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GUIDELINE SUMMARY

EPOS Primary Care Guidelines: European Position Paper on the Primary Care Diagnosis and Management of Rhinosinusitis and Nasal Polyps 2007 – a summary

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Summary

This paper is a summary of the 2007 European Position Paper on Rhinosinusitis and Nasal Polyps (EP3OS)[1] which was published in *Rhinology* in 2007. In order to widen dissemination of the EP3OS paper, the editors of *Rhinology* and the *Primary Care Respiratory Journal (PCRJ)* have agreed to publish this summary – which is focussed on the needs of general practitioners and community-based non-specialist clinicians – in the *PCRJ*. In the EP3OS process, an evidence-based methodology was used to identify evidence and to grade recommendations for clinical practice for the management of rhinosinusitis. The EP3OS Taskforce was commissioned by the European Academy of Allergology and Clinical Immunology (EAACI) with the aims of:

- Presenting specialist and generalist clinicians with an updated summary of knowledge of rhinosinusitis and nasal polyposis
- Providing clinicans with an evidence-based summary of diagnostic methods appropriate for specialist and generalist settings
- Providing evidence-based recommendations for management in specialist and generalist settings
- Proposing guidance for definitions and outcome measurements in clinical practice and in research in different settings.

The current document aims to distil the information presented in the full EP3OS document[1] into a shorter and more concise format suitable for use in primary care generalist settings. The summary recommendations for generalists are that clinicians should be aware that rhinitis and sinusitis usually co-exist, and that management strategies should encompass this. Acute rhinosinusitis is an inflammatory condition that may be diagnosed on the basis of acute symptoms of nasal blockage, obstruction, congestion with or without facial pain or reduced smell; many episodes are self-limiting, but where symptoms persist or increase after five days, topical nasal steroids may be considered, with addition of antibiotics in patients with more severe or increasing symptoms. Non-resolution in 14 days, or the presence of atypical symptoms, should prompt consideration of referral to specialist care. Chronic rhinosinusitis occurs when symptoms have been present for >12 weeks, and anterior rhinoscopy or more detailed endoscopy should be performed to identify polyps. Topical nasal corticosteroids, nasal douching, and use of antihistamines in allergic patients, may be used in patients without, or with less symptomatic, polyps; referral to specialist care is needed for patients whose symptoms do not respond or who have large polyps.

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See Appendix A at www.thepcrj.org

1. Introduction

Methodology

An evidence-based methodology was used to locate and grade the evidence and recommendations presented in this position paper. Relevant papers were searched by systematic searches in the Cochrane Library, Medline, and Embase from 1960 until April 2007. Evidence from these studies was assessed and graded by members of the EP3OS taskforce in working groups. Languages were limited to English, German, and French. Apart from the systematic search, hand searches were made and references found in the papers were reviewed. General search terms for the population were: MESH (Medical Subject Heading) terms "Sinusitis", "Ethmoid-Sinusitis", "Frontal-Sinusitis", "Maxillary-Sinusitis", "Sphenoid-Sinusitis", "Paranasal-Sinuses", "Ethmoid-Sinus", "Frontal-Sinus", "Maxillary-Sinus", "Sphenoid-Sinus" or "Nasal-Polyps. Furthermore, free text words – sinusitis, rhinosinusitis, nasal polyps and nasal polyps – were used for the searches.

Evidence is categorised as Ia (from a meta-analysis of randomised controlled trials, RCT), Ib (from at least one RCT), IIa (from at least one controlled study without randomisation), IIb (from at least one other type of quasi-experimental study), III (from non-experimental descriptive studies such as comparative studies, correlation studies and case-control studies) and IV (from expert committee reports or clinical experience of respected authorities or both). Recommendations are graded by strength as A (directly based on category I evidence), B (directly based on category II evidence or extrapolated from category I evidence), C (directly based on category III evidence or extrapolated from category I or II evidence) and D (directly based on category IV or extrapolated from category I,II or III evidence).

Background

This evidence-based guideline for the diagnosis and treatment of rhinosinusitis and nasal polyposis provides primary care generalists with a concise description of the epidemiology, pathophysiology, diagnosis and management of rhinosinusitis and nasal polyps. Rhinitis usually co-exists with sinusitis and the most effective diagnostic and management strategies address both, thus affirming the use of the term rhinosinusitis. Patients with acute or chronic rhinosinusitis may visit generalists or allergists, otolaryngologists and pulmonologists, but the majority of care for rhinosinusitis takes place in primary care.

Based on the 2007 European Position Paper on Rhinosinusitis and Nasal Polyps (EP3OS)[1] produced by a group of ENT surgeons, rhinologists, allergists and primary care physicians under the auspices of the European Academy of Allerology and Clinical Immunology (EACCI), this document summarises the issues related to rhinosinusitis most relevant to primary care. This document:

- Defines rhinosinusitis and nasal polyp syndromes as they present in the community
- Updates information on rhinosinusitis and nasal polyps
- Provides evidence-based recommendations for diagnosis and treatment of rhinosinusitis across different age groups
- Explores the impact of upper airways disease on lower airways conditions
- Identifies timely investigations and specialist referrals.

2. Definitions

Rhinosinusitis (including nasal polyps) is defined as:[1]

- Inflammation of the nose and the paranasal sinuses characterised by two or more symptoms, one of which should be either nasal blockage/obstruction/congestion or nasal discharge (anterior/posterior nasal drip):
  - ± facial pain/pressure,
  - ± reduction or loss of smell;

The disease severity can be divided into MILD (0-3), MODERATE (4-7) and SEVERE (8-10) using a 10-point scoring system or visual analogue scale (VAS) (Figure 1).

