SULTANATE OF OMAN

OMAN RESPIRATORY SOCIETY & OMAN FAMCO SOCIETY

In association with

MINISTRY OF HEALTH

GUIDELINES FOR THE MANAGEMENT OF ASTHMA

SECOND EDITION

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PREFACE

Despite the advances in understanding asthma pathophysiology and the availability of effective treatment, asthma remains a major burden worldwide to individuals, communities and health systems.

This is the second edition of the national asthma guidelines, covering adults and children. In addition it includes "Educational" and "Special Considerations" sections to assist health care providers in the management of asthma.

The first guideline was produced by the Ministry of Health in 1998. The current guideline is a combined effort by Oman Respiratory Society and Oman FAMCO Society.

We hope that all concerned will implement these guidelines to achieve better asthma control.

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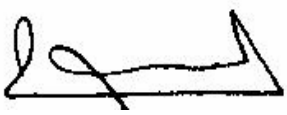
PREFACE

Asthma is a major cause of chronic morbidity throughout the world and there is evidence that its prevalence has increased considerably over the past few decades, especially in children. It is a disorder that affects physical, physiological, psychological and socioeconomic functions. Because of the social disabilities that relate both directly and indirectly to the persons affected, improving health status and thereby improving quality of life are the principle goals in asthma care.

Asthma can be controlled through appropriate prevention and management strategies. This manual outlines the principles and policies of the Ministry of Health in providing asthma care services at all levels of health care.

The aim of this guideline is to provide the approaches and techniques in early detection and diagnosis and to standardize the treatment patterns among all the health care providers.

Ministry of Health strongly endorses and hereby adopts these management guidelines. In recognition to the great efforts done, The Ministry would like to express its appreciation and gratitude to Oman Respiratory Society and Oman FAMCO Society for their initiative in updating the guideline.



Dr. Ahmed bin Mohammed Al-Saidi

The Undersecretary of Health Affairs

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ABBREVIATION LIST

Abbreviation	Terminology
AIA	Aspirin-Induced Asthma
A&E	Accident and Emergency
BPD	Bronchopulmonary Dysplasia
CO_2	Carbon Dioxide
COPD	Chronic Obstructive Pulmonary Disease
COX-1	Cyclooxygenase-1
ED	Emergency Department
EIA	Exercise-Induced Asthma
FEV1	Forced Expiratory Volume In One Second
FVC	Forced Vital Capacity
FAMCO	Family and Community Medicine
FM & PH	Family Medicine And Public Health
GERD	Gastro Esophageal Reflux
GINA	The Global Initiative For Asthma
H	Hour
HD	High Dependency
ICS	Inhaled Corticosteroids
ICU	Intensive Care Unit
IgE	Immunoglobulin E
INH	Inhalation
IV	Intra-Venous
LABA	Long Acting β_2 Agonist
Max	Maximum
Min	Minute
NSAIDs	Non Steroidal Anti-Inflammatory Drugs
PaCO2	Partial Pressure of Carbon Dioxide
PEF	Peak Expiratory Flow
PEFM	Peak Expiratory Flow Meter
PHC	Primary Health Care
PICU	Pediatric Intensive Care Unit
Pred	Predicted
PRN	When Needed
SABA	Short Acting β_2 . Agonists
SaO2	Oxygen Saturation
SQU	Sultan Qaboos University
SQUH	Sultan Qaboos University Hospital
VCD	Vocal Cord Dysfunction

INTRODUCTION

Asthma and other allergies are common chronic conditions with very high socioeconomic burden in all societies. It is estimated that asthma affects more than 300 million people worldwide and it causes approximately 240,000 deaths per year. In Oman the prevalence of asthma in children and adolescents is not only high (10% in young children and 20% in adolescents), but also is associated with severe symptoms. Although, there are no data on the prevalence of asthma in adults, its burden on patients and the society is likely to be high. Based on the findings in children, asthma is under-diagnosed, and under-treated in Oman.

Inadequate control of asthma continues to be a serious problem all over the world despite advances in understanding the inflammatory basis of asthma and well established disease management guidelines. Patients with inadequately controlled asthma are at a high risk of serious morbidity and mortality with consequent high economic cost to the population.

Primary care physicians are the main care providers for asthma patients and they can achieve complete control of asthma in the majority of their patients. However, this requires knowledge and understanding of asthma and its risk factors as well as adherence to the best practice management guidelines

PART ONE
ASTHMA MANAGEMENT IN ADULTS

1. Definition of 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 airway 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 widespread, but variable, airflow obstruction within the lung that is often reversible either spontaneously or with treatment". *(GINA 2007)*

2. When to Suspect Asthma

Breathlessness may be due to pulmonary, cardiac, hematological, metabolic or to diseases of other organs. The presence of multiple key indicators increases the probability of asthma, but Spirometry is needed to establish a diagnosis. The following factors help in differentiating asthma from other conditions:

- **Wheezing:** (A lack of wheezing and a normal chest examination do not exclude asthma)
- **History of any of the following:**
  - Cough (worse particularly at night)
  - Recurrent wheeze
  - Recurrent difficulty in breathing
  - Recurrent chest tightness
- **Symptoms occur or worsen in the presence of:**
  - Exercise
  - Viral infection
  - Inhalant allergens (e.g. animal fur or hair, house-dust mites, molds, pollen)
  - Irritants (tobacco or wood smoke, airborne chemicals)
  - Changes in weather
  - Strong emotional expression (laughing or crying hard)
  - Stress
  - Menstrual cycles
- **Symptoms occur or worsen at night, awakening the patient from sleep**

3. Medical History:

A detailed history of symptoms, aggravating factors, environmental factors, presence of the illness in the family, social aspects and patterns of exacerbation has to be taken during the first few visits. The impact of the disease on the person and the family and their perception of the disease are often needed in order to plan a proper treatment strategy.

a. Symptoms

— Coughing, Wheezing, Shortness of breath, Chest tightness and Sputum production

b. Pattern of Symptoms

— Perennial, seasonal, or both

— Continuous, episodic, or both

— Onset, duration, frequency, (number of days or nights per week or months)

— Diurnal variations, especially nocturnal and early morning

c. Precipitating and/or Aggravating Factors

— Viral respiratory infections

— Environmental allergens, indoor (e.g. mold, house-dust mite, cockroach, animal dander or secretory products) and outdoor (e.g. pollen)

— Characteristics of home including age, location, cooling and heating system, wood-burning stove (Barbecue)

— Humidifiers, carpeting over concrete, presence of molds or mildew, presence of pets with fur or hair, characteristics of rooms where patient spends time (e.g. bedroom and living room with attention to bedding, floor covering, stuffed furniture)

— Smoking (patient and others at home or work)

— Exercise

— Environmental changes (e.g. moving to new home; going on vacation; and/or alterations in workplace, work processes, or materials used)

— Irritants (e.g. tobacco smoke, strong odors, air pollutants)

— Occupational chemicals, dusts and particulates, vapors, gases, and aerosols

— Emotions (e.g. stress, crying or laughing hard, fear, anger, frustration)

— Incense**,** perfume and *bukhoor*

— Drugs (e.g. aspirin and other nonsteroidal anti-inflammatory drugs, beta-blockers including eye drops)

— Food, food additives and preservatives (e.g. sulfites)

— Changes in weather, or exposure to cold air

- Endocrine factors (e.g. menses, pregnancy, thyroid disease)
- Comorbid conditions (e.g. sinusitis, rhinitis, gastroesophageal reflux disease - GERD)

d. Family History

- History of asthma, allergy, sinusitis, rhinitis, eczema, or nasal polyps in close relatives

e. Disease Development and Treatment

- Age of onset and diagnosis
- History of early-life injury to the airway (e.g. parental smoking, bronchopulmonary dysplasia, pneumonia)
- Progression of the disease (better or worse)
- Current treatment and response, including plans for the management of exacerbations
- Frequency of short acting β2-agonist use
- The need for oral corticosteroid and frequency of use

f. Social History

- Daycare, workplace and school characteristics that interfere with adherence to treatment
- Social factors that interfere with adherence, such as substance abuse
- Social support/social network
- Level of education
- Work / job

g. History of Exacerbations

- Usual prodromal signs and symptoms
- Rapidity of onset
- Duration
- Number and severity of exacerbations in the past years
- Life-threatening exacerbations (e.g. intubation, intensive care unit admission)
- Usual patterns and management

h. Perception of the Disease

- Patient's perception and beliefs regarding use and long term effects of medications
- Family knowledge and beliefs of asthma

i. Impact of Asthma on Patient and Family

- Episodes of unscheduled care (emergency department (ED), urgent care, hospitalization)
- Number of days missed from school/work
- Limitation of activity, especially sports and strenuous work
- History of nocturnal awakening
- Effect on growth, development, behavior, school or work performance, and lifestyle
- Impact on family routines, activities, or dynamics
- Economic impact

4. Examination

- Height and weight (assessment of growth), nose, throat and paranasal sinuses (nasal polyps may be associated with asthma)
- Features of atopy
- A good general examination and recording of the vital signs including the respiratory rate
- Auscultation of the chest can be normal or one can hear a prolonged expiratory phase or diffuse wheezing

5. Investigations:

The medical history and physical examination are not always reliable in excluding other diagnoses or in assessing the lung status.

a. Peak Expiratory Flow (PEF)

Peak flow measurement is effort dependant and requires patient understanding. In certain patients measuring PEF prior to and after a bronchodilator or an exercise challenge may help in confirming the diagnosis.

Measurement of PEF variability by comparing the morning and evening PEF over a period of 2 weeks is also helpful. Variability over 20% supports the diagnosis. It is calculated as follows:

$$\text{Mean peak flow variability \%} = \frac{\text{(highest - lowest)}}{\text{highest}} \times 100$$

b. Spirometry:

Spirometry is generally recommended, rather than measurements by a peak flow meter, due to wide variability in peak flow rate and reference values. The absence of airway obstruction does not rule out asthma, especially if the patient is not symptomatic at the time of testing, since airflow obstruction in asthma is, by definition, intermittent (Table1).

Table 1: Interpreting Spirometry

Diagnosis	FEV_1	FVC	FEV_1/FVC%
Obstructive disease	Decreased	Normal or Decreased	Decreased
Restrictive disease	Decreased or normal	Decreased	Normal or increased
Reversible airway obstruction	Increase of >12 % of the base line value after administration of bronchodilator		
FEV_1 = Forced Expiratory Volume in One Second ,FVC = Forced Vital Capacity , FEV_1/ FVC% = FEV_1 as Percentage of FVC			

c. Additional Tests:

Additional pulmonary function studies like diffusing capacity, lung volumes or bronchial challenges studies may be needed to complete the evaluation. Other tests, which are routinely not necessary but may be useful, are:

- Chest X - Ray
- Absolute eosinophil count
- IgE
- Exhaled Nitric oxide
- Sputum eosinophils

6. Differential Diagnoses:

Not all patients who wheeze have asthma.

