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## Readability of ASPS and ASAPS Educational Websites: An Analysis of Consumer Impact

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### Abstract

**Background**—Patients use the internet to educate themselves about health related topics and learning about plastic surgery is a common activity for the enthusiastic consumers in the United States. How to educate the consumers regarding plastic surgical procedures is a continued concern for plastic surgeons when faced with the growing portion of the American population having relatively low healthcare literacy. The usefulness of health related education materials on the internet depends largely on their comprehensibility and understandability for all who visit the websites.

**Methods**—We studied the readability of patient education materials related to common plastic surgery procedures from the ASPS and ASAPS websites and compared them with materials on similar topics from 10 popular health information providing sites.

**Results**—We found that all analyzed documents on the ASPS and ASAPS websites targeted to the consumers were rated to be more difficult than the recommended reading grade level for most American adults and these documents were consistently amongst the most difficult to read when compared to the other health information websites.

**Conclusion**—The internet is an increasingly popular avenue for patients to educate themselves about plastic surgery procedures. Patient education materials provided on ASPS and ASAPS websites should be written at recommended reading grade levels to ensure it is readable and comprehensible to their audience.

### Keywords

readability; internet; literacy; plastic surgery; websites

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Internet use has increased substantially over the past decade with approximately 220 million Americans (greater than 70% of the population) being internet users.<sup>1</sup> It has been postulated that roughly 8 in 10 of American internet users have sought information on health related topics on the internet.<sup>2</sup> Studies on select patient populations have shown a consistent propensity amongst patients to seek health-related information on the internet.<sup>3-6</sup> The search and

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acquisition of health-related information on the internet is impactful, as the majority of patients using this medium report that medical information found on the internet influences their medical decisions.<sup>7</sup>

Health literacy is an important consideration in healthcare because it directly affects the ability of patients to make informed decisions, follow health maintenance regimens and treatment-related instructions in navigating the healthcare systems. Health literacy is a significant factor in predicting health outcomes, and people with low literacy tend to have low patient compliance, increased complication rates, and ultimately incur greater healthcare costs.<sup>10-18</sup> In extensive literacy assessments, nearly half of American adults are classified as being low or limited in basic language and health literacy<sup>19-20</sup>. Low literacy hinders the usefulness of the internet for the purpose of health-related patient education. The level or number of years of formal education attained poorly correlates with health literacy as studies show that reading grade level of the average American adult is an average of 4 grades below the highest level of education attained.<sup>10,21</sup> Therefore, materials written for the purposes of health education should be written between 6<sup>th</sup> to 8<sup>th</sup> reading grade levels.<sup>10,15,22-23</sup>

The specific aim of this study is to evaluate the readability of patient education materials on the American Society of Plastic Surgeons (ASPS) and American Society of Aesthetic Plastic Surgeons (ASAPS) websites. Secondly, we compared the readability of patient education materials for common plastic surgery procedures in these two websites with the most consulted health information websites as listed by Consumer Reports WebWatch.<sup>24</sup> We hypothesize that (1) patient education materials from the ASPS and ASAPS websites are more difficult to read and comprehend than information on the same topics obtained from the other websites, and (2) patient education materials from other websites are more likely to fall in the recommended 6<sup>th</sup> to 8<sup>th</sup> reading grade level range than materials from the ASPS and ASAPS websites.

## Materials and Methods

From a 2009 ASPS report, we acquired information on 15 common plastic surgery procedures in the calendar year of 2008, including cosmetic, reconstructive and minimally invasive procedures for both men and women (Table 1).<sup>25</sup> We searched the patient education section of the ASPS and ASAPS websites for materials on these 15 plastic surgery procedures. These procedures were also researched on the 10 most consulted websites for health care information on the internet as listed by Consumer Reports WebWatch (Table 2).<sup>24</sup> One of the websites in the top 10 was eliminated, drugs.com, because it provided pharmaceutical information only, the 11<sup>th</sup> website on the list was chosen to make the number of analyzed websites 10 in all.

After identifying patient education materials on the select 15 topics on all 12 websites (ASAPS, ASPS and the top 10 Consumer Reports listed sites), they were copied and pasted onto Microsoft word (Microsoft Office 2007, Redman, WA) documents. We omitted tables, diagrams, illustrations and their captions were omitted.

