Just the Cold or the Tip of the Iceberg: Rhinosinusitis in Children

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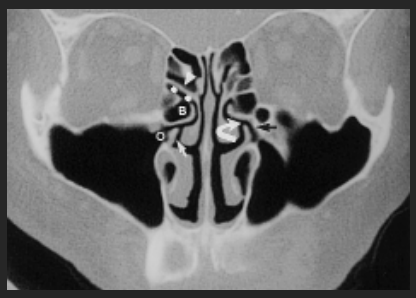
Overview

- Introduction
- Definition
- Etiopathogenesis
- Diagnosis
- Complications
- Medical Management
- Role of Surgery



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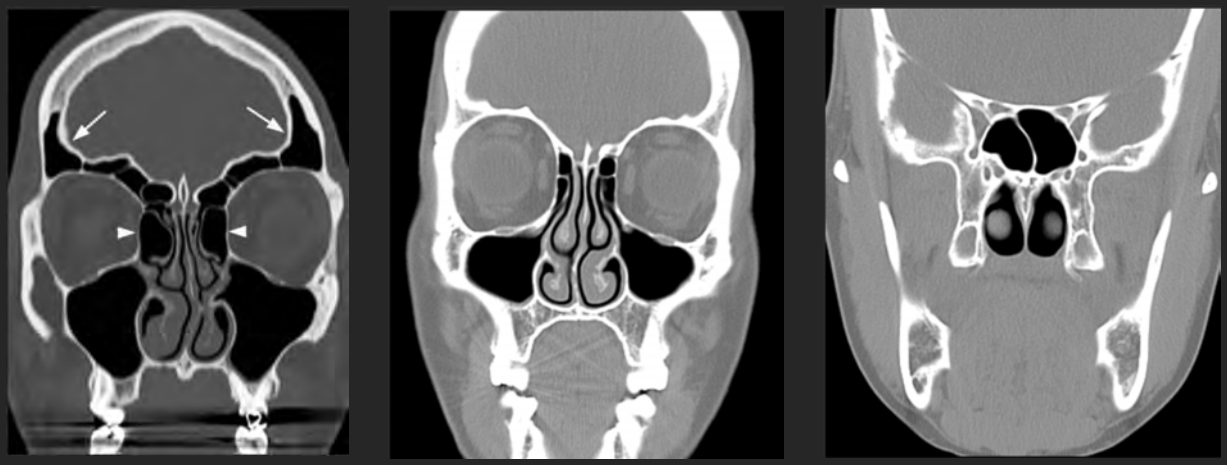
Paranasal Sinuses



http://uwmsk.org/sinusanatomy2/Frontal-Normal.html
http://ctscans.hawkelibrary.com/Normal-Coronal-CT-Scan/Norm_Sinus_9

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Rhinosinusitis

- Average child has 6-8 viral URIs per year
- 0.5 to 2% of URIs become bacterial
- 6 to 13% children by age 3 at least 1 bout ARS
- ARS accounts for 21% antibiotic R_X written
- $3.5 billion per year

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AAP Definition

- Acute bacterial rhinosinusitis (ABRS)
- Subacute bacterial rhinosinusitis
- Chronic rhinosinusitis (CRS)
- Recurrent acute bacterial rhinosinusitis

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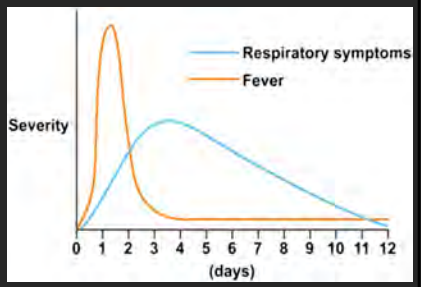
Acute Bacterial Rhinosinusitis (ABRS)

- Bacterial infection with inflammation of the mucosa of the paranasal sinuses lasting for <30 days with *complete resolution* of symptoms
- ↑ incidence in children < 6 yrs age
- Preceding viral URI > 80% of the time
- ***Persistent symptoms*** > 10 days after onset URI
- ***Worse*** after 5-7 days of onset after initial improvement
- ***Severe onset fever*** > 39° /102.2F for at least 3 days



Wald ER, et al. Clinical Practice Gu cideline for the Diagnosis and Management of Acute Bacterial Sinusitis in Children Aged 1 to 18 Years. *Pediatrics.* July 2013, 132 (1) e262-e280.

