

Assessing the Quality and Contents of Asthma-Related Information on the Korean Internet as an Educational Material for Patients

Despite the substantial amount of asthma-related information available on the internet, little is known about the quality of such information. We assessed asthma-related information on the Korean internet intended as an educational material for asthma patients. By entering the key word, 'asthma', into 4 popular search engines, 32 web sites were identified and categorized with respect to authorship. The core asthma educational concepts and Health On the Net Code of Conduct principles were used to evaluate informational value and justifiability of unreliable information. Eight of 32 web sites were categorized as *western physician*, seventeen as *oriental physician*, four as *commercial*, and three as *others*. The mean number of core asthma educational concepts on the whole web sites was 2.7 out of 8. By type of authorship, 1.7 on the *commercial* sites, 2.1 on the *oriental physician* sites, 3.5 on the *western physician* sites, and 5.0 on the *others* sites in decreasing order. One of the *western physician* sites, two of the *commercial* sites, and all of the *oriental physician* and *others* sites contained unreliable information. However all of them except one site failed to satisfy our criteria of justifiability. Asthma-related information currently available on the Korean internet is highly variable in quality and lacks core asthma educational concepts and justifiability.

Key Words : Asthma; Patient Education; Internet; Quality Assurance, Health Care; Quality Indicators, Health care

Heung-Woo Park*, Kyung-Up Min,
You-Young Kim, Sang-Heon Cho

Department of Internal Medicine, National Rehabilitation Hospital*, Seoul; Division of Allergy, Department of Internal Medicine, Seoul National University College of Medicine, Seoul, Korea

Received : 28 October 2003

Accepted : 29 January 2004

Address for correspondence

Sang-Heon Cho, M.D.
Division of Allergy, Department of Internal Medicine,
Seoul National University College of Medicine, 28
Yongon-dong, Chongno-gu, Seoul 110-744, Korea
Tel : +82.2-760-2971, Fax : +82.2-742-2912
E-mail : shcho@plaza.snu.ac.kr

INTRODUCTION

The internet, so-called information superhighway, is an accessible medium for medical information transfer, which makes the World Wide Web (WWW) component of internet a very powerful vehicle for providing educational materials to patients. The WWW contains about 800 million publicly available pages, and 3% are health-related web sites (1). In Korea, as of December 2002, 26 million people had access to the internet and proportion of *netizen* (term standing for those using internet frequently) is ranked the third in the world (2).

Some studies have reported that education programs for asthma patients improve medication compliance, decrease emergency department visits and hospitalizations, and promote the quality of life (3-5). In addition, formal asthma education programs have been shown to be cost-effective (6). It was also reported in Korea that education for asthma patients was important and effective to teach correct use of metered dose inhaler and improve the quality of life (7, 8). However cost and time issues remain barriers to its implementation (9). Computer-based educational programs delivered over the internet can overcome some of these limitations. Indeed, many web sites for the education of asthma patients are now available on the internet (10).

However it is still debatable that these web sites provide really useful and authoritative information for asthma patients. In other medical fields, several investigators have already tried to evaluate the type, contents, and quality of medical information available on the Korean internet (11-17). But until now, there have been few studies of asthma-related information on the internet. The present study was undertaken on that account. The objective of this study was to assess the quality and contents of asthma-related information on the Korean internet as an educational material for patients.

MATERIALS AND METHODS

A single key word, 'asthma (천식:喘息)', was entered into the most commonly utilized WWW search engines in Korea. 'Haesu (해수:咳嗽)', a traditional term for asthma-like symptoms used by general Koreans, or 'Hyochum (효천:哮喘)', the corresponding orient medical term for asthma, was not used as a key word because of its vagueness. The search engines we utilized were Yahoo Korea (www.yahoo.co.kr), Empas (www.empas.com), Naver (www.naver.com), and Daum (www.daum.net). These four engines rendered the results of each inquiry as a list of web site addresses, or universal resources locators

(URLs). We accessed web sites from January 27, to February 22, 2003. Web sites without transparency of authorship or without comprehensive contents comprised of definition, pathophysiology, management, and advices on the prevention of asthma were excluded in the analysis. The authorship, informational value as an educational material, and informational justifiability (defined below) were independently evaluated by two hand physicians according to the methods described by Stoo et al. (18). When the subjective characterization of the authorship or the nature of content differed between two evaluators, a third evaluator cast the deciding vote. The authorship of each web site was assigned to one of four categories: *western physician* indicates a western medical doctor or doctors who were in practice or affiliated with a university; *oriental physician* indicates an author or authors who were practitioners of traditional orient medicine; *commercial* indicates an author or authors who were marketing medications or devices for asthma; *others* indicates individuals or organizations not belonging to any of the previous categories.

