Asthma and Respiratory Foundation NZ
adult asthma guidelines:
a quick reference guide
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ABSTRACT
The purpose of the Asthma and Respiratory Foundation NZ Adult Asthma Guidelines is to provide simple, practical and evidence-based recommendations for the diagnosis, assessment and management of asthma in adults (aged 16 and over) in a quick reference format. 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.

Abbreviations:
ABG Arterial Blood Gas
ACT Asthma Control Test
ACOS Asthma/COPD overlap syndrome
COPD Chronic obstructive pulmonary disease
CXR Chest X-Ray
DHB District Health Board
DPI Dry-powder inhaler
ED Emergency Department
FeNO Fraction of expired nitric oxide
FEV₁ Forced expiratory volume in one second
FVC Forced vital capacity
HDU High Dependency Unit
ICS Inhaled corticosteroid
ICU Intensive Care Unit
LABA Long-acting beta-2 agonist
LAMA Long-acting muscarinic antagonist
MDI Pressurised Metered Dose Inhaler
NIV Non-invasive ventilation
NSAID Non-steroidal anti-inflammatory drug
PaO₂, PaCO₂ Arterial oxygen and carbon dioxide tension
PEF Peak expiratory flow
PHO Primary Health Organisation
SABA Short-acting beta-2 agonist
SpO₂ Oxygen saturation measured by pulse oximetry
U + E Urea and Electrolytes
Context
Providing health professionals with current best practice guidance sits within the Asthma and Respiratory Foundation NZ’s work programme, as a priority action towards reducing New Zealand’s significant respiratory health burden. Three important documents were released by the Foundation in 2015; Te Hā Ora: The National Respiratory Strategy,¹ The Impact of Respiratory Disease in New Zealand: 2014 update² and He Mararimatanga huangō: Asthma health literacy for Māori children in New Zealand.³ These set the context of the growing incidence and impact of asthma in New Zealand, the inequalities suffered by Māori, Pacific peoples and low income families, and the holistic approach needed to tackle the issues.

Guidelines review
The following documents were reviewed to formulate these Adult Asthma Guidelines: The New Zealand Guidelines Group 2002, ‘The Diagnosis and Treatment of Adult Asthma Best Practice Evidence-Based Guideline’,⁴ the National Asthma Council of Australia 2015 ‘Australian Asthma Handbook Quick Reference Guide’,⁵ the Global Initiative for Asthma 2016 ‘Asthma Management and Prevention’ including the companion ‘Pocket Guide’⁶ and the SIGN 2014 British Guidelines on the Management of Asthma including the ‘Quick Reference Guide’.⁷ A systematic review was not performed, although relevant references were reviewed where necessary to formulate this guideline version, and referenced as required to clarify differences in recommendations made between guidelines. Readers are referred to the above published guidelines and handbooks for the more comprehensive detail that they provide.

Grading
No levels of evidence grades are provided due to the format of the Adult Asthma Guidelines which is based on related Quick Reference Guides. Readers are referred to the above published guidelines and handbooks for the level of evidence for the recommendations on which the guidelines are based.

Guideline development group
This group included representatives from a range of professions and disciplines relevant to the scope of the guidelines. The first draft was written by Richard Beasley.

Development of the Adult Asthma Guidelines was funded by the Asthma and Respiratory Foundation NZ. No funding was sought or obtained from pharmaceutical companies.

Peer review
The draft guidelines were peer-reviewed by a wide range of respiratory health experts and key professional organisations, including the New Zealand Nurses Organisation Te Rūnanga o Aotearoa and Respiratory sections, the Pasifika GP Network, PHARMAC, the Royal New Zealand College of General Practitioners, the Thoracic Society of Australia and New Zealand, and the Internal Medicine Society of Australia and New Zealand.

Presentation
The guidelines are primarily presented through tables and figures with the intention to provide an electronic format which can be used in clinical practice. Key references are provided where necessary to support recommendations that may differ from previous guidelines or current clinical practice.

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 in the New Zealand Medical Journal and the Asthma and Respiratory Foundation NZ website, and disseminated widely via a range of publications, training opportunities and other communication channels, to health professionals, nursing and medical schools, PHOs and DHBs.

Implementation
The implementation of the guidelines by organisations will require communication, education and training strategies.

