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**Please begin the educational module on the next page**

January 2007

# Pediatric Asthma: Education for Emergency Care Professionals



Illinois EMSC is a collaborative program between the Illinois Department of Public Health and Loyola University Medical Center. Development of this presentation was supported in part by: Grant H 34 MC 02545 from the Department of Health and Human Services Administration, Maternal and Child Health Bureau



## Acknowledgements

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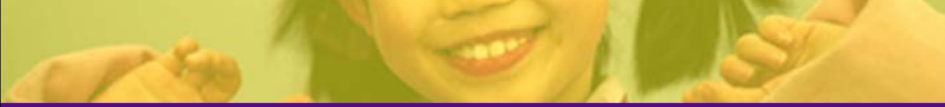
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## Introduction & Background

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## Goals

- **This educational module was developed to address some of the critical issues surrounding pediatric asthma. The goals of this resource are to:**
  - Define and explain the extent of the problem of pediatric asthma in Illinois
  - Summarize current recommendations for ED assessment and management of pediatric asthma
  - Highlight current research findings regarding pediatric asthma management as related to emergency care
  - Provide educational resources to healthcare professionals to share with pediatric patients/families dealing with asthma

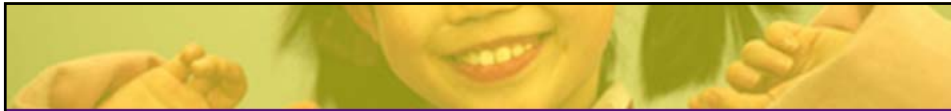
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## Introduction

- **Respiratory distress is a high risk/high volume presenting complaint for pediatric prehospital calls and Emergency Department visits.**
- **Pediatric asthma continues to be one of the top diagnoses for hospitalization in Illinois.**
- **Different healthcare groups/researchers have been working to learn more about the causes of asthma and the best ways to treat and prevent exacerbations.**
- **Anecdotally, a number of the Illinois EMSC CQI Liaisons have noticed a decline in the number of pediatric asthma cases presenting to their EDs. However, data demonstrates that pediatric asthma is still a problem that needs attention.**
  - ❖ Recommendations for assessment and management of pediatric asthma in the Emergency Department are based on the NIH/NHLBI *Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma* (published in 1997, updated in 2002), and AAAAI *Pediatric Asthma: Promoting Best Practices – Guide for Managing Asthma in Children* (2004).

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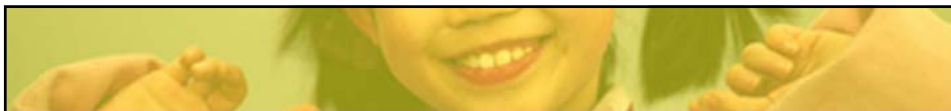


## NIH/NHLBI Guidelines – Brief History

- Although not products of a government agency, these guidelines have been highly regarded by the medical community as comprehensive resources in the effort to improve asthma care and quality of life for asthma sufferers.
  - ❖ 1991 – the 1<sup>st</sup> *Expert Panel Report: Guidelines for the Diagnosis and Management of Asthma* was published.
  - ❖ 1997 – *Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma* (EPR2) was published. The 4 main components of the EPR2 were:
    - Measures of Assessment and Monitoring (including an algorithm for ED management of asthma exacerbations)
    - Control of Factors Contributing to Asthma Severity
    - Pharmacologic Therapy (including specific recommendations for infants and young children)
    - Education for a Partnership in Asthma Care
  - ❖ 2002 - *Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma – Update on Selected Topics 2002* (EPR2 – Update 2002) was designed to address a few priority issues such as medication, monitoring and prevention.

Available at: <http://www.nhlbi.nih.gov/guidelines/asthma/index.htm>

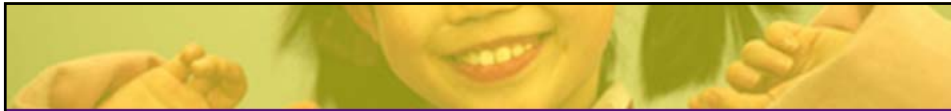
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## Widely Endorsed, Not Adequately Applied

- Even though the NIH/NHLBI Guidelines are cited in numerous asthma management articles and endorsed by the AAP & AMA, they have shown to be underutilized in actual practice (Meng et al. 1999; Scribano et al. 2001).
- Studies show a high level of awareness and understanding of the basic tenets of the guidelines, but lower level of compliance in areas such as:
  - PEFr monitoring
  - Use of written treatment plans
  - Scheduling routine follow up care (Finkelstein et al. 2000; McDermott et al. 1999)

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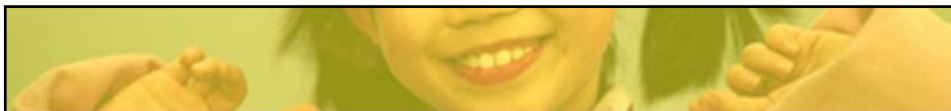


## AAAAI/NHLBI Collaboration

- In an effort to improve compliance with evidence-based recommendations made by the NHLBI, the American Academy of Allergy, Asthma and Immunology (AAAAI) translated the NHLBI guidelines into recommendations that can be more easily used by clinicians entitled, "*Promoting Best Practices - Guide for Management of Asthma in Children*" (AAAAI 2004).
  - Created to ensure that a broad spectrum of healthcare providers learn about, understand, and implement clinical/best practice information for diagnosing and managing pediatric asthma
  - Acknowledges the differences in assessment and management that exist for infants and younger children with asthma (i.e., children  $\leq 5$  years), and provides a stepwise approach for clinicians to follow
  - Includes a colorful, easy-to-read algorithm for ED asthma management

Available at: <http://www.aaaai.org/members/resources/initiatives/pediatricasthma.stm>

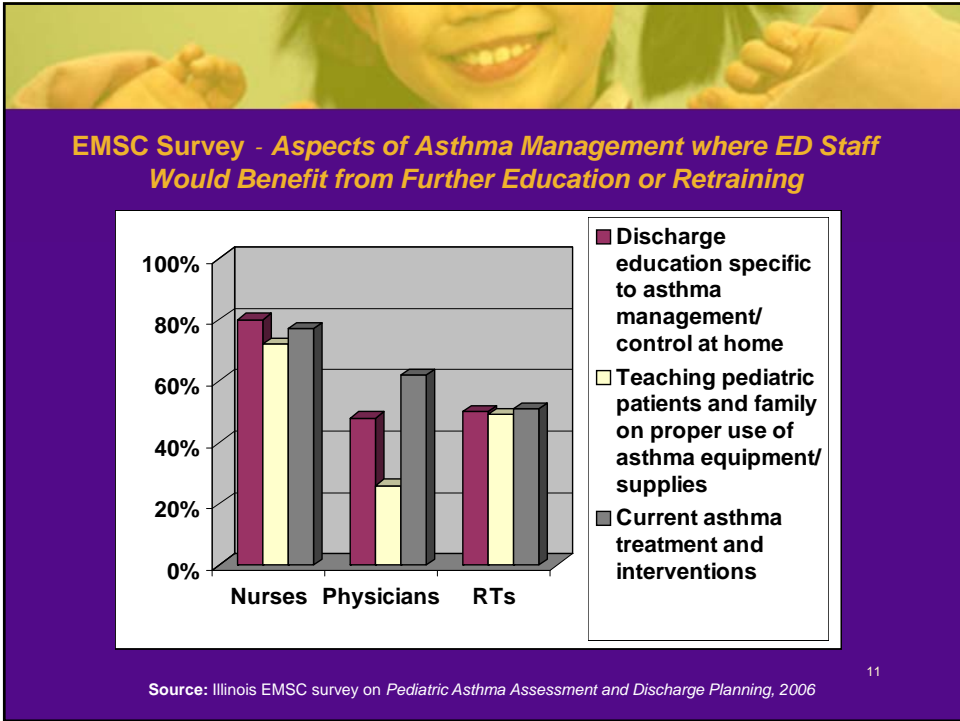
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## EMSC Survey of Illinois EDs in 2006 - Overview

- In 2006, 118 EDs actively participated in the Illinois EMSC CQI program (of these, 99 are recognized as PCCC, EDAP or SEDP facilities). Of the 118 facilities, 85 (72%) completed a Web-based asthma survey entitled, *Pediatric Asthma Assessment and Discharge Planning in the Emergency Department, 2006*.
- The survey focused on areas including:
  - Awareness/usage of national guidelines for pediatric asthma management
  - Current clinical treatment practices
  - Patient education practices
  - Interest in more staff education
  - Discharge planning practices
- A key area of interest was *in what aspects of asthma management would the ED staff benefit from further education or retraining*. The results help to illustrate the reasons behind the development of this educational module.
  - See the results on the next slide

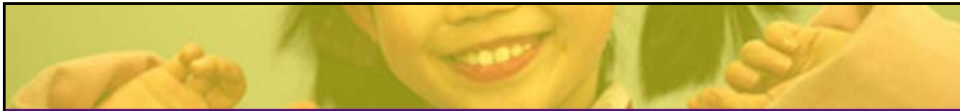
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## Understanding Asthma

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## What is Asthma?

- Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular, mast cells, eosinophils, T lymphocytes, macrophages, neutrophils, and epithelial cells. This inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread, but variable, airflow obstruction that is often reversible either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial hyperresponsiveness to a variety of stimuli (NHLBI 1997, p3).
  - Definition has implications for the diagnosis, treatment, management, and potential prevention of this chronic disorder.