Diagnosis has to be reassessed if the patient is not responding to conventional treatment. Some of the alternate diagnoses to be considered are:

- Chronic obstructive pulmonary disease (COPD)
- Aspiration
- Mechanical obstruction of the airways (benign or malignant tumors)
- Pulmonary infiltration with eosinophils
- Congestive heart failure
- Pulmonary embolism
- Cough secondary to drugs (e.g. angiotensin-converting enzyme inhibitors, and beta blockers)
- Foreign body in trachea or bronchus
- Vocal cord dysfunction (VCD)
- Vascular rings or laryngeal webs

1. ASSESSING SEVERITY

Classification of asthma by severity based on the level of symptoms, airflow limitation, and lung function is useful when decisions are being made about management at the initial assessment of a patient

A. Intermittent Asthma:

a. Clinical Features:

- Intermittent symptoms less than once a week
- Nocturnal symptoms not more than 2 times a month
- Asymptomatic in between attacks

b. Peak flow measurement:

- FEV1 or PEF ≥ 80% predicted
- FEV1 or PEF variability < 20%

B. Mild Persistent Asthma:

a. Clinical Features:

- Mild, brief symptoms, more than once per week, but less than once a day
- Nocturnal symptoms more than twice a month
- Asymptomatic between exacerbations
- Exacerbations may affect activity and sleep

b. Peak Flow Measurement:

- FEV1or PEF ≥ 80% predicted
- FEV1or PEF variability < 20-30%

C. Moderate Persistent Asthma:

a. Clinical Features:

- Symptoms daily
- Exacerbations may affect activity and sleep
- Nocturnal asthma symptoms more than once a week
- Daily use of inhaled β2-agonist

b. Peak Flow Measurement:

- FEV1or PEF 60-80% predicted
- FEV1or PEF variability > 30%

D. Severe Persistent Asthma

a. Clinical Features:

- Frequent exacerbations
- Daily symptoms
- Frequent nocturnal symptoms
- Limited physical activities

b. Peak Flow Measurement:

- FEV1or PEF ≤ 60% predicted
- FEV1or PEF variability >30%

2. ASSESSING CONTROL

Asthma severity can change over time or with treatment. The classification of asthma severity based on the level of control achieved with treatment is the best way to take ongoing treatment decisions. Table 2 lists the characteristics of Controlled, Partly controlled and Uncontrolled asthma. Asthma control can also be assessed by using a validated questionnaire like Asthma Control Test (Appendix 1)

Table 2: Levels of Asthma Control

Characteristics	Controlled	Partly controlled	Uncontrolled
Day time symptoms	None or ≤ 2 times/week	> 2 times /week	≥ 3 features of partly controlled asthma present in any week
Activity limitation	None	Any	
Night symptoms	None	Any	
Salbutamol use	None or ≤ 2 times/week	> 2 times / week	
PEF or FEV1	Normal	< 80 %	
Exacerbations	None	≥1/ year	One in any week

The aim of treatment is to achieve complete control of asthma symptoms and maintain it for prolonged periods. Over a period of time the lowest dose and the amount of medications have to be identified to keep the patient symptom free.

1. TREATMENT STEPS

The principle of step wise approach to treatment is to increase the dose, the frequency or the number of medications if needed or to decrease the same when possible to achieve and maintain control (Figure1).

- During each visit the patient's present treatment, compliance, inhaler technique and the level of asthma control achieved with current treatment should be assessed
- If not controlled go to the next higher step as discussed below
- If partly controlled, weigh the risk and benefit of further treatment option and how far control can be achieved in a particular patient
- If adequate control is achieved and maintained for 3 months, bring down the treatment to the next level
- For very mild intermittent asthma one can begin with **Step 1**
- Patients with persistent symptoms may need **Step 2** care to begin with
- More severe symptoms may need **Step 3 or Step 4** medications initially

STEP 1: AS NEEDED RELIEVER MEDICATIONS

This treatment is useful for patients with very mild symptoms like cough or wheezing of short duration occurring twice or less per week. This step is also recommended as the initial treatment option for patients with bronchospasm on exercise

Recommended: A short-acting inhaled β2 agonist (e.g. Salbutamol inhaler) as required

STEP 2: RELIEVER MEDICATION PLUS A SINGLE CONTROLLER

A reliever medication (e.g. Salbutamol) should be used as required

Recommended: A low-dose inhaled corticosteroid is recommended as the initial controller treatment for asthma patients (dose schedule of inhaled corticosteroid is given in Table 3).

Alternative: Oral leukotriene modifiers (e.g. Montelukast 10mg daily) can be advised especially in patients refusing or unable to use inhaled corticosteroid or when they experience local side effects.

STEP 3: RELIEVER MEDICATION PLUS ONE OR TWO CONTROLLERS

A reliever medication (e.g. Salbutamol) should be used as required

Recommended: A low-dose inhaled corticosteroid with an inhaled long acting β2-agonist is recommended either in a combination inhaler device or as separate components (dose schedule of inhaled corticosteroid is given in Table 3).

Alternative: Increase to medium dose inhaled corticosteroid (dose schedule of inhaled corticosteroid is given in (Table 3). If this dose is given as an inhaler, the use of a spacer device is recommended.

Others: Combine low-dose inhaled corticosteroid with oral leukotriene modifiers (e.g. Montelukast 10mg daily) or a sustained release Theophylline.

STEP 4: RELIEVER MEDICATION PLUS TWO OR MORE CONTROLLERS

A reliever medication (e.g. Salbutamol) should be used as required

Recommended: A medium or high dose inhaled corticosteroid with an inhaled long acting β2 agonist (LABA) is recommended either in a combination inhaler device or as separate components (dose schedule of inhaled corticosteroid is given in Table 3).

Alternative: Add a third controller, oral leukotriene modifiers (e.g. Montelukast 10mg daily) or a sustained release Theophylline to the medium or high dose inhaled corticosteroid with the inhaled long acting β2 agonist.

STEP 5: RELIEVER MEDICATION PLUS ADDITIONAL CONTROLLERS

This is recommended only when all the measures like environmental control, treatment of precipitating problems like post nasal drip, gastro esophageal reflux …etc fail and the diagnosis of asthma is properly established.

A reliever medication (e.g. Salbutamol) should be used as required

Recommended: Addition of oral corticosteroid to the combination of the high dose inhaled corticosteroid, inhaled long acting β2-agonist and leukotriene modifiers (e.g. Montelukast 10mg) or a sustained release Theophylline is recommended when asthma remains totally uncontrolled.

Alternative: Addition of anti-IgE treatment to other controller medications has been found to be of use in allergic asthma when oral corticosteroid fails. Anti-IgE treatment is better reserved for specialists in the referral centers and should not be considered by practitioners in general clinics.

Table 3: Equipotent Daily Doses of Inhaled Corticosteroid for Adults

Drug	Low Daily Dose	Medium Daily Dose	High daily Dose
Beclomethasone	200 - 500µg	>500 -1000µg	> 1000 - 2000µg
Budesonide	200 - 400µg	> 400 - 800µg	> 800 - 1600µg
Fluticasone	100 - 250µg	>250 - 500µg	> 500 - 1000µg

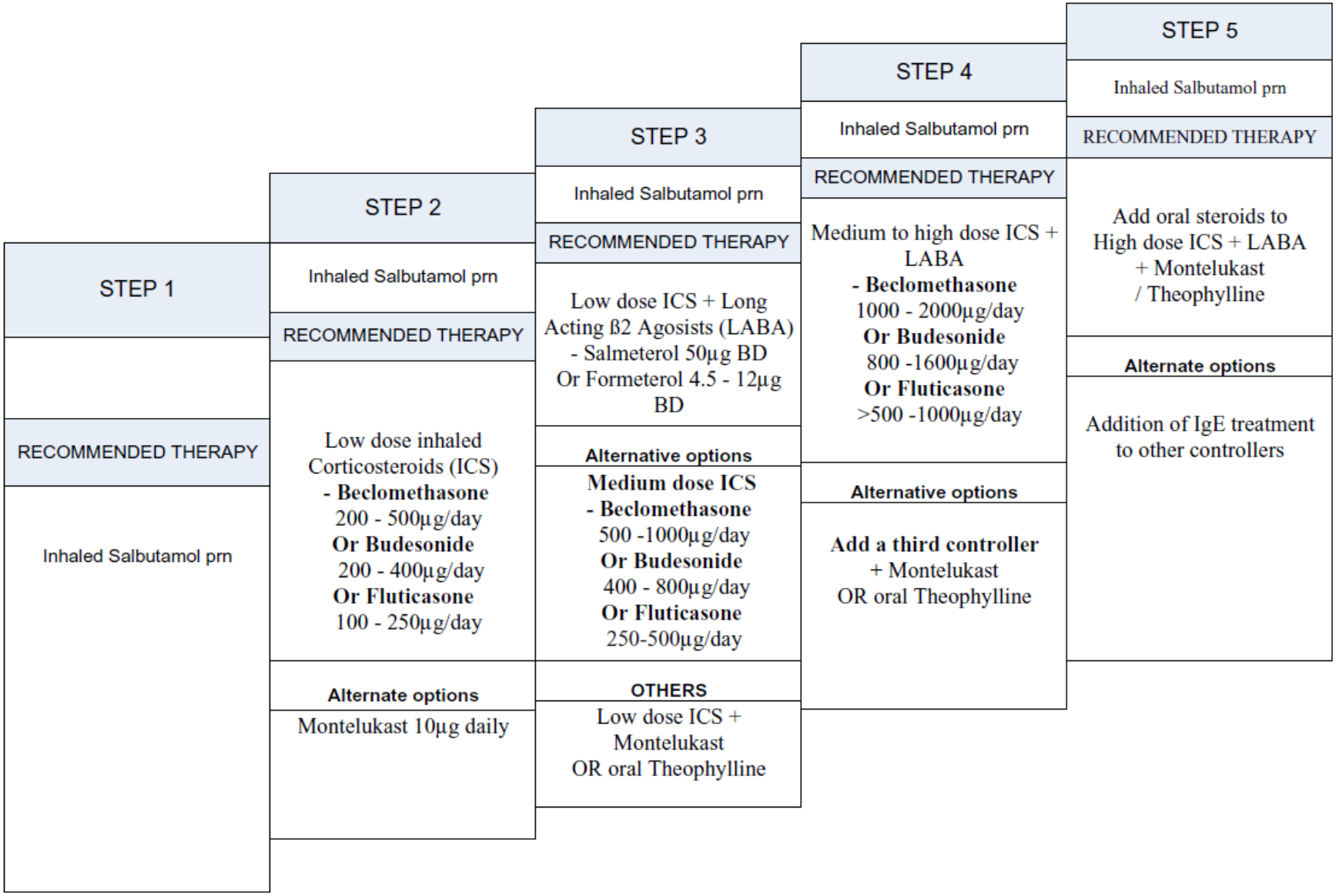
2. STEPPING DOWN

- Improvement may be noticed within days of starting controller medications. But the full benefit may be seen only after 3 to 4 months
- Once the physician is satisfied on the control obtained, stepping down the treatment can be planned after discussing with the patient. The preferred options are as follows:

Table 4: Stepping Down Options

CURRENT TREATMENT	STEPPING DOWN PLAN
Medium- high dose inhaled steroids	50% reduction in dose
Inhaled steroids + LABA	50% reduction in dose of inhaled steroids while continuing LABA. Further reduction to reach low dose and then to discontinue LABA OR Discontinue LABA while continuing high dose inhaled steroids
Low dose inhaled steroids	Switch to once daily dosing
Once daily low dose inhaled steroids	Controller treatment may be stopped if asthma remains controlled on a low dose of controller and there were no recurrences for one year

FIGURE 1: STEP UP CARE OF ASTHMA IN ADULTS



1. ASSESSMENT

Exacerbations of asthma are episodes of progressive increase in shortness of breath, coughing, wheezing, chest tightness or a combination of these symptoms. Severe exacerbations are potentially life threatening and so have to be identified early and closely observed. The aim of treatment is to relieve the airway obstruction, correct the hypoxia and prevent further worsening.

- Treatment is to be initiated as soon as an asthma attack is recognised, even before completing a full history or physical examination
- The history should include disease severity, duration of symptoms, current medications, the doses taken after the exacerbations, the response to the treatment and the risk factors for asthma related deaths (Table 5)
- The focus of evaluation should be on determining the severity of the attack (Table 6), identifying the precipitating factors and considering an alternate diagnosis
- Physical examination should start with a rapid evaluation of the patient's general appearance including anxiety level, mental status and the level of respiratory distress. Altered mental status, severely laboured breathing and accessory muscle use are signs of an impending respiratory failure
- PEF should be measured in all patients

Table 5: Factors Influencing the Development of Near Fatal or Fatal Asthma

Disease related	Psychosocial factors
Previous near fatal asthma (ICU admissions)	Non-compliance with treatment
Previous asthma admissions	Failure to attend appointments
Requiring ≥3 classes of asthma medications	Self-discharge from hospital
Recent heavy use of Salbutamol	Psychosis, depression
Repeated attendances at A&E	Alcohol or drug abuse
	Social, employment, income problems

Table 6: Levels of Severity of Asthma Exacerbations

	MILD	MODERATE	SEVERE
Breathlessness	While walking Can lie down	While talking Prefers sitting	While at rest Hunched forward
Talks in	Sentences	Phrases	Words
Alertness	May be agitated	Usually agitated	Usually agitated
Respiratory rate	Increased	Increased	Often >30/minute
Accessory muscles use	Usually not	Usually	Usually
Wheeze	Moderate often end expiratory only	Loud	Loud
Pulse rate (/ minute)	< 100	100 -120	>120
PEF	> 80%	60 - 80%	< 60%
SaO_2 (room air)	> 95%	91- 95%	< 91%

Life Threatening Asthma

Drowsiness or confusion, cyanosis feeble respiration, bradycardia, hypotension inaudiable breath sounds (silent chest), paradoxical thoracoabdominal movement and a PEF <33% all indicates a life threatening attack. $PaCO_2$ is usually low in acute severe asthma due to CO_2 washout, so a normal $PaCO_2$ or a raised $PaCO_2$ indicates severity.

