MANAGEMENT OF ASTHMA

Federal Bureau of Prisons

Clinical Guidance

MAY 2013
(REFORMATTED JUNE 2018)

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WHAT'S NEW IN THIS DOCUMENT?

NOTE: The formatting of this document was updated in June 2018.

This document is a major revision to the *BOP Clinical Practice Guidelines on the Management of Asthma*, issued in 2000. As such, the revisions are not highlighted, but are briefly discussed below.

The 2007 National Asthma Education and Prevention Program (NAEPP) Expert Panel Report emphasizes a shift in focus to monitoring asthma control as a goal for asthma therapy. The report also distinguishes asthma severity and asthma control. The current BOP guidelines contain modifications that parallel this new focus.

In addition, the 2007 NAEPP Expert Panel Report cites other key differences from its previous reports in 1997 and 2002:

- The critical role of inflammation has been further substantiated, but evidence is emerging for considerable variability in the pattern of inflammation, thus indicating phenotypic differences that may influence treatment responses.
- Gene-by-environmental interactions are important to the development and expression of asthma. Of the environmental factors, allergic reactions remain important. Evidence also suggests a key and expanding role for viral respiratory infections in these processes.
- The onset of asthma for most patients begins early in life with the pattern of disease persistence determined by early, recognizable risk factors including atopic disease, recurrent wheezing, and a parental history of asthma.
- Current asthma treatment with anti-inflammatory therapy does not appear to prevent progression of the underlying disease severity.

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1. PURPOSE

The BOP Clinical Guidance for the *Management of Asthma* provide recommendations for the medical management of Federal inmates with asthma.

2. DEFINITIONS

ASTHMA: NAEPP defines asthma as "a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyperresponsiveness, and an underlying inflammation. The interaction of these features of asthma determines the clinical manifestations and severity of asthma," as well as the response to treatment.[1] The resulting inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing. These episodes usually result in airway obstruction that can be variable and is often reversible, either spontaneously or with treatment.

PEFR (PEAK EXPIRATORY FLOW RATE): The maximum rate of exhalation during testing, using a peak flow meter or spirometer.

PEF (PEAK EXPIRATORY FLOW): A test that measures the PEFR.

PFM (PEAK FLOW METER): A simple device intended for home or clinic use, which allows a patient with asthma to measure his or her peak expiratory flow rates and compare them to expected ranges.

FVC (FORCED VITAL CAPACITY): The maximal volume of air forcibly exhaled from the point of maximal inhalation by a patient during spirometry.

FEV_1 (FORCED EXPIRATORY VOLUME IN 1 SECOND): The volume of air exhaled during the first second of the FVC.

FEV_6 (FORCED EXPIRATORY VOLUME IN 6 SECONDS): The Expert Panel has found this to be an acceptable substitute for FVC in adults and is easier for patients to complete.

[1] U.S. Department of Health and Human Services, National Institutes of Health, National Heart Lung and Blood Institute, National Asthma Education and Prevention Program. *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma*. NIH Publication No. 07-40511-440. Bethesda, MD: U.S. Dept of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute; 2007. Page 12. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf.

3. CAUSE

Although not thoroughly understood, asthma is a chronic inflammatory disorder of the airways. It is a result of the relationship between host factors and environmental exposures that occur at a critical time in immune system development. Host factors include innate immunity and genetics. The two major environmental factors contributing to the development of asthma are airborne allergens and viral respiratory infections. Several other environmental exposures—including tobacco smoke, air pollution, and diet—are associated with an increased risk for asthma; this association has not been clearly established.

Although researchers have been unable to define the cause of the inflammatory process leading to asthma, they have determined the following:

- The immunohistopathologic features of asthma include inflammatory cell infiltration. These features comprise: neutrophils (especially in sudden-onset, fatal asthma exacerbations; occupational asthma; and patients who smoke), eosinophils, lymphocytes, mast cell activation, and epithelial cell injury.
- Airway inflammation contributes to airway hyperresponsiveness, airflow limitation, respiratory symptoms, and disease chronicity.
- In some patients, persistent changes in airway structure occur, including sub-basement fibrosis, mucus hypersecretion, injury to epithelial cells, smooth muscle hypertrophy, and angiogenesis.
- Gene-by-environment interactions are important to the expression of asthma.
- Atopy, the genetic predisposition for the development of an immunoglobulin E-mediated (IgE-mediated) response to common aeroallergens, is the strongest identifiable predisposing factor for developing asthma.
- Viral respiratory infections are one of the most important causes of asthma exacerbation and may also contribute to the development of asthma.

4. DIAGNOSIS

The DIAGNOSIS of asthma requires the clinician to establish:

- Symptoms of recurrent episodes of airflow obstruction or airway hyperresponsiveness (see *Table 1*).
- Airflow obstruction that is at least partially reversible as measured by spirometry.
- Exclusion of alternative diagnoses (see *Table 4*).

The METHODS the clinician uses to establish the points mentioned above are:

- **DETAILED MEDICAL HISTORY:** When a provider is examining a patient suspected of having asthma, a detailed medical history is recommended—to identify symptoms that may be due to asthma and to support the likelihood of asthma. See *Appendix 4* for sample questions.

- **PHYSICAL EXAM:** Findings may increase the probability of asthma; however, a lack of findings does not rule out the diagnosis, as signs may be absent between episodes.
- **SPIROMETRY** is an objective measure to assess reversibility and can demonstrate obstruction.
- **ADDITIONAL TESTING:** Depending upon symptoms, the physical exam, and spirometry results, additional tests (see *Table 3*) may be necessary when considering differential diagnoses.

TABLE 1. KEY SYMPTOM INDICATORS FOR CONSIDERING A DIAGNOSIS OF ASTHMA

1. Consider a diagnosis of asthma and performing spirometry if any of the following indicators are present. *These indicators are not diagnostic in themselves, but the presence of multiple key indicators increases the probability of a diagnosis of asthma. Spirometry is needed to establish a diagnosis of asthma.*

2. *Eczema, hay fever, or a family history of asthma or atopic diseases are often associated with asthma, but they are NOT key indicators.*

➔ ***Wheezing:***
- High-pitched whistling sounds when breathing out
- Lack of wheezing and normal findings on chest examination do not exclude asthma

➔ ***History of any of the following:***
- Cough, particularly worse at night
- Recurrent wheeze
- Recurrent difficulty in breathing
- Recurrent chest tightness

➔ ***Symptoms occur or worsen in the presence of:***
- Exercise
- Viral infection
- Inhalant allergens (animals with fur or hair)
- House-dust mites (in mattresses, pillows, upholstered furniture, carpets)
- Mold
- Smoke (tobacco, wood) or other irritants
- Pollen
- Changes in weather
- Strong emotional expression (laughing or crying hard)
- Airborne chemicals or dusts
- Menstrual cycles
- Stress

➔ ***Symptoms occur or worsen at night, awakening the patient.***

PHYSICAL EXAMINATION

While examining the upper respiratory tract, chest, and skin, providers may observe the sounds of wheezing during normal breathing or a prolonged phase of forced exhalation. They may also find:

- **UPPER RESPIRATORY TRACT:** Increased nasal secretion, mucosal swelling, nasal polyps
  - If polyps are found, this could indicate an aspirin sensitivity or allergy leading to aspirin-exacerbated respiratory disease.
  - Finding a pale, swollen lining of the nasal cavities, upon examination with an otoscope, suggests associated allergic rhinitis, a common condition among patients with allergic asthma.
- **CHEST:** Use of accessory muscles, appearance of hunched shoulders, hyperexpansion of the chest, chest deformity.
- **SKIN:** Atopic dermatitis or eczema or other appearances of an allergic skin reaction. About one-third of patients with atopic dermatitis develop asthma.
- **CLUBBING:** This is not a feature of asthma; if present, the clinician should consider alternative diagnoses such as interstitial lung disease, lung cancer, and diffuse bronchiectasis, including cystic fibrosis.

SPIROMETRY

Spirometry is used to assess reversibility, can demonstrate obstruction, and is used over methods such as peak flow meters that are not diagnostic tools and are only recommended for monitoring. Spirometer measurements should be performed on inmates suspected of having asthma.

- *Due to the unreliability of medical history and physical exam in excluding other diagnoses and assessing lung function, spirometry is essential in making the diagnosis of asthma. Due to its diagnostic importance and the need for periodic monitoring, spirometry should be available for use in all institutions. Please refer to Appendix 11 for spirometry testing time frames.*

- Spirometry is used to determine if there is air flow obstruction and to determine if a bronchodilator produces reversibility over the short term. Measurements (FEV_1, FEV_6, FEV_1/FEV_6) are made before and after the inmate inhales a short-acting bronchodilator. Significant reversibility can be characterized by an increase in FEV_1 of greater than 200 mL and greater than 12% from baseline.
- In the past, FVC was used as the standard; however, FEV_6 has been shown to be more reproducible and less physically demanding than FVC. Furthermore, the use of FEV_6 results in diagnosing and treating asthma have been shown to be equivalent to those of FVC.
- When utilizing spirometry, correct technique, calibration methods, maintenance, as well as maximal effort by the patient are all necessary to complete the testing. Abnormalities of lung function are categorized in terms of *restrictive* and *obstructive* defects.
- The severity of the abnormal spirometric measurements is evaluated by comparing the inmate's results with reference values based on age, height, sex, and race.
- **Healthcare providers not trained in the interpretation of spirometry should have the results reviewed by a specialist.**

TABLE 2. SPIROMETRY TESTING OUTCOMES

VALUES	OUTCOME	NOTES
Results Indicating Possible Asthma Diagnosis*		
↓FEV_1 with normal or ↓FEV_1/FEV_6 ratio	Obstructive	See *Appendix 5*.
Results Indicating Possible Diagnosis Other Than Asthma		
Proportionately ↓FEV_6 with a normal or ↑FEV_1/FEV_6	Restrictive	• Absence of obstructive findings or the presence of restrictive indices suggests other causes of lung disease. • Evaluate lung volumes and the patient's *diffusing capacity for carbon monoxide* (DLCO).
Normal indices	Mild lung disease or in association with a secondary process (allergic bronchopulmonary aspergillosis [ABPA], sarcoidosis, obesity)	• Full studies may elucidate the presence of hyperinflation (due to COPD or asthma) or a reduction in diffusing capacity not typical for asthma. • In differentiating COPD from severe asthma, the DLCO is generally not reduced in patients with severe asthma.
Normal indices with active symptoms of typical asthma	May represent vocal cord dysfunction	An abnormal inspiratory flow volume loop with normal spirometry is suggestive, but not diagnostic of vocal cord dysfunction.

***** *Reversibility should be assessed as part of a workup and prior to the diagnosis of asthma.*

NOTE: *Chronic asthma may be associated with decreased lung function with a loss of response to bronchodilator. In these cases, a 2–3 week trial of an oral corticosteroid may be required to improve or achieve asthma control, so that reversibility testing may be completed without bias. The spirometry measurements that establish reversibility may not indicate the inmate's best lung function.*

ADDITIONAL STUDIES AND ALTERNATIVE DIAGNOSES

Although asthma is typically associated with an obstructive impairment that is reversible, neither spirometry nor any other single test or measurement is adequate to diagnose asthma. Many diseases are associated with this pattern of abnormality. The inmate's pattern of symptoms, medical history and exclusion of other possible diagnoses are also needed to establish a diagnosis of asthma. See *Table 3* below.

