

# Guidelines on Management of Adult Asthma: A Consensus Statement of the Malaysian Thoracic Society

Working Party of the Malaysian Thoracic Society, Department of Medicine, Universiti Kebangsaan Malaysia, 50300 Kuala Lumpur

## Introduction

Asthma is a common disease with unacceptably high morbidity and mortality. Many deaths and morbidity have been associated with inadequate treatment, underuse of objective measurement of severity and inadequate supervision<sup>1-3</sup>. Realising the need to improve the management of asthma among doctors in Malaysia, the Malaysian Thoracic Society initiated efforts to produce and publish this consensus statement on the management of asthma. Since consensus on management of asthma in children was initiated at about the same time by the Academy of Medicine of Malaysia, this statement by the Malaysian Thoracic Society only covers management of asthma in adults.

We realise that several asthma management guidelines for example those by the British Thoracic Society<sup>4</sup>, those from Australia and New Zealand<sup>5</sup> and the International consensus<sup>6</sup> are already available. However, local factors such as our health care delivery system, diverse socio-cultural background and level of education which are unique to our country need to be addressed. This prompted us to produce these local guidelines.

We regard the publication of guidelines on asthma management as one of the strategies to improve the overall management of asthma in the country. It should complement other programmes such as lectures, workshops, meetings and periodic publications. We hope these guidelines will serve as a useful reference for doctors although we also appreciate that views may differ in certain aspects of management. In certain circumstances, modification in management may have to be carried out.

Although there is no convincing evidence to date that asthma management guidelines reduce asthma mortality, it is not unreasonable to expect that proper management will result in reduced morbidity and consequently mortality too.

To ensure a spread of opinions the working party was selected among doctors working in government hospitals, academic institutions and private hospital.

## Participants:

A. Professor Dr BMZ Zainudin - Chairman  
Department of Medicine,  
Universiti Kebangsaan Malaysia,  
Kuala Lumpur.

Dr A. M. Aziah  
Institute of Respiratory Medicine,  
Hospital Kuala Lumpur.

Dr L N Hooi  
Chest Unit,  
Penang Hospital.

Dr I. Kuppusamy  
Institute of Respiratory Medicine,  
Hospital Kuala Lumpur.

A. Professor Dr C K Liam  
Department of Medicine,  
Hospital Universiti, Kuala Lumpur.

Dr George Simon  
Chest Unit,  
Hospital Alor Setar.

A. Professor Dr AW Sufarlan  
Department of Medicine,  
Universiti Kebangsaan Malaysia,  
Kuala Lumpur.

Dr W K Wong  
Pantai Medical Centre,  
Kuala Lumpur.

A. Professor Dr Ismail Yaacob  
Department of Medicine,  
Universiti Sains Malaysia,  
Kubang Kerian.

### Concept of Asthma

Asthma is a chronic inflammatory condition of the airways, the cause of which is not completely understood. The inflammation is characterised by oedema, infiltration with inflammatory cells especially eosinophils, hypertrophy of glands and smooth muscle and damaged epithelium. The inflammation results in the state of hyperresponsiveness where airways narrow easily in response to a wide range of stimuli<sup>7</sup>. This may result in coughing, wheezing, chest tightness and shortness of breath, which are often worse at night. These are the symptoms of an 'attack'. The airway narrowing is usually reversible but in some patients with chronic asthma the inflammation may lead to irreversible airways obstruction<sup>8</sup>. In general, the more severe the asthma the more frequent and severe are the attacks. Sometimes an acute attack can be fatal.

### Management of Chronic Asthma

#### Aims of management

The aims of management are :-

1. to recognise asthma
2. to abolish symptoms
3. to restore normal or best possible long term airway function
4. to reduce morbidity and prevent mortality

#### Approach to management

In order to achieve those aims the approach to management should include:

1. Education of patient and family
2. Avoidance of precipitating factors
3. Use of the lowest effective dose of convenient medications minimising short and long term side effects
4. Assessment of severity and response to treatment

#### Education of patient and family

This is an important but often neglected aspect in the management of asthma. It is essential in ensuring the patient's cooperation and compliance with therapy. As far as possible patients and their families should be encouraged and trained to actively participate in the management of their own asthma. Patient education should include the following information:

- i. Nature of asthma
- ii. Preventive measures/avoidance of triggers
- iii. Drugs used and their side-effects
- iv. Proper use of inhaled drugs
- v. Proper use of peak flow meter
- vi. Knowledge of the difference between relieving and preventive medications
- vii. Recognition of features of worsening asthma (increase in bronchodilator requirement, development of nocturnal symptoms, reducing peak flow rates).
- viii. Self management plan for selected, motivated patients or parents. (Appendix 1)
- ix. The danger of non prescribed self medication including certain traditional medicines.

