

**PROTOCOL ON DIAGNOSIS
AND MANAGEMENT OF
BRONCHIAL ASTHMA**

DRAFT

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List of abbreviations used in this protocol:

| | |
|--------------|--|
| PEFM | Peak expiratory flow meter |
| PEFR | Peak expiratory flow rate |
| PEF | Peak expiratory flow |
| MDI | Metered dose inhaler |
| ICS | inhaled cortico-steroid |
| LABA | Long acting Beta agonist |
| ICU | Intensive care unit |
| COPD | Chronic obstructive pulmonary disease |
| ECG | Electrocardiogram |
| IM | Intra muscular |
| IV | Intra venou |
| SC | Sub cuataneous |
| NSAID | Non steroidal anti inflammatory drugs |
| NCD | Non communicable Diseases |
| CBC | Complete blood count |
| ABG | Arterial blood gas |

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Preface by Federal Ministry of Health

The last few decades have witnessed tremendous advances in medical knowledge and technologies. This is evident by the visible proliferation of medical and clinical literature. The volume and diversity of these advances make it extremely difficult if not possible for the individual doctors to grasp.

For these reasons the national ministry of health in its endeavor to promote standards and improve the quality of health care has engaged in intense efforts to develop national guidelines, protocols and national services standards in order to ultimately improve patient's outcome.

The consultative council for respiratory disease has been requested to undertake this responsibility; Supported by the NCP department, a group of chest physicians which include experienced members has developed this document, the aim of which is to serve as a unified guide to medical practitioner at all levels of the health services to follow. We believe that this protocol will serve as a good tool to reduce morbidity, mortality from bronchial asthma as well as the intense family and social interaction resulting from its acute exacerbation.

The quality department would like to thank the working group and NCP department for their efforts to develop this document. And we are sure that it is going to be a good source of information and backup to all medical practitioners, whenever consulted.

INTRODUCTION:

Bronchial asthma is one of the commonest chronic diseases affecting about 10% of the world population; its prevalence varies from one region to another and at times within the same country. The exact prevalence in Sudan is not known, but different regional studies estimate the prevalence between 5-10%.The diseases affects both children and adults; moreover there is an increasing rate of the condition as an occupational hazard.

The main underlying causes for this increase are the expansion in industry and agriculture where so many chemicals old and new are being introduced and used in the various phases and processes. An added factor for this increase is atmospheric pollution and "modernization" and change of life style; particularly in developing countries; which resulted in the use of various chemicals indoors as food additives, detergents, insect propellants, strong perfumes which have been added to the indoor allergens already existing.

Although there has been an increasing awareness about the disease among medical communities and the public at large, there remains a gap in the understanding about the exact nature of the disease, and consequently it has become one of the most medical conditions which are still misunderstood, misdiagnosed and under treated, as a result of the perceived mystical nature of the condition. Despite the introduction of new and potent medications, the morbidity from bronchial asthma remains high. Many rely on accident and emergency departments for treatment. The rate of hospital admission is high and the mortality hasn't changed appreciably particularly in developing countries during the last few decades. Bronchial asthma is known to be a very frightening condition to the patient and families as well, leading to intense social interactions as well as economic losses as a result of days off work and school. Moreover the cost of treating bronchial asthma is very high. The cost of community based treatment versus hospital based treatment in UK is 152 compared to 650£ respectively.

All this prompted the consultative council for respiratory medicine to entrust a group of chest physicians which include experiences members whom develop this document in order to make it available to medical practitioners involved in dealing with bronchial asthma at different levels of the health care system. This

work has been facilitated and supported by the non communicable diseases dept. federal ministry of health whose role has been very much appreciated.

The Editors

Aim:

The aim of this protocol is to develop a practical comprehensive but not detailed approach to the diagnosis, assessment and management of bronchial asthma that could be applied at all health care levels.

Objectives:

1. To promote accurate diagnosis and classification of bronchial asthma and its severity.
2. To develop a management plan based on the rationality of this approach.
3. To recognize, classify and be able to manage acute exacerbation effectively.
4. To promote the essential educational elements about the disease to both health workers, patients and their relatives.
5. To lay a foundation on asthma registry that can provide good information about the disease.

Process:

Selection of the topic: the selection of the topic is clinical based. Bronchial asthma has been selected because it is one of the commonest medical conditions and important cause of morbidity and mortality as well as a cause of adverse family interactions and economic loss.

Selection of the team:

A group of chest physicians were selected who included experienced members. They were divided into four groups, covering the various aspects of the disease. Previous Local and international protocols were reviewed. Several documents were reviewed as well. Each sub group presented its own review to the whole group. Subjected to intense focused discussion and consensus opinion was secured. Presented to members of the consultative council whose remarks were then included in the final draft.

Expected outcome:

Outcome 1: reduction of acute exacerbation.

Measure: No of acute exacerbation attacks
Target: Reduction by 10% every year.

Outcome 2: promotion of use of ICS steroids.

Measure: No of patients using ICS.

Target: increase in the No of patients using ICS by 10% every year.

Outcome 3: increase awareness of the patients.

Measure: No of patients who understand the nature of the disease.

Target: increase in the No of patients who understand the nature of the disease.

Build awareness and commitment: full high level commitment and support sought and secured, as well as the support of other partners the consultative respiratory council and other professional groups.

Gather information:

Information gathered from previous international standards, national standards and published information and clinical experience.

Base line assessment:

Brief assessment on the current practice was conducted based on the experience of chest physicians, patients and relatives of emergency department and the National annual health statistic report.

Bronchial asthma definition:

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, the chronic inflammation is associated with air way hyperresponsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning.. These episodes are usually associated with wide spread, but varying, air flow obstruction within the lung that is often reversible either spontaneously or with treatment.

Types of Bronchial asthma:

- **Exercise-Induced Asthma:**

Exercise-induced asthma is a unique form of asthma that may accompany other forms of asthma. It usually presents with shortness of

breath, chest tightness, cough and/or wheeze. This frequently begins within minutes after ending the exercise. Resting for a period of time may resolve mild symptoms completely. Exercise-induced asthma is thought to result from cooling and drying of the airways.

