Health Centers of UWS
UNIVERSITY of WESTERN STATES

CSPE care pathway

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Sinus Pain and Rhinosinusitis

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Limitations

UWS care pathways and protocols provide evidence-informed, consensus-based guidelines to support clinical decision making. To best meet a patient's healthcare needs, variation from these guidelines may be appropriate based on more current information, clinical judgment of the practitioner, and/or patient preferences.

These pathways and protocols are informed by currently available evidence and developed by UWS personnel to guide clinical education and practice. Although individual procedures and decision points within the pathway may have established validity and/or reliability, the pathway as a whole has not been rigorously tested and therefore should not be adopted wholesale for broader use.

This Care Pathway is designed for use with patients presenting with pain over the sinuses and/or other symptoms of rhinitis, upper respiratory infection, sinusitis, or headache pain in which sinusitis is a reasonable differential.

Search Strategy

Multiple terms were combined and a standardized search strategy was employed in the areas of therapy, diagnosis, etiology and prognosis to be sure to include and identify articles that represent evidence-based clinically relevant studies. WSCC librarians used published strategies that have been developed by librarians and researchers associated with various evidence-based medical centers, including the Cochrane Collaboration.[i] The searches used at WSCC are either based on or identical to strategies that have been published by these professionals and in some cases validated by hand searches of the medical literature.[ii,iii]

The following data bases were searched from 1996 to early 1999: MEDLINE, CINAHL, MANTIS, and the Index to Chiropractic Literature. ECRI,[iv] the US Agency for Health Care Policy and Research, and appropriate professional organizations were used to search for published guidelines.

Citations were downloaded into reference management software and sorted by probable relevance, divided into groupings of high sensitivity, high specificity, and published guidelines. The primary authors reviewed the citations and abstracts, selected sources that appeared to be useful and relevant, and reviewed the original papers. More articles were requested and reviewed as well as focused searches performed on specific issues identified by the CSPE consensus committee during the entire review process.

2017 Edition

The core of the updates in this edition centered around two evidence-based clinical guidelines:

Orlandi RR, Kingdom TT, Hwang PH, et al. International Consensus Statement on Allergy and Rhinology: Rhinosinusitis. Int Forum Allergy Rhinol. 2016 Feb;6 Suppl 1:S22-209. doi: 10.1002/alr.21695. Review.

Rosenfeld RM, Piccirillo JF, Chandrasekhar SS. Et al. Clinical practice guideline (update): adult sinusitis. Otolaryngology-Head and Neck Surgery 2015, Vol 152(25)S1-S39. These are evidence-based guidelines for the American Academy of Otolaryngology-Head and Neck Surgery (AA)-HNS)

To check for additional relevant literature published after the original iteration of this document was written, in November 2016 a reference librarian conducted a search in PubMed on the terms **sinusitis OR rhinosinusitis**. Search results were filtered for systematic reviews and guidelines published 2014 to present. In January 2017 an additional PubMed search was conducted using the same search terms, this time with the Complementary Medicine subjects filter set and the publication dates filter set for 10 years. For both searches, articles were selected for review based on relevance of the title and abstract. To account for literature published post-search, a search alert for the terms **sinusitis OR rhinosinusitis** was set up in PubMed/NCBI and reviewed periodically through May 2017 for pertinent trials and reviews. Additional focused searches on a variety of specific topics were also conducted by the primary author using PubMed and clinical queries filter in response to questions which arose during the writing of this update and subsequent consensus process.

[i] Bero L, Rennie D. The Cochrane Collaboration. Preparing, maintaining, and disseminating systematic reviews of the effects of health care. JAMA 1995;274(24):1935-8.

[ii] Greenhalgh T. How to read a paper. The MEDLINE database. BMJ 1997;315(7101):180-3.

[iii] Haynes RB, Wilczynski N, McKibbon KA, Walker CJ, Sinclair JC. Developing optimal search strategies for detecting clinically sound studies in MEDLINE. J Am Med Inform Assoc 1994 Nov-Dec;1(6):447-58.

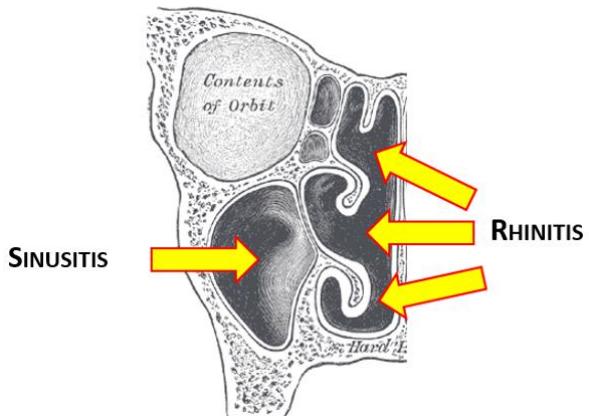
[iv] Healthcare Standards: 1999 Official Directory. Plymouth Meeting, PA: ECRI, 1999. Annual. WSCC Library call number: W 22 H434 1999.

Table of Contents

BACKGROUND

Sinus pain or pressure may be due to rhinosinusitis or may be referred from other sources in the head or neck. *Rhinosinusitis* (RS) is a symptomatic inflammation of the paranasal sinuses and nasal cavity. (Rosenfeld 2015) Sinus involvement is usually infectious in nature, caused by viral, bacterial, and/or fungal infections. RS may also be due to allergic reactions or as a response to environmental irritants. Rhinosinusitis is currently the preferred diagnostic term because sinusitis is nearly always also associated with inflammation of nasal mucus membranes. (Rosenfeld 2015)

Rhinitis (e.g., caused by the common cold or allergy), on the other hand, is simply inflammation of the nasal mucous membrane. An infection there can then spread into the sinuses causing RS. A precise clinical differentiation between these two diagnoses is often not possible.



Rhinosinusitis is considered to be "uncomplicated" unless there are signs and symptoms suggesting that the inflammation has extended outside the paranasal sinuses and nasal cavity to include neurologic, ophthalmologic, or other soft tissue involvement. (Rosenfeld 2015)

TYPES OF RHINOSINUSITIS

RS can be classified into two main categories: ***acute*** (ARS) and ***chronic*** *(CRS)*. Both acute and chronic RS can be bacterial or nonbacterial.

Recurrent acute RS is a term indicating that a patient has had 4* or more annual episodes of rhinosinusitis, without experiencing symptoms in between. (Rosenfeld 2015)

Symptoms and signs of acute and chronic RS are often very similar. Severity and duration may be the only distinguishing characteristics. However, even in terms of duration, there is not always a clear distinction.

Acute Rhinosinusitis (ARS)

To be considered acute, RS symptoms must be present longer than seven days but less than four weeks. (Rosenfeld 2015) Symptoms lasting less than seven days may be characterized simply as *rhinitis*.

Although 4 weeks is suggested as the maximum duration of ARS, this criterion is based more on consensus than on research evidence. A few authors suggest that ARS can last up to 12 weeks. RS lasting between 4 to 12 weeks has sometimes been labeled as *subacute rhinosinusitis*. Others, however, consider this period as simply reflecting either

* The average adult gets between 1.4 and 2.3 viral URIs per year and so a threshold of 4 episodes was set to prevent confusing multiple occurrences of rhinitis with recurrent acute RS. (Orlandi 2016)

lingering acute RS or early chronic RS, at least for clinical decision making purposes. (Rosenfeld 2015)

ARS is further classified by "presumed" etiology into acute bacterial rhinosinusitis (ABRS) or acute viral rhinosinusitis (VRS) based primarily on symptoms and time course. (AAO-HNS** recommendation, Rosenfeld 2015)

Chronic Rhinosinusitis (CRS)

Chronic rhinosinusitis (CRS) is defined as RS lasting more than 12 weeks, with or without acute exacerbations. It, too, is classified as chronic *bacterial* rhinosinusitis or *viral* rhinosinusitis. It can also be subcategorized as *with and without polyps*. (Rosenfeld 2015)

Nasal polyps are benign mucosal growths affecting about 4% of the population. They can be associated with children affected by cystic fibrosis as well as sinusitis. They have also been associated with a syndrome called aspirin-exacerbated respiratory disease (AERD) which involves both the upper and lower respiratory track in patients with asthma whose symptoms are aggravated by aspirin or other NSAIDs. (Baynard 2016) Patients who have chronic RS complicated by nasal polyps respond more poorly to standard sinusitis treatments and have a higher recurrence rate. (Orlandi 2016)

Another minor classification is ***Acute Exacerbation of Chronic RS*** which simply denotes a flare up of the otherwise steady baseline symptoms of chronic RS. (Orlandi 2016)

PATHOPHYSIOLOGY

The origin of RS may be bacterial, viral, fungal (rare), allergic or environmental. Most, but not all, cases begin when a viral upper respiratory infection (URI) of the nasal cavity spreads into the adjacent sinuses. (Orlandi 2016)

The ethmoid and maxillary sinuses appear to be most often affected; the frontal sinuses less so. Isolated sphenoid involvement is rare but quite serious. (Incaudo 1998, Hadley 1997).

Up to 30-50% of patients with clinically or radiographically suspected sinusitis have sterile aspirates from antral punctures. (Institute for Clinical Systems 1998).
Only about 0.5-2.0% of viral RS cases progress to acquire a bacterial infection. (Gwaltney 1996)

The mucosal inflammation caused by the viral infection is thought to block the opening to the sinuses. This leads to obstructing sinus drainage, stagnation of secretions, and growth of bacterial pathogens that already colonize the nose and nasopharynx. (Aring 2016) Furthermore, nose-blowing may propel nasal bacteria into the sinuses. A superimposed bacterial infection can develop at any time during the course of RS. (Rosenfeld 2015)

The most common community-acquired bacteria pathogens are *Streptococcus pneumoniae*, *Hemophilus influenzae* and *Moraxella catarrhalis*. The most common causes of acute viral RS are rhinovirus, adenovirus, influenza virus and parainfluenza virus. (Aring 2016)

RS may also be triggered by allergens although the data correlating allergy and acute RS are weak. The estimated prevalence of *allergic*

** * American Academy of Otolaryngology-Head and Neck Surgery clinical guidelines

rhinitis is about 20%. (Orlandi 2016) But the actual prevalence of allergic RS is less clear, partly because even a positive IgE skin test in an ARS patient is not proof of a cause and effect relationship.

Likewise, a negative test does not eliminate a role for allergens because local nasal allergic reactions can occur without evidence of systemic IgE sensitization. It has also been suggested that there could be a synergistic relationship between allergic and infectious assault on the sinuses. (Orlandi 2016)

Exposure to environmental irritants may cause or contribute to RS. Examples include smoking, air pollution, dust, molds, and chemicals. (Orlandi 2016)

The inferior turbinates may become swollen and enlarged when mucous membranes react to allergens or other irritants, creating congestion. Exact mechanisms remain unclear.

PREDISPOSING RISK FACTORS

Risk Factors for Chronic RS

- Deviated septum and other anatomical variations
- Tooth infection
- GERD
- Vitamin D deficiency
- Aspirin intake

A number of co-factors may predispose patients to chronic RS.

Anatomical variants

A deviated septum has been implicated and may have a limited pre-disposing effect in chronic RS. The risk of getting RS appears to increase with the severity of the deviation.

There is, however, no evidence on whether or not septoplasty reduces the risk of RS (ICARS-RS[∫] *Grade C evidence*, Orlandi 2016)
Other predisposing factors may include small sinuses, nasal polyps or tumors, structural changes due to previous trauma or birth defects, "recirculation phenomenon,[*]" and conchae bullosa.[**] (Orlandi 2016)

Other factors

Tooth infection. Infection of the maxillary molars can provide a portal of entry to the adjacent sinus cavity. Dental causes of acute RS are rare and, when present, are more commonly linked to in chronic RS. (*Grade C evidence*, Orlandi 2016)

GERD. There is significant evidence linking reflux esophagitis with chronic RS. Direct causation has not been demonstrated but one possible mechanism suggested is direct injury to the sinus mucosa from gastric acid. (*Grade B evidence*, Orlandi 2016)

Vitamin D deficiency. Patients who have chronic RS along with nasal polyps, acute fungal RS, or allergic RS commonly are vitamin D deficient. There appears to be a direct relationship between the vitamin levels and both the degree of mucosal damage in the sinuses and bone disease. (*Grade C evidence,* Orlandi 2016)

Aspirin. Aspirin ingestion may act as a symptom trigger for some patients with chronic RS with polyps. (ICARS-RS *Grade D evidence*, Orlandi 2016).

[∫] International Consensus on Allergy and Rhinology recommendations on rhinosinusitis.
[*] Retrograde transport of secreted mucus back into the sinus.
[**] A concha bullosa, a normal anatomic variant seen in up to half the population, is an air-filled cavity within a nasal turbinate. If large enough, it may obstruct the sinus opening and predispose to sinusitis.

Epidemiology & Natural History

RS is one of the most common health conditions in the United States and one of the most common conditions that medical physicians see in an ambulatory care setting. (Aring 2016) Annually it affects between 12-15% of US adults and is more common than hay fever (8.9%), acute asthma (3.8%) and chronic bronchitis (4.8%). (Orlandi 2016) Because, however, sinus pain is also often referred from other sources, some authors feel that sinusitis may be an over-diagnosed condition. (Hansen 1995, Schafer 1991).
Few studies have been devoted to the natural history of sinusitis. It has been estimated that the overall rate of spontaneous clinical recovery from acute sinusitis is as high as 40-45%. (Incaudo 1998) Many cases do not require treatment.

TIMELINES

PRESENTATION	PROBABLE DIAGNOSIS
2-3 days, mild symptoms	Rhinitis
4-7 days (may go 14 days with symptoms steadily improving) , mild to moderate symptoms	Viral RS
>10 days, or a "double sickening" around day 5-7 or very severe symptoms at day 3 or 4	Bacterial RS

Acute RS may have a rapid onset and typically lasts for about 4-7 days (slightly longer than acute rhinitis), with days 2-3 the most severe. Viral infections mimicking or causing sinusitis rarely last longer than a week. (Institute for Clinical Systems 1998). However, those that do not resolve require a thorough investigation to make the proper diagnosis.

The lack of solid information about the natural history of sinusitis makes it difficult to evaluate the efficacy or cost-effectiveness of intervention.

Many environmental factors influence the course of sinusitis. Some climates are worse than others for people with chronic sinusitis. The damp weather of the northern temperate zones is usually the most problematic. Atmospheric inversions and drops in barometric pressure seem to cause sinus difficulties. Pollutants, including smoking and secondary smoke, clearly have an impact on chronic sinusitis. Some patients report that the building they work in causes sinus problems (Sick Building Syndrome). (Schafer 1991).

EVALUATION: KEY FINDINGS

RS most often follows an upper respiratory tract infection or allergic rhinitis.

Any cold or upper respiratory infection lasting longer than a few days or prolonged nasal congestion can suggest the appropriateness of a work up for sinusitis.

A clear bimodal presentation would suggest the evolution of a sinusitis: upper respiratory symptoms followed by a period of improvement, and then replaced by more severe sinus pain and discharge (AKA "*double sickening*"). Even this sequence of presentation does not assure a definitive diagnosis. During the late phase of an uncomplicated rhinitis, there may be a day or two that the secretions become thicker. This leads to a productive cough, creating the suspicion of a sinusitis even when there is no significant sinus involvement. (Maltinski 1998).

DIAGNOSIS

The diagnosis of *acute* RS (ARS) is clinical in nature, based on a combination of symptoms and signs, and does *not* require ancillary studies.

Ancillary studies can play a more critical role in diagnosing *chronic* RS (CRS). Symptoms are very sensitive to making this diagnosis, but they have low specificity, often requiring endoscopy or CT imaging for confirmation. (Orlandi 2016)

For a quick reference, see Appendix IV.

CARDINAL SIGNS AND SYMPTOMS

There is an array of symptoms associated with RS, but a working diagnosis often hinges on just a few cardinal findings.

The Cardinal Diagnostic Criteria

Sudden onset of symptoms often occurring after a short course of rhinitis (several days) and consisting of

1) **nasal discharge** (anterior or posterior)*
OR
nasal obstruction/congestion,
AND
2) **facial pain-pressure-fullness,**
OR
reduction/loss of smell.

Clinical Mnemonic: **PODS** (**P**ain or facial pressure, nasal **O**bstruction, discolored **D**ischarge, loss of **S**mell.

Historically, combinations of major and minor symptoms were used to diagnose RS, but there has been significant movement away from this approach and instead the focus is on ***purulent discharge, nasal blockage/ congestion, facial pain or pressure, and loss of sense of smell.*** (Orlandi 2016, Rosenfeld 2015).