#### Avoidance of precipitating factors

The following factors may precipitate asthmatic attacks:

- i. Beta blockers - contraindicated in all asthmatics
- ii. Aspirin and nonsteroidal anti-inflammatory drugs - if known to precipitate asthma, these drugs should be avoided.
- iii. Allergens e.g. house dust mites, domestic pets, pollen should be avoided whenever possible.
- iv. Occupation - should be considered as a possible precipitating factor
- v. Smoking - active or passive
- vi. Day to day triggers - such as exercise and cold air. It is preferable to adjust treatment if avoidance imposes inappropriate restrictions on lifestyle.
- vii. Atmospheric pollution

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- viii. Food – if known to trigger asthma, should be avoided

### Drug treatment

There are 2 major groups of drugs to treat asthma:

1. Bronchodilator drugs – to relieve bronchospasm and improve symptoms
2. Anti inflammatory drugs – to treat the airway inflammation and bronchial hyperresponsiveness, the underlying cause of asthma, i.e. to prevent attacks.

### 1. Bronchodilators

These drugs treat symptoms of asthma. They should be used as required rather than regularly. When asthma is severe and difficult to control, bronchodilators may be taken on regular basis. There are 3 main groups of bronchodilators:

- i. Beta<sub>2</sub> agonists
- ii. Anticholinergics
- iii. Methylxanthines

#### i. Beta<sub>2</sub> agonists

These drugs are the most effective bronchodilators available. They are safe drugs with few side effects when taken by inhalation. The therapeutic effect is felt within a few minutes of inhalation. The main side effects are tremors and tachycardia. Oral slow release preparations and inhaled long acting beta<sub>2</sub> agonists such as salmeterol/bambuterol are useful for nocturnal asthma.

Examples: *Inhaled beta<sub>2</sub> agonist* :  
salbutamol (Ventolin, Respolin)  
terbutaline (Bricanyl)  
fenoterol (Berotec)  
salmeterol (Serevent) - long acting

*Oral long acting beta<sub>2</sub> agonist* :  
salbutamol (Volmax)  
terbutaline (Bricanyl durules)  
bambuterol (Bambec)

*Oral short acting beta<sub>2</sub> agonist*:  
salbutamol  
terbutaline etc.

#### ii. Anticholinergic drugs

Inhaled anticholinergics have slower onset but longer duration of action. They have very few side effects.

Examples : Ipratropium bromide (Atrovent)

#### iii. Methylxanthines

These drugs are available in oral and parenteral forms. Their usefulness is limited by very variable metabolism and a narrow therapeutic window. Sustained release preparations may be useful in nocturnal asthma<sup>9</sup>.

Examples: Nuelin SR, Theodur, Euphylline

Note: Inhaled beta<sub>2</sub> agonists are the bronchodilator of choice. As far as possible avoid using oral beta<sub>2</sub> agonists or xanthines as first line bronchodilator drugs.

## 2. Anti-inflammatory Drugs

As asthma is a chronic inflammatory condition, anti-inflammatory drugs should be a logical treatment for most patients except for those with mildest asthma. Reducing the inflammation will decrease bronchial hyperresponsiveness. The types of anti-inflammatory drugs include:

### i. Corticosteroids

Steroids are the main prophylactic drugs in adult asthmatics. They should be taken by inhalation and the dosage should be kept to a minimum to reduce side effects (usually local side effects)<sup>10</sup>. Oral steroids may be required for severe chronic asthma.

Examples:

Beclomethasone dipropionate (Becotide, Becloforte, Beclomet, Aldecin, Respocort)  
Budesonide (Pulmicort)

### ii. Sodium cromoglycate (Intal)

This drug is very safe with no significant side effects. It is given by inhalation (powder Spinhaler or metered dose inhaler). It is of greatest benefit in young, atopic patients<sup>11</sup>.

### Other treatments

Anti-histamines including ketotifen have been proven to be of limited efficacy in many clinical trials in

asthma<sup>12-14</sup>. Hyposensitisation is of limited value in the management of asthma<sup>15</sup>.

### Drug delivery

The inhaled route is preferred for beta<sub>2</sub> agonists and steroids as it produces the same benefit with fewer side-effects as compared to the oral route. The pressurised metered dose inhaler (MDI) is suitable for most patients as long as the inhalation technique is correct.

For patients with poor coordination, alternative methods for drug inhalation include: spacer devices, dry powder devices and breath-actuated pressurised MDI<sup>16-21</sup>.

Although oral treatment is convenient for most patients, the dose required is higher and therefore side effects are more common<sup>22-23</sup>.

### Approach to drug therapy - "Stepwise Approach"

Treatment should be carried out in a stepwise manner. Patients should be started on treatment at the step most appropriate for the initial severity of their condition. Treatment would then be changed (stepped-up or stepped-down) according to their progress.