The core asthma educational concepts proposed by Croft et al. (10) was used to assess the value of asthma-related information as an educational material. Table 1 listed these concepts. To satisfy each concept, several ideas as detailed in the 'National Asthma Education and Prevention Program (NAEP) Expert Panel Report 2' (19) should be fulfilled as follows. *Basic asthma pathophysiology*: Web sites should contain four or more of the following five ideas: chronic allergic inflammation, airway hyperreactivity, reversible airway obstruction, trilogy of symptoms (dyspnea, cough, and wheezing), and the likelihood of persistent airway limitation if left untreated. *Triggers of asthma attacks*: Web sites should contain four or more of the following five ideas: allergen, air pollution and smoking, harmful medications, co-morbid conditions, and hazardous foods potentially worsening symptoms of asthma. *Avoidance of asthma triggers*: Web sites should contain four or more of the following five ideas: measures to control environment, avoidance of harmful medications or foods, treatment or prevention of co-morbid conditions, cessation of smoking, and practical methods of safe exercise. *Mechanism of action of medication for asthma*: Web sites should describe the differences between long-term-control medications and quick-relief medications, and provide details of mechanisms and complications. *Importance of using anti-inflammatory medication*: Web sites should

Table 1. Core asthma educational concepts used to assess asthma-related information on the Korean internet

1. Basic asthma pathophysiology
2. Triggers of asthma attacks
3. Avoidance of asthma triggers
4. Mechanism of action of medication for asthma
5. Importance of using anti-inflammatory medication
6. Importance of availability of rescue medication
7. Self-assessment of respiratory status
8. Necessity of an action plan depending on respiratory status

emphasize clinical effects of anti-inflammatory therapy which include reduction in severity of symptoms, improvement in peak expiratory flow, and probable prevention of airway remodeling. *Importance of availability of rescue medication*: Web sites should teach patients to use short acting inhaled beta-2 agonist when dyspnea is aggravated, but on the other hand, warn that too great a reliance on the rescue medication is potentially harmful. *Self-assessment of respiratory status*: Web sites should emphasize self-assessment measures, such as, forced expiratory volume in 1 second (FEV1) or peak expiratory flow rate (PEFR), to allow patients to recognize a worsening of their asthma symptoms at an earlier stage. *Necessity of an action plan depending on respiratory status*: Web sites should introduce practical guidelines according to the results of self-assessment, such as, "Management of asthma exacerbations: Home treatment" as described by the NAEP Expert Panel Report 2 (19).

If web sites contained original concepts not included in the NAEP Expert Panel Report 2, these concepts were regarded as unreliable and further evaluated using the Health On the Net Code of Conduct (HON code) principles (20). These principles were proposed by the Health on the Net (HON) foundation, one of the groups that have developed generic rating tools in an attempt to objectively evaluate medical information on the WWW (21). The fifth one of eight principles was used to assess informational justifiability. In brief, the criteria centered on claims relating to the benefits/performance of a specific management, commercial product or services and the support of such claims by balanced evidence and clear references to source information, and where possible, the provision of specific HTML links to such information.

The Mann-Whitney U test were applied using the SPSS version 8.0 (Chicago, U.S.A.) to evaluate the statistical difference among the data. A *p* value of 0.05 or less was regarded as significant.

