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SPECIAL TOPIC
Education

Readability of Patient Education Materials in Plastic Surgery: Assessing 14 Years of Progress

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Background: Current recommendations suggest that patient education materials (PEMs) be written at or below the sixth-grade reading level. In a 2010 study, the average readability of PEMs on the American Society of Plastic Surgeons (ASPS) and The Aesthetic Society (AS) websites was found to be at the 11th-grade level or higher. We sought to assess progress made toward providing accessible PEMs.

Methods: PEMs were obtained from the ASPS and AS websites. The PEMs were entered into an online scoring tool. PEMs were scored on 3 common readability indices: Flesch–Kincaid, Simple Measure of Gobbledygook, and Flesch Reading Ease (FRE).

Results: The average grade level of ASPS PEMs calculated using the Flesch–Kincaid, Simple Measure of Gobbledygook, and FRE readability models were 9.7 ± 1.1, 12.6 ± 0.7, and 47.6 ± 6.2, respectively. This FRE score corresponds to approximately grade 13–16 reading levels. The average of AS PEMs were 9.3 ± 0.5, 12.3 ± 0.3, and 51.3 ± 3.9, respectively; this FRE corresponds to grade 10–12 reading levels. There were no PEMs written at or below the recommended sixth-grade reading level found on ASPS and AS websites.

Conclusions: Despite increasing awareness of the need for equitable access to healthcare, PEMs continue to be written at a reading level well above the recommendation. Over the past 14 years, we have seen only modest improvement in readability indices. In addition to advocating for more accessible PEMs, we must gather a deeper understanding of how patients seek information about plastic surgery.
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INTRODUCTION

Online patient education materials (PEMs) are critical to improving patients' understanding of medical diagnoses and treatment options. Electronic health literacy has been defined as the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem.[1] Approximately 85% of US adults are daily users of the internet and more than 80% search for health or medical information.[2] Yet, an estimated 52% of Americans have literacy skills at or below a sixth-grade reading level.[3]

The connection between low literacy and patient outcomes has yet to be fully established in the literature due to the complex interplay of health, literacy, and socioeconomic status.[4,5] Current data suggest that low literacy is associated with poorer self-reported health status.[3,6] Further, those with low literacy levels incur higher healthcare costs as a result of poor use of healthcare resources, such as higher rates of emergency department visits.[7–9] As a result, there lies a clear need to improve health literacy across the United States. Providing level-appropriate PEMs is 1 critical step toward improving patient outcomes, lowering healthcare costs, and providing safe and informed healthcare.

Current recommendations suggest that PEMs be written at or below the sixth-grade reading level, and yet many of our plastic surgery materials far exceed this level.[10–17]

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Aliu and Chung[18] determined that the average readability of PEMs on the American Society of Plastic Surgeons (ASPS) and The Aesthetic Society (AS) websites were written at 11th-grade reading levels or higher and were more difficult to read than other consumer healthcare websites.[18] The goal of this study sought to assess the progress made in the last decade toward providing accessible PEMs on our national organization websites and compare those to today's leading healthcare websites.

METHODS

ASPS and AS Plastic Surgery Resources

We performed a search of the patient education web pages on both the ASPS and AS websites. The text of each patient education article was saved in Microsoft Word (Version 16; Microsoft Corporation). We excluded captions, advertisements, and extraneous text irrelevant to patient education content.

Consumer Plastic Surgery Resources

We identified the top consumer healthcare websites based on publicly available website traffic data (Statista.com) and included those with plastic surgery PEMs that were indexed (ie, contained a dedicated table of contents; Table 1). Exclusion criteria were websites intended for healthcare providers, pharmaceutical websites, and sites that did not have an indexed plastic surgery PEM web page. Websites that lacked an indexed plastic surgery PEM web page were excluded due to the lack of ability to browse all plastic surgery topics systematically. Furthermore, nonindexed sites contained numerous articles not written or edited by medical professionals. PEMs from included websites were downloaded and saved in a similar fashion to ASPS and AS materials.