The patient education materials were in clearly delineated sections of the ASPS and ASAPS websites, so a site search was unnecessary. The other 10 sites treat broad range of non-plastic surgery. Hence we began our search on these site's main pages by typing in medical terminology or colloquialisms associated with the procedures we were investigating. We selected the first article that discussed the subject even if there were more comprehensive articles down the list. We also did not go beyond the first set of returned article pages from our search. The rationale for these were to establish consistency in search practices and secondly, internet use pattern studies suggest that internet users generally spend a relatively finite time online when in search of information.<sup>26</sup>

We used three programs to analyze the readability of each documents. The Flesch-Kincaid (FK) model, a tool included on Microsoft office word software (version 2007; Microsoft Corp, Redman, WA). This tool was activated by clicking on the “show readability statistics” from the “spelling and grammar” option under the tools tab. The FK model uses the formula; grade level =  $0.39 (\text{words per sentence}) + 11.8 (\text{syllables per word}) - 15.59$ . It provides reading grade level scores between 5<sup>th</sup> to 12<sup>th</sup> grade levels. Hence, documents that are more difficult than the 12<sup>th</sup> grade reading level are reported as the 12<sup>th</sup> grade reading level. The FK model has been widely used for analysis of health education materials.<sup>27-28</sup>

The second tool used is the SMOG (Simple Measure of Gobbledygook) index, which estimates the number of years of education required to comprehend a piece of writing. The SMOG index uses the formula; grade level =  $1.043 (\text{square root of } 30 (\text{number of polysyllables/number of sentences})) + 3.1291$ . We used a web-based program implementing this formula. The SMOG index, recommended by the National Cancer Institute, is widely used to estimate the readability of health messages.<sup>29-30</sup> Grade levels reported by this index correlate highly (0.985) with the actual years of education attained by test subjects who have 100% comprehension of test materials.<sup>31</sup> The grade level results from the SMOG index are generally higher than those obtained from the same documents with the FK-model because the SMOG index employs stricter criteria for readability and is based on 100% comprehension.<sup>32</sup>

A third measure of readability, the Flesch Reading Ease (FRE) is also included in the Microsoft Office Word program and is calculated alongside the FK model. The FRE formula is: score (0-100) =  $206.835 - 1.015 (\text{total words/total sentences}) - 84.6 (\text{total syllables/words})$ . A score on the FRE between 90-100 implies easy comprehension by an 11-year-old student, a score of 60-70 indicates average 13-15 year-old students can understand the presented material and a score of 0-30 is comprehended by college level students.

All texts were modified to prepare them for analysis according to stipulations given in the literature to avoid underestimation of difficulty. They were condensed into single paragraphs to avoid effects from paragraph breaks. Decimals, abbreviations, dashes, colons, semicolons, parenthesis, and slashes were removed from texts to avoid distorting sentence length. Copyright notices, disclaimers, author names and information, drug trade names and trade names of products such as injectables were also removed.<sup>33-34</sup>

Averages with standard deviations from the FK-model and SMOG tests and scores from the FRE test were calculated for each website. Averages were first compared between the ASAPS and ASPS websites. The ASAPS and ASPS averages were combined and treated as the control and then compared to the other ten websites individually. We excluded one of the 15 procedures, intense pulsed light (IPL), from the study because none of the websites had a dedicated textual composition for education related to it.

### Statistical analysis

Several epidemiological studies show that reading ability is normally distributed in the population.<sup>35-39</sup> Hence, comparisons of the calculated averages of the readability indices were compared using the unpaired Student's *t*-test with a significance level set at  $p < 0.05$ .

### Results

A total 14 topics were analyzed on 12 websites. Approximately 150 articles were analyzed with three readability measurements. Only three websites had patient education materials on all 14 topics. The average number of topics treated by each website was 12.6. Articles varied in length from 55 words to 2787 words. There was no correlation found between article length and readability.

