Obstetrics Guidelines

SUBJECT: ASTHMA AND PREGNANCY

The following guidelines have been adapted primarily from the "Report of the Working Group on Asthma and Pregnancy: Management of Asthma during Pregnancy" (September, 1993) and the "Guidelines for the Diagnosis and Management of Asthma" (April, 1997) published by the National Institutes of Health; National Heart, Lung, and Blood Institute.

I. Overview

A. Asthma is one of the most common chronic diseases in pregnancy. Bronchial asthma occurs in approximately 4% of all pregnancies and an additional 1O% may experience nonspecific airway hyper-responsiveness.

B. Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular, mast cells, eosinophils, T lymphocytes, macrophages, neutrophils, and epithelial cells. In susceptible individuals, this inflammation causes 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 that is often reversible either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial hyperresponsiveness to a variety of stimuli (NHLBI 1995).

C. In general, one-third of patients with asthma will improve during pregnancy, one-third will worsen, and the remaining one-third will be unchanged.

D. Maternal complications associated with uncontrolled asthma include:
1. Pre-eclampsia
2. Gestational hypertension
3. Hyperemesis gravidarum
4. Vaginal hemorrhage
5. Induced and complicated labor

E. Fetal complications associated with uncontrolled asthma include:
1. Increased risk of perinatal mortality
2. Intrauterine growth retardation
3. Pre-term birth
4. Low birth weight
5. Neonatal hypoxia

F. In patients with well-controlled asthma, there is little or no increased risk to the mother or her fetus. The risks of uncontrolled asthma are more harmful to the fetus than the medications used to control asthma. (**See Appendix 1: Drugs and Dosages for Asthma and Associated Conditions Preferred for Use During Pregnancy**). Poorly controlled asthma during pregnancy can result in increased perinatal mortality, increased prematurity, and low birth weight (Nelson & Weber, 1988).

II. Etiology and Diagnosis

A. Asthma is defined by the following characteristics:

1. Airway obstruction or airway narrowing that resolves or improves spontaneously or following treatment.

2. Airway inflammation: The presence of inflammatory cells (eosinophils, neutrophils, monocytes, and lymphocytes) in the airways. This is associated with epithelial injury, mucosal edema, abnormalities in neural mechanisms leading to increased airway obstruction and increased airway smooth muscle responsiveness.

3. Airway hyper-responsiveness to physical (e.g. allergens), chemical (e.g. tobacco smoke, strong odors, air pollutants, and food additives) and pharmacologic agents (e.g. aspirin, beta-blockers).

B. Diagnosis is based on the detailed medical history, physical exam focusing on the upper respiratory tract, chest, and skin and objective measurements of lung function to demonstrate reversibility (**See Appendix V: Sample Questions to Guide Assessment, Diagnosis and Ongoing Evaluation**.

1. Spirometry measures vital capacity, forced vital capacity, and FEV_1 (the volume of air expired in 1 second from maximum inspiration). The severity or asthma is best defined by FEV_1. Spirometry measurements before and after the patient inhales a short-acting bronchodilator should be undertaken for patients in whom the diagnosis of asthma is being considered. Spirometry tests are recommended (1) at the time of initial assessment, (2) after treatment is initiated and symptoms and PEFR have stabilized, and (3) least every 1 to 2 years.

2. Peak expiratory flow rate (PEFR) records the greatest flow velocity following forced expiration of fully inflated lungs. PEFR correlates well with FEV_1 and is obtained with an inexpensive, portable peak flow meter. PEFR only measures large airway function and is not sufficient alone to make a diagnosis of asthma or to fully evaluate the severity of asthma. However, peak flow monitoring can establish peak flow variability and thus aid in the determination of asthma severity when patients have asthma symptoms and normal spirometry. PEFR that varies 20% or more from PEFR measurement on arising in the morning (before taking an inhaled short-acting $beta_2$-agonist) to PEFR measurement in the early afternoon (after taking an inhaled short-acting $beta_2$-agonist) demonstrates reversible airflow limitation and diurnal variation necessary for a diagnosis of asthma.

3. Clinical presentation: Patient complaint of recurrent cough, wheezing, dyspnea, and chest tightness. These symptoms may worsen as follows: 1) in the evening (nocturnal), 2) as a result of seasonal variation, 3) following exercise, or 4) with exposure to cold air

ASTHMA SEVERITY	SYMPTOMS	NIGHTTIME SYMPTOMS	LUNG FUNCTION
STEP 4 **Severe Persistent**	• Continual symptoms • Limited physical activity • Frequent exacerbations	Frequent	• FEV_1 or PEFR $\leq$60% predicted • PEFR variability >30%
STEP 3 **Moderate Persistent**	• Daily symptoms • Daily use of inhaled short-acting $beta_2$-agonist • Exacerbations $\geq$2 times a week; may last days	> 1 time a week	• FEV_1 or PEF >60%-<80% predicted • PEFR variability >30%
STEP 2 **Mild Persistent**	• Symptoms >2 times a week but <1 time a day • Exacerbations may affect activity	> 2 times a month	• FEV_1 or PEF $\geq$80% predicted • PEFR variability 20-30%
STEP 1 **Mild Intermittent**	• Symptoms $\leq$2 times a week • Asymptomatic and normal PEFR between exacerbations • Exacerbations brief (from a few hours to a	$\leq$ 2 times a month	• FEV_1 or PEF $\geq$80% predicted • PEFR variability <20%

	few days); intensity may vary		

II. Management Considerations

A. The goals of therapy are:

1. To maintain (near) "normal" pulmonary function
2. To prevent chronic and troublesome symptoms
3. To maintain normal activity levels
4. To prevent recurrent exacerbations and minimize the need for emergency department visits or hospitalization
5. To provide optimal pharmacotherapy with minimal or no adverse effects
6. To meet patient and family expectations of and satisfaction with asthma care
7. To deliver a healthy baby.

Maintaining sufficient lung function and blood oxygenation to ensure adequate oxygen supply to the fetus is essential.

Recommendations common to all patients with asthma include:

1. Eliminate asthma triggers from the patient's environment **(See Appendix III: Patient Education)**

2. Aggressive management of rhinitis, sinusitis, or gastroesophageal reflus, if present with persistent asthma.

- a. antihistamines and decongestants for rhinitis
  - i. oral agents: pseudoephedrine, tripelennamine, and chlorpheniramine
  - ii. nasal spray: normal saline or oxymetazoline
  - iii. intranasal cromolyn or beclomethasone for allergic rhinitis
- b. the incidence of sinusitis in pregnancy is l.5%
  - i. treat with antibiotics for 14 to 21 days.
  - ii. drug of choice is amoxicillin; other drugs include erythromycin, sulfisoxazole, cephalosporins, and augmentin
- c. gastroesophageal reflux
  - i. medical management for complaints of frequent heartburn or pyrosis in combination with frequent episodes of nocturnal asthma
  - ii. avoid food and drink within 3 hours of retiring
  - iii. elevating the head of the bed on 6-8 inch blocks
  - iv. using appropriate pharmacologic therapy

3. Maintain adequate hydration

4. Patient education is essential for achieving optimal asthma control

5. Avoid salicylates and non-steroidal anti-imflamatory drugs, nonselective beta-blockers, and products containing sulfites

6. Pretreatment with beta-agonists or cromolyn prior to any exercise when indicated

7. Use a stepwise approach to pharmacologic management **(See Appendix IV: Patient Home Self-Management)**

- a. STEP UP: If control is not maintained, consider increasing treatment to next level of asthma severity. First, review patient medication technique, adherence, and environmental control/allergen avoidence.
- b. Gain control as quickly as possible; then decrease treatment to the least medication necessary to maintain control.
- c. A rescue course of systemic corticosteroids may be needed at any time and at any step.

8. Develop a written action plan for all patients with moderate to severe persistent asthma and all patients with a history of severe exacerbations.

9. Exacerbations due to viral respiratory infections are managed as follows:
   a. Mild symptoms: inhaled $beta_2$agonist q 4-6 hours for 24 hours; longer with a physician consult
   b. If infections reoccur more frequently than every 6 weeks, a step up in long-term care is recommended.
   c. If the infection provokes a moderate-to-severe exacerbation, a short course of systemic corticosteroids should be considered; if a history of severe exacerbations develops, systemic corticosteroids should be initiated at the first sign of infection.

10. STEP DOWN: Review treatment every 1 to 6 months; a gradual stepwise reduction in treatment may be possible

11. Referral to an asthma specialist for consultation or comanagement is recommended if there are difficulties achieving or maintaining control of asthma or if the patient requires Step 4: Severe Persistent Asthma care. Referral or consultation may be considered for Step 3: Moderate Persistent Asthma care.

12. Patients at high risk of asthma-related death require special attention—particularly intensive education, monitoring and care. They should be counseled to seek medical care early during an exacerbation and instructed about the availability of ambulance services.

Risk Factors for Death from Asthma

- Past history of sudden severe exacerbations
- Prior intubation for asthma
- Prior admission for asthma to an intensive care unit
- Two or more hospitalizations for asthma in the past year
- Three or more emergency care visits for asthma in the past year
- Hospitalization or an emergency care visit for asthma within the past month
- Use of >2 canisters per month of inhaled short-acting $beta_2$-agonist
- Current use of systemic corticosteroids or recent withdrawal from systemic corticosteroids
- Difficulty perceiving airflow obstruction or its severity
- Comorbidity, as from cardiovascular diseases or chronic obstructive pulmonary disease
- Serious psychiatric disease or psychosocial problems
- Low socioeconomic status and urban residence
- Illicit drug use
- Sensitivity to *Alternaria*

Sources: Kallenback et al. 1993; Rodrigo and Rodrigo, 1993; Suissa et al. 1994; Greenberger et al. 1993; O'Hollaren et al. 1991.

B. Mild Intermittent Asthma (See Appendix II: Chart 1A)

1. Long-Term Control: No daily medication needed

2. Quick Relief:

Symptomatic: short-acting bronchodilator: inhaled $beta_2$-agonists as needed for symptoms; 2 puffs tid-qid prn

Asymptomatic: No routine drug administration except for pretreatment of exercise-induced Bronchospasm; short-acting bronchodilator: inhaled $beta_2$-agonist; 2 puffs q 5 minutes prior to exercise

Use of short-acting inhaler more than 2 times a week may indicate the need to initiate long-term control therapy.

