I. INTRODUCTION`

I. INTRODUCTION

Asthma is a **chronic inflammatory disorder** of the airways associated with widespread but variable airflow obstruction. This obstruction is often reversible, either spontaneously or with treatment.

The **clinical presentation of asthma is not uniform** and reflects the many factors involved in the development and course of asthma. Many patients have **episodic symptoms** and known triggers, while many others present a different picture.

In 'typical' cases the diagnosis will be obvious from the clinical history but in many others **establishing the diagnosis objectively** relies on demonstrating variability of the airflow obstruction.

There are certain conditions that frequently accompany asthma and also serve to exacerbate asthma symptoms. These **co-morbid problems**, need to be recognised and properly treated if the patient is to achieve proper control of his disease. Some of these problems include:

- **Allergic rhinitis**
- **Sinusitis**
- **Gastroesophageal reflux**

The key to effective asthma management is the education of patients and/or parents about the disease.

II. DIAGNOSIS OF ASTHMA AND DIFFERENTIAL DIAGNOSES

DIAGNOSIS OF ASTHMA AND DIFFERENTIAL DIAGNOSES

Consider the diagnosis in the following situations:

- History of any of the following:
  - Cough, worse particularly at nights
  - Cough, wheeze or tight chest after exercise
  - Recurrent wheezing
  - Recurrent chest tightness
- Symptoms occur or worsen at nights, awakening patient.
- Symptoms occur or worsen on exposure to
  - Smoke
  - Viral Infection
  - Pollen
  - Changes in temperature
  - Aerosol chemicals
  - Animals with fur
  - Domestic dust (in mattresses, pillows, upholstered furniture, carpets)
  - Strong emotional expression (laughing or crying)
  - Physical exercise
- Colds repeatedly ‘go to the chest’, take more than 10 days to clear up, or improves when asthma medication is given.

- Reversible and variable airflow limitation – as measured with a spirometer or peak flow meter:
  - PEF increases more than 15% 20 minutes after **inhalation** of a short acting b_2- agonist, e.g. salbutamol
  - PEF varies more than 20% from morning to evening
  - PEF varies more than 15% after 6 minutes of running or exercise.

- **If the above features are recurrent and patient responds to asthma treatment, then it is likely that the patient is asthmatic.**

DIFFERENTIAL DIAGNOSES

Adults	**Children**
COPD	Bronchitis/bronchiolitis
Bronchitis	Foreign bodies
Laryngeal dysfunction	Laryngomalacia and bronchomalacia
Localised airway obstruction	Functional laryngeal dysfunction (psychogenic)
Extrinsic compression (tumours, aortic loops)	Heart failure
Heart failure	Bronchopulmonary dysplasia
Allergic bronchopulmonary aspergillosis	Cystic fibrosis
Vocal cord paralysis	

III. CLASSIFICATION OF ASTHMA SEVERITY

CLASSIFICATION OF ASTHMA SEVERTITY*

Clinical Features Before Treatment

(One of the features of severity is sufficient to place a patient in that category)

Asthma Severity	Symptoms	Night-time Symptoms	PEF or FEV_1
Step 4 Severe Persistent	Continuous Limited physical activity	Frequent	<60% predicted Variability >30%
Step 3 Moderate Persistent	Daily Use b_2-agonist daily Attacks affect activity	>once/week	>60% to 80% predicted Variability >30%
Step 2 Mild Persistent	>once/week but <once/day	>2 times/month	>80% predicted Variability 20 to 30%
Step 1 Intermittent	<once/week Asymptomatic and normal lung function between attacks.	<2 times/month	>80% predicted Variability <20%

*Adapted from the Caribbean Guidelines for Asthma Management and Prevention

Patients with mild or moderate asthma may be managed at a health center but severe asthma should be managed at hospital.

PROTOCOL: CLASSIFICATION OF ASTHMA SEVERITY		
Date Revised:	Distribution to Types III, IV and V health centres and to all hospitals	Index: III
Approved by: Director, Family Health Services		

IV. HIGH RISK PATIENTS

HIGH RISK PATIENTS

The following list is not to be considered all inclusive. Each patient should be assessed individually (especially those patients with many chronic medical disorders);

- Patients with severe persistent asthma who are maintained on oral steroids
- Patients with serious cardiac problems
- Patients who were recently hospitalized for acute exacerbation of asthma
- Patients who have previously been admitted to the ICU for control of asthma
- Patients with associated chronic or acute pulmonary problems
- Patients with multiple chronic medical problems

PROTOCOL: HIGH RISK PATIENTS		
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V. Severity of Asthma Attacks Charts

SEVERITY OF ASTHMA ATTACKS

Parameter*	Mild	Moderate	Severe	Respiratory Arrest Imminent
Breathless	Walking Can lie down	Talking Infant–softer shorter cry, difficulty feeding Prefers sitting	At rest Infant–stops feeding Hunched forward	
Talks in	Sentences	Phrases	Words	
Ability to cry	Good cry	Soft cry	Groaning	
Alertness	May be agitated	Usually agitated	Usually agitated	Drowsy or confused
Respiratory rate	Increased	Increased	Often >30/min(adults)	
Guide to rates of breathing associated with respiratory distress in awake children: **Age** — **Normal rate** <2 months — <60/min 2-12 months — <50/min 1-5 years — <40/min 6-8 years — <30/min				
Accessory muscles and suprasternal retractions	Usually not	Usually	Usually	Paradoxical thoraco–abdominal movement
Wheeze	Moderate, often only and expiratory	Loud	Usually loud but may be reduced	Absence of wheeze
Pulse/min (adult)	<100	100–200	>120	Bradycardia
Guide to Limits of pulse rates in infants and children: **AGE** — **NORMAL RATE** — **BRADYCARDIA** Infants — 2–12 months — <160/min — <80/min Preschool — 1–2 years — <120/min — <80/min School age — 3–8 years — <110/min — <80/min				
Pulsus paradoxus	Absent	May be present	Often present	Absence suggests Respiratory muscle fatigue
PEF **after initial bronchodilator** **% predicted or** **% personal best**	Over 80%	Approximately 60–80%	<60% predicted or personal best 100 L/min (adults) or response lasts <2 hours	
$Pa0_2$% (on air)	> 95%	91–95%	< 90%	
$Pa0_2$ (on air) And/or **$PaC0_2$**	Normal Test not usually necessary <45 mmHg	>60 mmHg <45 mmHg	<60 mmHg >45 mmHg: Possible respiratory failure	
Hypercapnia (hypoventilation) develops more readily in young children than in adults and adolescent.				
*Note: The presence of several parameters, but not necessarily all, indicate the general classification of the attack.				

PROTOCOL: SEVERITY OF ASTHMA ATTACKS		
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VI. Predicted Average Peak Flow Values

These tables are only a guideline. It is recommended that a patient's personal best be used as a baseline reading. Personal best is the maximum peak flow rate that patients can attain when their asthma is considered to be under control.

