

Evaluation of Asthma Websites for Patient and Parent Education

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The purpose of this study was to evaluate the quality of websites on asthma for patient and parent education. Seventy websites were evaluated based on the Health Information Technology Institute (HITI) criteria; eight core content criteria from the National Heart, Lung, and Blood Institute guidelines; and readability. The ten best websites for asthma education were identified for patient teaching and educating parents about asthma.

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The Internet is continuing to expand with consumers flocking to the World Wide Web for entertainment, shopping, chatting, and education. Almost two-thirds of all family households have computers in the home, and 46% of them are connected to the Internet. Seventy-five percent of all adults who use the Internet, nearly 100 million people, search for health care information (Pastore, 2002). The Internet is replacing books, magazines, and television as a prime source of information.

Information about health problems and treatment options is widely available on the Internet. Nearly half (48%) of the people searching for health information on the Web stated that the advice they found had improved the way they cared for themselves (Landis, 2001). In this same study, 55% reported that the Internet improved their access to medical and health information. Convenience, diversity, and anonymity were key reasons why people used the Web for health information (Landis, 2001). Some of these websites, however, may not present accurate and up-to-date information.

A significant health problem and chronic childhood illness in the United States is asthma (Skoner, 2001). Asthma in children is increasing at an alarming rate, affecting about 7.5% of children and adolescents under the age of 18. Asthma is rising more rapidly in preschool-aged children than in any other group (United States Department of Health and Human Services [USDHHS], 2000). The cost of asthma in the United States is \$10.7

billion (Michigan Asthma Communication Network, 2002). Asthma can lead to school absenteeism, sleep disturbances, activity restrictions, and poor psychological health (McPherson, Glazebrook, & Smyth, 2001; Skoner, 2001).

Patient education is an essential component of effective asthma management; yet, it has been estimated that only 8.4% of asthmatics receive this education. One objective of Healthy People 2010 is to increase this number to at least 30% over the next decade (USDHHS, 2000). There are many websites on asthma that can be used to supplement and reinforce face-to-face teaching by the nurse and that patients and parents can access on their own for information about asthma. Caution must be used, however, as some websites do not meet the standards for disseminating health information and may give misleading or incorrect information (Oermann & Pasma, 2001; Oermann, DiBartolomeo, & Mahfet, 2002). Nurses have an important

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role in evaluating websites so they can suggest quality sites to their patients.

PURPOSE

The purpose of this study was to evaluate the quality of 70 websites on asthma education based on the Health Information Technology Institute (HITI) criteria; eight core content criteria from the National Heart, Lung, and Blood Institute guidelines; and readability. The goal was to identify quality websites on asthma that could be recommended to patients and parents of children with asthma.

STUDIES OF HEALTH WEBSITES

Although the number of health websites is rapidly increasing, their quality still remains highly variable. Griffiths and Christensen (2000) reviewed the quality of websites on the treatment of depression using the site characteristics, quality of content compared to evidence-based guidelines, and accountability. Of the 21 frequently accessed websites, the information about depression was of poor quality and not adequately covered.

Another study compared the quality of information at a website against its popularity (Meric, Bernstam, Mirza, Hunt, Ames, Ross, et al., 2002). This study found that breast cancer was one of the most common health-related searches on the Internet, and these sites also contained more accurate information than other health topics. The type of content on the website rather than its quality correlated to the popularity of the site.

Another study examined the validity of criteria used to evaluate the quality of websites on five common health topics: chronic obstructive pulmonary disease, ankle sprain, emergency contraception, menorrhagia, and female sterilization (Kunst, Groot, Latthe, Latthe, & Khan, 2002). There were 121 websites evaluated on these topics. Features of website credibility, including source, currency, and hierarchy of evidence correlated only slightly with accuracy of the information at the site. The researchers concluded that apparently credible websites, based on these criteria, may not necessarily present accurate information (Kunst et al., 2002).

Another study used focus groups, naturalistic observation, and in-depth interviews to describe the techniques used by 21 consumers for locating and evaluating health information on the Web (Eysenbach & Kohler, 2002). The findings suggested that consumers' techniques were "sub optimal"

even though they were often successful in obtaining information to answer the health questions or concerns.