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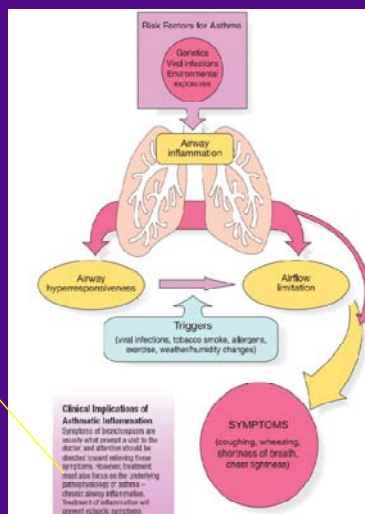


## Mechanisms Underlying the Definition of Asthma

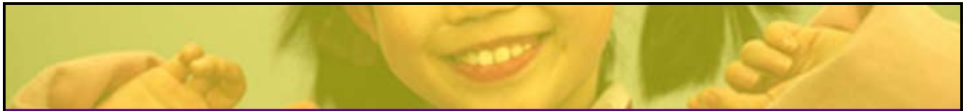
Because asthma is a chronic inflammatory disorder, if left untreated, the symptoms are persistent and can lead to pathologic damage.

Clinical Implications of Asthmatic Inflammation - Symptoms of bronchospasm are usually what prompt a visit to the doctor, and attention should be directed toward relieving these symptoms. However, treatment must also focus on the underlying pathophysiology of asthma – chronic airway inflammation. Treatment of inflammation will prevent episodic symptoms.

Source: AAAAI 2004  
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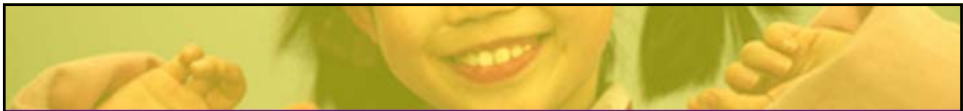


## An Avoidable Hospitalization

- **Asthma is classified as a condition in which hospitalization can be prevented with timely, effective outpatient care (Flores et al. 2005).**
- **Reasons cited by physicians were parent/patient-related:**
  - Medication issues (e.g., adherence problems, patient ran out/did not refill prescription)
  - Inadequate prevention (e.g., patient did not avoid triggers)
  - Patient delayed follow up care
  - Patient needed to call for care earlier
- **Conversely, reasons that parents cited were physician-related:**
  - Inadequate or no medical intervention given
  - Lack of adequate disease education provided
  - Physician failed to make diagnosis
  - No follow up care arranged

These reasons speak to the need for better communication and education on both sides. There exists great potential to combine efforts in order to make this ideal a reality.

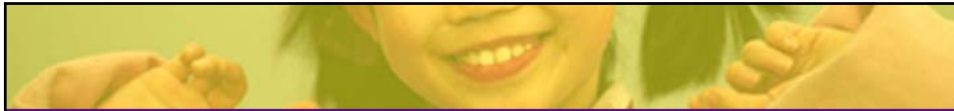
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## Your Asthma Goals

- **Keep these specific goals in mind when managing your asthma patients' conditions (NHLBI 1997, p4):**
  - ✓ Prevent chronic and troublesome symptoms
  - ✓ Maintain "normal" pulmonary function
  - ✓ Maintain normal activity levels
  - ✓ Prevent recurrent exacerbations of asthma; minimize the need for ED visits or hospitalizations
  - ✓ Provide optimal pharmacotherapy with minimal or no adverse effects
  - ✓ Meet patient/family expectations of and satisfaction with asthma care

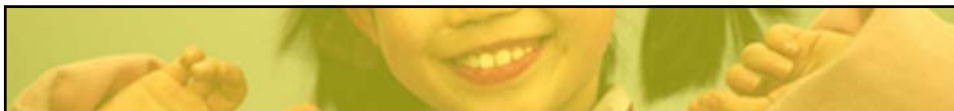
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## The Picture of Good Asthma Control

- As noted in AAAAI's *Pediatric Asthma: Promoting Best Practices – Guide for Managing Asthma in Children*, this is the picture of a person in good control of his/her asthma (AAAAI 2004, p39)
  - ✓ No coughing
  - ✓ No difficulty breathing
  - ✓ No wheezing or chest-tightness
  - ✓ No waking up at night with asthma symptoms
  - ✓ Normal activity level – including exercise, play, sports and school/daycare activities
  - ✓ No acute episodes that require a doctor or ED visit
  - ✓ No absence from school/work or activities
  - ✓ Normal/near normal lung functions

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## Why Should We Be Concerned? National & Local Statistics

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## The Hard Facts – Children & Asthma

- **Based on the National Health Interview Survey 2004 (Adams 2006):**
  - ✓ In the U.S., 9 million children < 18 years of age (12% of population based on 2000 Census) have *ever* been diagnosed with asthma
  - ✓ Almost 4 million children (6%) had an asthma attack in the past 12 months
  - ✓ Boys (15%) were more likely than girls (9%) diagnosed with asthma
  - ✓ Non-Hispanic black children (8%) were more likely than Hispanic children (4%) to have had an asthma attack in the past 12 months
  - ✓ Children in poor families (14%) were more likely to have ever been diagnosed in families that were not poor
  - ✓ Children in 'fair' or 'poor' health were 7 times as likely to have had an asthma attack in the past 12 months as children in 'excellent' or 'very good' health

*Do you recognize any of these populations (i.e., minority, economically disadvantaged, health compromised) as ones that visit your ED?*

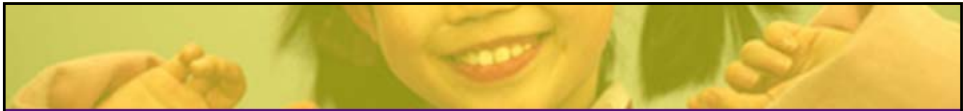
Available at: <http://www.cdc.gov/nchs/nhis.htm> 19



## Children are More Vulnerable

- **According to American Lung Association's (ALA) Lung Disease Data: 2006 report, asthma is the:**
  - Leading serious chronic illness of U.S. children
  - #1 cause of school absenteeism attributed to chronic illnesses, resulting in an estimated 12.8 million lost school days per year
  - 3<sup>rd</sup> leading cause of hospitalization among children < 15 years of age
- **Children are more vulnerable to air pollution (a common asthma trigger) than adults because:**
  - Their respiratory defenses are not fully formed
  - Children's airways are smaller and more likely to become blocked when irritated
  - Children breathe more rapidly, taking in more air pollution per pound of body weight
  - Children spend more time outside, playing and breathing hard, especially in the summertime when ozone levels are highest

Available at: <http://www.lungusa.org/site/pp.asp?c=dvLUK900E&b=33309#latest> 20

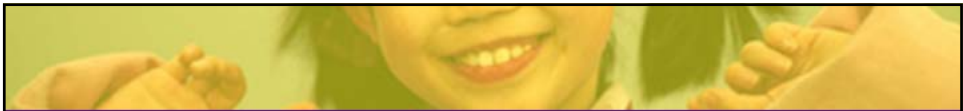


## Children & Smoking

- Additionally, ALA Lung Disease Data: 2006 report suggests that children of smokers are twice as likely to develop asthma compared to children of non-smokers.
  - Children are particularly vulnerable to environmental influences (such as cigarette smoke) because of their narrow airways and rapid respiration rate
  - Compared to adults, children's fast metabolism and ongoing physical development place them at increased risk from exposure to environmental pollutants

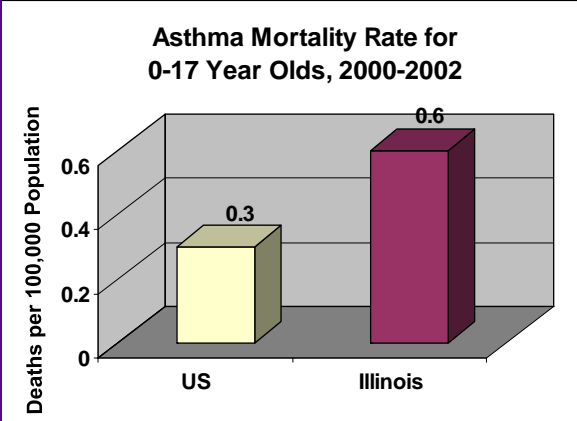
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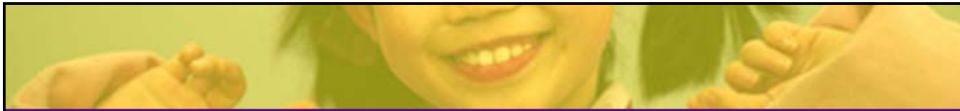
## Illinois Asthma – Twice as Deadly for Kids

Illinois mortality rates from asthma are twice the national rate for children between the ages of 0-17 years



Source: Centers for Disease Control and Prevention. National Center for Health Statistics. Health Data for All Ages. Available at: [http://www.cdc.gov/nchs/health\\_data\\_for\\_all\\_ages.htm](http://www.cdc.gov/nchs/health_data_for_all_ages.htm) accessed 5/18/2006

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## Illinois Asthma – African Americans at High Risk

Illinois mortality rates were particularly high for African American children (especially males), relative to the national average, during the years 2000 – 2002:

- For all 0 - 17 year old African Americans, Illinois mortality rates were 2.6 times the national average (2.3 deaths per 100,000 vs 0.9 per 100,000)
- For male 0 - 17 year old African Americans, Illinois mortality rates were 2.3 times the national average (2.7 deaths per 100,000 vs 1.2 per 100,000)

Source: Centers for Disease Control and Prevention. National Center for Health Statistics. Health Data for All Ages. Available at: [http://www.cdc.gov/nchs/health\\_data\\_for\\_all\\_ages.htm](http://www.cdc.gov/nchs/health_data_for_all_ages.htm) accessed 5/18/2006

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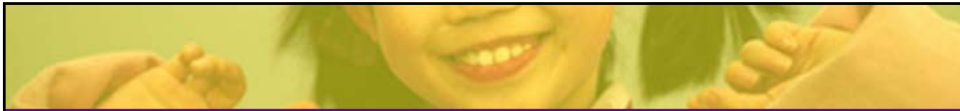


## Pediatric Asthma Management Recommendations for the ED

Recommendations for assessment and management of pediatric asthma in the Emergency Department are based on the NIH/NHLBI *Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma* (published in 1997, updated in 2002) and AAAAI *Pediatric Asthma: Promoting Best Practices – Guide for Managing Asthma in Children* (2004).

