MILD PERSISTENT ASTHMA: WHAT IS BEST PRACTICE REGARDING INHALED CORTICOSTEROIDS?

By

TERRI DEE DAVARI

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the clinical project of TERRI DEE DAVARI find it satisfactory and recommend that it be accepted.

[Signatures]

Chair

[Name]

[Name]
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>v</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Intermittent Versus Daily Inhaled Corticosteroids</td>
<td>2</td>
</tr>
<tr>
<td><strong>Overview of Asthma</strong></td>
<td></td>
</tr>
<tr>
<td>Epidemiology</td>
<td>2</td>
</tr>
<tr>
<td>Definition and Pathophysiology</td>
<td>3</td>
</tr>
<tr>
<td>Clinical Presentation</td>
<td>6</td>
</tr>
<tr>
<td>Diagnostic Tests</td>
<td>6</td>
</tr>
<tr>
<td>Classification of Asthma Severity</td>
<td>7</td>
</tr>
<tr>
<td>Health Belief Model</td>
<td>7</td>
</tr>
<tr>
<td>Patient and Provider Perceptions of Mild Persistent Asthma</td>
<td>8</td>
</tr>
<tr>
<td><strong>Review of Literature Regarding Inhaled Corticosteroids</strong></td>
<td></td>
</tr>
<tr>
<td>with Mild Persistent Asthma</td>
<td></td>
</tr>
<tr>
<td>Research Supporting Daily Inhaled Corticosteroids</td>
<td>10</td>
</tr>
<tr>
<td>Research Supporting Optional Daily Inhaled Corticosteroids</td>
<td>14</td>
</tr>
<tr>
<td>Guidelines and Actual Practice</td>
<td>16</td>
</tr>
<tr>
<td>Implications for Practice</td>
<td>17</td>
</tr>
<tr>
<td>Summary</td>
<td>18</td>
</tr>
<tr>
<td>References</td>
<td>19</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1. Mild persistent asthma criteria .................................................................24
Table 2. Health Belief Model ..................................................................................25
MILD PERSISTENT ASTHMA: WHAT IS BEST PRACTICE REGARDING INHALED CORTICOSTEROIDS?

Abstract

By Terri Davari, MN
Washington State University
December 2005

Chair: Lorna Schumann

Purpose: To provide an overview of asthma, discuss patient and provider perception of disease severity research, and address the controversial use of intermittent inhaled corticosteroid (ICS) therapy in mild persistent asthma.

Data Sources: Selected clinical articles and government guidelines.

Conclusions: Evidence-based research supports the daily use of inhaled corticosteroids in mild persistent asthma, as recommended by national and international guidelines. As compared to placebo or intermittent ICS use, greater control is achieved with daily ICS use as evidenced by an increase in forced expiratory volume in one second, peak expiratory flow, symptom-free days, and time to first severe asthma attack.

Implications for Practice: By incorporating the Health Belief Model, provider and patient ICS compliance can be achieved. By following established guidelines, patient outcomes can be improved and national health goals can be attained.

Key Words: mild persistent asthma, inhaled corticosteroids, Health Belief Model.

Author: Terri Davari, MN, RN, CCRN graduated from the FNP program at Washington State University.
Mild Persistent Asthma: What is Best Practice
Regarding Inhaled Corticosteroids?

Introduction

Asthma is a chronic disease affecting an estimated 300 million people worldwide without regard to age or race (Global Initiative for Asthma [GINA], 2004a). Although evidence-based guidelines have been developed to prevent disease progression, the burden associated with asthma morbidity continues to rise (GINA). While many cases of asthma fall under the mild persistent classification, much controversy exists regarding the management of this classification, specifically related to the use of inhaled corticosteroids (ICS).

