Asthma - Diagnosis and Management

Effective Date: June 30, 2010

Scope

This guideline provides recommendations for the recognition, diagnosis, and management of asthma in patients age 6 and older, in an office setting.

Care Objectives

The objectives of this guideline are to assist the practitioner caring for a patient with asthma to:

- improve diagnostic accuracy
- provide effective treatment and monitoring plans
- create a long-term plan of management, evaluation and care.

Diagnostic Code: 493 (Asthma)

Diagnosis/Investigation of Asthma

Asthma is a syndrome that is characterized by paroxysmal or persistent symptoms such as breathlessness, chest tightness, wheezing and cough. It is associated with variable airflow limitation and airway hyperresponsiveness in response to endogenous and exogenous stimuli. Inflammation and its resultant effects on airway structure are considered to be the main mechanisms leading to the development and persistence of asthma.

a. Signs and symptoms of asthma in children and adults

Table 1 – Clinical Features to Assess the Probability of Asthma

CHILDREN ≥ 6 YEARS	
Clinical Features that...	
Increase the Probability of Asthma	**Lower the Probability of Asthma**
• >1 of the following symptoms: wheeze, cough, difficulty breathing, chest tightness – particularly if these are o frequent and recurrent; o worse at night and in the early morning; o occur in response to, or are worse after, exercise, allergen exposure, cold or damp air, or with emotions or laughter; o occur apart from colds • Personal history of atopic disorder • Family history of atopic disorder and/or asthma • Wheeze heard on auscultation • History of improvement in symptoms or lung function in response to adequate therapy	• Symptoms with colds only, with no interval symptoms • Isolated cough in the absence of wheeze or difficulty breathing • History of moist or wet cough • Prominent dizziness, light-headedness, peripheral tingling • Repeatedly normal physical examination of chest when symptomatic • Normal peak expiratory flow (PEF) or spirometry when symptomatic • No response to a trial of asthma therapy • Clinical features pointing to alternative diagnosis

ADULTS	
Clinical Features that...	
Increase the Probability of Asthma	**Lower the Probability of Asthma**
• More than one of the following symptoms: wheeze, cough, breathlessness, chest tightness – particularly if: o symptoms are worse at night and in the early morning o symptoms in response to exercise, allergen exposure and cold air o symptoms after taking aspirin or beta blockers • History of atopic disorder • Family history of atopic disorder and/or asthma • Wheeze heard on auscultation • Otherwise unexplained low FEV_1 or PEF • Otherwise unexplained peripheral blood eosinophilia	• Prominent dizziness, light-headedness, peripheral tingling • Chronic productive cough in the absence of wheeze or breathlessness • Repeatedly normal physical examination of chest when symptomatic • Voice disturbance • Symptoms with colds only • Significant smoking history (i.e. > 20 pack-years) • Cardiac disease • Normal PEF or spirometry when symptomatic

** Table adapted from the BTS/SIGN British Guideline on the Management of Asthma – Quick Reference Guide[1]*

b. Diagnosis of asthma

When asthma is suspected from clinical features, and other disorders have been considered and ruled out (e.g. tumours in adults, foreign body in children; don't assume the presence of wheeze means asthma), confirm the diagnosis by objective measures of variable airflow obstruction and assess severity. In most cases the following criteria would suffice as objective evidence of variable airflow obstruction:

Spirometry:

- FEV_1 - A 12 % or greater improvement in forced expiratory volume (FEV_1) in children and adults, and > 200 ml in adults from the baseline 15 minutes after use of an inhaled short-acting $beta_2$ agonist.[2]

- PEF - Serial measures of peak expiratory flow (PEF): A > 20% change after administration of a bronchodilator; a 20% change in values over time. Typically pulmonary function normalizes after administration of a bronchodilator in asthmatic patients.[2]

When there is some probability of asthma and the above tests are non-diagnostic, the following tests may be used to help in the diagnosis of asthma:

- Methacholine challenge
- Exercise challenge
- Inhaled corticosteroid trial: appropriate doses of inhaled steroids for 4-6 weeks (Refer Table 4 and Appendix A)

Management

a. Control of Asthma - Control of airway hyperresponsiveness is the key to success; most people with asthma should have minimal to no impact on their quality of life. Evaluate and assess impact and exposure to allergens and irritants in individual patients. Complete cessation of smoking and avoidance of environmental tobacco smoke is strongly recommended.