RESULTS

After excluding duplications, 76 web sites with a unique URL were identified. However among them, 32 web sites with transparency of authorship and comprehensive contents were included in our analysis and categorized with respect to authorship as follows: 8 as *western physician*; 17 as *oriental physician*; 4 as *commercial*; and 3 as *others* (Table 2). Authors of the *others* sites were a pharmacist and two laymen (family mem-

Table 2. Distribution of the identified web sites by type of authorship

Authorship	No. of web sites	Rate (%)
Western physician	8	25.0
Oriental physician	17	53.1
Commercial	4	12.5
Others	3	9.4
Total	32	100

Table 3. Mean number of core asthma educational concepts by type of authorship

Authorship	Mean (\pm S.D.)
Western physician	3.5 (\pm 1.8)
Oriental physician	2.1 (\pm 1.2)
Commercial	1.7 (\pm 0.5)*
Others	5.0 (\pm 3.5)
Entire web sites	2.7 (\pm 1.8)

*significantly lower compared to *western physician* sites ($p < 0.05$).

Table 4. Frequency of inclusion of core asthma educational concepts by type of authorship

Core asthma educational concepts	No. of sites (%)			
	W. P.* (n=8)	O. P. [†] (n=17)	Commercial (n=4)	Others (n=3)
Basic asthma pathophysiology	7 (87.5)	9 (52.9)	2 (50)	2 (66.7)
Triggers of asthma attacks	6 (75)	16 (94.1)	3 (75)	3 (100)
Avoidance of asthma triggers	5 (62.5)	8 (47.1)	2 (50)	2 (66.7)
Mechanism of action of medication for asthma	4 (50)	1 (5.9)	0 (0)	2 (66.7)
Importance of use of anti-inflammatory medication	3 (37.5)	1 (5.9)	0 (0)	2 (66.7)
Importance of availability of rescue medication	3 (37.5)	1 (5.9)	0 (0)	2 (66.7)
Self-assessment of respiratory status	2 (25)	0 (0)	0 (0)	2 (66.7)
Necessity of an action plan depending on respiratory status	0 (0)	0 (0)	0 (0)	0 (0)

*W. P., Western physician; [†]O. P., Oriental physician.

bers of asthma patient).

The mean number of core asthma educational concepts of the whole web sites was 2.7 out of 8, and the median was 2 (range, 0 to 7 concepts). There was no significant difference between the mean number of the whole web sites and that of each group (Table 3). Compared to the western physician sites, only the mean number of the *commercial* sites was significantly lower ($p < 0.05$). Table 4 showed the frequency of inclusion of each concept by type of authorship. One of the *western physician* sites, two of the *commercial* sites, and all of the *oriental physician* and *others* sites contained unreliable information based on the traditional concept of orient medicine or author's personal experiences (Table 5). However these web sites failed to satisfy our criteria of justifiability, that is, lacked balanced evidences, clear references to source information or specific links. Only one of the *oriental physician* sites provided references to support its information, thus being regarded as justifiable. The greater part of unreliable information was related to treatment of asthma, for example, unique herbal medications, taping methods, placenta treatment, and fluctuation

Table 5. Number of sites containing unreliable information by type of authorship

	No. of sites (%)			
	W. P.* (n=8)	O. P. [†] (n=17)	Commercial (n=4)	Others (n=3)
No. of sites containing unreliable information	1 (12.5)	17 (100)	2 (50)	3 (100)
No. of sites containing unreliable information but satisfying criteria of justifiability	0 (0)	1 (5.9)	0 (0)	0 (0)

*W. P., Western physician; [†]O. P., Oriental physician.

Table 6. Details of unreliable information by type of authorship

	No. of sites (%)			
	W. P.* (n=1) [‡]	O. P. [†] (n=17) [‡]	Commercial (n=2) [‡]	Others (n=3) [‡]
Unreliable information concerning pathophysiology	0 (0)	5 (29.4)	2 (100)	2 (66.7)
Unreliable information concerning symptoms	0 (0)	3 (17.6)	0 (0)	0 (0)
Unreliable information concerning treatment	1 (100)	17 (100)	2 (100)	3 (100)

*W. P., Western physician; [†]O. P., Oriental physician. [‡]No. of sites containing unreliable information.

treatment (Table 6). Unreliable information concerning pathophysiology of asthma or symptoms was also found.