A VAS score of >5 has been shown to adversely affect a patient's quality of life.[2]

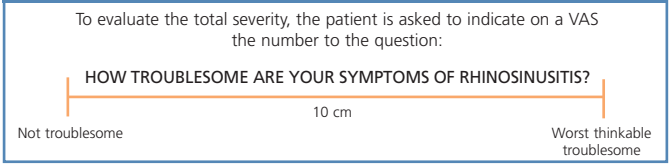
Acute rhinosinusitis (ARS) is defined as symptoms lasting less than 12 weeks with complete resolution and can be sub-divided into:[1]

- Common cold/acute viral rhinosinusitis (defined by duration of symptoms of less than 10 days, and
- Acute non-viral rhinosinusitis (defined by an increase of symptoms after five days or persistent symptoms after 10 days with less than 12 weeks duration)

Chronic rhinosinusitis (with or without nasal polyps) is defined as more than 12 weeks of symptoms without complete resolution of symptoms (NB – chronic rhinosinusitis may also be subject to exacerbations) and can be sub-divided into:

- Chronic rhinosinusitis with nasal polyps and
- Chronic rhinosinusitis without nasal polyps;

Figure 1. Visual analogue scale for symptom severity.



3. Anatomy and (patho)physiology

3.1 Anatomy

The nose and paranasal sinuses constitute a collection of air-filled spaces within the anterior skull. The paranasal sinuses

communicate with the nasal cavity through small apertures.

The nasal cavity and its adjacent paranasal sinuses are lined by pseudostratified columnar ciliated epithelium and secrete mucus. Particles and bacteria can be caught in this mucus, rendered harmless by enzymes, and can be transported down towards the oesophagus. Cilia play an important role in mucus transport.

The ostiomeatal complex, a functioning unit that comprises the various sinus ostia, plays a fundamental role in clearing of the paranasal sinuses with mucus moving through these small orifices. Problems occur when the orifice is too small for the amount of mucus, such as during times of increased mucus production (such as an upper respiratory tract infection – URTI) or if the tissue is inflamed making the orifice smaller or if ciliary function is impaired. Stasis of secretions follows and bacterial export ceases, causing a vicious cycle of further inflammation and ciliary dysfunction that can lead to acute bacterial infection and in time to chronic rhinosinusitis.

3.2 Pathophysiology

Rhinosinusitis is an inflammatory process affecting the mucosa of the nose and sinuses often associated with mucociliairy impairment,[3,4] (bacterial) infection,[5] allergy,[6] or rarely physical obstructions or anatomical variations.[7,8]

Nasal polyps appear as grape-like structures in the upper nasal cavity, originating from within the ostiomeatal complex. They consist of loose connective tissue, oedema, inflammatory cells (predominantly eosinophils) and some glands and capillaries, and are covered with varying types of epithelium. Why this ballooning of tissue occurs to form polyps in a subset of people with chronic rhinosinusitis is unknown.[9] Nasal polyps have a strong tendency to recur after surgery even when aeration is improved.[10] There is a definite relationship in patients with 'Samter's triad' – asthma, NSAID sensitivity and nasal polyps – although not all patients with NSAID sensitivity have nasal polyps, and vice-versa.

4. Epidemiology and predisposing factors

4.1 Epidemiology of acute rhinosinusitis

Rhinosinusitis is one of the most common reasons for a visit in general practice. It is estimated that adults suffer between two and five "colds" (episodes of acute viral rhinosinusitis) per year, and school children may suffer seven to 10 episodes each year.

Acute non-viral rhinosinusitis (ARS) is defined as:

- an increase in symptoms after five days or
- persistent symptoms after 10 days from a sudden onset of two or more of the symptoms:
  - nasal blockage/congestion,
  - anterior discharge/postnasal drip,
  - facial pain/pressure,
  - and/or reduction/loss of smell.

Despite the lack of association with bacterial infection, sinusitis is the fifth most common diagnosis for which antibiotics were prescribed in the US, accounting for 9% and 21% of all paediatric and adult antibiotic prescriptions respectively.[4]

4.2 Role of infection in acute rhinosinusitis

Bacterial infection complicates only 0.5% to 2% of viral URTIs, bacteria are present in only 60% of ARS cases[11] and in most instances resolve spontaneously.[12,13] In patients with a clinical diagnosis of ARS, less than half have significant abnormalities at X-ray examination.[14] The most common bacterial species isolated from the maxillary sinuses of patients with ARS are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*, the latter being more common in children.[15,16] Other streptococcal species, anaerobic bacteria and Staphylococcus aureus cause a small percentage of cases. Resistance patterns of the predominant pathogens vary considerably.[17,18]

Viral infection results in the loss of cilia and ciliated cells, reaching a maximum around one week after the infection.[19] Ciliary action is the most effective natural defence against ARS.

4.3 Allergy and rhinosinusitis

The association of ARS and allergy and atopy has not been clearly defined.[20]

4.4 Chronic rhinosinusitis (CRS)

The wide variations of definitions of CRS makes it difficult to estimate accurately the prevalence of CRS. A survey response to the question, 'Have you had sinusitis diagnosed by a health professional and lasting for more than six months?' provided estimates of from 2.7% and 6.6% of the population, increasing with age.[21]

4.5 Asthma and CRS

The concept of a unified airway with centrally mediated mechanisms that can affect both the nose and lungs supports the frequent association of asthma and rhinosinusitis.[22,23] However, their inter-relationship is poorly understood.

