Environmental Management of Pediatric Asthma

Guidelines for Health Care Providers

N • E • E • T • F
The National Environmental Education & Training Foundation

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NIEHS National Institute of Environmental Health Sciences

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This document has been reviewed in draft form by individuals chosen for their unique perspectives and technical expertise. The purpose of this independent review was to elicit candid and critical comments that would assist in making this publication as sound and effective as possible. We thank the following individuals for their review of this document:

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Although the reviewers listed above provided constructive comments and suggestions, they did not see the final draft of the document before its release. Responsibility for the final content rests with The National Environmental Education & Training Foundation.

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Introduction

These guidelines are the product of a new Pediatric Asthma Initiative aimed at integrating environmental management of asthma into pediatric health care. This document outlines competencies in environmental health relevant to pediatric asthma that should be mastered by primary health care providers, and outlines the environmental interventions that should be communicated to patients.

These environmental management guidelines were developed for pediatricians, family physicians, internists, pediatric nurse practitioners, pediatric nurses, and physician assistants. In addition, these guidelines should be integrated into respiratory therapists' and licensed case/care (LICSW) management professionals' education and training.

The guidelines contain three components:

- **Competencies:** An outline of the knowledge and skills that health care providers and health professional students should master and demonstrate in order to incorporate management of environmental asthma triggers into pediatric practice.
- **Environmental History Form:** A quick, easy, user-friendly document that can be utilized as an intake tool by the health care provider to help determine pediatric patients' environmental asthma triggers.
- **Environmental Intervention Guidelines:** Follow-up questions and intervention solutions to environmental asthma triggers.

Although environmental factors may play a role in the prevalence of asthma in the population, these guidelines are not directed at the primary prevention of pediatric asthma on a general scale. They are aimed instead at educating health care professionals on how to advise families about environmental interventions that can reduce or eliminate triggers for children who are already diagnosed with asthma.

It is important to recognize that environmental management is only one component of a comprehensive asthma management plan. These guidelines are founded upon the National Asthma Education and Prevention Program's (NAEPP) "Guidelines for the Diagnosis and Management of Asthma"[1] and it is recommended that they be used in conjunction with the clinical and pharmacological components of the NAEPP Guidelines. Additional guidance includes the use of pulmonary function testing and referral to an asthma specialist, either a pulmonologist or an allergist. No attempt is being made with these guidelines to supersede those of NAEPP, but rather to complement them. All children should have a written asthma care plan, and every child with mild persistent or more severe asthma should be treated with long-term control medication.

Environmental asthma triggers include indoor and outdoor allergens — such as dust mites, cockroaches, animal allergens, molds, and pollens — and indoor and outdoor pollutants and irritants, including environmental tobacco smoke (or secondhand smoke), chemicals, combustion by-products, and ozone and particulate matter. Although viruses and upper respiratory infections can exacerbate an asthma attack, they are not considered environmental asthma triggers for purposes of these guidelines.

The role of the asthma specialist (allergist or pulmonologist) may be crucial in helping to improve the care of these children. Primary care providers and asthma specialists should work together in evaluating the child, and in developing appropriate therapies and interventions. These guidelines are intended to guide primary care providers to consider environmental factors that may affect their patients' asthma. In some cases triggers may be more readily apparent than others. However, primary care providers should refer patients for allergy testing for confirmation of allergy when complicated or expensive interventions are being considered.

These guidelines are intended to be used with children (0-18 years) already diagnosed with asthma. Referral to a specialist is advised if the diagnosis of asthma is in doubt. Sources of guidelines for making the diagnosis of asthma include the NAEPP Guidelines and resources from Kaiser Permanente, the American Academy of Allergy Asthma & Immunology, and the American Academy of Pediatrics.

Background on the Pediatric Asthma Initiative

The Pediatric Asthma Initiative was launched by The National Environmental Education & Training Foundation, in partnership with the National Institute of Environmental Health Sciences and a steering committee of experts from academic institutions, federal agencies, and medical and nursing organizations. The Pediatric Asthma Initiative replicates the strategic framework of the National Strategies for Health Care Providers: Pesticides Initiative[2] developed by NEETF and the U.S. Environmental Protection Agency in partnership with a wide range of stakeholders. The Pesticides Initiative provides a model for incorporating environmental health information into the education and practice of primary health care providers. The Pesticides Initiative's National Pesticide Competency Guidelines for Medical & Nursing Education and the National Pesticide Practice Skills Guidelines for Medical & Nursing Practice served as models for the asthma guidelines.[3,4] Additional models were identified through a comprehensive literature search, in order to capitalize on current best practices and build upon existing tools and resources.

Environmental Management of Pediatric Asthma

The last several decades have seen a significant rise in the prevalence of asthma in children ages 0-17. Between 1980 and 1996, 12-month asthma prevalence among children increased from 3.5% to 6.2%. As of 2002, nine million U.S. children (12.2%) had ever been diagnosed with asthma[5], 6.1 million children (8.3%) currently had asthma[6], and 4.2 million (5.8%) had experienced an asthma attack within the previous year.[5] Asthma is more prevalent in children living in families below the poverty level. Children in poor families are more likely to have ever been diagnosed with asthma (16%) than children in families that are not poor (11%).[5] Children in fair or poor health are almost 7 times more likely to have had an asthma attack in the past 12 months than children in excellent or very good health (29% versus 4%).[5] In 2002, children age 5-17 missed 14.7 million school days due to asthma.[6] The environmentally attributable annual cost of pediatric asthma is estimated to be $2.0 billion.[7]

The role of environmental triggers of asthma is well recognized and has been included in the NAEPP Guidelines. Studies, such as the inner-city asthma study about individualized, home-based environmental interventions for hundreds of children in major U.S. cities, have demonstrated that environmental interventions decrease exposure to allergens, resulting in reduced asthma-associated morbidity.[8] However, in general, neither medical and nursing education programs nor pediatric practices frequently or fully incorporate environmental management and environmental history-taking into pediatric asthma treatment. A recent study reported that, although over half of practicing pediatricians surveyed had seen a patient with health issues related to environmental exposures, fewer than one-fifth were trained in taking an environmental history.[9]

The need for improvements in health professionals' environmental health knowledge has been expressed by leading health institutions, including the Institute of Medicine, the American Medical Association, and others.[10-14] Recognizing this need, the Ambulatory Pediatric Association issued a list of competencies for specialists in pediatric environmental health.[15] The American Academy of Pediatrics published a book on the identification, prevention, and treatment of childhood environmental health problems, which states that, "Avoiding environmental allergens and irritants is one of the primary goals of good asthma management."[16] The American Academy of Allergy Asthma & Immunology, acknowledging the importance of educating health care providers in this area, created an environmental management of asthma online continuing education program for its health care provider members.

A comprehensive approach to nursing and medical practice requires awareness, recognition, and treatment of critical factors that affect individual and community health, even if these factors are not obvious at first either to patients or their providers. Environmental interventions can occur if pediatric health care providers are knowledgeable about the importance and details of the issue, and able to communicate them effectively and sensitively to their patients' families.

Integration into the Curriculum and Clinical Practice

Although some modest progress has been made in introducing environmental management of pediatric asthma into medical and nursing curriculum and practice, studies conducted by medical and nursing expert workgroups, as well as leading medical and nursing organizations, recommend that environmental health content should be increased. Rather than compete with a crowded curriculum by adding separate course content, environmental management of asthma content can be integrated into existing pediatric instruction. This can be done by using environmental management of pediatric asthma to enhance existing case studies, or as exemplars. Additional opportunities for integration include the full range of continuing education programs, including Internet-based continuing education offerings, policy statements issued by national professional associations, and certification of training in environmental management of pediatric asthma.

For both medical and nursing education, a primary strategy for incorporating environmental management of pediatric asthma into existing curricula is to develop and support faculty champions/leaders who can take a leadership role in integrating children's environmental health into their institution in a sustainable fashion. These faculty members can lend expertise and support in their institutions and surrounding communities, teach courses, integrate competencies into curriculum, and serve as role models for how to integrate environmental health into health professional education. Residency Review Committees can require that such content be included in the residency curriculum. In addition, medical and nursing students can play a role in influencing curricula by educating fellow students through student organizations, such as the American Medical Student Association and National Student Nurse Association, and by encouraging school faculty and deans to introduce such content into the courses they offer.

Below are specific examples of points of insertion for environmental management of pediatric asthma content in medical and nursing curricula. It is recommended that such content be incorporated at all levels of the curricula.

