GINA 2014
INTRODUCTION

- Definition and diagnosis of asthma
- Assessment of asthma
- Treating asthma to control symptoms and minimize risk
- Asthma flare-ups (exacerbations)
- Diagnosis and management of asthma in children
  5 years and younger
- Primary prevention of asthma
GINA Strategy - major revision 2014

- New chapters
  - Management of asthma in children 5 years and younger, previously published separately in 2009
  - Diagnosis of asthma-COPD overlap (ACOS): a joint project of GINA and GOLD
Burden of asthma

- Asthma is one of the most common chronic diseases worldwide with an estimated 300 million affected individuals.
- Prevalence is increasing in many countries, especially in children.
- Asthma is a major cause of school and work absence.
- Health care expenditure on asthma is very high.
Definition of asthma

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation.

It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.
The diagnosis of asthma should be based on:
- A history of characteristic symptom patterns
- Evidence of variable airflow limitation, from bronchodilator reversibility testing or other tests

Document evidence for the diagnosis in the patient’s notes, preferably before starting controller treatment
- It is often more difficult to confirm the diagnosis after treatment has been started

Asthma is usually characterized by airway inflammation and airway hyperresponsiveness, but these are not necessary or sufficient to make the diagnosis of asthma.
Patient with respiratory symptoms
Are the symptoms typical of asthma?

YES

Detailed history/examination for asthma
History/examination supports asthma diagnosis?

NO

Clinical urgency, and other diagnoses unlikely

YES

Perform spirometry/PEF with reversibility test
Results support asthma diagnosis?

NO

Further history and tests for alternative diagnoses
Alternative diagnosis confirmed?

YES

Treat for ASTHMA

NO

Repeat on another occasion or arrange other tests
Confirms asthma diagnosis?

NO

Consider trial of treatment for most likely diagnosis, or refer for further investigations

YES

Empiric treatment with ICS and prn SABA
Review response
Diagnostic testing within 1-3 months

Treat for alternative diagnosis
Diagnosis of asthma – variable airflow limitation

- Confirm presence of airflow limitation
  - Document that FEV$_1$/FVC is reduced (at least once, when FEV$_1$ is low)
  - FEV$_1$/FVC ratio is normally >0.75 – 0.80 in healthy adults, and >0.90 in children

- Confirm variation in lung function is greater than in healthy individuals
  - The greater the variation, or the more times variation is seen, the greater probability that the diagnosis is asthma
  - Excessive bronchodilator reversibility (adults: increase in FEV$_1$ >12% and >200mL; children: increase >12% predicted)
  - Excessive diurnal variability from 1-2 weeks’ twice-daily PEF monitoring (daily amplitude x 100/daily mean, averaged)
  - Significant increase in FEV$_1$ or PEF after 4 weeks of controller treatment

- If initial testing is negative:
  - Repeat when patient is symptomatic, or after withholding bronchodilators
  - Refer for additional tests (especially children ≤5 years, or the elderly)
Typical spirometric tracings

Volume

Flow

FEV\textsubscript{1} (after BD)

Asthma (after BD)

Normal

Asthma

(before BD)

Time (seconds)

Note: Each FEV\textsubscript{1} represents the highest of three reproducible measurements
Assessment of asthma
## A. Symptom control

<table>
<thead>
<tr>
<th>In the past 4 weeks, has the patient had:</th>
<th>Level of asthma symptom control</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Daytime asthma symptoms more than twice a week?</td>
<td>Well-controlled  Partly controlled Uncontrolled</td>
</tr>
<tr>
<td>• Any night waking due to asthma?</td>
<td>Yes ☑  No ☐</td>
</tr>
<tr>
<td>• Reliever needed for symptoms* more than twice a week?</td>
<td>No ☐  Yes ☑</td>
</tr>
<tr>
<td>• Any activity limitation due to asthma?</td>
<td>No ☐  Yes ☑</td>
</tr>
</tbody>
</table>

