

## Nasal Allergy--In a Nutshell

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### Abstract

This provides an overview of Allergic Rhinitis and its management. It is very useful for students of Rhinology and clinicians managing this disease. It introduces them to a systematic approach of assessing allergic rhinitis patients which is very commonly found in most populations and causes considerably morbidity. Allergy per se is a very difficult subject to master and it is with great perseverance one can treat patients suffering from this condition. The cornerstone of managing a patient of allergic rhinitis is first and foremost obtaining a good history. This is to be followed by a thorough examination and investigations. The general practitioner is the first expert to be involved in management of allergic rhinitis patient followed by specialists in particular otorhinolaryngologists, and finally by allied healthcare personnel. Inflammation of nose and paranasal sinuses are characterized by two or more symptoms—namely, either nasal blockage/obstruction/congestion or nasal discharge. Associated symptoms include facial pain/pressure and either reduction or loss of smell. Certain diagnostic endoscopic signs of nasal polyps and or mucopurulent discharge and or mucosal oedema in the middle meatus and or CT changes of mucosa within the ostoemeatal complex, and or sinuses are seen. Definitions, aetiologies, clinical presentations, diagnosis/prognosis and management of allergic rhinitis is dealt with. Common allergens causing the disease are mentioned, pathophysiology and classification of allergic rhinitis is discussed in detail. Different types of allergen testing are highlighted along with their specific role and uniqueness. Principles of immunotherapy in treatment of allergic rhinitis are discussed here. Health effects of allergic rhinitis along with its impact on physical quality of life is mentioned. The basic idea of this presentation is to improve diagnostic accuracy by promoting appropriate use of ancillary tests like nasoendoscopy, allergy testing, computed tomography etc. and reduce inappropriate antibiotic use. The basic treatment plan of allergic rhinitis is according to the severity and duration. It consists of allergen avoidance, pharmacotherapy, allergen immunotherapy and surgery which has limited role.

**Keywords:** Allergy; Rhinitis; Pollens; Molds; Insects; Penicillium; Cladosporium; Hypersensitivity; Histamine; Hay Fever; Rose Fever; Transverse Nasal Crease; Rhinorrhoea; Allergic Salute; Allergic Shiners (Dennie-Morgan Lines); Cobblestone Appearance Of Oropharynx; Scratch Test; Intradermal Test; Patch Test; Rhinomanometry; Antihistamines; Immunotherapy; Topical Nasal Steroids; Cochrane; Mast Cell Stabilizer

### Abbreviations

IgA: Immunoglobulin A; IgE: Immunoglobulin E; AR: Allergic Rhinitis; NAR: Non-Allergic Rhinitis; ARIA: Allergic Rhinitis and its Impact on Asthma; >: Greater Than; <: Less Than; T.M.: Tympanic Membrane; NPT: Nasal Provocation Test; n NO: Nitrogen in Nitric Oxide; PNS: Para Nasal Sinuses; OM: Occipito-mental; CECT: Contrast Enhanced Computerized Scan; L.A.: Local Anaesthesia; G.A.: General Anaesthesia; PQLI: Physical Quality of Life Index; WAO: World Allergy Organization; SCIT: Subcutaneous immunotherapy; SLIT: Sublingual immunotherapy; AIT: Allergic Immunotherapy; e-Health: Electronic Health; DBPC: Double Blind Placebo Controlled; RCT: Randomized Controlled Trial; FDA: Food and Drug Administration federal agency in USA; SMD: Submucous Diathermy; I.T.: Inferior Turbinate; FESS: Functional Endoscopic Sinus Surgery; OMC: Osteo-meatal Complex

## Introduction

Rhinitis is a common presentation in E.N.T. clinics across the globe and allergy compounded with it causes even more difficult to treat for the clinician. This article is useful and handy for students and clinicians managing Allergy and Rhinitis. There is something in this for everyone - General Practitioners, Otorhinolaryngologists, Allergologists, Rhinologists and Allied Healthcare personnel. Special computer based newer modalities of investigations are highlighted in this which helps in assessing the nasal function of the affected patient. It's very common to sometimes feel like sneezing and have running nose but please see a doctor if the feeling persists and do take care of yourself. Allergic Rhinitis is made so easy to comprehend.

