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NEW ZEALAND CHILD ASTHMA GUIDELINES

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Asthma And Respiratory Foundation NZ New Zealand Child Asthma Guidelines: a quick reference guide

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ABSTRACT

The purpose of the New Zealand *Child Asthma Guidelines: a quick reference guide* is to provide simple, practical, evidence-based recommendations for the diagnosis, assessment and management of asthma in children in New Zealand, with the aim of improving outcomes and achieving health equity. The intended users are health professionals responsible for delivering asthma care in the community and hospital emergency department settings, and those responsible for the training of such health professionals.

Key words: assessment, asthma, child, diagnosis, guideline, inequities, health equity, management.

Short title: *New Zealand Child Asthma Guidelines*

Abbreviations:

FEV₁ Forced expiratory volume in one second
ICS Inhaled corticosteroid
LABA Long-acting beta-agonist
pMDI Pressurised metered dose inhaler
PEF Peak expiratory flow
SABA Short-acting beta-agonist
SpO₂ Oxygen saturation

1. Introduction

1.1 Inequities in Child Health in New Zealand

All children in New Zealand (NZ) have the right to achieve the highest standard of not just asthma treatment but also outcomes. In New Zealand, a large number of children have poor outcomes, especially due to disadvantages that arise from inadequate income to meet the basic needs for well-being. Unhealthy indoor environments (homes which are crowded, cold, damp, mouldy¹, smoke-exposed or with unflued gas heating²) also contribute. Māori and Pacific children with asthma are more likely to have severe asthma symptoms and be hospitalised but are less likely to be prescribed an inhaled corticosteroid (ICS), have an action plan, or receive adequate asthma education (see 4.5, 4.6). Other groups who experience inequities include refugees, people living in remote rural areas, and people with low English language proficiency. All health professionals have a role in improving health outcomes and achieving health equity, and these guidelines specify the actions required regarding asthma.

1.2 New reports to inform us

Three important reports were released by the Asthma and Respiratory Foundation of NZ in 2015 and contributed to the 2017 version of this guideline: *The Impact of Respiratory Disease in New Zealand: 2014 Update*³, *He Māramatanga Huangō: Asthma Health Literacy for Māori Children in New Zealand*⁴, and *Te Hā Ora: The National Respiratory Strategy*⁵. In 2018, *The Impact of Respiratory Disease in New Zealand* report was updated. These reports describe the growing impact of asthma in NZ, especially among children, the inequities suffered by Māori, Pacific peoples and low-income families, and the intersectoral and holistic approaches needed to tackle the issues.

1.3 Other guidelines consulted

This version is a revision of the 2017 guidelines. Revision was performed by a small committee formed from the original authors; however, this work is largely that of the original team who are credited as the authors of this document. The revision followed some new literature clarifying management of preschool wheeze. The following guidelines were reviewed in the preparation of the original document: the National Asthma Council of Australia 2015 *Australian Asthma Handbook* version 1.1, including the companion *Quick Reference Guide*⁶, the Global Initiative for Asthma 2020 *Asthma Management and Prevention*, including the companion *Pocket Guide*⁷, the SIGN 2016 *British Guidelines on the Management of Asthma*, including the

*Quick Reference Guide*⁸, and the Asthma and Respiratory Foundation NZ *Adolescent and Adult Asthma Guidelines 2020: A Quick Reference Guide*⁹. For the 2020 revision, major changes are found in the revision of the management of preschool wheeze and the transfer of the adolescent section to the adult guideline.

A systematic review was not performed, although relevant references were reviewed as required to formulate this guideline version, and to clarify differences in recommendations made between guidelines. Readers are referred to the above published guidelines and handbooks for the more comprehensive detail and references that they provide. Additional analyses and reviews on the assessment and management of preschool wheezing were consulted¹⁰⁻¹².

1.4 Grading

No levels of evidence grades are provided due to the format of the *Child Asthma Guidelines: A Quick Reference Guide*. Readers are referred to the above published guidelines and handbooks for the level of evidence for the recommendations on which the *Child Asthma Guidelines: A Quick Reference Guide* are based.

1.5 Age

Adolescents

These guidelines apply to children 11 years and below. The soon to be published *Adolescent and Adult Asthma Guidelines 2020: A Quick Reference Guide*, is intended for those 12 years and over. Special care is needed in ensuring that the adolescent transitions in a developmentally appropriate way as they become more independent, make their own decisions and emerge as adults.

Aged under 5 years

There are special considerations in young children (1-4 years) who wheeze, as many of them do not go on to develop asthma. See Diagnosis (2.2).

1.6 Guideline development

The Guideline Development Group included representatives from a range of professions, disciplines and backgrounds relevant to the scope of the guidelines. A *Draft for Consultation* of this report was peer-reviewed by a wide range of respiratory health experts and key professional organisations (see Appendix C).

The guidelines are primarily presented through lists, tables and figures in an electronic format, which can be used in clinical practice. Key references are provided

where necessary to support recommendations that may differ from previous or other guidelines, or standard clinical practice.

1.7 Dissemination plan

The guidelines will be translated into tools for practical use by health professionals and used to update existing consumer resources. They will be published on the Asthma and Respiratory Foundation NZ website: www.nzasthmaguidelines.co.nz and disseminated widely via a range of publications, training opportunities and other communication channels, to health professionals, nursing and medical schools, primary health organisations and district health boards.

1.8 Implementation

The implementation of the *Child Asthma Guidelines: A Quick Reference Guide* by organisations will require communication, education and training strategies.

1.9 Expiry date

The expiry date of the guide is 2025.

1.10 Top 10 ways health professionals can help childhood asthma (apart from prescribing medicines)

1. Relationships

Encourage continuity of care with doctors, nurses, asthma nurse educators and pharmacists in primary and secondary care. Easy access to a trusted nurse and telephone follow-up is recommended.

2. Smoke exposure

Ask about smoke exposure including vaping. Encourage reducing tobacco smoke exposure in the child's environment (home and car) and recommend smoking cessation. If appropriate, give advice and refer to a local smoking cessation service, or Quitline (0800 778 778). Provide Health Sponsorship Council's pamphlet *A Guide to Making Your Home and Car Smokefree* www.healthed.govt.nz/.

3. Housing

New Zealanders often live in unhealthy housing, and conditions are worse in private rental housing. Some families are homeless. Ask about housing and unhealthy features (crowding, cold, damp, mouldy, unflued gas heater). Provide the family and whānau with information about having a healthy home ("Tips for healthy living" www.asthmafoundation.org.nz/your-health/healthy-living). Refer for healthy housing assessment if available in your region.

4. Income

Assume that most families struggle with income and ask about it. Inquire about the ability to access the doctor, a pharmacy, and pay prescription costs. Does the child have partly or uncontrolled persistent asthma and meet criteria for Child Disability Allowance¹³? www.workandincome.govt.nz. Encourage all family and whānau members to use the same pharmacy to reduce prescription co-payments www.health.govt.nz/your-health/conditions-and-treatments/treatments-and-surgery/medications/prescription-charges

5. Health literacy

Assume little health literacy, and use steps described in *He Māramatanga Huangō: Asthma Health Literacy for Māori Children in New Zealand*. Specifically ask the child and whānau what they understand, what they want to know, and use simple language to explain about asthma, for example use the term 'asthma flare-up' rather than 'asthma exacerbation'. Use the term 'puffer' instead of 'inhaler'. Work with families to attain and maintain wellness, and not accept sickness as the norm.

6. Adherence

Firstly, assume inhaler device technique is poor, and check it. Secondly, assume adherence is imperfect, and don't judge. Ask questions in an open way, such as, "Many people take less preventer than the doctor prescribes – about how many times a week do you take your asthma preventer?"¹⁴⁻¹⁶

7. Asthma action plan

Develop an appropriate asthma action plan with the child, family and whānau and check the plan on each visit. Plans should be made available to schools and childcare facilities where appropriate. See: www.nzasthmaguidelines.co.nz/resources

8. Access

Help the family and whānau to understand how to access care appropriate to asthma severity and identify any barriers they have. Consider referral to asthma educator, nurse practitioner, public health nurse, Māori providers or paediatrician where available and appropriate.

9. Ambulance

Ensure the family and whānau know when and how to call an ambulance. In some regions this service may incur a charge so ensure families have ambulance membership to avoid charges.

10. Influenza vaccine

Ensure children with asthma or recurrent wheeze receive the influenza vaccine every year from 6 months of age.