2. TREATMENT

- Put the patient in a comfortable sitting position, legs down if possible, so that he/she can bend forward if needed and have support for the hands and legs
- The patient should not be left alone until the condition has clearly improved.

a. Oxygen

- Correct hypoxia urgently using high concentrations of oxygen to maintain SaO2 around 92% at least
- Oxygen driven nebulizers preferred to air driven

b. Nebulized Salbutamol

- Repeated doses:
- 2.5 to 5 mg every 20 minutes x 3 doses
- Then 2.5 to 10 mg every 1 to 4 hours (depends on the response)

c. Nebulized Ipratropium Bromide

- 0.5mg every 20 minutes x 3 doses, then 0.5mg every 6 hours
- Combining nebulized Ipratropium with β2-agonist produce significantly greater bronchodilatation than β2-agonist alone

d. Corticosteroids

- IV Hydrocortisone 100mg immediately and then every 6 hours
  OR IV Methyl prednisolone 125mg immediately and 60mg every 8 hours
- Should be changed to oral prednisolone once the patient improves

e. Magnesium Sulphate

- Only in hospital where monitoring facilities are available
- Single dose of 1.2 to 2 grams as IV infusion over 20 minutes
- Contra indicated in renal insufficiency
- Acts by blocking calcium influx thus preventing bronchoconstriction

f. Others

- Antibiotics: not routinely required
- IV Fluids may be needed for some patients
- Cough syrup: No definite role in the management of an exacerbation
- Aminophylline is not recommended for regular use

3. ADMISSION TO INTENSIVE CARE UNIT (ICU)

In certain situations (see below), the patient should be admitted to the ICU for close observation and monitoring.

- Rapidly worsening asthma or a lack of response to the initial therapy in the emergency department
- If patients have confusion, drowsiness, signs of impeding respiratory arrest, or loss of consciousness
- Impending respiratory arrest, as indicated by hypoxemia (PO_2 < 60mmHg) despite supplemental oxygen and/or hypercarbia (PCO_2 > 45mmHg)
- If intubation is required because of the continued deterioration of the patient's condition despite optimal treatment

4. DISCHARGE

Acute asthma relapse after discharge needs to be prevented. Many patients with asthma have contact with the health care only during exacerbations. So on discharge the attending doctor has to ensure the following:

- Review within 48 hours in the primary health care centre for patients discharged from Emergency department
- Monitor symptoms and PEF
- Check inhaler technique
- Provide written asthma action plan
- Modify treatment according to guidelines for chronic persistent asthma (ICS, inhaled LABA)
- Address factors that could have contributed to the present admission

5. MANAGEMENT OF EXACERBATIONS

MILD SYMPTOMS

- Oxygen + Nebulized Salbutamol every 20 minutes+ Prednisolone 40mg stat
- REASSESS AFTER ONE HOUR (Physical examination, PEF, SaO_2)
- Improved: Discharge on a five to seven day course of oral prednisolone, and their regular preventer and controller inhalers

MODERATE SYMPTOMS

- Oxygen + Nebulized Salbutamol + Nebulized Ipratropium bromide every 20 minutes + Hydrocortisone 100mg IV
- REASSESS AFTER ONE HOUR (Physical examination, PEF, SaO_2)
    - Improved: Continue nebulised Salbutamol every 30 minutes or one hour and reassess after three hours
    - If not improving: Give IV Magnesium Sulphate and continue as above
- Improved- Reassess and consider discharge
- Not improving- admit for continuation of treatment

SEVERE SYMPTOMS

- Oxygen + Nebulized Salbutamol + Nebulized Ipratropium bromide every 20 minutes + Hydrocortisone 100mg IV
- If not improving give IV Magnesium Sulphate
- CONTINUOUS ASSESSMENT
    - Improved: Admit for continuation of treatment
    - If not improving: Admit to ICU for further treatment

1. INTRODUCTION

Proper management of asthma starts from the primary health care (PHC). PHC physicians should manage intermittent, mild persistent and moderate persistent asthmatics requiring PRN short acting β2 agonist, inhaled steroids and long acting β2 agonist.

2. DIAGNOSIS:

- Detailed history should include allergy, drugs, occupational, environmental and family history
- Full physical examination should include sinuses, nose, throat, skin and respiratory system

3. INVESTIGATIONS:

- Peak expiratory flow measurement before and after inhaled short acting β2 agonist should be performed
- Complete Blood Count
- Chest X - Ray
- Spirometry

4. MANAGEMENT:

- Assess severity
- Assess control
- Manage as outlined in Section 4
- Check inhaler technique
- Educate the patient and the family

5. FOLLOW UP:

- Periodic follow up, at least 4-6 times a year should be arranged at the Primary Care Centre
- Inhaler technique (Appendix 6), Peak expiratory flow (Appendix 8) and Compliance should be checked at each visit

6. WHEN TO REFER TO SPECIALIST CLINIC

Consider referral to specialist if:

- Signs and symptoms are atypical
- Diagnosis is uncertain
- The patient is not responding to therapy
- The patient developed side effects from medications
- The patient requires frequent courses of oral corticosteroid
- The patient has occupational asthma
- Abnormal lung function persists when the symptoms are apparently controlled
- Achieving control is difficult
- Necessary asthma medications or spacer devices are unavailable
- Additional testing is indicated

7. WHEN TO REFER ASTHMA EXACERBATION TO SECONDARY CARE

- Patients with severe or life threatening asthma exacerbation
- Persistent severe dyspnoea despite short acting β2 agonist given repeatedly 2-3 times at 20-30 minutes intervals
- The symptoms worsen while on management
- Frequent or persistent exacerbations
- Lack of family monitoring and social support at home
- Patients from far away places, who have minimum access to health centers

1. EXERCISE-INDUCED ASTHMA (EIA):

- EIA is a problem among active children, adolescents, and young adults
- A history of wheezing, fatigue or poor performance on exercise may be the presentation. Physical examination at the time of symptoms may be helpful. Pulmonary function or exercise test may be needed often
- Patient should be advised to avoid exercise in cold weather, in places when pollen or air pollution levels are high and to do proper warm-ups before vigorous exercise
- Taking short acting β2 agonist 20-30 minutes before exercise is recommended
- Leukotriene modifiers should be considered in the management of EIA

2. PREGNANCY

- In approximately one-third of women asthma becomes worse; in one-third asthma becomes less severe; and in the remaining one-third it remains unchanged during pregnancy
- Poorly controlled asthma can have an adverse effect on the fetus, resulting in increased perinatal mortality, increased prematurity, and low birth weight
- There is no evidence to suggest an increased risk to the fetus for most medications used to treatment of asthma
- Inhaled corticosteroids, β2 agonists, leukotriene modifiers (e.g. Montelukast) and appropriately monitored use of Theophylline are completely safe in pregnancy
- As in other situations, the focus of asthma treatment must remain on control of symptoms and maintenance of normal lung function
- Acute exacerbations should be treated aggressively in order to avoid fetal hypoxia. Treatment should include nebulized β2 agonists and oxygen. Systemic corticosteroid should be instituted when necessary
- Pregnant patients with asthma should be advised that the greater risk to their baby lies with poorly controlled asthma, and all the present drugs are safe in pregnancy

3. RESPIRATORY INFECTIONS

- Respiratory infections have an important relationship to asthma as they provoke wheezing and increased symptoms in many patients. Microorganisms associated with increased asthma symptoms are often respiratory viruses
- Treatment of an infectious exacerbation follows the same principles as treatment of other asthma exacerbations. Because increased asthma symptoms can often persist for weeks after the infection is cleared, anti-inflammatory treatment should be continued

4. SURGERY

- Airway hyperresponsiveness, airflow limitation, and mucus hypersecretion predispose patients with asthma to intraoperative and postoperative respiratory complications
- The likelihood of these complications depends on the severity of asthma at the time of surgery and the type of surgery
- Pulmonary function should be measured. If the patients FEV1 is less than 80% of personal best, a brief course of oral corticosteroid should be considered
- Patients who have received systemic corticosteroid within the past 6 months should have systemic coverage during the surgical period (100mg hydrocortisone every 8 hours intravenously). This should be rapidly reduced 24 hours following surgery, as prolonged systemic corticosteroid therapy may inhibit wound healing

5. RHINITIS/SINUSITIS/NASAL POLYPS

- Many patients with asthma have a history of rhinitis and up to 30% of patients with persistent rhinitis have or develop asthma
- Treatment of Rhinitis may improve asthma symptoms. Intra-nasal corticosteroid as well as leukotriene modifiers, anticholinergics, allergen-specific immunotherapy, and anti-IgE therapy can be effective in both conditions
- Sinusitis is a complication of upper respiratory infections, allergic rhinitis, nasal polyps, and other forms of nasal obstruction. Both acute and chronic sinusitis can worsen asthma. Treatment should include topical nasal decongestants or topical nasal or even systemic corticosteroid and a 10 day course of antibiotics
- Nasal polyps associated with asthma and rhinitis, and sometimes with aspirin hypersensitivity, are seen primarily in patients over 40 years old. Nasal polyps are quite responsive to topical corticosteroid. A limited number of patients with corticosteroid-refractory polyps may benefit from surgery

6. OCCUPATIONAL ASTHMA

- Once a diagnosis of occupational asthma is established, complete avoidance of the relevant exposure is advisable
- Occupational asthma may persist for several years after removal from exposure to the causative agent, especially when the patient has had symptoms for a long time before cessation of exposure
- Pharmacologic therapy for occupational asthma is identical to therapy for other forms of asthma, but it is not a substitute for adequate avoidance

7. GASTROESOPHAGEAL REFLUX

- The relationship of increased asthma symptoms, particularly at night, to gastroesophageal reflux remains uncertain
- A diagnosis of gastroesophageal reflux in patients with asthma can best be made by simultaneously monitoring esophageal pH and lung function
- Medical management should be given for the relief of reflux symptoms as it is often effective. Patients may be advised to eat smaller, more frequent meals; avoid food or drink between meals and especially at bedtime; avoid fatty meals, alcohol and Theophylline

8. ASPIRIN-INDUCED ASTHMA (AIA)

- Up to 28% of adults with asthma, but rarely children, suffer from asthma exacerbations in response to aspirin and other non steroidal anti-inflammatory drugs (NSAIDs)
- The majority of patients first experience symptoms, which may include vasomotor rhinitis and profuse rhinorrhea, during the third to fourth decade of life. Asthma and hypersensitivity to aspirin often develop subsequently
- Patients with AIA should avoid aspirin, products containing it, other analgesics that inhibit cyclooxygenase-1 (COX-1). Where an NSAID is indicated, a COX-2 inhibitor may be considered with appropriate physician supervision and observation for at least one hour after administration

1. MANAGING ASTHMA DURING TRAVEL AND HOLIDAYS

- Advise the patient to consult their doctor before they travel
- Give a list of medications and explain the role of each
- Provide them with an Asthma Action Plan (Appendix 3 & Appendix 4)
- Advise them to take enough medications to last the whole trip
- Remind them to continue all medications especially preventers

2. PEAK EXPIRATORY FLOW METER (PEFM)

PEF is the fastest rate at which air can move through the airways during a forced expiration starting with fully inflated lungs, measured by a device called Peak Flow Meter.