PREDICTED AVERAGE PEAK EXPIRATORY FLOW (L/min)

Normal Males*

	Height (cm)				
Age (yrs)	**152**	**165**	**178**	**191**	**203**
20	554	575	594	611	626
25	580	603	622	640	656
30	594	617	637	655	672
35	599	622	643	661	677
40	597	620	641	659	675
45	591	613	633	651	668
50	580	602	622	640	656
55	566	588	608	625	640
60	551	572	591	607	622
65	533	554	572	588	603
70	515	535	552	568	582
75	496	515	532	547	560

Normal Females*

	Height (cm)				
Age (yrs)	**140**	**152**	**165**	**178**	**191**
20	444	460	474	486	497
25	455	471	485	497	509
30	458	475	489	502	513
35	458	474	488	501	512
40	453	469	483	496	507
45	446	462	476	488	499
50	437	453	466	478	489
55	427	442	455	467	477
60	415	430	443	454	464
65	403	417	430	441	451
70	390	404	416	427	436
75	377	391	402	413	422

Normal Children and Adolescents*

Height (cm)	**Males & Females**	**Height (cm)**	**Males & Females**	**Height (cm)**	**Males & Females**
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

Reference: Nunn, AJH, Gregg, I: *Brit Med J* 298: 1068-70, 1989.

PROTOCOL: PREDICTED AVERAGE PEAK EXPIRATORY FLOW (L/MIN)		
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VII. Management of Mild to Moderate Acute Exacerbation (in young children)

MANAGEMENT OF MILD/MODERATE ACUTE EXACERATION IN YOUNG CHILDREN (Under 5 Years)

NOTE CAREFULLY: Patients with **SEVERE OR LIFE THREATENING ASTHMA** should be managed in a hospital-based setting (e.g. casualty department/A&E), where support staff for close monitoring and resuscitation can be provided.

A) COMMUNITY/PRIMARY CARE SETTING

If features of mild/moderate episode exist

b_2-agonist therapy; up to 10 puffs by metered dose inhaler (MDI) with a spacer device (+/– face mask) at 1 puff every 15–30 secs. or by nebuliser 0.02 mls/kg of salbutamol solution (5 mg/ml) in 2 mls. N/saline 3–4 hourly.

Responds favourably:

- Resp. rate reduced
- Reduced use of accessory muscles

monitor Consider doubling maintenance monitor dose of inhaled steriods if patient was on it before. If b_2–agonist still required 3-4 hourly after 12+ hours, start a short course of prednisone for 1–3 days. Patients 1–5 years: 1–2 mg/kg/day (max 20 mg)

Unresponsive or relapse within 3–4 hours

Increase frequency of b_2–agonist; Repeat every 3–4 hours repeat every 20–30 mins, monitor cardiac status closely and for on signs of worsening distress.

Start after oral prednisone.
Oxygen therapy to maintain 0_2 Sat. >95% (4-6 L/min)

Transfer to hospital

PROTOCOL: MANAGEMENT OF MILD/MODERATE ACUTE EXACERATION IN YOUNG CHILDREN (UNDER 5 YEARS)		
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VIII. Management of mild to Moderate Acute Exacerbation (in older children and Adults)

MANAGEMENT OF MILD/MODERATE ACUTE EXACERBATION IN OLDER CHILDREN AND ADULTS

NOTE CAREFULLY: Patients with **SEVERE OR LIFE THREATENING ASTHMA** should be managed in a hospital-based setting (e.g. casualty dept./A&E), where support staff for resuscitation and close monitoring can be provided.

COMMUNITY/PRIMARY CARE SETTING

If Features of mild/moderate episode

Initial Treatment

Short–acting b_2-agonist; by metered dose inhaler (up to 10 puffs) or 1 ml salbutamol in 2–3 mls N/saline by nebuliser.

Oxygen to achieve 0_2 saturation >90%.

Systemic corticosteroids if no immediate response or patient recently took steroid tablets.

SEDATION is contraindicated

Repeat Assessment

(Physical Exam., PEF, 0_2 saturation, other tests as needed)

Moderate episode

- PEF 60–80% predicted/personal best
- Physical exam: moderate symptoms

Mix 1 ml salbutamol with 0.25 mg ipratropium bromide and 1–2 mls N/saline via nebuliser repeat every 20-30 mins as needed.
Consider corticosteroids
Continue treatment 1–3 hours provided there is improvement.

↓ ↘

Good response

- Response sustained 60 mins after last treatment
- Physical exam: normal
- PEF>70%
- No distress
- 0_2 saturation >90%

Poor response or relapse within 1-2 hours

Increase frequency of b_2-agonist to every 30 mins. or continuously if necessary.
Add 0.25 mg ipratropium bromide to nebuliser solution.
Oxygen to maintain 0_2 sat >90% (4–6 L/min)

↓

Transfer to Hospital

↓

Discharge Home

Continue treatment with inhaled b_2-agonist
Consider doubling maintenance dose of inhaled steroid if patient was on it before.
Consider a short course of prednisone for 1–3 days
Patient education:
Take medication properly
Review action plan
Close medical follow-up.

PROTOCOL: MANAGEMENT OF MILD/MODERATE ACUTE EXACERATION IN OLDER CHILDREN AND ADULTS		
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IX. Management of Acute Severe Asthma in Children Under 5 Years Old

MANAGEMENT OF ACUTE SEVERE ASTHMA IN CHILDREN UNDER 5 YEARS OLD

REMEMBER: In pre-school children there are other important causes of breathlessness and wheeze.

If you think a child has severe asthma, give b_2-agonist at once

RECOGNITION OF ACUTE SEVERE ASTHMA

- Too breathless to talk
- Too breathless to feed
- Respiration >50 breaths/min
- Pulse >140 beats/min
- Use of accessory muscles of breathing

Life Threatening Features

- Cyanosis, silent chest or poor respiratory effort
- Fatigue or exhaustion
- Agitation or reduced level of consciousness

CAUTION: Children with severe attacks may not appear distressed; assessment in the very young may be difficult. Be alert to any of the above features.

1. IMMEDIATE TREATMENT

- High flow oxygen via face mask (4–6L/min)
- Salbutamol (5 mg/ml) 0.02 ml/kg, max 0.5 ml via nebuliser or up to 10 puffs of MDI by a spacer device.
- Pulse oximetry is helpful; maintain $Sa0_2$ >95%.
- Prednisone 1–2 mg/kg/day (max. 20 mg)

If Bronchodilator Response is Poor:

- Give IV aminophylline 5 mg/kg over 20 mins followed by maintenance infusion of 1 mg/kg/hr; omit the loading dose if child already received oral theophylline.
- Give IV hydrocortisone 100 mg q6hrly.
- Add ipratropium 0.125 mg to nebulised b_2-agonist.

