Rhinosinusitis

Introduction

Rhinosinusitis is a common inflammatory condition affecting the mucous membranes of the paranasal sinuses and nasal cavity with or without the involvement of the underlying bone. This condition affects millions of individuals worldwide and constitutes one of the most common reasons for healthcare visits. The pathophysiology typically involves impaired mucociliary clearance and obstruction of the osteo-meatal with subsequent inflammation. This process can be triggered by various factors including viral infections, allergies, anatomical variations or underlying systemic conditions.

Diagnosis

<table>
<tr><th>Adults</th><th>Children</th></tr>
<tr><th colspan="2">Symptoms</th></tr>
<tr><td colspan="2">≥ 2 Nasal Symptoms, of which at least one of:
• Nasal blockage/congestion/obstruction
• Nasal discharge (Anterior - Rhinorrhoea/Posterior – Post nasal drip)</td></tr>
<tr><th colspan="2">Additional Symptoms</th></tr>
<tr><td colspan="2">Facial pain/pressure</td></tr>
<tr><td>Olfactory dysfunction – Anosmia or Hyposmia</td><td>Cough</td></tr>
<tr><th>Endoscopic signs</th><th>CT changes</th></tr>
<tr><td>• Nasal polyps
• Mucopurulent discharge from middle meatus
• Oedema/mucosal obstruction primarily in the middle meatus</td><td>Mucosal changes within the osteo-meatal complex and / or sinuses</td></tr>
</table>

OR

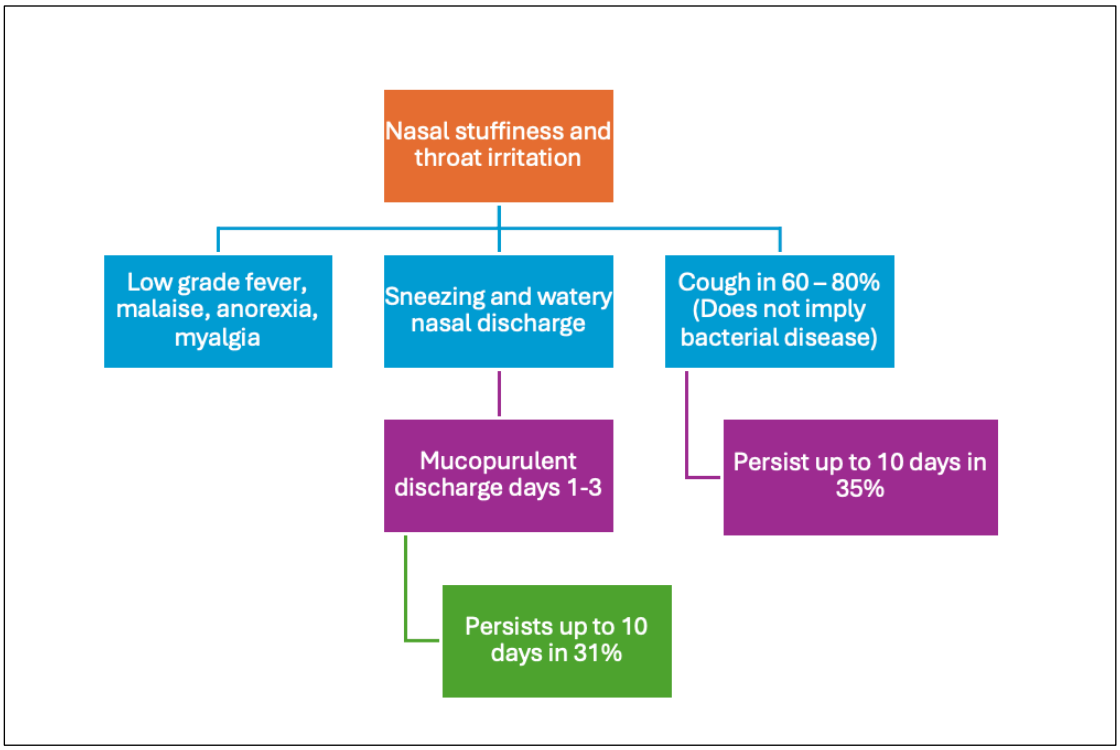
Rhinosinusitis represents a spectrum of disease, ranging from acute to chronic forms:

