

# Childhood asthma: going back to the basics

*David and Louise Cremonesini look at the management of childhood asthma and highlight the importance of assessing adherence and allergy on a regular basis*

Asthma is a long-term condition that cannot be cured. For most children and young people, however, it can be effectively managed. The UK has the highest prevalence of asthma in the world (Global Initiative for Asthma, 2012), which equates to around 1 million children in the UK having asthma (Primary Care Commissioning, 2012). This means that in every classroom across the UK there will be 2 children with asthma. The UK has some of the highest mortality rates compared with many other European countries. In 2010, there were 12 deaths from children aged 14 years or under and 24 744 emergency admissions for asthma among children in England (Primary Care Commissioning, 2012). It is known that there are often preventable factors for deaths, perhaps up to 90% of them (Primary Care Commissioning, 2012). Asthma UK (2013) estimates that 75% of hospital admissions for asthma are avoidable.

Over the years, there have been many publications around the evidence-based care of asthma. It is important to follow these resources for optimal management. However, prescribing the right inhalers is only a part of what is needed for any asthma review. Getting the basics right is key and is a minimum standard that people with asthma deserve. Jonsson et al (2012) conducted a study on this in Sweden, where the incidence of asthma in children and young people is estimated at 8–10%. This is lower than the UK. Nevertheless, it revealed a substantial gap between actual care provided for children and national recommendations described in Swedish guidelines. What was most striking was the lack of documentation around allergic triggers, education and inhaler technique.

This article will look at a typical asthma case that might present to a general practice. The authors will review it in the context of National Institute for Health and Care Excellence (NICE) quality standards for asthma that was released in February 2013. This article will also make reference to British Thoracic Society/Scottish Intercollegiate Guidelines Network (BTS/SIGN) (2012) guidelines on the management of asthma.

## Case study

Johnny is a 12-year-old boy who was diagnosed with asthma when he was 6. He has eczema and his mother has brought him for his annual review at the general practice surgery. She is concerned that he is suffering at school. Johnny has been coughing at night and has had 3 admissions to hospital in the past 6 months. He has a touch of hay fever but no food allergy or eczema. He is currently using montelukast, Seretide 50 Evohaler 2 puffs twice a day, and uses his Ventolin at least 5 times a week.

Before the practice nurse goes on to manage asthma in a child presenting with deteriorating respiratory symptoms, he/she should always consider these questions:

- Is this the right diagnosis?
- Is it asthma?
- Can you hear a wheeze?

Parents frequently use the term 'wheeze' to describe a rattle in the chest or a variety of upper airway noises. The best thing to do is imitate the sound to the parents. Not all wheezes are indicative of asthma. However, if there is no wheeze or breathlessness, asthma is highly unlikely (Bush et al, 2010).

An isolated dry cough is rarely indicative of asthma, especially if there is no breathlessness. A post-viral cough is a common reason for suspecting asthma. However, taking into consideration that preschool children can have at least 10 viral colds a year, a post-viral cough is a common occurrence (Bush et al, 2010). A trial of salbutamol might help to distinguish it from asthma, as well as a personal history of other atopic conditions. A persistent, wet and productive cough would certainly warrant further investigation and should not be diagnosed as asthma.

Clinical features that increase the probability of asthma in children are listed below (Levy et al, 2009):

- Wheezing
- Cough
- Difficulty breathing
- Chest tightness.

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The probability of asthma in the child increases if he/she presents with more than one of the following symptoms, particularly if (Levy et al, 2009):

- Symptoms are frequent and recurrent
- Symptoms are worse during the night and early morning
- Symptoms are triggered by exposure to exercise, animals, damp or cold air, emotions or laughter, and occur apart from colds
- The child has a history of atopic disorders
- There is a family history of atopy or asthma
- There is widespread wheeze on auscultation
- There is improvement on therapy.

**Asthma control test**

When assessing a child with asthma, the practice nurse must first decide whether his/her asthma is controlled. The case study represents a patient with poor control. Asthma UK (2013) found that 75% of children who are admitted into hospital will have had a period of poor control. Such admissions might have been prevented with the right treatment and assessment. When children are seen acutely and given prednisolone, for example, appropriate acute management is vital but also provides an opportunity to review asthma control prior to the attack. The review is therefore a chance to step up the child’s preventer treatment if appropriate.