Criteria for Hospital Admission:

- Any life threatening features
- Any features of acute severe asthma after initial management.
- Lower threshold for admission if patient had recent admission, previous severe attacks or there is concern over social circumstances.

2. SUBSEQUENT MANAGEMENT

If The Patient Is Improving Continue:

- Oxygen to maintain $Sa0_2$>95%
- Prednisone daily
- Nebulised b_2-agonist 2–4 hourly
- Monitor cardiac status

If Patient Is Not Improving After 20–30 Mins

- Continue oxygen and steroids
- Give nebulised b_2-agonist more frequently, up to every 30 minutes.
- Add Ipratropium 0.125 mg to nebuliser and repeat every 4 hours until improvement starts.
- Consider need for Chest X-ray.

If Patient Is Still Not Improving Give:

- Aminophylline (5 mg/kg) I.V. over 20 mins. Repeat every 6 hours as needed.

3. MONITORING TREATMENT

- Oximetry: maintain $Sa0_2$>95% and note clinical features at appropriate intervals.

4. CONSIDER ICU ADMISSION IF:

- Worsening or persistent hypoxia or hypercapnia
- Exhaustion, feeble respirations, confusion or drowsiness
- Coma or respiratory arrest

5. WHEN DISCHARGED FROM HOSPITAL

- Patient should be stable on discharge medication for 24 hours and have had inhaler technique checked and recorded
- Treatment with oral corticosteroid for total 1–3 days
- Self Management Plan or written instructions explained to patient.
- Follow-up appointment within 1–4 weeks to outpatient or specialist clinic, **with direct admission if deterioration within 24 hours.**

X. Management of Acute Severe Asthma in Children 5-15 years old

MANAGEMENT OF ACUTE SEVERE ASTHMA IN CHILDREN AGED 5-15 YEARS OLD

RECOGNITION OF ACUTE SEVERE ASTHMA

- Too breathless to talk
- Too breathless to feed
- Respiration >40 breaths/min
- Pulse >120 beats/min
- PEF <50% predicted or best

Life Threatening Features

- PEF <33% predicted
- Cyanosis, silent chest or poor respiratory effort
- Fatigue or exhaustion
- Agitation or reduced level of consciousness
- Pulsus paradoxus

Blood gas estimates are rarely needed in deciding initial management in children.

CAUTION: Children with severe attacks may not appear distressed; assessment in the very young may be difficult. Be alert to any of the above features.

1. IMMEDIATE TREATMENT

- High flow oxygen via face mask (4–6 L/min)
- Salbutamol 0.02 ml/kg, (max 0.1 ml) via nebuliser or similar dose via MDI and spacer.
- Prednisone 1–2 mg/kg (max. 40 mg).
- NO SEDATIVES

IF LIFE THREATENING FEATURES ARE PRESENT:

- Give IV aminophylline 5 mg/kg over 20 mins, then every 6 hours as needed. Omit the loading dose if child already on oral theophylline.
- Give IV hydrocortisone 100 mg q6hrly.
- Add ipratropium 0.25 mg to nebulised b_2-agonist (0.125 mg in children 6 years and under).

- Pulse oximetry may be helpful in assessing response to therapy. An $Sa0_2$ <92% may indicate a need for Chest X-ray.

CRITERIA FOR HOSPITAL ADMISSION:

- Any life threatening features
- Any features of acute severe asthma after the initial treatment, especially a PEF <33%.
- Lower threshold for admission if patient had recent admission, previous severe attacks or there is concern about the patient's social circumstances.

2. SUBSEQUENT MANAGEMENT

If Patient Is Improving Continue:

- High flow oxygen
- Prednisone 1–2 mg/kg daily (max. dose 40 mg)
- Nebulised b_2-agonist 4 hourly

If Patient Is Not Improving After 20-30 Mins:

- Continue oxygen and steroids
- Mix ipratropium bromide and b_2-agonist via nebuliser and repeat every 20-30 mins. if necessary.

3. MONITORING TREATMENT

- Repeat PEF measurement 20-30 minutes after starting treatment (if appropriate).
- Oximetry: Maintain $Sa0_2$ >92%
- Chart PEF (if appropriate) before and after the b_2-agonist is given and at least 2 times daily during hospitalization.

4. CONSIDER ICU ADMISSION

- If deteriorating PEF, worsening or persisting hypoxia or hypercapnia (PaO_2<60 mmHg; $PaCO_2$>45 mmHg).
- If exhaustion, feeble respirations, confusion or drowsiness.
- If life threatening features are present.
- If coma or respiratory arrest.

5. WHEN DISCHARGED FROM HOSPITAL

- Patient should have been on discharge medication for 24 hours and have had inhaler technique checked and recorded.
- PEF >75% of predicted or personal best and PEF diurnal variability <25%.
- Patient should have started oral steroids, inhaled steroids and inhaled bronchodilators.
- Patient should have a PEF meter and written self management plan, explained to parents.
- Review follow-up at out-patient clinic within 1-4 weeks, depending on patient's clinical status.
- Letter of admission details to patient's primary care physician or clinic.

XI. Management of Acute Severe Asthma in Adults

MANAGEMENT OF ACUTE SEVERE ASTHMA IN ADULTS

Many Deaths In Asthma Are Preventable: **Delay Can Be Fatal**

- **Features of Acute Severe Asthma**
  - PEF <50% of predicted or personal best
  - Can't complete sentences in one breath
  - Respiration >25 breaths/min
  - Pulse >110 beats/min
- **Life Threatening Features**
  - PEF <33% of predicted or personal best
  - Silent chest, cyanosis or feeble respiratory effort
  - Bradycardia or hypotension
  - Exhaustion, confusion or coma
  - Pulsus paradoxus

If SaO_2 <92% or a patient has any life threatening features, measure arterial blood gases.

Blood gas markers of a very severe, life threatening attack:

- Normal (36-45 mm Hg) or high $PaCO_2$
- Severe hypoxia: PaO_2 <60 mm Hg irrespective of treatment with oxygen.
- A low pH.

CAUTION: Patients with severe or life threatening attacks may not be distressed and may not have all the above abnormalities. Be alert to any of the above features.

1. IMMEDIATE TREATMENT

- Oxygen 40–60% (4–6L/min) (CO_2 retention is not usually aggravated by oxygen therapy in asthma).
- Salbutamol 1 ml in 2 mls N/saline via a nebuliser, or 10 puffs salbutamol MDI via a spacer device; may repeat in 20 mins.
- Prednisone 30–60 mg or intravenous hydrocortisone 200 mg.
- NO SEDATIVES OF ANY KIND
- Chest X-ray to exclude pneumothorax.

NB: Antibiotics are indicated only where there is <u>definite</u> evidence of infection.

