Clinical Guidelines
for the State of Qatar

The diagnosis and management of asthma in adults

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Diagnosis and management of asthma in adults
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1 Information about this guideline

1.1 Objective and purpose of the guideline
The purpose of this guideline is to define the appropriate diagnosis and management of asthma in adults. The objective is to reduce inappropriate prescribing and referral of patients presenting to any provider organisation in Qatar. It is intended that the guideline will be used primarily by physicians in primary care and outpatient settings.

1.2 Scope of the guideline
Diagnosis, assessment and management of acute and chronic asthma, in adults over age 18 years, in primary and secondary care, including:

- Non-pharmacological and pharmacological management.
- Choice of inhaler devices.

Aspects of care not covered in this guideline are:

- Management of asthma in pregnancy.
- Management of asthma in children.

1.3 Editorial approach
This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this guideline, has involved the following critical steps:

- Extensive literature search for well reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising physicians and subject matter experts from across provider organisations in Qatar.
- Independent review of the guideline by the Clinical Governance body appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Explicit review of the guideline by patient groups was not undertaken.

Whilst the MOPH has sponsored the development of the guideline, the MOPH has not influenced the specific recommendations made within it.
1.4 Sources of evidence
The professional literature published in the English language has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a clinical editor and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals (i.e. journals that are read and cited most often within their field).
3. Address an aspect of specific importance to the guideline in question.

Where included, the ‘goal length of stay’ stated within this guideline is supported by and validated through utilisation analysis of various international health insurance databases. The purpose of database analysis is to confirm the reasonability and clinical appropriateness of the goal, as an achievable benchmark for optimal duration of inpatient admission.

1.5 Evidence grading and recommendations
Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
  - Meta-analyses.
  - Randomised controlled trials with meta-analysis.
  - Randomised controlled trials.
  - Systematic reviews.

- **Level 2 (L2):**
  - Observational studies, examples include:
    - Cohort studies with statistical adjustment for potential confounders.
    - Cohort studies without adjustment.
    - Case series with historical or literature controls.
    - Uncontrolled case series.
  - Statements in published articles or textbooks.

- **Level 3 (L3):**
  - Expert opinion.
  - Unpublished data, examples include:
    - Large database analyses.
    - Written protocols or outcomes reports from large practices.
In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A1 (RGA1):** Evidence demonstrates at least moderate certainty of at least moderate net benefit.
- **Recommendation Grade A2 (RGA2):** Evidence demonstrates a net benefit, but of less than moderate certainty, and may consist of a consensus opinion of experts, case studies, and common standard care.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C1 (RGC1):** Evidence demonstrates a lack of net benefit; additional research is recommended.
- **Recommendation Grade C2 (RGC2):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.

### 1.6 Guideline Development Group members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the Clinical Governance Group. The GDG members have reviewed and provided feedback on the draft guideline relating to the topic. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Organisation</th>
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<tbody>
<tr>
<td>Dr Nisar Cherukattil Abdulla</td>
<td>General Practitioner</td>
<td>Aster DM Healthcare</td>
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<tr>
<td>Dr Abbas Abdallah Al Abbas</td>
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1.7 Responsibilities of healthcare professionals

This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.

The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or carers and should consider the individual risks and benefits of any intervention that is contemplated in the patient’s care.

1.8 Abbreviations used in this guideline

The abbreviations used in this guideline are as follows:

- **ACQ**: Asthma Control Questionnaire
- **ACT**: Asthma Control Test
- **AIDS**: Acquired Immunodeficiency Syndrome
- **BUD/FOR**: Budesonide & Formeterol
- **COPD**: Chronic Obstructive Pulmonary Disease
- **FE\textsubscript{NO}**: Fractional Exhaled Nitric Oxide
- **FEV\textsubscript{1}**: Forced Expiratory Volume in 1 second
- **GINA**: Global Initiative for Asthma
- **HIV**: Human Immunodeficiency Virus
- **ICU**: Intensive Care Unit
- **IPPV**: Intermittent positive pressure ventilation
- **LABA**: Long-acting beta\textsubscript{2}-agonists
- **NSAIDs**: Non-steroidal anti-inflammatory drugs
- **PaCO\textsubscript{2}**: Partial pressure of carbon dioxide
- **PaO\textsubscript{2}**: Partial pressure of oxygen
- **PCV13**: 13-valent pneumococcal conjugate vaccine
- **PPSV23**: 23-valent pneumococcal polysaccharide vaccine
- **PEF**: Peak Expiratory Flow rate
- **pMDI**: Pressurised metered dose inhaler
- **SABA**: Short-acting beta\textsubscript{2}-agonists
- **SpO\textsubscript{2}**: Percentage of oxygen saturation
2 Organisation of care in Qatar

2.1 Role of the Ministry of Public Health

The Ministry of Public Health of Qatar (MOPH) has been given the responsibility to guide reform in Qatar in order to establish one of the world’s most admired and renowned healthcare systems. The MOPH’s role is to create a clear vision for the nation’s health direction, set goals and objectives for the country, design policies to achieve the vision, regulate the medical landscape, protect the public’s health, set the health research agenda, and monitor and evaluate progress towards achieving those objectives.

The MOPH has the dual mandate to develop policies and programmes to improve the people’s health so that they may enjoy longer and more productive lives, and to lay the foundation for a vibrant country for decades to come.

The MOPH does not provide clinical services. Instead its goal is to vest responsibility for care in the hands of both public and private sector healthcare institutions, whilst regulating, monitoring, and evaluating this care against agreed upon outcomes. The MOPH is committed to establishing an environment that promotes quality and wellness through policies in such areas as public health, health insurance, information technology, licensure and credentialing; and continuing medical education.

2.2 Provision of care

Healthcare provision in Qatar comprises of the following main entities:

- Public Sector:
  - Primary care health centres - provided by the Primary Health Care Corporation of Qatar.
  - Secondary and tertiary care hospitals and outpatient clinics - provided by the Hamad Medical Corporation (HMC).
  - Paediatric Emergency Care provided by specialist Paediatric Emergency Centres within HMC.
  - QP Clinics for personnel and families of Qatar Petroleum.
  - Sports Medicine centre provided by a specialist Sport Medicine Hospital – Aspetar.
  - Ministry of Interior clinics for personnel and families of Qatar’s police services.
  - Ministry of Defence clinics for personnel and families of Qatar’s armed forces.
  - Specialist obstetric, gynaecological and paediatric care provided by Sidra Medical & Research Center.

- Private sector:
  - A range of single-handed generalist and specialist clinics.
  - Polyclinics.
  - Specialist hospitals.