- Can be used not only in hospital and clinic settings but also in home and office to help assess asthma severity, and evaluate response to therapy
- Can serve as early warning systems because a change in measurement from a patient's normal can signal trouble sufficiently early to take action to prevent an attack
- Healthy persons have good PEF but it gets reduced in presence of asthma and the reduction is proportional to the severity of asthma
- PEF is assessed by comparing it with the patients' personal best or with the predicted PEF value (Appendix 8)
- The predicted values are provided with all peak flow meters and are adjusted for height, race, sex, and age
- Personal Best Value**:** is the highest peak flow rate measured during a 2 week period when asthma is under control, or the highest reading of PEF in a year period (Appendix 9)
- Asthmatic patient should be trained on how to use PEFM, instructed how to find personal best and how to use the PEF reading (Appendix 7)
- PEF measurement should be performed at each visit and recorded for comparison during follows up visits

3. ASTHMA ACTION PLAN

An asthma action plan is a written plan developed by doctors, health educator or specialized nurses to help patients in the management of asthma episodes. It is a customized plan that tells the patient what to do based on changes of symptoms and peak flow readings.

A simple, easy-to-use asthma action plan uses the traffic light analogy as it relates to symptoms and daily peak flow monitoring. The green zone is "go" the yellow zone is "caution" and the red zone is "danger" (Appendices 3 & 4). Any asthma action plan should include at least the following information:

- A list of peak flow meter readings and zones based on personal best
- A list of routine symptoms such as coughing, wheezing, tightness in the chest, shortness of breath, and excess mucus production, and what they should do if these symptoms occur
- The name and dose of the preventer medication, the name and dose of the reliever medication
- Emergency telephone numbers and locations of emergency care
- Instructions about when to contact the doctor, and when to go directly to the hospital or health center for emergency

4. SPECIAL INSTRUCTIONS

- To select the best inhaler device for the patient, first evaluate his/her cognitive, inhalation, physical and visual abilities. Check selection criteria for inhaler devices (Appendix 5)
- When carer availability is essential in the management, make sure that they understand their role fully, and provide them with all necessary information
- To prevent inhaled corticosteroids and propellant side effects, advise the patient to gargle with tap water immediately after taking the inhaled medication and to use a large volume spacer
- Instruct patient how to clean and take care of their spacer devices
- Advise patient to keep all inhaled medications at room temperature
- Provide patients with a list of the names, dose and frequency for all prescribed asthma medications

5. QUALITY MANAGEMENT IN ASTHMA:

Centers which manage asthma patients in various departments such as PHC, Emergency department, In-Patient or Out- Patients specialty clinics, should have a system to maintain and assess asthma management according to the standards of care. This would include assessment, management and follow up patients in a structured process. Oman Respiratory Society Asthma Management Protocol (pages 63-66) is developed to guide health care providers in managing asthma and to improve the quality of care provided to patients. The protocol can also be use to evaluate and audit the management.

PART TWO
ASTHMA MANAGEMENT IN CHILDREN

1. DIAGNOSIS

Diagnosis of asthma in children especially those younger than four years old can be difficult and has important implications. Many are under-diagnosed and, therefore, do not receive adequate therapy. Similar to adults, assessment and monitoring of asthma in children should include history of symptoms, physical examination and assessment of quality of life. Other alternative diagnoses must be excluded.

A. Asthma Diagnosis in Children 0-4 Years of Age

Consider asthma in infants and young children who have four or more episodes of wheezing in the past year that lasted more than 1 day and affected sleep, AND who has either;

a. One of the following:

- A physician's diagnosis of atopic dermatitis
- Evidence of sensitization to aeroallergens
- A parental history of asthma

OR

b. Two of the following:

- Evidence of sensitization to foods
- ≥4% peripheral blood eosinophilia
- Wheezing apart from colds

B. Asthma Diagnosis in Children 5-12 Years of Age

Consider asthma if any of the following signs or symptoms is present:

a. History of any of the following**:**

- Cough, worse particularly at night
- Recurrent wheeze
- Recurrent difficulty in breathing
- Recurrent chest tightness

b. Symptoms occur or worse at night

c. Symptoms occur or worse in the presence of:

- Exercise
- Pollens
- Smoke
- House dust mites
- Drugs (aspirin, beta blockers)
- Strong emotions
- Respiratory (viral) infections
- Animals with fur
- Aerosol chemicals
- Changes in temperature

d. Reversible and variable airflow limitation as measured by a spirometer or a peak expiratory flow meter

2. INVESTIGATIONS:

- Spirometry and PEF can be done in child above 5 years of age as in adults
- Chest X-Ray may be done to exclude any other causes in atypical presentation
- Review also asthma investigations in adult (page 15 -16)

3. DIFFERENTIAL DIAGNOSIS:

Other causes of episodic or chronic wheeze, cough and breathlessness in children include:

- Cystic Fibrosis
- Primary immune deficiency
- Tracheomalacia
- Congenital heart disease
- Vascular rings
- Foreign bodies
- Chronic rhino-sinusitis
- Gastro-oesophageal reflux
- Recurrent lower respiratory tract infections
- Congenital malformations causing narrowing of the intrathoracic airways

1. CLASSIFICATION OF ASTHMA SEVERITY

a. Children age 0 – 4 years (Table 7)

b. Children age 5 – 12 years (Table 8)

Table 7: Classification of Asthma Severity and Therapy in Children 0-4 Years of Age

INTERMITTENT ASTHMA		MILD PERSISTENT		MODERATE PERSISTENT		SEVERE PERSISTENT	
COMPONENTS OF SEVERITY	**FREQUENCY**	**COMPONENTS OF SEVERITY**	**FREQUENCY**	**COMPONENTS OF SEVERITY**	**FREQUENCY**	**COMPONENTS OF SEVERITY**	**FREQUENCY**
Symptoms	≤ 2 days/week	Symptoms	> 2 days / week but not daily	Symptoms	Daily	Symptoms	Throughout the day
Night-time awakenings	≤ 2 days/month	Night-time awakenings	1-2 / month	Nigh time awakenings	3-4 / month	Nigh time awakenings	> 1 time/week
SABA used for symptom control (not EIA)	≤ 2 days/week	SABA used for symptom control (not EIA)	> 2 days/week but not daily	SABA used for symptom control (not EIA)	Daily	SABA used for symptom control (not EIA)	Several times / day
Interference with normal activity	None	Interference with normal activity	Minor	Interference with normal activity	Some limitation	Interference with normal activity	Extremely limited
Exacerbations	0 -1 year	Exacerbations	≥2 in 6 months requiring systemic corticosteroids, or ≥4 wheezing episodes/1 year lasting >1 day AND risk factors for persistent asthma	Exacerbations	≥2 in 6 months requiring systemic corticosteroids, or ≥4 wheezing episodes/1 year lasting >1 day AND risk factors for persistent asthma	Exacerbations	≥2 in 6 months requiring systemic corticosteroids, or ≥4 wheezing episodes/1 year lasting >1 day AND risk factors for persistent asthma
RECOMMENDED THERAPY **Salbutamol MDI with spacer; 2 puffs prn**		**RECOMMENDED THERAPY** Salbutamol MDI with spacer; 2 puffs prn. Give one of the following medications; - Beclomethasone MDI 100 - 200 µg/day, -Fluticasone MDI 100 - 200 µg/day, **-Budesonide (neb) 250-500 µg/ day,** **or** Montelukast oraly 4 - 5mg OD		**RECOMMENDED THERAPY** Salbutamol MDI with spacer; 2 puffs prn. Give one of the following medications; - Beclomethasone MDI 200-400 µg/day, - Fluticasone MDI 200 - 500 µg/day or Budesonide (neb) 500 - 1000 µg/ day		**RECOMMENDED THERAPY** **Consult asthma specialist** Salbutamol MDI with spacer; 2 puffs prn. Give one of the following medications; **- Beclomethasone MDI 200 - 400 µg/day,** **- Fluticasone MDI 200 - 500 µg/day** **or Budesonide (neb) 500-1000 µg/ day,** **And add Montelukast orally 4 - 5mg OD**	

Table 8: Classification of Asthma Severity and Therapy in Children 5-12 Years of Age

INTERMITTENT ASTHMA		MILD PERSISTENT		MODERATE PERSISTENT		SEVERE PERSISTENT	
COMPONENTS OF SEVERITY	**FREQUENCY**	**COMPONENTS OF SEVERITY**	**FREQUENCY**	**COMPONENTS OF SEVERITY**	**FREQUENCY**	**COMPONENTS OF SEVERITY**	**FREQUENCY**
Symptoms	≤ 2 days / week	Symptoms	> 2 days / week but not daily	Symptoms	>2 days/week but not daily	Symptoms	Throughout the day
Night-time awakenings	≤ 2 days / month	Night-time awakenings	3-4/month	Nigh time awakenings	>1 /week but not nightly	Nigh time awakenings	7/week
SABA used for symptom control (not EIA)	≤ 2 days / week	SABA used for symptom control (not EIA)	> 2 days/week but not daily	SABA used for symptom control (not EIA)	Daily	SABA used for symptom control (not EIA)	Several times / day
Interference with normal activity	None	Interference with normal activity	Minor Limitation	Interference with normal activity	Some limitation	Interference with normal activity	Extremely limited
Exacerbations	0-1 / year	Exacerbations	≥ 2 / year	Exacerbations	≥2 exacerbations/ year	Exacerbations	≥2 exacerbations/ year
Lung Function	FEV1 > 80% predicted FEV1/FVC > 85%	Lung Function	FEV1 ≥ 80% predicted FEV1/FVC > 85%	Lung Function	FEV1 = 60- 80% predicted FEV1/FVC =75-85%	Lung Function	FEV1< 60% predicted FEV1/FVC < 75%
RECOMMENDED THERAPY **Salbutamol MDI with spacer; 2 puffs prn**		**RECOMMENDED THERAPY** Salbutamol MDI with spacer; 2 puffs prn. Give one of the following medications; Beclomethasone MDI 100-200 µg/day, - Fluticasone MDI 100-200 µg/day, **- Budesonide (neb) 250-500 µg/ day** **or** Montelukast oraly 4 -5mg OD		**RECOMMENDED THERAPY** Salbutamol MDI with spacer; 2 puffs prn + **Option 1:** Give one of the followings; - Beclomethasone MDI 200-400 µg/day, - Fluticasone MDI 200- 500 µg/day, **or** Budesonide (neb) 500-1000 µg/ day **Option 2:** Give one of the followings; - Beclomethasone MDI 100-200 µg/day, -Fluticasone MDI 100-200 µg/day, **or** Budesonide (neb) 250-500 µg/ day And **add one of the followings;** Salmeterol 50µg/day or Formoterol 9-12µg/day **or** Montelukast orally 4-5mg OD		**RECOMMENDED THERAPY** Salbutamol MDI with spacer; 2 puffs prn. **Consult asthma specialist** Give one of the followings; **- Beclomethasone MDI 200-400 µg/day** **or Fluticasone MDI 200 -500 µg/day** **or Budesonide (neb) 500-1000 µg/ day** **AND add Montelukast orally 4 - 5mg OD**	

2. GOALS OF ASTHMA THERAPY

The goal of asthma therapy is to maintain long-term control of asthma with the least amount of medication. The Initiation and adjustment of asthma therapies is to achieve the followings:

- Maintain normal activity levels and exercise
- Maintain near-normal pulmonary function
- Prevent acute episodes of asthma
- Minimize emergency department visits and hospitalizations
- Avoid adverse effects of asthma medications

3. PRINCIPLES OF STEPWISE THERAPY IN CHILDREN (Tables 7&8)

- Use stepwise approach to therapy, in which the dose and number of medications and frequency of administration are increased as necessary and decreased when possible to achieve and maintain control
- The level of impairment generally is judged on the most severe measure
- Regular follow up 1- 6 months interval is essential, depending on the level of control.
- Once well-controlled asthma is achieved and maintained for 3 months, a step-down on pharmacological therapy is recommended
- Treatment of young children is often in the form of a therapeutic trial; therefore, it is essential to monitor the child's response to therapy. If there is no clear response within 4–6 weeks, the therapy should be discontinued and alternative therapies or alternative diagnoses considered

4. INHALED CORTICOSTEROIDS (ICS) IN CHILDREN

ICS are the preferred therapy for initiating long-term control therapy in children of all ages.