Table 1 outlines the criteria used to assess control. The practice nurse needs to ask questions about how the patient’s asthma has been in past few weeks in order to ascertain this. Suggested questions that can be used to assess control are:

- How often have you had to use your reliever treatment in the last week?

- Have you had your usual asthma symptoms during the day (cough, wheeze, chest tightness or breathlessness) in the last week or month?
- Have you had difficulty sleeping because of your asthma symptoms, including cough, in the last week or month?
- Has your asthma interfered with usual activities and/or school in the last week?

**Adherence**

Low adherence is very common and it can be difficult to assess. In primary care, the practice nurse has access to the patient’s prescriptions and can easily check this. However, simply requesting the medication regularly is not proof that the child is taking the medication or taking it properly. Children with perceived poor control and/or severe asthma may still have poor adherence.

Bracken et al (2009), though looking specifically at children referred to a specialist tertiary clinic with severe asthma, found that less than 15% of children collected enough prescriptions to cover their prophylactic asthma medications, with nearly one third picking up less than 50%. Some of those who collect their prescriptions may not inhale their medication appropriately and others may leave their medicine in a cupboard at home until it is out of date. The study also found that at home visits, 23% of families could not provide a complete set of accessible, in date medications at home.

The issue of supervision is linked with that of adherence. The practice nurse should ask about this, especially in older schoolchildren where it is more likely that parents have decided they can take medication on their own. Orrell-Valente et al (2008) found that 20% of 7-year-olds and 50% of 11-year-olds were unsupervised when taking medications.

It is difficult to challenge patients directly about their medicine-taking habits, but it is important to try to address this and ascertain reasons behind low adherence. A suggested approach might be: ‘I appreciate that it is hard to take these medicines twice a day. In a typical week, how many times might you forget?’ Make the child and parent realize that it is quite normal to forget treatment and that way they are more likely to be honest.

If the practice nurse has clear evidence that the child is not taking his/her medication, direct confrontation is unlikely to be helpful. Once the practice nurse, parent and child have acknowledged this, the practice nurse

**Table 1. Levels of asthma control**

Characteristic	Controlled (all of the following)	Partly controlled (any present in any week)	Uncontrolled
Daytime symptoms	None (2 or less per week)	More than twice a week	3 or more features of partly controlled asthma present in any week
Limitations of activities	None	Any	
Nocturnal symptoms or awakening	None	Any	
Need for rescue or reliever treatment	None (2 or less per week)	More than twice a week	
Lung function (PEF or FEV <sub>1</sub> )	Normal	<80% predicted or personal best on any day	

Adapted from: Global Initiative for Asthma, 2012

**Table 2. Summary of review looking at risk factors for childhood asthma deaths in the east of England from 2001–2006**

Male to female ratio 1:1
Age range: 8–17 years
50% had mild to moderate asthma—only half had been seen by a hospital specialist
45% were poorly compliant
30% only had a record of their asthma plan
50% of deaths occurred in 3 months (June–August)
65% were thought to be atopic—only 3 had allergy testing
In 20% of cases, animal exposure was a likely trigger before death
From: Anagnostou et al, 2012

should then enquire about reasons for this. This could be an opportunity for the family to review their morning routine, and a period of direct parental observation might be helpful initially. It could be that the child does not like using a spacer. If that is the case, prescribe a different inhaler that does not require a spacer for administration, e.g. a Turbohaler.

Additionally, the patient may need education about asthma. Early in the child’s life, the parent would have given the child all the treatment. Once that responsibility is transferred to the child, he/she may not be able to detect any noticeable benefit from a steroid inhaler and may then wonders why they need it. A child might say: ‘The blue helps me breathe!’ Although this is true, using the preventer is key to good asthma control and it is only by asking the child that the practice nurse ascertain, address and explain this. Asthma plans are key to this and will be discussed later in this article.

**Inhaler technique**

The inhaled drugs that are given to children need to get to the lower airways in order to work. This presents a challenge as from the mouth there is a right-angled curve to get through at the back of the throat, which must be navigated by the medicine staying airborne and not hitting the back of the throat. Swallowed, inhaled asthma medication will have no effect on the lungs. Considering how quickly the medicine comes out of a pressurized metered-dose inhaler (pMDI) on activation, using a pMDI in the mouth could result in most of the medicine hitting the back of the throat. It is important to check whether the patient is using their inhaler correctly. Evidence shows that more medicine gets to the lower airways by using a spacer compared with using a pMDI alone (Labiris and Dolovich, 2003). Furthermore, Levy et al (2013) showed that adults who can use pMDIs correctly have better asthma control, and those taking inhaled steroids via a spacer or breath-activated device resulted in better asthma control than via a pMDI alone.