*Excludes reliever taken before exercise, because many people take this routinely

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This classification is the same as the GINA 2010-12 assessment of ‘current control’, except that lung function now appears only in the assessment of risk factors.
A. Symptom control

**In the past 4 weeks, has the patient had:**

- Daytime asthma symptoms more than twice a week?  
  - Yes  
  - No
- Any night waking due to asthma?  
  - Yes  
  - No
- Reliever needed for symptoms* more than twice a week?  
  - Yes  
  - No
- Any activity limitation due to asthma?  
  - Yes  
  - No

**Level of asthma symptom control**

- **Well-controlled**
- **Partly controlled**
- **Uncontrolled**

  
<table>
<thead>
<tr>
<th>None of these</th>
<th>1-2 of these</th>
<th>3-4 of these</th>
</tr>
</thead>
</table>

B. Risk factors for poor asthma outcomes

- Assess risk factors at diagnosis and periodically
- Measure FEV\(_1\) at start of treatment, after 3–6 months of controller treatment to record the patient’s personal best, then periodically for ongoing risk assessment

**ASSESS PATIENT’S RISKS FOR:**

- Exacerbations
- Fixed airflow limitation
- Medication side-effects
Assessment of risk factors for poor asthma outcomes

**Risk factors for exacerbations include:**
- Ever intubated for asthma
- Uncontrolled asthma symptoms
- Having ≥1 exacerbation in last 12 months
- Low FEV$_1$ (measure lung function at start of treatment, at 3-6 months to assess personal best, and periodically thereafter)
- Incorrect inhaler technique and/or poor adherence
- Smoking
- Obesity, pregnancy, blood eosinophilia

**Risk factors for fixed airflow limitation include:**
- No ICS treatment, smoking, occupational exposure, mucus hypersecretion, blood eosinophilia

**Risk factors for medication side-effects include:**
- Frequent oral steroids, high dose/potent ICS, P450 inhibitors
Treating asthma to control symptoms and minimize risk
The long-term goals of asthma management are

1. **Symptom control**: to achieve good control of symptoms and maintain normal activity levels
2. **Risk reduction**: to minimize future risk of exacerbations, fixed airflow limitation and medication side-effects

Achieving these goals requires a partnership between patient and their health care providers

- Ask the patient about their own goals regarding their asthma
- Good communication strategies are essential
- Consider the health care system, medication availability, cultural and personal preferences and health literacy
The control-based asthma management cycle

Diagnosis
- Symptom control & risk factors (including lung function)
- Inhaler technique & adherence
- Patient preference

Symptoms
- Exacerbations
- Side-effects
- Patient satisfaction
- Lung function

Asthma medications
- Non-pharmacological strategies
- Treat modifiable risk factors

NEW!
Initial controller treatment for adults, adolescents and children 6–11 years

- **Start controller treatment early**
  - For best outcomes, initiate controller treatment as early as possible after making the diagnosis of asthma

- **Indications for regular low-dose ICS - any of:**
  - Asthma symptoms more than twice a month
  - Waking due to asthma more than once a month
  - Any asthma symptoms plus any risk factors for exacerbations
Initial controller treatment for adults, adolescents and children 6–11 years

- Consider starting at a higher step if:
  - Troublesome asthma symptoms on most days
  - Waking from asthma once or more a week, especially if any risk factors for exacerbations

- If initial asthma presentation is with an exacerbation:
  - Give a short course of oral steroids and start regular controller treatment (e.g. high dose ICS or medium dose ICS/LABA, then step down)
Stepwise approach to control asthma symptoms and reduce risk

- Diagnosis
  - Symptom control & risk factors (including lung function)
  - Inhaler technique & adherence
  - Patient preference

- Asthma medications
- Non-pharmacological strategies
- Treat modifiable risk factors

New!