- **Acute rhinosinusitis (ARS)** lasts less than 12 weeks and is predominantly viral in origin (98%), with bacterial infections accounting for fewer than 2% of cases.
    - **Acute viral rhinosinusitis (AVRS)**, often referred to as the 'common cold', typically lasts less than 10 days and is self-limiting.
    - **Acute Bacterial Rhinosinusitis (ABRS)** often follows AVRS when symptoms persist without improvement for at least 10 days or when symptoms initially improve but then worsen again (double-sickening phenomenon).
- **Recurrent acute rhinosinusitis (RARS)** describes a pattern of four or more episodes of acute rhinosinusitis per year, with symptom-free intervals between episodes.
- In contrast, **chronic rhinosinusitis (CRS)** persists for more than 12 weeks and is associated with ongoing mucosal inflammation.

Thus, relying on symptoms alone is a poor predictor of diagnosis, as the clinical presentation is similar, however the time frame changes. This classification system provides a framework to make a diagnosis and manage appropriately.

Acute (Viral) Rhinosinusitis – AVRS (or) "Common Cold"

Acute viral rhinosinusitis (AVRS) is caused by a range of respiratory viruses, including *Rhinovirus, Respiratory Syncytial virus (RSV), Influenza virus, Corona virus, Parainfluenza virus, Adenovirus and Enterovirus*. On average, adults experience between two to five episodes of AVRS per year, while children may have up to ten episodes annually, with some lasting as long as six weeks in children. Several factors predispose individuals to recurrent acute rhinosinusitis (ARS), including active and passive smoking, odontogenic sources, and anatomical variations, which are more commonly associated with recurrent cases. Ciliary impairment, whether due to smoking, allergic rhinitis, prior surgery, or conditions such as primary ciliary dyskinesia (PCD) or cystic fibrosis (CF) also plays a role. Additionally, the impact of allergies and gastro-oesophageal reflux disease (GORD) on recurrent ARS remains uncertain. Notably, a high prevalence of cough is observed in viral rhinosinusitis, contrasting with the Centor criteria for bacterial pharyngitis, where the absence of cough increases the likelihood of a bacterial cause.



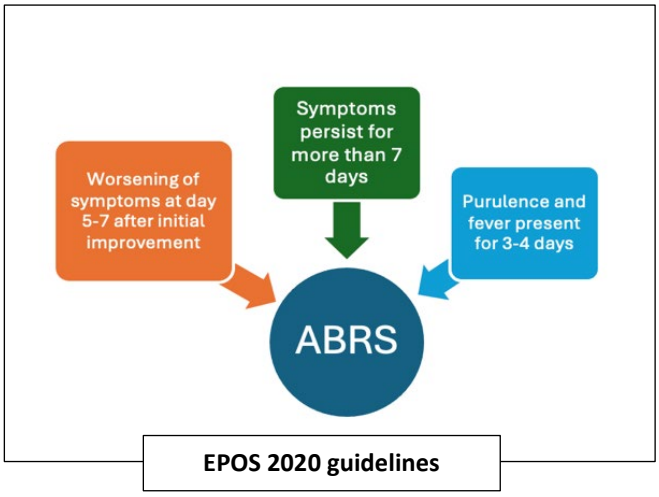
Acute Bacterial Rhinosinusitis (ABRS)

Acute bacterial rhinosinusitis (ABRS) accounts for fewer than 2% of all ARS cases, with the vast majority (98%) being viral in origin. Antibiotics are generally ineffective in viral cases and do not prevent complications. Excessive antibiotic use is harmful to the patient's microbiome and promotes bacterial resistance. Many bacterial infections can also resolve spontaneously (i.e. without antibiotics), with resolution rates of approximately 30% for *Streptococcus pneumoniae*, 60% for *Haemophilus influenzae*, and 80% for *Moraxella catarrhalis*.