3. Drug of choice: albuterol (Ventolin, Proventil)
   Other drugs: bitolterol (Tornalate), metaproterenol (Alupent, Metaprel), pirbuterol (Maxair), or terbutaline (Brethaire)
4. Education
   a. Teach basic facts about asthma
   b. Teach inhaler/spacer/holding chamber technique
   c. Discuss roles of medications
   d. Develop self-management plan
   e. Develop action plan for when and how to take rescue actions, especially for patients with a history of severe exacerbations
   f. Discuss appropriate environmental control measures to avoid exposure to known allergens and irritants
3. Baseline PEFR at time of assessment **(See Appendix III: Patient Education: How to Use a Peak Flow Meter**
4. Patients with intermittent asthma who have a history of severe exacerbations should have a detailed written action plan developed for them. (Refer to **Appendix II: Charts 4-6 as needed)**.
5. Routine prenatal care guidelines

C. Mild Persistent Asthma (See Appendix II: Chart 1B)

Note: It is recommended that any patient with persistent asthma, regardless of severity, receive long-term control medication the most effective of which contain anti-inflammatory effects.

1. Long-term Control: One daily medication; anti-inflammatory: either inhaled corticosteroid (low doses) or cromolyn or nedocromil; sustained-release theophylline to serum concentration of 5-15 mcg/mL is an alternative, but not the preferred therapy.
2. Quick Relief: Same as Mild Intermittent above
   Use of short-acting $beta_2$-agonists on a daily basis, or increasing use, indicates the need for additional long-term control therapy.
3. Education:
   a. All education topics listed under Mild Intermittent above, plus:
   b. Teach self-monitoring
   c. Refer to group education, if available
   d. Review and update self-management plan
4. Baseline spirometry evaluation during initial prenatal assessment as well as the baseline PEFR.
5. Routine prenatal care guidelines with careful attention paid to fetal growth and well-being.

D. Moderate Persistant Asthma (See Appendix II: Chart 2)

1. Long-Term Control: Daily Medication

EITHER:

Anti-inflammatory; inhaled corticosteroid (medium dose)

OR

Inhaled corticosteroid (low-medium dose) AND a long-acting bronchodilator, especially for nighttime symptoms: either long-acting inhaled beta$_2$-agonist, sustained-release theophylline, or long-acting beta$_2$-agonist tablets.

IF NEEDED:

Anti-inflammatory, inhaled corticosteroids (medium-high dose) AND a long-acting bronchodilator, as above.

2. Quick Relief:

a. Short-acting bronchodilator: inhaled beta$_2$-agonists as needed for symptoms

b. Intensity of treatment will depend on severity of exacerbation

c. Use of short-acting inhaled beta$_2$-agonists on a daily basis, or increasing use, indicates the need for additional long-term-control therapy.

3. Drugs of choice:

Five steroid inhalers are available and each drug has a different strength requiring its own dosing regimen. Patients may need 2 to 4 weeks of steroid inhaler therapy to elicit full benefit of the therapy. Doses exceeding 1600 mcg/day are associated with adrenal suppression. Use of a spacer device will limit the side effects dysponia and oral candidiasis.

Inhaled corticosteroid of choice: beclomethasone (Beclovent, Vanceril)

Estimated Comparative Daily Dosages for Inhaled Corticosteroids

Drug	**Low Dose (Adults)**	**Medium Dose (Adults)**	**High Dose (Adults)**
Beclomethasone dipropionate 42 mcg/puff 84 mcg/puff	168-504 mcg (4-12 puffs – 42 mcg) (2-6 puffs – 84 mcg)	504-840 mcg (12-20 puffs – 42 mcg) (6-10 puffs – 84 mcg)	>840 mcg (<20 puffs – 42 mcg) (>10 puffs – 84 mcg)
Budesonide Turbuhaler 200 mcg/dose	200-400 mcg (1-2 inhalations)	400-600 mcg (2-3 inhalations)	>600 mcg (>3 inhalations)
Flunisolide 250 mcg/puff	500-1,000 mcg (2-4 puffs)	1,000-2,000 mcg (4-8 puffs)	>2,000 mcg (>8 puffs)
Fluticasone MDI: 44, 110, 220 mcg/puff DPI: 50, 100, 250 mcg/dose	88-176 mcg (2-4 puffs – 44 mcg) (2-4 inhalations – 50 mcg)	176-440 mcg (4-10 puffs – 44 mcg) OR (2-4 puffs – 110 mcg) (2-4 inhalations – 100 mcg)	>440 mcg (>4 puffs – 11- mcg) OR (>2 puffs – 220 mcg) (>4 inhalations–100 mcg)OR (>2 inhalations – 250 mcg)
Triamcinolone acetonide 100 mcg/puff	400-800 mcg (4-8 puffs)	800-1,200 mcg (8-12 puffs)	>1,200 mcg (>12 puffs)

Long-acting bronchodilator:

EITHER: A long-acting inhaled beta$_2$-agonist:

-primarily for nighttime symptoms: Salmeterol OR

A long-acting beta$_2$-agonist tablet:

-sustained-release albuterol (4 mg q 12 hours) OR

A sustained-release theophylline: Starting dose: 10 mg/kg/day up to 300 mg max;

Usual maximum: 800 mg/day; Goal: achieve a serum concentration of 5-15 mcg/mL at steady state (at least 48 hours on the same dosage); monitor levels; evaluate factors affecting serum theophylline concentration e.g. food, diet, febrile illness, drug interaction, smoking

Systemic corticosteroid: Methylprednisolone, Prednisolone, or Prednisone; 7.5-60 mg daily in a single dose or qid as needed for control

3. A short course or "burst" of oral prednisone may be used to initiate therapy or correct deteriorating asthma control
4. Obtain a consult from a Pulmonary Medicine Specialist
5. All patients are to have a baseline spirometry assessment and be issued a peak flow meter with instructions on its use if not currently monitoring PEFR (**See Appendix III: Patient Education)**. To determine a personal best value, the patient should record a PEFR daily for 2 to 3 weeks when their asthma is under good control. Other education goals are the same as Mild Persistent asthma above.
6. Routine prenatal care guidelines with close observation of fetal growth and fetal well-being. Influenza vaccine is to be administered each fall. The vaccine is a killed virus and its administration is safe in all trimesters **(Immunizations in Pregnancy: I 1.15).**

D. Severe Asthma (See Appendix II: Chart 3)

1. Long-Term Control:
Anti-inflammatory; inhaled corticosteroid (high dose)
AND long-acting bronchodilator; either a long-acting, inhaled beta$_2$-agonist, an oral long-acting beta$_2$-agonist or sustained-release theophylline
AND corticosteroid tablets or syrup long term (2 mg/kg/day, generally do not exceed 60 mg per day)
AND short-acting, inhaled beta$_2$-agonists as needed for symptoms

2. To either initiate therapy or treat a period of gradual deterioration administer an oral prednisone "burst" of 3-10 day duration for active symptoms (dose 40-60mg in single or 2 divided doses; higher doses may be administered during severe exacerbations requiring hospitalization). Progress to chronic systemic corticosteroid therapy if control is unachieved on high dose inhaled corticosteroids with long-acting bronchodilators.
   a. Use the lowest possible dose (single dose daily or on alternate days)
   b. Monitor closely for corticosteroid adverse side effects
   c. When control of asthma is achieved, make persistent attempts to reduce systemic corticosteroids
   c. Co-manage with pulmonary medicine specialist

3. Spirometry and PEFRs as detailed in the moderate asthma section above **(See: Appendix III: Patient Education)**.

4. Routine prenatal care with careful assessment of fetal growth. Influenza vaccine is to be administered each fall (**See: Immunizations in Pregnancy: I 1.15**).

5. At 32 weeks, begin weekly fetal non-stress testing **(See: Antepartum Testing: A 1.30)**

7. Education includes all topics listed under Mild Persistent Asthma above as well as referral for individual education and counseling.

E. Acute Exacerbation (See Appendix II: Charts 4 (Home) & 6A (Hospital/Emergency))

1. Determine the severity of the attack; assess the history, physical exam, and PEFR.
PEFR value <50% of personal best or predicted PEFR suggests severe exacerbation.

2. Administer short-acting inhaled beta-agonists, then reassess. Administration routes include:
   a. albuterol MDI (90 mcg/puff) with spacer,
   b. albuterol respiratory treatment, dose 0.5% solution
   c. terbutaline, dose 0.25 mg administered subcutaneously

3. Admit to the hospital if there is limited or no improvement.
   a. Oxygen to achieve O_2 saturation >90%
   b. Systemic corticosteroid (oral or intravenous depending on exacerbation severity)
   d. Albuterol respiratory treatments every 1-3 hours with pre- and post- PEFR; consider adding an anticholinergic to nebulizer treatments
   e. Antibiotics if signs and symptoms of infection are present

F. Intrapartum (See Appendix II: Chart 5 (Labor) and Chart 6B Delivery))

1. Assess asthma control on admission; check PEFR.

2. If well controlled, continue routine asthma medications. If uncontrolled, manage as per acute exacerbation guidelines

3. Medications to use with caution:
   a. 15-methyl prostaglandin F_2 alpha
   b. morphine and meperidine

4. Hydrocortisone 50-100 mg IVPB every 8 hours until delivery if the patient received oral steroids within 4 weeks of delivery

IV. References

ACOG Technical Bulletin #224, (1996). Pulmonary Disease in Pregnancy.

Greenberger, P.A., Miller, T.P., Lifschultz, B. (1993). Circumstances surrounding deaths from asthma in Cook County (Chicago) Illinois. Allergy Proceedings, 14, 321-326.

Kallenbach, J.M., Frankel, A.H., Lapinsky, S.E., et al. (1993). Determinants of near fatality in acute severe asthma. American Journal of Medicine, 95, 265-272.

National Institutes of Health; National Heart, Lung, and Blood Institute (April, 1997). Expert Panel Report 2: Clinical Practice Guidelines: Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 97-4051.