#### Step 1

This treatment is for patients with MILD EPISODIC ASTHMA, characterised by normal or near normal lung function, infrequent symptoms and no nocturnal symptoms (Table I).

A beta<sub>2</sub> agonist by inhalation should be used on an 'as needed' basis. If not well controlled i.e. requiring usage of beta<sub>2</sub> agonist more than once a day, advance to step 2.

#### Step 2

This treatment is for MODERATE ASTHMA characterised by abnormal lung function (PEF 60 - 80% predicted), frequent symptoms requiring beta<sub>2</sub> agonist more than once daily or with night symptoms.

Addition of an inhaled anti-inflammatory agent is required. Low dose inhaled corticosteroids are the drugs of choice (e.g. beclomethasone or budesonide 200 - 800 mcg daily). Twice daily dosing is preferred

to improve compliance. Sodium cromoglycate may also be effective in some patients.

#### Step 3

This step is for SEVERE CHRONIC ASTHMA, i.e. patients with persistent symptoms (especially nocturnal symptoms), a continuing need for inhaled bronchodilators and peak flow of less than 60% predicted or best.

High dose of inhaled steroid should be used (beclomethasone or budesonide 800-2000 mcg daily) whilst inhaled beta<sub>2</sub> agonist should be taken on an 'as required' basis. It may be necessary to add one or more of the following :

1. Regular beta<sub>2</sub> agonists - oral beta<sub>2</sub> agonists (preferably long acting) or inhaled long acting beta<sub>2</sub>-agonist or nebulised beta<sub>2</sub>-agonists.
2. Inhaled ipratropium bromide (Atrovent) 40 mcg 3 - 4 times a day.
3. Sustained release theophylline. Whenever possible blood levels should be monitored.

Alternatively, whenever there are problems with high doses of inhaled steroids, these drugs may be added to step 2 medications.

#### Step 4

This step is for VERY SEVERE ASTHMA characterised by persistent symptoms not controlled by the above measures.

Oral steroids should be added and the dose kept to the lowest possible that achieves control.

#### Step Down

Patients should be reviewed regularly. When the patient's condition has been stable for 3 - 6 months, drug therapy may be stepped down gradually. The monitoring of symptoms and peak flow rate should be continued during drug reduction.

#### Rescue course of steroid tablets

"Rescue" courses of oral steroids may be needed to

**Table I**  
**Disease severity**

Grade	History	Bronchodilator requirement	Variability in PEF	Best PEF (percentage of predicted)
Severe	Wakes at night frequently with wheeze, cough, chest tightness on waking in morning; hospital admission in the last year; previous life-threatening attack	Needed more than four times a day	>30%	<60%
Moderate	Symptoms on most days Nocturnal symptoms > twice a month	Needed on most days	20% - 30%	60% - 80%
Mild	Mild occasional symptoms; for example, only with exercise or infections	Needed occasionally	10% - 20%	80% - 100%

*Note: One or more features may be present for any grade of severity. An individual should be assigned to the most severe grade in which any feature occurs.*

control exacerbations of asthma at any step. Indications may include :-

- i. symptoms and peak expiratory flow (PEF) get progressively worse day by day.
- ii. PEF falls below 60% of patient's best
- iii. sleep is disturbed by asthma
- iv. morning symptoms persist until midday
- v. there is a diminishing response to inhaled bronchodilators
- vi. emergency treatment with nebulised or injected bronchodilators is required.

**Method:**

Give 30 - 60 mg of prednisolone immediately. The dose should be tapered down and stopped within 7 - 14 days.

**Assessment of severity and response to treatment**

Assessment should be done as follows:

1. Clinical assessment. This should include patient's symptoms, sleep disturbances, effort tolerance,

disturbance of daily activities and the frequency of bronchodilator drug and/or rescue courses of steroid used.

2. Measuring peak expiratory flow (PEF). This can either be measured by Wright peak flow meter or mini-Wright peak flow meter. Mini-Wright peak flow meters are affordable for many patients.

**PEF Measurements**

- i. During periods of 'well-being'

This allows measurement of patient's best PEF value which will provide the target for the doctor and the patient to aim for. Twice daily measurements (morning and evening) before any inhaled bronchodilator treatment will determine the diurnal variability of airway calibre. This is calculated as the range divided by the highest value and expressed as a percentage.

$$\frac{\text{PEF (max)} - \text{PEF (min)}}{\text{PEF (max)}} \times 100 = \text{_____}\%$$

