Asthma is the leading chronic disease among children in the United States and accounts for 14 million lost school days annually (Centers for Disease Control & Prevention [CDC], 2002). Asthma prevalence increased 4.3% per year between 1980 and 1996 (Akinbami & Schoendorf, 2002). Asthma prevalence is higher in boys than girls, and non-Hispanic Black children are more likely to have asthma than non-Hispanic White or Hispanic children (CDC, 2002). Between the years 1980 and 2000, hospitalization rates for asthma were highest in children under age 15. Asthma mortality is similar among all pediatric age groups with the exception of death rates, which are twice as high for children between 11 and 17 years as for younger children (Akinbami & Schoendorf, 2002).

The increased prevalence of asthma in children clearly has an impact on school health nurses. Although elementary school health nurses have an appropriate level of knowledge concerning asthma, they have limited time and resources to implement asthma management education in the school setting (Calabrese et al., 1999). School health nurses spend more time addressing acute episodes of asthma (i.e., acute exacerbations) than they do on self-management activities (Calabrese et al., 1999).

Rural school health nurses lack adequate asthma educational resources or programs to support the educational needs of children with asthma who live in rural communities (Huss et al., 2001). The challenge of increasing rural children’s health knowledge can be linked to their limited access to asthma-related educational materials (Huss et al., 2001).

In response to the need for a child-friendly asthma teaching tool for children living in rural areas, My Asthma Coloring Book© was developed as a rural-specific asthma teaching tool for children in grades 1-5. The coloring book is one part of the A+ Asthma Rural Partnership research project funded by the National Institute of Nursing Research (RO1NR05062-01). This research project investigates the effect of an asthma educational intervention offered to rural elementary school children, their parents, and school health personnel. Children enrolled in this project attend three workshops that are offered after school. The purpose of the sessions is to provide asthma education. During the first workshop, the children are tested about their knowledge of asthma, their self-efficacy, and their quality of life. During the second and third sessions, children learn about basic asthma physiology, what to do during an asthma attack, asthma medications (controllers and quick-relievers), asthma medication delivery devices, rural environmental factors that aggravate asthma, how to use a peak-flow meter and a metered-dose inhaler with spacer, and asthma action plans (see Table 1).

The ultimate goal of the A+ Asthma Rural Partnership is to improve asthma management by parents, children, and school nurses. The role of the school nurse within this partnership is to improve asthma management in the school setting and to learn how to implement the asthma education program independently after the project is finished.

Note: Funding provided for this project by NINR grant # RO1NR05062-01A.

Note: The authors produced this article in a personal capacity, and this paper is not intended to represent the views of NIH, NINR, or the publisher. The images from the A+ Asthma Color Book on page 492 are used with permission of Karen Huss, who holds the copyright on the original publication.
**Development of the Coloring Book**

The rationale for the A+ Asthma Rural Partnership coloring book was to develop a child-friendly teaching tool using picture identification to educate rural elementary school children ages 6 to 12 years about asthma and asthma control. Wiley and Hendricks (1998) found that testing instruments that used picture identification enabled young children to focus on a specific topic. Holzheimer, Mohay, and Masters (1998) found that a picture book that communicates messages about asthma allowed parents to direct their child’s attention to content areas in which the child’s asthma knowledge was lacking, review relevant information, and reinforce educational messages. In addition, parents liked the self-pacing nature of a picture book.

In a study of fifth-grade children, Cleaver, Scheurer, and Shorey (1993) noted that fifth-grade children who were presented with silhouette illustrations focused on visual details that were familiar and had personal significance. The use of silhouette illustrations encouraged children to use their own experiences and understanding, based on past knowledge, to create meaning. Although the illustrations in the *My Asthma Coloring Book*® are not true silhouettes, they are black-and-white drawings that children can fill in with color. This activity produces an illustration closely resembling a silhouette and provides the child with an opportunity to use fine motor skills, touch, and creativity in the learning experience to increase personal significance and improve recall. Learning during the children’s workshops is enhanced and reinforced by the graphics and simple language in the coloring book. By teaching the same content in several different ways, students gain a deeper, more comprehensive understanding of the material (Lumsden, 1996).

A graphic artist with experience in publishing children’s books created the illustrations for *My Asthma Coloring Book*®. An initial draft was developed and reviewed by the investigators for accuracy, readability, age appropriateness, and ethnic relevance, and to ensure acceptance of the characters by the children. In addition, the A+ Asthma Rural Partnership Local and National Advisory Boards reviewed the content of the book. Members of these boards recommended that the book be revised to include more rural-specific allergens and pictures of more rural scenes such as barns, silos, and animals.

The readability of *My Asthma Coloring Book*® based on the Flesch reading ease score is 84.7 and the Flesch-Kincaid grade level is 2.6. The Flesch reading ease score rates the text on a 100-point scale. The higher the score, the easier it is to understand the text. A Flesch–Kincaid score of 2.6 indicates that children in grade two or above would have no difficulty reading the coloring book.