Healthy People 2010 goals include: a reduction of asthma-related deaths, hospitalizations, emergency room visits, and activity limitations and the number of missed school or work days; and increasing the number of asthmatics who receive formal education and appropriate care as guided by the National Institutes of Health's National Asthma Education and Prevention Program [NAEPP]. By incorporating the Health Belief Model (discussed below) into practice, health care providers can enable patients with asthma to improve control over their disease symptomology through education, thereby attaining national health goals (U.S. Department of Health and Human Services, 2000).

This manuscript addresses the inhaled corticosteroid controversy, provides an overview of asthma including epidemiology, pathophysiology, clinical findings, and diagnostic tests, reviews established guidelines and research literature related to the management of mild-persistent asthma, and suggests
incorporation the Health Belief Model (HBM) into practice to prevent disease progression.

Intermittent Versus Daily Inhaled Corticosteroids

Current guidelines recommend daily inhaled corticosteroids (ICS) for mild persistent asthma (GINA, 2004b; NAEPP, 2002). A lack of patient compliance and underestimation of disease severity by patients and providers have lead to the underutilization of ICS. Boushey et al.'s IMPACT study (2005) challenged the established guidelines and provides healthcare practitioners the option of prescribing ICS either daily or intermittently. Successful incorporation of the Health Belief Model into practice should eliminate the need for an option as patients will become motivated in controlling their disease by using daily inhaled corticosteroids.

Overview of Asthma

Epidemiology

Asthma is one of the most common chronic diseases in the world and claims 15 million disability-adjusted life years per year. One in 250 deaths worldwide is caused by asthma with the highest mortality in China. Asthma deaths of 5-34 year-olds ranks highest in Kazakhstan with a rate of over 2 per 100,000. Scotland has the highest prevalence of clinical asthma with 18.4% proportion of population (GINA, 2004a).

Of the over 316 million people in Canada and the United States, the mean prevalence of clinical asthma is 11.2%. The prevalence rate in American children has increased by 25-75% per decade, since 1960. Blacks and
Hispanics make up a large portion of these groups. In contrast with other Western countries, the United States mortality trends have increased in the last two decades: the mid-1990s has doubled that of the mid-1970s. The economic burden of asthma is approximately $12 billion annually (GINA, 2004a).

The Children & Asthma in America’s 2004 survey revealed that nearly one out of ten, or seven million American children, currently have asthma (GlaxoSmithKline, Inc., 2004). The Asthma in America’s 1998 survey revealed that 48% of Americans have a history of asthma, either themselves, in the same household, or in their immediate family (GlaxoSmithKline, Inc., 1998). The Centers for Disease Control and Prevention’s Behavioral Risk Factor Surveillance System for 2004 indicates a national prevalence rate of 8.2% for adults (2004). Asthma accounts for almost 500,000 hospitalizations (many which are preventable) and 5,000 deaths a year in the United States (NAEPP, 1997).

Thirty percent of the 15 million Americans with asthma have mild persistent asthma (Irani, 2005). O’Byrne describes asthmatics in this classification as the “silent majority”, as many rarely seek medical care for asthma symptoms (2005).

**Definition and Pathophysiology**

Once thought of as a disorder of airway smooth muscle leading to variability of obstruction, it is now known that asthma’s pathologic process involves acute inflammatory episodes in addition to the chronic inflammatory state, which results in asthma exacerbations. Asthma, if left untreated,
progresses and potentially leads to deterioration of lung function in some patients (Lemanske, 2000). Denudation of the airway epithelium, collagen deposition beneath the basement membrane, airway edema, mast cell activation, and neutrophils, eosinophils, and lymphocytes (especially TH2) cell infiltration are histopathologic features. Extensive inflammatory changes are not only seen in severe cases of asthma, but may be also present in mild disease (Haahtela, 2002).