- For medical education, the competencies can be incorporated into various courses throughout the four years of medical school and in residency. In the 1st and 2nd year of medical school, competencies can be taught in physical diagnosis, introduction to clinical medicine, and introduction to patient assessment courses. In the 3rd year, this material can be reinforced during clinical rotations and be included in medical school clerkships in pediatrics and family medicine. In the 4th year, such content can be included in electives for evidence-based medicine, environmental health, preventive health, epidemiology, or similar subject curriculum; in rotations for emergency medicine, public sector medicine, primary care, and pediatric medicine; and in instruction in ethical and legal issues of medical practice. Education should continue throughout residency training so that when a physician sees a child with asthma, environmental exposures and potential interventions are always included in the asthma management plan.
- For nursing education, environmental management of pediatric asthma content can be incorporated into various courses, electives, and units of instruction, depending on the curricula and course offerings of each school. For example, competencies in the knowledge, identification, and management of asthma triggers could be incorporated into patho-physiology, pediatric nursing, or community health nursing courses. Each of the competencies can be taught in classroom settings and reinforced in clinical rotations

for various subjects, such as community health, public health, home health, maternal/child health, and primary care management. Competencies could also be incorporated into additional units of instruction on topics such as health promotion, health education/teaching; protection and prevention of illness and injury; leadership in nursing; and current trends and issues in nursing practice including school nursing. The communication skills and advocacy competencies can be included in instruction on ethical, legal, and public policy issues and the patient advocacy role of the nurse. Additional points of insertion include environmental health nursing electives and fieldwork emphasizing environmental health.

There are numerous opportunities for incorporating environmental management of pediatric asthma content into pediatric health care practice. Practicing clinicians can introduce environmental management of pediatric asthma content into their daily practice by incorporating environmental history-taking and management of environmental triggers into the practices and protocols of the health settings where they deliver health care. Examples include adding environmental history-taking to electronic medical records, understanding the reimbursement available for teaching about environmental triggers and asthma management, or making referrals to asthma specialists or educators. Medical and nursing organizations and institutions can promote inclusion of environmental management of pediatric asthma in continuing education by offering continuing medical and nursing education sessions at conferences, grand rounds, and other educational functions, and by posting online modules on their websites.

In addition to medical and nursing curricula and clinical practice, it is recommended that environmental management of pediatric asthma content be integrated into the education and training of physician assistants, respiratory therapists, and licensed case/care (LICSW) management professionals.

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Part 1: Competencies for Environmental Management of Asthma

The set of competencies developed for the environmental management of asthma follow the normal sequence of interaction of health care provider and patient: knowledge, diagnosis, intervention/treatment, counseling, and education/communication. In addition, health care providers can play an important role in achieving wider health gains through advocacy of environmental improvements in the communities where they work. Sensitivity to the special needs of communities and individual families is very important when dealing with environmental interventions related to asthma.

These competencies apply to all settings where children (0-18 years) spend time, including homes, schools, daycares, cars, school buses, and recreational and occupational environments.

Competency I:
Knowledge of Environmental Asthma Triggers

1. **Develop a comprehensive knowledge base of indoor environmental triggers of asthma:**
   a. Recognize the components of indoor air pollution
   b. Recognize the effects of environmental tobacco smoke on asthma
   c. Recognize the sources and effects of dust mites on asthma
   d. Recognize the sources and effects of animal allergens on asthma
   e. Recognize the role of cockroach antigen on asthma
   f. Recognize the sources and effects of combustion by-products on asthma
   g. Recognize the sources and effects of mold on asthma
   h. Recognize the sources and effects of solvents and other chemical irritants
2. **Develop a comprehensive knowledge base of outdoor environmental triggers of asthma:**
   a. Recognize the components of outdoor air pollution
   b. Recognize how to interpret EPA's Air Quality Index (AQI)
   c. Recognize the effects of pollen (weeds, grasses, trees) on asthma
   d. Recognize the effects of molds on asthma
3. **Identify what particular environmental exposures are unique to the community in which one is practicing**
4. **Recognize the climatic factors that can exacerbate asthma**

Discussion:

A thorough knowledge of the environmental triggers of asthma is the basis for environmental interventions. Competency includes knowing both the effects as well as the sources of each trigger. Health care providers should have both a general knowledge of triggers as well as specific knowledge of the most frequent or common environmental triggers in their patients' communities, usually a result of outdoor air pollution (industrial smokestacks, releases of chemicals, roadways heavily used by trucks, etc.) or seasonal climate factors.

The list of triggers included here is not intended to be all-inclusive. Rather, it includes the triggers that appear to be most prevalent and for which there is the most evidence of impact. As further studies are undertaken, other triggers may be added to this list.

For specific information on environmental issues and sources of pollution in your area, speak with the state environmental department or local public health or environmental programs. Consult EPA's Envirofacts program (www.epa.gov/enviro/index_java.html) as a starting point in identifying environmental factors by zip code or map. Additional information on environmental asthma triggers can be obtained from a variety of organizations, such as the ones listed in the Appendix (page 28).

Competency II: Identification of Environmental Triggers of Asthma

1. **Be able to take a thorough environmental history for pediatric asthma patients**
2. **Determine when to refer for subspecialty consultation**
3. **Inquire about exposures that are unique to the pediatric asthma patient**
4. **Inquire about exposures unique to the community of the pediatric asthma patient**

Discussion:

While some families affected by asthma may recognize a connection between environmental factors and asthma, other families may not have considered them as potential triggers. Taking an environmental history can be a first step in creating the awareness that such a connection may exist. Families will not always make these connections, therefore it is important for health care providers to ask about the unique exposures that individuals might face in the home (or other indoor environments such as school and daycare) as well as in the community.

Health care providers should take into account the age of the child, the type of dwelling the child lives in, and the community or regional exposures that are most prevalent. There are some parts of the country, such as the South and Northwest, with relatively warm and humid climates where dust mite exposure and sensitivity are highly prevalent; in other areas, such as the Northeast, cockroach allergen sensitivity is more common. As a general rule, allergy becomes a more important part of asthma with each year of age from preschool up to about age 10-12, at which point roughly 80-90 percent of asthmatic children will have allergic triggers.

Most asthma specialists will perform specific testing to determine which allergen may trigger a patient's asthma symptoms. Skin testing is one efficient way to test for a large number of allergens, although other allergy testing procedures are available. In some cases, a thorough environmental history may point to a few specific triggers. An alternative to skin testing is the CAP-RAST, an in-vitro allergen specific test, which may be considered for a select group of major inhalant indoor environmental allergens e.g. house dust mite, pets, molds and cockroach. Proper interpretation of test results will likely require input from an allergy specialist.

Competency III:
Environmental Intervention and Treatment

1. **Understand the evidence for the various mitigation strategies for environmental triggers of asthma discussed under Competency I.**
2. **Be able to provide accurate information about the benefits and harms of products and services for control of environmental triggers**

Discussion:

A continuing difficulty in environmental management of asthma is that the data vary widely on different environmental triggers. Even triggers that might be commonly encountered in practice are often not well studied. Part 3 of these guidelines contains fact sheets for the most common environmental triggers and recommended interventions.

A number of products are promoted to the general public and people with asthma, claiming that they will remove environmental triggers of asthma. While some products such as allergen–impermeable pillow covers are recommended, others, such as ozone generating air cleaners that may result in harmful levels of ozone indoors are not recommended. Ozone-generators can, under certain conditions, produce levels of the lung irritant ozone significantly above levels thought harmful to human health. Ozone can damage the cells lining nasal passages and lungs making it difficult to breathe, and can exacerbate asthma symptoms. Parents should also be made aware that such air cleaning devices are sometimes placed in schools. Providers should understand the issues involved and provide information to families.

Competency IV: Ability to Counsel Caregivers and Pediatric Asthma Patient on the Reduction of Environmental Asthma Triggers

1. **Be able to counsel about reducing the effects of indoor environmental triggers of asthma, including:**
   a. reducing the child's exposure to tobacco smoke
   b. reducing exposure to indoor air pollution
   c. reducing dust mites in the home
   d. reducing animal allergens
   e. ways to mitigate cockroach antigen in the home
   f. reducing indoor exposure to molds
   g. avoiding exposure to solvents and other chemical irritants
2. **Be able to counsel about reducing the effects of outdoor environmental triggers of asthma, including:**
   a. reducing exposure to pollen
   b. reducing outdoor exposure to molds
   c. reducing or restricting exercise under adverse conditions, such as on AQI alert days
3. **Be able to recognize the stages of behavioral change as they relate to parental desires to stop smoking and other trigger abatements**

Discussion:

The term counseling is used here to give the sense of an interactive effort, in which the family affected by asthma is seen as a partner, an active participant in caring for the child with asthma. Counseling and educational efforts should extend to the variety of people who care for the person with asthma. This could include the child, older siblings, parents, grandparents, a babysitter, or other caregivers in the home. In addition to the child's own home, there may be other places (homes of relatives or neighbors, daycare centers, schools, the adolescent's and parents' workplace, recreational facilities) where the child spends significant amounts of time, and it may be appropriate to provide information to people in those settings as well.

Exercise-induced asthma could be related to stress from the exercise itself, or triggered by environmental exposures to air pollution or climatic factors if the exercise is done outdoors. In the latter case, providers should discuss with families options for indoor exercise.