Nasal function includes temperature regulation, olfaction, humidification, filtration and protection. Nasal lining contains secretion of IgA, proteins and enzymes. Nasal cilia propel the matter towards the natural ostia at frequency of 10 - 15 beats/min. Mucous moves at a rate of 2.5 - 7.5 ml. per min.

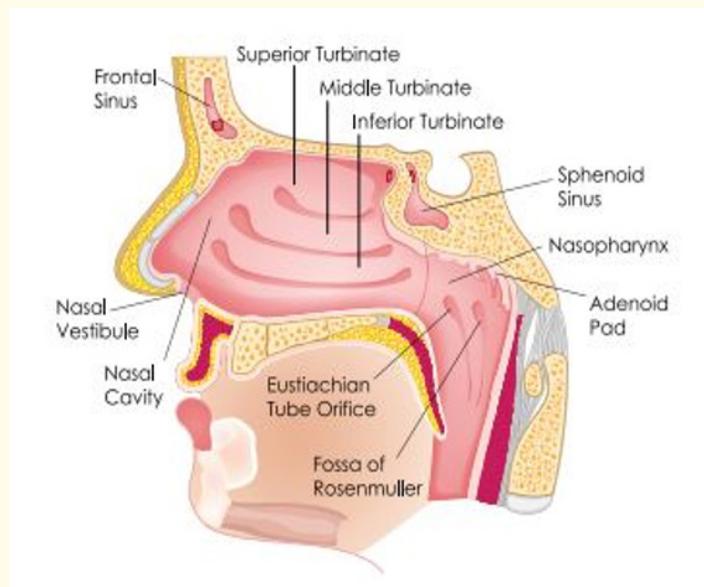


Figure 1

Rhinitis is the presentation of two or more nasal symptoms for more than one a day namely Nasal congestion/obstruction, Rhinorrhea, Sneezing, Itching, Impairment of smell. Rhinitis occurs most commonly as Allergic Rhinitis. Non-infectious rhinitis has been classified as either Allergic or Non-Allergic Rhinitis. Allergic Rhinitis affects 15 - 30% of population with a wide geographic variance. It is more common in children and adolescents. 50% of all rhinitis in E.N.T. Clinics is Allergic Rhinitis. Allergic Rhinitis is defined as immunologic nasal response, primarily mediated by IgE. Non-Allergic Rhinitis is defined as rhinitis symptoms in the absence of identifiable allergy, structural abnormality or sinus disease. So, Allergic Rhinitis is an inflammation of the nasal mucosa, caused by allergen. It is the most common Atopic allergic reaction.

## Aetiology

Aetiology is classified as Precipitating factors and Predisposing factors.

Precipitating factors are classified into aerobiological flora and nasal physiology. Aerobiological flora are Allergens present in the environment, House dust and dust mites, Feathers, Tobacco smoke, Industrial Chemicals and Animal dander. Nasal physiology are Disturbances in normal nasal cycle.

Predisposing factors are classified into genetic, endocrine, psychological, focal sensitivity tests, infections, physical, age and sex, IgA deficiency and common allergens.

Genetic factors indicate towards Multiple gene interactions are responsible for allergic phenotype. Chromosomes 5, 6, 11, 12 and 14 control inflammatory process in atopy. 50% of AR pts. Have positive family history.

Endocrine factors are Puberty, Pregnancy/Postpartum stages and Menopause.

Infections such as Fungal. Physical factors are Degree of pollution of air, Humidity and Temperature differences, Temperature changes.

Common allergens such as pollens (Spring tree pollens (Maple/Alder/Birch), Summer grass pollen (Blue grass, Sheep sorrel etc.), Autumn Weed pollen (Ragweed)), molds) Penicillium, Cladosporium etc.), INSECTS (Cockroaches, Houseflies, Fleas, Bedbugs).