IF LIFE THREATENING FEATURES ARE PRESENT

- Mix ipratropium 0.25 mg, 5 mg salbutamol and 1 ml N/saline and give via a nebuliser.
- Give IV aminophylline 250 mg over 20 mins. (DO NOT GIVE BOLUS AMINOPHYLLINE TO PATIENTS ALREADY TAKING ORAL THEOPHYLLINES).

CRITERIA FOR HOSPITAL ADMISSION:

- Any life threatening features
- Any feature of acute severe asthma PRESENT after initial treatment, especially if PEF <33% of predicted or personal best.
- High risk patients
- Incomplete response within 1–2 hours.

2. SUBSEQUENT MANAGEMENT:

If Patient Is Improving Continue:

- 40–60% oxygen (4–6 L/min)
- Prednisone 30–60 mg daily or IV hydrocortisone 200 mgq6hrly
- Nebulised b_2-agonist 2–4 hourly

If Patient Is Not Improving After 20–30 Mins

- Continue oxygen and steroids
- Give nebulised b_2-agonist more frequently, continuously if necessary.
- Add ipratropium 0.25 mg to the nebuliser 4 hourly until the patient is improving.

3. MONITORING TREATMENT:

- Repeat measurement of PEF 30 minutes after starting treatment.
- Oximetry: maintain SaO_2 >92%
- Repeat blood gas measurements within 2 hours of starting treatment if :
  (a) initial PaO_2 <60 mmHg.
  (b) $PaCO_2$ normal or raised
  (c) patient deteriorates
- Chart PEF before and after giving nebulised or inhaled b_2-agonist (salbutamol) and at least 4 times daily during hospital stay.

4. CONSIDER ICU ADMISSION IF:

- Deteriorating PEF, worsening or persisting hypoxia or hypercapnia (PaO_2 <60 mmHg; $PaCO_2$ >45 mmHg).
- Exhaustion, feeble respirations, confusion or drowsiness.
- Life threatening features are present.
- Coma or respiratory arrest.

5. WHEN DISCHARGED FROM HOSPITAL

- Patients should have been on discharge medication for 24 hours and have had inhaler technique checked and recorded.
- PEF >75% of predicted or best and PEF diurnal variability <25%.
- Treatment with oral and inhaled steroids in addition to bronchodilators must be given.
- Patient should have a PEF meter and written management plan.

- Follow up appointment within 1–4 weeks depending on severity of attack and frequency of admissions.... ALSO
- Determine the reason(s) for exacerbation and admission.
- Send details of admission to the patient's primary care clinic or physician.

PROTOCOL: MANAGEMENT OF ACUTE SEVERE ASTHMA IN ADULTS		
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XII. Long term Management of Asthma

XII.1 AIMS OF TREATMENT AND CRITERIA FOR REFERRAL TO A SPECIALIST

The aim of treatment is to *control* asthma. Good control is achieved when there is:

- Minimal (ideally no) chronic symptoms, including nocturnal symptoms.
- Minimal (infrequent) episodes.
- No emergency visits for acute exacerbation.
- Minimal need for prn b_2–agonist.
- No limitation on activities, including exercise.
- PEF variability <20%.
- Normal (or near normal) PEF.
- Minimal (or no) adverse effects from medications.

THE STEPWISE APPROACH to long-term management utilises the classification of asthma severity. Patients should start treatment at the step most appropriate to the initial severity of their condition. **Aim to establish control as quickly as possible;** then decrease treatment to the least medication required to maintain control:

- A rescue course of prednisone may be needed at any time and step.
- Patients should avoid or control triggers at each step.
- All therapy must include **patient education.**

REFER TO AN ASTHMA SPECIALIST IF:

- Patient has had a life-threatening asthma exacerbation.
- Signs and symptoms are atypical.
- Other conditions complicate asthma.
- Patients require continuous oral steroids or high-dose inhaled corticosteroids.
- Child under 5 years old and requires step 3 or 4 care (see page 35).
- Additional diagnostic testing (e.g. spirometry or CT-scan chest) is indicated.
- Patient is being considered for immunotherapy.

- Patient has severe persistent asthma.

PROTOCOL: AIMS OF TREATMENT AND CRITERIA FOR REFERRAL TO A SPECIALIST		
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XII.2. STEPWISE TREATMENT FOR INFANTS AND YOUNG CHILDREN Under 5 Years*

(Preferred Treatments are underlined)

Severity	Controllers	Relievers
Step 4 Severe Persistent	**Daily medications:** **Inhaled corticosteroid** • MDI with spacer and face mask >1 mg daily • Nebulized budesonide >1 mg bid • If needed, add oral steroids – lowest possible dose on alternate day, early morning schedule. Long–acting bronchodilator: either a long-acting inhaled b_2–agonist (for children over 5 years) or a sustained–release theophylline. Add a leukotriene antagonist.	**Inhaled short acting bronchodilator:** ***Inhaled b_2-agonist*** or ipratropium bromide as needed for symptoms, not to exceed 3–4 times in one day.
Step 3 Moderate Persistent	**Daily medication:** **Inhaled corticosteroid** • MDI with spacer and face mask 400–800 mcg daily PLUS **(where necessary)** • Inhaled long–acting b_2–agonist (children over 5 years old) or • Long acting theophylline. Consider adding a leukotriene antagonist.	**Inhaled short-acting bronchodilator:** **Inhaled b_2-agonist** or ipratropium bromide as needed for symptoms, not to exceed 3–4 times in one day.
Step 2 Mild Persistent	**Daily medication:** Either **inhaled corticosteroid** (200–400 mcg) or cromoglycate (use MDI with a spacer and face mask or use a nebuliser)	**Inhaled short-acting bronchodilator:** **Inhaled b_2-agonist** or ipratropium bromide as needed for symptoms, not to exceed 3–4 times in one day.
Severity	**Controllers**	**Relievers**
Step 1 Intermittent	None needed.	**Inhaled short–acting bronchodilator:** **Inhaled b_2–agonist** or ipratropium bromide as needed for symptoms, but not more than 3 times per week. Intensity of treatment will depend on severity of attack.

Step down
Review treatment every 3 to 6 months.
If control is sustained for at least 3 months, .
a gradual **stepwise reduction** in treatment may be possible.

Step Up
If control is not achieved, consider **step-up**
But first; review patient medication technique, compliance and environ-mental control (avoidance of allergens or other trigger factors).