- **Occupational Asthma:**

Occupational asthma is a special type of asthma triggered by an irritant or allergen found in the work environment.

- **Cough-Variant Asthma:**

Cough-variant asthma refers to asthma in which the major symptom is repetitive bursts of cough. Shortness of breath and chest tightness may also be experienced, but wheezing is not usually present.

- **Aspirin-Induced Asthma:**

About 3 or 4% of asthmatic individuals have significant asthmatic symptoms following aspirin ingestion. That's why most individuals with asthma rarely note a significant flare of asthmatic symptoms following the ingestion of any form of aspirin.

Asthma diagnosis:

The diagnosis of asthma is a clinical one; there is no standard definition of this type, or severity or frequency of symptoms nor on the findings of investigations. The absence of a gold standard definition means that it's not possible to make clear evidence based recommendations on how to make a diagnosis of bronchial asthma. The initial diagnosis is based on the assessment of symptoms and a measure of airflow obstruction. Spirometry is the preferred initial test to assess the presence and severity of airflow obstruction. patients with suspected airflow obstruction should be offered reversibility test and or a trial of treatment for a specified period.

- **Asthma is suspected in patients presenting with:**

- Shortness of breath.
- Chest tightness.
- Wheeze.
- Cough.

- **Supportive features for asthma diagnosis:**

- Episodic attacks.
- Have triggers e.g. dust, pollens, animals...etc.
- Previous symptoms of allergic rhinitis.
- History of atopic conditions.
- Family history of asthma.

- **Clinical examination:**

- May be normal.
- Wheezes: consider asthma.
- Crackles: consider other conditions (Heart failure, infection, lung fibrosis and bronchiectasis).

- **Differential diagnosis:**

1. Other forms of obstructive lungs disease, particularly COPD.
2. Non –respiratory causes of symptoms (e.g., left ventricular failure).
3. Bronchiectasis.
4. Hypereosinophilic syndrome.
5. Hyperventilation syndrome and panic attacks.
6. Upper airway obstruction e.g. inhaled foreign bodies.
7. Vocal cord dysfunction.

- **Investigations:**

1. Spirometry.
2. PEFR (Peak Expiratory Flow Rate).
3. Chest X ray .

***Improvement of 15% or more is taken as evidence of reversible airway obstruction.
If there is no response a steroid trial should be preformed.***

Other Investigations:

1. CBC
2. Tests of atopy

- **The same test can be performed by taking the second reading after one week of oral steroid therapy (40 mg once per day):**

Note: The reversibility test is not reliable in:

- 1- Children below 7 years of age.
- 2- Very old people.
- 3- Mentally handicapped.
- 4- Poor co-ordination.

Classification of asthma severity:

Classification of asthma severity is required for the stepwise management. This is based on clinical criteria as well as on the degree of reversibility

- **Intermittent:** symptoms disappear for long periods of time. On return, they may occur less than once per week, they last only a few hours or a few days .When there are nocturnal symptoms, they occur less than twice a month.
- **Persistent:** symptoms occurring more than once a week.

| | Intermittent asthma | Mild persistent asthma | Moderate persistent asthma | Severe persistent asthma |
|---------------------------|----------------------------|-------------------------------|-----------------------------------|---------------------------------|
| Symptoms | Less than once per week | Weekly but not daily | Daily but not continuous | Continuous |
| Nocturnal symptoms | Less than twice a month | More than twice a month | More than once a week | Frequent |
| PEF | 80% or more | 80% or more | 60% to 80% | Less than 60% |

Management of chronic asthma:

Goals of asthma treatment to fulfill control:

- A. Achieve and maintain control of symptoms.
- B. Maintain normal activity level, including exercise.
- C. Maintain pulmonary function as close to normal as possible.
- D. Prevent asthma exacerbations.
 - No emergency visit

- Minimal need for reliever medications
- E. Minimal adverse effects from asthma medications.
- F. Prevent asthma mortality.
- Asthma essential drugs:
- Anti-inflammatory (controllers) medicines to achieve and maintain control.
 - Bronchodilators (relievers): medicines to relieve the symptoms and airflow limitation.

Estimated equipotent daily doses of inhaled Glucocorticosteroids for adults:

| Drugs | Low daily dose | Medium daily dose | High daily dose |
|----------------|----------------|-------------------|-----------------|
| Beclomethasone | 200-500 | >500-1000 | >1000-2000 |
| Budesonide | 200-400 | >400-800 | >800-1600 |
| Fluticasone | 100-250 | >250-500 | >500-1000 |

Stepwise management in adults (in outpatient clinic):

Step 1 : intermittent

Inhaled β_2 agonist as required.(evidence level A)
 Patients with frequent use β_2 agonist should have their asthma reviewed (evidence level B)

Step 2 : mild persistent

Add inhaled steroid 200-800 mcg/day. 400 mcg is an appropriate starting dose for many patients.).(evidence level A)

Step 3 : moderate persistent

1. Add inhaled long –acting B2 agonist (LABA).(evidence level A)
2. Assess control of asthma:
 - Good response to LABA-continue LABA.
 - Benefit from LABA but control still inadequate –continue LABA and

increase inhaled steroid dose to 800 mcg /day * (if not already on this dose.

- No response to LABA – stop LABA and substitute with other therapies e.g. SR Theophylline.

REFER PATIENT FOR SPECIALIST CARE

Step 4:severe persistent

- Increasing inhaled steroid up to 2000 mcg/day.
- Addition of a fourth drug e.g. SR theophylline.
- Addition anti leukotriene receptors' antagonist.
- Control still inadequate: add daily use of oral steroid tablet in lowest dose.

REFER PATIENT FOR SPECIALIST CARE

Management of acute asthma in Emergency department

1-Establish the diagnosis of asthma by history and clinical examination.

History:

Determine how good or bad is the patient's asthma control in the chronic stable state

- Symptoms especially the presence of nocturnal symptoms
- Frequency of emergency department visits and ICU admissions.
- Long-term medications including oral steroid dependence
- Range of home peak expiratory flow rates (PEFs), if available

Evaluate the following concerning the current exacerbation:

- Duration
- Severity (see next)
- Potential precipitants
- Medications taken in response

Physical examination:

- Asses asthma severity:
Features of severe asthma are:

best or predicted; respirations ≥ 25 /min; pulse rate ≥ 110 beats/min; can't complete sentences in one breath and PEF $< 50\%$.

