Allergic rhinitis in children
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Allergic rhinitis is a common paediatric condition. In a worldwide study of over one million adolescents aged 13 and 14 years the prevalence was 14.6%. Allergic rhinitis is characterised by rhinorrhoea, nasal obstruction, epiphora, and nasal itching. Many patients and parents think of seasonal, pollen induced “hay fever”; however, numerous aeroallergens may produce perennial symptoms, and these have an important impact on children’s quality of life. Evidence based guidelines, advances in drug treatments, and novel specific immunotherapy have all improved the management of allergic rhinitis. We review the current literature, with particular respect to the Allergic Rhinitis and its Impact on Asthma guidelines, produced by the World Health Organization. 

What is allergic rhinitis and why is it important?
Allergic rhinitis is an IgE mediated disorder triggered by exposure of nasal mucosa to allergens. This results in rhinorrhea, itching, and sneezing as well as sleep disturbance, which are easily observed and reported by parents or guardians. However, nasal congestion, the most common symptom of allergic rhinitis, may be more difficult to elicit from young children. 

Allergic rhinitis is a common form of non-infectious rhinitis, but it is often confused with non-allergic conditions that can cause similar symptoms, including infections, endocrine disorders, and anatomical abnormalities (box 1). Allergic rhinitis is the most common cause of nasal congestion in children.

People with allergic rhinitis predominantly present to primary care. The Allergic Rhinitis in Schoolchildren Consensus Group found that the condition impaired school performance. It can also cause dysfunction in the family and difficulty integrating with peers. A study of 23 children with allergic rhinitis and 69 controls found significantly lower health related quality of life (assessed using the child health questionnaire) in children with allergic rhinitis compared with healthy controls. Quality of life can, however, be improved with treatment.

How common is it?
The prevalence of allergic rhinitis in children is increasing. In England, 10% of 6 and 7 year olds and 15-19% of 13 and 14 year olds have allergic rhinitis. The International Study of Asthma and Allergies in Childhood surveyed 1.2 million children in 98 countries. In western Europe 8.3% of 6 and 7 year olds had allergic rhinitis, compared with 8.8% in North America and 13.1% in South America. Overall, 80% of patients presenting with symptoms are diagnosed as having allergic rhinitis before 20 years of age. For 80-90% of children with allergic rhinitis symptoms continue into adulthood.

How is allergic rhinitis classified?
In both adults and children allergic rhinitis is subdivided into intermittent or persistent depending on the frequency of symptoms. Intermittent allergic rhinitis is related to infrequently encountered allergens such as animal danders, whereas persistent allergic rhinitis is related to commonly encountered allergens such as house dust mites. Intermittent allergic rhinitis is diagnosed if symptoms occur for less than four days a week or for less than four consecutive weeks. Persistent allergic rhinitis is diagnosed when symptoms occur for more than four days a week and for more than four consecutive weeks.

This classification replaced the previous one, which distinguished between seasonal and perennial allergic rhinitis, because symptoms may be triggered by many different allergens and patients may be exposed to allergens throughout the year. In an observational study of 2347 people with allergic rhinitis, 72% were sensitised to both seasonal allergens (pollens) and perennial allergens (house dust mite, cat and dog dander). In a cross sectional study of 6533 patients assessing the new classification of allergic rhinitis, more than 50% of people sensitised to seasonal allergens had persistent allergic rhinitis.
The classification of severity is based on the impact of symptoms on quality of life. If sleep and daily activities are not affected and symptoms are not too troublesome, then the allergic rhinitis is considered to be mild (fig 1).

**What causes it?**

The development of allergic rhinitis is mediated by genetic and environmental factors. In a longitudinal cohort study of 8176 families the likelihood of allergic rhinitis developing increased with a personal or parental history of allergy. The odds ratio of having allergic rhinitis at age 4.5 years was 10.21 if the child had a positive food allergy test result at age 4.5 years and 2.21 if the parents had a history of rhinitis.

Common allergens include house dust mites, animal danders, moulds, and tree and grass pollens. In a European study of 3034 adults and children from 14 countries, 33.4% of patients had a clinically relevant allergy to grasses, 26.5% to house dust mites, and 19.4% to cat danders. In a study of 1314 children the relative risk for developing wheeze in the preadolescent period was 3.82 in 5 year olds with allergic rhinitis.

**How is it diagnosed?**

Allergic rhinitis is a clinical diagnosis made according to diagnostic criteria, with allergy testing where necessary. A detailed patient and parental history will provide information about the severity and frequency of the symptoms, triggers, and response to treatment.