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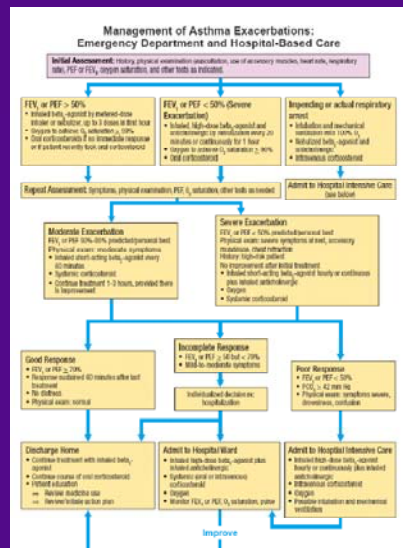
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## Shifts in Asthma Management

- Over the past decade, research into the pathogenesis of asthma has shed new light on asthma as a chronic lung condition that is controllable with the proper management.
- There is strong evidence for, and belief in the efficacy and safety of, long-term controller medications (e.g., inhaled corticosteroids).
- There is increased focus on the need for consistent, clear patient education during every healthcare opportunity.

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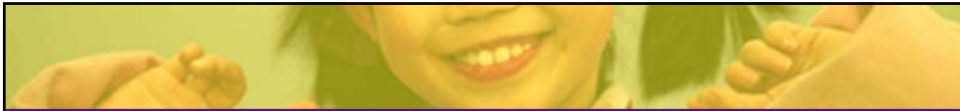
## Management of Asthma Exacerbations: ED & Hospital-Based Algorithm

The following slides will focus on each section of the algorithm, along with some special considerations.

Each focus area is outlined in red.

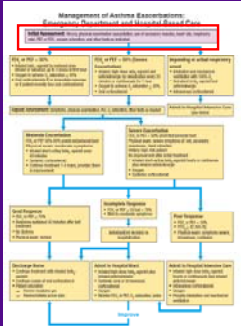
Source: AAAAI 2004  
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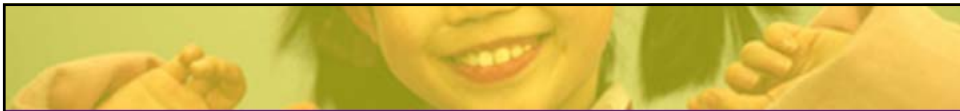


# Initial ED Assessment

- An appropriate initial assessment includes the following elements:
  - History
    - Prior exacerbations and/or ED visits
    - Time/onset of the current exacerbation
    - Comorbid conditions
    - Current medications including the time of last dose taken
  - Physical exam
    - Auscultation (e.g., wheezing, grunting, etc.)
    - Work of Breathing (e.g., use of accessory muscles, nasal flaring, etc.)
    - Heart rate
    - Respiratory rate
    - Skin color

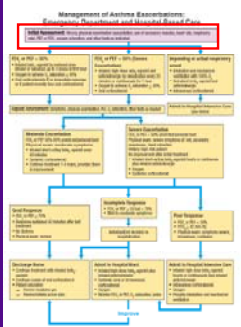


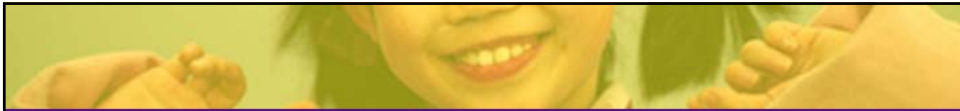
**Note: Take a more detailed H & P and perform lab studies only after initial therapy has been completed.**



# Initial ED Assessment (cont.)

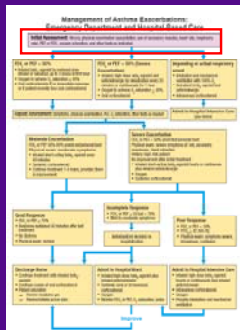
- Testing
  - Severity of airflow obstruction
    - With FEV<sub>1</sub> or PEF (if patient is > 5 years)
  - Oxygen saturation
  - Other tests as indicated
    - Chest x-ray is *not* recommended during the initial assessment unless there is suspicion of a complication (e.g., pneumothorax, pneumonia, etc.) (NHLBI 1997, p114)





## Special Consideration – Infant Assessment

- Due to the differences in the anatomy and physiology of an infant's lungs, he/she is at even greater risk for respiratory failure. Close monitoring is critically important.



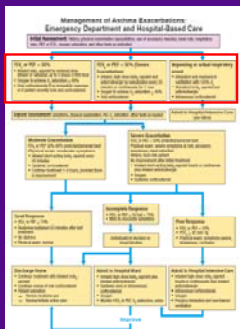
- Closely monitor  $O_2$  saturation by pulse oximetry to remain vigilant to signs of hypoxemia
- If impending respiratory failure is suspected, capillary or ABG measurements should be performed
- ❖ Viral infections (e.g., RSV) are the most common cause of acute wheezing in infants. The inflammatory response in the airways leads to air trapping and hyperinflation, atelectasis, increased respiratory rate, and wheezing.

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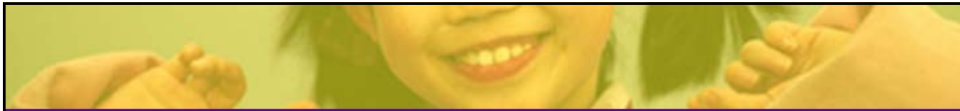


## Treatment - Overview

- The goals of treating exacerbations are:
  - rapid reversal of airflow obstruction
  - reduction in the likelihood of recurrence
  - correction of significant hypoxemia
- In the ED, exacerbations require:
  - close observation for signs of deterioration
  - frequent intervention
  - repeated measurement of lung function to determine effectiveness of the intervention
- ❖ Treatment should begin as soon as an asthma exacerbation is recognized and the initial assessment of lung function is determined.

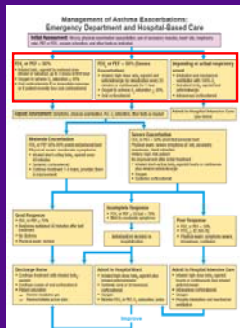


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## Treatment - Overview (Based on Severity of Exacerbation)

- The primary therapies (oxygen, inhaled beta<sub>2</sub>-agonists, and systemic corticosteroids) remain the same no matter the severity. However, the dose and frequency, and frequency of reassessment varies based on severity of the exacerbation.



- » Supplemental oxygen is recommended for most patients in order to maintain an SaO<sub>2</sub> ≥ 90 %. Continue to monitor O<sub>2</sub> saturation until a clear response to bronchodilator therapy is indicated.
- » Inhaled, short-acting beta<sub>2</sub>-agonists (every 20 to 30 minutes for three treatments) are recommended for *all* patients.
- » Systemic corticosteroids are recommended for patients with moderate-to-severe exacerbations and who do not respond completely to initial beta<sub>2</sub>-agonist therapy.

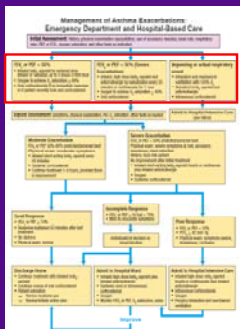
**Note:** Antibiotics are *not* recommended for the treatment of acute asthma exacerbations, except when needed to treat identified co morbid conditions (NHLBI 2002, p65)

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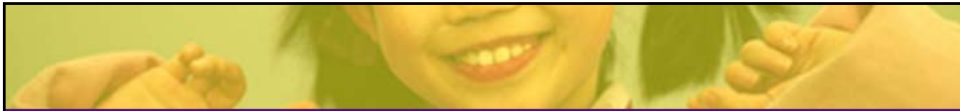


## Special Consideration – MDI vs. Nebulizer

- Studies show the repetitive or continuous administration of inhaled, short- acting beta<sub>2</sub>-agonists is the most effective means of reversing airflow obstruction (Lin et al. 1993; Lipworth et al. 1988).
  - Consider adding an anticholinergic (e.g., ipratropium bromide aka Atrovent®) to the beta<sub>2</sub>-agonist inhalant
- Studies show that bronchodilation can be effectively achieved by MDI with spacer/holding chamber or by nebulizer therapy (Mandelberg et al. 1997).
- However, continuous neb therapy may be preferable for children and other patients who struggle with using an MDI with spacer/holding chamber (Rudnitsky et al. 1993).
  - For children < 2 years, medication should be administered via neb or MDI with a proper face mask- *not* the “blow by” method



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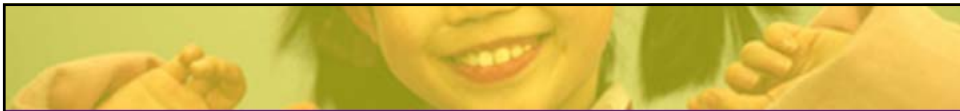
## Recommended Treatment – Mild to Moderate Exacerbation (post-initial assessment)

- For **mild to moderate** exacerbations (patients with FEV<sub>1</sub> or PEV > 50% predicted):

- Oxygen to achieve O<sub>2</sub> saturation ≥ 90%
- Inhaled beta<sub>2</sub>-agonist (by MDI or neb), up to 3 doses in 1<sup>st</sup> hour of treatment
- Oral corticosteroid
  - if no immediate response or if patient recently took an oral corticosteroid
- Reassess after therapy to determine appropriate next steps



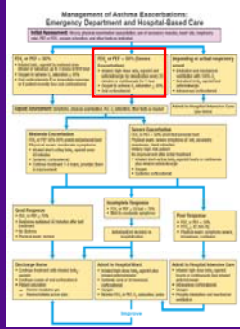
Note: a copy of [Usual Dosages for Asthma Medications - Emergency Medical Care](#) from the EPR2- Update 2002 can be found later in this module.