- Prefered controller choice
- Other controller options
- Reliever

**STEP 1**
- Low dose ICS
  - Consider low dose ICS
  - As-needed short-acting beta-agonist (SABA)

**STEP 2**
- Leukotriene receptor antagonists (LTRA)
- Low dose theophylline

**STEP 3**
- Med/high dose ICS
  - Med/high dose ICS + LTRA (or + theophylline)
  - High dose ICS + LTRA (or + theophylline)

**STEP 4**
- Med/high dose LABA
  - Add low dose CCS

**STEP 5**
- Refer for add-on treatment e.g. anti-IgE

**REMEMBER TO…**
- Provide guided self-management education (self-monitoring + written action plan + regular review)
- Treat modifiable risk factors and comorbidities, e.g. smoking, obesity, anxiety
- Advise about non-pharmacological therapies and strategies e.g. physical activity, weight loss, avoidance of sensitizers where appropriate
- Consider stepping up if ... uncontrolled symptoms, exacerbations or risks, but check diagnosis, inhaler technique and adherence first
- Consider stepping down if ... symptoms controlled for 3 months + low risk for exacerbations. Ceasing ICS is not advised.
## Low, medium and high dose inhaled corticosteroids
Adults and adolescents (≥12 years)

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Total daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Beclometasone dipropionate (CFC)</td>
<td>200–500</td>
</tr>
<tr>
<td>Beclometasone dipropionate (HFA)</td>
<td>100–200</td>
</tr>
<tr>
<td>Budesonide (DPI)</td>
<td>200–400</td>
</tr>
<tr>
<td>Ciclesonide (HFA)</td>
<td>80–160</td>
</tr>
<tr>
<td>Fluticasone propionate (DPI or HFA)</td>
<td>100–250</td>
</tr>
<tr>
<td>Mometasone furoate</td>
<td>110–220</td>
</tr>
<tr>
<td>Triamcinolone acetonide</td>
<td>400–1000</td>
</tr>
</tbody>
</table>
Low, medium and high dose inhaled corticosteroids
Children 6–11 years

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Total daily dose (mcg)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Beclometasone dipropionate (CFC)</td>
<td>100–200</td>
</tr>
<tr>
<td>Beclometasone dipropionate (HFA)</td>
<td>50–100</td>
</tr>
<tr>
<td>Budesonide (DPI)</td>
<td>100–200</td>
</tr>
<tr>
<td>Budesonide (nebules)</td>
<td>250–500</td>
</tr>
<tr>
<td>Ciclesonide (HFA)</td>
<td>80</td>
</tr>
<tr>
<td>Fluticasone propionate (DPI)</td>
<td>100–200</td>
</tr>
<tr>
<td>Fluticasone propionate (HFA)</td>
<td>100–200</td>
</tr>
<tr>
<td>Mometasone furoate</td>
<td>110</td>
</tr>
<tr>
<td>Triamcinolone acetonide</td>
<td>400–800</td>
</tr>
</tbody>
</table>
Reviewing response and adjusting treatment

- How often should asthma be reviewed?
  - 1-3 months after treatment started, then every 3-12 months
  - During pregnancy, every 4-6 weeks
  - After an exacerbation, within 1 week
Managing exacerbations in primary care

**PRIMARY CARE**
Patient presents with acute or sub-acute asthma exacerbation

**ASSESS the PATIENT**
Is it asthma?
Risk factors for asthma-related death?
Severity of exacerbation?

**MILD or MODERATE**
Talks in phrases, prefers sitting to lying, not agitated
Respiratory rate increased
Accessory muscles not used
Pulse rate 100–120 bpm
O₂ saturation (on air) 90–95%
PEF >50% predicted or best

**START TREATMENT**
SABA 4–10 puffs by pMDI + spacer, repeat every 20 minutes for 1 hour
Prednisolone: adults 1 mg/kg, max. 50 mg, children 1–2 mg/kg, max. 40 mg
Controlled oxygen (if available): target saturation 93–95% (children: 94–96%)