National Institutes of Health; National Heart, Lung, and Blood Institute (March, 1993). National Asthma Education Program: Report of the Working Group on Asthma and Pregnancy: Executive Summary: Management of Asthma During Pregnancy. NIH Publication No. 93-3279A

National Institutes of Health; National Heart, Lung, and Blood Institute (1992). Executive Summary: Management of Asthma During Pregnancy. NIH Publication No. 92-3279a.

National Institutes of Heart, Lung, and Blood Institute (1995). Global Initiative for Asthma. National Institutes of Health pub. No. 95-3659.

Nelson, H.S., Weber, R. W. (1988). Endocrine aspects of allergic diseases. In: Bierman, C. W., Pearlman, D.S., eds. Allergic Diseases From Infancy to Adulthood. W.B. Saunders: Philadelphia. ch. 15.

O'Hollaren, M.T., Yunginger, J.W., Offord, K.P., et al. (1991). Exposure to an aeroallergen as a possible precipitating factor in respiratory arrest in young patients with asthma. New England Journal of Medicine, 324, 359-363.

Rodrigo, C. Rodrigo, G. (1993). Assessment of the patient with acute asthma in the emergency department: A factor analysis study. Chest, 104:1325-1328.

Suissa, S., Ernst, P., Bolvin, J.F., et al. (1994). A cohort analysis of excess mortality in asthma and the use of inhaled beta$_2$-agonists. American Journal of Respiratory Critical Care Medicine, 149, 604-610.

APPENDIX IA: DRUGS AND DOSAGES FOR ASTHMA AND ASSOCIATED CONDITIONS
*PREFERRED FOR HOME MANAGEMENT USE DURING PREGNANCY**

Drug Class	Specific Drug	Dosage
Anti-Inflammatory	Cromolyn Sodium (MDI 1mg/puff)	2 puffs qid (inhalation)
	(Nebulizer sol'n)	1 ampule (20mg) tid-qid
		2 sprays in each nostril bid-qid (intranasal for nasal symptoms)
Inhaled corticosteroid	Beclomethasone (42 mcg/puff)	See Moderate Persistent Asthma for Low-Medium-High Dose
		2 sprays in each nostril bid (intranasal for allergic rhinitis)
Systemic corticosteroid	Prednisone	Short course "burst" for active symptoms: 40-60 mg per Day as single or 2 divided doses for 3-10 days If a prolonged course is required, a single a.m. dose on Alternate days may minimize adverse effects.
Bronchodilator		
Long-Acting Inhaled Beta$_2$-agonist (not used for routine symptom relief or exacerbations)	Salmeterol (MDI 21 mcg/puff)	2 puffs q 12 hours (one dose nightly for symptoms)
	(DPI 50 mcg/blister)	1 blister q 12 hours
	Sustained-release Albuterol	4 mg q 12 hours
Methylxanthines	Theophylline	Starting dose: 10 mg/kg/day up to 300 mg max; Usual max 800 mg/day; requires routine serum levels And attention to factors affecting serum concentrations (food, diet, febrile illness, drug interactions, smoking)
Short-Acting Inhaled Beta$_2$-agonist	Albuterol (MDI 90 mcg/puff)	2 puffs q 5 minutes prior to exercise if prior systems 2 puffs tid-qid prn
Antihistamine	Chlorpheniramine	4 mg by mouth up to qid 8-12 mg sustained-release bid
	Tripelennamine	25-50 mg by mouth up to qid 100 mg sustained-release bid
Decongestant	Pseudoephedrine	60 mg by mouth up to qid 120 mg sustained-release bid
	Oxymetazoline	Intranasal spray or drops up to 5 days for rhinosinusitis
Cough	Guaifenesin Dextromethorphan	2 tsp by mouth qid
Antibiotics	Amoxicillin	3 weeks therapy for sinusitis

*This table presents drugs and suggested dosages for the home management of asthma and associated conditions. Drugs and dosages for the treatment of exacerbations in the emergency department or hospital are presented in the full report of the working group. (1993. National Asthma Education Program. NIH: NLBI.)

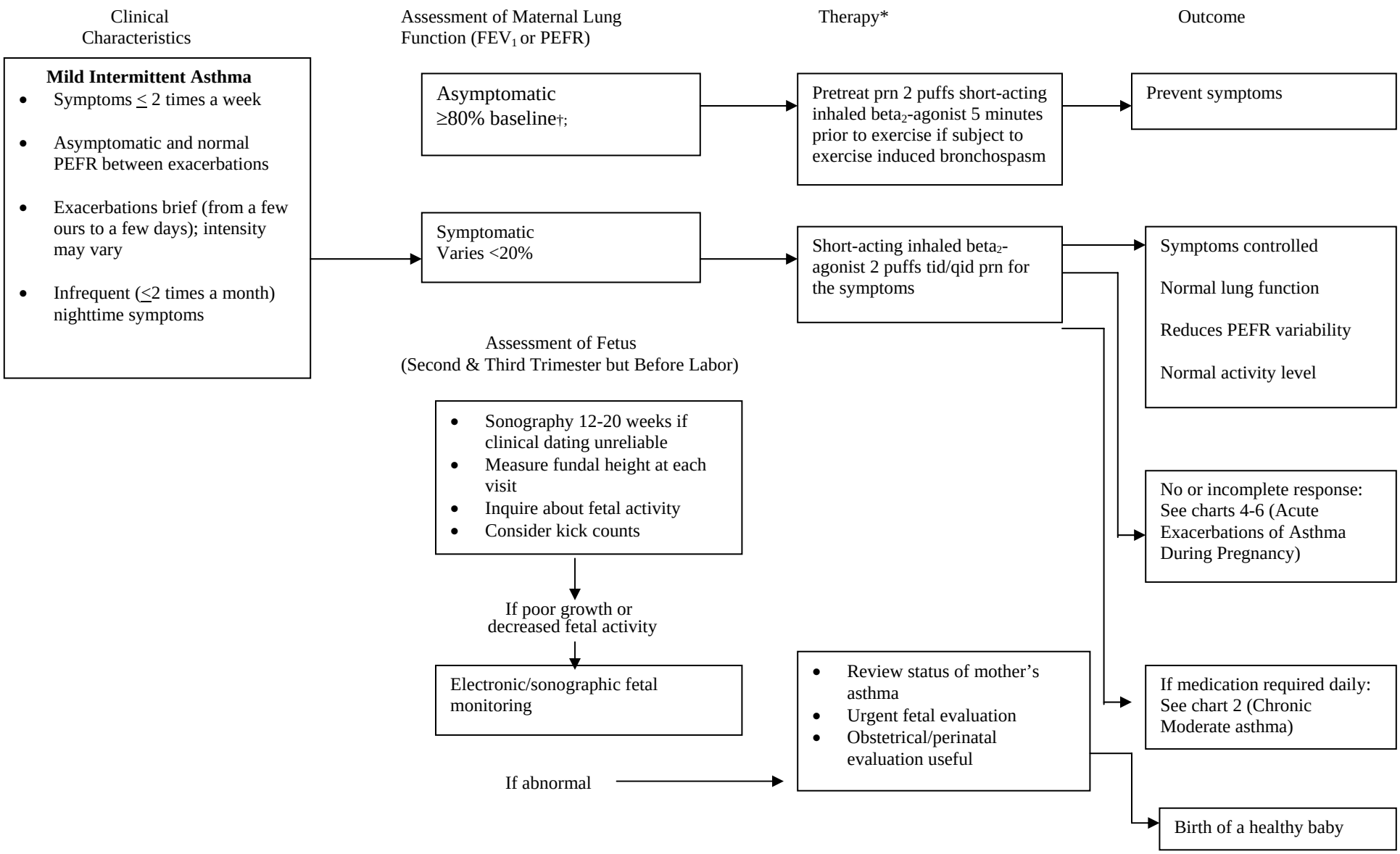
APPENDIX IB: DRUGS AND DOSAGES FOR ASTHMA AND ASSOCIATED CONDITIONS
PREFERRED FOR HOSPITAL/EMERGENCY ROOM MANAGEMENT USE

MEDICATIONS	ADULT DOSE	COMMENTS
Inhaled Short-Acting Beta$_2$-Agonists		
Albuterol Nebulizer solution (5 mg/mL)	2.5-5 mg every 20 minutes for 3 doses, then 2.5-10 mg every 1-4 hours as needed, or 10-15 mg/hour continuously	Only selective beta$_2$agonists are recommended. For optimal delivery, dilute aerosols to minimum of 4 mL at gas flow of 6-8 L/min.
MDI (90 mcg/puff)	4-8 puffs every 20 minutes up to 4 hours, then every 1-4 hours as needed	As effective as nebulized therapy if patient is able to coordinate inhalation maneuver. Use spacer/holding chamber.
BitoIterol Nebulizer solution (2 mg/mL)	See Albuterol dosing	Has not been studied in severe asthma exacerbations. Do not mix with other drugs.
MDI (370 mcg/puff)	See Albuterol dosing	Has not been studied in severe asthma exacerbations.
Pirbuterol MDI (200 mcg/puff)	See Albuterol dosing	Has not been studied in severe asthma exacerbations.
System (Injected) Beta$_2$agonists Epinephrine 1:1000 (1 mg/mL)	0.3-0.5 mg every 20 minutes for 3 doses subcutaneously	No proven advantage of systemic therapy over aerosol.
Terbutaline (1 mg/mL)	0.25 mg every 20 minutes for 3 doses subcutaneously	No proven advantage of systemic therapy over aerosol.
Anticholinergics		
Ipratropium bromide Nebulizer solution (.25 mg/mL)	0.5 mg every 30 minutes for 3 doses then every 2-4 hours as needed	May mix in same nebulizer with albuterol. Should not be used as first-line therapy; should be added to beta$_2$-agonist therapy.
MDI (18 mcg/puff)	4-8 puffs as needed	Dose delivered from MDI is low and has not been studied in asthma axacerbations.
Systemic Corticosteroids Prednisone Methylprednisolone Prednisolone	120-180 mg/day in 3 or 4 divided doses for 48 hours, then 60-80 mg/day until PEFR reaches 70% of predicted or personal best	For outpatient "burst" use 40-60 mg in single or 2 divided doses for 3-10 days

NOTE: No advantage has been found for higher dose corticosteroids in severe asthma exacerbations, nor is there any advantage for intravenous administration over oral therapy provided gastrointestinal transit time or absorption is not impaired. The usual regimen is to continue the frequent multiple daily dosing until the patient achieves an FEV_1 or PEFR of 50 percent of predicted or personal best and then lower the dose to twice daily. This usually occurs within 48 hours. Therapy following a hospitalization or emergency department visit may last from 3 to 10 days. If patients are then started on inhaled corticosteroids, studies indicate there is no need to taper the systemic corticosteroid dose. If the follow-up systemic corticosteroid therapy is to be given once daily, one study indicates that it may be more clinically effective to give the dose in the afternoon at 3:00 p.m., with no increase in adrenal suppression (Beam et al, 1992).