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Symptoms in ABRS

- **Nasal drainage**
- **Postnasal drip**
- **Fever**
- **Cough**
- Nasal congestion
- Fatigue
- Dental pain
- Hyposomia/anosmia
- Halitosis
- Irritability
- Nausea/vomiting
- Ear fullness/pressure
- ? Facial pain/pressure (especially when unilateral and focused in the region of a particular sinus group)

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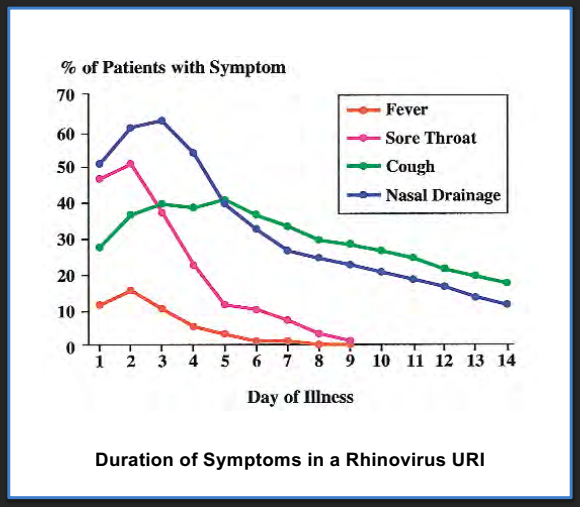
Diagnosis

- Ideal – sinus cultures
- Clinical based on signs and symptoms temporally
- Anterior rhinoscopy



Duration of Symptoms in a Rhinovirus URI

Sinus and Allergy Health Partnership, Antimicrobial guidelines for acute bacterial rhinosinusitis. *Otolaryngol. HeadNeck Surg. 123 1 part 2 (2000), pp. S1–S32*

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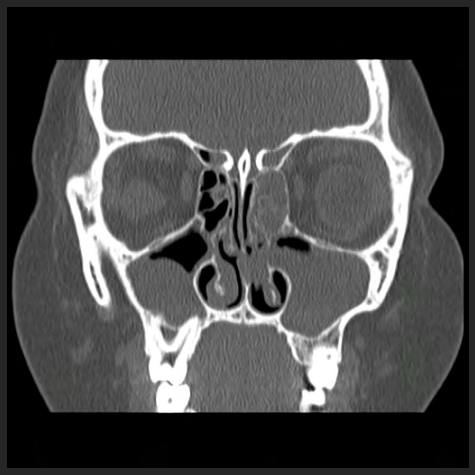
ABRS guidelines

STRONG RECOMMENDATION

Clinicians should NOT obtain imaging (plain X-ray, CT, MRI) for confirming diagnosis



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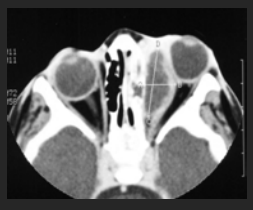
Imaging Indications

- Signs of orbital or intracranial complications
- Endoscopic sinus surgery is contemplated



Should be used judiciously in view of increased risk of radiation related malignancies in children

Wald ER, et al. Clinical Practice Gu cideline for the Diagnosis and Management of Acute Bacterial Sinusitis in Children Aged 1 to 18 Years. *Pediatrics.* July 2013, 132 (1) e262-e280

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Immunologic Workup

Rhinosinusitis

MC infectious complication in patients with humoral immunodeficiency

- Recurrent disease
- Poor response to antibiotics
- Refractory sinusitis (22%)*
- Sinus culture of unusual microbes
- Persistence of disease despite sinus surgery

* Vanlerverghe et al. The prevalence of humoral immunodeficiency in refractory rhinosinusitis: a retrospective analysis. B-ENT 2006;2 :161-66

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Treatment of ABRS

- Antibiotics
- Nasal saline rinse
- Topical steroids
- Topical decongestants
- ~~Oral decongestants~~

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Goal of Antibiotic Therapy

1. Return the sinuses back to health

2. Prevent severe complications such as intracranial or orbital complications or asthma exacerbations

3. Decrease the development of chronic disease

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ABRS

Poor scientific evidence to support use of most adjuvant agents

Therapy	Evidence/Support
Intranasal steroids	Might help, minimal risk
Saline irrigation	Might help, minimal risk
Antihistamines	Do not use except to treat concurrent allergy
Decongestants	Insufficient data to support use

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Pediatric ABRS Recommendations