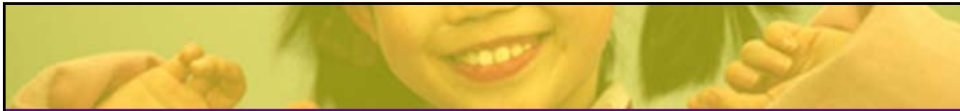


## Recommended Treatment – Severe Exacerbation (post- initial assessment)

- For **severe** exacerbations (patients with FEV<sub>1</sub> or PEV < 50% predicted):

- Oxygen to achieve O<sub>2</sub> saturation ≥ 90%
- Inhaled high-dose (short-acting) beta<sub>2</sub>-agonist *plus* inhaled anticholinergic [e.g., ipratropium bromide (Atrovent®)] by nebulizer every 20 minutes or continuously for one (1) hour
- Oral corticosteroid
- Reassess after therapy to determine appropriate next steps

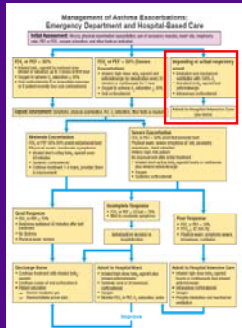




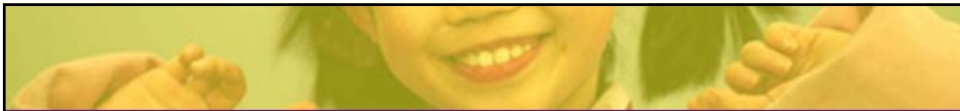
## Recommended Treatment – Impending Respiratory Arrest (post- initial assessment)

- For impending respiratory arrest:

- Intubation and mechanical ventilation with 100% Oxygen
- Nebulized beta<sub>2</sub>-agonist and anticholinergic
- IV corticosteroid
- Admit to hospital's ICU (or stabilize and transfer to higher level of care)



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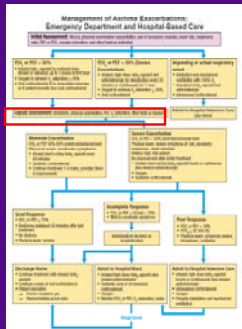


## Repeat Patient Assessment

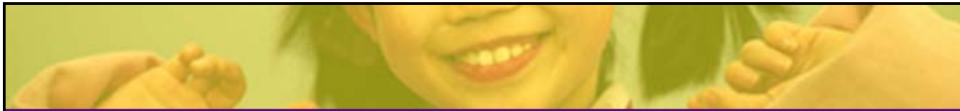
- Following the appropriate initial treatment based on the patient's level of severity (i.e., after the first 3 doses of inhaled beta<sub>2</sub>-agonist), repeat the patient assessment:

- Symptoms
- Physical exam (auscultation, use of accessory muscles, HR, RR, skin color)
- PEFR (if patient is able)
- Oxygen saturation
- Other tests as needed

*Determine the level of severity the patient is at this time, and act accordingly.*

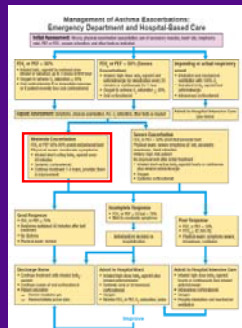


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## Post-Reassessment Treatment – Moderate Exacerbation

- If after the initial 3 doses of beta<sub>2</sub>-agonist, the patient's level of severity is considered moderate (patients with FEV<sub>1</sub> or PEV 50 – 80% predicted; moderate symptoms), the recommended treatment continues as follows:



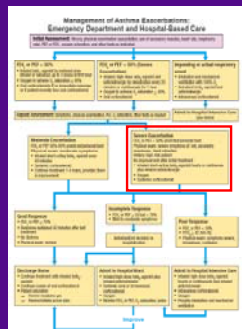
- Oxygen to achieve O<sub>2</sub> saturation ≥ 90%
- Inhaled short-acting beta<sub>2</sub>-agonist every 60 minutes
- Oral corticosteroid
- Continue treatment for 1- 3 hours, provided there is improvement
- Reassess after therapy to determine appropriate patient disposition

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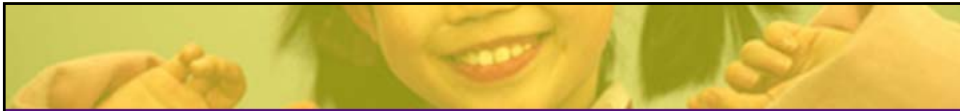
## Post-Reassessment Treatment – Severe Exacerbation

- If after the initial therapy (inhaled high-dose beta<sub>2</sub>-agonist, hourly or continuous), there is no improvement and the patient's level of severity is considered severe (patients with FEV<sub>1</sub> or PEV < 50% predicted; severe symptoms at rest, accessory muscle use, chest retraction), the recommended treatment is:



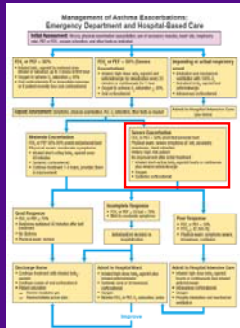
- Oxygen to achieve O<sub>2</sub> saturation ≥ 90%
- Inhaled short-acting beta<sub>2</sub>-agonist, hourly or continuous, *plus* inhaled anticholinergic
- Systemic corticosteroid
- Reassess after therapy to determine appropriate patient disposition

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## Special Consideration – IV Magnesium Sulfate

While activating transfer procedures to a higher level of care (or to your ICU), consider this therapy prior to transport. Discuss any additional therapies with the receiving hospital.

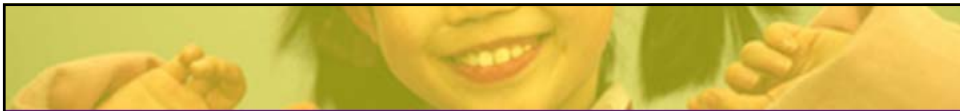


- For patients with severe acute asthma whom are not adequately responding to the primary therapies (O<sub>2</sub>, bronchodilators, steroids), adding IV magnesium sulfate to the combination of primary therapies appears to be safe and effective in:

- ✓ relieving bronchoconstriction
- ✓ improving asthma symptoms
- ✓ reducing hospital admissions

(Cheuk et al. 2005; Rowe and Camargo 2006; GINA 2005)

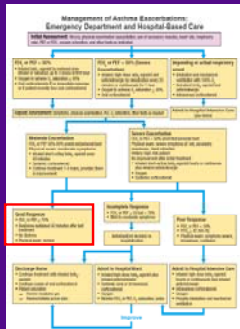
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## 2<sup>nd</sup> Reassessment – A Good Response

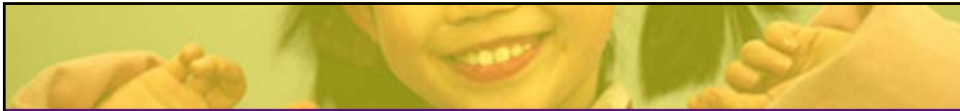
- A good response is defined as:

- FEV<sub>1</sub> or PEF ≥ 70%
- Response is sustained for 60 minutes after the last treatment
- No signs of distress
- Physical exam = normal



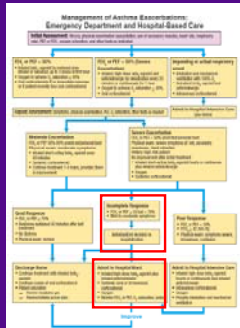
- **Discharge to Home**  
(see discharge instructions on a following slide)

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## 2<sup>nd</sup> Reassessment – An Incomplete Response

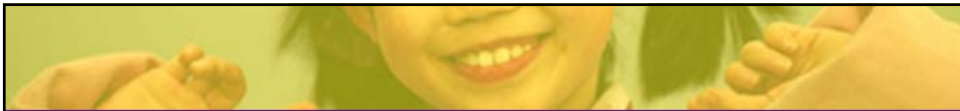
- An incomplete response is defined as:
  - FEV<sub>1</sub> or PEF ≥ 50% but < 70%
  - Physical exam = mild-to-moderate symptoms
- Disposition of patient is an individual decision – either:
  - Admit to Hospital with:
    - Inhaled high-dose beta<sub>2</sub>-agonist plus inhaled anticholinergic
    - Systemic corticosteroid (either IV or oral)
    - Oxygen
    - Monitor: O<sub>2</sub> sats, FEV<sub>1</sub> or PEV, pulse, etc.