APPENDIX II: CHART 1A. MANAGEMENT OF ASTHMA DURING PREGNANCY

CHRONIC MILD INTERMITTENT ASTHMA

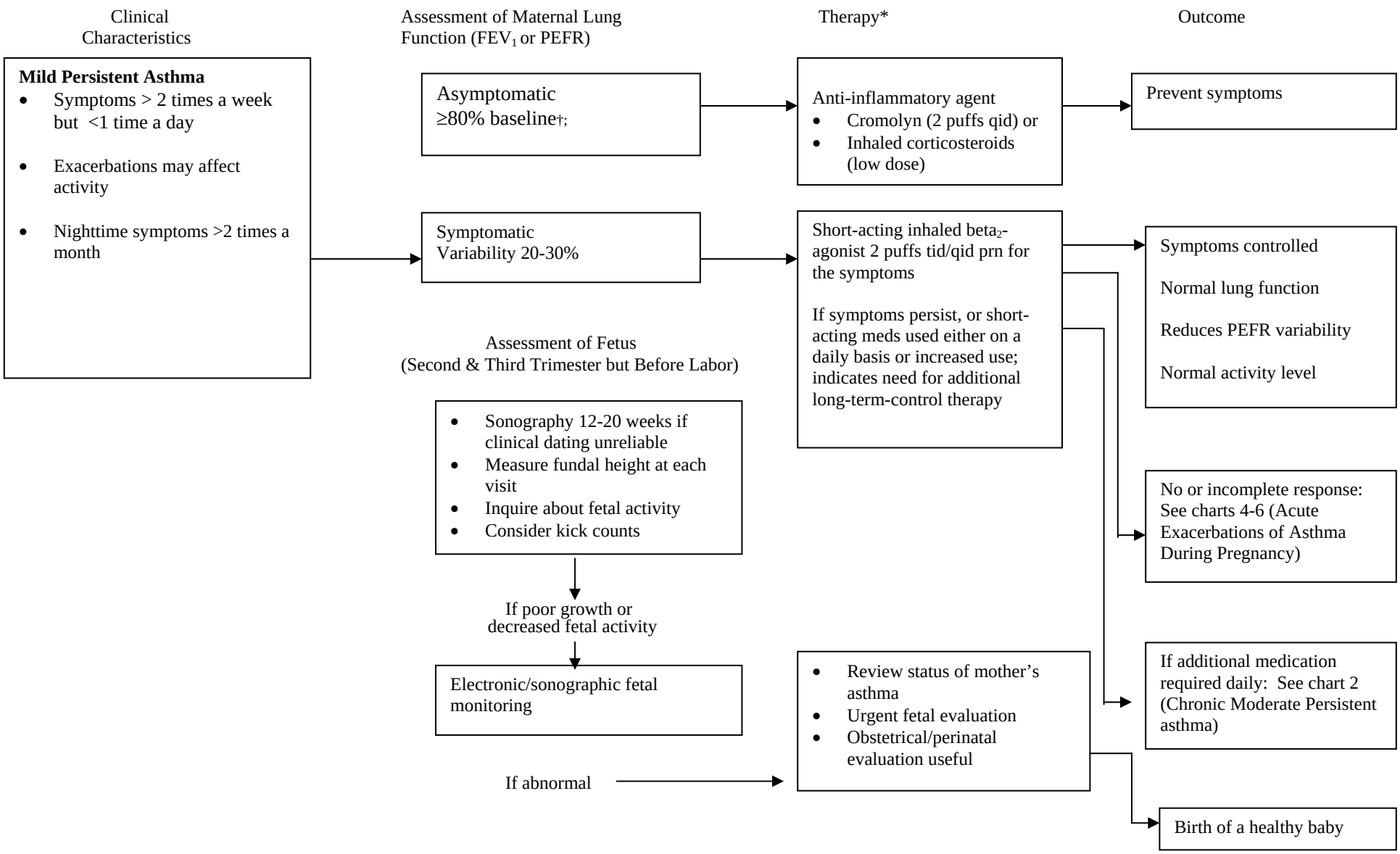


* All therapy must include patient education about prevention (including environmental control where appropriate) as well. as control of symptoms.

† PEFR percent baseline refers to the norm for the individual, established by the clinician. This may be percent predicted based on standardized norms or percent of patient's personal best.

APPENDIX II: CHART 1B. MANAGEMENT OF ASTHMA DURING PREGNANCY

CHRONIC MILD PERSISTENT ASTHMA

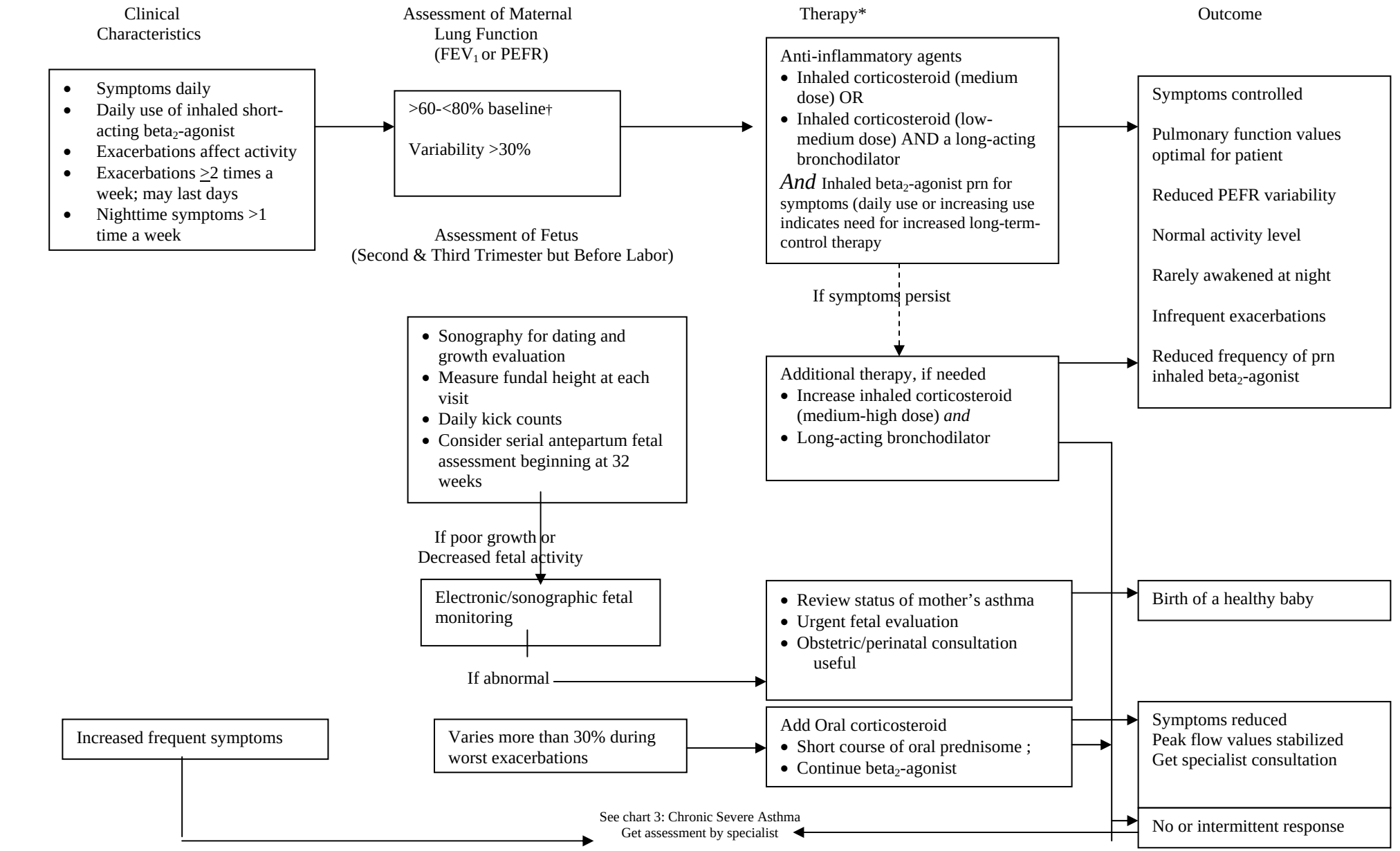


* All therapy must include patient education about prevention (including environmental control where appropriate) as well. as control of symptoms.

† PEFR percent baseline refers to the norm for the individual, established by the clinician. This may be percent predicted based on standardized norms or percent of patient's personal best.