**Chart 1**  
**Management of chronic asthma in adults**

STEP 1	STEP 2	STEP 3	STEP 4
<b>MILD EPISODIC ASTHMA</b>	<b>MODERATE ASTHMA</b>	<b>SEVERE CHRONIC ASTHMA</b>	<b>VERY SEVERE ASTHMA</b>
<ul style="list-style-type: none"> <li>- Infrequent symptoms</li> <li>- No nocturnal symptoms</li> <li>- PEF 80 - 100% predicted</li> </ul>	<ul style="list-style-type: none"> <li>- Frequent symptoms</li> <li>- Nocturnal symptoms present</li> <li>- PEF 60 - 80% predicted</li> </ul>	<ul style="list-style-type: none"> <li>- Persistent symptoms</li> <li>- Frequent nocturnal symptoms</li> <li>- PEF 60% predicted or less</li> </ul>	<ul style="list-style-type: none"> <li>- Persistent symptoms not controlled by step 3 medications</li> </ul>
<p>Treatment:</p> <ul style="list-style-type: none"> <li>- inhaled beta<sub>2</sub> agonist "as needed" for symptom relief. If needed more than once a day, advance to step 2</li> </ul>	<p>Treatment:</p> <ul style="list-style-type: none"> <li>- inhaled steroids eg. beclomethasone or budesonide 200 - 800 mcg/day or inhaled sodium cromoglycate plus</li> <li>- inhaled beta<sub>2</sub> agonist "as needed"</li> </ul>	<p>Treatment:</p> <ul style="list-style-type: none"> <li>- inhaled beclomethasone or budesonide 800 - 2000 mcg/day plus</li> <li>- inhaled beta<sub>2</sub> agonist as needed plus, if necessary oral beta<sub>2</sub> agonist preferably long acting), or</li> <li>- inhaled long acting beta<sub>2</sub> agonist, or</li> <li>- inhaled ipratropium bromide 40 mcg 3-4 times a day, or</li> <li>- oral theophylline (sustained release), or</li> <li>- nebulised beta<sub>2</sub> agonist, 2-4 times a day</li> </ul>	<p>Treatment:</p> <ul style="list-style-type: none"> <li>as in Step 3 plus oral steroids (the lowest dose possible)</li> </ul>

- NOTE:**
- Education is important for patients and relatives
  - Triggers avoidance whenever possible
  - Initial treatment depends on severity of asthma at first assessment
  - Review treatment every 3 - 6 months. When symptoms controlled, consider gradual step down of treatment. If uncontrolled, consider step up.
  - Monitor peak flow whenever possible for moderate, severe and very severe asthma
  - Use written asthma plan whenever feasible for moderate, severe and very severe asthma.

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PEF variability of less than 20% is regarded as mild, between 20 - 30% is moderate and more than 30% is severe. A good control of asthma means PEF variability is maintained at less than 10%.

### ii. During symptomatic episodes

During an attack of asthma PEF fairly accurately measures the degree of bronchospasm. A PEF of less than 50% of normal or best suggests a severe attack and a PEF of less than 33% suggests a very severe and life threatening attack. When the best PEF value is not known, a single reading of less than 200 l/min usually indicates a severe attack.

Hence, in addition to history and physical findings the PEF helps the doctor to decide on the appropriate therapy (besides history and physical findings). As far as possible patients with moderate and severe asthma should regularly measure their PEF twice a day especially when their asthma is worsening or when treatment is altered. Comparison to local normal values should be made<sup>24</sup> (Appendix 2).

### Specialist referral

Referral to a respiratory physician is appropriate when:

- i. there is doubt about the diagnosis
- ii. occupational asthma is suspected
- iii. management is difficult eg. brittle asthma or very severe asthma not successfully controlled
- iv. long term treatment with nebulised bronchodilator is needed
- v. asthma is worsening in a pregnant woman
- vi. asthma is interfering with patient's lifestyle despite changes in treatment

### Pregnancy and asthma

During pregnancy asthma in about one-third of women becomes worse, in one-third better and in one-third remains unchanged. However this cannot be predicted. Achieving good control of asthma is more important in order to prevent adverse effects on both foetus and mother than the theoretical risks of any of the presently used anti-asthma medications. Most drugs used to treat

asthma are safe with the exception of alpha adrenergic compounds and epinephrine (both are not usually used to treat asthma in Malaysia). Asthma in pregnancy therefore should be managed as in other patients. Acute exacerbations should be treated aggressively in order to avoid foetal hypoxia and maintain maternal well-being. Treatment should include nebulised beta<sub>2</sub>-agonists and oxygen; systemic corticosteroids should be instituted when necessary. Patients should also have adequate opportunity to discuss the safety of their medication.

### Guidelines for the management of acute asthma in adults

The presentation of a patient with acute asthma requires rapid assessment of its severity so that the appropriate treatment can be instituted.

Although an acute severe attack of asthma may occasionally develop within a few minutes or hours, it usually occurs against a background of long term poorly controlled asthma or asthma that has been worsening for some days or weeks. The severity of acute asthma attacks is usually underestimated by patients, their relatives and their doctors, mainly because of the failure to make objective measurements<sup>25</sup>. Inadequate assessment of such attacks and inappropriate treatment with overreliance on bronchodilators and underuse of steroids contribute to morbidity and deaths<sup>26-29</sup>.