The aim of the MOPH’s National Health Strategy is to rebalance healthcare delivery with a greater emphasis on primary and community care and an expansion of the role played by the private sector.
### 3 Key recommendations of the guideline

The key recommendations of this guideline are:

**Organisation of care in Qatar:**
- Dedicated asthma clinics should be considered in primary health care in Qatar [R-GDG].
- Spirometry should be made available to all primary care clinics and all outpatient clinics where asthmatic patients are managed [R-GDG].

**Investigations:**
- Spirometry is the preferred initial test to assess for the presence and severity of airflow obstruction in all patients with a high or intermediate probability of asthma [3,4,10,11][L1, RGA1].
- Peak Expiratory Flow Measurement should only be used if spirometry is unavailable [3,4,11][L2, RGA2].

**Occupational asthma:**
- Consider occupational asthma in all working-age people who experience symptoms of airflow limitation [3,16][L2, RGA1].
- Do not make a diagnosis on the basis of a compatible history alone, due to implications for future employment [R-GDG].
- Refer to a specialist in occupational lung diseases if uncertain about the diagnosis [R-GDG].

**Acute asthma:**
- Except for mild to moderate exacerbations of asthma, early referral to an Emergency Department is strongly recommended as asthma is a preventable cause of death [R-GDG].
- A patient who has had any feature of a life-threatening or near-fatal asthma attack at any time, or any feature of a severe asthma attack persisting after initial treatment, should be admitted to hospital, rather than discharged [3][L2, RGA2]
- Patients should ideally be managed on an outpatient basis or in an observation care setting. However if inpatient admission is indicated, the optimal length of stay for admission is 1 day [26][L3].

**Chronic asthma:**
- Asthma is best monitored in primary care by routine clinical review on at least an annual basis [3][L3, RGA2].
- Offer all patients self-management education including a written personalised asthma action plan [3,4,8][L1, RGA1].
- Theophyllines should be used with caution in patients with co-existing cardiac disease [R-GDG].
- Treatment with immunotherapy, omalizumab or bronchial thermoplasty should only be initiated in specialist centres with special expertise in the evaluation and management of patients with severe and difficult asthma [R-GDG].
4 Background information

4.1 Definition
Asthma is defined as a chronic and recurrent, completely or partially reversible airway obstruction; associated with airway inflammation and increased responsiveness of the airways, to a variety of stimuli; in the absence of an alternative explanation [1-5].

An ‘asthma attack’, also known as an ‘acute exacerbation of asthma’ is a term used to describe a rapid onset of worsening asthma symptoms [1-5].

4.2 Aetiology
Asthma comprises a range of heterogeneous phenotypes that differ in presentation, aetiology and pathophysiology. The fundamental causes of asthma however are not completely understood. The risk factors for each recognized phenotype of asthma include genetic, environmental and host factors. Although a family history of asthma is common, it is neither sufficient nor necessary for the development of asthma [6].

The substantial increases in the incidence of asthma over the past few decades and the geographic variation in both base prevalence rates and the magnitude of the increases support the thesis that environmental changes play a large role in the current asthma epidemic. Furthermore, environmental triggers may affect asthma differently at different times of a person’s life, and the relevant risk factors may change over time [6].

4.3 Prognosis
Although complete remission is possible in adult asthma, remission rates are low and limited to milder cases. Permanent lung function impairment develops in some asthmatic patients, and this risk is increased in smokers [1,2,5].

Longitudinal studies indicate that severe asthma has a poorer prognosis with regard to both development of permanent lung function impairment and hospitalization and mortality. In particular, patients with previous admissions to intensive care units and those with brittle asthma continue to be at high risk of severe asthma complications. Overall, the risk of death in asthmatic subjects is increased to approximately twice that in other subjects due to an increased risk of death from lung diseases [6].

4.4 Complications
Complications of asthma in adults include [1-8]:

- Death – asthma is a common cause of death around the world.
- Respiratory complications:
  - Status asthmaticus – acute exacerbation of asthma which remains unresponsive to initial treatment with nebulised bronchodilators.
  - Respiratory failure.
  - Collapsed lobe or lung.
  - Pneumothorax.
  - Pneumonia.
  - Pneumomediastinum.

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• Impaired quality of life may result from suboptimal control of asthma – this may include:
  ○ Impaired sleep.
  ○ Fatigue, resulting in:
    ▪ Interference with usual activities.
    ▪ Poor performance at work and increased absenteeism.
  ○ Psychological problems, including stress, anxiety, and depression.

4.5 Risk factors for development of asthma
Risk factors for developing asthma, include [3,5,6]:
• Family history of atopic disease, e.g.:
  ○ Asthma.
  ○ Eczema.
  ○ Allergic rhinitis.
  ○ Allergic conjunctivitis.
• Co-existence of atopic disease in the patient:
  ○ Eczema.
  ○ Allergic rhinitis.
  ○ Allergic conjunctivitis.
  ○ Food allergy.
• Female sex for persistence of asthma from childhood to adulthood.
• Bronchiolitis in infancy.
• Passive smoking.
5 Presentation

Asthma in adults typically causes recurrent respiratory symptoms of [1-4]:
- Wheeze.
- Cough.
- Difficulty breathing.
- Chest tightness.

The two main presentations of asthma in adults are:
- Acute asthma attack (an acute exacerbation of asthma).
- Chronic asthma.

5.1 Presentation of acute asthma
An acute asthma attack is characterised by [1,3-5]:
- Sudden onset of shortness of breath and wheeze.
- Increased respiratory effort and decreased exercise tolerance.

Factors that increase the risk of developing near-fatal or fatal asthma [1,3,4,5]:
- Previous near-fatal asthma e.g. previous ventilation or respiratory acidosis.
- Previous admission for asthma especially if within the last year.
- Requirement for three or more classes of asthma medication.
- Heavy use of beta₂ agonists.
- Repeated attendances at Emergency Department for asthma care especially if in the last year.
- Non-compliance with treatment or monitoring.
- Failure to attend appointments.
- Self-discharge from hospital.
- Psychosis, depression, other psychiatric illnesses or deliberate self-harm.
- Current or recent major tranquiliser use.
- Alcohol or substance misuse.
- Learning difficulties.
- Employment or income problems.
- Social isolation.
- Severe domestic, marital or legal stress.

5.2 Presentation of chronic asthma
Typical patterns [3,4]:
- Intermittent attacks superimposed on a baseline of good control.
- Chronic symptoms punctuated by intermittent worsening.
- Morning 'dipping', characterised by:
  - Worsening of symptoms and decreased peak flow in the early morning.
  - Improvement as the day progresses.
- Prominent nocturnal cough.
6 History

History taking should be directed to establishing the probability of a diagnosis of asthma and classification of the severity of asthma, according to the pattern of episodic symptoms that the patient reports.