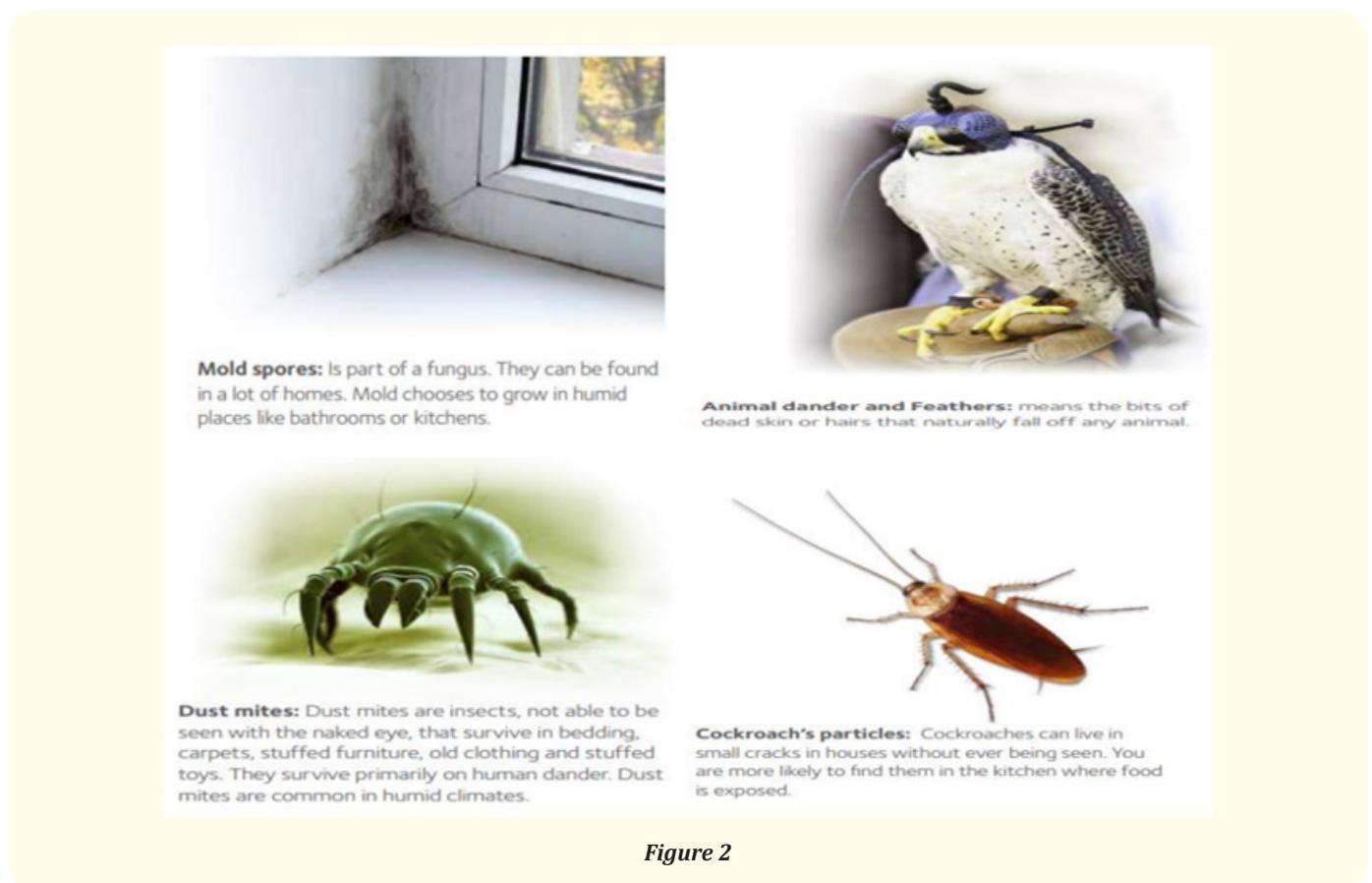


Figure 2

### Pathophysiology

Immunoglobulin IgE mediated type 1 hypersensitivity response to an antigen (allergen) in a genetically susceptible person. IgE is produced from plasma cells and the process is regulated by T-Suppressor lymphocytes or T-helper cells. IgE has affinity for mast cells and basophils and gets fixed to the surface of mast cells by its Fc end. Type 1 Hypersensitivity causes local vasodilation and increased capillary permeability. There is edema of the submucosal tissue by allergic fluid followed by infiltration by eosinophils and plasma cells leading to vascular dilatation which causes engorgement of the inferior turbinates and there is increased activity of sero-mucinous glands. Histamine exerts its pharmacologic effect on smooth muscle, vascular endothelium and mucous glands. Number of IgE molecules has been estimated as 5300 to 27,000 in non-allergic subject and 15,000 to 41,000 in allergic subjects. Hypersensitivity of the host depends on antigen dose, frequency of exposure, genetic make-up, and hormone activity of the body.

**Classification**

Allergic Rhinitis is currently classified into intermittent and persistent. In intermittent AR the symptoms are present less than 4 days per week and less than 4 weeks per year. In persistent AR the symptoms are present for greater than 4 days per week and for greater than 4 weeks per year.

The severity of AR is classified into mild and moderate to severe. Mild AR doesn't interfere with daily activities or doesn't produce any troublesome symptoms. Moderate to severe AR interferes at least with one of the factors such as impaired sleep, hampered daily activities/work, school/sick absenteeism, also produces troublesome symptoms.