### Aims of management

The aims of management are :

1. To prevent death
2. To relieve respiratory distress
3. To restore the patient's lung function to the best possible level as soon as possible
4. To prevent early relapse

### Assessment<sup>4,30-32</sup>

The severity of the attack should be assessed by :-

1. History taking
2. Physical examination
3. PEF measurement

**Features of moderately severe asthma**

- normal speech
- pulse rate < 110/min
- respiratory rate < 25 breaths/min
- PEF > 50% predicted or best value

**Features of acutely severe asthma**

The presence of any of the following indicates a severe attack of asthma:

- too breathless to complete sentences in one breath
- respiratory rate  $\geq$  25 breaths/min
- pulse rate  $\geq$  110/min
- PEF  $\leq$  50% predicted or best value

**Life threatening features**

The presence of any of the following indicates a very severe attack of asthma:

- central cyanosis
- feeble respiratory effort
- silent chest on auscultation
- bradycardia or hypotension
- exhaustion
- confusion or unconsciousness
- PEF < 33% predicted or best value (or a single reading of < 150l/min in patients who are not able to blow).

Arterial blood gas (ABG) tensions should be measured if a patient has any of the severe or life threatening features.

ABG markers of a very severe, life threatening attack include:

- a normal (5-6 kPa, or 36-45 mm Hg) or high PaCO<sub>2</sub>
- severe hypoxaemia: PaCO<sub>2</sub> < 8 kPa (60 mm Hg) irrespective of treatment with oxygen
- a low pH

**Management of acute asthma in accident and emergency department**

**Initial PEF > 75% (Mild acute asthma)**

Sometimes, patients with mild acute asthma may present at the A & E. This is characterised by an initial PEF of > 75% of predicted or best value. In this situation, just give the patient's usual inhaled bronchodilator (e.g. salbutamol, terbutaline or fenoterol) from a metered dose inhaler.

Observe for 60 minutes. If the patient is stable and PEF is still > 75%, discharge.

**Before discharge:**

- \* review adequacy of usual treatment and step up if necessary according to guidelines for treatment of chronic persistent asthma
- \* ensure patient has enough supply of medications
- \* check inhaler technique and correct if faulty
- \* advise patient to return immediately if asthma worsens
- \* make sure that patient has a clinic follow-up appointment

P/S: Patients should be considered for admission if social situations such as staying alone, lack of transport for emergency visit to hospital etc.

**Initial PEF < 75%**

Patients who present to the A & E with more severe degrees of acute asthma characterised by an initial PEF < 75% predicted or best value, should be managed as follows:

**1) Immediate treatment with:**

- (a) High concentration oxygen (>40%) in cases with initial PEF <50% at presentation.
- (b) High doses of inhaled beta<sub>2</sub> agonist (salbutamol 5 mg or terbutaline 5 mg or fenoterol 5 mg) via nebuliser driven by oxygen. If compressed air nebuliser is used, administration of supplemental oxygen when indicated should be continued.



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Alternatively, beta<sub>2</sub> agonist may be given by multiple actuations of a pressurised aerosol inhaler into a large spacer device (2-5 mg, i.e. 20-50 puffs, five puffs at a time).

Consider adding anticholinergic (e.g. ipratropium bromide 0.5 mg) to nebulised beta<sub>2</sub> agonist for patients with acute severe asthma.

- (c) Prednisolone tablets 30-60 mg. Very ill patients should be given intravenous hydrocortisone 200 mg stat.

NB. Sedatives should not be prescribed.

Antibiotics are indicated only if there is evidence of a bacterial infection. Do a chest X-ray if pneumothorax or pneumonia is suspected or features of acute severe or life threatening asthma are present.

If life threatening features are present :

- (d) Intravenous aminophylline 250 mg slowly over 20 minutes or intravenous terbutaline or salbutamol 250 mcg over 10 minutes.  
(Bolus aminophylline should not be given to patients already taking oral theophylline).

\* Patients with features of life threatening asthma require admission preferably to the intensive care unit (ICU) and should be accompanied by a doctor.

### Effects of treatment

The effects of treatment are monitored by

- the patient's assessment of symptoms
- physical examination
- repeat measurement of PEF 15-30 minutes after starting treatment

### Good response to initial treatment

Such patient should

- be free of wheezing and dyspnoea
- have a clear chest on auscultation
- have a postbronchodilator PEF which is > 75% of predicted or best value.

### Incomplete response to initial treatment

Such a patient has

- persistent wheezing or dyspnoea
- rhonchi on chest auscultation
- a postbronchodilator PEF which is 50-75% of predicted or best value

### Poor response to initial treatment

Such a patient has

- persistent, marked wheezing or breathlessness
- diffuse rhonchi on chest auscultation and other signs of acute severe asthma
- a postbronchodilator PEF < 50% of predicted or best value

The subsequent management of patients with an initial PEF < 75% predicted or best value is summarised in Table II.

