

# Rhinitis in general practice

Kenneth Vassallo

## Case scenario

A 3 year old boy presented with a 3 week history of nasal obstruction, clear rhinorrhea, difficulty with feeding and a productive cough. Child was afebrile, had occasional watery itchy eyes and mother claimed that at night he tended to wake up a couple of times coughing and crying. He suffered from eczema as a baby. On examination he had clear rhinorrhoea, nasal mucosa appeared red, ear drums looked slightly pink, tonsils swollen yet normal colour, cervical lymph nodes absent.

## Introduction

Rhinitis is inflammation of the nasal mucosa producing rhinorrhoea, sneezing, nasal congestion, nasal pruritis and post nasal drip. It is often accompanied by symptoms involving the eyes, ears and throat.<sup>1</sup> Rhinitis can be classified by aetiology into allergic and non-allergic. Allergic rhinitis can be intermittent, persistent, or occupational.<sup>2</sup> The most common cause of non-allergic rhinitis is infection that can be acute or chronic. Other types of non-allergic rhinitis are described in Figure 1.<sup>3,4</sup>

## Key words

Rhinitis, allergic, perennial, seasonal, vasomotor

**Kenneth Vassallo MD**  
Primary Health Care Department, Floriana  
Email: drkvassallo@yahoo.co.uk

Rhinitis is a very common disease and results in a significant number of GP consultations. The two most common forms of rhinitis a GP encounters are allergic rhinitis and rhinitis due to viral illness. It is a well known fact that the global prevalence of allergic rhinitis has been on the increase and Malta has shown a similar trend.<sup>5</sup> The peak prevalence of allergic rhinitis is observed in children and young adults. Prevalence estimates range from 10 to 30 percent of adults and up to 40 percent of children, making allergic rhinitis currently the most common chronic condition found in children. Malta was one of the centres that participated in The International Study of Asthma and Allergies in Childhood (ISAAC) and from this study it resulted that Malta had the second highest cumulative prevalence rate of allergic rhinitis in the world.<sup>6</sup>

Although rhinitis may appear to be a trivial illness it can cause a significant degree of morbidity. Rhinitis can alter the social life of patients,<sup>7</sup> affect school performance,<sup>8</sup> impair cognitive function,<sup>9</sup> work productivity<sup>10</sup> and has significant implication on costs.<sup>11</sup> Furthermore rhinitis is associated with a number of other co-morbidities, such as asthma, sinusitis,<sup>12</sup> sleep disturbance<sup>13</sup> etc. Up to 40% of patients with allergic rhinitis also have asthma and up to 80% of patients with asthma experience nasal symptoms. Furthermore, patients with allergic rhinitis have three times the risk of developing asthma compared with those without allergic rhinitis. Children who develop rhinitis within the first year of life have twice as much chance of developing asthma compared to those who develop rhinitis later in life. Treating allergic rhinitis has beneficial effects on asthma, suggesting that upper airway disease is a risk factor for asthma.<sup>14-16</sup>

## Aetiology

Over the past years, increasing number of studies support the fact that the pathophysiology of allergic rhinitis and asthma share the same mechanisms "one airway, one disease" (the unifying theory).<sup>17-19</sup> Allergic rhinitis, like asthma, is thought to be the result of an IgE-mediated reversible inflammation of the nasal mucosa that occurs on exposure to allergens. Risk factors for allergic rhinitis include:

- family history of atopy
- serum IgE > 100 IU/mL before age 6
- higher socioeconomic class
- exposure to indoor allergens such as animals and dust mites
- presence of a positive allergy skin prick test.<sup>20</sup>

People of a high socioeconomic class tend to be exposed to less “dirt” and microbes when young. Together with a genetic predisposition (atopy) this provides the perfect combination for predominance of Th2 cells over Th1 cells. Such individuals will develop allergic diseases on exposure to indoor allergens at a later age – The Hygiene Hypothesis.<sup>21</sup> Th2 cells promote the production of IgE antibodies that interact with mast cells and basophils to produce the acute-phase response resulting in sneezing, congestion and/or rhinorrhea. A late-phase response then peaks after 6-12 hours resulting mainly in nasal obstruction.<sup>22</sup> Aeroallergens include pollen and mould for intermittent allergic rhinitis, and for persistent rhinitis allergens include house dust mites, moulds, animal allergens, cockroaches, certain occupational allergens, as well as pollen in areas where pollen is prevalent perennially.<sup>14,20</sup>