**CONTINUE TREATMENT** with SABA as needed
ASSESS RESPONSE AT 1 HOUR (or earlier)

**LIFE-THREATENING**
Drowsy, confused or silent chest

**SEVERE**
Talks in words, sits hunched forwards, agitated
Respiratory rate >30/min
Accessory muscles in use
Pulse rate >120 bpm
O₂ saturation (on air) <90%
PEF ≤50% predicted or best

**TRANSFER TO ACUTE CARE FACILITY**
While waiting: give SABA, O₂, systemic corticosteroid

**NEW!**

**ASSESS FOR DISCHARGE**
Symptoms improved, not needing SABA
PEF improving, and >60–80% of personal best or predicted
Oxygen saturation >94% room air
Resources at home adequate

**ARRANGE at DISCHARGE**
Reliever: continue as needed
Controller: start, or step up. Check inhaler technique, adherence
Prednisolone: continue, usually for 5–7 days (3–5 days for children)
Follow up: within 2–7 days

**FOLLOW UP**
Reliever: reduce to as-needed
Controller: continue higher dose for short term (1–2 weeks) or long term (3 months), depending on background to exacerbation
Risk factors: check and correct modifiable risk factors that may have contributed to exacerbation, including inhaler technique and adherence
Action plan: Is it understood? Was it used appropriately? Does it need modification?
Diagnosis and management of asthma in children 5 years and younger
Probability of asthma diagnosis or response to asthma treatment in children ≤5 years

- Symptoms (cough, wheeze, heavy breathing) for <10 days during upper respiratory tract infections
  - 2–3 episodes per year
  - No symptoms between episodes

- Symptoms (cough, wheeze, heavy breathing) for >10 days during upper respiratory tract infections
  - >3 episodes per year, or severe episodes and/or night worsening
  - Between episodes child may have occasional cough, wheeze or heavy breathing
  - Atopy, or family history of asthma
Features suggesting asthma in children ≤5 years

<table>
<thead>
<tr>
<th>Feature</th>
<th>Characteristics suggesting asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>Recurrent or persistent non-productive cough that may be worse at night or accompanied by some wheezing and breathing difficulties. Cough occurring with exercise, laughing, crying or exposure to tobacco smoke in the absence of an apparent respiratory infection</td>
</tr>
<tr>
<td>Wheezing</td>
<td>Recurrent wheezing, including during sleep or with triggers such as activity, laughing, crying or exposure to tobacco smoke or air pollution</td>
</tr>
<tr>
<td>Difficult or heavy breathing or shortness of breath</td>
<td>Occurring with exercise, laughing, or crying</td>
</tr>
<tr>
<td>Reduced activity</td>
<td>Not running, playing or laughing at the same intensity as other children; tires earlier during walks (wants to be carried)</td>
</tr>
<tr>
<td>Past or family history</td>
<td>Other allergic disease (atopic dermatitis or allergic rhinitis) Asthma in first-degree relatives</td>
</tr>
<tr>
<td>Therapeutic trial with low dose ICS and as-needed SABA</td>
<td>Clinical improvement during 2–3 months of controller treatment and worsening when treatment is stopped</td>
</tr>
</tbody>
</table>
Stepwise approach – pharmacotherapy (children ≤5 years)

**STEP 1**
- Daily low dose ICS
- Leukotriene receptor antagonist (LTRA) Intermittent ICS
- As-needed short-acting beta₂-agonist (all children)

**STEP 2**
- Double ‘low dose’ ICS
- Low dose ICS + LTRA
- Inc. ICS frequency

**STEP 3**
- Continue controller & refer for specialist assessment
- Add LTRA

**STEP 4**
- Not well-controlled on double ICS
- First check diagnosis, inhaler skills, adherence, exposures

**CONSIDER THIS STEP FOR CHILDREN WITH:**
- Infrequent viral wheezing and no or few interval symptoms
- Symptom pattern consistent with asthma and asthma symptoms not well-controlled, or ≥3 exacerbations per year
- Symptom pattern not consistent with asthma but wheezing episodes occur frequently, e.g. every 6–8 weeks. Give diagnostic trial for 3 months.