Table 2 - Levels of Asthma Control

LEVELS OF ASTHMA CONTROL			
Characteristic	Controlled (All of the following)	Partly Controlled (Any measure present in any week)	Uncontrolled
Daytime symptoms	None (twice or less/week)	More than twice/week	Three or more features of partly controlled asthma present in any week.
Limitations of activities	None	Any	
Nocturnal symptoms/ awakening	None	Any	
Need for reliever/rescue treatment	None (twice or less/week)	More than twice/week	
Lung function (PEF or FEV_1) *	Normal	< 80% predicted or personal best (if known)	
Exacerbations	None	One or more/year†	One in any week‡

* Lung function testing is not reliable for children 5 years and younger.
† Any exacerbation should prompt review of maintenance treatment to ensure that it is adequate.
‡ By definition, an exacerbation in any week makes that an uncontrolled asthma week.
Table 2 used with permission from Global Strategy for Asthma Management and Prevention, Global Initiative for Asthma (GINA) 2008. Available at: http://www.ginasthma.org[3]

b. Pharmacological Management

- If expiratory flows are normal and symptoms are controlled (refer Table 2) an inhaled short-acting $beta_2$ agonist should be used as needed (refer Table 3 and Appendix A).
- If a rescue $beta_2$ agonist is needed more than 2 times per week (excluding preventative use prior to exercise) or if lung function is abnormal, an inhaled glucocorticosteroid (refer Table 3) is the next step.

Spacers:

- Technically, the most efficient way to maximize inhaled drug delivery to the lungs is through a metered dose inhaler (pMDI) and spacing device.[4] For adults, however, a dry powdered inhaler (DPI) has demonstrated efficacy and is more convenient for most people. If using an inhaled corticosteroid pMDI, a spacer device, in addition to usual oral hygiene, will minimize the risk of oral thrush.

Choice of Inhaler Device[4]	1st line	2nd line
Children	pMDI and spacer	DPI
Adults	DPI	pMDI and spacer

Table 3 - Stepwise Approach to the Management of Chronic Asthma in Patients ≥ 6 years

- ***Patient should start treatment at the step most appropriate to the initial severity of their asthma.***
- ***At each step, review medication adherence, inhaler technique, and patient education. Reconsider diagnosis if no or poor response to therapy.***
- ***If symptom control is maintained over 3 months, consider stepping down to the least medication necessary to maintain control.***

Step 1 **Inhaled short-acting beta$_2$ agonist (SABA)* as required.**

Step 2 **Add inhaled corticosteroid (ICS). In children age 6-11 years, start at a low dose.[5]** (Refer Table 4)

Step 3 **Add inhaled long-acting beta$_2$ agonist (LABA) in combination with an ICS.**

Assess control of asthma:

- **Good response to LABA/ICS combination →** continue
- **Benefit from LABA/ICS combination but control still inadequate** → continue LABA and increase steroid dose to high dose ICS (refer Table 4 and Appendix A)
- **No response to LABA/ICS combination →** stop LABA combination and continue high dose inhaled steroid† (refer Table 4 and Appendix A) and proceed to Step 4

Step 4 **Consider the following:**

- A short course of oral corticosteroids may be used in adults (i.e. prednisone 0.6 mg/kg/day for 5 days) to stabilize the patient
- Referring patient for specialist care
- Adding a third drug (e.g. leukotriene receptor antagonist, SR theophylline, or low dose daily oral steroids)

Increase Step to improve control as needed

Decrease Step to find and maintain lowest controlling step needed

*** Frequent use of short-acting beta agonists (SABA) may increase exacerbation risk.**

† Chronic, high dose of inhaled steroid use may be associated with a number of long term side effects and should prompt consideration of stepping down.[6]

Table 3 was adapted in part from the BTS/SIGN British Guideline on the Management of Asthma – Quick Reference Guide.[1]

Note: Long-acting beta agonists are contraindicated as monotherapy, but always used in combination with an appropriate dose of an inhaled corticosteroid.[7]

Table 4 – Estimated Dose Equivalents for Inhaled Corticosteroids[3,8,9,10,11]

