BEST PRACTICE

SPECIAL EDITION

Childhood ***Asthma***

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This guide is based on the Paediatric Society of New Zealand Guidelines for the Management of Asthma in Children (2005)[1]; the British Guideline on the Management of Asthma (2008)[2] and the National Asthma Council of Australia, Asthma Management Handbook, 2006.[3] This guide is designed to compliment the *bestpractice* decision support childhood asthma module.

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INTRODUCTION

NEW ZEALAND HAS ONE OF THE highest rates of childhood asthma in the world[4] with 25% of children aged 6–7 years and 30% of adolescents 13–14 years reporting asthma symptoms.[5] The prevalence has fallen in the last decade[6], but significant challenges remain. Among these are diagnosis, adherence and ethnic disparities in treatment.

Optimal management of childhood asthma includes:

- Diagnosis
- Awareness of common personal triggers
- Pharmacological treatment appropriate to the severity of the disease
- Continual review and adjustment of therapy
- Good adherence to prescribed medicines
- Availability of information and education strategies
- Use of asthma management action plans for the child and caregivers
- Knowledge of best practice and effective interventions by all health professionals involved in management

CONTENTS

Inequalities in asthma prevalence, morbidity and mortality

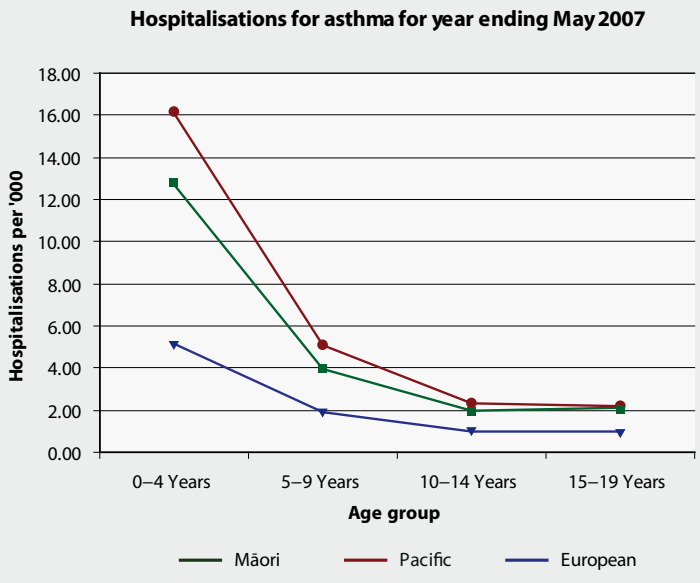
A Portrait of Health – Key results of the 2006/07 New Zealand Health Survey, reports that one in seven children aged 2–14 years (14.8%) had been diagnosed with asthma and were taking medication for this condition.[13] Adjusted for age, Māori children had a significantly higher rate of taking medication for asthma than children in the total population. Asian girls had significantly lower rates of medicated asthma.

Prevalence rates (Māori 26%, Pacific 22%, European/other 20%) are higher for Māori and Pacific children and this disparity increases with age.

Māori and Pacific children with asthma suffer more severe symptoms than other children,[7] are hospitalised more frequently and have more days off school as a result of their asthma.

Deaths from asthma are uncommon, and largely preventable. However, Māori are over 4 times more likely to die of asthma than non-Māori.

Known risk factors do not seem to explain these differences, neither is there evidence to suggest genetic or biological reasons for the increased burden of asthma among Māori



The disparity is greatest when considering Māori and Pacific children are 2–3 times more likely to be admitted to hospital for asthma than European/other children. Rates of hospitalisation are highest among Māori and Pacific pre-school and early school-aged children compared with European/other children.

Asthma is a health priority for Māori and Pacific children because it is more common, more severe and more likely to be fatal across all age-groups.

and Pacific children. Environmental triggers for asthma, and other significant health issues should be identified and managed during the primary care consultation.

Data shows that the ratio of reliever to preventer dispensings is higher in Māori and Pacific children than in European/other children (see accompanying prescribing report). This means that Māori and Pacific children are more likely to depend on an asthma reliever (such as salbutamol) and less likely to use inhaled corticosteroids than European/other children.

Asthma education is critical to effective self management. However studies have shown that Māori children and adolescents with asthma had lower levels of parental asthma knowledge, received less asthma medication, less asthma education, had more problems with accessing asthma care, and were less likely to have an action plan.

The challenge is for primary care to address these disparities. Key approaches include:

Setting realistic practice goals

- Ensure all children with asthma have access to appropriate medication
- Ensure all children with asthma have an up-to-date asthma management plan
- Record household smoking status
- Identify the person in the whānau who usually supervises the child's inhaler and spacer use

Building a trusting therapeutic relationship with patients and whānau

- Find out what whānau already know about asthma and their expectations regarding your role
- Discuss where the child fits within the whānau. Are there others in the whānau with asthma?
- Asking about housing conditions; is the house smokefree? Is the whānau living in damp housing conditions?
- Find out how asthma is affecting the whānau and child's life

Agree on realistic patient-centred health goals

- Ensure a realistic expectation of control
- Educate children with asthma and whānau about what level of asthma control is normal and how to achieve this
- Ensure every child has an asthma management plan
- Encourage and explain the benefits of a smoke free environment
- Make it easy for children and whānau to come back