In chronic cases, the presence of discolored nasal discharge and loss of smell, especially in combination, increase the probability of RS. (Orlandi 2016)

Purulent Drainage

The nasal discharge may appear purulent (cloudy or colored) or clear and may be

* The discharge can be anterior (nasal) or posterior (pharyngeal).

reported by the patient or observed by the provider during physical examination. There are some differences in opinion as to whether the discharge must be purulent in nature. In AAO-HNSF criteria (Rosenfeld 2015), the discharge must appear purulent. In fact, nasal obstruction without purulent nasal drainage is judged to be inconsistent with acute RS. On the other hand, in criteria set out by ICAR-RS (Orlando 2016), the presence of a purulent discharge is not absolutely necessary to make the diagnosis as long as there is at least some report or evidence of blockage or congestion.

A purulent discharge is usually yellow, brown or green in color. In allergic sinusitis, a thin watery discharge may be present.

If a discharge is present, it may be reported by the patient as a purulent rhinorrhea or as postnasal drip or discharge in the posterior pharynx. It may also be directly observed by the provider during a rhinoscopic exam or assessment of the oropharynx.

When the discharge is primarily nasal, the frontal or maxillary sinuses can be suspected; pharyngeal discharge implicates the ethmoid or, far less commonly, the sphenoid sinuses. (Incaudo 1998).

Nasal Obstruction/Congestion

Even if a discharge does not appear to be present or, if present, is not purulent, the patient with RS may complain of nasal obstruction. This may be variously reported as congestion, blockage, or stuffiness, or may be diagnosed by physical examination. The differential diagnosis includes rhinitis, RS, drug-induced nasal obstruction and mechanical/structural abnormalities such as polyps (Baynard 2016). Loss of the sense of smell may suggest the severity of the obstruction.

Nasal congestion and obstruction with production of thickened secretions can be the primary complaint in *chronic* sinusitis.

Clinical Tip: Nasal obstruction is so common in CRS, that its absence may increase the suspicion of a competing diagnosis. (Orlandi 2016)

Facial Pain

Craniofacial pain, stabbing or achy, is often the dominant symptom in acute RS but less commonly the primary complaint in chronic RS. (Ferguson 1995). Nonetheless, according to AAO-HNSF (Rosenfeld 2015) criteria, facial pain *without purulent nasal drainage* is not consistent with ARS.

In chronic presentations, rather than frank pain, a sense of “pressure” or “fullness” over a sinus is more common.

Clinical Tip: In chronic RS, the presence of pain (rather than just pressure) should trigger a careful assessment to rule out competing diagnosis. (Orlandi 2016)

When pain is part of a RS presentation, the pain location generally correlates poorly with the specific sinus involved. (Rosenfeld 2015) Sometimes a patient will present with a localized or diffuse *headache* or with dental pain (including pain with mastication) which can complicate the differential diagnosis.

In general, sinus headaches and facial pain may get worse in the late morning, improve in the afternoon as the patient is upright more, and may be aggravated by bending forward. There is some evidence that lying down may actually *reduce* the pain in maxillary sinusitis while aggravating the ethmoid sinuses (Hadley 1997).

Loss or Reduction in Sense of Smell

In the ICAR:RS (Orlandi 2016) criteria for RS, a complete loss of sense of smell (anosmia) or reduction in sense of smell (hyponosmia) is an important symptom which can substitute for facial pain in making the diagnosis. In the AAO-HNSF (Rosenfeld 2015) criteria, however, loss of sense of smell was not judged to be one of the pivotal symptoms.

Combination of signs. In one study in a primary care setting, a combination of the following signs and symptoms was helpful: maxillary toothache, poor response to nasal decongestants, abnormal transillumination, and colored nasal discharge by history or by examination. When none of these findings were present, sinusitis could be ruled out (LR +0.1), and when four or more were present, the LR was +6.4. (Williams 1991)

Additional Signs and Symptoms (Rosenfeld 2015, Orlandi 2016)

It is important to recognize the broad array of symptoms that can be part of an RS presentation. But because they are non-specific (i.e., present in many other conditions) or may be entirely absent, they do not play as large a diagnostic role as the cardinal signs and symptoms described above. (Orlandi 2016) Local ENT symptoms may be present such as sore throat, hoarseness, foul breath (*fetor oris*), and nasal speech. (Ann 2016) Some of these symptoms may be due to inflammation or post nasal drip and drainage into the pharynx.

Still other related symptoms include fullness in the ears and maxillary toothache. Periorbital edema (more common in children) may be observed.

Drainage may also provoke symptoms mimicking lung conditions such as wheezing or coughing. Cough is more common in the pediatric presentation and can be confused with asthma. When a cough is present, it may be worse at night. (Stafford 1990)

General Constitutional Signs and Symptoms

More general constitutional symptoms may be present as well, including fever (more common in ARS and in children), fatigue, malaise, and irritability (more common in children).

Chronic rhinosinusitis in particular may be accompanied by severe fatigue, poor sleep quality, depression, and lower quality of life scores. (Orlandi 2016)

A meta-analysis reported not only an increase prevalence of fatigue and “bodily pain” in patients with CRS, but also reported significant improvement in both symptoms after sinus surgery with an effect size of 0.77 (95% CI 0.59-0.95) for fatigue. (Orlandi 2016)

Bacterial vs Viral Infection

It is useful to try to differentiate bacterial from viral RS because, whereas antibiotic therapy is a reasonable option for a bacterial cause, it is inappropriate for viruses. (Rosenfeld 2015) Current reviews continue to caution against the over-prescription of antibiotics in the treatment of sinusitis. In fact, the 2015 AAO-HNS guidelines extended the recommendation of watchful waiting (without antibiotics) to all patients with uncomplicated acute RS regardless of severity (as opposed to just mild cases). (Rosenfeld 2015) The reasons for this caution is that RS is usually self-limiting, antibiotics offer only a minimal benefit for most patients and have a number of adverse

effects, and there has been a dramatic increase in the development of resistant strains of bacterial infection. (Rosenfeld 2015, Orlandi 2016)

Identifying which cases are bacterial vs viral can be particularly challenging in a portal of entry/primary care setting without the aid endoscopy or imaging. Nonetheless, for practical reasons, assessment is usually initially done without ancillary studies.

Criteria for Diagnosis of Bacterial RS

The diagnostic key factor is how the RS *progresses*.

The patient has symptoms or signs of ARS (purulent nasal drainage accompanied by nasal obstruction, facial pain-pressure-fullness, or both)

a) which persist *without evidence of improvement* for at least 10 days beyond the onset of upper respiratory symptoms,

OR

(b) worsen within 10 days *after an initial improvement (double worsening).*

(AAO-HNSF *strong recommendation*, Rosenfeld 2015)

Differentiation Based on Illness Pattern

A presumptive diagnosis of bacterial RS is primarily based on illness pattern and duration. (Rosenfeld 2015)

Symptoms such as a colored nasal/purulent discharge, fever, or facial pain can occur due to either bacterial or viral infection and so these symptoms in isolation cannot be used to make the differential diagnosis. (Orlandi 2016)

In the first 3 to 4 days of illness, viral and early-onset bacterial RS and even simple rhinitis may all present very similarly.

Exceptions to the time-based criteria above are patients who display extra-sinus indications of infection or unusually *severe* signs and symptoms in the first 3-4 days of their illness. (Aring 2016) The Infectious Disease Society of America (IDSA, *strong recommendation*) suggests that high fever ($\geq$ 102) in combination with purulent discharge or facial pain lasting $\geq$ 3-4 consecutive days at the beginning of the illness may also indicate a bacterial RS.

Viral pattern of RS

Viral RS symptoms generally peak days 2 to 3 after onset and then begin to improve. In these first few days, viral RS cannot be easily differentiated from bacterial (Aring 2016). Symptoms may persist 14 days or longer, but a key differentiating feature is that they are *mild and continue to decrease in severity*.

Bacterial pattern of RS

Duration is a key factor distinguishing acute bacterial RS from a common cold and from viral RS. Significant symptoms persisting beyond 10 days indicate a possible bacterial infection. Knowing the *progression* is also helpful. A bacterial infection is suspected if the patient's symptoms initially improve and then take a turn for the worse. This second round of sickening ("double sickening") often occurs after about 5 days. (Orlandi 2016)

The AAO-HNS criteria direct that acute bacterial RS should be diagnosed when "symptoms or signs of acute rhinosinusitis persist ***without evidence of improvement*** for at least 10 days beyond the onset of upper respiratory symptoms." (Rosenfeld 2015)

This pattern leads to a pragmatic diagnosis based on probability (e.g., there is about a 60% chance of confirming a bacterial infection by sinus aspiration if a patient has RS

symptoms for at least 10 days). Additionally, this is longer than the usual natural time course for a rhinovirus infection. (Orlandi 2016)

Differentiation Based on Signs and Symptoms

The clinical picture of an acute bacterial sinus infection usually includes purulent discharge, localized unilateral pain, and, as stated above, a period of worsening after an initial milder phase of illness which then extends beyond 10 days. (Orlandi 2016) The absence of green discharge and mild symptoms that do not affected sleep is more consistent with a viral presentation. (Shaikh 2013). However, differentiation cannot be reliably made on signs and symptoms; the timing and duration of the illness is thought to be the key differentiating characteristic. (Rosenfeld 2015)

Three Cardinal Symptoms of Bacterial RS*

1. Purulent (infected, colored, or oozing) nasal drainage.
2. Patient complaints of nasal obstruction
3. Facial or dental pain

Purulent drainage

A discharge may be present in viral, allergic or bacterial RS. In isolation a colored nasal discharge has a +LR of only 1.5 and –L% of 0.5 for a sinus infection. (Aring 2016) A *purulent* discharge can be consistent with the presence of bacteria on antral aspiration, and there is often radiographic evidence of a bacterial infection. This discharge may be observed during a rhinoscopic exam or when examining the throat. It also may simply be subjectively reported by the patient when they blow their nose or is experienced as postnasal drip or as a purulent discharge into the posterior pharynx. (Rosenfeld 2015)

Note: The absence of a discharge does not completely rule out a bacterial infection and its presence alone is insufficient to make the diagnosis.

Patient complaints of nasal obstruction

See comments on p. 9.

Facial or dental pain

The pain is usually unilateral, sometimes localized over the teeth and maxilla and can be severe (7 to 10 cm on a VAS). In one study in an ED (N=155), the combination of predominate unilateral pain and unilateral purulent discharge had a +LR of 4.5) (Berg 1988)

Other Clues for a Bacterial RS

- The probability of the sinusitis being bacterial is also increased if the symptoms occur after flying, diving, swimming, nasal packing, nasal intubation, or upper molar dental work. (Incaudo 1998)

- Fever (e.g., >38°C, 100.4°F), although present in many patients with bacterial RS, can also be present in a viral RS, especially during the first few days of illness. Fever has a sensitivity and specificity of only about 50% for acute bacterial RS. A systematic review concluded that there was a lack of evidence to support fever as a key differentiating finding to distinguish a bacterial from a viral sinus infection. (Hauer 2014, Rosenfeld 2015)

* There is not high level evidence that symptom duration and purulent discharge can reliably DDX bacterial vs viral RS; the AAO-HNS singled out these key symptoms and duration based on "first principles, subsidiary evidence and expert consensus." (Rosenfeld 2015)

- A somewhat different set of criteria for making a bacterial RS diagnosis are presented by Fokkens et al.

Fokkens Criteria

The patient must have the usual symptoms of RS and also meet at least 2 of the following criteria:

1) Symptoms last longer than 7 to 10 days or worsens again after initial improvement;
2) symptoms, particularly pain over teeth and maxilla, are severe (7 to 10 cm VAS);
3) purulent secretions on rhinoscopy;
4) increased ESR or elevated CRP;
5) fever >38°C; 100.4°F

Rosenfeld et al. disagree with parts of Fokkens criteria, reporting that there is no data to support symptom severity or purulence as key differentiators of bacterial vs viral ARS. Instead, they recommend relying principally on timing. (Orlandi 2016)

Infectious Spread

Screen for signs of infectious spread into other structures of the face or head. Complications are generally orbital, osseous or intracranial. Orbital complications are the most common. The complication rate in the United States has been reported to range from 2.7-4.3 per million, most commonly occurring in children with acute RS and adults with chronic RS. Complications generally signal the need for referral. Indicators include the following (Orlandi 2016):

- Orbital pain
- High fever (102°)
- Painful edema (possible preseptal cellulitis)
- Limited and painful ocular movement
- Visible swelling of the conjunctiva
- Exophthalmos (post-septal inflammation)
- Alerted mental status with high fever
- Frontal or retro-orbital migraine

Sinus Allergies vs Infections

Allergic rhinitis or allergic rhino*sinusitis* (RS) can have symptoms similar to each other and to acute bacterial or viral RS. Allergic rhinitis has an estimated prevalence of about 20%.

Additional clues of an allergic component to the illness include the following:

- A thin watery discharge, (lasting more than seven days) especially if associated with intermittent sneezing and a runny itchy nose or itchy watery eyes suggests a possible allergic rhinitis or rhinosinusitis.
- Patients usually have a history of allergic response (e.g., may have a seasonal trigger or symptoms may parallel pollen counts). (Maltinski 1998).
- Patients may have a consistently positive skin-prick test. (Orlandi 2016)
- Usually there is an absence of fever, chills, myalgia, lymphadenopathy, productive cough, and sore throat. (Maltinski 1998).
- The presence of mucopurulent discharge, pain, and loss of sense of smell support infectious RS more than allergic RS. (Orlandi 2016)
- Allergic rhinitis in conjunction with acute RS increases the likelihood of orbital complications (Orlandi 2016)

Clinical Tip: Patients with chronic or recurrent RS should be assessed for an allergic component.

DDX: Sinus Pain/Symptoms

The differential diagnosis for symptoms suggestive of acute RS includes *viral and allergic rhinitis*, *dental disease*, and various *headaches* and *facial pain syndromes*. An accurate working diagnosis can usually be made based on the patient's history and physical examination alone. Ancillary tests may sometimes be helpful especially in cases where the symptoms are particularly persistent or severe or when the diagnosis is in doubt. (Orlandi 2016)

Acute Viral Rhinitis

Since *acute rhinitis*, usually as part of an URI, often precedes true sinus involvement, it can be difficult to know if the patient is suffering from rhinitis alone or is somewhere on a continuum of a developing sinusitis. Symptoms include sneezing, rhinorrhea, nasal congestion, and nasal itching and can also be due to allergies (e.g., pollen, dust mites, molds, cockroaches, pet dander), non-allergenic irritants (e.g., cigarette smoke, perfume, car exhaust), medications or hormonal change. (Baynard 2016)

In addition to sinus pain, acute rhinitis may be accompanied by aches and pains all over the body, malaise, itchy and watery eyes, and profuse nasal discharge. But it is usually self-limiting and the patient fully recovers within a few days. (Friedman 1994)

Primary Headaches

RS headache presentation may overlap with some of the common primary headache syndromes such as tension-type headache, cervicogenic headache, myofascial headache (which is sometimes classified as a kind of tension-type headache), migraine, paroxysmal hemicrania, cluster headache, atypical fascial pain and midfacial segment pain.* (*See CSPE Cervicogenic Headache care pathway*.) Migraine and tension-type headache patients sometimes also have rhinorrhea and nasal congestion, complicating the diagnostic process. (Orlandi 2016) Glaucoma and TMD may also occasionally enter into the differential.

Headaches attributed to sinusitis are frequently misdiagnosed. In one large prospective study (N=2,991) 80% of patients with either physician reported or self-reported "sinus headache" who had no evidence of infection or prior history of migraine ended being diagnosed with a first time migraine. (Schreiber 2004)

Usually, but not always, the pattern of chronology and timing in addition to the presence of a purulent discharge are sufficient to separate RS from these other headaches.

Ancillary Studies

Neither nasal endoscopy, radiographs, blood work, nor any other ancillary study is required to make the initial diagnosis of *uncomplicated acute* RS. (Orlandi 2016)

CT scan and/or endoscopy are the most common tests of choice to increase the accuracy of the diagnosis in the case of chronic or recurrent RS. (AAO-HNSF *Strong Recommendation,* Rosenfeld 2015, Orlandi 2016). Additional tests can also be helpful in certain circumstances.

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* *Midfacial segment pain* is a type of facial neuralgia described as a feeling of symmetrical pain or more commonly "pressure," bilaterally across the nose, the eyes, or cheeks. Some patients report a sensation that their nose is blocked even though there is no actual airway obstruction. (Jones 2004)

Chronic cases may be treated for 2 to 3 months (based on the conservative management found in this care pathway). Treatment failure at this time should result in a referral for CT or endoscopy without first performing plain film radiography. CT is a more sensitive test than endoscopy, although endoscopy has the advantage of no radiation exposure. (Orlandi 2016).