*Adapted from the **Caribbean Guidelines for Asthma Management**

Approved by: Director, Family Health Services

XII.3. STEPWISE TREATMENT FOR OLDER CHILDREN AND ADULTS*

(Preferred Treatments are underlined)

Severity	Controllers	Relievers
Step 4 **Severe Persistent**	**Daily medication (divided in 2 equal doses):** **Inhaled corticosteroids,** 800–2,000 mcg or more and Long–acting bronchodilator: either long–acting inhaled b_2-agonist or sustained-release theophylline. Add a leukotriene antagonist. Corticosteroid tablets or syrup long term.	**Short-acting bronchodilator:** **Inhaled b_2-agonist** as needed for symptoms.
Step 3 **Moderate Persistent**	**Daily medications (divided in 2 equal doses):** **Inhaled corticosteroid**, 800–2,000 mcg and Long acting bronchodilator, especially for Night-time symptoms; either long-acting inhaled b_2-agonist or sustained-release theophylline Consider adding a leukotriene antagonist.	**Short-acting bronchodilator:** **Inhaled b_2-agonist** as needed for Symptoms; not to exceed 3–4 times in one day.
Step 2 **Mild Persistent**	**Daily medication (divided in 2 equal doses):** Either **inhaled corticosteroid** 200-500 mcg, **cromoglycate, nedocromil** or sustained-release theophylline. If needed, increase inhaled corticosteroids up to 800 mcg, or add long-acting bronchodilator (especially for night-time symptoms).	**Short-acting bronchodilator:** **Inhaled b_2-agonist** as needed for Symptoms; not to exceed 3–4 times in one day.
Step 1 **Intermittent**	**None needed.**	**Short-acting bronchodilator:** **Inhaled b_2-agonist** as needed for symptoms, but less than once per week. Intensity of treatment will depend on severity of attack. Inhaled b_2-agonist or cromoglycate before exercise or exposure to allergen.
Step down **Review treatment every 3–6 months.** If control is sustained for at least 3 months, a gradual **stepwise reduction** in treatment possible. compliance and (avoidance of factors).		**Step up** **If control is not achieved, consider step up.** But first : review patient medication technique, environmental control allergens or other trigger

*Adapted from the **Caribbean Guidelines for Asthma Management and Prevention.**

PROTOCOL: STEPWISE TREATMENT FOR OLDER CHILDREN AND ADULTS

Date Revised:	Distribution to all types III, IV and V health centres and all hospitals	Index: XII.3
Approved by: Director, Family Health Services		

XII.4. NOTES ON ASTHMA IN PREGNANCY

- Maternal hypoxemia will result in foetal hypoxia.
- Do not withhold medications that are beneficial to the mother.
- Most steroids do not cross the placental barrier freely.
- Remember the possibility of adrenal suppression at delivery.
- Do not give xanthines to mothers who are breast feeding.

PROTOCOL: NOTES ON ASTHMA IN PREGNANCY		
Date Revised:	Distribution to all types III, IV and V health centres and all hospitals	Index: XII.4

Approved by: Director, Family Health Services

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XIII. GUIDELINES FOR IMPLEMENTATION OF PROTOCOL

XIII. GUIDELINES FOR IMPLEMENTATION OF ASTHMA PROTOCOL

A. TRAINING OF PERSONNEL IN USE OF THE GUIDELINES

This should be done in 2 phases.

Phase 1: Is the training of asthma tutors – individuals who will be responsible for ongoing training of personnel. Each Regional Health Authority should identify 4–6 suitable individuals who will receive training as a group, with a view to becoming Asthma Educators. These individuals should be either public health nurses, health educators, nurse practitioners, district medical officers or senior medical residents from hospitals.

This group of 20–25 individuals could be trained by pulmonologists (adult and peadiatric) or asthma specialists. Training would require approximately 24 hours of workshop, which could be spread over 2 weekends. Individuals would then receive certification of having received 'Training in Asthma Management'. These core individuals would undergo a post–test; individuals to be used as Asthma Tutors should receive above 80% on the test.

Phase 2: Ongoing 'Asthma Management Workshops' 3–4 times per year in each region. All district medical officers, nurse practitioners, casualty officers (sessional or full time), residents on medical and paediatric wards should receive certification **within the first year of the programme.**

The training of other health workers can then be done as a part of the region's ongoing training for health workers.

B. REGIONAL HEALTH CLINICS

Each region should have at least one 'Asthma Clinic'. The South East Region , by virtue of its population density should have at least one per parish. Staffing of this clinic should include a minimum of:

- 1 physician (certified in asthma management)
- 1 trained nurse (certified in asthma management)
- A health educator (certified in asthma management) to visit at least once per week).
- Clerical workers
- 1 pharmacist (ideally).

	centres and all hospitals	
Approved by: Director, Family Health Services		

XIII.1. EQUIPMENT FOR ASTHMA CLINICS

1. A Spirometer machine
2. X-ray view box
3. Standing scale
4. Balance scale(infants)
5. Height chart/board
6. Pulse Oximeter Machine
7. Diagnostic Set
8. Heavy Duty Nebulisers x 3; (Casualty and A&E centres x 6)
9. Spacers with face mask x 6 (2 each size)
10. Spacers with removable mouth-piece x 3 (Mouth-pieces x 12)
11. Peak Flow Meters (with removable mouthpieces) x 12 (one per examination room/area)
12. A television and video machine for use in patient education
13. Oxygen cylinders with humidifiers
14. Suction machine and suction catheters
15. IV fluids and brannulas
16. IV drip stands
17. Resuscitation tray with resuscitation equipment including laryngoscopes
18. Telephone access to emergency vehicle.

PROTOCOL: EQUIPMENT FOR ASTHMA CLINICS		
Date Revised:	Distribution to all types III, IV and V health centres and all hospitals	Index: XIII.1
Approved by: Director, Family Health Services		

XIII.2. DRUGS FOR ASTHMA CLINICS

Corticosteroids		**Trade Names**
• Inhaled beclomethazone	–	Becotide, Beclofort, Las-Beclamethazone, Q-var
• Inhaled fluticasone	–	Flixotide
• Oral prednisone		
• Parentral hydrocortisone		
• Nebulised budesonide solution	–	Pulmicort
Long-acting beta$_2$-agonists		
• Salmeterol inhaler	–	Serovent
• Formeterol inhaler	–	Oxis or Foradil
Sustained-release theophylline		
• Aminophylline solution		
Short-acting beta$_2$-agonists		
• Salbutamol MDIs	–	Ventolin, Las-salbutamol Metered dose inhalers
• Salbutamol nebuliser solution	–	Ventolin, Las-salbutamol
Anti-cholinergic agent		
• Ipratropium bromide nebuliser solution	–	Atrovent , Las-ipratropium
Nasal preparations		
• Beclomethasone nasal drops	–	Betnesol
• Beclomethasone nasal spray	–	Beconase
• Fluticasone nasal spray	–	Flonase
IV Fluids		
• 0.9% N Saline		
• D5%W in 0.2% N Saline		
• Hartmann's or Lactated Ringer's Solution		
Non-steroidal Anti-inflammatory		

- Nedocromil – Tilade

Resuscitation Drugs

- Epinephrine
- Sodium Bicarbonate
- Glucose Solution (50%)

Leukotriene Antagonists

- Singulair
- Accolate

Mast Cell Stabilizer

- Cromoglycate – Intal

There are newer inhalers with hydrofluoralkane (HFA) propellants which forms a solution and penetrates deeper into the lungs. They are also ozone friendly. However, these are not widely available.