2. Diagnosis

Goal: All children who have asthma are correctly diagnosed promptly

2.1 Approach to diagnosis

- Asthma in children is defined on the basis of characteristic symptoms and signs occurring in a typical pattern (Table 1) and the response to treatment, in the absence of an alternative explanation.
- The key to making the diagnosis of asthma is to take a careful clinical history and assess clinical +/- spirometry response to inhaled bronchodilator and/or ICS treatment. There is no reliable single 'gold standard' diagnostic test.
- In children with a high probability of asthma, start a trial of treatment (see Figures 3 and 4) and assess the response to therapy.
- Spirometry showing at least a 12% response to bronchodilator or 10% decrease with exercise may be helpful but should be conducted by qualified staff and according to spirometry guidelines criteria. Better results are obtained if staff have experience working with children. The cut-off criteria used depend on the protocol employed.
- Initial diagnosis is probability-based and should always be reconsidered if the patient fails to respond to therapy or has atypical symptoms or signs.
- The diagnosis and monitoring of asthma requires frequent and repeated review. This may require the use of recall or follow-up systems (Figure 2).
- Continuity of care should be encouraged for follow-up for diagnosis and ongoing management.
- Algorithms are provided to guide the diagnosis in 1 to 4-year olds (Figure 1A) and 5 to 11-year olds (Figure 1B).

Practice points

- During a trial of therapy, give the patient a label of '*suspected asthma*' or '*suspected preschool asthma*' as a means of communicating with other health professionals.
- The next health professional seeing a child with a label of '*suspected asthma*' or '*suspected preschool asthma*' should determine the response to therapy and change the diagnostic label.
- In most children, observing a symptomatic response to treatment may help to confirm the diagnosis, but a limited response to bronchodilator or ICS does not rule out asthma.
- In children with a low probability of asthma, perform further investigations, such as chest X-ray and/or specialist referral prior to initiating preventer therapy.
- Spirometry may be helpful in older children (6 years and above if paediatric-trained technician).

- Cough or night cough alone in the absence of signs of wheeze and shortness of breath has a low likelihood of asthma, although wheeze may only be detected on auscultation and not by parents.
- In New Zealand, bronchiectasis should be considered in all children with respiratory symptoms. Sometimes bronchiectasis co-exists with asthma and can be missed on a chest X-ray. Chronic wet cough is a key marker.

2.2 Children 1 - 4 years of age

Young children under 5 years are a special group, as about half of those who wheeze do not have asthma at school age, and later. Previously described patterns of multi-trigger and episodic preschool viral wheeze do not remain constant and are not helpful in predicting risk¹⁷. Preschoolers with wheeze are managed according to the frequency and severity of symptoms and future risk of flare-ups⁷ and labelled accordingly to assist making decisions about prescribing ICS.

Infrequent preschool wheeze

These preschoolers have mild wheeze with viral illnesses and not at other times and have a low risk of severe flare-up. An alternative term sometimes used is '*infrequent episodic (viral) wheeze*'. ICS are not indicated.

Preschool asthma

For the following preschoolers consider them as having '*suspected preschool asthma*':

- Frequent episodes of wheeze (more than every 6-8 weeks).
- Severe episodes of wheeze (defined as needing to seek medical attention for a severe flare-up).
- Symptoms typical for asthma in the interval between viral illnesses.
- Regular night waking with symptoms of cough or wheeze.¹⁸

Give a trial of ICS for a minimum of 8 weeks. If there is a positive response, these children should then be labelled as '*preschool asthma*'. An alternative term sometimes used is '*frequent episodic (viral) wheeze*'. This label does not mean the child will go on to have asthma at school age or as an adult, which may be reassuring for many families. If the treatment above is not effective, the treatment should be stopped, after checking adherence and inhaler technique.

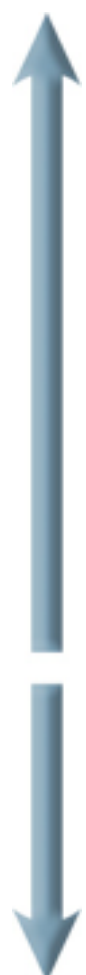
Practice points

- Preschoolers with wheeze are more likely to go on to have childhood or adult asthma if there is a personal history of eczema, a parental history of asthma, or if the child has elevated blood eosinophils or is sensitised to aeroallergens or food.¹⁹
- In all children over 1 year of age with recurrent wheeze, a bronchodilator should be prescribed as for asthma, according to clinical severity (see Figure 3).

2.3 Wheezing in children under 1 year

In children under 1 year, bronchiolitis is the most common cause of wheezing, and the PREDICT Australasian Bronchiolitis Clinical Practice Guideline²⁰ should be followed. If the illness does not seem to be bronchiolitis, then refer to Table 1, Figure 1A and section 2.2 for guidance.

Table 1: Clinical features that increase or decrease the probability of asthma in children



<p>A. Asthma more likely</p> <hr/> <ul style="list-style-type: none"> • More than one of the following: <ul style="list-style-type: none"> ◦ Wheeze (most sensitive and specific symptom of asthma) ◦ Breathlessness ◦ Chest tightness ◦ Cough • Particularly if: <ul style="list-style-type: none"> ◦ Typically, worse at night or in the early morning ◦ Provoked by exercise, cold air, allergen exposure, irritants, viral infections, stress and aspirin ◦ Recurrent or seasonal • Personal history of atopic disorder or family history of asthma • Widespread wheeze heard on chest auscultation • Otherwise unexplained expiratory airflow obstruction on spirometry • Otherwise unexplained blood eosinophilia or raised exhaled nitric oxide • Bronchial hyper-responsiveness on challenge testing at appropriate age • Positive response to bronchodilator (clinical or lung function).
<p>B. Asthma less likely</p> <hr/> <ul style="list-style-type: none"> • Isolated cough in absence of wheeze or difficulty breathing • History of wet, moist or productive cough • No wheeze or repeatedly normal physical examination when symptomatic • Normal spirometry or peak flow (PEF) when symptomatic • No response to trial of asthma treatment • Features that point to an alternative diagnosis (see C below).
<p>C. Red flags suggesting alternate diagnoses*</p> <hr/> <ul style="list-style-type: none"> • Daily symptoms from birth • Frequent or daily wet, moist-sounding or productive cough • Digital clubbing • Chest wall deformity • Failure to thrive • Heart murmur • Spilling, vomiting or choking • Asymmetrical chest findings • Stridor as well as wheeze • Persistent ear, nose or sinus infection • Family history of unusual chest disease • Symptoms much worse than objective signs or spirometry.

* Consider aspiration, bronchiectasis, ciliary dyskinesia, cystic fibrosis, developmental airway anomaly, foreign body aspiration, heart disease, hyperventilation, immunodeficiency, tuberculosis, vocal cord dysfunction

Figure 1A: Diagnostic pathway for asthma and wheeze in children 1 - 4 years^{6,8}