Croft and Peterson (2002) evaluated the quality of asthma education websites using these criteria: readability, language, download time, inclusion of educational concepts, use of creative technology, and compliance with Health On the Net (HON) principles. The HON principles are ethical standards that health websites should meet such as authority (the information at the website is provided by qualified professionals or indicates that it is from a nonmedically qualified person or group); complementarity (the information supports, not replaces, medical advice); and confidentiality (the website assures confidentiality of data on visitors to the site), among other standards (HON, 2002). Websites that meet the eight standards place a HON logo on their home page, informing patients that the site meets these standards of quality. Only 90 of the 145 websites evaluated actually contained information on asthma education. The average reading level was higher than the tenth grade, consistent with other studies on the readability of health websites (Berland, Elliott, Morales, Als-gazy, Kravitz, Broder, et al., 2001; Oermann & Wilson, 2000; Oermann et al., 2002). Overall, the study found that the websites on asthma education failed to meet the necessary criteria to ensure valid and accurate information for patient education.

METHOD FOR EVALUATING ASTHMA WEBSITES

The three search engines used for this study were Yahoo, Google, and AOL. These were chosen because they were rated as three of the top five visited search engines by Nielsen/Net Ratings, Inc. in March 2002 (Sullivan, 2002b) and were used in previous studies. The key word "asthma" was entered into each search engine. The total number of websites produced by the search was recorded. Starting at the top of the search engine list, websites that focused on asthma education were identified for further evaluation. The goal was to evaluate the first 25 asthma education websites on each search engine. There is limited research on how consumers actually search the Web for health information. In a small study, Eysenbach and Kohler (2002) reported that consumers explored only the first few links on general search engines.

In our study, if a website originated outside of the United States or was sponsored by the search engine, it was passed over, and we went to the next

universal resource locator (URL) on the list. The sponsored sites were passed over because they indicate paid listings that are offered enhanced placement (Sullivan, 2002a). If a website was duplicated on more than one search engine, that site was only evaluated once, and we moved to the next URL. Because of duplication, we reviewed 70 websites on asthma education instead of 75. This method of identifying websites to evaluate was consistent with other studies (Beredjikian, Bozentka, Steinberg, & Bernstein, 2000; Croft & Peterson, 2002; Oermann et al., 2002; Pandolfini & Bonati, 2002).

Criteria for Evaluation

Three of the authors who are pediatric nurses evaluated the 70 websites using the HITI criteria for assessing the quality of health information on the Internet. These criteria were developed by the Health Summit Working Group supported in part by the Agency for Healthcare Research and Quality and by Mitretek Systems (HITI, 1999). In previous studies of health websites, various evaluation criteria have been used, and there is lack of consensus about the best tools to use (Eysenbach, Powell, Juss, & Sa, 2002; Gagliardi & Jadad, 2002). However, the American Public Health Association (2001) has endorsed the HITI criteria as standards for the development and evaluation of health information on the Internet.

The seven criteria of the HITI are credibility, content, disclosure, links, design, interactivity, and caveats (HITI, 1999). There are further subsets under each of the criteria. We used an evaluation form, based on the HITI criteria and their subsets, to guide our review of each website. The form was developed and used in prior studies (Lesley & Oermann, 2002; Oermann & Pasma, 2001; Oermann et al., 2002; Oermann, Lowrey, & Thornley, *in press*).

The HITI (1999) indicates that the content at a health website must be "accurate and complete, and an appropriate disclaimer provided" (p. 5). To standardize the evaluation of the content, we identified whether the following content areas, essential when teaching patients and parents about asthma, were provided by the website: basic facts about asthma pathophysiology, triggers of asthma attacks, avoidance of asthma triggers, mechanism of action of medications for asthma (long-term control medication and quick relief rescue medication), skills for administering medication, skills for self-monitoring of respiratory status, and a man-

agement/action plan. These content areas are consistent with the National Heart, Lung, and Blood Institute guidelines on asthma education (National Institutes of Health [NIH], 1997) and the update of selected topics (NIH, 2002). Similar content areas also were used by Croft and Peterson (2002) in their review of asthma education sites. A special report by Clark and Partridge (2002) emphasized that one of the actions to make asthma education more effective was to ensure that it was consistent with national guidelines. An attachment to the HITI evaluation form was made for recording the evaluation of the content.

As many websites have links to other sites, the links are evaluated as one of the HITI criteria. In our study, if the site had four or fewer links in the main text, we clicked on each of the links and evaluated if they met the HITI criteria for links (selection, architecture, content, and back link-ages). If the main text had many links, we performed a random check of the links in the text, evaluating a minimum of four links per website.

At the outset, the three authors who were evaluating the websites reviewed the same three sites to establish inter-rater agreement: <http://www.mayoclinic.com/index.cfm>, <http://allergy.mcg.edu/>, and <http://www.aaaai.org/>. The evaluations were compared, and the inter-rater agreement ranged from 94% to 100%, with a mean of 97%.