	Recommendation	Alternate Treatment
Persistent illness (rhinorrhea and/or cough)	Antibiotic therapy* (esp if complication, another infection like AOME or underlying conditions like RAD, CF, immunodeficiency)	Observation for 3 additional days (decreases risk of developing antibiotic resistance and side effects like diarrhea)
Worsening course (rhinorrhea, cough +/- fever)	Antibiotic therapy	
Severe onset (fever > 102.2 and purulent rhinorrhea)	Antibiotic therapy	

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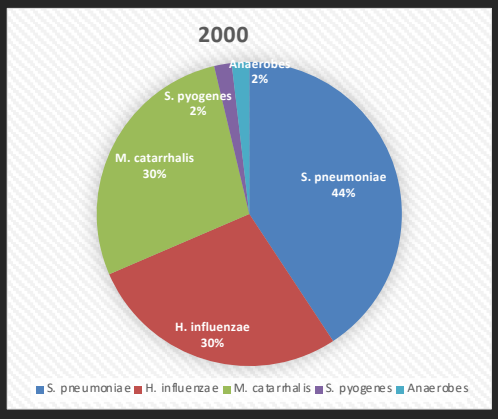
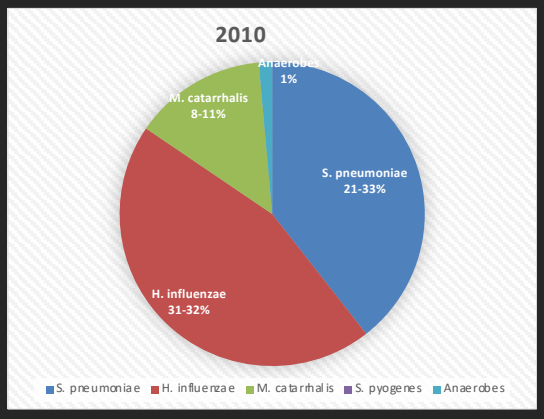
Microbiology





Pathogen	PCN resistance
Strep pneumoniae	10-60%
H. influenzae	10-42%
M. catarrhalis	95-100%

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Effects of Prevnar

- ↓ AOM caused by Strep pneumoniae
- ↑ AOM caused by nontypeable H. flu
- ↑ percentage β- lactamase producing strains of H. flu
- β- lactamase producing H. flu & M. cat cause 2/3 cases AOM
- Bacteria causing AOM generally the same as ARS
- Amoxicillin may not be drug of choice soon – *ID recommendations

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Antibiotic Resistance

- Porin channel blockage – Pseudomonas
- β-lactamase production – H. flu & M. cat
- Altered penicillin binding proteins – Strep pneumo
- Amox (45 mg/kg/day) ONLY, all else (90 mg/kg/day)

Mild to moderate disease

>2 yrs, no daycare

No antibiotic in 4 wks

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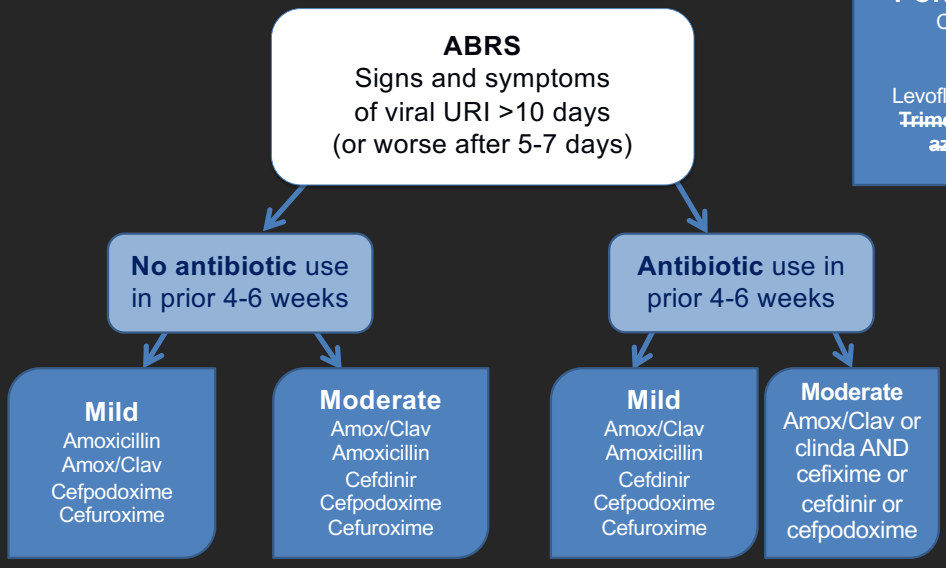
SAHP Treatment Guidelines