Expiry date
2019
Diagnosis

- The diagnosis of asthma starts with the recognition of a characteristic pattern of symptoms and signs, in the absence of an alternative explanation.
- The key to making the diagnosis of asthma is to take a careful clinical history and then to undertake a clinical examination, document variable expiratory airflow limitation and assess response to inhaled bronchodilator and/or inhaled corticosteroid (ICS) treatment (Table 1, Figure 1). There is no reliable single ‘gold standard’ diagnostic test.

Practice points

- An increase in FEV₁ ≥12% and ≥200ml from baseline after bronchodilator therapy are traditionally considered as diagnostic criteria for asthma. However, most people with asthma will not exhibit this degree of reversibility at any one assessment. There is a substantial overlap in bronchodilator reversibility between individuals with asthma, chronic obstructive pulmonary disease (COPD) and those with no respiratory disease, and as a result, no clear-cut divisions can be suggested.

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

<table>
<thead>
<tr>
<th>A. Asthma more likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Two or more of these symptoms:</td>
</tr>
<tr>
<td>- Wheeze (most sensitive and specific symptom of asthma)</td>
</tr>
<tr>
<td>- Breathlessness</td>
</tr>
<tr>
<td>- Chest tightness</td>
</tr>
<tr>
<td>- Cough.</td>
</tr>
<tr>
<td>- Symptom pattern:</td>
</tr>
<tr>
<td>- Typically worse at night or in the early morning</td>
</tr>
<tr>
<td>- Provoked by exercise, cold air, allergen exposure, irritants, viral infections, beta blockers, aspirin or other NSAIDs</td>
</tr>
<tr>
<td>- Recurrent or seasonal</td>
</tr>
<tr>
<td>- Began in childhood.</td>
</tr>
<tr>
<td>- History of atopic disorder or family history of asthma</td>
</tr>
<tr>
<td>- Widespread wheeze heard on chest auscultation</td>
</tr>
<tr>
<td>- Symptoms rapidly relieved by inhaled short-acting beta-2 agonist (SABA)</td>
</tr>
<tr>
<td>- Airflow obstruction on spirometry (FEV₁/FVC&lt;0.7)</td>
</tr>
<tr>
<td>- Increase in FEV₁ following bronchodilator, &gt;10%; the greater the increase, the greater the probability</td>
</tr>
<tr>
<td>- Variability in PEF over time (highest-lowest PEF/mean), &gt;15%; the greater the variability, the greater the probability.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Asthma less likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Chronic productive cough in absence of wheeze or breathlessness</td>
</tr>
<tr>
<td>- No wheeze when symptomatic</td>
</tr>
<tr>
<td>- Normal spirometry or PEF when symptomatic</td>
</tr>
<tr>
<td>- Symptoms beginning later in life, particularly in people who smoke</td>
</tr>
<tr>
<td>- Increase in FEV₁ following bronchodilator, &lt;10%; the lesser the increase, the lower the probability</td>
</tr>
<tr>
<td>- Variability in PEF over time, &lt;15%; the lesser the variability, the lower the probability</td>
</tr>
<tr>
<td>- No response to trial of asthma treatment.</td>
</tr>
</tbody>
</table>

Measurement of bronchial responsiveness, blood eosinophils and FeNO may be informative.
Alternative methods to identify variable airflow obstruction include repeat measures of spirometry with bronchodilator reversibility, peak flow variability with repeat measures at different times of the day and other specialist tests such as measures of bronchial hyper-responsiveness to exercise, methacholine or other provoking agents.

In most patients, observing a symptomatic response to treatment may help confirm the diagnosis, but a limited response to bronchodilator or ICS does not rule out asthma.

It may be difficult to distinguish between a diagnosis of asthma and COPD, particularly in adults with a smoking history, as they may have clinical features of both disorders.

This has led to the term ACOS (Asthma COPD Overlap Syndrome).

The possibility of an occupational cause should be considered in all cases of adult onset asthma. If occupational asthma is suspected, it needs to be formally investigated, and this may require specialist referral.

Assessing asthma severity, control and future risk

Evaluation of asthma severity, the level of control and the risk of future events are all important components of the assessment of individuals with asthma.

Severity of asthma is defined by the treatment needed to maintain good control.

Figure 1:
Practice points:
• For symptomatic patients, asthma severity can be determined only after a therapeutic trial of ICS for at least eight weeks. Start the therapeutic trial and book the follow-up appointment for eight weeks later.