TABLE 3. ADDITIONAL STUDIES WHEN CONSIDERING ALTERNATIVE DIAGNOSES

The following studies are not necessary for adults; however, they may aid the provider in considering an alternative diagnosis.
• **Additional pulmonary function studies** will help if there are questions about COPD (diffusing capacity), a restrictive defect (measures of lung volume), or VCD (evaluation of inspiratory flow-volume loops).
• **Bronchoprovocation** with methacholine, histamine, cold air, or exercise challenge may be useful when asthma is suspected and spirometry is normal or near normal. For safety reasons, bronchoprovocation should be carried out only by a trained individual. A positive test is diagnostic for airway hyperresponsiveness, which is a characteristic feature of asthma, but can also be present in other conditions. Thus, a positive test is consistent with asthma, but a negative test may be more helpful to rule out asthma.
• **Chest x-ray** is used to exclude other diagnoses.
• **Allergy testing** is generally not indicated, but should be considered for inmates with persistent, moderate to severe asthma which is not responding adequately to standard treatment. As a diagnostic test, it may occasionally prove useful in determining specific allergens which should be avoided by the patient. Immunotherapy based upon allergy testing must be justified as medically necessary and approved on a case-by-case basis.

Although recurrent episodes of cough and wheezing are most often due to asthma, the clinician needs to be alert for other possible diagnoses. The differential diagnoses for asthma are listed in *Table 4* below. Clinical features differentiating COPD and asthma are listed in *Table 5*.

TABLE 4. DIFFERENTIAL DIAGNOSTIC POSSIBILITIES FOR ASTHMA IN ADULTS

DIFFERENTIAL DIAGNOSES
• **Chronic obstructive pulmonary disease (COPD)** (e.g., chronic bronchitis or emphysema). COPD and asthma can be very difficult to distinguish in untreated patients. See *Table 5* for additional clinical features that can help a provider determine a diagnosis. • **Congestive heart failure** • **Pulmonary embolism** • **Mechanical obstruction of the airways** (benign and malignant tumors) • **Pulmonary infiltration** with eosinophilia (Churg-Strauss syndrome) • **Cough resulting from administration of drugs** (e.g., angiotensin-converting enzyme [ACE] inhibitors) • **Evaluation for gastroesophageal reflux disease (GERD) should be pursued if suggested by history or examination.** Respiratory symptoms are often seen in those with acid reflux and, conversely, gastroesophageal reflux is common among patients with asthma. Reflux has been identified as a trigger for asthma. GERD should be considered if the inmate's symptoms suggest dyspepsia, or if nocturnal awakening with asthma attacks is a consistent pattern. An empirical trial of a proton pump inhibitor or H-2 blocker is recommended if GERD is suspected. • **Vocal cord dysfunction (VCD) is a distinct disorder, although it may mimic asthma or coexist with asthma.** VCD is difficult to treat and medications used to treat asthma typically are ineffective for this condition. VCD should be considered in difficult-to-treat, atypical asthma patients.
NOTE: *In addition to alternative diagnoses, several conditions may coexist with asthma, which can complicate a diagnosis. These include ABPA, obstructive sleep apnea, and GERD.*

TABLE 5. CLINICAL FEATURES DIFFERENTIATING COPD AND ASTHMA

CLINICAL FEATURES	COPD	ASTHMA
Smoker or ex-smoker	Nearly all	Possibly
Symptoms under age 35	Rare	Often
Chronic productive cough	Common	Uncommon
Breathlessness	Persistent, progressive	Variable
Nighttime waking with breathlessness and/or wheeze	Uncommon	Common
Commonly associated with atopic symptoms and seasonal allergies	Uncommon	Common
Significant diurnal or day-to-day variability of symptoms	Uncommon	Common
Favorable response to inhaled glucocorticoids	Inconsistent	Consistent
Source: VA/DoD Clinical Practice Guideline: Management of Asthma in Children and Adults, version 2-2009, page 20. Department of Veterans Affairs Department of Defense; 2009. Available at: *http://www.healthquality.va.gov/asthma/ast_2_full.pdf*		

5. ASSESSMENT AND MONITORING

Appropriate asthma management is based on assessing and monitoring disease severity, control, and responsiveness to treatment.

SEVERITY

Severity is defined as the intensity of the disease process, and the level of severity is determined by assessing the disease burden in terms of **impairment** and **risk of adverse events** associated with asthma. Classifying asthma severity is useful for initial therapeutic decisions regarding appropriate medications and interventions.

- Although severity is more accurately assessed before a patient begins long-term asthma treatment, often a provider is faced with a patient who is already on a drug regimen for the treatment of their asthma. In these cases, it is useful to classify severity based on the minimum amount of drug therapy needed to achieve control. This method postulates that the patient is responsive to the current treatment and focuses on the importance of achieving a satisfactory level of asthma control.
- For patients not on long-term controller medications, severity is based on measurement of impairment and risk utilizing the most severe category in which any feature appears.

IMPAIRMENT concerns the functional limitations of the patient, as well as the frequency and severity of symptoms. Impairment is usually assessed by spirometry and patient history. The evaluation of the inmate's symptoms over the previous four weeks includes:

- Need for a short-acting beta$_2$-agonist (SABA) for immediate relief
- Number of work/school days absent
- Ability to perform normal daily activities
- Nighttime awakenings
- Quality of life assessments

Functional limitations should be assessed through spirometry by measuring FEV_1, FEV_6, and the ratio FEV_1/FEV_6. Peak flow is not reliable for assessing initial severity due to unique patient characteristics, but may be useful in assessing control on an ongoing basis. Validated self-assessment questionnaires—such as the Asthma Control Test™, Asthma Control Questionnaire, and Asthma Therapy Assessment Questionnaire© (see *Appendix 10*)—can be helpful in evaluating impairment.

RISK is the likelihood that the patient will experience adverse events such as asthma exacerbations, progressive and irreversible loss of pulmonary function, or side effects to drug therapy. Risk can be hard to assess, but a comprehensive medical history can provide key information. The test which should be most utilized when assessing the risk of future adverse events is spirometry—especially FEV_1 expressed as a percent of the predicted value or as a proportion of the FEV_6 (FEV_1/ FEV_6). Other specific measures to assess risk in relation to severity include:

- Previous frequency and severity of exacerbations
- Oral corticosteroid use
- Urgent care visits
- Lung function

For example, if an inmate has had an exacerbation requiring an emergency department visit, hospitalization, or intensive care unit admission—especially in the past year—then his or her risk of a severe exacerbation is increased; this will alter the treatment approach to that complication.

Currently, there are insufficient data to associate frequency of exacerbations with various levels of asthma severity. In general, more frequent and intense (e.g., requiring urgent/unscheduled care, hospitalization, or ICU admission) exacerbations may indicate more severe underlying asthma. For treatment purposes, two or more exacerbations requiring oral systemic corticosteroids annually may be considered the same as persistent asthma, regardless of the absence of impairment levels consistent with persistent asthma.

Initial severity classification determines the recommended step at which to initiate therapy, although the clinician must also consider individual patient needs when making treatment decisions. Treatment should be initiated as follows:

- Intermittent asthma: **STEP 1**
- Mild persistent asthma: **STEP 2**
- Moderate persistent asthma: **STEP 3**
- Severe persistent asthma: **STEP 4**, **STEP 5**, or **STEP 6**

➔ *See Appendix 5, Classifying Asthma Severity and Initiating Treatment, for a summary of the above information.*

CONTROL

Asthma control is assessed by how well a patient's symptoms, functional impairments, and risks of problematic events are minimized and goals of therapy are met. The monitoring of asthma control is vital to guiding therapy adjustments or the decision to maintain current treatment.

- **Ultimately, level of control should guide treatment**; this may include maintaining current treatment, stepping up if necessary, or stepping down if possible. Before stepping up therapy, adherence, inhaler technique, environmental control, and comorbid conditions should always be considered.
- **Comorbid conditions may complicate the presentation of asthma and impede asthma management.** The treatment of these conditions may improve asthma control. Comorbid conditions include: ABPA, gastroesophageal reflux, obesity, obstructive sleep apnea, rhinitis/sinusitis, stress, and depression.

RESPONSIVENESS

Patient responsiveness to treatment is the ease by which asthma control is achieved through pharmacological therapy. When assessing asthma therapy, one must keep in mind that therapies may produce responsiveness in one area without producing results in the other. For example, substituting a LABA for an inhaled corticosteroid (ICS) might maintain control of symptoms and function (improved impairment), but not reduce the risk of exacerbations (unimproved risk).

In the future, non-invasive biomarkers (blood/sputum eosinophils, fractionated exhaled nitric oxide, urinary leukotrienes, etc.) may also be assessed. However, at this time, their use has not been validated.

PEAK FLOW

SELF-MONITORING ACTION PLANS

Self-monitoring action plans, either peak flow- or symptom-based, play an important part in the management of asthma. Studies do not clearly show superiority of one type of plan over the other; however, both show similar benefits if taught and followed correctly. Both types of plans appear to increase patients' awareness of the disease status and control, thereby helping patients "tune in" to their disease; furthermore, action plans enhance clinician-patient communication. Regardless of the approach (peak flow monitoring, symptom monitoring, or a combination of both), self-monitoring is critical to the effectiveness of asthma self-management.

Therefore, all patients, regardless of their use of peak flow monitoring, should be provided with a written asthma action plan that includes:

- Daily treatment
- How to recognize and respond to worsening asthma
- Self-adjustment of medications in response to acute symptoms or changes in PEF measures

The nature and intensity of self-monitoring should be individualized, based on a variety of factors, including: asthma severity, the patient's ability to perceive airflow obstruction, and patient preferences. Patients who have difficulty identifying and reporting subjective measures warrant the use of peak flow monitoring.

➔ *See Appendix 17 and Appendix 18 for sample asthma action plans based on self-monitoring (in English and Spanish).*

PEAK EXPIRATORY FLOW

PEF measurements provide a means to obtain simple, quantitative, and reproducible assessments of the existence and severity of airflow obstruction. **It must be stressed that peak flow meters function best as tools for ongoing monitoring, not diagnosis.**

The relative usefulness of peak flow measurements as monitoring tools can be individualized. Measurement of PEF is dependent on effort and technique; therefore, patients need instructions, demonstrations, and frequent reviews of technique, including patient demonstration. PEF measurements may have decreased utility in the elderly, those who have histories of rapid onset of severe airflow obstruction, and those who have trouble perceiving signs and symptoms of early worsening asthma.

Long-term daily peak flow monitoring can be helpful in detecting early changes in disease states that require treatment, evaluating responses to changes in therapy, and affording a quantitative measure of impairment. Long-term daily peak flow monitoring should be considered for patients who:

- Have moderate or severe persistent asthma
- Have a history of severe exacerbations
- Poorly perceive airflow obstruction and worsening asthma
- Prefer this monitoring method

Peak flow use during exacerbations will help determine the severity of the exacerbations and guide therapeutic decisions. Consider peak flow monitoring during exacerbations of asthma for patients who have:

- A history of severe exacerbations
- Moderate or severe persistent asthma
- Difficulty perceiving signs of worsening asthma

The frequency of PEF monitoring depends on the needs of the individual patient. A patient who is a poor perceiver of asthma symptoms may need to measure PEF every morning and evening, both before and after using inhaled medications, and when symptoms of asthma are noted. Another patient with more stable asthma may need to measure PEF only when experiencing symptoms or when they are at risk for an asthma flare, such as during an upper respiratory infection.

- Once baseline values are established (see *Peak Flow Monitoring* below), each patient's personal best value must be re-evaluated annually to account for disease progression.
- In addition, the PEF measurements should be compared with office spirometry at least once per year, since the PEF in some cases has been less accurate than measurement of FEV_1 in detecting airflow obstruction.

PEAK FLOW MONITORING

Peak flow meters should be utilized according to the directions in *Appendix 11*, *Measuring Lung Function*. Baseline measures, as well as the establishment of green, yellow, and red zones for peak flow meters, should be made using the instructions in *Appendix 12*, *Establishing Baseline Measures for Peak Flow Monitoring*.

The accuracy of peak flow monitoring devices may decrease over time. Therefore, measurements that are at odds with the clinical status of the patient may be related to technical and not physiologic factors, and consideration should be given to reviewing technique with the patient or replacing the patient's current device. If peak flow monitoring is performed, the written asthma action plan should use the patient's personal best peak flow as the reference value.