Important points in the history to elicit include [1-3,5-9]:

- Ask about symptoms that are episodic, variable, and typically worse at night, including:
  - Wheeze.
  - Shortness of breath.
  - Chest tightness.
  - Cough.
  - Symptoms that worsen after exposure to recognised triggers, including:
    - Pollen.
    - Dust (house dust mite).
    - Animal allergen.
    - Exercise.
    - Viral infections.
    - Chemicals.
    - Environmental and household tobacco smoke and mould.
  - Recent medication initiation or change, including:
    - Aspirin.
    - Non-steroidal anti-inflammatory drugs (NSAIDs).
    - Beta blocker tablets.
    - Eye drops, e.g. beta blocker, prostaglandins.
- Seasonal or diurnal variation.
- Severity of illness and control.
- Exercise limitation.
- Sleep disturbance and sleeping conditions.
- Establish whether there is a personal and/or family history of asthma or other atopic conditions, e.g. eczema, allergic rhinitis.

- Occupation:
  - Elicit information about:
    - Materials with which they work.
    - Whether their symptoms improve regularly when away from work.
  - 1 in 6 cases of new or recurrent asthma is attributable to occupation.

- Pets.
- Carpeting.
- Housing conditions.
7 Examination

Examination in a patient presenting with acute asthma should be directed towards establishing the severity of the exacerbation, according to the degree of respiratory distress that is evident and excluding other possible causes of acute respiratory distress [3,4,8].

In all patients the following points in the examination should be reviewed [3,4,8]:
- Presence of cyanosis.
- Consciousness level.
- Respiratory rate, degree of breathlessness.
- Accessory muscle usage.
- Pulse rate.
- Presence of wheeze:
  - Inspiratory or expiratory wheeze.
  - A 'silent chest' may be indicative of a life threatening exacerbation.

Examination of a patient presenting with chronic asthma, should focus on [1-4,8,9]:
- Establishing the presence of the classical end expiratory wheeze. If the patient is asymptomatic at the time of the presentation, then the examination maybe unremarkable.
- Signs of atopic disease e.g. eczema, allergic rhinitis, allergic conjunctivitis.
- Signs of comorbid conditions e.g. gastro-oesophageal reflux, obesity, chronic rhinosinusitis.
- Signs of poorly-controlled chronic disease.
- Exclusion of other differential diagnoses.

8 Investigations

Spirometry [3,4,10,11]:
- Is the preferred initial test to assess for the presence and severity of airflow obstruction [3,4,10,11][L1, RGA1] as it is more adept at identifying airway obstruction than peak expiratory flow (PEF), and the results are less dependent on effort [3].
- Should be made available to all primary care clinics and all outpatient clinics where asthmatic patients are managed [R-GDG].
- Reversibility testing: An increase in FEV₁ of ≥12% from baseline and an absolute increase of 200ml, following inhaled bronchodilator or corticosteroids suggests asthma [4][L1].

Peak Expiratory Flow measurement (PEF):
- Use PEF only if spirometry is unavailable [3,4,11][L2, RGA2].

Fractional exhaled nitric oxide (FE\textsubscript{NO}) testing [3,4,10,12]:
- A non-invasive marker of airway inflammation in asthma.
- Indicative of eosinophilic asthma and is raised in eosinophilic airway inflammation.
- Recommended as an option for asthma-specialised physicians to help diagnose asthma in adults who are considered to have an intermediate probability of having asthma, in combination with other diagnostic options.
- Further investigation is recommended if FE\textsubscript{NO} test result is negative, as a negative result does not exclude asthma [3,4,11][L2, RGA2].

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Broncho-provocation testing (e.g. methacholine challenge testing) [3,4,9,12][L1]:
- Used to assist in the diagnosis of asthma.
- A negative test effectively excludes asthma.

Other investigations, may include [1,3,4,10,11]:
- Full lung function tests.
- Tests of atopy.
- Chest radiograph - consider performing, if the patient presents with severe or life-threatening asthma or atypically with additional symptoms or signs.
- Arterial blood gas - in a hospital setting.

9 Differential diagnosis of chronic asthma

Differential diagnosis of asthma includes [1,3-5]:
- Absence of airflow obstruction:
  - Upper airway cough syndrome (post-nasal drip).
  - Gastro-oesophageal reflux.
  - Rhinitis.
  - Post viral bronchial hyper-reactivity.
  - Heart failure.
  - Hyperventilation and dysfunctional breathing syndromes.
  - Vocal cord dysfunction.
  - Pulmonary fibrosis.
  - Chronic cough syndrome.

- Presence of airflow obstruction [3,4,10,11]:
  - Acute bronchitis.
  - COPD.
  - Bronchiectasis – may also be associated with non-obstructive spirometry.
  - Inhaled foreign body.
  - Lung cancer – may also be associated with non-obstructive spirometry.
  - Sarcoidosis – may also be associated with non-obstructive spirometry.
  - Obliterative bronchiolitis.

Rarer differential diagnoses which may cause a failure to respond include [1-4,10,11]:
- Aspiration.
- Interstitial lung disease.
- Pulmonary embolism.
- Churg-Strauss syndrome.
- Tracheal bronchomalacia.

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Management – acute asthma

A presentation of an acute attack may be classified according to the degree of respiratory distress that is observed [3,4]. Except for mild to moderate exacerbations, early referral to an Emergency Department is strongly recommended as asthma is a preventable cause of death [R-GDG].

Management of acute asthma in the community

The main classifications of an acute exacerbation of asthma and their initial management, are outlined in the table below. If a patient has signs and symptoms across categories, always treat according to their most severe features [3].

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Life threatening</th>
<th>Severe</th>
<th>Mild to moderate</th>
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<tbody>
<tr>
<td>• Silent chest, cyanosis or poor respiratory effort.</td>
<td>• Unable to complete sentences.</td>
<td>• No features of acute severe asthma.</td>
<td>• Speech normal.</td>
</tr>
<tr>
<td>• Exhaustion, altered consciousness.</td>
<td></td>
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<tr>
<td>• Patient may not be distressed.</td>
<td>• Respiratory rate ≥25 breaths per min.</td>
<td>• Respiration &lt;25 breaths per min.</td>
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<tr>
<td>• Arrhythmia or hypotension.</td>
<td>• Pulse ≥110 bpm.</td>
<td>• Pulse &lt;110 bpm.</td>
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<tr>
<td>• SpO₂ &lt;92% on oxygen.</td>
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<tr>
<td>• PaO₂ &lt;8 kPa (60 mmHg)</td>
<td>• SpO₂ ≥92% on oxygen.</td>
<td>• SpO₂ ≥92% on air.</td>
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<tr>
<td>• Normal PaCO₂ (4.6-6.0 kPa, 35-45 mmHg).</td>
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<td>• PEF &lt;33% of best or predicted.</td>
<td>• PEF 33-50% of best or predicted.</td>
<td>• PEF &gt;50-75% best or predicted.</td>
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<tr>
<td>If available, provide the patient with oxygen to maintain SpO₂ level of 94-98%.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Use nebulised salbutamol 5mg and ipratropium bromide 500mcg.</td>
<td>• Use nebulised salbutamol 5mg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Administer nebuliser by piped oxygen (Flow rate &gt;6L/min) or;</td>
<td>• Administer nebuliser by piped oxygen (Flow rate &gt;6L/min) or;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Air-driven nebuliser with supplemental oxygen.</td>
<td>• Air-driven nebuliser with supplemental oxygen.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Give IV hydrocortisone 100mg; or</td>
<td>• Give oral prednisolone 40mg-50mg; or</td>
<td>• Give oral prednisolone 40mg-50mg, if more than one nebuliser required.</td>
<td></td>
</tr>
<tr>
<td>• IV methylprednisolone 60-120mg.</td>
<td>• IV hydrocortisone 100mg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Measure and record PEF every 15 mins.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• If no response, refer to hospital.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If good response, observe to ensure complete recovery or transfer to hospital.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer to hospital immediately</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• If good response to initial management:</td>
<td>• Continue or step-up treatment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Continue prednisolone for 5-7 days.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10.1: Assessment and initial management of acute asthma in the community [3].