The chronic inflammation present in asthma leads to irreversible tissue destruction and airway remodeling, resulting in a decline of lung function. Rasmussen, Taylor, Flannery, Cowan, Greene, Herbison, et al. (2002) found that airway remodeling in asthma begins in childhood and continues into adult life. The researchers performed serial pulmonary function tests on more than 1,000 New Zealand Children born in 1972 and 1973 over two decades and analyzed indirect measurements of airway remodeling by measuring FEV1/VC. Those with low postbronchodilator ratios showed a greater decline in pre-bronchodilator FEV1/VC ratios, as compared to “normal” postbronchodilator ratios. This study supports the “Dutch hypothesis”—the history of asthma or airway hyperresponsiveness makes one more susceptible to a more rapid decline of ventilatory function. Chronic inflammation occurs from the complex interaction of inflammatory cells and mediators such as histamine, platelet-activating factor, products of the arachidonic acid cascade (LTC4, LTD4, and LTE4) and toxic oxygen radicals. This interaction in turn recruits additional inflammatory cells, which leads to further inflammation, bronchospasm, airway mucous secretion,
and airway microvascular leakage. The result of this cascade of events leads to airway edema and narrowing. The epithelial damage of the bronchial mucosa is caused by the granular constituents of eosinophil major basic protein, resulting in smooth muscle hypertrophy, which leads to pulmonary function decline (Lemanske, 2000).

Anti-inflammatory medications initiated early in treatment have been shown to inhibit irreversible airway remodeling. Bibi, Feigenbaum, Hessen, & Shoseyov (in press) supported this with their study of nearly 200 children. Looking at the same definition of airway remodeling as defined by Rasmussen and colleagues (2002), these researchers followed children over five years. The children treated with regular inhaled corticosteroids decreased their postbronchodilator FEV₁/FVC ratio from 35% to 20.9%. Those in the untreated group increased their postbronchodilator FEV₁/FVC ratio from 10% to 28% by the end of the five years. These findings, as well as those described in Rasmussen et al’s study should be shared with patients with even mild asthma to enable a realistic perception of asthma severity.

Atopy is the strongest genetic link in the development of asthma. Atopy is the tendency to develop allergic diseases such as allergic rhinitis, asthma, and atopic dermatitis. Atopic persons mount IgE responses to common inhaled and food allergens. Although not all atopic persons have asthma, 85% of children with atopy also develop asthma and 40-50% of adults mount allergic responses to aeroallergens (Peden, 2000). Perceived susceptibility, the first construct of the
Health Belief Model described later, can be addressed early on in patients presenting with components of atopy.

*Clinical Presentation*

Clinical findings of asthma include episodic wheezing, dyspnea, chest tightness, and cough. Variability of these findings is present between asthmatics. Nasal manifestations, eczema, atopic dermatitis, or other skin allergic disorders often coincide with asthma. Airflow obstruction is evidenced by wheezing during normal breathing or a prolonged forced expiratory phase. During an acute attack, wheezing may not be present due to airflow obstruction; instead, reduced breath sounds with a prolonged expiration may be evident (Chesnutt & Prendergast, 2004).

*Diagnostic Tests*

The diagnosis of asthma is made with confirmatory pulmonary function testing (PFT) with spirometry by evaluating forced expiratory volume in one second/forced vital capacity (FEV₁/FVC) before and after administration of a bronchodilator. Airway obstruction is seen with a reduction of FEV₁/FVC less than 75%. After administration of a short-acting bronchodilator, improvement in the FEV₁ and/or FVC may be seen; however, airflow obstruction irreversibility is not proven by the absence of an improvement in lung function. Bronchial provocation testing with histamine or methacholine aids in diagnosis, if spirometry is not diagnostic. A decrease in FEV₁ of at least 20% after provocative exposure confirms the diagnosis (Chesnutt & Prendergast, 2004).
Classification of Asthma Severity

Disease severity is based on PFT measurements, asthma symptoms, and the need for rescue medication (i.e., short-acting beta agonist). The Expert Panel of the National Asthma Education and Prevention Program [NAEPP] (2002), and the Global Initiative for Asthma [GINA] (2004b) have identical severity classifications for both adults and children. The four classifications are mild intermittent, mild persistent, moderate persistent, and severe persistent. GINA has stricter criteria for mild persistent asthma in that it identifies having symptoms only once per week as mild persistent (see Table 1). When using these severity categories, clinical parameters should be evaluated before treatment is provided or before adequate control of asthma is achieved (GINA & NAEPP). Failure to consider current medication use may lead the provider in under- or overestimating disease prevalence (Bisgaard & Szefler, 2005).