Anterior rhinoscopy should be performed in primary care (this may be easily done using a standard auroscope). Young children are best examined while sitting on their parent’s or guardian’s lap with the caregiver placing one arm around the child’s head and one around the arms. The auroscope is inserted into the nose in a posterior direction. Whereas normal mucosa is pink, the nasal mucosa in allergic rhinitis is typically swollen and greyish. Examination can identify hypertrophy of the nasal turbinates (fig 2), nasal polyps (rare in children, except in those with cystic fibrosis) (fig 3), foreign bodies, or purulence in the nasal cavity suggestive of adenoiditis or rhinosinusitis.

**Is allergic rhinitis linked to asthma?**

The epidemiological link between asthma and allergic rhinitis is well established. Both conditions are diseases of respiratory tract mucosa, linked by common immunological processes, and they respond to similar treatments.

**Box 2: When to refer patients**

- If symptoms are poorly controlled despite medical treatment (see fig 3) or the patient experiences troublesome side effects from treatment
- If there is concern about other diagnoses such as chronic rhinosinusitis and nasal polyps
- If symptoms are atypical—recurrent bloody nasal discharge, pain, disturbance in vision, or neurological signs, warrant consideration for urgent referral
- If nasal obstruction predominates, refer to an ear, nose, and throat specialist
- If itching and rhinorrhea predominant, particularly in the presence of asthma, refer to an allergy specialist

In children with coexisting allergic rhinitis and asthma, exacerbation of allergic rhinitis leads to acute episodes of asthma, whereas treatment of rhinitis improves asthma control. Children with allergic rhinitis are at a greater risk of asthma. In a cohort study of 7383 children, allergic rhinitis in childhood was associated with a sevenfold increased risk of asthma in the preadolescent period. In a smaller cohort study of 1314 children the relative risk for developing wheeze in the preadolescent period was 3.82 in 5 year olds with allergic rhinitis.
exists about the diagnosis then referral to an ear, nose, and throat specialist is necessary. Nasal swabs for culture are not diagnostically useful.2 Red flag symptoms in children with allergic rhinitis include unilaterial symptoms, recurrent bloody nasal discharge, pain, or visual disturbance. A cranial nerve examination should be performed to assess the eye for visual disturbance and diplopia and the face for paraesthesia and weakness that could indicate a rare sinonasal tumour. Children with any of these symptoms should be referred urgently to an ear, nose, and throat specialist for further assessment.

Children should be routinely referred to secondary care if symptoms remain poorly controlled despite medical treatment (fig 4), treatment causes troublesome side effects, or the diagnosis remains uncertain (box 2). Referral can be made either to an ear, nose, and throat specialist or to an allergy clinic depending on local availability, although if coexistent asthma is poorly controlled an allergist may be preferable.

Investigations in secondary care include nasendoscopy, which allows visualisation of the posterior nasal cavity and middle meatus.7 Radiology is not routinely required in primary or secondary care.

When is allergy testing appropriate?
A systematic review on allergy testing in children recommends testing for allergic rhinitis if symptoms are resistant to treatment or the child is being investigated for concurrent asthma.26 In a cross sectional study of 784 children in primary care with doctor diagnosed allergic rhinitis, 89% had a positive IgE test result for one or more allergens.25 Allergy testing can determine a specific allergy and therefore can help to encourage avoidance of allergens and help in the recommendation of allergy specific treatment such as antihistamines or immunotherapy.2 25

Allergy testing is performed by either skin prick testing or measuring the levels of serum specific IgE.26 In skin prick testing selected allergens as well as positive and negative controls (histamine and glycerol, respectively) are introduced through the skin using a needle.2 Any wheal greater than 3 mm at 15 minutes is considered important, providing there is no response to the negative control (fig 5).2

Radioallergosorbent testing using radiolabelled anti-IgE is used to quantify the serum levels of IgE for a particular allergen. Testing for specific allergens is based on clinical suspicion, as with skin prick testing. Commonly, radioallergosorbent testing measures responses to house dust mites, pollen, and dander from cats, dogs, and other furred animals.24

Skin prick testing has a better positive predictive value than radioallergosorbent testing (48.7% vs 43.5%, respectively) and provides immediate results for discussion with patients.24 The results can, however, be influenced by the recent use of antihistamines. In practice, the choice between tests in primary care will depend on local availability.

How is allergic rhinitis treated?
The treatment of allergic rhinitis includes avoidance of allergens, nasal irrigation, drugs, and specific immunotherapy.