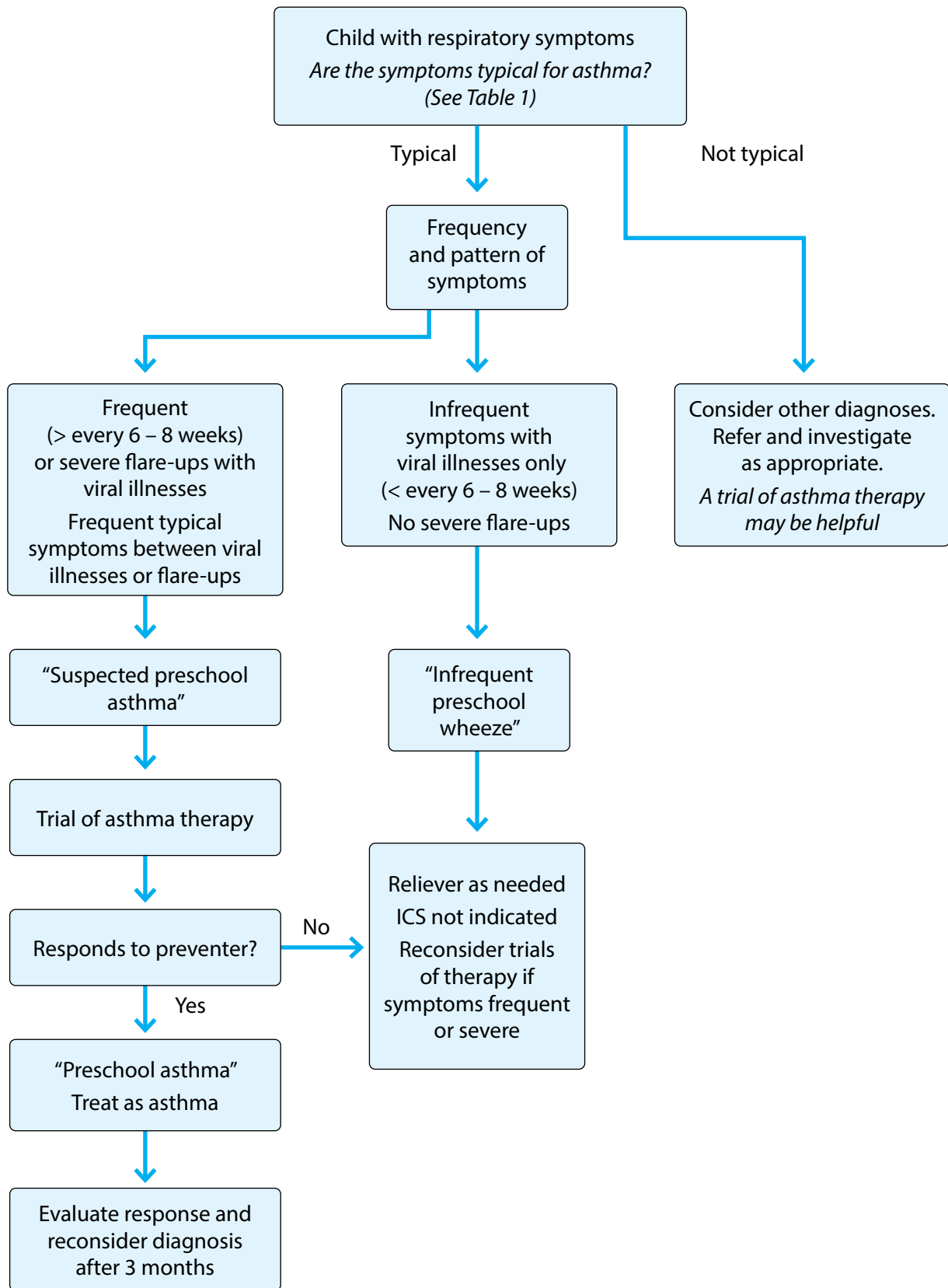
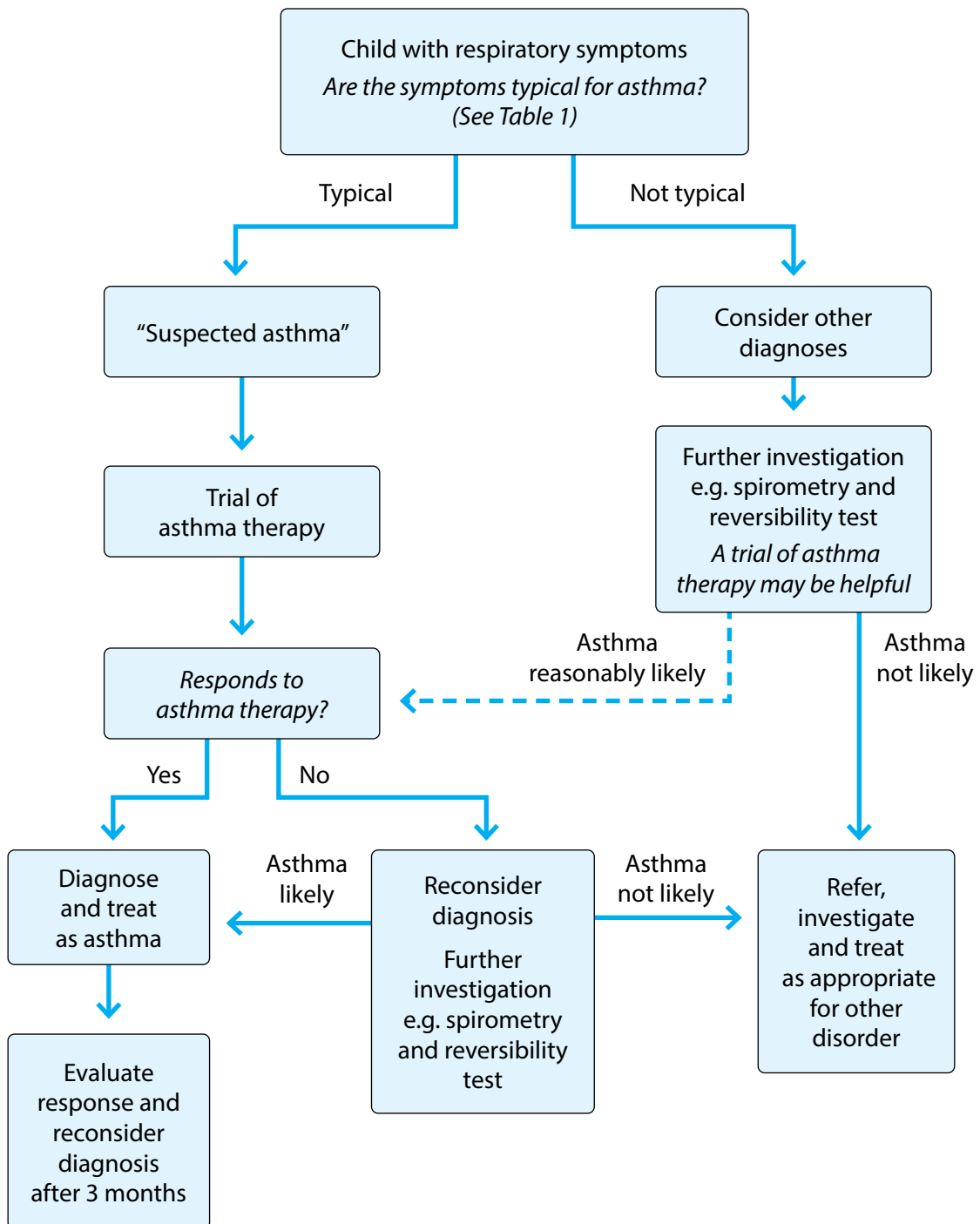


Figure 1B: Diagnostic pathway for asthma and wheeze in children 5 - 11 years



3. Assessing asthma severity, control and future risk

Goal: All children with asthma are assessed for their severity, control and future risk

3.1 Evaluation of asthma control and severity

- Evaluation of asthma severity, the level of control and the risk of future events are important components of the assessment of children with asthma.
- Asthma control is defined by the frequency of symptoms, the degree to which symptoms affect sleep and activity, and the need for reliever medication.
- Poor asthma control is defined as regular symptoms occurring in a usual week that affect the patient's

quality of life, or according to the asthma symptom control measures below.

- Poor control should trigger a review of adherence, inhaler technique and preventer therapy.
- If poor control persists, then reconsider the diagnosis.
- If poor control persists despite above, then consider increasing the asthma treatment step.
- The level of asthma control should be assessed regularly.

Two methods for assessing asthma symptom control are:

- Child-Asthma Control Test (4 to 11 years): www.asthmacontrol.co.nz
- GINA assessment of control questions.

Table 2 GINA assessment of asthma symptom control in children 5 - 11 years (See Table 3)¹

(GINA recommends assessment of risk factors as an essential part of the assessment of asthma control)

A. Asthma symptom control		Level of asthma symptom control		
In the past 4 weeks, has the patient had:		Well controlled	Partly controlled	Uncontrolled
<ul style="list-style-type: none"> • Daytime asthma symptoms more than twice/week? • Any night waking due to asthma? • Reliever needed for symptoms* more than twice/week? • Any activity limitation due to asthma? 	Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>	} None of these	1-2 of these	3-4 of these

(Modified with permission of GINA)

Practice points – severity and future risk:

- Assessment of asthma also involves assessing risk of adverse outcomes, including severe flare-ups, death and treatment-related adverse effects (Table 3).
- Severity of asthma is defined by the treatment step (Figures 3 and 4) needed to maintain good control. Work with patient/parent to determine what good control looks like.⁶
- For symptomatic children, asthma severity can be determined only after a therapeutic trial of ICS for at least 8 weeks (Figures 3 and 4). Start the therapeutic trial and book the follow-up appointment for 8 weeks later.
- The best predictor of future asthma flare-ups is the number of flare-ups in the last 12 months.
- Growth (height and weight) should be measured at least annually in children with asthma and plotted on a percentile chart. Fall-off on percentiles suggests poor asthma control; other causes include

malnutrition, frequent oral corticosteroids or after initiation of higher dose ICS.

- Increase in weight may reflect inappropriate diet and steroid dose.
- Monitor healthcare use. Children with high healthcare use (such as hospital admissions, emergency department visits, emergency doctor visits, and unplanned doctor visits) are at high risk for severe or life-threatening asthma.
- Monitor medicine use. Children with high medication requirements or usage (such as courses of oral steroids, frequency of beta-agonist prescriptions, and more prescriptions for beta-agonists than ICS) are at high risk for severe or life-threatening asthma.
- Each time the child is seen, and control is assessed, consider stepping up or stepping down therapy, as per Figure 3 and 4.