Competency V: Effective Communication and Patient Follow-Up Skills

1. **Be culturally and linguistically competent**
2. **Be aware of developmental implications and discuss issues at an age- appropriate level**
3. **Identify where in your area pediatric asthma patients can be referred for home visits and home evaluations**
4. **Develop a system to track the pediatric asthma patients in your practice**
5. **Determine when to refer to an asthma educator or other social services**

Discussion:

Primary care providers need good communication skills with patients, families, and people in the community. While some environmental interventions are fairly simple and straightforward, others relate to highly sensitive issues. Some patients' families may be less likely to offer honest answers to sensitive questions (particularly on smoking and cockroaches) and may be unreceptive to entertaining the possibility of an intervention. Knowing different ways of asking about tobacco usage, for example, can help in getting the necessary information without alienating the respondent. While sensitive, the information is needed for accurate diagnosis and intervention.

Adherence to interventions for sensitive topics (e.g., smoking cessation, reducing exposure to pet allergens in the home) may present special challenges for the health care provider. Health care providers will need skills in enlisting the help of patients' families, even when it may involve considerable effort or sacrifice on their parts, for such things as removing pets from the home, or committing to quitting smoking or smoking only outdoors. People sometimes signal a willingness to change behaviors, such as smoking cessation, and providers should be sure not to miss such opportunities.

Because pediatric asthma covers the age range of 0-18 years, practitioners need to develop age-appropriate levels of communication for dealing with children, from infants to young adults.

It is also important to have good lines of communication between the primary care professional and the asthma specialist. Referrals are likely for various reasons, including prudent diagnosis, teaching the patient how to manage the asthma, allergy testing, interpreting pulmonary function testing, etc.

Competency VI: Advocacy

1. **Be able to assess an environmental exposure in the community**
2. **Be aware of smoking cessation programs offered in the community**
3. **Be able to communicate with community members, school board members, political groups, legislative bodies, media, and other stakeholders about environmental risks**
4. **Work with school officials to identify potential environmental exposures and advocate for targeted prevention strategies**
5. **Collaborate with community leaders to promote clean air where children live, learn, work, and play**
6. **Understand the concept of environmental justice and special needs of at-risk populations**

Discussion:

Health care providers have an important proactive role to play in working with the community to prevent certain environmental exposures. Developing networks of community groups and public officials can enhance a provider's effectiveness in accomplishing goals. Providers should also become aware of community resources, such as smoking cessation programs, to which they can refer patients.

The emphasis is on partnerships, which combine the efforts of family, relatives and neighbors, health care provider, school, and community in a collaborative effort.

Part 2: Environmental History Form for Pediatric Asthma

This form is intended for use with children already diagnosed with asthma. Designed for ease of use, the Environmental History Form is obviously not comprehensive and is intended as an initial intake tool. Questions with a "yes" answer should be followed up with additional in-depth questions on particular triggers and recommendations about possible interventions provided in Part 3. It is recommended that a health care provider (physician, nurse, nurse practitioner, or physician's assistant) administer the questions rather than being given to the patient's caregiver to fill out.

The Environmental History Form is also available as a Word document on the Web (http://www.neetf.org/Health/asthmahistoryform.htm); If the practice uses an electronic medical record, clinicians can cut and paste all or parts of it into their existing history-taking templates. In addition to clinical practice, the form can be used as a teaching tool at nursing and medical schools along with the competencies and the intervention guidelines.

The far right hand side of the form has a column labeled "Follow Up", which allows the provider to add notes about what has or has not been done about particular triggers. Practitioners should be able to make a viable recommendation to control the environmental trigger about which they are asking; therefore, questions which do not have a follow-up action that can reasonably be taken are not included on this form.

Practitioners should use a great deal of sensitivity in taking an environmental history. As noted earlier, some families are aware of possible connections between behavior, conditions in the home and school, and pediatric asthma. Others are unaware of these linkages, and the environmental history will be the first opportunity to make these connections. Providers should not hesitate to ask the questions for fear that the answers will be inaccurate. Even if a question is not answered accurately, the question itself suggests to the person that there is a connection between asthma and the activity in question, and therefore may be a useful motivation to change behavior in the future.

It is very important to ask about all environments in which a child with asthma may be spending significant amounts of time, including all residences where the child sleeps or spends time, schools, daycares, camps, work, recreational activities, and college dorms (for 17-18 year olds). This form should also be used to elicit information on triggers commonly overlooked, such as weekly trips to a relative where a hobby or pet is located.

Environmental History Form for Pediatric Asthma Patient

Specify that questions related to the child's home also apply to other indoor environments where the child spends time, including school, daycare, car, school bus, work, and recreational facilities.

				Follow up/ Notes
Is your child's asthma worse at night?	❑ Yes	❑ No	❑ Not sure	
Is your child's asthma worse at specific locations? If so, where? _____	❑ Yes	❑ No	❑ Not sure	
Is your child's asthma worse during a particular season? If so, which one? _____	❑ Yes	❑ No	❑ Not sure	
Is your child's asthma worse with a particular change in climate? If so, which?_____	❑ Yes	❑ No	❑ Not sure	
Can you identify any specific trigger(s) that makes your child's asthma worse? If so, what? _____	❑ Yes	❑ No	❑ Not sure	
Have you noticed whether dust exposure makes your child's asthma worse?	❑ Yes	❑ No	❑ Not sure	
Does your child sleep with stuffed animals?	❑ Yes	❑ No	❑ Not sure	
Is there wall-to-wall carpet in your child's bedroom?	❑ Yes	❑ No	❑ Not sure	
Have you used any means for dust mite control? If so, which ones? _____	❑ Yes	❑ No	❑ Not sure	
Do you have any furry pets?	❑ Yes	❑ No	❑ Not sure	
Do you see evidence of rats or mice in your home weekly?	❑ Yes	❑ No	❑ Not sure	
Do you see cockroaches in your home daily?	❑ Yes	❑ No	❑ Not sure	
Do any family members, caregivers or friends smoke?	❑ Yes	❑ No	❑ Not sure	
Does this person(s) have an interest or desire to quit?	❑ Yes	❑ No	❑ Not sure	
Does your child/teenager smoke?	❑ Yes	❑ No	❑ Not sure	
Do you see or smell mold/mildew in your home?	❑ Yes	❑ No	❑ Not sure	
Is there evidence of water damage in your home?	❑ Yes	❑ No	❑ Not sure	
Do you use a humidifier or swamp cooler?	❑ Yes	❑ No	❑ Not sure	
Have you had new carpets, paint, floor refinishing, or other changes at your house in the past year?	❑ Yes	❑ No	❑ Not sure	
Does your child or another family member have a hobby that uses materials that are toxic or give off fumes?	❑ Yes	❑ No	❑ Not sure	
Has outdoor air pollution ever made your child's asthma worse?	❑ Yes	❑ No	❑ Not sure	
Does your child limit outdoor activities during a Code Orange or Code Red air quality alert for ozone or particle pollution?	❑ Yes	❑ No	❑ Not sure	
Do you use a wood burning fireplace or stove?	❑ Yes	❑ No	❑ Not sure	
Do you use unvented appliances such as a gas stove for heating your home?	❑ Yes	❑ No	❑ Not sure	
Does your child have contact with other irritants (e.g., perfumes, cleaning agents, or sprays)?	❑ Yes	❑ No	❑ Not sure	

What other concerns do you have regarding your child's asthma that have not yet been discussed?

_____

_____

NEETF Pediatric Asthma Initiative

Part 3:
Environmental Intervention Guidelines

These environmental intervention guidelines are to be used for children already diagnosed with asthma. A separate fact sheet is provided for each of the major environmental asthma triggers. The questions on these fact sheets are intended to supplement the questions listed in the environmental history form related to each trigger. Interventions that are thought to be the most crucial for each asthma trigger are listed first and in ***bold*** *type. In addition to educating families on effective interventions, it is also important to explain why certain interventions are not recommended, particularly the use of ozone-generating air cleaners which may be harmful. Furthermore, providers should give families affected by asthma: educational materials (an example of a patient handout is listed under each trigger); relevant website information; and information about allergy supplies, smoking cessation programs, and other community resources. A variety of these materials available from a number of organizations are listed at http://www.neetf.org/Health/asthma_resources.htm.*

The intervention guidelines assume a two-visit concept for the patient. The first visit includes taking an environmental history, possible allergy testing or referral, and a commitment by the parent to work on reducing exposures to known allergens or irritants. The second, follow-up visit involves counseling of the patient or patient's family on controlling the exposures that trigger the child's asthma. In addition to this two-visit concept, providers should work with the family to schedule appropriate follow-up visits to evaluate the patients' self-management skills. It is very important to ask about all environments in which a child with asthma may be spending significant amounts of time, including all residences where the child sleeps or spends time, such as schools, daycares, camps, and college dorms.