• Severe asthma is asthma that remains uncontrolled despite optimal treatment, taken correctly. Patients who initially present with frequent symptoms often have mild asthma, which can be well controlled with ICS therapy.

Asthma symptom control is defined by the frequency of symptoms, the degree to which symptoms affect sleep and activity, and the need for reliever medication.

Practice point:
• Many patients under-report their asthma symptoms on general enquiry. Different methods for assessing asthma symptom control are available including:

i) Asthma Control Test (Figure 2)
This test has been widely validated10 and is recommended with the following cut points:

ACT scores:
- 20–25: well controlled
- 16–19: partly controlled
- 5–15: poorly controlled

The latest version of the test can be accessed via http://www.asthmacontrol.co.nz/.

Table 2: Definition of levels of asthma symptom control, regardless of current treatment.

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>• Daytime symptoms ≤2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week</td>
</tr>
<tr>
<td>• Need for reliever ≤2 days per week</td>
<td>• Need for reliever &gt;2 days per week</td>
<td>• Need for reliever &gt;2 days per week</td>
</tr>
<tr>
<td>• No limitation of activities</td>
<td>• Any limitation of activities</td>
<td>• Any limitation of activities</td>
</tr>
<tr>
<td>• No symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
</tr>
</tbody>
</table>

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous four weeks.


ii) Australian Asthma Handbook
This provides useful alternative questions that might be used to assess control (Table 2).5

Assessment of the risk of adverse outcomes including severe exacerbations, mortality and treatment-related adverse effects is also required (Table 3).

Practice point:
• High-risk patients can be identified by monitoring health care use (such as hospital admissions, ED and emergency and/or unplanned doctor visits) and medication requirements (such as courses of steroids, frequency of SABA prescriptions and more prescriptions for SABA than ICS).

Identifying management goals in collaboration with the patient
Managing asthma requires a partnership between the patient, their whānau and their healthcare team. This involves agreeing on management goals and a cycle based on repeated assessment, adjustment of treatment and review of responses as outlined in Figure 3.11

Practice points:
• Check adherence and inhaler technique (and instruct patients using
Figure 2: The Asthma Control Test.

**Asthma Control Test (ACT™) © 2002, 2007 Quality Metric Inc. All rights reserved. ACT™ is a trademark of QualityMetric Incorporated.**
Table 3: Clinical features associated with increased risk of severe exacerbations and/or mortality.

<table>
<thead>
<tr>
<th>A. Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Poor symptom control</td>
</tr>
<tr>
<td>• Hospitalisation or ED visit in the last year</td>
</tr>
<tr>
<td>• High SABA use (&gt;1 canister per month)</td>
</tr>
<tr>
<td>• Home nebuliser</td>
</tr>
<tr>
<td>• History of sudden asthma attacks</td>
</tr>
<tr>
<td>• Impaired lung function (FEV₁ &lt; 60% predicted)</td>
</tr>
<tr>
<td>• Raised blood eosinophil count</td>
</tr>
<tr>
<td>• ICU admission or intubation (ever)</td>
</tr>
<tr>
<td>• Requirement for long-term or repeated courses of oral corticosteroids.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Comorbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Psychotropic medications</td>
</tr>
<tr>
<td>• Major psychosocial problems</td>
</tr>
<tr>
<td>• Smoking</td>
</tr>
<tr>
<td>• Alcohol and drug abuse</td>
</tr>
<tr>
<td>• Aspirin or other NSAID sensitivity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Underuse or poor adherence to ICS treatment</td>
</tr>
<tr>
<td>• Discontinuity of medical care</td>
</tr>
<tr>
<td>• Socioeconomic disadvantage</td>
</tr>
<tr>
<td>• Māori and Pacific ethnicity</td>
</tr>
<tr>
<td>• Occupational asthma.</td>
</tr>
</tbody>
</table>

Figure 3: The control-based asthma management cycle.

Adapted from reference 6.
a physical demonstration of correct technique) at every visit.

- Consider alternative inhaler devices if persistent difficulty with technique.
- It is strongly recommended that a spacer is used with the pressurised metered dose inhaler (MDI) for the regular administration of ICS, ICS/long acting beta-2 agonist (LABA) and the administration of SABA in the setting of an acute attack. The two preferred methods are: one deep slow inhalation and a 10 second breath-hold, or 5–6 tidal breaths.