APPENDIX II: CHART 2. MANAGEMENT OF ASTHMA DURING PREGNANCY

CHRONIC MODERATE PERSISTANT ASTHMA



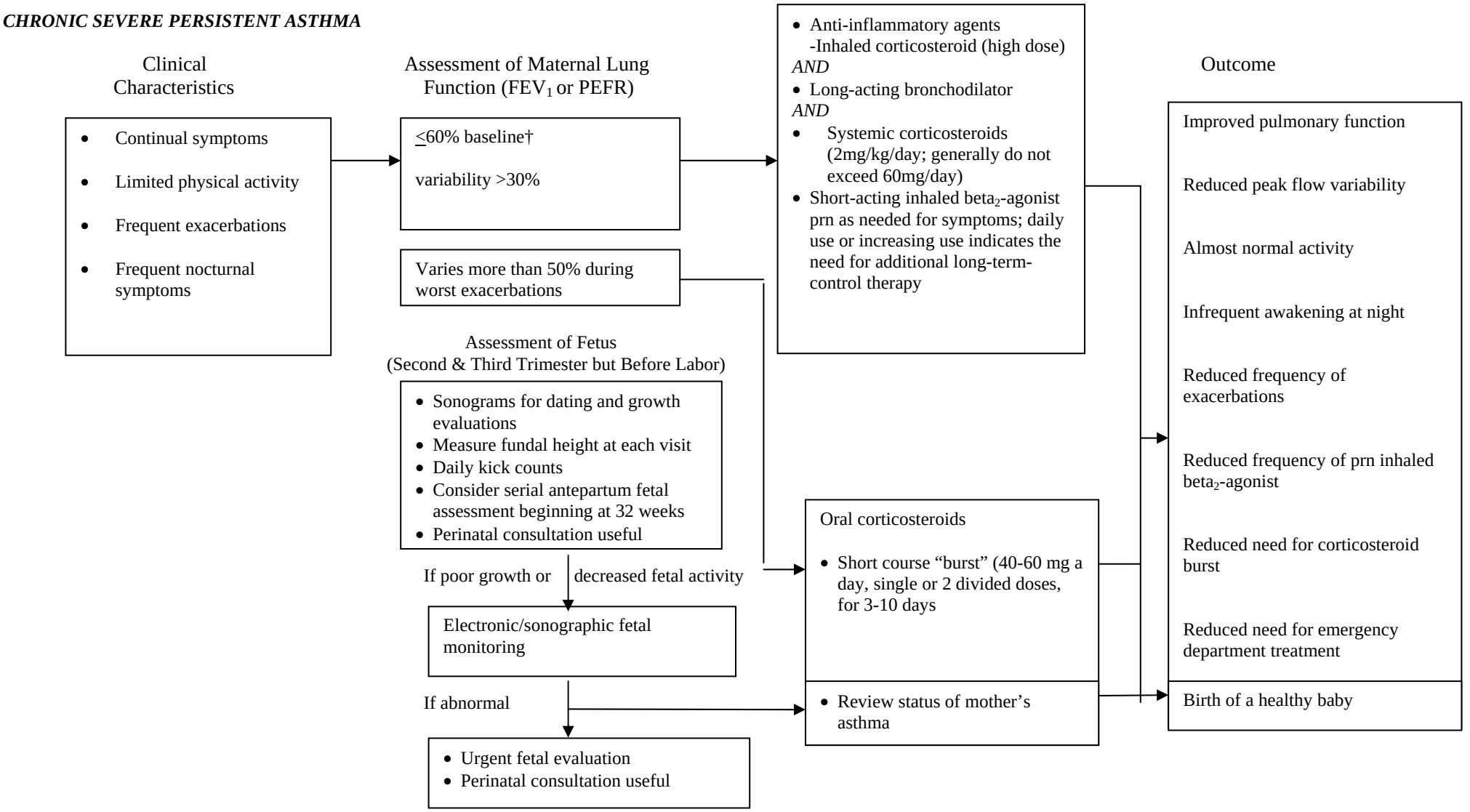
* All therapy must include patient education about prevention (including environmental control where appropriate) as well as control of symptoms.

† PEFR percent baseline refers to the norm for the individual, established by the clinician. This may be percent predicted based on standardized norms or percent of patient's personal best.

†† If exceed 3-4 doses a day, consider additional therapy other than inhaled $beta_2$-agonist.

APPENDIX II: CHART 3. MANAGEMENT OF ASTHMA DURING PREGNANCY

CHRONIC SEVERE PERSISTENT ASTHMA



Note: Individuals with severe asthma should be evaluated by an asthma specialist.

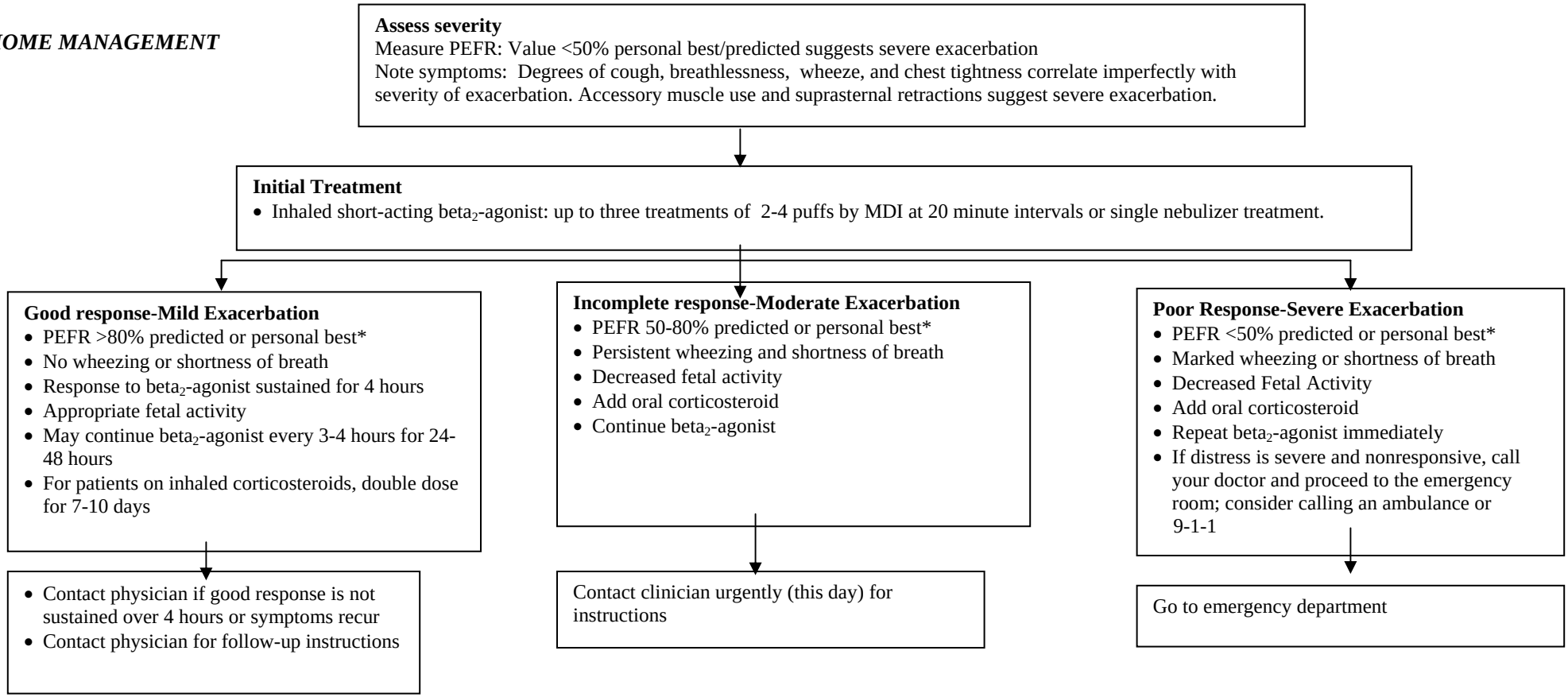
* All therapy must include patient education about prevention (including environmental control where appropriate) as well as control of symptoms.

† PEFR percent baseline refers to the norm for the individual, established by the clinician. This may be percent predicted based on standardized norms or percent of patient's personal best.

†† If exceed 3-4 doses a day, consider additional therapy other than inhaled beta$_2$-agonist

APPENDIX II: CHART 4. ACUTE EXACERBATIONS OF ASTHMA DURING PREGNANCY

HOME MANAGEMENT



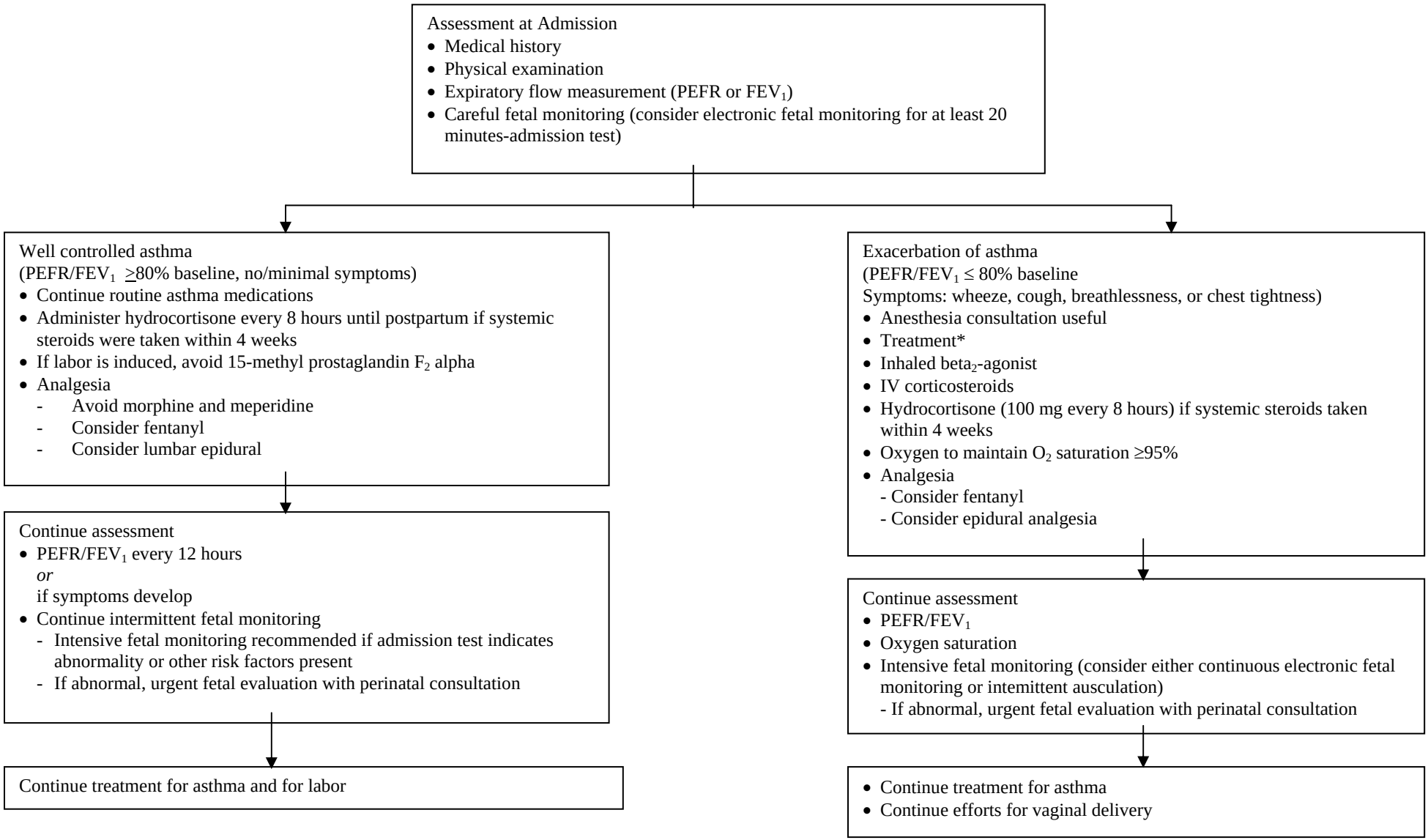
* PEFR percent baseline refers to norm for the individual, established by the clinician. This may be percent predicted based on standardized norms or percent of patient's personal best.