Test Menu

Endoscopy	Bacterial culture
CT	ESR/CRP
MRI	CBC
Radiographs	Nasal secretion tests
	Allergy testing

Nasal Endoscopy

"Nasal endoscopy is recommended in conjunction with a history and physical examination for a patient being evaluated for chronic RS." (ICAR:RS, *grade B evidence*, Orlandi 2016)

After a decongestant and anesthetic is applied to the nasal passage, an endoscope is guided through the nostril to the opening of each sinus without entering the sinus. The provider can score pathological changes based on the extent and location of mucosal inflammation, the presence and character of any discharge, presence of scars or crusts, and the position of the middle turbinate. (Orlando 2016)

In the case of chronic RS, the addition of endoscopic evaluation has been reported to improve the post-test probability from about 39% when relying *only* on clinical signs and symptoms to about 66%. Compared to CT, however, it has poorer sensitivity and is more likely to miss the diagnosis. (Orlandi 2016)

Imaging

"Clinicians should not obtain radiographic imaging for patients who meet diagnostic criteria for acute rhinosinusitis unless a complication or alternative diagnosis is suspected." (AAO-HNS recommendation Rosenfeld 2015)

Imaging of the sinuses is appropriate for the patient who does not respond to conservative or antibiotic therapy or for the patient who has an unusual presentation of sinusitis.

Cases that require imaging would generally result in referral to an allopathic physician or specialist.

INDICATIONS FOR RADIOGRAPHS

Since the diagnostic value of a positive clinical examination and of a radiograph is comparable for uncomplicated RS, ***plain film radiographs are not recommended***. (Ebell 2016)

INDICATIONS FOR CT

CT without contrast, not plain radiography or MRI, is the modality of choice to confirm chronic RS. (Orlandi 2016) Mucosa thickening ≥ 5mm is consistent with sinus infection. (Aring 2016)

The American College of Radiology (ACR) appropriateness criteria (2012) suggest that immunodeficient patients with acute or subacute RS are also candidates for sinus CT because of the risk for invasive fungal infection (rating 7/9, "usually appropriate"). Additional recommendations include CT of the paranasal sinuses and orbits in patients with ocular or neurologic deficits (rating 9/9 appropriateness) and paranasal sinus CT for patients with unilateral nasal polyps (rating 9/9 appropriateness).

There is some debate as to the timing of when CTs should be ordered in the case of chronic RS. One approach is to order CT initially in cases of suspected chronic RS to confirm the diagnosis before placing patients on extended symptom-based regimens of antibiotics. Another approach is to limit the use of CT to patients 1) who have not responded to maximum medical therapy, 2) to plan for sinus surgery, or 3) to clarify the diagnosis in patients with symptoms of chronic RS, but who lack any objective evidence from anterior rhinoscopy or endoscopy. (Orlandi 2016)

Note: Patients with initial red flags for complications, however, should be referred immediately for CT, without initial radiographs.

Sinus screening CTs utilize the coronal plane and produce several images through the paranasal sinuses. This series of scans is relatively inexpensive and demonstrates the pertinent drainage pathways of the ostiomeatal complex. If more serious pathology is discovered, then a more thorough complete sinus CT is performed incorporating both coronal and axial images. This study is approximately double the cost of the screening exam.

Although sinus CT is a primary tool for diagnosing chronic or complicated RS, studies suggest that CT findings do not necessarily predict the impact of the condition on the patient nor are they consistent with scores from quality of life questionnaires. (Orlandi 2017)

INDICATION FOR MRI

Magnetic Resonance Imaging (MRI) usually is reserved for differential diagnoses of more serious conditions already identified by CT, such as intracranial and intraorbital complications of sinusitis, neoplasms, and fungal disease. (ACR 2012 rating 9/9 appropriates).

The findings in such cases are correlated with the CT findings to render a complete diagnosis. Because the distinction between aerated sinus and completely obstructed sinus may be clinically important, the opportunity for error with MRI is too great to warrant its sole use. Furthermore, underestimation of the presence of chronic secretions and the severity of sinus disease may also occur if MRI is the only imaging examination used.

ULTRASOUND

In one systematic review, ultrasound was comparable to and plain film radiographs for diagnosing RS (Ebrell 2016). On the other hand, in an earlier Engels 2000 study, ultrasound was less predictive than either radiographs or symptoms. Other sources suggest that at this time the evidence is inconclusive regarding the overall usefulness of ultrasound for diagnosis (Dynamed 1/17). ACR Appropriateness Criteria do not address the use of ultrasound for diagnostic imaging of sinonasal disease.

Bacterial Culture

Although acute bacterial sinusitis can be proven only by sinus aspiration and cultures of the aspirate, the patient history and physical will usually provide enough information to make a presumptive diagnosis. Neither cultures of sinus aspirations nor nasopharyngeal cultures are required to make a bacterial RS diagnosis. (Orlandi 2016)

Nasopharyngeal cultures are not recommended. The specimen can become contaminated with other pathogens from the nasopharynx and does not accurately reflect the sinus biome. Much more accurate is to

refer to obtain a sample from the middle meatus guided by endoscopy, but this is not commonly done for routine, uncomplicated RS. (Rosenfeld 2015) Culturing a specimen from the sinus can help direct antibiotic therapy in difficult cases.

In rare cases it may be necessary to refer the patient to an otolaryngologist for sinus puncture. This would only be recommended in cases where antibiotic therapy was used and the patient did not respond and/or after conservative therapies were thoroughly exhausted.

Basic Blood Tests

Blood tests are not required to make a diagnosis of acute RS, but may occasionally be helpful in differentiating more difficult cases. Aggregate Grade of Evidence: C (Level) (Orlandi 2016)

A 2016 systematic review reported that CRP and /or ESR have some limited value in supporting a diagnosis of acute RS. The LR+ for an ESR >30 has a reported +LR of 4.1 and if >40 a +LR of 7.40. A positive CRP had a +LR of 2.9. (Ebell 2016) The higher the CRP level, the more predictive the finding. Another report indicated that 79% of patients with a CRP above 49mg/L had maxillary sinusitis compared to only 34% who had an elevated CRP but below 11 mg/L. (Aring 2016)

A complete blood count (CBC) is considered only when systemic involvement is suspected.

Nasal secretions

In equivocal cases, a nasal swab can be done and assessed for cytology. Leucocytes suggest a bacterial or viral infection while the presence of eosinophils suggests allergic rhinitis.

A novel approach, doing a dipstick of test on nasal sections, has shown some promise. A positive test for leucocyte esterase had an +LR 18.4 and –LR 0.17. This approach has not been validated in other studies (Ebell 2016).

Allergy Testing

Tests for food and environmental allergens (e.g., ELISA IgG4, RAST IgE) may be helpful if allergy is the suspected cause of the sinus pain, especially in chronic or recurrent cases. (ICAR:RS, Orlandi 2016; AAO-HNSF, Rosenfeld 2015)

EVALUATION STRATEGY

The assessment strategy has 6 major objectives:

1. Differentiate RS vs rhinitis vs other causes of the symptoms (e.g., referred pain from another source). (See p 14.)
2. If the patient has RS, differentiate acute, chronic, or recurrent. (If chronic, record as chronic with or without polyps). (See pp 4-5.)
3. If the patient has RS, differentiate viral vs bacterial (or allergic/irritant). (See pp 11-13.)
4. Screen for severe complications resulting from infectious spread beyond the sinuses and refer as needed. (See pp 13.)
5. Establish a baseline to monitor improvement (e.g., symptom severity, frequency and duration and/or a questionnaire such as the SNOT-20) especially for chronic or recurrent RS. (See Appendix 1).
6. Assess patients who have chronic rhinosinusitis or recurrent acute rhino-sinusitis for co-morbidities such as *asthma*, *cystic fibrosis*, *ciliary dyskinesia*[*] and any *immunocompromised state*.[**] (AAO-HNS recommendation, Rosenfeld 2015)

HISTORY

The following are some of the critical factors to ascertain during the history process.

Pain location

Although pain location does not dependably predict which sinuses are involved, it is useful to see the variety of locations that can be associated with various sinuses. (Williams 1991).

- Maxillary sinusitis: pain in the maxillary area, toothache and frontal headache.
- Frontal sinusitis: pain over the sinuses or frontal headache, severe pain to the temple or sometimes to the occiput.
- Ethmoid sinusitis: pain behind and between the eyes, and a frontal headache that is often described as “splitting.”
- Isolated sphenoid sinusitis (rare). Pain is less well localized and is referred to the frontal or occipital area.
- Diffuse pain may be present throughout the head and neck, including the vertex of the skull and occiput, mimicking a mild meningitis. (Haley 1997).

Predisposing Factors

- Identify the immediate circumstances of the current episode. These would include recent upper respiratory infection (include the length of time of the symptoms and whether there is a bimodal pattern), dental procedures, exposure to smoke,

[*] Primary ciliary dyskinesia is a rare genetic disorder that associated with dysfunction of cilia lining the respiratory tract, sinuses, Eustachian tube and middle ear.

[**] “Based on one systematic review and multiple observational studies; with a preponderance of benefit over harm.” (Rosenfeld 2015)

physical or chemical irritants, household molds, and forceful nose blowing.

- Factors that increase the risk for infection: frequent participation in swimming and diving, immuno-suppressive therapy, chronic diseases such as diabetes or renal disease.

- A history of recurrent allergic rhinitis or uncontrolled allergies.

- Predisposing factors such as nasal polyps previous nose/facial trauma or surgery to the nose or birth defects. (Orlandi 2016)

- In the case of chronic symptoms, ask about a deviated septum, GERD, and aspirin intake. (Orlandi 2016)

Modifying factors

- Ask if leaning forward or lying down makes the pain worse.

- Find out if the patient has taken and responded to decongestants (failure can support an RS diagnosis).

Cardinal symptoms

- Find out if the patient is experiencing a sense of nasal congestion, stuffiness or blockage.

- Find out if there has been a change in the ability to smell.

Associated symptoms

- Find out if there is a discharge and, if present, its color.

- Find out about any associated symptoms such as fever, cough, sore throat, stuffy ear, malaise, fatigue, etc.

Medications

- Find out about the use of drugs that can cause mucosal edema (e.g., hypertensives, anti-osteoporosis drugs, hormone replacement sprays) (Orlandi 2016)

Additional Key Information

- Carefully document the number, duration and severity of episodes to use as outcome measures.
- Especially in cases of chronic or recurrent RS, consider getting a baseline measurement using the Sino-Nasal Outcome Test 20 (SNOT-20). (See Appendix 1.) It is a widely used, self-administered, quality-of-life questionnaire for patients with RS. It is composed of 20 multiple-choice items, taking about 10 minutes to complete. (Pynnonen 2009)

Physical Evaluation

Key Aspects of PE

- Observe
- Take temperature (& other vitals)
- Percuss/transilluminate sinuses
- Rhinoscopic exam
- Examine pharynx
- Tap maxillary teeth
- Palpate lymph nodes
- Examine cervical muscles and joints
- Screen TMJ
- Perform otoscopic exam (in children)
- Lung auscultation (if indicated)
- Cranial nerves II to VI (if indicated)

According to Rosenfeld 2015, “The initial diagnostic evaluation for ARS should include measurement of vital signs (temperature, pulse, blood pressure, respiratory rate) and a physical examination of the head and neck.”

The provider should also look for signs of extra-sinus involvement (orbital or facial cellulitis, orbital protrusion, abnormalities of eye movement, neck stiffness).

Observe

The provider should pay special attention to the following: altered (hyponasal) speech indicating nasal obstruction, facial erythema due to congestion of the capillaries or edema over the cheek bone or around the periorbital area. (Rosenfeld 2015)

Take temperature

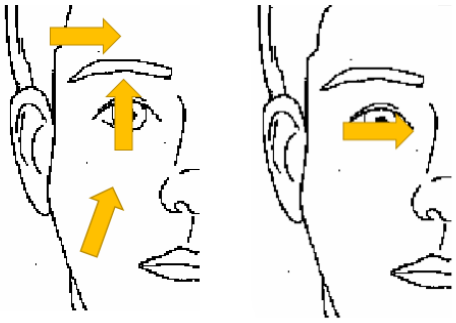
The degree of fever may be used as an indicator for referral. Fevers over 102°F indicate an acute infection that may warrant referral for consideration of antibiotic therapy. High fevers in conjunction with other symptoms can also suggest spread into the orbit or intracranial structures. Patients with low-grade fever or no fever may best be treated with other conservative therapies and should be watched closely and referred if they are not responding to care.

Percuss/transilluminate sinuses

There are differences of opinion regarding the value of the transillumination and percussing the sinuses. Some authors recommend them; others feel that they are not useful. (Hadley 1997, Incaudo 1998).*

Percussion/palpation. Palpable cheek tenderness, especially unilateral, may be present in acute sinusitis (Rosenfeld 2015) Percuss the sinuses for tenderness (48-50% sensitivity, 62-65% specificity). (Williams 1991) The pain may be more severe in acute than in chronic RS. Palpation and percussion can be performed in the following locations (optional):

- Medial angle of the eye (ethmoid sinus)
- Roof of the orbit (beneath the frontal ridge) (frontal sinus)
- The bony prominence at the cheek (maxillary)
- Anterior frontal wall (frontal sinus)
- The palate (intraoral) (maxillary sinus)



PALPATION/PERCUSSION

Transillumination. Transillumination may help detect consolidation and confirm a suspected case of sinusitis, especially in frontal sinusitis. (Williams 1997).

Note that paranasal transillumination is the most studied but least agreed upon physical examination maneuver. It is no longer as commonly done as it once was. Since first being described in 1899 by Voltolini, its value as a diagnostic test has been hotly debated.

Transillumination has been described as "highly predictive of disease" with a 90% sensitivity for frontal sinuses (Williams 1991). Another author has described transillumination as an act of "methodological limitation." Although two of the better studies had differing results, both studies suggest that transillumination may be more useful for diagnosing sinusitis when performed by otolaryngologists (Williams 1991).

* The consensus of the CSPE working group was that transillumination is rarely necessary.

In another study of 113 patients with nasal symptoms and abnormal sinus radiographs, transillumination was highly useful for those patients examined by an otolaryngologist, when the sinus was either completely opaque (LR=∞) or completely normal (LR=+0.04). The procedure was less useful, however, when the finding was dull transillumination (LR=+0.41).* In contrast to the previous study, opaque transillumination ruled in sinusitis and normal transillumination ruled it out. (Williams 1991).

Rhinoscopic Exam

"Anterior rhinoscopy is recommended and may reveal evidence of inflammation, mucosal edema, and discharge." (Orlandi 2016). Although not as accurate as nasal endoscopy, anterior rhinoscopic evaluation allows the provider to look for the presence of irregularly bright red mucosa, edema, crusts, purulence and/or polyps, septal deviation or the effects of trauma/surgery to the nose. One significant limitation is that, unlike endoscopy, often it is difficult to visualize tissue beyond the inferior turbinate. (Orlandi 2016)

If polyps are seen and the patient is under the age of 16, arrange for a sweat test to rule out cystic fibrosis. If the patient is an adult, consider referral for an ENT evaluation. Nasal tumors are more common in men ≥ 60 years. Malignant nasal tumors are rare (3% of all head and neck cancers) but can present as chronic RS including symptoms such as complaints of unilateral obstruction, lacrimation, and epistaxis. (Baynard 2016)

Chronic RS with polyps can be associated with poorer response to standard treatment and increase chance of recurrence.

* The higher the positive Likelihood Ratio (LR), the greater the power at ruling in a condition, and the lower the negative LR, the greater the power at ruling it out.

Clinical Tip: Tumors may need to be ruled out when a patient appears to have unilateral polyps. (Orlandi 2016)

If there are crusty patches on the nasal mucosa that do not bleed, are painless when picked away, and leave a pale white lining at the site, fungal infection should be highly suspected (Williams 1991).

If the patient has nasal discharge that is watery without pus, suspect allergic or vasomotor rhinitis. If discharge is yellow or greenish in color, suspect chronic bacterial sinusitis—although the exact color itself is not of particular diagnostic importance nor does it necessarily mean that the patient has bacterial sinusitis. A nasal culture may be indicated, and/or the patient may be referred for antibiotic therapy, especially if symptoms include a fever of 102°F or higher. If discharge is cloudy but colorless, suspect nonbacterial or viral sinusitis.

If there is drainage of pus from ostia of the nasal meatus, suspect acute sinusitis. This suspicion is strengthened if the drainage is unilateral or if the patient has facial or head pain that increases when lying down, bending, or straining (as in Valsalva's maneuver) (Williams 1991).

If there is no discharge, but the patient is experiencing chronic congestion, the patient may have an upper respiratory infection.

If there is no discharge and no congestion, other causes of sinus pain should be more closely investigated.

Obstruction Due to Foreign Object. Simple rhinoscopic examination of the nasal meatuses along with a thorough history should reveal this as a cause of nasal pain. Remove obstruction or refer for removal.

Examine the pharynx

Examine the pharynx with a penlight. Note any signs of pharyngitis or purulent discharge tracking down the posterior pharynx from the sinuses. This would be one of the key findings for RS as well as suggestive of bacterial RS.