**Initial treatment choices (when to add ICS)**

- At initial diagnosis, all patients with asthma should be provided with a SABA to take as required for relief of symptoms.
- The key issue is when to start ICS therapy. There are proven benefits from the early introduction of ICS therapy in patients with mild or intermittent asthma and very few symptoms but the adherence to ICS therapy in real world studies is generally poor. This has led to uncertainty in determining the right stage at which to start ICS. It is recommended that ICS therapy is introduced if patients have symptoms ≥2 times in the last week, with evidence of benefit in patients with less frequent symptoms.
- An exacerbation requiring oral corticosteroids in the previous year is widely regarded as a requirement for regular ICS therapy to reduce the risk of further exacerbations.
- The daily doses of ICS which achieve 80–90% of maximum obtainable efficacy are shown in Table 4. These can be considered ‘standard’ doses for ICS, rather than ‘low’ doses as previously suggested.
- It is recommended that treatment with ICS is started at these standard doses. There is no greater benefit with initiation of ICS therapy at daily doses two to four times higher than these doses.
- Higher doses may be used in patients in whom adequate control is not achieved, or the patient may be switched to ICS/ LABA combination therapy.
- ICS and ICS/LABA are best administered from an MDI with spacer or from a dry-powder inhaler (DPI).

**Step up to ICS/LABA therapy**

- Combination ICS/LABA single-inhaler treatment may either be prescribed at a fixed maintenance dose with a SABA as reliever therapy or, only for budesonide/formoterol, as Single ICS/LABA Maintenance and Reliever Therapy (SMART regimen).
- The SMART regimen involves using the budesonide/formoterol combination inhaler for both regular maintenance use (once or twice daily), and for relief of symptoms (one actuation as required). Patients should not be prescribed a SABA reliever when taking the SMART regimen.
- The SMART regimen is more effective at reducing severe exacerbations than maintenance ICS/LABA with SABA reliever therapy. It is the preferred ICS/LABA regimen for treating patients at risk of severe exacerbations.
- Currently in New Zealand the SMART

<table>
<thead>
<tr>
<th>Beclomethasone dipropionate</th>
<th>400–500 μg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beclomethasone dipropionate extrafine</td>
<td>200 μg/day</td>
</tr>
<tr>
<td>Budesonide</td>
<td>400 μg/day</td>
</tr>
<tr>
<td>Fluticasone propionate</td>
<td>200–250 μg/day</td>
</tr>
</tbody>
</table>
A regimen is only approved for use with the budesonide/formoterol DPI.

- LABA monotherapy is unsafe in patients with asthma and is a risk if patients are poorly adherent with ICS therapy. LABAs should not be prescribed in a separate inhaler from ICS in patients with asthma.

**Stepwise approach to asthma treatment**

**Pharmacological treatment**

In the stepwise approach to asthma management, patients step up and down as required to achieve and maintain control of their asthma and reduce the risk of exacerbations (Figure 4).

**Figure 4:** The stepwise approach to asthma treatment.

**STEP UP** to achieve control and reduce risk of exacerbations

**STEP DOWN** after a period of prolonged control to find and maintain lowest required step

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**STEP 1**
SABA reliever therapy

**STEP 2**
Maintenance standard dose ICS and SABA reliever therapy

**STEP 3**
Maintenance standard dose ICS/LABA and SABA reliever therapy

**STEP 4**
Maintenance high dose (not standard) ICS/LABA and SABA reliever therapy

**STEP 5**
- Maintenance high dose (not standard) ICS/LABA and SABA reliever therapy
- High dose (not standard) Single ICS/LABA Maintenance and Reliever Therapy (SMART regimen)
  - Consider add on treatment and seek specialist advice

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**Recommended ICS/LABA doses in adult asthma**