Readability

After completion of the HITI evaluation and assessment of content of each website, readability was measured using a computerized version of the Flesch-Kincaid (FK) on Microsoft Word 2000. A full page of text was copied into Microsoft Word, and a spelling and grammar check was done. When Word completes the spelling and grammar check, it provides a readability score (grade level) based on the average number of syllables per word and words per sentence (Oermann & Wilson, 2000). This method for assessing readability was used in other studies (Croft & Peterson, 2002; Oermann & Wilson, 2000; Oermann et al., 2002; Oermann et al., *in press*).

QUALITY OF ASTHMA EDUCATION WEBSITES

Credibility

According to the HITI criteria, the credibility of health information is determined by its source (source of the site, credentials of authors, conflict

of interest, and bias), context, currency, and relevance/utility. Most significant to credibility is the *source* of the information at the website. Examples of credible websites in this study included the Environmental Protection Agency, the National Heart, Lung, and Blood Institute (NHLBI), and the American Lung Association.

Of the 70 sites reviewed, 21 (30%) sites were developed by professional or health organizations, 16 (23%) were commercial sites, 9 (13%) were medical centers, 8 (11%) were governmental sites, 6 (8.6%) were private physician practices, 4 (5.7%) were pharmaceutical websites, 4 (5.7%) were private individual websites, and 2 (3%) were research sites. Credentials were listed on 57 (81.4%) of the websites. To evaluate the credentials, we checked the website for a listing of the qualifications and credentials of the authors of the content and if there were any personal or financial associations.

Conflict of interest was determined by examining the material at the website and deciding if it was more promotional than educational in focus. Websites that contained many advertisements for purchasing products or services were determined to have a conflict of interest unless the advertisements were clearly identified as such. It was found that websites generated by private physicians often promoted their practice and services with less emphasis on the educational aspect. Overall, of the websites evaluated, 21 (30%) displayed a conflict of interest.

Bias was measured by determining if the site leaned toward a particular idea, cure, or product. Twenty-four (34.3%) of the sites favored a particular idea or investment. For example, one site offered a "revolutionary" technique to control asthma, which was developed by the company that owned the site.

Context is the setting of the website and its appropriateness to a learning environment. Sites that contained many advertisements or distractions did not provide the proper setting for patient and parent education. The setting was appropriate in 60 (85.7%) of the sites surveyed.

Currency is evaluated to establish the timeliness of the information posted although it does not guarantee that the information is accurate. Many sites contained copyright dates but failed to list when new material was added or when the site was last updated. However, even some "excellent" sites did not list when the website was updated or revised by the Webmaster. Material dated from 1997 on was accepted as current information consistent with the date of the published *Expert Panel Report*

2: *Guidelines for the Diagnosis and Management of Asthma* (NIH, 1997). Although updated guidelines are now available (NIH, 2002), developers need time to incorporate that information into their sites. Fifty-seven (81.4%) of the websites were current.

To evaluate *relevancy or utility*, we examined the usefulness of the website; 55 (78.6%) sites would be valuable for learning about asthma. The most relevant sites provided specific information about asthma, including visual explanations of asthma pathophysiology, and techniques to manage asthma such as diaries and trigger lists. One useful website was Asthma (<http://www.asthma.about.com>), which included a parent corner that described asthma and the issues that concern parents of asthmatics.

Content

The content at a website should be accurate and based on the best available scientific evidence. The website should indicate any omissions in content and identify the original sources that support the information at the site (HITI, 1999). Health websites should have a disclaimer that the content is general health information, not medical advice.

Half ($n = 36$, 51.4%) of the asthma education websites omitted important content, which hampered their usefulness. For instance, the site Dramatic Asthma Relief (<http://www.dramatic-asthma-relief.com>) omitted skills for administering medication, skills for self-monitoring of respiratory status, and discussion of a management/action plan and focused instead on reasons to purchase their Asthma Relief Report. Interestingly, even a website from a credible organization such as the World Health Organization (http://www.who.int/ncd/asthma/asthma_publications.htm) contained omissions. The WHO website failed to include content such as triggers of asthma and actions of long-term control and quick relief rescue medications. Furthermore, of the websites reviewed, 21 (30%) neglected to include the original sources or references. At these sites, the reader is unable to validate the material presented.