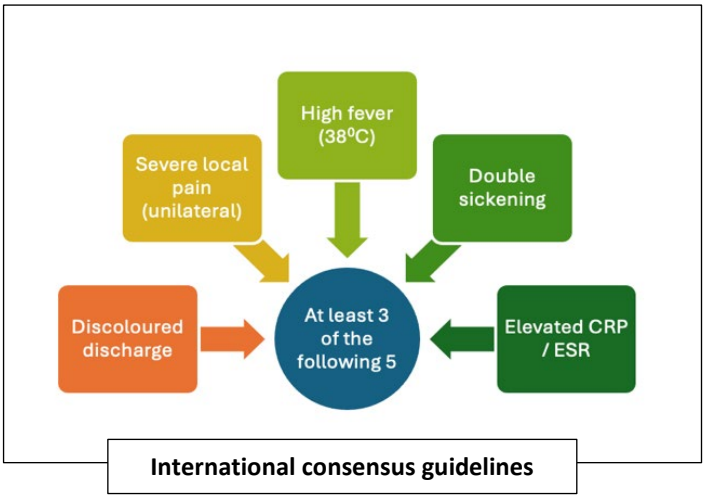
Risk factors predisposing individuals to ABRS				
Dental	**Iatrogenic**	**Immunodeficiency**	**Mechanical**	**Mucosal oedema**
Infections or procedures (Anatomical proximity to maxillary sinus)	• Sinus surgery • Nasogastric tubes • Nasal packing • Mechanical ventilation	• HIV • Immunoglobulin deficiencies (IgA, IgG, IgM) • Cilia problems – Smoking, PCD & CF	• Deviated septum • Nasal polyps • Hypertrophic inferior turbinate • Trauma • Tumour • Foreign bodies • Granulomatosis with polyangiitis (GPA)	• Preceding AVRS • Allergic rhinitis • Vasomotor rhinitis

So, when is ARS bacterial and when are antibiotics indicated?

Determining when ARS is bacterial and when antibiotics are indicated remains a challenge, as there is no universally agreed-upon definition. International consensus guidelines, such as the European Position Paper on Rhinosinusitis (EPOS 2020) and other international consensus statements, provide criteria to help distinguish bacterial infections.