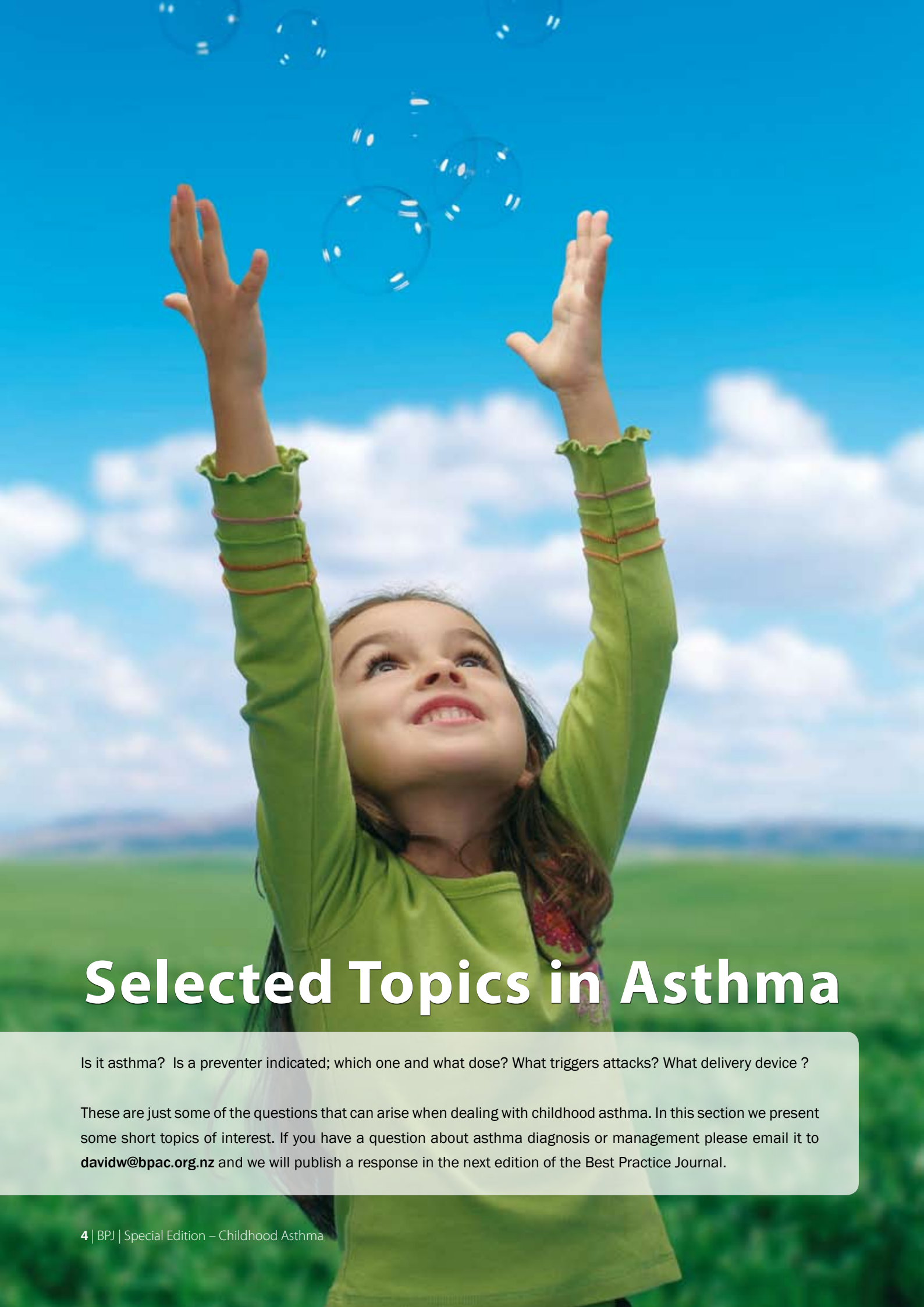
Form Partnerships

- Consider referral to specialist asthma services, asthma educators, Māori providers and other specialist services where available and appropriate

Further reading

See BPJ 13 – Asthma and chronic cough in Māori children.[8]

Trying to Catch Our Breath. The burden of preventable breathing diseases in children and young people. The Asthma and Respiratory Foundation of New Zealand, 2006.



Selected Topics in Asthma

Is it asthma? Is a preventer indicated; which one and what dose? What triggers attacks? What delivery device ?

These are just some of the questions that can arise when dealing with childhood asthma. In this section we present some short topics of interest. If you have a question about asthma diagnosis or management please email it to **davidw@bpac.org.nz** and we will publish a response in the next edition of the Best Practice Journal.

Intermittent or persistent asthma and the role of preventers

It is important to obtain the historical pattern of asthma symptoms to determine if asthma is persistent or intermittent and the need for regular preventer treatment. If the pattern of symptoms is uncertain, consider the use of a symptom diary or organise frequent reviews until the pattern becomes clear.

Intermittent asthma

Infrequent intermittent asthma

About 75% of children with asthma have infrequent intermittent asthma[2] in which children have isolated episodes of asthma lasting from 1–2 days up to 1–2 weeks. Characteristics of infrequent intermittent asthma are:

- triggered by URTI or environmental allergen
- episodes more than 6–8 weeks apart
- asymptomatic in the interval periods

Although the severity of episodes varies, most are relatively mild but they still account for a significant number of hospital admissions.

Regular preventive therapy is not usually recommended for infrequent intermittent asthma. Management involves recognition and treatment of symptoms, reducing the risk of infections and minimising exposure to triggers. Complete avoidance of exposure to cigarette smoke is also important.

ICS may be overprescribed in this group in the misconception that they reduce the number of exacerbations due to viral infections and have beneficial effects on lung function and asthma disease progression. There is no evidence to support maintenance ICS for the prevention and management of mild episodic viral induced wheeze.[12]

Frequent intermittent asthma

About 20% of children with asthma have frequent intermittent asthma (more than two exacerbations per month and minimal symptoms between episodes) and may benefit from regular preventer therapy, usually low dose ICS. The preventer may only be required during the winter months.

Persistent asthma

About 5 – 10% of children with asthma have persistent asthma where symptoms occur on most days and often include; sleep disturbance due to cough or wheeze, early morning chest tightness, exercise intolerance and spontaneous wheeze.

Acute asthma episodes, as in intermittent asthma, may also be superimposed on this persistent pattern. Severity ranges from mild (daytime symptoms several times per week) to severe (continual daytime symptoms).

Regular preventive treatment is indicated for persistent asthma (usually starting with a low dose ICS) and titrated to effect, with add on therapy as required.

Which inhaled corticosteroid?

The inhaled corticosteroid preparations available in New Zealand are listed in Table 2 (see page 16). Clinically they are all equally effective at equivalent doses.

Note: 200 mcg of fluticasone is equivalent to 400 mcg of budesonide or beclomethasone.

Choice might be governed by the type of inhaler device available or intolerance to the propellant. For example:

- Switching from beclomethasone (Beclazone) to budesonide (Pulmicort) if the child is able to efficiently use a breath activated inhaler
- Switching to fluticasone (Flixotide) if a CFC-free preparation is preferred
- Child personal preference (e.g. what their friend has)

Safety of inhaled corticosteroids

In children, doses of ICS greater than 200 mcg/day fluticasone or 400 mcg/day beclomethasone may be associated with systemic side-effects including growth failure and adrenal suppression. Children receiving such doses should preferably be seen by a paediatrician and their asthma management plan should include advice about steroid replacement during severe illness.[2]

Common Asthma Triggers

Cigarette smoke

Cigarette smoke and its constituent chemicals that are absorbed into the environment (e.g., into furniture, clothes and cars) are irritants and can cause asthma and/or worsen symptoms.