Health Belief Model

The Health Belief Model (HBM) was implemented in the 1950s by United States Public Health Service psychologists with primary care activities, such as flu vaccines. The HBM orients practitioners and researchers to the roles of cognitions and motivation in health-related behavior (Elder, Geller, Hovell, & Mayer, 1994). The model stresses personal responsibility, focuses on the relationship of health behavior, practices, and utilization of health services, assists the patient to take action, and enables the patient to take ownership of their disease (Lecture by Dr. Kris Miller, Washington State University, September 18, 2002).
Four main concepts make up the HBM: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. The concepts cues to action and self-efficacy have been added to the model. The HBM can be incorporated into practice by providers with patients who may be susceptible to noncompliance of ICS use, as well as other management activities. The HBM can also be applied to providers who are noncompliant in following the guidelines. Table 2 outlines the HBM, defines the concepts, and provides application and outcome examples for both patients and providers.

Patient and Provider Perceptions of Mild Persistent Asthma

Bisgaard & Szefler (2005) provide an overview of research on asthma prevalence. The Asthma in America (AIA), the Asthma Insights and Reality in Europe (AIRE) and the Prevalence of Recurrent Respiratory Episodes in Preschool Children (PREPAC) surveys all confirm Bisgaard & Szefler’s conclusion, that asthma disease burden is worldwide in children and adolescents with and without current asthma treatment. The AIA and AIRE surveys reported that symptoms of mild intermittent or mild persistent asthma were by far the most prevalent among those surveyed (Bisgaard & Szefler).

The true extent of mild persistent asthma, especially in children, is difficult to determine because of survey design flaws, reliance upon caregiver reports, and reliance on severity classifications. Both the AIRE and AIA surveys relied on physician diagnosis of asthma, before a subject was included in the research. Because many persons with mild forms of asthma do not seek medical care, persons with more severe forms of asthma, may have skewed these surveys
(Bisgaard & Szefler, 2005). Wolfenden, Eiette, Krishnan, Skinner, Steinwachs, & Wu's (2003) cohort study of adults in a managed care program revealed an underestimation of severity of asthma by physicians (and lack of ICS prescribing) which contributed to poor asthma control. Of the 4,005 mostly white female subjects in this study, current asthma symptoms were moderate (39%) and severe (50%), while the physician estimates were mild (44%) and moderate (45%). Of the 39% of patients self-report of moderate asthma, 35% were prescribed daily ICS (2003). Under-estimation of asthma does not assist the patient in gaining a realistic perception of their asthma severity; this concept of the Health Belief Model helps patients identify the ramifications of not treating their asthma.

Physicians are not the only ones who underestimate asthma severity. Yoos, Kitzman, McMullen, Sidora-Arcoleo, & Anson (2005) showed that 48% of parents of 228 children recruited, reported nonstandard asthma symptoms (ie, fatigue, itchy throat). Only 16% of the parents reported cough—the hallmark symptom of asthma. The authors concluded that because of communication challenges between children and their parents, many parents underestimate the severity of the child's disease.

A retrospective medical record review study by Yawn & Yawn (in press) with a sample size of 500 children between the ages of 5-18 revealed a lack of basic clinical information used in assessing asthma severity. Only 12% of the records indicated any missed work, school, or activity days, only 9% recorded asthma triggers, and only 4% even documented asthma severity. Adherence to
established national guidelines is difficult or impossible to impose, which presumably leads to a worsening of asthma severity. By incorporating the HBM in the management of asthma, cues to action such as presenting asthma diaries and peak expiratory flow (PEF) logs, can promote providers to adhere to guideline recommendations.