Although the symptoms of allergic and non-allergic rhinitis overlap significantly, the causes appear to be entirely different.<sup>1</sup> Infective rhinitis is usually due to one of a large number of viruses (e.g. Rhinovirus), and bacterial infection is usually a secondary complication.<sup>23</sup> The pathophysiology of NARES (non-allergic rhinitis with eosinophilia syndrome) is poorly understood, but a key component involves a self-perpetuating, chronic eosinophilic nasal inflammation with development of nasal micropolyposis and polyposis. Mast cells are likely to play an important role as well. NARES is a risk factor for the development of nasal polyposis and aspirin sensitivity, as well as obstructive sleep apnoea.<sup>24</sup> Unlike NARES, in vasomotor rhinitis there are no abundant eosinophils in the nasal mucosa and current theories for vasomotor rhinitis include increased cholinergic glandular secretory activity (for runners; have mainly rhinorrhea), and nociceptive neurons with heightened

sensitivity to usually innocent stimuli (for dry patients; have mainly nasal obstruction).<sup>23</sup>

In both allergic and non-allergic rhinitis once an inflammatory process is set in, one ends up with non-specific nasal hyperreactivity: there is an increased nasal response to normal stimuli resulting in sneezing, nasal congestion and/or secretion.<sup>14</sup>

## Diagnosis

Differentiating allergic rhinitis from other causes of rhinitis can be difficult because the diagnostic criteria for various forms of rhinitis are not always clear-cut.<sup>25</sup> To date most of the literature has focused on the diagnosis and management of allergic rhinitis. Recommendations for specific diagnostic criteria and treatment options for non-allergic rhinitis are often lacking compared with those addressing allergic rhinitis.<sup>26</sup> Accurate diagnosis is important because therapies that are effective for allergic rhinitis (i.e. antihistamines) may be less effective for other types of rhinitis.<sup>27</sup>

To complicate things further, it is known that a number of people suffer from a combination of allergic and non-allergic rhinitis. Research shows that the prevalence of pure allergic rhinitis in the adult population with symptoms is 43%, combination allergic rhinitis and non-allergic rhinitis is 34%, and pure non-allergic rhinitis is 23%.<sup>28</sup> A study in Malta involving 415 patients presenting with rhinitis of 3 months duration showed that 55% of the patients were atopic and common allergens involved house dust mite, cat dander and grass pollen. Skin test-negative patients with idiopathic rhinitis were mostly females and tended to present a decade later.<sup>5</sup>

When one is dealing with a patient with rhinitis, a detailed history and focused physical examination are essential for the correct assessment and management of the patient<sup>25</sup> (Figure 1).<sup>20,22,29,30</sup> Furthermore, it is important that one enquires into the impact the condition has on the patient's life

**Table 1:** Conditions that may mimic rhinitis and their signs and symptoms

### Conditions that may mimic rhinitis

- Inflammatory or immunologic conditions e.g. Wegener's granulomatosis
- Cerebrospinal fluid rhinorrhea (previous head injury)
- Ciliary defects
- Structural or mechanical conditions e.g. choanal atresia, deviated nasal septum, enlarged adenoids, foreign bodies (especially children), nasal tumours

### Signs and symptoms associated with the above conditions

#### History

- Unilateral nasal obstruction and/or unilateral rhinorrhea,
- Nasal bleeding
- Decreased sensation of face, palate and teeth
- Previous head trauma and clear rhinorrhea
- Ulcerative lesion in nose
- Past history of trauma to the Nose

#### Examination

- Deviated nasal septum
- Visible nasal polyps/foreign body

**Table 2:** Classification of allergic rhinitis<sup>22</sup>

Classification	Definition
<b>Intermittent</b>	Occurs 4 days or less per week or for less than 4 weeks
<b>Persistent</b>	Occur more than 4 days per week and for more than 4 weeks
<b>Mild</b>	All of the following: normal sleep; normal daily activities, sport, leisure; normal work and school; symptoms not troublesome
<b>Moderate-severe</b>	One or more of the following: abnormal sleep; impairment of daily activities, sport, leisure; problems caused at work or school; troublesome symptoms

and what are the patient’s expectations from treatment. One should always ask what medications the patient has already tried as most patients would tend to have already used a number of over the counter medications.