6. TREATMENT OF ASTHMA

Medications for the treatment of asthma include quick-relief and long-term control medications.

➔ *Specific medications prescribed for treating asthma, along with recommended dosages, are outlined in Appendix 8, Overview of Classes of Asthma Medications.*

All inmates with asthma should be offered influenza vaccination annually and a pneumococcal vaccination in accordance with current Centers for Disease Control and Prevention guidelines.

QUICK-RELIEF MEDICATIONS

SHORT-ACTING BETA$_2$-AGONISTS (SABAS)

Albuterol (a short-acting beta$_2$-agonist) is the therapy of choice for the relief of acute bronchospasm and for the prevention of exercise-induced bronchospasm (EIB). Albuterol should not be used as a "performance enhancer" in non-asthmatics. Nonselective agents such as epinephrine and metaproterenol are not recommended due to the potential for excessive cardiac stimulation.

ANTICHOLINERGICS

Ipratropium is a first-line treatment for bronchospasms that are secondary to beta-blocker use. Anticholinergic agents are not effective in treating EIB.

- Ipratropium is not to be used as a first- line agent for bronchodilation. It may serve as an alternative bronchodilator for inmates who do not tolerate inhaled beta$_2$-agonists.
- Ipratropium can be used in combination with an inhaled beta$_2$-agonist for additive benefit with the first three of multiple beta$_2$-agonist treatments for an acute exacerbation in moderate or severe asthma.

Tiotropium should not be utilized as a quick relief medication due to its delayed onset of action.

SYSTEMIC CORTICOSTEROIDS

Systemic corticosteroids are indicated for moderate-to-severe exacerbations to speed recovery and prevent recurrence of exacerbations. During an asthma exacerbation, doubling the dose of an inhaled corticosteroid is not effective. Hydrocortisone sodium succinate or dexamethasone, given either intramuscular or intravenously, are the most rapid-acting agents; however, their onset of action is several hours. Short-term therapy should continue until the inmate achieves 80% of his/her personal best objective measures, usually 3–10 days.

➔ *Tapering systemic steroids following clinical improvement after a short treatment course does not prevent relapse and is NOT recommended.*

LONG-TERM CONTROL MEDICATIONS

CORTICOSTEROIDS

Inhaled corticosteroid (ICS) formulations such as beclomethasone, mometasone, budesonide, and fluticasone are used for long-term control of asthma; their regular use, when medically indicated for asthma, is associated with improved asthma control, reduced risk of exacerbations, and decreased risk of death. Although the benefits of ICSs outweigh the risk of systemic adverse effects, they should be titrated to as low a dose as needed to maintain control. The NAEPP Expert Panel reported that most patients were able to maintain asthma control with a 50% reduction in dose of their ICS, if the patient had been well-controlled on a high dose of an ICS alone for at least 60 days.

➔ *See Appendix 9 for recommended dosing of inhaled corticosteroids.*

Systemic corticosteroids such as methylprednisolone, prednisolone, and prednisone may be used long-term for the prevention of symptoms associated with severe persistent asthma.

MAST CELL STABILIZERS

Cromolyn or nedocromil are mild-to-moderate potency, anti-inflammatory medications. The therapeutic efficacy of these agents may not be apparent for 4–6 weeks after the initiation of treatment. These agents are not routinely used for the treatment of asthma, but should be prescribed selectively and prophylactically to prevent asthma specifically related to exercise or unavoidable exposures to known allergens.

LONG-ACTING BETA$_2$-AGONISTS (LABAS)

Salmeterol and formoterol relax smooth muscle by selective action on beta$_2$ receptors. Their action has minimal effect on heart rate and provides up to 12 hours of bronchodilation. They are used concomitantly with ICSs for long-term control of symptoms, especially nocturnal symptoms and for preventing exercise-induced bronchospasm. It has been shown that adding a LABA to a low-dose ICS reduces the frequency of exacerbations to a greater extent than doubling the dose of ICS; however, there are concerns about the potential risk of rare life-threatening or fatal exacerbations. Inhaled beta$_2$-agonists are preferred over oral agents, since they are longer-acting and have fewer side effects.

- LABAs are not to be used as monotherapy and should never be used to treat acute symptoms or exacerbations of asthma. Acute asthmatic episodes should be treated with short-acting beta$_2$-agonists.
- Caution should be used in patients with cardiovascular disorders, especially coronary insufficiency, cardiac arrhythmias, and hypertension. Symptoms such as increased blood pressure, heart rate, and anxiety can occur after the use of LABAs, and may require their discontinuation.
- LABAs should not be utilized if reversibility with a SABA cannot be demonstrated (characterized by an increase in FEV_1 of greater than 200 mL and greater than 12% from baseline).

METHYLXANTHINES

Sustained release theophylline is a mild-to-moderate potency bronchodilator used as an alternative, although not preferred, adjunct to inhaled corticosteroids. These agents may also have a mild anti-inflammatory effect. Routine serum monitoring is essential, since theophylline has a narrow therapeutic range (5–15 mcg/ml) with potentially serious toxicities, drug interactions, and significant person-to-person variability.

LEUKOTRIENE RECEPTOR ANTAGONISTS

Leukotriene receptor antagonists, zafirlukast and montelukast, exert their therapeutic effect by reducing leukotriene-mediated effects, including airway edema, smooth muscle contraction, and altered cellular activity associated with the inflammatory process. Zileuton is another medication with the same pharmacokinetic effects as zafirlukast and montelukast; however, it is rarely used due to multiple pharmacological interactions and the requirement of frequent administration. Montelukast has fewer interactions than zileuton and is administered once daily.

➔ *Leukotriene modifiers offer the convenience of oral therapy, but are significantly less effective than inhaled corticosteroids.*

SPECIAL SITUATIONS

EXERCISE INDUCED BRONCHOSPASM (EIB)

- A SABA used shortly before exercise (or as close to exercise as possible) may be helpful in preventing symptoms for 2–3 hours.
- SABAs should not be used as a "performance enhancer" in non-asthmatics.
- Patients experiencing frequent, severe EIB may indicate poorly controlled asthma and therefore a need to initiate or increase daily, long-term control therapy.

TREATMENT IN PREGNANCY

- Providers should monitor pregnant patients' asthma status during prenatal visits.
- Albuterol is the preferred SABA because it has an excellent safety profile; furthermore, the most data related to safety during human pregnancy are available for this medication.
- ICSs are the preferred treatment for long-term control medication in pregnant patients. Budesonide is the preferred ICS, as it has been studied more in pregnant patients than other ICSs.
- For the treatment of comorbid conditions, intranasal corticosteroids are recommended for treating allergic rhinitis because they have a low risk of systemic effect.

7. STEP THERAPY FOR ASTHMA

The BOP approach to treating asthma is a stepwise approach based on the NAEPP expert panel report. Clinicians should individualize treatment plans, as well as develop an individual action plan for inmates (see *Appendix 17* and *Appendix 18*). Since the course of the disease is variable, once asthma control is achieved, monitoring is essential. At times it may be necessary to step up or down therapy. Stepping therapy down is necessary for identifying the minimum medication necessary to maintain control and minimizing the risk of adverse events.

➔ *Once the provider assesses the inmate's impairment and risk, the provider should refer to Appendix 5 to determine the level of care and to Appendix 6 for the corresponding treatment level. This can be accomplished both at initiation of therapy and during follow-up care.*

- Inhalers play a significant role in the treatment of asthma. When inmates start using any new inhaler device, they should be educated on proper technique. This education should be performed with the device present.
- After the initiation of the treatment plan, a follow-up appointment in 2–6 weeks is recommended to assess the inmate's response to the therapy. If the inmate is not well-controlled, the asthma education and self-care behaviors need to be assessed before advancing to the next step. At times, a course of oral systemic steroids may be necessary to regain control of an inmate's asthma more quickly.
- After an inmate has been well-controlled on a drug therapy for at least 3 months, then a step-down in therapy can be considered. As part of the step-down consideration, the expert panel recommends an ICS reduction of 25–50% every 3 months to the lowest possible dose that is required to maintain asthma control.

STEP 1: INTERMITTENT ASTHMA

At this stage in asthma therapy, a detailed asthma management plan should be in place. This plan should ensure that the inmate understands when and how a medication should be taken, how much to take, how to evaluate the response to therapy, when to seek medical care, and what to do when the desired effect is not achieved or side effects are encountered.

A short-acting inhaled bronchodilator (beta$_2$-agonist) as needed for symptom control is usually sufficient treatment for intermittent asthma. Periodic monitoring is appropriate to assess whether a maintenance medication is necessary. If a SABA is required more than 2 times a week, then the inmate should be considered for a possible step-up in therapy.

For certain persons with intermittent asthma, severe life-threatening exacerbations may occur, separated by lengthy periods of normal pulmonary function without symptoms. For an exacerbation that is precipitated by a viral respiratory infection, the following is recommended:

- **Mild symptoms:** SABA every 4-6 hours for 24 hours or longer (nebulizer or MDI may be used)
- **Moderate-severe symptoms:** Short course of a systemic corticosteroid
- **History of severe exacerbations with viral respiratory infections:** Systemic corticosteroids at the first sign of infection

Note that SABA usage for exercise induced bronchospasm (EIB) or viral infections should not factor into this assessment. An inmate who is excessively using a SABA due to deconditioning, and has a decreased ability to exercise, does not necessarily require a step-up in treatment. The preemptive use of a SABA shortly before exercise will benefit inmates that experience EIB.

STEP 2: MILD PERSISTENT ASTHMA

Persistent asthma should be treated with a daily "maintenance" medication. The most effective medications and the mainstay of asthma therapy are the inhaled corticosteroids (ICSs). At this stage of asthma severity, an ICS should be initiated at a low dose. Although some studies have looked at the usefulness of PRN ICS use in mild persistent asthma, there is no clear evidence of positive long-term outcomes. Therefore, the BOP does NOT recommend intermittent usage of an ICS in asthma treatment.

I**nmates with persistent asthma must have a quick-relief medication available to them.** Alternative treatments include mast cell stabilizers, leukotriene modifiers (LTRAs), and sustained-release theophylline:

- Mast cell stabilizers (cromolyn and nedocromil) have a strong safety profile, but limited efficacy.
- LTRAs (e.g., montelukast) have been shown to prevent symptoms and provide long-term control, but studies have shown them to be inferior to ICSs on most outcome measures.
- Theophylline has a narrow therapeutic index, and thus needs to be monitored periodically. Given its modest clinical effectiveness, due primarily to being a bronchodilator, theophylline is not a preferred medication; however, it remains a therapeutic option for some inmates (e.g., inmate needing a tablet/capsule).

Some inmates may have persistent asthma symptoms during certain seasons and intermittent symptoms the rest of the year. Consideration should be given to treat these inmates with maintenance therapy during the affected season and step them down the rest of the year.

STEP 3: MODERATE PERSISTENT ASTHMA

An inmate requiring a step-up in therapy should have their inhaler technique and compliance reviewed. Environmental factors, as well as comorbid conditions could be attributing to an inmate's worsening asthma, and should be taken into account. Consultation with an asthma specialist may also be considered at this stage.

- **The ICS should be increased to a medium dose** (see *Appendix 9*). For most inmates, this increase should improve lung function, reduce symptoms, and significantly reduce their risk of exacerbations. While taking an ICS at a medium dose can cause systemic side effects, the risk is small, due to limited systemic absorption.
- **Alternative therapies** include maintaining the low-dose ICS with the addition of either an LTRA or theophylline; however, as in **STEP 2**, these medications are not preferred.