• Features of life threatening asthma are:

Silent chest; cyanosis; poor respiratory effort; bradycardia; arrhythmia; hypotension; exhaustion; confusion; coma, SpO₂ $< 92\%$.

• These findings are not sensitive indicators of severe attacks; up to 50 percent of patients with severe airflow obstruction will not manifest many of these abnormalities.

• Look for signs of pneumothorax or pneumomediastinum.

Investigations:

. PEF measurement:

• This is the best test for assessing the severity of an asthma attack.

• It is easy to perform and when repeated over time can be used to monitor a patient's response to treatment.

• Predicted values for an individual differ with size, age, gender, and ethnicity, but a peak flow rate below 200 L/min indicates severe obstruction .

• Peak expiratory flow rate, should be interpreted with caution and with regards to the clinical context.

• They are more useful in the monitoring of patients with asthma than in making the initial diagnosis.

. Arterial blood gas (ABG) analysis:

• This is generally indicated among patients with persistent dyspnea (despite initial bronchodilator therapy) whose PEF is 50% - 33% of predicted or those with signs of life threatening asthma.

Chest x-ray:

• particularly to patients with suspected complications such as pneumothorax; pneumomediastinum; consolidation; those with features of life threatening asthma; and those who fail to respond to the initial treatment satisfactorily.

Other investigations:

- Blood urea & electrolytes (when appropriate).
- ECG (when appropriate).

2- Assessment of severity:

A. Where facilities are available:

| <i>Mild to moderate</i> | <i>Severe</i> | <i>Life threatening</i> |
|----------------------------|---|---|
| Worsening symptoms | -In ability to complete a sentence in one breath. | Silent chest Cyanosis Confusion coma hypotension |
| RR < 25/min | RR ≥ 25/min | |
| Pulse < 110/min | -Pulse ≥ 110/min | -Bradycardia |
| SaO ₂ > 92% | SaO ₂ > 92% | SaO ₂ < 92% ↑ Pao ₂ < 60 m hg Normal or high pa co ₂ Respiratory acidosis |
| PEFR 75-50% | PEFR 50-33% | PEFR < 33% |
| | | History of previous assisted ventilation because of Asthma. |
| No signs of severe asthma. | Presence of any one of the above → Severe Asthma. | Presence of any of the above → life threatening asthma. |

Complications:

1. Pneumothorax
2. Lung collapse

3. Pneumo mediastinum
4. Respiratory failure.
5. Cardiac arrest

3. Management (according to severity):

For a stepwise approach for treating acute asthma exacerbations please Refer to the attached flowchart.

General Remarks:

- Give high flow oxygen to all patients with acute severe asthma. .(evidence level C)
- High dose inhaled B agonist is the first line of management in acute severe asthma and administration as early as possible is recommended. .(evidence level A)
- Give steroids in adequate doses. .(evidence level A)
- Ipratropium bromide provides greater bronchodilation for patients not rapidly responding to initial beta agonist therapy. .(evidence level B)
- There is no evidence for any difference in efficacy between salbutamol or terbutaline.
- Generally, avoid I.V. aminophylline if salbutamol is available.
- Rarely, however, some patients with severe or life threatening asthma with poor response to inhaled therapy may gain additional benefit from IV aminophylline maintenance oral therapy then give infusion of 0.5 – 0.7 mg/kg/h.
- The combination of salbutamol and intravenous aminophylline results in no further bronchodilation than that achieved with nebulized beta agonists alone and may lead to increased risk of toxicity.
- In the absence of vomiting, oral administration of corticosteroids can be substituted for intravenous administration. Oral formulations are rapidly absorbed and exhibit comparable efficacy.
- If a nebulizer is unavailable, salbutamol may be delivered via a metered dose inhaler (MDI) with a spacer. The equivalent dose has not been precisely defined, but four to six carefully administered inhalations from an MDI with spacer have generally been found to equal one nebulizer treatment.

- Follow up is done every 30 minutes (consciousness, pulse, BP, RR, oxygen saturation and cyanosis)
- close observation during the first hour of treatment is required.
- Routine prescription of antibiotics is not indicated for acute asthma. (evidence level B)
- I/V fluids may be required for some patients.

1) Treatment of Acute Severe asthma:

Referral: refer to hospital any patient with features of acute severe asthma or life threatening asthma. (evidence level D)

- 1- Insure Patent airway.
- 2- Give high flow oxygen (4-6 l/min) (40-60%) to keep SaO₂ ≥ 92%.
- 3- Nebulizer Salbutamol 2.5-5mg every 15-30/min to keep SaO₂ ≥ 92% and then every 4-6 hours.
- 4- Steroids: Hydrocortisone 100-200 I.V. 6hrly± prednisolone (0.5-1mg/kg)- 40mg daily for at least 5 days OR until recovery.
- 5- Consider continuous Nebulisation if response is poor.
- 6- Add Nebulised Ipratropium bromide 0.5mg 4-6hrly for patients with poor initial response to β₂ agonist therapy OR for cases of life threatening asthma.
- 7- Magnesium Sulphate 1.2-2gm I.V. infusion (100ml of saline) over 20 minutes once only (if there is no response to above mentioned treatment).
- 8- I.V. theophylline (Aminophylline) 5-7 mg/kg slowly over 20 minutes.(If not on oral theophylline) (if there is no response to above mentioned treatment).
- 9- If still poor response arrange for ventilator & give epinephrine 0.5ml of 1:1000 IM.
- 10- Admit to hospital, ask for specialist advice.

Criteria for Hospital admission

- Patient showed no response to B agonists, and/or ipratropium and he does not improve for at least 75% of his predicted value following 2-4 hours, of intensive therapy in the A & E department.
- A patient requiring B₂ agonists more frequently than every 4 hours.
- A patient with past history of life threatening asthma or assisted ventilation.