It is always important to keep in mind that there are a number of conditions that can mimic rhinitis. Even though these tend not to be that common it is important to consider these especially when patients present with certain signs and symptoms (see Table 1).<sup>23,31</sup>

### Investigation

Investigations for rhinitis are carried out in a situation when:

- diagnosis is uncertain and symptoms are severe
- patient is not responding to empirical treatment
- identification of allergen is intended to direct allergen avoidance or immunotherapy.<sup>22,32</sup>

Empiric treatment is appropriate in patients with classic symptoms, or in patients with an unclear diagnosis who yet have mild symptoms.<sup>32</sup>

The diagnosis of allergic disease depends on identifying both the symptoms occurring on allergen exposure and the relevant allergen-specific test.<sup>33</sup> The most common diagnostic tests for identifying atopy and the particular allergen/s involved are the skin test and the allergen-specific immunoglobulin E (IgE) antibody test. Other diagnostic tools used in rhinitis include nasal provocation testing, nasal cytology (e.g., blown secretions, scraping, lavage, and biopsy), imaging (X-ray, CT, MRI) and nasolaryngoscopy.

### Skin Testing

Skin testing involves introducing (percutaneously or intradermally) controlled amounts of allergen and control substances into the skin. A positive test will produce a classic weal reaction that is compared with controls.

### Allergen-specific IgE antibody testing (radioallergosorbent testing [RAST])

A raised total blood IgE suggests allergic disease but this result is non-specific.<sup>34</sup> RAST on the other hand is highly specific but generally not as sensitive as skin testing and is more costly.<sup>27</sup> It is recommended when skin testing is not practical or available, when patients are taking medications that interfere with skin testing (e.g. tricyclic antidepressants, antihistamines) or when skin testing is contraindicated<sup>33</sup> (e.g. severe eczema).<sup>35,36</sup>

### Nasal endoscopy

This can detect nasal and sinus pathology that is not detectable with a nasal speculum. Referral for nasal endoscopy is indicated when symptoms persist despite treatment. It is also indicated for the assessment of nasal polyps, crusting high in the nasal cavity, serosanguinous discharge, acute and chronic rhinosinusitis and nasal perforations and ulceration.

### Management

The management of rhinitis can be divided into four main categories:<sup>14</sup>

1. Avoidance of inciting factor, whether allergens or irritants
2. Pharmacological therapy
3. Immunotherapy for allergic rhinitis
4. Patient education

Table 3: Treatment options for allergic rhinitis			
Type of allergic rhinitis	First-line treatments	Alternative or add-on treatments*	Comment
Mild intermittent	Oral antihistamines, Intranasal antihistamines	Intranasal decongestants	Allergen avoidance may eliminate need for drugs
Mild persistent or is a moderate-severe intermittent	Oral antihistamines, Intranasal corticosteroids (CS) (preferred when persistent disease), intranasal antihistamines	Intranasal decongestants, Sodium cromoglycate	Sodium cromoglycate useful alternative to antihistamines and corticosteroids, especially in children
Moderate-severe persistent	Intranasal CS	Oral antihistamines, intranasal antihistamines (if sneeze and itch predominant), sodium cromoglycate, Ipratropium bromide (if rhinorrhea predominant), Leukotriene antagonists†	Ipratropium bromide useful for persistent runny nose. Leukotriene antagonists may be useful if there is coexisting asthma. If nasal obstruction predominant try decongestant or oral CS for short term if it fails consider surgical referral
* These drugs should usually be used if initial treatment alone has proved ineffective, although they may be used first if standard first-line drugs are unsuitable or contraindicated. † Not licensed for use in allergic rhinitis			