### 2) Subsequent management in the ward or ICU

Continue - oxygen at 40%

- intravenous hydrocortisone 200 mg 6 hourly or prednisolone 30-60 mg daily
- nebulised beta<sub>2</sub>-agonist 4 hourly, this can subsequently be changed to metered dose inhaler (It may be necessary to give nebulised beta<sub>2</sub>-agonist more frequently, up to every 15-30 minutes and to add ipratropium bromide 0.5 mg to nebulised beta<sub>2</sub>-agonist and repeat 6 hourly if patient is not improving).

If patient is still not improving, also give

- aminophylline infusion (0.5-0.9 mg/kg/hour); monitor blood levels (where facility is available) if aminophylline infusion is continued for more than 24 hours, or
- terbutaline or salbutamol infusion as an alternative to aminophylline, at 3-20 mcg/min after an initial intravenous bolus dose of 250 mcg over 10 minutes

### 3) Monitoring the effects of the treatment

- \* Repeat measurement of PEF 15-30 minutes after starting treatment.
- \* Maintain arterial oxygen saturation above 92% (if facility for pulse oximetry is available).

**Table II**  
**Emergency room management 30 minutes after**  
**initial treatment of acute asthma with a PEF < 75%**  
**predicted or best on arrival**

Good response and PEF > 75% predicted or best value	Incomplete response and PEF 50-75% predicted or best value	Poor response and PEF < 50% predicted or best value
Observe for another 60 minutes.	Repeat nebulised beta <sub>2</sub> agonist.	<b>ADMIT.</b>
If patient is stable or improving and PEF is still >75%, <b>DISCHARGE.</b>	Observe for 60 minutes.  1) If PEF is still ≤ 75%, <b>ADMIT.</b>  2) If patient improves and PEF > 75%, <b>DISCHARGE.</b>	

\* Patients requiring admission  
should be accompanied by a nurse or doctor.