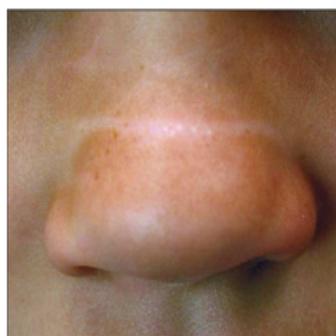
AR is formerly classified into seasonal and perennial based on the allergens. Seasonal Hay Fever, misnomer- no hay/no fever. Summer Cold caused by viruses causing URTI. Rose Fever seen usually in Indian Subcontinent (colourful/fragrant flowering plants). Perennial Allergens present throughout the year.

**Signs and symptoms of AR**

Symptoms of AR are sneezing, itching of eyes, ears and palate, rhinorrhoea, post nasal drip, congestion, anosmia, headache, otalgia, epiphora, red eyes, swollen eyes, fatigue, drowsiness and malaise.

**Physical examination**

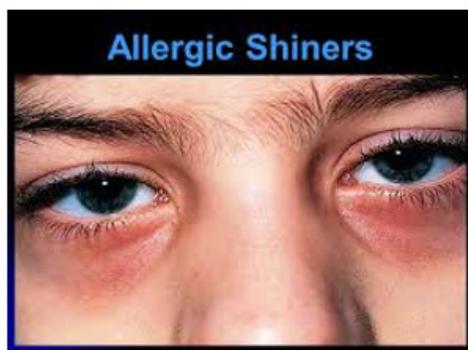
During Physical examination we check for transverse nasal crease (Horizontal crease across the lower half of the bridge of nose), rhinorrhoea (Thin watery secretions from nose).



Transverse Nasal Crease



Allergic salute



Allergic shiners (Dennie-Morgan lines)



Cobblestone appearance of oropharynx

Figure 3

Associated features with AR are Injected and swelling of palpebral conjunctiva with excess tearing, Retracted T.M.'s, Overbite, Periorbital oedema.

**Investigations**

Skin prick tests---gold standard. This is also known as Scratch Test/Intradermal Test. Controlled amounts of allergen and control substances are introduced into the skin---this procedure is convenient, safe and widely accepted.



Figure 4

Goal of the investigation is the detection of immediate allergic response caused by release of mast cells or basophil IgE specific mediators---Wheal/Flare after 15 mins. More investigations are such as RAST-Radio-Allergo-Sorbent Test for specific IgE estimation. PRIST-Plasma Reactive Immuno-Sorbent Test for specific IgE estimation. SET Test-Skin End-Point Titration Test Latest skin test for allergy and is more reliable.