## 1. Avoidance of inciting factors

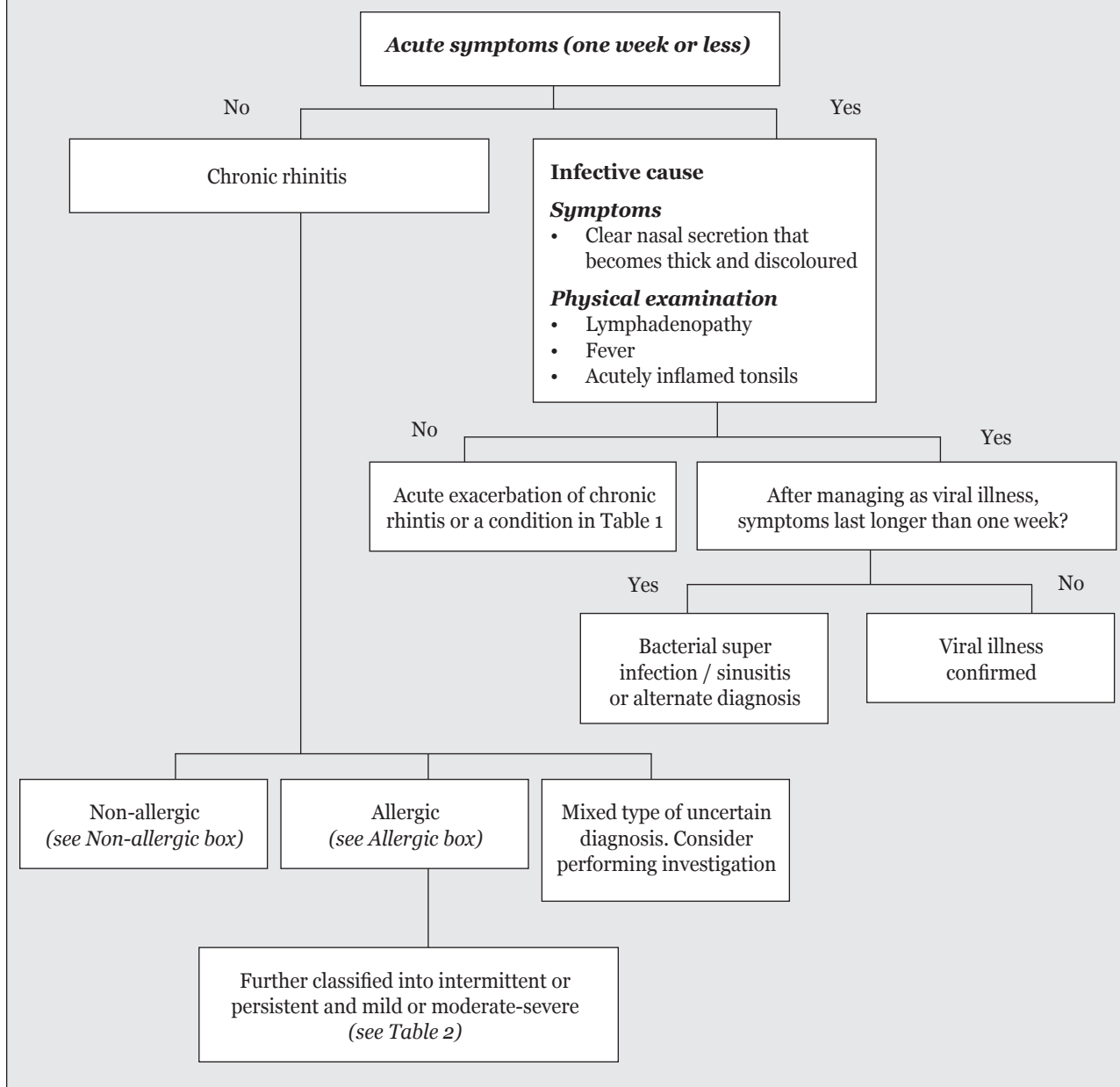
Inciting factors can be divided into aeroallergens in people with allergic rhinitis and irritating factors in all types of non-allergic rhinitis. When it comes to aeroallergen avoidance, it is common opinion that one should consider undergoing antigen testing before committing the patient to the expenses and burden of certain allergen avoidance methods.<sup>31</sup> Allergen avoidance should be targeted towards those allergens the patient has tested positive to. The World Allergy Organisation (WAO) has issued a patient information sheet describing different methods of allergen avoidance.<sup>37</sup> Furthermore WAO together with WHO have issued guidelines on primary, secondary and tertiary prevention of atopy such as breast feeding till 6 months of age and parental smoking avoidance during pregnancy and early childhood, in the case of primary prevention.<sup>37</sup> Even though

all the current rhinitis guidelines now suggest that allergen avoidance, including house mites, should be an integral part of a management strategy, more data is needed to fully appreciate the value of allergen avoidance.<sup>14</sup> Some recent studies regarding house dust mite avoidance (including a meta analysis) question the benefits of house dust mite avoidance methods.<sup>38,39</sup> In the case of non-allergic rhinitis, it is important that the patient learns what factors make their rhinitis worse and tries to avoid them, such as removal of a drug in drug-induced rhinitis, correction of endocrine abnormality in hormonal induced rhinitis and avoidance of irritants in vasomotor rhinitis.