Sinus and Allergy Health Partnership, Antimicrobial guidelines for acute bacterial rhinosinusitis. *Otolaryngol. HeadNeck Surg. 123 1 part 2 (2000), pp. S1–S32*

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Factors A/W Increased Antibiotic Resistance

- Age < 2
- Daycare attendance
- Antibiotic use within 3 months

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Guidelines: Pediatric ABRS

Reassess patient at **72 hours –** since majority of symptoms improvement occurs in first 3 days

Initial management	Worse in 72 hours	Not improved in 72 hours
Observation	Initiate antibiotic therapy	Shared decision: antibiotic therapy vs. continued observation
Amoxicillin	High dose amoxicillin-clavulanate	Shared decision: continue amoxicillin vs. high dose amoxicillin-clavulanate
High dose amoxicillin-clavulanate	Clindamycin + cefixime vs. Linezolid + cefixime vs. Levofloxacin	Shared decision: continue current therapy vs. alternate therapy

Wald ER, et al. Clinical Practice Gu cideline for the Diagnosis and Management of Acute Bacterial Sinusitis in Children Aged 1 to 18 Years. *Pediatrics.* July 2013, 132 (1) e262-e280

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Complications of ABRS

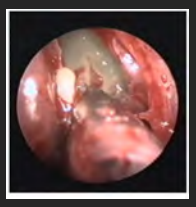
Orbital

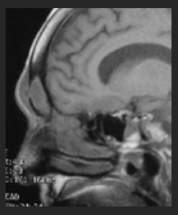
(Chandler et al)

- Preseptal cellulitis
- Postseptal cellulitis
- Subperiosteal abscess
- Orbital abscess
- Cavernous sinus thrombosis

Subgaleal

- Pott's puffy tumor
- Osteomyelitis
- Mucopyocele





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Signs and symptoms in Complications

- Persistent fever
- Eyelid swelling, erythema, tenderness
- Proptosis
- Visual acuity
- Restricted EOM
- Facial swelling
- Headache
- Vomiting
- Photosensitivity
- Lethargy

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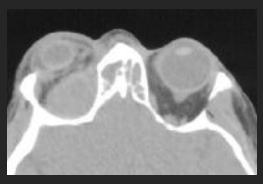
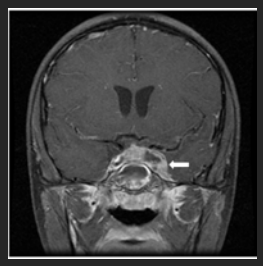
Management of ABRS complications

- Multidisciplinary treatment
- Medical vs Surgical – IV antibiotics
- Imaging studies needed – CT vs MRI





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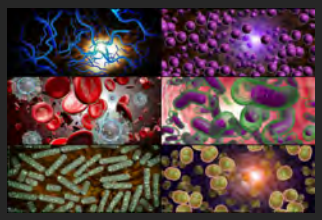
Recurrent ABRS

3 episodes in 6 months

4 episodes in 1 year

More common daycare attendance or older siblings in school



? ⇧ risk of Staph aureus

Consider referral to rule out anatomical obstruction

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Subacute Rhinosinusitis

- Persistent mild to moderate symptoms
- Lasts 30 to 90 days
- Symptoms can be intermittent but resolve completely
- Nasal discharge, cough, low grade fever
- Culture directed antibiotics needed
- Consider referral to rule out anatomical abnormality

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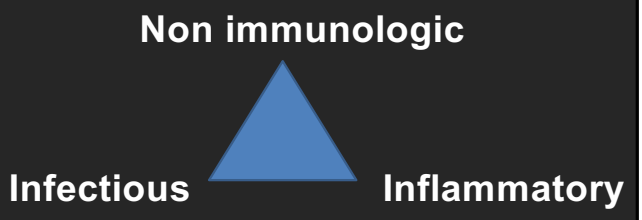
Chronic Rhinosinusitis

- Persistent inflammation of PNS lasting > 90 days
- Persistent symptoms of cough, rhinorrhoea
- Nasal obstruction
- Pathophysiology poorly understood