Diagnosis and management of asthma in adults
(Date of next revision: December 2018)
Management of acute asthma in the Emergency Department

The management of acute asthma in the Emergency Department setting is outlined in the table below.

<table>
<thead>
<tr>
<th>Life threatening</th>
<th>Severe</th>
<th>Mild to moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consider ventilation.</td>
<td>• Consider ventilation if life threatening features develop.</td>
<td>• Monitor for deterioration.</td>
</tr>
<tr>
<td>• Discuss with ICU early.</td>
<td>• Prescribe oxygen to maintain SpO2 level of 94-98%.</td>
<td>• Oxygen not usually required</td>
</tr>
<tr>
<td>• Maintain SpO2 level at 88-92% in those at risk of hypercapnic respiratory failure.</td>
<td>• Use nebulised salbutamol 5mg and ipratropium bromide 500mcg.</td>
<td>• Salbutamol pMDI via spacer.</td>
</tr>
<tr>
<td>• Administer nebuliser by piped oxygen (Flow rate &gt;6L/min) or; Air-driven nebuliser with supplemental oxygen.</td>
<td>• Give IV hydrocortisone 100mg; or IV methylprednisolone 60-120mg.</td>
<td>• 4 puffs initially followed by 2 puffs every 2 mins, up to maximum of 10 puffs.</td>
</tr>
<tr>
<td>• Give oral prednisolone 40mg-50mg; or IV hydrocortisone 100mg.</td>
<td>• Measure blood gases.</td>
<td>• Reassess patient after 15mins and record:</td>
</tr>
<tr>
<td>• Obtain chest radiograph.</td>
<td>• Consider serum potassium and glucose levels.</td>
<td>o PEF.</td>
</tr>
<tr>
<td>• Consider serum potassium and glucose levels.</td>
<td>• Repeat nebulised salbutamol 5mg if PEF remains &lt;75% of predicted or best.</td>
<td>o Symptoms and response to treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o Heart rate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o Respiratory rate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o SpO2.</td>
</tr>
<tr>
<td>Further management</td>
<td></td>
<td>Consider adding nebulised ipratropium bromide 500mcg, if poor initial response.</td>
</tr>
<tr>
<td>• Repeat nebulised salbutamol 5mg and ipratropium bromide 500mcg every 15mins.</td>
<td>• Correct electrolyte disturbances.</td>
<td>• Consider discharge if PEF &gt;75% of predicted or best; and patient is stable after 60mins of observation.</td>
</tr>
<tr>
<td>• If no response consider continuous nebulised salbutamol 5-10mg/hr (only if appropriate nebuliser is available).</td>
<td>• Repeat arterial blood gas.</td>
<td>• Continue salbutamol with corticosteroid nebulisers if PEF 50-75% of predicted or best.</td>
</tr>
<tr>
<td>• Consider magnesium sulphate 1.2-2g; IV over 20 minutes</td>
<td>• Admit patient to ward or ICU.</td>
<td>• Consider discharge if PEF &gt;75% of predicted or best; and patient is stable after 60mins of observation.</td>
</tr>
<tr>
<td>• Only give after consultation with senior medical staff.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10.2: Management of acute asthma in the Emergency Department [3,4].

Diagnosis and management of asthma in adults
(Date of next revision: December 2018)
10.3  Further specialist management of acute asthma
Consider further treatment options if poor response to treatment. Consider the following and discuss with a senior physician [3,4,8,14]:
- Continuous salbutamol nebuliser.
- IV magnesium sulphate.
- IV aminophylline.
- IV beta₂ agonist.
- Intermittent positive pressure ventilation (IPPV).

NB: Nebulised magnesium is not recommended for the treatment of acute asthma [3].
NB: Antibiotics are not routinely indicated [3].

10.4  Criteria for discharge
Consider discharging the patient from the Emergency Department if there has been a good response to treatment and the patient is stable after at least 60mins of observation (see Table 10.2).

Also consider the following [3,4,15][L1, RGA1]:
- Consider an extended observation period prior to discharge in all patients who received nebulised beta₂ agonists prior to presentation (see Section 12.1 and 12.2)
- Provide oral prednisolone daily for at least 5 days or until recovery.
- In all patients ensure treatment supply of inhaled corticosteroid and beta₂ agonist.
- Check inhaler technique.
- Arrange primary care physician follow-up within 2 days of discharge.
- Send a fax or electronic discharge letter to the primary care physician within 24 hours of discharge from the Emergency Department.

NB: A patient who has had any feature of a life-threatening or near-fatal asthma attack at any time, or any feature of a severe asthma attack persisting after initial treatment, should be admitted to hospital, rather than discharged [3][L2, RGA2][see Section 12.2].

10.5  Follow-up of acute asthma in primary care
Follow-up patients in primary care within 2 days of an acute asthma attack requiring treatment in the community, Emergency Department or hospital setting [2,3][L2, RGA2].

Follow-up in primary care will include the following [3][see also Section 11.6]:
- Monitor symptoms and PEF.
- Check inhaler technique.
- Review medication according to chronic asthma guidance (see Section 11).
- Address any trigger factors and potentially preventable contributors.
- Give asthma education.
- Discuss a clear plan for what to do if symptoms worsen.
- Provide or review written asthma action plan.
11 Management – chronic asthma

A diagnosis of chronic asthma is primarily clinical and based upon the history and examination findings. An assessment of the probability of an asthma diagnosis should be made in order to determine appropriate next steps in the patient’s management [3,4,8,10].

11.1 Assessing the probability of an asthma diagnosis
Assessment of the probability of asthma, is based on the findings of both history and examination.

