

Investigative Urology

# Analysis of Content Legibility for Smartphones of Websites of the Korean Urological Association and Other Urological Societies in Korea

Joo Yong Lee, Dong Hyuk Kang, Hong Sang Moon, Yong Tae Kim, Tag Keun Yoo<sup>1</sup>, Hong Yong Choi, Tchun Yong Lee, Seung Wook Lee<sup>1</sup>

Department of Urology, Hanyang University College of Medicine, <sup>1</sup>Eulji Hospital, Eulji University School of Medicine, Seoul, Korea

**Purpose:** We performed an analysis of the smartphone legibility of the websites of the Korean Urological Association (KUA) and other urological societies.

**Materials and Methods:** This study was conducted on the websites of the KUA and nine other urological societies. Each website was accessed via iPhone Safari and Android Chrome, respectively, to evaluate the establishment and readability of the mobile web pages. The provision of Really Simple Syndication (RSS) feeds by the websites and whether the websites had Twitter and Facebook accounts were evaluated. In addition, a validation test on the web standards was performed by using the World Wide Web Consortium (W3C<sup>®</sup>) Markup Validation Service, and subsequently the numbers of errors and warnings that occurred were analyzed.

**Results:** When accessed via Safari, two websites were legible, four were somewhat legible, and four were somewhat illegible. When accessed via Chrome, two websites were legible, six were somewhat legible, and two were somewhat illegible. One website provided an RSS feed and two websites managed members via separate Twitter accounts. No website supported mobile web pages. The result of the W3C<sup>®</sup> Markup Validation test on 10 websites showed a mean error rate of 221.6 (range, 13-1,477) and a mean warning rate of 127.13 (range, 0-655).

**Conclusions:** The smartphone legibility level of the websites of urological societies was relatively low. Improved smartphone legibility and web standard compliance of the websites of urological societies are required to keep up with the popularity of smartphones.

**Key Words:** Internet; Korea; Urology; Webcasts

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Article History:**

received 5 January, 2011  
accepted 24 January, 2011

**Corresponding Author:**

Seung Wook Lee  
Department of Urology, Eulji Hospital,  
Eulji University School of Medicine, 14,  
Hangeulbiseok-gil, Nowon-gu, Seoul  
139-711, Korea  
TEL: +82-2-970-8306  
FAX: +82-2-970-8349  
E-mail: swleepark@gmail.com

## INTRODUCTION

Since the advent of the first-generation iPhone (Apple Inc, Cupertino, CA, USA) in 2007, smartphones have become a part of our lives [1]. Smartphones, which evolved from personal digital assistants (PDA), are expected to be used by more than 100 million people worldwide in 2012 [2]. Not only can individuals use smartphones personally and professionally to make telephone calls and send e-mail, but they can also search the Internet and use various applica-

tions to track and view information about social networking, health, money or budgets, projects, and other topics [3]. Smartphone popularization has also led to the use of various web browsers such as Safari (Apple Inc), Chrome (Google Inc., Mountain View, CA, USA), and Opera (Opera Software ASA, Oslo, Norway) in addition to Internet Explorer (Microsoft Corp., Redmond, WA, USA) on personal computers (PCs). This trend has required multi-platform websites that comply with web standards because content on the Internet is distributed on a daily basis. In

particular, Web 2.0, which is characterized by online communities, open sharing, interactivity, and collaboration [4], combined with smartphones has been extending its influence via social networks. Most Internet environments in Korea, however, are still been optimized for Internet Explorer, and multi-platform websites are insufficient.

All urological societies including the Korean Urological Association (KUA), Korean Society for Sexual Medicine and Andrology (KSSMA), Korean Urological Oncology Society (KUOS), Korean Society of Pediatric Urology (KSPU), Korean Continence Society (KCS), Korean Endourological Society (KES), Korean Prostate Society (KPS), Korean Association of Urological Practitioners in Private Clinic (KAUPPC), Korean Association of Urogenital Tract Infection and Inflammation (KAUTII), and Korean Society of Urological Research (KSUR) have been operating websites with a separate domain. However, studies on the web standards and smartphone legibility of the websites of these domestic urological societies have not been conducted. Accordingly, we performed validity tests on the web standard compliance and analyzed the smartphone legibility of the websites of the KUA and other urological societies.

## MATERIALS AND METHODS

### 1. Websites of urological societies

The study was conducted on the websites KUA and other urological societies registered to the KUA, including KSSMA, KUOS, KSPU, KCS, KES, KPS, KAUPPC, KAUTII, and KSUR. The Korean Urogenital Trauma Study Group was excluded because it has its home page on Freechal (<http://home.freechal.com/urotrauma/>) without a separate website. The main page address of each website was used for analysis (Table 1).