Although primary care providers do not perform skin testing as an asthma specialist might, in vitro testing is an option that may be considered. However, any testing should be focused on allergens that are identified by the environmental history, and should not replace timely allergy referral. The health care provider should try to document sensitivity for each suspected allergen through allergy testing before making any major or costly recommendations related to environmental controls. However, some simple and low cost recommendations may be reasonable, particularly in areas where widespread exposure to cockroaches or dust mites is well known. Providers can assist families in implementing environmental interventions by helping them prioritize the changes they make in the home. For example, providers can encourage families to begin by creating a safe sleeping zone for the child.

A separate fact sheet is not provided for outdoor pollens (from trees, grass, or weeds) and molds. To avoid exposures, children should be recommended to stay indoors with windows closed in an air conditioned environment — if possible — during the season in which they have problems with outdoor allergens, especially during the afternoon.

Viral illnesses are not included in this list of environmental triggers, although their importance in triggering and exacerbating asthma is recognized. Primary care providers should remain aware that when a child with known asthma develops an upper respiratory infection, an asthma exacerbation is likely to follow.

As noted earlier, environmental management is only one component of a comprehensive asthma management plan. It is recommended that these materials be used in conjunction with the National Asthma Education and Prevention Program's clinical and pharmacological guidelines.

Dust Mites and Asthma

Dust mites are tiny microscopic relatives of the spider that live on mattresses, bedding, upholstered furniture carpets, and curtains. These tiny creatures feed on the flakes of skin that people and pets shed daily, and they thrive in warm and humid environments.

Additional History Questions to Supplement the History Form

- Did you know that dust mite exposure can trigger asthma symptoms?
- What type of floor covering is in your child's bedroom?
- Do you have a vacuum cleaner with a HEPA filter?
- What have you tried so far to reduce dust/dust mite exposure?
- How often do you wash your child's bed linens?
- Are you currently using a mattress or pillow covering on your child's bed?
- Do you use other ways to decrease dust mite exposure?

Possible Interventions:

No matter how clean a home is, dust mites cannot be totally eliminated. The following suggestions can reduce exposure. Emphasis should be placed on reducing dust mite exposure where the child sleeps.

- **Encase all pillows and mattresses of the beds that the child sleeps on using allergen impermeable encasings.** (There are numerous sources for allergen impermeable encasings, and prices as well as quality may vary.)
- **Wash bedding weekly to remove allergen. Wash in hot water (130˚ F) to kill mites**
- Replace wool or feathered bedding with synthetic materials that will withstand repeated hot water washing
- Either remove from the bedroom or wash and thoroughly dry stuffed toys weekly
- Move stuffed toys away from the pillow the child sleeps on
- Vacuum once or twice weekly preferably using a vacuum cleaner with a HEPA filter or a double-layered microfilter bag (when the child is not around)
- Use a damp mop or rag to remove dust, not a dry cloth that just stirs up dust mite allergens
- Avoid use of humidifiers
- The following interventions are expensive and are only recommended after an allergist has identified your child as allergic to dust mites:
- Consider replacing draperies with blinds or other wipeable window covering
- Consider carpet removal in the child's bedroom
- Consider removing upholstered furniture
- Consider using portable air cleaner with HEPA filter for child's bedroom
- **Avoid use of ozone generators and certain ionic air cleaners which can actually generate harmful ozone**

Follow-Up / Notes:

Possible Information Flyer to Give to Patient Families:

Asthma & Allergy Prevention: Dust Mites
http://www.niehs.nih.gov/airborne/prevent/mites.html

Animal Allergens and Asthma

Additional History Questions to Supplement the History Form

- What type of furry pet(s) do you have (and how many of each)?
- Is it a strictly indoor pet? _____ outdoor? _____ indoor/outdoor? _____
- Does your child sleep with the pet?
- Has your child's asthma become worse since having the pet?
- If you moved your pet outdoors, did your child's asthma improve?
- If there is evidence of rodents in your home, how severe is the problem (mild, moderate, severe, very severe)
- Does your child's classroom (or other places he/she spends time) have a furry pet that he/she plays with?

Possible Interventions:

Interventions with regard to pets should only be recommended if the child is allergic to the animal. Testing should therefore be done before making any recommendations. To reduce your child's exposure to animal allergens, the first two options below have been shown to be the most effective:

- **Consider finding a new home for indoor cats, dogs, and pet rodents**
- **At a minimum, keep pets outside**
- If neither of those are possible, the following may help reduce exposure:
- Keep pets out of the child's bedroom
- Encase mattresses and pillows
- Remove carpets
- Vacuum regularly using a cleaner with a HEPA filter or a double-layered microfilter bag (when the child is not around)
- Use portable air cleaner with HEPA filter for child's bedroom
- Keep pets off furniture and out of cars
- Bathing cats and dogs has been shown to decrease these allergens, however, it must be done at least twice a week to be effective
- **If rats or mice have been observed, use the least toxic extermination method, such as traps and baits**
- **Also use methods listed for cockroach control (See Cockroach Allergen and Asthma fact sheet on page 22)**

Follow-Up / Notes:

Possible Information Flyer to Give to Patient Families:

Allergy & Asthma Prevention: Pets & Animals
http://www.niehs.nih.gov/airborne/prevent/pets.html

Cockroach Allergen and Asthma

Additional History Questions to Supplement the History Form:

- Approximately how many cockroaches do you see in your home on a daily basis?
- Do you see evidence of cockroach droppings?
- How do you get rid of the cockroaches in your home?
- Does your child's school (or other places she/he spends time) have cockroaches?

Possible Interventions:

Eradication can be very difficult, especially in apartment buildings, and it is often temporary. Roaches follow food and water sources in your house. In general, the **least toxic methods of roach control should be employed first.**

- **Clean up all food items/ crumbs/ spills as soon as possible**
- **Store food and trash in closed containers**
- **Limit spread of food around house, especially bedrooms**
- **Fix water leaks under sinks**
- **Mop kitchen floor at least once a week**
- **Clean counter tops daily**
- Take garbage out daily
- Check for and plug up crevices outside your house that cockroaches may enter
- **Use the integrated pest management (IPM) approach for extermination — least toxic methods first**
- Use boric acid powder under stoves and other appliances
- Use bait stations and gels. It is highly recommended to use a professional, licensed exterminator.
- If you choose to apply the pesticides yourself, read the product label and follow all directions carefully
- Avoid using liquid sprays inside the house, especially near places children crawl, play, or sleep
- **Never attempt to use industrial strength pesticide sprays that require dilution**

Follow-Up / Notes:

Possible Information Flyer to Give to Patient Families:

Asthma & Allergy Prevention: Cockroaches
http://www.niehs.nih.gov/airborne/prevent/roach.html

Mold/Mildew and Asthma

Mold spores are allergens that can be found both indoors and outdoors. Molds are found indoors in dark, warm, and humid environments such as basements, attics, bathrooms, and laundry rooms. They are also found in air conditioners, humidifiers, refrigerator drip trays and garbage pails. Molds grow outdoors in moist shady areas. They are common in soil, decaying vegetation, compost piles, rotting wood, and fallen leaves. Mold growth outdoors is seasonal, first appearing in early spring and thriving until the first frost.

Additional History Questions to Supplement the History Form:

- Do you see mold growth in any part of your home?
- How large an area is the mold growth? (i.e. greater than 3 ft. x 3 ft?)
- Does your child's school (or other places he/she spends time) have mold growth?
- Do you have problems with moisture or leaks in your home?
- Do you frequently have condensation on your windows?
- Have you tried using something to decrease the humidity in your home?

Possible Interventions:

The emphasis should first be on controlling all sources of moisture in the house. Items that are too moldy to clean should be discarded. The size of the mold contamination in the house should determine how the mold gets cleaned up. Generally, an area of 3 feet x 3 feet or larger should be cleaned by a professional.

- Check faucets, pipes, and ductwork for leaks and repair as soon as possible
- Control indoor humidity
  - Use a dehumidifier or air conditioner (non evaporative or water-filled type) to maintain indoor relative humidity below 50%
  - Clean the dehumidifier as instructed by the manufacturer
  - Do not use a humidifier
  - Vent bathrooms and clothes dryers to the outside
  - Install and use exhaust fans in the kitchen, baths and damp areas
  - Avoid carpet and wallpaper in rooms prone to dampness
  - For those who own a home with an evaporative cooler, control the humidity level with a dehumidifier
- When first turning on home or car air conditioners, have your child leave the room or drive with the windows open for several minutes to allow mold spores to disperse
- Remove decaying debris from the yard, roof, and gutters
- Your child should avoid raking leaves, mowing lawns, or working with peat, mulch, hay, or dead wood if he/she is allergic to mold spores
- If you choose to clean mold yourself, use chlorine solution diluted 1:10 with water but do not mix bleach with other cleaning solutions containing ammonia due to toxic fumes
- Quaternary ammonium compounds are effective fungicides when bleach cannot be used
- For extensive mold contamination, (greater than 9 square feet – 3 ft. x 3 ft.) professional removal is recommended.