- A patient with $PEFR \leq 75\%$ after 4 hours of intensive therapy in the A & E department.
 - Presence of factors indicating high risk for asthma mortality.
 - Social factors that may interfere with asthma care.
- 11- Give IV B2 agonist..
 - 12- Add Magnesium Sulphate 1.2-2gm I.V. infusion (100ml of saline) over 20 minutes once only (if there is no response to above mentioned treatment).(evidence level B)
 - 13- Consider I.V. theophylline (Aminophylline) 5-7 mg/kg slowly over 20 minutes. (If not on oral theophylline) (If there is no response to above mentioned treatment).
 - 14- ??? If still poor response give epinephrine 0.5ml of 1:1000 IM & arrange for ICU admission accompanied by doctor skilled to intubate if necessary.(evidence level C)
- **Mild to moderate:** - give nebulised short acting β_2 agonist and a short course of steroid. Review frequently; if after one hour of treatment the symptoms and signs improved & PEF is $> 75\%$ of the predicted or best value, the patient may be discharged home with appropriate changes to his asthma medications, in the absence of concerns, (evidence level C):-
Still have significant symptoms
 - Compliance concerns.
 - Brittle asthma.
 - Previous life threatening asthma.
 - Patients presenting at or after midnight.
 - Pregnant Ladies.
 - Exacerbation despite adequate oral steroid pre-presentation.
 - Adverse social circumstances.
 - If there is partial/ no response (no improvement of symptoms, clinical signs of PR, RR, Patient stable and PEF 75- 50%) continue therapy and consider admission.
 - If the patient deteriorates or develops life threatening features admit to ICU (evidence level B)

Criteria of discharge from hospital:-

- 1- Off Nebulised drugs and on discharged medications for at least 24hrs.
- 2- Nocturnal symptoms subsided for at least two nights.
- 3- The patient had been educated how to use MDIs properly.

4- PEF \geq 75% of the best or predicted value.

Warning: Sedatives are absolutely contraindicated in acute severe asthma.

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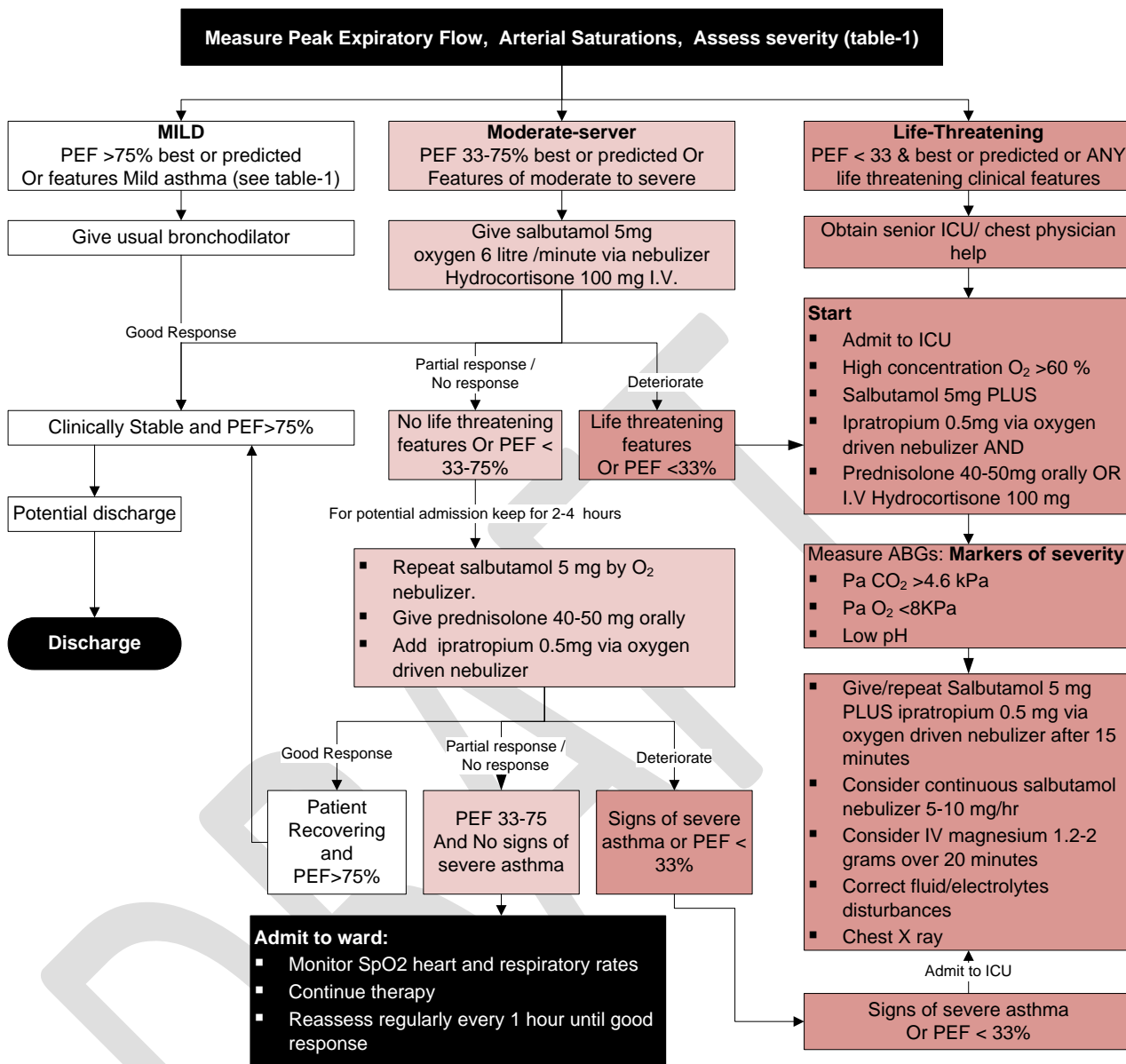


Table -1

| Mild to moderate | Severe | Life threatening |
|---|---|--|
| <ul style="list-style-type: none"> Worsening symptoms RR < 25/min Pulse < 110/min SaO₂ > 92% PEFR 75-50% No signs of severe asthma. | <ul style="list-style-type: none"> In ability to complete a sentence in one breathe. RR ≥ 25/min Pulse ≥ 110/min SaO₂ > 92% PEFR 50-33% Presence of any one of the above → Severe Asthma. | <ul style="list-style-type: none"> Silent chest, Cyanosis, Confusion, coma , hypotension Bradycardia SaO₂ < 92%, PaO₂ < 60 mmHg, Normal or high Pa CO₂, Respiratory acidosis PEFR < 33% History of previous assisted ventilation because of Asthma. Presence of any of the above → life threatening asthma. |

Good Response:

- Clinical improvement (dyspnea, PR, RR, diminished Wheez) and PEFR PEF >75% best or predicted

Partial response:

- Clinical improvement (dyspnea, PR, RR, diminished Wheez) and PEFR PEF 50-75%.