DISCUSSION

In this study we evaluated asthma-related information on the Korean internet using the core asthma educational concept proposed by Croft and Peterson (10) and the Health On the Net Code of Conduct (HON code) principles proposed by the HON Foundation (20). Our review of four popular search engines returned 32 unique web sites. The mean number of core asthma educational concepts on the whole web sites was 2.7 out of 8. As many as 23 web sites contained unreliable information. However only one site satisfied our criteria of justifiability. From these data we concluded that asthma-related information currently available on the Korean internet is highly variable in quality and fails to meet the information needs of patients as an educational material.

Using same concepts as us, Croft and Peterson (10) evaluated 145 sites on the WWW containing asthma educational material and found that the mean number of core asthma educational concepts included was 4.9. One of the reason explaining the difference between two studies was that over half of the web sites included in this study were categorized as *oriental physician*. In a previous report by Kim et al. using a key word, 'stroke', 71.4% of the web sites identified on the

Korean internet were based on traditional oriental medicine (17). For some concepts, which included basic pathophysiology of asthma, triggers of asthmatic attacks, and necessity of avoidance of triggers, the *oriental physician* sites showed a tendency to share common views of western medicine (Table 4). However with respect to treatment of asthma, their approach was different from western medicine. They usually recommended various kinds of herbs and traditional natural foods. In addition, several sites introduced quite unique forms of management, such as, 'fluctuation treatment' or 'placenta treatment'. Therefore the *oriental physician* sites contained fewer core asthma educational concepts based on western medicine. Confining discussion to the *western physician* sites, the mean number of core asthma educational concepts was 3.5, which was still fewer than the result of Croft and Peterson (10). The plausible explanation was that only a few *western physician* sites contained the last four concepts concerning medication and self-assessment. For effective management of asthma, knowing the importance of anti-inflammatory medication, understanding the potential harm of an excessive reliance on rescue medication, periodic self-assessment, and adjusting the level of medication according to results of self-assessment are needed (19). In this respect, to be qualified as a good educational material, web sites on the Korean internet containing asthma-related information should include information upon medication of asthma, measures of self-assessment, and action plan depending on respiratory status.

Surprisingly, though statistically insignificant, the mean number of core asthma educational concepts included on the *others* sites was higher than the *western physician* sites (5.0 vs. 3.5). However information on the *others* sites was just a mixed collection of contents obtained from other web sites. In addition, the Bulletin Board System (BBS) of the *others* sites fully consisted of non-supervised recants of personal experiences. Even though such information was often partly correct, its disorganized presentation is likely to confuse and mislead information-seekers, especially non-professionals. Accordingly there is urgent necessity for the principles to guide development and posting of web site contents and ensure site visitors' or patients' right to confidentiality like "Guidelines for medical and health information sites on the internet" proposed by the American Medical Association (22).

This study had two limitations. Originally we focused on a single keyword, 'asthma', because we believed that it would be a popular and easy choice of those searching for asthma-related information on the internet. However, as Berland et al. reported, only 20% of the search results led to relevant content when simple search term, such as 'depression' or 'obesity', was entered into search engines (23). If we had chosen combinations of several words as key words, we would have identified more web sites containing comprehensive information. The other limitation was that the core asthma educational concepts we used to assess information of web sites on the Korean internet was totally based on western medicine. In

Korea traditional orient medicine frequently takes an alternative role to western medicine. It was quite beyond the scope of our study to evaluate whether treatments based on orient medicine work or not. However well-balanced assessment of asthma-related information on the internet would have been possible if we had developed a new evaluation principle reflecting the situation peculiar to Korea.

The internet has the potential to be a powerful information resources, which could fully meet a patient's health information needs. Ideally, patients would be able to learn much of what they need to know from high-quality web sites, and thus the time that they spend with their physicians could be used more efficiently. However, this requires that web sites present well-organized and accurate information in a comprehensive manner. Research is needed to determine how a patient's use of internet facilities, complements or complicates patient-physician communication and how patients and health professionals can make better use of this resource.

