



Management of chronic rhinosinusitis

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Summary Chronic rhinosinusitis (CRS) is one of the most common reasons that persons seek medical care.¹ CRS may originate from or be perpetuated by local or systemic factors predisposing to sinus ostial obstruction and infection. These factors include anatomic or inflammatory factors leading to sinus ostial narrowing, disturbances in mucociliary transport, and subsequent infection. CRS is diagnosed by various symptoms (lasting for at least 12 weeks), which include long-term nasal congestion, thick mucus production, loss of sense of smell, sinus pressure, and facial pain, as well as physical and radiographic evidence of mucosal swelling. The goal of medical management is to reduce the swelling and inflammation, especially of the ostia, and promote drainage and a more normal nasal environment. The medical treatment should include empiric broad-spectrum antibiotics with adjunctive therapy, including nasal and oral steroids, decongestants, expectorants, and saline nasal irrigation. If symptoms improve after four weeks of treatment initiation, it is recommended that the nasal steroid sprays and nasal saline irrigations should continue for at least three months. If symptoms do not improve and there is still presence of CRS signs and symptoms, the patient should be referred to an appropriate specialist for further management.

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Introduction

Chronic rhinosinusitis (CRS) is one of the most common reasons that persons seek medical care. Experts estimate that about 31 million people in United States are affected by chronic sinusitis annually. CRS results in 18 to 22 million office visits per year, and Americans spend more than \$2 billion annually on over-the-counter medications to treat CRS and other nasal and sinus disorders.^{1,2}

Rhinosinusitis is replacing the term *sinusitis* because sinusitis is often preceded by rhinitis and rarely occurs without concurrent nasal airway inflammation.^{3,4} Acute rhinosinusitis refers to inflammation of the mucous membranes

lining the paranasal sinuses of less than four weeks' duration.

Subacute rhinosinusitis refers to a diseased state when the patient has symptoms of four to 12 weeks' duration. CRS is a group of disorders characterized by inflammation of the sinonasal mucosa for at least 12 weeks'. A fourth diagnostic category, recurrent acute rhinosinusitis, is defined as patients who develop discrete episodes of acute infection that are separated by a period of normal function and minimal symptoms. It is important to differentiate recurrent acute sinusitis from CRS.

Pathophysiology

CRS may originate from or be perpetuated by local or systemic factors predisposing to sinus ostial obstruction and infection. These factors include anatomic or inflammatory factors lead-

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Table 1 Factors contributing to rhinosinusitis⁵⁻⁷

Anatomic factors	Inflammatory factors	
	Infectious	Noninfectious
<ul style="list-style-type: none"> ■ Turbinate hypertrophy ■ Paradoxical curvature of the middle turbinate ■ Septal deviation ■ Concha bullosa deformity (pneumatization of middle turbinate) ■ Nasal polyposis ■ Prolonged use of nasogastric tube ■ Foreign body ■ Mucocele 	<ul style="list-style-type: none"> ■ Infectious agents <ul style="list-style-type: none"> ◆ Bacterial ◆ Viral ◆ Fungal 	<ul style="list-style-type: none"> ■ Exposure to external irritants <ul style="list-style-type: none"> ◆ Air pollution ◆ Smoking ◆ Cocaine abuse ■ History of hyper-reactivity <ul style="list-style-type: none"> ◆ Allergic rhinitis ◆ Aspirin sensitivity, asthma, polyps ■ Deficiencies in immune response <ul style="list-style-type: none"> ◆ IgG or IgA subclass deficiencies ◆ Common variable immunodeficiency ◆ AIDS ■ Cystic fibrosis ■ Ciliary dyskinesia

ing to sinus ostial narrowing, disturbances in mucociliary transport, and subsequent infection (Table 1).⁵⁻⁷

Anatomically, the nose and sinuses are one of the most complex aspects of the human anatomy. The nose is comprised of midline nasal septum and an inferior, middle, and superior turbinate. The paranasal sinuses are comprised of the maxillary, ethmoid, frontal, and sphenoid sinuses (Figure 1). Anatomic variation in these structures (e.g., nasal septal deviation, hypertrophy of middle and inferior turbinates, anatomically narrowed sinus ostia) can result in ostial obstruction. Anatomic changes can also occur as a result of inflammatory processes such as nasal polyposis and mucocele (Figure 2). Prolonged use of a nasogastric tube or presence of a foreign body can also create anatomic changes leading to chronic infection.

