



## **Overview of the Presentation and Updated Management of Sinusitis**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Acute and chronic sinusitis are common primary care presentations. They are caused by mucosal inflammation, which inhibits mucociliary function of the nose and paranasal sinuses. Because it affects the mucous membranes that line both the nose and the sinuses, the complete medical word for sinusitis is "rhinosinusitis". Sinusitis is usually caused by a viral upper respiratory tract infection, with bacterial sinusitis occurring in about 2% of cases, yet in most cases overall antibiotics are being used and prescribed which is in most part are not needed, and cases often resolves without antibiotics need, most general practitioners rely on clinical findings to make the diagnosis. Watchful waiting and symptom treatment with nasal oxymetazoline, pseudoephedrine, and saline nasal irrigation are recommended. In this paper, we overview the presentation and management of sinusitis.

**Keywords:** Sinusitis; rhinosinusitis; presentation; management; mucociliary function; nasal oxymetazoline; pseudoephedrine.

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## 1. INTRODUCTION

Acute and chronic sinusitis are common primary care presentations. They are caused by mucosal inflammation, which inhibits mucociliary function of the nose and paranasal sinuses [1]. The infection of the paranasal sinuses is known as sinusitis. Because it affects the mucous membranes that line both the nose and the sinuses, the complete medical word for sinusitis is "rhinosinusitis" [2] chronic sinusitis however is an inflammatory condition that affects the paranasal sinuses and lasts for at least 12 weeks, and it's a common chronic sickness in the united states that affects all age groups [3], rhinosinusitis affects an estimated 35 million people in the united states each year, resulting in nearly 16 million clinic visits. It is more frequent in women, with the maximum prevalence occurring between the ages of 45 and 64 [4,5].

Sinusitis is usually caused by a viral upper respiratory tract infection, with bacterial sinusitis occurring in about 2% of cases, yet in most cases overall antibiotics are being used and prescribed which is in most part are not needed, and cases often resolves without antibiotics need [6], most general practitioners rely on clinical findings to make the diagnosis. Signs and symptoms of acute bacterial sinusitis and those of a prolonged viral upper respiratory tract infection are closely similar. Nasal congestion, rhinorrhoea, facial pain, hyposmia, sneezing, and, if more severe, additional malaise and fever are among the symptoms that afflict 1% to 5% of the adult population in europe each year [7].

Antibiotics are still overused in individuals with mild acute sinusitis that lasts only a few days. Non-clinical factors influencing antibiotic use for acute sinusitis include the particular provider, the provider's specialty, and the presence of a medical trainee [8].

## 2. ETIOLOGY

The following are the several types of rhinosinusitis etiologies:

- Allergic, any allergic reaction can also cause sinusitis (e.g.: pollen grains).
- Infectious whether it's viral or bacterial it can be caused by coronavirus, rhinovirus, and influenza virus [9], parainfluenza virus 10 the rhinovirus has been identified as the source of 50% of common cold episodes .

Sars-cov-2 virus (responsible for the recent covid-19 pandemics) could also implicate same symptoms [10- 12].

- Bacterial infections: anaerobic bacteria, staphylococcus aureus, gram-negative bacteria, streptococcus pneumoniae, haemophilus influenzae, moraxella catarrhalis [13].
- Approximately 50% of persons with a clinical diagnosis of acute sinusitis had a bacterial sinus infection, according to a study. Streptococcus pneumoniae and haemophilus influenzae are the most common pathogens in acute bacterial sinusitis [14].
- Although fungal allergy and the presence of fungal hyphae in eosinophil-laden mucus (known as allergic mucin) are key features identifying a small subset of cases of allergic fungal sinusitis, patients with CRS show immune hyperresponsiveness to fungi such as "alternaria" species, as evidenced by increased cytokine expression independent of Ige levels, indicating that nonallergic mechanisms also play a role [15- 18].

## 3. EPIDEMIOLOGY PROFILE

Annually, 30 million primary care visits and \$11 billion in healthcare costs are attributed to acute sinusitis [19]. Chronic sinusitis affects about 14.6 percent of the US population and is the fifth most frequent antibiotic-resistant infection [20,21].