STEP 4: SEVERE PERSISTENT ASTHMA

STEP 4 of care requires adding a LABA to the inmate's medication regimen. The addition of a LABA has been shown to improve spirometric measurements, decrease symptoms, and reduce exacerbations in most people. Providers should be aware of the black box warning for rare life-threatening or fatal exacerbations associated with LABAs. With the addition of a LABA, the provider may be able to slightly decrease the dose of the ICS.

An alternative therapy would be the use of a high-dose ICS regimen. While high doses of ICS have shown only minimal improvements in LFTs, they can decrease the frequency of severe exacerbations. High doses of ICS do have a significantly higher risk of adverse effects. However, a high-dose ICS regimen may prove beneficial for patients who do not show significant reversibility to a short-acting bronchodilator, thereby preventing the use of a LABA. Significant reversibility can be characterized by an increase in FEV_1 of greater than 200 mL and greater than 12% from baseline

Other alternative therapies include the addition to the low-dose ICS of either an LTRA or theophylline; however, as in **STEP 2**, these medications are not preferred. If an add-on therapy does not result in an improvement of the inmate's asthma control, then it should be discontinued and a trial of another add-on therapy should be initiated.

➔ ***Step 4 therapy is also appropriate for inmates who experience recurrent severe exacerbations.***

STEP 5: SEVERE PERSISTENT ASTHMA

Consultation with an asthma specialist may be prudent if an inmate requires this step of treatment. High-dose ICS together with a LABA is recommended. Although studies have shown a flattening in the dose-response curve as the amount of ICS is increased in patients with mild to moderate asthma, patients with severe asthma continue to receive improved benefit. At this step, if an inmate has sensitivity to relevant perennial allergens, omalizumab may be considered as an adjunctive therapy. A positive skin test or in vitro reactivity to perennial allergens must be confirmed. Clinicians who administer omalizumab should be prepared and equipped to identify and treat anaphylaxis.

STEP 6: SEVERE PERSISTENT ASTHMA

At this step, consultation with a pulmonary specialist is advised. An oral corticosteroid should be added to high-dose ICS and LABA on a trial basis. This trial is to assess reversibility; hence the need for long-term corticosteroid therapy. If corticosteroids need to be used for a longer period of time, then the lowest possible dose (single dose daily or on alternate days) should be utilized. Once asthma control is achieved, attempts should be made to reduce the systemic corticosteroids. Alternatively, a trial of an LTRA, theophylline, or zileuton can be added to high-dose ICS and LABA.

8. ASTHMA EXACERBATION MANAGEMENT

Decreases in expiratory airflow characterize an asthma exacerbation. Symptoms can include progressively worsening shortness of breath, cough, wheezing, and chest tightness. Objective information gives a more reliable indication of the severity of an exacerbation. Therefore, exacerbations should be quantified by measuring the inmate's decrease in expiratory airflow with a spirometer (if readily available) or peak flow meter.

Early recognition of exacerbations results in the best outcomes for patients. For this reason, an asthma action plan is an important tool in enabling patients to self-monitor and respond appropriately (see *Appendix 17* and *Appendix 18*, sample action plans in English and Spanish). An inmate's first step to countering an acute worsening of their asthma is to utilize a quick-relief medication (albuterol). If adequate relief is not obtained and the symptoms are worsening, they should report to health services.

When an inmate presents with a possible asthma exacerbation, the severity should be assessed first, and then appropriate clinical actions taken. FEV_1 or PEF should be obtained on arrival and approximately 30 minutes after initial treatment. Pulse oximetry measurements are useful to assess severity and improvement with treatment. A brief history can be obtained upon admission to HSU to identify the time of onset and potential causes of the current exacerbation, as well as the severity of symptoms compared to prior exacerbations and response to therapy for those exacerbations.

➔ *See Table 6 below for categories of severity of asthma exacerbation, including symptoms and signs, initial PEV or FEV_1, and the associated clinical course.*

TABLE 6. SEVERITY OF ASTHMA EXACERBATION

SEVERITY	SYMPTOMS & SIGNS	INITIAL PEF (OR FEV_1)	CLINICAL COURSE
Mild	Dyspnea only with activity	PEF ≥70% predicted or personal best	• Usually does not require HSU visit • Prompt relief with inhaled quick-relief medications • Possible short course of oral systemic corticosteroids
Moderate	Dyspnea interferes with or limits usual activity	PEF 40–69% predicted or personal best	• Usually requires visit to HSU • Relief from frequent inhaled quick-relief medications • Oral systemic corticosteroids • Some symptoms last for 1–2 days after treatment is begun
Severe	• Dyspnea while at rest • Interferes with conversation	PEF <40% predicted or personal best	• Usually requires ED visit and likely hospitalization • Partial relief from frequent inhaled quick-relief medications • Oral systemic corticosteroids • Symptoms may last for >3 days after treatment has begun • Adjunctive therapies are helpful
Life-Threatening	• Too dyspneic to speak • Perspiring	PEF <25% predicted or personal best	• Requires ED/hospitalization—possible ICU • Minimal or no relief from frequent inhaled SABA • Intravenous corticosteroids • Adjunctive therapies are helpful

TREATMENT OF EXACERBATIONS

The treatment goals for asthma exacerbation management are as follows:

1. **Reverse airflow obstruction.**

   Repetitive administration of a SABA via MDI or nebulizer has the best results for reversing an airflow obstruction, but inmates with moderate or severe exacerbations or who fail to respond promptly to SABA treatment will need a course of systemic corticosteroids.

2. **Correct hypoxemia.**

   Oxygen supplementation is needed to correct significant hypoxemia in moderate to severe exacerbations.

3. **Prevent relapse.**

   The incidence of relapse can be reduced by utilizing short courses of oral corticosteroids, and continuing more intensive treatment for several days, depending on severity, after an exacerbation. Doubling the dose of an inhaled corticosteroid has not been shown to be an effective treatment for exacerbations, but higher doses may be an alternative for patients who have significant adverse effects to systemic corticosteroids. Upon completion of this intensive treatment the inmate can be placed back onto their previous maintenance regimen.

TABLE 7. DOSAGES OF DRUGS FOR ASTHMA EXACERBATIONS

MEDICATION	DOSE/DURATION	NOTES
Inhaled Short-Acting Beta$_2$-Agonist (SABA)		
Albuterol (nebulizer)	• 2.5–5 mg every 20 minutes x 3 doses • Then, 2.5–10 mg every 1–4 hours PRN, or 10–15 mg/hour continuously	• Onset of action ≤ 5 minutes: Significant response expected after 1st dose. • Repeat dosing does not equal incremental bronchodilation • Initial 3 doses sufficient for most exacerbations
Albuterol (MDI, 90 mcg/puff)	• 4–8 puffs every 20 minutes up to 4 hours • Then, every 1–4 hours PRN	
Anticholinergics		
Ipratropium (nebulizer)	• 0.5 mg every 20 minutes for 3 doses • Then, PRN	
Combination Agents		
Ipratropium/Albuterol (nebulizer)	• 3 mL every 20 minutes for up to 3 doses per episode • Then, scheduled dosing for those with severe exacerbations	
Systemic Corticosteroids		
Prednisone Methylprednisolone Prednisolone	40–60 mg in single dose or 2 divided doses daily, for 3–10 days	In most cases, oral therapy is preferred over IV therapy, and tapering is unnecessary. (*See third **NOTE** below about tapering.)*

NOTES:

- Due to similar efficacy, oral therapy is preferred over intravenous therapy, as long as there is no impairment to the gastrointestinal system and compliance is not a concern.
- There is no advantage to using higher doses of corticosteroids in severe asthma exacerbations.
- Tapering is not necessary for corticosteroid courses of less than 1 week, and probably not needed for courses up to 10 days (especially if the inmate is taking an ICS).

The following treatments are NOT recommended for treating exacerbations:

- Methylxanthines
- Antibiotics (unless as needed for comorbid conditions)
- Aggressive hydration
- Mucolytics

HOSPITALIZATION

The decision to hospitalize an inmate should be based on the inmate's history and severity of prior exacerbations, the severity of present signs and symptoms, the response to emergency treatment, and the duration of unresolved symptoms.

➔ ***Severe airflow obstruction—****demonstrated by signs of impending respiratory failure such as the inability to speak, declining mental clarity, or worsening of respiratory muscle fatigue****—requires immediate referral to a local emergency department regardless of other associated factors.***

COMPLIANCE

An inmate's compliance with prescribed asthma medications should be reviewed. Treatment failure is often due to compliance issues such as failure to use medications correctly or frequently enough to prevent exacerbations.

9. PATIENT EDUCATION FOR SELF-MANAGEMENT

Asthma self-management education is an essential component in achieving positive outcomes and improved asthma control. Effective patient education, including individualized action plans, leads to improved asthma knowledge and skills for self-management. These self-management skills can reduce the number of hospitalizations, as well as improve quality of life by reducing symptoms and lessening limitation of activity. Proper patient education can also afford better medication utilization and compliance.

Effective patient education includes the following components, which are discussed in more detail below:

- Basic facts defining asthma
- Definition of well-controlled asthma
- Basic facts about asthma medications
- Proper technique for inhalers
- Identifying and managing asthma triggers
- How to use a peak flow meter
- When and how to address worsening asthma
- How to use a metered dose inhaler

BASIC FACTS DEFINING ASTHMA

Patients should be provided with basic information about asthma. Asthma education is most effective when provided at the time of diagnosis with supplementation and reinforcement at every encounter. Education should include information on day-to-day and acute management with prescribed adjustments of medications. Concepts such as inflammation, bronchoconstriction, chronicity of disease, and levels of control should be addressed.

➔ *See Appendix 13 and Appendix 14, patient fact sheets about asthma in English and Spanish.*

BASIC FACTS ABOUT ASTHMA MEDICATIONS

For optimal self-management, patients need to be educated about their medication, especially how and when to use them. Regardless of the delivery device selected, detailed education on the use and maintenance of the device is necessary. The package inserts provided with these products often include detailed diagrams explaining proper technique. The patient should be able to demonstrate good technique initially and with each follow-up visit. Reinforcement of proper technique ensures proper delivery of medication.

Although numerous patients utilize metered dose inhalers (MDI) each day, many do not operate them correctly. As a result, both the provider and the patient may be unaware of improper usage and incorrectly assume a medication is ineffective. This may lead prescribers to unnecessarily change or step up therapy.

In order to promote the effective use of an inhaler, providers should:

- At each routine encounter, have the patient demonstrate using the MDI by performing an actual inhalation.
- Prescribe inhalers with valved holding chambers or require the use of a spacer with the prescribed MDI for those patients who cannot demonstrate adequate technique.
- Educate the patient on how many inhalations should be used at one time. For example, if the instructions say to utilize two puffs, how long should the patient wait after each puff?
- Educate the patient on the order in which inhalers should be used. For example, should the patient use a beta-agonist before using a corticosteroid?

IDENTIFYING AND MANAGING ASTHMA TRIGGERS

Assisting patients with identification of asthma triggers promotes good asthma control. Understanding associations of symptoms with inhaled allergen exposure can also play a significant role in patient self-management. Patients instructed to monitor their symptoms in relation to workplace exposure to chemicals, dust, or smoke can provide insight about changes that may promote better control.

HOW TO USE A PEAK FLOW METER

Some patients have difficulty describing or recognizing changes in their level of asthma control. Peak flow meters provide an objective measure to help patients identify changes and take steps to treat and prevent exacerbations. The patient should be instructed in proper technique and how to utilize the results. Using a peak flow meter can help patients make optimal use of a written asthma action plan.

➔ *See Appendix 15 and Appendix 16, patient fact sheets on peak flow meters, in English and Spanish.*

WRITTEN ASTHMA ACTION PLAN

A written asthma action plan provides patients with a step-by-step approach for monitoring asthma control. The written asthma action plan includes the individualized medication regimen for daily control, as well as a plan of action for worsening asthma symptoms. The patient should be included in the development of the action plan, and the plan should be addressed at follow-up visits to ensure that patients appropriately manage exacerbations.