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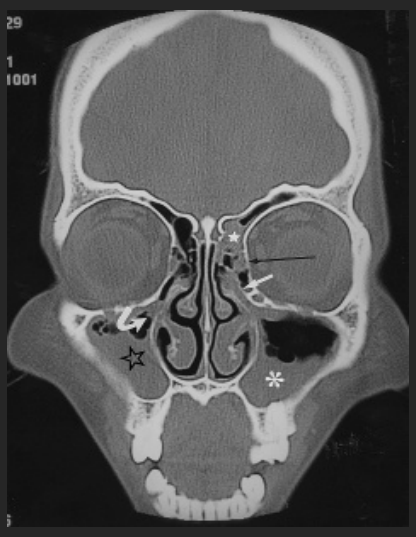
Subtypes of Chronic Rhinosinusitis

- With nasal polyps
- Without nasal polyps
- Allergic fungal rhinosinusitis (AFRS/AFS)
- Chronic invasive fungal sinusitis



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Predisposing Factors

Immunity (innate and adaptive)

Mucociliary clearance (normal mucus blanket)

Patent sinonasal drainage pathways

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Predisposing Factors

- **Viral URIs**
- **Allergic rhinitis**
- Nonallergic rhinitis with eosinophilia syndrome (NARES)
- Daycare attendance
- GERD
- 2nd hand smoke exposure
- Dental infection
- Allergic fungal rhinosinusitis AFRS
- Cystic fibrosis
- Aspirin-exacerbated respiratory disease (Samter's triad)
- Primary ciliary dyskinesia
- Kartagener's syndrome
- CVID (36% - 54%)
- Hyper IgM syndrome (43%)
- IgA/ Ig G deficiency
- Churg-Strauss syndrome (76%)
- HIV
- Granulomatous diseases

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Nasal Polyps in AFRS

- Physiology: allergy to mold/fungus (documented)
- Usually unilateral in pediatric population
- Does not require treatment with antifungals/antibiotics
- Definitive diagnosis and treatment is via surgery

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Treatment for CRS

Maximal medical treatment

- Antibiotics for 3 weeks – could require culture directed antibiotic
- Nasal saline rinses
- Topical steroids daily
- Mucolytics
- ? IV antibiotics
- ? Oral Steroids

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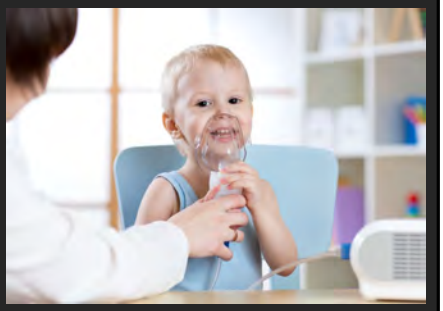
Asthma & Rhinosinusitis

- 35% asthmatic children have rhinosinusitis
- Rhinosinusitis worsens asthma symptoms
  - Sinobronchial reflex
  - Inflammatory mediators
  - Postnasal drip
- Medical and surgical treatment of rhinosinusitis improves asthma symptoms



Friedman R, Ackerman M, Wald E, et al. Asthma and bacterial sinusitis in children. J. Allergy Clin. Immunol. 1984; 74:185-94

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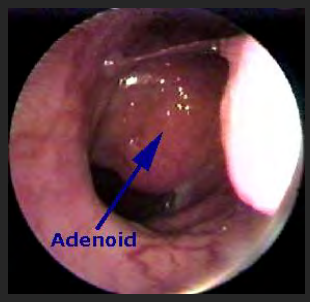
Adenoids & Rhinosinusitis

Zuliani et al showed biofilms on
95% surface of adenoid in CRS **vs** 2% in OSA



Coticchia J, Zuliani G, Coleman C, et al. Biofilm surface area in the pediatric nasopharynx: chronic rhinosinusitis vs obstructive sleep apnea. Arch Otolaryngol Head Neck Surg. 2007;133(2):110-4

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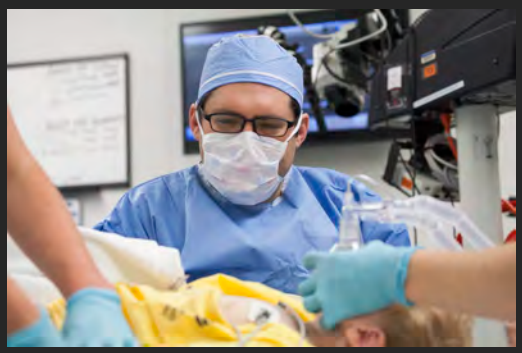
Role of Surgery