or

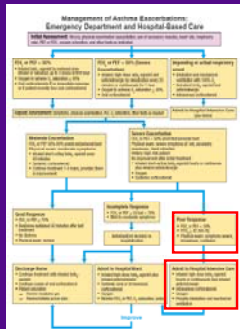
- Discharge to Home

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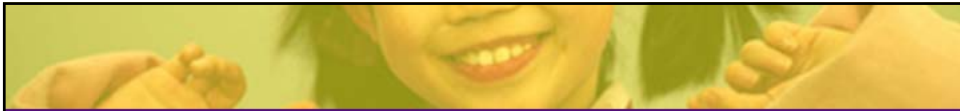


## 2<sup>nd</sup> Reassessment – A Poor Response

- A poor response is defined as:
  - FEV<sub>1</sub> or PEF < 50%
  - PCO<sub>2</sub> ≥ 42 mm Hg
  - Physical exam = severe symptoms, drowsiness, confusion
- Admit to the ICU with:
  - Inhaled high-dose beta<sub>2</sub>-agonist, hourly or continuous, plus inhaled anticholinergic
  - IV corticosteroid
  - Oxygen
  - Possible intubation and ventilation



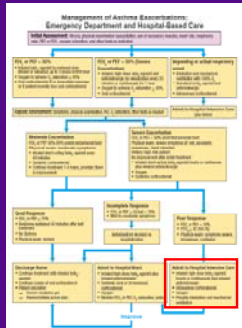
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## Special Consideration – Ventilation Issues

### Indications for intubation are based on clinical status:

- Unresponsive to maximal therapy
- Increasing hypercapnia
- Respiratory exhaustion & fatigue
- Altered level of consciousness
- etc.



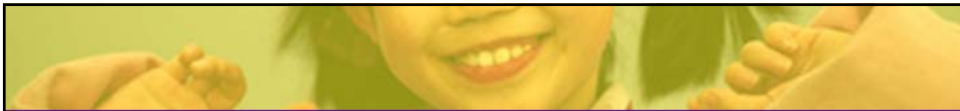
- Mechanical ventilation of patients with severe acute asthma presents special challenges, and should be performed selectively in a controlled setting by a physician with extensive experience in airway management.

- The primary objective is to avoid the adverse consequences of dynamic hyperinflation (DHI) (e.g., hypotension and barotrauma).

- “Controlled hypoventilation” (aka “permissive hypercapnia”) – recommended strategy to provide adequate oxygenation and ventilation while minimizing consequences (Tuxen 1994; NHLBI 1997; Shapiro 2002; Oddo et al. 2006). Minimize DHI by ensuring sufficient expiratory time. Strategy involves using a pattern of low:
  - minute ventilation
  - tidal volume, and
  - respiratory rate

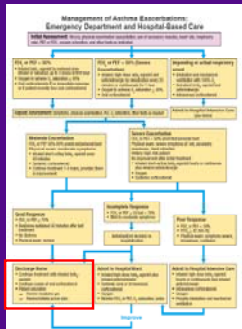
Children intubated for asthma should be admitted to a PICU or transferred to a facility that has appropriate capabilities.

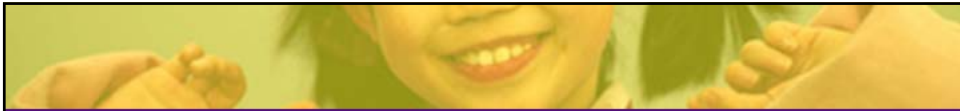
\*Please refer to noted sources for more details regarding ventilation management of children with asthma. 43



## Discharge to Home

- Continue treatment with inhaled beta<sub>2</sub>-agonist
- Continue oral corticosteroids for 3 –10 days
  - Consider starting patients with persistent asthma on inhaled corticosteroids (ICS)
    - Start this therapy before the course of oral corticosteroid is completed due to its gradual therapeutic effects
  - Or encourage patients with persistent asthma to continue using already prescribed ICS
- Review Peak Flow meter technique/diary
- Arrange appointment for follow up visit with PCP within 5 days of discharge
  - ❖ arrange for PCP or asthma clinic visit if patient does not have an appropriate medical home

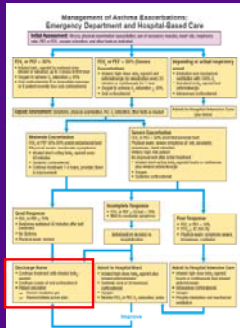




## Discharge to Home (cont.)

### Patient/family education - Key Points

- Review basics of asthma
- Review medication use (both emergency and daily/controller medications)
- Demonstrate medical device technique (MDI/spacer/chamber, nebulizer, Peak Flow meter, bulb syringe for infants)
- Review when to return to ED
- Arrange for follow up care with PCP/asthma clinic (assist in securing a medical home for any patient in need)
- Teach patient self-assessment techniques (monitoring symptoms and PEFr, identify patient's triggers, address smoking cessation, collaborate on an asthma action plan)



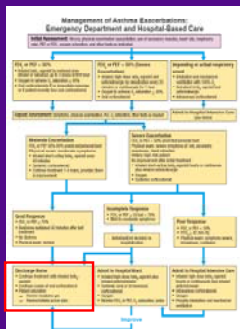
Even if you/your staff may not be able to address all of these educational issues, it's important to take advantage of any "teachable" moment to reinforce the elements that can reduce the recurrence rate of exacerbations.

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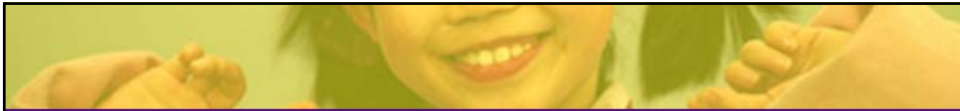
## Special Consideration – Albuterol Syrup

The use of albuterol syrup has fallen out of favor over the past decade with the advent of better modalities of targeted, inhaled delivery systems (e.g., MDI with spacer/holding chamber, nebulizer solution).



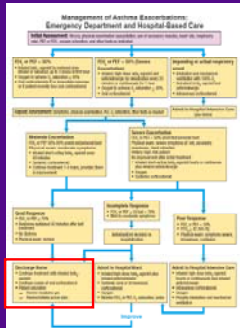
- AAAAI Guidelines (2004, p88) prefer *inhaled* beta<sub>2</sub>-agonists to oral because higher concentrations are delivered more effectively to the airways, the onset of action is substantially shorter, and systemic side effects can be avoided or minimized.
- Study among inner-city pediatric PCPs found the practice of prescribing albuterol syrup remained commonplace among community-based PCPs, but infrequent among hospital-affiliated PCPs (Rastogi et al. 2006).
  - Authors concluded lack of updated information was a possible reason that community-based PCPs continued to prescribe syrup.

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## Special Consideration – Albuterol Syrup (cont.)

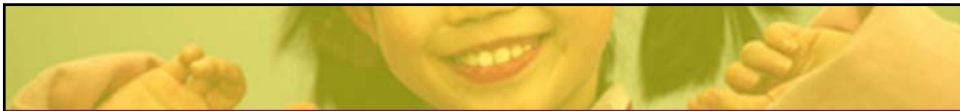
- An infant bronchiolitis study comparing albuterol syrup to placebo syrup showed no significant outcome differences between the groups. These authors *did not* recommend albuterol syrup as a treatment (Patel et al. 2003).



- In EMSC's *Pediatric Asthma Assessment and Discharge Planning* survey, 54% of EDs reported that patients with asthma symptoms were ever sent home with albuterol syrup
  - This was reported more frequently in EMS regions 1-6 (i.e., rural and downstate areas) than in regions 7-11 (i.e., Chicago and collar counties) (66% vs 41%,  $p < 0.05$ ).

Review your ED's current asthma management practices. Consider using inhaler-type delivery systems for albuterol administration rather than syrup.

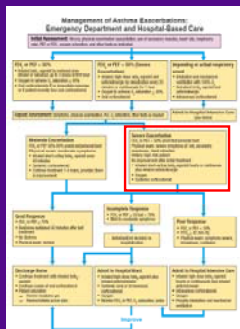
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## Current Research - Severe Acute Asthma

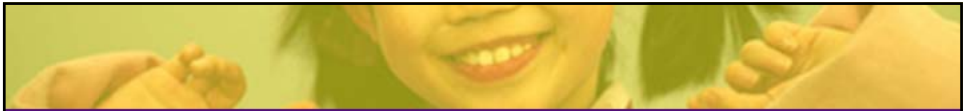
Discuss any additional therapies with your critical care staff and/or the receiving hospital if transport process is activated.

- The following are currently under investigation as potentially effective adjunctive therapies for patients with severe acute asthma:
  - **Noninvasive ventilation (BiPAP)** – decreases work of breathing, alleviates muscle fatigue, and allows spontaneous ventilation; may help to avoid intubation (Soroksky 2003; Needleman et al. 2004; Thill et al. 2004)
  - **Heliox** (Helium/Oxygen mixture) – allows greater oxygen delivery during inspiration; reduces airway resistance and work of breathing until primary therapies have time to act; which can help to defer/avoid intubation (Kudukis et al. 1997; Rodrigo et al. 2001; Reuben and Harris 2004)
  - **IV Ketamine** – produces bronchodilation of airway smooth muscle; has shown improved gas exchange, compliance, and overall lung function in patients with severe acute asthma resistant to primary therapies (Rock 1986; Petrillo 2001; Galbis-Reig and Rasansky 2004)



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## Identifying Persistent Asthma (quick assessment)

**Rules of Two™ - The Rules of Two® were designed by the Baylor Health Care System to keep asthma therapy very basic.**

• **Consider your patient a good candidate for maintenance therapy if:**

- ✓ He/she uses a quick-relief inhaler more than 2 times per week
- ✓ Symptoms wake him/her up at night more than 2 times per month, and
- ✓ He/she refills the quick-relief inhaler prescription more than 2 times per year

RULES OF TWO® is a trademark of the Baylor Health Care System.