XIII.3. EDUCATIONAL MATERIALS

1. 500 poster size charts should be made of charts 1 & 2 and the 'Some Possible Asthma Triggers' chart. These should be distributed to all clinics, casualty/A&E department, medical and paediatric wards.

2. 5000 patient booklets entitled 'You and your family can control asthma' – 2000 for South East Region and 1000 for each of the other regions.

3. 5000 Home Management Plans, which is found in the centre of the patient booklets.

4. 2500 new intake and 5000 follow-up progress notes.

5. 5000 acute management charts to be used for all asthmatics with acute exacerbation.

6. 1000 copies of the 'Asthma Protocol' manual to be distributed to all clinics, medical and paediatric wards, casualty/A&E departments.

7. 5000 medication checklist card to be given to all asthmatics.

PROTOCOL: EDUCATIONAL MATERIALS		
Date Revised:	Distribution to types III, IV and V health centres and all hospitals	Index: XIII.3
Approved by: Director, Family Health Services		

XIV. Asthma Chart for Acute Exacerbation Monitoring

XIV. ASTHMA CHART FOR MANAGEMENT OF ACUTE EXACERBATION MONITORING

Name: _____

_____ _____

Date: **Time:**

Age: **Temp:** **RR:** **HR:** **B/P:** **Wt:** **Ht:**

Peak Flow Value: **O_2 Sat:**

Normal PFV for patient:

Circle (Y) or (N) of features below.

Symptoms:

Duration:

Wheezing (Y/N) _____

S.O.B (Y/N) _____

Cough (Y/N) _____

Fever (Y/N) _____

Choking (Y/N) _____

Vomiting (Y/N), (state # of times in last 24 hrs.) _____

Other (state) _____

Past History:

Asthma (Y/N)

Wheezing (Y/N)

Date of last episode of asthma attack or wheezing _____

List any asthma medications currently taking? _____

(include dose and duration) _____

Any steroid use or dependence ? _____

Previous intubation? _____

Any drug allergies? (Y/N); if yes, list drugs. _____

Attending asthma clinic? ((Y/N) If yes, last appt. date _____

Number of admissions for asthma ; last admission date _____

Examination:

Cyanosis (Y/N); Flaring (Y/N); CR (Y/N); SCR (Y/N); Oedema (Y/N)

Sweating (Y/N) Restlessness (Y/N); Stridor (Y/N); Clubbing (Y/N);

Air entry (describe): _____

Rhonchi (Y/N), if yes state where: _____

Crackles /Creps (Y/N); if yes state where: _____

Liver palpable (Y/N): _____

Treatment in last 24 hours: Circle whichever is appropriate.

Inhaled/oral/nebulised salbutamol (Y/N); if yes, state dose & time _____

Inhaled/oral/IV steroids (Y/N); if yes state dose & time _____

Oral theophylline/IV aminophylline (Y/N); if yes, state dose & time _____

Any other drugs? (list:) _____

Initial Treatment

Drugs:	**Dose:**	**Time:**	**Signature:**
Oxygen			
Inhaled salbutamol/nebulised salbutamol		1st 2nd 3rd	
Prednisone			
Hydrocortisone			
Others:			

Comments: (asthma severity, drug reactions, etc.)

_____

_____

Reassessment

Time: PFV: O_2 Sat:

RR: HR: Temp: B/P:

Flaring (Y/N); Tracheal Tug (Y/N)

ICR (Y/N); SCR (Y/N); Air Entry (good/poor); Crackles /Creps (Y/N); Rhonchi (Y/N)

Subsequent Treatment

Drug:	**Dose:**	**Time:**	**Signature:**
Oxygen			
Inhaled/nebulised salbutamol		1st 2nd 3rd	
Ipratropium bromide		1st 2nd	
Aminophylline			
IV Hydrocortisone			
Other			

Investigations/Findings

Chest X-ray

Other

Comments: (Asthma severity, need for admission/transfer etc.) _____

_____

_____ **Signature:** _____

PROTOCOL: ASTHMA CHART FOR MANAGEMENT OF ACUTE EXACERBATION MONITORING		
Date Revised:	Distribution to all types III, IV and V health centres and all hospitals	Index: XIV
Approved by: Director, Family Health Services		

XV. Asthma Clinic: New Patient Intake Notes

XV. ASTHMA CLINIC: NEW PATIENT INTAKE NOTES

Date: (DD/MM/YY) (_____/_____/ _____)

Name: _____

Date of Birth: _____ **Age:** _____

Address: _____

Telephone (H) _____ **(W):** _____ **Contact:** _____

Next of Kin: _____

Guardian: _____

Mother: _____ **Father:** _____

Historian: _____ **Relationship:** _____

Referred from: _____

Reason(s) for Referral: _____

_____

_____

History (tick or circle where appropriate)

- Known lung disease
- Heart Problems
- Any recurrent or prolonged infections
- Foreign Body Aspiration
- Reflux Disease
- Feeding problems/ excessive vomiting/choking
- Fatty stools
- Consanguinity (Blood relative with the disease)
- HIV/AIDS disease
- Nocturnal Cough
- Exercise induced cough/chest pain/wheeze
- Disturbed sleep (parents/child)
- Diabetes
- Drugs, e.g. NSAIDS or *b*-blockers?
- Any other illnesses? (List below)

HPC:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Neonatal Problems: _____ **Birth Weight:** _____

_____

_____

_____

_____

Hospitalisations (List diagnoses, dates and hospital name):

_____

_____

_____

Circle as appropriate below:

No. of Visits to (Clinic/Casualty or A&E /Private Doctor) for Asthma: _____

Weekly: _____ **Monthly:** _____ **Yearly:** _____ **Date of last visit:** _____

Personal Hx.