Disclaimers should state that the information presented does not replace professional medical advice. With respect to disclaimers, 48 (68.6%) sites had a disclaimer such as:

This web site is not being used to make diagnoses, administer treatment, prescribe medications, or order tests. The information contained is provided as an educational service, which can assist you in your personal research on

a specific disease. . . This web site is not a replacement for the relationship you have with your healthcare provider. Any information provided is not medical advice and should not be substituted for regular consultation with your healthcare provider (MyAsthma, 2002).

Disclosure

The website should reveal its intent by clearly stating its mission or purpose. The intent of the website, for example, education, was clear in most of the sites ($n = 57$, 81.4%).

Profiling is the collection of information about people visiting the website. If consumers are asked to provide information at a website, they should be told how that information will be used. Of the 70 sites evaluated, 13 (18.6%) asked for user input or registration. Some sites offered an incentive for the user to enroll and participate in their survey. These incentives ranged from free inhalers to special coupons or discounts.

Links

Links within a website or external links should supplement and enhance the information provided at the site. Many of the sites surveyed connected the user to exemplary websites such as the NHLBI and the American Lung Association (ALA) that in turn provided supplementary information. Two-thirds of the websites had links to credible sites with accurate, current, and relevant information about asthma. We also evaluated the ease of movement to and from the links and found that 57 (81.4%) of the sites were easily navigated.

Design

The design of the website is evaluated based on three criteria: accessibility, logical organization (navigability), and use of an internal search engine. Websites should be accessible by the lowest level available browser; all 70 sites met this criterion. The majority (81%) of the sites were logically organized and easy to navigate, including return to the top of the page and home page options. Attractive sites using audio such as Health Talk Asthma Education Network (<http://www.healthtalk.com/aen/>) and visual aids such as Ed's Asthma Track (<http://asthmatrack.org>) are appealing and may enhance the knowledge gained from the website.

Interactivity

Interactivity creates a mechanism for exchange of information between the user and the website or

among several users (HITI, 1999). A large proportion (83%) of the websites contained a link or an e-mail address for comments or questions; 14 (20%) of the sites had discussion boards or chat rooms.

Caveats

Caveats, or "red flags," signal to the consumer that the information provided may be misleading. With respect to products and services, 8 (11.4%) of the websites claimed "amazing results" or successes in asthma management with the use of their techniques or products. No evidence, however, was cited to support these claims.

Readability

The readability of the Web pages also was evaluated. The mean reading level of the 70 websites was grade level 9.2, higher than the recommended eighth-grade level (Oermann & Wilson, 2000). The reading levels ranged from grades 2.7 to 12; the website with the 2.7 grade reading level was geared to young children and used a storybook-like format. Only 20 (28.6%) of the websites had a reading level of eighth grade or below.

Core Content Criteria

To evaluate the quality of the information provided at the websites, we identified eight core content criteria, ie, information that should be included in an asthma education program, based on the National Heart, Lung, and Blood Institute guidelines on asthma education (NIH, 1997) and the update of selected topics (NIH, 2002). Thirty (42.9%) of the 70 websites contained content on all eight criteria. These 30 sites were primarily government, pharmaceutical, and organizational sponsored sites. Ten (14.3%) of the websites did not include any of the eight content criteria; these were commercial, physician, and private individual sponsored sites.

To effectively manage asthma, it is critical that patients, parents, and other caregivers are able to recognize early symptoms and respond appropriately (McPherson et al., 2001). This includes skills for administering asthma medication, self-monitoring of respiratory status, and a well-developed management action plan. Surprisingly, only 48.6% of the sites reviewed in this study presented skills for administering medica-

Table 1. Comparison of Core Content Areas at websites

Asthma Content Areas	% of Websites Current Study (N = 70)	% of Websites Croft & Peterson (N = 145)
Basic Asthma		
Pathophysiology	80.0	84.4
Triggers of Asthma	75.7	91.1
Avoidance of Triggers	68.6	72.2
Action of Long Term Control		
Medications	62.9	55.6
Action of Quick Relief Rescue		
Medications	61.4	60.0
Skills for Administering		
Medications	48.6	*
Skills for Self Monitoring of		
Respiratory Status	50.0	46.7
Management Action Plan	50.0	43.3

*Not examined in study.

tions, and only 50% included skills for self-monitoring and discussion of a management action plan (Table 1).

Similar to the findings of the Croft and Peterson (2002) study, the inclusion of educational concepts varied among the websites (Table 1). In our study, basic asthma pathophysiology was presented in 56 (80%) of the websites and was the most frequently included content. Triggers of asthma were discussed in 53 (75.7%) of the sites. In comparison, Croft and Peterson (2002) found that triggers of asthma were presented at most of the websites (91.1%), followed by asthma pathophysiology (84.4%). Many of the asthma websites in both studies were found to lack important content that is vital to the management and control of asthma.