### 2. Smartphone legibility

Each website was accessed via iPhone Safari and Android Chrome, respectively, to evaluate the establishment and readability of the mobile web pages. For the iPhone, iOS 4.2 (Apple Inc.) run on the iPhone 4 was used for readability evaluation. For the Android phone, Android 2.2 run on Galaxy S (Samsung Electronics, Suwon, Korea) was used for readability evaluation. Readability was classified as

“legible” for main menu display, “somewhat legible” for no main menu display, “somewhat illegible” for content interruption by the attached banner, and “illegible” for no display. Legibility evaluation was performed by two urologists and two urological residents and a final determination was made after discussion.

### 3. Providing RSS feed and social network promotion

Really Simple Syndication (RSS) uses extensive markup language (XML) to constantly scan the content of websites for updates, which are then delivered to the subscribers' desktops or mobile devices through an RSS feed [5]. Whether an RSS feed was provided by the websites to update the web board and journal contents was analyzed. Society promotion and communication delivery among the members through Twitter (<http://www.twitter.com>) and Facebook (<http://www.facebook.com>) were also evaluated.

### 4. Web standard compliance

Web standard validation analysis was performed by using World Wide Web Consortium (W3C<sup>®</sup>) Markup Validation Service (<http://www.w3.org/>). W3C<sup>®</sup> Markup Validation finds the errors and warnings related to the HyperText Markup Language (HTML) pages [6]. It validates the web page regarding errors in HTML tags, properties of the web page, and standards of the web page mentioned by the W3C organization. The numbers of errors and warnings that occurred during W3C<sup>®</sup> markup validation were analyzed.

## RESULTS

### 1. Smartphone legibility

None of the websites analyzed supported a separate mobile web page for smartphones. When accessed via iPhone Safari, the KES and KUOS websites were legible; the KUA, KSSMA, KCS, and KPS websites were somewhat legible; and the KSPU, KAUPPC, KAUTII, and KSUR websites were somewhat illegible. When accessed via Android Chrome, the KES and KUOS websites were legible; the KUA, KSSMA, KCS, KPS, KAUTII, and KSUR websites were somewhat illegible; and the KSPU and KAUPPC websites were somewhat illegible. In summary, when accessed via iPhone Safari, two websites were legible, four websites

TABLE 1. Analyzed websites and their addresses for urological societies in Korea

Society	Website address
Korean Urological Association (KUA)	<a href="http://www.urology.or.kr/home.html">http://www.urology.or.kr/home.html</a>
Korean Society for Sexual Medicine and Andrology (KSSMA)	<a href="http://www.andrology.or.kr/">http://www.andrology.or.kr/</a>
Korean Urological Oncological Society (KUOS)	<a href="http://www.kuos.or.kr/">http://www.kuos.or.kr/</a>
Korean Society of Pediatric Urology (KSPU)	<a href="http://www.kspu.or.kr/main.html">http://www.kspu.or.kr/main.html</a>
Korean Continence Society (KCS)	<a href="http://www.kocon.or.kr/">http://www.kocon.or.kr/</a>
Korean Endourological Society (KES)	<a href="http://www.endourology.or.kr/2008/">http://www.endourology.or.kr/2008/</a>
Korean Prostate Society (KPS)	<a href="http://www.prostate.or.kr/">http://www.prostate.or.kr/</a>
Korean Association of Urological Practitioners in Private Clinic (KAUPPC)	<a href="http://www.uospace.com/">http://www.uospace.com/</a>
Korean Association of Urogenital Tract Infection and Inflammation (KAUTII)	<a href="http://www.uti.or.kr/">http://www.uti.or.kr/</a>
Korean Society of Urological Research (KSUR)	<a href="http://www.kur.or.kr/">http://www.kur.or.kr/</a>

**TABLE 2.** The results of W3C<sup>®</sup> Markup Validation and access of Safari on the iPhone and Google Chrome on the Android for websites of urological societies in Korea

Society website	Access of smartphone web browser <sup>b</sup>		
	Mobile website	iPhone	Android
Korean Urological Association (KUA)	a	2	2
Korean Society for Sexual Medicine and Andrology (KSSMA)	a	2	2
Korean Urological Oncological Society (KUOS)	a	1	1
Korean Society of Pediatric Urology (KSPU)	a	3	3
Korean Continence Society (KCS)	a	2	2
Korean Endourological Society (KES)	a	1	1
Korean Prostate Society (KPS)	a	2	2
Korean Association of Urological Practitioners in Private Clinic (KAUPPC)	a	3	3
Korean Association of Urogenital Tract Infection and Inflammation (KAUTII)	a	3	2
Korean Society of Urological Research (KSUR)	a	3	2