Less common tests are total serum IgE, total blood eosinophil count, nasal smears may show increased eosinophilic level, PATCH TEST is used to determine delayed type hypersensitivity and the allergen is placed in the skin for 48 hrs. The area of reaction is noted and if any allergens present are identified. This is more useful in skin problems and food allergy.

**Nasal provocation tests (NPT)**

The potential allergen is sprayed into the nose and the number of sneezes counted or any change in Rhinomanometry is noted. Very time-consuming test as each allergen takes 20 mins. To test in order to allow the nose to return to normal after the challenge. It is useful for rare and occupational allergens. Contraindications of NPT are Pregnancy/< 5yrs. age /Recent nasal surgery < 8 wks. /Uncontrolled asthma, Nasal/systemic corticosteroids should be avoided for 1 wk. and Antihistaminic for 72 hrs.



Rhinometer

Spraying Device for NPT

Figure 5

### New diagnostic methods

#### Exhaled nitric oxide (e NO)

Similar to e NO in asthma, n NO is a non-invasive marker. Potentially suitable to monitor upper airway inflammation following allergen-induced late response. In AR pts., increased levels of n NO have been measured. However, the applicability of n NO as a marker of upper airway inflammation awaits validation. Exhaled nitric oxide (e NO) is currently the MOST RELIABLE MARKER of rhino-bronchial inflammation, but its routine assessment is difficult as the test is available only in highly specialized centres.

#### Other investigations

X-RAY PNS---Water's (OM view). CECT of PNS....2 mm. Coronal cuts are preferred. NASOENDOSCOPY. under L.A./G.A. Hopkins rod (0°/30°/70°). Evaluate the individual for asthma. At some centres FAST-Fluro Allergo Sorbent Test is done.

#### Complications of AR

Complications of AR are allergic asthma, chronic otitis media, hearing loss, chronic nasal obstruction, sinusitis, orthodontic malocclusion in children.



*Figure 6*

#### Prognosis

Treatment is available and pts. remain asymptomatic only until re-exposure to allergic antigen. There is no evidence of mortality from the disease but there is very high morbidity. PQLI is affected. Seasonal allergic symptoms improve as patients age.

#### Management of AR

Management of Allergic Rhinitis includes Allergen avoidance and environmental control measures, Medical/pharmacologic treatment, Immunotherapy and Surgery.

Choice of treatment will depend on efficacy, safety, cost-effectiveness, patient preferences, combination, objectives of treatment, likely adherence to recommendations, severity and control of disease and presence of co-morbidities.

Practical allergen avoidance tips given by WAO for public education purposes are as follows.