The text of each article was processed on readable.com (Added Bytes Ltd, Horsham, UK), which generates scores across multiple readability indices. The score of each of the PEMs was tabulated on Microsoft Excel (Version 16; Microsoft Corporation), and an average readability score for each of the indices was averaged across each website to produce a final readability score for each site. Statistical analysis included an unpaired t test with a significance level set at P less than 0.05.

Table 1. Top 10 Healthcare Websites in the United States Based on Website Traffic

1. Healthline.com
2. CVS.com
3. NIH.gov
4. WebMD.com*
5. CDC.gov
6. Walgreens.com
7. MayoClinic.org*
8. MedicalNewsToday.com
9. AARP.org
10. AthenaHealth.com

*Websites included in the analysis.
Source: Similarweb.com.

Takeaways

Question: Have we made progress in the readability of patient education materials (PEMs)?

Findings: PEMs provided by the American Society of Plastic Surgeons and the Aesthetic Society continue to be written at a reading level above the sixth grade.

Meaning: Equitable access to PEMs requires ongoing work at the national society level.

Reading Scores

Flesch–Kinkaid

Flesch–Kinkaid (FK) is a commonly used model for the analysis of reading materials.[19] The model accounts for words per sentence and syllables per word to assign a reading grade level (RGL) to a document. The FK grade level is calculated using the following equation: 0.39 (total words/total sentences) + 11.8 (total syllables/total words) − 15.59.[20]

Flesch Reading Ease

The Flesch Reading Ease (FRE) model produces a score ranging from 0 to 100 that corresponds to comprehension by age.[21] A higher score corresponds to easier materials. The FRE score is calculated using the following equation: 206.835 − 1.015 (total words/total sentences) − 84 (total syllables/total words).[20]

Simple Measure of Gobbledygook Index

The Simple Measure of Gobbledygook (SMOG) index is similar to FK by providing an RGL.[22] The equation for calculating the SMOG RGL is as follows: 1.043 (√30 [total polysyllabic words/total sentences]) + 3.1291.[23]

RESULTS

In addition to the ASPS and AS websites, 2 consumer websites met the inclusion criteria. The text of each PEM was downloaded from ASPS (n = 57), AS (n = 46), Mayo Clinic (n = 40), and WebMD (n = 24). See Table 2 for the summary of results.

Flesch–Kinkaid

Using FK, a score greater than 6 corresponds to materials above the recommended RGL. The average difficulty scores of ASPS and AS materials were 9.7 ± 1.0 and 9.3 ± 0.5, respectively. When compared with ASPS materials, both consumer websites were easier to read (Mayo Clinic 9.0 ± 1.4, $P = 0.008$, and WebMD 8.0 ± 1.3, $P < 0.001$). ASPS materials were also more difficult than AS materials ($P = 0.005$). Although Mayo Clinic materials were similar in reading difficulty to AS ($P = 0.25$), WebMD resources were noted to be easier ($P < 0.001$).

Flesch Reading Ease

According to FRE scoring, any score less than 80 corresponds to materials above the recommended RGL. The average difficulty scores of ASPS and AS materials were 47.6 ± 6.2 and 51.3 ± 3.9, respectively. Similar to the FK scale, the ASPS materials were significantly more difficult

Table 2. Average Reading Scores for the FK Model, FRE, and SMOG Index Across Websites

	FK (RGL)	FRE	SMOG Index (RGL)
ASPS	9.7 ± 1.0	47.6 ± 6.2	12.6 ± 0.7
AS	9.3 ± 0.5	51.3 ± 3.9*	12.3 ± 0.3**
Mayo Clinic	9.0 ± 1.4**	51.6 ± 9.8**	11.7 ± 1.1*†
WebMD	8.0 ± 1.3*‡	60.5 ± 8.1*‡	11.2 ± 1.3*‡

Compared with ASPS * = $P < 0.001$, ** = $P < 0.05$. Compared with AS † = $P < 0.05$, ‡ = $P < 0.001$.