Follow-Up / Notes:

Possible Information Flyer to Give to Patient Families:

Asthma & Allergy Prevention: Mold Spores
http://www.niehs.nih.gov/airborne/prevent/mold.html

Environmental Tobacco Smoke and Asthma

Cigarette smoke contains many toxic chemicals and irritants. Children exposed to tobacco smoke have increased asthma exacerbations and other problems, including lower respiratory infections and middle ear infections. Infants have an increased risk of sudden infant death syndrome. Simply "smoking outside" is not enough to limit the harm to children from tobacco smoke. Remember that smoke settles in clothes, hair, car upholstery, and furniture. Once a parent or a caregiver acknowledges that he/she smokes, the provider should consider writing a referral for a smoking cessation or a community support program.

Additional History Questions to Supplement the History Form:

- Who in the family smokes cigarettes?
  How many cigarettes per day?
  Does he/she (they) smoke in the house? _____
  Outside? _____ Both inside and outside? _____ In the car? _____
- Does anyone who spends time at your house smoke (friends, neighbors, relatives)?
- Have you established a smoking ban or no smoking policy in the household?
- Does anyone smoke in childcare settings where the child stays?
- Describe the circumstances when your child may be exposed to smoke?

Possible Interventions:

- **Keep your home and car smoke-free**
- **Seek support to quit smoking, consider aids such as nicotine gum, patch, and medication from your doctor to help you in quitting**
- **Choose smoke-free childcare and social settings**
- Seek smoke-free environments in restaurants, theaters, and hotel rooms
- If you choose to smoke, do not smoke near your child

Follow-Up / Notes:

Possible Information Flyer to Give to Patient Families:

Asthma & Allergy Prevention: Cigarette Smoke
http://www.niehs.nih.gov/airborne/prevent/smoke.html

Air Pollution and Asthma

This category covers a wide range of toxic chemicals and pollutants, whether from industrial or vehicle pollution outdoors, or from the use of wood stoves, volatile organic compounds, or other substances indoors. Combustion by–products (e.g., nitrogen dioxide) and other pollutants can be respiratory irritants. Solvents and other chemicals can be found in building materials and can volatize during the 1-2 year period after new construction. Diesel exhaust from school buses and other forms of air pollution can also worsen asthma. Health care providers may want to sign up for Enviroflash email or pager notification of air quality forecasts in areas where it is offered. (For more information, see: http://cfpub.epa.gov/airnow/index.cfm?action=airnow.enviroflash)

Additional History Questions to Supplement the History Form:

Indoor Air Pollution Questions

- Do you live in a home that was built in the past 1-2 years?
- If you recently made changes to your house – installed new carpets, painted, or other changes – how long ago was that?
- Was there a change in your child's asthma symptoms after moving to a new house or having the work mentioned above done in your home?
- Do you ever notice a chemical smell in your home?
- If you have a wood burning fireplace or stove, how many times per month in the winter do you use it?
- Does anyone in your house use strong-smelling perfumes, scented candles, hairsprays, or other aerosol substances?

Outdoor Air Pollution Questions

- Do you live within 300 yards of a major roadway or highway? _____ An area where trucks or other vehicles idle? _____ A major industry with smokestacks? _____
- Is residential or agricultural burning a problem where you live?
- How do you hear about air quality alerts?

Possible Interventions:

For **indoor** air pollution, the two best approaches to reducing indoor air pollution are source control and ventilation.

- **Eliminate tobacco smoke**
- **Use good housekeeping practices to control particles**
- **Install an exhaust fan close to the source of contaminants, and vent it to the outside**
- Properly ventilate the room where a fuel-burning appliance is being used
- Ensure that wood stove doors are tight-fitting
- Follow manufacturers' instructions when using an unvented kerosene or gas space heater
- Ensure that fireplaces are properly vented so smoke escapes through the chimney
- Never use a gas-cooking appliance as a heating source
- Open windows especially when indoor pollutant sources are in use (this option must be balanced against the concern of mold or other plant allergens and outdoor air pollution)
- Parents should change clothes prior to returning from work if they work around any strong smelling chemicals or paints or other toxic substances
- Avoid strong odors and minimize use of products and materials that emit irritants, such as smoke, strong perfumes, talcum powder, hair sprays, cleaning products, paint fumes, sawdust, chalk dust, air freshener sprays, and insect sprays

Outdoor air pollution, especially ozone and particulate matter can increase asthma symptoms.

- **Monitor air quality index levels and reduce your child's outdoor activities when the AQI is in the unhealthy range**
- **If your child's symptoms are worse or he/she requires more albuterol (rescue medicine) the day after AQI levels are in the unhealthy range, contact your health care provider**
- Use HEPA filters in household vents
- Reduce use of candles, wood-burning stoves and fireplaces
- If particle pollution levels are high outdoors, do not vacuum the floor since this increases particle levels indoors
- Advise your child to stay away from the exhaust pipe of idling school buses and trucks
- Consider moving to a new location if this is possible

Follow-Up / Notes:

Possible Information Flyers to Give to Patient Families:

Asthma Home Environment Checklist
http://permanent.access.gpo.gov/websites/epagov/www.epa.gov/asthma/images/home_environment_checklist.pdf

Asthma And Outdoor Air Pollution
http://www.epa.gov/airnow/health-prof/Asthma_Flyer_Final.pdf

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Kaiser Permanente SoCal Environmental Control Sheet.

National Institute of Environmental Health Sciences. Asthma and Allergy Prevention Home page. Available at: http://www.niehs.nih.gov/airborne/prevent/alert.html.

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Appendix: Sources of Additional Information

Information on environmental asthma triggers can be obtained from a variety of organizations, including:

- American Academy of Allergy, Asthma and Immunology (www.aaaai.org)
- American Academy of Pediatrics (www.aap.org)
- American College of Allergy, Asthma, and Immunology (www.aaai.org)
- American Lung Association (www.lungusa.org)
- Kaiser Permanente (www.kaiserpermanente.org)
- National Asthma Education and Prevention Program (http://www.nhlbi.nih.gov/about/naepp/)
- National Library of Medicine's Toxtown (http://toxtown.nlm.nih.gov)
- U.S. Environmental Protection Agency
  Asthma and Indoor Environments (www.epa.gov/asthma/)
  Regional Offices (http://www.epa.gov/epahome/locate2.htm)

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Environmental Asthma Trigger Source Reduction

Source Control: General

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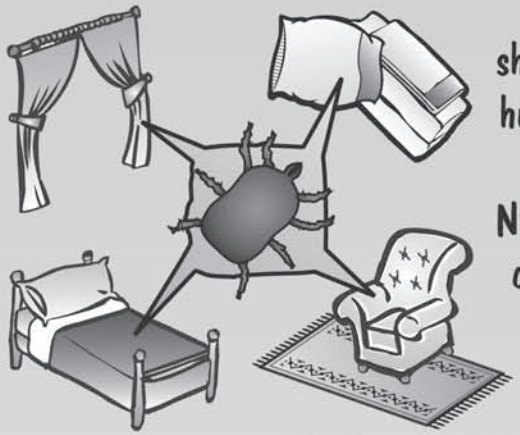
Sample Patient Flyers

DUST MITES

Dust mites are tiny microscopic relatives of the spider and live on mattresses, bedding, upholstered furniture, carpets and curtains.

These tiny creatures feed on the flakes of skin that people and pets shed daily and they thrive in warm and humid environments.



No matter how clean a home is, dust mites cannot be totally eliminated. However, the number of mites can be reduced by following the suggestions below.

Preventive Strategies

- Encase your mattress and pillows in dust-proof or allergen impermeable covers (available from specialty supply mail order companies or some bedding and department stores).
- Wash all bedding and blankets once a week in hot water (at least 130-140° F) to kill dust mites. Non-washable bedding can be frozen overnight to kill dust mites.
- Replace wool or feathered bedding with synthetic materials and traditional stuffed animals with washable ones.
- If possible, replace wall-to-wall carpets in bedrooms with bare floors (linoleum, tile or wood) and remove fabric curtains and upholstered furniture.
- Use a damp mop or rag to remove dust. Never use a dry cloth since this just stirs up mite allergens.
- Use a dehumidifier or air conditioner to maintain relative humidity at about 50% or below.
- Use a vacuum cleaner with either a double-layered microfilter bag or a HEPA filter to trap allergens that pass through a vacuum's exhaust.
- Wear a mask while vacuuming to avoid inhaling allergens, and stay out of the vacuumed area for 20 minutes to allow any dust and allergens to settle after vacuuming.