<table>
<thead>
<tr>
<th>Step 3</th>
<th>Step 4 + 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP/Salm 50/25 2 inh BD + SABA for relief</td>
<td>FP/Salm 125/25 2 inh BD + SABA for relief</td>
</tr>
<tr>
<td>FP/Salm 100/50 1 inh BD + SABA for relief</td>
<td>FP/Salm 250/50 1 inh BD + SABA for relief</td>
</tr>
<tr>
<td>Bud/Form 100/6 2 inh BD + SABA for relief</td>
<td>Bud/Form 200/6 2 inh BD + SABA for relief</td>
</tr>
<tr>
<td>Bud/Form 200/6 1 inh BD + SABA for relief</td>
<td>FF/Vilanterol 100/25 1 inh OD + SABA for relief</td>
</tr>
<tr>
<td>SMART regimen</td>
<td>Or</td>
</tr>
<tr>
<td>Bud/Form 100/6 2 inh BD + 1 inh for relief</td>
<td>Bud/Form 200/6 2 inh BD + 1 inh for relief</td>
</tr>
<tr>
<td>Bud/Form 200/6 1 inh BD + 1 inh for relief</td>
<td>[Bud/Form 400/12 is not recommended]</td>
</tr>
</tbody>
</table>

FP/Salm: Fluticasone Propionate/Salmeterol; Bud/Form: Budesonide/Formoterol; FF/Vilanterol: Fluticasone Furoate/Vilanterol; OD: once daily; BD: twice daily; SMART: Single ICS/LABA Maintenance and Reliever Therapy.
Practice points:
- Consider stepping up if uncontrolled symptoms, exacerbations or at increased risk, but check diagnosis, adherence, inhaler technique and modifiable risk factors first.
- Consider stepping down if symptoms are controlled for three months and low risk for exacerbations.20 Ceasing ICS is not advised.
- At step 5, additional high dose ICS, oral steroids, monoclonal antibody therapy (IgE) and oral theophylline may be considered as add on treatment, with specialist review. The provision of a home nebuliser is not recommended.
- Alternative therapies such as sodium cromoglycate, nedocromil or montelukast may be considered in some patients at the lower steps.
- In asthma patients with features of COPD, long acting muscarinic antagonists (LAMA) may be considered.21
- At each step check inhaler technique, adherence to treatment, understanding of self-management plan and barriers to self-care.

Non-pharmacological measures
- The key non-pharmacological measures to improve asthma outcomes include smoking cessation, weight loss and breathing exercise programmes.
- Avoiding triggers which have been identified to provoke or precipitate attacks such as aspirin and other NSAIDs or attacks associated with features of anaphylaxis.
- Currently available house dust mite avoidance measures are not effective.22
- Modifications to diet are unlikely to improve asthma control. Food avoidance should not be recommended unless an allergy or sensitivity has been confirmed.
- Exercise should be encouraged. If exercise provokes asthma it is a marker of poor control and should lead to a review of treatment.

- Limitation of exposure or removal from the workplace is crucial in the management of occupational asthma.
- Asthma control may be improved by a warm, dry domestic environment.23
- Unflued gas heaters may make asthma symptoms worse.

Self-management
Self-management education based on a written, personalised, action plan improves health outcomes and should be offered to all people with asthma.11,24,25

Practice points:
- Asthma action plans may be based on symptoms with or without peak flow measurements and comprise either three or four stages depending on patient and health professional preference.
- Asthma and Respiratory Foundation NZ asthma action plans (Figures 5A, 5B, 5C) can be downloaded from their website http://asthmafoundation.org.nz/:
  - ICS and SABA (three and four stage plan)
  - ICS/LABA and SABA (three stage plan)
  - Single ICS/LABA Maintenance and Reliever Therapy (SMART regimen)
- The peak flow level at which patients are guided to recognise worsening asthma is around 80% (of best), severe asthma at 60 to 70% (of best) and an asthma emergency at around 50% (of best).
- The four-stage plan has been shown to be effective in the management of asthma. In this plan there is an extra step giving patients the option of increasing the dose of ICS, up to four-fold, through increasing the frequency of use, and/or the dose at each use, when they recognise worsening asthma symptoms. Patients should be advised to return to their normal ICS dose once asthma symptoms have improved.
- The recommended action plans can be modified as required depending on patient and practitioner preference.
Figure 5A: Maintenance ICS and SABA reliever four-stage asthma action plan.

Figure 5B: Maintenance ICS/LABA and SABA reliever three-stage asthma action plan or maintenance ICS and SABA reliever three-stage asthma action plan.
The standard regimen for a course of prednisone in the situation of severe asthma is 40mg daily for five days. An alternative regimen is 40mg daily until definite improvement, and then 20mg daily for the same number of days.