Table 3: Features associated with increased risk of severe asthma flare-ups and/or death from asthma²¹

<p>A. Asthma</p> <hr/> <ul style="list-style-type: none"> • Poor asthma control. • Hospitalisation or emergency department visit for asthma in the last year. • Extreme inhaled bronchodilator use (>1 canister per month). • History of sudden asthma attacks. • Intensive care admission or intubation (ever). • Requirement for long-term oral steroids. <p>B. Comorbidity</p> <hr/> <ul style="list-style-type: none"> • Major psychosocial problems. • Alcohol and drug abuse in family. • Severe food allergy and anaphylaxis. <p>C. Other factors</p> <hr/> <ul style="list-style-type: none"> • Poor inhaler technique. • Underuse or poor adherence to ICS treatment. • Tobacco smoke exposure. • Discontinuous medical care. • Socioeconomic disadvantage. • Financial hardship. • Unhealthy housing. • Māori and Pacific ethnicity. • Child protection issues (consider Vulnerable Children Act 2014). www.legislation.govt.nz/act/public/2014/0040/latest/DLM5501618.html
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4. Management approaches

4.1 Identifying management goals with the child and whānau

Goal: The child, family and whānau participate in goal setting

- Managing asthma requires a partnership between the child, their parents, their whānau, and their healthcare team. This will change and develop as children age and involves patient willingness and understanding, agreeing on management goals.
- Management and partnership are based on a cycle of repeated assessment, adjustment of treatment and review of responses, as outlined in Figure 2.

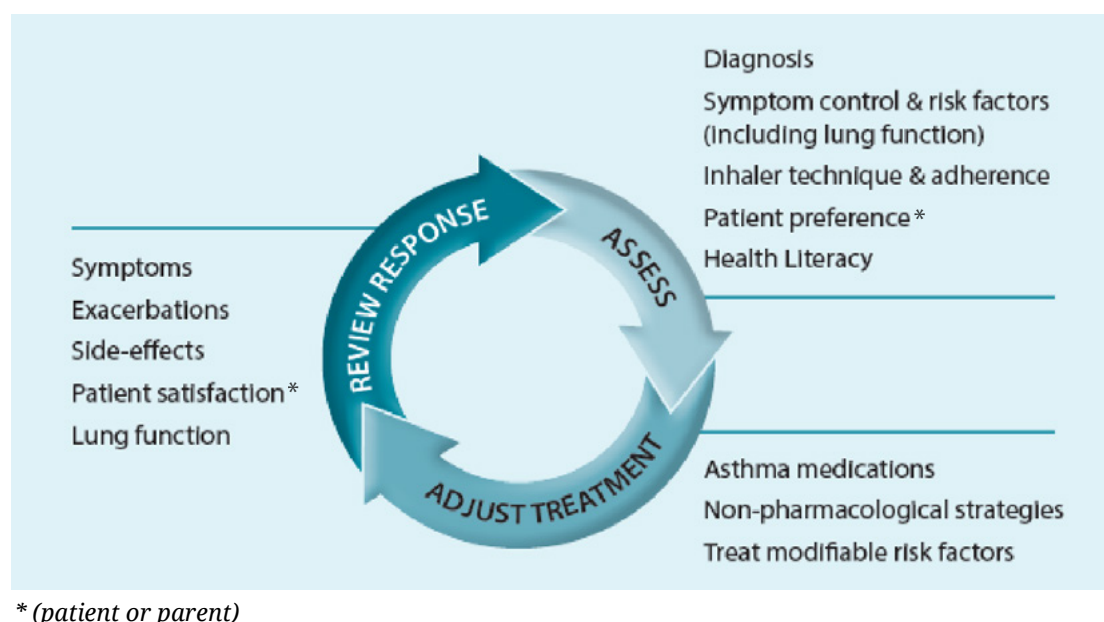
4.2 Non-pharmacological measures

Goal: Personal, whānau or environmental factors which may be unsettling asthma are identified and addressed (also see 1.10)

- To improve asthma outcomes, avoid exposure to known triggers which precipitate a flare-up, and exposure to smoking or vaping.
- Exercise and physical activity should be encouraged, as exercise induced asthma can be managed. Chlorinated swimming pools may be a trigger for some children.
- Psychosocial stressors are potent triggers of asthma symptoms. Identification of these triggers and the introduction of very simple strategies, such as slow, relaxed breathing when stressed, may help the patient and whānau in managing symptoms.

- If anxiety or panic play a part, involve the family and whānau to support the patient and consider referral for psychological counselling.
- Dysfunctional breathing or a breathing pattern disorder can be a contributing factor in the severity of symptoms. A physiotherapist can advise on breathing awareness and exercises to help relaxation and improve effectiveness of breathing.
- Keeping the nose clear will help asthma control, as it filters, warms and humidifies the air to the lungs. Saline drops as needed to clear the nose (maximum four times per day) and frequent blowing are usually adequate.
- Asthma control may be improved by better insulation and avoiding cold, damp, mouldy, or crowded housing.
- Unflued gas heaters may make asthma symptoms worse www.health.govt.nz/your-health/healthy-living/environmental-health/household-items-and-electronics/unflued-gas-heaters.
- House dust mite (HDM) avoidance measures are only effective in children who are confirmed to be sensitised to HDM and require impermeable bed encasings to work.³³
- Modifications to diet, such as eliminating foods, are unlikely to improve asthma control unless confirmed food allergy.

Figure 2: Asthma management as a continuous cycle of monitoring and reassessment, adapted from GINA (1)



4.3 Self-management

Goal: Effective self/family/whānau education and management is achieved

- Asthma education and improving health literacy and self-efficacy are fundamental in asthma management and are the responsibility of all health professionals.
- All patients with asthma and their caregivers should be offered management education, which should include a written personalised asthma action plan (See 4.4). Ask the patient/parent how best to achieve this.^{36, 37}
- The prescriber must ensure that education is given, an action plan is provided, and inhaler technique is checked. Providing a prescription without addressing these is ineffective.
- Refer to community asthma nurse or nurse educator if the family or whānau have difficulty with self-management, or after any hospital admission with asthma.
- Adherence to treatment should be routinely assessed and encouragement provided as part of the self-management education. The health professional should gain an understanding of why the patient/parent is choosing not to follow advice, as there may be specific circumstances which can be addressed.^{7, 8}
- Ensure caregivers and whānau understand the importance of not running out of inhalers and prescribed medication. Check that they know the process for obtaining repeat prescriptions.

- Ensure enough medications are prescribed and reinforce the need for appropriate regular clinical assessment.
- Asthma management should be addressed in all areas where the child spends significant time, including multiple homes, childcare and school.

Practice points – enhancing self-management:

- Asthma education should increase health knowledge about asthma, general health literacy and self-efficacy, and should be reinforced at every visit.
- Teach families to recognise when asthma is poorly controlled, and know when and how to call emergency services.
- Asthma education should utilise a variety of media, including printed materials as well as verbal explanations, and printed materials in the first language if possible, e.g. www.pamp.co.nz, a website which produces simple, individualised pictorial asthma medication plans in Te Reo Māori, Samoan, Tongan, Tuvaluan and Chinese²⁴.
- Education should be delivered in chunks and delivered across multiple visits instead of all at once.
- Education should be developmentally appropriate. As children mature, offer further information, and coach to take increasing responsibility for their care.
- Ask children and families what they already know, then add to their knowledge by ‘scaffolding’ new information in manageable steps.
- Inhaler technique should be routinely assessed wherever possible and training provided as part of self-management education.

4.4 Asthma action plans

Goal: All children with asthma are provided with an asthma action plan

- To assist in self-management of childhood asthma, consider all of the child’s regular caregivers and environments in preparing and distributing the action plan.
- Asthma action plans that are symptom-based, rather than PEF-based, are preferred in children, although some older children may want a PEF-based plan.
- Child asthma action plans from the Asthma and Respiratory Foundation NZ can be downloaded from: www.nzasthmaguidelines.co.nz/resources
- The *Child Asthma Action Plan* should be written and reviewed with the caregivers and whānau. It must be individualised for the child and culturally appropriate (see Appendix A).
- A *Child Asthma Symptom Diary* may be used to clarify the pattern of symptoms and response to treatment, to guide the Action Plan (see Appendix B).

- The My Asthma App may be helpful in developing the action plan and can be downloaded from: Android: bit.ly/AsthmaAppAndroid or Apple: bit.ly/AsthmaAppApple

Practice points – asthma action plans:

- Always involve the child by using developmentally appropriate language.
- Ensure the child (in an age appropriate manner) and the caregivers and whānau understand the plan.
- Keep a record of the plan and provide copies of the *Child Asthma Action Plan* for all caregivers – including multiple homes, childcare or school.
- Review the plan at least annually with the child, family and whānau. The frequency of reviews will depend on the whānau’s confidence and competence with asthma management.
- Highlight the need to take 2 puffs of reliever prior to exercise if the child has exercise related symptoms.
- The instructions on the *Child Asthma Action Plan* should be specific enough that re-interpretation or re-prescription by another health professional is not necessary when performing education.