In the case study, Johnny uses the Seretide 50 Evohaler directly in his mouth and he has been doing that since his mother allowed him to take charge of his medicines. Some teenagers may regard spacers as ‘babyish’, so it is vital to emphasize the importance of the spacer but acknowledge that there are alternatives. Children from the age of 4–5 years or earlier should be swapped from a spacer with

a mask to one with a mouthpiece. Allow them to practise using it for a while before disposing of the mask one. A mask spacer is much better than no spacer in older children. Explain the technique of using the spacer and watch them do it. The Asthma UK website is a good resource and shows useful videos that highlight inhaler technique.

As children get older, there are two potential techniques with a spacer: tidal breathing (3–5 normal breaths per puff) or slow inhalation and hold. Either technique is good and the child should be allowed to pick their preferred method. Inhalation over 3–4 seconds must be slow as if it is inhaled too quickly, the medicine will hit back of the throat. The practice nurse should listen out for the whistle on the blue spacer, which should not be heard. If the whistle is heard, this means that the child is inhaling too quickly and at increased risk of having the medication being deposited at the back of the throat.

NICE (2013) recommends that people with asthma are given specific training and assessment in inhaler technique before starting any new inhaler treatment.

**Environment**

Persistent exposure to smoke will aggravate symptoms and potentially lead to steroid resistance (Chalmers et al, 2002). Even if parents do not smoke in the house, smoking remains on the clothes and the child will remain exposed to it. Some asthmatic children may be smokers as well. In the context of asthma management, it should be highlighted that any exposure will not help and so offering alternatives to help give smoking up should be part of the annual review

Less obvious issues regarding environment include the presence of allergic triggers that the child is exposed to. Anagnostou et al (2012) published a review looking at risk factors for childhood asthma deaths in the East of England between 2001–2006. There were 20 childhood deaths in this period and a summary of their findings can be seen in *Table 2*.

**Links with allergy**

Allergy is major risk factor for asthma and should be assessed at least once a year. The practice nurse should ask about:

- Triggers
- Pet exposure
- Seasonal triggers
- Hay fever.

Hay fever is closely linked with asthma. A survey in UK general practice carried out by Magnan et al (2008) showed that asthma patients with significant rhinitis were 4–5 times more likely to have poorly-controlled asthma compared to patients with rhinitis, with an odds ratio greater than that for poor compliance with asthma therapy. More often than not, asthma sufferers have hay fever too.

Treatment of hay fever is covered well by Scadding and Walker (2012). A key point to consider is achieving control of symptoms so that the effect on quality of life is minimized. Daily non-sedating antihistamine is the first line of treatment, and if still symptomatic the next step is to add a nasal steroid. Newer types are safer for children and can be used from 6 years of age (e.g. fluticasone propionate or mometasone furoate). It is important to check the patient's technique as it is vital to aim the spray to the outside of the nostril and not to sniff hard. This will keep the steroids in the nose and allow them to work (Scadding et al, 2012) (*Figure 1*).

If the history suggests an allergic trigger that is present outside of the hay fever season, the likely cause will be either animal hair or house dust mites. It is therefore important to ask about animal exposure and see if arrival of any pets to the household coincides with a deterioration in asthma. However, pets that have been with the family for long time can also become an allergic cause after prolonged exposure. Offering an immunoglobulin E blood test to look for specific animal hair, pollen or house dust mites should help in prompting a discussion around ways to avoid that trigger. The Allergy UK website is an excellent portal for information around this and is a useful source of information for families. Removing a pet is a big step for many families, so look for evidence to support this, e.g. symptoms of sneeze, rash or wheeze associated with direct contact or resolution of symptoms when on holiday.

### **Psychosocial**

Psychosocial morbidity goes hand in hand with asthma. In practice, it is not helpful to try to ascertain whether the child is anxious or depressed because of asthma. Instead, treat each problem individually. Hyperventilation syndromes or vocal cord dysfunction may present as asthma that is non-responsive to treatment, but at presentation the patient may have normal saturations.

Habit cough occurs in children and to diag-

nose this warrants one question: What happens when the child is asleep? If all noises and cough disappear, asthma can be ruled out.