Currently, one in ten children in New Zealand is exposed to second-hand smoke in their home.[13] It is uncertain exactly how many infants are exposed to cigarette smoke in-utero, however exposure to tobacco smoke during key developmental stages, in-utero and a few months post-birth, greatly increases the risk of developing asthma and allergy.[14]

Among teenagers who smoked, there is evidence to show that their risk of developing asthma increased four-fold if they smoked regularly. Furthermore, the risk of developing asthma doubled if their mothers had also smoked while pregnant with them.[15]

Repeated exposure to the irritants in cigarette smoke causes hyperplasia of mucous glands, leading to increased production of mucous that accumulates in airways. Chronic inflammation of smaller airways may also occur in developing lungs, narrowing the airways and leading to decreased lung capacity. The effects contribute to asthma symptoms and other respiratory illnesses.[16]

All carers of asthmatic children should be asked whether they smoke and provided with support to quit. They should also be provided with effective ways to protect their children from the harmful effects of cigarette smoke exposure, for example, suggest smoking outside or changing clothes before picking up young children.

Allergens

Allergens can include house dust mites, pets, pollen, moulds and in rare cases, foods. If the allergen is not clear from the history consider skin sensitivity testing.

Colds and Flu

Many children have intermittent asthma in which symptoms are only triggered by a viral infection. These children do not generally benefit from regular preventer treatment, and the focus is on management of exacerbations and minimising exposure to triggers, including active or passive exposure to tobacco smoke.[17]

Physical factors

Physical factors such as exercise, cold air and mould associated with damp housing can provoke asthma symptoms. Portable, unflued gas heaters are the only source of heating in many New Zealand homes. These heaters release a significant amount of water into the home environment. Asthma symptoms induced by environmental or seasonal changes often require increased dose of preventer or reliever medicine as appropriate.

- Smoking and exposure to tobacco smoke contributes to the risk of developing asthma, exacerbates asthma symptoms and increases the risk of virus triggered asthma attacks
- People who smoke and are in close proximity to children (e.g., parents in the home) should be advised of the many adverse effects of smoking on children, including increased wheezing in infancy. Smokers should be offered advice and support to stop smoking and provide smoke free homes and cars.

What is the place of mast cell stabilisers, sodium cromoglycate and nedocromil?

Sodium cromoglycate inhibits the immediate and late response to allergen challenge and is potentially useful if used before allergen exposure in susceptible children.

It may be useful as initial preventer treatment for children with intermittent asthma or mild persistent asthma, especially if there are reasons that an ICS cannot be used.

- Onset is slow but an effect is usually seen after one to two weeks. A four week trial is recommended before considering other treatments
- There is no additional benefit from adding sodium cromoglycate to an established regimen of ICS or oral corticosteroid
- It can be used in addition to or instead of a SABA to prevent exercise induced asthma
- No clear benefits have been shown in children aged under five years
- Side effects are minimal
- Powder for inhalation (Intal Spincaps) and aerosol (Vicrom) are partly subsidised

Nedocromil is chemically different to corticosteroids and cromoglycate. It inhibits asthmatic reactions to allergens and exercise, and has a similar protective effect as cromoglycate against these stimuli, but is longer acting.

Nedocromil appears to have a place in the treatment of asthmatic cough due to a direct effect on sensory nerves. Any reduction in cough usually occurs within the first two to three days.

Long acting beta-2 agonists (LABA) in treatment of asthma

There are currently two long acting beta agonists (LABAs) available in New Zealand; eformoterol (Oxis, Foradil) and salmeterol (Serevent).

Role of LABAs

The addition of a LABA may improve lung function and reduce exacerbations in children who are still symptomatic despite regular preventer treatment with an ICS.

For children on a standard dose of ICS (100 mcg/day fluticasone or 200 mcg/day beclomethesone) a LABA can be added as an alternative to increasing the ICS dose. Improved symptom control may be seen also when LABA are added to higher doses of ICS (200 mcg/day fluticasone or 400 mcg/day beclomethesone).

Research from the UK, and anecdotal experience from New Zealand, indicate that children are often prescribed higher doses of ICS instead of the addition of a LABA. The addition of a LABA should be considered before increasing the dose of ICS above 200 mcg/day fluticasone.

In children who are already on high dose ICS (200 mcg/day fluticasone or greater) a dose reduction may be considered after the LABA is added.

How to use LABAs

LABAs are not preventers, but are sometimes referred to as symptom controllers. They need to be used concurrently with an ICS.

LABAs are not licensed for use in children aged under four years (salmeterol) and under six years (eformoterol) but may be an option as add on therapy on the advice of a paediatrician.

Good patient education is required when prescribing a LABA with the main emphasis on advising continued use of the ICS. Many people who are switched to a LABA perceive that the ICS preventer is no longer required and either don't pick up repeats at their pharmacy or become less compliant. Children and their caregivers should be advised about the importance of continuing the use of their ICS, even if the dose is reduced.

There is some concern that regular LABA use may reduce the bronchodilatory response to SABA. When a LABA is added careful review of symptom control is required to assess whether there is any change in response to SABA. Children using LABA may need more doses of SABA to relieve bronchoconstriction than those not using LABA and should be told about this. They should be reminded that their new inhaler is not a reliever and to have their reliever available to use if they have symptoms.

It is recommended a short acting beta agonist (SABA) is prescribed with any LABA preparation.

Combination LABA/ICS preparations

Available preparations are salmeterol with fluticasone (Seretide) and eformoterol with budesonide (Symbicort and Vannair). These preparations may be useful if it is considered that the patient would benefit from a combined inhaler.

Eformoterol may be used as a reliever when used in the combination ICS product but salmeterol cannot as its onset of action is too slow (15 – 20 minutes).

Role of nebulisers in childhood asthma

Nebulisers have a limited role in childhood asthma. MDI with a spacer is as effective as a nebuliser, quicker to use, more portable and usually more acceptable to the child and caregiver.

Indications for nebuliser use in children include;

- When the asthma is so severe that the child cannot move the spacer valve
- When the child is sensitive to the aerosol propellant
- When the child does not tolerate/refuses delivery by a spacer

The nebuliser should only be used if it delivers adequate flow. If it takes longer than five minutes to deliver 2.5 mL of solution, the airflow is inadequate for correct nebulisation. Nebulisers should be serviced at least annually.