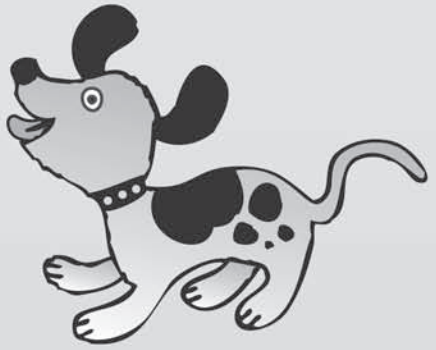
NIEHS
National Institute of Environmental Health Sciences

http://www.niehs.nih.gov/airborne/prevent/mites.html

PETS & ANIMALS

Many people think animal allergies are caused by the fur or feathers of their pet. In fact, allergies are actually aggravated by:

- proteins secreted by oil glands and shed as dander
- proteins in saliva (which stick to fur when animals lick themselves)
- aerosolized urine from rodents and guinea pigs



Keep in mind that you can sneeze with and without your pet being present. Although an animal may be out of sight, their allergens are not. This is because pet allergens are carried on very small particles. As a result, pet allergens can remain circulating in the air and remain on carpets and furniture for weeks and months after a pet is gone. Allergens may also be present in public buildings, schools, etc. where there are no pets.

Preventive Strategies

- Remove pets from your home if possible.
- If pet removal is not possible, keep them out of bedrooms and confined to areas without carpets or upholstered furniture.
- If possible, bathe pets weekly to reduce the amount of allergens.

- Wear a dust mask and gloves when near rodents.
- After playing with your pet, wash your hands and clean your clothes to remove pet allergens.
- Avoid contact with soiled litter cages.
- Dust often with a damp cloth.

NIEHS
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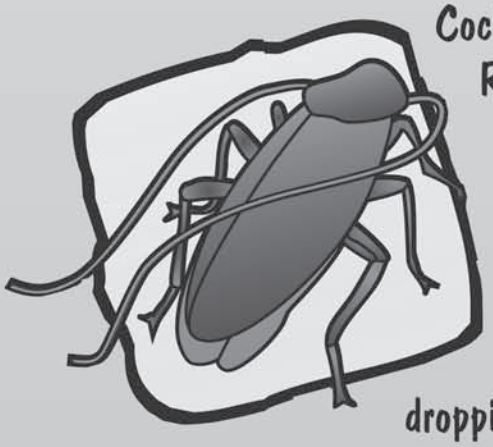
http://www.niehs.nih.gov/airborne/prevent/pets.html

COCKROACHES



Cockroaches are one of the most common and allergenic of indoor pests. Recent studies have found a strong association between the presence of cockroaches and increases in the severity of asthma symptoms in individuals who are sensitive to cockroach allergens. These pests are common even in the cleanest of crowded urban areas and older dwellings. They are found in all types of neighborhoods. The proteins found in cockroach saliva are particularly allergenic but the body and droppings of cockroaches also contain allergenic proteins.

Preventive Strategies

- Limit the spread of food around the house and especially keep food out of bedrooms.
- Keep food and garbage in closed, tight-lidded containers. Never leave food out in the kitchen.
- Do not leave out pet food or dirty food bowls.
- Mop the kitchen floor and wash countertops at least once a week.
- Eliminate water sources that attract these pests, such as leaky faucets and drain pipes.
- Plug up crevices around the house through which cockroaches can enter.
- Use bait stations and other environmentally safe pesticides to reduce cockroach infestation.

NIEHS
National Institute of Environmental Health Sciences

http://www.niehs.nih.gov/airborne/prevent/roach.html

MOLD SPORES

Several molds that grow both indoors and outdoors, produce allergenic substances. These allergens can be found in mold spores and other fungal structures (e.g. hyphae). There is no definite seasonal pattern to molds that grow indoors. However outdoor molds are seasonal, first appearing in early spring and thriving until the first frost.

Indoor molds are found in dark, warm, humid and musty environments such as damp basements, cellars, attics, bathrooms and laundry rooms. They are also found where fresh food is stored, in refrigerator drip trays, garbage pails, air conditioners and humidifiers.

Outdoor molds grow in moist shady areas. They are common in soil, decaying vegetation, compost piles, rotting wood and fallen leaves.

Preventive Strategies

- Use a dehumidifier or air conditioner to maintain relative humidity below 50% and keep temperatures cool.
- Vent bathrooms and clothes dryers to the outside, and run bathroom and kitchen vents while bathing and cooking.
- Regularly check faucets, pipes and ductwork for leaks.
- When first turning on home or car air conditioners, leave the room or drive with the windows open for several minutes to allow mold spores to disperse.
- Remove decaying debris from the yard, roof and gutters.
- Avoid raking leaves, mowing lawns or working with peat, mulch, hay or dead wood. If you must do yard work, wear a mask and avoid working on hot, humid days.

NIEHS
National Institute of Environmental Health Sciences

http://www.niehs.nih.gov/airborne/prevent/mold.html

CIGARETTE SMOKE

Cigarette smoke contains a number of toxic chemicals and irritants. People with allergies may be more sensitive to cigarette smoke than others and research studies indicate that smoking may aggravate allergies.

Smoking does not just harm smokers but also those around them. Research has shown that children and spouses of smokers tend to have more respiratory infections and asthma than those of non-smokers. In addition, exposure to second-hand smoke can increase the risk of allergic complications such as sinusitis and bronchitis.

Common symptoms of smoke irritation are burning or watery eyes, nasal congestion, coughing, hoarseness and shortness of breath presenting as a wheeze.

Preventive Strategies

- Don't smoke and if you do, seek support to quit smoking. Contact Puff-Free Partners, such as:

National Cancer Institute
1-800-QUIT-NOW
http://www.smokefree.gov

Nicotine Anonymous
1-415-750-0328
http://www.nicotine-anonymous.org

American Lung Association
1-800-LUNG-USA
http://www.lungusa.org/ tobacco/index.html

Centers for Disease Control
1-800-CDC-1311
http://www.cdc.gov/tobacco/how2quit.htm

American Cancer Society
1-800-ACS-2345
http://www.cancer.org/tobacco

- Seek smoke-free environments in restaurants, theaters and hotel rooms.
- Avoid smoking in closed areas like homes or cars where others may be exposed to second-hand smoke.

NIEHS
National Institute of Environmental Health Sciences
http://www.niehs.nih.gov/airborne/prevent/smoke.html

United States Environmental Protection Agency

ASTHMA HOME ENVIRONMENT

☑ CHECKLIST

Home visits provide an opportunity to educate and equip asthma patients with the tools to effectively manage their disease in concert with a physician's care. This checklist—designed for home care visitors—provides a list of questions and action steps to assist in the identification and mitigation of environmental asthma triggers commonly found in and around the home. The checklist is organized into three sections—building information, home interior and room interior. The room interior is further subdivided by categories (such as bedding and sleeping arrangements, flooring, window treatments, and moisture control). This will allow the home care visitor to focus on the specific activities or things in a room—in particular the asthma patient's sleeping area—that might produce or harbor environmental triggers. The activities recommended in this checklist are generally simple and low cost. Information on outdoor air pollution follows the checklist. The last page includes information on U.S. Environmental Protection Agency (EPA) resources and an area for the home care visitor to record a home visit summary.

If the patient's sensitivities to allergens (such as dust mites, pests, warm-blooded pets and mold) and irritants (such as secondhand smoke and nitrogen dioxide) are known, the home care visitor should begin by focusing on relevant areas. This checklist covers the following allergens and irritants, which are commonly found in homes. Information is also provided on chemical irritants—found in some scented and unscented consumer products—which may worsen asthma symptoms.

Dust Mites

Triggers: Body parts and droppings.

Where Found: Highest levels found in mattresses and bedding. Also found in carpeting, curtains and draperies, upholstered furniture, and stuffed toys. Dust mites are too small to be seen with the naked eye and are found in almost every home.

Pests (such as cockroaches and rodents)

Triggers: Cockroaches – Body parts, secretions, and droppings.
Rodents – Hair, skin flakes, urine, and saliva.

Where Found: Often found in areas with food and water such as kitchens, bathrooms, and basements.

Warm-Blooded Pets (such as cats and dogs)

Triggers: Skin flakes, urine, and saliva.

Where Found: Throughout entire house, if allowed inside.

Mold

Triggers: Mold and mold spores which may begin growing indoors when they land on damp or wet surfaces.

Where Found: Often found in areas with excess moisture such as kitchens, bathrooms, and basements. There are many types of mold and they can be found in any climate.

Secondhand Smoke

Trigger: Secondhand smoke – Mixture of smoke from the burning end of a cigarette, pipe or cigar and the smoke exhaled by a smoker.

Where Found: Home or car where smoking is allowed.

Nitrogen Dioxide (combustion by-product)

Trigger: Nitrogen dioxide – An odorless gas that can irritate your eyes, nose, and throat and may cause shortness of breath.

Where Found: Associated with gas cooking appliances, fireplaces, woodstoves, and unvented kerosene and gas space heaters.

BUILDING INFORMATION

(This information may be helpful to determine reasonable mitigations.)

What type of building does the patient live in?

- ☐ House
- ☐ Duplex
- ☐ Apartment
- ☐ Mobile home
- ☐ Other_____

Notes:

Does the patient own or rent?