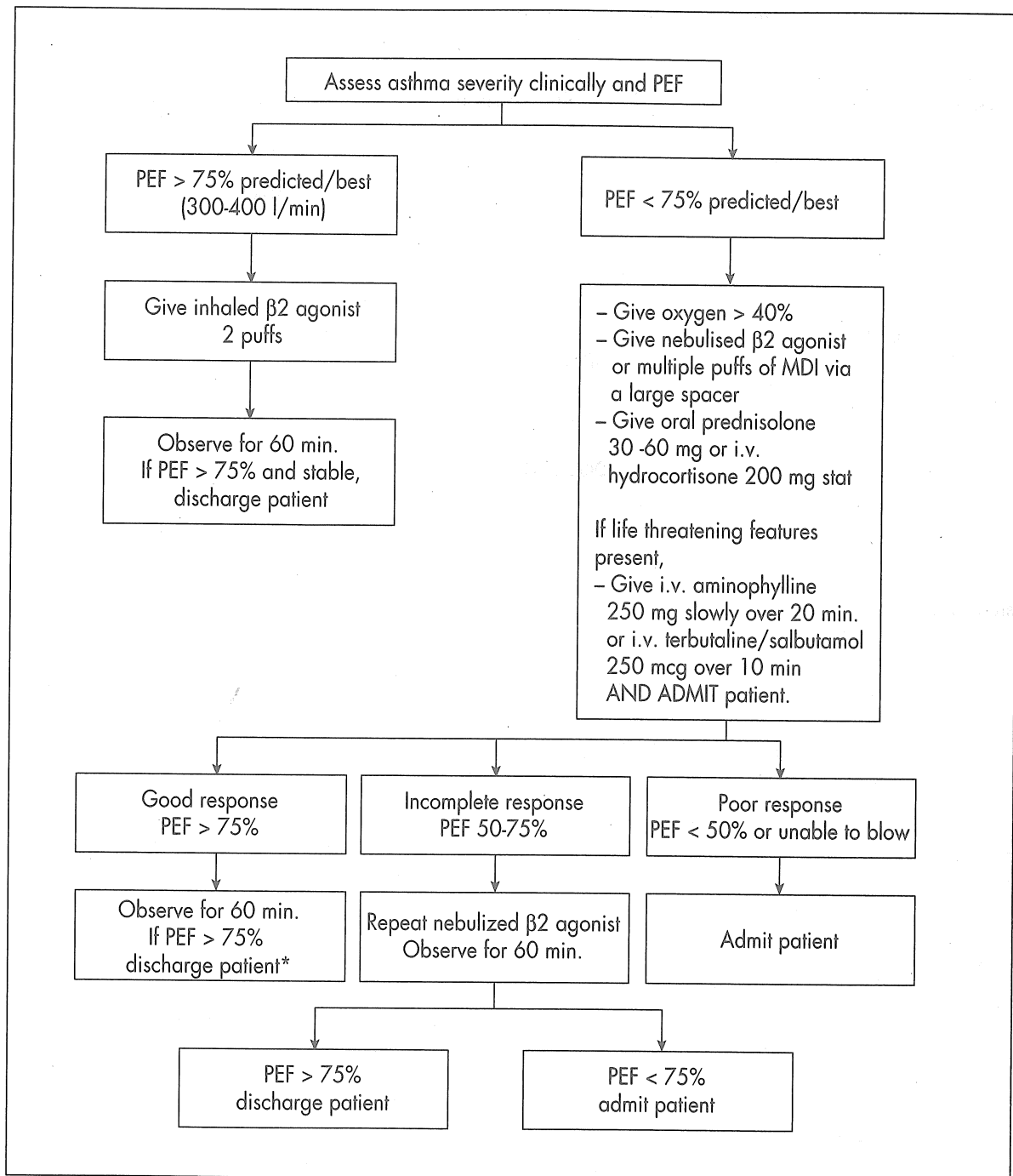
**Before discharge :**

- \* give prednisolone 30-60 mg daily tapering over 7-14 days, plus regular inhaled steroids and inhaled beta<sub>2</sub> agonist to be taken as needed
- \* review adequacy of usual treatment and step up if necessary according to guidelines for treatment of chronic persistent asthma
- \* ensure patient has enough supply of medications
- \* check inhaler technique and correct if faulty
- \* arrange for follow-up
- \* advise patient to return immediately if asthma worsens

*P.S.: Patients should be considered for admission if social situations such as staying alone, lack of transport for emergency visit to hospital etc.*

- \* Repeat arterial blood gas measurements if initial results are abnormal or if patient deteriorates.
- \* Chart PEF before and 15 minutes after giving nebulised or inhaled beta<sub>2</sub>-agonist at least 4 times daily throughout the hospital stay.
- 4) **Other investigations :**
  - (a) serum electrolytes (hypokalaemia is a recognised complication of treatment with beta<sub>2</sub>-agonist and corticosteroids)
  - (b) electrocardiogram if indicated
- 5) **Transfer patient to the intensive care unit or prepare to intubate if there is :**
  - deteriorating PEF
  - worsening hypoxaemia, or hypercapnia
  - exhaustion or feeble respirations
  - confusion or drowsiness
  - coma or respiratory arrest

Chart 2  
Summary of emergency room management of acute asthma



P.S.: Before discharge ensure that the patient's treatment is proper, the medicine is adequate, the inhaler technique is correct, the appointment for review is given and patient is advised to return if condition deteriorates.

**In ICU,**

- Continue with oxygen supplementation.
- Continue with intravenous hydrocortisone.
- If the patient is mechanically ventilated, administer nebulised beta<sub>2</sub>-agonist (with or without ipratropium) via the endotracheal tube. This can be given up to every 15-30 minutes.
- Intravenous aminophylline infusion or terbutaline or salbutamol infusion may also be given.

**6) Before discharge, the patient should be :**

- started on inhaled steroids for at least 48 hours in addition to a short course of oral prednisolone and bronchodilators
- stable on the medication he is going to take outside the hospital for at least 24 hours
- having PEF of >75% of predicted or best value and PEF diurnal variability of < 25%
- taught and checked on the correct inhaler technique and if necessary, alternative inhaler devices should be prescribed
- educated on the discharge medication, home peak flow monitoring and self management plan (for selected, motivated patients), and the importance of regular follow-up
- given an early follow-up appointment within 4 weeks for reassessment of the condition and for adjustment of the medications.

**Management of acute asthma in general practice**

Management is similar to that in the accident and emergency department. The clinic should have facility

for oxygen administration and it is essential that equipment for resuscitation should be available.

**These are indications for immediate referral to hospital**

1. Any life threatening features
2. Any features of a severe attack that persist after initial treatment
3. PEF 15-30 minutes after nebulisation which is < 50% of predicted or best value

**Threshold for referral to hospital should be lowered for patients:<sup>4</sup>**

- seen in the afternoon or evening rather than earlier in the day
- with previous severe attacks, especially if the onset of the current attack was rapid
- in whom there is concern over the social circumstances or relatives' ability to respond appropriately

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## CONSENSUS STATEMENT

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## APPENDIX 1

Example of a written asthma management plan.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

### Tel. Numbers

General Practitioner : \_\_\_\_\_

Specialist: \_\_\_\_\_

Ambulance: \_\_\_\_\_

Hospital: \_\_\_\_\_

Usual Medication:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

Best Peak Flow Reading \_\_\_\_\_ L/min.