4.6 Other factors affecting CRS

Other host factors and environmental factors may increase the likelihood of developing RS. Common factors include immunosupression, cystic fibrosis, Kartaganer's Syndrome, hormonal problems (e.g. hypothyroidism), cigarette smoking and low income.[24]

4.7 Chronic rhinosinusitis and nasal polyps

Large nasal polyps (NP) can be visualised by anterior rhinoscopy, whereas smaller polyps require nasal endoscopy. Estimates of the population-prevalence of NP have been reported to be as high as 2.7%[25] with between 0.2% and 1% of all people developing NPs at some time.[26] There are no racial differences in prevalence but the presence of NPs

increase with age (mean 42 years)[26] and are more frequently found in men.[27,28]

4.8 Rhinosinusitis in children

Few studies are available to clarify the epidemiology of RS in children. "Pathological" CT scans have been reported in up to 30% of children aged one to six years,[29] dropping to 15% in those children six to 12 years of age. In the two weeks after an "URTI", less than 50% of sinus radiographs were considered "clear". Day care,[30] nasal obstruction, passive smoking,[31] and tonsillitis or otitis media[32] may increase the risk of RS. Breast feeding has not been found to be protective.[33]

5. Inflammatory mechanisms

Rhinosinusitis appears to be a heterogeneous group of diseases. It is currently not understood whether acute recurrent rhinosinusitis necessarily develops into chronic rhinosinusitis, which then possibly gives rise to polyp growth, or whether these entities develop independently from each other.

In the acute setting, the common cold and other viral URTIs are commonly presumed to be the triggering event. Common cold symptoms are usually short-lived with a peak of severity at 48 hours with limited inflammation; the course of ARS with or without secondary bacterial infection appears longer, involving a not fully understood immune response and a complex and varied inflammatory reaction. It is possible that interactions and co-operation between viruses and bacteria and bacterial biofilms may play an important role in some cases. Tissue eosinophilia may occur in CRS,[34] and shows some relationship to severity prognosis and polyp development, which are rich in eosinophils. Various cellular elements including eosinophils, neutrophils, mast cells, macrophages and lymphocytes; with a range of mediators including cytokines (e.g. IL-1, IL-6, IL-8, TNF-α, IL-3, GM-CSF, ICAM-1, MPO and ECP), and chemokines (e.g. RANTES and eotaxin) have been described in CRS. Leukotrienes and their receptors have been shown to be up-regulated in nasal polyp tissue. There is a great deal of research examining the immunological mechanisms underlying ARS, CRS and nasal polyps that may identify future therapies and specific phenotypes, but has minimal current practical impact on the community diagnosis and management.

6. Rhinosinusitis symptoms and their assessment

6.1 Symptoms of rhinosinusitis

Subjective assessment of rhinosinusitis is based on symptoms:

- nasal blockage, congestion or stuffiness
- nasal discharge or postnasal drip, often mucopurulent
- facial pain or pressure, headache, and
- reduction/loss of smell.

Other respiratory symptoms may include pharyngeal, laryngeal and tracheal irritation causing sore throat, dysphonia and cough. More systemic symptoms such as drowsiness, malaise and fever may also occur. Symptoms are similar with ARS, CRS, with or without polyps, but may vary in pattern and intensity, with more specific and intense symptoms in ARS. Nasal polyps may cause nasal congestion, acting as one-way valves to limit airflow and increasing the likelihood of smell disorders.[35] A template may help structure review and recording of these symptoms. (see Figure 3, Appendix A, at www.thepcrj.org)

6.1.1 Nasal obstruction

Assessing the degree of nasal obstruction is often based on patient report which can vary widely and be influenced by feelings of congestion and "pressure". Nasal peak flow provides an objective and reproducible assessment but is seldom used in primary care practices despite the ease of use and low cost of the personal nasal peak flow meter which is portable, thus allowing repeated measures at home, worksite or health care office.

Rhinomanometry,[36] acoustic rhinometry and rhinostereometry[37] are available in some specialists' offices.

6.1.2 Nasal discharge

No objective measures of the quality or quantity of nasal discharge exist but attempts should be made to assess and record the character, amount and pattern of nasal discharge over time.

6.1.3 Smell abnormalities

Several mechanisms may lead to smell disorders including mucosal obstruction of the olfactory niche (conductive loss) and/or degenerative alterations in the olfactory mucosa due to the disease or its treatment.

A history of smell sensation disturbance including patterns over time should be elicited and documented. In specialist settings objective olfaction testing is possible.[37]

6.1.4 Facial pain and pressure

Facial or dental pain, especially unilateral pain, is associated with acute maxillary sinusitis.[38]

6.1.5 Overall rating of rhinosinusitis severity

Several validated tools use a combination of symptoms and their impact on a person's quality of life to assess overall severity of ARS or CRS,[39,40] but most are currently too time consuming for use in clinical practice. The Visual Analogue Score (Figure 1) is simple to use and is currently undergoing validation.

6.2 Examination

6.2.1 Anterior rhinoscopy

Anterior rhinoscopy may miss small nasal polyps but is required for all patients with chronic nasal disease. If diagnostic doubt exists refer patients for nasal endoscopy.

6.2.2 Imaging

Imaging studies are not recommended for the routine diagnosis and management of rhinosinusitis since plain sinus x-rays yield many false positive and false negative results.[41,42] CT scans, the imaging modality of choice, should be used when signs or symptoms are unilateral or suggestive of more serious conditions.