Inflammatory factors include infectious and noninfectious stimuli. Infectious inflammation is associated with bacterial, viral, or fungal infection. Noninfectious inflammation can arise because of allergic processes, atopy, hyper-reactivity, immunodeficiencies, and environmental irritants. Noninfectious inflammation is associated with the predom-

inance of eosinophils and mixed mononuclear cells and the relative paucity of neutrophils commonly seen in chronic sinusitis.⁵

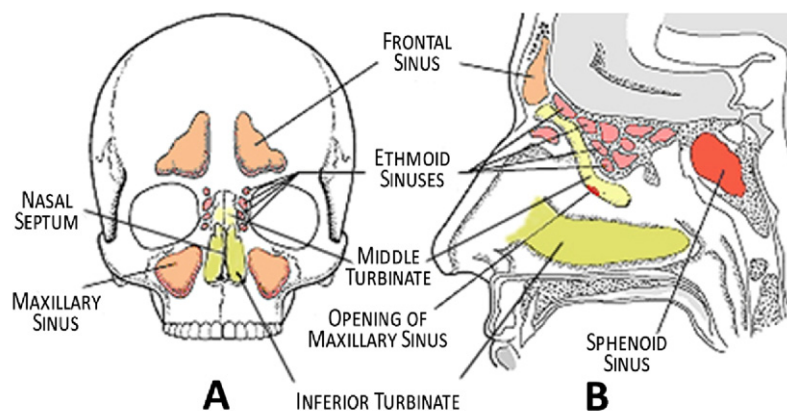
Diagnosis

Clinical diagnosis

Patients with CRS suffer from long-term nasal congestion, thick mucus production, loss of sense of smell, sinus pressure, and facial pain.⁸ Some other associated symptoms include eustachian tube dysfunction, throat irritation, cough, fatigue, and malaise. Also, most patients have a history of at least one episode of acute rhinosinusitis treated by antibiotics.¹⁰

Diagnostic criteria

The symptoms are categorized as either major or minor (Table 2)¹ and they should persist for at least 12 weeks to



A= Anterior View, B=Sagittal View

Figure 1 Anatomy of nose and sinuses.

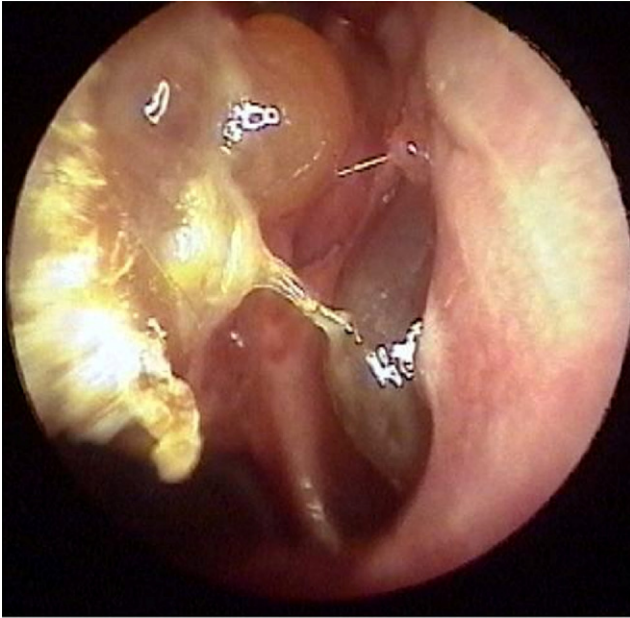


Figure 2 Endoscopic view of polyps in left middle meatus.

realize a diagnosis of rhinosinusitis. A patient is considered to have CRS if two or more major symptoms or at least one major and two or more minor symptoms are present. The accuracy of reported rhinosinusitis cases is difficult to ascertain because its diagnosis on the basis of symptoms alone can be unreliable. Because of the absence of a widely accepted definition for CRS, the Sinus and Allergy Health Partnership (an industry-sponsored expert panel) convened a multidisciplinary task force in January 2002 to develop definitions for CRS, allowing clinicians and researchers to more accurately diagnose this disease (Table 3).¹ The panel concluded that the diagnosis of CRS may be strongly suggested by symptoms and duration of illness but should be confirmed by physical or radiologic evidence of mucosal swelling.

Diagnostic testing

It is recommended that all patients who meet the clinical criteria for CRS have a computed tomographic (CT) scan or

Table 2 Factors associated with diagnosis of rhinosinusitis¹

Major factors	Minor factors
Facial pain/pressure*	Headache
Nasal obstruction/blockage	Fever (all nonacute)
Nasal discharge/purulence/disco- lored postnasal drainage	Halitosis
Hyposmia/anosmia	Fatigue
Purulence in nasal cavity on examination	Dental pain
	Cough
	Ear pain/pressure/ fullness

*Facial pain/pressure alone does not constitute a suggestive history for rhinosinusitis in the absence of another major nasal symptom or sign.