- ICS, especially at low doses and even for extended periods of time, are generally safe
- The potential for the adverse effect of low- to medium-dose ICS on linear growth is usually limited to a small reduction in growth velocity, approximately 1cm in the first year of treatment that is generally not progressive over time. Children receiving ICS should be monitored, by using a stadiometer, for changes in growth
- The potential risks of ICS are well balanced by their benefits

Table 9: Equipotent Daily Doses of ICS for Children

Drug	Low Daily Dose	Medium Daily Dose	High daily Dose
Beclomethasone	100 – 200µg	>200 – 400µg	> 400µg
Budesonide	100 – 200µg	>200 – 400µg	> 400µg
Fluticasone	100 – 200µg	>200 – 500µg	> 500µg
Budesonide -Neb	250 – 500µg	>500 – 1000µg	> 1000µg

5. REDUCING RISKS WITH ICS THERAPY

- Use a spacer with metered dose inhalers to reduce oral deposition
- Rinse mouth/gargle after inhalation (with any form of device delivery)
- Wean to lower dose with sustained control
- Consider other add-on therapy rather than higher doses of ICS for incomplete control

6. MONITORING ASTHMA PROGRESSION

The following measures should be monitored over the course of follow up visits:

- Course of medications including frequency of use of Salbutamol
- Episodes of severe exacerbations requiring systemic corticosteroids
- Unscheduled clinic or emergency department visits
- Hospitalizations
- Pulmonary function test for 5 years and above
- Height and growth velocity of patients using ICS

7. LEVELS OF ASTHMA CONTROL

Table 2: Levels of Asthma Control

Characteristic	Controlled	Partly controlled	Uncontrolled
Day time symptoms	None or ≤ 2 times/week	> 2 times /week	≥ 3 features of partly controlled asthma present in any week
Activity limitation	None	Any	
Night symptoms	None	Any	
Salbutamol use	None or ≤ 2 times/week	> 2 times / week	
PEF or FEV1	Normal	< 80%	
Exacerbations	None	≥ 1/ year	One in any week

8. INDICATORS OF POOR ASTHMA CONTROL

- Awakens at night with symptoms
- Has unscheduled clinic or emergency department visits
- Has an increased need for short-acting inhaled β2 agonists (e.g. Salbutamol)
- Uses more than one canister of short acting β2 agonist/month

9. MAIN REASONS FOR POOR CONTROL OF ASTHMA

- Poor inhaler technique
- Non- adherence to asthma therapy
- Wrong diagnosis
- Under treatment with anti inflammatory medications (ICS)
- Over reliance on short acting β2 agonists
- Presence of other coexisting conditions
- GERD
- Sinusitis
- Allergic rhinitis
- Continuous exposure to allergens

10. WHAT TO DO IF CONTROL IS NOT ACHIEVED

- Assess patient adherence and technique in using medications correctly and address as appropriate
- Address other factors that diminish control of asthma such as coexisting conditions, a new or increased exposure to allergens or irritants, or psychosocial problems
- In some cases, alternative diagnosis should be considered

11. WHEN TO REFER TO SPECIALIST:

Consider referral to specialist if:

- There are difficulties in achieving or maintaining control of asthma
- When moderate or higher doses of inhaled corticosteroids are required to achieve and maintain control
- Additional education is indicated to improve the patients' management skills or adherence
- Immunotherapy or other immunomodulators are considered, or additional tests are indicated to determine the role of allergy

These guidelines are ***not*** intended for the management of children with such associated conditions as cystic fibrosis, cardiovascular disease, chronic lung disease, Bronchopulmonary dysplasia **(BPD)** and immune deficiency syndromes.

1. ASSESSMENT OF SEVERE EXACERBATION

Categorize according to the most severe symptom or signs

	MILD	MODERATE	SEVERE
Breathlessness	• While walking • Can lie down	• While talking • Prefers sitting	• While at rest • Infant stops feeding • Sits upright
Talks in:	Sentences	Phrases	Words
Alertness	May be agitated	Usually agitated	Usually agitated
Respiratory rate (per minute) Expected normal < 2 mo < 60 2-12mo < 50 1-5 years < 40 > 5 years < 30	Increased	Increased	Very increased
Accessory muscle use and retractions	Usually not	Commonly	Usually
Wheeze	Moderate end expiratory	Loud throughout exhalation	Loud inspiratory and expiratory
Pulse rate / min Expected normal 2-12mo < 160 1-2 years < 120 2-8 years < 110 > 8 years < 100	Mild increase	Moderate increase	Marked increase
Pulse oximetry (room air)	> 95 %	91 – 95 %	< 91 %

- **Features of life threatening asthma (any one of the following):**
  - Drowsy or confused
  - Apnea
  - Inaudible breath sounds
  - Paradoxical thoraco-abdominal movement
  - Respiratory muscle fatigue / shallow respiration
  - Cyanosis
  - Bradycardia
  - Silent chest

2. MANAGEMENT OF MILD TO MODERATE EXACERBATIONS

* Sit up child, if possible
* Give humidified O_2 to maintain SaO_2 > 93%
* Nebulized Salbutamol up to 3 doses in one hour at 20 minutes interval
* Refer to the doses in the table of drug doses

↓

* Give Prednisolone 1-2mg/kg (max 40mg) by mouth

Or

* IV Hydrocortisone 10mg/kg (max 250mg) intravenously stat if vomiting or not tolerating/taking oral prednisolone

↓

Is there any improvement on re-assessment?

YES	SOME IMPROVEMENT	NO MPROVEMENT
If respiratory distress improved & SaO_2 > 96% * Home with management plan * Inhaled salbutamol with spacer * Prednisolone 1-2mg/kg / day in 2 divided doses for 2 days * Follow up after 3-5 days	* SaO_2 93-96% * Admit * Nebulized salbutamol every 1-4 hours * Regular review * Hydrocortisone 4-5mg/ kg/dose q 6 h * Change to prednislone 1-2mg/kg/day when tolerated	* Proceed to severe exacerbation management guidelines * May need admission to high dependency area

3. MANAGEMENT OF SEVERE EXACERBATION

* **Sit the child up / propped up position, if possible**
* Give **humidified O_2** to maintain SaO_2 > 93%
* **Nebulized Salbutamol** upto 3 doses in one hour at 20 minutes interval or give continuous nebulized Salbutamol. Refer to table for doses and appropriate method of administration
* Add **nebulized Ipratropium** bromide 0.25 – 0.5mg with each dose of Salbutamol for 3 doses in one hour Start **IV fluids** at 2/3rd maintenance requirement
* Give M**ethylprednisolone / Hydrocortisone** IV stat
* Consider giving **$MgSO_4$** intravenously in a dose of 25-75mg/kg (max 2g) over 20 minute period in children with more severe exacerbations. $MgSO_4$ can be administered under monitoring even in Emergency Room if there is a delay in shifting the patient to HD/PICU **Although this is a safe dose, it is recommended that BP must be monitored while administering $MgSO_4$ intravenously**

Is there any improvement on re-assessment?

YES

FURTHER TREATMENT

* Monitor closely, including pulse oximetry

* Nebulized Salbutamol hourly and then gradually decrease the frequency to 1-4 hourly intervals when there is further improvement

* Nebulized Ipratropium bromide q 6 h may be considered

* Continue Methylprednisolone / Hydrocortisone IV

NO IMPROVEMENT

* Alert / admit in PICU
* Check ABG & UE, do chest X-ray
* Give loading dose A**minophylline** 6mg/kg over 30 minute period, followed by continuous infusion at the following rate (max 50mg/h) depending on the age of child:

2-6mo	0.4mg/kg/h
6-11mo	0.7mg/kg/h
1-9 years	1mg/kg/h
10-12 years	0.8mg/kg/h
Cardiac /Liver failure	0.2mg/kg/h

* Continue nebulized Salbutamol h/ continuously
* Continue to monitor closely in PICU. Wean off infusions if there is improvement. If there is no improvement in spite of all above measures, consider intubation and mechanical ventilation

Patients with life threatening asthma require admission to ICU/PICU

4. DRUG DOSES FOR ASTHMA IN CHILDREN

MEDICATION	DOSE	COMMENTS
Salbutamol nebulizing solution	• 0 – 1 month 1.25 to 2.5mg • > 1months 2.5 to 5mg To be given every 20 minutes x 3 doses, then every 1-4 h or 5mg/kg/h by continuous nebulization	• Dilute up to 4ml with normal saline • O_2 flow at 6-10 L/min • The face mask should be tightly fitting
Ipratropium bromide nebulizing solution	• 0-1 year 25mcg/kg • >1-5 years 125-250mcg • > 5 -12 years 250-500mcg • >12 years 500mcg To be given every 20 min in severe attack x 3 doses, then every 4-6 h	• Can be mixed with Salbutamol solution • Titrate to response
Aminophylline Only to be used where monitoring facility is available	Loading dose 6mg/kg IV infusion over 30 min, followed by maintenance infusion	• Use a loading dose of 3mg/kg in children on maintenance oral Theophylline • Monitor serum levels
Hydrocortisone IV	10mg/kg stat and then 4-5mg/kg q6h (max 250mg)	Convert to oral Prednisolone when stabilized
Prednisolone tablets	1-2mg/kg/day orally in 2 divided doses for 3-5 days (max 40mg/day)	There is no need to taper if patients are started on inhaled corticosteroid
Methylprednisolone IV	0.5 to 1mg/kg/dose q6h then reducing to minimum effective dose	
Magnesium sulfate IV	25-75mg/kg (max 2g) IV infusion over 20 minutes	• Monitor BP during and for up to 90 min after infusion • Monitor level if frequent doses or infusion is required

PART THREE

REFERENCES & APPENDICES

SECTION11:
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APPENDIX 1: ASTHMA CONTROL TEST

الاختبار التالي يمكن أن يساعد الأشخاص المصابين بالربو (عمر 12 سنة فأكثر) في تقييم سيطرتهم على الربو.

الرجاء رسم دائرة حول الدرجة المناسبة لكل سؤال من الآسئلة الخمسة

يمكنك أن تحسب مجموع درجاتك في اختبار السيطرة على الربو بجمع درجاتك عن كل إجابة، تأكد من مراجعة نتائجك مع طبيبك

الدرجة (25) سيطرة تامة | الدرجة (من 20 إلى 24) سيطرة جيدة | الدرجة (أقل من 20) خارج حدود السيطرة

السؤال الأول: خلال ال4 أسابيع الماضية، كم من الوقت منعك الربو من إنجاز القدر الكافي في العمل، أو الدراسة، أو المنزل؟

كل الوقت 1	معظم الوقت 2	بعض الوقت 3	قليل من الوقت 4	لم يحصل في أي وقت 5	

السؤال الثاني: خلال ال4 أسابيع الماضية، كم مرة حصل لك ضيق نفس؟

> 1 في اليوم 1	مرة واحدة في اليوم 2	3- 6 مرات في الاسبوع 3	2-1 مرة في الاسبوع 4	لم يحصل أبد 5	

السؤال الثالث: خلال ال4 أسابيع الماضية، كم مرة أيقظتك أعراض الربو (الأزيز، السعال، ضيق التنفس أو ألم في الصدر) أثناء الليل أو في وقت أبكر من العادة في الصباح ؟

≤ 4 مرآت ليلا في الأسبوع 1	3-2 مرة ليلا في الاسبوع 2	مرة واحدة في الاسبوع 3	1- 2 مرة في ال4 أسابيع 4	لم يحصل أبد 5	

السؤال الرابع: خلال ال4 أسابيع الماضية، كم مرة استخدمت بخاخة سريعة المفعول أو جهاز الرذاذ(مثل سالبيوتامول)؟

≤ من 3 مرات في اليوم 1	1- 2 مرة في اليوم 2	1- 2 مرة في الاسبوع 3	≥ 1 مرة في الاسبوع 4	لم يحصل أبد 5	

السؤال الخامس: خلال ال4 أسابيع الماضية، ما هو تقييمك للسيطرة على الربو عندك؟

لا يوجد سيطرة أبدا 1	سيطرة ضعيفة 2	يوجد سيطر إلى حد ما 3	سيطرة جيدة 4	سيطرة تامة 5	

اجمع الدرجات للحصول على المجموع الكلي

APPENDIX 2: ASTHMA CONTROL TEST

ACT can help patients (12 years and older) to assess the level of their asthma control

Please circle the appropriate score for each question. There are 5 questions in Total

You can calculate your "Total Asthma Control Test" score by adding up the numbers for each of your responses

Total Score: Less than 20 Not Controlled 20-24 Well Control 25 = Total Control

Question 1. During the past 4 weeks, how often did your asthma prevent you from getting as much done at work, school or home?