Clinical features that increase the probability of asthma [3,4]:
- More than one of the following symptoms:
  - Wheeze.
  - Cough.
  - Breathlessness.
  - Chest tightness.
- Particularly if the symptoms above:
  - Are worse at night and in the early morning.
  - Occur in response to, or are worse after:
    - Exercise.
    - Allergen exposure.
    - Cold air.
  - Occur after taking aspirin or beta blockers.
- Personal history of atopic disorder.
- Family history of atopic disorder and/or asthma.
- Widespread wheeze audible on auscultation.
- Otherwise unexplained low FEV\textsubscript{1} or PEF on historical or serial readings.
- Otherwise unexplained peripheral blood eosinophilia.

Clinical features that lower the probability of asthma [3,4]:
- Prominent dizziness, light-headedness, peripheral tingling.
- Chronic productive cough in the absence of wheeze or breathlessness.
- Repeatedly normal physical examination of chest when symptomatic.
- Voice disturbance.
- Symptoms with colds only.
- Significant smoking history, i.e. more than 20 pack-years.
- Cardiac disease.
- Normal PEF or spirometry when symptomatic:
  - Normal spirometry when not symptomatic does not exclude the diagnosis of asthma.
  - Repeated measurements of lung function are often more informative than a single assessment.
11.1.1 High probability of asthma:
A diagnosis of asthma can be made on the basis of clinical history and examination where typical symptoms and signs are present and a trial of treatment can then begin. However due to the significance of the diagnosis and the potential for ongoing treatment over many years, objective confirmation of the diagnosis is recommended [3,4].

Spirometry testing is regarded as a superior test to PEF for confirmation of a suspected diagnosis of asthma as it provides clearer evidence of obstructive lung disease and results are less dependent upon effort [3,4,10] (see Section 8).

Perform spirometry in all patients with a high probability of asthma [4].
- Use reversibility testing in patients with symptoms at the time of assessment (see Section 8).
- If there are no symptoms at the time of assessment, (or if there is an incomplete response to reversibility testing), assess with spirometry after 6-8 weeks of inhaled corticosteroids or after 14 days of oral prednisolone treatment [R-GDG].
- If there is no objective evidence of obstruction when the patient is symptomatic, reconsider the diagnosis [3,4,10].

Consider starting a trial of treatment [3,4][L2, RGA2]:
- The choice of treatment [3,4]:
  - Depends on frequency and severity of symptoms.
  - Use either inhaled bronchodilators or corticosteroids.

Consider additional tests to establish the diagnosis if spirometry or a trial of treatment are inconclusive. These may include [3,4,10-13]:
- Other tests of airflow obstruction.
- Tests of airway responsiveness.
- Tests of airway inflammation.

11.1.2 Intermediate probability of asthma:
In patients with an intermediate probability of asthma, spirometry should be performed. Further investigation then depends on whether airflow obstruction is present [3,4][L2, RGA2](see Section 8).

11.1.2.1 FEV1/FVC less than 0.8 with intermediate probability of asthma
Undertake further investigation [3,4,10-13]:
- Offer a reversibility test and/or a trial of treatment for a specified period.

If there is a positive reversibility test or an adequate response to a trial of treatment [3,4][L2, RGA2]:
- Treat as asthma.
- For small improvements in FEV1 reversibility tests, consider:
  - Continuation of treatment – should be based on objective assessment of symptoms using validated tools.
  - Trials of treatment withdrawal may be helpful if diagnosis is in doubt.
If there is a negative reversibility test or no response to trial of treatment [3,4][L2, RGA2]:
- Assess adherence and inhaler technique.
- Consider tests for alternative conditions (see Section 8).
- Consider referral for further investigations e.g. tests of airway hyper-responsiveness and/or airway inflammation (see Section 8).

11.1.2.2 FEV1/FVC greater than 0.8 with intermediate probability of asthma
Arrange further investigations or consider referral to a specialist for further assessment [3,4,12][L1, RGA2]:
- Assessment of airway responsiveness and/or airway inflammation have high sensitivity, so a normal result indicates that the diagnosis is highly unlikely to be asthma [12].

11.1.3 Low probability of asthma:
- If symptoms are thought to be due to an alternative diagnosis, investigate and manage accordingly [3,4].
- If there is no response to treatment of alternative conditions consider referral to a specialist for further assessment of the patient [3,4].

11.2 Consider occupational asthma
Consider occupational asthma in all working-age people who experience symptoms of airflow limitation [3,16][L2, RGA1]:
- Ask the following screening questions and if positive, investigate for occupational asthma [3]:
  o Are you better on days away from work?
  o Are you better on holiday?

Diagnosis of occupational asthma is an iterative process, therefore investigate with minimal delay [3,16]:
- Arrange for the patient to perform serial PEF measurements at least 4 times/day, at and away from work.
- Where a suspected agent is a known sensitising agent, measure specific IgE levels [3,16]:
  o Use skin prick testing or tests for specific IgE for occupational asthma caused by high-molecular agents, but don’t use if cause by low-molecular weight agents.
  o If there is doubt, discuss with a specialist in occupational lung disease or allergist.
  o NB: Do not make a diagnosis on the basis of a compatible history alone, due to implications for future employment [R-GDG].
  o Refer to a specialist in occupational lung diseases if uncertain about the diagnosis [R-GDG].

- If occupational asthma has been diagnosed [3,16]:
  o Advise the person to avoid further exposure to the causative agent.
  o Advise the person that it is important to inform their employer, who can take appropriate protective measures.
  o Seek written informed consent to communicate with the employer and/or their occupational health provider about the diagnosis and protective measures.
11.3 Consider exercise-induced asthma:
For most patients, exercise induced asthma is an expression of poorly controlled asthma and regular treatment including inhaled corticosteroids should be considered [3,4,8].

Immediately prior to exercise, inhaled short-acting beta-2-agonists are the drug of choice [3,4,8]. Treatment with relievers such as short-acting beta2-agonists (SABAs) or anticholinergics, administered 10-15 minutes before exercise is the most preferable method of preventing exercise-induced bronchoconstriction.

If exercise is a specific problem in patients taking inhaled corticosteroids who are otherwise well controlled, consider the following therapies [3][L2, RGA2]:
- Leukotriene receptor antagonists.
- Long-acting beta2-agonists (LABAs).
- Theophylline, may be used under the direction of an asthma-specialised physician [R-GDG].

11.4 Principles of treatment
Principles of treatment of chronic asthma [1-4,7,8]:
- Optimisation of lung function.
- Relief of chronic symptoms with minimal medication.
- Prevention or decrease of asthma attacks.
- Minimisation of sleep disruption.
- Normalisation of everyday activities.
- Minimisation of medication side effects.
- Regular exercise unlimited by disease.
- Education and involvement of family in the management of asthma.