Tap maxillary teeth

In cases of acute rhinosinusitis, tapping the teeth with a tongue depressor may cause pain. (Rosenfeld 2015). If the pain is severe, periodontal abscess should be suspected. If so, refer to a dentist.

The presence of maxillary toothache and/or sensitivity to tapping on the teeth during the physical exam implicates the maxillary sinus. This finding is uncommon (11% sensitivity) but is considered to be very specific (93% specificity) (Williams 1991). A dental infection may either refer pain mimicking a case of sinusitis or, more likely, may be a direct cause of bacterial sinusitis. In either case, this is relatively rare and more common in chronic RS. (Orlandi 2016)

Palpate lymph nodes

Whenever an infection of the head or neck is suspected, head and neck lymph nodes should be routinely palpated.

Clinical alert: It is important to record which lymph nodes are enlarged, any tenderness, whether they are moveable, feel encapsulated and *most importantly the size*.

Examine head & neck

Soft Tissue and Joint Lesions

Trigger Points. Simmons and Travell (1999) suggest that sinusitis may lead to and perpetuate myofascial trigger points (MFTPs) in the SCM. In the absence of evidence of sinusitis, examine the muscles of the head and neck for trigger points that may aggravate or reproduce the referred sinus pain. Simmons and Travell report that trigger points in temporalis and SCM can mimic frontal sinus pain, orbicularis oculi and zygomaticus major the ethmoid sinus, and the SCM, masseter, medial pterygoid, and platysma the maxillary sinus. Treat MFTPs as needed.

Cervical Spine. Reduced active range of motion of the neck could be associated with extra-spinal spread of an infection. Palpation of the cervical spine should be done to determine the presence of any joint dysfunctions that may be contributing to the sinus pain or may be the result of a viscerosomatic reflex (Pintal 1989).

Screen TMJ

TMD. In the absence of evidence of sinusitis, consider evaluating the temporomandibular joint (TMJ). Temporomandibular disorder (TMD) may mimic sinus pain. (Simmons 1999). If this is the case, a functional examination of the joint should reveal dysfunction and may recreate or aggravate the symptoms. Evaluation should at a minimum include observing AROM of the jaw and palpating the TMJ and the master and temporal muscles. Note that trigger points in the lateral

pterygoids may mimic sinus pain. (Simmons 1999)

Perform otoscopic exam (in children)

Generally, an otoscopic examination is not necessary in adults unless the patient's presentation includes ear stuffiness or pain. In children, however, it should be done routinely since otitis media can present in many non-specific ways.

Lung auscultation (if indicated)

If cough is part of the presentation, lung auscultation may be useful to investigate the possibility of asthma.

Cranial nerves II to V (if indicated)

The practitioner may choose to test these cranial nerves. Neurological deficits or pain with eye movement suggests a serious complication of sinusitis and warrants immediate referral for further assessment.

Special Considerations: Pediatrics

RS presents similarly in children and adults (e.g., headache, nasal obstruction, postnasal drip/rhinorrhea and cough), with a few key differences. (Orlandi 2016)

- Cough may predominate rather than loss of sense of smell. (Orlandi 2016)
- Symptoms may be more insidious in children (Williams 1991). History may not be as reliable in children as in adults in formulating diagnostic conclusions (Williams 1991).
- Children who present with fever, headache, and facial pain may already be suffering from complications (Incaudo 1998). Consider referring these children for further evaluation.
- Perform an otoscopic examination. Tympanic membrane changes (sensitivity 68%) are the most common physical examination finding associated with RS in children (deBock 1994.)
- A fever of 102°F or higher suggests the need for referral for further evaluation (deBock 1994).
- Transillumination may be less reliable in children than in adults (Williams 1991).
- Periorbital edema and irritability are more common in children.

Red Flags: Poorer Prognosis for Conservative Care

- Fever of 102°F and/or chills may indicate an extension of the bacterial infection beyond the sinuses and would warrant further investigation and/or referral.
- Yellow, brown or green discharge, positive culture, or positive ESR/CRP may indicate bacterial infection and may warrant referral for possible antibiotic therapy if the patient fails to respond to conservative care after a reasonable therapeutic trial. Again, because many cases of rhino-sinusitis do not respond well to antibiotic therapy, conservative care should not be abandoned too early. (Kaliner 1997)
- Stiff neck and/or disorientation are signs of extension of infection to the central nervous system. Immediate referral is indicated. (Smith 1991).

- Changes in visual acuity or deficits in cranial nerve III (such as abnormal extraocular motion, protrusion of the eye), IV, or V could suggest an infection of the sphenoid. Although rare, this would constitute a medical emergency (Institute for Clinical Systems 1998).

Other signs of complications resulting in immediate referral for antibiotic therapy include orbital pain, periorbital swelling/ erythema, or facial swelling/erythema (Institute for Clinical Systems 1998).

MANAGEMENT STRATEGY

Acute and chronic sinusitis may benefit from a therapeutic trial of conservative, non-antibiotic intervention. Recent studies have shown that treatment of sinusitis with antibiotics is not as effective as previously thought. (Rosenfeld 2015, Orlandi 2016) In addition, over prescribing of antibiotics carries with it the threat of increased bacterial resistance.

Referral for antibiotics should be reserved for those cases when systemic involvement is suspected or when the patient fails to respond to conservative care in a reasonable period of time. Severity of the symptoms in itself does not indicate the need for antibiotics (Rosenfeld 2015). Nonetheless, during the PARQ conference, the patient should be thoroughly informed of the procedures, alternatives, risks and benefits of conservative care as well as those of a standard medical approach (see Appendix II: PARQ Conference Considerations).

STRATEGY BASED ON PATIENT PROFILE

Approach to Rhinitis

Presentation: The patient has symptoms of recent onset of rhinitis/cold, congestion, even a headache/sinus "pressure" lasting several days.

Strategy: Offer advice and reassure the patient that the condition is benign and usually self-limiting. In the first week or so (from the time of onset), treat like a cold (e.g., rest, fluids, adjust, lymphatic massage, etc.).

For patients with mild to moderate symptoms, intranasal corticosteroids are effective for both allergic and non-allergic rhinitis and saline irrigation can be beneficial. If these interventions are insufficient for symptom relief, a second generation antihistamine (e.g., loratadine, cetirizine, fexofenadine) is an option**.** Note that the older generation antihistamines can cause unwanted sedation, impaired cognitive function and agitation in children. If allergic rhinitis is suspected, attempt to identify and, if possible, eliminate allergens. If the rhinitis is secondary to a drug that the patient is taking, then eliminating or finding a substitute for the drug is indicated. (Bayard 2016). Note: in the case of prescribed medications, this should only be done by the prescribing physician or another with prescribing privileges.

DRUGS THAT CAN INDUCE RHINITIS

Oral medications
ACE inhibitors
Beta-blockers
NSADs
Oral contraceptives
Antidepressants

Rebound effects (after discontinuing)
Alpha-adrenergic decongestive sprays (if used for 5-7 days)
Intranasal cocaine
Methamphetamines

Approach to Acute Rhinosinusitis

Presentation: The patient has additional symptoms (i.e., purulent discharge, facial pain/headache, loss of sense of smell, congestion/nasal obstruction, perhaps a failure to respond to decongestants) that last longer than several days but without any red

flags or complications. Symptoms that last longer than 10 days, are very severe early on, or come on as part of a "double sickening" suggest a bacterial cause. Symptoms of acute RS generally last less than a month and certainly less than 3 months.

Strategy: In the case of acute RS, the AAO-HNS recommends that medical physicians should either offer watchful waiting (without antibiotics) or prescribe initial antibiotic therapy for adults with uncomplicated acute bacterial RS. "Watchful waiting should be offered only when there is assurance of follow-up, such that antibiotic therapy is started if the patient's condition fails to improve by 7 days after ABRS diagnosis or if it worsens at any time."* (Rosenfeld 2015) However, if any red flags or complicating factors are present, consider immediate referral for antibiotic therapy.

For both viral and bacterial acute RS, ICARS-RS and AAO-HNS primarily recommend analgesics, topical intranasal steroids, and/or nasal saline irrigation. The evidence for treating viral RS is based on RCTs "with limitations" and cohort studies. The balance of benefit and harm is "unclear" and varies by patient. The evidence for treating bacterial RS is based on RCTs with heterogeneous populations, diagnostic criteria, and outcome measures. (Rosenfeld 2015 Orlandi 2016)

Manual therapy options include spinal manipulation, sinus percussion and lymphatic drainage. If the episode appears to be part of a longer trend, more direct treatment of the nasal passages with nasal specific or argyrol may also be considered. If the patient fails to respond in approximately one week of care, consider referring for antibiotics.

*Based on systematic reviews of double-blind RCTs and what was judged to be a relative balance of benefit and risk." (Rosenfeld 2015)

First line treatments
Saline irrigation (AAO-HNS, ICARS-RS)
Intranasal corticosteroid sprays (AAO-HNS, ICARS-RS)
Analgesics (AAO-HNS)

Optional
Spinal Manipulation
Sinus percussion/lymphatic drainage
Referral for antibiotic (AAO-HNS, ICARS-RS)
Nasal specific therapy
Allergy/immune assessment (AAO-HNS, ICARS-RS)
Argyrol treatment
Steam inhalation

Approach to Chronic Rhinosinusitis

Presentation: The patient presents with symptoms lasting more than 8-12 weeks or has had more than 2 episodes over a 6-month period, with or without previous medical evaluation or management.

Strategy: Many of the interventions are similar to the treatment of acute RS. Patients with chronic RS may particularly benefit from the treatment options in this care pathway, especially if they have already experienced relative treatment failure with medical therapy.† In the uncomplicated case, nasal specific or argyrol applications may be useful to promote adequate drainage, especially for this patient population.

If there is no improvement in 4-6 weeks of treatment, consider referral for further evaluation, CT/endoscopy, and/or possible treatment with macrolides and/or a brief course of oral corticosteroids.

In some cases, it may be indicated to test patients for allergies. The AAO-HNS recommends testing for allergy and immune

† Opinion of the CSPE Working Group.

function in evaluating a patient with chronic rhinosinusitis or recurrent rhinosinusitis.* (Rosenfeld 2015)

Chronic RS *without* nasal polyps (RSsNP)

First line treatments
Saline irrigation (AAO-HNS, ICARS-RS)
Intranasal corticosteroid sprays (AAO-HNS, ICARS-RS)
Nasal specific therapy

Optional
Manipulation
Sinus percussion/lymphatic drainage
Referral for macrolides (AAO-HNS, ICARS-RS)
Allergy/immune assessment (AAO-HNS, ICARS-RS)
Argyrol
Steam inhalation

Chronic RS *with* nasal polyps (CRSwNP)

First line treatments
Saline irrigation (ICARS-RS)
Intranasal corticosteroid sprays (ICARS-RS)
Referral for oral corticosteroids (1 short course) (ICARS-RS)
Address asthma symptoms if present (ICARS-RS)
Aspirin desensitization (AERD** patients) (ICARS-RS)

Optional
Manipulation
Sinus percussion/lymphatic drainage
Referral for macrolides
Allergy/immune assessment
Argyrol
Low salicylate diet for AERD patients

* Based on observational studies with an unclear balance of benefit vs harm. (Rosenfeld 2015)
** Asthma exacerbated respiratory disease

Approach to Treatment-resistant Chronic RS

For patents who fail conservative care and medical therapy (macrolides and corticosteroids), surgical interventions may be necessary. A newer alternative is balloon dilation therapy. Finally, diet modifications may be helpful.

Strategy Based Treatment Objectives

Another way to consider treatment options is based on clinical objectives.

Specific Therapeutic Objectives

- Control infection
- Improve drainage, promote decongestion, reduce symptoms
- Improve immune status
- Address chronic inflammation
- Restore normal biomechanics of associated neck structures
- Remove potential allergens

Affect Drainage

The clinician and patient may decide on either direct, indirect, or a combination of methods for promoting drainage.

"Direct" methods may be more effective than indirect. By consensus of the CSPE working group, nasal specific is likely to be the most effective modality for the treatment of chronic sinusitis. However, many patients may find this procedure undesirable due to the discomfort involved. If that is the case, argyrol nasal applications may be the preferable modality. The supervising clinician should discuss the pros and cons of each of these modalities with the patient. Together, they

should decide which course of treatment is best suited to the patient's condition and circumstances. Nasal lavage, both in office and as a home care modality, is also useful.
By consensus opinion of the CSPE working group, using the eustachian tube manipulation as described on p.33 is effective for the treatment of ear complications that often accompany sinusitis.

"***Indirect" methods*** may be employed in addition to or in place of the direct procedures cited above. Percussion techniques may offer symptomatic relief as well as have some effect on drainage.

Physiotherapeutic modalities have been employed by chiropractic physicians for the treatment of chronic sinusitis for many years. There is no consensus as to whether one is better than another nor as to the degree of effectiveness.

Lymphatic massage can be used as an adjunct to either direct or indirect methods of drainage.

Promote Decongestion

Consider advising steam inhalation, sinus lavage, or use natural or over-the-counter decongestants. Drink sufficient water.

Support the Immune System

Consider advising patient to take supplements that may support the immune system, especially in chronic sinusitis. (See Appendix III, Vitamins, Supplements and Botanicals.)

Address chronic inflammation

In patients with chronic RS, especially those that have not responded favorably to the interventions outlined in this protocol, dietary modification is another therapeutic tool to consider. These interventions include supplementing with probiotics as well as considering a diet high in nondigestable carbohydrates (limited proteins and fats), a low salicylate diet, or a Mediterranean diet. (Nayan 2015).

Restore Proper Biomechanics

If TMJ/spinal joint dysfunction or soft tissue lesions (e.g., SCM trigger points) (Simons 1999) are detected, treat as needed.

Remove or Control Known Allergens

Investigation for dietary allergens should be considered in all patients with chronic sinusitis. In recurrent cases, consider air filtration systems for the home to remove allergens and purify the air. Assessing the home and workplace for airborne allergens such as mold and cleaning to reduce dust, dander and pet hair are also reasonable options.

The relationship between allergies and RS is primarily theoretical. Epidemiological studies are roughly split, half supporting a connection and half not. No studies have been conducted to see if controlling allergies improves the symptoms or duration of illness. (Orlandi 2016). Nonetheless, ICSRs-RS suggests that allergy testing remains an option, as long as the cost and time are weighed against the supposed potential benefits.

Asthma

Both chronic RS (especially with polyps) and asthma frequently co-exist in the same patient. They are affected by similar triggers and co-factors and are known to interact with each other, increasing either the severity or frequency of each. Likewise treating either one of the conditions often has a beneficial effect on both. (Orlandi 2016)

MANAGEMENT: SPECIFIC PROCEDURES

MANUAL THERAPY

Manual Treatment Options

1. Nasal specific
2. Percussion
3. Facial Massage & Lymph drainage
4. Joint manipulation
5. Eustachian tube manipulation (AKA "endonasal technique")/ear popper

1. NASAL SPECIFIC TREATMENT

Nasal specific is a procedure based on rapidly dilating the *nasal* passages (not to be confused with the medical procedure of *sinus* balloon dilation).

Performing the procedure

Between 1-3* finger cots are unraveled within each other and *tightly* secured to the end of a sphygmomanometer bulb with waxed dental floss. The provider should tug hard on the cots to test their security. The cots are then lubricated with a water-soluble lubricating gel and guided into the nasal passageways. The blunt end of a toothpick or cotton swab is used to insert the cot into the nasal passage. Take care that the toothpick or applicator does not irritate the mucosa by making sure the cot covers the end. The direction of insertion of the finger cot is slightly lateral to medial.

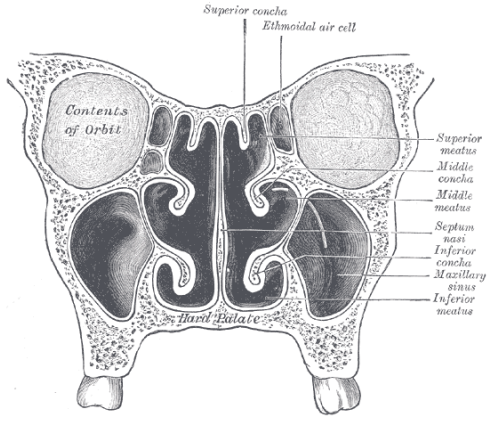
The applicator is then removed and the nose is lightly compressed around the valve of the sphygmomanometer bulb. The patient is asked to inhale, exhale, inhale, close their mouth and hold their breath as the cot is inflated. Both nostrils are occluded, the bulb is inflated (with one to three full squeezes of the bulb) and then the air valve is quickly released. The practitioner should grip the end of the cot to make sure that it remains anchored to the bulb.

This procedure is repeated, inserting the balloon at different angles, for each of the six nasal meatuses (Berman 1993). Start with a more perpendicular angle to the face for the inferior meatus to a shallower angle, almost paralleling the face, for the superior meatus.