Optimal use of spacers

- Use a spacer with a mask for children under two years and a spacer without mask as soon as the child can breathe consistently using the spacer mouthpiece
- The size of the spacer is relatively unimportant but small volume spacers are more convenient
- Shake the inhaler before each puff
- Deliver one puff in to the spacer at a time.
- Allow the child to breath normally through the spacer for six breaths after each puff
- Replace spacers every six months if they are used regularly
- Wash the spacer once per week using dishwashing liquid. Allow to air dry.
- A new spacer or one that has not been used for several months requires priming before use. A spacer can be primed by washing as above or by firing ten puffs of reliever into the spacer.

Paracetamol and the link with asthma

No reason to stop using paracetamol in children for pain and fever.

A recent New Zealand study published in the Lancet found that the use of paracetamol for fever in the first year of life was associated with increased risk of asthma, rhinoconjunctivitis or eczema at age 6 – 7 years.

Background

The prevalence of asthma has been increasing for over 50 years but the reasons for this are not understood. During this period the use of paracetamol has also increased. Earlier studies have shown a link between paracetamol use and asthma. The latest study reports some findings from Phase Three of ISAAC which is an ongoing, multicentre, international study, looking at asthma and allergies in children.

Parents of children aged 6 – 7 years were asked about their child's use of paracetamol in the previous 12 months and about the use of paracetamol use for fever in the child's first year of life. Parents were asked about symptoms of wheeze (as an indication of asthma), symptoms of itchy eyes and nose, and symptoms of itchy skin rash. Other variables such as country of residence, age, gender, parental smoking and diet were considered.

Key Study findings

- Paracetamol use in the first year of life was associated with an increased risk of asthma symptoms ("wheezing or whistling in the chest") when aged 6 – 7 years (OR 1.46; 95%CI 1.36 – 1.56)
- There was an association between asthma symptoms in the previous 12 months and reported use of paracetamol in the previous 12 months. The paracetamol use was classified as medium (at least once per year) and high (at least once per month).
- Medium and high current users of paracetamol were more likely to have "severe" asthma than never users.

In conclusion the authors suggest that use of paracetamol may be a risk factor for the development of asthma and other allergic conditions. However, an observational study like this can identify signals for further investigation but not establish causality. Some possible confounders and sources of bias identified by the authors and other commentators are;

- Recall bias; accuracy of reporting of paracetamol use and symptoms by parents
- Problems with translations and interpretations of questionnaires in different countries
- Children with the reported symptoms may have been more likely to be given paracetamol
- The symptom of wheeze has many other causes other than asthma in this age group

Conclusion

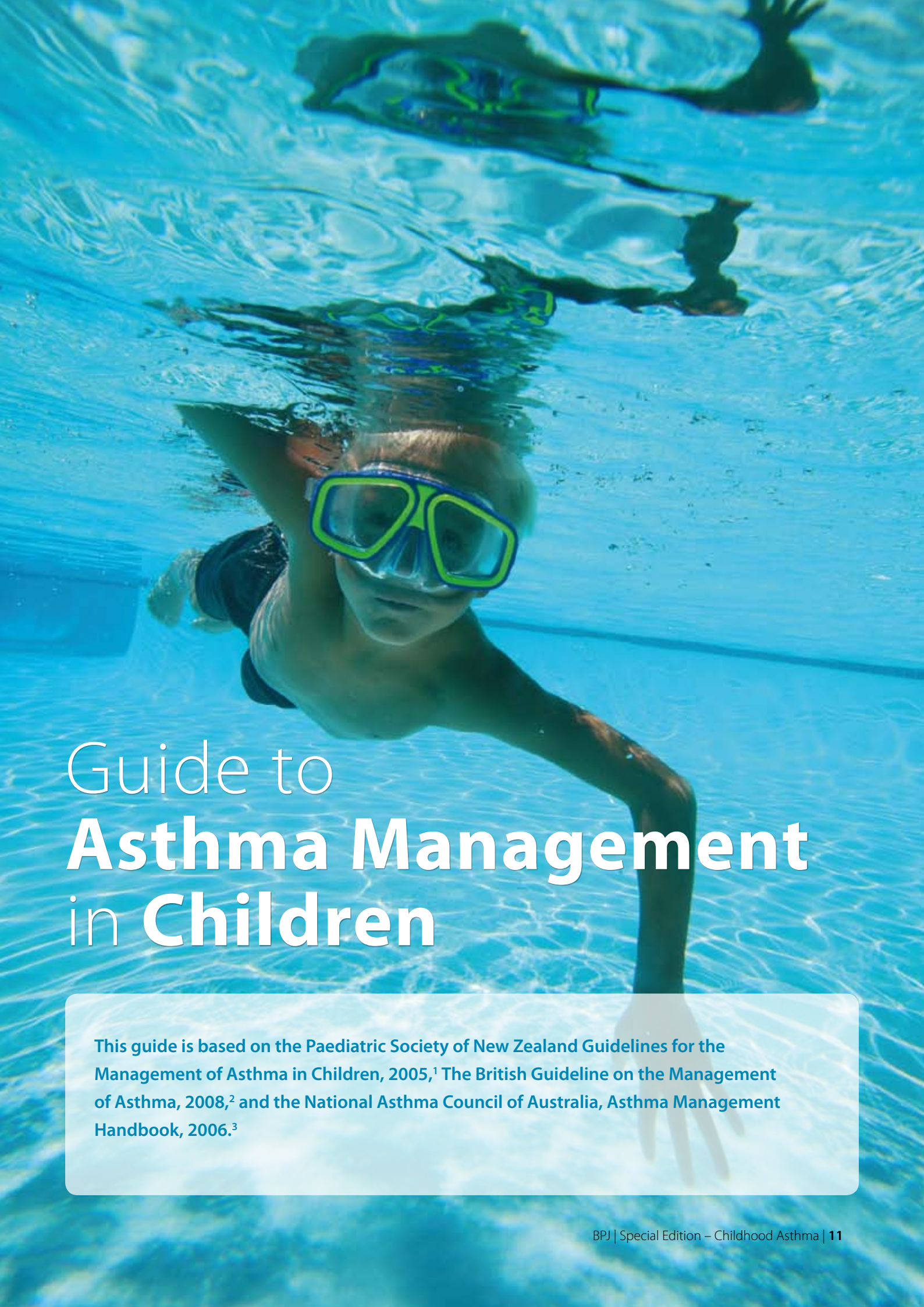
A causal link between the use of paracetamol and the development of asthma has not been shown but further research in to the long term effects of paracetamol is justified. Paracetamol is still indicated for the treatment of pain and fever but as with any medicine, it should only be used when indicated. Antipyretic drugs should not be given routinely to children if they are otherwise well but either paracetamol or ibuprofen may used if the child is distressed or unwell. Ibuprofen may cause more adverse effects than paracetamol and can aggravate or provoke asthma symptoms in some children.