### FK-model analysis

Patient education materials from the ASPS and ASAPS websites scored a mean reading grade level of  $11.9 \pm 0.2$  and  $12.0 \pm 0.3$  respectively. The range of average reading grade levels across all 12 websites was from  $8.9 \pm 0.9$  to  $12.0 \pm 0.3$ . We compared averages from each of the 10 popular health related websites to averages from ASPS and ASAPS websites respectively and this showed that the patient education materials from the ASPS and ASAPS websites were more difficult to read than materials from all other websites and significantly so than nine of the 10 websites (Table 3). There was no significant difference between the average readability scores from the ASPS and ASAPS websites ( $p = 0.41$ ).

### FRE score analysis

The FRE analysis gives a reading grade level result, a score between 0 and 100 indicating the ease of reading and comprehending a document, the lower the number, the more difficult to read the document. The average readability scores from the ASPS and ASAPS websites were  $34.6 \pm 7.1$  and  $35.3 \pm 5.4$  respectively. There was no significant difference between the two websites,  $p = 0.77$ . The range of FRE score averages across all 12 websites is between  $59.2 \pm 4.4$  and  $35.3 \pm 5.4$ . We compared FRE score averages from each of the 10 popular health related websites to the ASPS and ASAPS averages, it showed that the patient education materials from the ASPS and ASAPS websites were more difficult to read than materials from all other websites and were significantly more difficult to read than materials from eight of the 10 websites (Table 3).

### SMOG index analysis

Like the FK-model, the SMOG index reports readability as estimations of reading grade levels. Reading grade levels were uniformly higher than those reported by the FK-model on the same articles. The range of reading grade level averages across all 12 websites are between  $11.9 \pm 0.7$  and  $14.9 \pm 2.0$ . Although the ASPS and ASAPS websites made up 2 of the 3 highest averages, realage.com contained the most difficult articles to read according to this analysis. As with the FK-model and the FRE analyses, there was no significant difference between the averages of the ASPS and ASAPS websites,  $p = 0.66$ . However, ASPS and ASAPS websites contained significantly more difficult articles than seven of the 10 other websites (Table 3).

## Discussion

Internet popularity has grown globally and the majority of Americans (79%) are engaged on line.<sup>1,40</sup> Amongst its myriad applications, search for information including health-related information is one of commonest uses of the internet today, with 8 in 10 internet users have searched for health information.<sup>2,41</sup> Sixty-nine percent of people using the internet for health education issues do not discuss the information found with their physicians; additionally, 60% believe the information from internet sources is equal to or better than physician provided information.<sup>3,7</sup> Unfortunately, several studies on internet-acquired health-related information have suggested deficiencies in the quality of information with regards to accuracy, comprehensiveness and relevance of content found.<sup>42-49</sup> This finding has also been borne out in plastic surgery literature.<sup>50-51</sup>

Literacy assessments in the United States have existed since the 1930s, and these studies have included health literacy that is defined as the measure of an individual's ability to read, understand and apply health-related information in making decisions and following treatment instruction.<sup>52</sup> Patients with low literacy are 52% more likely to need hospital admissions.<sup>53</sup> Literacy is the best predictor of health status, more than income, employment status, age, education level, racial or ethnic group.<sup>8-9,17-18</sup> Patients with low literacy understand their chronic diseases less and engage in more risky behaviors as well.<sup>17-18, 54-55</sup> These studies

report that approximately half of American adults have low health literacy.<sup>19-20</sup> Even though majority of the adult population has achieved a high school education, the average reading level of the American adult is between the 8<sup>th</sup> and 9<sup>th</sup> grade level.<sup>56</sup>

Given the internet's popularity, physicians in different organization have taken advantage of it for dissemination of information regarding patient education and consumer service. However, if health information provided on the internet by physicians is to be useful, the comprehensibility of the materials has to be ensured. Reading grade level contributes immensely to the comprehensibility of documents<sup>12</sup>. This project was undertaken to evaluate the readability of patient education materials on the American Society of Plastic Surgeons (ASPS) and the American Society of Aesthetic Plastic Surgery (ASAPS) websites. Furthermore, we compared the readability of materials found on the ASAPS and ASPS websites with information on the same topics gathered from the 10 most popular websites for health-related information as rated by a credible source for consumer-related data.<sup>24</sup>