* One experienced practitioner suggests starting with 1 cot at first. The more cots used, the greater the pressure exerted in the nasal passage.

Alternating from side to side, the inferior cavity is first inflated, then the middle, and finally the superior. As an option, the inferior cavity can be inflated one more time. If the patient is experiencing discomfort, the progression of inflations may be discontinued prior to treating all of the cavities. Ideally, each level receiving treatment should be inflated bilaterally to avoid asymmetrical stress on the structures.

At the end of the procedure have the patient gently blow their nose to check for bleeding. If there is no bleeding, they can blow harder to get out the lubricant. They also should gargle with warm water.



The patient may report a crackling or popping and may experience immediate post nasal drainage. Significant reduction in symptoms is expected within one to three treatments. If no improvement is achieved after three treatments, this modality should be discontinued. Generally, two to five treatments over a two-week period achieve maximum benefit. Yearly or seasonal repeat treatment may be necessary. (See CSPE videotape Nasal Specific Procedure.)

Complications and side effects

Every patient who experiences the nasal specific technique has a unique reaction to it. Some patients find there is no particular discomfort with the procedure while others find it very uncomfortable. Most say they experience a sensation of pressure, much like diving to the bottom of the deep end of a swimming pool. Each inflation and deflation of the bulb is so quick that the discomfort only lasts for seconds. There may be a cracking or popping sound as the sinus area expands with each inflation.

Generally, patients do not find this experience too unpleasant, especially when they immediately experience improvement in their symptoms. Minor soreness in the face and teeth for a couple of days has been reported (Berman 1993). However, some patients find nasal specific to be uncomfortable (similar to the sensation of aspirating water through the nose) or painful enough that they do not want to continue treatment. The patient often better tolerates successive treatments.

In addition, occasionally patients will experience a temporary stuffiness due to swelling of membranes of the nose. This only lasts for a period of about 24 hours. Throat irritation due to increased drainage from the sinuses may also occur. Again, this is temporary and goes away in a short time.

Complications from the nasal specific procedure appear to be uncommon. Occasionally, patients will experience a nose bleed, especially if they tend to get nose bleeds at other times. Like other nose bleeds, the ones that occasionally accompany this procedure stop after a few minutes.

Patients with a history of epistaxis may be more likely to get a nose bleed from this procedure than other patients. On the other hand, patients who experience a nose bleed during the first nasal specific procedure may not get a nose bleed with subsequent treatments. There is the possibility of

hemorrhage of ruptured veins, but this is very rare (Berman 1993).

There is the possibility of hemorrhage of ruptured veins, but this is very rare. Patients with a history of epistaxis may be more likely to get a nose bleed from this procedure than other patients. Furthermore, patients who experience a nose bleed during the nasal specific procedure may not get a nose bleed with subsequent treatments.

There has been at least one case reported where an asthma attack was initiated by the nasal specific procedure.[††] Therefore, as a precaution, the clinician should be sure that patients with a history of asthma have their inhaler with them when they are going to undergo this therapy.

The balloon will sometimes enter the oral cavity when it inflates. The authors are aware of one case in which the balloon was momentarily stuck, filling the mouth and had to be burst with a sharp object. Although this complication appears to be exceedingly rare, having a pair of scissors immediately available may be an appropriate precaution.

There has been one documented case of asphyxiation in an infant from the finger cot breaking and blocking the airway (Berman 1993). When deciding whether to use nasal specific technique on children under two years of age, the practitioner needs to balance the possible benefits of treatment with the inherent discomfort of the procedure and the possible self-limiting nature of the condition.

Contraindications

Patients with bleeding disorders or patients who are taking anticoagulant medications should be considered high risk patients and therefore may not be good candidates for this procedure.

Note: Patients with prior nasal surgery, especially with modification of the turbinates, are not good candidates for nasal specific because the integrity of the structures is unpredictable. At least one post-surgical case has been reported of a possible fracture of the cribriform plate with CSF leakage due to the nasal specific procedure.[‡]

Other contraindications include recent (under two years) nasal or facial bone fracture, a history of prolonged nasal steroid use, cocaine inhalation, nasal polyps, or a history of severe and excessive nose bleeds.

Evidence & Rationale

Nasal specific procedure is believed to increase the opening to the sinuses and therefore allow for better drainage. It also may allow better circulation of the air within the sinuses promoting healing of infected tissues.

There is only one case study published in the peer reviewed literature. A 41-year-old woman with chronic sinusitis and sinus headaches obtained relief only when a series of 10 nasal specific treatments over a two month period was added to her usual chiropractic care. (Folweiler 1995)

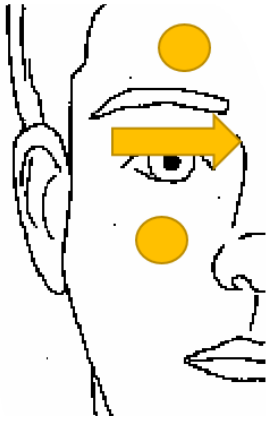
There are currently no other clinical studies published on this procedure. Treatment effectiveness is based on decades of clinical experience in UWS clinics. The judgment of the CSPE working group is that observed benefits outweigh the risks.

[††] 1996 primary author (Oliver) reported this case from private practice experience.

[‡] Reported to the author by NCMIC (National Chiropractic Mutual Insurance Company). (Oliver 1996)

2. Percussion

Place the patient in the supine position. Warm towels can be placed over the sinuses for 5-10 minutes before beginning the percussion. This, along with facial massage, helps to relax the patient and is thought to promote drainage. Gently percuss the frontal and maxillary sinuses for several minutes (see picture).



Complications and side effects. There are no known risks to this procedure.

Rationale: Percussion is thought to mechanically stimulate the sinuses to promote drainage. There are currently no clinical studies published on this procedure. The judgment of the CSPE working group is that presumed benefits outweigh the risks.

3. Facial Massage and Lymphatic Drainage Techniques

Place the patient in the supine position. A slow, gentle stroking massage is performed using both thumbs or thenar eminences, one on either side of the face. Begin at the center of the forehead and sweep along the frontal area around the orbital region and down to the front of the ears. Continue with these sweeps in a superiorward and widening pattern.

To massage along the maxillary region, begin at the top of the bridge of the nose and sweep along the inferior orbital ridges, continuing along the TMJ and down along the mandible. Continue with these sweeps in an inferiorward and widening pattern to include the entire maxillary region.

Acupressure points in this area include GB14, UB2, ST2, LI20, and multiple points along the orbital ridges. These points may be gently held with thumb or finger pressure for 5-10 seconds throughout the massage. (Schafer 1991). (See Appendix IV, Acupressure Points for Sinusitis.)

To facilitate lymphatic and sinus drainage, elevate the patient's head. Turn the patient's head to one side and massage down the neck along the anterior and posterior SCM lymphatic chains.

Turn the patient's head to the opposite side and repeat this procedure. Following the massage and lymphatic drainage, place warm towels along the sinuses and neck for 5-10 minutes. (See CSPE videotape, "Sinusitis.") Mechanical massage and vibration devices may be employed to assist in facial massage and/or lymphatic drainage.

Complications and side effects. There are no known risks to these procedures.

Rationale: Facial massage is believed to stimulate the skin over the sinuses to promote drainage of the sinuses. Lymphatic drainage techniques stimulate the flow of lymphatic fluids which may encourage the infection fighting processes. There are currently no clinical studies published on this procedure other than in a case series as part of a manual therapy approach (Mendez 2012). Treatment effectiveness is based on decades of clinical experience in UWS clinics. The judgment of

the CSPE working group is that presumed benefits outweigh the risks.

4. Adjusting/Joint Mobilization

It is the consensus opinion of the CSPE Committee that the frequency of spinal manipulation recommended is two to three times per week during the early stages of treatment. A two-week therapeutic trial should be sufficient to assess results.

If the patient is improving, manipulation should be continued on a schedule appropriate to the individual case. If, however, there is no improvement within two weeks of therapy, further use of this modality is unlikely to yield further therapeutic effect.

Complications and side effects. Spinal manipulation of sinusitis patients carries no additional risks beyond those rare side-effects associated with the procedure itself.

Rationale: Based upon clinical experience, it appears that spinal manipulation, particularly of the upper cervical spine, helps to reduce the symptoms of sinusitis. The mechanism of this phenomenon is unclear. In addition, joint dysfunction may be present as a viscero-somatic response to sinus irritation (20).

A 2012 case series (N=12) reported that patients with chronic (at least 12 months) rhinosinusitis without polyps had an average improvement in craniofacial pain of 85% over baseline and improvement on RS specific questionnaires after 7 weeks of care. Treatment consisted of weekly full spine manipulation along with neuromuscular technique to decompress the TMJ, myofascial release of the anterior cervical muscles and hyoid, mobilization of the maxilla bones, and mobilization and compression of the frontal bone. (Mendez-Sanchez 2012)

A 2007 RCT (N=61 chronic RS) with a wait list control reported a clinically and statistically significant improvement above baseline in headache severity improved by 47% (NRS dropped from 3.1 to 1.7) and a 43% reduction in sinus pressure. There was essentially no improvement in the control group. The intervention was comprised of 5 osteopathic treatments spread over 10 weeks. Unfortunately, the specific osteopathic treatments were not described. (Roos 2007)

5. Eustachian Tube Manipulation (AKA "Endonasal" Technique)*

This procedure is not a direct treatment for sinusitis. Many cases of sinusitis, however, are accompanied by eustachian tube dysfunction resulting in plugged ears and may lead to the development of a complicating otitis media. This manual therapy technique appears to be effective in treating this eustachian tube blockage.

Performing the procedure

Introduce the gloved finger, palmar surface upward, into the mouth. Proceed past the uvula, without touching it, into the nasopharynx and laterally outward and upward to the Fossa of Rosenmüller. A sweep of the fossa is made and a tractional tug of the inferior tissues is applied as the finger is withdrawn. Some practitioners employ a very firm pressure on the opening to the eustachian tube to stretch this opening. However, recent clinical experience and the consensus of the CSPE committee suggests that a gentle downward tug is sufficient to gain results. Occasionally, patients will report an immediate relief from pressure or a crackling sound in the ears.

* Historically at UWS this procedure has gone by the misnomer "endonasal" technique even though the treatment is not performed through the nasal passage.

A mild astringent may be used on the gloved finger. The patient should gargle with a mild antiseptic mouthwash or warm salt water after the procedure to decrease the risk of spreading infection to the throat (Finnell 1955).

The procedure should be performed over 1-3 visits as a therapeutic trial for the treatment of eustachian tube dysfunction. If a reduction of symptoms is not achieved after three treatments, it is unlikely that further applications will result in a positive response. (See CSPE videotape, "Sinusitis.")

Relative contraindications. This procedure should not be done when there is evidence of an acute throat infection as exudates may be transported from the nasopharynx to the inner ear.

Complications and side effects. Many patients fear that they will gag from this procedure. However, it is done so quickly that slight gagging may occur, but not vomiting. Some patients report momentary pain. There are no known complications. Side effects are also rare but the patient may experience minor swelling and/or slight bleeding from capillary rupture in the nasopharynx.

When deciding whether to this technique on children under two years of age, the practitioner should balance the possible benefits of treatment with the inherent discomfort of the procedure and possible self-limiting nature of the condition.

Rationale: The procedure is thought to indirectly affect the eustachian tube (Channell 2008). It may, for example, remove a mucous plug, allowing for better drainage from the middle ear. Furthermore, the procedure appears to stimulate the production of mucus in the posterior nasopharynx, which improves drainage from the nasal cavities.

There are currently no clinical studies published on this procedure. Treatment effectiveness is based on decades of clinical experience in UWS clinics. The judgment of the CSPE working group is that observed benefits outweigh the risks.

Ear Popper

The Ear Popper is a modified Politzer* mechanical device that can be used as an alternative method to open the eustachian tube. This hand held battery powered device, can be used to help relieve ear congestion.

Performing the procedure

1) Have the patient sip and hold a drink of water in their mouth
2) Hold the device (with nosepiece) firmly against the nostril on the symptomatic side, *creating a good tight seal*.
3) Press the other nostril closed.
4) Push the button and hold for 3 seconds
5) Then while the device is running have the patient swallow the water to close off the oropharynx.
6) Repeat for other nostril.
7) Wait 5-minutes and repeat for both nostrils.

* The Politzer maneuver is a based on forcing air into the nostril to open the eustachian tube and inflate the middle ear.

Listen for a pitch change in the motor while the patient is swallowing (similar to the sound if you were to place your finger over the hole in the device while the engine is running). If there is no change in pitch, it may indicate that you did not maintain a good seal over the nostril.

Within 5-10 minutes the patient may feel a warm sensation in the back of their throat, suggesting that the eustachian tube has been opened and is now draining. It is also recommended that after the Ear Popper procedure the patient should gargle with salt water and spit out the water to help clear the throat of possible bacteria (this should occur with or without the warm sensation).

Side effects: The patient may feel a pop in the ear and a "clogged" sensation may be felt for a few minutes.

Rationale: Based on the Politzer Maneuver, the ear popper delivers a safe, constant, regulated flow of air into the nasal cavity. During the movement of swallowing, the air is diverted up the eustachian tube, clearing and ventilating the middle ear and allowing the accumulated fluids to drain.

A 2005 RCT measured the impact of using a home version of the Ear Popper for 7 weeks on 94 children with persistent middle ear effusion (MEE) and hearing loss. At end of the 7-week self-care program, the hearing sensitivity of 73.9% of the treated ears improved to normal limits compared to only 26.7% of the control ears. It is unclear whether allocation was concealed or the outcome assessors were blinded. (Atick 2005)

In a follow up prospective study, children in the control group (N=30) and those who did not have a satisfactory response to the 7 week program (N=8) participated in another round of self-care. 43 of 60 ears (71.7%) in the former control group experienced significant improvements in hearing within normal limits and, and normal or moderate tympanic membrane mobility was observed in 30 of 34 otoscopically examined ears (88.2%). In the extended-treatment group, hearing sensitivity returned to within normal limits in 9 of 10 impaired ears (90.0%). (Silman 2005)
A similar device also based on combing the Valsalva and Politzer maneuvers was tested in an RCT (N=31) in children with OME. Middle ear pressure was normalized in 52% and improved in 31% compared to 15% normalized and 15% improved in the control. (Bidarian-Moniri 2013)

In a 2013 Cochrane review of autoinflation for OME, a sub-group analysis of studies using a Politzer device for under one month had an RR of 7.07 (95% CI 3.70 to 13.51) for clinical improvement. (Perera 2013)

Topical Applications

Treatment options
1. Nasal lavage
2. Intranasal steroids
3. Argyrol Nasal application

1. Nasal Lavage (AKA irrigation)

Nasal lavage (AKA irrigation, nasal douche, wash or Neti Pot treatment) is a rinse of the nasal passages with a lukewarm salt water solution.

The AAO-HNS recommends saline nasal irrigation for symptom relief of acute viral and bacterial RS and chronic RS. (Rosenfeld 2015). It can be used as a stand-alone or adjunct treatment. "The safety and minimal side effects of saline irrigation, however, make it an attractive sole therapy for CRS." (Rosenfeld 2015)

The ICARS-RS (Orlandi 2016) suggests that it is an option of acute RS and strongly recommended for chronic RS (LOE A). Reported benefits include improved symptoms, quality of life scores, decreased use of medications, and changes in endoscopic and radiographic measures.

Low volume approaches such as using saline spray is not as effective as saline lavage in terms of promoting drainage and improving quality of life measures. (Rosenfeld 2015, Orlandi 2016)

Performing the Procedure

The lavage can be prepared by mixing one-fourth teaspoon of sea salt with 7 ounces of warm water.* There is no "optimum" formula. Either an isotonic or hypertonic solution can be used. Although there is insufficient evidence to support one over the other, a 3-5 % hypertonic saline may have "a superior anti-inflammatory effect and better ability to thin mucous and transiently improve mucociliary clearance." (Rosenfeld 2015)

A 2015 review suggested that large volume, low pressure irrigation using undiluted seawater appeared to be optimum due in part to its mix of sodium, potassium, calcium and magnesium ions and bicarbonates. (Bastier 2015)

A 2016 study suggested that manuka honey could also be used for irrigation on patients with active chronic RS who had prior sinus surgery and, while having a similar beneficial effect on symptoms, also improved culture counts based on its anti-bacterial action. (Lee 2016).

* In one study patients made a 2.0% saline solution comprised of 1 teaspoon (5 mL) of salt (heaped), a half teaspoon (2.5 mL) of baking soda and 1 pint (473 mL) of tap water. (Little 2016)

The saline solution is introduced into one nostril and drains out the other. It can be introduced by a "pump or squirt bottle, with a nebulizer or with gravity based pressure using a vessel with a nasal spout, such as a 'neti pot'." Narial Nasal Cups are available to assist in introducing the saline into the nasal passages.