1 All the time	2 Most of the time	3 Some times	4 A little of the time	5 None of the time

Question 2. During the past 4 weeks, how often have you had shortness of breath?

1 > 1 time a day	2 Once a day	3 3-6 times a week	4 1-2 times a week	5 Not at all

Question 3. During the last 4 weeks, how often did your asthma symptoms (wheeze, cough, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?

1 ≥ 4 times a week	2 2-3 nights a week	3 Once a week	4 Once or twice	5 Not at all

Question 4. During the last 4 weeks, how often have you used your rescue inhaler or nebulised medication (such as Salbutamol)?

1 ≥ 3 times a day	2 1-2 times a day	3 2-3 times a week	4 ≤ 1 time a week	5 Not at all

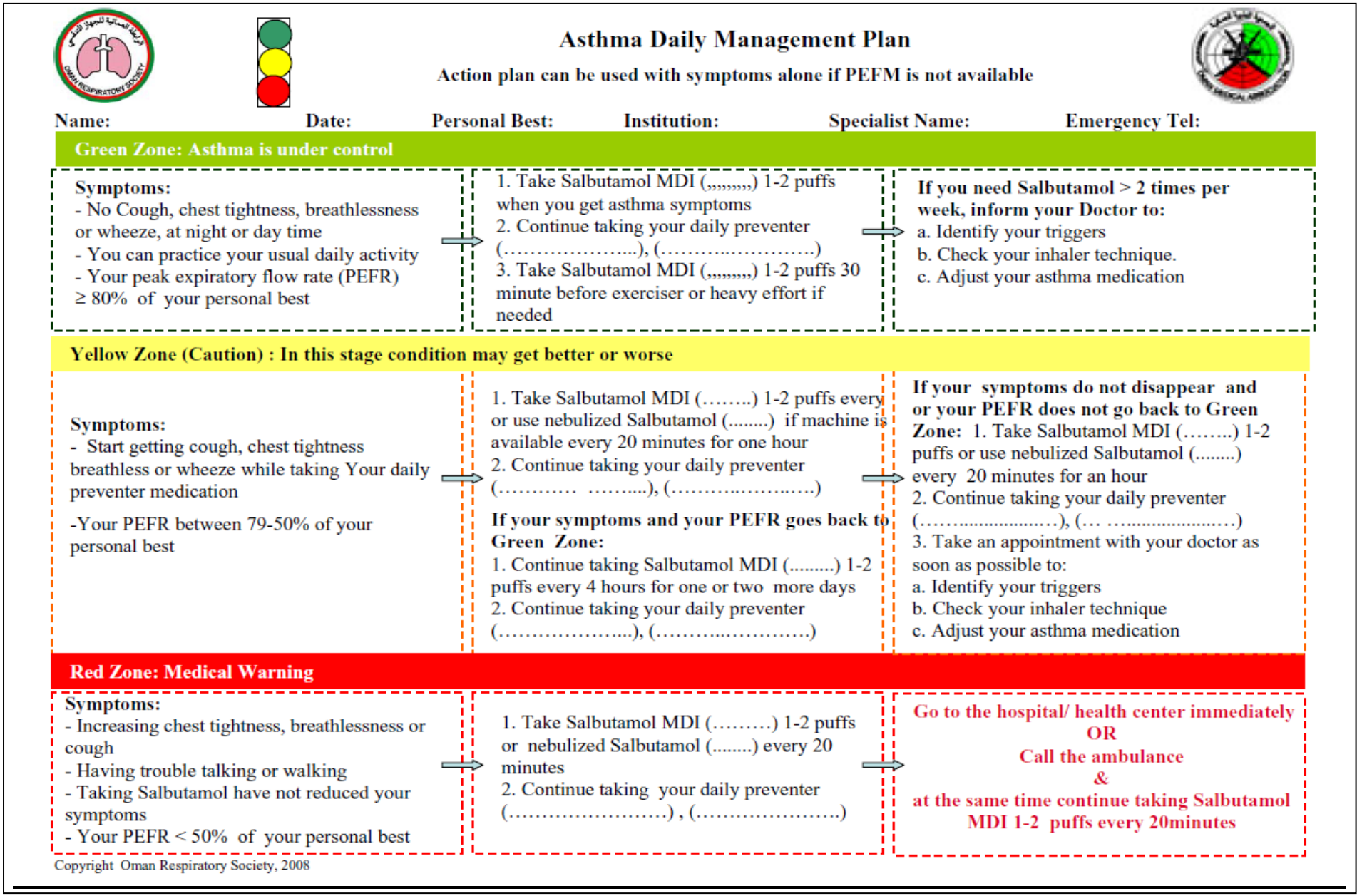
Question 5. How would you rate your asthma control during the past 4 weeks?

1 Not controlled	2 Poorly controlled	3 Somewhat controlled	4 Well controlled	5 Complete control

Add up your score to get your total **Total :**

APPENDIX 3: ASTHMA ACTION PLAN

APPENDIX 4: ASTHMA ACTION PLAN



Asthma Daily Management Plan

Action plan can be used with symptoms alone if PEFM is not available

Name: **Date:** **Personal Best:** **Institution:** **Specialist Name:** **Emergency Tel:**

Green Zone: Asthma is under control

Symptoms:
- No Cough, chest tightness, breathlessness or wheeze, at night or day time
- You can practice your usual daily activity
- Your peak expiratory flow rate (PEFR) ≥ 80% of your personal best

1. Take Salbutamol MDI (,,,,,,,,,) 1-2 puffs when you get asthma symptoms
2. Continue taking your daily preventer (……..), (……..……)
3. Take Salbutamol MDI (,,,,,,,,,) 1-2 puffs 30 minute before exerciser or heavy effort if needed

If you need Salbutamol > 2 times per week, inform your Doctor to:
a. Identify your triggers
b. Check your inhaler technique.
c. Adjust your asthma medication

Yellow Zone (Caution) : In this stage condition may get better or worse

Symptoms:
- Start getting cough, chest tightness breathless or wheeze while taking Your daily preventer medication

-Your PEFR between 79-50% of your personal best

1. Take Salbutamol MDI (……..) 1-2 puffs every or use nebulized Salbutamol (.....) if machine is available every 20 minutes for one hour
2. Continue taking your daily preventer (…… ……..), (……..……..…)

If your symptoms and your PEFR goes back to Green Zone:
1. Continue taking Salbutamol MDI (.....) 1-2 puffs every 4 hours for one or two more days
2. Continue taking your daily preventer (……..), (……..……)

If your symptoms do not disappear and or your PEFR does not go back to Green Zone: 1. Take Salbutamol MDI (……..) 1-2 puffs or use nebulized Salbutamol (.....) every 20 minutes for an hour
2. Continue taking your daily preventer (……..……), (… ……..……)
3. Take an appointment with your doctor as soon as possible to:
a. Identify your triggers
b. Check your inhaler technique
c. Adjust your asthma medication

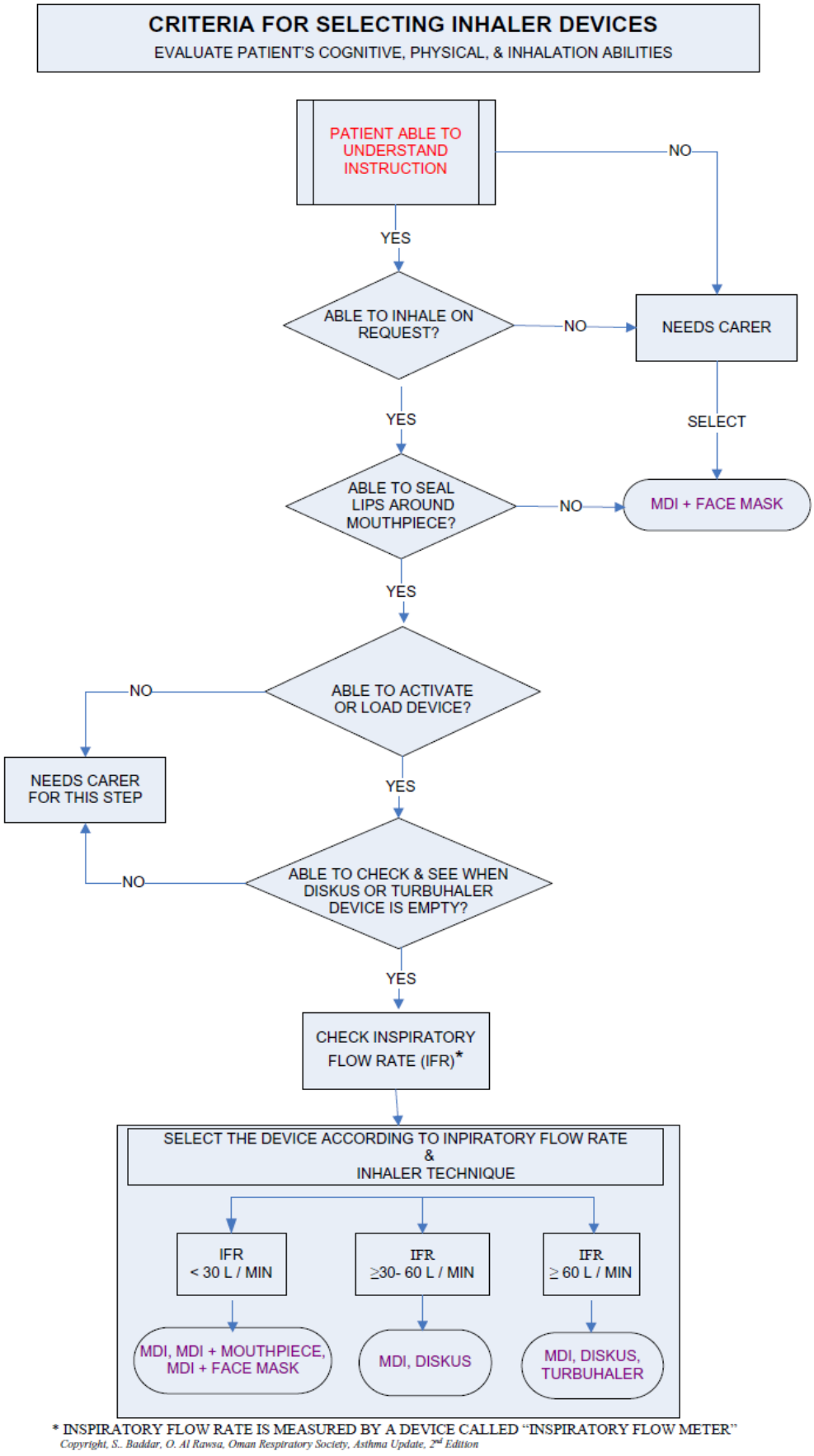
Red Zone: Medical Warning

Symptoms:
- Increasing chest tightness, breathlessness or cough
- Having trouble talking or walking
- Taking Salbutamol have not reduced your symptoms
- Your PEFR < 50% of your personal best

1. Take Salbutamol MDI (……) 1-2 puffs or nebulized Salbutamol (.....) every 20 minutes
2. Continue taking your daily preventer (……) , (……)

Go to the hospital/ health center immediately
OR
Call the ambulance
&
at the same time continue taking Salbutamol MDI 1-2 puffs every 20minutes

APPENDIX 5: SELECTING INHALER DEVICES



APPENDIX 6: INHALER TECHNICQUE STEPS

ASSESSMENT OF INHALER TECHNIQUE

Observe patient's technique & for each step put a √ or X in appropriate column

Good technique (G) = all essential steps (E) performed accurately
Poor technique (P) = one or more essential steps (E) performed inaccurately * Common problem step