### **Treatment**

Once the practice nurse has addressed the basics, it is then important to review actual medication and doses. BTS/SIGN (2012) guidelines outlines the stepwise treatment for asthma (*Table 3*). Poorly-controlled asthma means treatment must be 'stepped up'. However, if asthma appears well controlled treatment should be 'stepped down' as well. Children can outgrow their asthma so practice nurses should be considering this all the time. If children only have seasonal asthma associated with hay fever, they might not need any preventer treatment during winter months if asymptomatic. In this situation, start preventer treatment 2 months before their hay fever season kicks off and stop at the end of the season.

It is important to note that BTS/SIGN (2012) guidelines advise when children should be referred. A study looking specifically at asthma deaths found that 50% of children with severe asthma were not followed up by the hospital (Anagnostou et al, 2012). Children not achieving good control on step 3 treatment should be referred to hospital for an assessment.

NICE (2013) recommends that people with difficult asthma should be offered an assessment by a multidisciplinary, difficult asthma service.

### **Inhaled steroids**

Once started, inhaled steroids might start to have an effect after 2 weeks (Asthma UK, 2013). However, the authors' personal practice is to give any initiation or step up treatment 2 months before reviewing for any benefit. Hyland et al (2009) reviewed the advice being given out by asthma nurses in primary care around use of inhaled corticosteroids and discovered wide variations in the advice being given to patients, with 70% admitting advising intermittent inhaled steroid use. BTS/SIGN (2012) guidelines state:

There is no evidence that increasing the dose of inhaled steroids is effective in treating acute symptoms, but it is good practice for children already receiving inhaled steroids to continue with their usual maintenance doses.

For exacerbations, if the child needs steroids,

this should be given orally for 3–5 days. Children seen in primary care should be given oral steroids promptly, even if they are being referred to hospital.

NICE (2013) recommends that people aged 5 years or older presenting to a health professional with a severe or life-threatening acute exacerbation of asthma should receive oral or intravenous steroids within 1 hour of presentation.

## Education

After instigating the right treatment, the last thing to ensure is that the family and child understand what has been explained to them and the importance of why these medicines are being issued. Then, the child must be given an asthma plan. NICE (2013) recommends that people with asthma should receive a written personalized action plan.

There is plenty of evidence that this helps with achieving good control since earlier stepping up of salbutamol doses or attendance to their general practice will lead to quicker resolution of symptoms (Wolf et al, 2003). Personalized action plans can reduce readmission rates and empower families to take more control of their child's asthma as they feel more confident in managing it. Children should also be given a plan when discharged from hospital. There are many examples of plans available and a useful resource is the Asthma UK website. Liaise with the local secondary care team and perhaps use the same plan to ensure continuity for families. Evidence shows that this is not done well in primary care (Hersh et al, 2010).

## Children are not small adults

Managing asthma properly is complicated and takes time. This is further complicated by the fact that children are different from adults. The main differences can be classified into four main categories, as discussed below.

## Partnership

It is vital to work in partnership and involve both parent and child in management plans and treatment strategies. As the child grows, the parent needs further support when control is passed to the child. A good time to start passing over that control is when the child starts secondary school.

## Safeguarding issues

Adults often make decisions about compliance and technique themselves and they have ultimate responsibility for controlling their

asthma. This is not the case in children and poor compliance and/or attendance can never be blamed on the child. A child cannot fail to attend, only fail to be brought (Powell and Appleton 2012), and this might be a sign of neglect by the parent.

Writing to families requesting appointments should never be the only intervention and practitioners need to consider telephone calls, issuing repeat salbutamol prescriptions only after a face-to-face review or involving secondary or social care colleagues. Speak to the school, health visitor or school nurse to get a sense of how the parent's control is.