REFERENCES

1. Lawrence S, Giles CL. *Accessibility of information on the Web. Nature* 1999; 400: 107-9.
2. Korea Network Information Center. *Internet statistics. Available at: <http://www.nic.or.kr>. Accessed February 8, 2003.*
3. Cote J, Cartier A, Robichaud P, Boutin H, Malo JL, Rouleau M, Fillion A, Lavallee M, Krusky M, Boulet LP. *Influence on asthma morbidity of asthma education programs based on self-management plans following treatment optimization. Am J Respir Crit Care Med* 1997; 155: 1509-14.
4. de Oliveira MA, Bruno VF, Ballini LS, BritoJardim JR, Fernandes AL. *Evaluation of an educational program for asthma control in adults. J Asthma* 1997; 34: 395-403.
5. van der Palen J, Klein JJ, Zielhuis GA, van Herwaarden CL. *The role of self-treatment guidelines in self-management education for adult asthmatics. Respir Med* 1998; 92: 668-75.
6. Liljas B, Lahdensuo A. *Is asthma self-management cost-effective? Patient Educ Couns* 1997; 32: S97-104.
7. Kim SG, Jang AS, Kim YK, Lee S, Seo JP, Yang SW, Choi SI, Park SH, Lee KR, Park JH. *The effect of patient education on correct use of metered dose inhalers in patients with asthma. J Asthma Allergy Clin Immunol* 2000; 20: 695-701.
8. Lim JY, Chung SM, Choung JT. *The role of patient and parents education in the management of pediatric asthma. Pediatr Allergy Respir Dis* 2000; 10: 51-60.
9. Peterson MW, Strommer-Pace L, Dayton C. *Asthma patient education: current utilization in pulmonary training programs. J Asthma* 2001; 38: 261-7.
10. Croft DR, Peterson MW. *An evaluation of the quality and contents of asthma education on the World Wide Web. Chest* 2002; 121: 1301-7.
11. Choi ES, Lee YB, Park HM, Shin DJ, Choi SW, Youn ST. *The construction and the evaluation of web sites on epilepsy information. J Korean Soc Med Inform* 2003; 9: 131-41.

12. Kim YT, Kim SH, Kim JW, Shin JS, Park KH. *Investigation of colonoscopy information on the internet. Yonsei Med J* 2003; 44: 307-12.
13. Sim MS, Song KJ, Choi PJ, Kwon WY, Song HG, Jeong YK. *Assessment of credibility and accuracy of contents on basic life support on the internet in Korea and Japan. J Korean Soc Emerg Med* 2003; 14: 93-8.
14. Chang MC, Kim CD, Roh HR, Chae GB, Choi WJ. *Analysis of surgical websites in Korea. J Korean Surg Soc* 2003; 64: 1-5.
15. Kim JH, Park CK. *Internet for patient education of liver diseases. Korean J Hepatol* 2002; 8: 105-6.
16. Park JH, Kim HJ, Joo KJ. *Analysis of urology homepage using the internet. Korean J Urol* 2001; 42: 1328-32.
17. Kim CH, Oh BS, Han SH, Hur JK, Kim YJ, Park DS. *Evaluating rehabilitative medical information on the Korean internet: carpal tunnel syndrome, stroke. J Korean Acad Rehab Med* 2002; 26: 802-5.
18. Stoo LC, Moneta GL, Edwards JM. *Vascular surgery and the internet: A poor source of patient-oriented information. J Vasc Surg* 1999; 30: 84-91.
19. National Asthma Education and Prevention Program. *Expert panel report 2: Guidelines for diagnosis and management of asthma: National Institutes of Health. April 1997; Publication No. 97-4051.*
20. Health on the Net Foundation. *Health on the Net Code of Conducts. version 1.6 Available at: http://www.hon.ch/HONcode/Honcode_check.html. Accessed February 3, 2003.*
21. Kim P, Eng TR, Deering MJ, Maxfield A. *Published criteria for evaluating health related web site: review. BMJ* 1999; 318: 647-9.
22. Winker MA, Flanagan A, Chi-Lum B, White J, Andrews K, Kennett RL, DeAngelis CD, Musacchio RA. *Guidelines for medical and health information sites on the internet. JAMA* 2000; 283: 1600-6.
23. Berland GK, Elliott MN, Morales LS, Algazy JI, Kravitz RL, Broder MS, Kanouse DE, Munoz JA, Puyol JA, Lara M, Watkins KE, Yang H, McGlynn EA. *Health information on the internet: accessibility, quality, and readability in English and Spanish. JAMA* 2001; 285: 2612-21.