## 2. Pharmacological therapy

Due to the chronicity of most forms of rhinitis, most patients will need to take their medications either all year round or else

**Figure 1: Differentiating between different types of rhinitis**



**Figure 1 continued: Acute symptoms (one week or less)**

### Allergic rhinitis

- Family history of atopy (eczema, allergic rhinitis, asthma)
- Atopic march (eczema/food allergy, asthma, rhinitis/conjunctivitis)
- Symptoms occur on exposure to common known antigens with seasonal or exposure variation
- Nasal and palatal itch and paroxysm of sneezing
- Clear rhinorrhea
- Nasal congestion
- Allergic conjunctivitis
- Age of onset below 20
- Malaise, headache and fatigue
- Symptoms related to work (allergic occupational rhinitis)

### Physical examination

*In general practice, the nose can be examined with an auriscope fitted with the largest speculum*

- Allergic shiners (blue-grey or purple discoloration under the lower eyelids)
- Allergic salute and transverse nasal crease
- Adenoid facies
- Wheezing in chest (asthma)
- Eczema
- Throat – in allergic rhinitis post-nasal drip is usually not prominent
- Nasal polyps uncommon

### Investigation

- Positive skin test and IgE tests to common allergens

Key: ACE = Angiotensin converting enzyme inhibitor, NARES = Non-allergic rhinitis with eosinophilia syndrome, NSAIDS = Non-steroidal anti-inflammatory drugs, OCP = oral contraceptive pill

### Non-allergic rhinitis

Diagnosis mainly based on excluding allergic rhinitis

1. Congestion rather than rhinorrhoea/sneezing
2. No FH of Atopy
3. Prominent post nasal drip and enlarged tonsil
4. Usually perennial yet variations can occur with weather changes/irritant exposure
5. Negative skin tests and normal IgE concentrations.

Some specific points on particular types of non-allergic rhinitis:

- **NARES:** Eosinophilic infiltration on nasal cytology. Sneezing paroxysms, profuse watery runny nose, nasal pruritus, occasional loss of smell. Associated with non-IgE mediated asthma, aspirin intolerance, nasal polyps.
- **Vasomotor rhinitis:** Most develop rhinitis (congestion and hyper secretion mainly) in response to environmental conditions, such as cold air, high humidity, strong odours, and inhaled irritants. Diagnosed through exclusion of all other types of rhinitis.
- **Hormonal rhinitis:** pregnancy, puberty, the use of OCP, and hypothyroidism may all be associated with nasal obstruction and discharge.
- **Drug-induced rhinitis** may be caused by several drugs, including ACE, beta-blockers, and OCP, Aspirin and NSAIDS. Use of intranasal decongestants for more than 5–7 days may cause rhinitis medicamentosa.
- **Occupational rhinitis:** symptoms which are temporally related to exposure at work and which improve away from the workplace.

during certain periods of the year. Pharmacological therapy can either be given orally or intranasally. Intranasal treatment has the advantage that high concentrations are delivered directly to the nose thus reducing systemic side effects. Yet at times delivery is suboptimal and intranasal treatment does little to improve other associated symptoms such as conjunctivitis.<sup>14</sup>

There are a number of pharmacological options available:<sup>14,31,40</sup>

- Oral/intranasal antihistamines
- Intranasal corticosteroids
- Oral/intranasal decongestants
- Intranasal sodium cromoglycate
- Intranasal anticholinergics
- Leukotriene antagonists
- Oral corticosteroids

The choice of a particular treatment or combination depends on the type of rhinitis being diagnosed, on the severity of symptoms and on patients' expectations and preferences (see Table 3<sup>14,22</sup> for Allergic Rhinitis and Table 4<sup>20,24,27,41-45</sup> for non-allergic rhinitis). In certain situations treatment can be

taken on demand, e.g. taking an antihistamine before visiting someone that has pets. Also in very severe cases one can use a short course (maximum 2 weeks) of oral steroids as a last resort. This will provide quick relief of symptoms and will also clear nasal blockage thus allowing better penetration of intranasal treatment.<sup>22</sup>

### 3. Immunotherapy

This modality of treatment only applies for allergic rhinitis. Allergen-specific immunotherapy can be either given by the subcutaneous or sublingual route (SLIT). It requires 3 or more years of treatment and subcutaneous immunotherapy carries the risk of anaphylaxis. This treatment modality is intended for patients that suffer from allergic rhinitis with demonstrable IgE mediated disease.<sup>46</sup> It is recommended in patients who have had a long duration of symptoms; or in whom pharmacotherapy has been partially or totally ineffective or induced side-effects; or in patients who do not want to take treatment long term.<sup>14</sup> It is most effective for house-dust mite, pollen and cat allergy.<sup>47</sup> Sublingual immunotherapy (SLIT) is effective in reducing rhinitis symptom scores and anti-allergic medication requirements compared to