Name	Adult mcg per day[a]			Children (6-11 years) mcg per day[a]		
	Low	**Medium**	**High (Max LD)**	**Low**	**Medium**	**High (Max LD)**
beclomethasone dipropionate HFA pMDI (Qvar™)	≤ 250	251-500	> 500 (800)	≤ 100	101-200[b]	> 200[b] (200)
budesonide DPI (Pulmicort® Turbuhaler®)	≤ 400	401-800	> 800 (2400)	≤ 200	201-400[b]	> 400[b] (400)
ciclesonide pMDI (Alvesco®)	≤ 200	201-400	> 400 (800)	100	101-200[b]	> 200[b] (200)
fluticasone priopionate HFA pMDI (Flovent®) + spacer	≤ 250	251-500	> 500 (2000)	≤ 100	101-200[b]	> 200[b] (400)
fluticasone priopionate DPI (Flovent® Diskus)	≤ 250	251-500	> 500 (2000)	≤ 100	101-200[b]	> 200[b] (400)

Abbreviations: **DPI** = dry powder inhaler; **HFA** = hydrofluoroalkane;
Max LD = maximum licensed dose; **pMDI** = pressurized metered dose inhaler (aerosol)
Notes:
[a] Dosage equivalents are approximate and depend on factors such as inhaler technique. Pediatric equivalency doses are less well established. Total daily doses usually divided into two doses. Once daily dosing may be effective in some patients with milder disease. Ciclesonide is given as a single daily dose except for 800 mcg/day which is given in two divided doses.
[b] Administration of ≥ 200 ug/day fluticasone or equivalent in pediatric patients may be associated with systemic side effects.[6,12,13] Pediatric patients treated with high dose inhaled corticosteroids should be under the care of a paediatrician or pediatric respirologist.

c. Lifestyle Management /Self Management

- Refer patients to an asthma education program where available.
- Patients should understand:
  - proper use of their prescribed medication;
  - techniques of administration;
  - what constitutes “control” of asthma; and
  - how to monitor control with PEF measurement or symptom monitoring.
- Include a written action plan for asthma management (refer Appendix B).
- Discuss strategies to assist patients to stop smoking. For assistance to quit, refer patients who smoke to smoking cessation programs such as QuitNow (refer Physician and Patient Resources).
- At each office visit review:
  - asthma control,
  - action plan adequacy, and
  - inhaler technique.
- Provide guidance about when to see the primary health care provider, and when to go to an emergency room if there is an asthma exacerbation.
- Refer patients to resources for patient education tools (refer Physician and Patient Resources).

d. Managing chronic asthma

- Include an action plan to increase therapy when asthma is not controlled and to decrease therapy when asthma is well controlled (refer Appendix B).
- Periodically discuss adequacy of asthma control with the patient.
- Identify and eliminate barriers to effective control.
- Consider measuring peak flow at each office visit.
- Encourage the patient/family to actively manage their illness.
- If a patient is not responding to therapy, and compliance and inhaler technique is appropriate, consider an alternative diagnosis and/or referral for further assessment.
- Recommend annual influenza vaccination for the patient and their family.

- In your office consider creating:
    - a registry of patients with asthma;
    - an automated recall system; and
    - flowcharts, patient handouts (refer Physician and Patient Resources) and checklists.

Rationale

The incidence of asthma in British Columbia (B.C.) for patients between 5 and 54 years has remained constant since the year 2000, with an age standardized incidence rate for 2007/08 of 0.61%.[14] This amounts to almost 24,000 new cases of asthma in B.C.[14] The prevalence of asthma in B.C. has increased steadily since 2000 with an age standardized prevalence rate for 2007/08 of 8.78%, or an estimated 390,000 prevalent cases.[14] Hospital and Medical Services Plan costs in 2007/08 attributed to asthma patients (5-54 years of age) amount to $490/patient and $552/patient respectively, amounting to over 400 million dollars.[14]

Early detection, appropriate treatment, and consistent application of guidelines for education, self-management and follow-up are expected to reduced morbidity and mortality due to asthma. Universally applied, this approach may reduce hospitalizations.[15]

The most important contributing factors for inadequate management may include: delayed diagnosis and insufficient patient education (including airflow measurements), under assessment of the severity of the disease, under treatment with anti-inflammatory agents, over-reliance on inhaled $beta_2$ agonists, failure to consider co-morbid medical conditions (e.g. rhinosinusitis, gastro-esophageal reflux disease (GERD), cystic fibrosis (CF), depression), or social conditions (e.g. family discord, life stresses) as contributors. Medical care delivery can be improved by addressing these factors.