➔ *See Appendix 17 and Appendix 18, sample action plans in English and Spanish.*

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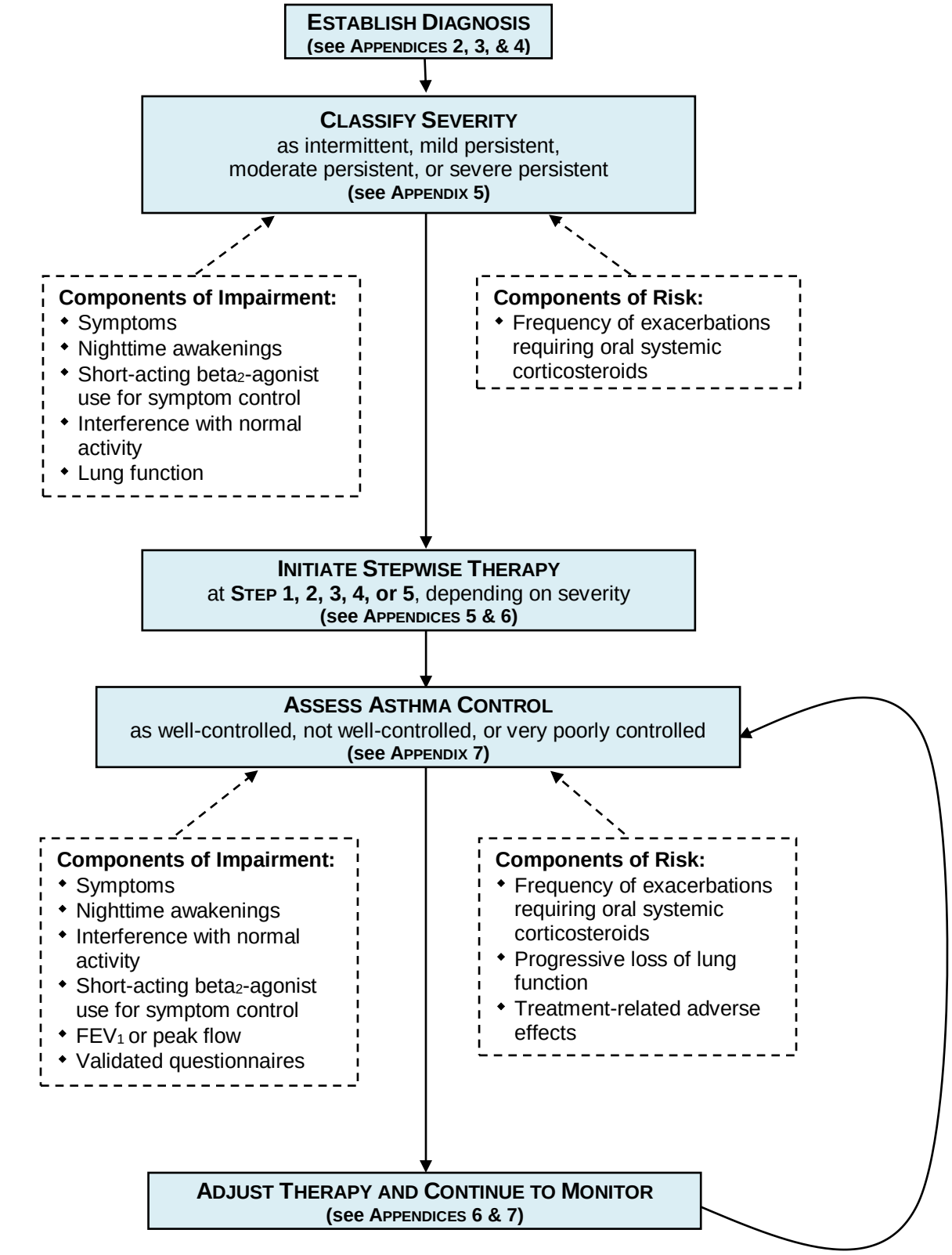
APPENDIX 1. OVERVIEW: DIAGNOSIS AND MANAGEMENT OF ASTHMA (*for Patients Not Currently Taking Long-Term Control Medications*)



APPENDIX 2. METHODS FOR ESTABLISHING THE DIAGNOSIS

➔ **DETAILED MEDICAL HISTORY, in particular:**
• Overall pattern of symptoms (e.g., perennial, seasonal, or both; continual, episodic, or both; diurnal variations) • Precipitating factors (such as the presence of allergic triggers) • Family history of asthma, allergy, or other atopic disorders
➔ **PHYSICAL EXAMINATION, in particular:**
• Upper respiratory tract • Chest • Skin
➔ **SPIROMETRY:**
• An objective, reliable measure • Can be used to establish reversibility (as opposed to peak flow meters which are used for monitoring and are not diagnostic)
➔ **EXCLUSION OF ALTERNATIVE DIAGNOSES**
Notes: • ***In general, a diagnosis of asthma is established if:*** ***(1)*** *episodic symptoms of airflow obstruction or airway hyperresponsiveness are present,* ***(2)*** *airflow obstruction is at least partially reversible as measured by spirometry, and* ***(3)*** *alternative diagnoses are excluded.* • ***See Table 1 for key indicators in diagnosing asthma****.*

APPENDIX 3. SAMPLE QUESTIONS FOR THE DIAGNOSIS AND INITIAL ASSESSMENT OF ASTHMA

A "YES" answer to any of these questions suggests that an asthma diagnosis is likely.

In the past 12 months …

- Have you had a sudden severe episode or recurrent episodes of coughing, wheezing (high-pitched whistling sounds when breathing out), chest tightness, or shortness of breath?
- Have you had colds that "go to the chest" or take more than 10 days to get over?
- Have you had coughing, wheezing, or shortness of breath during a particular season or time of the year?
- Have you had coughing, wheezing, or shortness of breath in certain places or when exposed to certain things (e.g., animals, tobacco smoke, perfumes)?
- Have you used any medications that help you breathe better? How often?
- Are your symptoms relieved when the medications are used?

In the past 4 weeks, have you had coughing, wheezing, or shortness of breath …

- At night that has awakened you?
- Upon awakening?
- After running, moderate exercise, or other physical activity?

These questions are examples and do not represent a standardized assessment or diagnostic instrument. The validity and reliability of these questions have not been assessed.

APPENDIX 4. SUGGESTED ITEMS FOR DETAILED MEDICAL HISTORY

The medical history of a new patient who is known or thought to have asthma should address the following items*:

1. Symptoms
- Cough
- Wheezing
- Shortness of breath
- Chest tightness
- Sputum production

2. Pattern of Symptoms
- Perennial, seasonal, or both
- Continual, episodic, or both
- Onset, duration, frequency (number of days or nights, per week or month)
- Diurnal variations, especially nocturnal and on awakening in early morning

3. Precipitating and/or Aggravating Factors
- Viral respiratory infections
- Environmental allergens, indoor (e.g., mold, house-dust mite, cockroach, animal dander or secretory products) and outdoor (e.g., pollen)
- Characteristics of home including age, location, cooling and heating system, wood-burning stove, humidifier, carpeting over concrete, presence of molds or mildew, characteristics of rooms where patient spends time (e.g., bedroom and living room with attention to bedding, floor covering, stuffed furniture)
- Smoking (patient and others in home or daycare)
- Exercise
- Occupational chemicals or allergens
- Environmental change (e.g., moving; and/or alterations in workplace, work processes, or materials used)
- Irritants (e.g., tobacco smoke, strong odors, air pollutants, occupational chemicals, dusts and particulates, vapors, gases, and aerosols)
- Emotions (e.g., fear, anger, frustration, hard laughing)
- Stress (e.g., fear, anger, frustration)
- Drugs (e.g., aspirin; and other nonsteroidal anti-inflammatory drugs, beta-blockers including eye drops, others)
- Food, food additives, and preservatives (e.g., sulfites)
- Changes in weather, exposure to cold air
- Endocrine factors (e.g., menses, pregnancy, thyroid disease)
- Comorbid conditions (e.g. sinusitis, rhinitis, GERD)

4. Development of Disease and Treatment
- Age of onset and diagnosis
- History of early-life injury to airways (e.g., bronchopulmonary dysplasia, pneumonia, parental smoking)
- Progression of disease (better or worse)
- Present management and response, including plans for managing exacerbations
- Frequency of using SABA
- Need for oral corticosteroids and frequency of use

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

6. Social History
- Workplace characteristics that may interfere with adherence
- Social factors that interfere with adherence, such as substance abuse
- Social support/social networks
- Level of education completed
- Employment

7. History of Exacerbations
- Usual prodromal signs and symptoms
- Rapidity of onset
- Duration
- Frequency
- Severity (need for urgent care, hospitalization, ICU admission)
- Life-threatening exacerbations (e.g., intubation, ICU admission)
- Number and severity of exacerbations in the past year.
- Usual patterns and management (what works?)

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

9. Assessment of Patient's and Family's Perceptions of Disease
- Patient's, and spouse's or partner's knowledge of asthma and belief in the chronicity of asthma and in the efficacy of treatment
- Patient's perception and beliefs regarding use and long-term effects of medications
- Ability of patient, spouse, or partner to cope with disease
- Level of family support and patient's and spouse's, or partner's capacity to recognize severity of an exacerbation
- Economic resources
- Sociocultural beliefs

**** This list does not represent a standardized assessment or diagnostic instrument. The validity and reliability of this list have not been assessed.***

Adapted from: Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, Full Report 2007. NIH Publication No. 07-40511-440.

APPENDIX 5. CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT
(for Patients Not Currently Taking Long-Term Control Medications)

COMPONENTS OF SEVERITY[1]		CLASSIFICATION OF ASTHMA SEVERITY			
		INTERMITTENT	MILD PERSISTENT	MODERATE PERSISTENT	SEVERE PERSISTENT
IMPAIRMENT	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily, and not more than 1x on any day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function *Normal FEV_1/FEV_6:* *< 20 yr 85%* *20–39 yr 80%* *40–59 yr 75%* *60–80 yr 70%*	◆ Normal FEV_1 between exacerbations ◆ FEV_1 >80% predicted ◆ FEV_1/FEV_6 normal	◆ FEV_1 >80% predicted ◆ FEV_1/FEV_6 normal	◆ FEV_1 >60% but <80% predicted ◆ FEV_1/FEV_6 reduced 5%	◆ FEV_1 <60% predicted ◆ FEV_1/FEV_6 reduced >5%
RISK	Exacerbations requiring oral systemic corticosteroids	0–1/year[2]	≥2/year[2]		
		Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV_1.			
RECOMMENDED STEP FOR INITIATING TREATMENT[3] (See *Appendix 6* for treatment steps.)		**For intermittent: STEP 1**	**For mild persistent: STEP 2**	**For moderate persistent: STEP 3**	**For severe persistent: STEP 4, 5, or 6**
				For STEPS 3–6, consider adding short course of oral systemic corticosteroids.	
		In 2–6 weeks, evaluate the level of asthma control that has been achieved and adjust therapy accordingly.			