4.5 Māori – getting it right for Māori children with asthma

Goal: Māori children have asthma outcomes equal to non-Māori and non-Pacific children

Māori rights in regards to health, recognised in Te Tiriti O Waitangi and other national and international declarations, promote both Māori participation in health-related decision making, as well as equity of health outcomes for all New Zealanders.

Currently, Māori with asthma are more likely to be hospitalised or die due to asthma. Despite this, Māori with asthma are less likely to be prescribed ICS, have an asthma action plan, or receive adequate education. Major barriers to good asthma management for Māori may include access to care, discontinuity and poor-quality care, and poor health literacy.

Māori whānau have greater exposure to environmental triggers for asthma, such as smoking, vaping and poor housing^{9, 25}

The aim should be equitable outcomes, not just equitable treatment. The evidence of the health literacy demands, barriers, facilitators, and steps to delivering excellent asthma management with Māori are described in He Māramatanga Huangō: Asthma Health Literacy for Māori Children in New Zealand.

It is recommended that for Māori with asthma:

- Māori leadership is required in the development of asthma management programmes that improve

access to asthma care and facilitate ‘wrap-around’ services to address the wider determinants (such as housing or financial factors) for Māori with asthma.

- A systematic approach to health literacy and asthma education for Māori whānau is required.
- Asthma healthcare providers should support staff to develop cultural competency skills for engaging Māori with asthma and their whānau, in line with professional requirements.
- Asthma providers should undertake clinical audit or other similar quality-improvement activities to monitor and improve asthma care and outcomes for Māori.²⁶

Practice points – Māori at every review:

- Ensure all Māori children with wheeze and asthma receive appropriate preventer therapy.
- Ensure all Māori children with wheeze and asthma have an action plan.
- Ensure all Māori children with wheeze and asthma and their whānau receive asthma education and that this repeated in appropriate-sized chunks.
- Consider a referral to a local Māori health provider if available.

4.6 Pacific peoples – getting it right for Pacific children with asthma

Goal: Pacific children have asthma outcomes equal to non-Pacific & non-Māori children

The Pacific population is diverse and growing fast, with Pacific children numbering one in four babies born in Auckland. Pacific children have great disparities and unequal access to healthcare compared with other New Zealand children.²⁷⁻³²

Changes will come from health workers understanding the drivers for poor health in minority groups, and action at multiple levels of the health and social systems. Central action to improve the health of Pacific children will be a commitment to work with the strengths of the Pacific communities.

The following recommendations for action needed for good levels of health services and practitioners are based on theory and lessons from good practice:

- Understand the Pacific population profile, with the majority living in urban areas. Perform an audit on the clinical activities and understand who is registered with the service, and who is registered but do not attend.
- With over 60% of Pacific children living in families with hardship and 30% in severe hardship, material insecurities will affect caregiver and whānau

engagement with health providers. Practitioners should explore these insecurities and set up effective pathways to address these.

- Research shows communication difficulties are a barrier for healthcare. Assess the level of English language proficiency, and use interpreters if necessary. Use asthma self-management resources written in the first language whenever possible.

Practice points – Pacific children at every review:

- Ensure all Pacific children with wheeze and asthma receive appropriate preventer therapy.
- Ensure all Pacific children with wheeze and asthma have an action plan.
- Ensure all Pacific children with wheeze and asthma and their family and aiga receive asthma education and that this repeated in appropriate-sized chunks.
- Consider a referral to a local Pacific health provider if available.

4.7 Health systems approaches

Goal: All aspects of the health system will support better asthma care, aiming to achieve equity and improve outcomes

Good asthma management requires a system approach incorporating information systems to improve quality and service delivery.

The following are recommended:

- Computerised decision-support systems, such as web-based systems for self-management. These should incorporate simple tools for the assessment and monitoring of asthma control.
- School-based asthma interventions, such as education programmes and *Asthma Friendly Schools*.
- Pharmacy-based interventions, such as inhaler technique education and the identification of asthma medicine uptake from dispensing history e.g. infrequent preventer dispensing history.

5. Medicines

5.1 Inhaler devices at different ages

Goal: The correct inhaler device is considered and age appropriate

- Prescribe an inhaler device that is appropriate for the development of the child and ensure that the child and/or caregiver is able to demonstrate they can use it correctly (Table 4).
- Health professionals who teach patients should ensure they have correct inhaler technique themselves.
- When teaching inhaler technique, have the child or caregiver demonstrate how they use the device. Use checklists and reminder lists to identify and correct errors.
- Inhaler technique needs to be taught repeatedly. Check inhaler technique and adherence at every visit by asking the child or caregiver to demonstrate how they use the device.
- Advise not to share inhalers.
- Consider alternative inhaler devices if the patient has persistent difficulty with technique.

Table 4: Inhaler devices recommended by age group

Inhaler device	< 2 years	2-4 years	5-7 years	8-11 years
pMDI, small volume spacer & mask	Yes	May transition to no mask		
pMDI & spacer No mask		Possible	Yes	Yes
pMDI (alone)*				Possible, but use with a spacer is preferable
Dry powder device			Possible	Yes
Breath-activated device			Possible	Yes

*A spacer should be used with the pMDI for the regular administration of ICS, and for the administration of SABA in the setting of an acute attack.

5.2 Stepwise approach to long-term asthma treatment

Goal: The right step of medicine in the right device is used for the age and symptoms of the child

- In the stepwise approach to management, children step-up and down therapy as required to achieve and maintain control of their symptoms and reduce the risk of asthma flare-ups.^{6, 8, 34}
- Achieving good control requires frequent and repeated assessments. This may require the use of recall or follow-up systems.
- At each step, check inhaler technique, adherence to treatment, understanding of a self-management plan, and barriers to self-care.^{6,8, 31-33,36-38}
- Most children who are compliant and have good inhaler technique will be well controlled on standard preventer therapy - if they are not, then reconsider the diagnosis.
- Alternative therapies, such as tiotropium, may be considered in some children on specialist advice. Tiotropium, a long-acting muscarinic receptor antagonist (LAMA), is currently licensed for use but not funded for asthma indications in New Zealand²² and the role of LAMAs in paediatric asthma is not yet clear.
- At Step 5, oral steroids, oral theophylline, and monoclonal antibody therapy, may be considered as an add-on treatment, if directed by a paediatrician.