"The optimal frequency or method of irrigation is uncertain." (Rosenfeld 2015) A reasonable recommendation is to perform the irrigation daily during active infections (Chester 1996).

Patients should be recommended to regularly disinfect their irrigation bottles (e.g., microwave after irrigation) and periodically replace them. Water should always be used from a clean source (e.g., avoiding well water). (Orlandi 2016) Using distilled water or boiling or treating tap water with ultraviolet light is recommended. Carbon filtration is not recommended. (Ordermann 2017)

Complications & Adverse Effects

There is a 5-10% probability of minor adverse effects such as nasal burning, nausea and ear plugging (hypertonic solutions have been associated with 10-25% of cases). Other side effects include local nasal bleeding, fluid dropping from the nose, headaches, and bottle contamination. (Rosenfeld 2015, Orlandi 2016) No major side effects were reported in 22 trials, with the exception of 2 deaths from amoebic meningoencephalitis likely due to using contaminated water. (Orlandi 2016)

Rationale & Evidence

Saline nasal irrigation provides a means by which the paranasal mucosa is hydrated, purulent discharge is flushed from the

recesses of the nasal passages, and crusted nasal discharge is cleared, thus promoting adequate drainage. In addition, irrigation offsets the potential rebound mucosal swelling common with the use of topical vaso-constricting decongestants (Galen 1997).

Acute RS: AAO-HNS guidelines state that saline nasal lavage "may improve quality of life, decrease symptoms, and decrease medication use for acute bacterial RS, particularly in patients with frequent sinusitis." (Rosenfeld 2015)

Rosenfeld (2015) reports on two trials where hypertonic (3%-5%) saline irrigation showed a modest benefit for acute RS in two clinical trials (Inanli 2002; Rabago 2002). Patients in the lavage group improved 14 and 15 points on 100-point scale compared to only 1 and 8.5 in the control groups. One older RCT, however, found no difference for patients with a cold and acute RS when treated with hypertonic saline, normal saline, or just observation. (Adam 1998)

ICARS-RS summarizes the mixed evidence by stating "although the studies individually do not provide a compelling case for the use of saline in ARS, taken together they can be interpreted as demonstrating a likely benefit in terms of nasal function and patient symptoms with minimal likely harms." (Orlandi 2016)

Chronic /recurrent RS: Multiple systematic reviews have reported symptomatic relief for chronic RS with this procedure (Harvey 2007, Wei 2013; Van den Berg 2014). "Nasal saline irrigation is effective as sole treatment for CRS or as an adjunct to topical nasal steroids, but compared directly with topical nasal steroids, the benefits of saline irrigation are less pronounced." (Rosenfeld 2015)

A 2016 pragmatic RCT in a primary care setting compared the following groups for 6 months: 1) a group of patients (N=219) who performed daily saline irrigation (150 mL through each nostril), 2) a group (N=210) who received only usual medical care, 3) a group who did only steam inhalation (N=232), and 4) a group who did both steam inhalation and nasal irrigation (N=210). The saline groups were given a video demonstrating how to make their own buf-fered 2.0% saline irrigation solution.* More patients in the saline irrigation cohorts maintained a clinically significant 10-point improvement on the Rhinosinusitis Disability Index with nasal irrigation than the usual care group (44.1% v. 36.6%). Interestingly the patients who combined nasal irrigation with steam inhalation made up a large part of that success rate even though the steam inhalation group demonstrated no benefits from that intervention when used alone. (Little 2016) The NNT of 13 was larger than previous studies, but those studies had incorporated more intense training (i.e., video, live demon-strations, coached practice in front of the providers, more follow up contacts, and monitoring a diary to ensure compliance). In addition, fewer patients who performed nasal irrigation used over-the-counter medications (59.4% v. 68.0%), and fewer intended to consult a doctor in future episodes. One significant limitation of this study was that the dropout rate was slightly over 20%.

2. Intranasal Steroids

The AAO-HNS recommends topical intranasal cortico steroid therapy for chronic RS. (Rosenfeld 2015) Some intranasal corticosteroids are available over the counter (e.g., Flonase, Nasacort, Rhinocort).

* Every 1-2 days, mix 1 heaped teaspoon (5 mL) of salt (heaped), a half teaspoon (2.5 mL) of baking soda and 1 pint (473 mL) of tap water.

Likewise, the INCARS-RS (Orlandi 2016) gave strong recommendation for nasal corticosteroids for acute RS with small but significant benefit (decrease symptom duration and severity) over placebo with rare mild side effects. Higher doses appear to be more effective than lower doses. Intranasal steroids may be more effective in patients who have a concurrent allergic rhinitis. (Ann 2016) It can be used a monotherapy or in conjunction with other treatments. They also recommend it for chronic RS for improved symptoms and improved endoscopic findings (although the evidence is stronger for RS with polyps compared to without). (Orlandi 2016) Side effects can include headache and epistaxis.

Rationale & Evidence

The anti-inflammatory properties of corticosteroids result in stabilizing the sinus membranes and inhibiting histamine release thereby reducing mucosal swelling.

An NNT of 13-15 has been reported in a 2013 Cochrane meta-analysis of 6 studies and benefits may not occur until later (15-21 days). (Ann 2016).

A 2013 Cochrane meta-analysis (N=1,943; 4 studies) reported that symptoms in patients receiving INCS, particularly higher-dose treatments, were more likely to resolve or improve than in placebo treated patients. There was an NNT of approximately 14 for complete or marked symptom relief. Complete benefits may not occur until (15-21 days) later. (Ann 2016).

Chronic RS with polyps: Most of the evidence supports benefits for patients with chronic RS with nasal polyps using standard applications like sprays or drops. The large majority of 35 studies in one systematic review reported by INCARS-RS (2016) documented improvement in at least some of the clinical outcomes including endoscopic evaluation, quality of life measures, tests of olfaction and polyp recurrence rates. Improvement is also expected for severity of all symptoms (low quality evidence). More specifically, moderate improvement is expected for nasal blockage and a small benefit for rhinorrhea (moderate quality evidence). (Chong 2016).

Chronic RS without polyps:

The evidence for this subgroup is more variable and overall not as strong. A 2009 systematic review of 5 studies by Kalish et. al. found some evidence of symptom relief, but the overall evidence was judged to be insufficient to demonstrate clear benefit. Snidvongs et. al. (2011) reviewed 5 studies and did confirm improvement in symptom scores. Subsequent RCTs have also reported mixed results. (Orlandi 2016)

Adverse Effects

There was an increased risk of epistaxis with intranasal corticosteroids (risk ratio (RR) 2.74, 95% CI 1.88 to 4.00; 2508 participants; 13 studies; high quality evidence). Nosebleeds ranged from mild to more severe; for some patients this amounted to just small streaks of blood. (Chong 2016)

3. Argyrol Nasal Application

Procedure

Long, cotton-tipped applicators are saturated in a 10% mild silver protein solution (argyrol) and inserted into the middle nasal meatus.

The applicators remain in the nose for approximately 60 minutes. The patient sits with head bent so that nasal mucus can flow

down the end of the applicator and into an emesis basin.

Repeat this procedure for two consecutive days, skip a day, and repeat on the fourth day. On rare occasions, a fourth application is added if it appears the patient would derive some benefit.

Complications and adverse effects

There are no reported adverse effects from this procedure although *orally* administered silver can have side effects ranging from deposition of silver granules throughout internal organs and blue-grey discoloration of the skin (from chronic low dose exposure) to gastrointestinal ulceration, hemolysis, agranulocytosis and neural toxicity (from high dose exposure).

A concern is that various colloidal products are unregulated and in 1999 the FDA ruled that due to significant differences in product concentrations (ranging from very low to life-threateningly high concentrations), over the counter products with silver salts or colloidal silver were not generally recognized as safe. For these reasons the ICAR-RS does not recommend its use. (Orlandi 2016).

Evidence & Rationale

Argyrol nasal applications also irritate the nasal mucosa causing the production of copious amounts of mucus. This flow of mucus promotes drainage of the sinuses and causes infective agents to be carried out of the nasal cavities.

Colloidal silver solutions have been shown to decrease the *S. aureus* compared to a control in an *in vitro* study. (Goggin 2014).

In an *in vivo* animal study, silver solutions in concentrations of 30 ppm, 20 ppm, 10 ppm, and 5 ppm were applied to the sinuses of sheep and all concentrations revealed significantly reduced biofilm biomass.* This outcome is of particular interest because it is the biofilm matrix formation that can make the infection more resistant to routine antimicrobial agents. In patients with recalcitrant cases of chronic RS, *S. aureus* biofilms have been associated with poor outcomes even when treated aggressively with medical and surgical therapy.

Regarding side effects, hematological and biochemical parameters were within normal limits in all animals. Silver blood levels were higher than in the controls, but lower than those seen in comparable studies on burn victims treated with silver dressings and silver sulfadiazine cream. In these cases, even with elevated blood levels of silver, organ tests were normal. The authors concluded "Thus a proven antibacterial antibiofilm agent, silver has a low toxicity profile. The other advantage of silver is failure of the bacteria to develop resistance. All this evidence suggests that colloidal silver could become a viable treatment option in CRS." (Rajiv 2015)

Topical application of argyrol has been used in the UWS clinic system over 30 years and appears to be an effective adjunct for some patients without apparent significant side effects.

PHYSIOTHERAPEUTIC MODALITIES

MICROCURRENT WITH ACUPRESSURE POINTS (based on Jaskoviak 1993)

Common Acupressure Points Used
GB14, UB2, LI20, LI14 (Schaffer 1991) (See Appendix III.)

* Biofilms are colonies of microbes embedded in a matrix of polymers attached to a surface or to each other.

Parameters: Tsunami wave (alt. Current), 10-50 µamps, 0.3 H2 to 30 H2

Probe Method: 10 seconds each point, three times

Pad Method:

- 2 pads placed, one on each frontal sinus (above eyes)
- 2 pads placed, one on each maxillary sinus (lateral to nose)
- 20-30 minute treatment

***Rationale*:** Microcurrent stimulates reflex points that affect the sinuses through the nervous system. This effect promotes drainage of the sinuses through shrinkage of the mucous membranes.

HOME CARE

Home care options

1. Steam inhalation
2. Dietary and national considerations
3. Vitamin and botanical
4. OTCs
5. General self-care advice

1. Steam Inhalation

Although an easy and popular intervention, evidence suggests that it is not particularly effective except perhaps to reduce headaches in patients with RS or when combined with nasal irrigation.

Performing the Procedure

One method is for patients to create a tent by placing a towel over a bowl of recently boiled water and to slowly inhale the steam for about 5 minutes. (Little 2016)

Evidence

There may be benefits in terms of reducing the number of headaches or when prescribed in addition to nasal irrigation. Otherwise, research has failed to demonstrate any or only limited other benefits when applied to patients with RS, acute coryzal illness, or acute respiratory tract infections. (Little 2016)

In one study, steam inhalation (N=232) was compared to usual care (N=210), nasal irrigation (N=219), and combined treatments (N=210). Steam inhalation reduced headache but had no significant effect on other outcomes. The study, however, was limited by a dropout rate slightly over 20% (Little 2016)

2. Dietary and Nutritional Considerations

Dietary and nutritional interventions are usually reserved for the treatment of chronic or chronic recurrent sinusitis, especially those with recalcitrant cases. Supporting the gut biome and/or reducing inflammation through dietary modifications may be helpful for these patients (Nayan 2015)

Options

Probiotic supplementation
High nondigestable carb diet
Low salicylate diet
Mediterranean diet
Allergen elimination diet

PROBIOTIC SUPPLEMENTATION

The World Health Organization defines probiotics as live microorganisms which when ingested in therapeutic qualities can confer health benefits. Strains such as *Lactobacillus* and *Bifidobacterium* may help to modulate the general immune and host inflammatory

response by affecting the makeup of the gut flora. Studies have reported benefits for chronic respiratory diseases and these diseases have a strong associate with chronic RS. (Nayan 2015)

Most of the evidence for probiotic supplementation revolves around treating conditions related to sinusitis. A 2009 RCT demonstrated improved quality of life for patients with *persistent allergic rhinitis* when probiotics were combined with H1 antihistamines. (Borchers 2009). A 2011 Cochrane systematic review supported their effectiveness compared to placebo for preventing *upper respiratory infections* as well as reducing antibiotic use. A 2015 Cochrane meta-analysis reported a reduction in *respiratory illness episodes*. One study (Mukerji), however, showed no improvement in *sinonasal quality of life scores* in patients taking *L rhamnosus.* (Nayan 2015)

Typical amounts of probiotics prescribed for preventing respiratory illness in most studies are 1 to 10 billion CFU (colony-forming units) of a *Lactobaccillus* strain daily for children or adults. (Costa 2014, Berggren 2011, Lue 2012, Leyer 2009, Waki 2014). A few studies have added an equivalent amount of a *Bifidobacterium* strain. (Leyer 2009, Rerksuppaphol)

HIGH NONDIGESTABLE CARB DIET

This diet strategy also targets the gut microbiome with the goal of promoting the proliferation of "good bacteria." Diets high in fruits and vegetables and lower in fats and sugars may create a more favorable environment in the gut.

LOW SALICYLATE DIET

Aspirin exacerbated respiratory disease (AERD) is a combination of eosinophilic RS with nasal polyps, asthma, and respiratory symptoms triggered by aspirin ingestion. Certain foods contain high levels of nonacetylated salicylates. Reducing the intake may be beneficial for patients with AERD. (Nayan 2015) A small (N=30) prospective crossover study demonstrated statistically significant improvements in the SNOT 20 (15 point improvement) as well as objective endoscopic changes compared to patients on a regular diet. (Sommer 2016) (For more details, see Appendix VII.)

MEDITERRANEAN DIET

Although studies specifically on RS are lacking, the anti-inflammatory effects of a Mediterranean diet have demonstrable CRP lowering effects, the ability to lower the risk for multiple conditions such as heart disease, type 2 diabetes, and cancer as well as beneficial effects for asthma and Crohn's disease (Nayan 2015).

ALLERGEN ELIMINATION DIET

The most common food allergens are milk, eggs, wheat, rye, corn, sugar, chocolate, cola, yeast, coffee, tea, alcohol, legumes and food additives.

3. Vitamin and Botanical Considerations

Options
Sinupret ©
Bromelain
Pelargonium sidoides
N-acetylcysteine (NAC)

Little has been published regarding the vitamin and botanical treatment of sinusitis specifically. Although the research is very limited, some herbal preparations may be an option for symptom control. If practitioners

choose to give additional supplemental support, they can consult Appendix II: Vitamins, Supplements and Botanicals. They should be familiar with the indications, contra-indications, toxicity levels, and interactions of the particular substance before prescribing its use (Werbach 1994).

Sinupret ©

In vitro and animal studies have demonstrated anti-viral, antimicrobial, anti-inflammatory, and anti-secretolytic effects of Sinupret©. (Passai 2015). A 2006 systematic review cited evidence from four studies favoring a commercial herbal therapy Sinupret© which includes sorrel herb, elder flower, primula flower, verbena herb, and gentian root (Guo 2006). One of these trials was a double-blind RCT (N=160) on acute RS, assessing the added value of Sinupret vs a placebo in combination with usual care consisting of *Vibramycin* and a decongestant (otrivin) therapy. The Sinupret patients reported greater improvement in mucosal swelling, nasal obstruction and headache as well as radiographic improvement. (Neubaurer 1994) The trials had no placebo controls, and so the self-resolving natural history of acute RS cannot be ruled out.

More recent RCTs have evaluated Sinupret for the treatment of acute viral rhinosinusitis. One report pooled results from a total of 589 patients and found improved symptom and quality of life scores, with an NNT of 10. (Jund 2015)

Results on treating chronic RS have been mixed. These studies had a number of methodological flaws and were sponsored by a commercial interest and so a clinical recommendation is hard to make.

Typical daily dosing of Sinupret is 3 to 6 tablets in divided doses. The herbal preparation has had a good safety profile.

Bromelain

In a cohort trial of children under 11 with ARS, 116 patients from 19 German health centers, a Bromelain preparation (N = 62) was compared to a combination of Bromelain-and standard therapies (N = 34), or with standard therapies alone (N = 20). Bromelain tablets lowered the duration of symptoms in a multi-centered study (N=116.) Patients treated with brom-elain had symptoms for an average of 6.66 days vs 7.95 standard therapy vs 9.06 with combination therapy. Other than one case of a self-limiting pineapple allergic reaction, the safety profile was good. (Braun 2005). See Appendix II for dosing.