No response:

- Clinical improvement (dyspnea, PR, RR, diminished Wheeze) and PEFR PEF >33% and < 50% .

Special clinical circumstances:

1- **Pregnancy:**

- Acute severe asthma is an emergency and should be treated in hospital.
- Should be treated in the same way as in non-pregnant women.(evidence level C)
- Oxygen should be delivered immediately to achieve saturation above 95%.
- β 2 agonist, inhaled corticosteroid and oral steroids should be used as for non pregnant ladies. (evidence level C)
- In labour regional blocks are preferred to general anesthesia, and prostaglandins F2a should be used with extreme caution.
- Asthma in pregnancy should be monitored closely.

2- **Diabetes mellitus:** Corticosteroids are not contraindicated; inhaled corticosteroids are safe with no significant effect on glycaemic control.

3- **Active Pulmonary tuberculosis:** Treat as normal.

4- **Hypertension:** Treat as normal, antihypertensive drugs should be checked (e.g. ACEI, β Blockers).

5- **Surgery:** patients with bronchial asthma scheduled for surgery should be reviewed before surgery.

Patients with un-controlled bronchial asthma should be reviewed with chest physician.

General remarks:-

If you are in place where there is no electricity you can use large volume spacer & Salbutamol inhaler instead of Nebulised Salbutamol

2) **Life threatening asthma:**

Having been managed and improved in the ICU, the patient may be transferred to the ward (see flowchart).

Role of primary health care centers and rural hospitals:

1. Treatment of mild cases requiring B agonist.
2. Follow up of these patients 3 - 4 times a year.
3. Referral of moderate cases to secondary care facilities for control.
4. Follow up of these patients after being controlled and referred back from secondary care centers.

Assessment of severity when facilities are not available (PHC and Rural hospitals):

Severe:

- Patient can not complete the sentence in one breath
- RR \geq 25/min
- Pulse \geq 110/min
- Generalized wheeze.
- PEFr 50-33%

Moderate severity:

- Symptoms are increasing.
- Increased demand for reliever medication..
- No features of severe asthma..
- PEFr 50 -75%

Mild cases:

- Symptoms are increasing
- Increased demand for reliever medication.
- No features of severe asthma.
- PEFr $>$ 75%.

Role of secondary care centers:

1. Diagnosis of bronchial asthma patients.
2. Treatment and follow up of moderate cases of bronchial asthma.
3. Referral of mild cases of bronchial asthma to be followed by the primary care centers.
4. Referral of severe cases to tertiary care centers.

Indication for referral to specialist

- A. Uncertainty with diagnosis
 - Patients receiving multiple courses of antibiotics.
 - Possibility of COPD.
 - Asthma for the first time after the age of 60 years.
 - Suspected vocal cord dysfunction.
- B. Suspected occupational asthma
- C. Management problems
 - Previous history of life threatening asthma or ventilatory support.
 - Brittle asthma.
 - Recurrent exacerbation >2 per month.
 - Recent discharge following admission for severe exacerbation.
 - Rapid onset of acute severe asthma
 - Oral corticosteroid dependence.
 - Poor control despite adequate treatment
 - Co-existing significant medical illness like thyroid disease, DM hypertension and heart failure.
 - Collagen vascular disease, peptic ulcer, cardiac failure.
 - Frequent school absenteeism.
 - Significant corticosteroid side effects.

Health Education

Health education is part and parcel of the management of bronchial asthma. It will enable the patient to understand the nature of the illness, how to protect himself and the importance of treatment. This will boost his confidence; make him more interactive with his doctor and receptive to his advice. Health education should start as soon as the diagnosis is made and continue throughout the subsequent visits.

- Objectives of health education:
 - Improve patient understanding about the disease.
 - Change the patient behavior towards the disease and improve his confidence and cooperation.

- Achieve patient satisfaction.
- Topics to be discussed while educating patient:
 - **What is Asthma?**
- Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, the chronic inflammation is associated with air way hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning.. These episodes are usually associated with wide spread, but varying, air flow obstruction within the lung that is often reversible either spontaneously or with treatment.
 - **Wrong Beliefs**
 - Many patients and relatives have got wrong beliefs about the disease. Some of them think it is an infectious disease others think that the strength of the hereditary factor is very strong that it's mandatory to affect all members of the family some even think that the medication particularly the inhaler is addictive. Hence all these points should be touched on and explained in simple terms
 - **Rationale of therapy**
The aim of therapy is to suppress this inflammation by anti inflammatory drugs the most important of which are steroids. At the same time bronchodilators are given to relieve the bronchospasm. Bronchodilators are known as the relievers whereas the anti inflammatory drugs are known as the controllers which are the mainstay of treatment.
 - **Medication**
 - Medication should be reviewed at each visit, and stress should be laid on the usefulness of the anti- inflammatory drugs particularly the advantage of the inhalers. At the same time pointing out the possible side effects without causing undue worries to the patient.
 - **Triggers**
 - Acute severe asthma may be triggered by drugs like aspirin, B-blockers and NSAIDS; pollutants in the air such as dust, viral infection, tree and grass pollen and as well by indoor allergens such as house dust, mites fungi ,chemical inhalants and fumes.It is hence important to identify these triggers in order to avoid them.