Adherence to treatment should be routinely assessed and encouragement provided as part of the self-management education. For example, encourage patients to link their inhaler use with some other activity such as cleaning their teeth (and then rinsing their mouth).

Inhaler technique should be routinely assessed at consultations and training provided as part of self-management education. It is preferable to administer ICS and ICS/LABA MDIs via a spacer, or to use a DPI.

The four-step adult asthma consultation, which includes guidance for writing an asthma action plan, is provided in the appendix.

**Treatable traits**

A key feature of the management of adult asthma is the recognition and treatment of overlapping disorders, comorbidities, environmental and behavioural factors, recently referred to as ‘treatable traits’. The assessment and management of some of the treatable traits may require specialist referral. One schema to consider is outlined in Table 5.
Asthma in Māori

Māori rights in regards to health, recognised in Te Tiriti of 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 action plan or receive adequate education. Major barriers to good asthma management for Māori include access to care, discontinuity and poor quality care, and reduced health literacy. Māori whānau have greater exposure to environmental triggers for asthma, such as smoking and poor housing. It is recommended that for Māori with asthma:

- Asthma providers should undertake clinical audit or other similar quality-improvement activities to monitor and improve asthma care and outcomes for Māori. The asthma action plan system of care, including the SMART regimen have been shown to improve outcomes in Māori.
- A systematic approach to health literacy and asthma education for Māori whānau is required. The evidence of the health literacy demands, the barriers and facilitators, and steps to delivering excellent asthma management with Māori which are described in He maramatanga huango: Asthma health literacy for Māori children in New Zealand also apply to adults.
- Asthma providers should support staff to develop cultural competency skills for engaging Māori with asthma and their whānau, in line with professional requirements. Information about the role of respiratory nurses working with Māori can be found on the New Zealand Nurses Organisation: http://www.nzno.org.nz/groups/colleges_sections/sections/respiratory_nurses.
- 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.

Asthma in Pacific peoples

Similar considerations are likely to apply to asthma in Pacific peoples who also have a disproportionate burden of asthma, including high rates of hospital admission, and should be considered a high-risk group requiring targeted care. Inclusive in this targeted approach is addressing risk factors such as poor housing, overcrowding, health literacy, obesity, smoking and poor access to health care services.
Asthma in pregnancy

Pregnancy can affect the course of asthma and women should be advised of the importance of maintaining good asthma control during pregnancy to avoid risk to both mother and baby.

- SABAs, ICS and LABAs should be used as normal during pregnancy.
- The risks to the baby of poor asthma control in pregnancy outweigh any theoretical risks associated with asthma medications.
- Oral steroids should be used as normal when indicated during pregnancy for women with severe asthma.
- Acute severe asthma in pregnancy is a medical emergency and should be treated in hospital.

Management of acute severe asthma (primary care, afterhours or ED)

Acute asthma management is based on:

- objective measurement of severity (Table 6)
- assessment of the need for referral to hospital and/or hospital admission (Table 7)
- administering treatment appropriate for the degree of severity and
- repeatedly reassessing the response to treatment.

Direct measurement of airflow obstruction is the best and most objective marker of asthma severity. This can be based on either the measurement of peak expiratory flow (PEF) or preferably FEV₁, if available, with both measures expressed as percent of the previous best or predicted normal values.

The levels of FEV₁ or PEF to signify severe and life-threatening asthma in these situations differ from (and are lower than) those used by patients in action plans in a non-health-care setting.

Key priorities include identification of a life-threatening attack requiring urgent admission to an ICU or HDU, and a severe asthma attack requiring hospital admission (Table 7).

An evidence-based algorithm for the management of severe asthma can be used to guide treatment (Figure 6).  

Practice points:

- A lack of response to initial bronchodilator treatment and/or a requirement for repeat doses indicates the likely requirement for referral to hospital and/or admission.
- For most patients, initial treatment with a SABA via a spacer and oral steroids is likely to be sufficient. Reserve nebulised bronchodilators for those with severe asthma who do not respond to initial inhaled therapy.
- Magnesium sulphate is the preferred intravenous bronchodilator to be administered in life-threatening asthma complications.

Table 6: Levels of severity of acute asthma exacerbation.