For more information

Beasley R. Association between paracetamol use in infancy and childhood, and risk of asthma, rhinoconjunctivitis, and eczema in children aged 6–7 years: analysis from Phase Three of the ISAAC programme. Lancet 2008; 372:1039-1048

Paracetamol associated with asthma symptoms

http://www.medsafe.govt.nz/hot/alerts/ParacetamolAsthma.asp



Guide to **Asthma Management** in **Children**

This guide is based on the Paediatric Society of New Zealand Guidelines for the Management of Asthma in Children, 2005,[1] The British Guideline on the Management of Asthma, 2008,[2] and the National Asthma Council of Australia, Asthma Management Handbook, 2006.[3]

Diagnosis of asthma in children

The initial assessment in children who are suspected of having asthma should focus on the presence of key features and clinical findings from the history or examination, and careful consideration of alternative diagnoses.

The key features of asthma are:

- Recurrent wheeze and breathlessness with or without cough
- Variation in the intensity and duration of symptoms
- Symptom free periods

Wheeze

Asthma should be suspected in any child with recurrent or persistent wheeze whether audible or detected on auscultation. However, alternative causes of wheeze should be considered especially in young children (Table 1). Wheeze due to asthma is often accompanied by cough, shortness of breath or both.

Asthma can occur in infants aged less than one year, but it is more difficult to diagnose because of the number of different causes of wheeze at this age. Instigation of inhaled corticosteroid treatment in infants should only be done with caution if the likelihood for asthma is high and preferably in consultation with a paediatrician.

In very young children be especially aware of non-asthma causes of wheeze. The diagnosis of the cause of recurrent wheezing in infants is often difficult.

For more information please refer to Pattemore P. Wheeze in infants and young children. Diagnosis and management options. New Zealand Family Physician 2008; August 35(4):264-69.

Cough

Cough is a common symptom of asthma, it can be the main symptom in children but it is very rare for it to be the

Table 1. Some non-asthma causes of wheeze in young children

Associated Signs/Symptoms	Possible causes
Fever, cough	Respiratory tract infections, e.g. bronchiolitis
Persistent wet cough	Cystic fibrosis, recurrent aspiration, bronchiectasis
Excessive vomiting or spilling	Reflux (with or without aspiration)
Dysphagia	Swallowing problems (with or without aspiration)
Transient infant wheezing (onset in infancy, no associated atopy)	Maternal smoking or other irritants
Abnormal voice or cry	Laryngeal problems
Focal signs in the chest	Developmental delay, post-viral pneumonia, bronchiectasis, tuberculosis
Inspiratory stridor as well as wheeze	Central airway or laryngeal disorder Inhaled foreign body
Recurrent wheeze and failure to thrive	Cystic fibrosis, gastroesophageal reflux
Clubbing	Cystic fibrosis, bronchiectasis

(adapted from [1,3])

only symptom. Cough due to asthma is usually associated with wheeze and episodes of breathlessness. A diagnosis of asthma is unlikely if cough is present without associated clinical findings consistent with asthma, especially wheeze.

Recurrent non-specific cough, without accompanying wheeze, is very common particularly in pre-school age children, and can lead to a misdiagnosis of asthma. It is not usually associated with atopy or a family history of asthma and often occurs after a respiratory tract infection. Recurrent non-specific cough is typically dry, worse in the early morning and during exercise, and occurs in short paroxysms sometimes followed by vomiting. In between episodes the child is well with no wheeze.

Most children with acute cough are likely to have an uncomplicated viral acute respiratory tract infection, but the possibility of a more serious problem such as foreign body aspiration, should always be considered.

When cough is the predominant symptom of suspected asthma, careful assessment is required to avoid making an incorrect diagnosis of asthma.[3] Chronic or recurrent cough in the absence of wheeze is unlikely to be due to asthma.[9]

Clinical Features in the diagnosis of asthma

In addition to the key features of asthma, the presence or absence of other factors and clinical findings assist in determining the probability of a diagnosis of asthma.

Factors that increase the probability of asthma

- More than one of the following symptoms – wheeze, cough, breathlessness, chest tightness – particularly if these are frequent and recurrent; are worse at night and in the early morning; occur in response to or worsen after exercise or other triggers, such as emotional upsets; or occur apart from colds
- Audible wheeze or widespread wheeze heard on auscultation
- Clinical findings; increased respiratory rate, prolonged expiratory phase, chest shape (over-inflation, Harrison's sulcus), use of accessory muscles
- Personal history of atopic disorder
- Family history of atopy or asthma, especially maternal
- Improvement in symptoms or lung function in response to reversibility testing or adequate treatment

Factors that lower the probability of asthma

- Isolated cough in absence of wheeze or difficulty breathing
- History of moist cough
- Prominent dizziness, light-headedness, peripheral tingling
- Repeatedly normal physical examination of chest when symptomatic
- Normal peak expiratory flow (PER) or spirometry when symptomatic
- No response to a trial of asthma treatment
- Clinical features suggesting alternative diagnosis
- Asymmetrical findings on chest examination

The diagnosis of asthma is a clinical one. It is based on recognising a characteristic pattern of episodic symptoms in the absence of an alternative explanation.[2]

Reversibility Testing

This can help with the diagnosis of asthma and can be viewed as a trial of treatment.

If the child presents with a history of symptoms and has clinical findings at the time of examination, one suggested method is:

- One puff of salbutamol MDI via a spacer, followed by six breaths through the spacer
- Repeat above
- Review and assess the response after 20 minutes
- Base confirmation of clinical asthma on easing of signs and symptoms following treatment
- Practices vary and some practitioners consider that up to six puffs (given separately) are required for reliable testing

If the child presents with a history of symptoms but no clinical findings consistent with asthma at the time of examination, instruct caregiver to administer salbutamol as above recording response to treatment in an asthma symptoms diary.

Management options

Low probability of asthma

Consider alternative causes of wheeze, cough or dyspnoea. Further investigations or specialist referral may be required.

Intermediate probability of asthma

Consider the need for lung function testing and the possibility of other diagnoses such as chest infection and foreign body inhalation. If asthma is still the most likely diagnosis and there are no features to suggest an alternative diagnosis, consider a trial of treatment with a beta-2 agonist as above. If treatment is not beneficial, consider further investigation and/or specialist referral.