* Patients at high risk of asthma-related death should receive immediate clinical attention after initial treatment. Additional therapy may be required.

Risk Factors for Death from Asthma (Sources: Kallenback et al, 1993; Rodrigo & Rodrigo, 1993; Suissa et al, 1994; Greenberger et al, 1993; O'Hollaren et al, 1991)

- Past history of sudden severe exacerbations
- Prior intubation for asthma
- Prior admission for asthma to an intensive care unit
- Two or more hospitalizations for asthma in the past year
- Three or more emergency care visits for asthma in the past year
- Hospitalization or an emergency care visit for asthma within the past month
- Use of > 2 cannisters per month of inhaled short-acting beta$_2$-agonist
- Current use of systemic corticosteroids or recent withdrawal from systemic corticosteroids
- Difficulty perceiving airflow obstruction or its severity
- Comorbidity, as from cardiovascular diseases or chronic obstructive pulmonary disease
- Serious psychiatric disease or psychosocial problems
- Low socioeconomic status and urban residence
- Illicit drug use
- Sensitivity to *Alternaria*

APPENDIX II: CHART 5. MANAGEMENT OF ASTHMA DURING LABOR



*** See chart and discussion "Acute Exacerbations of Asthma: Emergency Department Management" in the full report: Management of Asthma During Pregnancy; Bethesda, M.D: U.S. Department of Health and Human Services, National Heart, Lung, and Blood Institute; 1992.**

APPENDIX II: CHART 6A. ACUTE EXACERBATIONS OF ASTHMA DURING PREGNANCY

EMERGENCY DEPARTMENT AND HOSPITAL MANAGEMENT

Initial Assessment

- Detailed medical history (Hx)
- Complete physical examination (PE)
- Expiratory flow measurement: PEFR or FEV_1
- Oxygen saturation
- Other tests as indicated
- Intensive fetal assessment (consider either continuous Electronic fetal monitoring or intermittent auscultation)

Special attention for:
-past history of respiratory failure
-suspicion of intrauterine growth retardation
-uterine irritability
-complicating medical conditions
-history of steroid-induced complications (e.g., psychosis)

*** PEFR percent baseline refers to the norm of the individual, established by the clinician. This may be percent base on standardized norms or percent of patient's personal best.**

FEV_1 or PEFR >50%
- Inhaled $beta_2$-agonist by metered dose inhaler or nebulizer, up to 3 doses in the first hour
- Oral systemic corticosteroids if no immediate response or if patient recently took oral systemic corticosteroid
- Supplemental oxygen to maintain 0_2 saturation ≥90%

FEV_1 or PEFR <50% (Severe Exacerbation)
- Inhaled high dose $beta_2$-agonist and anticholinergic by nebulization every 20 minutes or continuously for 1 hour
- Oxygen to achieve O_2 saturation ≥ 90%
- Oral systemic corticosteroid

Impending or Actual Respiratory Arrest
- Intubation and mechanical ventilation with 100% O_2 (PEFR/FEV ≤25% & CO2 ≥35 mm Hg)
- Nebulized $beta_2$-agonist and anticholinergic
- Intravenous corticosteroid
- Vaginal delivery, if possible; c-section if not

Admit to Hospital Intensive Care (see below)

Repeat Assessment
Symptoms, physical examination, PEF, O_2 saturation, other tests as needed

Moderate Exacerbation: FEV_1 or PEFR 50-80% predicted/personal best
- Physical exam: moderate symptoms
- Inhaled short-acting $beta_2$-agonist every 60 minutes
- Systemic corticosteroid
- Continue treatment 1-3 hours, provided there is improvement

Severe Exacerbation
- FEV_1 or PEFR <50% predicted/personal best*
- Physical exam: severe symptoms at rest, accessory muscle use; chest retraction
- History: high-risk patient
- No improvement after initial treatment
- Inhaled short-acting $beta_2$ –agonist hourly or continuous + inhaled anticholinergic
- Oxygen
- Systemic corticosteroid

Good Response
- FEV_1 or PEFR ≥ 70%
- Response sustained 60 minutes after last treatment
- No distress
- Physical exam: normal

Incomplete Response
- FEV_1 or PEFR ≥50% but <70%
- Mild-to-Moderate symptoms

Poor Response
- FEV_1 or PEFR <50%
- PCO_2 ≥42mm Hg
- Physical exam: symptoms severe; drowsiness; confusion

Individualized decision re: hospitalization

Discharge Home
- Continue treatment with inhaled $beta_2$-agonist
- Continue course of oral corticosteroid
- Provide patient education, especially
  - medication use, including inhaler technique
  - PEFR measurement at home; Review/Initiate Action Plan
  - Close medical follow-up (within 7-10 days of discharge)

Admit to Hospital Floor
- Inhaled $beta_2$ –agonist + inhaled anticholinergic
- Systemic (oral or intravenous) corticosteroid
- Oxygen; Monitor FEV_1 /PEFR, O_2 sats; pulse

Admit to Hospital Intensive Care
- Inhaled $beta_2$ –agonist hourly or continuously + inhaled anticholinergic
- Intravenous corticosteroid
- Oxygen
- Possible intubation and mechanical ventilation

APPENDIX II: CHART 6B. MANAGEMENT OF ASTHMA DURING DELIVERY

Assessment at Admission

- Review and update medical history
- Physical examination
- Expiratory flow measurement (PEFR or FEV_1)
- Oxygen saturation (oximeter or arterial blood gas)
- Careful fetal monitoring

Well controlled mild, moderate, or severe asthma
(PEFR/FEV_1 ≥ 80% baseline, no/minimal symptoms)

- Continue routine inhaled asthma medications
- Transfer routine oral asthma medications to IV route
- Administer hydrocortisone (100 mg every 8 hours until postpartum) if systemic steroids were taken within 4 weeks
- Analgesia
  -Avoid morphine and meperidine
  -Consider fentanyl
  -Consider lumbar epidural with diluted concentration of local anesthetic and narcotics
- Anesthesia, if necessary
  -Pre-anesthetic atropine and glycopyrrolate
  -Low concentrations of halogenated anesthetics

Exacerbation of asthma
(PEFR/FEV_1 ≤ 80% baseline; Symptoms: wheeze, cough, breathlessness, or chest tightness**)**
Treat exacerbation (see Chart 6A)

- Inhaled $beta_2$-agonist
- IV corticosteroids
- Hydrocortisone (100 mg every 8 hours until postpartum) if systolic steroids were taken within 4 weeks
- Oxygen to achieve O_2 saturation ≥ 95%

Continue efforts for vaginal delivery

- Notify anesthesia consultant and pediatrician
- Analgesia
  -Consider fentanyl
  -Consider epidural analgesia
- Anesthetic, if necessary
  -Pre-anesthetic atropine and glycopyrrolate
  -Low concentrations of halogenated anesthetic

Continue assessment

- PEFR/FEV_1
- Oxygen saturation
- Intensive fetal monitoring (consider either continuous electronic fetal monitoring or intermittent auscultation)
- Perform vaginal delivery, if possible

Impending or Actual Respiratory Failure
(PEFR/FEV_1 ≤25% and CO_2 ≥ 35 mm Hg)
Symptoms: exterme distress; confusion

- Notify anesthesia consultant and pediatrician
- Initiate mechanical ventilation
- Perform vaginal delivery, if possible
- Emergency cesarean section, if necessary

INTERVENTION	DOSE/TIMING	EDUCATION/ ADVISE	MD/CNM/RN INITIALS
Inhaled medications (MDI + spacer/holding chamber)	Select agent, dose and frequency (e.g. albuterol)	Teach purpose Teach technique (handout)	
$Beta_2$-agonist	2-6 puffs q 3-4 hr prn	Emphasize need for spacer/holding chamber	
Corticosteroids	Medium dose	Observe patient Technique	
Oral medications	Select agent, dose, and frequency (e.g. prednisone 20 mg bid for 3-10 days)	Teach purpose Teach side effects (handout)	
Peak flow meter	Measure a.m. and p.m. PEFR and record best of three tries each time	Teach purpose Teach technique (handout) (daily record)	
Follow-up visit	Make appointment for Follow-up care with Primary clinician or asthma specialist	Confirm patient has appointment within 7 days of hospital discharge.	
Action Plan	Before or at discharge	Instruct patient (and/or Caregiver/family) on simple plan for actions to take when symptoms and PEFR values suggest recurrent airflow obstruction (handout)	

Patient/Family Signature:_____
Date/Time:_____

UIC Medical Center **APPENDIX III: PATIENT EDUCATION**

***TIPS FOR PREGNANT WOMEN WITH ASTHMA:* GOOD NEWS!**
ASTHMA CAN BE CONTROLLED DURING PREGNANCY

Congratulations on your pregnancy and for coming today to work on staying healthy! It is important to keep your asthma under control so that your baby gets enough oxygen to grow well. Asthma symptoms such as coughing, chest tightness, wheezing and shortness of breath can make your baby less healthy, smaller when born, or could lead to your baby being born too early. The following steps list what you can do to control your asthma and protect your baby.