Figure 3: Stepwise approach to treatment of children with wheeze 1 - 4 years

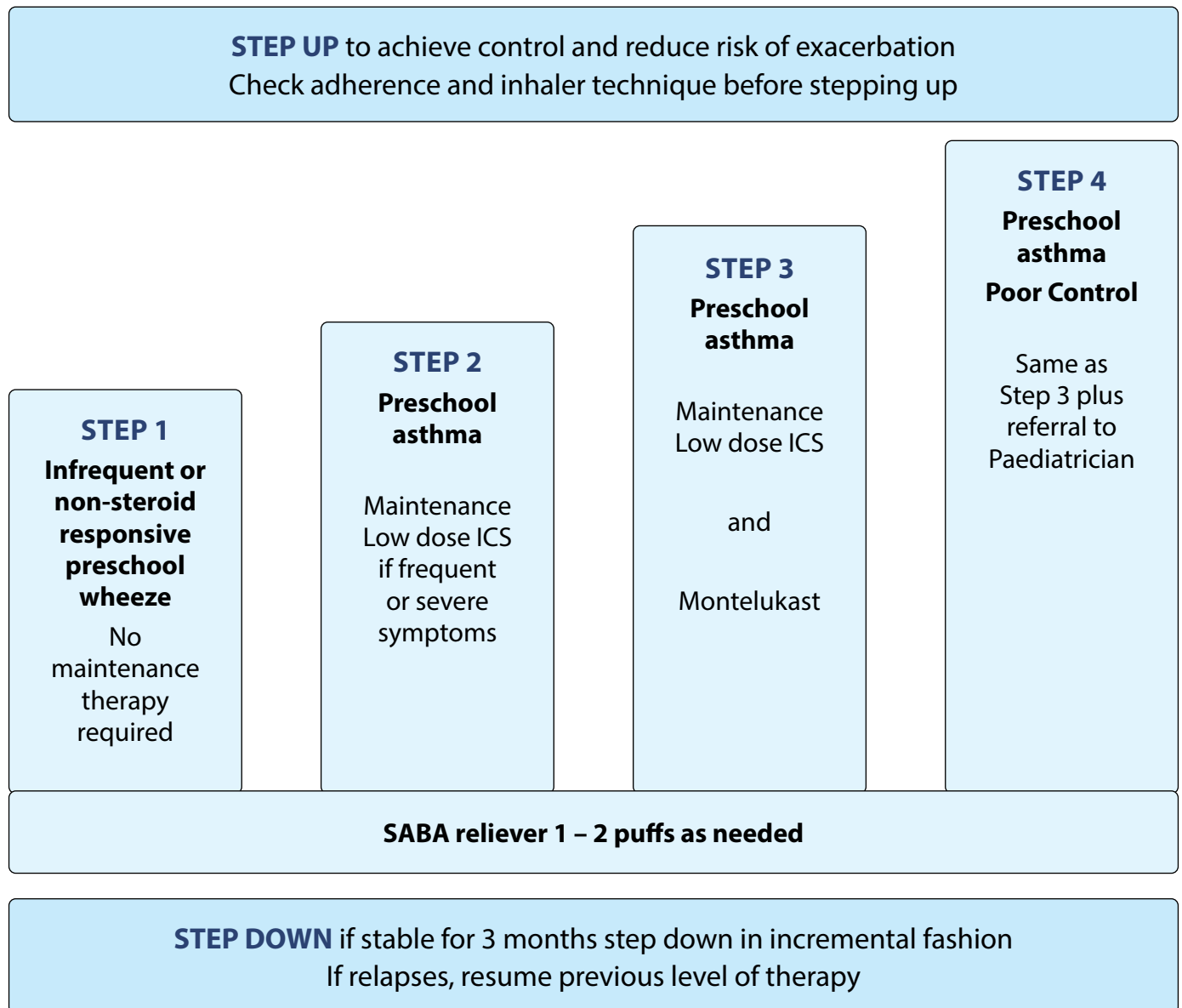
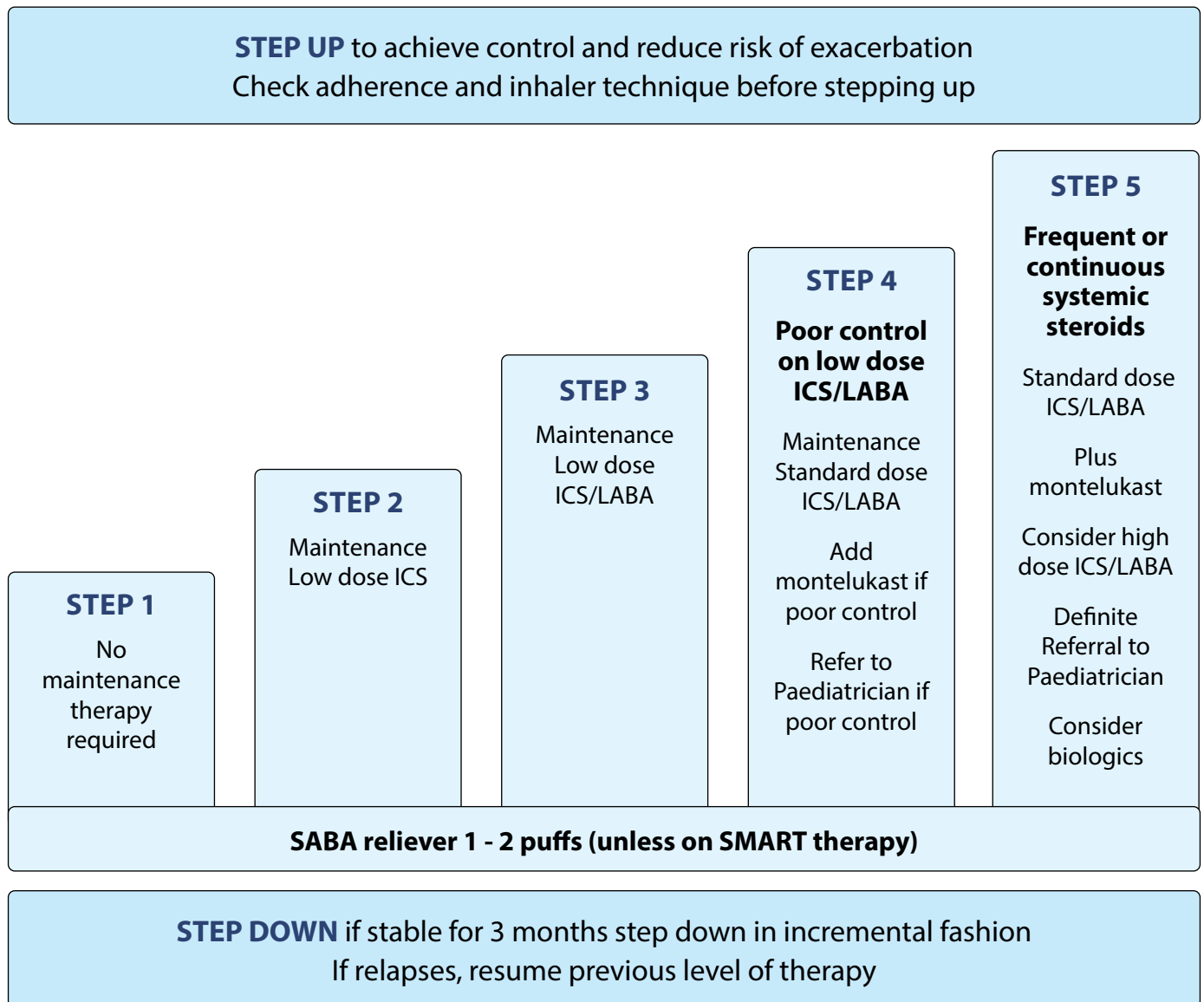


Figure 4: Stepwise approach to treatment of children with asthma 5 - 11 years



Practice points – stepwise management:

- Step-up and Step-down are determined by asthma control (see 3.1 Asthma Control Test and Table 2). Step-up may be required when asthma is partially controlled or uncontrolled. Once asthma has been well-controlled for at least 8 weeks, consider Step-down, and reassess control after at least 12 weeks.
- Many children have intermittent asthma (Step 1) and do not need an asthma preventer; however, children with a flare-up in the last 12 months are at increased risk and a preventer considered.
- Recommended doses of ICS are lower in children than adults (See Table 5). The usual maximum daily dose in children is also lower than adults, and equivalent to beclomethasone 800 micrograms, or fluticasone propionate 500 micrograms. Both these

- doses are at the top of the dose response curve. If this dose is exceeded there is no therapeutic benefit, and there is an increase in adverse medication effects.
- When issuing repeat prescriptions for reliever inhalers, ensure that preventer medication is being used.
 - When writing prescriptions for inhalers, ensure that directions are written so the pharmacist may dispense the number of inhalers required by the patient as allowed within the 3-month supply limit. Additional inhalers may be required for children living across two households or needing extra inhalers for school.
 - Influenza vaccination should be encouraged for all children and preschoolers at future risk of a flare-up.
 - Remember non-pharmacological approaches to management as well as medicines (see 1.10 and 4.2).

5.3 Initial treatment choices (when to add ICS)

Goal: For children with asthma, ICS are prescribed and taken when indicated

- At initial diagnosis, all children with asthma should be provided with a SABA to take as required for relief of symptoms.
- It is recommended that ICS therapy is introduced if children have symptoms > 2 times per week, use their reliever > 2 times per week, have regular night waking in the past month, or have a flare-up requiring oral steroids in the previous year.⁸
- ICS therapy should also be introduced if there is

excessive pickup or purchase of reliever inhalers (3 or more per year).

- Diagnosis is often made at a time when preventer therapy should be introduced.
- If the child is likely to have an asthma flare-up in a particular season or time of the year, then they should be prescribed ICS therapy during that time.
- In preschoolers, intermittent ICS therapy may be used as an alternative to regular therapy. This is initiated at the first sign of an URTI at “standard” dose (Table 5).²³ Regular rather than intermittent therapy is preferred for those with frequent symptoms.

Table 5: The recommended low and standard daily dose of ICS in children with asthma. “High” doses are double the standard doses (see Tables 4 and 5)

Low dose		Standard dose	
Beclomethasone dipropionate	200 mcg/day	Beclomethasone dipropionate	400-500 mcg/day
Beclomethasone dipropionate ultrafine	100 mcg/day	Beclomethasone dipropionate ultrafine	200 mcg/day
Budesonide	200 mcg/day	Budesonide	400mcg/day
Fluticasone propionate	100 mcg/day	Fluticasone propionate	200-250mcg/day

Practice points on ICS:

- The daily doses of ICS in children, which achieve 80-90% of maximum efficacy, are the low doses shown in Table 5. The doses labelled ‘standard’ doses are the same microgram/day ‘standard’ doses in the Adolescent and Adult Asthma Guidelines.
- ICS should be administered from a pMDI with spacer, or from a dry-powder inhaler. The child’s ability to use the inhaler should be checked.^{6,7,42,43}

- The LABA should be stopped if the child deteriorates after starting it.
- The LABA should be stopped after 3 months if ineffective.

