should be: "Repeat on the other side."

These errors been corrected in the online version.

Reference

1. **Wilson JF**. In the clinic. Acute sinusitis. Ann Intern Med. 2010;153: ITC3-1-15. [PMID: 20820036]