		METERED DOSE INHALER (MDI) • (Ventolin®, Becotide® or Beclomethasone®)
1E		Remove MDI Cap
2E*		Shake vigorously
3		Exhale slowly & completely
4E		Insert MDI upright between teeth & closed lips around it
5E*		Inhale steadily and deeply through mouth whilst…
6E*		…immediately depress canister for
7E		…one depression
8		Remove inhaler keeping lips closed
9		Hold breath as much as possible
10		Breath normally
11		For 2nd dose wait 20-30 seconds.
12E		…then repeat steps 2- 10
13		Wipe MDI mouthpiece with clean tissue
14		Replace cap of MDI

		TURBUHALER® (Salbutamol, Budesonide, Formoterol & Symbicort®)
1E		Unscrew cover
2		Exhale slowly & completely away from mouthpiece
3E*		Hold turbuhaler **upright**
4E		Turn the coloured grip as far as it will go…
5E*		…then turn back till click sound is heard
6E		Insert mouthpiece between teeth & close lips around it
7E		Inhale forcefully & deeply through mouth
8		Remove turbuhaler® keeping lips closed
9		Hold breath for 5-10 seconds
10		Breathe normally
11		For a 2nd dose wait 20-30 seconds
12E		…then repeat steps 2-10
13		Wipe mouthpiece with clean dry tissue
14		Replace cover

		MDI+ MOUTHPIECE SPACER
1E		Remove cap from MDI
2E		Hold inhaler t & shake vigorously
3E*		Insert MDI upright into spacer, opposite mouthpiece
4E		Exhale slowly & completely away from mouthpiece
5		Insert spacer mouthpiece between teeth, close lips
6E		Depress canister once
7E		Inhale slowly & deeply through mouth
8E		Remove spacer keeping lips closed
9		Hold breath for as much as you can
10E		Breathe normally
11		Remove MDI from spacer
12		For a 2nd dose wait 20-30 seconds
13E		…then repeat steps 2-11
14		Remove MDI from spacer and replace cap
15		Wipe spacer mouthpiece with clean tissue
16		Keep spacer in clean place

		MDI+FACE MASK SPACER
1E		Remove MDI cap
2E*		**Shake vigorously**
3E		Insert upright MDI into spacer
4E		Hold MDI & spacer together keeping MDI in upright position
5		Place mask over mouth & nose…
6E		…and press gently to seal mask
7E		Depress canister once
8E		Inhale….
9		…through open mouth…
10E		…for 5 breaths
11		For a 2nd dose wait 20-30 seconds
12		…then repeat steps 3-8
13E		Remove MDI from spacer
14		Replace cap of MDI
15		Keep spacer in clean place
16		Wipe face with clean wet cloth

		AEROLIZER® (Formoterol)
1E		Remove the aerolizer® blue cover
2		Hold the base of the aerolizer firmly
3E		Open aerolizer® by turning the mouthpiece clockwise
4E		Remove one capsule from foil strip
5E		Place the capsule in the inhaler slot
6E		Close aerolizer® following the arrow on mouthpiece
7E*		Hold aerolizer® upright & press blue buttons at base (listen for the clicking sounds of capsule piercing)
8		…then release the blue buttons
9E		Insert mouthpiece between teeth & close lips
10E		Inhale steadily & deeply through mouth
11		Remove aerolizer® keeping lips closed
12		Hold breath for 5-10 seconds
13		Breathe normally
14E		Open aerolizer® & check capsule is empty
15E		If necessary repeat steps 9-13 till capsule is empty
16E		Remove empty capsule & close & replace cap
17		Replace blue cover
18		Wipe mouthpiece with clean dry tissue

		DISKUS® (Fluticasone, Salmeterol, & Seretide®)
1		Hold the outer case in one hand and…
2*		…place your other thumb on the thumbgrip
3E		Push thumbgrip away as far as it will go until it clicks
4		Exhale slowly & completely away from mouthpiece
5		Hold diskus® with mouthpiece facing you
6E*		…slide lever away as far as it will go until it clicks
7E*		Insert mouthpiece between teeth & close lips around it
8E*		Inhale steadily & deeply through mouth
9		Remove diskus® keeping lips closed
10		Hold breath for 5-10 seconds
11		Breathe normally
12		To close diskus® put your thumb in the thumbgrip
13		…& slide it backwards till you hear a click
14		For a 2nd dose wait 20-30 seconds
15E		…then repeat steps 1-12 (* load 2nd dose!)
16		Wipe mouthpiece with clean dry tissue
17		To close diskus® repeat steps 12 & 13

- **MDI closed mouth technique is preferred to ensure consistence approach & facilitate compliance**

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APPENDIX 7: HOW TO USE PEAK FLOW METER

How To Use Peak Expiratory Flow Meter

Check the cursor to the zero

Connect a clean mouth piece or new cardboard to the PFM

1. Stand Up If Possible

2.Breath in deeply in from your mouth

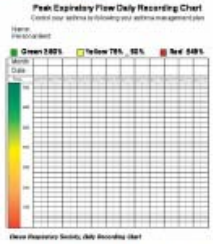
3. Insert Mouth Piece in your mouth and Seal your Lips

4. Blow (One Big Fast Blow) as fast and hard as you can

5. That will shoot the cursor to the correct point in the scale

6. Repeat the test two more times to obtain 3 readings.

7. Record the highest reading in your daily recording chart



Peak Expiratory Flow Daily Recording Chart

Control your asthma by following your asthma management plan

Name: Personal Best:

Date: Institution:

Green ≥ 80% Yellow 79% _ 50% Red ≤49%

	Date														
	Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
650															
600															
550															
500															
450															
400															
350															
300															
250															
200															
150															
100															
50															

APPENDIX 8: PEAK FLOW RATE FOLLOW UP CHART

Peak Expiratory Flow Section (Sample)

Age: 35 yr **Sex: F**

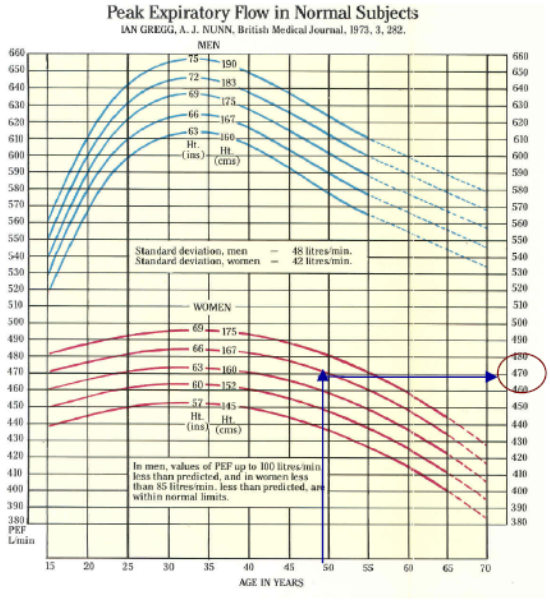
Ht:167cm

Date	Predicted	Pre Rx Measured	% of Predicted	Post RX	% of Change
2\1\2008	430	250	58%	360	360-250 =110 110/250 = 44 %

Peak Expiratory Flow Rate Measurement
Normal Children and Adolescents (Male& Female)

Height	Score	Height	Score	Height	Score
109	147	130	254	150	360
112	160	132	267	152	373
114	173	135	280	155	387
117	187	137	293	157	400
119	200	140	307	160	413
122	214	142	320	163	427
124	227	145	334	165	440
127	240	147	347	168	454

References: Global Strategy for Asthma Management and Prevention, National Institute of Health, National Heart Lung g and Blood Institute. Publication No. 95-3659.1995, Stempel DA et al, Ann Allergy Asthma Immunol (U.S) Feb 1996 76 (2)p 153 ISSUN:1081-1206.



Peak Expiratory Flow rate Reading Guidelines

Asthma Classification	Predicted	Variability **
Intermittent	80%	< 20%
Mild	80%	20% -30%
Moderate	60% - 80%	30%
Severe	<60%	> 30%

***Variability is between the night & morning reading*

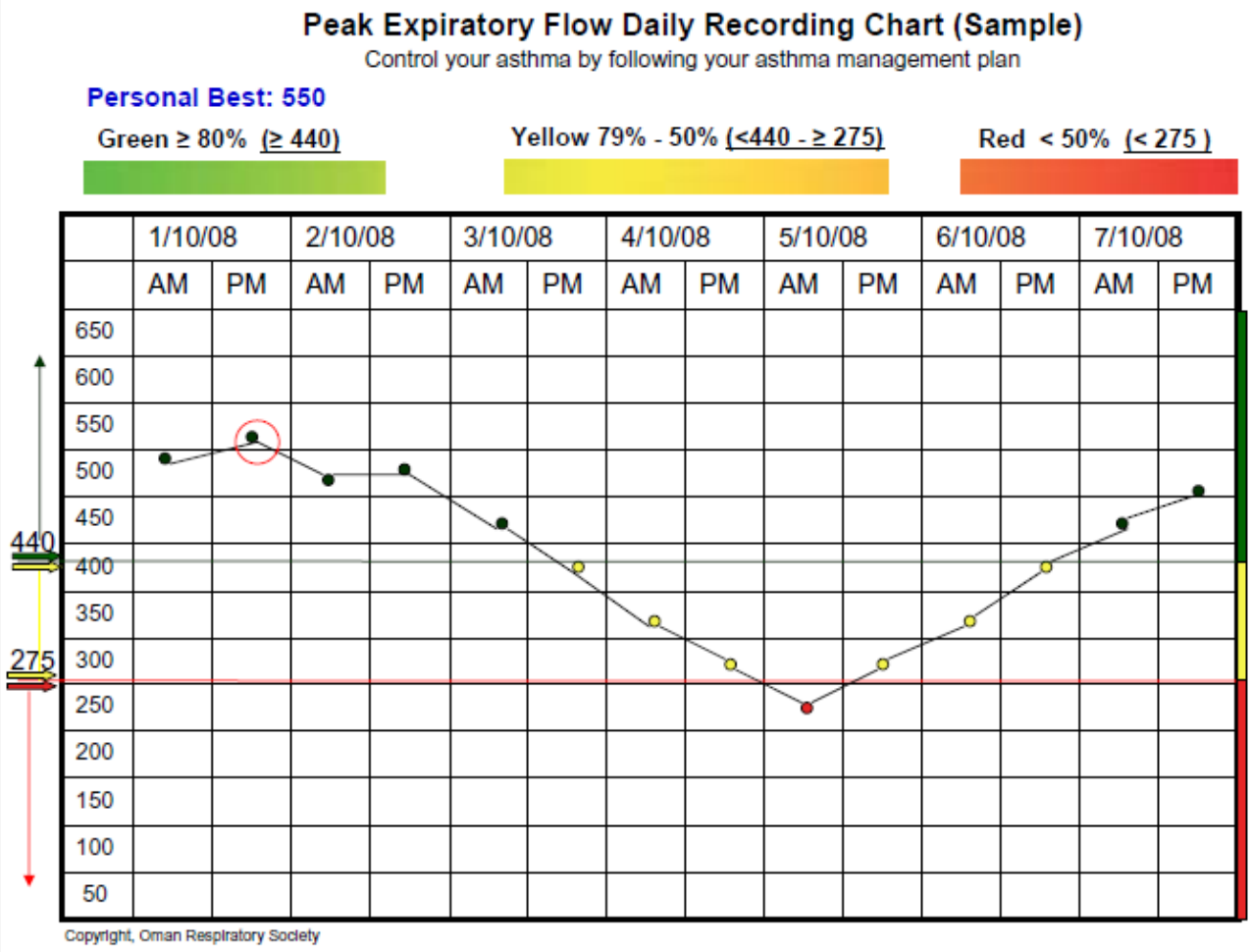
REFERENCE: BADDAR, WORTHING, AL RAWAS, OSMAN, AL RIYAMI, REESPIRATORY CARE. DECEMBER 2006 VOL 51 NO 12

APPENDIX 9: HOW TO FIND PERSONAL BEST VALUE

How to Find PEF Personal Best

Personal best is the highest number that can be achieved on a peak flow meter over a 2-3 week period when your asthma is under control, and should:

1. Take daily asthma preventer in the morning, wait at least 6 hours to take the reading
2. Take the reading between noon and 2:00 PM for 1- 2 weeks period
3. Blow 3 consecutive reading and write down the highest number
4. Record the highest number on the daily recording chart for each day
5. The highest number during this period is called personal best
6. This number can change over time so the test must be repeated yearly



APPENDIX 10: ASTHMA MANAGEMENT PROTOCOL

Asthma Management Protocol

1. Clinical History Section:

Name: Family History of Asthma:

MRN: Duration of Symptoms:

Sex:

Hospital / Health Center:

Fill in A, B, C, D & E at First Visit Only.