In some children, particularly those less than five years of age, with insufficient evidence to confirm a diagnosis of asthma but no features to suggest an alternative diagnosis, possible approaches include:

- Watchful waiting with review
- Reversibility testing if possible
- A trial of treatment with a beta-2 agonist and, if not beneficial, further investigation or specialist referral.

High Probability of Asthma.

Consider a trial of as required treatment with a beta-2 agonist as above.

Peak Expiratory Flow (PEF) and Spirometry

Children under 5 are unlikely to be able to perform PEF or spirometry in a consistent and reliable way to give objective assessment of lung function and bronchodilator response.

In children over 5 years, spirometry may be used to assist the initial diagnosis, when assessing the response to treatment (especially during acute episodes), and monitoring in case of poor perception of airways obstruction.

Observation of symptoms is recommended as the primary judgment of asthma control over PEF monitoring which provides variable and potentially unreliable results. PEF can be used to compliment symptomatic monitoring of asthma control and when assessing response to treatment changes.

- A PEF measured at < 80% of predicted PEF may be indicative of asthma that is not well controlled
- A PEF measured at < 60% of predicted may be indicative of severe asthma

Some cautions regarding the use of PEF:

- Long periods of monitoring often result in fabrication of results
- There may be too much reliance on results at the expense of symptomatic monitoring.
- PEF meters vary in their readings
- Single readings are not reliable

Maintenance therapy for childhood asthma

This summary broadly follows the stepwise approach described in the Paediatric Society of New Zealand guidelines with modifications and updates where appropriate.

The stepwise approach aims to eliminate intermittent symptoms as quickly as possible by starting treatment at the level most likely to achieve this. The aim is to achieve the best possible lung function and to maintain control by stepping up treatments as necessary, and stepping down when control is good.

Before changing drug treatment, always check compliance with existing therapies, inhaler technique and minimise any trigger factors.

Stepwise pharmacological management in children

1 Step One — short acting beta-2 agonist (SABA)

All children with symptomatic asthma should be prescribed an inhaled short acting beta-2 agonist (SABA) to be taken as required for symptoms. Most children have infrequent intermittent asthma, with mild episodes of symptoms requiring treatment less often than once every 1 – 2 months, and do not require regular preventer treatment.

For most cases, salbutamol metered dose inhaler (MDI) is suitable. The inhaler device and the method of delivery depend on the age of the child and mastery of technique.

- Most children aged 8 years and younger will require salbutamol MDI with spacer and a mask or mouthpiece. It is recommended that children use a mouthpiece with their spacer as soon as they can. Older children in this range may be able to master a terbutaline (Bricanyl) turbuhaler, which is breath activated.
- For children aged 8 – 15 years, MDI via a spacer and a mouthpiece is the preferred method of delivery.
- For children over 8 years, terbutaline may be considered if MDI plus spacer is inconvenient or if a dry powder inhaler is preferred. A dry powder inhaler may be more convenient for school or sport. Terbutaline is only available as a turbuhaler and cannot be used with a spacer.
- Older children might prefer to use a MDI without a spacer, although some authorities recommend a spacer is best for everyone with asthma

2 Step Two — Inhaledcorticosteroid (ICS)

The exact threshold for the introduction of regular preventer therapy is unclear and is a clinical decision based on the severity and frequency of symptoms. The following is a guide.

ICS are generally indicated when the child is:

- Using a short acting beta-2 agonist 3 times a week or more
- Symptomatic 3 times per week and exacerbations restrict activity or sleep
- Unresponsive to short acting beta agonists after 2 – 4 weeks
- Waking one night per week or more due to asthma
- Experiencing attacks more than every 4 – 6 weeks
- Having infrequent but severe attacks or shows reversible airflow obstruction between attacks

(adapted from [3, 10])

ICS preparations in New Zealand

Table 2 describes the ICS preparations (excluding combination products) which are available in New Zealand.

Dose of ICS

There are a number of assumptions made with respect to the dose response curve of ICS and also dose equivalence. This is compounded by differences in technique and methods of drug delivery. These general points should be taken as a guide in combination with individual clinical response.

- The starting dose of ICS should be titrated against the severity of the disease (as assessed by clinical symptoms). The lowest dose to achieve and maintain control should be used.
- The dose response curve for fluticasone starts to plateau between 100 and 200 mcg/day.[11] Similarly the dose response curve for beclomethasone and budesonide flattens out between 200 and 400 mcg/day.
- A suitable starting dose is 100 – 200 mcg/day fluticasone or 200 – 400 mcg/day beclomethasone or budesonide. Use the higher dose for greater severity
- Over 80% of children will respond to 200 mcg/day fluticasone or 400 mcg/day beclomethasone or budesonide

Alternative preventers

The mast cell stabilisers, cromones, such as nedocromil (Tilade) and sodium cromoglycate (Intal or Vicrom) may be useful as an alternative if an ICS cannot be used or if there is resistance to their use (see page 7). They are not as clinically effective as ICS for most people with asthma.

The Leukotriene receptor antagonist (LTRA) montelukast is also a possible alternative to ICS on specialist advice (see below).

Table 2 Inhaled corticosteroid preparations available in New Zealand

Generic Name	Brand Name	Dose Equivalence	Comments
Fluticasone propionate (FP)	Flixotide	100 mcg	MDI is CFC free. Breath activated Accuhaler also available (partly subsidized)
Beclomethasone dipropionate (BDP)	Beclazone	200 mcg	Available as MDI only for use with or without spacer.
Budesonide dipropionate (BUD)	Pulmicort (as turbuhaler)	200 mcg	Turbuhaler is a useful alternative to MDI or MDI plus spacer. Cannot be used with a spacer.
Beclomethasone dipropionate (BDP-HFA)*	QVAR	100 mcg	Not currently subsidized CFC free

*For the purposes of this article dose equivalents refer to beclomethasone which is the CFC containing preparation of beclomethasone (Beclazone). Beclomethasone-HFA (QVAR) is the CFC free preparation of beclomethasone and is about twice as potent as beclomethasone (i.e. half the dose is required) due to smaller particle size. Some guidelines have started to use beclomethasone-HFA as the dose equivalence standard.

3 Step Three — Add on therapy.

If the child is under 2 years, consider referral to a paediatrician.

In children under 5 years, if there has been no response to the maximum dose of ICS which is 200 mcg/day fluticasone or 400 mcg/day beclomethasone or budesonide and adherence and technique is good, consider referral to a paediatrician.