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‘Low dose’ inhaled corticosteroids (mcg/day) for children ≤5 years

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Low daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beclometasone dipropionate (HFA)</td>
<td>100</td>
</tr>
<tr>
<td>Budesonide (pMDI + spacer)</td>
<td>200</td>
</tr>
<tr>
<td>Budesonide (nebulizer)</td>
<td>500</td>
</tr>
<tr>
<td>Fluticasone propionate (HFA)</td>
<td>100</td>
</tr>
<tr>
<td>Ciclesonide</td>
<td>160</td>
</tr>
<tr>
<td>Mometasone furoate</td>
<td>Not studied below age 4 years</td>
</tr>
<tr>
<td>Triamcinolone acetonide</td>
<td>Not studied in this age group</td>
</tr>
</tbody>
</table>
### Initial assessment of acute asthma exacerbations in children ≤5 years

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Mild</th>
<th>Severe*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered consciousness</td>
<td>No</td>
<td>Agitated, confused or drowsy</td>
</tr>
<tr>
<td>Oximetry on presentation (SaO₂)**</td>
<td>&gt;95%</td>
<td>&lt;92%</td>
</tr>
<tr>
<td>Speech†</td>
<td>Sentences</td>
<td>Words</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>&lt;100 beats/min</td>
<td>&gt;200 beats/min (0–3 years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;180 beats/min (4–5 years)</td>
</tr>
<tr>
<td>Central cyanosis</td>
<td>Absent</td>
<td>Likely to be present</td>
</tr>
<tr>
<td>Wheeze intensity</td>
<td>Variable</td>
<td>Chest may be quiet</td>
</tr>
</tbody>
</table>

*Any of these features indicates a severe exacerbation

**Oximetry before treatment with oxygen or bronchodilator

† Take into account the child’s normal developmental capability
# Initial management of asthma exacerbations in children ≤5 years

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Dose and administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplemental oxygen</td>
<td>24% delivered by face mask (usually 1L/min) to maintain oxygen saturation 94-98%</td>
</tr>
<tr>
<td>Inhaled SABA</td>
<td>2–6 puffs of salbutamol by spacer, or 2.5mg by nebulizer, every 20 min for first hour, then reassess severity. If symptoms persist or recur, give an additional 2-3 puffs per hour. Admit to hospital if &gt;10 puffs required in 3-4 hours.</td>
</tr>
<tr>
<td>Systemic corticosteroids</td>
<td>Give initial dose of oral prednisolone (1-2mg/kg up to maximum of 20mg for children &lt;2 years; 30 mg for 2-5 years)</td>
</tr>
</tbody>
</table>

## Additional options in the first hour of treatment

- **Ipratropium bromide**: For moderate/severe exacerbations, give 2 puffs of ipratropium bromide 80mcg (or 250mcg by nebulizer) every 20 minutes for one hour only.
- **Magnesium sulfate**: Consider nebulized isotonic MgSO₄ (150mg) 3 doses in first hour for children ≥2 years with severe exacerbation.
Primary prevention of asthma
Primary prevention of asthma

- The development and persistence of asthma are driven by gene-environment interactions.
- For children, a ‘window of opportunity’ exists *in utero* and in early life, but intervention studies are limited.
- For intervention strategies including allergen avoidance.
Primary prevention of asthma

Current recommendations are

- Avoid exposure to tobacco smoke in pregnancy and early life
- Encourage vaginal delivery
- Advise breast-feeding for its general health benefits
- Where possible, avoid use of paracetamol (acetaminophen) and broad-spectrum antibiotics in the first year of life