- **Work with your health care team**:
  - -Keep your appointments
  - -Ask questions (Hint: write them down to help remember them all)
  - -Fill out your asthma record every day, keep it with you and bring it to every visit
  - -Talk about any problems you have with your asthma plan or medicines
  - -Make sure you understand your asthma plan before you leave the office

- **Take your medicines as planned**:
  - -Don't stop taking your asthma medicines unless your doctor suggests this
  - -Speak with your doctor before you take ANY new medicines or over-the-counter drugs (drugs you choose yourself at the store for a headache, cold or cough).

  REMEMBER: Using asthma medicine during pregnancy is much safer than letting your asthma go out of control. Your doctor will give you the medicines that are safe for pregnant women when taken as directed.

- **Watch your asthma; treat symptoms fast**:
  - -Use a peak flow meter each day to pick up early changes in your asthma.
  - -Use your asthma plan to tell if your asthma is getting worse.
  - -Work with your health care team to learn new ways to notice early asthma symptoms

- **Stay away from your asthma triggers**:
  - -Asthma triggers are the things that make your asthma worse like house dust mites or damp places, animals, tobacco smoke or very cold air.
  - -Read "How to Control Asthma Triggers" and ask questions

- **Do not smoke or be around smoke**:
  - -Smoke makes it more likely to have an asthma episode
  - -Smoking during pregnancy makes it more likely that your baby will be born too early, too small and be sick more often.
  - -Babies living around smoke are more likely to get asthma
  - -Ask your health care team for help for you or family members who want to stop smoking

ANSWERS TO SOME COMMON QUESTIONS ABOUT ASTHMA & PREGNANCY

- **Are asthma medicines safe for pregnant women?**
  Yes, asthma medicines are safe when you take them as directed by your health care team. It is very important for your baby's health that you keep your asthma under good control!

- **Can I exercise?**
  Yes, you may exercise. Exercise is important and you should be able to be physically active without having asthma symptoms. Talk to your health care team about this.

- **Can I take my allergy shots?**
  Yes, allergy shots may be continued if you were getting them before you were pregnant. But, allergy shots should not be started for the first time while you are pregnant.

- **Should I get a flu shot in the fall?**
  You may get flu shots. These are made from dead viruses that will not harm you or your baby. Flu shots are often recommended for people who have asthma. Ask you health care team what they recommend.

- **What happens if I get an asthma episode (or "attack") during labor and delivery?**
  Asthma episodes usually *do not* occur during labor and delivery. If asthma symptoms do occur, you will receive fast treatment and be watched carefully. Your asthma will be controlled during labor and delivery.

- **Will my breast milk be safe for my baby?**
  Yes, very little asthma medicine will get to your baby through your breast milk. The small amount in breast milk will not harm your baby. The good things for baby in your breast milk makes breast feeding a great choice.

- **Will my baby have asthma?**
  Maybe. A child is more likely to have asthma when one or more parents have asthma or allergies. Talk about this at the first visit with your baby's health provider.

(Adapted from National Asthma Education Program. *Teaching Your Patients About Asthma: A Clinician's Guide.* Washington, D.C.: U.S. Department of Health and Human Services, 1992.)

HOW TO CONTROL ASTHMA TRIGGERS

When you have asthma, your airways are very sensitive. They may react to things called triggers—these are things that can make asthma symptoms start. When you are near an asthma trigger your airways may become swollen, tighten up, and produce too much mucus. You may start to wheeze, cough, have congestion, itchy eyes, or a runny nose. It is important to find out what your asthma triggers are and figure out ways to control them.

Each person has different triggers. Attached is a checklist listing common triggers and actions you can take to control them. Controlling triggers is an important part of making your asthma plan work well. Use the following steps to learn more about your asthma triggers:

- Ask your health care team to help you find out what your asthma triggers are.
- Keep a written record of what you were doing and where you were each time asthma symptoms begin.
- Work with your health care team to choose the actions to reduce your symptoms.
- Number each action item in order of importance. Carry out the actions at the top of your list first.
- At each health care visit, bring your record and talk about how this plan is working.

KEY ASTHMA TRIGGERS AND GENERAL ASTHMA TRIGGER FACTS:

- Smoking or being around people who smoke is a very common asthma trigger

  Cigarette smoke can also harm your infant and young children. Studies show that children who breathe their mother's smoke have more lung diseases, such as asthma. Children with asthma who are around smoke have reduced lung function. They need more medicine and emergency room visits than children who are not around smoke.

- All warm-blooded pets, including dogs, cats, birds, and rodents can make your asthma worse. The flakes or scales from the skin, hair or feathers of these animals and dried saliva or urine can make people start coughing, wheezing, or get itchy, watery eyes. This is often called an allergy or allergic reaction. The shortness of a pet's hair does not matter. There is no such thing as an allergy-free dog or cat.
- Exercise can make some people's asthma worse. But do not avoid exercise. Exercise is important to your good health! Your asthma plan will help you exercise without bothering your asthma.
- Environmental triggers can include pollen and molds in the air outdoors as well as indoor problems with house dust mites, molds, strong odors and sprays.
- Very cold weather as well as colds or the flu can bring on asthma symptoms

Remember: Following the suggestions on the attached checklist will help keep asthma episodes from starting. Controlling triggers will help your asthma medicine work better! A plan to control your asthma triggers is an important part of controlling asthma!!

COMMON ASTHMA TRIGGERS

POLLENS AND MOLDS (OUTSIDE)

- ☐ Use air conditioning, if possible, during seasons when pollen and mold are highest
- ☐ Keep windows closed during seasons when pollen and mold are highest
- ☐ Avoid handling wet leaves or garden debris
- ☐ Consider staying indoors during the middle of the day and afternoon when the pollen count is highest
- ☐ If you are outside when the pollen count is high, it might help if you wash your hair before you go to bed

HOUSE DUST MITES

- ☐ Put your mattress in an airtight, or plastic, cover
- ☐ Put your pillow in an airtight cover or wash it once a week, every week, in hot water (130^{o} F)
- ☐ Avoid sleeping or lying on upholstered furniture
- ☐ Remove carpets that are laid on concrete
- ☐ Wash your bed covers and clothes once a week, every week, in hot water (130^{o}F)
- ☐ Reduce indoor humidity to less than 50 percent. Use a dehumidifier if needed.
- ☐ Remove carpets from your bedroom
- ☐ Use chemical agents to kill mites or to change mite antigens in the house
- ☐ Avoid using a vacuum or being in a room while it is being vacuumed
- ☐ If you must vacuum, reduce the amount of dust you breathe in:
  - Use a dust mask
  - Use a central vacuum cleaner with the collecting bag outside the home
  - Use a vacuum cleaner that has powerful suction

ANIMAL ALLERGY

- ☐ Remove the animal from the house
- ☐ If you must have a pet with fur or feathers, keep the pet out of your bedroom *at all times*
- ☐ If there is forced-air heating in the home and you have a pet, close the air ducts in your bedroom
- ☐ Wash the pet once a week, every week
- ☐ Avoid visits to friends or relatives who have pets with fur or feathers
- ☐ Take asthma medicine before visiting places where animals with fur or feathers are present (cromolyn is often preferred)
- ☐ Choose a pet without fur or feathers
- ☐ Avoid products made with feathers, for example, pillows and comforters. Also avoid pillows, bedding, and furniture stuffed with kapok (silky fibers from the seed pods of the silk-cotton tree)

COCKROACH ALLERGY

- ☐ Use insect sprays; but have someone else spray when you are out of the house
- ☐ Air out your home for a few hours after spraying
- ☐ Use roach traps

COMMON ASTHMA TRIGGERS – Page 2

WEATHER

- ☐ Wear a scarf over your mouth and nose in cold weather
- ☐ Pull a turtleneck over your nose on windy or cold days
- ☐ Dress warmly in the winter or on windy days

INDOOR MOLDS

- ☐ Keep bathrooms, kitchens, and basements well aired
- ☐ Clean bathrooms, kitchens, and basements regularly
- ☐ Do not use humidifiers
- ☐ Use dehumidifiers for damp basement areas, with humidity level set for less than 50 percent but above 25 percent. Empty and clean the dehumidifier water tray regularly.

TOBACCO SMOKE

- ☐ Do not smoke
- ☐ Do not allow smoking in your home
- ☐ Have household members smoke outside
- ☐ Do not allow any smoking in your bedroom. Encourage family members to quite smoking. Ask your health care team for help on how to quit smoking.

WOOD SMOKE

- ☐ Avoid using a wood-burning stove to heat your home
- ☐ Avoid using kerosene heaters

STRONG ODORS AND SPRAYS

- ☐ Do not stay in your home when it is being painted. Allow the paint to dry.
- ☐ Avoid perfume and perfumed cosmetics such as talcum powder and hair spray
- ☐ Do not use room deodorizers
- ☐ Use non-perfumed household cleaning products whenever possible
- ☐ Reduce strong cooking odors, especially frying, by using a fan and opening windows

COLDS AND INFECTIONS

- ☐ Wash your hands frequently if people around you have a cold or the flu
- ☐ Be sure to get the right amount of rest, exercise, and nutritious food each day
- ☐ Talk to your health care team about yearly flu shots
- ☐ Do not take over-the-counter cold medicines such as cough medicine or antihistamines unless you speak with your doctor first

EXERCISE

- ☐ Work out a medicine plan with your doctor that helps you to exercise comfortably
- ☐ Take inhaled beta$_2$-agonist or cromolyn medicine before you start to exercise, if needed
- ☐ Warm up before exercising and cool down afterwards

*HOW TO USE A METERED-DOSE INHALER**

Using a metered-dose inhaler is a good way to take asthma medicines. There are few side effects because the medicine goes right to the airways inside the lungs. It takes only 5 to 1O minutes for the medicine to have an effect compared to liquid asthma medicines, which can take l to 3 hours. A spacer or holding chamber attached to the inhaler can help make your inhaler easier to use. For patients taking inhaled steroids, a spacer may help prevent irritation to the mouth. Your health care team will ask you to show us your inhaler technique at each visit.