7. Management (see Tables 1-5 and Figures 2,4-6)

7.1 Treatment of rhinosinusitis with corticosteroids

7.1.1 Acute rhinosinusitis

The biggest question in treating is whether to use intra-nasal corticosteroids alone or in combination with antibiotics. The data on corticosteroid monotherapy are limited but one study has shown that twice-daily topical steroids (mometasone 200 mcg twice daily) was effective in treating ARS and more effective than therapy with oral antibiotics.[43] A number of other studies have shown that nasal corticosteroids provide additional efficacy (reduced symptoms but not x-ray improvements) when added to antibiotics, including positive studies using budesonide as a complement to erythromycin.[44-49] Oral corticosteroids have also been investigated in ARS with little evidence to support their use other than for pain relief. Overall, the evidence (grade I) supports the use of nasal corticosteroids both as monotherapy and as adjunctive therapy for ARS. There is little evidence to support prophylactic use of nasal corticosteroids to prevent recurrence of ARS episodes.[50]

7.1.2 Chronic rhinosinusitis without nasal polyps

The results of studies on the use of topical corticosteroids in CRS without polyps are mixed[51-55] and there is no evidence to support the use of oral corticosteroids in CRS without nasal polyps.

7.1.3 Chronic rhinosinusitis with NP

Topical intra-nasal corticosteroids have shown to be effective in reducing polyp size, symptoms of nasal blockage, secretion and sneezing in people with CRS and NP.[56-58] Nasal drops appear to be more effective than sprays and are more likely to improve smell disorders (evidence Ib). Systemic corticosteroids have traditionally been used in patients with NP although there is only limited evidence from placebo-controlled studies to support this strategy.[59,60]

7.1.4 Safety of nasal corticosteroids

Much attention has focused on the safety of intranasal application. Intra-nasal corticosteroids are occasionally associated with minor nose bleeding but nasal biopsy studies show no detrimental structural effects following long-term use.[61]

The systemic bioavailability of intranasal corticosteroids (INS) varies from <1% to up to 40-50% of the dose given.[62] Although potential adverse events might include slowed growth, ocular effects, effects on bone, and hypothalamic-pituitary-adrenal axis suppression, observed effects have been very small (mainly minimal growth suppression in children) even with long term use and follow-up. Studies with the newer INS that have low systemic bioavailability have found no systemic effects, thus providing reassurance that judicious use of INS is safe even when also treating asthma with inhaled corticosteroids.[63] While short bursts of oral corticosteroids are probably safe and effective in CRS, repeated or prolonged use significantly enhances the risk of side effects.

7.2 Treatment of rhinosinusitis with antibiotics

7.2.1 Acute community acquired rhinosinusitis

Current evidence provides limited supports for the use of penicillin or amoxicillin for seven to 14 days in treatment of ARS. Antibiotics have been shown to result in clinical cures in about 82% of patients compared to 69% cures with placebo therapy. Clinicians should weigh the moderate benefits of antibiotic use in ARS against the potential for side effects[64] and risk of enhancing antibacterial resistance. Signs suggesting more serious infection – such as a fever of >38 deg C and severe headache – should prompt antibiotic therapy where the choice of agent will depend on local resistance patterns.

Of the more than 2000 studies on the antibiotic treatment of ARS, only 49 meet the Cochrane Board criteria for use in a meta-analysis.[64] Overall data showed a relative risk (RR) of 1.72 [CI 95% 1.00 to 2.96] for cure with use of antibiotic therapy. No improved outcomes (82% cures) were seen using newer antibiotics such as cephalosporins, macrolides,

Table 1. Treatment evidence and recommendations for adults with acute rhinosinusitis.

Therapy	Level	Grade of recommendation	Relevance
Oral antibiotic	Ia	A	yes: after 5 days, or in severe cases
Topical corticosteroid	Ib	A	yes
Topical steroid and oral antibiotic combined	Ib	A	yes
Oral corticosteroid	Ib	A	yes reduces pain in severe disease
Oral antihistamine	Ib	B	yes, only in allergic patients
Nasal douche	Ib (-)#	D	no
Decongestant	Ib (-)#	D	yes, as symptomatic relief
Mucolytics	none	no	no
Phytotherapy	Ib	D	no

: (Ib) study with a negative outcome

Table 2. Treatment evidence and recommendations for adults with chronic rhinosinusitis without nasal polyps.

Therapy	Level	Grade of recommendation	Relevance
Oral antibiotic therapy short term <2 weeks	Ib (-)	C	no
Oral antibiotic therapy long term >12 weeks	Ib (-)	A	yes
Antibiotics - topical	III	D	no
Steroid - topical	Ib (-)	A	yes
Steroid - oral	no data	D	no
Nasal saline douche	Ib (-)	A	yes
Decongestant oral / topical	no data	D	no
Mucolytics	III	C	no
Antimycotics - systemic	Ib (-)#	D	no
Antimycotics - topical	Ib (-)#	D	no
Oral antihistamine in allergic patients	no data	D	no
Proton pump inhibitors	no data	D	no
Bacterial lysates	Ib (-)	A	no
Immunomodulators	Ib (-)#	D	no
Phytotherapy	Ib (-)#	D	no
Anti-leukotrienes	III	C	no

: (Ib) study with a negative outcome

Table 3. Treatment evidence and recommendations for adults with chronic rhinosinusitis with nasal polyps.