For children aged 5 – 15 years add a Long Acting beta-2 Agonist (LABA) if optimal response has not been achieved with a trial of ICS.

In some cases, the child will have been tried on the maximum dose of ICS at step two (200 mcg/day fluticasone or equivalent). However, the addition of a LABA can improve asthma symptom control when added to lower doses of ICS.

LABA are fully subsidised in children under 12 years if asthma is poorly controlled despite using ICS for at least 3 months at a total daily dose of 100 mcg/day of fluticasone or equivalent.

LABA are not preventers and need to be given concurrently with an ICS.

It is unsafe for a LABA to be used without inhaled corticosteroids

Assess the response to the LABA and continue if there is a good response to treatment. If there is some benefit from LABA at maximum dose (eformoterol 12 mcg BD or salmeterol 50 mcg BD) but control is still not adequate, increase the dose of ICS to 200 mcg/day fluticasone or equivalent, if not already on this dose.

If there is no response to the LABA, stop their use and proceed to step four.

4 Step Four—Persistent Poor Control

Increase the dose of ICS to 300 – 400 mcg/day fluticasone or 600 – 800 mcg/day beclomethasone or budesonide. Continue to review add on therapy and refer to a paediatrician if there is no improvement.

In most guidelines a trial of montelukast (not subsidised) or theophylline is suggested if there has been no response to LABA at step 3. GPs could consider this on the advice of a specialist especially if there was resistance to further increase in the dose of ICS or no response to the ICS doses advocated in step 4.

Montelukast can be used as sole therapy in children with frequent intermittent or mild persistent asthma which may be an option if there are reasons not to use an ICS. It may also be useful when compliance with an ICS is poor as it is given orally once per day.

Theophylline has significant systemic adverse effects and drug interactions; it is best prescribed by those experienced in its use.

5 Step Five—Continued Poor Control

- Urgent discussion with a paediatrician is mandatory
- Maintain high dose ICS
- Consider oral steroids in the lowest dose to provide adequate control
- Montelukast (not subsidised) or Theophylline may be considered in the interim

Assessment of Asthma Control

The aims of management are;

- Minimal symptoms at night
- Minimal need for reliever medication
- No limitation of physical activity
- Normal lung function

These parameters can be used as benchmarks for management. For example increased use of relievers, troublesome night-time symptoms or reduced exercise tolerance may all indicate worsening control.

As well as increased use of short acting beta agonists, any change in response to a dose should be noted. If the child's usual dose provides symptom relief for less than 3–4 hours this might indicate worsening asthma. It is important that the child or caregiver understand that decreasing symptom relief from the usual short acting beta agonist doses indicates worsening asthma. A symptom diary may be useful and keeping one should be encouraged.

In young children under 5 years an accurate record of response to initial treatment is very important as transient infant wheeze or intermittent viral- induced wheezing may not respond to a short acting beta agonist reliever or ICS preventer. It is important to recognize this group as they may be misdiagnosed as having asthma and do not require ongoing asthma treatment.[3]

Avoid making an assessment of asthma control based on any symptom in isolation, particularly nocturnal cough. Although cough may be a useful marker of asthma control it is important to also consider symptoms of airflow limitation (wheeze, dyspnoea, exercise limitation). Cough does not reliably predict onset of an asthma exacerbation in all children and nocturnal wheezing and dyspnoea are more reliable than cough in assessing the pattern and severity of asthma.

Stepping Down Treatment

Stepping down treatment can be considered when control of asthma has been achieved and maintained. Children should be maintained on the lowest possible dose of ICS but any reductions should be slow. Consider reducing the ICS dose by 25 – 50% every 3 months, particularly if the ICS dose is at the higher end of the range.

After a period of complete symptom control (e.g. 6 months) and at times where there are fewer asthma triggers (e.g. pollen) it may be appropriate to withdraw treatment with ICS.

If the child is on a LABA, reducing the dose of ICS is reasonable if the use of LABA has improved response or if the asthma control has improved over time. However, use of a LABA without any ICS may confer greater risk of asthma exacerbation or even asthma death.

Summary of stepwise pharmacological management in children

STEP 1

Infrequent intermittent asthma*

Inhaled short acting beta-2 agonist (SABA) to be taken as required.

STEP 2

Regular preventer therapy (refer to indications on page 15)

Add inhaled steroid 100–200 mcg fluticasone or 200–400 mcg beclomethasone or budesonide daily. Use the higher dose with greater severity.

In children under 5 years if there is no response to the maximum dose of ICS (with good technique and compliance), consider referral to a paediatrician.

Nedocromil or sodium cromoglycate may be a useful alternative if an ICS cannot be used. Montelukast is also a possible alternative to ICS on specialist advice.

STEP 3

Add on therapy

1. Add inhaled long acting beta-2 Agonist (LABA).
2. Assess response to LABA:
   - Good response to LABA — continue LABA
   - Some benefit from LABA in maximum dose but control still inadequate—increase inhaled steroid to 400 mcg/day BDP or BUD, or 200 mcg/day FP (if not already on this dose)

STEP 4

Persistent poor control**

Double check compliance with existing treatments, inhaler technique and minimise any trigger factors including smoking.

Increase the dose of ICS to 300 – 400 mcg/day fluticasone or 600 – 800 mcg/day beclomethasone or budesonide. Continue to review add on therapy and refer to a paediatrician if there is no improvement.

STEP 5

Continued poor control

- Urgent discussion with a paediatrician is required
- Maintain high dose ICS
- Consider oral steroids in the lowest dose to provide adequate control

* Also referred to as mild infrequent asthma in the New Zealand Guidelines 2005

** In most guidelines a trial of montelukast or theophylline is suggested if there has been no response to LABA at step 3. GPs could consider this on the advice of a specialist especially if there was resistance to further increase in the dose of ICS or no response to the ICS doses advocated in step 4.

ASTHMA EDUCATION
for children and their families

Asthma education for children and their families can improve outcomes. This includes making the time to:

- Help the caregiver understand any uncertainty around diagnosis
- Address concerns of the child and carer
- Assess the impact of asthma on day to day activities
- Help carers understand the role of each treatment and how they work
- Explore practical solutions to improve adherence
- Explain what to do when symptoms worsen

Help caregivers/whānau understand any uncertainty around diagnosis

Confirming a diagnosis of asthma in children, particularly in younger children, is difficult even for the most experienced health professional and can often create uncertainty for the family. It is important to be honest about the diagnosis if there is uncertainty. If the diagnosis suggests that this child is a “wheezy infant” call it that.