- **How to deal with triggers?**
 - House dust mites are the commonest triggers in the house so measures to reduce it are advised to be adopted particularly in humid areas. These measures include, washing carpets and blankets with warm water once a month. Sometimes encasing pillows with polythene cover might be useful. Cigarettes and other chemicals like air fresheners and insecticides should be avoided in the environment in those with hyper responsiveness.
- **Acute exacerbations**

These are the acute forms of Asthma leading to severe dyspnoea, and may result in hypoxia , the hypoxemia may worsen and lead to life threatening asthma and death. Acute

ANNEX:

1) The reversibility test:

- 1- Explain the test to the patient and let him hold the PFM.
- 2- Record the height, age and sex of the patient.
- 3- Take the predicted value for the patient from the table to the nearest age and height and record it.
- 4- Ask the patient to sit upright and hold the PFM straight in front of him.
- 5- Let the patient take a maximum inspiration, put the tip of the mouth piece in his mouth, seal it with his lips and then blow out as HARD & FAST as possible.
- 6- Read the PFR and record.
- 7- Let the patient perform three measurements and take the best reading.
- 8- Give the patient 400 µg inhaled Salbutamol by a spacer
- 9- Repeat the test after 15 minutes and take the best out of three readings.
- 10- Calculate the result of the reversibility test.

2) severe attacks should be treated in the emergency department or under supervision of a chest specialist.

Medications to Treat Asthma: How to Use a Spray Inhaler



Health-care provider should evaluate inhaler technique at each visit.

Source: "What You and Your Family Can Do About Asthma" by the Global Initiative For Asthma
Created and funded by NIH/NHLBI



Courtesy

Using inhalers

Using an inhaler is the most common way of taking asthma medicines. It is also a very effective way because inhaling the medicine takes it straight into the lungs. It is important that the medicine is taken properly. And thus the inhalation techniques should be explained to the patient.

It is very common to experience problems using inhalers. The doctor will be able to check the patient's inhaler technique or may give a different inhaler. He may also suggest that one of the following options is tried:

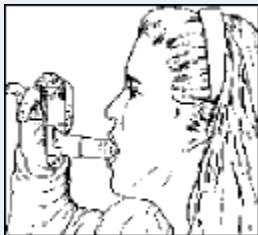


- Large volume spacers are available on prescription. These make aerosol inhalers easier to use and more effective. They trap the medicine inside the spacer, so the patient doesn't have to worry about pressing the inhaler and breathing in at exactly the same time.

How do I use a meter-dose correctly?



A. Open mouth. Hold inhaler 1 to 2 inches away.



B. Use spacer attached to inhaler.



C. Hold inhaler in your mouth
Here's what to do:

1. Remove the cap and hold the inhaler upright.
2. Shake the inhaler.
3. Tilt the head back slightly and breathe out.
4. Hold the inhaler as in one of the pictures to the right. A or B are the most effective, but C is acceptable for people who are unable to use A or B.
5. Spacers are useful for all patients, especially young children and older adults (see picture B).
6. Press down on the inhaler to release the medicine as you start to breathe in slowly.
7. Breathe in slowly for 3 to 5 seconds.
8. Hold the breath for 10 seconds to allow medicine to go deeply into your lungs.
9. Repeat puffs as directed. Wait 1 minute between puffs to allow the second puff to get into the lungs better.

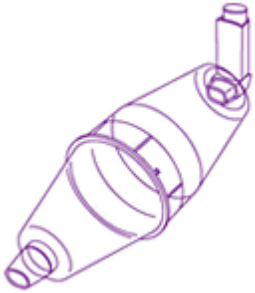
NOTE: These instructions are for a metered-dose inhaler only. Inhaled dry powder capsules are used differently. To use a dry powder inhaler, close your mouth tightly around the mouthpiece of the inhaler and breathe in quickly.

Spacers: A spacer is a large plastic or metal container, with a mouthpiece at one end and a hole for the aerosol inhaler at the other. Spacers work only with an aerosol inhaler.

○ *Why are spacers important?*

- Spacers are important because they help to deliver asthma medicine to the lungs. They also make the inhaler easier to use and reduce the risk of side effects.

There are several different brands of spacers that fit different inhalers and are available on prescription (including



- Spacers are very important because:

- They make aerosol inhalers easier to use and more effective.
- More medicine is delivered to the lungs than when just using the inhaler on its own.
- They are convenient and compact and work at least as well as nebulizers at treating most asthma attacks in children and adults.
- They help to reduce the possibility of side effects from the higher doses of preventer medicines by reducing the amount of medicine that is swallowed and absorbed into the body.



○ Handy hints for using a spacer

- The doctor should show the patient how to use his inhaler and spacer properly.
- The spacer given should fit the inhaler.
- One puff of the inhaler is delivered into the spacer and breathed in deeply through the mouthpiece.
- Patient's breath should be held for ten seconds (or for as long as is comfortable) then he should breathe out slowly.
- It is best to take at least two deeply held breaths for each puff of the inhaler.
- If the patient finds it difficult to take deep breaths, breathing in and out of the mouthpiece several times is just as good.
- The step above for each dose/puff needed should be repeated.

- The spacer is washed once a month – and left to drip-dry as this helps to prevent the medicines sticking to the sides.
- Using metal or anti-static spacers can help to make sure that most of the medicine gets into the patient’s lungs.
- The spacer should be replaced at least every year, especially if it has been used daily.

Nebulizers

A nebulizer is a machine that creates a mist of medicine, which is then breathed in through a mask or mouthpiece. They are more commonly used to give high doses of reliever medicines in an emergency situation, for example in hospital or a doctor’s surgery

Use of nebulizers to treat acute attacks at home should be discouraged, When a patient develops an acute attack, his condition should be assessed properly by a doctor so as to advise on the best treatment which is not necessarily just giving nebulised ventolin as it is not the sole appropriate treatment. The patient and relatives would be under the wrong impression that the patient is having the correct treatment, while he is not. In many situations this has led to the development of life threatening situations with the tragic eventuality of death. Nebulised ventolin at home in very rare situations after critical and thoughtful assessment of patient’s condition should be advised by a chest specialist.