11.5 Monitoring asthmatic patients
Monitoring [3,4]:
- Asthma is best monitored in primary care by routine clinical review on at least an annual basis [3][L3, RGA2].
- Dedicated asthma clinics should be considered in primary health care in Qatar [R-GDG].
- Consider closer monitoring of individuals with poor lung function and a history of asthma attacks in the previous year [3-5].
- Monitor and record [3,4]:
  - Symptomatic asthma control – consider using one of the following:
    - GINA Asthma level of control criteria.
    - Asthma Control Questionnaire (ACQ).
    - Asthma Control Test (ACT).
  - Lung function assessed by spirometry or PEF at diagnosis, 3-6 months later and then every 3-12 months according to level of control.
  - Frequency of asthma attacks, oral corticosteroid use, and time off work since last assessment.
  - Inhaler technique (should be checked at least annually).
  - Adherence to treatment.
  - Bronchodilator reliance.
  - Self-management plans – review at least annually.
11.6 The asthma review
At each consultation, and before starting a new drug therapy, review the following [3,4,8,14,15]:
- Asthma education – including a written asthma action plan.
- Asthma control, treatment and goals.
- Compliance and inhaler technique.
- Trigger factors.
- Lifestyle advice.
- Vaccination status.

11.6.1 Asthma education
Provide information on [3,4,8,14]:
- Basic facts about asthma.
- Roles of asthma medication i.e. ‘reliever’ versus ‘preventer’.
- Inhaler technique.
- Written asthma action plan [3,4,8]:
  - Offer all patients self-management education including a written personalised asthma action plan [3,4,8][L1, RGA1].
  - The action plan:
    - May be based on symptoms and/or peak flow.
    - Should be regularly reviewed and adherence to the plan, checked.
  - Consider changing the action plan if [3,4,8]:
    - Life goals change.
    - Diagnosis or prognosis change.
    - Health status changes.
    - Social support changes.
    - Medical evidence changes.
    - Environmental control measures.
    - Emphasise need for regular follow-up visits.

11.6.2 Asthma control, and agree treatment goals
Assess control after initiating different therapies [3,4]:
- Review symptoms against GINA asthma control criteria.
- Consider using the Asthma Control Questionnaire (ACQ) or Asthma Control Test (ACT).
- Ask for a history of asthma attack or hospital admission.
- Use an objective measure of lung function to assess control, e.g. Spirometry or PEF.
- Check frequency of reliever medication use.

Good control:
Control is ideal when patients [3,4]:
- Have no daytime symptoms.
- Have no asthma attacks.
- Are not requiring rescue medications.
- Are not waking at night.
- Have no limitations on activity, including exercise.
- Have normal lung function – FEV₁ and/or PEF greater than 80% of predicted or best.
- Minimal side effects from medication.
**Step-down therapy:**
Once asthma is controlled, stepping down therapy is recommended [3,4,8].

Step-down therapy [3,4,8]:
- Consider reduction in doses after a period of stability judged by symptoms and objective measurement of lung function.
- Review regularly when stepping down.
- When deciding which medication to step down first and at what rate, take into account:
  - Severity of asthma.
  - Treatment side effects.
  - Time on the current dose.
  - The achieved beneficial effect.
  - Patient preference.
- Maintain patients at the lowest possible dose of inhaled corticosteroid [17]:
  - Any reduction should be slow.
  - Consider 25-50% reductions in inhaled corticosteroids therapy every 3 months.
- Consider stopping Inhaled Long-acting beta-agonists (LABA) as soon as asthma control is achieved for at least 3 months [3,18].
- LABAs should not be used without concurrent inhaled corticosteroids [3,4,8,18].

**11.6.3 Compliance and inhaler technique**
Compliance and inhaler technique [3,4,8]:
- Check compliance by:
  - Direct questioning.
  - Reviewing prescription refill frequency.
- For people who are able, encourage patient-directed treatment adjustment based on the asthma plan.
- Observe inhaler technique before issuing the first prescription for an inhaler and at each visit document PEF measurement.

**Choice of inhaler device:**
On selection of an inhaler device, it is important that consideration is given to other aspects of asthma care that influence the effective delivery of inhaled therapy, including [3,4]:
- Individual practical training in the use of the specific device.
- Monitoring of effective inhaler technique and adherence to therapy.
- Regular review (i.e. no less than annual) of inhaler needs, which may change over time with increasing age.
- Consider review by asthma educator, if available [R-GDG].
- Using mixed inhaler types may cause confusion or increased errors in use so using the same type of device may improve outcomes.
- If the patient is unable to use the device, an alternative should be found.

**Spacers [3]:**
- Administer the drug by repeated single actuations of the pMDI, each followed by inhalation.
- There should be minimal delay between actuation and inhalation.
- Tidal breathing is as effective as single breaths.
• Clean spacer monthly – wash in detergent and allow to dry in air. Wipe the mouthpiece clean of detergent before use.
• Replace plastic spacers at least every 12 months – some may require changing every 6 months.

11.6.4 Trigger factors including smoking and occupation
Consider and ask about exposure to triggers (see Section 6).

11.6.5 Lifestyle advice
Offer the following advice [1-4,19]:
• Encourage smoking cessation in people who smoke.
• Encourage all people with asthma to exercise regularly.
• Air ionisers are not recommended.

11.6.6 Consider vaccination status
Consider vaccination status:
• Influenza vaccine is recommended on an annual basis to all patients diagnosed with asthma.
• Pneumococcal vaccination is recommended in immunocompetent adult patients diagnosed with asthma, unless contraindicated, as follows [20]:
  o Adults aged 19 to 64 years with asthma administer 13-valent pneumococcal conjugate vaccine (PCV13).
  o At age ≥65 years, administer PCV13 at least 1 year after 23-valent pneumococcal polysaccharide vaccine (PPSV23), followed by another dose of PPSV23 at least 1 year after PCV13 and at least 5 years after the last dose of PPSV23.

11.7 Step-wise pharmacological management:
Start treatment at the most appropriate step according to the initial severity of the patient’s asthma [3,4]. Therapy should be stepped up or down depending on the degree of control of symptoms, until the patient is stable on the minimum medication necessary to control symptoms [3,4].

11.7.1 Step 1 - Mild intermittent asthma
Prescribe an inhaled short-acting beta₂ agonist (SABA) [3,4,8][L1, RGA1]:
• Use as short term reliever therapy for all patients with symptomatic asthma.
• As-required use is at least as good as regular four times daily administration.
• Frequency of follow-up is dependent on the severity of asthma.
• Assess urgently any patients prescribed more than one short acting bronchodilator inhaler per month and take measures to improve asthma control if it is found to be poor.