Therapy	Level	Grade of recommendation	Relevance
Oral antibiotics short term <2 weeks	no data	D	no
Oral antibiotics long term >12 weeks	no data	D	yes, for late relapse
Topical antibiotics	no data	D	no
Topical steroids	Ib	A	yes
Oral steroids	Ib	A	yes
Nasal douche	Ib no data in single use	A	yes for symptomatic relief
Decongestant topical / oral	no data in single use	D	no
Mucolytics	no data	D	no
Antimycotics - systemic	Ib (-)#	D	no
Antimycotics - topical	Ib (-)#	A	no
Oral antihistamine in allergic patients	Ib (I)#	A	no, in allergy
Capsaicin	II	B	no
Proton pump inhibitors	II	C	no
Immunomodulators	no data	D	no
Phytotherapy	no data	D	no
Anti-leukotrienes	III	C	no

Some of these studies also included patients with CRS without nasal polyps

: (Ib) study with a negative outcome

minocycline versus penicillins (amoxicillin, penicillin V).

7.2.2 Antibiotics in chronic rhinosinusitis

The data supporting the use of antibiotics in CRS are limited with no placebo-controlled trials available.

A number of clinical reports have stated that long-term, low-dose macrolide antibiotics are effective in treating CRS incurable by surgery or glucocorticosteroid treatment,[65-67] with two recent controlled trials supporting macrolide treatment.[68,69] The exact mechanism of action is not known, and futher placebo-controlled are required and urgently needed to confirm this observation.

7.3 Other medical management for rhinosinusitis

In addition to use of antibiotics and intra-nasal steroids, usual therapy for ARS and CRS often includes short-term

decongestant use during acute episodes. Other therapies have very little evidence of efficacy but are in common use in certain regions or among certain groups of patients or clinicians. These include antral washings, isotonic/hypertonic saline as nasal douche, antihistamines, antimycotics, mucolytic agents/phytomedical preparations, immunomodulators/immunostimulants and bacterial lysate preparations. For selected patients with CRS and gastroesophageal reflux, treatment of reflux disease has shown benefit for ARS or CRS.

7.3.1 Decongestants

Nasal decongestants have been shown to improve congestion in the inferior and middle turbinates but not in the ethmoidal or maxillary sinuses.[70,71] Decongestants may have indirect beneficial effects on inflammation[72] and improving mucociliary clearance[73] but have not been shown to be superior to saline, when added to antibiotic and antihistamine treatment in children with ARS.[74] No evidence is available on the use of decongestants in CRS with or without NP.

Decongestant use is associated with tachyphylaxis after five to seven days, resulting in rebound, and may lead to rhinitis medicamentosa.[75]

7.3.2 Antihistamines, cromones

Oral antihistamines may reduce symptoms in adult patients with allergic rhinitis[76] but were not helpful in treating children with ARS.[74] Cromolyn sodium was no better than saline when use in ARS.[77]

Antihistamines may have a role in symptomatic postoperative treatment of recurrent polyposis but have no impact on polyp size (evidence Ib).[78] Although commonly prescribed, there is no evidence of benefit from antihistamine treatment for CRS.

7.4 Surgery for rhinosinusitis

Sinus surgery is generally reserved for people with CRS with and without polyps. Please see the full EPOS document[1] for a full discussion of surgery in rhinosinusitis.

For most CRS patients, appropriate medical treatment is as effective as surgery, and sinus surgery should be reserved for patients who do not satisfactorily respond to medical treatment and should be combined with medical therapy both pre- and post-operatively.[79] Surgery may be useful in the treatment of complications of acute rhinosinusitis.

8. Complications of rhinosinusitis and nasal polyps

The complications of RS are defined as orbital, osseous and endocranial.[80] Since the introduction of antibiotics, the rate of complications has declined. However, when they do occur they may be sudden in onset and associated with marked morbidity or even occasional mortality.[81] In patients with acute bacterial rhinosinusitis with intracranial spread, morbidity can be as high as 5-10%; these patients should be considered as medical emergencies requiring immediate hospitalisation.

8.1 Orbital complications

Orbital involvement is one of the most common complications of RS, especially involving the ethmoid sinuses, and is manifested by swelling, exophthalmos, and impaired extra-ocular eye movements.[82] Periorbital or orbital cellulitis may result from direct or vascular spread of the sinus infection and usually progress or present with these progressively more severe stages:

- periorbital cellulitis (preseptal edema),
- orbital cellulitis,
- subperiosteal abscess,
- orbital abscess or phlegmon and
- cavernous sinus thrombosis.

Spread of infection from the maxillary or frontal sinus produces swelling of the lower or upper eyelid, respectively.

8.2 Endocranial complications

The clinical presentation of all these complications is non-specific, being characterised by high fever, frontal or retro-orbital migraine, generic signs of meningeal irritation and by various degrees of altered mental state. Complications include meningitis (most common), epidural or subdural abscesses, brain abscess, cerebritis, and cavernous sinus thrombosis, often heralded by signs of increased intracranial pressure, meningeal irritation, and focal neurologic deficits.[82]

8.3 Cavernous sinus thrombosis

This rare and dramatic complication of sinusitis should be considered in the presence of bilateral lid drop, exophthalmos, ophthalmic nerve neuralgia, retro-ocular headache with deep pain behind the orbit, complete ophthalmoplegia, papilloedema and signs of meningeal irritation associated with spiking fevers and prostration.

9. Rhinosinusitis in children

9.1 Epidemiology and pathophysiology

Rhinosinusitis is a common and commonly-overlooked problem in children.