Source: *Get in the Zone – Asthma Education through Problem-based Learning*, Illinois Chapter of the AAP

This tool is primarily intended for primary/specialty care settings. But, the "rules" can be easily applied in an emergency care setting to evaluate patient's current level of asthma control and the need to address/initiate maintenance regimen.

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## Identifying Persistent Asthma (quick assessment) (cont.)

Keep in mind that these are general guidelines and not necessarily adopted by the NHLBI.

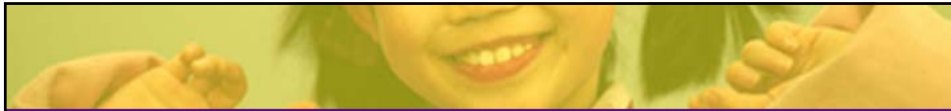
### More Rules of Two®

**These additional rules apply to younger children and toddlers.**

- ✓ They have more than 2 episodes of wheezing in a twelve-month period
- ✓ They have had more than 2 bursts of oral steroids in the past twelve months, and
- ✓ They have had exercise-induced symptoms more than 2 times per week.

*These conditions indicate that asthma is not in good control*

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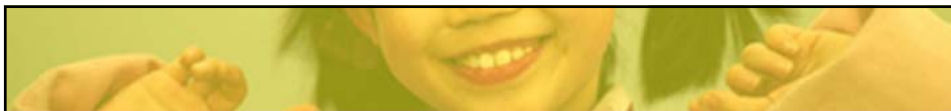


## Inhaled Corticosteroid (ICS) Therapy



- "Inhaled corticosteroids are the most effective long-term therapy available for mild, moderate, or severe persistent asthma; in general, ICS are well tolerated and safe at recommended doses" (NHLBI 1997, p71).
- For children < 5 years, EPR2– Update on Selected Topics (2002, p18) recommends low-dose ICS with nebulizer, dry powder inhaler, or MDI with holding chamber with/out a face mask.
- The Childhood Asthma Management Program (CAMP) Research Group, a multicenter treatment trial for asthma, found that ICS-treated patients showed *less* supplemental beta<sub>2</sub>-agonist use, *fewer* courses of oral corticosteroids, *lower* hospitalization utilization, *reduced* airway hyperresponsiveness, symptom scores and symptom frequency (CAMP 2000).

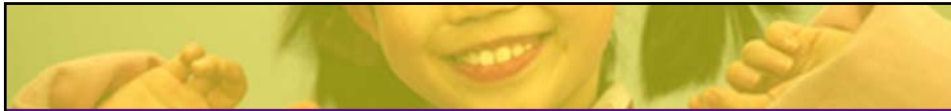
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## ICS Therapy (cont.)

- Other recent publications strongly encourage ED physicians to incorporate ICS as part of their discharge plan in order to give their patients the best opportunity to regain control over their persistent asthma (Sin and Man 2002; Singer et al. 2005; Rowe and Majumdar 2005).
- ❖ Prior to discharge from the ED, consider initiating ICS therapy for patients with *poorly controlled, persistent asthma* (whom answer yes to the Rules of Two™) especially for those patients who tend to use the ED as their primary care setting.
  - Encourage patients with persistent asthma to continue using their ICS if previously prescribed

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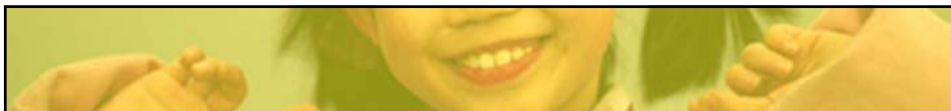
## ICS Usage Can Prevent Death From Asthma

- A population-based cohort study by Suissa (2000) included more than 30,000 subjects, between the ages of 5 – 44 years.
- Researchers followed the subjects from 1975 to 1997.
- Of 562 deaths, 77 were attributed to asthma. 66 of these were matched to control patients who also had severe asthma.

**Results:** The rate of death from asthma among users of ICS compared with nonusers was reduced by nearly **50%** with the use of more than 6 canisters/year.

*Source: Get in the Zone – Asthma Education through Problem-based Learning. Illinois Chapter of the AAP*

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## Distribution of Inhaled Corticosteroids

Reduced bioavailability is another issue related to ICS usage.

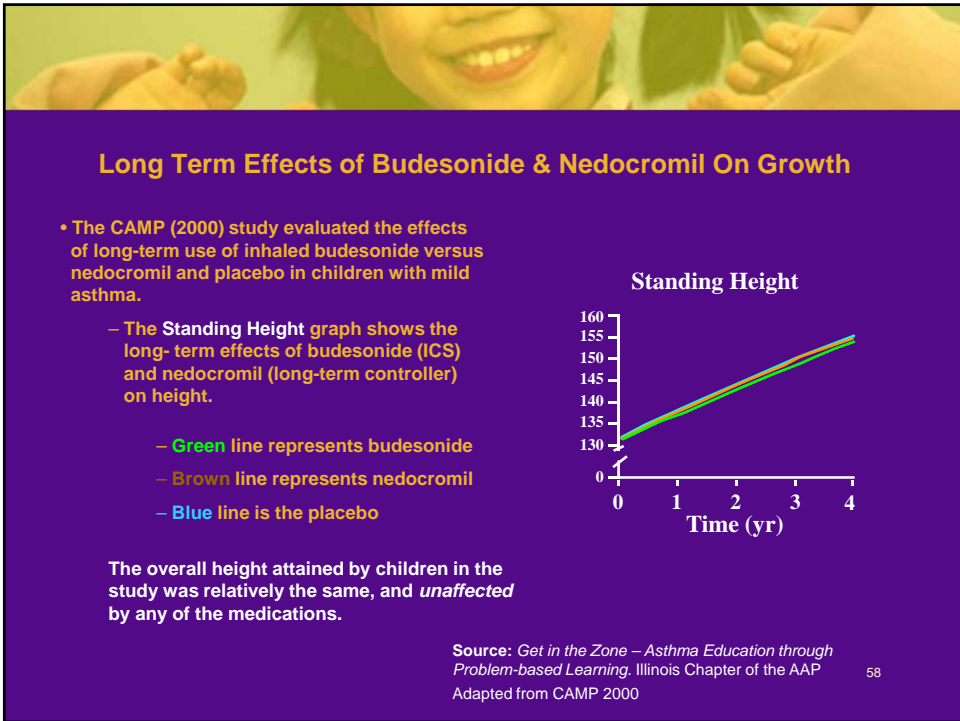
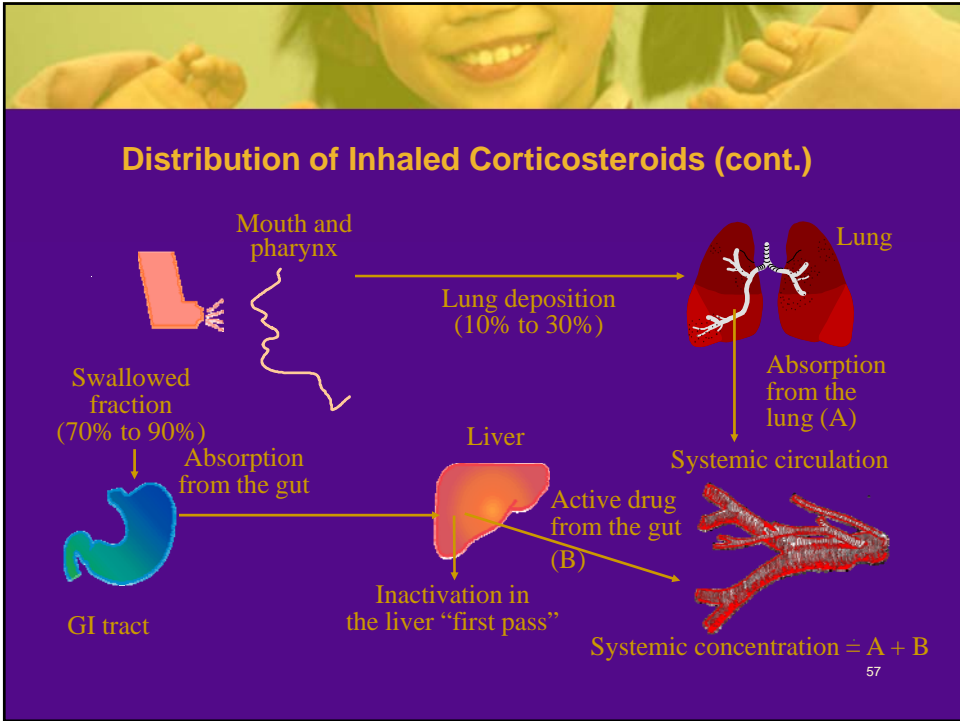
**Definition:** The degree and rate at which a substance is absorbed into a living system or is made available at the site of physiological activity.