11.7.2 Step 2 - Regular asthma preventer therapy
Prescribe a regular inhaled corticosteroids at a low dose, in addition to SABA in patients with any of the following [3,4,17][L1, RGA1]:
• Asthma attack in the last 2 years.
• Using inhaled beta₂ agonists 3 times per week or more.
• Symptoms are present 3 times per week or more.
• Waking one night per week or more due to asthma symptoms.

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Prescribing inhaled corticosteroids [3,17]:
- A reasonable starting dose will usually be 400 micrograms beclometasone (or equivalent) per day.
- Note that some products are more potent – all should be prescribed by dose and brand.
- Give inhaled corticosteroids initially twice daily, except ciclesonide which is given once daily.
- Titrate the dose of inhaled corticosteroid to the lowest dose at which effective control of asthma is maintained.

11.7.3 Step 3 - Add-on therapy
Add-on therapy:
- Long-acting beta₂-agonist (LABA) in addition to low-dose inhaled corticosteroid and as-required SABA [3,4,18,21].
  - LABAs have been shown to be more effective than leukotriene receptor antagonists.
  - Should only be considered in patients who are already taking inhaled corticosteroids.
  - Should be considered before increasing inhaled corticosteroid dose above 800 micrograms beclomethasone (or equivalent) per day.
- Salmeterol or formoterol can be used in conjunction with inhaled corticosteroids (dose depends on age, device used and severity of symptoms)

Once benefit of a long acting beta₂ agonist has been demonstrated, prescription in a combination inhaler with inhaled corticosteroid is recommended [3,4,18,21]. Use of long acting beta₂ agonist without inhaled corticosteroid is not advised, and combination inhalers prevent this occurring [3,4,18].

Inadequate control with inhaled LABA
If there is some benefit but asthma control remains suboptimal [3,4,21]:
- Continue inhaled LABA; and
- Increase the dose of inhaled corticosteroids to beclometasone 800 micrograms/day (or equivalent).

If there is no response to LABA [3]:
- Stop the LABA.
- Increase the dose of inhaled corticosteroids to beclometasone 800 micrograms/day (or equivalent.
- If control continues to remain inadequate, consider sequential trials of another add-on therapy such as:
  - Leukotriene receptor antagonist.
  - Theophyllines (to be used with caution in patients with co-existing cardiac disease)[R-GDG].

In selected adults who have poor control of their asthma – use of budesonide/formoterol in a single inhaler as rescue medication (instead of a SABA), in addition to its regular use as controller therapy has been shown to be an effective treatment regimen [3]:
- When this management option is introduced the total regular dose of daily inhaled corticosteroids should not be decreased.
- Patients taking budesonide/formoterol as rescue medication once a day or more, should have their treatment reviewed.

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11.7.4 Step 4 - Persistent poor control
If control remains inadequate on 800 micrograms beclomethasone (or equivalent) daily of an inhaled corticosteroid plus a LABA and as-required SABA, consider the following interventions [3,4,17]:
- Increasing inhaled corticosteroids to 2000 micrograms/day of beclometasone based on severity of disease.
- Leukotriene receptor antagonist.
- Theophyllines (to be used with caution in patients with co-existing cardiac disease)[R-GDG].
- Slow release beta₂-agonist tablets. Use with caution in patients already taking a LABA.

11.7.5 Step 5 – Continuous or frequent use of oral corticosteroids
For the small number of patients not controlled at step 4, use daily corticosteroid tablets in the lowest dose providing adequate control [3,4]. Before preceding to step 5 however, refer patients with inadequately controlled asthma to an asthma-specialised physician [3,4].

Management with oral corticosteroids [3,4,17]:
- Use the lowest dose that will provide adequate control of symptoms.
- Maintain a high dose of inhaled corticosteroid.
- Review history and examination, particularly asking about and looking for indications of steroid-induced adverse effects.
- Prevent and treat steroid-induced adverse effects [17]:
  - Loss of bone mineral density – those people receiving prednisolone for more than 3 months should be prescribed a bisphosphonate:
    - Do not prescribe a bisphosphonate to women who are pregnant or breastfeeding.
    - Consider alternatives in women of childbearing age.
  - Monitor blood pressure and dyslipidaemia.
  - Check for diabetes mellitus.
  - Consider checking for cataracts.

Review treatment [3,4]:
- Stop the trial of oral corticosteroids after 6 weeks, if there is no reduction in corticosteroid use, improvement in symptoms, or lung function during that time.
- Experienced centres may consider a 3 month trial of immunosuppressants (e.g. methotrexate or ciclosporin) if other treatments have proved unsuccessful (and the risks and benefits have been discussed with the patient).
- Phenotype patients and define inflammatory characteristics.
- In patients with allergic bronchopulmonary aspergillosis, consider a four month trial of itraconazole as this may decrease steroid tablet dose and improve control.

11.7.6 Poor response to step 4 or step 5 treatment
Patients who continue to have persistent symptoms and/or frequent asthma attacks despite treatment at step 4 or step 5 should be assessed through a multidisciplinary ‘difficult asthma’ service and should include [3]:
- Confirmation of the diagnosis.
- Identification of the mechanism of persisting symptoms.
- Assessment of adherence to therapy – consider this before escalating treatment.

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• Assessment of co-existent psychological morbidity.
• Assessment for dysfunctional breathing syndrome.
• Allergen testing to moulds.
• Consideration of induced sputum eosinophil count monitoring to guide steroid treatment.

11.7.6.1 Additional therapies for consideration:

Immunotherapy [3]:
• Subcutaneous or sublingual immunotherapy is not routinely recommended for the treatment of asthma, however may be considered in selected patients with proven hypersensitivity to specific allergens.

Biological therapy [3,4,22]:
Consider omalizumab add-on therapy who do not respond to treatment:
• Omalizumab is a monoclonal antibody that binds to IgE, given subcutaneously every 2 or 4 weeks.
• Omalizumab is recommended as an add-on therapy to treat severe persistent confirmed allergic, IgE-mediated, asthma, (with serum IgE levels of 30-700IU/ml) in adults and children aged 6 years and older who need continuous or frequent oral corticosteroid treatment, as defined as 4 or more courses of oral steroids in the previous year [22][L2, RGA1].
• Treatment should only be initiated in specialist centres with special expertise in the evaluation and management of patients with severe and difficult asthma [R-GDG].
• Patients who may benefit the most from omalizumab are those with very severe asthma, such as those who are on maintenance oral corticosteroids, or who have been hospitalised because of asthma in the previous year.
• Use of omalizumab as an add-on to optimised standard therapy is more clinically effective in treating severe persistent allergic asthma than optimised standard therapy alone.
• Patients should be assessed for the effectiveness of omalizumab at 16 weeks – continue only in those who have markedly improved.