Zeiger, et al. (2004) found in their Mild Asthma Montelukast versus Inhaled Corticosteroid (MIAMI) study that “Although asthma may appear mild, acute exacerbations may be life threatening, as up to 33% of asthma-related deaths in a pediatric population occurred in individuals thought to have only trivial or mild asthma” (page 899). This randomized two-arm parallel-group study with 400 adults and adolescents, advised that daily therapy, with either ICS or a leukotriene receptor antagonist is beneficial in mild persistent asthmatics.

Review of Literature Regarding Inhaled Corticosteroids

Using PubMed and ProQuest, the key search terms used for literature review included mild persistent asthma and inhaled corticosteroid. Of the 137 articles produced, literature was limited to inhaled corticosteroid use with the asthma classification of mild persistent only. The three randomized trials (OPTIMA, START, and IMPACT) discussed in this section also provided references for supportive literature.

Research Supporting Daily Inhaled Corticosteroids

Two major studies have demonstrated substantial benefits with inhaled steroid use in mild persistent asthma: the OPTIMA and START trials. O'Byrne et al., (2001) performed a double-blind, randomized, and parallel-group study at
198 centers in 17 countries to assess optimal treatment of mild asthmatics. The study had two groups: Group A consisted of 698 steroid-naïve patients who were treated with twice daily budesonide 100 micrograms, twice daily budesonide 100 micrograms, plus 4.5 micrograms formoterol, or placebo. Group B consisted of 1,272 corticosteroid-treated subjects assigned to twice daily budesonide 100 micrograms, twice daily budesonide 100 micrograms, plus formoterol (a long-acting beta agonist) 4.5 micrograms, or twice daily budesonide 200 micrograms, plus formoterol 4.5 micrograms. The primary outcome variables were time to first severe asthma exacerbation and poorly controlled asthma days. Group A’s budesonide alone subjects reduced the risk of severe exacerbation by 60% and poorly controlled days by 48%. The addition of formoterol did not affect the primary outcomes, but did increase lung function as evidenced by increases in FEV₁ and morning peak expiratory flow. Patients taking budesonide, plus formoterol in Group B reduced the risk for first severe exacerbation by 43% and for poorly controlled days by 30%. The study results demonstrated that the addition of an ICS to corticosteroid-naïve patients is beneficial, whereas the addition of the long-acting beta agonist is beneficial to those already being treated with an ICS. Application of the Health Belief Model to the findings in this study’s primary outcomes can be shared with asthmatic patients in realizing the perceived benefits of using ICS on a daily basis. The perceived severity of asthma is also addressed with regards to missed school or work, hospitalizations, or a decrease in one’s activity level.
Pawels, et al. published their START (Inhaled Steroid Treatment as Regular Therapy in Early Asthma) trial results in 2003. This trial included over seven thousand corticosteroid-naïve patients from 32 countries with mild persistent asthma less than two years. The patients were randomized to either budesonide or placebo once daily for three years in addition to their usual medication. It was found that patients assigned to the budesonide arm had few courses of systemic corticosteroids and more symptom-free days (14.1 days) than the placebo arm patients. The patients receiving budesonide reduced the risk of having a severe asthma exacerbation (the primary outcome) by almost half. The patients taking budesonide also increased their postbronchodilator \( FEV_1 \) by 1.48\% \( (p<0.0001) \) after one year of treatment and 0.88\% \( (p=0.0001) \) after three years and their prebronchodilator \( FEV_1 \) was 2.24\% after one year and 1.71\% \( (p<0.0001 \text{ for both time points}) \) after three years. The effectiveness of the budesonide was independent of lung function or medications at baseline. Again, the findings of this study can be shared with the patient and/or family when incorporating the HBM into practice. This education can enable the patient/family to accurately perceive the severity of asthma and reduce the perceived barriers of daily ICS use. The objective measurements of \( FEV_1 \) improvements in this study can also influence a patient’s perceived benefits, as well.

budesonide was $0.42/day. With the addition of 14.1 additional symptom-free days gained in the daily budesonide arm as compared to usual therapy, the cost was offset by a decrease of absences from work or school, which reduced the cost to only $0.14/day. The perceived barriers construct of the HBM can be addressed with this study in demonstrating that control of one’s disease only costs pennies a day.