A distinct microbial flora causes hospital-acquired acute sinusitis than community-acquired acute sinusitis, sinus puncture studies have shown staphylococcus aureus, pseudomonas species, klebsiella species, and other gram-negative organisms, polymicrobial infections account for about 35 percent to 40 percent of hospital-acquired sinusitis cases, which are frequently bilateral, when compared to patients who received orotracheal intubation, those who had nasotracheal intubation had a 0% to 40% higher risk of nosocomial sinusitis. Nasogastric tubes, nasal packing, cranial and facial fractures, and the use of corticosteroids and antibiotics are all risk factors for sinusitis in hospital inpatients [16].

In the case of rarer, one study looked at a medical claims database of 13.1 million people and found

that the prevalence of rars was 0.035 percent from 2003 to 2008, or 4588 cases. With a mean age of 43.5 years, this population was largely female (72.1%). The yearly cost burden for these patients was around \$1091, which included prescription costs and physician visits. The average number of health-care visits per patient per year was 5.6, while the average number of prescriptions dispensed per year was 9.4. [22].

In adult general care clinics, up to 38% of individuals with sinusitis symptoms may have acute bacterial rhinosinusitis. The prevalence was higher in otolaryngology practises (50 to 80 percent). Acute bacterial sinusitis affects 6 to 18 percent of children who arrive with upper respiratory infections in primary care [23,24].

#### 4. DIAGNOSIS

Clinically, it is characterized by nasal congestion, rhinorrhoea, facial pain, hyposmia, sneezing, and, if more severe, additional malaise and fever [14].

Viral infections cause local inflammation and blockage of the sinus ostia. Additionally, they can disrupt the ciliary function of the sinuses, leading to stasis and subsequent bacterial colonization [9].

Despite the fact that there is a lot of overlap in individual symptoms between ars and crs, crs is significantly more diverse. The presence or absence of the following characteristics are the most essential distinguishing characteristics: (1) nasal polyposis, (2) eosinophilic or other inflammatory characteristics in nasal mucus, and (3) fungal hyphae [15], so in contrast to ars, crs is rarely diagnosed solely on the basis of symptoms, due to the overlap between it and other diseases symptoms such as headaches or oral pain caused by a malignancy or other causes.

The major reason for evaluating a patient for crs is if they have had rs symptoms for more than 8-12 weeks.[25] and furthermore the diagnosis is being followed on the following criteria evidence: Table (1) [26,27,28,29].

One of the following confirming measurements should be taken:

- Endoscopic manifestations of: polyps in the nose and/or mucopurulent discharge, mainly from the middle meatus and/or the

interstitial oedema and mucosal blockage, usually in the middle meatus.

- Changes in ct: alterations in the mucosa of the osteo-meatal complex and/or sinuses [17].

When diagnosing or evaluating a patient with crs or recurrent acute rhinosinusitis, the practitioner should get computed tomography of the paranasal sinuses [30-32].

#### 5. FUNGAL SINUSITIS

There are 4 main clinicopathological disorders associated with fungal sinusitis, as follows:

**1- Indolent fungal sinusitis:** indolent granulomas with large cells characterise this condition. A mouldy odour or significant nasal crusting are common clinical signs of chronic sinusitis.

**2- A mycetoma:** it is a mass of hyphae on the mucous membrane, that supports nutrients.

**3- Invasive fungal sinusitis:** which is characterized by soft tissue necrosis, fibrosis, and fungal invasion of arteries, which can progress to ocular problems, meningitis, and CNS involvement, and it's usually occurs in immune compromised patients.

**4- Allergic fungal sinusitis:** resembles allergic bronchopulmonary aspergillosis in appearance. Atopic individuals, 75 percent of whom have asthma and 85 percent have nasal polyps, develop this non-invasive illness [18].