W3C<sup>®</sup>: World Wide Web Consortium. <sup>a</sup>: Mobile website has not been constructed. <sup>b</sup>: 1: legible, 2: somewhat legible, 3: somewhat illegible, 4: illegible

were somewhat legible, and four websites were somewhat illegible, whereas two websites were legible, six websites were somewhat legible, and two websites were somewhat illegible when accessed via Android Chrome. In summary, the websites of the KUOS and the KES, which showed lower errors in the web standard test, also showed higher legibility (Table 2).

## 2. Providing RSS feed and social network promotion

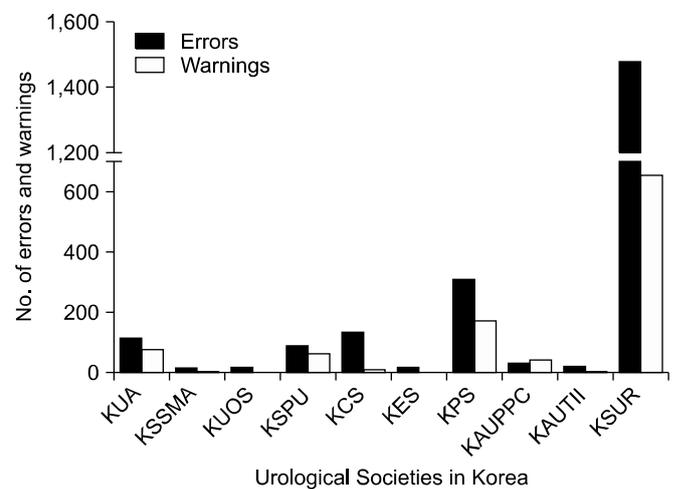
The KPS website provided an RSS feed for the web board, and the KCS website provided an RSS feed for the International Neurourology Journal (<http://journal.koon.or.kr/rss/news/feed.xml>). No other website analyzed provided an RSS feed. Only the KCS ([http://twitter.com/KCS\\_urology](http://twitter.com/KCS_urology)) and KSSMA ([http://twitter.com/K\\_Andrology](http://twitter.com/K_Andrology)) websites delivered society news via Twitter accounts. None of the websites analyzed used a Facebook account.

## 3. Web standard compliance

The result of the W3C<sup>®</sup> markup validation test on 10 websites showed a mean error rate of 221.6 (range, 13-1,477) and a mean warning rate of 127.13 (range, 0-655). The error and warning rates of each website were as follows: KSUR (1,477 errors, 655 warnings), KPS (308 errors, 171 warnings), KCS (133 errors, 8 warnings), KUA (113 errors, 76 warnings), KSPU (87 errors, 61 warnings), KAUPPC (31 errors, 41 warnings), KAUTII (20 errors, 3 warnings), KUOS (17 errors, 0 warning), KES (17 errors, 0 warning), and KSSMA (13 errors, 2 warnings) (Fig. 1).

## DISCUSSION

Over the past several years, smartphones, which are mobile phones with functions of computerized systems for sending e-mails and accessing the Web, have become a part of everyday life [7]. The iPhone, which was announced at MacWorld 2007 in January 2007, is a smartphone that has the three main features of a touch-screen-based iPod



**FIG. 1.** The results of World Wide Web Consortium (W3C<sup>®</sup>) Markup Validation of the websites of urological societies in Korea. KUA: Korean Urological Association, KSSMA: Korean Society for Sexual Medicine and Andrology, KUOS: Korean Urological Oncological Society, KSPU: Korean Society of Pediatric Urology, KCS: Korean Continence Society, KES: Korean Endourological Society, KPS: Korean Prostate Society, KAUPPC: Korean Association of Urological Practitioners in Private Clinic, KAUTII: Korean Association of Urogenital Tract Infection and Inflammation, KSUR: Korean Society of Urological Research.

(Apple Inc), cellular phone, and mobile internet. It was officially released in Korea in November 2009. Android is a mobile operating system platform that was announced in November 2007 by Open Headset Alliance, which was mainly formed by Google. iPhone and Android-installed smartphones are at the center of the worldwide smartphone popularity.