The main concern with the use of ICS in patients with mild disease is the possibility of systemic effects. Because patients with mild persistent asthma have a higher airway patency, than those with more severe forms, greater deposition of the medication may be permitted in the distal lung units, which may increase systemic absorption (Irani, 2005). Also of concern is inhibition of growth development of children. The three-year START study showed a 1.34 cm reduction in growth, compared to placebo of children younger than 11 years; the first year of the study demonstrated the greatest growth reduction (Pawels, et al. 2001). The Childhood Asthma Management Program Research Group (CAMP) only showed a 1.1 cm growth reduction in the first year of ICS therapy with budesonide at 400 micrograms/day (Childhood Asthma Management Program Research Group, 2000).

Agertoft & Pedersen’s (2000) found no adverse effects on growth with ICS. Their long-term study found that adult height was not affected by studying 211 children receiving budesonide for a mean of 9.2 years even with a dose of 500 micrograms/day.
Allen's (1998) article summarized 6 short-term studies and 18 long-term studies of inhaled beclomethasone dipropionate and budesonide on growth in asthmatic children; the results of these studies are widely varied due to methodology. Many of the studies on this topic had flawed study designs. Some flaws included using knemometry, which does not predict long-term growth, a lack of pubertal status assessment, inadequate, untreated control group subjects, lack of baseline growth rate data, and baseline differences in age and height between treatment groups. After a discussion on several studies among children who take conventional dose ICS therapy, growth failure is rare; the risk increases with continuous daily doses of more than 400 micrograms/day. Practitioners must consider total corticosteroid burden of a child suffering from allergic rhinitis, also receiving an intranasal corticosteroid.

The systemic effects and growth concerns related to ICS therapy can be addressed with patients and their families by sharing the findings from these studies. In doing so, a reduction in perceived barriers can be achieved.

Research Supporting Optional Daily Inhaled Corticosteroids

The Improving Asthma Control (IMPACT) Trial studied 225 asthmatic adults, aged 18 to 65 years old (Boushey et al., 2005). Inclusion criteria included physician-diagnosed asthma, a FEV₁ of at least 70% of the predicted value (which was measured more than four hours after receiving a bronchodilator), at least a 12% increase in FEV₁ and at least 200 ml after inhalation of albuterol or a fall in FEV₁ of at least 20% after provocation of less than 16 mg/ml of methacholine. After receiving home peak flow meters, each subject was advised
to keep a daily diary of the symptoms the NAEPP and GINA (Table 1) use for severity classification. After 4 weeks, the diaries were analyzed to ensure the subjects did classify as having mild persistent asthma. All subjects received prednisone, high-dose budesonide, and zafirlukast (a leukotriene modifier) for 10-14 days before being assigned to a treatment group. Subjects were then assigned to being treated with inhaled budesonide twice daily, taking zafirlukast twice daily, or intermittent short-course ICS treatment guided by a symptom-based action plan alone. All subjects were allowed a course of inhaled or oral corticosteroids, as needed for worsening asthma symptoms. Morning peak expiratory flow rate was the primary outcome measure. FEV₁ pre- and post-bronchodilator treatment, the frequency of asthma exacerbations, number of symptom-free days, and quality-of-life were also measured.

Similar rates of asthma exacerbations and increases in peak expiratory flow rates were found between the three groups. Subjects receiving daily ICS had 26 more symptom-free days than the other two groups and had greater improvements in pre-bronchodilator FEV₁, bronchial reactivity, the percentage of sputum eosinophils, exhaled nitric oxide, and scores for asthma control. Significant improvement in post-bronchodilator FEV₁ or in the quality-of-life was not found in the daily ICS group. The intermittent ICS group used corticosteroids for only 0.5 week of the study year (Boushey et al., 2005).