- ☐ Own
- ☐ Rent

Notes:

Questions	Answers	Action Steps
HOME INTERIOR		▲ **MAY REQUIRE ADDITIONAL TIME AND/OR RESOURCES.**
Secondhand Smoke		
Does anyone smoke in the home or car?	☐ Y ☐ N	■ Keep the home and car smoke-free. ■ Do not allow visitors to smoke in the home. ■ Take the smoke-free home pledge and post a smoke-free home decal or magnet to show that the house is a "smoke-free" zone.
Notes:		
Warm-blooded Pets (such as cats and dogs)		
Is the patient's asthma worse when around warm-blooded pets?	☐ Y ☐ N	■ If possible, remove the pet from the home or keep the pet outside. ■ If this is not possible, keep the pet out of the patient's sleeping area and off of the furniture.
Notes:		
Consumer Products		
Is the patient's asthma worse when around chemicals or products with strong odors (such as cleaners, paints, adhesives, pesticides, air fresheners, or cosmetics)?	☐ Y ☐ N	■ Limit patient's exposure as much as possible by minimizing product use, using products only when patient is not present, or trying alternative products. ■ If products are used, carefully follow manufacturer's instructions on the label and make sure the area is well ventilated.
Notes:		
Heating and Cooling Systems		
Does the heating and cooling system use filters?	☐ Y ☐ N	▲ If so, replace the filters quarterly. ▲ Use filters with higher efficiency than standard furnace filters, such as upgraded pleated filters, if heating or cooling system manufacturer's specifications allow.
Notes:		

Questions	Answers	Action Steps
HOME INTERIOR (continued)		▲ **MAY REQUIRE ADDITIONAL TIME AND/OR RESOURCES.**
Does the heating system use a fuel-burning appliance (such as an oil or gas furnace)? *Notes:*	☐ Y ☐ N	▲ Have the heating system - including furnaces, flues and chimneys - professionally inspected annually. ▲ Promptly repair cracks or damaged parts.
Are supplemental heating sources used? (Check all that apply) *Notes:*	☐ Fireplace ☐ Wood-burning stove ☐ Unvented kerosene or gas space heater ☐ Other_____	■ Properly ventilate the room where a fuel-burning appliance is used. Consider using appliances that vent to the outside whenever possible. ■ Never use a gas-cooking appliance as a heating source. ■ If using a fireplace, make sure it is properly vented to help ensure smoke escapes through the chimney. ■ If using a wood-burning stove, make sure that doors are tight-fitting. Use aged or cured wood only and follow the manufacturer's instructions for starting, stoking, and putting out the fire. ■ If using an unvented kerosene or gas space heater, follow the manufacturer's instructions for proper fuel to use and keep the heater properly adjusted.
Are there air conditioning window units? *Notes:*	☐ Y ☐ N	■ Run window air conditioner with the vent control open to increase the outdoor ventilation rate during the cooling season.
ROOM INTERIOR		
Bedding and Sleeping Arrangements		
What does the patient sleep on? (Check all that apply) *Notes:*	☐ Mattress with box springs ☐ Sofa ☐ Other_____	▲ Cover patient's mattress in a dust-proof (allergen impermeable) zippered cover. Clean cover according to manufacturer's instructions. ■ If it is necessary for the patient to sleep on upholstered furniture such as a sofa, then cover furniture with washable slipcovers or sheets and vacuum furniture regularly (including removing cushions and vacuuming in cracks and crevices).
What types of bedding does the patient use? (Check all that apply) *Notes:*	☐ Bedspread (e.g., comforter, quilt) ☐ Blankets ☐ Pillows ☐ Sheets ☐ Other (e.g., sleeping bag) _____	■ Choose washable bedding. ■ Wash bedding regularly in hot water and dry completely. ▲ Cover patient's pillow in a dust-proof (allergen impermeable) zippered cover. Clean cover according to manufacturer's instructions.

Questions	Answers	Action Steps
ROOM INTERIOR (continued)		▲ **MAY REQUIRE ADDITIONAL TIME AND/OR RESOURCES.**
Flooring		
What type of floor covering is present? (Check all that apply)	☐ Carpeting ☐ Hardwood floor, tile, or vinyl flooring ☐ Throw rugs ☐ Other_____	■ If carpeting is present, vacuum carpets, area rugs, and floors regularly. ■ If possible, use a vacuum cleaner with a high efficiency filter. ■ Mop hard surface floors regularly. ■ Wash throw rugs regularly in hot water. Dry completely. ■ Clean baseboards regularly using a damp cloth with warm, soapy water. ■ Someone besides the patient should vacuum, sweep, empty the dust canister and change the vacuum bag. ■ If possible, the patient should stay out of rooms when they are being vacuumed or swept. ■ If the patient vacuums, sweeps, empties the dust canister, or changes the vacuum bag, he or she should wear a dust mask.
Notes:		
Upholstered Furniture and Stuffed Toys		
Is there upholstered furniture present?	☐ Y ☐ N	■ Cover upholstered furniture with washable slipcovers or sheets. ■ Vacuum upholstered furniture regularly, including removing cushions and vacuuming in cracks and crevices. ▲ If replacing furniture, consider purchasing a non-upholstered furniture - such as vinyl, wood, or leather - that can be easily wiped down.
Notes:		
Are stuffed toys present?	☐ Y ☐ N	■ Choose washable stuffed toys, and wash frequently in hot water. Dry completely. ■ Limit the number of stuffed toys in patient's bed and sleeping area.
Notes:		
Window Treatments		
What window coverings are present? (Check all that apply)	☐ Curtains or drapes ☐ Blinds ☐ Shades ☐ Other_____	■ Vacuum drapes regularly. ■ Wash and dry curtains regularly. ■ Dust window sills, blinds, and shades regularly using a damp cloth with warm, soapy water. Dry completely. ▲ If possible, replace curtains or drapes with plastic, vinyl, wood, or aluminum blinds.
Notes:		
Cooking Appliances		
Are gas cooking appliances used?	☐ Y ☐ N	■ When cooking with a gas appliance, turn on an exhaust fan or open a window. ■ Avoid misuse of the appliance by following the manufacturer's instructions for operation.
Notes:		

Questions	Answers	Action Steps
ROOM INTERIOR (continued)		▲ **MAY REQUIRE ADDITIONAL TIME AND/OR RESOURCES.**
Moisture Control		
Is there evidence of water damage, moisture, or leaks (such as damp carpet or leaky plumbing)? *Notes:*	☐ Y ☐ N	■ Dry damp or wet items within 24-48 hours to avoid mold growth. ▲ Fix water leaks (such as leaky plumbing) as soon as possible. ▲ Replace absorbent materials, such as ceiling tiles and carpet, if mold is present. ▲ Use air conditioner or dehumidifier to maintain low indoor humidity. If possible, keep indoor humidity below 60% (ideally between 30-50%) relative humidity.
Do you see or smell mold or mildew (such as in the bathroom on tub, shower, walls, or windows)? *Notes:*	☐ Y ☐ N	■ Open a window or turn on an exhaust fan when there is excessive moisture in the room, such as when showering or cooking. ■ Scrub mold off hard surfaces with detergent and water. Dry completely. ■ Clean up mold and dry surfaces completely before painting or caulking. ▲ Replace absorbent materials, such as ceiling tiles and carpet, if mold is present.
Is standing water present (such as in refrigerator drip pans, air conditioner drip pans, or house plants)? *Notes:*	☐ Y ☐ N	■ Empty and clean refrigerator and air conditioner drip pans regularly. ■ Avoid standing water in plant containers.
Are humidifiers used in the patient's house? *Notes:*	☐ Y ☐ N	■ Use humidifier only when conditions require it, use the correct setting to maintain indoor relative humidity between 30-50 percent, and clean humidifier reservoirs regularly. ■ Use low mineral content water to prevent the build-up of scale and dispersal of minerals into the air. ■ Follow manufacturer's instructions for use, maintenance, and replacement of any materials supplied with the humidifier.
Are rooms and moisture-producing appliances—such as stoves, clothes dryers, or dishwashers—properly vented (including venting to the outside if specified by the manufacturer)? *Notes:*	☐ Y ☐ N	■ Increase ventilation or air movement by opening doors and/or windows when practical. Use fans as needed. ■ Run the bathroom exhaust fan or open the window when showering. ■ Use exhaust fans or open windows whenever cooking or washing dishes. ■ Vent appliances properly according to manufacturer's specifications.

Questions	Answers	Action Steps
ROOM INTERIOR (continued)		▲ **MAY REQUIRE ADDITIONAL TIME AND/OR RESOURCES.**
Pest Control		
Is there evidence of cockroaches and/or rodents (such as droppings or dead specimens in traps)? *Notes:*	☐ Y ☐ N	■ Clean all surfaces where you have seen pests. ■ Use poison baits, boric acid, or traps to kill pests. Minimize use of sprays. If sprays are used: limit the spray to the infested area, carefully follow the instructions on the label, make sure there is plenty of fresh air where the spray is being used and, if possible, keep patient out of the room.
Are there food crumbs or open or unsealed food? *Notes:*	☐ Y ☐ N	■ Clean all food crumbs or spilled liquids right away. ■ Store food in sealed containers. ■ Remove food, bags, newspapers, and empty boxes, cans, and bottles from the sleeping area. ■ Put all garbage in plastic trash bags. Seal trash bags and put them into garbage cans with fitted lids every day.
Are there holes or gaps between construction materials and pipes that could allow pests to enter the house? *Notes:*	☐ Y ☐ N	■ Seal holes or gaps between construction materials and pipes, or ask the owner to do so.
Is there evidence of standing water or leaks? *Notes:*	☐ Y ☐ N	■ Dry damp or wet items within 24-48 hours to avoid mold growth. ■ Avoid standing water in house plant containers and drip pans. ▲ Fix water leaks (such as leaky plumbing) as soon as possible.