Please tick (√) or (X) when appropriate.

A. Smoker ( ) EX Smoker ( ) Passive Smoker ( )

B. History of: a. Allergic Rhinitis ( ) b. Nasal Polyps ( ) b. Eczema/Atopic Dermatitis ( )

C. What asthma medication is the patient currently taking?

a. Nothing ( ) b. Inhaled short acting ß2 agonist ( ) c. Long acting ß2 agonist ( )
d. Inhaled steroids ( ) e. Oral steroids ( ) f. Theophylline ( )
g. Oral Salbutamol ( ) h. Other ( )……..

D. Has the patient used nebulised Salbutamol in the last 12 months?

a. Home ( ) b. Hospital ( ) c. Health center ( ) d. Others ( )

E. Has the patient been admitted for asthma in the last 12 months? a. General ward ( ) b. ICU ( )

Please tick (√) or (X) when appropriate				
Date: → → →				
1. Does the patient have:				
a. Cough (when patient does not have common cold)				
b. Phlegm production				
c. Breathlessness				
d. Chest tightness				
e. Wheeze				
2. Are the symptoms worse:				
a. At night				
b. With exercise				
c. With influenza or common cold				
d. When exposed to specific trigger factors such as, (dust, smoke, foam, pollens, incense, .bukhoor etc)…..				
e. On taking specific ‡medications, please specify				
f. During specific times of the year (winter, humidity, etc)……..				
3. Since last visit ***(if yes, specify freqenc):***				
a. Has the patient used nebulized bronchodilator?				
b. Has the patient been admitted for asthma?				
4. Do the symptoms improved with asthma therapy? ***Good (G), Moderate (M), Poor (P), New Patient (N)***				

‡Some medication may cause respiratory symptoms:
1. Beta blocker 2. ACE inhibitors (Captopril, Cilazapril, Lisinopril) 3. Additives in inhalers 4. NSAIDs

REFERENCE: BADDAR, WORTHING, AL RAWAS, OSMAN, AL RIYAMI, REESPIRATORY CARE. DECEMBER 2006 VOL 51 NO 12

APPENDIX 10: ASTHMA MANAGEMENT PROTOCOL

2. Medical Assessment Section:

Age: **Height:**

PEFR Test	Date	Date	Date	Date
Predicted value				
Actual value				
% of (Predicated/Change)				

Compliance Good (G), Poor (P), New Patient (N)				
Inhaler Technique Good (G), Poor (P), New Patient (N)				
MDI, Spacer with (MP or Mask)				
Turbuhaler®				
Aerolizer®				
Diskus®				

Asthma Control Test (ACT)

Date:				
Total Score:				

1. During the past 4 weeks: How often did your asthma prevent you from getting as much done at work, school or home?

All the time 1	Most of the time 2	Some of the time 3	A little of the time 4	Non of the time 5	

2. How often have you had shortness of breath?

> 1 time /day 1	Once a day 2	3-6 times a week 3	1-2 times a week 4	Non at all 5	

3. How often did your asthma symptoms (wheeze, cough, chest tightness, breathlessness, pain) wake you up at night or earlier than usual in the morning?

≥ 4 times a week 1	2 -3 nights a week 2	Once a week 3	1-2 times / month 4	Not at all 5	

4. How often have you used your rescue inhaler or nebulised medication (such as Salbutamol)?

≥ 3 times a day 1	1- 2 times a day 2	2- 3 times a week 3	≤1 time a week 4	Non at all 5	

5. How would you rate your asthma control during the past 4 weeks?

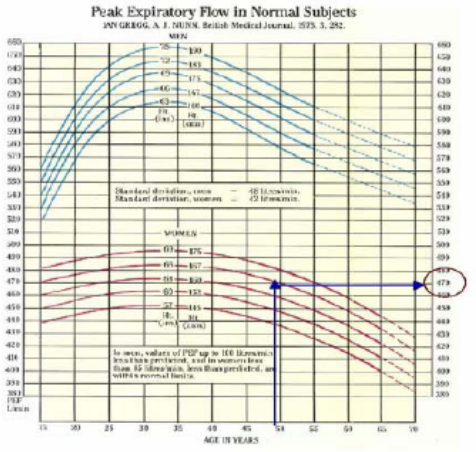
Not controlled 1	Poorly controlled 2	Somewhat controlled 3	Well controlled 4	Complete control 5	

ACT Reference: < 20 = Not Controlled 20 – 24 = Well Controlled 25 = Full Control Score:.....

Peak Expiratory Flow Rate Measurement
Normal Children and Adolescents (Male& Female)

Height	Score	Height	Score	Height	Score
109	147	130	254	150	360
112	160	132	267	152	373
114	173	135	280	155	387
117	187	137	293	157	400
119	200	140	307	160	413
122	214	142	320	163	427
124	227	145	334	165	440
127	240	147	347	168	454

References: Global Strategy for Asthma Management and Prevention, National Institute of Health, National Heart Lung g and Blood Institute, Publication No. 95-3659,1995, Stempel DA et al. Ann Allergy Asthma Immunol (U.S.) Feb 1996 76 (2 p 153 ISSN: 1081-1206.



Peak Flow Rate Guidelines: Controlled asthma: PEFR ≥ 80% of Predicted Uncontrolled asthma: PEFR <80% of Predicted

REFERENCE: BADDAR, WORTHING, AL RAWAS, OSMAN, AL RIYAMI, REESPIRATORY CARE. DECEMBER 2006 VOL 51 NO 12

APPENDIX 10: ASTHMA MANAGEMENT PROTOCOL

3. Medication Section: Dose & Frequency

For Asthma Severity; Review Quick Reference Guidelines			Date	Date	Date	Date
Asthma Severity:						
Medication	**Device**	**Strength**				
Short acting ß2 agonist						
Salbutamol	MDI	100µg/inh				
Salbutamol	Rotahaler®	200µg/cap				
Salbutamol	Rotahaler®	400µg/cap				
Salbutamol	Neb Solution	5mg/mL				
Salbutamol	Syrup	2mg/5mL				
Salbutamol	Tablets	2mg				
ICS						
Beclomethasone	MDI	50µg/inh				
Beclomethasone	MDI	250µg/inh				
Budesonide	Turbuhaler®	100µg/inh				
Budesonide	Turbuhaler®	200µg/inh				
Budesonide	Turbuhaler®	400µg/inh				
Fluticasone	MDI	50µg/inh				
Fluticasone	MDI	125/inh				
Fluticasone	MDI	250µg/inh				
Fluticasone	Diskus®	100µg/inh				
Fluticasone	Diskus®	250µg/inh				
LABA						
Salmeterol	MDI	25µg/inh				
Salmeterol	Diskus®	50µg/inh				
Formoterol	Aerolizer®	12µg/ cap				
Formoterol	Turbuhaler®	9µg/ inh				
ICS+LABA (Combined)		**Dose/inh**				
Symbicort® Budesonide+Formoterol)	Turbuhaler®	80µg/4.5µg per inh				
Symbicort®	Turbuhaler®	160µg /4.5µg				
Seretide® Fluticasone+Salmeterol)	Diskus®	100µg/50µg				
Seretide®	Diskus®	250µg/50µg				
Seretide®	Diskus®	500µg/50µg				
Other						
Sod.cromoglycate	MDI	5mg/inh				
Motelukast Sodium	Tablets	5mg /tab				
Motelukast Sodium	Tablets	10mg /tab				
Theophylline	SR Tablets	200mg /tab				
Theophylline	SR Tablets	300mg /tab				
Oral Steroids						
Prednisolone	Tablets	1mg /tab				
Prednisolone	Tablets	5mg /tab				
Prednisolone	Tablets	25mg/tab				
Other (non asthma medication)						
Referral to Specialist:						
Institution						
Reason for referral						

REFERENCE: BADDAR, WORTHING, AL RAWAS, OSMAN, AL RIYAMI, REESPIRATORY CARE. DECEMBER 2006 VOL 51 NO 12

APPENDIX 10: ASTHMA MANAGEMENT PROTOCOL

4. Quick Reference Guidelines

Assess severity to initiate therapy

During a patient's initial presentation, if the patient is not currently taking long-term control medication, asthma severity is assessed to guide clinical decisions for initiating the appropriate medication and other therapeutic interventions.

Classification of Asthma & Therapy

Step 1	**Mild Intermittent** **Symptoms < 1 time / week** **Night symptoms ≤ 2 / month** **PEFR or FEV1 ≥ 80% of predicted or personal best** • **Variability < 20%**	**Inhaled short acting ß2 agonist when needed;** **Salbutamol (100-200µg)**
Step 2	**Mild Persistent** **Symptoms ≥ 1 time / week but not daily** **Night symptoms > 2 / month** **Attacks may affect activity** **PEFR or FEV1 ≥ 80% of predicted or personal best** • **Variability between 20-30%**	Inhaled short acting ß2 agonist PRN **+ Low dose ICS** (Beclomethasone 200 – 500µg or Budesonide 200 - 400µg or Fluticasone 100 -250µg) **or Leukotriene modifiers (Monteleukast 10 mg daily)**
Step 3	**Moderate Persistent** **Daily symptoms** **Night symptoms >1 / week** **Attacks may affect activities** **PEFR or FEV1 60-80% of predicted or personal best** • **Variability > 30%**	Inhaled short acting ß2 agonist PRN + Low dose ICS +**Inhaled long acting β2-agonist** (LABA; Salmeterol 50µg BD or Formeterol 4.5-12µg BD) **or Medium Daily Dose ICS** (Beclomethasone >500 -1000µg or Budesonide > 400 - 800µg or Fluticasone >250 - 500µg) or Low dose ICS + **Leukotriene modifiers** or Low dose ICS +**Sustained Release Theophylline**
Step 4	**Severe Persistent** **Continuous symptoms** **Frequent night symptoms** **Limited physical activity** **PEFR or FEV1 ≤ 60% of predicted or personal best** • **Variability > 30%**	Inhaled short acting ß2 agonist PRN **+ Medium or high dose ICS + LABA** or Medium or high dose ICS + Leukotriene modifiers **or Medium or high dose ICS + Sustained release Theophylline** **or High Daily Dose ICS** Beclomethasone >1000 - 2000µg or Budesonide >800 - 1600µg or Fluticasone >500 - 1000µg
Step 5	**Referral to Specialist** **Asthma is not Controlled with medication in Step 4**	Inhaled short acting ß2 agonist PRN **+ High dose ICS + LABA + Leukotriene modifiers +Oral steroids** **or High dose ICS + LABA + Sustained release Theophylline +Oral steroids**

Step Up
If control is not achieved, consider step up, But first review:
a. Inhaler technique b. Compliance c. Trigger factors
Patients persisting in step 4, should be referred to a chest specialist

Step Down
Review treatment every 3 to 6 months.
If control is sustained for at least 3 months, a gradual stepwise reduction in treatment should be considered

Assess Control to Adjust Therapy

Table2: Levels of asthma control

Characteristic	Controlled	Partly controlled	Uncontrolled
Day time symptoms	None (≤ 2 times/week)	> 2 times/week	≥ 3 features of partly controlled asthma present in any week
Activity limitation	None	Any	
Night symptoms	None	Any	
Salbutamol use	None (≤ 2 times/week)	> 2 times/week	
PEF or FEV1	Normal	< 80%	
Exacerbations	None	≥ 1 / year	One in any week

REFERENCE: BADDAR, WORTHING, AL RAWAS, OSMAN, AL RIYAMI, REESPIRATORY CARE. DECEMBER 2006 VOL 51 NO 12

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