5.4 When to add LABA therapy in children 11 years and under

Goal: LABAs should never be prescribed without ICS

- Combination ICS/LABA combined single inhaler treatment should be prescribed at a fixed maintenance dose and patients also prescribed a SABA as a reliever therapy. LABA monotherapy is unsafe.
- LABAs should not be used in children < 4 years of age. Montelukast should be used instead as add-on therapy.
- LABAs (with ICS) should not be initiated when the child is clinically unstable. They should be stopped if they are ineffective or worsen asthma stability.

5.5 SMART Therapy

SMART therapy (“Single combination ICS/LABA inhaler Maintenance And Reliever Therapy”) is the use of a combination ICS/fast onset LABA inhaler as both maintenance and reliever therapy in children. There is one previous study of combined ICS/LABA maintenance and reliever showing a marked reduction in exacerbations, compared to fixed doses of ICS/LABA or ICS plus SABA.⁴⁴ ICS and SABA combinations are also under study.⁴⁵

At the moment, there is insufficient evidence to recommend SMART therapy as first line therapy in children 11 years and under, but it may be considered on specialist advice in select children who are poorly controlled on Steps 3 - 5:

- The child should be able to use the inhaler device effectively even when short of breath.
- The child and/or carer should understand the

upper limit on reliever doses per day allowed in the action plan, before seeking medical assistance.

- A long-acting beta-agonist with rapid onset of action must be used, and the only product licensed in New Zealand for this approach is Symbicort via turbuhaler.
- Prescription should be for one puff twice daily of the 100/6 microgram turbuhaler as the regular scheduled maintenance dose.
- One puff is given as needed as reliever. Up to 4 reliever puffs per day may be used. After this, the child and caregiver should seek medical attention for a flare-up.
- When presenting to primary or secondary care for a flare-up, a SABA may be given as usual.

5.6 Montelukast

- In preschoolers, montelukast should be trialled as add-on therapy for children who remain poorly controlled on ICS.
- In school age children, montelukast may be trialled in children poorly controlled on combined ICS/LABA therapy.
- As montelukast is not effective in all patients, the trial should be stopped if not successful or if there are adverse effects.
- Montelukast may also be considered as an alternative to ICS at Step 2 in preschool and school-age children, but ICS are generally more effective.⁴⁶
- The dose of montelukast is 4 mg once daily in children under 5 years and 5 mg in school-age children. The different doses are different formulations, so the effective dose is quite different between them.
- Montelukast is generally safe with a similar rate of

adverse events as placebo in trials.^{47,48} However, due to neuropsychiatric side-effects, the medication should not be used for mild symptoms, and parents should be warned to stop the medication if there is increased suicidal ideation in older children, or sleep and behavioural disturbance.

5.7 Specialist referral and step 5 therapy

Children requiring frequent or continuous doses of systemic steroids (more than 14 days in a 12-month period), or who are poorly controlled at Step 4, or who are on Step 5 should be referred to a specialist paediatrician for review.

- Lack of response to preventer therapy suggests the child may not have asthma and the diagnosis should be reviewed, which may require specialist investigation.
- A prolonged course (> 7 days) of daily or alternate day oral corticosteroid may be required in some cases to gain symptomatic control, and this may best be prescribed under specialist supervision and with objective monitoring of benefit.
- Children are at greater risk of adverse events to systemic steroids than adults and should be monitored, and any effects on growth assessed by a specialist if they receive frequent steroids.
- Injectable biologic anti-inflammatory agents (e.g. omalizumab and mepolizumab), which prevent flare-ups and reduce the need for systemic corticosteroids, are now available. These require specialist review for funding and need to be initiated in a secondary care setting. These agents are safe and effective and where appropriate their use is encouraged, but outside the scope of these guidelines.

6. Treatment of acute severe asthma (primary care, after-hours care or ED)

Goal: All children should be managed to avoid life-threatening asthma or death

Acute asthma management is based on:

- Objective measurement of severity.
- Assessment of the need for referral to hospital and/or hospital admission (Table 5).
- Administering treatment appropriate for the degree of severity.

- Repeatedly reassessing the response to treatment.
- Monitor pulse rate, respiratory rate, accessory muscle use and ability to speak (words/breath).
- Key priorities include identification of a life-threatening attack requiring urgent admission to intensive care, and a severe asthma attack requiring hospital admission (Table 6 and Figure 5).

Table 6: Criteria for acute referral to hospital and/or hospital admission in children

- Child with any feature of life-threatening asthma.
- Child with any feature of an acute severe attack persisting after initial treatment.
- Child in whom other considerations suggest that admission may be appropriate:
 - Still have significant symptoms after initial treatment
 - Psychosocial problems in child or parent/caregiver
 - Physical disability or learning difficulties
 - Previous near-fatal or brittle asthma
 - Flare-up despite adequate dose of oral steroids pre-presentation
 - Presentation at night
 - Remote location or without transportation/communication

Nebulisation, spirometry and peak expiratory flow monitoring are aerosol generating procedures and their use should be minimised while COVID-19 is a risk.

Practice points – acute severe asthma:

- A lack of response to initial bronchodilator treatment and/or a requirement for repeat doses 2-hourly or more often indicates the need for referral to hospital and/or admission.
- For most children, initial treatment with beta-agonist via a spacer and oral steroids is likely to be sufficient. Reserve nebulised beta-agonists for those with severe asthma who require continuous oxygen.⁴⁹
- If the child does not respond to initial therapy via spacer, carefully observe spacer technique, and if inhalation is ineffective use a nebuliser.
- The standard regimen for a course of prednisone in the situation of severe asthma is 1 - 2 milligrams/kg (to a maximum of 40 milligrams) daily for 3 - 5 days.
- Steroids, such as oral prednisone are not likely to be effective in children < 5 years. In this age group, they should be reserved for children admitted to hospital (or who are en route) and who are on oxygen.
- In ambulance or hospital consider IV magnesium sulphate according to local protocol if the patient is life-threatening or a patient with severe asthma is deteriorating. Salbutamol and sometimes aminophylline may also be used depending on local protocols.
- Non-invasive ventilation in life-threatening asthma is not recommended outside of an intensive care setting.
- For children with acute severe asthma who are treated in primary care or discharged from the after-hours clinic or ED, long-term management should be reviewed and follow-up appointment within the week with their primary healthcare team should be arranged.
- All children ≥ 5 years who have presented with acute severe asthma, and who are not taking ICS, should be prescribed ICS before going home.⁸
- Avoid prescribing antibiotics, unless clear evidence of a bacterial infection. Asthma flare-ups are usually caused by viruses.

Figure 5: Algorithm for community management of moderate, severe and life-threatening acute asthma in children 4 – 11 years.