#### 5. VIRAL AND BACTERIAL SINUSITIS AND ANTIBIOTICS USAGE

Unfortunately antibiotic misuse is one of the main concerns of the modern medicine because it increases the bacterial resistance with each miss-use, and sinusitis is one of the main diseases that are being miss-diagnosed for bacterial infection while it's viral infection in the most cases, as 66.0 percent of patients with moderate, short-term symptoms are prescribed antibiotics, and that non-clinical factors such as the particular provider's specialization and the presence of a medical trainee had a substantial impact on antibiotic use. For acute sinusitis, family medicine physicians use fewer antibiotics than internal medicine providers, but emergency medicine providers use more antibiotics [8].

**Table 1. Diagnosis criteria and special measurement**

Diagnosis	Criteria for diagnosis	Special measurement
Crs	More than 12 weeks, anterior or mucopurulent drainage, nasal obstruction, facial pressure and pain (in case of non-np) with or without loss of smell	- Endoscopy - Anterior endoscopy - Nasal airways examination (non-np) - Ct for ent specialists
Afrs	Evidence of existing of mucin (fungal hyphae) and inflammation, plus one of the early mentioned symptoms	- Ige test - Culture showing fungus
Ars	Existing of one of the similar symptoms mentioned earlier for less than 8 weeks	- Ct - Mri

Fever (more than 38 degrees), facial pain, purulent nasal discharge, and the length of symptoms elevated erythrocyte sedimentation rate/c-reactive protein, have all been used to distinguish between bacterial and viral types. [17].

**6. MANAGEMENT**

Acute sinusitis is a self-limiting condition that usually resolves on its own. Watchful waiting and symptom treatment with nasal oxymetazoline, pseudoephedrine, and saline nasal irrigation are recommended by the american academy of otolaryngology-head & neck surgery (aao-hns) in patients with acute bacterial sinusitis. Spontaneous resolution occurs at a rapid rate: within two weeks, 80% of people with sinusitis who are clinically diagnosed improve without medication [33,34].

In the case of moderate symptoms, some of the measures that can be done include:

- Inhale steam.
- Nasal saline irrigation improves mucus secretion movement and thins discharges. In addition to other drugs used in the treatment of ars, a systematic review advised saline douching for adults with ars and children with ars [35,36].
- Maintain hydration.
- Use face packs that are warm.
- Use decongestants – use saline nasal drops, (and it’s not recommended to take antihistamines) [20].
- In case of ars topical antihistamines, such as azelastine, can help reduce inflammation and irritation of the mucosa,

as well as edema in the nasal passages and sinus ostia [22].

- Leukotriene receptor antagonist such as montelukast and others help effectively reduce symptoms caused by allergens [22].
- Another topical decongestant spray, such as oxymetazoline or phenylephrine, may assist relieve congestion by constricting local blood vessels. Patients should be warned about rebound congestion after using these decongestant sprays, and they should only use them for 2-3 days.

In comparison to placebo, corticosteroids (intranasal spray) may reduce symptoms. [14] the mainstay of treatment for rhinosinusitis is intranasal corticosteroids (incs). Meltzer and colleagues conducted a big study with 981 participants. When compared to placebo, incs as monotherapy in ars demonstrated a significant reduction in symptoms [36]. Several drugs can help with symptoms, but they don’t speed up recovery. Acetylsalicylic acid (the active ingredient in aspirin) and acetaminophen are two of them (also called paracetamol) [35].

Decongestants, unlike steroid sprays, begin working immediately. They seek to minimize mucous membrane swelling, make breathing through the nose easier in the short term, and help you sleep better at night. Decongestants, on the other hand, may have the opposite effect: the membranes in the nose normally swell up again after a few hours. The rebound effect is the term for this [35].

**7. ANTIBIOTIC TREATMENT**

Amoxicillin and amoxicillin–clavulanic acid aren’t any better than placebo at reducing treatment

failure rates, and they're linked to gastrointestinal problems, cephalosporins and macrolides on the other hand are not more effective but they have fewer side effects, and also the use of long term treatment which is up to ten days is not more effective than short term antibiotic course which is three to five days [14].