Pelargonium sidoides

One 2009 multicenter double blind RCT (N = 103) demonstrated that *Pelargonium sidoides* drops (marketed domestically as UMCKA ColdCare) administered to patients with ARS improved SNOT-20 scores and radiographic changes over placebo and resulted in complete resolution at day 21 (RR 0.43, 95% CI 0.30 to 0.62). (Brachert 2009) A 2009 Cochrane review rated the quality of evidence as only “very low.” (Timmer 2013)

N-acetylcysteine (NAC)

N-Acetylcysteine is considered to be a safe mucolytic and antioxidant agent. Part of the molecule breaks mucus into smaller, less viscous units. NAC has been reported to increase clearance mucociliary rate 35 percent compared to placebo percent. Although commonly prescribed in clinical medical and naturopathic practice in combination with steroids, the real efficacy is not well studied. In

a 2017 small, double blind, randomized placebo controlled trial (N=39) the addition of 600 mg oral NAC once daily to oral amoxicillin-clavulanic acid and normal saline nasal drops for 10 days and oral pseudoephedrine for 7 days owed no added benefit. (Bahtouee 2017) The typical adult oral dose is 600-1,500 mg daily in three divided doses. NAC is generally safe and well tolerated. Common side effects of high oral doses are nausea, vomiting, and other gastrointestinal symptoms.

4. Over-the-Counter Medications

Options
Decongestants
Antihistamines
Analgesics

DECONGESTANTS

The ICARS-RS (Orlandi 2016) does not make a recommendation regarding decongestants based on insufficient evidence. They may have short term effect on symptoms of the common cold, but they do not affect the sinuses. (Aring 2016)

If decongestants are used, topical sprays may be preferable to oral agents but they should always be discontinued after 72 hours to prevent the complication of rebound congestion (*rhinitis medicamentosa*).

Adverse effects

Decongestants do have many possible adverse effects and should be used cautiously. Their use should be especially cautious among elderly or hypertensive patients (Smith 1993).

Rationale & Evidence

Decongestants are often prescribed as adjunctive therapy for bacterial sinusitis, but their efficacy remains unproved. They shrink nasal mucous membranes, perhaps thereby facilitating sinus drainage when the sinus ostia are obstructed by mucosal swelling. However, decongestants may also impede important bacterial clearance mechanisms by inhibiting mucosal ciliary action.

Despite several systemic reviews, there is little evidence to support the use of decongestants, other than they may possibly improve saccharin transit times. (Orlandi 2016)

ANTIHISTAMINES

The ICARS-RS (Orlandi 2016) does not make a recommendation regarding antihistamines for acute RS based on insufficient evidence.

Unless prominent allergic symptoms are also present, antihistamines are probably of little value in the management of acute sinusitis. They may dry nasal mucosa excessively and thus impede sinus drainage (Smith 1993).

ANALGESICS

Acetaminophen or over the counter NSAIDs may help relieve pain or fever in acute RS and chronic viral RS. Narcotics are not recommended. (Aring 2016, Rosenfeld 2015)

5. General Self-Care Advice

Note: Patients should be instructed to call back if symptoms worsen or do not improve within 1 week of home therapy (Institute for Clinical Systems 1998).

- Patients suffering from sinusitis should drink at least six to eight 8-oz. glasses of water per day (Maltinski 1998).
- Chronic cases may be aided by moderate exercise.
- Using a humidifier may be beneficial. (Maltinski 1998).
- Recurrent cases should consider air filtration systems for the home to remove allergens and purify the air.
- Steam inhalation produces nasal vasoconstriction and promotes drainage. One to two 15-minute treatments are recommended daily. Eucalyptus or camphor can be added to the water to enhance the effects of the steam.*
- Smokers with recurrent and/or chronic sinusitis should be encouraged to quit smoking.
- Daily nasal lavage may help to promote drainage and reduce the healing time (Institute for Clinical Systems 1998).
- Avoid exposure to possible allergens/ irritants (e.g., smoke, abrupt change in temperature, dust) (Maltinksi 1998).

OTHER ASPECTS OF MANAGEMENT

Outcome Measurements

- Reduction or cessation of symptoms (Institute for Clinical Systems 1998).
- In recurrent sinusitis, alleviating the number or intensity of episodes.
- Use appropriate CSPE questionnaires (such as the SNOT 20). See Appendix I.

Prognosis

- Patients with acute bacterial sinusitis generally respond to antibiotic therapy within 3 to 5 days.
- In the opinion of a small 2000 focus group from the CSPE committee, approximately 70% of patients with uncomplicated acute sinusitis seem to respond to conservative care including nutritional support, spinal manipulation, and soft tissue techniques within 3 to 10 days.
- Most clinicians responding to an internal survey for the 2000 CSPE care pathway reported a greater than 50% success rate in treating patients with chronic allergic sinusitis. Clinicians surveyed who performed nasal specific, eustachian tube manipulation (AKA endonasal technique), and/or argyrol techniques reported a greater than 75% success rate in treating patients with chronic sinusitis. A 2000 survey of 36 patients who presented to the WSCC Outpatient Clinic with signs and symptoms of sinusitis and were treated with the conservative protocols outlined in this pathway found that 85% reported a positive response to therapy. Most clinicians surveyed expect a significant improvement in their patients with chronic sinusitis within 3 to 4 weeks in order to justify continued therapy.

CONSIDERATIONS FOR REFERRAL/CONSULTATION

Patients suspected of having a significant bacterial infection as evidenced by a fever over 102°F, purulent green or yellow discharge, facial pain and/or malaise warrant consideration for referral. Minor bacterial infections may best be treated with the

*Consensus of the CSPE working group.

conservative care procedures outlined here. In any case, if the patient fails to respond to treatment, or the condition worsens after 7 to 10 days, then referral is indicated.
Patients who do not have evidence of bacterial infection but have failed to respond to conservative care could be referred to licensed practitioners for consideration of acupuncture (Shuzhuang 1993).

Acute sinusitis in young children, especially of the frontal sinus may best be treated by antibiotics.

Pharmaceutical Therapeutics

Antibiotic Therapy

Clinical Note: Although doctors of chiropractic cannot prescribe antibiotics in most jurisdictions, they should discuss with patients as part of a PARQ conference the option of referral to a medical prescriber for consideration of antibiotic treatment.

ACUTE BACTERIAL RS

Many cases of mild bacterial rhinosinusitis resolve without specific treatment. Antibiotic therapy is an option for patients with acute or acute recurrent bacterial RS, especially in patients with moderate to severe symptoms or if the patient is immunocompromised. The benefits over placebo, however, are generally small and are possibly offset by the harm. (Orlandi 2016)

Multiple reviews report cure rates of about 91% compared to 86% for placebo at 7 to 15 days. (Orlandi 2016) When antibiotics are prescribed based on a clinical presentation, the NNT ranges from 11-18 for illness resolution between 7-14 days. (Ebell 2016, Orlandi 2016). Overall, multiple meta-analyses estimate that only about 5% of patients recover faster when antibiotics are prescribed for presumed acute bacterial RS. (Aring 2016, Orlandi 2016) However, these estimates may be somewhat skewed. Given that the suspected diagnosis of acute bacterial RS was made clinically rather than by culture confirmation in some of these studies means that patients with viral RS could potentially have been included in the antibiotic treatment group. If this is the case, the research results may underestimate the effectiveness of treating acute bacterial RS with antibiotics. (Patel 2017)

The number needed to harm (NNH) when using antibiotics for acute RS is about 8. Adverse side effects, especially gastro-intestinal complaints like nausea, vomiting, diarrhea, and abdominal discomfort, are the main potential harm. There is also a low risk of an anaphylaxic reaction to the medication. Furthermore, the issue of increasing emergence of antibiotic resistant bacteria with overuse of antibiotics must always be taken into account as a potential harm. (Orlandi 2016)

Any use of antibiotics should be decided judiciously. A strategy commonly employed in medicine is to recommend that a patient continue symptomatic treatment measures but also provide a written prescription for antibiotics at the time of the visit. The patient is instructed to fill the prescription and take the course of antibiotics only if there is no improvement after 7 additional days of conservative care or if there is significant worsening of symptoms during the next 7 days. (Orlandi 2016)

The most common organisms found in cases of acute bacterial rhinosinusitis in children and adults consistently include *Streptococcus pneumoniae* and *Hemophilus influenzae.* These

two organisms combined are responsible for about 50% of the cases. *Moraxella catarrhalis* and anaerobic bacteria fill out the list of other offenders with *M. catarrhalis* being more common in children than adults.

PRIMARY ANTIBIOTIC CHOICE

The first-line antibiotic treatment options for acute bacterial RS are amoxicillin or amoxicillin/clavulanate (Augmentin). (Orlandi 2016, Patel 2017) Amoxicillin is effective against many *S. pneumoniae* and H. influenza strains, though resistance is increasing among both types of bacteria. The clavulanate moiety is a beta-lactamase inhibitor and extends the antimicrobial coverage to some resistant strains. However, due to emerging beta-lactamase resistance, Augmentin may not be effective against M. catarrhalis and some H. influenzae organisms. If a patient fails to respond to amoxicillin or amoxicillin/ clavulanate within 3-5 days, a second-line antibiotic can be employed. Second-line antibiotics should also be used in patients who are allergic to penicillin.

SECONDARY ANTIBIOTIC OPTIONS

Most sources agree that the best second-line antibiotics for acute bacterial RS are doxycycline or respiratory fluoroquinolones such as moxifloxacin and levofloxacin. (Orlandi 2016, Patel 2017).

Additional options include:

- trimethoprim-sulfamethoxazole (TMP-SMZ), a sulfa drug

  or
- clindamycin PLUS either a second-generation cephalosporin, Cefprozil or Cefuroxime, or the third-generation cephalosporin Cefpodoxime

Previously, the macrolide class of antibiotics, including medications such as azithromycin, clarithromycin, and erythromycin were utilized to treat acute bacterial RS, but they are no longer considered effective agents in the acute rhinosinusitis setting. (Patel 2017) Histograms should be referenced to determine the most up to date local and regional rates of antibiotic resistance for the commonly implicated microbes in rhinosinusitis as the rates of resistance change over time.

LENGTH OF THERAPY

The typical duration of antibiotic treatment is 7-10 days. Symptoms of acute bacterial rhinosinusitis usually start to improve within 48-72 hours of initiating antibiotic therapy.

Other treatment duration options include trying a shorter course of just 5 days. This is a reasonable option in adults who are not immunocompromised. The advantages of a shorter course include better compliance with treatment and less adverse side effects, though a longer course may be necessary if symptoms have not completely resolved after 5 days. (Aring 2016)

Some physicians prefer a longer treatment course of 10-14 days of antibiotics. The fact that up to 20% of adults with acute rhinosinusitis remain culture-positive after 7 days of treatment provides some rationale for this practice.

CHRONIC RS

In chronic rhinosinusitis, the bacteria tend to shift toward mixed anaerobe and aerobe infections, gram negative bacteria, and organisms with antimicrobial resistance requiring different antibiotic choices than those effective in acute bacterial RS cases.

In addition, chronic RS is now thought to be predominantly a persistent inflammatory problem rather than an overtly infectious process.
Macrolides are currently the main antibiotic class that is recommended as an option for treating chronic RS (Grade B evidence). (Orlandi 2016) Macrolides are likely beneficial because they have both antimicrobial and anti-inflammatory properties. Chronic RS patients may note symptom improvement with longer courses of macrolide treatment, typically around 3 weeks in duration, although many studies involve ≥12 weeks of medication. In patients with chronic RS *with* polyps there is also a significant decrease in polyp size especially when macrolide treatment is employed after endoscopic sinus surgery. (Orlandi 2016) It is generally recommended that when antibiotics are used they be given along with other treatment modalities including saline irrigation and intranasal corticosteroid sprays, rather than as a single therapy. This is true in patients with chronic RS as well as those with acute RS.

Orlandi (2016) suggests that there is insufficient research evidence to make a recommendation for or against the use of antibiotics other than macrolides for chronic RS *without* nasal polyps. If an antibiotic is used in patients with chronic RS *without* polyps, it should be chosen based on a culture of mucous obtained from the sinuses rather than just empirically.

Although non-macrolide antibiotics are often still prescribed for patients with chronic RS *with* polyps, Orlandi (2016) actually recommends against their use as the evidence fails to show symptom improvement with use of these other antibiotic classes.

Overall, considerable debate remains in deciding who should be treated with antibiotics at all. Most allopathic physicians agree with employing antibiotic treatment for patients with fever >102°F, facial pain and purulent drainage or with air-fluid levels in the sinuses on CT scan.

Oral Steroids

Chronic RS *with* polyps: ICARS-RS recommends a 2-3 week trial of oral corticosteroids (LOE A) - which requires referral to a medical prescriber. Long term and frequent use should be avoided because of the potential harmful side effects when corticosteroids are given systemically. (Orlandi 2016)

Chronic RS *without* polyps: The ICARS-RS (Orlandi 2016) does not make a recommendation for or against oral corticosteroids for chronic RS *without* nasal polyps because evidence of benefit verses harm is lacking. The same warning to avoid prolonged use would apply if a practitioner chooses to use oral corticosteroids in this subgroup.

Adverse Effects

A large cohort retrospective study found that even relatively short term use of oral corticosteroids was associated with an increased risk for sepsis, thromboembolism and fracture. Within 30 days of drug initiation, the rates of sepsis increased 5.30x (95% CI 3.80 to 7.41), as well as venous thrombo-embolism (3.33x, 95% CI 2.78 to 3.99), and fracture (1.87x, 95% CI 1.69 to 2.07). These rates diminished over the next 3 months. (Waljee 2017)

Low quality evidence cites adverse effects that include GI symptoms (RR 3.45, 95% CI 1.11 to 10.78; 187 participants; three studies), increase in insomnia (RR 3.63, 95% CI 1.10 to 11.95; 187 participants; three studies) as well

as transient adrenal suppression, and increased bone turnover. At the doses used the impact on mood changes was not statistically significant (RR 2.50, 95% CI 0.55 to 11.41; 40 participants). (Orlandi 2016; Head 2016 Cochrane)

Rationale & Evidence

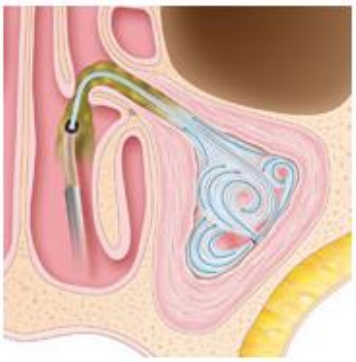
A 2016 Cochrane systematic review of patients with chronic RS *with* polyps determined that there were definite benefits in regards to decreased sinusitis symptoms, decreased nasal polyp size, and improved quality of life scores among patients receiving a short course of oral corticosteroids verses placebo. However, the improvements were not maintained at 3-6 month followup. (Head 2016) Only 2-3 studies, each with small numbers of patients, were included in the Cochrane review, resulting in an overall low quality of evidence and the conclusion that further research is needed to make stronger recommendations. (Head 2016)

Medical/Surgical Procedures

Referral to an otolaryngologist (ENT) is required in cases of chronic RS where the patient has failed medical management (prescription medication(s) and conservative measures were unsuccessful in resolving symptoms). In such cases, balloon dilation or endoscopic sinus surgery may be indicated to treat patients with chronic RS with or without nasal polyps.

Balloon Ostial Dilation (BOD)

A catheter is introduced through the nasal passage into the targeted sinus ostium.* An attached balloon is inflated, expanding the sinus opening and widening the walls. A saline solution is also sprayed into the sinus to flush out pus and mucus.



Evidence

Although the evidence is somewhat limited, a systematic review of 17 studies suggests that there is clinically significant improvement in SNOT-20 scores and quality of life among chronic RS patients after receiving BOD. Although the BOD procedure has the potential advantage over endoscopic sinus surgery of being able to be performed in the office setting rather than in an operating room, results were actually generally considered better when BOD was performed in the operating room. (Levy 2016)

Sinus Surgery

The main type of surgical intervention to treat chronic RS involves opening of the sinus ostia via nasal endoscopy to promote mucous drainage. This endoscopic sinus surgery (ESS) is performed by an ear, nose and throat specialist (ENT). For best results ESS should always be paired with post-operative medical anti-inflammatory treatment to help prevent recurrence of sinus blockage. (Patel 2017)

CHOICE OF PROCEDURE

* This medical endoscopic guided medical procedure differs from nasal specific treatment in which the balloon is introduced only into the turbinates.

The decision as to which intervention is best for a given patient is often left to the discretion of the ENT surgeon, as high quality data comparing balloon dilation and endoscopic sinus surgery is limited. Most trials evaluating the effectiveness of these two procedures were supported by manufacturers of the balloon catheters and so carry the potential for bias. That being said, the trials we do have that compared BOD to ESS have not demonstrated significant differences in SNOT-20 scores within 1 year after the procedures, suggesting comparable success rates. (Levy 2016, Orlandi 2016) Because these trials involved patients with mild disease, Orlandi (2016) does suggest that ESS may be the preferred technique among patients with more severe chronic RS. We do not have longer term data to support this recommend-ation, but theoretically with a larger drainage hole as produced with ESS compared to BOD, these patients may benefit from longer term sinus drainage and intranasal medication delivery.