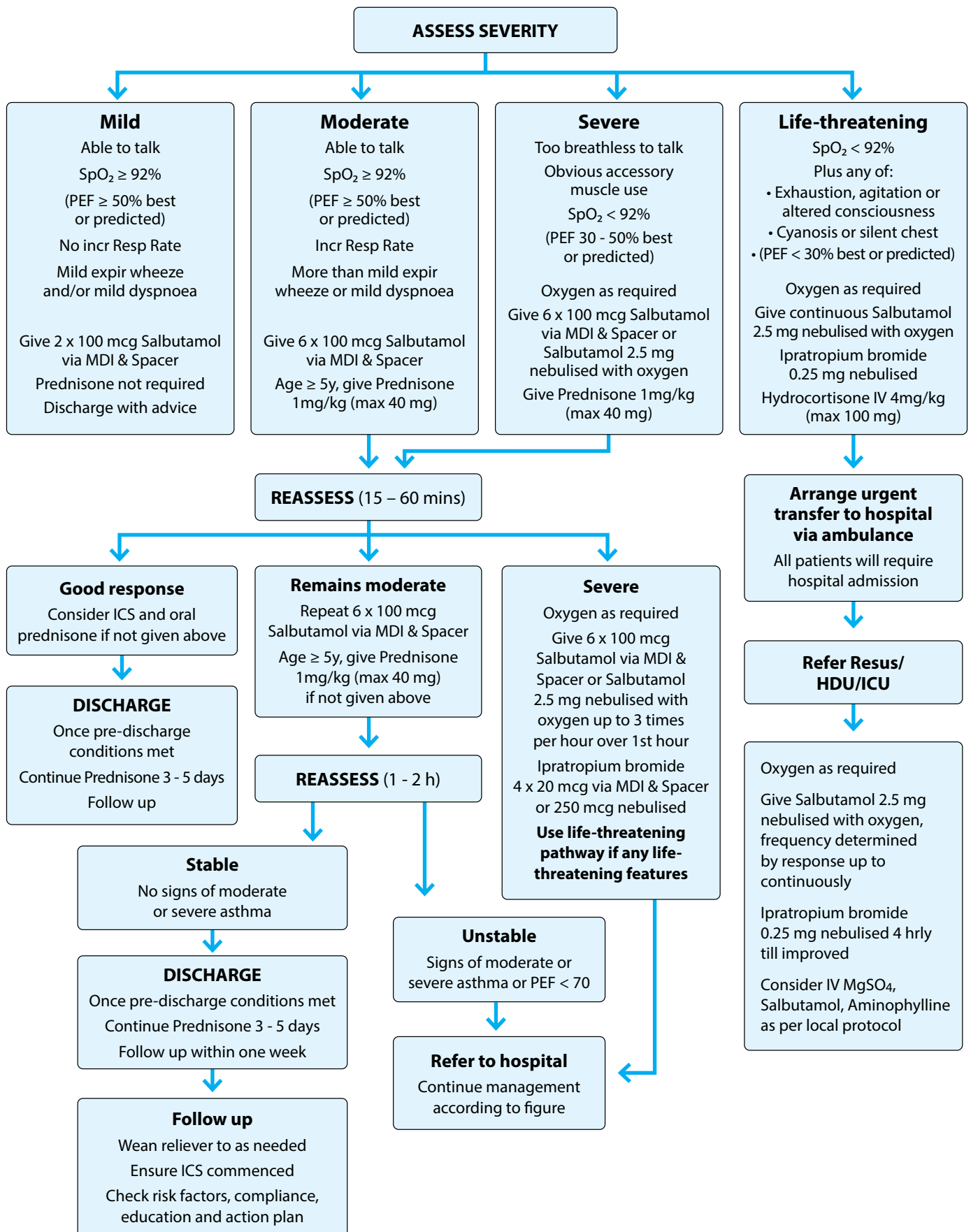


Table 7: Pre-discharge considerations in children

1. Most children presenting with acute flare-ups of asthma should have a course of oral prednisone, 1 - 2 milligrams/kg (to a maximum of 40 milligrams) daily for 3 - 5 days.
2. All children admitted to hospital for asthma should have a structured review assessing control, inhaler technique, asthma education, an action plan and follow-up by a specialist.
3. It is recommended that children have prednisone and ICS dispensed prior to discharge to ensure there are no barriers to taking medication.
4. Before sending a child home, ensure that the child with caregiver:
 - Understands treatment prescribed and the signs of worsening asthma.
 - Can demonstrate inhaler use correctly and has a supply of the medication.
 - Understands how to contact emergency services/seek further advice if symptoms deteriorate (i.e. has an action plan).
 - Has access to phone and transportation.
 - Arranges an early follow-up appointment with their primary healthcare team for review (within a week).
5. Consider:
 - Referral to asthma educator.
 - Housing and social implications, e.g. social worker involvement.
 - Encourage notification of hospital admission to school or childcare centre.

Checks at follow-up visit after admission

1. Clinical assessment – resolution of symptoms and signs would be expected.
2. Consider spirometry in older children.
3. Child and/or carer understand treatment prescribed and the signs of worsening asthma.
4. Child and/or carer can demonstrate inhaler use correctly and has a supply of the medication.
5. Carer understands how to contact emergency services/seek further advice if symptoms deteriorate.
6. Check written action plan.
7. Check housing and social implications.
8. Check vaccinations and other preventive measures.

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Appendix A

 <p>Well</p> <p>When I'm well:</p> <ul style="list-style-type: none"> • I have no cough • I play just like other children • I use my reliever puffer less than 2 times a week 	<p>My puffers are:</p> <p>Preventer: I take this every day even when I'm well. The name of my preventer is [] The colour is [] I take [] puffs in the morning and [] puffs at night through a spacer.</p> <p>Reliever: I take this only when I need it The name of my reliever is [] The colour is [] I take [] puffs through a spacer when I wheeze, cough or when it's hard to breathe.</p> <p>If I find it hard to breathe when I exercise I should: Take [] puffs of my reliever</p>
<p>Worse</p> <p>When my asthma is getting worse:</p> <ul style="list-style-type: none"> • I cough or wheeze and it's hard to breathe, or • I'm waking at night because of my asthma, or • I cough or wheeze when I play, or • I need my reliever inhaler to control my asthma more than 2 times per week 	<p>If my asthma gets worse I should:</p> <p>Keep taking my preventer every day as normal and take [] puffs of my reliever every 4 hours if I'm not getting better doing this I should see my doctor today</p> <p>Contact: []</p>
<p>Worried</p> <p>My asthma is a worry when:</p> <ul style="list-style-type: none"> • My reliever isn't helping, or • I'm finding it hard to breathe, or • I'm breathing hard and fast, or • I'm sucking in around my ribs/throat, try looking under my shirt • I'm looking pale or blue 	<p>Sit me down and try to stay calm</p> <p>Give me 6 puffs of reliever through a spacer, taking 6 breaths for each puff</p> <p>If I don't start to improve I need help now ↑</p> <p>Emergency</p> <p>DIAL 111 and ask for an ambulance</p> <p>WHILE YOU'RE WAITING:</p> <ul style="list-style-type: none"> • Try to stay calm and keep me sitting upright • Give 6 puffs of reliever through a spacer every 6 minutes with 6 breaths for each puff until help arrives

Date Prepared: _____ Doctor/Nurse Signature: _____ Plan to be reviewed when treatment changed

Appendix B

Doctor: _____ Preventer: _____ Reliever: _____

If you are frightened at any stage call 111.

Refer to the symptoms key to help you fill in the symptom diary chart below. Use this Symptom Diary along side your Asthma Action Plan.

Well
If you have ticked only the green boxes, things are going really well.

Worse
If you have ticked any of the yellow boxes, increase your treatment in line with your action plan. If you're not getting better see your doctor today.

Worried
If you have ticked any of the orange boxes, see a doctor today.

Asthma Emergency
If you have ticked any of the red boxes, you need to dial 111 and ask for an ambulance.

Date	Did you cough today?	Did you wheeze today?	Did your asthma affect your normal activity?	Did your asthma wake you up in the night?	How many doses of reliever did you take today?	Comments

Appendix C

List of organisations and individuals consulted for feedback:

All DHBs	NZ Medical Association
All PHOs	NZ Resuscitation Council
Asthma NZ	NZ Speech Therapists Association
Australasian College of Emergency Medicine	NZNO & NZNO College of Respiratory Nurses
Authors of Asthma and Respiratory Foundation NZ, NZ Adolescent and Adult Asthma Guidelines	Paediatric Society
Breathing works	Paediatrics' Otago Medical School
Canterbury Health	Pasifika GP Network
Conference delegates	Pasifika Medical Association
Departments of General Practice for Medical Schools	PHARMAC Pharmaceutical Management Agency
General Practice NZ	Pharmaceutical Society of NZ
Health Informatics NZ	Pharmacy Guild of NZ
Health Information Standards Organisation	Philippa Howden-Chapman
Ian Town	POI Team Public Health South
Internal Medicine Society of Australia and NZ	ProCare Clinical Advisory Committee
Julian Crane	Respiratory and Sleep Medicine Auckland University
Kidz First	Royal Australasian College of Physicians
Maternal and Child Health Mid-Central District Health	Royal NZ College of GPs
Medtech	Special Education
Medical Research Institute of New Zealand	St Johns Ambulance
Ministry of Education	Starship Children's Health
Ministry of Health NGO	Te Ora: Māori Medical Practitioners
National Health IT Board	Teresa Chalecki
Nicola Corna	Te Rūnganga o Aotearoa (NZNO Māori)
Ngā Kaitiaki o Te Puna o Rongōāo Aotearoa, Māori Pharmacists' Association	Thoracic Society of Australia and NZ – NZ Branch
NPNZ	TSANZ Nurses special interest group
	Wellington Free Ambulance

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Dr Harwood reports personal fees from Astra Zeneca Limited outside the submitted work;

Dr Reid reports affiliation with Contract Research outside the submitted work;

Dr Asher reports one grant from Boehringer Ingelheim New Zealand outside the submitted work;

Dr Ingham reports personal fees from Te Hā Ora: The Asthma & Respiratory Foundation of New Zealand, grants from Janssen Research & Development, non-financial support from Astra Zeneca, outside the submitted work;

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