EPOS 2020 guidelines



International consensus guidelines

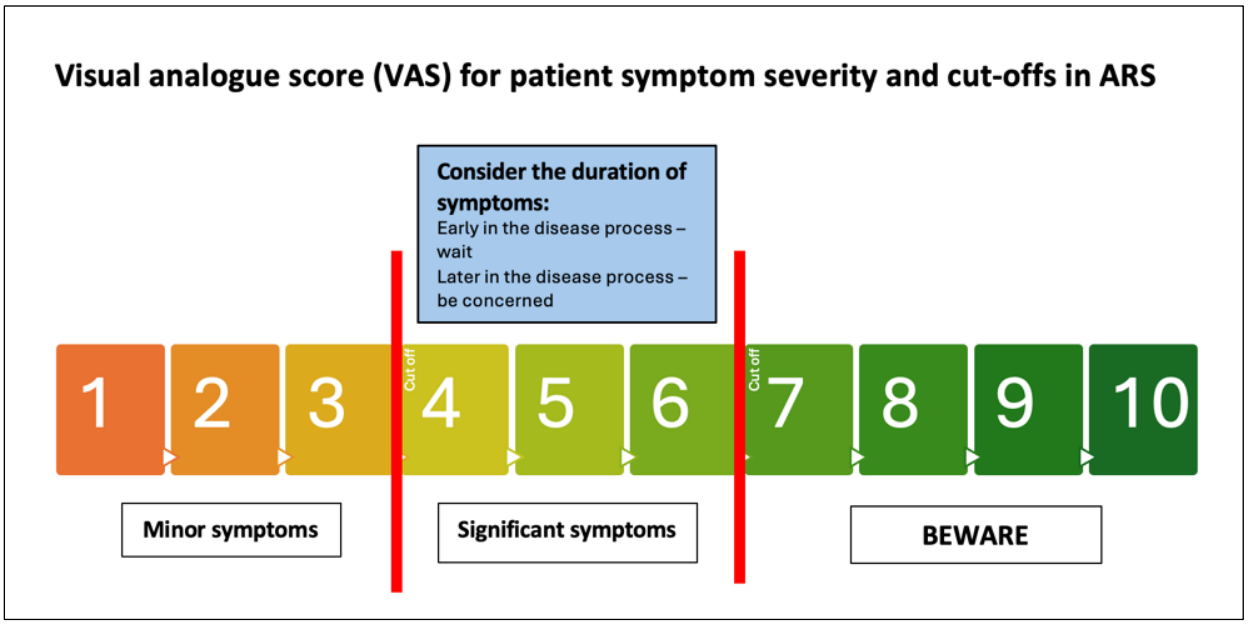
Markers suggestive of bacterial involvement include:

- Acute onset
- A fever exceeding 38°C is strongly associated with *Streptococcus pneumoniae* and *Haemophilus influenzae* and especially in conjunction with more severe symptoms.
- Biomarkers such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) can guide antibiotic use. If low avoid antibiotics, however, if elevated it correlates with bacterial disease on MCS from a sinus puncture and CT scan changes.
- Procalcitonin (PCT) also help guide antibiotic use. If normal levels, antibiotics were avoided without any detrimental outcomes.

Despite variations in classification criteria, antibiotics are generally recommended in the following clinical scenarios:

1. **Complicated sinusitis** – involvement of the eyes, brain or bone.
2. **Double sickening** – an initial illness with partial recovery followed by worsening symptoms, which is the best indicator of secondary bacterial infection.

3. **Stepwise worsening** – progressive symptom deterioration, particularly if the visual analogue scale (VAS) score exceeds 6.
4. **Severe frontal headache** – especially if the VAS score is greater than 6.
5. **Symptoms persisting beyond 10 days** – particularly if significant (VAS >



For example, in a 35-year-old man presenting with nasal obstruction, mucopurulent rhinorrhoea, and fever for 2–3 days with moderate severity (VAS 4–5), conservative treatment with symptomatic management may be sufficient. However, if the same patient presents on day 6–7 with persistent symptoms and poor follow-up, antibiotics may be considered. In contrast, if he has a severe frontal headache with a VAS score of 8–10, antibiotic therapy is more strongly recommended.

	AVRS	ABRS	Recurrent ARS
Symptoms	Two or more symptoms, of which one should be either: **Blockage/obstruction/congestions** OR **nasal discharge** (anterior/posterior) +/- facial pain/pressure +/- hyposmia/anosmia **(cough in children)**		
Additional symptoms	fever, cough, toothache, halitosis, otalgia, tiredness, pain on bending forward, dysphonia and sore throat		
Time frame	< 10 days No severe fever No lasting purulence No worsening	Can occur early after an AVRS but is rare. Chances of it being secondary bacterial infection correlates with days after onset and severity of symptoms.	≥ 4 / year