Antibiotic usage is not recommended unless it's abs, because in most cases the usage of antibiotic has proven not much of a big factor unless some of the cases such as when tests show acute maxillary sinusitis, therapy with penicillin or amoxicillin has a moderate effect. Antibiotics are used to treat purulent sputum rather than sickness symptoms [20].

Acute bacterial rhinosinusitis (abrs) is a common bacterial sinus infection with complications such as infection spreading to the orbit and central nervous system<sup>37</sup>. If the infection has been confirmed as bacterial an antibiotic course should be started immediately to avoid any further complications [37,38].

There are few high-quality studies on the management of abs. The current agreement is that amoxicillin-clavulanate, given orally at a regular dose of 45 mg/kg/day, is the medication of choice for most cases of uncomplicated abs in children who do not have antibacterial resistance. Oral high-dose amoxicillin-clavulanate (90mg/kg/day) is the treatment of choice for patients with severe abs or uncomplicated acute sinusitis who are at risk for severe disease or antibiotic resistance [39-41].

Doxycycline or a respiratory fluoroquinolone are alternatives for people who are allergic to penicillin or who require second-line antibiotics (levofloxacin, moxifloxacin). Also, clindamycin plus cefixime or cefpodoxime for 10 days are two other antibiotic options [22]. To boost anaerobic coverage, metronidazole can be added to any of these agents. Antibiotics for chronic sinusitis should cover *S. Aureus* and be efficient against beta-lactamase-producing organisms, which are more common in chronic illness [33].

Amoxicillin efficacy is less than 70% in some communities. Some people respond well to trimethoprim-sulfamethoxazole, although resistance is more common [33]. Moxifloxacin 5-day therapy for abrs can also be used as treatment and it has been found to have more effect than placebo [42, 43].

## 8. SURGICAL MANAGEMENT

Acute sinus infection with a secondary infection. Endoscopic sinus surgery may be an option if medicinal treatment fails. The goal of endoscopic sinus surgery (ess) is to relieve blockages in the osteomeatal complex (omc), which is the common drainage site for the frontal, maxillary, and anterior ethmoid sinuses. Although studies have shown that surgery has excellent effects, with subjective improvements ranging from 70% to 98 percent of patients, surgery does not always cure the disease and should be used in conjunction with medical treatment [39].

Those who do not respond to first-line medical therapy should see an otolaryngologist, and patients with a history of other comorbidities (e.g., vasculitides, granulomatous illnesses, cystic fibrosis, and immunodeficiency) should see an allergist or pulmonologist [23].

## 9. OTHER MANAGEMENT OPTIONS

Dupilumab (trade name: dupixent) has been licenced for the treatment of severe chronic sinusitis and nasal polyps in adults in Germany since October 2019. It is injected under the skin every two weeks and is used in conjunction with a steroid nasal spray. Studies have shown that dupilumab relieves the symptoms of chronic sinusitis better than a steroid nasal spray alone [38].

## 10. HERBAL TREATMENT OPTIONS

- Pelargonium sidoides, 60 drops 3 times daily, up to 3 weeks
- Sinupret: 2 tablets or 30 drops of liquid formula 3 times daily
- Sinfrontal: 1 tablet per hour until improvement is seen, then 2 tablets 3 times daily (maximum of 12 tablets daily), up to 3 weeks
- Cineole: 200 mg three times a day (consider using during the first four days of acute rhinosinusitis)
- Esberitox: three tablets three times a day
- Myrtol extract: 300 mg three times a day
- For children with recurrent, chronic rhinosinusitis, consider taking cod liver oil with a multivitamin containing selenium [42].

## 11. CONCLUSION

Antibiotics' potential effectiveness in treating acute rhinosinusitis is minimal and must be weighed against the danger of side effects. In light of antibiotic resistance and the rarity of significant consequences, antibiotics have no role in the treatment of uncomplicated acute rhinosinusitis. It's recommended to wait for the auto-resolve of sinusitis as most cases can heal without any treatment.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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