TOP TEN WEBSITES

Based on our evaluations, we identified ten quality websites that nurses could recommend to patients and parents of asthmatics (Table 2). These websites were chosen because they met the HITI criteria, contained the eight core content areas for asthma education, had an attractive appearance, and were easily navigable. Although readability was considered in our selection of the top sites, websites were not excluded for having a slightly higher than recommended reading level. Nurses and nurse practitioners can direct patients and parents to these websites and can use the sites to supplement their asthma education.

A number of the websites included innovative strategies to present the content. For example, the Health Talk website had audio presentations available on many topics. Although the readability of

the website was at the 9.7 grade level, the audio presentation of the information would be a resource for those who are less apt to read long text and would be beneficial to audio learners. Similarly, the FreeBreather website contained interactive visual methods of learning that would appeal to young patients with asthma. These methods encourage interaction with the content at the website. The use of "multimedia in pediatric education offers exciting possibilities, and by supplementing, rather than replacing more traditional educational methods, it can be seen as an additional tool to help educate children with asthma and encourage self management" (McPherson et al., 2001, p. 448).

The American Lung Association website demonstrated this educational creativity while maintaining a reading level at the eighth grade. The site included extensive resources and also linked to many other credible websites. Other characteristics of the top ten websites are listed in Table 2.

USING ASTHMA WEBSITES IN PATIENT EDUCATION

A key aspect of pediatric nursing is to educate the child and parent. Although education may begin in the health care setting, parents often have questions after their visits. The Internet is a valuable resource for parents to get immediate answers to their questions and for reinforcement of learning. However, the vast number of websites can be overwhelming. For example, our results using three search engines totaled 2,740,320 hits when the word "asthma" was entered. Nurses can help patients and parents untangle some of the confusion by recommending valuable websites along with educating parents on how to critique the credibility of the site's information.

Beyond the top ten websites, there were other sites that were noteworthy. An excellent website for children was the National Jewish Medical and Research Center at <http://www.njc.org/wizard/intro.html>. This website presents material in a storybook format at a second to third grade reading level. Colorful pictures and graphics provide an appropriate educational format for children.

Nurses should emphasize to parents that the Internet is a continually changing information source. This review of websites represents only a moment in time on the World Wide Web. Thus, it is also important for nurses to equip patients and parents with basic tools to independently evaluate websites.

Table 2. Top Ten Websites

Website	Internet Address	Description/Comments
American Lung Association	http://www.lungusa.org/asthma	Complete educational information with an online club for kids, teen site, and relevant links. Many resources available, including magazines, books, and school programs.
National Education Association Health Information Network	http://www.asthmaandschools.org/	Information for parents and educators on asthma, including how to manage asthma at school. Extensive resource database available with links to publications, educational materials, websites, and medical information.
MSN Health with WebMD	http://content.health.msn.com/condition_center/asm	Asthma basics, including content on what is asthma, triggers, diagnosis, treatment, and living with asthma. Links to articles with appropriate reading level for general public. Site easy to navigate.
Clearbreathing	http://www.clearbreathing.com/	Pharmaceutical sponsored site with animations of pathophysiology of asthma. Information pertinent for parents as well as teens. High-quality references and links easily accessed.
National Library of Medicine	http://www.nlm.nih.gov/medlineplus/asthma.html	Interactive tutorial about all aspects of asthma (also available in Spanish). Links to latest news, research, and clinical trials. Valuable links to many other resources. Easy to navigate.
American Academy of Allergy, Asthma and Immunology	http://www.aaaai.org/	Reproducible asthma book for children (available in Spanish and English). Information for consumers and professionals. Online Back-to-School interactive visual game.
Health Talk Asthma Education Network	http://www.healthtalk.com/aen/	Click to listen to informative audio presentations. Expert opinions and discussions. Question and answer format. Latest news on asthma.
Allergy and Asthma Network, Mothers of Asthmatics	http://www.aanma.org/	Nonprofit network organization of families. Visually pleasing with user-friendly icons. Comprehensive information with link to questions and answers with asthma nurse. Reviewed by medical advisory board.
Free Breather	http://www.freebreather.com/	Comprehensive site and visually attractive. Kids Corner, an interactive program using educational Flash movies, would be appealing to children. Favorably reviewed by American Academy of Family Physicians Foundation. Links to recent health news related to asthma.
Asthma and Allergy Foundation of America	http://www.aafa.org/	Patient organization for asthma education advocacy and research. Printable action plans for child care and school.

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