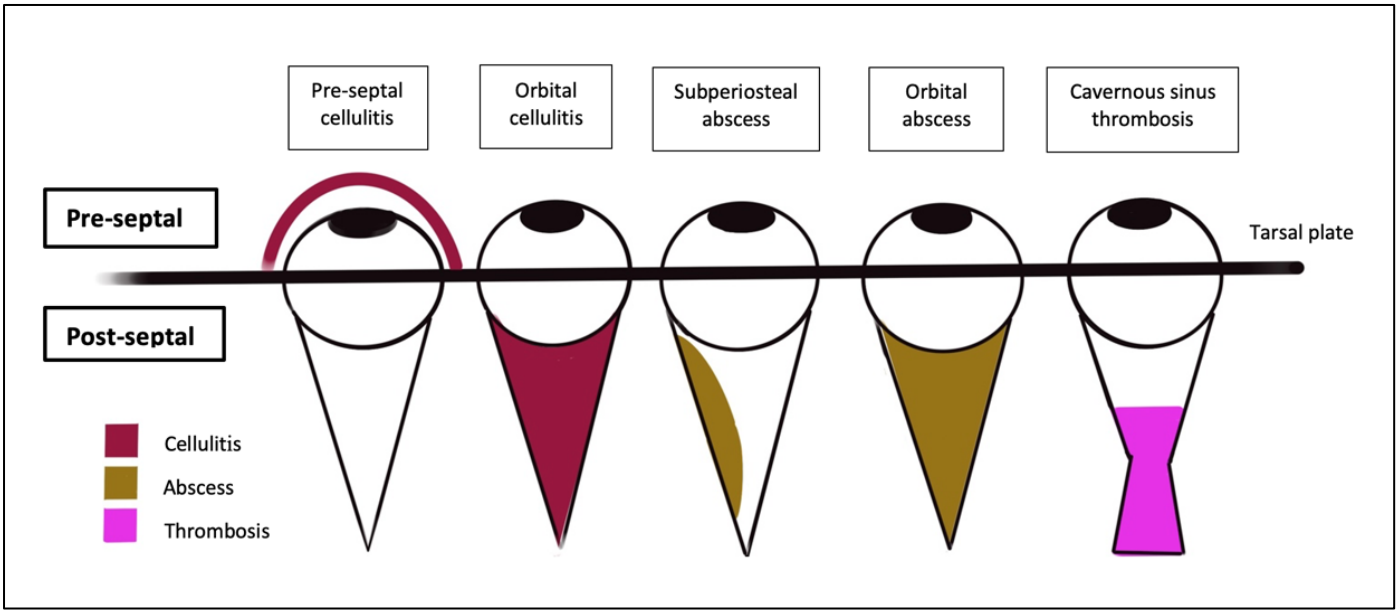
Complicated Sinusitis

Complicated sinusitis should be ruled out in every patient with ARS

Eye involvement occurs in 60-80% of cases of complicated sinusitis and is particularly common in children. It is classified according to the Chandler system:

1. **Pre-septal orbital cellulitis** - infection is limited to the soft tissue anterior to the tarsal plate.
2. **Post-septal orbital cellulitis** – infection extends into the orbit

3. Subperiosteal abscess – pus collection between the bony orbital walls and periorbita (usually medially over the lamina papyracea or supero-lateral)
4. **Orbital abscess** – abscess formation within the orbital contents
5. **Cavernous sinus thrombosis** – development of retrograde phlebitis via the ophthalmic veins to the cavernous sinus