Table 3 Measures for diagnosing CRS for adult clinical care¹

1. Continuous symptoms that persist for 12 consecutive weeks or longer and physical findings of rhinosinusitis on examination or radiographic sinus imaging
2. One of these signs of inflammation must be present and identified in association with ongoing symptoms consistent with CRS:
 - a. Discolored nasal drainage arising from the nasal passages, nasal polyps, or polypoid swelling as identified on physical examination
 - b. Edema or erythema of the middle meatus or ethmoid bulla as identified by nasal endoscopy
 - c. Generalized or localized erythema, edema, or granulation tissue; if the middle meatus or ethmoid bulla is not involved, radiologic imaging is required to confirm a diagnosis
 - d. Imaging modalities for confirming the diagnosis:
 - i. CT scan demonstrating isolated or diffuse mucosal thickening, bone changes, air-fluid level
 - ii. Plain sinus radiograph (Waters' view) revealing mucous membrane thickening of 5 mm or greater or complete opacity of one or more sinuses
 - iii. MRI is not recommended as an alternative to CT for routine diagnosis of CRS because of its excessively high sensitivity and lack of specificity

nasal endoscopy to confirm the diagnosis (Figure 3). Other radiographic modalities such as standard sinus radiographs or magnetic resonance imaging (MRI) are suboptimal in diagnosis of CRS. Sinus radiographs lack detail of the ethmoid and sphenoid sinuses, making interpretation of mucosal thickening difficult. MRI is not recommended as

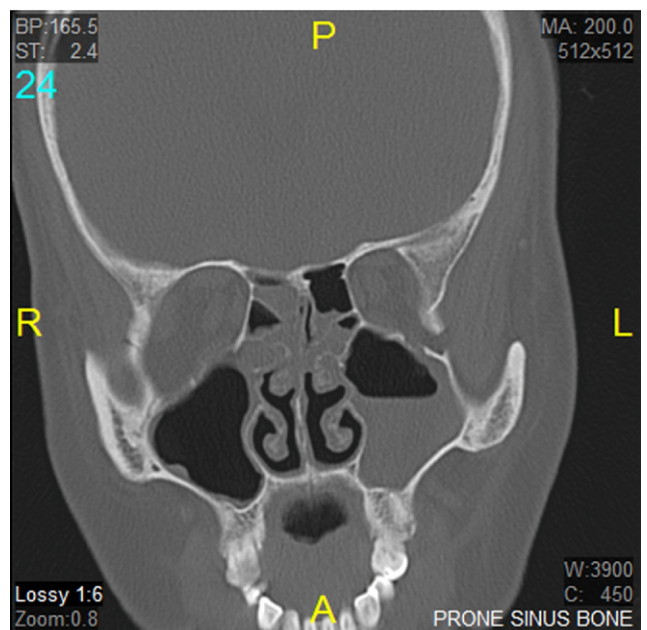


Figure 3 CT-Scan: Coronal image showing ethmoid sinus mucosal thickening and left maxillary sinus air-fluid level.

an alternative to CT scan for routine diagnosis of CRS because of its excessively high sensitivity and lack of specificity.¹

If purulence is noted on exam, both aerobic and anaerobic cultures (preferably endoscopically-guided) should be obtained to guide antimicrobial treatment (Figure 4). However, there is controversy about effectiveness and reliability of these cultures.¹¹ Cultures generally show polymicrobial flora including pathogenic organisms mingled with various nonvirulent or opportunistic or beta-lactamase-producing organisms, and a high percentage of anaerobes.¹ However, the cultures can be useful in specific circumstances such as for immunocompromised patients and for treatment failure after appropriate antibiotic therapy.

Managing chronic rhinosinusitis

The goal of medical management is to reduce the swelling and inflammation, especially of the ostia, and promote drainage and a more normal nasal environment.

Medical treatment

Antibiotics. The first therapeutic consideration is choice of antibiotics. For initial empiric therapy, antibiotics should cover bacteria known to be present in CRS, specifically *Staphylococcus*, anaerobes, and gram-negative bacilli. The most commonly used antibiotic for this is amoxicillin-clavulanic acid. Some alternatives are clindamycin, cefuroxime, clarithromycin/metronidazole, and levofloxacin (Table 4). The



Figure 4 Endoscopic view of purulence from left middle meatus.