Appendix I: SNOT 20

Sino-Nasal Outcome Test (SNOT-20)

Sinus Survey

The following questionnaire is intended to help define your symptoms and provide valuable information and insights for Dr. Leeman. Answer the questions, rating to the best of your ability the problems you have experienced over the past two weeks. After completing the survey, please print this page and bring it to your appointment.

1. Consider how severe the problem is when you experience it and how frequently it happens, please rate each item below on how "bad" it is by ticking the radio button that corresponds with you feel.	No problem	Very mild problem	Mild or slight problem	Moderate problem	Severe problem	Problem as bad as it can be
	0	1	2	3	4	5
1. Need to blow nose	○	○	○	○	○	○
2. Sneezing	○	○	○	○	○	○
3. Runny nose	○	○	○	○	○	○
4. Cough	○	○	○	○	○	○
5. Post-nasal discharge	○	○	○	○	○	○
6. Thick nasal discharge	○	○	○	○	○	○
7. Ear fullness	○	○	○	○	○	○
8. Dizziness	○	○	○	○	○	○
9. Ear pain	○	○	○	○	○	○
10. Facial pain / pressure	○	○	○	○	○	○

	No problem	Very mild problem	Mild or slight problem	Moderate problem	Severe problem	Problem as bad as it can be
	0	1	2	3	4	5
11. Difficulty falling asleep	○	○	○	○	○	○
12. Wake up at night	○	○	○	○	○	○
13. Lack of sleep	○	○	○	○	○	○
14. Wake up tired	○	○	○	○	○	○
15. Fatigue	○	○	○	○	○	○
16. Reduced productivity	○	○	○	○	○	○
17. Reduced concentration	○	○	○	○	○	○
18. Frustrated / restless / irritable	○	○	○	○	○	○
19. Sad	○	○	○	○	○	○
20. Embarrassed	○	○	○	○	○	○

Score	Evaluation	Recommended Next Step
0 to 10	No problem to mild problem	No actions necessary or symptoms can be treated with OTC medication.
11 to 40	Moderate problem	An appointment with a specialist or your PCP is recommended and/or prescription medicine can be taken to treat symptoms.
41 to 69	Moderate to severe	An appointment with a specialist or your PCP is recommended and/or prescription medicine can be taken to treat symptoms.
70 to 100	Severe to "as bad as it can be"	And appointment with a specialist is recommended, treatment to be determined by doctor. Possible surgical candidate.

Appendix II: Vitamins, Supplements and Botanicals

Little has been published regarding the vitamin and botanical treatment of sinusitis specifically. Although Bromelain is the best documented supplement for sinusitis, there is both insufficient evidence and consensus to support or refute the following options (each of which are found in the literature or actual practice).

BROMELAIN

Dose: Controlled research supports the use of bromelain for the treatment of sinusitis. Therapeutic doses based on this research are difficult to discern because pharmaceutical units used to describe these doses are no longer in use and equivalencies in modern units are unknown. Nonetheless, current clinical authorities suggest at least 2000 MCU of bromelain per day up to as much as 9000 MCU per day (Gaby 1995. Murray 1999).

Bromelain potency is measured in enzyme units, typically MCU (milk-clotting units) or GDU (gelatin digesting units). One GDU is equivalent to 1.5 MCU. Product labels indicate enzyme activity per gram of bromelain concentrate and total weight of concentrate per tablet. These numbers must be multiplied together to arrive at total enzyme activity per tablet. For example, a product containing 200 mg tablets of 1800 MCU/gram bromelain provides 360 MCU per tablet.

Contraindication/Adverse reactions: Occasional gastric disturbances or diarrhea. Potential allergic reactions.

Efficacy: Several studies have suggested that bromelain may have a beneficial effect on sinusitis.

In one double-blind study comparing the use of bromelain with placebo, 87% of those patients who took bromelain reported good to excellent results compared with 68% of the placebo group (Ryan 1967). Two other double-blind studies also reported a reduction in sinusitis symptoms. Taub 1967, Seltzer 1967). Urtica diocia (Stinging Nettle)

Dose: For treatment of allergic rhinitis, a freeze-dried preparation of 300 mg b.i.d. or t.i.d. for a one week trial has been recommended (Werbach 1994). If effective, use as needed to alleviate allergic rhinitis component of sinusitis.

Contraindication/Adverse Reaction: None known**.**

Efficacy: Stinging Nettle has historically been used to alleviate symptoms of allergic rhinitis. To date only one small double-blind study has been done to substantiate this claim. It reported “moderate effectiveness” in controlling symptoms (Mittman 1990).

PANTOTHENIC ACID

In a small preliminary trial, supplementation with 250 mg of pantothenic acid two times a day was demonstrated to help most patients suffering from allergic rhinitis, a significant predisposing factor for sinusitis (Martin 1999).

VITAMIN C

The rationale for oral supplementation is speculative. Histamine is associated with increased nasal and sinus congestion. In one study, vitamin C supplementation (1,000 mg three times per day) reduced histamine levels in people with either high histamine levels or low blood levels of vitamin C (Clemetson 1980). Although preliminary evidence supports the use of vitamin C when injected into the sinuses of people suffering with acute sinusitis, the effect of oral vitamin C on symptoms of sinusitis has yet to be formally studied (Nikolaev 1994).

ECHINACEA AUGUSTIFOLIA AND ECHINACEA PURPUREA (PURPLE CONEFLOWER)

The role of Echinacea in treating *sinusitis* has not been studied. There is evidence suggesting that it is useful in treating the symptoms of rhinitis (Melchart 1994, Dorn 1997, Hoheisel 1997, Brinkehorn 1999) although it appears to have little to no effect in preventing upper respiratory infections (Grimm 1999, Melchart 1998).

Dose: For immune stimulation, the dose is generally given t.i.d. in any of the following forms:

- Dried root (or as tea): 0.5 to 1 g
- Freeze-dried plant: 325 to 650 mg
- Juice of aerial portion of E. purpurea in 22% ethanol: 1 to 2 ml
- Tincture (1:5): 2 to 4 ml (1 to 2 tsp)
- Fluid extract (1:1): 1 to 2 ml (0.5 to 1 tsp)
- Solid (dry powdered) extract (6.5:1 or 3.5% echinacoside): 100 to 250 mg

Contraindications/Adverse Reactions:

Echinacea should not be used in patients with autoimmune disease. Otherwise Echinacea is reported as an extremely safe herb with no reports of toxicity (Werbach 1994).

Rationale: Echinacea has historically been used to support and promote the natural powers of resistance of the body, especially in infectious conditions in the nose and throat (Blumenthat 1998). Numerous studies have shown that Echinacea has profound immunostimulatory effects resulting in enhanced T-cell mitogenesis, macrophage phagocytosis, antibody binding, and natural killer cell activity, as well as increased levels of circulatory neutrophils (Werbach 1994) .

N-ACETYLCYSTEINE (NAC)

Several members of the CSPE Committee report that NAC (600 mg twice daily) shortens the duration of a given episode of sinusitis. While there have been no studies testing the effect of NAC on patients with sinusitis, several studies have looked at NAC as a treatment for other respiratory illnesses. NAC has historically been used as a mucolytic agent in a variety of respiratory illnesses; however, clinical results are equivocal (Kelly 1998). Parr et al. gave either NAC or placebo to 526 patients suffering from chronic bronchitis for a six-month period. No statistically significant difference was found between the two groups in the number of acute exacerbations, but patients taking NAC showed a significant reduction in the number of days they were incapacitated (Parr 1980).

NAC appears to reduce symptomatology associated with influenza and influenza-like episodes. A total of 262 subjects were given either placebo or NAC (600mg) orally twice daily for six months. Although frequency of seroconversion towards A/HINI Singapore 6/86 influenza virus was similar in the two groups, NAC treatment decreased both the frequency and severity of influenza-like episodes, and the length of time confined to bed (DeFlora 1997).

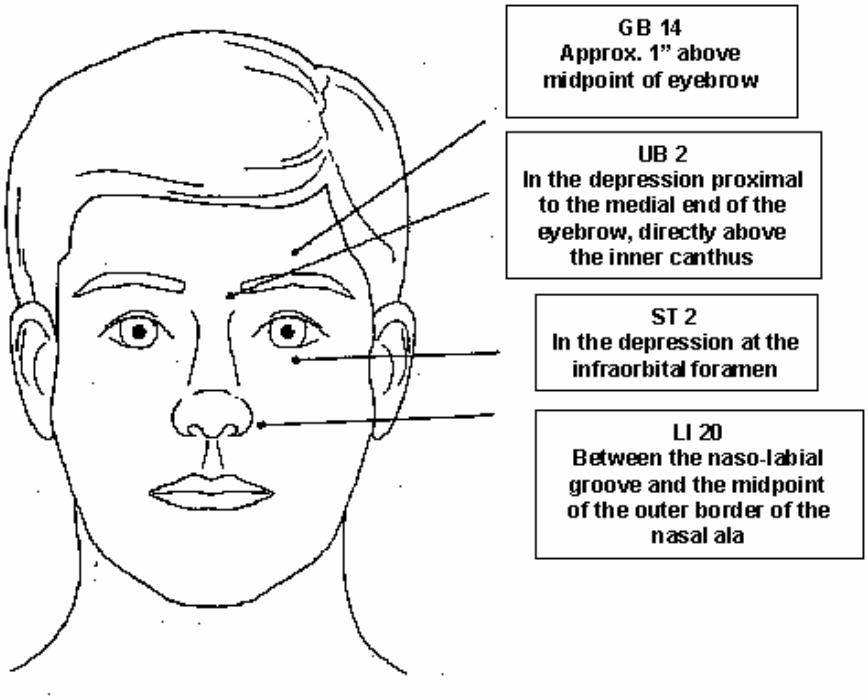
PREPARED FORMULAS

Members of the CSPE committee who employ botanicals/supplements in treating upper respiratory infections or sinusitis often use prepared formulas. These formulas contain various combinations of the following substances.

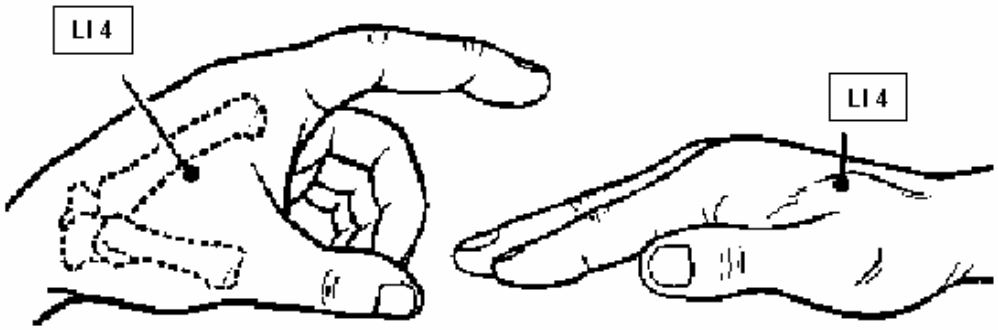
- Bromelain
- *Echinacea augustifolia* and *purpurea* (purple coneflower)
- Vitamin C

Appendix III: Acupressure Points for Sinusitis

Points are located bilaterally on the face and hands.



LI 4



Appendix IV: Rapid Diagnosis Reference Chart

(modified after Rosenfeld 2015 & Orlandi 2016)

Type of Rhinosinusitis (RS)	Definition	Diagnostic Criteria
Acute rhinosinusitis (ARS)	ARS is symptomatic inflammation of the paranasal sinuses and nasal cavity.	Sudden onset of symptoms and up to 4 weeks of **purulent nasal drainage** (anterior or posterior) [5]**or nasal obstruction/congestion**,[6] **and** **facial pain-pressure-fullness**,[7] or **reduction/loss of smell**.[8]
Viral rhinosinusitis (VRS)	ARS presumed to be caused by a viral infection.	Symptoms or signs of acute rhinosinusitis are present **less than 10 days** and the **symptoms are not worsening**
Acute bacterial rhinosinusitis (ABRS)	ARS presumed to be caused by a bacterial infection.	a. ARS **fails to improve within 10 days** or more beyond the onset of upper respiratory symptoms **or** b. symptoms or signs of ARS **worsen within 10 days** after an initial improvement (double worsening)
Subacute rhinosinusitis (*not a* common classification)	Probably slow to resolve ARS or an early presentation of CRS	Rhinosinusitis symptoms lasting between 4-12 weeks.
Chronic rhinosinusitis (CRS) Can be subdivided into *with* and *without* polyps.	Signs and symptoms of RS lasting 12 weeks or longer	≥2 of the following signs and symptoms: • **nasal mucopurulent drainage** (anterior, posterior, or both), • **nasal obstruction** (congestion), • **facial pain-pressure-fullness**, or • **decreased sense of smell**. **AND** inflammation is documented by one or more of the following findings: • **purulent mucus or edema** in the middle meatus or anterior ethmoid region,[9] • **polyps** in nasal cavity or the middle meatus,[5] and/or • **CT imaging** shows paranasal sinuses inflammation
Recurrent acute rhinosinusitis	≥4 episodes/year of ABRS without signs or symptoms between episodes	• each episode of ABRS should meet RS diagnostic criteria

[5] Anterior through the nasal passage or posterior into the pharynx.
[6] Nasal obstruction may be reported by the patient as nasal obstruction, congestion, blockage, or stuffiness, or may be diagnosed by physical examination.
[7] Facial pain-pressure-fullness may involve the anterior face, periorbital region, or manifest with headache that is localized or diffuse.
[8] In children cough is a much more significant symptom than is decreased sense of smell. The 4 most common symptoms identified in children with sinusitis are headache, nasal obstruction, postnasal drainage/rhinorrhea, and cough.
[9] Assessment is usually by endoscopy.

Appendix V: Low Salicylate Diet (Assembled by M. Puckey, BPharm on Aug 23, 2016)

Salicylate is a chemical found in aspirin and found in many foods. Patients with chronic RS combined with asthma may have a syndrome whose symptomatic episodes are triggered by exposure to salicylates. In some cases, following a strict diet which eliminates foods thought to be high in salicylates may be necessary. Note that some people who are allergic to salicylate are also allergic to yellow food dye #5 (tartrazine).

Summer et al (2016) report "Currently, there is a lack of consensus in the published literature regarding the salicylate content of foods. For dietary exclusion of high-salicylate foods to be considered, a diagnostic diet for 6 weeks should first be undertaken followed by reintroduction of foods to prove the efficacy of the exclusion. Prior to following a prolonged low-salicylate diet, consultation with a dietician may be advisable to ensure that individuals are not lacking any required nutrients on a long-term basis."

Beverages

Avoid	Allowed
Beer, birch beer, and root beer	Cereal drinks
Bubbly drinks (like soda pop)	Milk (any kind)
Regular coffee	Decaffeinated coffee
Tea	Pear juice (homemade)
Wine, port, rum and liqueurs	Whiskey, vodka or gin

Breads and Starches

Avoid	Allowed
Sweet Potato	Breads and cereals
	Noodles and pastas
	Peas
	Potato (white, peeled)
	Rice

Desserts / Sweets

Avoid	Allowed
Pies and cakes made with fruits	Homemade cakes & cookies made without fruits & jam
Mint or wintergreen products	

Fats

Avoid	Allowed
Almonds, peanuts and avocados	Butter and margarine
Mayonnaise	Cashews and poppy seeds
Olives and olive oil	Vegetable oils
Salad dressings	

Fruits

Avoid (including juices)	Allowed
Apples	Apples (golden delicious variety)
Apricots	Bananas
Berries: blackberries, boysenberries, raspberries, blueberries, cranberries and strawberries	Nashi pears
Cherries	Papayas
Currants	Pears (peeled)
Dates	Rhubarb
Gooseberries and huckleberries	
Grapes and raisins	
Kiwifruit	
Lemons	
Melon (all kinds)	
Oranges and mandarins	
Nectarines and peaches	
Pineapple	
Plums and prunes	
Pomegranates	

Vegetables

Avoid	Allowed
Alfalfa sprouts	Brussels sprouts
Asparagus	Cabbage
Beetroot	Celery
Broccoli and Cauliflower	Green beans
Chili	Iceberg lettuce
Cucumber	
Endive	
Olives	
Peppers (Capsicum)	
Radishes	
Tomatoes	
Zucchini	

Miscellaneous Foods

Avoid	Allowed
Cloves	Carob and cocoa
Mint or wintergreen flavorings	Malt vinegar
Pickles	Parsley
Red, white and cider vinegar	Salt
Aniseed, basil, bay leaf, chili powder, curry, coriander, nutmeg, vanilla essence and pepper	White sugar and maple syrup

From Drugs.com https://www.drugs.com/article/low-salicylate-diet.html

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