Figure 1. Correct procedure for using a nasal spray

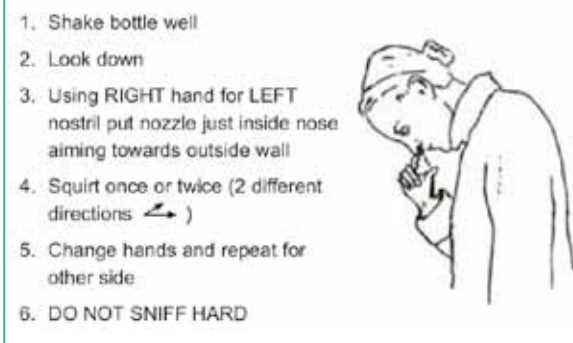


Table 3. Stepwise management protocol for asthma

	Under 5 years	5–12 years
<b>Step 1</b>	Inhaled short-acting $\beta_2$ -agonist as required	Inhaled short-acting $\beta_2$ -agonist as required
<b>Step 2</b>	Consider montelukast first line, symptoms only virus related Trial of ICS 200–400 mcg BDP or equivalent but stop after 3 months and review. If symptoms return, restart and wean to lowest dose possible	Inhaled corticosteroid 200–400 mcg BDP or equivalent
<b>Step 3</b>	If on ICS, add montelukast If on montelukast, add ICS 200–400 mcg BDP or equivalent Low threshold to refer for paediatric opinion	Add inhaled LABA in combined inhaler: – If effective, continue – If partially effective, continue LABA and increase ICS to 400 mcg BDP – If ineffective, stop LABA and increase ICS to 400 mcg BDP Consider adding montelukast If symptomatic on LABA. ICS 400 mcg BDP and montelukast, move on to step 4
<b>Step 4</b>	Refer all children for specialist paediatric opinion	Increase ICS dose to 800 mcg together with chosen effective regime from step 3 and refer to paediatric respiratory clinic
<b>Step 5</b>		Refer all children for specialist paediatric opinion
<b>Stepping down</b>		
The lowest possible dose of ICS should be used to achieve control When control has been achieved, the ICS dose should be stepped down where possible, or add on therapies withdrawn Patients should be reviewed after any change to treatment in 2–3 months time		
<b>Notes</b>		
Choice of combined inhaler depends on whether child will use spacer or not All doses given are total daily dose Doubling the ICS dose during an exacerbation is not recommended Before changing any dose, review issues such as technique and adherence Equivalent doses for common steroid preparations: beclometasone dipropionate 400 mcg; budesonide 400 mcg; fluticasone propionate 200 mcg		
ICS: inhaled corticosteroids; LABA: long-acting $\beta_2$ -agonist From: British Thoracic Society/Scottish Intercollegiate Guidelines Network, 2012		

**KEY POINTS**

- All children must use a spacer for inhaled steroids and have their technique reviewed regularly
- All children with asthma must be given a written personalized asthma plan
- The practice nurse should consider any allergic triggers and possible tests during diagnosis
- The child's prescription history, adherence and control should be assessed at every review
- Safeguarding issues should be considered when children fail to attend repeatedly for follow-up and have poor control

**Further guidance**

Resources for managing asthma and advice for coping with an asthma diagnosis are available from **Asthma UK**. Visit: [www.asthma.org.uk](http://www.asthma.org.uk)

The **National Eczema Society** provides practical advice about treating and managing eczema. Visit: [www.eczema.org](http://www.eczema.org)

**Diagnosis**

Be wary of starting steroids in young children under 5 years. As recurrent wheeze with colds is common, ask about symptoms in-between before considering a steroid inhaler. Consider trials of stopping treatment in these children and assess response and perceived improvement on starting treatment, which might be due to a prolonged infection-free period. Children can be labelled asthmatic at a young age and remain unnecessarily on treatment for years.

**Allergy**

Allergies are more common in children and more likely to be a contributing trigger. The practice nurse should ask about other allergic problems and address treatment of those too. Possible allergic problems could include eczema and food allergy. Children with suspected immunoglobulin E mediated food allergy and concomitant asthma should be reviewed by a paediatrician and offered testing to confirm diagnosis (NICE, 2011). Asthma is the biggest risk factor for anaphylaxis and deaths from food allergy. Children with both these conditions should have an adrenaline auto-injector. Ensure that the parent and child know how to use the device before issuing it.

**Conclusions**

Practice nurses play a vital role in managing childhood asthma in primary care. In addition to prescribing the right inhalers, practice nurses need to consider allergic triggers, education and inhaler technique. Low adherence is a key factor behind poor asthma control, which can be difficult to assess. Therefore, after instigating the right treatment, the practice nurse must ensure that the family and child understand what has been explained to them and the importance of why these medicines are being issued. The child must also be given a personalized asthma plan.

When treating children with asthma, it is important to remember that children cannot be viewed as 'small adults'. Issues such as responsibility being passed to the child and safeguarding need to be considered throughout the process to ensure that both parent and child are able to control the child's asthma.