These difficulties may be interpreted by families as inaccuracies, creating a sense of unease. The result can be quite profound with many parents not ‘believing’ the diagnosis or that a diagnosis cannot be made with certainty and thus do not engage in the education session or treatment protocols. This may lead to anxiety in the parents and reluctance to give treatments.

Address the concerns of the child and carer

It is important to establish what the concerns of the child and carers are and to address these. This sounds like common sense but is often missed as health professionals tackle what they see as the problems. Often the problems are linked and a common theme can be sourced and so begins the foundation to work together. A good question to ask parents or an older child is "what is worrying you most?"

Assess the impact of asthma on day to day activities

Key questions to ask include

- What triggers cough and wheeze, what time of the day does it occur?
- Have there been any acute attacks? How severe was the worst attack?
- Have you had to seek emergency or after hours medical care?
- How does the asthma affect the child's life? Does it limit activities? Have they missed any school?
- How often has the child had to use reliever treatment? How effective was it?

Help carers understand the role of each treatment and how they work

Written asthma management plan are particularly useful in helping children and carers understand the role of each treatment. A good example of this is in explaining the value in continuing inhaled corticosteroid for long periods of time not short bursts.

Explore practical solutions to improve adherence

There are a number of practical solutions that may help children and carers adhere to medication regimens, these may include:

- Keeping the inhaler in sight so it's not forgotten, aligning it with an activity done every day like cleaning teeth, setting the cell phone on alarm (great for older children) or addressing roles and responsibilities in the family. Surprisingly many parents have a very unrealistic expectation of young children to self administer their medications independently.
- If the child is moving between two homes on a regular basis then perhaps two sets of medication may be more realistic. Education to both parents/ grandparents or other family members may be necessary.
- The parents approach should be firm but kind – there are no choices, the medication will be given. The child may have a choice "before your story or after" – "when" not "if". Having a treat like a story or sticker afterwards may help but lengthy discussions or negotiations usually do not. Reassure and encourage the parents in this approach while acknowledging the difficulties.
- Inhaled therapy should be introduced to a child in an age appropriate way – for example demonstrate how to use an inhaler and a spacer on a toy to a young child. Show them an appropriate hold to ease delivery and demonstrate constant praise to both the child receiving the inhaler and the parent giving it.

Many parents are fearful of the word "steroid" - they need to be convinced that this is going to do their child greater good than harm.

Asthma education of the child and the family should lead to an understanding of good control of asthma and the role of medications in achieving this

Adherence/Compliance with prescribed treatment

The main reasons for poor adherence would most likely fall into five categories:

- Parents do not understand the treatment which leads to confusion
- Parents are uncertain of the diagnosis (see above)
- Parents fear the medication (steroid)
- Parents may be disorganised or busy or maybe it is just not a priority in their busy often chaotic lives
- Parents experience difficulty in administration of treatments (address below)

To tackle these issues the key is to find the source of the problem and then work together to find solutions. These can be:

- Addressing the concerns around the medication
- Helping parents understand the role of each treatment and how they work.

It takes time

In older children it is important to establish why they don't take their medication. Are they embarrassed? Do they believe they don't have a problem? Are they disorganised? Or maybe even they can't be bothered. Educators need to negotiate what support these children require to acknowledge the difficulties of what we are asking them to do. Educators need to work beside them not at them to find solutions, to find out what is important to them such as sports and encourage and reward achievements. The carer's role here may be to remind but not to nag.

When to call for emergency help

This is one of the most stressful times for parents of a child with asthma – when to call for help if things go wrong and a fear of missing something important.

- Acknowledge the experiences they have had
- Discuss the calls they have made and congratulate them on doing it to build a parent's confidence
- Introduce self-management plans to assist in when to get assistance and symptom diaries to help guide management. Plans need to be relevant to the child and experience of the family, clearly written and understood. Plans will not be effective if the parent doesn't accept the diagnosis
- Discuss the plan and encourage questions
- Review at each visit

In Summary

Asthma education of the child and the family should lead to an understanding of good control of asthma and the role of medications in achieving this, including how to use inhaler devices and what to do in the case of an exacerbation.

Tu Kotahi Māori Asthma Trust

Tu Kotahi Māori Asthma Society was established due to a need to reduce the barriers for Māori in receiving quality asthma care.

As well as providing education in homes or in other setting where whānau feel comfortable, the service enables other social and health issues that may be impacting on a child's asthma to be addressed.

Tu Kotahi Māori Asthma Society suggests that housing, heating, budgeting, transport and the cost of healthcare and prescriptions are some of the complex factors that should be factored into an overall asthma management plan. They recommend the following when developing an asthma management plan:

- Consider a simple pictorial management plan including pictures of inhalers and spacers. This simplifies the instructions for giving medications and can be followed by anyone in the whānau involved in the care of the child.
- Personalise the plan, including the child's name. This can be provided to all caregivers, and the school.
- Demonstrate how to use the medication with a spacer and provide simple information that reinforces both technique and maintenance of the medication and spacer
- Consider using a doll or teddy bear as a teaching aide when demonstrating how to use a spacer to younger children and whānau. Spacers are less likely to be used if the learning experience is traumatic.

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Asthma Education Desktop Prompt

The following desktop prompt has been used extensively by GPs, practice nurses and asthma educators in Wellington and surrounding areas. Adapted from an original document provided by Barbara Scott of WIPA

1. Four questions to assess asthma control:
    a. When did you last use your blue reliever inhaler more than three times a week?
    b. Do you wake wheezing at night?
    c. Has your activity level changed because of your breathing?
    d. Where do you keep your reliever inhaler?
2. When was the child's last episode of asthma education?
3. Does the child understand:
    a. Their asthma?
    b. Where their asthma medication works, i.e., relievers relax the airway muscle, preventers work on the inflammation and swelling inside the airways. (What tools have you got to describe this to your patients?)
    c. The importance of using their medication appropriately?
    d. When their asthma is deteriorating?
4. Assess reliever use, i.e., type, technique,* frequency.
5. Assess preventer use.*
6. Assess symptom controller use (symptom controller is the term applied to long acting beta-2 agonists or LABA).*
7. Does the child have an asthma management plan?
    a. Is it current?
    b. Do they follow it?
8. Ensure the child or cargiver is given appropriate written information and a follow-up appointment.
9. Refer for comprehensive asthma education.

*Ask the child or caregiver to show you how they use the device

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