### YOUR ASTHMA IS MODERATELY SEVERE IF:

- You wake up once or twice a night with asthma
- You need your bronchodilator more than 4 times a day
- You notice wheeze and difficulty in breathing more than usual during the day
- Your peak flow is less than \_\_\_\_\_ (80% of best)

You should double the dose of \_\_\_\_\_ for 2 weeks

### YOUR ASTHMA IS SEVERE IF:

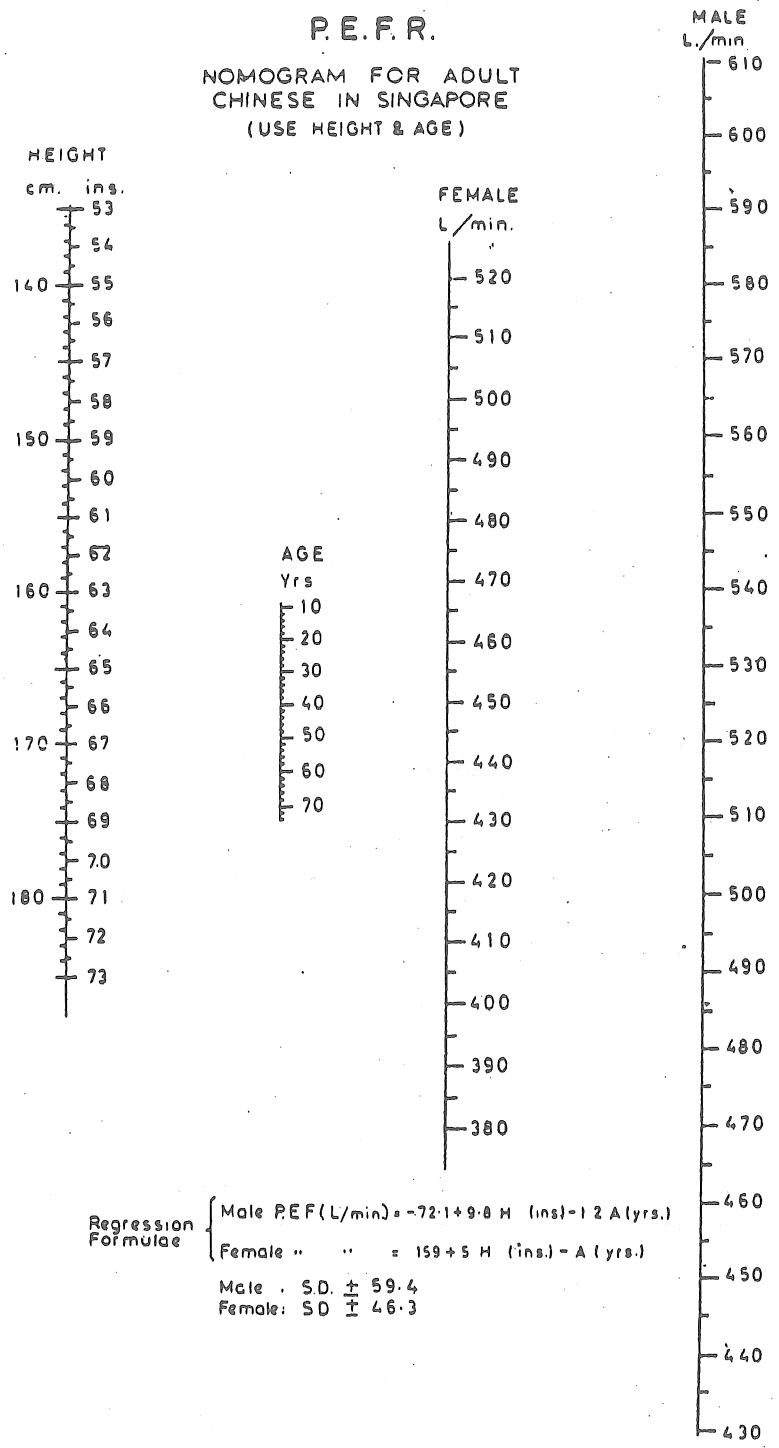
- You wake up with asthma more than twice a night
- You need your bronchodilator more than 6 times a day
- You notice wheeze and difficulty in breathing most of the day
- Your peak flow is less than \_\_\_\_\_ (60% of best)

You should double the dose of your \_\_\_\_\_ for 2 weeks and take \_\_\_\_\_ tablets of prednisolone (\_\_\_\_mg) on the first day and reduce that by 1 tablet each day.

### YOUR ASTHMA IS VERY SEVERE IF:

- You are awake most of the night
- You are short of breath at rest
- You can only speak in short sentences of a few words
- Your peak flow is less than \_\_\_\_\_ (50% of best) even after extra doses of medication.

You should take 5 puffs of \_\_\_\_\_ and immediately take \_\_\_\_\_ tablets of prednisolone (\_\_\_\_mg) and see your doctor



Nomogram for prediction of PEF from age and height in male and female Chinese adults.