**Table 4:** Treatment options for non-allergic rhinitis

<b>Treatment</b>	<b>Comments</b>
<b>Oral antihistamine</b>	Have minimal or no benefit in certain Non-Allergic Rhinitis (infectious, vasomotor etc). Can be used as an adjuvant to nasal CS in the treatment of NARES
<b>Intranasal antihistamine</b>	Effective for sneezing, rhinorrhea, post nasal drip and nasal congestion
<b>Intranasal CS</b>	Effective in the treatment of certain types of non allergic rhinitis, especially NARES. Very effective in relieving nasal obstruction
<b>Intranasal anticholinergic</b>	Very effective for rhinorrhea
<b>Oral/intranasal decongestant</b>	Effective in relieving nasal congestion and post nasal drip
<b>Leukotriene antagonists</b>	Few studies are available, yet may be used as adjuvant to nasal steroid in NARES

Key: CS = Corticosteroid, NARES = Non-allergic rhinitis with eosinophilia syndrome

placebo. There is insufficient evidence comparing it to injection immunotherapy to quantify the treatment effect.<sup>22</sup> It is suitable for people with mite or pollen allergies who have had a systemic reaction to injection immunotherapy or who do not wish to have an injection.<sup>14</sup>

### What is on the horizon?

Apart from the continuous effort by the industry to develop better antihistamines, topical corticosteroids and other small molecules, there appear not to be any novel drug treatments for rhinitis ‘around the corner.’ The most exciting future therapies are safe and effective new vaccinations and all are essentially improvements on traditional desensitisation injections.<sup>48</sup>

The anti-IgE monoclonal antibody Omalizumab has been shown to be effective in the treatment of allergic rhinitis<sup>49,50</sup> and asthma, yet its cost is still too high. However, it does promise to offer a one in all solution for atopic individuals, being effective for all forms of atopic disease (i.e. asthma, allergic rhinitis, eczema) found in these people.

### Conclusion

In a survey of sufferers of allergic rhinitis, 60% of all allergic rhinitis patients responded that they are “very interested” in finding a new medication and 25% are “constantly” trying different medications to find one that “works.” Those who were dissatisfied also said their health care provider does not understand their allergy treatment needs and does not take their allergy symptoms seriously.<sup>51</sup>

It is essential that GPs have a sound understanding of the different forms of rhinitis and all the different treatment options available. They must then take time to understand the implication of the condition on their patients’ life, and what are the patients’ expectations. It is important to always keep in mind that one is treating the patient rather than the rhinitis itself.

Thus if a patient is satisfied with symptom control, even though not completely symptom free, there is no need of increasing or adding medication, as this can only impair compliance and add side effects.

### References

1. Druce HM. Allergic and non-allergic rhinitis. In: Middleton EJ, Reed CE, Ellis EF, et al, editors. Allergy principles and practice. 5th edition. St. Louis: Mosby-Year Book Inc, 1998: 1005-16.
2. Quillen DM, Feller DB. Diagnosing Rhinitis: Allergic vs. non-allergic. Am Fam Physician. 2006;73:1583-90
3. Lieberman P. Rhinitis. In: Bone RC, editor. Current practice of medicine. Vol 2. Philadelphia: Churchill Livingstone 1996; VII:5.1–VII:5.10.
4. Mygind N, Anggard A, Druce HM. Definition, classification, and terminology [of rhinitis]. In: Mygind N, Weeke B, editors. Allergic and vasomotor rhinitis. Copenhagen, Munksgaard, 1985;15.
5. Agius AM, Cordina M, Calleja N. The role of atopy in Maltese patients with chronic rhinitis. Clin Otolaryngol Allied Sci. 2004;29:247-53.
6. Montefort S, Lenicker HM, Caruna S, Agius Muscat H. Asthma, rhinitis and eczema in Maltese 13-15 year-old schoolchildren - prevalence, severity and associated factors [ISAAC]. Clin Exp Allergy. 1998;28:1089-99.
7. Bousquet J, Bullinger M, Fayol C, Marquis P, Valentin B, Burtin B. Assessment of quality of life in patients with perennial allergic rhinitis with the French version of the SF-36 Health Status Questionnaire. J Allergy Clin Immunol. 1994;94:182-8.
8. Simons FE. Learning impairment and allergic rhinitis. Allergy Asthma Proc. 1996;17:185-9.
9. Vuurman EF, van Veggel LM, Uiterwijk MM, Leutner D, O’Hanlon JF. Seasonal allergic rhinitis and antihistamine effects on children’s learning. Ann Allergy. 1993;71:121-6.
10. Cockburn IM, Bailit HL, Berndt ER, Finkelstein SN. Loss of work productivity due to illness and medical treatment. J Occup Environ Med. 1999;41:948-53.
11. Malone DC, Lawson KA, Smith DH, Arrighi HM, Battista C. A cost of illness study of allergic rhinitis in the United States. J Allergy Clin Immunol. 1997;99:22-7.
12. Nathan RA. The burden of allergic rhinitis. Allergy Asthma Proc. 2007;28:3-9.
13. Rappai M, Collop N, Kemp S, deShazo R. The nose and sleep-disordered breathing: what we know and what we do not know. Chest. 2003;124:2309-23.