References

1 British Thoracic Society, Scottish Intercollegiate Guidelines Network. British Guideline on the Management of Asthma – Quick Reference Guide. Available at http://www.sign.ac.uk/pdf/qrg101.pdf Accessed June 14, 2010.

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8 e-CPS [Internet]. Ottawa (ON): Canadian Pharmacists Association; c2009 [cited 2010 Feb16]. Available from http://www.e-cps.ca. Also available in paper copy from the publisher.

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Physician and Patient Resources

Alberta Health Services – ICAN: http://www.calgaryhealthregion.ca/ican/index.html
Provides asthma information for kids, teens, and adults. Features asthma information translated into 11 languages.

Allergy and Asthma Information Association: http://aaia.ca/en/index.htm
Mission is to create safer environments and improve quality of life for Canadians affected by allergy, asthma, and anaphylaxis by empowering individuals and providing education, leadership, and a national voice.

The Asthma Society of Canada: http://www.asthma.ca/adults/
Toll free 1-866-787-4050
Provides a variety of free educational materials and resources that provide Canadians with the latest asthma news and information.

Asthma UK: http://www.asthma.org.uk/
Asthma UK's health information resources have been developed by healthcare professionals and tested by people with asthma. They provide heaalth information, support and advice.

BC Lung Association: http://www.bc.lung.ca/index.html
Greater Vancouver 604-731-5864
Toll free in B.C. 1-800-665-5864
A non-profit and volunteer-based health charity, the BC Lung Association offers in-depth information on asthma programs and educational resources.

The Canadian Lung Association: http://www.lung.ca/home-accueil_e.php
Toll Free 1-888-566-5864
Publishes the Lung Association Asthma Handbook (available at http://www.lung.ca/pdf/handbook_web.pdf); a comprehensive guide that is written in a clear, easy-to-understand style for people with asthma.

HealthLink BC: www.HealthLinkBC.ca
In B.C. dial 8-1-1 for easy access to non-emergency health information and services.
TTY (deaf and hearing-impaired) call 7-1-1.
Translation services are available in over 130 languages on request.

QuitNow: www.quitnow.ca
An internet-based quit smoking service, available FREE-of-charge to all British Columbia residents.
Toll Free in B.C. 1-877-455-2233
Translation services are available in over 130 languages on request.

List of Abbreviations

DPI - dry powder inhaler
FEV_1 - forced expiratory volume in 1 second
ICS - inhaled corticosteroid
PEF - peak expiratory flow
pMDI - pressurized metered dose inhaler
SABA - short-acting $beta_2$ agonist

Appendices

Appendix A – Asthma Inhalation Drug Dosing and Cost
Appendix B – Personal Action Plan

Associated Documents

The following documents accompany this guideline:

- Summary

This guideline is based on scientific evidence current as of the Effective Date.

This guideline was developed by the Guidelines and Protocols Advisory Committee, approved by the British Columbia Medical Association, and adopted by the Medical Services Commission.

A PDA version of this guideline is also available at www.Clinipearls.ca/BCGuidelines

The principles of the Guidelines and Protocols Advisory Committee are to:

- encourage appropriate responses to common medical situations
- recommend actions that are sufficient and efficient, neither excessive nor deficient
- permit exceptions when justified by clinical circumstances

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DISCLAIMER

Appendix A – Asthma Inhalation Drug Dosing and Cost[7]