The prevalence increases after age six to eight years, and in temperate climates is more common during the autumn and winter.[83] The risk also increases with day-care attendance in young children.

9.2 Symptoms and signs

Three patterns of symptoms should alert a clinician to the possibility of RS:

1. A cold with nasal discharge, daytime cough worsening at night that lasts longer than 10 days
2. A cold that seems more severe then usual (high fever, copious purulent discharge, peri-orbital oedema and pain)

Table 4. Treatment evidence and recommendations for children with acute rhinosinusitis.

Therapy	Level	Grade of recommendation	Relevance
Oral antibiotic	Ia	A	yes: after 5 days, or in severe cases
Topical corticosteroid	IV	D	yes
Topical steroid on top of oral antibiotic	Ib	A	yes
Topical decongestant	III (-)	C	no
Saline douching	IV	D	yes

Table 5. Treatment evidence and recommendations for children with chronic rhinosinusitis.

Therapy	Level	Grade of recommendation	Relevance
Oral antibiotic	Ia	A	yes, small effect
Topical corticosteroid	IV	D	yes
Saline douching	III	C	yes
Therapy for gastro-oesophageal reflux	III	C	yes

3. A cold that was improving but suddenly worsens (with or without fever).

9.3 Management (see Table 4)

Uncomplicated acute rhinosinusitis in children usually only needs symptomatic treatment.

9.3.1 Topical or oral decongestants

Topical β2-agonists (xylo- and oxymetazoline) are the preferred decongestant in children. Careful dosage is important when treating infants and young children, to prevent toxic manifestations.

9.3.2 Nasal douching

Saline nose drops or sprays are popular with paediatricians and isotonic saline at body temperature may decrease nasal secretions and nasal oedema. However, prepared nasal saline can be expensive.

9.3.3 Antibiotics

Antibiotics for persistent nasal discharge reduce the persistent of short and medium term symptoms but eight children are needed to be treated for every one improved (NNT=8, [CI 95% 5 to 29]).[84] No long term benefits were documented. Antibiotics should be reserved largely for severe disease.

9.3.4 Topical corticosteroids in ARS

Topical corticosteroids may be effective in reducing cough and nasal discharge when used in conjunction with antibiotics for ARS in children.[85] There are a large number of studies showing that local corticosteroids are safe in children with rhinitis.[86-90]

9.4 Management of chronic rhinosinusitis in children (see Table 5)

In the young child, CRS usually resolves spontaneously and complications are uncommon, so treatment is not usually required. When treatment is needed, local corticosteroids may be used – although no data exists and the recommendations to use topical steroids is extrapolated from effectiveness and safety studies in children with ARS (Level IV).

10. Chronic rhinosinusitis with or without nasal polyps in relation to the lower airways

The nose is the entry to the airway and plays a crucial role in lower airway homeostasis by warming up, humidifying and filtering incoming air. Blockage of the nose redirects air through the mouth, bypassing the important nasal functions. Additionally the nose and bronchi seem to communicate via mechanisms such as neural reflexes and systemic pathways.

10.1 Asthma and chronic rhinosinusitis

Asthma is a co-morbid condition of CRS with up to 50% of CRS patients having asthma[91,92] or bronchial hyperreactivity after methacholine challenge.[92] Conversely, RS symptoms are commonly reported among people with asthma (up to 80%). Endoscopy sinus surgery (ESS) for CRS improves bronchial symptoms and reduces medication use for bronchial asthma.[92]

One percent of the general population and 10% of people with asthma have aspirin-induced asthma characterised by the triad of aspirin sensitivity, asthma and nasal polyposis.[93] After endoscopic sinus surgery for NP in patients with concomitant asthma, a significant improvement in lung function and a reduction of systemic steroid use has been reported.[94]