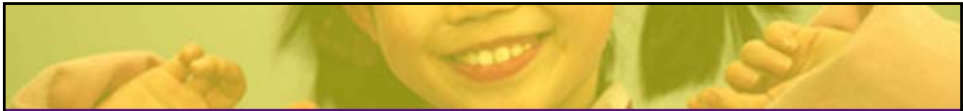
**Distribution:**

- The majority of the dispensed dose is swallowed; **only 10- 30% reaches the lungs** - depending on device and patient technique (see next slide for illustration).
- From the fraction that is deposited into the lungs, **even less** will be systemically absorbed. The potential for systemic side effects is created when this absorption occurs.
- The **swallowed fraction will be inactivated**, in part, or in total, during its first pass through the liver. So, the total systemic "load" of an ICS will be the sum of that which is absorbed through the lungs, mouth and pharynx, and the fraction that is not inactivated during the first pass through the liver.
- Most currently available ICS are **highly inactivated** in the first pass through the liver, leading to **low systemic bioavailability**.

*Source: Get in the Zone – Asthma Education through Problem-based Learning. Illinois Chapter of the AAP Adapted from NHLBI 1997*

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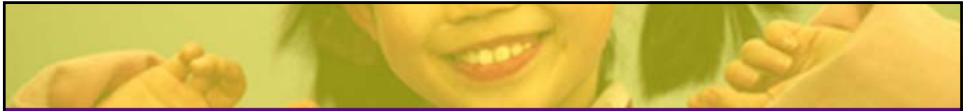
## ICS Safety Data - Summary

- Inhaled corticosteroid safety data demonstrate:
  - ✓ Positive effects of chronic inflammation in the lung
  - ✓ Protection of lung function
  - ✓ Reduced risk of death, hospitalizations, and emergency room visits for asthma
  - ✓ Reduced bioavailability
  - ✓ No effect on final adult height

Remember: Oral steroid bursts expose a child to a much higher systemic dose of steroid than an inhaled steroid used daily.

Source: *Get in the Zone – Asthma Education through Problem-based Learning*. Illinois Chapter of the AAP

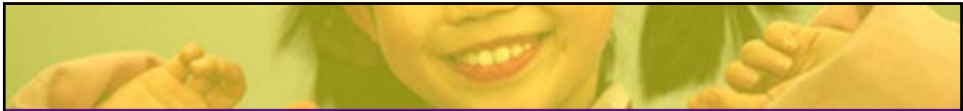
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## Focus on Asthma Education

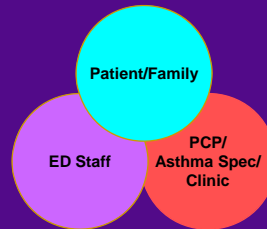
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## Education as a Partnership

- Due to the complex nature of asthma, patient/family education plays a key role in the management, and potential prevention, of the disease.
- Patient education should begin at time of diagnosis, and integrated into every step of of clinical asthma care (which includes ED visits).
  - Educate your ED staff to communicate the same key messages to patients to ensure consistent reinforcement.
- Work in collaboration with your local primary care physicians, asthma specialists, and asthma clinics to bridge the gap between knowledge and practice.
  - Understanding that asthma is a chronic disease (and that the ED is not the most appropriate setting for in-depth education), be proactive. Find out what people, resources, groups, etc are available to your patients and utilize them (many useful Illinois resources can be found in **Appendix B**).



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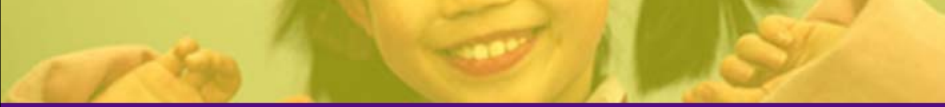
## Fundamental Patient/Family Education – Summary

Does your ED Asthma Patient Education include each of these resources?

- [Basic asthma fact sheet](#) – a simple explanation of the asthma disease process
- [Understanding use/importance of emergency medications](#) – focus on the difference between daily and emergency medications to handle acute asthma exacerbations
- [Understanding use/importance of daily, long-term controller medications](#) – focus on the fact that asthma is a chronic inflammatory disorder of the airways; how compliance to daily medications help in keeping the disease under control

This is a summary of recommended asthma patient/family education to incorporate during the ED visit. Your ED team will determine which elements each patient/family would benefit from most in a short amount of time (many useful resources can be found in Appendix A).

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### Fundamental Patient/Family Education – Summary (cont.)

Does your ED Asthma Patient Education include each of these resources?

- Understanding use of medication devices – demonstrate proper technique based on patient's age/developmental level and family comprehension (Peak Flow meter, MDI w/ spacer, nebulizer, bulb syringe for infants, etc)
- Understanding the importance of follow up care – explain when to return to the ED; arrange follow up appointment with PCP/asthma specialist; help establish a medical home, if necessary
- Monitoring symptoms/avoiding triggers – review how a patient can control his/her asthma by monitoring symptoms and avoiding triggers

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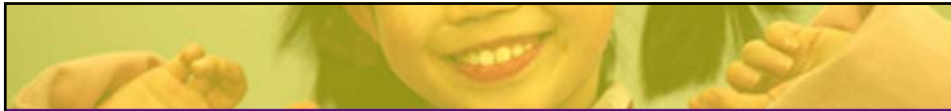


### Fundamental Patient/Family Education – Summary (cont.)

Does your ED Asthma Patient Education include each of these resources?

- Peak Flow record/diary – remind patient the importance of monitoring lung function on a daily basis in order to be cognizant of status changes that may be indicative of poor asthma control
- Smoking cessation (for patients and/or caregivers) – discuss the impact of first and second-hand smoke and providing resources/support to quit smoking
- Asthma action plan – this is a patient/provider collaborative document to delineate steps that a patient should take in response to his/her assessment of how well controlled asthma is on a daily basis
- Kid friendly resources – examples of ready made asthma resources/toolkits that are developed specifically for children.

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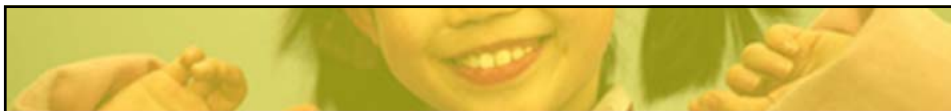


## Barriers to Effective Asthma Management & Education

Keep these common barriers in mind when working to provide effective care and education to your asthma patients/families:

- ❖ **Differing levels of comprehension among patients/families** (e.g., many patients still consider asthma as an acute vs. chronic condition)
- ❖ **Inconsistent messages given from healthcare professionals that cause confusion for the patient/family** (sometimes within the same department/hospital)
- ❖ **Patient/family reluctance to comply with a daily medication** (may be due to financial concerns)
- ❖ **Health concerns with taking a daily medication** (i.e., misinformation re: risk of stunted growth from taking ICS)

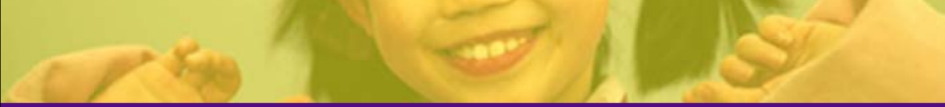
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## Conclusion: Keys to Success

- **What healthcare professionals can do to succeed (Flores et al. 2005):**
  - ✓ **Receive adequate professional education**
  - ✓ **Provide aggressive medical regimens**
  - ✓ **Facilitate follow up medical care**
  - ✓ **Provide information on patient self-management, importance of medication adherence, asthma triggers, etc**
  - ✓ **Ensure all members of the healthcare team are providing consistent educational messages to patients and their families**

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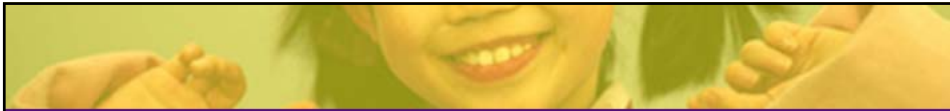
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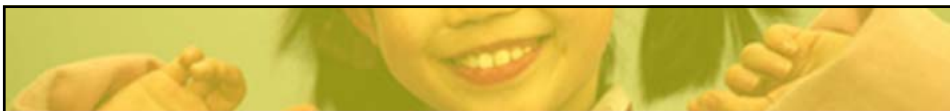
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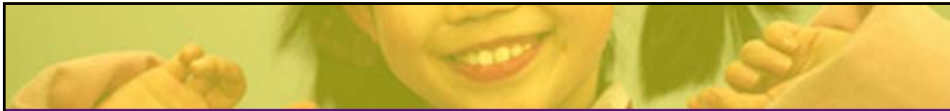
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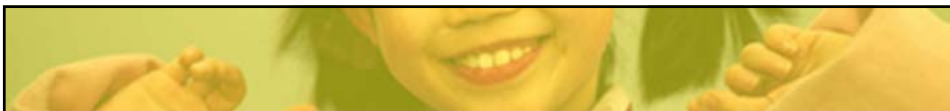
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## Appendix A: Patient/Family Educational Resources

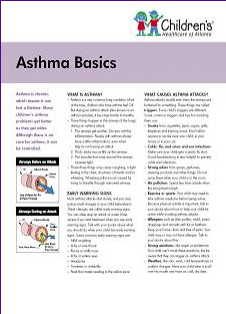
Provides a visual example of each type  
of patient/family education piece  
and links to other examples

[menu](#)

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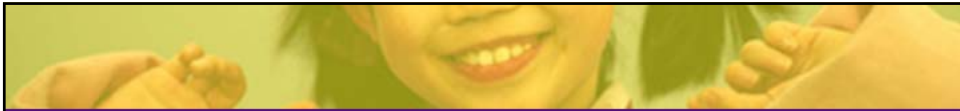
## Patient/Family Education – The Basics



- **Basic asthma fact sheet** – is a simple explanation of the asthma disease process. Here are a few examples:
  - [AAP's Children's Health Topics](#)
  - [American Academy of Family Physicians \(familydoctor.org\)](#)
  - [Asthma Society of Canada](#)
  - [Children's Healthcare of Atlanta](#)
  - [National Center for Environmental Health at the CDC \(BAM!\)](#)
  - [NHLBI - Expert Panel Report 3 \(EPR3\): Guidelines for the Diagnosis and Management of Asthma](#)
  - [Nemours Center for Children's Health Media \(KidsHealth.org\)](#)

Source: [Children's Healthcare of Atlanta](#)

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## Patient/Family Education – Emergency Meds

**Asthma Medicines**

- The right medicines can control asthma.
- The two main kinds of asthma medicines are quick relief medicines and long-term medicines.