Table 3. Most Difficult PEMs According to FK Model, FRE, and SMOG Index Across Websites

	FK (RGL)	FRE (Score)	SMOG Index (RGL)
ASPS	Regenerative medicine (14.5)	Congenital anomalies (22.5)	Regenerative medicine (15.8)
AS	Vaginal rejuvenation (10.6)	Vaginal rejuvenation (40.2)	Vaginal rejuvenation (13.2)
Mayo Clinic	Robotic surgery (12.3)	Minimally invasive surgery (23.8)	Robotic surgery (14.8)
WebMD	Cosmetic surgery options (10.4)	Cosmetic surgery options (46.9)	Cosmetic surgery options (13.6)

than AS materials ($P < 0.001$) and both consumer websites (Mayo Clinic 51.6 ± 9.8, $P = 0.028$, and WebMD 60.5 ± 8.1, $P < 0.001$). AS and Mayo Clinic materials were not significantly different in reading difficulty ($P = 0.83$), but AS materials were more difficult than WebMD ($P < 0.001$).

SMOG Index

Using the SMOG index, any score greater than 6 corresponds to an RGL above the recommendation. Similar to FK and FRE, ASPS materials (12.6 ± 0.7) were more difficult than AS (12.3 ± 0.3, $P = 0.004$), WebMD (11.2 ± 1.3, $P < 0.001$), and Mayo Clinic (11.7 ± 1.1, $P < 0.001$). AS materials were more difficult than both Mayo Clinic and WebMD. RGLs assigned by SMOG were consistently higher than those of FK, as described in the literature.[24]

DISCUSSION

Our analysis of PEMs on the ASPS, AS, Mayo Clinic, and WebMD websites demonstrates that PEMs continue to be written above the recommended reading level for patients. Despite ample research in this arena, little progress has been made to make content more accessible to patients in recent years.[25–29] This is concerning, considering the long-standing problem of low literacy rates in the United States, which has been tied to economic inequality, disparities in educational quality, and insufficient access to early childhood education in underfunded communities. Historically, systemic issues such as segregation, language barriers for non-English-speaking populations, and limited resources in public schools have perpetuated these literacy challenges.[30,31] More recently, standardized testing and curriculum changes have been criticized for not adequately addressing underlying problems that contribute to low literacy.[32]

Efforts to improve literacy have been made through legislation dating back to 1965, with the Elementary and Secondary Education Act aiming to increase funding to provide literacy services and educational resources for populations most in need.[33] Subsequent legislation has included No Child Left Behind (2002), Race to the Top (2009), and the Every Student Succeeds Act of 2015, which allocated additional resources toward literacy in our schools, with more than $17 billion in funding for 2022.[34] Despite these aggressive efforts, literacy rates have remained poor and have even declined due to the impact of the COVID-19 pandemic.[35,36] Recognizing the implications of this public health crisis, surgical specialties have realized the need to effectively communicate with patients.

When compared with data obtained 12 years ago by Aliu and Chung,[18] there is a noted decrease in scores for both ASPS and AS across all 3 readability models. Although consumer websites such as WebMD and Mayo Clinic have shown slight improvements, overall progress in the last decade has been modest. Every article published by ASPS remains above a sixth-grade reading level, with a majority (82.5%) at a high school level or higher, and a few (3.5%) still at a college level according to the FK model (Table 3). Consumer websites have also made little progress, with only 1 article below the recommended reading level (WebMD: How to take care of your stitches, FK 3.7, FRE 86.8).

Although it is difficult to identify the precise differences between PEMs provided by national organizations and easier-to-read PEMs provided by consumer websites, several factors must be considered.

First, simplifying the materials may result in important details being lost, potentially diluting the content provided to consumers. Because medical and surgical terminology is inherently difficult, scores may be falsely elevated despite adequate explanations or definitions of difficult terminology (ie, abdominoplasty or blepharoplasty). Second, patient comprehension is not necessarily tied directly to readability scores. Roberts et al[37] reported that the self-reported utility of the American Society for Surgery of the Hand PEMs was not correlated with FK and FRE scores. Thus, we must recognize that readability indices do not reflect comprehension, and efforts should be made to assess comprehension when developing resources.