The Internet is a common way to access all kinds of information; thus, it has come to have a highly influential place in health care as well [8]. Especially, since a wide range of Web 2.0 technologies have become very popular

within the general population [9], Web 2.0 technologies such as Asynchronous JavaScript and XML (AJAX) have led to improved web interfaces that mimic the real-time responsiveness of desktop applications within a browser window [10]. The popular use of smartphones has led to an environment in which the Internet is more widely available. In particular, Twitter, YouTube (<http://www.youtube.com>), and Facebook, which provide services represented as Web 2.0 websites, combined with smartphones are an often-used source of health care information [11]. According to a study led by Pandey et al, there was approximately 9.5 hours of H1N1-related information registered on YouTube, and 61.5% of this information was reported to be useful [12]. In a similar study reported by Sood et al, there was more than 16 hours of information related to kidney stone disease on YouTube, and 68.0% of this information was reported to be useful [13]. Murugiah et al reported that cardiopulmonary resuscitation (CPR)-related YouTube information was analyzed in the same way [14]. In the aforementioned studies, YouTube, one of the most popular Web 2.0 sites, was considered to be a relatively accurate informational source, and the results of these studies can be applied to smartphones as well as PCs. YouTube, which is one of the basic applications of iOS and Android, is popular and can be used to deliver a lot of information.

In the past year, several doctors and medical librarians have put Web 2.0 in the spotlight [15]; one excellent article even discussed its impact in clinical practice [16]. In particular, with an RSS reader using an RSS feed, the update status of various medical journals can be quickly identified via smartphones and PCs [17]. PubMed (<http://www.pubmed.gov>) and MEDLINE have also been offering RSS feeds [18]. Today, medical societies, universities, other institutions and organizations, and medical journals offer valuable information for everyday practice and life [19]. Their websites include the majority of the relevant, available online information by use of Web 2.0 technologies as RSS feeds.

Recently, Web 2.0 combined with the smartphone has enabled an easier way to access the worldwide social networking communities on Twitter and Facebook. Twitter is a Web 2.0 site wherein users share brief (< 140 characters) text status updates ("tweets") to share a wealth of data with "followers" [20]. Twitter was launched in only 2006 but has experienced a meteoric rise in popularity, or notoriety, depending on whom you ask [21]. Facebook, one of the most popular Web 2.0 websites, claims more than 400 million active users [22]. The average age of Facebook users continues to rise as the popularity of these websites expands. Platforms such as Twitter and Facebook enable people to share their knowledge and experience, creating a rich array of user-generated content. Twitter and Facebook have recently been expanding into the information and communication space of medicine and health areas. Scanfeld et al conducted a study on the delivery of antibiotics information through Twitter [23]. They concluded that relatively precise health information and advice can be disseminated through Twitter. Garner and O'Sullivan investigated the

professional behaviors of undergraduate medical students using Facebook [24]. They concluded that the students were able to share their opinions and were relieved from anxiety about the future through social networking. The results of the aforementioned studies indicate that Twitter and Facebook can provide communication spaces for members through social networking and are very useful for public relations and information delivery. The European Association of Urology (EAU; <http://twitter.com/Uroweb/>) and the American Urological Association (AUA; <http://www.facebook.com/pages/American-Urological-Association/83496027206>) have already opened accounts on Twitter and Facebook to freely communicate all over the world.

The Internet environment in Korea has also been quickly adapting to the era of the smartphone and Web 2.0. Portal sites such as Daum (<http://m.daum.net>) and Naver (<http://m.naver.com>) have been supporting a separate mobile web page, and various conventional media have been operating mobile web pages and released smartphone applications. However, the websites of medical and health areas have not kept up with the popularity of smartphones. KoreaMed (<http://www.koreamed.org>), a leading medical search engine in Korea, does not provide an RSS feed in contrast with PubMed. KoreaMed Synapse (<http://synapse.koreamed.org>), which is a website providing full text of medical journals in Korea, also does not provide an RSS feed. In addition, as shown in this study, the websites of the urological societies did not provide separate mobile web pages and inhibited smartphone legibility by inserting a menu using Flash (Adobe System Inc., San Jose, CA, USA) without complying with the web standards. Furthermore, only two websites provided communication space through Twitter. Also, the websites of the urological societies may cause an inconvenience when connecting via smartphone-installed iOS or Android because of their low web standard compliance. None of the societies except for the KCS provided an RSS feed of medical journals; thus, we cannot use an RSS reader to review newly updated articles.

This study was an observational study of web standard compliance, provision of RSS feeds, social networking availability, and smartphone legibility of the websites of urological societies. In February of 2010, the number of smartphone users in Korea was estimated at approximately 7 million. Samsung Economic Research Institute (<http://www.seri.org>) also predicted that one of five Korean people will use a smartphone in 2011 [25]. We have to pay attention to the rapid growth of smartphone users, including Korean urologists, although each society will pay the price to construct mobile web pages, increase smartphone legibility, and provide RSS feeds and social networking promotion. The results of this study suggest that higher smartphone legibility, web standard compliance, and social networking availability should be achieved by the websites of the urological societies in the near future.