Key: EIB = exercise-induced bronchospasm; **FEV_1** = forced expiratory volume in 1 second; **FEV_1** = forced expiratory volume in 6 seconds; **ICU** = intensive care unit

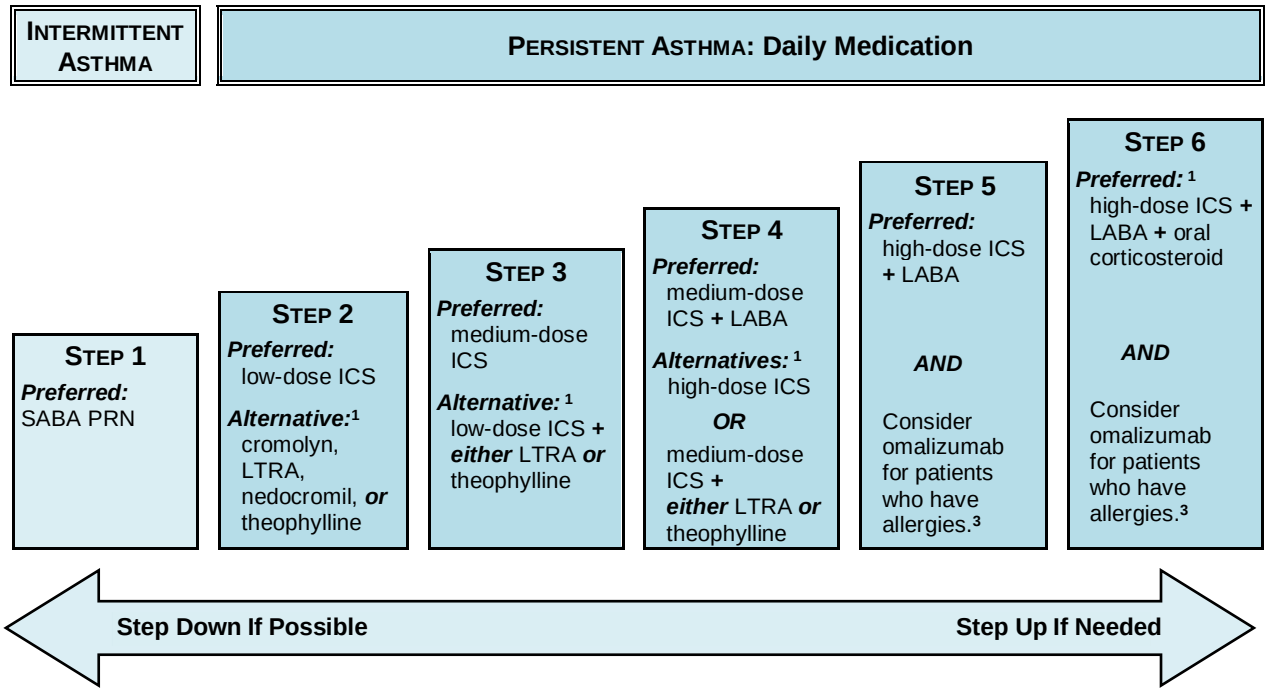
Notes:

[1] Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2–4 weeks and spirometry. **Assign severity to the most severe category in which any feature occurs.**

[2] At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

[3] The stepwise approach is meant to assist, not replace, the clinical decision-making required to meet individual patient needs.

APPENDIX 6. STEPWISE APPROACH FOR MANAGING ASTHMA



Quick-Relief Medication for all Patients:

- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed.
- Use of SABA >2 days/week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step-up treatment.

Key: Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy. **ICS** = inhaled corticosteroid; **LABA** = long-acting inhaled beta$_2$-agonist; **LTRA** = leukotriene receptor antagonist; **SABA** = inhaled short-acting beta$_2$-agonist

The stepwise approach is meant to assist, not replace, the clinical decision-making required to meet individual patient needs. [2]

Stepping up/down: Step-down only if asthma is well-controlled for at least 3 months.
Before stepping-up, check adherence, environmental control, comorbid conditions, and if adding medication, refer to formulary criteria.

At STEPS 3–6: Consult with asthma specialist if STEP 4 or higher is required; consider consultation at STEP 3.

At STEPS 2–4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma.[3,4]
Immunotherapy should only be considered after consultation with the Regional Medical Director.

At STEPS 1–6: Provide patient education, environmental control, and management of comorbidities.

Notes:

[1] If **alternative treatment** is used and response is inadequate, discontinue it and use the preferred treatment before stepping up. **Zileuton** is a less desirable alternative due to limited studies as adjunctive therapy and the need to monitor liver function. **Theophylline** requires monitoring of serum concentration levels. In STEP 6, before **oral corticosteroids** are introduced, a trial of high-dose ICS + LABA + either LTRA, theophylline, or zileuton may be considered, although this approach has not been studied in clinical trials.

[2] STEP 1, 2, and 3 preferred therapies are based on Evidence A; STEP 3 alternative therapy is based on Evidence A for LTRA, Evidence B for theophylline. STEP 4 preferred therapy is based on Evidence B, and alternative therapy is based on Evidence B for LTRA and theophylline. STEP 5 preferred therapy is based on Evidence B. STEP 6 preferred therapy is based on (EPR—2 1997) and Evidence B for omalizumab.

[3] Clinicians who administer **immunotherapy** or **omalizumab** should be prepared and equipped to identify and treat anaphylaxis that may occur.

[4] Immunotherapy for STEPS 2–4 is based on Evidence B for house-dust mites, animal danders, and pollens; evidence is weak or lacking for molds and cockroaches. Evidence is strongest for immunotherapy with single allergens. The role of allergy in asthma is greater in children than in adults.

APPENDIX 7. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY

COMPONENTS OF CONTROL[1]		CLASSIFICATION OF ASTHMA CONTROL		
		WELL-CONTROLLED	NOT WELL-CONTROLLED	VERY POORLY CONTROLLED
IMPAIRMENT	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1–3x/week	≥4x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	FEV_1 or peak flow	>80% predicted/ personal best	60–80% predicted/ personal best	<60% predicted/ personal best
	Validated questionnaires:[2] ◆ ATAQ ◆ ACQ ◆ ACT	 ◆ 0 ◆ ≤0.75[3] ◆ ≥20	 ◆ 1–2 ◆ ≥1.5 ◆ 16–19	 ◆ 3–4 ◆ N/A ◆ ≤15
RISK	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year[4]	
		Consider severity and interval since last exacerbation.		
	Progressive loss of lung function	Evaluation requires long-term follow-up care.		
	Treatment-related adverse effects	Medication side-effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control, but should be considered in the overall assessment of risk.		
RECOMMENDED ACTION FOR TREATMENT[5, 6] (See *Appendix 6* for treatment steps.)		**If well-controlled:** ◆ Maintain current step. ◆ Regular follow-up at every 1–6 months to maintain control. ◆ Consider step down if well-controlled for at least 3 months.	**If not well-controlled:** ◆ Step up 1 step. ◆ Re-evaluate in 2–6 weeks. ◆ For side effects, consider alternative treatment options.	**If very poorly controlled:** ◆ Consider short course of oral systemic corticosteroids ◆ Step up 1–2 steps. ◆ Re-evaluate in 2 wks. ◆ For side effects, consider alternative treatment options.

Key: EIB = exercise-induced bronchospasm; **ICU** =I intensive care unit

Notes:

[1] **Level of control is based on the most severe impairment or risk category.** Assess impairment domain by patient's recall of previous 2–4 weeks and by spirometry or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient's asthma is better or worse since the last visit.

[2] **ATAQ** = Asthma Therapy Assessment Questionnaire©; **ACQ** = Asthma Control Questionnaire©; **ACT** = Asthma Control Test™ ; *Minimal Important Difference:* 1.0 for the ATAQ, 0.5 for the ACQ, not determined for the ACT.

[3] ACQ values of 0.76–1.4 are indeterminate regarding well-controlled asthma.

[4] At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poor disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well controlled asthma.

[5] The stepwise approach is meant to assist, not replace, the clinical decision-making required to meet individual patient needs.

[6] **Before step-up in therapy:** Review adherence to medication, inhaler technique, environmental control, and comorbid conditions. If an alternative treatment option was used in a step, discontinue and use the preferred treatment for that step.

APPENDIX 8. OVERVIEW OF CLASSES OF ASTHMA MEDICATIONS

MEDICATION CLASS	EXAMPLES	MECHANISM	MODE OF ADMINISTRATION
LONG-TERM CONTROLLER MEDICATIONS			
ICSs	◆ Budesonide ◆ Beclomethasone ◆ Ciclesonide ◆ Fluticasone ◆ Mometasone	Anti-inflammatory	Inhaled once or twice daily
LABAs	◆ Salmeterol ◆ Formoterol	Bronchodilator	Inhaled twice daily
Combination LABA/ICS	◆ Salmeterol/fluticasone ◆ Formoterol/budesonide	Combination anti-inflammatory/ bronchodilator	Inhaled twice daily
Leukotriene modifiers	◆ Montelukast ◆ Zileuton	Anti-inflammatory and bronchodilatory effects	Oral (once daily for montelukast, four times a day for zileuton)
Mast cell stabilizers[1]	◆ Cromolyn ◆ Nedocromil	Anti-inflammatory (stabilizes mast cells and interferes with chloride channel function)	Inhaled 4 times daily
Methylxanthines	◆ Theophylline	Bronchodilators; may have mild anti-inflammatory effects	Oral (liquid, sustained-release tablets, and capsules)
QUICK-RELIEF AGENTS			
SABAs	◆ Albuterol ◆ Levalbuterol ◆ Pirbuterol	Bronchodilator	Inhaled every 4–6 hours, as needed *Exercise-induced asthma:* Use 15 minutes prior to exercise (not to be used as a "performance enhancer" in non-asthmatics).
Anticholinergic[2]	◆ Ipratropium bromide[3]	Bronchodilator (inhibits muscarinic cholinergic receptors), reduces intrinsic vagal tone of the airways	Inhaled every 6 hours during moderate or severe asthma exacerbations
Oral corticosteroids	◆ Methylprednisolone ◆ Prednisolone ◆ Prednisone	Anti-inflammatory	Oral (often given in short-course bursts during exacerbations)

Key: **ICS** = inhaled corticosteroid; **LABA** = long-acting ß-agonist; **SABA** = short-acting ß-agonist; **SC** = subcutaneous

[1] Mast cell stabilizers are usually used only prophylactically to prevent asthma specifically related to exercise or unavoidable exposures to known allergens

[2] Tiotropium should not be utilized as a quick relief medication due to its delayed onset of action.

[3] Ipratropium bromide has not demonstrated effectiveness in long-term management of asthma.

APPENDIX 9. INHALED CORTICOSTEROIDS DOSING CHART

INHALED STEROID	LOW DOSE	MEDIUM DOSE	HIGH DOSE
Beclomethasone HFA 40 mcg or 80 mcg	80–240 mcg ***Initial:*** 80 mcg BID	240–480 mcg ***Initial:*** 160 mcg BID	>480 mcg ***Max:*** 320 mcg BID
Budesonide 90 mcg or 180 mcg	180–600 mcg ***Initial:*** 180 mcg BID	600–1200 mcg ***Initial:*** 360 mcg BID	>1200 mcg ***Max:*** 720 mcg BID
Fluticasone HFA 44 mcg, 110 mcg, or 220 mcg	88–264 mcg ***Initial:*** 88 mcg BID	>264–440 mcg ***Initial:*** 220 mcg BID (110 mcg, 2 puffs BID)	>440 mcg ***Max:*** 880 mcg BID
Mometasone Furoate 110 mcg or 220 mcg	220 mcg ***Initial:*** 220 mcg daily	440 mcg ***Initial:*** 440 mcg daily *or* 220 mcg BID	>440 mcg ***Max:*** 440 mcg BID
Fluticasone/Salmeterol 100/50 mcg, 250/50 mcg, or 500/50 mcg	100–300 mcg***** ***Initial:*** 100/50 mcg BID	>300–500 mcg***** ***Initial:*** 250/50 mcg BID	>500 mcg***** ***Max****:* 500/50 mcg BID
Budesonide/Formoterol 80/4.5 mcg or 160/4.5 mcg		320–640 mcg****** ***Initial:*** 80/4.5 mcg, two puffs BID	640 mcg****** ***Max:*** 160/4.5 mcg, two puffs BID
Flunisolide 250 mcg	500–1000 mcg ***Initial:*** 500 mcg BID	1000–2000 mcg	2000 mcg ***Max*****:** 1000 mcg BID

***** Low, medium, and high dosing of fluticasone/salmeterol is determined by the dose of fluticasone administered.
****** Medium, high, and max dosing of budesonide/formoterol is determined by the dose of budesonide administered.