Additional efforts were made to avoid portraying negative ethnic or sexist roles in the coloring book. Narahara (1998) and Ambady, Shih, Kim, and Pittinsky (2001) report that negative gender or ethnic portrayal affects children’s self-perception, self-esteem, and performance. For this reason, although the number of characters in the coloring book is limited, the gender and ethnic mix was matched to that of rural children in grades 1-5 on the Eastern shore of Maryland.

After approval of the Internal Review Board, the coloring book was piloted with eight elementary school children, ages 7 to 10 years, living in one rural county on the Eastern Shore of Maryland (Resto et al., 2001). Anecdotal reports from the children indicated that the coloring book was fun and promoted learning. Many children took the coloring book home and shared the content with their parents and siblings. One child even asked for an additional coloring book. Follow-up reports from parents whose children used the coloring book were also positive. For example, one parent stated, “My daughter still pulls out her asthma coloring book.”

**Description of Coloring Book**

The main character of *My Asthma Coloring Book*® is Nurse Asthma Wise (an owl dressed in nursing attire – a white lab coat with a stethoscope) who welcomes children to her health room (see Figure 1). A nurse was selected as the main character because of children’s familiarity with nurses, especially school health nurses. Nurse Asthma Wise introduces the children to two students, Brandon and Elizabeth, who have asthma (see Figure 2). Brandon and Elizabeth share their asthma experiences and understanding, based on past knowledge, to increase personal significance and improve recall. Members of these boards recommended that the book be revised to include more rural-specific allergens and pictures of more rural scenes such as barns, silos, and animals.

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**Table 1: A+ Asthma Children’s Workshop Content**

<table>
<thead>
<tr>
<th>Session</th>
<th>Content</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>Administration of study questionnaires</td>
<td>Complete the following questionnaires: Asthma Knowledge Questionnaire, Self-efficacy Questionnaire, Quality of Life Questionnaire.</td>
</tr>
<tr>
<td>Session 2</td>
<td>What is asthma? What is an asthma action plan? Rural and environmental factors that make asthma worse. Warning signs of an asthma attack. How to clean a nebulizer. How to use a peak-flow meter. Asthma medications.</td>
<td>Asthma awareness curriculum for elementary school’s activity. Poster demonstration of rural factors that make asthma worse. Role-play on how to ask adults to stop smoking around them. Show-and-tell about nebulizer equipment. Return demonstration of peak-flow meter. Asthma medication poster. <em>My Asthma Coloring Book</em>®</td>
</tr>
</tbody>
</table>

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Meet Nurse Asthma Wise and Friends

Hello! I’m Nurse Asthma Wise. I’m here to help you learn how to control your asthma.

Welcome!

Figure 1. Nurse Asthma Wise

Figure 2. Friends Who Have Asthma

My friends, Brandon and Elizabeth both have asthma - just like you.

Figure 3. Triggers, Irritants, and Allergens

Things That Make Asthma Worse
Circle things that make your asthma worse.

Dust mites

Strong smells and pesticides

Roaches

Colds

Grain dust and fertilizer

Weather Changes

Smoke

Running and playing hard

Cool, dry air

Animals with fur and birds

Pollen, trees and fresh cut grass

Figure 4. A+ Asthma Rural Partnership Asthma Action Plan

Primary Care Provider (PCP) name and Ph. #
Location of Closest Emergency Room:

<table>
<thead>
<tr>
<th>Name of Medicine</th>
<th>CONTROLLER MEDICATIONS</th>
<th>How much to take</th>
<th>How often or when to take</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Name of Medicine</th>
<th>QUICK RELIEVER/RESCUE MEDICATIONS</th>
<th>How much to take</th>
<th>How often or when to take</th>
</tr>
</thead>
</table>

Controller: medicines are medicines you need to take every day. This will help to keep asthma episodes from starting. Quick relievers/Rescue or emergencies medicines are taken when your peak flow numbers are in the yellow or red zone, or when your child has asthma symptoms, such as wheezing or coughing.

GREEN ZONE
Breathing is good with no cough, wheeze, or chest tightness during work, school, exercise, or play.

> 50% Green Zone: Good Control. No asthma symptoms. Take medications as usual.

ACTION: Continue with your daily controller medications.

YELLOW ZONE
Caution: Asthma symptoms are present (cough, wheeze, chest tightness), or you notice increased need for inhaled quick reliever/rescue medicine, or increased asthma symptoms upon awakening, or awakening at night with asthma symptoms.

50-80% Yellow Zone: Caution! Use a short-acting inhaled beta-agonist. Check with primary care provider about changing medications or increasing doses.

ACTION:
1. Take ______ puffs of your quick reliever/rescue medication. Repeat ______ times.
2. If no relief from asthma symptoms after repeated quick reliever/rescue medication Call Primary Care Provider (PCP).

DANGER: You continue to get worse even after taking quick reliever/rescue medications in Yellow Zone.

< 50% Red Zone: Medical Alert! Use a short-acting inhaled beta-agonist. Call primary care provider. If unable to reach PCP go to Emergency department or call 911.