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**References**

Anagnostou K, Harrison B, Iles R, Nasser S (2012) Risk factors for childhood asthma deaths from the UK Eastern Region Confidential Enquiry 2001–2006. *Prim Care Respir J* 21(1): 71–7

Asthma UK (2013) Asthma facts and FAQs. <http://tinyurl.com/nvwosdy> (accessed 17 September 2013)

Bracken M, Fleming L, Hall P et al (2009) The importance of nurse-led home visits in the assessment of children with problematic asthma. *Arch Dis Child* 94(10): 780–4

British Thoracic Society, Scottish Intercollegiate Guidelines Network (2012) British guideline on the management of asthma: a national clinical guideline. <http://tinyurl.com/c4a6jbo> (accessed 23 September 2013)

Bush A, Bossley C, Fleming L, Wilson N (2010) Avoiding common mistakes in the management of asthma: or, is the child a WADDLER? *Paediatr Child Health* 20(7): 344–6

Chalmers G, Macleod K, Little S et al (2002) Influence of cigarette smoking on inhaled corticosteroid treatment in mild asthma. *Thorax* 57(3): 226–30

Global Initiative for Asthma (2012) Global strategy for asthma management and prevention. <http://tinyurl.com/qfwwgez> (accessed 17 September 2013)

Hersh AL, Orrell-Valente JK, Maselli JH et al (2010) Decreasing frequency of asthma education in primary care. *J Asthma* 47(1): 21–5

Hyland ME, Blake S, Greaves CJ et al (2009) Guidelines versus practice: UK asthma nurses often recommend intermittent, symptom-driven use of inhaled corticosteroids. *Prim Care Respir J* 18(2): 114–7

Jonsson M, Egmar AC, Kiessling A et al (2012) Adherence to national guidelines for children with asthma at primary health centres in Sweden: potential for improvement. *Prim Care Respir J* 21(3): 276–82

Labiris NR, Dolovich MB (2003) Pulmonary drug delivery. Part II: the role of inhalant delivery. *Br J Clin Pharmacol* 56(6): 600–12

Levy ML, Thomas M, Small I et al (2009) Summary of the 2008 BTS/SIGN British Guideline on the management of asthma. *Prim Care Respir J* 18(Suppl 1): S1–16

Levy ML, Hardwell A, McKnight E, Holmes J (2013) Asthma patients' inability to use a pressurised metered-dose inhaler (pMDI) correctly correlates with poor asthma control as defined by the Global Initiative for Asthma (GINA) strategy: a retrospective analysis. <http://tinyurl.com/o7yzpflu> (accessed 23 September 2013)

Magnan A, Meunier JP, Saugnac C et al (2008) Frequency and impact of allergic rhinitis in asthma patients in everyday general medical practice: a French observational cross-sectional study. *Allergy* 63(3): 292–8

National Institute for Health and Care Excellence (2011) Food allergy in children and young people. Clinical guidance 116. <http://guidance.nice.org.uk/CG116> (accessed 23 September 2013)

National Institute for Health and Care Excellence (2013) Quality standard for asthma. <http://tinyurl.com/o5uehyt> (accessed 23 September 2013)

Orrell-Valente JK, Jarlsberg LG, Hill LG et al (2008) At what age do children start taking daily asthma medicines on their own? *Pediatrics* 122(6): e1186–92

Primary Care Commissioning (2012) Designing and commissioning services for adults with asthma: a good practice guide. <http://tinyurl.com/otcsgdu> (accessed 17 September 2013)

Powell C, Appleton JV (2012) Children and young people's missed health care appointments: reconceptualising 'Did Not Attend' to 'Was Not Brought'—a review of the evidence for practice. *J Res Nurs* 17(2): 181–92

Scadding GK, Durham SR, Mirakian R et al (2008) BSACI guideline for the management of allergic and non-allergic rhinitis. *Clin Exp Allergy* 38(1): 19–42

Scadding G, Walker S (2012) Poor asthma control?—then look up the nose. The importance of co-morbid rhinitis in patients with asthma. *Prim Care Respir J* 21(2): 222–8

Wolf FM, Guevara JP, Grum CM et al (2003) Educational interventions for asthma in children. In: *Cochrane Database of Systematic Reviews* 2002, Issue 4. John Wiley and Sons Ltd, London