- Sinusitis/Allergic Rhinitis/Allergic Conjunctivitis/Eczema

  _____

  _____
- Smoking (Y/N) If yes: No of cigarettes per day:
- Nursery attendance (Y/N); If yes: Age started: _____ ; size of nursery: _____ no of children:
- Absence from work/school because of asthma: (Y/N);
- If yes, No. of days per month/term/year: _____

  _____
- Parents workdays missed (per month/per year):

Family History: (state family member's relationship);

- Asthma:
- Lung Problems(including chronic cough):
- Admission or clinic visits to National Chest Hospital:
- HIV/AIDS disease
- Sinusitis/allergic rhinitis/allergic conjunctivitis/severe eczema
- Other:

Environmental and other triggers (circle all that apply): **Medication List:type/dose/frequency**

- Infections (colds/flu/other) 1)
- Animals (indoor/outdoor): (dogs/cats/birds/chickens) 2)
- House dust (carpets/rugs/sofa/drapes/stuffed toys, etc.) 3)
- Flowering plants/trees: _____ 4)
  (name)
- Smoke: cigar/cigarettes/marijuana/coal/wood stoves 5)
- Out-door pollutants: (garbage burning (home or dump), cane burning, construction) 6)
- Exercise
- Strong emotions/stress
- Industries: factories/dressmaking/hairdressing/furniture making/car repairs

- Weather changes
- Foods/others

Examination:

Wt: ——— **Ht:** ——— **Temp:** ——— **HR:** ——— **RR:** ——— **PF Value:** ———

O_2 Sat: _____

General _____
Clubbing: (Y/N)

_____

Lymph Nodes: _____

Eyes _____

Ears: _____

Nose: _____

Throat: _____

Lungs: _____

_____

_____

_____

CVS: _____

_____

Abdomen: _____

_____

CNS: _____

_____

Skin: _____

_____

Other: _____

Assessment: _____

_____

_____

Investigations: _____

_____

_____

Plan (tick those that were done):

Asthma Facts:

Triggers: (discuss and give advise on avoidance measures)
Inhalers: (explain relievers and controllers; demonstrate how to assess if inhalers are empty, and inform about side effects of medications)
Action Plan:(write and explain, discuss asthma symptoms, give advise when to seek help)
Spacer Device: (explain, demonstrate and prescribe)
Peak Flow Meter: (demonstrate, prescribe and explain usefulness)
Symptoms/Peak Flow Diary (explain use, and request at each visit)
Reading material/booklets on asthma.

Medications: _____

_____

_____

_____

Appointment: _____ **Signature:** _____

PROTOCOL: ASTHMA CLINIC: NEW PATIENT INTAKE NOTES		
Date Revised:	Distribution to all types III, IV and V health centres and all hospitals	Index: XV
Approved by: Director, Family Health Services		

XVI. Asthma Clinic: Follow-up Progress Notes

XVI. ASTHMA CLINIC: FOLLOW-UP PROGRESS NOTES

Date:(DD/MM/YY/) (____/____/____)

Name: **Docket No.**

Historian: **Relationship:**

Age: **HR** **RR** **Temp.** **Wt.** **Ht.**

Peak Flow Value (clinic): **(home):** **PF Variability**

O_2Sat:

Since last visit:

Any hospitalisations? (If yes, list dates):

Any visits to Casualty/A&E/ Private Doctor/ clinic? (for asthma and any other problem)
(List problem and date):

Current problems:

Any nocturnal cough?

Exercise intolerance (same/improved)

Bronchodilator use: (per day or night, per week)

Medications: **Dose:** **Frequency:**

1.
2.
3.
4.
5.
6.

Examination:

General: **Clubbing (Y/N)**

Lymph nodes:

Eyes:

Ears:

Nose:

Throat:

Lungs:

CVS:

Abdomen:

CNS:

Skin:

Other:

Assessment:

Investigations:

Plan: (ask patient to demonstrate spacer and peak flow meter use. Explain home management plan. Review plan from last visit; discuss any concerns with medication. Re-educate as needed.)

Medications:

Appointment:

Signature:

PROTOCOL: ASTHMA CLINIC: FOLLOW-UP PROGRESS NOTES		
Date Revised:	Distribution to all types III, IV and V health centres and all hospitals	Index: XVI
Approved by: Director, Family Health Services		

XVII. Severity of Asthma Attacks (Poster 1)

Poster 1

XVII. SEVERITY OF ASTHMA ATTACKS

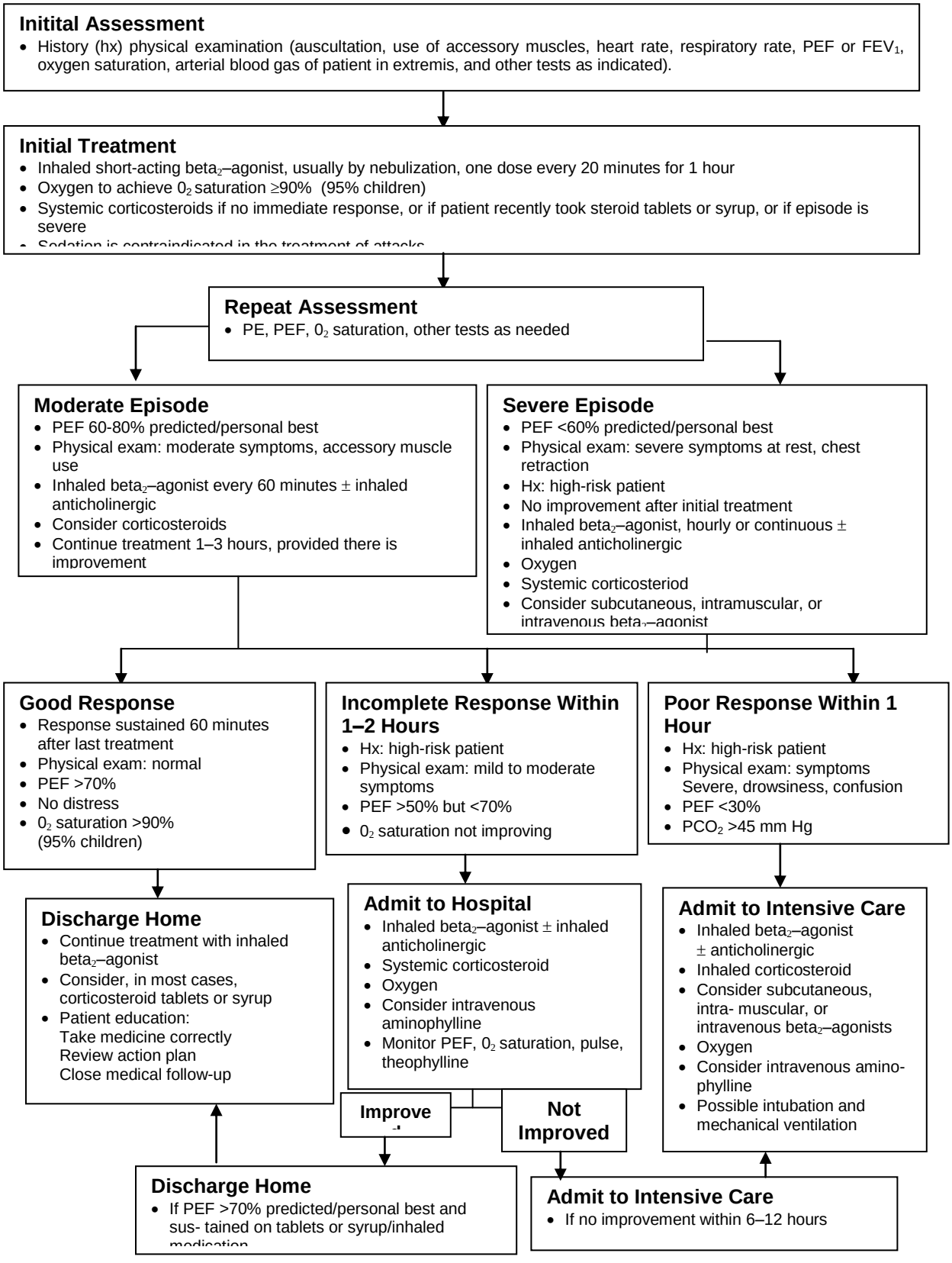
Parameter*	Mild	Moderate	Severe	Respiratory Arrest Imminent
Breathless	Walking Can lie down	Talking Infant–softer shorter cry, difficulty feeding Prefers sitting	At rest Infant–stops feeding Hunched forward	
Talks in	Sentences	Phrases	Words	
Ability to cry	Good cry	Soft cry	Groaning	
Alertness	May be agitated	Usually agitated	Usually agitated	Drowsy or confused
Respiratory rate	Increased	Increased	Often >30/min (adults)	
Guide to rates of breathing associated with respiratory distress in awake children: **Age** — **Normal rate** <2 months — <60/min 2–12 months — <50/min 1–5 years — <40/min 6–8 years — <30/min				
Accessory muscles and suprasternal retractions	Usually not	Usually	Usually	Paradoxical thoraco–abdominal movement
Wheeze	Moderate, often only and expiratory	Loud	Usually loud but may be reduced	Absence of wheeze
Pulse/min (adult)	<100	100–200	>120	Bradycardia
Guide to Limits of Pulse rates in infants and children: **AGE** — **NORMAL RATE** — **BRADYCARDIA** Infants — 2–12 months — <160/min — <80/min Preschool — 1–2 years — <120/min — <80/min School age — 3–8 years — <110/min — <80/min				
Pulsus paradoxus	Absent	May be present	Often present	Absence suggests respiratory muscle fatigue
PEF **After initial bronchodilator** **% predicted or** **% personal best**	Over 80%	Approximately 60–80%	<60% predicted or personal best 100 L/min (adults) or response lasts <2 hours	
Sa02 (on air)	>95%	91–95%	<90%	
Pa02 (on air) and/or **PaC02**	Normal Test not usually necessary <45 mm Hg	>60 mmHg <45 mmHg	<60 mm Hg >45 mmHg: Possible respiratory failure	
Hypercapnia (hypoventilation) develops more readily in young children than in adults and adolescents.				