1. Take ______ puffs of your quick reliever/rescue medication. Repeat ______ times.
2. Call your PCP now. If you cannot contact PCP, go directly to the Emergency Room Now, Or Call 911 Do Not Wait.
Elizabeth help the coloring book user to understand that other children have asthma. The emphasis of the first section of the coloring book is that many people have asthma, including role models such as professional athletes and pop-stars. This introduces the idea that children with asthma are as capable as children without asthma. Nurse Asthma Wise recruits the coloring book user to help Brandon and Elizabeth learn to control their asthma.

The next section of the coloring book contains content on how the lungs work, how asthma affects the lungs, and what actions children with asthma should take when they are having asthma symptoms. Simple anatomy and physiology of the lungs are pictured and described, along with basic pathophysiology of asthma. An activity is included to help the children understand these concepts. The coloring book provides information about what children should do when an asthma attack starts, by stressing three important steps: 1. tell an adult, 2. take a quick-reliever asthma medication, 3. sit down and relax.

Environmental triggers such as dust mites, pollen, pets, and cockroaches are shown along with triggers commonly found in rural areas such as grain dust, fertilizer, strong smells and pesticides (see Figure 3). To reinforce environmental control, the book encourages children to identify and circle pictures of the triggers that make their asthma worse.

Nurse Asthma Wise encourages the coloring book user to talk to their doctor, nurse, and other health care professionals about their asthma. She recommends that children and their parents make a list of questions to ask their health care provider and to facilitate communication at each well child visit. Previous studies indicate that poor communication between health care providers and patients may influence asthma morbidity and mortality (Clark et al., 2000; Clark, Gong, & Kaciroti, 2001).

The importance of having an Asthma Action Plan (AAP) is highlighted so that caregivers and children have written instructions about what to do if an asthma attack occurs (see Figure 4). Nurse Asthma Wise suggests keeping a copy of the AAP at home, at school, and in any setting where the child spends considerable time so that adults can be aware of how to treat the child’s acute asthma symptoms and episodes. She suggests that there are others who should be informed about asthma symptoms and treatment, such as the child’s coach, teacher, bus driver, and babysitter.

Nurse Asthma Wise encourages children to continue playing sports and cautions them to tell their health care provider if exercise makes their asthma worse, because they might need extra asthma medication before exercise. Nurse Asthma Wise teaches that peak-flow meters are used to help people know when additional asthma medications are needed. The coloring book content reinforces the importance of taking control of asthma. It states that when asthma is under control, children can run and play like other children and will not have to go to the hospital as often.

Implementation

After the didactic asthma education component in session two, each child in the intervention group is given a copy of My Asthma Coloring Book© and non-toxic crayons, markers, and stickers. The Asthma Nurse Educator reviews the coloring book with the children and asks if they would like to read it out loud. Student volunteers take turns reading to the group, and then all the children are encouraged to color in the book. The nurse highlights selected areas for review and stresses that children should not feel that they are different or “left out” because they have asthma. The nurse uses the coloring book to emphasize the importance of having an AAP and the benefits of having a copy of the plan at home and in school for emergencies. While reading the coloring book, many children voluntarily share their comments about asthma. For example, children have discussed their asthma medications, hospitalizations, and environmental triggers.

At the end of session two, children are encouraged to take the coloring book home and read it with their parents to reinforce the asthma education. The ultimate goal is to have children share the newly learned asthma information with their family and peers. In session three, the nurse asks the children to share how they used their coloring book since the last session. The nurse uses this session to summarize all the lessons.

Applications for Clinical Practice and Research

My Asthma Coloring Book© has been used with 112 children who have received the intervention portion of the A+ Asthma Rural Partnership Research Project (RO1 NR05062-01). The staff of the A+ Asthma Rural Partnership research project delivered all of the educational workshops. None of the school health nurses participated in the implementation of the workshops, perhaps because all of the workshops were offered after school hours. Limited resources did not permit compensation for school nurses after the school day. In school settings where children cannot remain after school, school nurses might consider offering the asthma workshop during lunchtime or at recess.

Although My Asthma Coloring Book© has been used exclusively in this research study, it could easily be integrated into a team approach to asthma education in many settings. For example, school nurses could use the coloring book for an asthma support group or a school-based asthma club. Nurses and physicians could use it in outpatient clinics and offices. Nurses and respiratory therapists in hospital emergency departments and on pediatric units could use the coloring book when children are admitted for acute asthma. Home health agency nurses can also use the coloring book on home visits. In all these settings the coloring book can be used to provide initial asthma education, to reinforce earlier education, and to encourage discussion about the various aspects of asthma management, including asthma medications. Spontaneous teaching opportunities occur frequently during interactions between health care providers and parents and children with asthma. The nurse and other health care providers can make full use of the coloring book during these teachable moments. Because of its easy readability and many illustrations, the coloring book may assist nurses and other health care providers to present information about asthma to non-English speaking children and their families.

Conclusion

My Asthma Coloring Book© is a child-friendly teaching tool that has been warmly received by elementary school children and a valuable resource in the A+ Asthma Rural Partnership research project. The My Asthma Coloring Book© has the potential for several creative, futuristic applications to practice and is available free of charge to readers on the Pediatric Nursing Web page at www.pediatricnursing.net

References


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