Bronchial thermoplasty [3,23]:
Bronchial thermoplasty decreases bronchial smooth muscle mass and has been shown to improve symptoms and quality of life in selected patients with severe asthma [23][L2, RGA2]:
• May be used if there are special arrangements for clinical governance, consent, and audit or research.
• Patient selection and treatment should be by a respiratory team with special expertise in managing severe and difficult asthma [R-GDG].
Fig 11.7: Step-wise management of asthma in adults [3,4].
11.8 Referral for specialist assessment
Consider referral for specialist assessment if [3,4,8][L2, RGA2]:
- The diagnosis is unclear.
- Suspected occupational asthma.
- Unexpected clinical findings e.g.:
  - Persistent non-variable breathlessness.
  - Chronic sputum production.
  - Cyanosis.
  - Finger clubbing.
  - Crackles/crepitations on auscultation.
  - Monophonic wheeze or stridor (indicative of upper airways obstruction).
  - Cardiac disease.
  - Prominent systemic features, e.g. myalgia, fever, weight loss.
- Unexplained restrictive spirometry.
- Shadowing on chest radiograph.
- Marked blood eosinophilia (more than 1x10⁹/L).
- Poor response to asthma treatment:
  - Before proceeding to Step 5 management, refer patients with inadequately controlled asthma to specialist care.
- Severe acute asthma attack.
- New onset asthma symptoms in the elderly.
12 Inpatient management

The management of acute asthma is described in Section 10.

12.1 Observation care criteria
Observation care e.g. in the Emergency department or Medical Assessment Unit, may be appropriate for patient with moderate to severe asthma with any of the following [1,3,4,14,24]:

- Patient has received acute treatment for 1 to 2 hours.
- Significant findings persist - as indicated by any of the following:
  - Respiratory rate greater than 24 breaths per minute.
  - Continued accessory muscle use.
  - Continued retractions.
  - Patient unable to complete full sentences in one breath.
  - PEF less than 50% of predicted or personal best.
  - PEF less than 75% of predicted or personal best with an identified risk factor, i.e.:
    - History of sudden severe asthma exacerbation.
    - History of intubation for asthma.
    - Previous inpatient admission for asthma in past 12 months.
    - Three or more emergency care visits for asthma in previous 12 months.
    - Hospital or emergency care visit for asthma in past month.
    - Use of more than 2 canisters of inhaled SABA per month.
    - Inadequate access to medical care or medications.
    - Lack of transportation to hospital.
    - Home circumstances do not allow for adequate home care.
    - Pregnancy.
    - Comorbidity (e.g., cardiovascular disease, other chronic lung disease).

12.2 Inpatient admission criteria
Admission is indicated for any of the following [1-4,24]:

- Ventilatory support required.
- PEF less than 33% of predicted or personal best before treatment.
- PEF less than 50% of predicted or personal best after treatment.
- Oxygen saturation less than 92%.
- PaO2 less than 8.0 kPa (60mmHg).
- PaCO2 of 5.6 kPa (42 mmHg) or greater.
- Cyanosis.
- Absent or markedly diminished breath sounds (silent chest).
- Cardiac dysrhythmia (e.g. bradycardia).
- Haemodynamic instability.
- Change in mental status.
- Radiographic evidence of complication requiring inpatient treatment (e.g. pneumonia, pneumothorax).
- Respiratory finding that is severe or persistent (e.g. dyspnoea, tachypnoea, accessory muscle use).
- Airflow measurements less than 50% of predicted or personal best that persist (e.g., over 24 hours) or worsen despite treatments.
- Supplemental oxygen, respiratory treatments or monitoring that are performable only in acute inpatient setting.
12.3 ICU admission criteria
Admission to ICU is appropriate for any of the following [3,4,25][L2, RGA1]:
- Impending or actual respiratory arrest.
- Need for mechanical ventilation.
- PEF less than 33% of predicted or personal best.
- PEF or FEV₁ less than 40% of predicted after initial treatment.
- Persistent or worsening hypoxia.
- Acidosis.
- Hypercapnia.
- Severe drowsiness, confusion or coma.
- Requirement for continuous inhaled bronchodilators.

12.4 Goal length of stay
Patients should ideally be managed on an outpatient basis or in an observation care setting. However if inpatient admission is indicated, the optimal length of stay for admission is 1 day [26][L3].

12.5 Extended stay criteria
Extended stay is classified as:
- Minimal stay (a few hours to 1 day)
- Brief (1 to 3 days)
- Moderate (4 to 7 days)
- Prolonged (more than 7 days).

Extended stay, beyond goal length of stay, may be needed for [2,25,27-31][L1]:
- Severe respiratory failure:
  - Anticipate possible mechanical ventilation or non-invasive positive pressure ventilation.
  - Patient requiring mechanical ventilation or non-invasive ventilation for status asthmaticus may require longer duration of therapy before adequate response.
  - Anticipate intense bronchodilator treatment with continuous nebulisation.
  - Expect brief to moderate stay extension.
  - Status asthmaticus:
    - Resist and severe signs and symptoms of asthma despite aggressive conventional treatment, including intubation and mechanical ventilation, may require general anaesthesia.
    - Expect brief to moderate stay extension.
  - Chronic obstructive asthma:
    - Severe attacks may result in slow resolution of admission indicators.
    - Anticipate continued intense bronchodilation treatment and flow monitoring.
    - Expect brief stay extension.
  - Secondary causes and complications:
    - Infectious causes (e.g. pneumonia) and asthma complications (e.g. pneumothorax) may require additional therapy.
    - Expect brief stay extension.
    - Clinically significant exacerbation of comorbidities (e.g. congestive heart failure, atrial fibrillation).
    - Anticipate specific treatment of comorbidity.
    - Expect brief stay extension.

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o Slow resolution:
  o Severe attacks may result in slow resolution of admission indicators.
  o Anticipate continued intense bronchodilation treatment, flow monitoring, and oxygen as needed.
  o Expect brief stay extension.

o Older patient:
  o Patient 65 years or older may require longer acute hospital care.
  o Expect brief stay extension.

12.6 Readmission risk
Risk of readmission is increased by presence of any of the following [1-4,24,32,38][L1]:
- Non-elective hospitalisation in past 6 months.
- 2 or more Emergency Department visits in past 6 months.
- No source of outpatient care other than emergency department (e.g. no primary care provider).
- Severe care transition barriers (e.g. no caregiver).
- Severe or end-stage renal disease (on dialysis or GFR less than 30 mL/min/1.73m² (0.5 mL/sec/1.73m²)).
- AIDS (i.e. not only HIV-positive).
- Metastatic solid tumour (e.g. lung cancer, breast cancer).
- Advanced liver disease (e.g. cirrhosis with portal hypertension, history of variceal bleed).
References

9. Royal College of Physicians (RCP), the Academy of Medical Royal Colleges (AMRC). A clinician’s guide to record standards - Part 2: Standards for the structure and content of medical records and communications when patients are admitted to hospital. London: Digital and Health Information Policy Directorate; 2008.