The premise of the IMPACT trial seems to dismiss the power of motivation, as it accepts the fact that patients will be noncompliant. That being
said, the findings, like those of the OPTIMA and START trials, can be shared with patients who need to realize the benefits of daily ICS therapy.

Guidelines and Actual Practice

The IMPACT Trial set out to determine if intermittent use of ICS is effective in mild persistent asthma as opposed to daily ICS therapy as recommended by the NAEPP, GINA, the OPTIMA trial, and the START trial (Boushey et al., 2005). Most patients with mild persistent asthma inconsistently refill their controller medication and are aware, when they do require ICS therapy. This is supported by Milgrom, Bender, Ackerson, Bowry, Smith, & Rand's (1996) research of 24 children over a 13-week period of time, which indicated low adherence to prescribed ICS therapy than reported on diary cards.

Price & Kemp (1999) described a compliance study which indicated self-report ICS compliance rates of adults as high as 73%. By evaluating canister weight, objective measurements showed that only 15% of these adults used their inhaler as prescribed. Obstacles identified by Price & Kemp in treating adolescent asthma which contribute to noncompliance include: feelings of isolation and the need to blend in with peer groups, worry of asthma's effect on relationships, and fear of growth reduction or delayed puberty. Other findings were school and social absence due to asthma resulting in psychological disturbances of self-esteem and self-image, and the avoidance of physical activity due to fear of having an attack.

Although several editorials have questioned the IMPACT Trial (Fabbri, 2005; O'Byrne, 2005; Fabbri, 2005; Stanbrook, 2005), the reality of daily ICS use
by patients (as stated earlier) and the provider practices should be considered. Finkelstein et al. (2000) found that most physicians adhere to national guidelines, but do not optimize anti-inflammatory medications. Watson, Kerstjens, Rabe, Kiri, Visick, & Postma (2005) found sub-optimal asthma control of mild asthmatics in the United Kingdom, as evidenced by morbidity outcomes. As referred to earlier, Wolfenden et al. (2003) found physicians underestimate asthma severity, as demonstrated by a link to inadequate asthma care.

Implications for Practice

Research based on national and international guidelines support the use of daily ICS therapy in patients with mild persistent asthma to prevent decline in pulmonary status secondary to irreversible airway remodeling (GINA, 2004b; Haatela, 2002; Lemanske, 2002; NAEPP, 2002; O'Byrne 2001; Pawels, 2003). O'Byrne acknowledges in his 2005 editorial that individuals with mild persistent asthma tend to minimize symptoms or adapt to the symptoms. O'Byrne also claims that regular low-dose ICS provides clinical benefit which results in continued use of ICS which addresses the self-efficacy concept of the HBM.

As with many chronic diseases, patient denial and treatment non-compliance are barriers providers must face. The Health Belief Model's framework is clear and easy to adapt into practice when managing asthma, no matter the classification. By facilitating the patient to perceive the severity and benefits of treating his or her mild-persistent asthma, and assisting in addressing the perceived barriers, the perceived benefits can be realized, and an enhanced self-efficacy can occur.
Summary

Daily ICS therapy for mild persistent asthma is best practice as supported by current research. Adams & Fuhlbrigge’s research reported that use of anti-inflammatory medication was significantly associated with patients reporting their provider having an excellent ability to explain asthma management (2003). By keeping abreast of current research related to the pathophysiology and the management of asthma and by adopting the Health Belief Model into practice, patient outcomes will be improved and national health goals can be attained.
References


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severity leads to undertreatment. *Archives of Internal Medicine, 163*(2), 231-236.