The importance of ensuring the readability of patient education materials on the ASPS and ASAPS websites is borne out of the assumption that the relevance, comprehensiveness and accuracy of information provided these websites is guaranteed. This is in contrast with general web-based health information that several studies have suggested to be unreliable in quality.<sup>42-51</sup> Of the 150 articles that were analyzed in this study, only 5 articles, which equates to 3% of articles, achieved between 6<sup>th</sup> and 8<sup>th</sup> grade reading level and none scored below the 6<sup>th</sup> grade reading level with the FK-model analysis. Using the stricter criteria of the SMOG index analysis, none of the articles achieved the 6<sup>th</sup> to 8<sup>th</sup> reading grade level. Additionally, the ASPS and ASAPS patient education materials were consistently on average the most difficult to read by using all three methods of analysis and some articles even reaching a reading grade level of 17, which translates to beyond college level reading. The logical inference from these findings is that majority, if not all, of the information provided for patient education is not comprehensible to the majority of patients who may have limited literacy capability.

ASPS and ASAPS websites can be made more accessible to the general public. There are resources available to achieve this goal including materials provided by federal institutions including the Centers for Disease Control and Prevention (Simply Put)<sup>23</sup>, Center for Medicare Education (Writing Easy-to-Read Materials)<sup>57</sup>, National Library of Medicine (Understanding Health Literacy and its Barriers)<sup>58</sup>, National Cancer Institute (Clear and Simple: Developing Effective Print Materials for Low-Literate Readers)<sup>59</sup>, state agencies like the Washington state Office of Health Promotion (Guidelines to Developing Easy-to-Read Health Education Materials)<sup>60</sup>, and private organizations like the Society for Technical Communication, Usability Special Interest Group (Readability Research)<sup>61</sup>.

We recommend improving readability of patient education materials on the ASAPS and ASPS websites by paying attention to the message content (text), formatting, and use of adjunctive educational materials such as illustrations. There is evidence that some of these efforts have been considered and addressed to different degrees by both websites. A good example of this is the use of bold type to represent emphasized points and subheadings that are designed as questions to focus the reader's attention on a "chunk" of the subject matter at a time. Additionally, each sub-topic of the subject matter is treated independently on its own page with cues to the next sub-topic at the end of the text, which is also equivalent to chunking. ASPS website uses bulleted lists to enhance the readability of a document. Both websites employ illustrations and other visuals to elaborate on technical details and represent potential results that can also improve the comprehension of a document.

However, when we analyzed the quantifiable contributors to readability, the potential for vast improvement on both ASPS and ASAPS websites is evident. Word choice is particularly

germane in composing medical education materials. It is recommended that alternative words are used for complex words, medical terms, and acronyms.<sup>23</sup> Medical terms and phrases such as “lipoplasty”, “capsular contracture”, “magnetic resonance imaging”, “irregular pigmentation” were not uncommon words on both websites. Although the ASPS website provided a list of definitions at the end of documents, this was on a separate page; definitions should be included in context.<sup>23</sup> Additionally, sentences of 8-10 words are recommended to enhance readability.<sup>23</sup> The average sentence length for patient education documents on the ASPS website was  $20.3 \pm 2.0$  and  $18.5 \pm 4.0$  for the ASAPS websites. To draw an inference, this will very likely make it difficult for many patients to read and comprehend these documents.

Although Friedman's and Hoffman-Goetz's discussion was aimed specifically at the development of cancer information websites, we believe it is also applicable to websites for patient directed medical information in general. They recommend presenting materials for different subpopulations, pretesting for readability and comprehension, engaging website designers, health writers and graphic illustrators to focus on clarity, plain language and appropriate illustrations.<sup>33</sup> Links to scientific details should be provided for patients with sophisticated reading skills because this could enhance their comprehension.<sup>33</sup> The American Cancer Society ([www.cancer.org](http://www.cancer.org)) is one example of an organization with keen attention paid to readability and comprehensibility of health education materials they produce. Editors and writers are specifically encouraged to use plain language; topics are presented at several reading grade and peer-counseling programs have also been implemented.<sup>12</sup>

Our search patterns on the internet, especially on the 10 websites that were compared to the ASPS and ASAPS websites were not based on observed or actual patient search patterns. We made assumptions about documents that patients would choose for their enlightenment. We did standardize the search patterns to minimize the bias in results and our analysis. Furthermore, we did not directly test the comprehension of any cohort of the patient education materials as part of the study; instead, we used readability formulas to predict the difficulty patients would have with the documents. In spite of these limitations, readability formulas are reliable at giving an idea about the skill required to read and comprehend a document as they are calibrated against more laborious and detailed readability surveys. Hence, they can and should be used in the process of preparation of patient education materials for the internet to ensure usefulness of these documents to their intended audience.