14. ARIA. (2001) Allergic rhinitis and its impact on asthma. ARIA workshop report. *J Allergy Clin Immunol.* 2001;108(5 Suppl),1-205.
15. Crystal-Peters J, Neslusan C, Crown WH, Torres, A. Treating allergic rhinitis in patients with comorbid asthma: the risk of asthma-related hospitalizations and emergency department visits. *J Allergy Clin Immunol.* 2002;109:57-62.
16. National Institutes of Health, National Heart, Lung, and Blood Institute. Guidelines for the diagnosis and management of asthma. Expert Panel Report 2. NIH (Bethesda, US) Publication no. 97-4051. National Institutes of Health; 1997.
17. Grossman J. One airway, one disease. *Chest.* 1997;111 (2 Suppl):11S-16S.
18. Vignola AM, Chanez P, Godard P, Bousquet J. Relationships between rhinitis and asthma. *Allergy.* 1998;53:833-9.
19. Simons FE. Allergic rhinobronchitis: the asthma-allergic rhinitis link. *J Allergy Clin Immunol.* 1999;104:534-40.
20. Dykewicz, MS, Fineman S, Skoner DP. Joint Task Force Summary Statements on Diagnosis and Management of Rhinitis. *Annals of Allergy, Asthma & Immunology.* 1998;81:474-77
21. Munoz-Lopez F. Validity of the hygiene hypothesis. *Allergol Immunopathol (Madr).* 2006;34:129-30.
22. Prodigy – Allergic Rhinitis [Online]. [http://www.cks.library.nhs.uk/allergic\\_rhinitis](http://www.cks.library.nhs.uk/allergic_rhinitis) (accessed 29 May 2007).
23. Dykewicz MS, Fineman S, Skoner DP, Nicklas R, Lee R, Blessing-Moore J, *et al.* Diagnosis and management of rhinitis: complete guidelines of the Joint Task Force on Practice Parameters in Allergy, Asthma and Immunology. *American Academy of Allergy, Asthma and Immunology. Ann Allergy Asthma Immunol.* 1998;81(5 pt 2):478-518.
24. Ellis AK, Keith PK. Non-allergic rhinitis with eosinophilia syndrome. *Curr Allergy Asthma Rep.* 2006;6:215-20.
25. Quillen DM, Feller DB. Diagnosing rhinitis: allergic vs. non-allergic. *Am Fam Physician.* 2006;73:1583-90.
26. Nassef M, Shapiro G, Casale TB; Respiratory and Allergic Disease Foundation. Identifying and managing rhinitis and its subtypes: allergic and non-allergic components. A consensus report and materials from the Respiratory and Allergic Disease Foundation. *Curr Med Res Opin.* 2006;22:2541-8
27. Agency for Healthcare Research and Quality. Management of allergic and non-allergic rhinitis. Evidence report/technology assessment No. 54, Publication No. 02-E024, May 2002. Rockville, Md.: Agency for Healthcare Research and Quality, 2002. <http://www.ahrq.gov/clinic/tp/rhinterp.htm>. (accessed 1 June, 2007).
28. Settipane RA, Lieberman P. Update on non-allergic rhinitis. *Ann Allergy Asthma Immunol.* 2001;86:494-507.
29. ASCIA Education Resources - Management of Allergic Rhinitis. [http://www.medeserv.com.au/ascia/aer/infobulletins/management\\_allergic\\_rhinitis.htm](http://www.medeserv.com.au/ascia/aer/infobulletins/management_allergic_rhinitis.htm) (accessed on 29<sup>th</sup> May 2007).
30. Spergel JM. Atopic march: link to upper airways. *Curr Opin Allergy Clin Immunol.* 2005;5:17-21.
31. Respiratory Illness in Children and Adults (Guideline). [http://www.icsi.org/respiratory\\_illness\\_in\\_children\\_and\\_adults\\_guideline\\_/respiratory\\_illness\\_in\\_children\\_and\\_adults\\_guideline\\_\\_13116.html](http://www.icsi.org/respiratory_illness_in_children_and_adults_guideline_/respiratory_illness_in_children_and_adults_guideline__13116.html) (accessed 28<sup>th</sup> May 2007).
32. Gendo K, Larson EB. Evidence-based diagnostic strategies for evaluating suspected allergic rhinitis. *Ann Intern Med.* 2004;140:278-89.