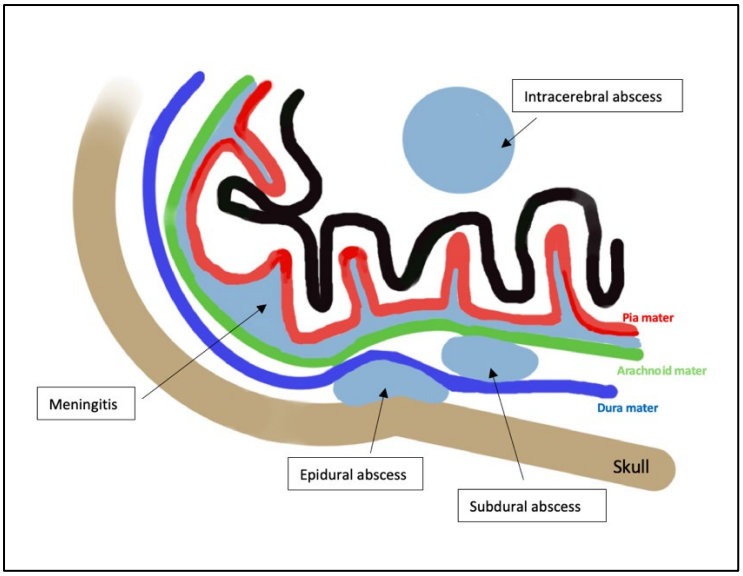
Key signs of orbital involvement include conjunctival chemosis (oedema), erythema, proptosis, limited extraocular eye muscle movements (ophthalmoplegia) and a relative afferent pupillary defect (RAPD), which can be assessed using the swinging flashlight test. Additional indicators such as abnormal colour vision (especially red and green) and visual acuity or field deficits may appear later in the disease process.

Clinical note: Orbital complications are diagnosed clinically. RAPD – reflex arc has afferent (optic) and efferent (oculomotor) nerve supply. First, shine the light into the normal eye causing bilateral pupil constriction because the afferent limb is intact and there is consensual innervation to the efferent limb on the opposite side. Then shine into the affected eye. The optic nerve (afferent limb) is not working as well (due to increased pressure and ischaemia in the orbit), thus the signal is not perceived as well in the affected eye and the pupil dilates. This is a relative afferent pupillary defect (RAPD).

Brain complications are seen in 15-20% of complicated sinusitis cases and is often seen in young adults. Possible intracranial complications include:

1. **Extradural abscess** – localized collection of pus between the dura mater and skull.
2. **Subdural empyema** – pus accumulation between the dura and arachnoid mater.
3. **Bacterial meningitis** – infection of the meninges, often presenting with fever, neck stiffness, photophobia and an altered mental status.
4. **Intracerebral abscess** – localized infection within brain parenchyma, which may lead to neurological deficits.
5. **Cavernous sinus thrombosis** – characterized by bilateral eye swelling due to venous congestion from interconnected veins draining both orbits.

Intracranial complications can present with non-specific symptoms, including fever, headache and subtle behavioural changes. Thus, computerised tomography (CT) imaging is essential to exclude these potentially life-threatening complications.



Bony complications are seen in 5% of cases

1. **Osteomyelitis** – most commonly affects the frontal bone, with maxillary involvement being rare.
2. **Frontal subperiosteal abscess** – previously referred to as Pott's puffy tumour, characterized by a localized swelling over the forehead.

Clinical Note: Any unexplained frontal swelling in children and young adults should raise suspicion for a sinus-related complication. In such scenarios a CT scan is essential, especially to exclude any associated intracranial complications.

Treatment of Acute Rhinosinusitis

AVRS	ABRS

• Education
• Prevention of AVRS: Probiotics & Exercise
• Decongestants < 10 days
• NSAIDS/Paracetamol
• Zinc
• Vitamin C
• Nasal rinses
• Herbal medicine
  ○ BNO1016 / Sinupret®
  ○ Cineole
  ○ Andrographis paniculata
	• As per AVRS
	• Antibiotics as per above clinical features

After diagnosing an ABRS, what antibiotics and what dose?
Organisms implicated with spontaneous resolution rates (i.e. without antibiotics)

- Streptococcus pneumonia – 30% → more virulent and may need antibiotics
- Hemophilus influenzae – 60% → Most common strain is non-typeable H. influenza which is resistant to penicillin so need β-lactimase inhibitor (**Co-amoxiclav)**
- Moraxella catarrhalis – 80%