The ASPS and ASAPS have taken advantage of the growing popularity of the internet, especially the propensity patients have shown to search for health-related information on this modern portal of knowledge dissemination. It is imperative that the information provided be useful for the target audience. Readability analysis shows that patient education materials on ASPS and ASAPS websites are presented at reading grade levels too high to comprehend by most American adults. Pre-testing patient education materials amongst the target audience to evaluate for readability comprehensibility is warranted with appropriate changes made to ensure ease of reading. Many resources are available to direct this effort.

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**Table 1**

Analyzed plastic surgery procedures and their popularity

<b>Procedure</b>	<b>No. performed in 2008 (<i>in thousands</i>)</b>
Breast augmentation	307
Rhinoplasty	279
Liposuction	245
Blepharoplasty	221
Abdominoplasty	121
Botox	5,014
Fillers (Hyaluronic Acid)	1,109
Chemical peel	1,048
Laser hair removal	891
Microdermabrasion	841
Laser resurfacing	400
Breast reduction (women)	88
Breast reduction (men)	17
Hair transplantation	17

Source: American Society of Plastic Surgeons (ASPS). The National Clearing House of Plastic Surgery Statistics.

**Table 2**

Most popular websites for health information, by traffic.

<b>1</b>	<b>National Institutes of Health</b>
<b>2</b>	<b>WebMD</b>
<b>3</b>	<b>MSN Health &amp; Fitness</b>
<b>4</b>	<b>About Health</b>
5	MedicineNet.com
<b>6</b>	<b>Yahoo! Health</b>
7	MayoClinic.com
<b>8</b>	<b>RealAge</b>
<b>9</b>	<b>AOL Health</b>
10	Drugs.com *
11	QualityHealth.com
12	Aetna IntelliHealth
13	KidsHealth
14	Healthology
15	RxList
16	Everyday Health
17	MedHelp.org
18	Prevention.com
19	eMedicineHealth
20	familydoctor.org

Source: Consumer reports Webwatch/Healthratings.org.

\* Not included in analysis as it provided only pharmaceutical information.

Analyzed websites in bold type.

**Table 3**

Average grade level (FK-Model, SMOG index) and scores (FRE) of analyzed websites

	FK-Model (RGL) *	FRE Scores	SMOG index (RGL) *
ASPS	11.9±0.2	34.6±7.1	14.5±1.3
ASAPS	12.0±0.3	35.3±5.4	14.3±1.1
Medline	<b>10.0±1.5</b>	<b>53.0±9.2</b>	<b>12.8±1.5</b>
WebMD	<b>10.8±0.8</b>	<b>45.5±6.8</b>	<b>12.4±0.6</b>
MSNhealth & Fitness	<b>10.7±1.0</b>	<b>48.0±5.0</b>	<b>12.4±0.7</b>
Abouthealth	<b>10.6±1.5</b>	<b>49.5±10.1</b>	13.3±1.6
MedicineNet.com	<b>9.9±1.0</b>	<b>51.8±8.0</b>	<b>12.8±0.8</b>
Yahoo! Health	<b>8.9±0.9</b>	<b>59.2±4.4</b>	<b>11.9±0.7</b>
Mayoclinic.com	<b>9.5±1.4</b>	<b>52.7±8.6</b>	<b>12.2±1.2</b>
Realage	11.5±0.8	40.9±11.2	14.9±2.0
AOLhealth	<b>9.9±1.1</b>	<b>51.5±5.8</b>	<b>12.7±1.2</b>
Qualityhealth.com	<b>10.4±1.1</b>	43.8±13.8	13.2±2.0

Comparison of the difficulty of ASPS and ASAPS (shaded) patient education information to that of 10 popular websites. Bold type shows ASPS/ASAPS significantly more difficult than corresponding website ( $p < 0.05$ ). SMOG index, recommended by National Cancer Institute for health education documents, has more stringent criteria and hence is judged to be more appropriate for readability analysis.

\* Reading grade level