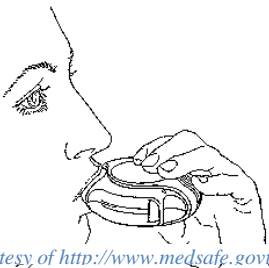


ADAM

Courtesy of: <http://www.nlm.nih.gov>

How to use the Accuhaler?

1. Hold the outer casing of the accuhaler in one hand whilst pushing the thumb grip away until a click is heard.
2. Hold Accuhaler with mouthpiece towards you, slide lever away until it clicks. This makes the dose available for inhalation and moves the dose counter on.
3. Holding Accuhaler level, breathe out gently away from the device, put mouthpiece in mouth and suck in steadily and deeply.
4. Remove Accuhaler from mouth and hold breath for about 10 seconds.
5. To close, slide thumb grip back towards you as far as it will go until it clicks.
6. For a second dose repeat steps 1-5.



Courtesy of <http://www.medsafe.govt.nz>

How to use a Turbuhaler:

1. Unscrew the cap and take it off. Hold the inhaler upright.



2. Twist the colored grip of your Turbuhaler® as far as it will go. Then twist it all the way back. You have done it right when you hear a "click".
3. Breathe out away from the device.
4. Put the mouthpiece between your teeth, and close your lips around it. Breathe in forcefully and deeply through your mouth.
5. Remove the Turbuhaler from your mouth before breathing out.
6. Always check the number in the side counter window under the mouthpiece to see how many doses are left. For the Turbuhalers that do not have a dose counter window, check the window for a red mark, which means your medication is running out. When finished, replace the cap.

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BRONCHIAL ASTHMA DISCHARGE ORDERS

| | | |
|---|------------------------------|-----------------------------|
| <input type="checkbox"/> Date and Time : | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Home O ² | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | |
| <input type="checkbox"/> Activity : Bed rest <input type="checkbox"/> As Tolerated <input type="checkbox"/> Mobilize <input type="checkbox"/> | | |
| <input type="checkbox"/> Schedule PFTs 4-6 weeks post discharge. | | |
| <input type="checkbox"/> CXR weeks post discharge | | |
| <input type="checkbox"/> | | |
| <input type="checkbox"/> PEFR on discharge : | | |
| <input type="checkbox"/> Follow Up (within 1-2 weeks): | | |
| | Consultant | weeks |
| <input type="checkbox"/> | | |
| <input type="checkbox"/> | | |

| |
|---|
| <input type="checkbox"/> Medications on Discharge |
| 1. |
| 2. |
| 3. |
| 4. |
| 5. |
| 6. |
| 7. |
| 8. |
| 9. |
| 10. |

Physician Name & Signature /Date:

Asthma Follow-Up Form

Name: _____ **Gender/F** _____ **DOB:** _____ **MRN:** _____
Date: _____
PEFR: _____ **FEV1 Pre:** _____ **FVC Pre:** _____ **FEV1 Post:** _____ **%Change:** _____
Partnership Targets achieved: Yes No

| | |
|--|--|
| Have you been taking your medications as prescribed? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Have you needed more reliever medications than usual? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Has your asthma awakened you at night? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Are you participating in your usual physical activities? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Has your peak flow been below your personal best? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Have you needed any urgent medical care? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Please show me how you take your medicine? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| During the last month have you ever stopped your medicine because you were feeling better? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Are you avoiding exposure to risk factors: smoking, animal, drug etc? | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| What concerns might you have about your asthma, medicines, or management plan? | Yes <input type="checkbox"/> No <input type="checkbox"/> |

Note & Signature:

Asthma Medicines Not Registered In Sudan

- 1- Salbutamol I.V 500 mcg/ml.
- 2- Salbutamol infusion preparation 1mg /ml.
- 3- Salbutamol dry powder for inhalation-metered dose inhaler 100mcg/ puff.
- 4- Terbutalin injection.
- 5- Terbutalin Turbuhaler.
- 6- Terbutalin neubalised solution.
- 7- Ipratropium bromide solution for nebuliser 250mcg/5ml -500mcg/5ml.
- 8- Ipratropium bromide 20mcg metered dose inhaler.
- 9- Tiotropium (long acting) inhalation powder hard capsule 18mcg.
- 10- Tiotropium solution for inhalation 205mcg/metered inhalation.

Asthma Medicines Registered In Sudan (2008)