OUTDOOR AIR POLLUTION

Exposure to air pollution (mainly ozone and particle pollution) can trigger asthma attacks. The Air Quality Index (AQI) is a tool to provide the public with clear and timely information on local air quality and whether air pollution levels pose a possible health concern. The AQI is reported and forecasted every day in many areas throughout the U.S. on local weather reports and through national media. Asthma attacks are most likely to occur the day **after** outdoor pollution levels are high.

People can take simple steps to reduce their exposure to outdoor air pollution. When the AQI reports unhealthy levels:

- Limit physical exertion outdoors.
- Consider changing the time of day of strenuous outdoor activity to avoid the period when air pollution levels are high or consider postponing sports activities to another time.
- Reduce the intensity of the activity, or spend less time engaged in strenuous activities. For example, coaches can rotate players more frequently in strenuous sports, like soccer. Resting players reduces their exposure to air pollution.

To learn more about and access the AQI, visit www.epa.gov/airnow.

Educational Resources:

To learn more about EPA's programs on:

- Asthma and steps you can take to remove environmental triggers from the home, visit www.epa.gov/asthma.
- Secondhand smoke and how to make your home and car smoke-free, visit www.epa.gov/smokefree or call the smoke-free home pledge number at 1-866-SMOKE-FREE (1-866-766-5337).
- Household pest management and how to apply integrated pest management at home, visit www.epa.gov/pesticides/controlling/home.htm.

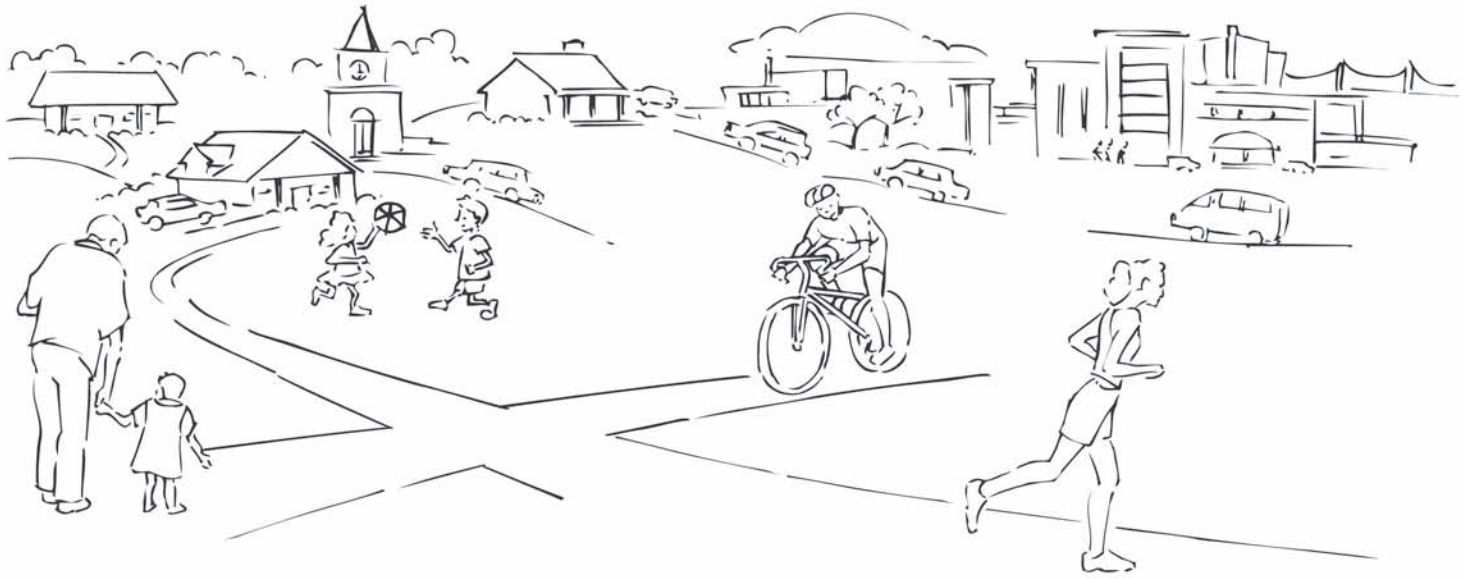
To order materials at no cost on:

- Asthma and secondhand smoke, call EPA's Indoor Air Quality Information Line at 1-800-438-4318.
- Household pest management, call EPA's National Center for Environmental Publications at 1-800-490-9198.

SUMMARY

Use this space to record triggers identified and mitigations recommended. You are encouraged to provide this information to the patient's health care provider.

ASTHMA AND OUTDOOR AIR POLLUTION



1 Air pollution can make asthma symptoms worse and trigger attacks.

If you or your child has asthma, have you ever noticed symptoms get worse when the air is polluted? Air pollution can make it harder to breathe. It can also cause other symptoms, like coughing, wheezing, chest discomfort, and a burning feeling in the lungs.

Two key air pollutants can affect asthma. One is *ozone* (found in smog). The other is *particle pollution* (found in haze, smoke, and dust). When ozone and particle pollution are in the air, adults and children with asthma are more likely to have symptoms.

2 You can take steps to help protect your health from air pollution.

► *Get to know how sensitive you are to air pollution.*

- Notice your asthma symptoms when you are physically active. Do they happen more often when the air is more polluted? If so, you may be sensitive to air pollution.
- Also notice any asthma symptoms that begin up to a day *after* you have been outdoors in polluted air. Air pollution can make you more sensitive to asthma triggers, like mold and dust mites. If you are more sensitive than usual to indoor asthma triggers, it could be due to air pollution outdoors.

► *Know when and where air pollution may be bad.*

- *Ozone* is often worst on hot summer days, especially in the afternoons and early evenings.
- *Particle pollution* can be bad any time of year, even in winter. It can be especially bad when the weather is calm, allowing air pollution to build up. Particle levels can also be high:
  - — Near busy roads, during rush hour, and around factories.
  - — When there is smoke in the air from wood stoves, fireplaces, or burning vegetation.

► ***Plan activities when and where pollution levels are lower.*** Regular exercise is important for staying healthy, especially for people with asthma. By adjusting when and where you exercise, you can lead a healthy lifestyle and help reduce your asthma symptoms when the air is polluted. In summer, plan your most vigorous activities for the morning. Try to exercise away from busy roads or industrial areas. On hot, smoggy days when ozone levels are high, think about exercising indoors.

► ***Change your activity level.*** When the air is polluted, try to take it easier if you are active outdoors. This will reduce how much pollution you breathe. Even if you can't change your schedule, you might be able to change your activity so it is less intense. For example, go for a walk instead of a jog. Or, spend less time on the activity. For example, jog for 20 minutes instead of 30.

► ***Listen to your body.*** If you get asthma symptoms when the air is polluted, stop your activity. Find another, less intense activity.

► ***Keep your quick-relief medicine on hand when you're active outdoors.*** That way, if you do have symptoms, you'll be prepared. This is especially important if you're starting a new activity that is more intense than you are used to.

► ***Consult your health care provider.*** If you have asthma symptoms when the air is polluted, talk with your health care provider.

- If you will be exercising more than usual, discuss this with your health care provider. Ask whether you should use medicine before you start outdoor activities.
- If you have symptoms during a certain type of activity, ask your health care provider if you should follow an asthma action plan.

3 Get up-to-date information about your local air quality:

Sometimes you can tell that the air is polluted—for example, on a smoggy or hazy day. But often you can't. In many areas, you can find air quality forecasts and reports on local TV or radio. These reports use the Air Quality Index, or AQI, a simple color scale, to tell you how clean or polluted the air is. You can also find these reports on the Internet at: *www.epa.gov/airnow.* You can use the AQI to plan your activities each day to help reduce your asthma symptoms.

4 For more information:

Air quality and health:

- EPA's AIRNow website at *www.epa.gov/airnow*
- Call 1-800-490-9198 to request free EPA brochures on: *Ozone and Your Health, Particle Pollution and Your Health, and Air Quality Index: A Guide to Air Quality and Your Health.*

Asthma:

- Centers for Disease Control and Prevention (CDC) Web site at *www.cdc.gov/asthma*

Indoor air and asthma:

- EPA's asthma website at *www.epa.gov/asthma*

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