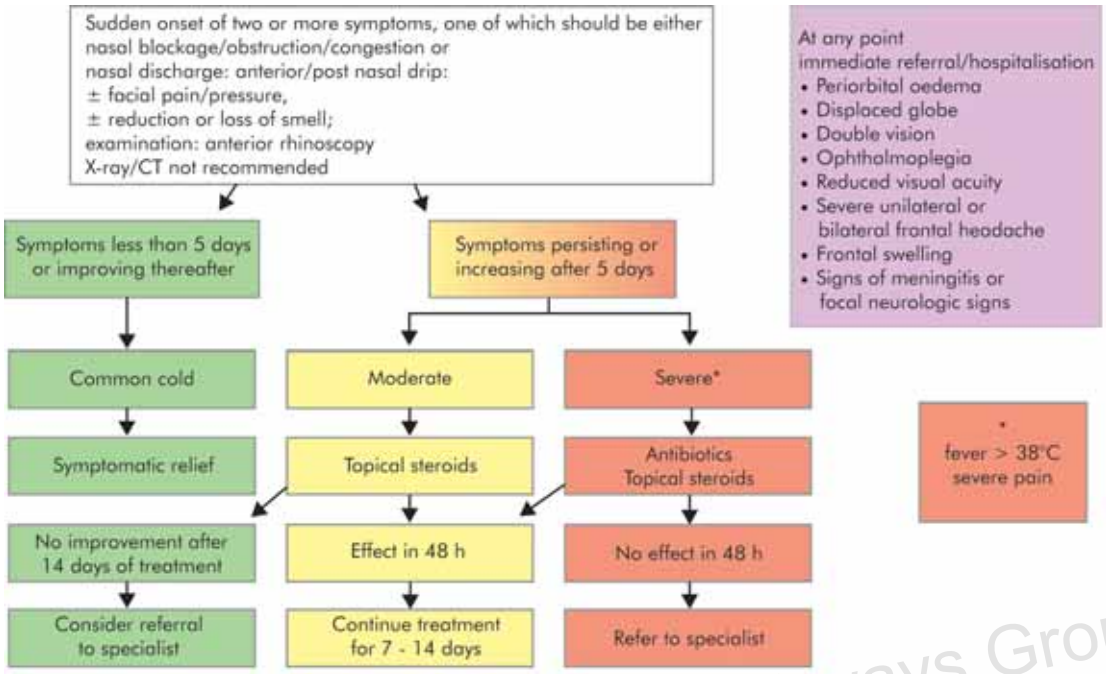
10.2 COPD and rhinosinusitis

Up to 88% of patients with COPD have reported experiencing nasal symptoms, most commonly rhinorrhoea,[95] and these symptoms are correlated with overall quality of life.[95] No information is available on the nasobronchial interaction in COPD patients.

11. Evidence-based schemes for diagnosis and treatment

The schemes for diagnosis and treatment of ARS and CRS (see Figure 2 and also Figures 4-6, Appendix A, at www.thepcrj.org) were developed from a critical evaluation of available evidence. Tables 1-5 give the level of evidence for

Figure 2. Evidence-based management scheme for adults with acute rhinosinusitis



studies with a positive outcome and well-powered studies with negative outcomes. "Ib (-)" denotes a well-designed study with a negative outcome. The grade of recommendation for the available therapies are given with relevance indicated (e.g. whether the group of authors think this treatment is relevant in the indicated disease). A template for the primary care diagnosis and coding of acute rhinosinusitis is shown in Figure 3 (see Appendix A at www.thepcrj.org) and with Read and ICD codes for international use.

Conflict of interest declaration

MT has received honoraria for consultancy work and speaker fees from Schering Plough. BY has received research grants from Schering Plough, AstraZeneca and Merck. DP has received honoraria for consultancy work and speaker fees from Schering Plough and GSK. VI and WF have no conflicts of interest.

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Appendix A

Figure 3. Data recording template for acute rhinosinusitis (displaying numerical Read and ICD (red) codes.

READ CODE	PROMPT	AGE & SEX	READ CODE	CODED SUBSETS	Free text / numeric	Comments and rules
	Overall diagnosis -select one	0-140				
			H01..00	Acute sinusitis 461.9		
			H010.00	Acute maxillary sinusitis 461.0		
			H011.00	Acute frontal sinusitis 461.1		
			H012.00	Acute ethmoidal sinusitis 461.2		
			H014.00	Acute rhinosinusitis no code		
			H01y000	Acute pansinusitis 461.8		
			H00..00	Acute nasopharyngitis 460		
			H051.00	Acute upper respiratory tract infection 460		
			H053.00	Tracheopharyngitis - Acute Pharyngitis 462		
			H054.00	Recurrent upper respiratory tract infection no code		
			H055.00	Pharyngolaryngitis 465.0		
			H05z.12	Viral upper respiratory tract infection NOS no code		
	Symptoms of nasal blockage/obstruction/c	0-140				
			1C82.00	Nasal obstruction present 478.1	on examination	absent default
			H1y1z12	Nasal congestion 478.1	symptom	
	Symptoms of nasal discharge/anterior/pos	0-140				
			1C83.00	Nasal discharge present 478.1		absent default
			2D26.00	Postnasal discharge refers to sinusitis		
	Facial pain / pressure yes?	0-140				
			R040000	[D]Facial pain 784.0		absent default
	Reduction/loss of sense of smell?	0-140				
			Z7C2311	Able to recognise smells 781.1		Select one first default
			ZV41500	[V]Problem with smell or taste 781.1		
			1B45.00	Anosmia - loss of smell sense 781.1		
	Temperature	0-140				
			2E31.00	O/E - temperature normal ? No code		Select one first default
			2E3..11	O/E - temperature level 780.6		this requires a numeric entry
			165..12	Pyrexia symptoms 780.6		
	Prior history of rhinitis and chronic rhinosinu	0-140				
			H17..00	Allergic rhinitis 477.9		absent default
			H17..11	Perennial rhinitis 472.0		
			H13..11	Chronic rhinosinusitis No code		
	Time off work / school	0-140				
			13JX.00	Time off work No code	default 0	
	Duration of symptoms in days	0-140				
			1D3..00	Time since symptom started No code	default 0	
	Any advice given	0-140				
			ZG81.00	Advice to read information ?	default free text "acute rhinosinusitis"	
			8CA..00	Patient given advice ? you would only use the diagnosis that you provided the counseling on	default free text "verbal advice"	
	Red Flags					
SP3..00	Medical care complication NEC	0-140				
	Facial or eye swelling		22C9.00	O/E - periorbital oedema 376.33		absent default
			F4G3600	Exophthalmos due to lateral displacement of globe 376.30		absent default
			16J5.00	Facial swelling ? No code		absent default if used default
	Vision normal / abnormal		668A.00	Normal vision No code		select this or one of next two - this one default
			668B.00	Poor visual acuity 369.9		
			1B72.00	Diplopia/double vision 368.31		
	Eye movements normal / abnormal		2BJ1.00	O/E - eye movements normal No code		select this or next one - this one default
			F4Jy.00	Other disorders of binocular eye movements 368.31		
	? Severe Headache		1BA1.00	No headache No code		select this or one of next two - this one default
			1BB..00	Headache character No code	default free text "severe"	
			1BA5.00	Frontal headache No code	default free text "severe"	
				Just headache - 784.0		