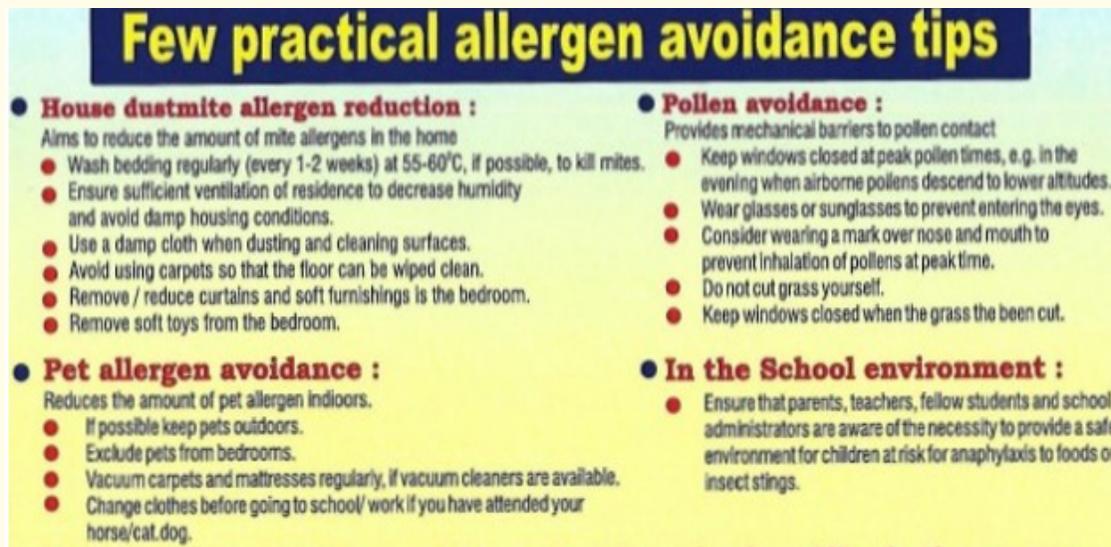


Figure 7

**Pharmacotherapy**

Oral antihistaminic are 1<sup>st</sup> GEN:- Chlorpheniramine maleate/Diphenhydramine/Clemastine, 2<sup>nd</sup> GEN:- Loratadine/Terfenadine/Acrivastine, 3<sup>rd</sup> GEN:- Fexofenadine/Cetirizine. Topical application of Azelastine. NEWER - Desloratadine/Levocetirizine.

**Acute phase medications**

Antihistamines are effective in blocking histaminic effects. (Runny nose/Watery eyes). Side Effects of antihistamines are Sedation, Dry mouth, Nausea, Dizziness, Blurred vision, Nervousness. Non-sedating antihistamines (Cetirizine/Loratadine) has fewer side effects. Fexofenadine is more effective (has a lower risk of cardiac arrhythmias). Decongestants will Shrink mucous membranes by vasoconstriction. These are available OTC/in combination with antihistaminic, analgesics and anti cholinergic. Anticholinergic Agents Inhibit mucous secretions which acts as drying agents. Topical Eye Preparations reduces inflammation/relieves burning and itching.



Figure 8

**Preventive therapy**

Intranasal Corticosteroids Reduces inflammation of mucosa, prevents mediator release, can be used safely daily, can be given systemically as a short course during a disabling attack. Intranasal Cromolyn Sodium Mast cell stabilizer Prevents release of chemical mediators. Oral Mast Cell Stabilizer; Ophthalmic solution cromolyn.

Topical nasal steroids are dexamethasone, beclomethasone dipropionate, triamcinolone acetonide, flunisolide, budesonide, fluticasone propionate, mometasone furoate and ciclesonide.

Leukotriene receptor antagonists (anti leukotriene agents) are monteleukast (singular)/zafirleukast (acolocate) and pranleukast. These drugs reduce inflammation, oedema and mucous secretions of allergic rhinitis. Zileuton (5-lipoxygenase inhibitor) is a similar drug and is used in many parts of the world.

**Immunotherapy (AIT)**

SCIT is effective in seasonal pollinosis and mite allergy. SLIT is Effective and safe alternative, best in seasonal AR. Cochrane reviews shows that both are equally effective and the patient is in equipoise. These are more effective in adult pts. 3yrs. Of treatment with both SCIT and SLIT has been shown to provide long term clinical benefits for at least 2 yrs. after their discontinuation. The choice of therapy depends on grounds of convenience, availability of resources and personal preferences. SCIT requires administration in a specialist clinic whereas SLIT can be self-administered.

**Current concepts and future needs**

Although AIT is considered a safe and effective treatment for AR, however, its clinical effect is still contested by many due to: Heterogeneity in clinical trial designs, Study populations, Therapeutic formulations, Efficacy criteria. There is ample scope for physicians, patient organizations, companies and regulators to improve clinical trials in AIT and, to provide patients with better treatments. Inclusion of allergic pts. with relevant diseases(s) in AIT trials. Exclusion of polyallergic pts. (with clinically relevant, overlapping allergen exposures) in AIT trials. Clinically defined responders in AIT trials. Allergen exposure chambers in AIT trials. Differences in regional and seasonal exposures. Adaptive trial designs should be discussed with regulatory bodies. Patient-to-patient differences in treatment adherence and allergen exposure. (Use of “e-health” is recommended). The placebo effect in AIT is to be considered. Ethical and technical aspects of DBPC/RCT’s, especially in paediatric populations. The importance of safety reporting. (WAO guidelines for reporting systemic and local adverse events should be applied).