## CONCLUSIONS

The websites of the KUOS and the KES, which showed lower errors in the web standard test, also showed higher legibility on an iPhone and android-installed smartphone. Most websites neither provided an RSS feed nor used social networks for membership management. The web standard compliance level of the websites of urological societies was relatively low. Improved web standard compliance and smartphone legibility of the websites of urological societies are required to keep up with the popularity of smartphones.

## Conflicts of Interest

The authors have nothing to disclose.

## REFERENCES

- Oehler RL, Smith K, Toney JF. Infectious diseases resources for the iPhone. *Clin Infect Dis* 2010;50:1268-74.
- Raento M, Oulasvirta A, Eagle N. Smartphones: an emerging tool for social scientists. *Sociol Methods Res* 2009;37:426-54.
- Kovic I, Lulic I, Brumini G. Examining the medical blogosphere: an online survey of medical bloggers. *J Med Internet Res* 2008;10:e28.
- Wright A, Bates DW, Middleton B, Hongsermeier T, Kashyap V, Thomas SM, et al. Creating and sharing clinical decision support content with Web 2.0: issues and examples. *J Biomed Inform* 2009;42:334-46.
- Wu WG, Li J. RSS made easy: a basic guide for librarians. *Med Ref Serv Q* 2007;26:37-50.
- Muin M, Fontelo P. Technical development of PubMed interact: an improved interface for MEDLINE/PubMed searches. *BMC Med Inform Decis Mak* 2006;6:36.
- Brusco JM. Using smartphone applications in perioperative practice. *AORN J* 2010;92:503-8.
- Jo HS, Hwang MS, Lee H. Market segmentation of health information use on the Internet in Korea. *Int J Med Inform* 2010;79:707-15.
- Sandars J, Schroter S. Web 2.0 technologies for undergraduate and postgraduate medical education: an online survey. *Postgrad Med J* 2007;83:759-62.
- Eysenbach G. Medicine 2.0: social networking, collaboration, participation, apomediation, and openness. *J Med Internet Res* 2008;10:e22.
- Steinberg PL, Wason S, Stern JM, Deters L, Kowal B, Seigne J. YouTube as source of prostate cancer information. *Urology* 2010;75:619-22.
- Pandey A, Patni N, Singh M, Sood A, Singh G. YouTube as a source of information on the H1N1 influenza pandemic. *Am J Prev Med* 2010;38:e1-3.
- Sood A, Sarangi S, Pandey A, Murugiah K. YouTube as a Source of Information on Kidney Stone Disease. *Urology* 2010;Epub ahead of print
- Murugiah K, Vallakati A, Rajput K, Sood A, Challa NR. YouTube as a source of information on cardiopulmonary resuscitation. *Resuscitation* 2010;Epub ahead of print
- Abbasi K. Journals join the podcast revolution. *J R Soc Med* 2006;99:329.
- Boulos MN, Maramba I, Wheeler S. Wikis, blogs and podcasts: a new generation of Web-based tools for virtual collaborative clinical practice and education. *BMC Med Educ* 2006;6:41.
- Doree J. RSS: A Brief Introduction. *J Man Manip Ther* 2007;15:57-8.
- Giustini D. How Web 2.0 is changing medicine. *BMJ* 2006;333:1283-4.
- Fragoulis KN, Vardakas KZ, Falagas ME. Open access World Wide Web resources on urogenital infections. *Nephrol Dial Transplant* 2007;22:3046-7.
- Chew C, Eysenbach G. Pandemics in the age of Twitter: content analysis of Tweets during the 2009 H1N1 outbreak. *PLoS One* 2010;5:e14118.
- Martens E. Twitter for scientists. *ACS Chem Biol* 2010;5:149.
- Landman MP, Shelton J, Kauffmann RM, Dattilo JB. Guidelines for maintaining a professional compass in the era of social networking. *J Surg Educ* 2010;67:381-6.
- Scanfeld D, Scanfeld V, Larson EL. Dissemination of health information through social networks: twitter and antibiotics. *Am J Infect Control* 2010;38:182-8.
- Garner J, O'Sullivan H. Facebook and the professional behaviours of undergraduate medical students. *Clin Teach* 2010;7:112-5.
- Mobile bingbang and the future of business management, CEO information, Samsung Economic Research Institute 2010;760:1-2.