Table 4 Antibiotics used for treating CRS infections¹⁴⁻¹⁶

First line	Alternatives
Amoxicillin/Clavulanic acid	Clarithromycin/metronidazole
Clindamycin	Cefuroxime
Levofloxacin	Erythromycin

duration of antibiotic therapy should be at least three weeks.^{9,10}

Adjunctive therapy. Adjunctive therapy should include nasal steroid sprays for at least one month to aid in reduction of mucosal edema. In addition, oral systemic steroids can be used in cases of severe or refractory swelling and/or inflammation. Decongestants and expectorants also aid in the treatment of swelling and congestion associated with CRS. Nasal saline irrigation, or nasal lavage, is a simple treatment that relieves the symptoms of a variety of sinus and nasal conditions. It helps flush out thickened mucus and irritants from the nose. A video demonstration of saline nasal irrigation is available online at the Mayo Clinic website (<http://www.mayoclinic.com/health/nasal-lavage/MM00552>).²⁰

Follow-up and prognosis

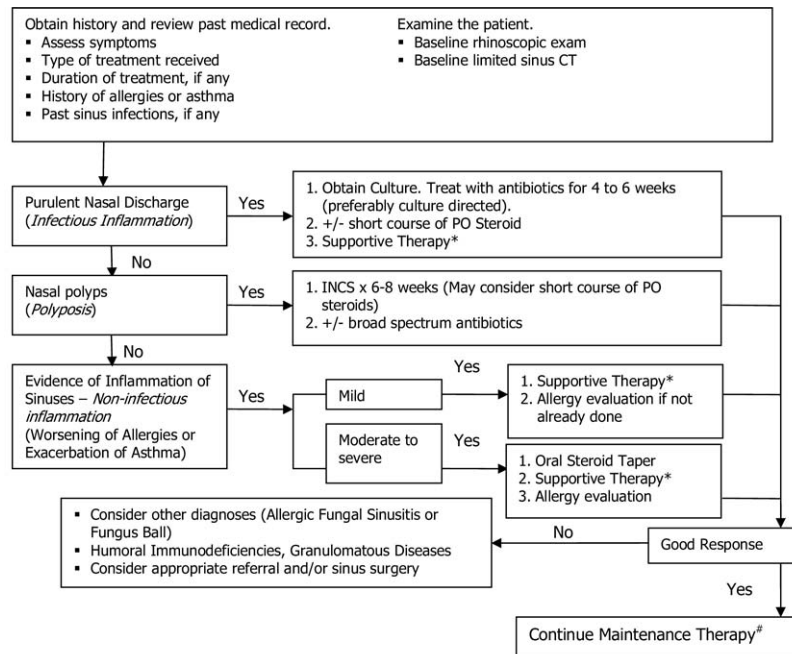
The patient should be followed up in the office one month after the initiation of medical treatment. If a patient's symptoms are improved, it is recommended that the nasal steroid sprays and nasal saline irrigations should continue for at least three months.¹⁰ If symptoms do not improve and there is still presence of CRS signs and symptoms, the patient should be referred to an appropriate specialist for further management (Table 5).

Conclusion

CRS is a common medical condition seen in the primary care setting. It is diagnosed by the presence of various symptoms including long-term nasal congestion, thick mucus production, loss of sense of smell, sinus pressure, and facial pain, as well

Table 5 Indications for referral or surgery

- Otolaryngologist
 - Persistent signs and symptoms of CRS despite multiple rounds of antibiotics
 - Radiographic evidence of anatomic obstructions (nasal septal deviation, nasal polyposis, mucocele, concha bullosa, and turbinate hypertrophy)
 - Complications of CRS (orbital, intracranial, etc.)
- Allergist/Immunologist
 - Persistent signs and symptoms of CRS with history of asthma or allergies
 - Personal or family history of immune deficiencies



* Supportive Therapy consists of: a) Intra-Nasal Corticosteroid Spray (INCS), b) Saline Irrigations, c) +/- Leukotriene modulators
Maintenance Therapy consists of Topical INCS for at least 3 months, and continued afterwards for as long as symptoms warrant.
Saline irrigation may be useful. Allergen avoidance with allergy management if patient has allergies or asthma.

Figure 5 Management of Chronic Rhinosinusitis.^{9,12}

as physical and radiographic evidence of mucosal swelling. The medical treatment should include empiric broad-spectrum antibiotics with adjunctive therapy, including nasal and oral steroids, decongestants, expectorants, and saline nasal irrigations. If the symptoms persist beyond four weeks after initiation of treatment, the patient should be referred to an otolaryngologist. A treatment algorithm for the management of chronic rhinosinusitis is presented in Figure 5.

Uncited References

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