**Omalizumab for treatment of AR**



Figure 9

This is a new treatment strategy for allergic rhinitis DBPC study of RAGWEED immunotherapy<sup>7</sup> is done. Prohibitive high cost. It is not FDA approved for this indication. Periodic use is justified in treatment of resistant patients especially those with seasonal disease. This drug acts by removal of circulating free IgE by the recombinant humanized monoclonal anti IgE antibody.

**Surgical treatment**

Surgical treatment has limited use, SMD of I.T. reduces the size of boggy turbinates. Septoplasty is done for the Correction of septal deviation. FESS is done for the Clearance of sinuses and OMC If indicated. Vidian Neurectomy is done in certain selected cases.

**Surprising relief for stuffy nose: Sex**

According to Dr. Michael Benninger, Otolaryngologist, Chairman of Cleveland Clinic’s Head and Neck Institute, in a study done in May, 2018 has some surprising findings. The potential effect of sexual activity works the same for man and women. Swollen tissues in nose block the passages in AR creating congestion and making it harder to breathe. During arousal, the Sympathetic NS gets into play, adrenaline levels go up and blood vessels constrict. Less blood flow to the nose means less inflammation, so the nose opens up and one can breathe more easily. Lying on back position for both men and women, one cannot experience the same level of congestion relief due to effects of gravity.

**Stepladder approach in treatment of AR**

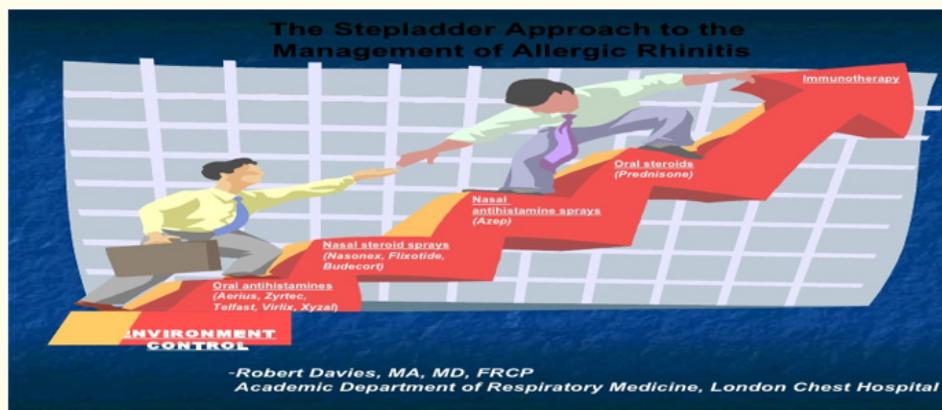


Figure 10

**Allergic rhinitis guide: Frequently asked questions (FAQ'S)**

- 1) What is common medication mistake that people make?
- 2) How long should one stay on allergy treatment?
- 3) How can one differentiate between common cold and AR?
- 4) What are the side effects of allergy medications?
- 5) How to use nasal sprays?
- 6) Are the steroids in nasal sprays safe?
- 7) What is the difference between the nasal medications and oral medications?
- 8) How quickly can one expect to get relief from allergy treatment?
- 9) Taking corticosteroids inhalers to control asthma symptoms, can one also take allergy medications?
- 10) What are the types of allergy tests?.....IgE skin test/Intradermal test /Specific IgE in blood [1-10].



*Figure 11*

## Conclusion

The main takeaways and points to ponder for the students/clinicians dealing with Allergic Rhinitis patients is that they should be comfortably able to answer all the Frequently Asked Questions mentioned at the end of the article. Updating oneself and keep abreast with the latest developments in the field of nasal allergy will go a long way in successfully controlling and preventing this disease.

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