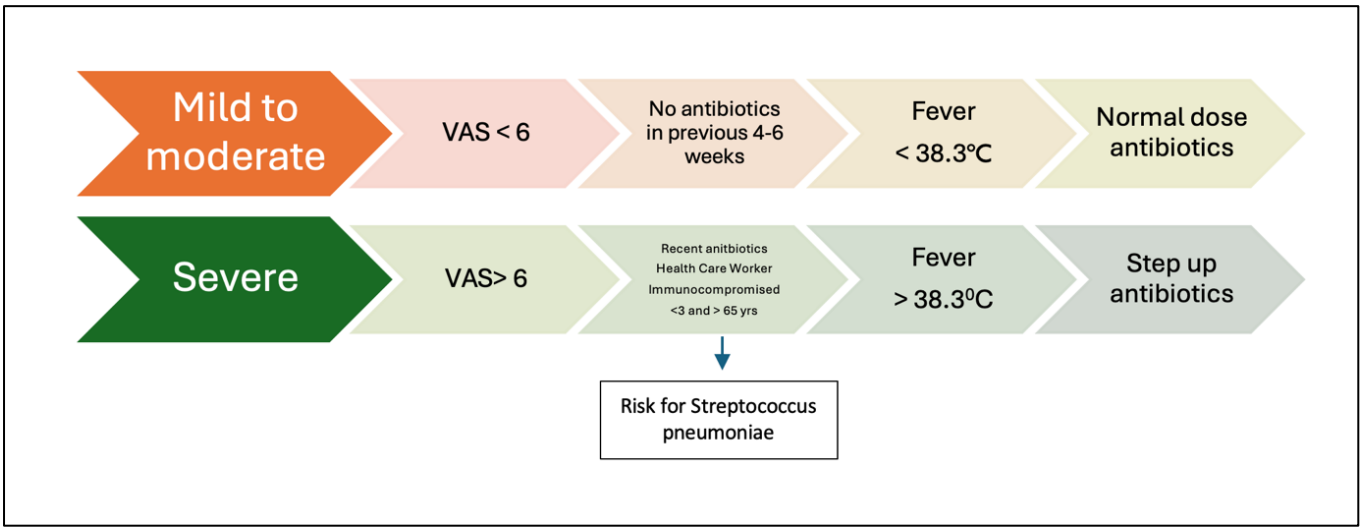
Recommended antibiotic choice:

- Amoxicillin (80-90 mg/kg/d) divided into 2 doses (1g 8hrly) if no prior antibiotic course
- Amoxicillin-Clavulanate (90mg/kg/d – 6.4 mg/kg/d) divided into 2 doses

- If higher doses of Amoxicillin needed, add Amoxicillin only, no need for extra Clavulanate

- ***β***-Lactam Allergy:
  - Non-type 1:
    - Cefuroxime (30mg/kg/d) divided into 2 doses (1g 12hrly)
    - Cefpodoxime (16mg/kg/d) divided into 2 doses (400mg 12hly)
  - Type 1:
    - Azithromycin (10mg/kg/d) (500mg dly) – 3 days
    - Clarithromycin (15-30mg/kg/d) in divided doses (500mg bd or 500mg modified release daily dose)
    - Erythromycin (40mg/kg/d) in divided doses

- Alternative for Type 1 Allergy:
  - Children: Levofloxacin (20mg/kg/d – daily or divided doses)
  - Adults:
    - Levofloxacin 500mg 12hrly (OR) 750mg dly
    - Moxifloxacin 400mg dly
- Failure of antibiotic treatment after 48-72 hours:
  - Amoxicillin-Clavulanate (90mg/kg/d – 6.4mg/kg/d) divide in 2 doses
  - Ceftriaxone (50mg/kg/d) daily dose (1g dly) – 3 days
  - Alternatives:
    - Clindamycin (90-150mg/kg/d) in 3 divided doses (450mg 8hrly) +/- 2nd/3rd generation Cephalosporin (5-7d)



When to use a higher antibiotic dose:

- Risk factors for *Streptococcus pneumonia (as above)*
- Severely ill, toxic patient
- Complicated disease