**The right medicines can control asthma.**

- Asthma medicines are very safe and effective.
- You cannot get addicted to asthma medicines.
- It is very important to use asthma medicines the right way.
- Some medicines may make you feel sick from time to time.

**The two main kinds of asthma medicines are quick relief medicines and long-term medicines.**

**Quick relief medicines** - Other names for these medicines include:

- Rescue medicines
- Openers
- Bronchodilators

Everyone with asthma should have a quick relief medicine. Quick relief medicines help stop coughing and wheezing by quickly opening lung airways. Do not use only for a short time. If you use a quick relief medicine more than 2 or 3 times a week, you should probably be taking a long-term medicine too. Some brand names for these medicines are Albuterol, Proventil, and Ventolin.

**Long-term medicines** - Other names for these medicines include:

- Inhaled corticosteroids
- Controller medicines
- Anti-inflammatories

Long-term medicines only work with help from other medicines every day. They help stop swelling in the airways. They make your lungs work better so you can breathe easier and have fewer asthma symptoms and severe asthma episodes. Some brand names for long-term medicines are Flovent, Advair, Singulair, and Advair.

San Diego  
Childhood  
Asthma Initiative

Source: [San Diego Childhood Asthma Initiative \(ALA\)](#)

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- **Understanding the use of emergency medications** – focusing on the difference between daily and emergency medications to handle acute asthma exacerbations. A few examples are:

- [American Academy of Family Physicians \(familydoctor.org\)](#)
- [EVERYDAYKIDZ Program \(AstraZeneca\)](#)
- [Keepkidshealthy.com](#)
- [Nemours Center for Children's Health Media \(KidsHealth.org\)](#)
- [San Diego Childhood Asthma Initiative \(ALA\)](#)



## Patient/Family Education – Daily Controller Meds

**Types of Long-term Asthma Medications**

- There are different kinds of long-term medicines.

**There are different kinds of long-term medicines.**

**Inhaled Corticosteroids**  
There are several different types of steroids. This medicine is not the same kind of steroid that some people use to build muscles. This medicine is very effective in opening the swelling in the airways. Inhaled steroids have few side effects. It is important to take this medicine daily.  
Brand names include:  
Flovent, Advair, Pulmicort, Beclovent, Aerobid, Pulmicort

**Combination Inhaled Corticosteroid/Long-acting Beta<sub>2</sub> Agonist**  
Corticosteroid and beta-agonist both work by reducing swelling in the airways. These medications must be taken at regular intervals every day, up to four times daily.  
Brand names include:  
Spiriva, Flixotide

**Leukotriene Modifiers**  
This medicine comes in the form of a pill. You take this kind of medicine daily to reduce swelling in the airways in the lungs.  
Brand names include:  
Accolate, Singulair, Zileuton

**Long-acting Beta<sub>2</sub> Agonists**  
These medications are similar to quick relief medications but they stay in the airways longer and last longer. They should only be used with other long-term medications, never alone. They should not be used to provide quick relief of symptoms.  
Brand names include:  
Serevent, Foradil, Valerone

**Oral Corticosteroids**  
Oral corticosteroids are usually taken for a few days after an asthma episode. They come in the form of pills or syrup. Long-term use of this kind of medication can cause side effects. People with very severe asthma may take these daily.  
Brand names include:  
Prelone, Prednisolone, Decadron

San Diego  
Childhood  
Asthma Initiative

Source: [San Diego Childhood Asthma Initiative \(ALA\)](#)

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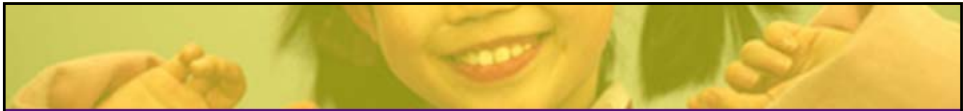
- **Understanding use/importance of daily, long-term controller medications** – focusing on the fact that asthma is a chronic inflammatory disorder of the airways, compliance to daily medications (e.g., ICS) help in keeping the disease under control. A few examples are:

- [AAAAI – Allergy & Asthma Medication Guide](#)
- [AAP - Section on Allergy and Immunology](#)
- [Canadian Lung Association - Asthma](#)
- [NHLBI – Diseases and Condition Index](#)
- [San Diego Childhood Asthma Initiative \(ALA\)](#)

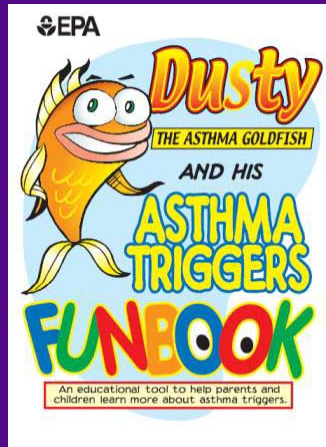








## Patient/Family Education – Kid Friendly Resources



Source: [Dusty the Asthma Goldfish](#) (EPA)

- Here are a few examples of ready made asthma resources/toolkits that are developed specifically for children.

- [Arthur™ Asthma Campaign](#)
- [Asthma Action America](#)
- [Dusty the Asthma Goldfish](#) (EPA)
- [EVERYDAYKIDZ Program](#) (AstraZeneca)
- [iCAN](#)
- [Just For Kids](#) (AAAAI)
- [National Library of Medicine](#) (online tutorial)

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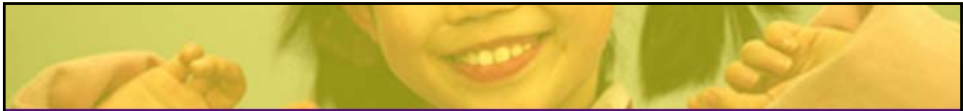


## Appendix B: Illinois Asthma Resources

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## Chicago Asthma Consortium (CAC)

- Formed in 1996 to coordinate the activities of institutions and individuals engaged in asthma diagnosis, treatment, and education advocacy.
- CAC is made up of medical and public health professionals, and others dedicated to improving the quality of life for people with asthma through information sharing, networking and advocacy.
- **Goals:**
  - Raise awareness of patients, health professionals, and the public that asthma is a serious disease
  - Promote a partnership among patients and healthcare providers through best practice treatment and education programs
  - Facilitate collaboration among healthcare professionals to identify available community resources to appropriately diagnose and better manage asthma
  - Encourage asthma patients (regardless of income, color, gender, language or disability) to enter into continuing care by facilitating access to care

Available at: <http://www.chicagoasthma.org>

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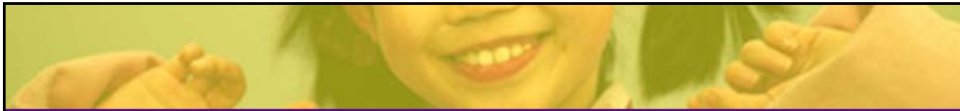
## CAC Resource – Chicago Asthma Atlas

- Provides Chicago-based community asthma groups with outcome data by zip code. The Atlas provides a directory of asthma programs in Chicago.
- This map displays the percentage of patients with appropriate use of inhaled steroids grouped by the zip code of the provider writing prescriptions for patients (Ages 3 – 17).



Available at:  
<http://www.chicagoasthmaatlas.org/htmls/presinfo.asp?zip=&cdt=kidspv>

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## CAC Resource – Chicago Asthma Atlas

This directory provides a partial listing of asthma programs in the Chicago area. The programs are grouped by area and by programs offered (see example below).



**Asthma Programs in Chicago**

**Zip Code: 60610**

**Near North Family Health Center**  
Near North Family Health Center  
351 W. Chestnut  
Chicago, IL 60610-3050  
(773) 763-4060

**Comprehensive Asthma Care**  
A member of Access Community Health Network (ACHN). See ACHN program description.

60610

East: Lake Michigan/N State St. (0)  
West: N Halsted St. (799W)  
North: W North Av. (E590N)  
South: E Grand Av. (800N)

Available at: <http://www.chicagoasthmaatlas.org/htmls/progInfo.asp>

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## Mobile C.A.R.E. Foundation

- The Mobile C.A.R.E. Foundation is a non-profit organization dedicated to providing free asthma care and education to children in underserved areas of Chicago.
  - **Mission:** To provide free and comprehensive asthma care and health education to children in Chicago's underserved communities via mobile medical clinics.
  - **How it works:** A participating Chicago school hosts a regularly occurring visit from a "asthma van." Local area students visit the van with a parent or guardian to receive an initial asthma medical exam. If diagnosed with asthma, the student receives medication and learns about the asthma "do's and don'ts." To help students stay healthy, Mobile C.A.R.E. provides follow up visits, education, and medication.
  - **Staff:** Each van is staffed by a pediatric asthma doctor, an asthma nurse educator, and a clinical assistant.
  - All services and medications are *free*.



Available at: <http://www.mobilecarefoundation.org/index.html>

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