Generic name	Trade name (formulation)	Standard Rx[a] for adult and patients ≥ 6 yrs[a] (max dose)[b]	Cost[c] per puff (strength)	PharmaCare Coverage
Short-Acting Beta-2 Agonists Inhaled (SABA)				
salbutamol	**Airomir™** (pMDI) **Ventolin® HFA, Generics**	**≥ 6 yrs:** 100-200 mcg qid prn (**max 6-11 yrs:** 400 mcg per day) (**max ≥ 12 yrs:** 800 mcg per day)	$ 0.04 (120 mcg) $ 0.07 (100 mcg) $ 0.02-0.04 (100 mcg)	Regular benefit, LCA
	Ventolin® Diskus® (DPI)	**≥ 6 yrs:** 200 mcg tid-qid prn	$ 0.23 (200 mcg)	Not a benefit
terbutaline	**Bricanyl® Turbuhaler®** (DPI)	**≥ 6 yrs:** 500 mcg prn (max 3000 mcg per day)	$ 0.08 (500 mcg)	Regular benefit
Inhaled Corticosteroid (ICS)				
beclomethasone dipropionate	**Qvar™ HFA** (pMDI)	**6-11 yrs:** 50-100 mcg bid **≥ 12 yrs:** 50-400 mcg bid	$ 0.16, $ 0.31 (50 mcg, 100 mcg)	Regular benefit
budesonide	**Pulmicort® Turbuhaler®** (DPI)	**6-12 yrs:** 100-200 mcg bid > **12 yrs:** 400-2400 mcg per day divided bid-qid	$ 0.16, $ 0.33, $ 0.58 (100 mcg, 200 mcg, 400 mcg)	Regular benefit
ciclesonide	**Alvesco®** (pMDI)	**6-11 yrs:** 100-200 mcg once daily (may divide dose to bid) **≥ 12 yrs:** 100-800 mcg once daily (may divide dose to bid)	$ 0.38, 0.63 (100 mcg, 200 mcg)	Regular benefit
fluticasone priopionate	**Flovent® HFA** (pMDI)	**6-16 yrs:** 50-200 mcg bid **≥ 16 yrs:** 100-1000 mcg bid	$ 0.21, $ 0.36, $ 0.72 (50 mcg, 125 mcg, 250 mcg)	Regular benefit
	Flovent® Diskus® (DPI)	**6-16 yrs:** 50-200 mcg bid **≥ 16 yrs:** 100-1000 mcg bid	$ 0.27 - 1.44 (50 mcg, 100 mcg, 250 mcg, 500 mcg)	Regular benefit
Inhaled Corticosteroid / Long-acting Beta-2 Agonist Combination (ICS/LABA)				
budesonide/ formoterol	**Symbicort® Turbuhaler®** (DPI)	**≥ 12 yrs:** i-ii puffs once or twice daily plus prn up to 8 puffs per day	$ 0.54 (100/6 mcg) $ 0.74 (200/6 mcg)	Limited coverage
fluticasone/ salmeterol	**Advair® Diskus®** (DPI)	**6-11 yrs:** i puff bid [100/50] **≥ 12 yrs:** i puff bid [100/50, 250/50, 500/50]	$ 1.40 (100/50 mcg) $ 1.68 (250/50 mcg) $ 2.37 (500/50 mcg)	Limited coverage
fluticasone/ salmeterol	**Advair®** (pMDI)	**≥ 12 yrs:** ii puffs bid [125/25 mcg, 250/25 mcg]	$ 0.84 (125/25 mcg) $ 1.19 (250/25 mcg)	Limited coverage

Long-Acting Beta-2 Agonists Inhaled (LABA) (Note – LABA's are contraindicated as monotherapy)					
formoterol fumarate	**Foradil®** (DPI)	**≥ 6 yrs:** 12-24 mcg bid	$ 0.84	(12 mcg)	Limited coverage
formoterol fumarate dihydrate	**Oxeze® Turbuhaler®** (DPI)	**6-16 yrs:** 6-12 mcg bid > **16 yrs:** 6-24 mcg bid	$ 0.58 $ 0.78	(6 mcg) (12 mcg)	Limited coverage
Salmeterol	**Serevent® Diskus®, Serevent® Diskhaler®** (DPI)	**≥ 6 yrs:** 50 mcg bid	$ 0.98 $ 0.98	(50 mcg) (50 mcg)	Limited coverage

Abbreviations: DPI = dry powder inhaler; **HFA** = hydrofluoroalkane; **max** = maximum; **pMDI** = pressurized metered dose inhaler (aerosol); **yrs** = year

Notes: a. Dosage (number of puffs or inhalations) as per manufacturer's drug monograph b. If no maximum dose, consider upper limit of dosage range as maximum dose. c. Prices are approximate retail cost as of September 2009 and do not including dispensing fee.