33. Douglass JA, O'Hehir RE. Diagnosis, treatment and prevention of allergic disease: the basics. *The Medical Journal of Australia.* 2006;185:228-33.
34. Gray RD, Lipworth, BJ. The GP's role in allergic rhinitis. *Practitioner.* 2003;247:418-23
35. Bernstein IL, Storms WW; Joint Task Force on Practice Parameters for the Diagnosis and Treatment of Asthma. The American Academy of Allergy, Asthma and Immunology and the American College of Allergy, Asthma and Immunology. Practice parameters for allergy diagnostic testing. *Ann Allergy Asthma Immunol.* 1995;75:543-625.
36. Cross S, Buck S, Hubbard J. Allergy in general practice. *BMJ.* 1998;316:1584-7.
37. World Allergy Organisation – Allergic Disease Resource Centre. [http://www.worldallergy.org/public/allergic\\_diseases\\_center/paa\\_allergenavoidance.shtml](http://www.worldallergy.org/public/allergic_diseases_center/paa_allergenavoidance.shtml) (accessed 7<sup>th</sup> June 2007).
38. Göttsche PC, Johansen HK, Schmidt LM, Burr ML. House dust mite control measures for asthma. *Cochrane Database Syst Rev.* 2004;(4):CD001187.
39. Terreehorst I, Hak E, Oosting AJ, Tempels-Pavlica Z, de Monchy JG, Bruijnzeel-Koomen CA, *et al.* Evaluation of impermeable covers for bedding in patients with allergic rhinitis. *N Engl J Med.* 2003;349:237-46.
40. Wheeler PW, Wheeler SF. Vasomotor rhinitis. *Am Fam Physician.* 2005;72:1057-62.
41. Lau J, Long A. Chronic rhinitis: allergic or nonallergic? [Editorial] *Am Fam Physician.* 2003;67:705-6
42. Banov CH, Lieberman P; for the Vasomotor Rhinitis Study Groups. Efficacy of azelastine nasal spray in the treatment of vasomotor (perennial nonallergic) rhinitis. *Ann Allergy Asthma Immunol.* 2001;86:28-35
43. Wight RG, Jones AS, Beckingham E, Andersson B, Ek L. A double blind comparison of intranasal budesonide 400 micrograms and 800 micrograms in perennial rhinitis. *Clin Otolaryngol.* 1992;17:354-8.
44. Webb DR, Meltzer EO, Finn AF Jr, Rickard KA, Pepsin PJ, Westlund R, *et al.* Intranasal fluticasone propionate is effective for perennial nonallergic rhinitis with or without eosinophilia. *Ann Allergy Asthma Immunol.* 2002;88:385-90
45. Druce HM, Spector SL, Fireman P, Kaiser H, Meltzer EO, Boggs P *et al.* Double-blind study of intranasal ipratropium bromide in nonallergic perennial rhinitis. *Ann Allergy.* 1992;69:53-60.
46. Joint Task Force on Practice Parameters. American Academy of Allergy, Asthma and Immunology. American College of Allergy, Asthma and Immunology. Allergen immunotherapy: a practice parameter. *Annals of Allergy, Asthma & Immunology.* 2003; 90 (Suppl 1), 1-40.
47. Plaut M, Valentine MD. Clinical practice. Allergic rhinitis. *N Engl J Med.* 2005;353:1934-44.
48. Gardner L, O'Hehir RE, Rolland JM. T-cell targeted allergen derivatives for improved efficacy and safety of specific immunotherapy for allergic disease. *Curr Med Chem.* 2003;2:351-65.
49. Casale TB, Bernstein IL, Busse WW, LaForce CF, Tinkelman DG, Stoltz RR *et al.* Use of anti-IgE humanized monoclonal antibody in ragweed-induced allergic rhinitis. *J Allergy Clin Immunol.* 1997;100:110-21.
50. Chervinsky P, Casale T, Townley R, Tripathy I, Hedgecock S, Fowler-Taylor A, *et al.* Omalizumab, an anti-IgE antibody, in the treatment of adults and adolescents with perennial allergic rhinitis. *Ann Allergy Asthma Immunol.* 2003;91:160-7.
51. Marple BF, Fornadley JA, Patel AA, Fineman SM, Fromer L, Krouse JH, *et al.*; American Academy of Otolaryngic Allergy Working Group on Allergic Rhinitis. Keys to successful management of patients with allergic rhinitis: Focus on patient confidence, compliance, and satisfaction. *Otolaryngol Head Neck Surg.* 2007;136(6 Suppl):S107-24.