APPENDIX 10. PATIENT SELF-ASSESSMENT QUESTIONNAIRE

ASTHMA SELF-ASSESSMENT QUESTIONNAIRE for Adults (18 years or older)		
Patient's name:		ID number:
Provider's name:		Date: / /
Read each question below.	**Check one answer for each question.**	**Enter the value of your answer (0 or 1) below.**
1. During the past 4 weeks:		
a. Did you miss any work or normal daily activity because of asthma?	☐ Yes **(1)** ☐ No **(0)** ☐ Unsure **(1)**	
b. Did you wake up at night because of asthma?	☐ Yes **(1)** ☐ No **(0)** ☐ Unsure **(1)**	
c. Did you believe that your asthma was well controlled?	☐ Yes **(1)** ☐ No **(0)** ☐ Unsure **(1)**	
2. Do you use an inhaler for quick relief from asthma symptoms?	☐ Yes **(1)** ☐ No **(0)** ☐ Unsure **(1)**	
If yes: **In the past 4 weeks**, what was the highest number of puffs in 1 day you took of the inhaler?	☐ 0 **(0)** ☐ 1 to 4 puffs **(0)** ☐ 5 to 8 puffs **(1)** ☐ 9 to 12 puffs **(1)** ☐ More than 12 puffs **(1)**	
3. During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?	☐ Not at all **(0)** ☐ Once a week or less **(0)** ☐ 2 or 3 times per week **(1)** ☐ 1 or 2 times per day **(1)** ☐ 3 or more times a day **(1)**	
	TOTAL SCORE:	
➔ **If your TOTAL SCORE is 1 or greater, discuss this questionnaire with your provider.** ←		

Adapted from the *Asthma Therapy Assessment Questionnaire*, available in English and Spanish at:
http://www.asthmacontrolcheck.com/asthma_control/asthmacontrolcheck/hcp/index.jsp?WT.svl=1#g11

APPENDIX 11. MEASURING LUNG FUNCTION

PEAK FLOW MONITORING

Benefits

The use of peak flow monitoring can be a useful tool to monitor asthma control. Peak flow monitoring can measure the day-to-day changes in breathing patterns to help the patient to:

- Track the control of asthma over time.
- Show how well treatment is working.
- Recognize signs of flare-up before symptoms appear.
- Decide when to seek medical attention.

Frequency

The frequency of monitoring asthma control with the use of peak flow monitoring is a matter of clinical judgment. The health care provider should consider the following measurement time frames:

- Consider peak flow monitoring at 2-to-6 week intervals for patients who are just starting therapy or who require a step up in therapy to achieve or regain asthma control.
- Consider peak flow monitoring for patients who have well controlled asthma during scheduled Chronic Care Clinic visits and when the patient senses the asthma is getting worse.
- Consider peak flow monitoring at 3-month intervals if a step down in therapy is anticipated.
- Consider daily peak flow monitoring for patients who have moderate or severe persistent asthma, those who have a history of severe exacerbations, and those who poorly perceive airway obstruction or worsening asthma. This could be accomplished by issuing a self-carry peak flow meter and education on its use to those patients with unstable asthma to better monitor the patient's asthma control.

SPIROMETRY TESTING TIME FRAMES

The health care provider should consider the following spirometry testing time frames:

- At the initial assessment for patients whom the diagnosis of asthma is suspected.
- After asthma treatment is initiated and symptoms and Peak Expiratory Flow (PEF) have stabilized.
- During periods of progressive or prolonged loss of asthma control.
- At least every 1–2 years; more frequently, depending on response to therapy.

APPENDIX 12. ESTABLISHING BASELINE MEASURES FOR PEAK FLOW MONITORING

ESTABLISHING INDIVIDUAL PEAK EXPIRATORY FLOW RATE (PEFR) RANGES

Baseline values are necessary for evaluating future values. Whenever possible, baseline values should be obtained when the patient is feeling well after a period of maximal asthma therapy. The patient should then record PEFR measurements 2–4 times daily for 2 weeks.

1. **Establish Personal Best PEFR:** The personal best (highest measurement) is determined from the readings gathered by the inmate.

2. **Establish Green, Yellow, and Red Zones:**

   a. **Green Zone** – The patient's normal PEFR range is defined as 80–100% of the patient's personal best. When readings are within this range, symptoms are not present, and the patient should be advised to adhere to his or her regular maintenance regimen.

   b. **Yellow Zone** – In this range, defined as 50–80% of personal best, airways are somewhat obstructed. The patient should implement the treatment plan decided upon with the clinician to reverse airway narrowing and regain control. The wide range represented by the yellow zone can be subdivided above and below the 65% level, if desired.

   c. **Red Zone** – Defined as below 50% of personal best, this range signals an urgent situation and the inmate should seek medical attention. ***Bronchodilator therapy should be started immediately*.**

NOTES:

- *Each patient's personal best value must be re-evaluated annually to account for disease progression.*
- *In addition, the PEFR measurements should be compared with office spirometry at least once per year; in some cases, the PEFR has been less accurate than measurement of FEV_1 in detecting airflow obstruction.*

APPENDIX 13. PATIENT FACT SHEET: BASIC FACTS ABOUT ASTHMA

What is asthma? Asthma is a long-term disease that affects your lungs. It can cause wheezing, chest tightness, coughing, and a feeling of breathlessness. When these things happen, it is called an "asthma attack."

What happens during an asthma attack? During an asthma attack, the airways in the lungs become inflamed or swollen. The inflammation and swelling make the airways smaller, which is why it is hard to breathe. Some asthma attacks are mild and only bother you a little. Some asthma attacks are severe and are an emergency. ***The table below lists the symptoms of asthma attacks*:**

Mild Asthma Attack	Severe Asthma Attack	EMERGENCY!
Breathlessness while walking	Breathlessness while resting	Extreme difficulty breathing
Breathing faster than normal	More than 30 breaths each minute	Bluish color to lips and face
Can speak in short sentences	Can speak words, but not sentences	Cannot speak
Wheezing	Loudly wheezing	Severe anxiety
Heart rate less than 100 beats per minute	Heart rate more than 120 beats per minute	Rapid pulse and sweating

Can asthma be cured? Asthma does not have a cure, but you can take steps to control it. You and your doctor will work together to make asthma attacks less likely. You will be helping to control your asthma by using your medicine the way it is prescribed and by avoiding or managing "asthma triggers."

What are asthma triggers? Asthma triggers are different for different people. You might be allergic to something in your environment, and sometimes these allergies trigger asthma attacks. Some common asthma triggers include: dust, pollen, mold, cigarette smoke, and smoke from burning leaves or grass. Asthma can also be triggered by dry, cold air and by exercise.

What kind of medicine is used to manage asthma? Asthma is commonly managed by using different types of inhalers. Inhalers are medicine you breathe into your lungs. Some give you quick relief when you are having an asthma attack. Others are meant to use every day in order to prevent asthma attacks. Your doctor may also suggest some other medicines to help treat allergies or manage other triggers.

Quick Relief Inhalers	Long-Term Control Inhalers
Use when having symptoms	Use every day
Helps during an asthma attack	Do NOT use during an asthma attack

How do I know if my asthma is under control? When you are not wheezing or coughing, have no difficulty breathing with your normal activities, sleep better, and don't need emergency medical help.

Well-Controlled	Getting Worse	EMERGENCY!
No symptoms during day or night	Wheeze, cough, chest tightness	Very short of breath
Normal activities are not a problem	Have some difficulty with normal activities	Cannot do normal activities
Peak flow > 80% of personal best	Peak flow 50%–79% of personal best	Peak flow <50% of personal best

What do I do if my asthma is NOT under control? If you are having an **asthma emergency**, notify the nearest staff member. If you believe your asthma is **getting worse**, please report to sick call.

APPENDIX 14. DATOS BÁSICOS SOBRE EL ASMA (BASIC FACTS ABOUT ASTHMA)

Qué es el Asma? El Asma es una enfermedad pulmonar de largo tiempo. Puede causar silbido en los pulmones, pecho apretado, tos, o sentir falta de aire. Cuando esto sucede se conoce como un ataque de Asma.

Qué pasa durante un ataque del Asma? Durante un ataque de asma, la vía respiratoria se inflama. La inflamación puede causar hinchazón a su vez reducir la entrada de aire por la vía respiratoria, causando dificultad para respirar. Algunos ataques de Asma son leves y solo te sientes corto de respiración o malestar. Otros ataques de Asma son severos y pueden ser una emergencia. La tabla demuestra los síntomas de un ataque asmático:

Ataque Asmático Leve	Ataque Asmático Severo	Emergencia
Sentir la falta de aire cuando camina	La falta de aire mientras se esta en reposo	Extrema dificultad para respirar
Respirar mas rápido de lo normal	30 respiraciones por minuto o mas	La cara y los labios están descoloridos (se ven morados o azules)
Puede hablar con frases pequeñas	Puede hablar palabras pero no frases	No puede hablar
Silbidos en el pecho	Fuerte silbido en el pecho	Ansiedad severa
Ritmo cardiaco menos de 100 latidos por minuto	Ritmo cardiaco mas de 120 latidos por minuto	Pulso cardiaco rápidos y sudoración

Se Puede curar el Asma? El Asma no tiene cura, pero se puede coger pasos para controlar. Siguiendo las indicaciones médicas puede reducir los ataques de Asma. Debe conocer lo le provocar el ataque de Asma y evitarlo y tomar sus medicamento según indica el medico.

Qué son los desencadenantes del Asma? Lo provocación para un ataque de Asma es diferente en cada persona. Usted puede ser alérgico a algo en el ambiente, y a veces estas alergias pueden desencadenar ataques de Asma. Algunos desencadenantes comunes incluye: polvo, polen, moho, humo de quemar hojas o pasto. El frio seco y el ejercicio también pueden provocar Asma.

¿Cuáles medicamentos son usados para controlar el asma? El Asma se puede controlar usando diferentes tipos de inhaladores. Los inhaladores son medicinas inhaladas por la boca y llegan directo a los pulmones. Algunos dan alivio rápido cuando se tiene un ataque de Asma. Otros inhaladores son de uso diario o de mantenimiento para prevenir un ataque de asma. Su médico también podría sugerir otros medicamentos para ayudarle a tratar alergia u otros factores que causan asma.

Inhaladores Para Alivio Rápido	Inhaladores Para Controlar a Largo Plazo
Se usa cuando usted esta teniendo las síntomas	Se usa a diario
Le ayuda durante un ataque de asma	No debe de usar durante un ataque de asma

Cómo puedo saber si mi Asma está bajo control? Cuando usted no tiene silbido en el pecho, no esta tosiendo, no tiene dificultad para respirar con actividades normales, puede dormir mejor, y no necesita ayuda de emergencia.

Bien Controlado	Empeorando	Emergencia
No tiene síntomas durante el día ni la noche	Silbido en el pecho, tos, presión en el pecho o pecho apretado	La respiración es muy corta
Sus actividades diarias no le causa problemas	Dificultad en las actividades normales	No puede hacer actividades normales
Flujo Espiratorio Máximo (FEM) > 80 %	Flujo Espiratorio Máximo (FEM) de 50–79 %	Flujo Espiratorio Máximo < 50 %

Qué puedo hacer si mi Asma no está bajo control? Si usted se siente en una emergencia asmática, notifíquele al empleado que le quede mas cerca. Si usted cree que su asma esta empeorando repórtese a la consulta medica.

APPENDIX 15. PATIENT FACT SHEET: PEAK FLOW METER INFORMATION

WHAT IS A PEAK FLOW METER?

A peak flow meter is a tool that you and your doctor can use to help you manage your asthma. Using your peak flow meter can help you recognize when you need to make changes to your asthma plan.