| No | Brand name | Generic Name | Pack Size | Pack Price |
|----|------------------------------------|-----------------------------|--------------|--------------------------------------|
| 1 | Salbocima 4mg tab | Salbutamol sulphate | 20tab | SDG2.1427 |
| 2 | Theo SR 100mgcap | theophlline | 20 cap | s/ 1.05 |
| 3 | Theo SR 200mgcap | theophlline | 10cap | s/1 |
| 4 | Theo SR 300mgcap | theophlline | 10cap | s/ 1.45 |
| 5 | Aironyl 1.5mg/5ml syrup | Terbutaline sulphate | 120mlbott | s/1.6 |
| 6 | Amibutamol2mg/5ml syrup | Salbutamol sulphate | bott | SDG 2.5 |
| 7 | Amibutamol 4mg tab | Salbutamol sulphate | 300tab | SDG 3 |
| 8 | Adelcort 5 mg tab | Prednisolone | 10tab | s/ 0.5 |
| 9 | Syntovent 2.5mgtab | Terbutaline sulphate | 100 tab | s/2.75 |
| 10 | Salamol 100 mcg /dose inh | Salbutamol sulphate | 120Doses can | s/1.62 |
| 11 | Salamol 2mg/5ml syrup | Salbutamol sulphate | bott | GBP 1.15 |
| 12 | Medoline 2mgtab | Salbutamol sulphate | 50&1000 tab | s/24/1000> s1.2/50>sw |
| 13 | Medoline 4mgtab | Salbutamol sulphate | 51&1000 tab | s/28/1000> s1.4/50>sw |
| 14 | Prednisolone 5mg tab | Prednisolone | 100 tab | s/1.11 |
| 15 | Beclomethasone .05mg/dose inh | Beclomethosone | can | s/2.6 |
| 16 | Salbutamol | Salbutamol | can | s/ 1.95 |
| 17 | Theophy-12 200mg tab | Theophlline | 20tab | s/ o.633 |
| 18 | Beclosone 50mcg /dose inh | Beclomethasone dipropionate | can | s/ 2.60 |
| 19 | Ambolar 15 mg/ 5ml syrup | Ambroxol HCL | 100 ml bott | s/1.5 |
| 20 | Aerolin 100mcg /dose inh | Salbutamol sulphate | Can | s/2.65 |
| 21 | Salbutamol sulphate 2mg /5ml syrup | Salbutamol sulphate | Bott | s/1.55 |
| 22 | Salbutamol sulphate 4mgtab | Salbutamol sulphate | 20 tab | s/0.65 |
| 23 | Butalin0.1mg inh | Salbutamol | Bott | s/0.0186/M 1 |
| 24 | Butalin 2mgtab | Salbutamol sulphate | 20&100 tab | s/22.32/1000 tab&s/0.45/2 0tab |
| 25 | Butalin 4mgtab | Salbutamol sulphate | 20 tab | s/0.57 |
| 26 | Prednisolone 5mg tab | Prednisolone | 1000 tab | s/16.82 |
| 27 | Asmalat 2mg/5mg l syurp | Salbutamol sulphate | 150mlbott | s/1033 |
| 28 | Asthalin 100mcg/doseinh | Salbutamol sulphate | Can | s/2021 |
| 29 | Beclate100mcg/doseinh | Beclomethasone dipropionate | Can | s/6 |
| 30 | Serobid 25mcg/dose inh | Salmeterol xinafoate | Can | s/4.3 |
| 31 | Asmanore 2mg/5ml syurp | Salbutamol sulphate | Bott | s/1.65 |
| 32 | Asmanore 4mg tab | Salbutamol sulphate | 30tab | s/1.29 |

| | | | | |
|----|--|---|---------------|-------------------------------|
| 33 | <i>Bricanyl</i> 0.3mg/ml syurp | <i>Terbutaline sulphate</i> | 100 mlbott | s/3 |
| 34 | <i>Oxis</i> 4.5mcg /doseinh | <i>Formoterol fumarate</i> | can | s/10.04 |
| 35 | <i>Oxis</i> 9mcg /doseinh | <i>Formoterol fumarate</i> | can | s/17.3 |
| 36 | <i>Pulmicort</i> tubuhaler 200mcg/dose inh | <i>Budesonide</i> | can | s/13 |
| 37 | <i>Pulmicort</i> tubuhaler 400mcg/dose inh | <i>Budesonide</i> | can | s/14.8 |
| 38 | <i>Symbicort</i> tubuhaler(160mcg+4.5mmcg)ir | <i>Budesonide+Fotmoterol+ fumarate</i> | can | s/16.4/60doses&32.9/120doses |
| 39 | <i>Symbicort</i> tubuhaler(80mcg+4.5mmcg)inl | <i>Budesonide+Fotmoterol+ fumarate</i> | can | s/13.45/60doses&26.9/120doses |
| 40 | <i>Asmadil</i> 2mg/5ml syurp | <i>Salbutamol sulphate</i> | 120mlbott | s/13 |
| 41 | <i>Aminophyline</i> renaudin 250mg/10ml inj | <i>Aminophyline</i> | 100amp | C20.43 |
| 42 | <i>Prdniso</i> 20mg tab | <i>Prednisolone</i> | | |
| 43 | <i>Sultamo</i> 4mg tab | <i>Salbutamol sulphate</i> | Tab | s/0.0285/tab |
| 44 | <i>Derihaler</i> 100mcg /doseinhaler | <i>Salbutamol</i> | Dose | s/0.012 |
| 45 | <i>Flixotide</i> 125mcg/dose evohaler | <i>Fluticasone Propionate</i> | Can | C7.43/60doses&c14/120doses |
| 46 | <i>Flixotide</i> 250mcg/dose evohaler | <i>Fluticasone Propionate</i> | Can | C14.85/60doses&c26.4/120doses |
| 47 | <i>Flixotide</i> 50mcg/dose evohaler | <i>Fluticasone Propionate</i> | Can | C3.74/60doses &c7.05/120doses |
| 48 | <i>Seretide</i> (50mcg+100mcg)dose inh | <i>Salmeterol xinafoate+ Fluticasone Propionate</i> | 60dose diskus | C10 |
| 49 | <i>Seretide</i> (50mcg+250mcg)dose inh | <i>Salmeterol xinafoate+ Fluticasone Propionate</i> | 60dose diskus | C13 |
| 50 | <i>Serevent</i> 25mcg/dose evohaler | <i>Salmeterol xinafoate</i> | 60dose can | C9.64 |
| 51 | <i>Ventolin</i> 100mcg/dose evohaler | <i>Salmetero sulphate</i> | 200dose can | C2.94 |
| 52 | <i>Ventolin</i> 2mg //5mlsyurp | <i>Salmetero sulphate</i> | 20ml bott | C1.44 |
| 53 | <i>Ventolin</i> 5mg /ml sol for inh | <i>Salmetero sulphate</i> | | |
| 54 | <i>Bisolvon</i> 2mg/ml oral drops | <i>BromhexineHCl</i> | bott | C1.56 |
| 55 | <i>Bisolvon</i> 8mg tab | <i>BromhexineHC</i> | 20 tab | C1.58 |
| 56 | <i>Combivent</i> (120mcg+21mcg)dose inh | <i>Salmetero sulphate+lpratropiumbrom</i> | 10ml can | C6.8 |
| 57 | <i>Wafamol</i> 4mg tab | <i>Salmetero sulphate</i> | 1000 tab | SDG85 |
| 58 | <i>Minophyline</i> CR300mg tab | <i>Theophlline</i> | 30tab | s/1.5 |
| 59 | <i>Salbovent</i> 2mg/5ml syuep | <i>Salmetero sulphate</i> | 120ml bott | s/0.605 |
| 60 | <i>Formonide</i> | <i>Budesonide + formetrol</i> | 200m | s/5.5 |

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