USING THE INHALER:

l. Remove the cap and hold the inhaler upright.
2. Shake the inhaler.
3. Tilt your head back slightly and breathe out.
4. Use the inhaler in one of the following ways. (A or B are the best; C is okay if you are having trouble with A or B or are using a breath-activated inhaler). D is for a dry powder inhaler
   - A. Open mouth with inhaler l to 2 inches away
   - B. Use spacer/holding chamber especially for steroids
   - C. In the mouth; try not to use with steroids
   - D. Close mouth around inhaler and inhale rapidly
5. Press down on the inhaler to release the medicine as you start to breathe in slowly.
6. Breathe in slowly for 3 to 5 seconds.
7. Hold your breath for 1O seconds to allow the medicine to reach deep into your lungs.
8. Repeat puffs as prescribed. Waiting l minute between puffs may permit the second puff to go deeper into the lungs.
9. Spacers/holding chambers are useful for all patients. They are recommended with inhaled steroids

CLEANING: The inhaler should be cleaned often to prevent buildup that will clog the inhaler.

l Once a day, clean the inhaler and cap by rinsing them in warm running water and then let them dry.

2. Twice a week wash the plastic mouthpiece with mild dishwashing soap and warm water. Rinse and dry it well before putting it back.

CHECKING HOW MUCH MEDICINE IS LEFT IN THE CANISTER:

l If the canister is new, it is full.

2. An easy way to check the amount of medicine left in your metered-dose inhaler is to place the canister in a container of water and observe the position it takes in the water.

UIC Medical Center **APPENDIX III: PATIENT EDUCATION**

*HOW TO USE A PEAK FLOW METER **

It is very important during pregnancy to keep your lung function close to normal--that is, to make sure that your lungs are working as well as possible. Normal lung function is needed to provide enough oxygen to your growing baby!

A peak flow meter is a device that measures how well air moves out of your lungs. This information will help you and your doctor better control your asthma. For example, during an asthma episode the airways of the lungs get usually begin to narrow slowly. The peak flow meter can measure how much the airways are blocked hours--even days--before you feel any chest tightness, coughing, or wheezing. By taking your medicine(s) early, as soon as the peak flow measure changes, you may be able to stop the episode quickly and avoid a severe episode of asthma.

The peak flow meter can also be used to help you and your health care team:

- Decide if your medicine plan is working well.
- Decide when to add, reduce, or stop medicine.
- Decide when to seek emergency care.
- Identify triggers--that is, what causes your asthma to get worse.

Peak flow meters are used to check your asthma the way that blood pressure cuffs are used to check high blood pressure.

***HOW TO USE A PEAK FLOW METER**:*

1. Place the arrow at the base of the numbered scale.
2. Stand up.
3. Take a deep breath and fill your lungs completely.
4. Place the mouthpiece in your mouth and close your lips around it. Do not put your tongue inside the hole.
5. Blow out as hard and fast as you can in a single blow.

- Write down the number you get. But if you cough or make a mistake, don't write down the number. Try again.
- Repeat steps l through 5 two more times and write down the best of the three blows in your asthma record.

FIND YOUR PERSONAL BEST PEAK FLOW NUMBER

Your *personal best* peak flow number is the highest peak flow number you can achieve over a 2-3 week period **when your asthma is under good control**. Good control is when you feel good and do not have any asthma symptoms.

Each patient's asthma is different, and your best peak flow number may be higher or lower than the peak flow for someone of your same height, weight, and sex. This means that it is important for you to find your own personal best peak flow number. Your treatment plan needs to be based on your own personal best peak flow number.

*Adapted from the National Asthma Education Program, *Teaching Your Patients About Asthma: A Clinician's Guide. Washington, D.C.:* Department of Health and Human Services,

To find out your personal best peak flow number, you will need to do these things:

- Use the peak flow meter every day for 2 to 3 weeks.
- Measure and write down your peak flow at these times:
  1) Between noon and 2:00 p.m. each day
  2) Each time AFTER you take your short-acting inhaled $beta_2$-agonist to relieve symptoms
  3) At any other time your health care team suggests
- Review the information in your asthma record at each visit with your health care team.

TALK WITH YOUR DOCTOR: WHAT TO DO WHEN YOUR PEAK FLOW NUMBERS CHANGE

The most important thing about measuring your peak flow number every day is to see how much it changes from your personal best number and from one reading to another. Your doctor will give you an "asthma control plan" that tells you what actions to take when there is a change in your peak flow numbers. For example, a fall in your peak flow of 20 to 30 percent of your personal best number may mean the start of an asthma episode. You need to closely follow your asthma control plan!

USE THE PEAK FLOW ZONE SYSTEM TO MANAGE YOUR ASTHMA

Peak flow zones are set up like traffic lights to help you know what to do when your peak flow number changes. Once you know your personal best peak flow number, your doctor will give you the numbers that tell you what to do in each zone. You or your doctor can write these on your Asthma Control Plan and your asthma record. For example:

GREEN ZONE (more than ___L/min [80 to 100 percent of your personal best number]) signals ***all clear or OK***. No asthma symptoms are present, and you may take your medicines as usual.

YELLOW ZONE (between ___L/min and ___L/min [50 to less than 80 percent of your personal best number]) signals ***caution***. An episode of asthma may be starting and you need to take your short-acting inhaled $beta_2$-agonist right away. Also, your asthma may not be under good day-to-day control. Ask your doctor if you need to change or increase your daily medicines.

RED ZONE (below ___L/min [50 percent of your personal best number]) signals a ***medical alert or DANGER***. You must take a short-acting inhaled $beta_2$-agonist right away. Call your doctor or the emergency room and ask what to do, or go directly to the hospital emergency room.

USE THE ASTHMA RECORD TO KEEP TRACK OF YOUR PEAK FLOW

Write down your peak flow number on your Asthma Record every day when you wake up before taking your medicine, or as instructed by your health care team.

Adapted from National Asthma Education Program. *Teaching Your Patients About Asthma: A Clinician's Guide*, Washington, D.C.: US. Department of Health and Human Services, 1992.

UIC Medical Center APPENDIX 1V: PATIENT HOME SELF-MANAGEMENT

WEEKLY ASTHMA RECORD*

PERSONAL TARGET/PERFORMANCE:	**Date**:
My predicted peak flow number[+]	
My personal best peak flow number	
My green zone (OK) 80-100% of personal best	
My yellow zone (Caution) 50-80% of personal best	
My red zone (Danger) less than 50% of personal best	

Date:														
	am	pm	am	pm	am	pm	am	pm	am	Pm	am	pm	am	pm
Peak Flow Reading														
No asthma symptoms														
Mild asthma symptoms														
Moderate asthma symptoms														
Serious asthma symptoms														
Medicine used to stop symptoms														
Urgent visit to the doctor														

1. Take your peak flow reading every morning (am) when you wake up before taking any medicine and every afternoon between noon and 2 p.m. **Try to take your peak flow readings at the same times each day.** If you take an inhaled beta$_2$-agonist medicine, take your peak flow reading **after** taking it. Write down the highest reading of 3 tries in the box that says peak flow reading.
2. Look at the upper left corner box to see if your number is in the green, yellow or red zone
3. In the space below the day's date and time, put an "x" in the box that matches the symptoms you have at the time you take your peak flow reading (See below definitions).
4. Look at your "Asthma Control Plan" for what to do in the zone based on your symptoms.
5. Put an "x" in the "medicine used" box if you took ***extra*** medicine to stop your symptoms.
6. If you made any visit to your doctor's office, emergency room, or hospital for treatment of an asthma episode, put an "x" in the box marked "urgent visit".

No Symtoms:	No symptoms (wheeze, cough, chest tightness, or shortness of breath) even with normal physical activity
Mild Symptoms	Symptoms during physical activity, but not at rest. Asthma symptoms do not keep you from sleeping or being active
Moderate Symptoms	Symptoms while at rest; symptoms may keep you from sleeping or being active
Severe Symptoms	Severe symptoms at rest (wheeze may be absent); symptoms cause problems walking or talking; the muscles in your neck or between your ribs are pulled in when breathing

*Adapted from National Asthma Education Program. *Teaching Your Patients About Asthma: A Clinician's Guide.* Washington. D.C.: U,5. Department of Health and Human Services, 1992.

† Your doctor can also provide you with the average peak flow number for someone of your sex, height, and usual weight.

UIC Medical Center APPENDIX III: PATIENT HOME SELF-MANAGEMENT

ASTHMA ACTION PLAN

NAME_____**DATE**_____

It is important in managing asthma to keep track of your symptoms, medicines and peak flow numbers every day. You can use the colors of a traffic light to help you follow your asthma medicine plan:

GREEN ZONE: OK Use your regular prevention medicine (anti-inflammatory)
YELLOW ZONE: CAUTION Use quick-relief medicine (short-acting bronchodilator) AND your regular prevention medicine
RED ZONE: DANGER! Get help from your healthcare team right away

Your GREEN ZONE is _____ or 80-100% of your personal best. OK - GO!
Your breathing is good with no cough, wheeze, or chest tightness during work, school, exercise or play.
ACTION: Continue with the medicine listed in your daily treatment plan

Your YELLOW ZONE is _____or 50-80% of your personal best. CAUTION!
Asthma symptoms are present (cough, wheeze, chest tightness).
Your peak flow number drops below _____ or you notice:
- Increased need for inhaled quick-relief medicine
- Increased asthma symptoms upon awakening
- Begin/increase treatment with oral steroids:
- Take _____mg of _____every a.m._____ p.m._____
- Call your health care team at (312-_____) or Emergency Room (312-_____)

Your RED ZONE is _____or 50% or less of your personal best. DANGER!
Your peak flow number drops below _____, OR you continue to get worse after increasing Treatment according to the directions in the YELLOW ZONE above.

ACTIONS:
- Take _____puffs of your quick relief (bronchodilator) medicine. Repeat ____ times
- Take _____puffs of _____(anti-inflammatory)_____times per day
- Begin/increase treatment with oral steroids:
- Take _____mg of _____every a.m._____ p.m._____
- Call your health care team at (312-_____) or Emergency Room (312-_____)

Other important phone numbers for emergency transportation:_____

AT ANY TIME, CALL YOUR HEALTH CARE TEAM IF:
- Asthma symptoms worsen while you are taking oral steroids, OR
- Inhaled bronchodilator treatments are not lasting 4 hours, OR
- Your peak flow number remains or falls below _____ in spite of using this ACTION plan.

Provider's Signature:_____

Patient's Signature (or Family Member): _____

Adapted from: Understanding Asthma Health Management Bulletin; Information for asthma patients and their friends

[signatures on file]
Reviewed July 2007 – no changes made to document at this time

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