- Adenoidectomy
- Adenoidectomy with maxillary antrostomy and lavage
- Adenoidectomy & IV antibiotics
- FESS – limited usually, facial growth unaffected
- Balloon sinuplasty



Bothwell MR, Piccirillo JF, Lusk RP, Ridenour BD. Long-term outcomes of facial growth after FES surgery.*Otolaryngol Head Neck Surg. 2000;123(2):P102*

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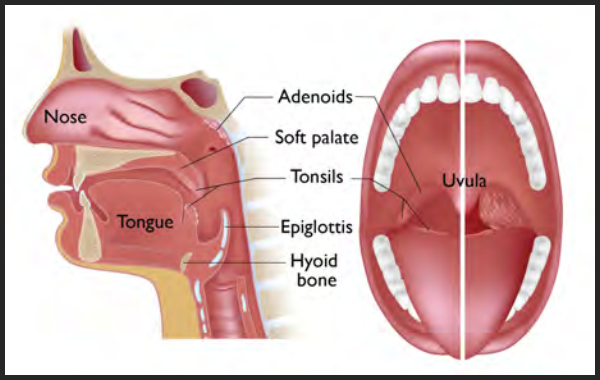
Adenoidectomy

Brietzke meta-analysis showed 60-70% improvement after adenoidectomy



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Balloon Sinuplasty

- Sinusitis recurrence post surgery is usually due to scarring
- Minimal invasive
- Easily combined with adenoidectomy

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QOL

- QOL studies show much lower QOL in patients with CRS compared to other chronic illness like JRA, ADHD, asthma
- Lusk et al – 10-year follow up showed parents more satisfied after surgical management than medical management
- Surgery indicated when maximal medical management fails

Cunningham MJ, Chiu EJ, Landgraf JM, Gliklich RE. The health impact of chronic recurrent rhinosinusitis in children. *Arch Otolaryngol Head Neck Surg 2000;126:1363-68*

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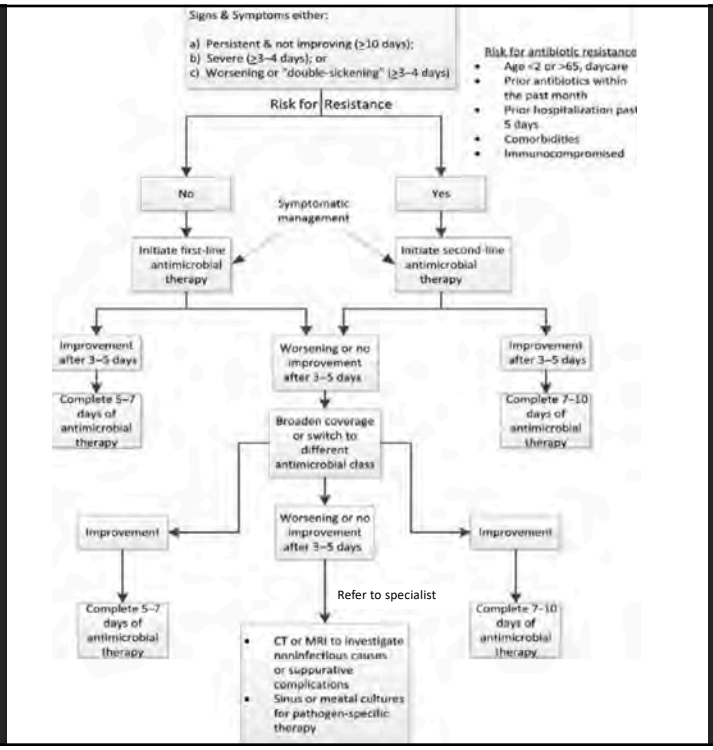

IDSA Guideline for ABRS: CID. March 20,2012

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When to Refer

- Recurrent acute sinusitis
- Subacute sinusitis
- When maximal medical therapy has failed for PCRS
- Allergic fungal sinusitis
- Immunodeficiency/PCD/CF

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Summary

- Rhinosinusitis affects QOL, financial burden
- Primarily clinical diagnosis – Viral vs Bacterial
- Prompt treatment with appropriate dose antibiotic and local treatment is the key
- Complications require high index of suspicion
- Surgery is indicated
  - When maximal medical management fails – helps relieve obstruction and improve access for topical treatment
  - Treating complications, multidisciplinary management

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