Allergen avoidance
Allergen control has principally focused on reducing exposure to house dust mites. However, a multicentre randomised controlled trial of 696 children found no difference between children assigned to preventive measures, which included mite impermeable mattress covers and an educational package on allergen avoidance, and those assigned to the control group.27 Therefore the Allergic Rhinitis and its Impact on Asthma guidelines do not recommend either chemical or physical methods to reduce exposure to house dust mite.28

In another randomised controlled trial, symptoms of allergic rhinitis were significantly reduced in people with an allergy to cat dander who were instructed on environmental interventions compared with controls. Environmental controls included washing the cats every two weeks, removing carpets from bedrooms, and washing floors regularly.29 The 2010 update of the Allergic Rhinitis and its Impact on Asthma guidelines recommends that sensitised patients should avoid exposure to animal dander at home.26 Additionally it recommends that patients with an allergy to mould should avoid exposure to indoor moulds.28 Indoor moulds are associated with dampness. Exposure to moulds can be reduced by eliminating any sources of dampness and cleaning the environment thoroughly to remove the moulds.

Nasal irrigation
Nasal irrigation with saline is an inexpensive treatment for allergic rhinitis. A randomised controlled trial of 20 children with allergic rhinitis showed a considerable improvement in nasal itching and congestion, rhinorrhoea, and sneezing.

![Fig 4: Treatment algorithm for allergic rhinitis](image-url)
in those assigned to nasal irrigation using hypertonic saline (n=10) and reduced the need for antihistamines after two weeks of treatment.

Saline irrigation improves mucociliary function, reducing mucosal oedema and decreasing inflammatory mediators. Irrigation is generally well tolerated in children because of the preference towards finer sprays, and it can be used in infants aged 1 month or more. Commercially available paediatric irrigation kits contain a nasal irrigation bottle and sachets of measured sodium chloride for adding to warm water. Alternatively, a small syringe or a bulb applicator may be used. Ideally, douching may be incorporated into a daily bathing regimen and should be continued while symptoms persist.

**Drug treatment**

Drugs available for treating allergic rhinitis in children are oral or intranasal antihistamines, intranasal corticosteroids, and leukotriene receptor antagonists. Figure 4 provides an algorithm for the treatment of allergic rhinitis. The Allergic Rhinitis and its Impact on Asthma guidelines do not recommend treatments in a particular order, except in persistent, moderate or severe allergic rhinitis where intranasal steroids are the preferred treatment.

**Antihistamines**

First generation antihistamines such as chlorphenamine should be avoided in children, as their sedating action can further impair school performance. Second generation H1 antihistamines, such as cetirizine, azelastine, desloratidine, levocetirizine, and loratadine, have fewer side effects than earlier formulations; in particular they are less sedating, faster acting, and have a longer duration of action.

For moderately severe intermittent allergic rhinitis or mild persistent allergic rhinitis the Allergic Rhinitis and its Impact on Asthma guidelines recommend that if there is a response to antihistamines then treatment should be continued for one month and then reviewed. If there is no improvement then alternative treatments should be considered. We would advise that patients are reviewed 2-4 weeks after starting treatment, or sooner if symptoms have not improved. A systematic review found that oral and intranasal preparations were equally effective in treating allergic rhinitis. However, intranasal treatment has a faster onset of action than oral treatment. In a small randomised controlled trial of 46 patients, the onset of action for intranasal azelastine was 15 minutes compared with 150 minutes for oral desloratidine.

Treatment for ocular symptoms should be given orally; alternatively, intraocular topical treatment can be used.

A multicentre randomised controlled trial consisting of 360 children showed that rupatadine, a second generation antihistamine, significantly reduced total nasal symptom scores (for severity of sneezing, rhinorrhoea, and nasal and ocular pruritus) after four weeks compared with placebo. Another double blinded randomised controlled trial of 177 children showed that once daily levocetirizine in children resulted in a significant improvement in the symptoms of allergic rhinitis compared with placebo. More than 80% of the children reported an improvement in symptoms with levocetirizine. None of the children discontinued treatment during the six week study period because of side effects.

Parents and patients should be informed about the possibility of drowsiness, even with second generation antihistamines, which normally improves after a few days. Other side effects include headache and gastrointestinal upset.

A meta-analysis of randomised controlled trials found that 24.1% of children taking fexofenadine experienced an adverse event compared with 24.4% taking placebo. Headache was the commonest reported side effect, occurring in 4.3% of participants taking placebo and 5.8% of participants taking fexofenadine. No sedative effects were reported. The commonest reported adverse effect with intranasal antihistamines is bitter taste, with the rate of epistaxis and nasal discomfort being the same as for placebo.