WHAT DOES IT MEASURE?

A peak flow meter helps you measure how well you move air out of your lungs. It can help you recognize when your airways are beginning to narrow and you need treatment. Your peak flow meter has an indicator that will land on a number. You can compare that number to your **PERSONAL BEST PEAK FLOW NUMBER** to make decisions about your asthma.

WHAT IS A PERSONAL BEST PEAK FLOW NUMBER?

Your personal best peak flow number is the highest number you reach on your meter when you have your asthma under good control. You should find this number over a two-week period when you are not having symptoms and are feeling well.

WHY DO I NEED A PERSONAL BEST PEAK FLOW NUMBER?

It is important to find your own best peak flow number because it will be different from other people—even other people who might be the same age or size as you. Your treatment plan will be specialized for you, based on this number. Once you know this number, your doctor can help you determine three zones for your asthma control: **GREEN**, **YELLOW**, and **RED**.

HOW DO I USE THE THREE ZONES?

Your doctor will prepare an **ASTHMA ACTION PLAN** for you, showing your three zones, and which medications to use in each zone:

- The **GREEN ZONE** will be numbers 80% or more of your personal best peak flow number. This indicates that you have good control of your asthma and can use your medicines as usual.
- The **YELLOW ZONE** will be numbers between 50% and 80% of your personal best peak flow number. If you have multiple readings in this zone, you should use your quick relief medication, and test again after a few minutes. If you continue to get readings in this zone, you should talk to your doctor about whether you need to change or increase your medication.
- The **RED ZONE** will be numbers less than 50% of your personal best peak flow number.
  - ➔ ***When your number is in the red zone, you should use your quick relief medication immediately.*** *Alert your correctional officer or work supervisor to contact health services right away!*

ARE THERE ANY OTHER WAYS I CAN USE MY PEAK FLOW METER TO MANAGE MY ASTHMA?

You can keep a diary of your peak flow numbers at different times of the day, before or after certain activities, and during different seasons. This may help you identify “asthma triggers” and gain better control of your asthma.

HOW DO I USE THE PEAK FLOW METER?

See the instructions on the next page.

HOW TO USE A PEAK FLOW METER

1. Move the indicator to the very bottom of the numbered scale on your meter.

2. Stand up.

3. Take a deep breath, filling your lungs as much as possible.

4. Place the mouthpiece in your mouth and close your lips around it. Make sure your lips form a seal and your tongue does not block the mouthpiece.

5. Blow out as hard and fast as you can in a single blow.

6. Write down the number shown by the indicator. If you make a mistake or cough, do not write down the number. Try it again.

7. Repeat until you have written down three numbers. Write the highest of the three numbers in your asthma diary. Be sure to write down the date.

8. If you are having difficulty using your peak flow meter, please tell your doctor.

APPENDIX 16. HOJA DE INFORMACIÓN PARA EL PACIENTE: INFORMACIÓN SOBRE EL MEDIDOR DEL FLUJO MÁXIMO (FEM) (PEAK FLOW METER INFORMATION)

Qué es un medidor del flujo máximo?

Un medidor de flujo máximo es una herramienta que usted y su médico pueden utilizar para ayudarle a manejar su asma. Usando su medidor de flujo máximo puede ayudarle a reconocer cuando se necesita realizar cambios en su plan de asma.

Qué mide?

Un medidor de flujo máximo le ayuda a medir como se mueve el aire espiratorio de sus pulmones. Puede ayudarle a reconocer cuando las vías respiratorias están comenzando a estrecharse y la necesidad de tratamiento. Su medidor de flujo máximo tiene un indicador que le dará un número. Usted puede comparar ese número a su "Mejor flujo Máximo Personal" para tomar decisiones sobre su asma.

Cual es el mejor numero personal del flujo?

Su mejor numero de Flujo Máximo Personal o pico es el número más alto que pueda alcanzar con su medidor cuando tenga su asma bajo control. Usted encontrará este número durante un período de dos semanas cuando no tenga síntomas y se sienta bien.

¿Por qué necesito el Número de Flujo Máximo Personal?

Es importante encontrar su mejor número de flujo máximo, ya que será diferente que el de otras personas, incluso de otras personas que podrían ser de la misma edad o tamaño que usted. Su plan de tratamiento será especial para usted, basado en este número. Una vez que se conoce este número, su médico puede ayudarle a determinar tres zonas para el control del asma: **Verde**, **Amarillo** y **Rojo**.

Cómo utilizo Yo las tres zonas?

Su médico prepara un "Plan de acción de asma" para usted, mostrando sus tres zonas y los medicamentos a utilizar en cada zona:

- La **Zona Verde** serán números 80% o más del Numero Máximo del Flujo Personal. Esto indica que tiene buen control de su asma y puede usar sus medicamentos como de costumbre.
- La **Zona Amarilla** serán números entre 50% y 80% del Número Máximo del Flujo Personal. Si usted tiene múltiples lecturas en esta zona, deberá utilizar el medicamento de alivio rápido y repetir la prueba otra vez después de unos minutos. Si continúas obteniendo lecturas en esta zona, debe hablar con su médico sobre si usted necesita cambiar o aumentar su medicamento.
- La **Zona Roja** será menor que 50% del Numero Máximo del Flujo Personal.
  - ➔ *En este caso, debe usar su medicamento de alivio rápido inmediatamente. Alertar a su Oficial Correccional o supervisor de trabajo para que notifique al servicio de salud de inmediato.*

Hay algún otro modo que pueda usar mi medidor de flujo máximo para manejar mi asma?

Usted puede llevar un diario de sus números de flujo máximo en diferentes horas del día, antes o después de ciertas actividades y durante diferentes épocas del año. Esto puede ayudarle a identificar los "factores que desencadenantes del asma" y obtener el mejor control de su asma.

Como se usa el medidor de flujo máximo?

Vea las instrucciones en la página siguiente.

Cómo usar un medidor de flujo máximo (How to Use a Peak Flow Meter)

1. Mueva el indicador a la parte más inferior de la escala numerada en su medidor.

2. Obtenga la posición erecta (Parada).

3. Toma una respiración profunda, llenando sus pulmones tanto como sea posible.

4. Coloque la boquilla en la boca y cierre sus labios alrededor de ella. Asegúrese de que sus labios forman un sello y la lengua no obstruya la boquilla.

5. Sople hacia fuera tan duro y rápido como sea posible en un solo golpe.

6. Anote el número mostrado por el indicador. Si cometes un error o tos, no anote el número. Inténtelo de nuevo.

7. Repita hasta que haya escrito tres resultados numéricos. Escriba el mayor de los tres números en su agenda de asma. Asegúrese de escribir la fecha.

8. Si usted está teniendo dificultad para usar su medidor de flujo máximo, por favor, dígale a su médico.

APPENDIX 17. ASTHMA ACTION PLAN

Patient: **Doctor:** **Date: / /**

GREEN ZONE

DOING WELL:

- No cough, wheeze, chest tightness, or shortness of breath during the day
- No difficulty with normal activities
- **PEAK FLOW is more than:** _____

My best peak flow is: _____

1. Take these long-term-control medications daily:

Medication	How Much to Take	When to Take It

2. Before exercise: *If prescribed, take ___ puffs 15 minutes before activity.*

YELLOW ZONE

ASTHMA IS GETTING WORSE:

- Cough, wheeze, chest tightness, or shortness of breath, ***or***
- Waking at night due to asthma, ***or***
- Can do some, but not all, normal activities, ***or***
- **PEAK FLOW:** _____ to _____

1. Continue taking your Green Zone medications and add:

_____ 4 or 6 puffs every 20 minutes, for up to 1 hour *OR* use Nebulizer once
(short-acting beta$_2$ agonist)

2. If your symptoms (and peak flow, if used) return to Green Zone, continue monitoring.
If your symptoms (and peak flow, if used) do NOT return to Green Zone after 1 hour:

Take: _____ 4 or 6 puffs *OR* Nebulizer
(short-acting beta$_2$ agonist)

Add: _____ _____ mg per day for ____ days
(oral corticosteroid)

3. Report to Health Services for Sick Call.

RED ZONE

MEDICAL ALERT!

- Very short of breath, ***or***
- Quick relief medicines have not helped, ***or***
- Cannot do normal activities, ***or***
- Symptoms are same or worse after 24 hours in the Yellow Zone, ***or***
- **PEAK FLOW is less than:** _____

1. Take this medicine immediately:

_____ **4 or 6 puffs *OR* Nebulizer**
(short-acting beta$_2$ agonist)

_____ _____ **mg**
(oral corticosteroid)

2. Alert your Correctional Officer or Work Supervisor and seek medical attention!

***** DANGER SIGNS *****

IF YOU HAVE THESE SYMPTOMS:
➜ Trouble walking and talking due to shortness of breath
➜ Lips or fingernails turning blue

DO THIS IMMEDIATELY:
➜ Take 4 to 6 puffs of quick-relief medicine ***AND***
➜ Alert the Correctional Officer and get medical attention NOW!!

APPENDIX 18. PLAN DE ACCION DEL ASMA (ASTHMA ACTION PLAN)

Paciente: **Doctor:** **Fecha: / /**

ZONA VERDE (GREEN ZONE)

HACIENDO BIEN:

- No tos, sibilancias, opresión en el pecho o dificultad para respirar durante el día
- Ninguna dificultad con las actividades normales
- **Flujo Máximo Espiratorio es más de:** _____

Mi mejor flujo máximo es: _____

1. Tome diariamente estos medicamentos para control de largo plazo:

Medicación	¿Cuánto a tomar	Cuando tomarlo

2. Antes del ejercicio: *Si indicado tomar ____ soplos 15 minutos antes de la actividad.*

ZONA AMARILLA (YELLOW ZONE)

EL ASMA ESTA EMPEORANDO:

- Tos, sibilancias, opresión en el pecho o dificultad para respirar, ***o***
- Despertar en la noche debido al asma, ***o***
- Puede hacer algunos, pero no todos, las actividades normales, ***o***
- **Flujo máximo:** _____ to _____

1. CONTINÚE TOMANDO sus medicamentos de zona verde y añadir:

_____ 4 o 6 inhalaciones cada 20 minutos, hasta 1 hora
O utilizar nebulizador una vez

(agonista de acción corta beta$_2$)

2. Si los síntomas (y el flujo máximo, si se usa) retornan a la zona verde, continúe monitorizando
Si los síntomas (y el flujo máximo, si se usa) no retornan a la zona verde después de 1 hora:

Tome: _____ 4 o 6 soplos *o* nebulizador

(agonista de acción corta beta$_2$)

Añadir: _____ ___ mg al día durante los días ___

(corticosteroides orales)

3. REPÓRTESE AL SERVICIO DE SALUD PARA LA CONSULTA.

ZONA ROJA (RED ZONE)

ALERTA MÉDICA!

- Mucha dificultad para respirar, ***o***
- Los medicamentos de alivio rápido no ayudan, ***o***
- No puede realizar actividades normales, ***o***
- Los síntomas son igual o peor después de 24 horas en la zona amarilla, ***o***
- **FLUJO Máximo Espiratorio es menos de:** _____

1. Tomar este medicamento inmediatamente:

_____ **4 o 6 soplos *o* Nebulizador**

(Beta-agonista de acción corta$_2$)

_____ **___ mg**

(corticosteroides orales)

2. Alerte su Oficial Correccional o Supervisor de trabajo y busque atención médica!

***** SEÑALES DE PELIGRO *****

SI USTED TIENE ESTOS SÍNTOMAS:
➜ Dificultad para caminar y hablar debido a la dificultad para respirar
➜ Los labios o las uñas se tornan azul

HAGA ESTO INMEDIATAMENTE:
➜ Toma 4 a 6 soplos de medicamento de alivio rápido ***Y***
➜ Alerta al Oficial Correccional y obtén atención médica AHORA!!