Patient learning styles must also be considered when providing education and developing PEMs.[25] One such model of learning, the VARK model, suggests there are 4 primary learning types: (1) visual, (2) aural, (3) read/write, and (4)kinesthetic.[38] Most individuals identify as multimodal learners, preferring a combination of 2 or more learning types.[39,40] Although the primary objective of the present work is to evaluate written materials, it is

Table 4. Recommendations for Improved Access to and Readability of PEMs

Rewrite resources at the sixth-grade reading level
Consider providing resources targeted for patients' literacy level (basic or advanced)
Streamline social media links to online resources that meet reading level recommendations
Encourage national society members to provide links to society resources
Provide ample supplemental material including figures, diagrams, pictures, and videos
Consider the use of AI platforms to rewrite or generate resources
Promote further research into comprehension-based education material development

important to recognize supplemental PEMs on these sites. ASPS, for instance, has recently provided nonwritten resources, including illustrations, 3-dimensional animations, and other media.[41] These web-based supplements provide visual and auditory materials to augment understanding, similar to the use of traditional anatomical models and illustrations in an office setting.

Social media have become a common source of plastic surgery information.[42] Recent survey data suggest that 61.9% of plastic surgeons use social media pages.[43] Yet, posts by plastic surgeons represent only 30.2% of plastic surgery content in the United States.[44] These statistics suggest that patients must sift through vast amounts of information, much of which is not from a plastic surgeon, to find valuable educational content. Direct links to education resources (such as those included in this study) are uncommon, and those that are provided are often to primary literature, which far exceeds recommended reading levels.[45]

We advocate for national plastic surgery societies to enhance the accessibility of PEMs for all patients (Table 4). Specifically, we advocate for improved readability of materials, with a goal of reaching a sixth-grade reading level. In cases of more complex topics where this reading level may be difficult, a more simplistic version may be considered. An excellent example of this approach is seen on UpToDate.com, where patient education content is divided into "The Basics" and "Beyond the Basics." The latter offers more comprehensive information and includes medical terminology tailored to patients with higher literacy levels. As described above, a mix of 2 or more learning styles are preferred by most individuals, and thus, a variety of media types should be included. Plastic surgery organizations should continue to engage in social media platforms and provide direct links to reputable resources. Encouraging members of these organizations to share links to these materials would streamline access for patients.

As artificial intelligence (AI) software continues to evolve, its role in patient education will be critically important. Materials that can be generated or modified may provide improved readability, though additional research in this area is needed.[46] Importantly, generative AI has the ability to create content that may contain inaccurate or unsafe recommendations, threatening patient safety as consumer access to AI becomes more readily available. Aside from AI, there are many online, commercially available readability tools that content editors can utilize to ensure improved readability of materials. Importantly, readability is only 1 tool to measure written materials; the ease with which content can be read must be balanced with sufficient detail to provide complete information. Without adequate detail, there may be reduced comprehension of the materials. Ongoing research in this area is recommended to understand the relationship between PEM readability and comprehension among patients.

Our study has several limitations. First, the consumer websites we included in the study are indeed highly trafficked, though we lack the granular details to support that the traffic to the website serves as a proxy for traffic to the plastic surgery resource pages. Furthermore, the websites excluded from the analysis also contained content related to plastic surgery. Unfortunately, these data were not organized in a way that is conducive to reproducible research. This underscores the explosion of content on the internet related to plastic surgery, the vast majority of which is not reputable, peer-reviewed, or evidence-based.

CONCLUSIONS

Our data suggest that there has been only a modest improvement in the readability of PEMs over the past decade. Nearly all of our literature remains more difficult than a sixth-grade reading level and more difficult than PEMs on consumer websites. We advocate for improved readability of materials, providing more supplemental content, and increased visibility of these resources through social media channels.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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