PharmaCare coverage:
Spacers are not currently listed as a PharmaCare benefit. PharmaCare coverage as of February 2010.

Regular benefit drugs - do not require Special Authority. Patients may receive full or partial coverage since some of these drugs are included in the Low Cost Alternative (LCA) program.

Low Cost Alternative (LCA) - When multiple medications contain the same active ingredient (usually generic products), patients receive full coverage for the drug with the lowest average PharmaCare claimed price. The remaining products are partial benefits.

Limited coverage drugs - require Special Authority. These drugs are not normally regarded as first-line therapies or there are drugs for which a more cost-effective alternative exists.

In all cases - coverage is subject to drug price limits set by PharmaCare and to the patient's PharmaCare plan rules and deductibles.

Please review product monographs at http://webprod.hc-sc.gc.ca/dpd-bdpp/index-eng.jsp and regularly review current Health Canada advisories, warnings and recalls at: http://www.hc-sc.gc.ca/ahc-asc/media/
See http://www.health.gov.bc.ca/pharmacare/ for further information.

Appendix B

PERSONAL ACTION PLAN FOR: _____ DATE: _____

My reliever medicine is called: _____

My preventer medicine is called: _____

MY ASTHMA TRIGGERS ARE:

_____

** Asthma control may be measured using symptom control, a peak flow meter, or a combination of both.*

Green Level: Well-Controlled Asthma*

- Normal breathing
- No cough or wheeze
- Normal activity
- Normal sleep
- Seldom need extra reliever inhaler

Peak Flow Reading: _____ to _____
(80% - 100% of personal best)

What should I do?

- Use regular medicine
- Avoid triggers

	Amount	How Often
Preventer:	_____	_____
Reliever:	_____	_____

Check my peak flow reading:

_____ *times per* _____ *(day/week).*

Yellow Level: Worsening Asthma*

- Symptoms at night
- Cold symptoms
- Symptoms worse with exercise

Peak Flow Reading: _____ to _____
(65% - 80% of personal best)

What should I do?

- Increase your preventer to _____ puffs, _____ times a day _____ (7 or 14 days), or until peak flow returns to _____
- Take extra reliever inhaler as needed up to _____
- Continue with other regular treatments.
- Measure your peak flow _____ times daily

Orange Level: Severe Asthma*

- Asthma symptoms at rest
- Little relief from reliever medication
- Symptoms worse with exercise
- Peak flow readings not improving with inhaler

Peak Flow Reading: _____ to _____
(50% - 65% of personal best)

What should I do?

- **Contact your doctor**

AND

- If Prednisone has been prescribed for you, take _____mg (_____ tablets) at once and then each morning for _____ days
- Take extra reliever as needed

Red Level: Dangerous Asthma*

DANGER SIGNS
- Sudden severe attack of asthma
- No relief with reliever medication
- Difficulty speaking, or
- Feel faint or frightened, or
- Feel yourself getting worse

Peak Flow Reading: _____ to _____
(less than 50% of personal best)

What should I do?

- If you have **any** of the **DANGER SIGNS OF ASTHMA:**

GET MEDICAL HELP IMMEDIATELY

- Use your reliever as much as you need to on the way to the doctor or hospital

DIAL 911 FOR AN AMBULANCE

LEVELS OF ASTHMA CONTROL[§]			
Characteristic	Controlled (All of the following)	Partly Controlled (Any measure present in any week)	Uncontrolled
Daytime symptoms	None (twice or less/week)	More than twice/week	Three or more features of partly controlled asthma present in any week.
Limitations of activities	None	Any	
Nocturnal symptoms/ awakening	None	Any	
Need for reliever/rescue treatment	None (twice or less/week)	More than twice/week	
Lung function (PEF or FEV_1) *	Normal	< 80% predicted or personal best (if known)	
Exacerbations	None	One or more/year†	One in any week‡

* Lung function testing is not reliable for children 5 years and younger.
† Any exacerbation should prompt review of maintenance treatment to ensure that it is adequate.
‡ By definition, an exacerbation in any week makes that an uncontrolled asthma week.
§ *Table used with permission from Global Strategy for Asthma Management and Prevention, Global Initiative for Asthma (GINA) 2008. Available at: http://www.ginasthma.org*