Both cetirizine and loratadine are licensed for use in children over 2 years of age, whereas levocetirizine should only be used in children older than 6 years.

**Intranasal corticosteroids**

Corticosteroids have a key role in suppressing the allergic response, and intranasal application allows high drug concentrations to be achieved locally with minimal adverse systemic effects. A randomised controlled trial of 134 children aged 6-11 years with allergic rhinitis randomised to 100 µg mometasone furoate once daily had a significant reduction in total nasal symptom scores compared with children randomised to placebo, reducing scores by 39%. A systematic review of 16 randomised controlled trials comprising 2267 participants (adults and children) confirmed the superiority of intranasal corticosteroids over antihistamines in allergic rhinitis.

Intranasal corticosteroids are more effective than antihistamines for nasal congestion and should be used if congestion predominates. It is safe for intranasal corticosteroids to be initiated in primary care and they should be continued as long as symptoms persist. Mometasone furoate and fluticasone propionate are licensed for use in children over the age of 6 years. However, the European Academy of Allergy and Clinical Immunology recommends their use in children as young as 2 years. Intranasal steroids should be administered with the head tilted forwards. The nozzle should be introduced into the nose and pointed along the hard palate and slightly laterally to avoid contact with the septum.
The onset of action of intranasal steroids is slower than that of intranasal antihistamines. In a randomised controlled trial of 425 patients it took 150 minutes for an effect to be noticed with mometasone compared with 30 minutes for nasal olopatadine. A meta-analysis in children and adults found that the therapeutic effect of fluticasone became apparent within 12 hours, but in some of the studies this was as early as 2-4 hours.

Patients and parents should be counselled about the possible side effects of intranasal steroids, including irritation of the nose and throat, epistaxis, headaches, and disturbances with smell and taste. Studies suggest that the side effect profile of modern intranasal steroids is similar to that of placebo. In a subanalysis of three randomised controlled trials in children aged 6-11 years, 7% of adverse events occurred in those taking fluticasone and 8% in those taking placebo. Headache was the commonest adverse event. The rate of epistaxis was 4% in both the groups.

Modern intranasal glucocorticoids have low bioavailability and have not been found to impair growth. The hypothalamic-pituitary-adrenal axis does not seem to be affected by intranasal glucocorticoids. In a randomised controlled trial comparing mometasone furoate with placebo in 98 children, no impact on growth was found in children as young as 3 years after treatment with 100 μg of mometasone furoate once daily for one year. The authors also found that it was safe to continue treatment in children who required inhaled or topical corticosteroids for asthma or atopic dermatitis. Betamethasone should, however, be avoided in children because of its high bioavailability and risk of growth retardation.

Given that studies have not shown an effect on the hypothalamic-pituitary-adrenal axis, weaning off treatment is not required.

Other drug treatments
Leukotrienes are inflammatory mediators produced by inflammatory cells, including mast cells and eosinophils. A systematic review of 11 trials found that antileukotrienes were as equally effective as antihistamines but less effective than nasal corticosteroids in improving nasal symptom scores and quality of life in patients with allergic rhinitis. Antileukotrienes are recommended for all forms of intermittent allergic rhinitis as well as for mild persistent allergic rhinitis and are third line treatment for moderate or severe persistent allergic rhinitis. They are particularly useful in patients with coexisting asthma and allergic rhinitis as they reduce bronchospasm and attenuate the inflammatory response. Montelukast is recommended for the treatment of allergic rhinitis in children older than 6 years. It is well tolerated, with a meta-analysis showing that side effects in children were similar to those of placebo. Treatment should be continued while children are symptomatic, but if there is no response to treatment after 2-4 weeks then an alternative drug should be considered.

Nasal decongestants relieve nasal obstruction but are ineffective against other symptoms such as itching and sneezing. Additionally, prolonged use can cause rebound congestion. The Allergic Rhinitis and its Impact on Asthma guidelines do not recommend the use of nasal decongestants in children with allergic rhinitis.

Immunotherapy
Immunotherapy, or desensitisation, involves exposing patients to increasing amounts of allergen to induce immunological tolerance. Accurate identification of the triggering allergen by clinical history in combination with allergen testing is key.