<table>
<thead>
<tr>
<th>Level</th>
<th>Characteristics</th>
</tr>
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<tbody>
<tr>
<td><strong>Moderate asthma exacerbation</strong></td>
<td>Increasing symptoms</td>
</tr>
<tr>
<td></td>
<td>FEV₁ or PEF &gt;50% best or predicted</td>
</tr>
<tr>
<td></td>
<td>No features of acute severe asthma.</td>
</tr>
<tr>
<td><strong>Severe asthma</strong></td>
<td>Any one of:</td>
</tr>
<tr>
<td></td>
<td>FEV₁ or PEF 30–50% best or predicted</td>
</tr>
<tr>
<td></td>
<td>Respiratory rate ≥25/min</td>
</tr>
<tr>
<td></td>
<td>Heart rate ≥110/min</td>
</tr>
<tr>
<td></td>
<td>Inability to complete sentences in one breath.</td>
</tr>
<tr>
<td><strong>Life-threatening asthma</strong></td>
<td>Any one of the following in a patient with severe asthma:</td>
</tr>
<tr>
<td></td>
<td>FEV₁ or PEF &lt;30% best or predicted</td>
</tr>
<tr>
<td></td>
<td>SpO₂ &lt;92% or PaO₂ &lt;60mmHg</td>
</tr>
<tr>
<td></td>
<td>PaCO₂ ≥45mmHg</td>
</tr>
<tr>
<td></td>
<td>Inability to talk#</td>
</tr>
<tr>
<td></td>
<td>Silent chest#</td>
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<tr>
<td></td>
<td>Cyanosis#</td>
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<tr>
<td></td>
<td>Feeble respiratory effort, exhaustion#</td>
</tr>
<tr>
<td></td>
<td>Hypotension or bradycardia#.</td>
</tr>
</tbody>
</table>

# These are very late manifestations and reflect a patient at risk of imminent respiratory arrest.
Table 7: Criteria for referral to hospital and/or hospital admission.

- Patients with any feature of life-threatening asthma
- Patients with any feature of severe attack persisting after initial treatment
- Patients in whom other considerations suggest that admission may be appropriate:
  - Still have significant symptoms
  - Living alone/socially isolated
  - Psychosocial problems
  - Physical disability or learning difficulties
  - Previous near fatal attack
  - Exacerbation despite adequate dose of oral steroids pre-presentation
  - Presentation at night
  - Pregnancy.

There is no role for intravenous beta-2 agonists, unless inhaled treatment cannot be given. Similarly, there is no role for intravenous aminophylline.

- There is no role for adrenaline (epinephrine) unless asthma is accompanied by anaphylaxis or angioedema.
- There is insufficient evidence to support the use of non-invasive ventilation (NIV) in life-threatening asthma, outside an ICU or HDU setting, and as a result it is not recommended in other settings.

- For patients who are treated in primary care or discharged from the Afterhours or ED, long term management should be reviewed and an early follow-up appointment with their primary healthcare team should be arranged. All patients not taking ICS should be started on ICS before going home (Table 8).

Figure 6:

ALGORITHM FOR MANAGEMENT OF SEVERE ASTHMA

1. **IMMEDIATELY**
   - **MILD/MODERATE FEV₁/PEF >50%**
     - Give 6x100µg salbutamol via MDI and spacer*
   - **FEV₁/PEF >70%**
     - Consider oral prednisone 40mg, if not given above, and ICS
   - **FEV₁/PEF 50-70%**
     - Give prednisone 40mg if not given above
     - Repeat salbutamol 6x100µg via MDI and spacer*
   - **FEV₁/PEF <50%**
     - Give 6x100µg salbutamol via MDI and spacer* or salbutamol 2.5mg via nebulisation, prednisone 40mg, oxygen if required to keep sats > 92%

2. **ASSESS SEVERITY**
   - **SEVERE FEV₁/PEF 30-50%**
     - Give 6x100µg salbutamol via MDI and spacer* or salbutamol 2.5mg via nebulisation, prednisone 40mg, oxygen if required to keep sats > 92%
   - **LIFE-THREATENING FEV₁/PEF <30%**
     - Give continuous salbutamol via nebulisation, ipratropium bromide 500µg via nebulisation, IV hydrocortisone 100mg or prednisone 40mg, oxygen if required to keep sats > 92%

3. **15-60 MIN**
   - **DISCHARGE**
     - Once pre-discharge conditions are met

4. **1-2 HR**
   - **REASSESS**
     - **STABLE**
       - No signs of severe asthma and FEV₁/PEF > 70%
       - Once pre-discharge conditions are met
     - **UNSTABLE**
       - Signs of severe asthma or FEV₁/PEF <50-70%