Table 1. Mild persistent asthma criteria

<table>
<thead>
<tr>
<th>Criterion</th>
<th>*National Asthma Education and Prevention Program</th>
<th>**Global Initiative for Asthma</th>
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<tr>
<td>Symptoms</td>
<td>&gt;2/wk, but &lt;1 x/day</td>
<td>&gt;1/wk but &lt;1x/day</td>
</tr>
<tr>
<td>Nighttime symptoms</td>
<td>&gt;2x/month</td>
<td>&gt;2x/month</td>
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<tr>
<td>FEV₁ or PEF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Predicted</td>
<td>&gt;= 80</td>
<td>&gt;=80</td>
</tr>
<tr>
<td>Variability, %</td>
<td>20-30</td>
<td>20-30</td>
</tr>
<tr>
<td>Exacerbations</td>
<td>----</td>
<td>May affect activity or sleep</td>
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<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
<th>Application</th>
<th>Application &amp; Outcome Examples</th>
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<tbody>
<tr>
<td><strong>Perceived Susceptibility</strong></td>
<td>One's opinion of chances of developing a condition</td>
<td>Define patients at risk, personalize risk based on a pt's features or behavior; heighten perceived susceptibility if too low</td>
<td>Provider can give anticipatory guidance to patient with symptoms of atopy and the risk of developing asthma. Provider can discuss smoking effects and disease progression. Provider should investigate a cough, even without wheezing present.</td>
</tr>
<tr>
<td><strong>Perceived Severity</strong></td>
<td>One's opinion of how serious a condition and its sequelae are</td>
<td>Specify consequences of the risk and the condition</td>
<td>Provider can explain that although pt has mild asthma, a life threatening attack can occur. Provider can discuss the ramifications of absenteeism, activity restrictions, and hospitalizations without the daily use of ICS. Evidence-based literature can make providers aware of the need to control inflammation with the daily use of ICS to prevent disease progression and absenteeism and decrease morbidity and mortality.</td>
</tr>
<tr>
<td><strong>Perceived Benefits</strong></td>
<td>One's opinion of the efficacy of using advised action to reduce risk or seriousness of impact</td>
<td>Define action to take; how, where, when; clarify positive effects to be</td>
<td>Patients can realize a relatively &quot;normal&quot; activities if asthma controlled by daily ICS use. Provider can reduce the burden of frequent office visits and hospitalizations by following guidelines.</td>
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Table 2. Health Belief Model (Continued)

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<th>Concept</th>
<th>Definition</th>
<th>Application</th>
<th>Application &amp; Outcome Examples</th>
</tr>
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<tbody>
<tr>
<td><strong>Perceived Barriers</strong></td>
<td>One's opinion of the tangible and psychological costs of advised action</td>
<td>Identify and reduce barriers through reassurance, incentives, assistance</td>
<td>Patient barriers can be decreased with the reinforcement of a written action plan, instruction on use of inhaler, PEF meter, and asthma diary, and the low-cost of ICS. Misconceptions of prescribed ICS use (ie, growth reduction) can be clarified by evidence-based literature review. GINA and NAEPP guidelines posted in exam rooms “remind” providers (and patients) the ease of the step-wise approach to managing asthma. ICS are included on all formularies.</td>
</tr>
<tr>
<td><strong>Cues to Action</strong></td>
<td>Strategies to activate “readiness”</td>
<td>Provide how-to-information, promote awareness, reminders.</td>
<td>Provider asks for and reviews patient PEF meter logs at each office visit. Provider can offer group asthma education and give incentives to patients who bring PEF meter logs to appointment visits. The NAEPP or GINA guidelines can be used in auditing charts for quality assurance.</td>
</tr>
<tr>
<td><strong>Self-Efficacy</strong></td>
<td>Confidence in pt's ability to take action</td>
<td>Provide education, guidance in performing action</td>
<td>Patient is proficient in managing his/her asthma and avoids disease progression. Provider receives monetary award for managing patient by following evidence-based medicine and therefore decreasing his/her patients’ morbidity and mortality.</td>
</tr>
</tbody>
</table>