Immunotherapy can be delivered subcutaneously or sublingually, with sublingual treatment more commonly used in children. For subcutaneous treatment, a weekly injection of allergen extract is given. Dosage is progressively increased until a maintenance dose is achieved, and thereafter monthly injections are continued for two or three years. Sublingual treatment delivers the allergen extract under the tongue. As with subcutaneous treatment, the dosage is increased until a maintenance dose is achieved. After an initial dose under medical supervision, treatment may be administered at home. A meta-analysis of 22 double blinded randomised controlled trials of 979 adults and children found that immunotherapy improved symptoms scores and
reduced drug use. Another meta-analysis of 10 placebo controlled double blinded randomised controlled trials in 577 children with allergic rhinitis showed sublingual treatment to be effective at reducing symptom scores in children and adolescents aged 3-18 years as well as reducing requirements for drug treatment.\(^2\) These findings were corroborated by a Cochrane review of children and adults who received sublingual treatment.\(^1\) In children, sublingual treatment was more effective if used for longer than 18 months.\(^3\) The exact duration of immunotherapy in children is unknown, but it is conventionally given for three years.\(^4\) In a controlled study in 23 children a significant reduction in symptoms of allergic rhinitis and sensitisation to new allergens occurred six years after cessation of immunotherapy, suggesting that the treatment has a disease modifying effect.\(^5\)

Side effects of sublingual treatment range from localised itch, rhinitis, and mild asthma to (rarely) anaphylaxis.\(^6\)\(^7\) A Cochrane review found that severe side effects were rare. There were no reported cases of anaphylaxis.\(^8\) Other adverse events included wheezing, urticaria, conjunctivitis, gastrointestinal upset, and headache. The number of reported adverse events was similar in people taking sublingual immunotherapy and placebo, except for gastrointestinal upset, which was reported by 88/630 people in the sublingual immunotherapy group and 10/561 people in the placebo group. Taking antihistamines before immunotherapy reduces both the frequency and the severity of systemic side effects.\(^9\) Sublingual treatment avoids the morbidity of repeated injections and the need for hospital attendance. Immunotherapy can be used in children aged more than 5 years.\(^10\) In addition to the direct benefits of immunotherapy in children with allergic rhinitis, specific immunotherapy can also reduce the risk of asthma.\(^11\) In a randomised controlled trial in 113 children with allergic rhinitis but no asthma, those in the control arm were 3.8 times more likely to develop asthma than those in the sublingual treatment arm.\(^12\) The reduction in the risk persisted after the cessation of immunotherapy.\(^13\) Additionally, children receiving sublingual treatment needed fewer drugs for allergic rhinitis and reported lower symptom scores.\(^14\) Thus there is great potential for reducing the burden of disease caused by allergic rhinitis as well as for reducing the risk of asthma.

Guidelines form the British Society for Allergy and Clinical Immunology recommend that immunotherapy should be considered in patients with poorly controlled symptoms despite maximal drug treatment.\(^15\) Contraindications include use of β blockers and perennial asthma, unless symptoms are mild and intermittent and controlled with occasional use of bronchodilators.\(^16\)

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Competing interests: ATF is a trustee of Allergy UK; a site principal investigator for a multicentre study of the sublingual immunotherapy product Grazax produced by ALK-Abello, has lectured for Medapharma, GSK, Stallergenes, and Allergy Therapeutics, and has received payment from GSK and Medapharma towards travel and accommodation costs for attendance at conferences.

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ALL THINGS CONSIDERED

Are there any approved medical abbreviations?

The appraisal form for a senior advanced practitioner asked: “Does the practitioner in question use approved medical abbreviations while prescribing and making entries in medical notes?”

I know a host of medical abbreviations—ac, bid, od, qd, qid, and so on—but what are “approved” medical abbreviations?

The Royal College of General Practitioners lists about 200 medical abbreviations on its website. A Google search provides hundreds more. Although medical abbreviations are probably used all over the world, there seems to be no uniformity—even between hospitals in the same country. This can lead to misunderstandings among patients and may seriously affect their care.

Research into paediatric note taking has reported a lack of a systematic approach and substantive errors of interpretation, in some cases with dire consequences for patients.

A more standardised approach to medical abbreviations is therefore needed in clinical practice. Should doctors follow the advice of the International Committee of Medical Journal Editors that authors should spell out an abbreviation on its first appearance? Should there be an approved abbreviation dictionary? Should medical students be taught approved abbreviations? Should the General Medical Council provide guidelines, or should the royal colleges take the lead?

Despite thinking hard about the issue, I still cannot satisfactorily answer the question about the senior advanced practitioner’s use of abbreviations.

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References are in the version on thebmj.com.

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