5. **REFER TO ICU/HDU**
   - **ARRANGE URGENT TRANSFER TO HOSPITAL BY AMBULANCE**
     - All patients will require hospital admission
   - **BREATHING ISSUE**
     - Give salbutamol 2.5mg via nebulisation, frequency determined by response, up to continuously
     - Ipratropium bromide 500µg via nebulisation, up to hourly, consider IV magnesium sulphate 1.2-2.0g over 20 min, oxygen if required to keep sats 92-96%

6. **ADMIT**

*Administrated in individual doses

For practical purposes, the FEV₁ and PEF are considered interchangeable when expressed as % predicted for the purpose of assessment of acute asthma severity.
Table 8: Pre-discharge considerations.

1. Most patients presenting with acute exacerbations of asthma should have a course of oral prednisone, 40mg daily for at least five days.
2. All patients should have an ICS started, or current use reinforced.
3. It is recommended that patients have prednisone and ICS dispensed prior to discharge to ensure there are no barriers to taking medication.
4. Before the patient goes home, ensure that the patient:
   • Understands treatment prescribed and the signs of worsening asthma
   • Has a peak flow meter and knows at what level to contact emergency medical help if worsens
   • Can use their inhalers correctly and has a supply of their medication
   • Arranges an early follow-up appointment with their primary healthcare team for review
   • Consider referral to a specialist respiratory service.

Appendix

The four-step adult asthma consultation

<table>
<thead>
<tr>
<th>1. Assess asthma control</th>
<th>2. Consider other relevant clinical issues</th>
<th>3. Decide if increase or decrease in maintenance therapy required</th>
<th>4. Complete the asthma action plan</th>
</tr>
</thead>
</table>
| Complete the Asthma Control Test (ACT) score | Ask about compliance with maintenance treatment | Is a step up in the level of treatment required if asthma is not adequately controlled, poor lung function or recent severe exacerbation? | Decide which plan to use:  
   - Three stage maintenance ICS + SABA reliever  
   - Four stage maintenance ICS + SABA reliever  
   [This includes the instruction to increase dose and frequency of ICS in worsening asthma]  
   - Three stage ICS/LABA + SABA reliever  
   - Single ICS/LABA Maintenance and Reliever Therapy [SMART] |
| 20–25: well controlled  
16–19: partly controlled  
5–15: poorly controlled | Check inhaler technique | Is a step down in the level of treatment possible if there has been a sustained period of good control? | For those with peak flow instructions, enter personal best recent peak flow and peak flow at each level in the plan. The recommended cut points of <80% for getting worse, <60 to 70% for severe asthma and <50% for an emergency are a reference guide only and can be adjusted according to clinical judgement depending on the patient. |
| Review lung function tests  
Peak flow monitoring and/or Spirometry | Enquire about clinical features associated with an increased risk | Decide whether peak flow monitoring is indicated | Enter the prednisone regimen. The standard regimen in severe asthma is 40mg daily for five days. An alternative regimen is 40mg daily until there is definite improvement and then 20mg daily for the same number of days. |
| Review history of severe asthma attacks in last 12 months (requiring urgent medical review, oral steroids or bronchodilator nebuliser use) | Consider treatable traits | | Enter additional instructions in the box provided. This may include avoidance of provoking factors such as aspirin. |
GUIDELINES

Figure 7A: Completing the maintenance ICS and SABA reliever four-stage asthma action plan.

Figure 7B: Completing the maintenance ICS/LABA and SABA reliever or maintenance ICS and SABA reliever three-stage asthma action plan.
Figure 7C: Completing the Single ICS/LABA Maintenance and Reliever Therapy (SMART) asthma action plan.

Competing interests:

Richard Beasley has received payment for lectures from and been a member of the AstraZeneca, GlaxoSmithKline and Novartis advisory boards, and received research grants from AstraZeneca, Cephalon, Chiesi, Genentech, GlaxoSmithKline and Novartis. Robert Hancox has received payment to his institution for lectures and/or advisory boards from AstraZeneca, GlaxoSmithKline and Novartis and non-financial support from Boehringer Ingelheim.

Jim Reid is a member of the GlaxoSmithKline Expert Advisory Committee.

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