Figure 4. Evidence-based management scheme for adults with chronic rhinosinusitis

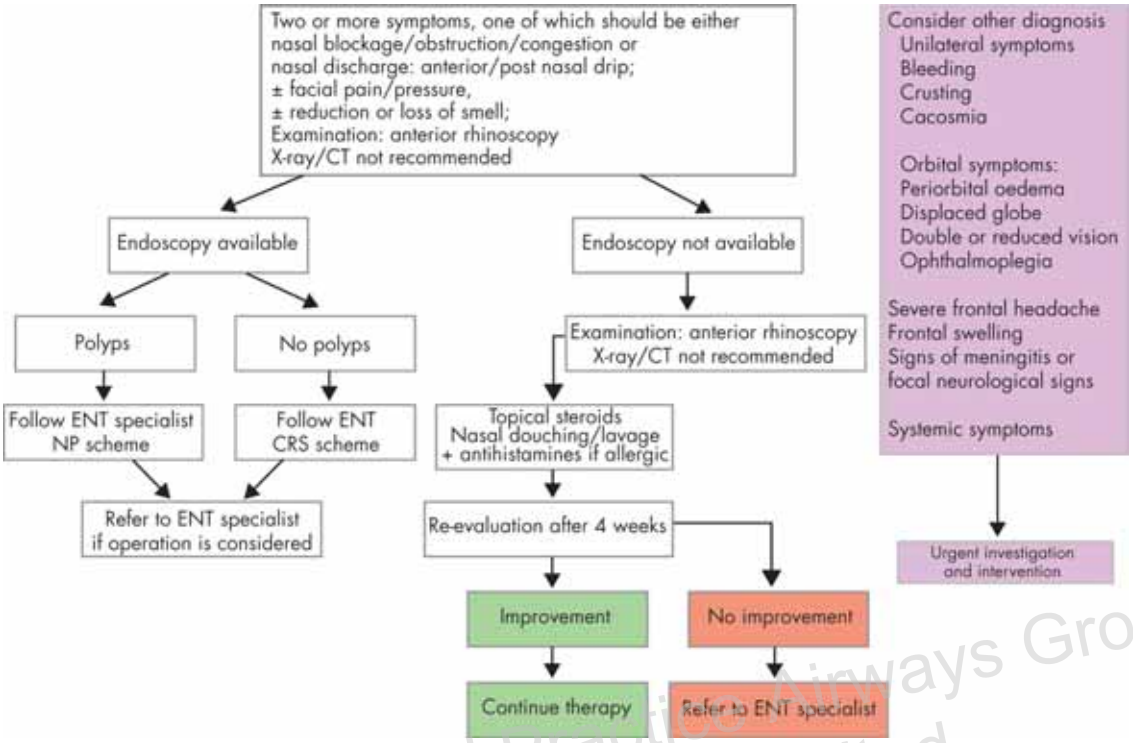

Figure 5. Evidence-based management scheme for children with acute rhinosinusitis

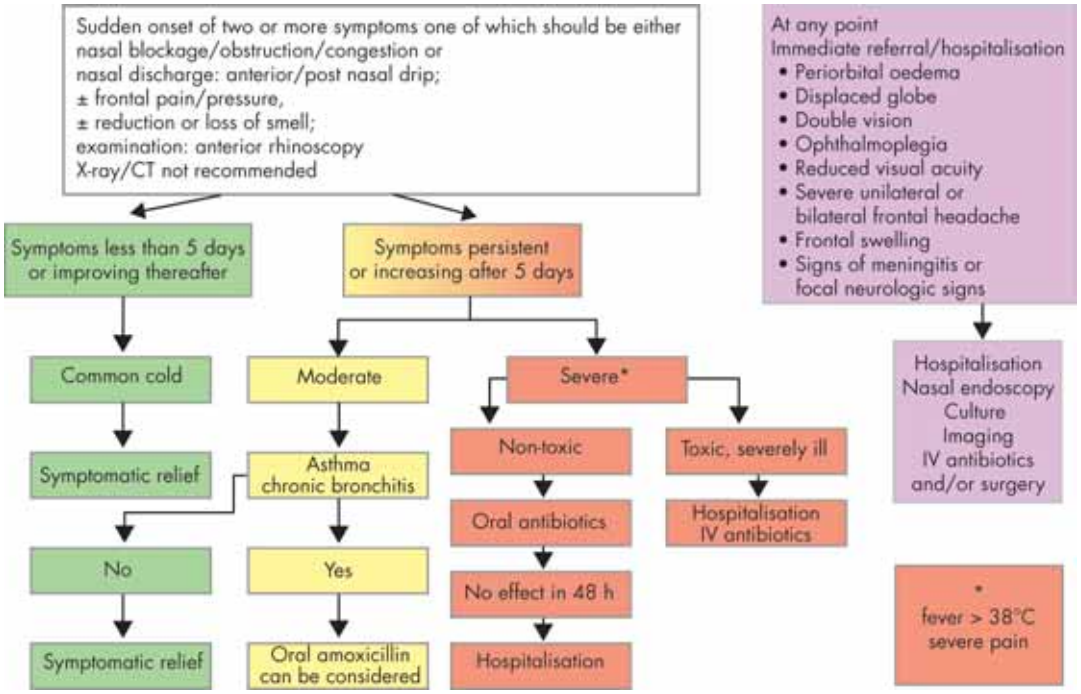

Figure 6. Evidence-based management scheme for children with chronic rhinosinusitis