*Note: The presence of several parameters, but not necessarily all, indicate the general classification of the attack.

XVIII. Management of Asthma Attacks (Poster 2)

Poster 2

MANAGEMENT OF ASTHMA ATTACKS: HOSPITAL-BASED CARE



Note: Preferred treatments are inhaled beta$_2$–agonists in high doses and corticosteroids. If inhaled beta$_2$–agonists are not available, theophylline may be considered. There may be a slight therapeutic advantage in using anti–cholinergic

XIX. ‘Some Possible Asthma Triggers’ (Poster 3)

Poster 3

Some Possible Asthma Triggers

ALLERGIES

- Foods such as nuts, chocolate, eggs, orange juice, fish, milk, peanut butter.
- Pollens from flowers, trees, grasses, hay, ragweed. Mould spores.
- Animals such as rabbits, cats, dogs, hamsters, gerbils, chickens, birds.
- Feather pillows, down comforters.
- Insect parts such as those from dead cockroaches.

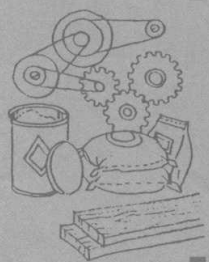
DUSTS

- Cloth upholstered furniture, carpets, draperies that gather dust.
- Brooms and dusters that raise dust.
- Dirty filters on hot air furnaces and air conditioners that put dust into the air.
- Dust in beds and pillows.

HOUSEHOLD PRODUCTS

- Vapours from cleaning solvents, paint, paint thinner, liquid chlorine bleach.
- Sprays from furniture polish, starch, cleaners, room deodorizers.
- Spray deodorants, perfumes, hair sprays, talcum powder, scented cosmetics.

ON THE JOB



- Dust, vapours, or fumes from:
  - Wood products (western red cedar, some pine and birch woods, mahogany).
  - Flour, cereals, grains, coffee, tea, papain.
  - Metals (platinum, chromium, nickel sulphate, soldering fumes).
  - Cotton, flax, hemp.
- Mould from decaying hay.

INFECTIONS

- Colds, other viruses, bronchitis, tonsillitis, sore throat.

EXERCISE

- Wheezing may begin after overexertion.

SMOKE

- From cigarettes, cigars, pipes - either yours or someone else's.

WEATHER

- Blasts of cold air.
- Excessive humidity.
- Changes in seasons.

AIR POLLUTION

- Traffic jams.
- Parking jams.
- Smoke-filled rooms.

NIGHTTIME

- Lying down, tiredness, accumulating mucus.

EMOTIONS

- Fear, anger, frustration, laughing too hard, crying, coughing.

BREATHING FREE ASTHMA-IN-ACTION

Provided as an educational service to physicians and their patients by:
Glaxo Educational Support Team
c/o Glaxo Wellcome Caribbean
8 Olivier Road, Kingston 8, Jamaica, W.I.

XX. Asthma Medicine/Management Plan

Asthma Medicine Plan

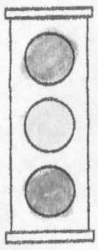
Name: _____

Doctor: _____ **Date:** _____

Phone for doctor or clinic: _____

Phone for taxi or friend: _____

You can use the colors of a traffic light to help learn about your asthma medicines.



1. **Green** means **Go**.
   Use preventive medicine.
2. **Yellow** means **Caution**.
   Use quick-relief medicine.
3. **Red** means **Stop**.
   Get help from a doctor.

1. Green - Go

- Breathing is good
- No cough or wheeze
- Can work and play

Peak Flow Number
_____ to _____

Use preventive medicine.

Medicine	How much to take	When to take it

20 minutes before sports, use this medicine:

_____

2. Yellow - Caution

Cough

Wheeze

Tight chest

Wake up at night

Peak Flow Number
_____ to _____

Take quick-relief medicine to keep an asthma attack from getting bad.

Medicine	How much to take	When to take it

3. Red - Stop - Danger

- Medicine is not helping
- Breathing is hard and fast
- Nose opens wide
- Can't walk
- Ribs show
- Can't talk well

Peak Flow Number
_____ to _____

Get help from a doctor now!
Take these medicines until you talk with the doctor.

Medicine	How much to take	When to take it

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